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Valencia 2017

City and territory
in the Globalization Age

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City and territory
in the Globalization Age

1. Stages in territorial configuration

Making a sustainable network-community for refugees from the Fukushima nuclear plant disaster in a stable historic castle town and region

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Abstract. *After the Fukushima nuclear power plant accident disaster, all of the residents in the area contaminated by radioactivity and all public facilities were evacuated to surrounding regions or more remote cities on the direction of the central government. As a result, temporary housing estates for the refugees are scattered, and aged refugees still remain on these estates six years after the disaster. The town of Namie had the largest number of people who were ordered to evacuate in the evacuated area. The city of Nihonmatsu, adjacent to the contaminated area, is a typical Japanese castle town, and accepted many Namie refugees, offering temporary housing, and housing the town office, schools, hospitals, industrial sites, etc. The Fukushima Namie Recovery Project team, organized by the NPO Shinmachi-Namie and Waseda University, proposed a Network-community connecting several refugee housing estates, evacuated public facilities and other core city services. These need to be connected and their community reintegrated, in practice facilitating the "support system for the network community". This vision of a Network-community would be adapted to the historically stable region, which includes various dispersed, aged and isolated communities. Nihonmatsu, as the Castle Town of the Nakadori region of Fukushima Prefecture, is noteworthy for its historical urban areas, old streets, lots of unoccupied housing etc. That is, it is very hard to get the people of Nihonmatsu to think optimistically about shelter for Namie evacuees. Nevertheless, areas of the Nakadori region including Nihonmatsu may cooperate with the Namie evacuees and reinvigorate the ruined coastline by means of the "Network Community" – a network encompassing various historical traditions that still exist today as regional assets; thus, the vision for the future of Fukushima is one of hope.*

Keywords: Network community, Castle town region, Refugees from Fukushima nuclear power plant accident disaster

Introduction

Due to the disastrous incident that occurred in the Fukushima Daiichi Nuclear Power Plant (operated by TEPCO), the entire population of the town of Namie were compelled to leave their livelihoods and evacuate to other parts of Japan. Since this disaster, both the Waseda Institute of Urban and Regional Studies and the Satoh Laboratory of Waseda University have devoted themselves to the rehabilitation of the devastated areas. Both groups received a request from the Machizukuri Corporation NPO Shin-machi Namie (abbreviated below to: Shin-machi Namie), and since the autumn of 2011, the Waseda Group have endeavoured to support the Fukushima victims through activities aimed at community rehabilitation.
The fundamental stance of our research then is close cooperation with the city plan of the Namie-machi administration, and the

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promotion of the Rehabilitation Machizukuri project. To this end, a mutual agreement for three-way research cooperation was reached between the Namie Town government, the Non-Profit Organization "Shin-machi Namie" and Waseda University, so that the Machizukuri project may proceed smoothly. At the beginning of 2012, the Waseda research group proposed a basic schema for a circulatory process for the restoration of the Namie community over a period of thirty or forty years. (Fig. 1)
March 2017 marked six years since the disaster, and in April of this year the evacuation order was cancelled in the central section of Namie town, although the entire population of the town has evacuated, sought refuge elsewhere, and settled down in new communities built around the outskirts of Namie or in a number of host cities. (Table 1)

For the time being, before they are able to return to Namie-town, the spiritual and material safety and stability of the private lives of the refugees must be ensured. The task remains of upgrading infrastructure and planning new public housing in the host cities of Fukushima Prefecture, and the evacuees must carry on rebuilding their lives and moving forward to a fresh start; yet, these scattered evacuee communities should not be isolated. Close to each community should be constructed public facilities, familiar grocery stores or cafés for social interaction so that the scattered communities can interact and are not cut off from each other. Every "Namie outer community in a host city" built with familiar public facilities close by may not only interact with other communities but also inherit the culture and heritage of Namie. In order to beef up these "neighbouring communities," they need to be linked by means of an information system and a means of transit; and therefore the concept of the "Network Community (Fig. 2)" was put forward.

Taking the concept of the "Network Community" as its basis, this paper describes the "emerging multi-layered urban region in the host city region which accepted refugees from the contaminated coastal area, forming a network-community for refugees, centred on a historically stable castle town and its surroundings".

The network-community includes the "outer communities" formed by refugees and the "inner communities" in Namie town as base via which refugees may return to their home town, and these outer and inner communities are linked by a network of transit and information systems.

Research Question regarding the New Network-community and the Historic Region

The research question of this paper is how to build a network-community connecting the "Namie outer communities in host cities", and how to revitalize the city region by means of a network-community formed in the historically stable and declining castle town region.

One of the host cities accepting evacuees from the disaster area, the City of Nihonmatsu is a typical Japanese castle town. Nihonmatsu Castle is located on hilly land in the centre of a basin, and the castle town developed along the Oshu Highway axis that runs east to west. The town was constructed by Niwa Mitsushige, beginning in 1643. The Kasumigajo castle was constructed on a hill to the northwest of the town, and the samurai area was laid out below the castle. The castle town in its entirety was built with a sophisticated landscape design early in the 17th century, surrounded by and in harmony with nature, composed of mountains

Number of refugees	From Namie Town (as of 31th/Dec. /2016)	From Fukushima Pref. overall (as of 20th/Feb./2017)
Total	20,833	(79,446)
within Fukushima Pref.	14,470	(39,608)
outside of Fukushima Pref.	6,363	(39,818)

Table1

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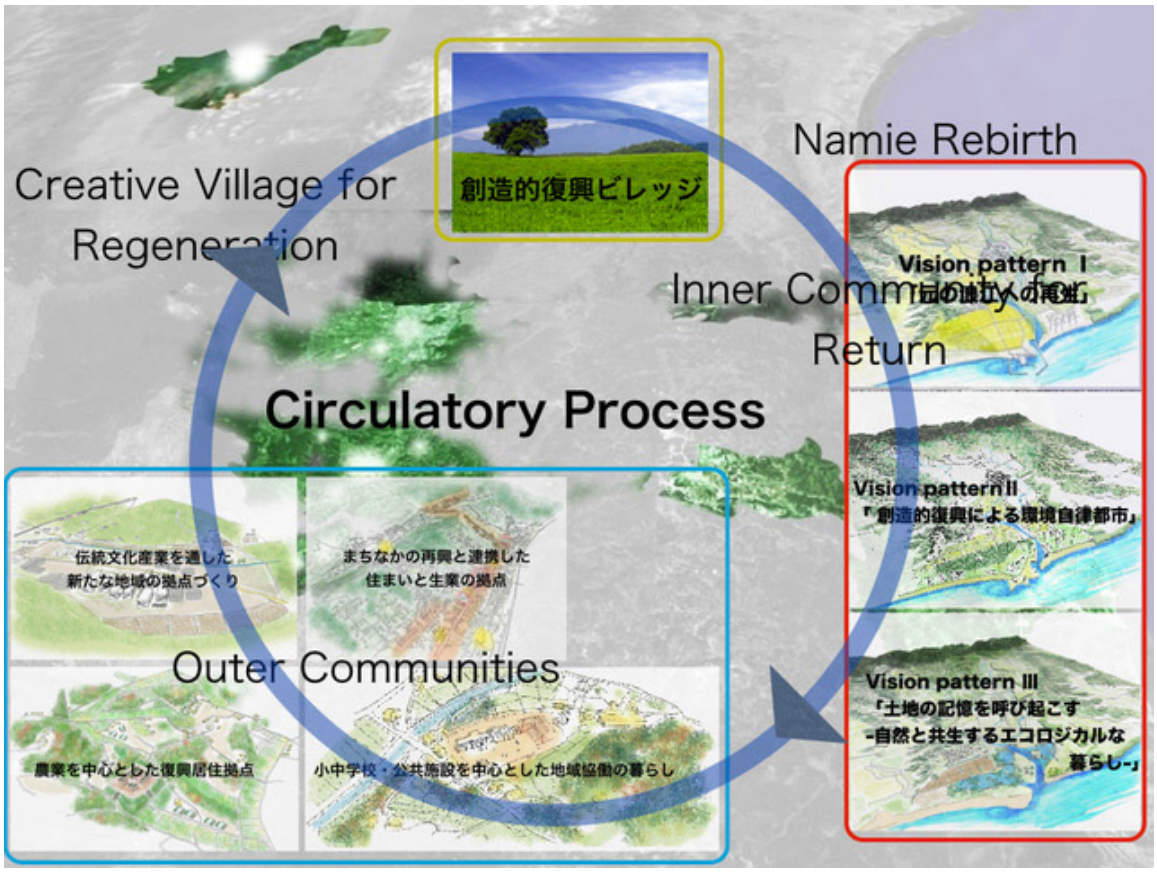

Figure 1. (Hypothetical Vision for Rebuilding the Namie Community)

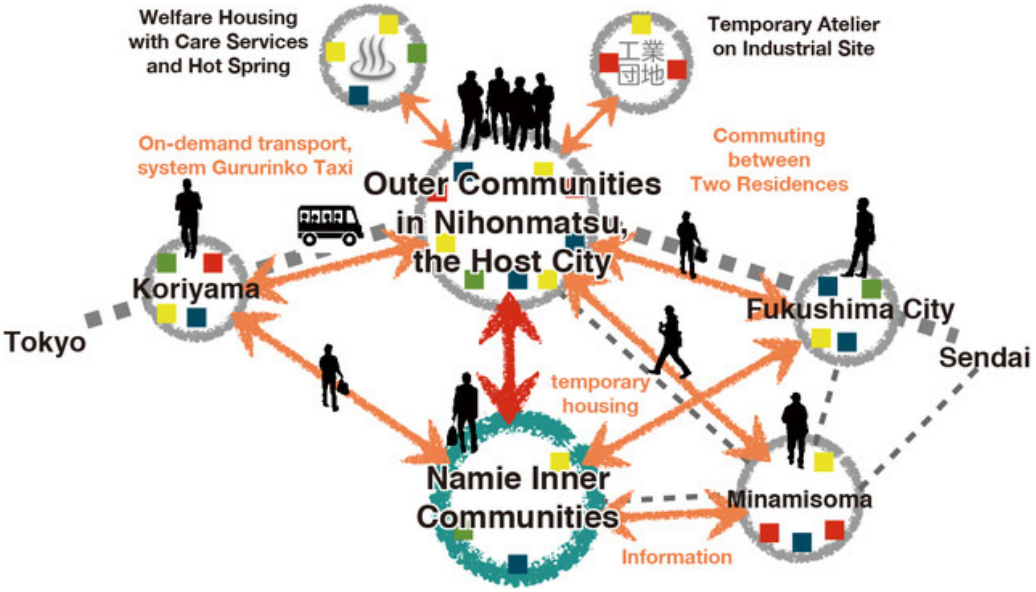

Figure 2. (Image of Network-Community for Rebirth)

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clothed in forests and an abundant water supply, symbolizing a sacred place. Using the natural environment as its foundation, urban planning is done organically, incorporating Nature. Various important places and views are connected and linked in the historic city and its surrounding areas. (Fig. 3)

In the Modern Age, since the late 19th century, the Nihonmatsu city region grew as a regional centre. Modern infrastructure was built over the historic urban form starting in the late 19th century, and urban sprawl was evident.

Since the 1980s, Nihonmatsu city centre and its surrounding areas have been declining, losing population and commercial activity – a common phenomenon in provincial urban areas throughout Japan.

After the disaster on the 11th March 2011, the schools and public facilities of Namie Town were removed from the original town area and scattered throughout the Nihonmatsu city region together with some temporary housing estates. "Outer communities," which were formed from temporary housing and other public facilities just after the disaster, need to be transformed in various ways into stable communities for the future lives of the refugees, through the construction of public and other housing, community and health care facilities. The laying over this region of a network-community of the refugees' outer communities will cause a new active energy and diversified culture to emerge. The laying of a network community over the stable and rather declining region could energise and regenerate the region. In order to avoid the isolation of each outer community, the communities should be linked by an on-demand transit system managed by a non-profit organization, and linked by an online social network system.

A collaborative planning process implemented between Nihonmatsu City and Namie Town, both at the citizen level and at the local government level, would have the effect of revitalising the region through the overlaying of the network-community. On this basis, if the Namie evacuees and the citizenry of Nihonmatsu could work together, a new model of community recovery is possible.

Those developed, or mature, regions may appear to be stable, but behind their outward appearance those regions themselves can be dull and inactive. In addition, the evacuee communities have had no alternative but to evacuate from their deep cultural roots to other regions, so conflict between the host communities and the evacuee communities does occur.

Taking as its basis the concept of the "Network Community," this paper presents four stages describing the particulars and details of the actions and methods employed, which are still being developed by our research team members. The aim is to make the town people aware of the meaning of "action research" by bringing up the process in thorough discussion of the process of action, and by expanding cooperation between the numerous subjective groups; and in this way we may expect the townspeople to see their regions energized and their communities revived.

This research began in Stage One by matching the project developed by the Japan Scientific and Technology Agency (JST) and designed to suit multiple dwellings for evacuees who favour the scattered type of community; this paper concerns itself here with how the Network Community is shaped.

Sharing of the Rehabilitation Scenario Stage 0: September 2011 ~ September 2012

Having been asked to help the project of "Shin-machi Namie," the Waseda Institute of Urban and Regional Studies and the Satoh Laboratory of Waseda University began to work on this in September 2011, setting up collaboration and team participation as the premise for the study and promotion of the assumed vision for the long-term rehabilitation of Namie. Here we set out the process for Stage Zero, in which the scenario of a network community and the vision of rehabilitation for tomorrow was prepared and shared with the people of the town.

The nuclear power plant accident was both a turning point and yet an opportunity as well. Many of the town folk wish to return to Namie and others don't; yet the townspeople as a

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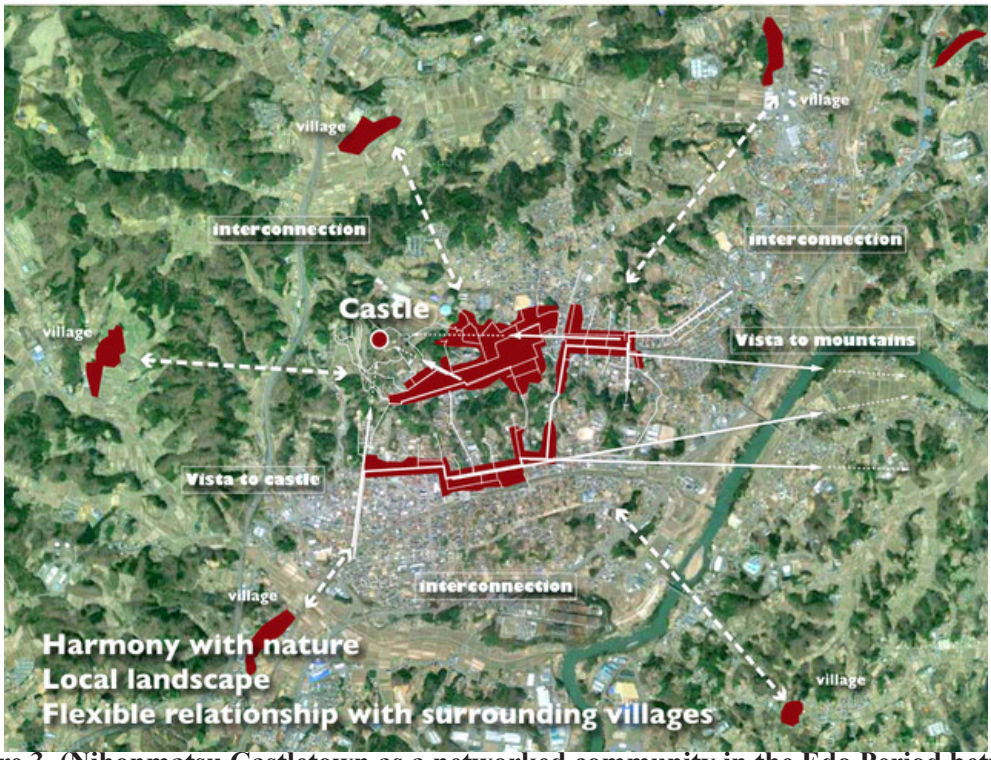

Figure 3. (Nihonmatsu Castletown as a networked community in the Edo Period between the 17th and 20th centuries)

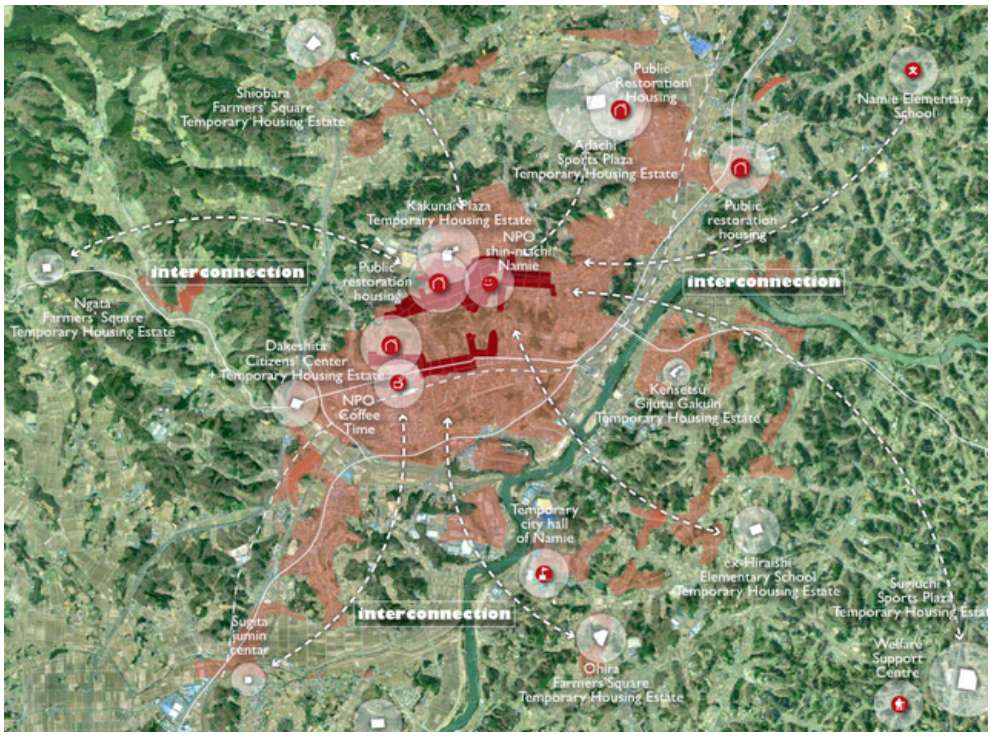

Figure 4. (Interconnection between outer communities, various layers and elements of the network system)

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whole need a vision to keep them together and maintain a unified community.

Below are described three types of community cooperation designed with the concept of linkage (see Chart 2), to pave the way for reconstruction.

(1) The Namie Inner Communities (the communities to be rebuilt within Namie)

The process for the return to Namie-machi still remains uncertain; the R&D group assumed three scenarios relating to the future of Namie. In the first scenario, the majority of the people of Namie, around 60%-80%, would return and be eager to see the regeneration of their town as it was before, and the revival of their communities. In the second scenario, many young people would feel hesitant about going home, but roughly half – about 40%-60% – of them would like to make Namie "an autonomous city regenerated by creative reconstruction." And in the third scenario it is assumed that only 20%-40% would return; they would recall the memory of Namie and live ecologically in harmony with nature.

(2) Little Namie (Namie outer communities)

The communities built in host cities as rehabilitation housing complexes must be able to meet the diverse needs of the evacuees. A network system, in particular, is needed to keep the scattered communities in touch with each other. Collaboration may also help revitalise the host cities.

(3) Villages of Creative Rehabilitation

Leaving Fukushima to search for new communities nearby or elsewhere in the Japanese islands, these evacuees would surely be eager for a community where they can have a stable life together. Making the most of the untapped resources of the land, they can lead a gentle life, raising their children, farming, raising livestock and enjoying social welfare, free from the radioactive contamination.

The mechanism to support the Network Community system ~ Creating a rough consensus Stage 1: October 2012 ~ March 2013

Since October 2012, the activities of Stage Zero have been developed and implemented as a JST R&D project. The Satoh Laboratory of Urban Planning, Waseda (the Satoh Group), the Asano Mitsuyuki Laboratory of Transportation Planning (the Asano Group), and the Andō Kiyoshi Laboratory of Social Psychology, Tōyō University (the Andō Group) took this opportunity to establish a new JST research group.

Here, we describe the process of Stage One in which a specific spatial image of the Network Community, the mechanism to support it and the scheme to put it into practice were studied.

Community Spatial Image and Public Transport System

Motivated by the idea of the Network Community developed and shared in Stage Zero, the Waseda team worked out three types of community design with specific spatial planning; two of these are Namie outer communities formed in host cities, and the third type was designed within Namie itself.

Type (1) is the "Outer Community within in the Host City," planned in cooperation with the host city to build public housing and establish bases for commercial and welfare services.

Type (2) is the "Outer Community outside the Host City," established close to the temporary housing on the outskirts of the host city, with the aim of sustaining the Namie evacuee communities that developed in the temporary housing.

Type (3) is the "Namie Inner Communities," meaning the communities to be rebuilt within Namie in the future as bases to which the evacuees could return, planned with an eye to promoting the full-scale return to Namie in the long term.

When thinking about the public transport system, the Asano Group considered the possibility of their New Gururinko transportation system being accepted, based on the image of the on-demand Namie Gururinko taxi system, which had been widely used by the townsfolk prior to the Great Earthquake and Tsunami Disaster of 2011. From this starting point, the Asano Group designed three transportation systems; the Nakayoshi town-taxi for daily activities like shopping or hospital visits, the Mirai town-taxi for temporary returns to Namie, and the Enjoy town-taxi for

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travel to recreational facilities like theatres, hot springs and hotels, and transit between homes and various public locations.

Based on the October Organisers' Meeting and the workshops held in November 2012, the models made for Machizukuri and related systems were amended and modified; and on 23-24 November the traditional Toka-ichi Festival (the most significant traditional annual event in Namie, held ever since the Meiji Era) was held in Nihonmatsu and opened to the people of Nihonmatsu for participation and creative suggestions.

Namie Declaration 1303: the Process for full-scale project implementation

Following the planning of the three types of communities, the research groups gave serious consideration to the project schemes to implement the designed projects, seeking to energise the evacuee communities.

The Satoh Group and the Asano Group, working in cooperation with the researchers and consultants from the Waseda Institute of Urban and Regional Studies, proposed several business models and the staff capable of providing the necessary cooperation. After two Organisers' meetings, most organizers had an understanding of what projects they were able to participate in, and their individual role.

Take the town of Kori-machi to begin with; this town, located in the northern part of Fukushima Prefecture, provided land on which to build a temporary housing complex for evacuees, almost all of whom are from Namie. The land is right next to the town, and plans went ahead to build a municipal rehabilitation public housing complex and private housing for sale. Thus, the above-mentioned "Outer community outside the host city" is working towards the rehabilitation of Namie; meanwhile, the Chairman of the local government, an organiser of the Fukko-juku project, began a survey of the people living in temporary housing regarding their intentions to live in this outer community outside the host city.

The NPO Corporation Jin (Jin) had been involved in the social welfare of Namie before the earthquake disaster of 2011, and since the disaster, Jin has run Support Centres in the contemporary housing complexes, and has considered the possibility of running the New Gururinko transportation system out of its Support Centre in Sugiuchi District, Nihonmatsu.

The Namie Association of Commerce and Industry has begun working on commercial activities in cooperation with the commercial areas of Nihonmatsu City to where many Namie people evacuated, and some members have started to emerge who have firmly resolved to boost local commerce and industry by creating a commercial base for the "outer community within the host city".

Through this process, the six Projects aimed at bringing about the great vision of dreams and hope shared in Stage Zero were put into practice and the Namie Declaration 1303 was officially issued on March 2013, and received the approval of many at the Namie Rehabilitation Symposium, held in the same month.

Building a foundation for the implementation of Rehabilitation Machizukuri in the refuge areas Stage 2: April 2013 ~ March 2014

In Stage One, the structure to support the image of the Network Community was shared with the local government of the host city, and with the forming of a system of mutual collaboration the foundation was in place to build the Namie Outer Communities in Host Cities in preparation for the transfer of these Outer Communities back to Namie.

The aim here is to advocate "Machizukuri for Cooperative Rehabilitation," and in order to put this into practice, the rules and structure of a cooperative network must be prepared as the foundation on which this Machizukuri for Cooperative Rehabilitation can be built. This is the process of Stage Two.

A study: the Business Scheme to start the Cooperative Rehabilitation

The first step to Nihonmatsu-Namie Cooperative Rehabilitation was taken in the central area of Nihonmatsu City where the temporary housing constructions and many Namie evacuees are concentrated. A series of

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meetings and discussions was held focused on the issue of how to energise the town of Nihonmatsu whilst building the Namie Outer Community in the Host City through the sharing by the people of Nihonmatsu and the Namie evacuees of the town's vacant land, unoccupied housing, and the commercial areas and historical resources of the castle town. The Satoh Group added to these discussions, from its surveys of vacant land and unoccupied housing, several proposals and amendments to the Namie Declaration 1303. All this, then, was examined carefully by the businessmen, tradesmen and professionals in various fields from both Namie and Nihonmatsu, and discussions began regarding a scheme to put these amendments into practice. Organisational issues regarding land acquisition and the procurement of funding to put the scheme into effect were shared, and it became clear that for the process of Cooperative Rehabilitation to go ahead it would be necessary to request the national government, the prefectural government and Namie to facilitate systematic land use.

Preparation of a structure to request a system to promote Cooperative Rehabilitation

Thus, in order to act in accordance with the consensus of the evacuees with regard to this request, the Satoh Group proposed the establishment of the Machizukuri Committee headed by the Chairman of the temporary housing residents' association, and in September 2013 a meeting of the representatives of the temporary housing residents' association was held.

Moreover, since the Machizukuri for Namie Cooperative Rehabilitation must be seen as a model for recovery for all communities struck by the nuclear power plant disaster, with the cooperation of the Fukushima Cooperative Rehabilitation (Co-Rehabi), which has built a network of victims from every part of the nuclear disaster area and their supporters, a Machizukuri forum was held. At this forum, the "Vision for the Cooperative Rehabilitation of Fukushima" was adopted by the disaster-hit communities and host communities of Fukushima as a body, and thus Cooperative Rehabilitation was started. (see Fig. 6)

Later, the Namie Machizukuri Council for Rehabilitation (the Council) was founded, following the holding of two preparatory meetings at which official requests were made and processed forward. This led to the Namie Declaration 1405, and in May 2014 the Council was officially established. In addition, a petition endorsed with over 1,100 signatures was handed in to the Mayor of Namie Town.

Beginning the experiment in earnest Stage 3: April 2014 ~

Finally, we come to Stage Three, in which practical experiments based on the activities carried out so far would be carried out in earnest.

To begin with, the Council shares information using the Namie Information Network and holds a regular monthly meeting. In addition, a network system is planned whereby a tablet terminal will be distributed to each of the more than 10,000 Namie households before the end of the 2014 fiscal year, and in cooperation with Code for Japan an app is being developed to maintain the bond between the townspeople. It is expected that this system will be used and updated, boosting the easy and timely sharing of information via SNS.

Based on the results of the New Gururinko taxi experiment in Stage Two, Jin, an NPO Corporation involved in this kind of social welfare experiment, has started full-scale practical tests – the Nakayoshi-taxi service in the Sugiuchi temporary housing area, and the Enjoy taxi service in the Adachi temporary housing area, etc. In addition, the monitoring system Ogenki Call System, developed by Professor A. Ogawa of Iwate City Univ., and using the telephones being installed in each area will surely serve a vital role in supporting the daily lives of the people of Namie. (Fig.2)
Further, in Ishikura District, land adjacent to the Adachi temporary housing complex has been reserved for the construction of prefectural disaster recovery public housing. The attached facilities will include the clinics and assembly halls evacuated from Namie and already established in the Adachi temporary housing complex. This plan is by and large

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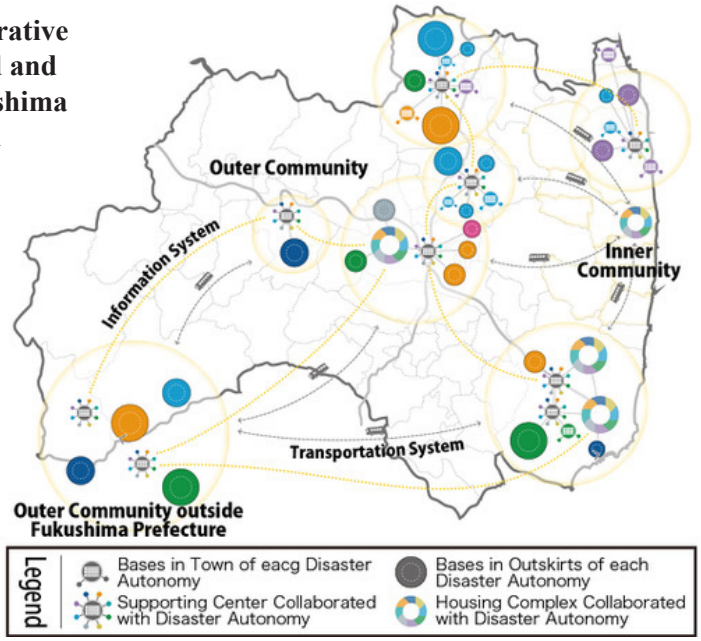
similar to the "Outer community outside the host city" of Stage One. In the case of Ishikura, the Waseda team has studied the possibility of town development incorporating the outskirts working on the premise that two hundred units of middle-class public housing will be built compliant with Fukushima standards. Working with the residents of the Adachi temporary housing complex, the Satoh Group has studied this perspective through a series of workshop meetings with the residents of the Adachi complex, using models. (Fig.5)

In this way, Stage Three is still on-going and the full-scale practical experiments are being carried out on the basis of the shared vision and the system established in Stage Two. This scheme could be expanded to all areas of Fukushima Prefecture where the many negative impacts of the nuclear plant accident damaged the local economy and society, in order to revitalise this area. (Fig. 6)

Figure 5. (Design workshop by refugees using models and images at an outer community project site)

Figure 6. (Vision for the Collaborative Reconstruction of Evacuated and Host Cities & Towns in Fukushima Prefecture as a Network Community)



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Conclusion

The 21st century faces a complicated situation, both locally and globally. As we see in Europe today, some local communities are becoming unstable and swinging between the developed, mature Europe and those unstable, changing regions where communities are endlessly in conflict against each other.

My point here is that both the stable countries and the dynamically changing communities just might be brought together in cooperation rather than be separated in conflict. Each region has its own diversified context, and each is different. Both the stable society and the turbulent society must respect the other. A new spatial model to act as an appropriate social solution for sustaining stability in these regions needs to be found. Through practical investigation into situations like Fukushima, I believe we could find a new vision for local communities and design a model to make the vision a reality.

I hope that the vision of the Network Community can also be adapted to those historical regions where the communities are aging, isolated and relatively inactive.

We must have a new vision for regional communities, and we must prepare a model for that vision.

The signs of turbulence started in Japan; my country suffered the catastrophe of the destruction, by earthquake and tsunami, of a nuclear power plant. And, in the wider world today, the mature and stable Europe has started to experience tumult and unease from its encounter with chaotic Arabic countries, or with nations who are eager to achieve their own growth.

In other words, the world today cannot afford to have its countries split into two polarities.

A new social and spatial model is needed that will enable us to stand firm and safe between the two polarities of the regional model; we must try to make these two types of regions embrace each other in peace, both socially and spatially.

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Measuring compactness of the urban landscape within a city territory for environmental capabilities: The case of 50 cities in Eastern China

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Abstract. *When a compact city is pursued as the strategy for urban sustainability the understanding of compactness is varied from the developed countries to the developing countries. In China the historical cities are characterized with high density and mixed land use. After a short time of motorization they still show compact forms in the central city. A large amount of newly developed areas are distributed in clusters near or far from the center. The crop land and natural habitat are encroached to different degrees. This paper developed an approach to measure the structural compactness of urban landscape patches within a city territory. It included six spatial metrics to measure the shape and density of the central agglomeration, the area configuration and distant relationship between the central agglomeration and the other clusters, and the distribution of all urban patches. By this approach the 50 cities in eastern China were categorized into five classes of forms: mono-center, multi-nucleus, centralized group, cluster group and scatter. Then the vegetation biomass loss with urban expansion was calculated based on remote sensing data, and used to assess the environmental capability of the five types of urban form. The suggestions of urban form optimization could be put forward for the five categories of cities.*

Keywords: Compactness, Chinese city, spatial metrics, vegetation biomass, urban planning

Introduction

Under the background of rapid urbanization worldwide, a compact city is promoted to mitigate the adverse consequences of urban area growth. It features a high density and mixed-use urban form, being claimed to conserve arable land and wildlife habitats, decrease travel by car and reduce fuel emission, improve access to services and facilities and provide more efficient public infrastructure. Despite the policy in land use policy and urban planning in many countries, the meaning of compactness lacks of consensus and few data are sought to support the claimed advantages (Jenks, Burton & Williams, 1996). Thus different indicators are studied to measure the variety of attributes of compactness. For instance, Burton (2002) defined a set of indicators at dimensions of density, mixed-use and intensity and tested in 25 UK towns. These cities performed differently for different indicators, and the scores for individual rather than the composite indicators of compactness display greater contrasts between cities. This divergent result is clearly not conductive to a clear description of traits of compactness, upon which the causes and consequences

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are to be studied. Considering uncertainty in and huge demand for the data of population density and mixed land use, morphological measures are much feasible to describe the actual physical form of built-up areas with the clarified definition, detailed and robust spatial data. A range of spatial metrics derived from the definition of sprawl condition, have been adopted to measure urban compactness as the other side of the coin (Galster et al., 2001; Tsai, 2005). They depicting land use patterns at dimensions of density, continuity, centrality, clustering etc., can be compared among cities in different countries (Angel et al., 2005; Huang et al., 2007; Hagen-Zanker & Timmermans, 2008). In addition the physical and spatial pattern of urban areas provides a basis upon which to achieve urban efficiency. For instance, through selecting particular urban form we can estimate how much energy can be saved. To build such a consistent planning paradigm there are still some lack of studies aimed at integrated innovative analytical approach and accurate assessment of urban performance under investigation (Silva, 2016). This paper will take the real case scenarios of Chinese cities to study the physical forms of built-up areas aiming at assessing urban performance.

Chinese cities have two thousand years of history, many of the old city developed within the city wall until the 1950s. Since the 1980s, the process of urbanization accelerated in the form of increase in the number and scale. The new city was built on the basis of the original county town. Big cities, in addition to their own outward extension, but also built some secondary centers in their territories through the establishment of development zones, new towns, and etc., thus promoting the expansion of urban scale. During this period, the population growth and employment needs drove urban expansion on the hand of endogenous stimuli, and on the other hand the urban planning regulated to a large extent the scale and morphological changes of Chinese cities (Chen et al., 2009). China's urban planning policy which took the excessive expansion of the city in the West and other developing countries as a mirror, strictly restricted the development of large cities. In the perspective of saving land, a criterion of per square kilometer per 10,000 people has been severely implemented in the master urban plan, effectively maintaining the high population density in the central city. At the same time, the group development is promoted to meet the needs of urban growth. The group layout of compact urban clusters in a city territory has been reflected in the master plan. In this context, most of the city's central area and other concentration areas are dense, although it cannot be said that the full efficient use of land, the study of compact development shifts to focus on the compactness of city group structure (Fang & Qi, 2007; Ma & Jin, 2011). It involves not only the centralized layout of edge growth to a core but also the multi-center concentration, or multi-level center of the centralized layout. Thus the dimension of global spatial autocorrelation should be considered to reflect the compact thinking of the group.

Methodology

Considering the multi-dimensional and multi-index characteristics of urban compactness, a clustering analysis method was used in this study, by which the cities with significant discrepancy in compactness were quantitatively differentiated and classified. Based on the SPSS19.0 software, the Euclidean metric is chosen as the measure of similarity, and according to the values of compactness index the sample cities are classified by the Wards method of hierarchical clustering. On the one hand, the classification approach can partly keep information of the basic indicators and avoid the semantic ambiguity of the composite index. On the other hand, the synthetic type through classification can be used as the basis upon which urban performance be assessed, and effect index by types can be obtained and discussed in association with compactness. In this study the indicator of vegetation biomass loss under urban expansion is adopted for the performance assessment. A higher indicator value denotes the bigger ecological loss caused by urban expansion in the selected urban form type, meaning the effects of the compactness type is less preferred.

The spatial metrics are selected to reflect the

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structural compactness. Because of the core-periphery structure of Chinese cities all the urban clusters in a city territory are separated into the central built-up area and the others. The dimensions of density, shape, distance and spatial autocorrelation have been considered for the individual or composite characteristics of the two types of urban clusters. The density and shape measures are only applied to the central built-up area which hold the major urban activities, as the first level of compactness metrics. The second level of compactness measures reflect the spatial structure of the central area and the other urban landscape patches, including their area composition and distance distribution. In addition, the global spatial autocorrelation index is used to analyze the spatial layout characteristics of all patches as the third level of compactness measure. Each level of specific indicators are chosen from the defined spatial metrics in literature (Richardson, 1973; Brueckner & Fansler, 1983; Cole, 1964; Tsai, 2005). After repeated comparison of index feasibility, applicability in Chinese cities and data availability, six indicators have been determined in this study, including the Richardson compactness, density gradient at the first level; continuity, Galster centrality at the second level; Gini coefficient and Moran'I coefficient at the third level. Their definition and calculation methods are shown in Table 1.

The study area is located in the central eastern coastal area of China, including all the designated cities in the Yangtze River Delta excepting for Zhoushan which is composed of islands. The total of 50 selected cities include two types: the city with district (or prefecture-level city) and the city without district (or county-level city). The territory of the first type city is the outline boundary of its urban districts, excluding the area under jurisdiction of the county, for the second type city the territory is the administrative scope (Fig. 1). In this study the built-up areas in a city territory involves the central one and its peripheral clusters, key towns, not including rural settlements. We obtain the patch vector data of the built areas from interpretation of the satellite images with the resolution of 30 meters in 2000 and 2010, which is used for calculation of the spatial metrics. Moreover the data of the urban land within the concentric circles for the density gradient calculation, as well as the built-up area on the grid for spatial autocorrelation analysis can be acquired by the superposition operation of the vector data.

Taking vegetation biomass as an example, this study attempts to assess the city performance with different compactness. Vegetation biomass presenting the total amount of organic matter (dry weight) in a unit area, at a given time, and distinguishing the types of green areas quantitatively, is mapped based on multi-sourced data, including remote sensing, meteorology, land use/cover, forest inventory, and grain yield (Li et al., 2016). With the data of built-up area change from 2000 to 2010, the biomass loss values per unit area of urban expansion is calculated for the assessment. The higher the value the lower the benefit of the compact city type in a view of vegetation conservation.

Measurement and analysis

Results for the six compactness metrics are reported for each of the 50 YRD cities. Similar to the previous literature, different indicators perform different among the cities by the bar graph (Fig. 2). When considering the size of the city the large cities are characterized with some lower density gradient and higher Moran'I, while variation of the indicator among small cities is little. In general the indicators and the size of the city is not particularly consistent with the law of change, revealing that the indicators of independence is strong. Five urban form types are obtained by cluster analysis. For each type, the difference between the internal mean value and the mean value of each index is expressed by standard deviation (Table 2). When the average of one or more indicators within a type is much higher than the mean of corresponding indicator, this type is regarded to be dominated by this or several indicators. According to the core-peripheral relations denoted by the indicators, combined with the experience observation of real case of urban areas, the five types are defined and modeled,

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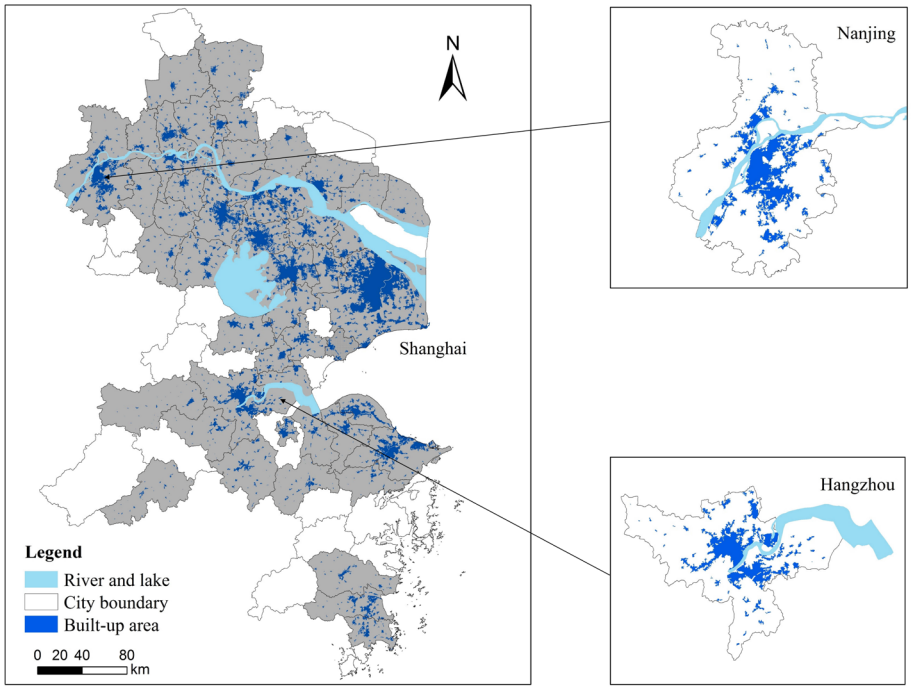

Figure 1. Location of the 50 cities in the Yangtze River Delta region in eastern China

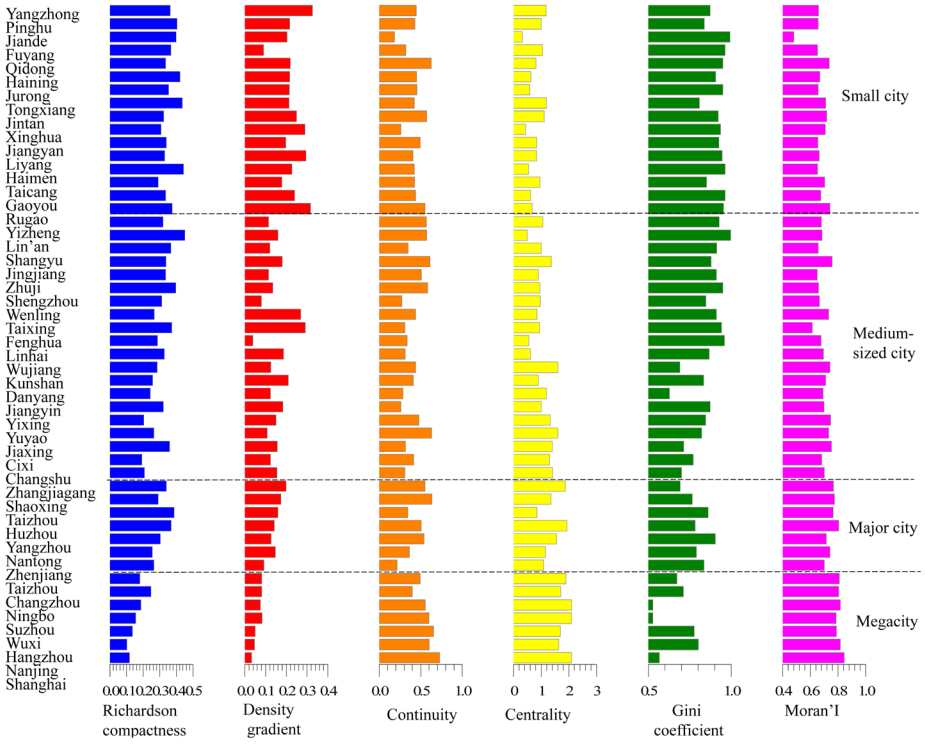

Figure 2. Variation of 6 spatial metrics among 50 cities in the Yangtze River Delta region
Note: according to statistical yearbook of 2009 from National Bureau of Statistics of China, 50 cities are divided into four categories: megacity (more than 1 million people), major city (0.5~1 million people), medium-sized city (0.2~0.5 million people), small city (less than 0.2 million people)

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such as the type of centralized group, the type of scattering and so on (Fig. 3). The details are illustrated in the following paragraphs.

Type I involves the cities in the form of centralized group, including Shanghai, Nanjing, Wuxi, Hangzhou and Suzhou. For the five cities the continuity, centrality and Moran' I index are higher than those of other categories, indicating that the urban land patches in the city territory is balanced and highly clustered (the high Moran' I), the central area occupies a big proportion (the high continuity), and the peripheral group land shows the trend to the heart (the high centrality). The shape compactness and density gradients are generally low, indicating that the central area is loosely formed. By investigating the real urban cases, the form may be related with the strong radiation effect of big city center of this type of cities, which leads to

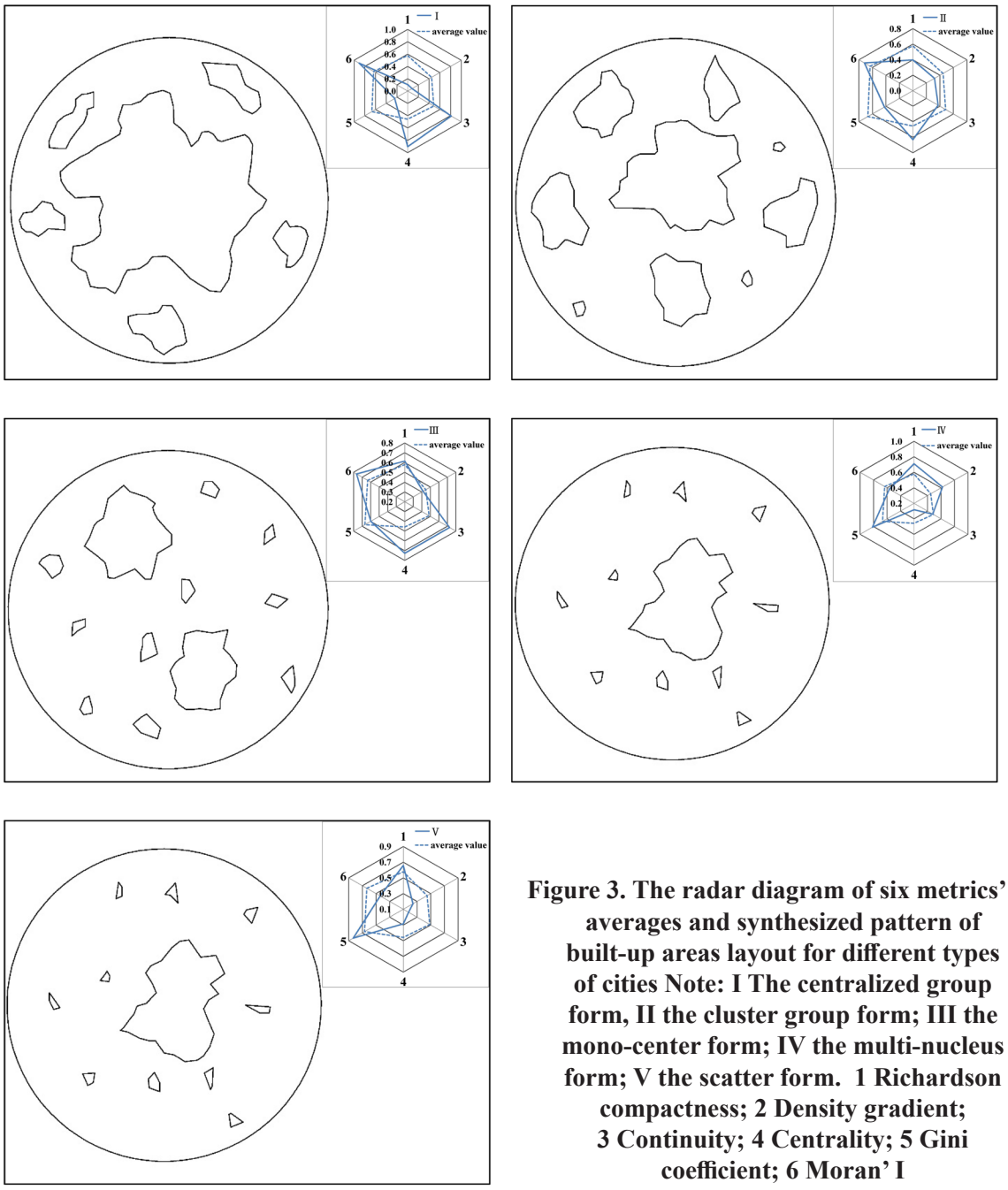

Figure 3. The radar diagram of six metrics' averages and synthesized pattern of built-up areas layout for different types of cities Note: I The centralized group form, II the cluster group form; III the mono-center form; IV the multi-nucleus form; V the scatter form. 1 Richardson compactness; 2 Density gradient; 3 Continuity; 4 Centrality; 5 Gini coefficient; 6 Moran' I

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leaping development as well as extension from the center, the surrounding towns expanding to the center, and the overall urban intensity being high.

Type II represents the cities with a cluster group layout, including the three prefecture level cities of Ningbo, Changzhou and Zhenjiang, and the five county-level cities of Yuyao, Cixi, Jiangyin, Changshu, Zhangjiagang and Kunshan. The cities in this type have higher centrality index and Moran' I coefficient, but lower continuity index, indicating that the proportion of the center area is reduced, and the peripheral urban clusters and the center together show the group layout. For the prefecture level cities, due to the more developed new towns and port areas, the central area declines in the dominant position. The county-level city is in the rapid development of industrial parks and township enterprises, which promote a great growth of towns catching up with the central city, accordingly performing a multi-cluster distribution pattern.

Type III represents the mono-center cities, including Nantong, Jiaxing, Yangzhou, Taizhou, Shaoxing five prefecture-level cities and Jingjiang a county-level city. The city type features high continuity index and high centrality index, indicating the prominent position of the central area; at the same time the Moran' I coefficient and Gini coefficient are higher than the mean, indicating the uneven distribution of urban land in the city territory. The central area gathering elements of resources in the polarization stage of development, grows faster than the surrounding and further attracts capital, technology, talent, services and other elements to continuously gather in the center. The gap between center and the external increases and enhances the distribution of single-center urban form.

Type IV is named as the multi-nucleus city form, including one prefecture-level city (Huzhou) and 24 county-level cities, the most of the YRD cities. The Gini coefficient is higher, indicating that the spatial distribution of the urban land is not balanced and concentrated in a few patches. However, the continuity index and the centrality index are lower, revealing that the central area has a low proportion and the other urban areas don't show centripetal agglomeration. In addition, the Moran' I coefficient is lower, indicating that the overall degree of urban clustering is not high, and further reveals the "several dots" layout feature. Investigating the practical cases, the size of the cities belonging to this category is generally small, and the economic activities are concentrated in several towns with outstanding development advantages in the territory, which constitutes the nucleus of urban development.

Type V features a scatter form, including a prefecture-level city of Taizhou and Linhai, Wenling, Fuyang, Shangyu, Jiande five county-level cities. The contiguity index and the Moran' I coefficient of these cities are the lowest among all categories, indicating that the size of the central area is not dominant and the overall degree of agglomeration is low. Gini coefficient is the highest in five categories of cities, showing that the urban development is very uneven. In general, the development of land within the domain is low, and do not have the characteristics of centripetal organization, showing a strong dispersion. Investigating the real scenarios of this kind of cities, the layout of urban development is affected by the natural division of the mountain and the hills as well as the spontaneous construction along roads. The built-up area often appears narrow strips, and the structure of the urban land use is relative loose.

For the above five different types of urban compactness, the biomass loss for urban expansion between 2000-2010 is calculated with the biomass spatial data, and the results show that the average loss of urban type I is the lowest, the average loss of type V is the highest, the average loss of IV is the second highest, and the average loss of type II is not much different from that of III (Table 3). Based on the morphological characteristics of five types of cities and their biomass loss assessment results, it can be seen that the types with central agglomeration or aggregation around the central group (I, II, III), present the lower biomass loss rate, and accordingly perform better for the ecological efficiency. The development of multi-nucleus and discrete cities is easy to lead to greater biomass loss. This conclusion is consistent with the general understanding of the compact city, and

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reasonable. In order to eliminate the interference of other factors, we calculated the population density and economic density of each type of city, and found that these factors do not have obvious regularity between the various types, and there is no significant correlation with most of the morphological indices. This indicate that the classification results are not affected by these population and economic factors, with independence and stability for featuring urban form. Although the natural conditions such as terrain and vegetation cover influence the spatial distribution of biomass and further influence the biomass loss, the difference existing at the small scale in local area can be neglected considering the average of the city scale. Therefore, we believe that this result can be used to guide the urban planning in the study area. In order to maximize the effects of the compactness, the city should choose a centripetal and clustering structure: for the city with a stable dominant center, the new clusters should be located around; for the small and medium-sized cities at the fast growth stage without a strong center, strengthen and expand the central area is conducive to the formation of a compact and efficient form.

Conclusion

In the Yangtze River Delta, where the urban population density is high, the urban spatial compactness is diverse, involving the geometric compactness of the central city, the close relationship between the center and the periphery, and the global agglomeration. Five different types of representations are defined as the basis for the performance assessment and planning of urban spatial structure. The analysis manifests that the compact structure of centripetal gather can play a better ecological benefit. For the small and medium-sized cities which are in the stage of growth and not forming a strong center, it is beneficial to strengthen and expand the central group to form a compact and efficient form structure. The current study only takes this dimension of biomass to account for the stability and significance of the compactness classification, which should be used for more evaluation of the effects of urban morphology.

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Stages in the configuration of urban form in urban development planning: the emerging role of open spaces as sustainability mechanism. The case of Valladolid (Spain)

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Abstract. *Along the last five decades and through three different stages, the urban development plans —general plans— of Valladolid, a medium-sized Spanish city, show an interesting evolution in the way of configuring the global urban form and controlling urban development that we can also find in other similar Spanish cities. In the sixties and seventies, plans proposed 'autonomous' expansive schemes foreseeing a huge rate of urban growth, so they defined wide areas to be urbanised through new transport infrastructures and typical zoning mechanisms. In the eighties, after decay in urban and economic development and during the transition to democracy, the new local governments focused on the existing city and fostered a more controlled urban growth. However, plans continued to employ the same tools to manage future urban form —definition of transport infrastructures and sectors to be urbanised—, although they looked for more 'controllable' forms, such as radio-concentric ones, aiming at a gradual and homogeneous implementation —compact city—. When real-estate market recovered in early nineties, this strategy revealed its weaknesses: fragmented urban fringe and tendency to a congestive model, reinforced when a new generation of expansive plans drove these schemes out of the limits they were conceived with. However, an alternative and more sustainable model had already emerged, as some new urban planning tools proposed a change of perspective: managing global urban form not through future urbanised spaces, but through open ones, generating an 'empty' network able to give coherence to the whole urban structure in a metropolitan scale.*

Keywords: Urban development planning, urban model, open spaces, Valladolid, Spain

Introduction

The term of 'urban morphology' is related to different urban research traditions. One of the most influential is the Conzenian school, whose antecedents are the work of some German geographers at the end of nineteenth century. Their starting point was 'the scope that existed for recognizing within town plans the stages in their development' (Whitehand, 2001, p. 104). That approach concerns town plans understood as the result of different urban processes of both growing and transformation, whether these processes were planned or not.

M. R. G. Conzen developed this approach through new concepts such as urban fringe or morphological frame. The latter relates to the morphogenesis, specifically during the transformation of rural land to urban tissues. The forms that are created at that time show 'a powerful long-term influence'; 'town plans are powerful influences on future forms, with residual features being passed down through successive generations of society, often over very lengthy periods' (Whitehand, 2001, p. 106).

Considering these processes of generation of new urban spaces, they can also appeal to town plans understood not as a result, but as a project. Urban development planning deals

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precisely with the transformation of non-urban areas into urban ones, proposing a more or less defined form, according to their scope. These forms that plans propose are the result of different influences and, as pointed, they are themselves a powerful influence, even though the plan is revised or substituted by a new one before becoming the real town plan. Thus, it is also possible and very interesting to analyse the stages in the configuration of urban form in urban development planning, comprising the characterization of the influences affecting every stage and the influence of every of them in the next ones. Following the Conzenian term, this paper aims at defining successive 'morphological periods' in urban development planning in the Spanish city of Valladolid.

Regarding this aim, it is first necessary to set the concept of urban development planning, as it comprises a wide range of planning tools with very different scopes. This paper focus on urban development planning tools whose scope comprises the whole city, namely planning tools defining the global urban form. Thus, it concentrates on urban structure and the way it is defined rather than on typological analysis. In the Spanish case, this kind of tools corresponds to the so-called Planes Generales de Ordenación Urbana or general plans, whose main objective has consisted of planning the urban development of the whole city, defining those areas to be urbanised in the short and in the long term along with the structure supporting this growth.

Second, it is also necessary to justify why Valladolid has been chosen as case. Valladolid is a medium-sized city located in the centre of the region of Castilla y Léon, in the north-west of inner Spain, and along the last five decades, it has experienced an impressive urban growth. At the end of the fifties it had only 150,000 inhabitants, and it is now the centre of a metropolitan area with 400,000 inhabitants, three quarters of them corresponding to the city. This growth was to be managed through different general plans; among them, two comprising the city and two comprising both the city and its metropolitan area can be highlighted. Beyond its specific characteristics and proposals, these plans represent the trends in Spanish urban planning along this period to be also found in other similar Spanish cities. Regarding urban form configuration, they define three clear stages that could be explained as the evolution of general plans towards more place-based proposals.

The sixties and seventies: autonomous schemes for an expansive urban growth

Form early sixties, Spanish economy experienced an impressive growth that was accompanied by a huge urban growth. In fact, a clear connection was established by the politicians between both phenomena, so it was stated that urban growth would reinforce economic growth. Consequently, the Spanish government promoted an expansive urban policy that required a new generation of urban planning tools.

The first Spanish Land Property and Urban Planning Act had been approved in 1956. This act created the general plans as the main tool within urban law in charge to plan urban growth in every municipality. These plans were to be coordinated at a provincial and even national level, and were also to de developed through other planning tools affecting sectors to be urbanised or transformed. However, the implementation of this act was slow and partial. Some municipalities approved their general plans, but they continued to follow schemes and to use mechanisms that they had been using since nineteenth century. The Ministry of Housing, created in 1957 to assume all competences concerning urban planning and development, decided to act by itself and it developed a lot of urban projects even though the general plans of the municipalities had not included them. At the same time, it put pressure on municipalities so they approved new general plans fostering urban growth.

The case of Valladolid is very representative of this process. During the sixties, the population grew more than 50% and that involved a remarkable urban transformation. A lot of neighbourhoods became densified and new residential zones for workers were built in some little vacant spaces among them. This transformation was mainly controlled by local real estate developers supported by the

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Figure 1.
Metropolitan Plan of Valladolid, 1970.
Road network: plan of stages

municipal government, which was reluctant to update the obsolete urban plan that had been approved in 1939. However, at the end of this decade, when these local developers were also looking for new ways of getting profits from urban growth, the local government finally accepted the suggestion of the Ministry of Housing to elaborate a new general plan.

At that moment, the Directorate-General for Urbanism was also looking for new ways of configuring urban growth. Most general plans that had been approved until then were rather traditional plans of expansion through ensanches, but that did not satisfy the requirements of the great urban growth that Spanish cities were experiencing. Rejecting the typical monocentric model, the 'directional growth' became the best solution (Terán, 1982, p. 402-3). This new urban model came from the theories developed by C. A. Doxiadis, widely spread in Spain. This famous Greek architect defended that the traditional urban model, composed of centre and periphery, was no longer viable due to the expansion of cities. He then proposed the alternative of the 'dynapolis', so 'the modern metropolis can expand following a direction […] centre and periphery would keep a continuous balance while the city grows over vacant or uninhabited spaces' (Doxiadis, 1963, p. 112).

Regarding this new orientation of urban planning policies, the new general plan of Valladolid became 'the clearest example of directional planning, which has assumed the well-known proposals of Doxiadis' (Terán, 1982, p. 403). In 1968, the local government of Valladolid commissioned a team leaded by the architect Javier de Mesones the elaboration of this new general plan, but the Ministry of Housing decided that this plan would include not only the municipality of Valladolid, but also other 13 municipalities around it, in order to promote urban development at a metropolitan scale. The general plan became then a metropolitan plan.

Doxiadis had explained that the dynapolis 'would progressively take its geometric form through a rectilinear system of axes', and that grid would be organised through the 'human sector', 'basic element of widest urban zones as a whole' (Doxiadis, 1963, p. 112-5). The new metropolitan plan, which was finally approved in 1970, clearly assumed these ideas. Taking into account that the workers neighbourhoods were mainly located along the north and the east of the city, the plan proposed to foster the urban growth towards the southwest, which was also the direction of the main transportation routes connecting with Madrid and the northwest of Spain. Following this direction, the plan designed an ambitious grid of motorways that extends beyond the limits of the municipality of Valladolid ignoring any territorial constraint and that defines residential sectors for 20,000 inhabitants, while new industrial zones are placed at the east, close to workers neighbourhoods.

New transportation infrastructures and typical zoning mechanisms define an urban model that matches Doxiadis ideas and that is also 'a faithful reflection of the urban planning policy, prevailing in the sixties, impelled by Local and Central Administrations' (Figueroa Salas, 2000, p. 52). There is not any reflection on existing urban conditions, but reports that analysed the opportunities to contribute to economic development through urban growth. Valladolid had 235,000 inhabitants at the

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beginning of the seventies, many of them living in bad conditions, but the metropolitan plan concentrated only on how to reach 780,000 inhabitants in 2003. Foreseeing this huge population growth, it proposed an 'autonomous' expansive scheme, an abstract and self-organised grid to make that growth possible. However, the economic crisis that burst just a few years later made this proposal unfeasible. Along with other factors, that resulted in a clear shift in urban policies that also affected the way to plan the urban form of the city.

The eighties: a radio-concentric model for a compact city

From the mid-seventies, Spain entered into a period of deep political and economic changes. The international crisis that burst in 1973 affected Spanish economy and stopped urban growth while the country was carrying out the transition to democracy after the death of dictator Franco in 1975. After the first democratic general election that took place in 1977 and once the new democratic Constitution was approved in 1978, the government called for the first municipal election on April 1979. Urban issues played a key role during that campaign. Left-wing parties such as the socialists or the communists pledged themselves to foster a radical shift in urban policies. They promised to focus on workers neighbourhoods, which were suffering severe deficits of basic urban equipment such as parks, schools, health centres, etc., and regarding urban growth, they rejected the expansive models that had been promoted but had become unfeasible. Eventually, these parties won the election in most important Spanish cities, including Valladolid, so they started to put their promises into practice, which involved the revision of general plans.

Beyond this reformist spirit, the new generation of general plans promoted by these new local governments assumed a 'dialectical relationship between structure and form, between structure and plan' (Calvo, 1990, p. 99). They looked for an integrated perspective combining two approaches: the parts defining

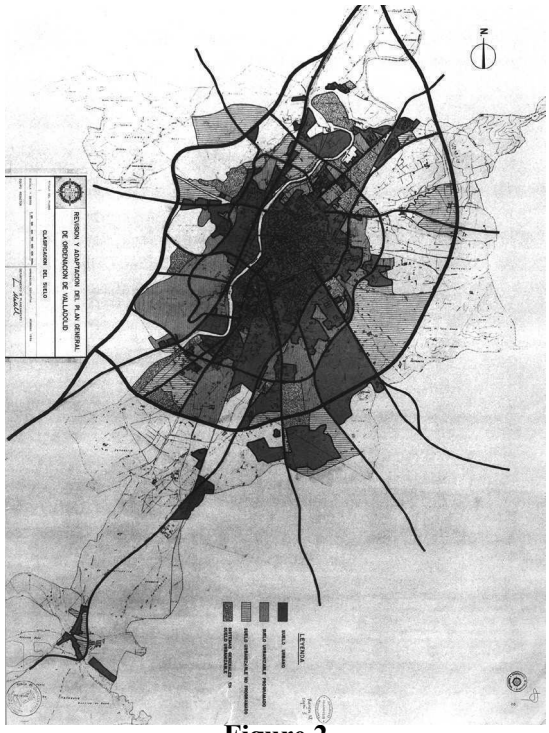

Figure 2.
General Plan of Valladolid, 1984.
General Structure and land classification.

the whole, and the whole defining the parts, i.e. they analysed and reflected on every part of the city so it would match the whole structure of the city, and they also checked that the addition of all parts would result in a balanced global structure. In this regard, they paid a particular attention to urban form at the intermediate scale, considering the existing city as the main reference and promoting its improvement in terms of reinforcing the coherence among the typologies, the network of streets and the planned or existing public spaces and buildings. All these features shared by most plans of that period were summarized by some authors under the expression of a 'more urban urbanism', so attached to the existing city that, in fact, 'the form of the city is the existing city itself, yet corrected and improved' (Solá-Morales and Parcerisa, 1987, p. 50).

However, the problem of future urban growth had also to be faced. As the previous expansive models were considered excessive and unfitted to the existing city, the objective consisted of finding a model that would continue to be expansive but that would also allow the continuity with the existing city and even its improvement. While the most innovative

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effort concentrated on the re-definition of urban form within the existing city, the global urban structure was usually conceived from conservative schemes that had proved its efficiency, such as the radio-concentric ones. Aymonino (1981, p. 173-4) points that this scheme 'assumes a growth model based on a single political-administrative centre' and that it becomes 'the most suitable to foresee urban development —mainly composed of residential settlements—; indeed, these new sectors can be considered, within this scheme, as pieces to be added to a system that runs since preceding times […] such as the system of the compact city'. Consequently, the radio-concentric model affirms the municipal power within metropolitan frameworks and it also sets the will to control urban growth, following this model of successive pieces that fit in a previously defined structure that emerges from the existing city and guarantees a continuity between what exists and what is planned. Valladolid and its new general plan, elaborated by a team headed by Bernardo Ynzenga and approved in 1984, are again a clear example.

This general plan aimed to get a 'spatially balanced and, specially, socially inclusive urban model, in contrast with the previous ones and assuming a radio-concentric spatial structure' (Fernández-Maroto 2015, p. 260). This radio-concentric scheme was composed of a double system of ring roads. The inner ring road was placed close to the existing periphery of the city, to fill in the spaces between it and this new road with new residential areas combined with public spaces to serve to both the existing and the planned neighbourhoods. Further away, the outer ring road defines a belt of residential sectors that would assume the urban growth in the long term and that define the final foreseen model of a compact city. However, this apparently isotropic scheme was altered by the effects of the metropolitan plan of 1970. Both ring roads are in fact uncomplete, as they connect with a motorway that follows the southwest direction that the metropolitan plan identified as the developing corridor to promote. Furthermore, the foreseen new residential sectors were to follow a programming that prioritized many located likewise in the southwest of the city. In fact, most of them were previous projects of local real estate developers that the new general plan decided to assume.

Thus, this general plan made use of traditional planning tools such as transport infrastructures or residential sectors to complete the existing neighbourhoods or 'pieces' of the city with additional future ones. All of them would remain embedded in a radio-concentric scheme that would guarantee a gradual and homogeneous growth towards a bigger but compact city. 'The costs of imposing to territory this apparently right conceptual form […] seem here high' (Solá-Morales, 1985, p. 11), but it was thought that the urban growth inertia towards the southwest could be controlled inside this scheme, and the illusion of a compact city prevailed. However, it turned soon into disillusion.

The nineties: the emergence of an alternative model in a fragmented territory

After the years of crisis, urban growth resumed from mid-eighties following economic

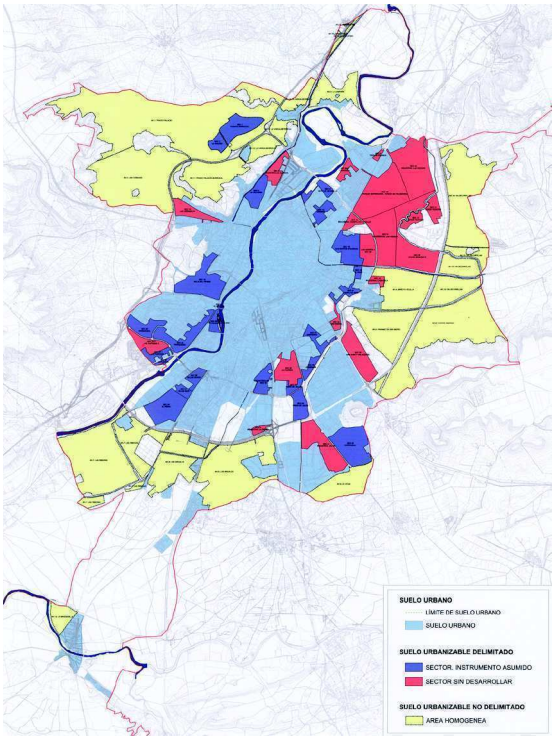

Figure 3.
General Plan of Valladolid, 2003.
Land classification.

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development. Real estate market started a path of growth that briefly stopped between 1992 and 1993 but that progressively sped up since mid-nineties to the extent of generating a bubble that finally burst in 2008. As happened in the sixties and seventies, the role of real estate market in Spanish economy was fostered. First, investments were promoted through fiscal benefits. Later, actions related to urban law and practice were also taken. The Land Property and Urban Planning Act was reformed in 1998 to increase land offer to be urbanised, and municipal governments promoted the revision of general plans to put this policy into practice. Within this context, 'the question of urban planning, of the construction of the city, give in to the question of land, of the management of land market' (Roch Peña, 2001, p. 6). The concern on urban form and its cultural and social significance that existed in the eighties disappeared in practice.

In Valladolid, new residential sectors started to be developed from mid-eighties, all of them located in the south of the city. At the same time, some other municipalities close to this part of the city started to attract population that used to live in Valladolid, especially young people who found good dwellings at a better price than in the city. Ignoring the principle of territorial balance that the general plan approved in 1984 included, the municipal government of Valladolid reacted to this phenomenon and it promoted a complete new neighbourhood in the south of Valladolid after buying some land there. However, that action did not stop the move of people from the city to its surrounding municipalities, especially to those located in the southwest, the traditional and always promoted axis of development.

These surrounding municipalities had started to revise their general planning tools to increase the quantity of land to be urbanised and the municipal government of Valladolid decided eventually to employ the same strategy. The radio-concentric scheme that was defined in the eighties was driven out of the limits it was conceived with when a revision of the general plan was approved in 2003. Although numerous residential sectors that have been foreseen close to the existing city had not been developed, new ones were defined beyond the outer ring road, without thinking in a new scheme to assume that kind of expansion. It was a 'hyper-forecast of urban development […] with no coherence regarding its strategical points' (Rivas Sanz, 2008, p. 289), a plan with no urban form, as spatial mechanisms are completely absent.

When real estate market fell down in 2008, the consequences of this uncontrolled urban growth revealed themselves. Urban development had driven some parts of the city to a situation of congestion, with an excessive concentration of new residential zones, whereas some other parts became failed, as some zones were urbanised but not occupied, remaining half-empty. Emerging urban centralities were also bad managed, as several malls were promoted even though there was not enough demand to make them viable. This expansive urban model left behind a fragmented urban fringe, a condition that has been pointed as the main characteristic of contemporary cities, in opposition to 'the image of a regular, isotropic and infinite urban space, purified of any contingent character' (Secchi, 2004, p. 150). The kind of urban space that was foreseen

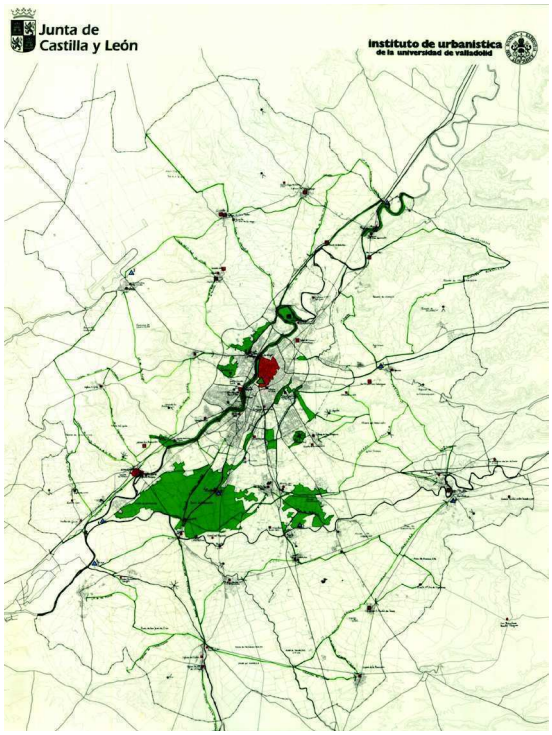

Figure 4.
Land Planning Guidelines for Valladolid, 2001. System of parks and green corridors.

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in the eighties and that revealed itself as unfeasible in the nineties. The question is then how to manage urban form within the context of the diffuse city.

In this regard, an alternative and more sustainable model had already emerged in Valladolid during the years of expansive growth. When the regional government of Castilla y León assumed competences in urban issues from mid-nineties, it approved a Territorial Planning Act that included new urban planning tools regarding metropolitan areas. Consequently, it commissioned the elaboration of the Land Planning Guidelines for Valladolid and its surrounding area, whose objective was to establish some criteria to manage urban growth without affecting the competences of municipal governments, which obviously constituted a great constraint. However, this new and innovative planning tool overcame this barrier by proposing a new perspective to define urban form at a metropolitan scale. The Land Planning Guidelines were not allowed to decide where to locate new urban areas, but they were allowed to prevent urban growth in those areas that merit a protection, due to its ecological or productive values. After thoroughly analysing the characteristics of the territory in the whole metropolitan area, the Land Planning Guidelines defined several spaces to be protected: the so-called Areas of Singular Ecological Value, which are the most important natural spaces, and the so-called Most Valuable Agrarian Landscapes, which are linked to historic infrastructures that had defined the structure of the territory. Furthermore, the Land Planning Guidelines proposed a metropolitan system of parks and green corridors to be 'the moderative key of dispersed growth and the guarantee of the positive quality of settlements system' (Rivas Sanz, 2010, p. 313).

Thus, they proposed a structure for the whole metropolitan area to be built upon a system of protected spaces and green corridors. Open spaces and the 'empty' network that would connect them emerged as the best way to define urban form in the context of the diffuse urban growth and the fragmented territory. They aimed at giving coherence to the whole urban structure in a metropolitan scale,

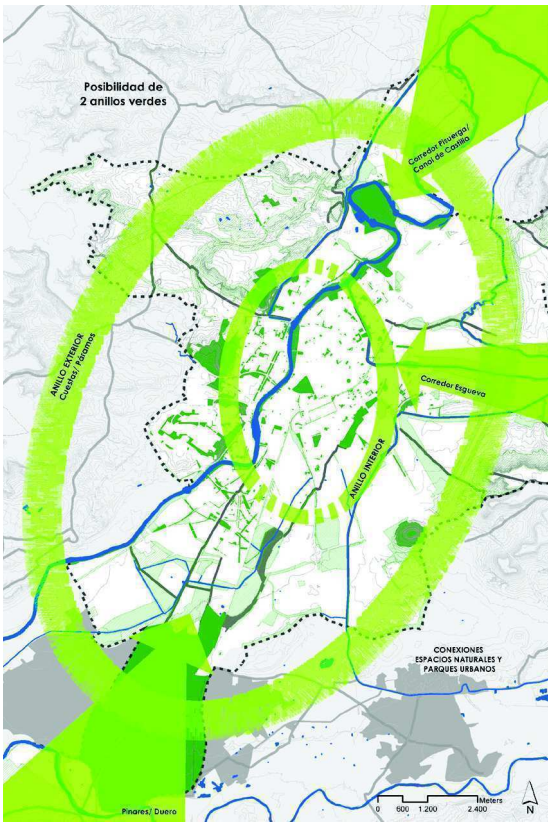

Figure 5.
General Plan of Valladolid (Advance), 2012. Scheme of inner and outer green belts

while the traditional mechanisms consisting of defining the zones to be urbanised were risking its sustainability.

Conclusion

Planning cities or metropolitan areas through an alternative system based on non-urbanised spaces and corridors is emerging as a more sustainable urban model. The process described in the case of Valladolid can also be found in other similar Spanish cities. For instance, the Accompanying Plan for the International Exhibition that took place in Zaragoza in 2008 proposed a network of green spaces related to various rivers and waterways. Gathering all reflections regarding this question that had been conducted for more than 15 years, this proposal aimed at giving coherence to the whole urban structure by guiding urban regeneration actions. The pioneering and most known case is Vitoria and its Green Belt, a comprehensive project for

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the whole periphery of the city that started in the eighties as a way to avoid floods and that later had to face expansive strains regarding new residential areas that put it at risk.

This kind of new urban networks is more and more related to a shift in city management summarised through the expression 'grey to green' (CABE, 2009), which means that traditional 'grey' urban infrastructures such as roads or canals can be substituted by more place-based, green mechanisms, which results in a more sustainable management of urban metabolism. However, it can also be read as a shift in urban form planning. In the context of the diffuse city, closed schemes employing these same 'grey' systems as planning mechanisms are not able to control urban growth, which is nowadays fragmented and depends on a multiplicity of decisions that are impossible to foresee. It is thus important to define an underlying scheme ensuring a more resilient and sustainable urban development.

The challenge consists of integrating this alternative model in usual urban planning, which continues to be very depending on those traditional mechanisms regarding the definition of future urban form. This new way is nevertheless little by little paved. After the bubble burst, Valladolid is now revising it general plan, and the advance document that was approved in 2012 to guide the revision proposed a new perspective on general urban form that is structured upon an inner and outer green belt. Following the spirit of the Land Planning Guidelines, these green belts are to assume the role of the inner and outer ring roads, which have been guiding urban form in the last thirty years.

Acknowledgments

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The substratum permanent structures of Roman Valencia

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Abstract. *The shape of the territory and the urban settlement of numerous Valencian cities were strongly conditioned by the original imprinting of Roman planning, characterized –as it is known- by large scale infrastructures, by settlements of orthogonal axes and by the allocation of the plot division into square modular divisions called centuriae. All the later interventions took necessarily into account such structures, which underwent numerous transformations over time, especially from the second half of the twentieth century. Then innovations and developments in modern technology contributed –more than in any other period– to neglect and override the traces of the original configuration. Territorial and urban research into Roman structures in the Italian peninsula has allowed the recognition of a sufficiently large number of plans, thus allowing the development of a complete general research method to read analogous structures in different Romanized territories. The authors now propose to apply this method to the territory of the Valencian Community. The rectilinear outline of Via Augusta with its forking side paths, the orthogonal signs of the agrarian fabric, the military milestones and the administrative divisions suggest, also in this case, the possibility of retracing the original pattern. Its structure could contribute, among other things, to explain the logic of the expansions outside the walls of the historic centre of Valencia that might otherwise seem arbitrary and meaningless.*

Keywords: Roman Valencia, substratum permanent structures, city planning, historical transformations

Introduction

This conference paper is the result of a joint research started by the mid-1990's and suspended because of a lack of funding by the European Community. The research was basically part of a series of educational and cultural initiatives involving, in various areas, researchers teams from the Facoltà di Architettura di Firenze and from the Escuela Técnica Superior de Arquitectura de la Universitat Politècnica de València (Cataldi and Corona, 2002). After more than 20 years, on this important occasion, placing Valencia at the centre of international attention on the Urban Morphology studies, we considered it appropriate to resume the hypotheses from that time in order to update, confirm and compare them with recent studies on the urban form of Rome (Cataldi, 2016) and Florence (Cataldi, 2017, in print). The "substratum permanent structures" of Roman territorial planning (centuriations, first of all) seem to play, in our opinion, a very important role due to their binding presence in the urban transformation processes in the countless European cities of Roman origin.

The method of 'reading' and the hypotheses of Forma quadrata theory

Territory is a kind of huge spatial solid palimpsest, which bears the "structural signs"

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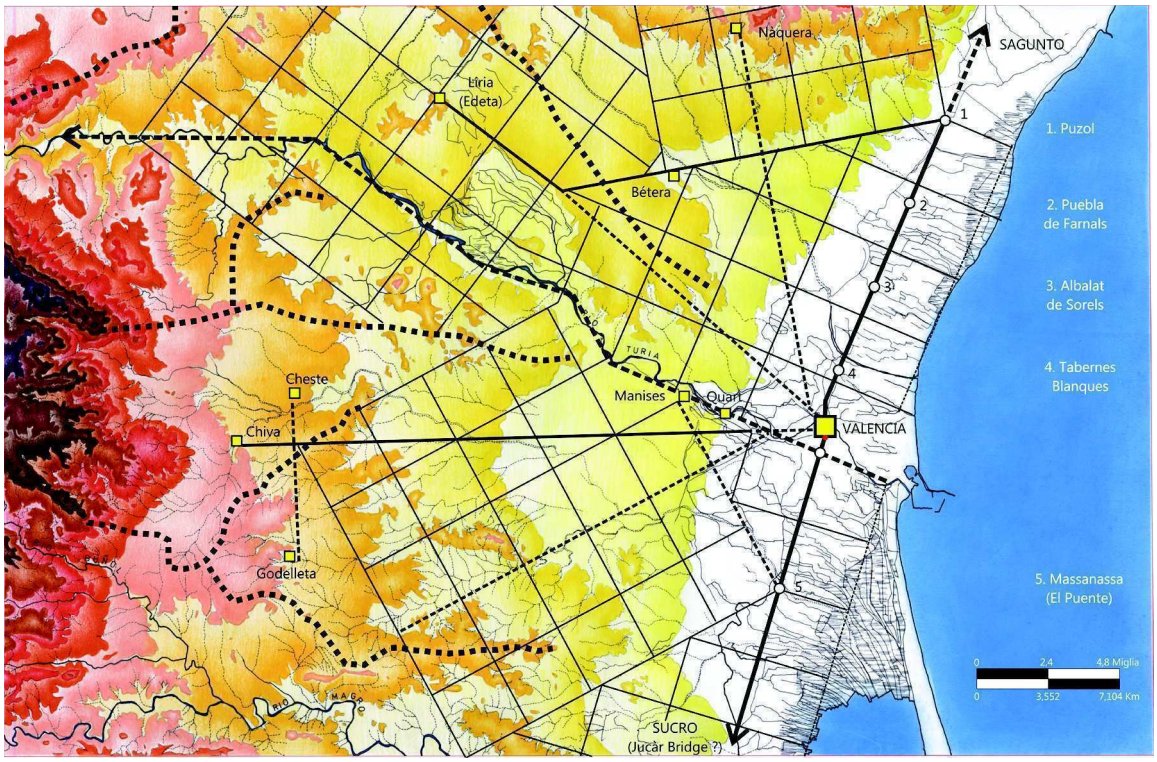

Figure 1.

Hypothetical reconstruction of the Roman planning of Valencia's territory in the imperial period.

introduced by men, overlapping and reusing them over the course of time (Cataldi, 1977). So territory, in this sense, can be considered as the only big book that cannot be counterfeited in the history of humanity, nowadays spread over the entire surface of the planet. The reading of this book is generally made by pulling off the layers of the different stratified systems of signs that, as the chapters of a tale, all together give shape to the plot. The semantic key element of each diachronic "tale" logically depends on the degree to which the inherited structures are reused, whose "essential" components (that cannot be missing) –conventionally divided at a methodological level– are settlements, fabrics, routes and limits (Cataldi, 2009, P. 141). Interpretative difficulties about the phase changes stem from the fact that the new settlements' systems of signs are, normally, the concrete expression of mental abstract programmes (projects).

The substratum structures of the Roman period, as well as those of other previous ridge-top phases (Cataldi, 1977, pp. 45- 46) are the most persistent: probably because they initiated the right of private property in the western world, i.e. the possibility of passing along lands and properties to heirs. The Forma quadrata theory is the result of multiple convergent readings of territories planned by Romans (Cataldi et al, 2000; Cataldi 2007; 2016; 2017). Due to length restrictions, on this occasion we can just suggest two fundamental hypotheses of this theory, based on the assumption that Roman surveyors designed their plans on measured maps called formae, technically created on geodesic squared meshes with oriented modular coordinates secundum caelum, with clearly reducible dimensions (scale-related), starting from an ager of twelve square miles, through the saltus (1/25th of the ager) to end with the centuria (1/25th of the saltus). As on a squared paper, they then designed the colonial plan on a map, establishing on the geodesic mesh the best direction (from a hydraulic point of view for the rainwater runoff) for the two axes cardo and decumanus of the new squared planned unit (with the typical dimensions of an ager oriented secundum naturam), using for this task certain relations of integers univocally fixed, on maps and on the land, in reference fixed points of the geodesic mesh (Cataldi, 2007; 2016).

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The regional plan of Roman Valencia (Figure 1)

• The two straight layouts of Via Heraklea – Augusta.

The layout of Via Heraklea-Augusta, north of Valencia's plain, is well-known and it is not difficult to find the marks of Roman centuriation on it. It is clear to notice that the road's straight layout and its counter axis, based at the end of the Turia River valley, cross themselves orthogonally in the proximity of what would become the city of Valencia.

However, what is less clear –and strengthens the findings reported in this paper– is its study in the light of what we called Forma quadrata secundum caelum. Everything makes sense when we consider the coincidence of important territorial milestones and Roman urbanisation with the big 12x12 Roman miles squares (Ager) and its subdivisions in 25 saltus (Cataldi, 2017, in print).

According to this theory, the squared system secundum caelum oriented at cardinal points could be the primary system thanks to which Romans gained a general vision of their whole territory and the reference geographic system, useful later on to design, secundum naturam, communication roads and cities based on them.

This way, Valencia's territory has its northeast vertex in the settlement of Puçol, and the location of the Turia river mouth during the Romanisation period would be marked on its southern side, where counter-axis of the Turia valley starts. It must be noted that the coastal line in the foundational period of Valencia city should have been a few kilometres to the interior (Furió et al., 1999, p. 13).

It wasn't just a matter of drawing some points on a grid. The Forma quadrata allowed establishing, through simple relations with the mesh, the directions of different layouts. This way, the northern section of Via Heraklea has a 3:7 relation with the grid and, inversely, the end of the Turia river valley has a 7:3 relation.

It can't be seen as random the fact that settlements between Puçol and Valencia (Puebla de Farnals, Albalat dels Sorells y Tavernes Blanques) are at the same distance on Via Heraklea's straight layout: it could be the topographic result of consecutive triangulations in order to keep the road layout straight.

If the straight northern section of the Via kept the same direction in the southern Valencia plain, it would end up encountering the hills. Thus, it was necessary to use a different ratio 3:10 in order to orient the itinerary with the foothill line and keep it in the plain, avoiding Albufera. It is not random that the Miguelete tower is nowadays its visual point of reference. The intermediate settlement Massanassa is placed close to El Puente, place-name indicating explicitly its strategic function of territorial control. It is placed as well on a possible topographic triangulation spot.

• The squared fabrics of plain (centuriae) and mountain (saltus)

However, Roman surveyors not only used the ager grid with its secundum caelum orientation (N-S, E-W). Following the analogy established in this paper with the procedures used in different Roman-founded places in Italy and especially Florence (Cataldi, 2017, in print), we could suppose that each of the two straight sections of Via Heraklea-Augusta might have served as axes generating big modular units (agri coloniali), with 12 Roman miles each side, divided into 25 saltus (5x5) in mountain areas and, in turn, divided in 25 centuriae (5x5) in more fertile plain areas. In the areas close to Valencia, this assumption is not just a mere hypothesis because it is easy to find a coincidence between the current agricultural and political divisions and the layout of the various aforementioned agri.

Continuing with the Florentine analogy, we can assume that, over the centuries, the layout of agri coloniali –with their consequent saltus and centuriae– presented more complex layouts, as they were based on the itineraries that connected the main city, Valencia, with the most prominent surrounding Iberian cities: Liria, Náquera and Chiva.

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Urban developments of Roman Valencia

• The hypothetical squared founding castrum on the Turia River island (Figure 2).

Historians (Sanchis Guarner, 19721; 19885 , p. 22) and archaeologists (Escrivà Chiver et al., 2010, p. 30) seem to agree on the fact that Valencia was founded in the year 138 B.C. on one of the many river islands created by different branches at the Turia delta, close in that area to its mouth.

It doesn't seem that other settlers had established before in that location because no remains from other cultures have been found in the subsoil, underneath the first Roman settlement layer.

All this allows us to assume that the beginning of Valencia was a Roman military camp that would be settled on the highest spot of the biggest delta island of river Turia, in a spot that would let them control the location where Via Heraklea met the river. This settlement was even more successful because Valencia lays half way between the two main cities of the Republican period on the Mediterranean coast: Tarragona and Cartagena, 250 Km far from each of them (López-Davalillo Larrea, J.,1999, p. 69).

Tito Livio (Sanchis Guarner, 19721; 19885 , p. 22), from whom we got just a short summary, talks about Valencia as an oppidum, meaning a stronghold or walled city. However, given its strategic value for the protection of the location where Via Heraklea met the river Turia, we can assume that a castrum was initially located where later there would be the city of Valencia. This hypothesis coincides with the usual customs of the Roman army and has been detected in the founding of different cities, particularly in Florence (Cataldi et alii, 2000, p. 17; Cataldi, 2016, in print) which is our point of reference and contrast.

If we admit that the Florentine model is valid, we have to accept that the Valencian castrum was a settlement based on a squared cardo-decumanus structure of 1000 feet per side, to which 100 would be added as an area of belonging. Thus we get to 1200 feet per side, which equates to a quarter centuria. It seems logic that no remains of this have been found because of the lightness of the materials used for its construction (stockades and tents), especially if the new city would be built on it later on. Here, the research method based on reading the signs on the territory and on the current urban fabric is especially valuable to understand the shapes and infrastructures built in the past.

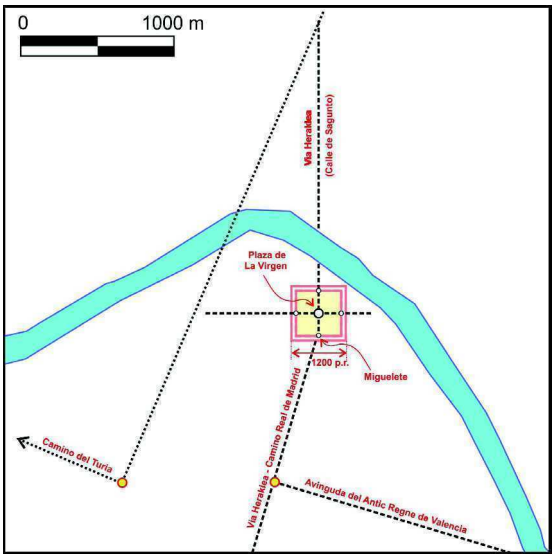

Figure 2.
Hypothesis on the original castrum in Roman Valencia.

So for this reason we have to suppose that Valencia's castrum was placed on a big fluvial terrace elevated over surrounding lands and encircled by some of the many branches in which the river Turia was divided in this final section of its course, allowing an efficient defence and a better control over the river crossing. Cardo and Decumanus maximus probably were the same as the ones used later on in the city. This way, we could accept that the first settlement was a Roman squared camp, 1200 feet long, with the main cardo maximus axis being the same as the current calle de Navellos and its extension on the other side of the river: calle de Sagunto. The presence of this road, whose course still exists in the current urban fabric and has the same orientation as the cardo in the future city, is necessary to find the oblique line of Via Heraklea's northern section (3:7 ratio) and still maintains the place-name corresponding to Porta Saguntina. In the south, starting from Porta Sucronensis, Via Heraklea starts with a new orientation (3:10 ratio) which

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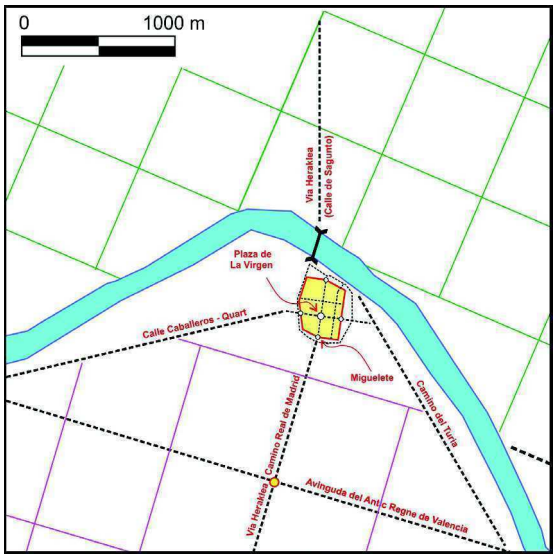

Figure 3.
Hypothesis on the urban form of Valencia in the Republican period.

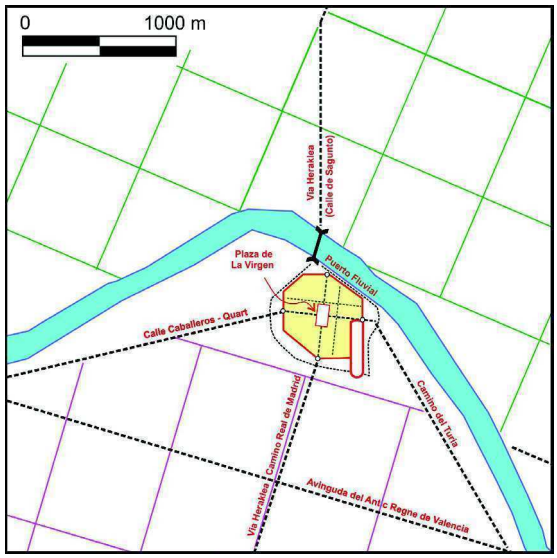

Figure 4.
Hypothesis on the urban form of Valencia in the Imperial period.

allows avoiding the Albufera lagoon and the hills southwest of Valencia's plain. If this theory were true, the location for the construction of the Miguelete many centuries later wouldn't be random: besides its Cathedral's bell tower function, it would also be the perspective focus of Via Augusta, or better said, the visual point of reference of the southern section of the aforesaid Via.

Sometime after this camp, the oppidum that Tito Livio wrote about was founded (Sanchis Guarner, 19721; 19885, p. 22). We can assume that, starting from this moment, the layout of centuria fabrics started to be planned on the brims of the two straight sections of Via Heraklea. The existence of this initial spatial organisation is evident in transport infrastructures, rural ways, irrigation system and division among municipalities, and it strengthens the validity of the assumptions of this paper.

With the transformation from Castrum to Oppidum (Fig.3), the military camp becomes a colony and the place of the soldiers is taken by settlers, who normally would have been discharged soldiers (Sanchis Guarner, 19721; 19885 p. 24; Escrivà Chiver et al, 2010, pp. 53-54). According to the remains found and funeral uses, it seems that these first settlers came from central and southern Italy. The colonial city maintained the road structure and increased its surface.

This paper suggests an interpretation of the location of a highly significant element, cardo maximus, which is not the same as the most accepted interpretation among Valencia's archaeologists (Escrivà Chiver et al., 2010, p. 46). In particular, it doesn't make sense that the northern connection were made through the current calle de Alboraia because this road is parallel to Via Heraklea and their connection would be impossible. However, if the cardo maximus laid on the current calle de Navellos, its logical extension being calle de Sagunto, which follows the same direction, the connection with Via Heraklea would be direct and, moreover, it is consistent with the urbanising Roman customs.

• The developments of municipium in the imperial period (Figure 4).

After a long period of almost complete abandonment that started with the destruction and burning of the city in the year 75 B.C. after the Civil War (Sanchis Guarner, 19721; 19885 , p. 26; López-Davalillo Larrea, J., 1999, p. 58; Escrivà Chiver et al., 2010, p. 58), the municipium of Valencia was reconstructed, but it maintained the basic structures layout and the fundamental location of the Forum, which was however reconstructed –even in its pavement–

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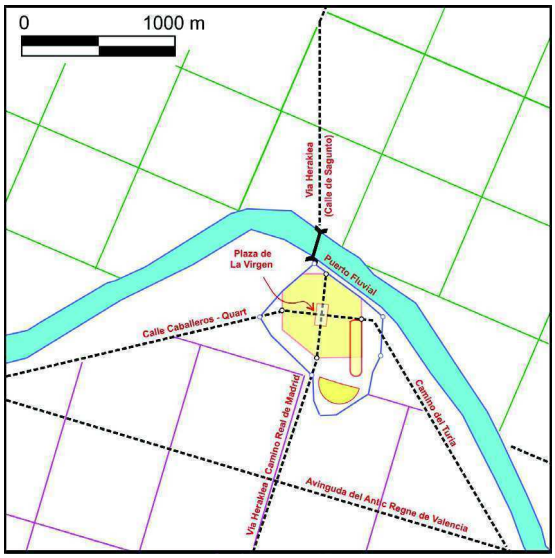

Figure 5.

Valencia's Islamic walls seem to substantially follow the route of the second fringe belt of the imperial city, except from the southern route, whose expansion can be explained by the presence of a hypothetical theatre, that could be recognised over the basis of the current urban network signs.

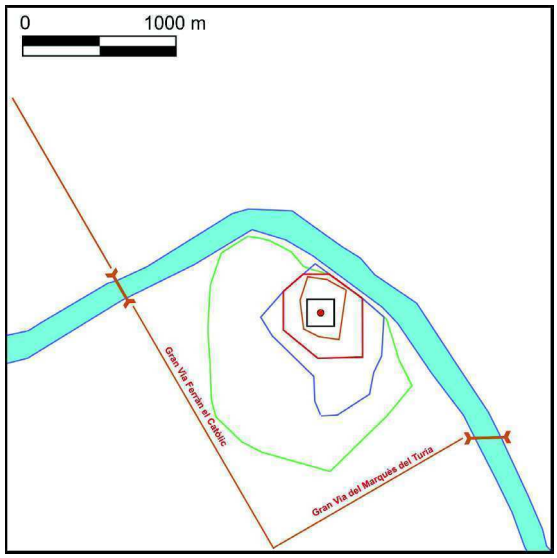

Figure 6.

Synthetic representation of the development processes of the urban form of Valencia, besides the Islamic walls, including the 14th Century walls and the two Grandes Vías from the first years of the 19th Century.

and provided with important monumental buildings (Escrivà Chiver et al., 2010, pp. 50-57). Thanks to it, Valencia reached the rank of one of the main cities in Hispania. The walls follow a polygonal geometric layout. This layout –which we hypothetically reconstructed on the basis of its traces on the actual fabric of the external itinerary of the fringe-belt– seems to observe the typically Roman principles of symmetry and regularity. The Saguntina and Sucronensis gates, placed respectively in the far north and south of the cardo maximus, were built together with the corresponding wall edges, while the east and west gates of decumanus maximus seem to be placed at the centre of large walls.

The documented presence of an important circus in the southeast part of the city (Escrivà Chiver et al., 2010, pp. 37-39) allows to rightfully address the question of the existence of a theatre because, in Roman cities of the imperial period, it was customary for this important building dedicated to theatre performances to be constructed before the circus (Merlo, 1996). Likewise, it is possible that no remains of the possible theatre have been found yet, the same way that nobody talked about the circus of Valencia until a few years ago when archaeological findings proving its presence were found. Again, the research method based on the reading of current fabrics allows to propose the hypothesis on the existence of the theatre assuming that it could have had an impact on the curved section of the Islamic wall in its southern route (Sanchis Guarner, 19721; 19885 , p. 44; (Figure 5).

Conclusion

From our paper, we can draw two conclusions:

In the case of cities with a Roman origin, the methodological need to inductively reconstruct, starting from current signs, the planned mesh of centuriations designed on the margins of the large consular roads. Unlike reductionist positions that only consider as valid the interpretations based on findings of material remains or documents of the time, the presence of layouts and landmarks that meet the Roman way of proceeding in the current fabric can be used to propose hypotheses on historic processes that generated cities and current territories. The layouts of roads and ways, the divisions in property and between municipalities are, if interpreted correctly,

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just as real as the material remains, and they must become part of a global process aiming at understanding the past.

The need to analyse the influence that the ancient fabrics had on the modern planned structures. In this sense, the case of Valencia is exemplary: two of the main modern infrastructures, the railway line and the international airport of Manises, actually follow the orthogonal layouts of Roman planning based on cardo and decumanus. The knowledge and interpretation of facts that took place more than 2000 years ago is valuable in itself, but it is also useful to correctly understand the current situation and to distinguish between the aspects of reality that are a consequence of history and those which are just a matter of random chance.

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Dysfunctions in the territorial form: The case of Valencia

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Abstract. *It is possible to associate the idea of territorial harmony with the idea of territorial function. The perception of a territory with distributed uses that allow the observer to identify its functions and a landscape, urban and territorial, appropriate to the uses, generates a sense of harmony or order of "things", uses, in the territory. To the contrary, when, for example, people observe a natural space or resource as agricultural lands, where other external uses are located, such as industrial installations or transport infrastructures, the observer perceives a disorderly, degraded and dysfunctional landscape. This idea can serve as a basis to analyze the territorial forms. This article aims to analyze the territorial dysfunctions that have occurred in the process of transformation of the metropolitan area of Valencia and propose actions to manage the territory to sustainability. In metropolitan areas, such as the case of Valencia, there are usually spaces of great environmental value that give an environmental service as an ecological pantry for the population. However, in recent times, many of these spaces have undergone processes of urban sprawl that have produced a collapse of territorial harmony. In addition, mature metropolitan areas have low or no population growth while the artificial territory continues to increase. It is necessary to promote positive initiatives to identify and manage the green infrastructure. This implies a structural review of territorial management processes to achieve sustainability.*

Keywords: Territorial quality, regional planning, territorial landscape, territorial management, urban sprawl

Introduction

Currently, European cities, in general, are in equilibrium situation of growth. The cities were grown during a long period. This period produced urbanized urban areas but also the urban sprawl phenomenon in periurban zones and a list of infrastructures networks that connect the sources of energy, natural resources and people trips with the city.

Particularly in Spain, with a strong tradition of urban planning, intervention on the territory and the city has focused mainly on urban development of the city, or expansion of the city, and, to a lesser extent, in the city built. The management system for urban development generates complete urban forms of the sectors that are developed. However, the rural land or "non-urbanizable" land (according to the name used in Spanish laws), when is not protected, accumulates diverse elements of all kinds that end up converting it, in many cases, in a "no place". Now, when cities cease to grow and urban borders consolidate, their degradation is appreciated. Until recently, these degraded edges were often spaces waiting for their urbanization. This situation made them into places and forms indefinite and, therefore, without harmony. And now also the absence of quality of that space indefinite of the urban borders is appreciated. Many of them have been generated by infrastructures. This paper intends to make an approximation to these degraded forms, to the processes and technical behaviors that have originated them and to possible forms of intervention.

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Periurban dynamics

Especially in the 21st century and during the urban expansion period 1997-2007 and the period of real estate crisis, from 2008 to the present, metropolitan areas have increased surfaces and decreased density.

This phenomenon is general. For example Wheeler (2017) studied the dynamics of six metropolitan regions of US in period 1980-2005, and concluded:

•Metropolitan areas had a very big increase of their urbanized areas and a very big increase of surface of metropolitan areas.

•Metropolitan areas had an important decrease of density both of population and houses in metropolitan regions.

In Spain, between 1997-2007, there was an expansive economic cycle based on real estate speculation that ended with the economic crisis that started in 2008 and which still stands today (Miralles, 2014) with special consequences in touristic coastal zones (Garcia-Ayllón, 2013).

Feria et al. (2016) studied the dynamics of metropolitan areas of Spain between 2001 and 2011. They observed that, in the case of Spain, metropolitan areas increased its populations during the period of real state bubble as you can see in Table 1. But in the crisis period, its population stopped or decreased. They think that this trend will continue. In spite of that, the processes of metropolitan areas expansions and urban sprawl keep going on and densities continue decreasing. That is the case of metropolitan area of Valencia, a metropolitan area next to Mediterranean Sea.

So it is necessary to know the new reality of metropolitan areas to generate policies in order

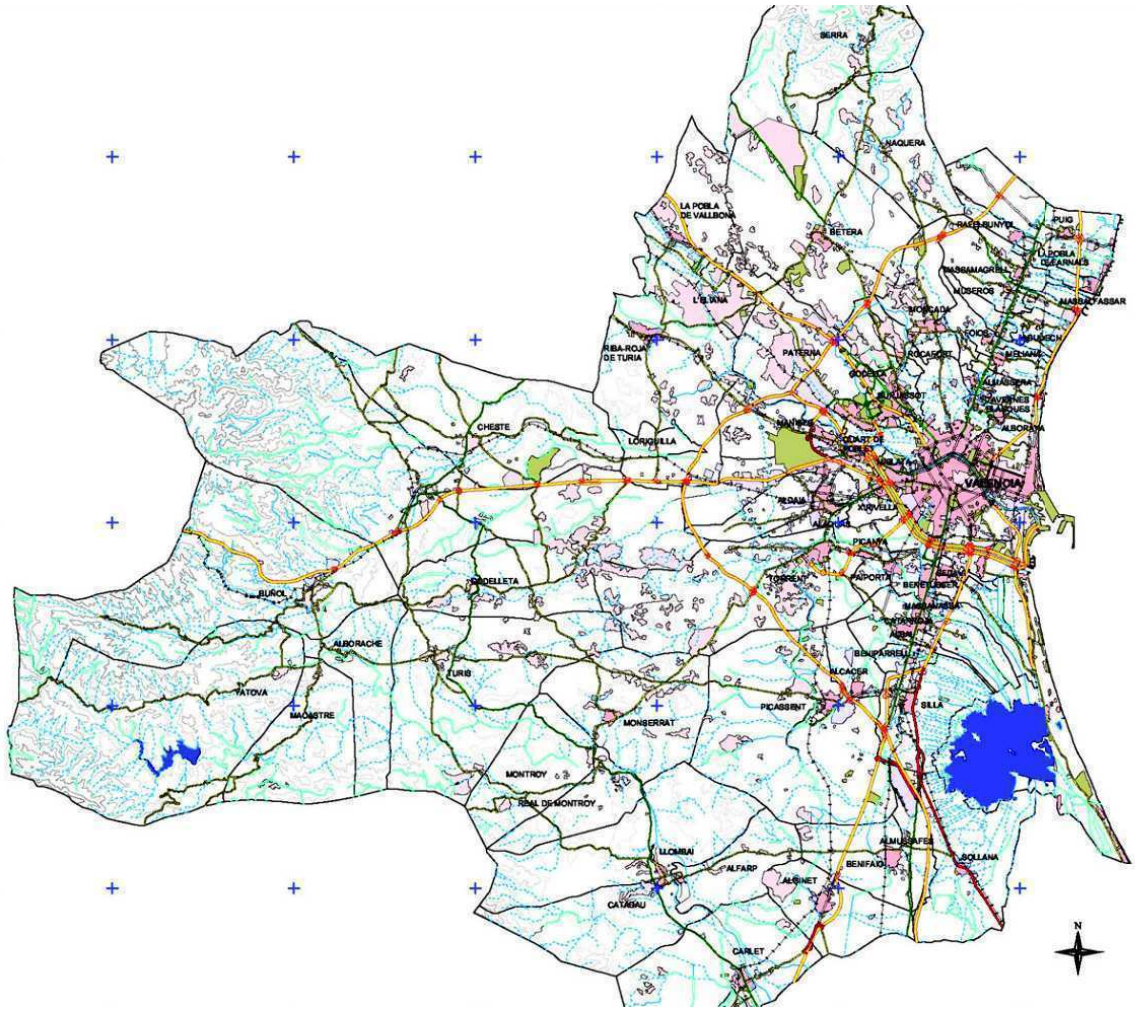

Figure 1.
Metropolitan area of Valencia. Source: UDR F.Eiximenis.

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Figure 2.
High Speed Train infrastructure seen from the bridge to pass.

Figure 3.
Indefinite places between infrastructures.

to improve sustainability on metropolitan territory by a new kind of planning (Miralles, 2015a). In this situation, environmental issues process to strategic environmental assessment are essential.

In the metropolitan area of Valencia different borders can be identified in function of a list of criteria. According Valencian Community's Territorial Strategy (GVA), the functional area of Valencia covers an area of 3,897 km2 with a population of 1,774,550 inhabitants in 2015. The area includes 90 municipalities. In Fig. 1, it can be seen the surface occupied by the metropolitan area according a study realized by the author's research team UDR F.Eiximenis in 2003. The surface of metropolitan area in 2003 was very similar to the current one.

In 2005, the population of this area was 1,740,335 inhabitants that increased to 1,807,826 in 2015 according to the data of Initial Document for Strategic Environmental Assessment or Draft Plan of Metropolitan Plan of Valencia (GVA). In addition, there are 895 ha of urbanized land with a capacity for 22,375 new homes and 1,280 ha of commercial and industrial urbanized lands with a capacity for 51,200 new employees.

So, metropolitan area has had a moderate increase between 2005 and 2015. However, as shows Table 2, artificial surface has had a large increase according Boira (2011).

In addition there is an important amount of land prepared for urban development, as shows Table 3. With an average density of 25 homes/ha, land planned for residential developments in urban plans (urbanizable lands) has a capacity for about 150,000 new homes or 375,000 inhabitants. On the other hand, land for economic activities, with a ratio of 40 employees/ha, has a capacity for about 138,000 new employees.

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Figure 4.
. The 'new' landscapes of High Speed Train infrastructure on metropolitan rural areas of Valencia.

Figure 5.
Chaotic mix uses in metropolitan rural area of Valencia.

All this means that although population does not grow just a little, urban use is increasing in a very intensive way. Urban expansion in metropolitan area of Valencia has taken place in the form of urban sprawl as can be seen in Fig. 1. This involves an increase in the cost of municipal public services (Gielen, 2016) (Gielen et al, 2017).

On the other hand, this intensive process of urban expansion and sprawl produces important environmental impacts. In fact, in addition, this urban expansion is completed by all type of uses in rural land or "not urbanizable land" (named according to legal Spanish qualification). Really, a great part of metropolitan area is a mix of urban areas and rural areas with high level of artificial uses of houses, facilities and infrastructure networks (routes, motorways, rail trains, electric energy lines, water channels …).

The final result for metropolitan urban areas is a landscape of a chaotic mix of isolated urban and rural uses without any harmony. In contrast with urban areas that are organized according to an urban plan, the metropolitan rural areas have no criterion for their ordination. Usually it is only an overlap of different uses on the territory according to partial criteria and without a global landscape vision. Some examples of the real situation on Valencia metropolitan area are shown in images 2, 3, 4 and 5.

Environmental intervention instruments without success

Paradoxically, the European Union has developed instruments of environmental intervention in the territory or environmental

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control of interventions in the territory for a long time. The Environmental Impact Directive of the projects, including the civil works projects of the infrastructure networks that supply natural resources to the cities, dates back to 1986, that is, 31 years ago. And the Directive on environmental assessment of plans and programs or strategic environmental assessment was approved in 2001, that is, 16 years ago.

If we look at the figures 2, 3 and 4 corresponding to the infrastructure of the high-speed train built about the year 2010, the landscape integration shines by its absence. These cases occur systematically and the example noted is no exception. It is still the usual way of designing public works practiced by civil engineers in Spain and, what is worse, is still the way of projecting civil works that is taught in the Civil Engineering Schools (Engineering of Roads, Channels and Ports according to the Spanish name) of the Spanish universities. This has been evident in the project to expand the V-30 recently exposed to the public.

Environmental impact studies, strategic environmental assessment, landscape integration or landscape altered by civil works are often considered as bureaucratic obstacles to overcome or obstacles to overcome. Often, these studies are contracted with the objective of justifying environmentally the previously decided solutions. The interest in drafting civil works projects that generate landscapes with a certain quality is minimal and the facts, which are evident in the images that are offered, demonstrate this.

The landscape of the borders

As a result of the above-mentioned dynamics, large metropolitan areas are largely occupied by degraded rural areas, especially urban borders. These areas not have a specific vocation, are indefinite. In theory, they are rural areas but in fact are areas with mixtures of uses that break the rural landscape and the economic continuity of the rural uses of the territory.

Conventional planning is not intended to address and intervene in these areas primarily because of the scale of work. The intervention must be carried out practically at the project level in order to define the detail.

On the other hand, if the scale of intervention in these edge landscapes has to be a project scale, the appropriate moment to define the intervention is the moment of definition of the project that produces these indefinite spaces. This implies consideration of three aspects.

On the one hand, the scope of the project definition, for example in the case of a railway infrastructure, cannot be strictly reduced to the land that physically occupies the infrastructure, but must be extended to the residual spaces it generates and which will potentially be degraded with the objective to act upon them. That is, it is necessary to rearrange uses and activities in these spaces or even their use for activities in building or for activities such as urban gardens.

Secondly, guaranteeing intervention in these adjoining spaces implies practically expropriation. The expropriation of these adjoining lands has an economic cost that can be significant. The application of excessive expropriation prices for land with practically no usefulness in a free market situation, in compliance with the current legislation in Spain, highlights the need to review the theory of land ownership.

Thirdly, for this type of landscape intervention to be effective, the intervention methodology and the delimitation of areas potentially at risk of degradation should be established as a rule. Otherwise, as is the current situation, the tendency is to minimize costs and, consequently, any type of intervention that envolving an additional cost. All this, although it is clear that the cause of these undefined landscapes is the civil work or intervention that is implemented in the territory breaking the preexisting rural landscape structure.

Conclusion

Although the population of metropolitan areas is stabilizing, the occupation of space in these areas has increased considerably. This dynamic has produced normally degraded periurban spaces adjoining the private and public

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facilities and infrastructure networks that cross these spaces to provide natural resources to cities.

Among the infrastructures that generate this type of spaces are the transport networks such as highways, roads and railroad, electric energy network, water supply and waste water networks ... In university schools, it is not properly formed to correct this landscape impacts and avoid the degraded landscapes that produce the infrastructures.

Studies and procedures for the evaluation of environmental impacts that today exist have failed to generate a landscape integration or landscape improvement of the areas degrade by the infrastructures.

It is necessary to define intervention methodologies in these urban borders that must be defined at the project level in the spaces adjacent to civil works or other elements that causes of landscape degradation.

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Appendix

Table 1. Population evolution of metropolitan areas of Spain. Source: Feria et al (2016).

	2001		2011	
Metropolitan area	Municipalities	Population	Municipalities	Population
Madrid	172	5,623,784	172	6,729,769
Barcelona	130	4,340,618	139	5,088,201
Valencia	74	1,594,762	80	1,935,363
Sevilla	49	1,369,708	51	1,581,798
Málaga-Marbella	29	1,000,900	25	1,239,954

Table 2. Population evolution and artificial land (technical terminology of the CO-RINE data base) of Valencia Urban Region (1990-2006). Source: Boira (2011).

Artificial land (ha)	1990	2000	2006
Valencian Community	73.335,28	109.612,90	125.794,52
Valencia Urban Region	28.116,76	36.363,74	41.766,75

Table 3. Land for urban development. Source: GVA.

Urbanizable land	Surface (ha)
Residential	6,138.86
Public facilities	1,987.26
Economic activities	4,464.07
- Industrial	3,468.74
- Tertiary	995.33
TOTAL	12,590.19

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Poly-nuclear urban system, landscape identity and economic development: The Vega Baja of the Segura River (Alicante) case study

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Abstract. *The geographical area of this study -the Vega Baja alluvial plain- is characterized by its intensively irrigated agricultural pattern. It is one of the last remaining Huerta European landscapes identified in the Dobris Report and dates back to the ninth-century. Since the 1990s, the introduction of new land uses has modified the configuration patterns of otherwise stable traditional settlements. The exceptionally rapid pace of this process has had a significant impact on the landscape, the environment, and on how the local population relates to their surroundings. Moreover, in the last twenty-five years, the local economy has undergone restructuring, producing a mind-shift among local communities and resulting in a meaningful loss of crop production surface to make way for town-planning developments. The preservation of the Huerta's landscape identity requires a comprehensive and integrated reference framework to ensure sustainable development which is a goal advanced by this work. To this end, four key categories -Landscape, Agriculture, Habitat and Tourism- are defined and analyzed over three separate time periods that reflect the evolution of the territory. The aim of this paper is to provide an analytical territorial framework that can inform and guide future decision making —in the context of sustainable economic development— that should embrace a comprehensive approach to Huerta landscape identity values.*

Keywords: Poly-nuclear urban system, landscape identity, Huerta landscape, Vega Baja, Segura River

Introduction

The territory that comprises the Vega Baja of the Segura River (Alicante province) has experienced a drastic change in terms of land occupancy and settlement growth patterns in the last twenty-five years evidenced by the introduction of new economic activities. Agricultural land use has been declining and in its place tourism related businesses have flourished. New emerging patterns of urban settlements, driven by changing economic factors have been highlighted. This process has significantly impacted the landscape and how the local population relates to their living environment. The Vega Baja plane of the Segura River developed from the expansion of its functional network systems –water canals (irrigation and drainage), routes (pathways), and enclaves (settlements)– which enabled the occupation and colonization of extensive areas of marshy land from the ninth century. The territorial organization of this study's area developed over the course of eleven centuries and remained relatively stable until after 1986, when agriculture lost its primacy and followed by an intense rural exodus (García-Mayor & Canales Martínez, 2017). Consequently, over the course of the last twenty years specific changes in land management policies have

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been implemented. The local economy has undergone rapid restructuring along with a mind-shift among local communities, resulting in a trend away from agriculture to property developments. This trend is visibly evident in the meaningful loss of crop production surface. The Vega Baja is one of the last remaining Huerta European landscapes identified in the Dobris Report. Thereby, a more comprehensive and integrated approach is required to preserve the values inherent in Huerta landscape identity and local culture. This paper bridges the knowledge gap surrounding the Huerta by analyzing the categories –landscape; agriculture; habitat; and tourism– across three key time frames. The objective of this integrated approach is to understand the territorial processes from a chronological perspective which would facilitate better integration between the planning and managing of strategies for more sustainable economic development of the area in question.

Methodology

The methodology adopts an explanatory case study research (Yin, 2009) that explores cause-effect relationships between quantitative and qualitative holistic data. This approach highlights the coherence inherent to structural landscape features in different spatial scales and the consequences of changes which erode the main identity characteristics. Following the argument of Marc Antrop (2005), the changing perception of a place also influences the types of and the various aspects of landscape that are studied, protected and managed.

The Vega Baja of Segura River is a territory that has been widely studied by several authors and researchers from different perspectives: agrarian structure (Canales, 1993); changes in urban growth (Vera, 1984; Torres, 1995; Casado 1997; Martí & Nolasco-Cirugeda, 2011); landscape identity (Ponce, 2011; Garcia-Mayor, 2017); tourist development (Navalón, 2003; Huete & Mantecón, 2011; Canales & López, 2012; Morote & Hernández, 2016); real estate development (Burgos, 2011; Martínez, 2016). This study provides a compilation and analysis of the most relevant research results of the Huerta case study with complementary fieldwork that provides an updated and enhanced overview of how the territory's settlements have evolved. The study also considers the population's perception of the territory and focuses on two main processes: changes in space configuration promoted by new productive activities and addressed through four key aspects: landscape, agriculture, habitat and tourism; and the change in the community's mindset over the three defined time periods shown in Figure 1.

Up to 1965 this territory had a predominance of arable crops –up to four crops per year – following a ten-century tradition. From 1966 to 1994, a marked changeover occurred from the exclusive hegemony of arable crops to the introduction of irrigated mainly citrus tree orchards. After 1994, the area entered a new phase driven by the urban and territorial planning legislation of the Valencian Community. The political will to promote an economy based on urban development projects resulted in the fragmented but rapid process of urbanization of agricultural plots (Figure 1). The territorial transformation described in this case study has a direct repercussion on the way locals interact with their environment. This in turn influences the perception of the value of cultural assets such as the Huerta –largely driven by economic interests– and is reflected in the laws passed and policies implemented.

Stages of the Territory's spatial organization

Huerta landscape's character from inception to 1965, reflected distinctive features of Vega Baja territorial configuration caused by secular human adaptation to the adverse environmental conditions existing in this area characterised by its aridity, periodic floods and relict swamp areas. The Huerta's longevity is crucial to understanding the significance of the changes that occurred post 1965, which have altered the traditional landscape model.

Up to 1965 the traditional agricultural Huerta landscape followed the same organizational and cultural patterns which enabled settlement and

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Period	Landscape	Agriculture	Habitat	Tourism
Until 1965	Predominance of Arable **Crops**	· Subsistence farming · Direct land tenure · Fragmentation of land ownership	·Rural population adapted to Huerta environment ·Linear hamlets ·Scattered dwellings	· On coastal strip ·Recreational use of rural environment · Secondary economic activity
1966 - 1994	Transition to **Irrigated tree crops**	· Mechanised commercial exploitation · Part-time farming · High number of small farms	·Intensive rural exodus · Moderate urban growths · Unsuitability of traditional house typology	· Mass tourism begins ·Holiday apartment main tourist model · Isolated housing estates
Since 1994	Transformation towards **fragmented urbanised agricultural plots**	· Loss of agricultural competitiveness · No intergeneration continuity · Change of entrepreneurial mindset	·Urban legislation as driving force for changes ·New settlement patterns ·Residential Tourism	· New inland development areas · Property developments linked to golf courses · Revisiting *Huerta's* environmental value

Figure 1. Vega Baja of the Segura River Huerta: chronological evolution of the four key categories.

agricultural production with the transformation of this marshy land. The colonization of this valley progressed in line with the development of the network of irrigation and drainage canals. This eliminated the health problems associated with large areas of still water. Progressively, over ten centuries, topography, geomorphology and flood risk were the factors responsible for defining and creating this specific agricultural landscape –the Huerta–. The development of this complex system involved the overlapping of four functional networks: water lines –irrigation and drainage canals–; routes –pathways–; settlements –small villages, linear hamlets, scattered dwellings–; agricultural production –plots and crops–.

The water network is the key element in the valley spatial configuration. This is a balanced network, designed with minimum slope, obtaining maximum use of minimum water resources. The Pathway network constitutes the second most important Huerta landscape structural feature. It is a dense mesh hierarchically organized. Apart from its evident function, which is the connectivity between settlements and the fields; the paths also provide access to the canals and the other components (e.g. canal locks) for water management control and for maintenance of the network. Water and pathway networks have influenced both the occupation and development of this valley as well as settlement territorial locations, patterns and shapes.

Settlement locations in this area have always been conditioned by the Segura River flooding episodes' level, as well as the preservation of the most productive agricultural land. The Poly-nuclear urban system in the Huerta territory is composed of the aforementioned settlement types –small villages, linear hamlets and scattered dwellings–. Small villages are located in three types of strategic areas: i) at the lower end of the mountain slopes, positioned between the irrigated Huerta plain and the dry crop areas; ii) in the middle of the plain on a slightly raised area caused by the accumulation of sediment; and, iii) below the 10 m isohypse from the 18th century during the final period of the Huerta expansion. The linear hamlets are the most characteristic form apart from the main settlements. Their origin was the agricultural labourer's sub-standard single-family dwelling that spontaneously occupied the narrow space between the trail passage width and the fertile agricultural plot, through the appropriation of the ground strip along traditional pathways. The dwellings formed an alignment, following the shaft pathway network, remaining only on one side of the trail and using the minimum surface to prioritise productive land. On some routes,

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Figure 2. Typical linear hamlet. Pressure from tourist and residential demands: widening road network by covering the waterways.

Figure 3. Urban expansion in the area between the urban tissue and the Huerta plots. Building typology reproducing typical coastal designs for tourists.

the pathway was so narrow that part of the house extended over the water canal. Finally, scattered dwellings were typical farmhouses, situated in the core of smallholding agricultural areas.

The Huerta landscape transformed this alluvial plain, providing a greater visual and cultural homogeneity based on the agricultural practices and the settlement patterns and shapes as well as their spatial distribution throughout the Vega Baja area. The entire Vega Baja plain was a homogeneous landscape before 1965, characterised by predominant short-cycle crops as well as scattered settlement distribution which generated peri-agricultural urban areas with an extensive visual scope. Both agriculture and habitat combined to create a landscape perception based on the dynamics of crop rotation and other local agricultural practices. The village of Orihuela was the main referral capital city for urban, administrative and commercial services.

During the 1970s, some reservoirs were built for water regulation near the edge of the valley to decrease the flood risk and provide a better water distribution throughout the year. This facilitated the progressive introduction of orchards -mainly lemon tree- which gradually replaced vegetable crops, providing a permanent green canopy, changing the image of the Huerta landscape.

The period between 1966 and 1994 is a kind of transitional model from the agricultural system to a new economic model, characterized by two main features: agriculture as an economic base; and new opportunities for property development and investment using profits from agricultural production. In this latter case, the local agricultural production evolved from a subsistence agricultural production to market driven production. The spread of citrus orchards during this stage had several consequences. From the landscape perspective, the Huerta panorama changes from a dynamic landscape with seasonal changes to a what we can labelled as a static landscape, fragmented by scattered orchards surrounding vegetable plots. Socially, there is a reduction in the demand for agricultural labour which resulted in a rural exodus of day-labourers that were replaced by specialized groups. Economically, the continuity of owner farming but with agriculture as a part time activity as well as changes in the commercialization of agricultural products, among others (Canales & Ponce, 2016).

The position of the city of Orihuela as the main urban center losses its hegemony when the small towns and villages scattered across the valley grow and extend their urban services and business offers. The residents of the consolidated linear hamlets remain but modernize and refurbish their clustered humble houses to improve comfort and habitability. For this purpose, the house's ground occupancy increases, resulting in a loss of the existing small courtyards between houses, where neighbours used to carry out some of the domestic duties,

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as well as some secondary farming tasks. Replacing the courtyards, a kind of continuous façade appears, hiding the visual links between fields and pathways, as well as removing the social space for resident interaction. This transformation causes the gradual emergence of abandoned farm houses and agricultural plots. There has been a progressive mindset change attracted by the new property market spurred on by the development of tourism nearby on the Mediterranean shores

From the mid-1960s, the Vega Baja coastal strip was a highly developed area with its emergence as a sun-and-beach tourism destination. This space was originally the main summer leisure destination for locals, who copied the Huerta linear hamlet model in front of the sea, and this configuration was an attractive place for foreigners which stimulated the development of a very dynamic property market. The capital invested –mainly from the profits of Huerta agriculture– was used to develop apartment blocks for renting, replacing the traditional beach detached-houses. Additionally, the building and construction material sector and complementary services related to interior design flourish. The opportunity for farmers to have better incomes in the real estate sector represented the greatest factor that changed the local mindset.

In the 1990s there are two milestones in the management of the territory which had a significant effect on the Vega Baja area. The first one was the finalization of the works of the Plan de Defensa contra Avenidas en la Cuenca del Segura (Plan against the Segura River Flooding, drafted and implemented by the Segura River Water Authority). The modifications introduced to the river course and river bed reduced the risk of flood events and opened a new opportunity for the occupancy of the Huerta with residential developments in the pre-coastal strip. The second fact was the adoption of the Valencian Land Law in 1994. This new regulation provided flexibility and encouraged soil transformation for urban developments, which in turn gave investors a powerful tool which boosted the property market at the expense of the agricultural sector. As a consequence, in this stage there was a split from the traditional management of the land, and the characteristic balance between agriculture, housing and social context was disrupted.

The fieldwork undertaken in this area revealed the appearance of several low quality and fragmented areas which interfere with the perception of the traditional cultural space of the Huerta landscape. There is a process of transformation of the Huerta land into artificial surfaces due to the management of the territory in the last three decades. Only seven out of twenty-two main villages are originally located in the central area of the Vega Baja alluvial plain, but all of the twenty-two have developed their urban extensions occupying traditional Huerta plots towards the central part of this valley.

In addition to the aforementioned territorial occupancy, there have been developed some

Figure 4. Abandoned Huerta plots in expectation of urban development in Almoradi.

Figure 5. Landscape fragmentation: wall of a gated community comprising single-family dwellings

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major roads overlapped with the traditional Huerta path network, which implementation has promoted new areas for commercial strips, scattered industrial parks and residential developments. This situation has increased Huerta landscape fragmentation, as well as has produced loss of main landscape character features at different scales. From 2007 this tendency was slow down with the economic crisis and several significant urban developments, some associated to a golf course as an added attraction for property business, were led unfinished or abruptly paralyzed.

This territorial pattern has evolved from a balanced agricultural and town model, to a disaggregated and intrusive one. The coastal touristic model of residential developments has been copied inland as a successful real estate business, and foreign resident population registered represent more than the local inhabitants. As an example, the municipalities of San Fulgencio or Rojales, located at the lower end of the mountain slopes, positioned between the irrigated Huerta plain and the dry crop areas, have percentages of 60.3% and 70.5 % of foreign residents respectively. As well, we can also find municipalities such as Daya Vieja, located in the central part of the plain, surrounded by the traditional Huerta area, with similar percentages of foreign residents, 64.3% data compilation with information taken from the Spanish National Statistics Institute data (INE, 2011). All three examples have a different urban pattern and growth but are representative of the way new developments have been introduce in this territory in reference with the main town center: San Fulgencio and Rojales have scattered gated communities separated from the main urban nucleus; in contrast, the new developments in Daya Vieja study case are adjacent to the main village urban tissue. All these study cases represent a trend of change in this territory where radically changed Huerta landscape perception, in which urban grows has provoked a great environmental impact in a changing social context with a large foreign population.

Discussions and conclusion

The spatial organization of Huerta landscape at the Vega Baja of the Segura River in Alicante province has experimented important changes in relation with the loss of economical hegemony of the agriculture. The boosting of touristic activities as a profitable business has modify the way cities or new developments are planned and occupy the land, as well as a different way of interacting with the surrounding Huerta landscape. The consideration of the coastal strip as touristic attractiveness, together with good climate conditions, fostered this economical sector development which will extent from the coastline to inland. This way, the touristic residential designs spread into the adjacent historical Huerta landscape, where the green orchard trees canopy replace the blue Mediterranean Sea views, as environmental components of a desired nature. During the last decades tourism has lead the regional economic development in two different ways: directly with the consolidation of gathered residential developments in the coastline and also in connection with golf course areas; or indirectly in the inland municipal centers. As a result, the perception of the Vega Baja Huerta landscape has changed. This polynuclear and scattered territory has transformed the continuous Huerta's pattern landscape into a fragmented peri-urban agricultural space.

The Huerta landscape transformation has taken place in a short period –less than 15 years between 1994 to 2007– with a strong urban expansion, clearly impacted by the villages of Guardamar del Segura and Torrevieja, the latter being one of the forerunner cities in mass tourism and situated only thirteen kilometers distant from the Vega Baja valley. These developments were supported by locally-generated capital –profits from agricultural production–, and driven by the Valencian urbanistic legislation. Susceptible of being understood as progress, these quick changes in the Vega Baja municipalities have had a negative impact over: settlements identity, the environment and Huerta landscape cultural identity. Place experience relates to a multisensory and cultural understanding, and it influences the local community will which

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in turn determines the community decision making. The Huerta of the Vega Baja is a prime example of this hypothesis.

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The industrial architecture of Mauro Lleó in the growth of the modern Valencia

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Abstract. *After the urban stagnation that supposed the autarchic stage, began the true urban "boom" that would double the urbanized area of the city of Valencia. From the radio-concentric structural solution proposed by the PGOU of 1946, new urban and industrial development axes were established, the western one being Manises-Quart de Poblet-Aldaia, specialized in the metal industry. But the Plan was not feasible without a network of roads that would give the historic roads the right proportion to their new condition. This is the case of the Camí Reial de Castilla that in 1953 opened to traffic, becoming the new entrance of the road from Madrid to the city of Valencia and the connection with the airport of Manises. This created a great commercial and industrial axis along where large companies would be installed given their good communications with the state capital. This is the case of the Coca-Cola bottler (1958), the metal processing plant FLEX (1961) or the S.E.A.T. subsidiary (1965), all of which are the work of the same architect, Mauro Lleó Serret (1914-2001), who became pioneer in the construction of modern Valencia. It is important to know the architecture that has helped to configure part of our city, in this case the one that connects with its western metropolitan area, giving it a façade that will approach solutions already used by the great masters of architecture like Mies.*

Keywords: radio-concentric structure, industrial axis, Coca-Cola, FLEX, S.E.A.T.

Introduction

Once the urban stagnation of the autarchic stage between the years 1939 and 1957 was overcome, a great urban growth began that would double its urbanized area through a tentacular model oriented towards the tertiary economy.

In the 1940s, the Higher Order Commission of the Province was created, specifically in 1944, and had as its initial task the drafting of a provincial plan, which was not finally processed but would serve for the drafting of a General Plan of Urban Planning of the city that finally was approved the 18 of December of 1946.

This General Plan affected most of the municipalities in the region, which were thus placed at the service of the central city by means of a radiocentric model on which the new axes of urban growth were located: two of them residential, towards Burjassot- Godella and Torrent, and three industrial, to the north the textile-chemical, to the west the metal industry and ceramist of Manises-Quart of Poblet-Aldaia and to the south the logger. Thus, different sectors with a specific functionality were delimited, leaving between them the areas of industrial tolerance (the round and the Road of Transits), first and third ring widening from the old core and industrial preference zones to the east and northeast of the city.

But the Plan was not viable without an extension of the road network and for that reason new radial routes were opened and historical routes saturated and congested, such

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as Camí Reial de Castilla, which also proposed to divert (Gaja y Boira, 1994).

In 1953, the avenue of Castilla, completely paved, opened to traffic. It became the new entrance from Madrid to the city of Valencia as an extension of the streets of Pintor Benedito, San José de Calasanz and San Francisco de Borja. The project had a width of forty meters from the Transit Trail to the junction with the Lliria train and from there to the Torrent road sixty-five, although for a time the avenue was only ten meters wide with side areas to Ride or carriage, leaving the airfield of Manises only nine kilometers from the center. This created a great commercial and industrial axis along which would be installed large companies given their good communications with the capital of the state, Madrid.

The decade between 1960 and 1970 is the period in which the urban and demographic growth of the city spread quickly to other centers of L'Horta and one could say that it was when the Metropolitan Area of Valencia was effectively created. The city remained as a service center, coordinator of the whole area, and led to the decentralization of industrial activity in the peripheral nuclei that had to be delimited, attracting large numbers of immigrant population. Of these nuclei was the one of L'Horta Oest (Manises-Quart of Poblet-Aldaia) that experienced greater growth due to its industrial activity, since it already had a substrate craft that facilitated the development of industrial estates.

Methodology

There are various ways of dealing with the analysis of historical architecture. This article intends to analyze three works of Mauro Lleó Serret architecture, in a period, 1953-1970, and in a concrete space, Valencia, to understand how modern architecture is able to configure city, creating its facades, organizing its spaces... The difficulty, however, lies in converting isolated facts into universal realities that can verify the starting hypotheses. The inductive method is used to demonstrate a series of propositions from a given number of cases.

These cases belong to the field of industrial architecture where the constructive innovations are introduced more quickly, and these will be the ones that give us generalizable answers based on the established hypotheses.

For the analysis of each work is essential to know all the existing documentation. Projects are then used in the public archives of the municipalities where they are located, in the personal archives of the architect and in the publications where they have been made known. This fact allows us to know the original graphic material of the projects, which places them, from the beginning, within the history of modern architecture.

Measurement and analysis

Project of bottling plant "Coca-Cola" in Quart de Poblet, Valencia (1958)

Mauro Lleó signed the initial project of bottling plant in 1958, the only one in collaboration with Luis Albert, and successive extensions until March 1971, the date of the fifth and last expansion designed for the company.

The architects, following the modern precepts, made a separation between the road and pedestrian traffic, premise in which would coincide the three projects that are presented. The pedestrian traffic placed it in the main façade, after a garden of sinuous forms that combined different materials together with small plates of water and streams that rested on a green tapestry that unified everything, with the will to want to recreate the field in an environment Industrial and with a great amount of traffic of which they looked for, certainly, to protect themselves. The remaining accesses to the plant, such as those for truck services, were solved by the perpendicular and parallel streets to the avenue so that they did not cross the pedestrian access and the main road access with the service roadside. In addition, there was also an interior street that separated the main building from the workshop, leaving enough space for truck parking.

The project spaces were in accordance with the functional program that was given to the architects with the assignment and contemplated areas of production, sales, administration, general offices and management, and visits

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or propaganda. Thus, the bottling plant was initially formed by two buildings, one of them the main one that would meet the described areas and a second building of workshops that was not shown in the project floor plans. (Fig. 1, Fig. 2)

The main building, still indebted to the Gutiérrez-Soto models in terms of finishing materials such as brick and glass mosaic, played in its composition with simple volumes of one or two floors that successfully matched the program that contained each one of them.

The first volume was an inverted L-shaped body of a single, closed plant, with an interior height of three meters and with an access porch that occupied all its main front to the avenue with a depth of four meters. In its interior, the program was organized in different

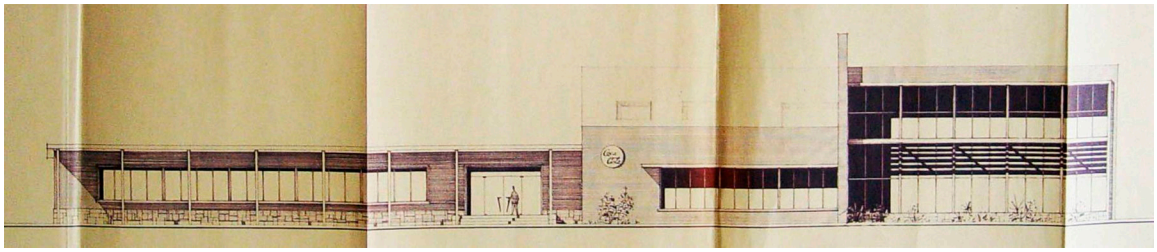

Figure 1. (South façade of the main building according to the Coca-Cola bottling plant project. June 1958)

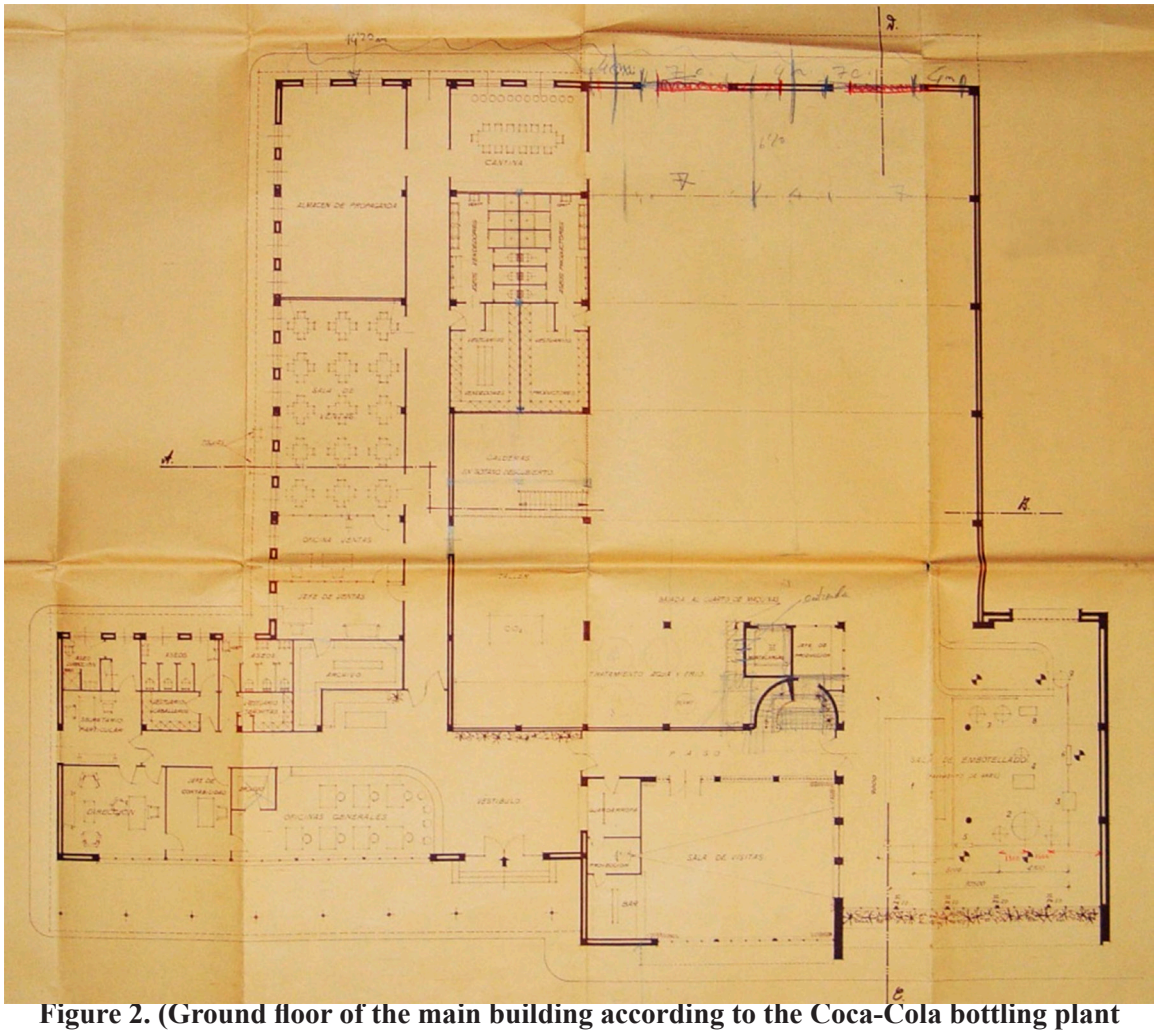

Figure 2. (Ground floor of the main building according to the Coca-Cola bottling plant project. June 1958)

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areas that included a large reception hall and offices, service area, changing rooms, canteen, publicity store and sales chiefs, accounting and management.

Secondly, a two-storey parallelepiped containing the production area and visits and which in turn was messed with the warehouse. In the main façade this volume was divided in two equal parts by a wall that stood out in both plant and height, giving importance and presence to the space where Coca-Cola was produced. It was an element that acted as a claim where, in addition, was placed the logo of the mark to make it visible for vehicles that accessed the capital from the Madrid highway. Inside, the visitor room, the bottling room, the office of the production manager and the water and cold treatment area on the ground floor and first floor, the storage of the various products needed to manufacture the Coca "Cola, they completed the program.

Finally, the warehouse, in a parallelepipedic form of twenty-three meters of light, formed by five gullies of six and twenty-five meters solved with a cover in the form of a sawtooth. This left openings oriented north for the natural lighting of the warehouse that were solved with a fixed metalwork closed with armed glass, a resource that would become the hallmark of all the architect's industrial projects.

The construction presented different types of openings and solutions depending on the orientation and the representativeness of the façade. Thus, on the southern main façade the building opened to the visitor and the access road to the city showing its interior with large glazing that invited to enter. Given the orientation of this façade, the bottling room protected itself from the sunshine with a "fixed horizontal aluminum shutter", as the project's memory said, another of the resources that would characterize Mauro Lleó's buildings, both teachers and industrialists. In addition, this façade, set back two meters in relation to the line marked by the living room, solved this space with a garden that did not prevent the vision of what happened inside but protected from excessive approchement.

The whole structure of the building was solved with reinforced concrete except the cover in sawtooth of the warehouse and the pillars of the access portico and hollows of facade, the first resolved with profiles of steel drawn in cold of five inches of internal diameter and the latter through two UPN 140.

The metal processing plant FLEX in Quart de Poblet, Valencia (1961)

On a site near the bottling plant, the new building for the metal processing plant was built. This construction occupied part of the same foreseeing a growing development of the industry with possible future extensions by the north and the west, leaving a garden space of protection against the avenue as it happened in the bottling plant "Coca-Cola".

The factory set designed by Mauro Lleó, consists of three completely differentiated volumes. The main building, five stories high and rectangular in shape, is the highest volume of the whole. Constructed with a reinforced concrete structure with pillars and hanging beams, the architect began to show in this the structural reticule as a compositional resource in façade that took center stage when being located in the exterior plane of that volume. In its southern main orientation, the space between the interior façade and the grid of pillars, not accessible from the upper floors, was occupied by horizontal slabs of reinforced concrete fabricated "in situ". Was solved in each floor with a face wall, of different height depending on the level, and glazing closing the rest of the height to the upper floor. (Fig. 3, Fig. 4)

This building was designed for delicate works of low load organized vertically from top to bottom, the ground floor being intended for exhibition, offices, archives and address, with a direct access to the area of sale on its façade to the Castilla Avenue . The upper floors, from first to fifth, were diaphanous, illuminated and ventilated by three of their facades (east, west and main south), all of which were intended for the manufacture of carcasses. It is striking the organization of the work in vertical remembering the spinners English of nineteenth century.

The rest of the enclosures of this volume,

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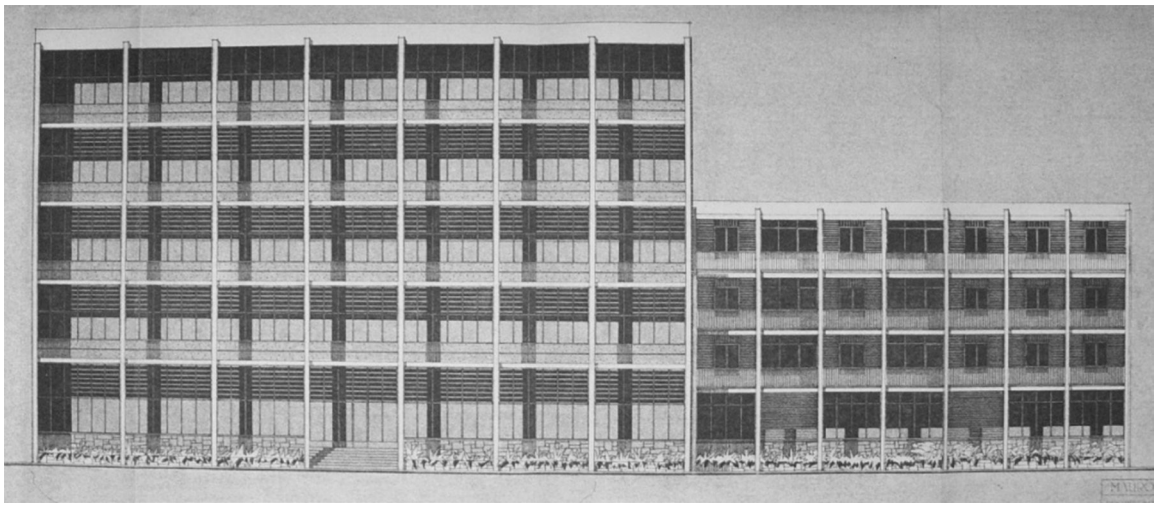

Figure 3. (Plan nº 5, modified, south façade. Metal processing plant FLEX. May 1961)

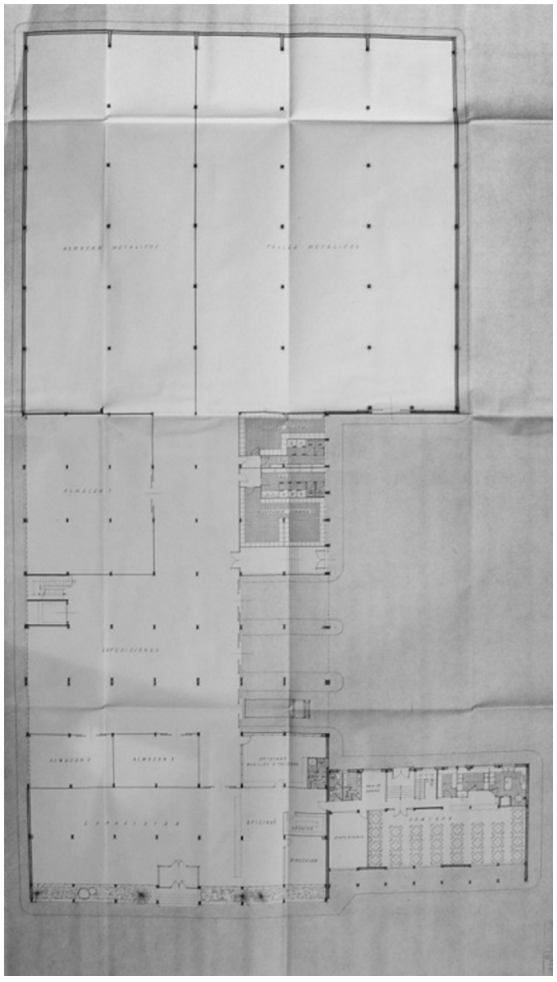

Figure 4. (Plan nº 2, ground floor. Metal processing plant FLEX. May 1961)

and still needing sun protection in some orientations like the west, were solved in line of façade, again showing the reinforced concrete grid of the structure of the building, with façade brick panels and windows in its high part closing the holes left by the structure. The next volume was a single-storey warehouse for forging and mechanization workshops and metal warehouses. This building was covered with a metal structure in the form of saw teeth that generated openings oriented to the north for the natural illumination of the warehouse, reason why its facade closure was totally blind. Again the lighting resort north on the deck featuring the building.

Finally, the whole has a third block, a four-storey parallelepiped for services and houses, which solves its southern facade with the same resource as the main building, keeping the structural grid of reinforced concrete in the foreground and retracting the enclosure with Respect to this. However, there is a clear desire of the architect to give maximum prominence to the main industrial building so that it is ahead of the housing, generating a shadow that visually increases the distance between them.

The main structure of the factory is reinforced concrete for two fundamental reasons, for the ease of an immediate execution and for its greater resistance to fire. Given the dimensions of the whole, three expansion joints should be located, which can be clearly seen both on the floor and on the façade. Two of them corresponded to the separation between the different blocks: between the main building and the warehouse, and between the main

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building and the building of services and houses. The third, however, was located in the main building, approximately at its midpoint.
It is worth mentioning the reticular structure of the main building composed of perpendicular porticos to the southern façade, with a distance of four to sixty meters, while the light between pillars was five and fifty meters. This separation was according to the engineers of the industry, "the ideal for the kind of work to be done". The slabs were projected from ribbed slabs with reinforced concrete vaults vibrated as lost formwork that, as the memory commented, could be replaced by a similar prefabricated system as Pratton. Therefore, although still concrete, the lattice is confirmed as a compositional resource that brings the architect closer to the Miesian constructive solutions with the desire, in addition, to substitute as far as possible the constructive systems of mounting slabs "in situ" by other prefabricated units that would have improved lead times.

Building project for the S.E.A.T. (Spanish Society of Tourism Cars, S.A.) in Valencia (1965)

Mauro Lleó was commissioned to design and direct the construction of the building for the Seat branch in Valencia in 1963. The project, which was finally drafted two years later, would be the step towards standardized construction and prefabrication, although still with misgivings, in the solution of its façades with curtain walls, brise-soleil and metal canopies.

Compositionally, the building responded to the six-meter module, which the company marked as a premise for all its projects, distributing around five buildings (A, B, C, D and E) around an inner courtyard that resolved each one of them. Height and dimension, a part of the program given to the architect. Among these, volumetrically highlighted the workshop building again by the solution of its sawtooth roof, and the vehicle exhibition building, which was not finally built, a geodesic sphere of steel and glass, "a very unique element of attraction, a glass polyhedron surrounded by a garden and only united by very light elements of a single plant ", as explained by the architect in a letter to the Mayor of Valencia in response to the refusal to grant a license of works for the branch in 1965. A drawing of the architect of the whole of the building, would serve for his presentation before the property advancing the image of what would be the project once executed. (Fig. 5, Fig. 6)

Building A consists of two floors. The first or low was destined in its northwest part to access of workers, control, wardrobe, medicine cabinets and the warehouse, that bordered with the building B, that was destined to mechanic shop. In the second plant was located the workshop of sheet, the warehouse of sheet and the dining rooms of workers. Building A had a width of five modules, that is, thirty-two meters.

Building B consists of five floors. The first (ground floor) was for the main access of the cars to the branch, lines of acceptance, service station, diagnosis and offices of the Technical Assistance Service, while on the second floor (first floor), was located the coupon line and the revised car depot. On the third (second floor), the tuning lines and the tank of cars were ready for delivery, and finally the fourth and fifth plants were exclusively destined to deposit new cars. All of these plants were connected to each other by ramps, a staircase and an elevator. This building also had a basement floor for conditioning services, generator set and elevator equipment, which did not occupy more than three modules of the area adjacent to building A.

Building C, on a single floor, was used to store spare parts with their corresponding offices. The D, for its part, was composed of two plants. The first (or low) was for access to office staff, employee locker rooms, sales offices and car deposit for immediate delivery and the second for offices. Finally, building E was intended for exhibition and was attached directly to building B and D.

The façades in this project have great importance since they are the signs of identity, the image of modernity that the brand intends to project. In addition, they are designed and executed perfectly according to their orientation and belonging to a particular block

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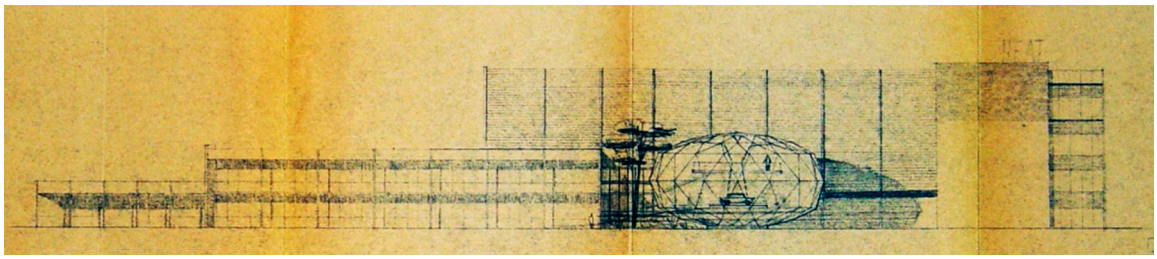

Figure 5. (Main elevation of the proposed Seat branch in Valencia, March 1964)

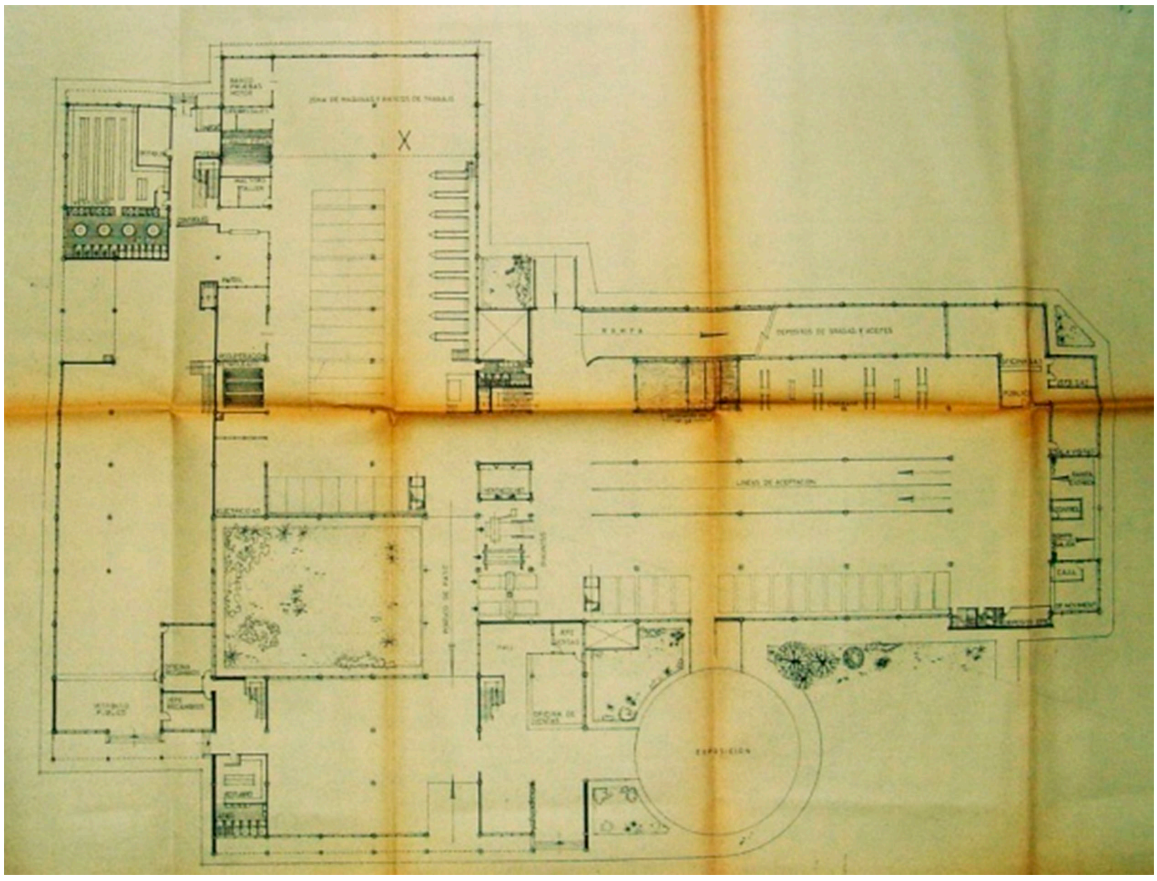

Figure 6. (Ground floor of the building project for the Seat branch of Valencia in May 1965)

of the whole, using resources already tested by the architect in their project of bottling plant Coca-Cola or La Pureza School, near the Seat building, as they are for example the horizontal canopies on the south facade of building D.

Like the plants, all the façades were worked following the Seat module of six to forty meters, thus having a total correspondence with the structure of the building, which made it a completely harmonic ensemble. This module, or the division of the same in equal parts, was visible in the carpenters, in the curtain walls and also in the frames of the brise-soleil of the façade of building B. It was therefore a module that accompanied the façade in its entirety and was well marked in the planes of elevation and detail.

The building had to be built in the shortest possible time, which led, among other things, to the use of metal structure and the maximum use of prefabricated elements on the façade, apart from those referring to the type of local construction, which is why large pieces of brick appeared or lined with white artificial stone. Among the prefabricated materials that Mauro Lleó used were panels of Glasal, Ytong and carpentry and brise-soleil of CASA, which reflected in its project plans.

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The Glasal was used as part of a sandwich panel of the company PANASA that formed by white Glasal, insulating and blue Glasal on its outer face. With a total thickness of thirty-eight millimeters and cloths of one with twenty by one with fifty meters approximately, this one was placed in part of the enclosures of the warehouse and store of spare parts.

CASA's Brise-Soleil consisted of aluminum grid panels that combined effective control of sunlight with a wide flexibility in design, appearance and finish. Its special design fins, mounted in grooves inclined on profiles, had the advantage of controlling solar energy effectively. The profiles were extruded in high quality aluminum alloy as well as the sheets for the manufacture of the fins and the clamping elements were of aluminum and stainless steel to prevent their corrosion. Although it was allowed to be assembled in three ways, panels supported, cantilevered or suspended, the suspended panels of an auxiliary structure directly supported in the structure of the building were mounted in the branch.

CASA also designed the carpentry of the curtain wall of the north façade of the car deposit building that acquired with this the character of automobile showcase. So, at night, when the building was turning on its lights, it showed the new vehicles inside, on several floors, acting as a complaint to the prospective buyer. The model used to solve this facade was the S-45 Arcadia series. The cloths between the carpentry were solved with fixed glass and, in the case of having openings, these were sliding.

Conclusion

From 1953 onwards a recovery in industrial activity began in Spain, although the change of orientation in the growth model of the Spanish economy had its starting point definitive in the Economic Stabilization Plan of 1959 that stopped inflation, devalued the peseta and was followed by measures liberalizing imports.

In the international context, the moment was also favorable for an intermediate-low-level country of development to open up to the outside world, since the main European economies, as well as the United States and Japan, lived the longest and Intense economic growth in history and could exert a significant drag on the Spanish economy through trade and direct investment.

And that is how the east-west axis linking the city of Valencia with Madrid grew, urbanistically and economically, becoming a powerful axis in terms of communications thanks to its strategic situation but also in a large advertising platform where the most important in the industrial and commercial sector of the moment. These include the Coca-Cola bottling plant (1958), the Flex metal transform factory (1961) and the Seat subsidiary (1965), whose buildings, all of them by the same architect, Mauro Lleó Serret (1914-2001). They became pioneers of modernity in the city.

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The processes of urban sprawl in the environment of mid-size cities during the period of expansive urbanism. Territorial impact in an interior area (Castilla-La Mancha, Spain)

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Abstract. *The processes of urban sprawl have increased since the end of the century. They have occurred in a context of economic prosperity, in which part of the capital surplus has been directed towards the construction industry, and especially towards the dwellings. The dynamic has been reproduced in the different scales of the urban hierarchy. Much of the new urban developments and constructions have been directed to the peripheral areas. Urban sprawl has increased in the environment of big cities, but also around medium-sized cities. This reality is manifested differently, depending on the case, but it has also left some general processes. In this essay attention has been centered on the changes in the housing in the peripheries of the Spanish medium-sized cities. The changes between 1991 and 2016 in a radius of 30 around the cities selected have been analyzed in order to identify the scope of urban sprawl, the temporary differences in the process and the most common collected ones. As an object of analysis seven inner and remote cities of Castilla- La Mancha have been used. We can observe a priori differentiating processes, and others that respond to logics associated to the influence of the polynuclear metropolitan area of Madrid.*

Keywords: Mid-size city, urban sprawl, expansive urbanism, inner cities, Castilla-La Mancha

The trivialization of urban sprawl

The transformations produced in recent decades in urban spaces bring associated changes in functions, structures and landscapes. This has meant a certain redefinition of the traditional model of city, which includes, among other things, the transition from compact morphologies to a growing role of diffusion and urban sprawl. Urban Sprawl began to be patent in United States after the Second World War (Garreau, 1994), evolving towards the deterritorialization and reterritorialization of the city in the peripheries (Soja, 2008, 222). Since then it has been spreading to other sociocultural contexts of the developed areas, in which peri-urban landscapes have been becoming routine and banal, reproduced in most cases under the dispersed city of low building density patterns. Its incidence is such that it is identified as one of the most important problems arising for the 21st century (Arellano and Roca, 2010). The process affects the different scales of the urban hierarchy. It is especially striking and manifest in large metropolitan areas, but it is also becoming more common in the mid-sized environments, where their effects are less intense and their territorial scope is smaller (Richardson, 2004; Hoggart, 2005; Phepls et al, 2006; EEA, 2006; DeMatteis, 2015).

The change of city model possibly responds to diverse reasons, although they act jointly and with uneven effect. Sometimes transformation

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engines are of global scope, and others are due to local situations. Some have a high processing capacity, while others accompany and increase the role of the first ones. Among the structural ones, we highlight those played by the information society and the spread of ICTs.

It is what has been termed as network society (Castells, 2006), that has favored new types of relations, substituting proximity by connectivity, distance by time... These changes have opened a new stage to the automobile and remote connection scope beyond the limits of the traditional city. The growing interest of the capital on investing and immobilize financial surpluses in urban spaces is global, thus supporting the construction of new buildings, in many cases under forms of dispersed city. The strategies employed have been diverse: on the one hand, the granting of credits to the public sector (for new urban developments and creation and/or improvement of infrastructures); on the other hand, loans to the private sector (developers –who get big capital gains on the conversion of rural land into urban– and final homebuyers through the mortgage market) (Harvey, 1985, 2005, 2013). In most of cases, they have had a clear speculative function, in addition to the actual production.

The role of the Governments in recent decades has been strategic at different levels, in a generalized context of neoliberal policies. The Administration has progressively left aside the regulatory task of land markets, reducing their function, and limiting it to the intervention in urban, regional and spatial planning (Harvey, 2013, 52). On the other hand, we can also see this in the support to homeownership through tax reductions or exemptions from taxes. It has been therefore a crucial actor in the process of construction and reconstruction of traditional cities, but also of peripheral housing estates (Harvey, 2013, 77). Added to all this, the consideration of the real estate sector as an engine for employment and income generation, in a context of expansive economy and surplus of capital in the public and private sectors.

To these general processes, others specific to each society are added. The Spanish construction sector has been immersed in a special growth, in the period between 1998 and 2008. These years of unprecedented dynamics have been qualified under explanatory and suggestive names: “prodigious decade of urbanism” (Burriel, 2014), “urban tsunami” (Gaja, 2008), “pathological drift” (Roch, 2015).The urbanized area and housing, public infrastructure, industrial spaces, large social and leisure equipment, and the land have grown very fast (and nearly uncontrolled)... The reasons for the strong expansion of the real estate sector are linked to: rise in incomes; fall in interest rates; favorable policies to obtain credits to buy a house (rather than rental) (Romero, 2010, 23; Gaja, 2008); massive arrival of labour immigrants; increase in the demand of second homes in the traditional sun and beach destinations (both by Spaniards and foreigners); incorporation of financial institutions to the housing sector (Herce, 2013, 349; Lois et al., 2016, 14); proliferation of private investors, many of them with speculative zeal; changes of consumer preferences; more permissive land legislation, which turned practically everything on building land, and which was accompanied by the figure of the urbanization agent (Gaja, 2008); influence of promoters enterprises and construction on public administrations, especially small municipalities, with many examples of urban corruption (Lois, and Piñeira, 2016, 243)... The result has been a massive production of urban space, a false material expansion, that does not correspond with population growth or the construction of any new cumulative order (Roch, 2015, 59).

The processes previously targeted have had obvious territorial and urban effects in most of the peripheries of the Spanish cities. There has been a certain breakdown of the traditional urban fabric for the benefit of new ways that favor the dispersion and territorial (and social) segregation. The essential condition for the creation of these new forms of town outside the city has been the improvement of connectivity (ICT –dependent on the private sector– and communication –roads–, responsibility of the management infrastructure). They have been especially strong in the surroundings of the large metropolitan areas. It has also become apparent in urban and peri-urban coastal areas of strong implementation of residential sun

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and beach tourism. Scientific literature has given these issues much attention. The mid-sized interior places have been given much less treatment, and they are here discussed from the perspective of the evolution of housing.

The urban sprawl in the middle of the Spanish peninsular interior cities: Castilla – La Mancha. Methodological proposal

This work deals with a complex aspect, urban sprawl, which does not appear clearly defined (Cebrián, 2013), in the context of intermediate cities, on which there is not an agreement. This category of the urban hierarchy has been considered within the range between fifty and three hundred thousand inhabitants (Mega, 2000). As case study we have chosen a group of inner cities, in which the effects of residential tourism have hardly been present. They have been selected because the processes of urban sprawl are explained for reasons associated with their respective internal dynamics, but they are also understood on occasions by the influence of a great city nearby, which generates sprawl and urban and functional overflow towards them. In this case, the analysis is applied in Albacete, Ciudad Real, Cuenca, Guadalajara, Toledo, Talavera de la Reina and Puertollano. All of them have a population between fifty and two hundred thousand inhabitants, and belong to the autonomous community of Castilla - La Mancha (Spain).

Some general features help to explain and understand the structure of the urban network of this region. The distribution and size of the cities in the territory has not left a urban nucleus important enough to organize the other cities and, consequently, the regional territory. For this reason, it can be understood as a headless region, without any great catalyst center, since bigger cities are peripheral, and preside over urban systems of provincial level in most of cases, while the interior towns are smaller and have regional spheres of influence (Cebrián, 2007, 179). It is not the object of this work to consider the functional orientation of each of them. We should bear in mind that there is a large city located in the center of the country, which dominates part of the national urban system, that penetrates and organizes functionally much of the regional territory. The polynuclear metropolitan area of Madrid has a noticeable influence on Guadalajara and Toledo, following the route of the main roads that connect these two cities with the national capital (Burriel, 2014).

The objective of the essay is focused on two aspects: on the one hand, the real scope of the processes of urban sprawl in these seven cities; on the other hand, identify the incidence that the building typologies of low density in the process (single-family homes) have had. We have resorted to an analytical methodology, using the cadastre (General direction of Cadastre, Ministry of Finance and Public Service, Government of Spain), which some authors consider to have high reliability and accuracy (Mora-Garcia et al., 2015; Santos et al., 2014), and specifically open access files ".Cat". The territorial scope of analysis is a radius of 30 kilometers around each town. From the information available in the virtual headquarters of the cadastre (<https://www.sedecatastro.gob.es>, accessed 28 February 2017), a work of extraction and conversion of records has been made, selecting some variables related to housing. The data were presented in an aggregate and very brief way. The considered temporary cycle is between 1991 and 2016, reorganized into three periods, in order to have an overview of the years prior to the expansive city planning (1991-1998), of what happened in the years of major construction in Spain (1999-2008), and what has happened since the crisis (2009-2016).

The variables were employed to identify, at the level of municipality, the temporal and territorial evolution of the number of dwellings by category. For this purpose the following record types have been used: on the one hand, and in order to meet changes in the total number of homes, the type of register 15 (real estate) has been employed, within the category of urban class (UR) that are coded with the V use (residential); on the other hand, and in order to meet changes in the building typology, we have resorted to the type of register 14 (Construction), using the

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constructive typologies: 1.1 Urban collective housing (including the categories 1.1.1: collective housing of urban, open building, and 1.1.2.: collective housing of urban character, building in a closed block of buildings) and 1.2. urban single-family homes (which collects the typologies: 1.2.1.: single-family homes of urban and isolated or semi-detached buildings, and 1.2.2.: single-family homes of urban character, built in line or in closed block of buildings). To obtain the total values of housing by building typology at municipality level, the category 1.3.1. (exclusive use of housing and construction) is also included.

The resulting data have been mapped to scale of municipality, in order to identify changes in relation to the year of reference (1990). Another part of data added for different considered periods has been presented in tables, including data grouped in selected time periods and large territorial units (municipality where the central city is located, and the set of municipalities that make up the respective urban crowns). We must bear in mind that the scale of analysis (municipality) leaves disparate realities, by the substantial demographic and territorial differences that exist in them, and because the settlement models are not homogeneous. You must also consider data grouped into time series, comprising approximately a decade, so the specific situations of each year are masked in what happened during the entire period.

The processes of urban sprawl in the peripheries of the mid-sized cities of Castilla - La Mancha. Evolution and distribution of the overall real estate.

Some general ideas that contribute to present what happened at the territorial level and in the temporary field can be extracted from the analysis of the data. On the one hand, it highlights the fact that many more homes in the crowns have been built (more than two hundred thirty thousand) than in central cities (one hundred thirty-four thousand). On the other hand, the remarkable difference in the models followed by seven cities considered should be emphasized.

In some cases the growth of housing (real estate) has been primarily focused in the municipality in which the central city is located (in comparison with what happened in the municipalities located in the crown): especially in the cases of Albacete and Cuenca. A prominent role of peripheries (Puertollano, Ciudad Real and Talavera de la Reina) appears on the other cases. However, it is striking that in some cases urban crowns are clearly the most dynamic (situation that is perceived so clearly in Toledo and Guadalajara, where actual housing growth has been concentrated outside the two capitals - in fact, the growth of housing has been five times higher in the crown than in the municipality that is home to the central city).

From the temporal point of view, there are several interesting issues. It is patent the effect that a period of expansive urbanism has had in main cities of Castilla - La Mancha: between 1999 and 2008 is when more housing there has been (almost two hundred five thousand). But it is also this period in which more intensity and relevance the dynamics of urban areas there have been: in those years more than one hundred thirty-six thousand homes in the respective crowns have been built (66% of new homes have been built in the peripheral municipalities). It is not a new phenomenon, since this situation was already clear in the previous period (1991-1998), in which the total number of collected homes was about half than in the expansive urbanism, of which 56% was already built in urban peripheries, and the cases of Toledo and Guadalajara were already heavily influenced by forms of urban sprawl in their respective crowns (Table 1).

Considering the role played by the building typology of low density, some singularities can also be targeted. On the one hand, the strong establishment that urban single-family homes have had (1.2) in the urban crowns along two first periods considered. This has been the dominant construction typology (twice that of the block housing). On the other hand, it is striking that seven crowns have had the main form of urban development on the constructive typologies of low density until 2008. From that moment the process has been reversed, and the collective housing appears as the dominant construction typology again (Table 2).

At the municipal level we can see the acceleration produced until 2008 in the maps of the first two periods considered (the most

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dynamic in terms of homes built (Maps 1 to 4), especially striking in the municipalities close to Guadalajara and Toledo. The process maintains a special intensity towards Madrid, where there is a growing attraction and functional integration. In the other cities of the region, the phenomenon is less intense, although nearby municipalities which have been especially benefited usually appear (Maps 1 and 2).

Conclusion

The effects of the expansive city planning, understood through the evolution of the housing typologies at municipality level, have been manifested in all the analyzed cases. It has been patchy in intensity and scope, with the uniqueness that its dynamics has been especially striking in the crowns of Guadalajara and Toledo. As a general rule its intensity can be outlined in the municipalities close to cities and close to high capacity roads. But above all in the area of immediate influence of Madrid. The impairment of the phenomenon is also evident as the distance grows, suggesting that the threshold of 30 Km exceeds the area of real influence. It is catching the elevated role assumed by single-family homes, which have taken over the landscape and have been the main exponent of the increase in housing until 2008. On the other hand, it seems that the crisis has served as a brake on the dynamics, and also a change in the trend in constructive modalities for the block of buildings.

	1991-1998		1999-2008		2009-2016		TOTAL (1991-2016)	
	Central City	Urban crown	Central city	urban crown	Central city	Uurban crown	Central city	urban crown
Albacete	14749	1384	17589	3058	5697	1058	38035	5500
Cuenca	3594	1196	7838	2049	1342	893	12774	4138
Ciudad-Real	6407	6776	11349	13504	2375	3322	20131	23602
Guadalajara	6182	24957	10147	57331	2564	12963	18893	95251
Puertollano	3092	2250	4658	2885	1445	848	9195	5983
Talavera de la Reina	6254	4020	7829	8324	1389	1947	15472	14291
Toledo	7075	20943	9043	48857	3416	12260	19534	82060
TOTAL	47353	61526	68453	136008	18228	33291	134034	230825
TOTAL CITY + CROWN		108879		204461		51519		364859

Source: Cadastre. Own research. 2017.

Table 1. Real estate evolution.

	1991-1998				1999-2008				2009-2016				TOTAL (1991-2016)			
	Central City		Urban crown		Central city		Urban crown		Central city		Urban crown		Central city		Urban crown	
	1.1.	1.2.	1.1.	1.2.	1.1.	1.2.	1.1.	1.2.	1.1.	1.2.	1.1.	1.2.	1.1.	1.2.	1.1.	1.2.
Albacete	13133	1577	362	1014	15446	2123	1104	1946	4786	910	537	519	33365	4610	2003	3479
Cuenca	3212	380	56	1454	6710	1126	336	1614	1237	105	347	479	11159	1611	739	3547
Ciudad-Real	4896	1511	1936	4826	9873	1476	4811	8673	2218	154	1595	1724	16987	3141	8342	15223
Guadalajara	4662	1517	10268	14891	7915	2208	24504	36710	5128	263	8918	4436	17705	3988	43690	56037
Puertollano	2677	375	401	1840	3791	853	478	2389	1198	246	230	615	7666	1474	1109	4844
Talavera de la Reina	5440	811	147	4367	6733	1094	691	7923	1080	308	318	1798	13253	2213	1156	14088
Toledo	5612	1462	2316	11522	5707	3335	13522	25598	3069	347	4416	4417	14388	5144	20254	41537
TOTAL	39632	7633	15486	39914	56175	12215	45446	84853	18716	2333	16361	13988	114523	22181	77293	138755
TOTAL 1.1.+1.2.		47265		55400		68390		130229		21049		30349		136704		216048

Source: Cadastre. Own research, 2017.

Table 2. Real estate evolution by typologies (1.1. In blocks; 1.2. Single family).

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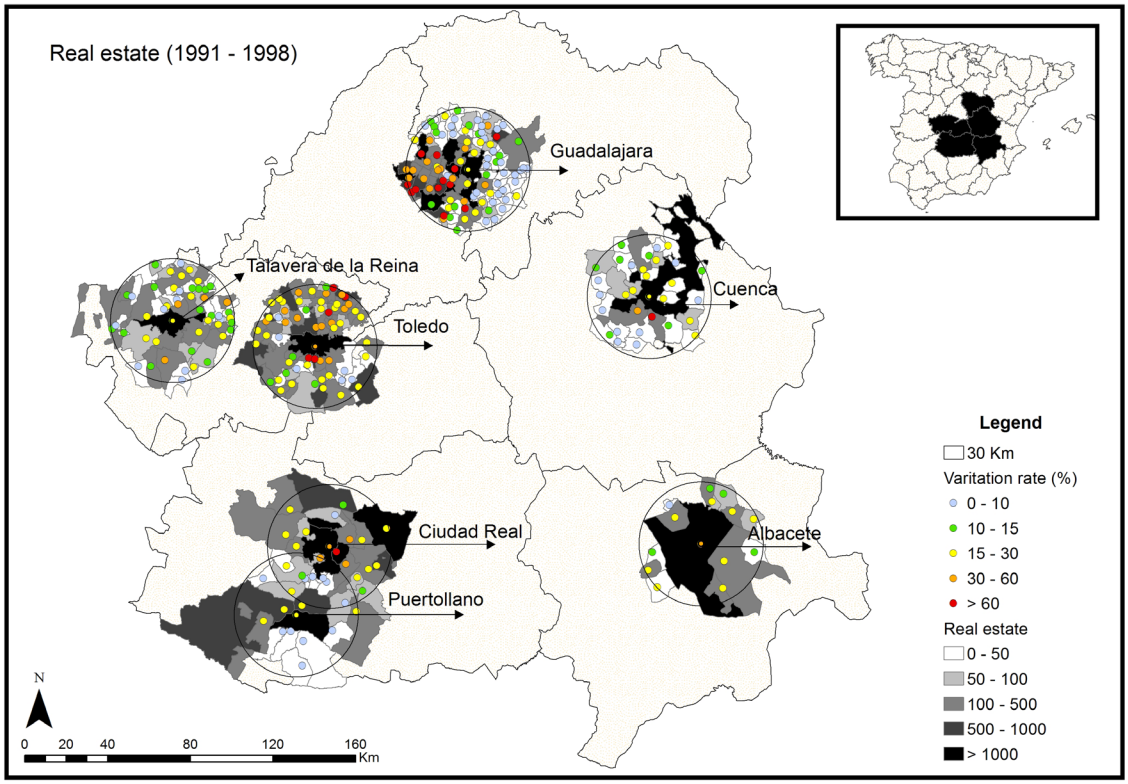

Figure 1. Map 1. Real estate 1991 – 1998.

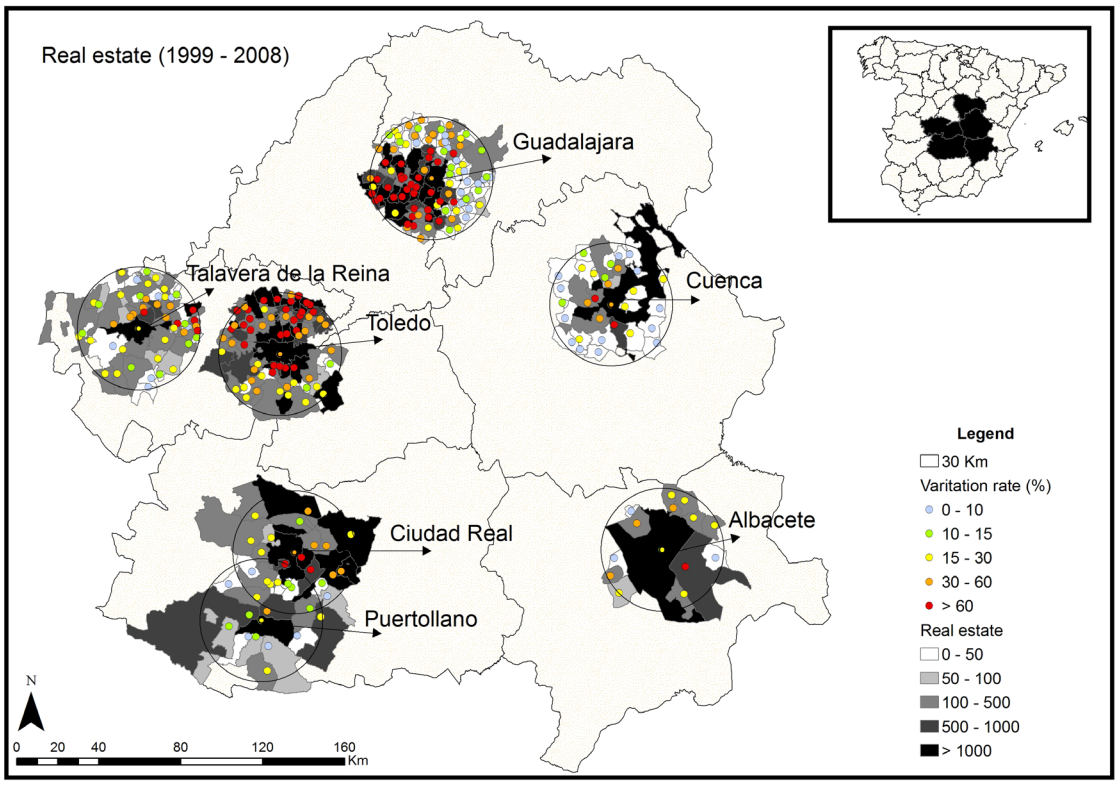

Figure 3. Map 2. Real estate 1999 – 2008.

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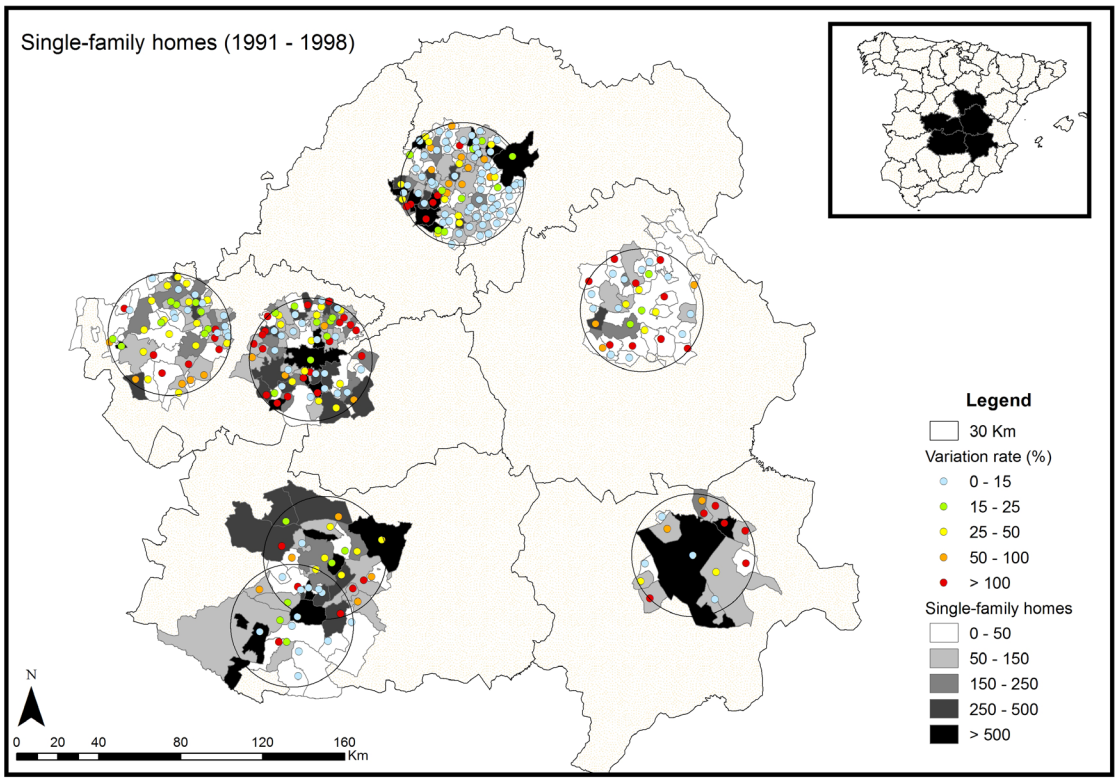

Figure 3. Map 3. Single-family homes 1991 – 1998.

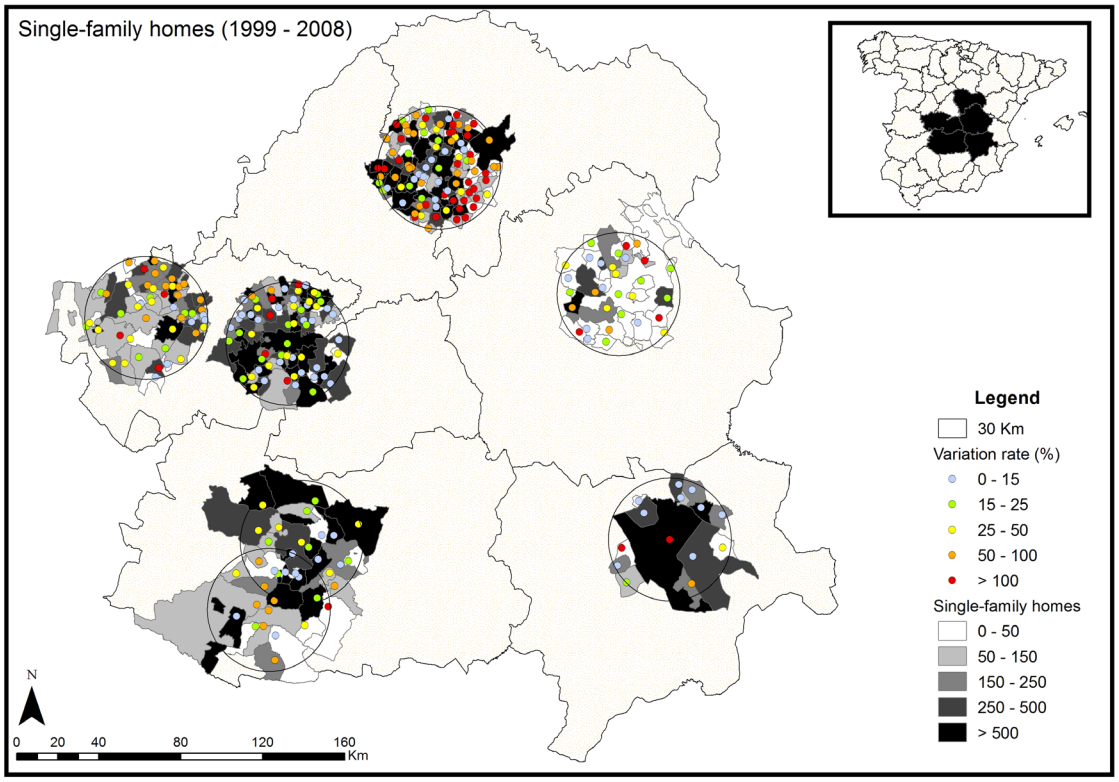

Figure 4. Map 4. Single-family homes 1999 – 2008.

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In this case the concrete location of the new constructions has not been analyzed, although it is possible to think that they have sprung up in urban edges of rural centres and next to the central cities. All these reflections, however require to delve into the subject, since as noted at the beginning of this work, the dynamics have been the result of a combination of various factors, which have resulted in some urban morphologies and some constructive typologies that deviate from those that have traditionally characterized these cities, where urban sprawl has had a marginal presence until the beginning of the decade of the nineties of the last century.

Notes

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Uninhabited territories: contemporary strategies to recover and preserve abandoned settlements and their areas of influence in Alto Aragón

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Abstract. *The late but accelerated industrialization of our country in the early 1900's resulted in a polarization of the population movements: while certain cities increased exponentially their number of inhabitants, an important percentage of the territory gradually experienced a consequent depopulation. Whereas the effects of the former phenomenon in the cities have been deeply examined, the impact of the latter in the territory is a relatively unexplored subject, thus full of possibilities. In some areas, the rural exodus was so sudden that the development of their pre-industrial residential schemes froze-up and, thus, the high-value cultural landscape that they take part in remained almost unaltered until today. Most of these abandoned settlements had an intense and balanced relationship with their surroundings. Their location, morphology and the links among them were built upon an environmental friendly and resource efficient basis. This study will focus on the sustainable anthropization of the territory that was performed by these villages, in order to value them as intangible assets and to identify the most feasible strategies to their recovery. As case study, in Altoaragon, we can find no less than 150 abandoned settlements and, in the same territory, almost 30 villages that have been recovered in the last 30 years. Through a comparative study of the latter, we seek to develop generic strategies to help identify, among the former, those settlements or abandoned areas with more potential, and to draw the basic guidelines to restore and protect the pre-industrial stage as a whole.*

Keywords: Uninhabited territories, Altoaragon, abandoned settelmens, cultural landscape,anthropization

Introduction

The intensive depopulation phenomenon suffered by the mountain areas of the Iberian Peninsula marked the beginning of its economy's downfall and the abrupt ending of a culture, inherited from the pre-industrial era, based on the exploitation of all available land,.

Voluntary migration (for economic reasons) or forced migration (due to water and reforestation policies of totalitarian ilk) emptied a vast amount of population nuclei throughout the Spanish geography, but this phenomenon was especially felt in the Altoaragón region. Only in this area, more than 200 population nuclei were abandoned over a period of not more than 80 years (Serrano 2007). The population as a whole dropped by more than half, leaving certain areas practically deserted. .(Ubieto 1983,)

This trend appears to be contained since the 80s; the abandonment of nuclei stops and the population decline slows down. Improved communications, and the development of a better tourist offer begin to attract new visitors and allow the population to settle once again in

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certain parts of the altoaragonés territory. The rationalization of the Ebro's basin reservoir system, and the gradual abandonment of reforestation policies, serve to expose many of the depopulated hamlets that had remained until then concealed.

In just a few years, dozens of population hubs became visible in more than acceptable preservation conditions, located within some of the most beautiful scenery in the area. The ownership of a good part of the uninhabited nuclei had fallen into the administration's hands, but even those families who still retained ownership of their homes had suffered heavy uprooting. These nuclei stand as frozen mementos of the era of the greatest demographic splendor in the altoaragonés territory, still unscathed by industrialization and the tourism boom.

Over the past 40 years more than 30 of such uninhabited hamlets have been restored and are in the process of recovery. These experiences correspond with public and private initiatives, involve mountain or valley settlements and are absolutely heterogeneous. All of them have meant the revitalization of the population centers and the settlement of new population in a territory that had previously been abandoned. The reoccupation demand, that affects the remainder of the depopulated hubs, never ceases to increase, turning this group of settlements into a cultural landscape of great potential but also one which is especially vulnerable.

The "untouched" state in which these settlements have remained for so many decades makes them an attractive element of great patrimonial value, not just architecturally but also in relation to the territory. The ensemble of all these depopulated villages, grouped according to their geographical location and administrative relations, could serve as a mosaic of cultural landscapes, essential to understanding how our ancestors interacted with the territory.

The main objective of this study will be to catalog and categorize the collection of depopulated settlements in the Altoaragón, as well as to analyze their potential restoration.

The list of depopulated settlements resulting from this work will focus on those that may still retain some recognizable architectural elements and whose original structure is bound to be recognized as an urban setting. The ownership and administrative status of the same must be clear, in order to evaluate any future action.

The selection will result from the grouping of depopulated settlements in relation to their common territorial context or their still recognizable historical interrelations. Contrary to single recovery experiences, commitment to the comprehensive protection and promotion of the cultural landscape invites us to consider the ensemble of villages that fall sufficiently close together as unique scattered settlements.

On the other hand, for the development of indicators that allow us to identify which of the depopulated settlements have greater restoration potential we shall analyze the collection of successful recovery experiences in the late 20th century. We will determine which have been the decisive repopulating factors, as opposed to the rest of the depopulated villages.

We could, therefore, conclude that the study of this group of settlements will remain within three layers of analysis (territorial, administrative and patrimonial) and that this different layer work is the only one capable of reflecting the complexity of the cultural landscape we pretend to describe and encourage.

Despite the altoaragonés territory's peculiarities and the variety and uniqueness of the analyzed cases, the lessons that could be deduced from their analysis pretend to serve as tools and as a basis for later studies that could be applied to other similar territories. It is also understood that all these data will be key to the development of strategies for territorial cohesion.

Methodology

The depopulation phenomenon is tremendously complex and abandoned settlements are but one of its consequences. In order to unearth the clues that make this recovery possible we must first understand the reasons behind the abandonment, as well as the specific context in which it took place. The purpose of this study focuses on the abandoned nuclei in

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	1860	1900	1998
Unión Europea			116,0
España	29,4	36,5	78,8
Aragón	18,7	19,5	24,8
Huesca	16,8	16,3	13,1
Teruel	16,0	17,0	9,2
Zaragoza	22,6	24,4	48,7
Pirineo aragonés	13,1	12,4	6,0
Jacetania	15,5	15,8	9,2
Alto Gállego	9,6	9,7	8,9
Sobrarbe	10,5	10,4	3,0
Ribagorza	16,2	13,7	4,8

Figure 1

Table of the evolution of population density in Europe-Spain-Aragon (INE-Pinilla,2011)

Altoaragón, within the so-called Mountain Area. Among these we shall choose those still recognizable as settlements. Once the scope of the field of study is clear and has been firmly developed, equivalent recovery cases from the past 40 years have been analyzed, which give us the necessary clues to understanding how these processes work and which aspects favor their progress. Lastly, in light of these cases, indicators have been developed in order to apply them to the whole of the selected deserted nuclei. Conclusions have been drawn from the results thereof.

The demographic and territorial context. Depopulation phenomenon analysis.

Population movements, which once helped gradually control overpopulation, became massive and definitive in the mid-19th century due to the industrialization of our country (Germán 1995, 19-34). The phenomenon's impact in Altoaragón was of a bigger magnitude than elsewhere on our peninsula due to water and reforestation policies of unprecedented proportions.

In the late 20th century this desertion trend stops, but not the aftereffects of mass migration. The four regions of the Aragonese Pyrenees suffer equally from these depopulation processes. Jacetania, Alto Gallego, Sobrarbe and Ribagorza encompass almost all the analyzed nuclei within this study.

Depopulation results in great inequality within the country's demographic. Population density on the Aragonese provinces, Spain or Europe, evolves favorably in detriment of these regions with little infrastructure and barely no industry.

Depopulation's evolution

We could divide the evolution of depopulation, on a temporary level, in four separate stages:

-18th century and first third of the 19th century; demographic peek of the Aragonese Pyrenees

-Second half of the 19th century; the onset of industrialization in Spain, and the beginning of economic related migration.

-First half of the 20th century; the consolidation of industrialization and the onset of water policies.

-Second half of the 20th century; development of water and reforestation policies; massive buying or expropriation of land by the State.

The causes behind depopulation

By that order, the direct or indirect causes of

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depopulation could be summarized as:

-The collapse of the artisan economy under the industrial production boom. Industrial development not only invites migration closer to production centers, but it also makes it impossible for handcrafted products to compete in a falling prices market.

-Enforcement of water policies, which translated into the forced expropriation of towns and fertile land, encouraged the dismemberment of local economies and the abandonment of entire valleys. (Herránz 1995, 79-101).

-Enforcement of reforestation policies to prevent reservoir clogging by sediment transport. The slopes by the riverbeds and the fertile areas dedicated to crops are turned into pine plantations.

-The mountain area's own territorial structure of small scattered settlements weakens its reaction capability, moreover once the deeply seated interdependencies and balance start to break. (Hernández 2008,).

The depopulation of Altoaragón has been a radical and fast process by which, in less than 100 years, a territory changed its social and demographic structure but managed to retain its pre-industrial landscape setup intact.

Scope of the study. Abandoned settlement selection.

The defined field of study includes the entirety of the Aragonese Pyrenees mountain area, in which most of the depopulated hamlets of the Aragonese community are concentrated.

The settlements targeted by our study are not in any case single buildings but hamlets of two or more dwellings, root to any urban reality. By these criteria, 142 of the 200 existing settlements should be regarded as towns and retain sufficient elements to still be recognized as such; the rest are isolated buildings (Pardinas or Mesones) or are so deteriorated that their decay should be considered irreversible.

It is our intention to group certain towns from the selection. The reason behind this resides in an existing land occupation scheme by which nuclei belonging to different geographical areas worked closely linked together. As the settlements were being selected, their different "spheres of influence" themselves were taking shape. (Serrano 2011,) If the specialized bibliography is to be considered, each of this groups appeared to operate in a virtually autonomous fashion, with all their communities managing their resources together.

The deserted village final list our work is based on includes: DGA and CHE catalogs from 1986 to 2007, that serve as tools to assess their possessions, as well as photographer Cristian Laglera's own list, gathered for his blog "despobladosdehuesca.com", where he collects the photographs and experiences from visits to the various dwellings within the Huesca province made over the last five years; much more up to date than the administration's own. Nevertheless, all population nuclei have been visited, photographed and cataloged in the hopes of obtaining the most reliable results. It is important to note that all settlements have been legislatively depopulated, and since it is our aim to regulate the reoccupation in accordance to the law, "squatter" settlements will still appear as abandoned nuclei on our list.

Our determination to include the totality of the uninhabited villages in the mountain areas of Huesca makes this study a reference catalog for anyone interested in consulting their current state.

Experiences in the restoration of abandoned settlements

In the 1980s the depopulation of the Altoaragón slows down and some previously abandoned settlements begin to repopulate.

The improvement of communications, the careful exploitation of an untouched landscape and the political backing of the right building policies, have managed to turn tourism into a prosperous affair and also to diversify the economy of the Pyrenees. This new holistic view, respectful of heritage and environment, helps put these settlements back on the map.

This change in landscape didn't occur overnight. It's taken several stages that have gradually cleared the context for reoccupation.

-The suspension of expansive water policies in the Ebro river basin and water level variations on some of the province's reservoirs allow

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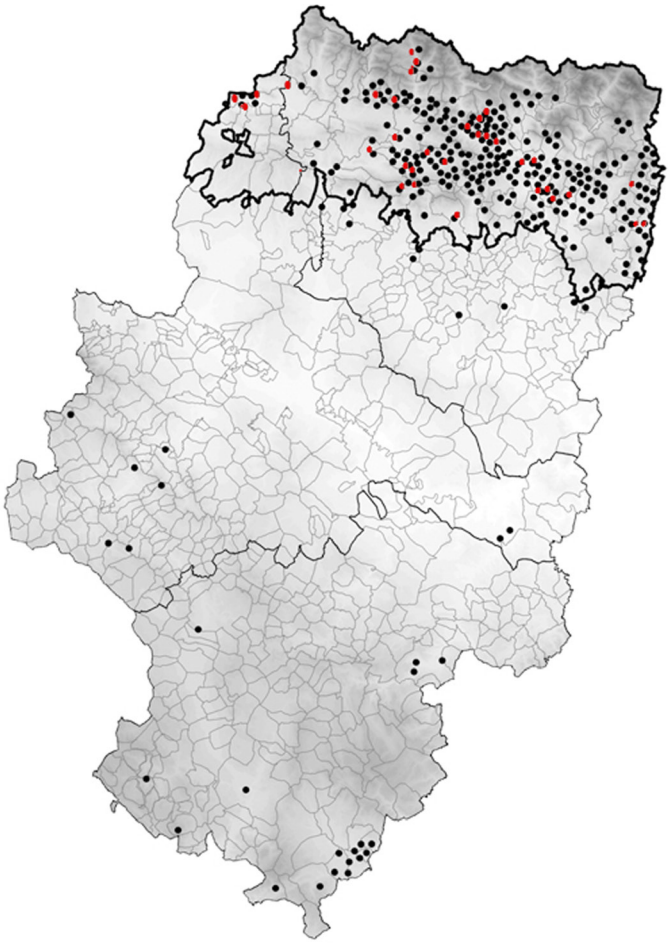

Figure 2
Map of Aragon with the location of abandoned and recovered villages, 2012 (own elaboration)

for the recovery of populations that had been flooded over, or the exploitation of cropland that lay submerged until recently.

-The repeal of reforestation policies and the momentum given by the DGA's support towards mountain conservation restores the value of a heritage that was before hidden. (Iriarte 1995, 117-140).

-The improvement of communications and the rise of the country's economic level favor the return of many of those who migrated in the past but didn't lose ownership of their homes.

At the same time these processes were taking place the urban legislative framework and land management has been evolving, adapting to these new phenomena.

"Construir sobre lo construido", Sixto Marín's 2012 Master thesis, analyzed these processes in detail and located the most interesting recovery cases of abandoned settlements from the referenced field of study.

The aspects that proved to be decisive in the recovery of these abandoned settlements and that, at the same time, helped to characterize each of the initiatives were:

-Territorial context: distance to the region's administrative seat, access to major roads or altitude.

-Heritage Value: quantity and quality of cataloged architectural elements with patrimonial value.

-Accessibility: quality of road access.

-Ownership: whether the buildings and surrounding fields are public or private.

-Urban planning: whether the settlement has been included in the municipality's General Planning or the existence of its own specific planning.

-Conservation Level: general conservation state of the buildings and communal urban elements.

In all the studied recovery cases in the Altoaragón, starting conditions ended up proving to be very favorable. Henceforth, we'll incorporate this study's conclusions onto the deserted village ensemble, making use of

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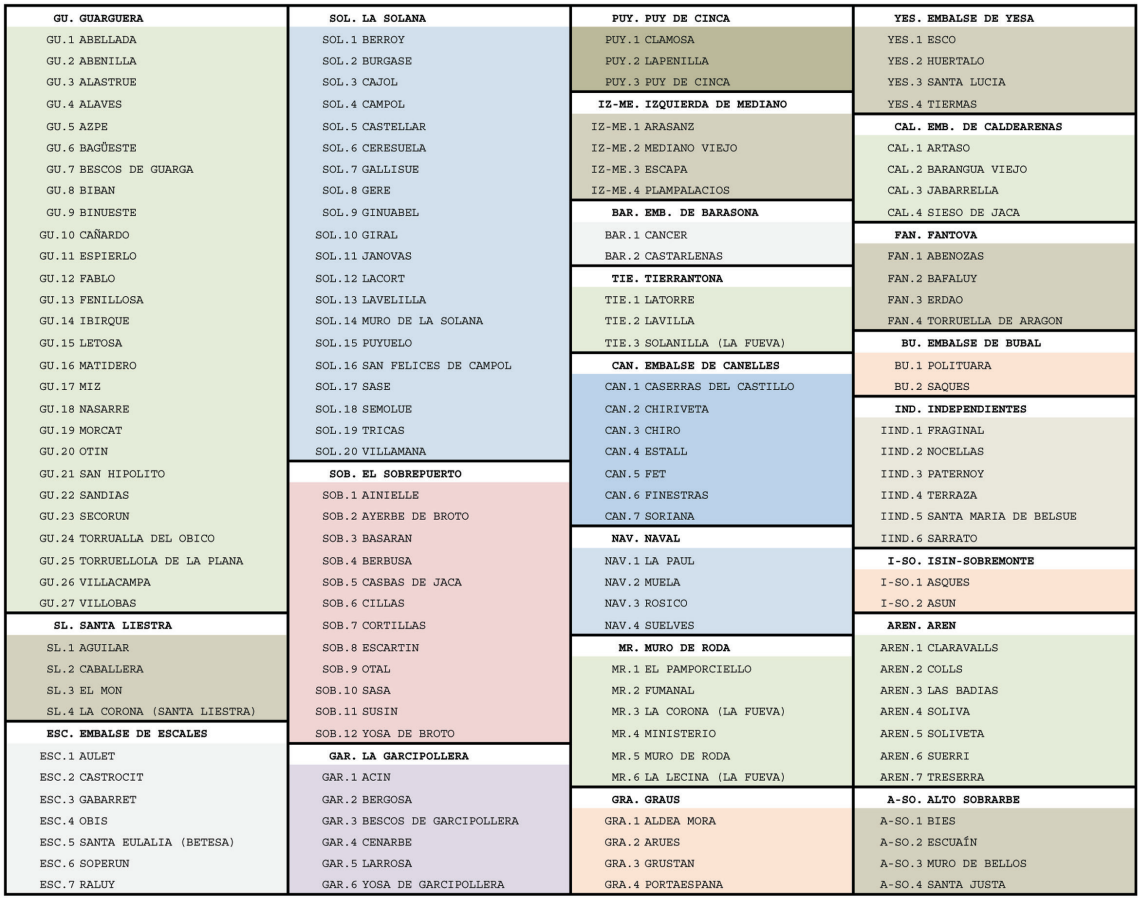

GU. GUARGUERA	SOL. LA SOLANA	PUY. PUY DE CINCA	YES. EMBALSE DE YESA
GU.1 ABELLADA	SOL.1 BERROY	PUY.1 CLAMOSA	YES.1 ESCO
GU.2 ABENILLA	SOL.2 BURGASE	PUY.2 LAPENILLA	YES.2 HUERTALO
GU.3 ALASTRUE	SOL.3 CAJOL	PUY.3 PUY DE CINCA	YES.3 SANTA LUCIA
GU.4 ALAVES	SOL.4 CAMPOL	IZ-ME. IZQUIERDA DE MEDIANO	YES.4 TIERMAS
GU.5 AZPE	SOL.5 CASTELLAR	IZ-ME.1 ARASANZ	CAL. EMB. DE CALDEARENAS
GU.6 BAGÜESTE	SOL.6 CERESUELA	IZ-ME.2 MEDIANO VIEJO	CAL.1 ARTASO
GU.7 BESCOS DE GUARGA	SOL.7 GALLISUE	IZ-ME.3 ESCAPA	CAL.2 BARANGUA VIEJO
GU.8 BIBAN	SOL.8 GERE	IZ-ME.4 PLAMPALACIOS	CAL.3 JABARRELLA
GU.9 BINUESTE	SOL.9 GINUABEL	BAR. EMB. DE BARASONA	CAL.4 SIESO DE JACA
GU.10 CAÑARDO	SOL.10 GIRAL	BAR.1 CANCER	FAN. FANTOVA
GU.11 ESPIERLO	SOL.11 JANOVAS	BAR.2 CASTARLENAS	FAN.1 ABENOZAS
GU.12 FABLO	SOL.12 LACORT	TIE. TIERRANTONA	FAN.2 BAFALUY
GU.13 FENILLOSA	SOL.13 LAVELILLA	TIE.1 LATORRE	FAN.3 ERDAO
GU.14 IBIRQUE	SOL.14 MURO DE LA SOLANA	TIE.2 LAVILLA	FAN.4 TORRUELLA DE ARAGON
GU.15 LETOSA	SOL.15 PUYUELO	TIE.3 SOLANILLA (LA FUEVA)	BU. EMBALSE DE BUBAL
GU.16 MATIDERO	SOL.16 SAN FELICES DE CAMPOL	CAN. EMBALSE DE CANELLES	BU.1 POLITUARA
GU.17 MIZ	SOL.17 SASE	CAN.1 CASERRAS DEL CASTILLO	BU.2 SAQUES
GU.18 NASARRE	SOL.18 SEMOLUE	CAN.2 CHIRIVETA	IND. INDEPENDIENTES
GU.19 MORCAT	SOL.19 TRICAS	CAN.3 CHIRO	IIND.1 FRAGINAL
GU.20 OTIN	SOL.20 VILLAMANA	CAN.4 ESTALL	IIND.2 NOCELLAS
GU.21 SAN HIPOLITO	SOB. EL SOBREPUERTO	CAN.5 FET	IIND.3 PATERNOY
GU.22 SANDIAS	SOB.1 AINIELLE	CAN.6 FINESTRAS	IIND.4 TERRAZA
GU.23 SECORUN	SOB.2 AYERBE DE BROTO	CAN.7 SORIANA	IIND.5 SANTA MARIA DE BELSUE
GU.24 TORRUALLA DEL OBICO	SOB.3 BASARAN	NAV. NAVAL	IIND.6 SARRATO
GU.25 TORRUELLOLA DE LA PLANA	SOB.4 BERBUSA	NAV.1 LA PAUL	I-SO. ISIN-SOBREMONTE
GU.26 VILLACAMPA	SOB.5 CASBAS DE JACA	NAV.2 MUELA	I-SO.1 ASQUES
GU.27 VILLOBAS	SOB.6 CILLAS	NAV.3 ROSICO	I-SO.2 ASUN
SL. SANTA LIESTRA	SOB.7 CORTILLAS	NAV.4 SUELVES	AREN. AREN
SL.1 AGUILAR	SOB.8 ESCARTIN	MR. MURO DE RODA	AREN.1 CLARAVALLS
SL.2 CABALLERA	SOB.9 OTAL	MR.1 EL PAMPORCIELLO	AREN.2 COLLS
SL.3 EL MON	SOB.10 SASA	MR.2 FUMANAL	AREN.3 LAS BADIAS
SL.4 LA CORONA (SANTA LIESTRA)	SOB.11 SUSIN	MR.3 LA CORONA (LA FUEVA)	AREN.4 SOLIVA
ESC. EMBALSE DE ESCALES	SOB.12 YOSA DE BROTO	MR.4 MINISTERIO	AREN.5 SOLIVETA
ESC.1 AULET	GAR. LA GARCIPOLLERA	MR.5 MURO DE RODA	AREN.6 SUERRI
ESC.2 CASTROCIT	GAR.1 ACIN	MR.6 LA LECINA (LA FUEVA)	AREN.7 TRESERRA
ESC.3 GABARRET	GAR.2 BERGOSA	GRA. GRAUS	A-SO. ALTO SOBRARBE
ESC.4 OBIS	GAR.3 BESCOS DE GARCIPOLLERA	GRA.1 ALDEA MORA	A-SO.1 BIES
ESC.5 SANTA EULALIA (BETESA)	GAR.4 CENARBE	GRA.2 ARUES	A-SO.2 ESCUAÍN
ESC.6 SOPERUN	GAR.5 LARROSA	GRA.3 GRUSTAN	A-SO.3 MURO DE BELLOS
ESC.7 RALUY	GAR.6 YOSA DE GARCIPOLLERA	GRA.4 PORTAESPANA	A-SO.4 SANTA JUSTA

Figure 3
Summary table of selected abandoned villages (own elaboration)

these factors as indicators that will allow us to quantify and compare their levels of influence.

Measurement and analysis

Each of the abandoned villages selected got its own file with the most relevant features, drawn from the analysis of the recovered settlement cases, to evaluate their current state in order to draw comparisons.

In order to assess their restoration potential, the most relevant characteristics served as indicators, which made evaluation of their overall impact possible.

At the end, a summary table was produced, compiling and homogenizing the most relevant information from both the population nuclei and the conservation agents involved. This table includes a summary sheet with the indicators' valuations. This makes for a better comprehension of all the compiled data and the comparison of the various cases. The characteristics or indicators of the restoration potential are grouped under the following headings:

Relation to the territory

The description of the settlement's geographic environment helps place them in relation to their territory and makes a first assessment of their relationship possible.

We specify:
-Municipality
-Region
-Area of influence
-Altitude
-Gradient
-Distance to municipality's administrative seat
-Time as municipality's administrative seat
-Proximity to elements of economic or touristic interest

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Chronological frame

We analyze the population's evolution from the early 20th century until the depopulation's onset, as well as the causes behind this.

These data provides us with information on the level of preservation and ownership of the remains, divided by expropriation, sale or abandonment.

We ascertain:

-Population in 1900/1950

-Depopulation date

-Causes behind the depopulation

State of infrastructures

We assess the current state of access and infrastructure, bad or non-existent in general, as depopulation coincided with the rest of the country's infrastructural improvements.

The importance of this summary resides in the fact that all these basic services must be guaranteed if recognition as urban terrain is sought, which could make future investments unviable.

We analyzed:

-Road access (accessibility)

-Electricity supply

-Water supply

-Sanitation network

-Telephone communications network

Observed criteria are seen on table 1.

Ownership and usage

The proprietary rights determine the rehabilitation process' timetable; belonging to the Autonomous Region, the Central State, the Town Hall or the Individuals, noting the presence or absence of "squatters" that may interfere with future recovery attempts. Categorization takes into account the potential agility to manage planning.

The area's economic activity and usage could either ruin or guarantee its future development. As a rule it may be cattle farming, agriculture or tourism.

We analyzed:

-Hamlet's ownership

-Land ownership

-Main economic activity

The valuation thresholds are described on table 2.

Building's heritage and degree of general conservation

In so far as heritage protection is among the objectives of the abandoned dwellings' restoration, the listed buildings are accounted for and described, some of which have been declared Sites of Cultural Interest. (Sabaté 2010,).

The assessed potential for restoration will be consistent with the percentage of roofed buildings in relation to the total built surface of the nucleus.

We analyzed:

-SCI volume

-Other cataloged properties

-General state of buildings

We provide the following valuation thresholds on table 3

Table 1

Accessibility		Electricity	Water	Sanitation	Telephone
[0-1 km)	1	1 if available	1 if available	1 if available	1 if available
[1-5 km)	0.8				
[5-10 km)	0.6				
[10-20 km)	0.4	0 if unavailable	0 if unavailable	0 if unavailable	0 if unavailable
[20 -… km)	0.2				
– km	0.2				

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Planning

The dwelling's restoration potential will be estimated based on the available planning tools. There are certain municipalities with specific plans, which organize and regulate, and others which disregard the existence of these settlements.

We analyze:

-Hypothetical surface of urban center

-Specific planning tools

-Planning development agents

-Planning by the municipality's head

The valuation is seen on table 4.

Scenic Landscape Assessment

The natural beauty of the surrounding landscape is objectively analyzed based on the presence or absence of:

-Natural interest resources, such as:

a.- Rivers and reservoirs.

b.- Heritage of mankind areas

c.- Protected natural spaces

d.- Reserves of the biosphere

e.- Natural wetlands network

-Infrastructural visual impact. Proximity to communication or energy transport networks is deemed disadvantageous.

-Revitalizing activities or potential for their development. Well-adjusted interactions with nature, past or present, bear a positive value ensuring man´s survival on the terrain. Examples: cattle farming, agriculture, controlled tourism.

-Culture revitalizing heritage and assets. Presence of these resources greatly improves potential, moreover when they may be exploited

$$preserved\ percentage = \frac{m^2 of\ roofed\ infrastructure}{m^2 built} = \frac{m^2 of\ roofed\ infrastructure}{(m^2 of\ roofed\ infrastructure + exposed)}$$

Table 2

Description	Valuation
Town Hall	5
Autonomous Region	4
Hydrographic confederation	3
Mixed	2
Individuals	1
Anyone + squatter	1

Table 3

Description	Range	Valuation
In state of total ruin	[0%-20%)	1
Partial ruin	[20%-40%)	2
Stable	[40%-60%)	3
Normal Conservation	[60%-80%)	4
Good conservation	[80%-100%)	5
No data	-	1

Table 4

Description	Code	Valuation
Special Plan present	SP	5
There is a municipal General Planning which includes and defines the hamlet	PGOU DEL	4
There is a municipal General Planning which includes the hamlet	PGOU SR	3
There is a municipal General Planning which does not include the hamlet	PGOU NR	2
There is no Planning, subsidiary rules (municipal or extra-municipal), or delimitation plans for urban land.	SP, NNSS, Or PDSU	1
No data	-	1

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towards tourism. There are two categories: Site of Cultural Interest and Listed Site.

-Impact of new construction. The way this fits with the surroundings and the respect it shows for the village's essence will be positively valued, as opposed to agricultural constructions with industrial type materials.

The criteria are seen on table 5.

Results

The data obtained from the study of such characteristics within the defined field of study consists of:

Communities and settlements data sheets. (Figure 4)

A separate data sheet has been prepared for each area of influence, including an orthophotographic map, with the location of the settlements, as well as access and gradient schematics for an easy understanding of their overall arrangement. Along with the graphic data, there is a summary of the most important features in case a detailed study of the area is needed.

Individual settlement data sheets. (Figure 5)

-Location map within each area,

-1/2500 scale settlement map, with buildings in ruins outlined and a proposal for delimitation.

-1/2500 scale ortophotographic map, with a scenic landscape preservation outline.

-Three degrees of proximity images: panoramic (to explain the relationship with the environment), ensemble (to explain the relationships between infrastructures) and detailed (to explain the preservation status)

-Pentagonal diagram. The interior polygon shape will reflect the joint assessment of the following characteristics: the Ownership, the building's State of Conservation, how it fits within the Planning, the General Infrastructure State and its Scenic Value.

A summary graphic sheet (Figure 6)

The restoration potential gathered data, grouped by area.

In light of this, it is clear that each group is extremely heterogeneous when it comes to its nuclei's potential. Therefore, the recovery potential of the whole becomes increasingly complex.

It would most likely be advisable to include any data of territorial nature into the area analysis if integration into a global recovery strategy is to be considered, coupled with the settlement's potential.

Conclusion

The ensemble of settlements, still standing though uninhabited since the second half of the 19th century, constitutes in itself a memory of pre-industrial Altoaragón. Its study revealed a varied, intelligent and respectful way to inhabit and interact with the territory. And so we have been able to clearly define the extension, state and potential of the territorial stratum, endemic and intact.

Table 5

Resources of interest	Infrastructural impact	Economic activities	Heritage and culture	Impact of new construction
1 if available	1 if unavailable	1 if available	SCI rating + Listed Site	1 not available
0 if unavailable	0 if available	0 if unavailable		0 if available

$$listed\ site\ valuation = \frac{number\ of\ listed\ sites\ in\ nucleus}{number\ of\ listed\ sites\ within\ the\ nucleus\ with\ most\ assets} \times 0.5$$

$$TOTAL = (\sum variables) \gg 1, o\ 1 < 1 TOTAL = (\sum variables) \gg 1, o\ 1 < 1$$

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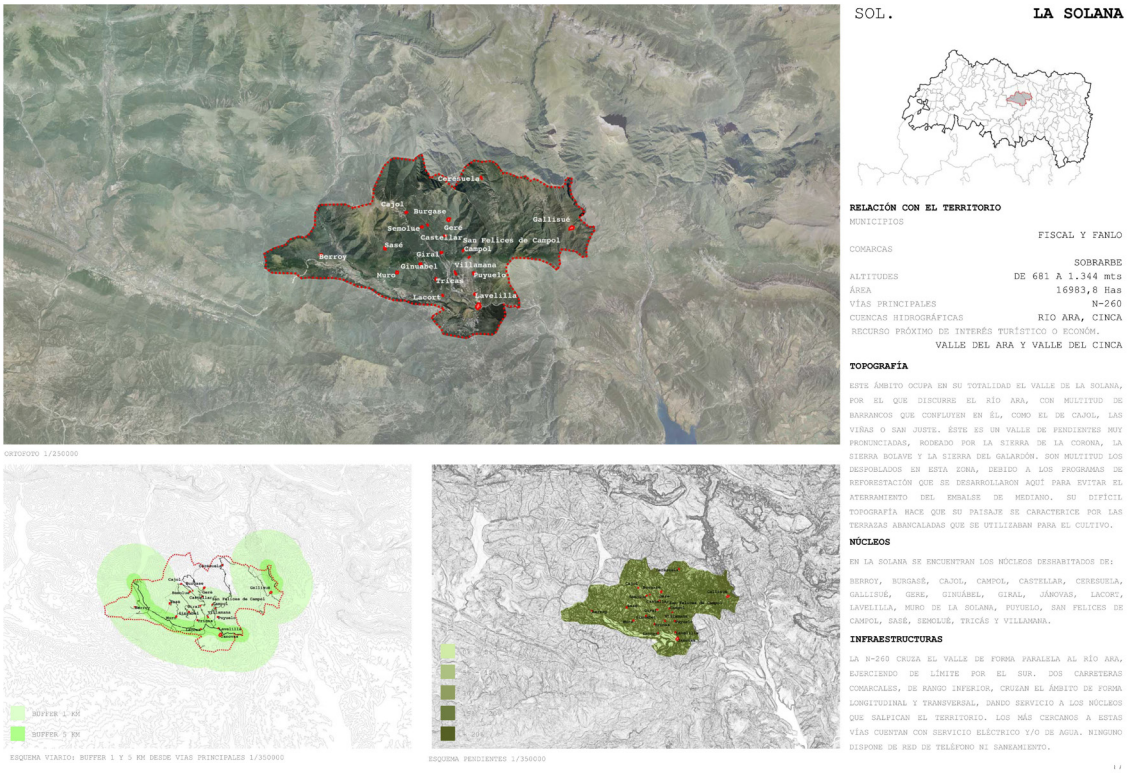

Figure 4
Communities and settlements data sheet (own elaboration)

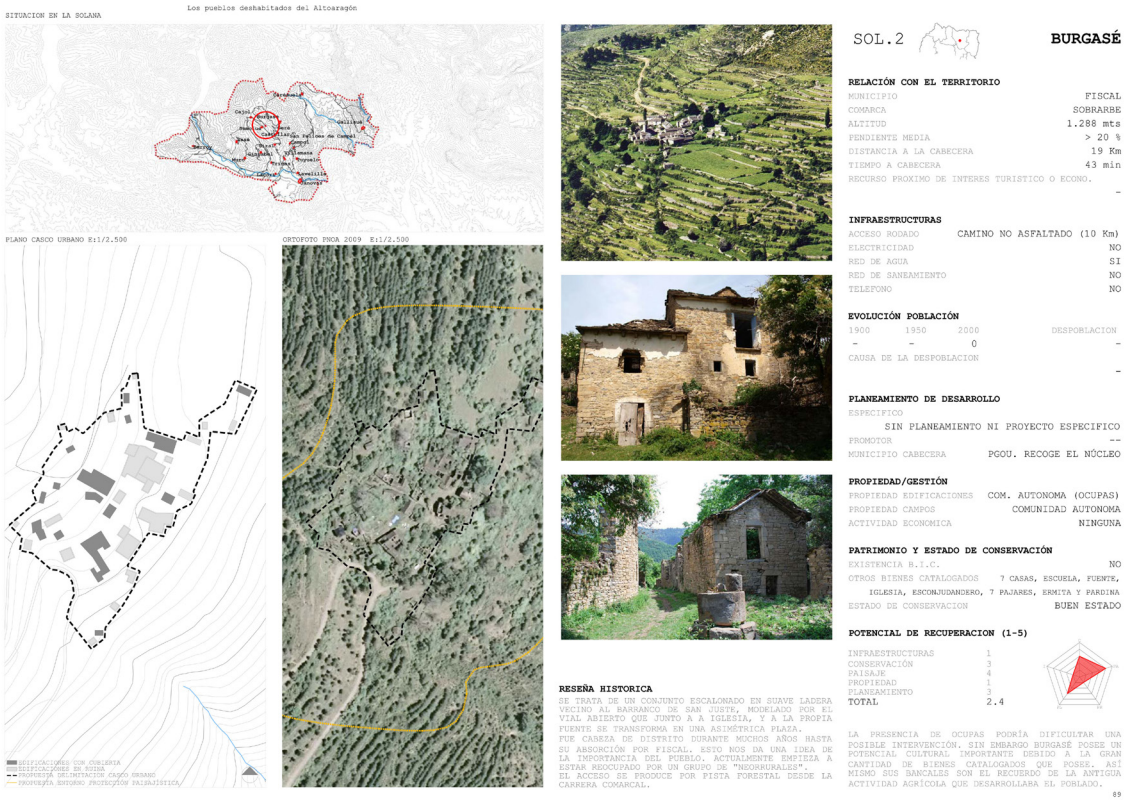

Figure 5
Individual settlement data sheet (own elaboration)

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As a result of the rapid process of depopulation that the altoaragonés territory was subjected to during the previous century, its heritage has remained untouched. This actually provides a unique opportunity for the global approach of preservation interventions or recovery of such heritage.

Over the last thirty years the reoccupation of uninhabited population nuclei has been steady. The study of the circumstances in which these processes have occurred has laid the foundation on which the potential recovery of the ensemble of the still abandoned settlements is based. In light of this comparison, many settlements with a reasonable restoration potential have been detected, as well as others which could easily be strengthened.

Of the total 142 towns studied, 89 have a medium to high restoration potential, while the rest would show objective difficulties for a complete repopulation. Therefore, any realistic goals towards possible actions regarding the abandoned hamlets ensemble should consider adapting restoration strategies based on the individual characteristics and potential of each one, and not so much the complete revitalization of the given area, which still show demographic problems today. Hence, for some settlements there will be a viable rehabilitation whilst others will benefit enough from just the consolidation of their remains. In any case, restoration strategies should make the leap from the individual to the collective. It is only so, that something as valuable as these settlements can be protected; their relationship with their own context and to the surrounding populations.

It has also been revealed that, historically, the towns in the Huesca Pyrenees worked together as scattered habitats but were thoroughly interrelated. The "areas of influence" under which these abandoned settlements have been grouped obey to their territorial and historic links and relations, uncovered by the bibliography.

Man inhabits the territory, but he also exploits and travels across it. The footprint left

Figure 6
Summary graphic sheet (own elaboration)

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by his actions, still indelible in these abandoned environments, deserves the same recognition and protection as the settlements themselves.

It hasn't been this study's aim to analyze these areas in detail, beyond their circumscription or the observation of their settlements, but the development of a conservation plan should possess all this information for the complete preservation of the scenic stratum which this heritage is composed of.

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Marinilla´s cultural landscape and spatial characterization (Colombia)

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Abstract. *The historic center of Marinilla, a National Monument since 1959, is located 50 kilometers east from Medellin in the San Nicolas Valley. It has exceptional landscape conditions, highly productive lands, and a large percentage of the water reserve that supplies the region and the country, giving the territory an economic center character since colonial times. These physical values are part of the collective imagination as a recreation area and an opportunity for development since the 1960s, according to the construction of large national infrastructure. At the same time, it was affected by the internal armed conflict in the 1980s and 1990s, and more recently, related to the spatial dynamics of the region: unplanned urban expansion, changes in land use and vegetation cover, with great effects on the cultural landscape. In a post-conflict situation, the economic strategies of different groups have used tourism as a social-spatial management strategy to improve the territory. However, the rural identity shows spatial imbalances, not recognizing elements of historical construction whose legacies must be revealed to ensure equitable development. We propose an approach from cultural landscape in a revision of the historical, symbolic and relational transformation through five dimensions–anthropic, productive, political, symbolic and spatial–analyzing competitiveness, tourism, the real estate pressure and social management, in different scales, during three historical moments.*

Keywords: Marinilla, cultural landscape, paths and highways, landscape transversality, tourism

Introduction

The municipality of Marinilla has a wealth of natural, agricultural, forestry and heritage resources. It is located at 2120 meters above sea level, in the Santa Rita Valley of the geological formation called Valle de San Nicolás, and is part of the Negro River basin, source of the Guatapé dam, the largest in the country since it was built.

The valley of San Nicolás had an accelerated process of occupation during the seventeenth century with the change of the region capital, formerly in Santa Fe de Antioquia (1541), to Santiago de Arma Rionegro in 1783. Although Marinilla was only proclaimed a 'Villa' in 1787 taking advantage of preexisting indigenous settlements located in areas near El Peñol. The first two municipalities "only reached maturity as urban centers by the end of the eighteenth century and the beginning of the nineteenth century" (González, 2015). Since then, they form a triangle that shared territorial interests of power, mining resources, processes of occupation, among others, and they formed a corridor that was part of the route of gold exports from the interior of the country to Spain. This situation favored the population growth through commercial routes and spatial relations with the valley of Aburrá–where the city of Medellín is located from 1675–and the Río Cauca valley, where the capital of the region

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was located then (Santa Fe de Antioquia), and founded as a product of the Spanish conquest.

Marinilla and its cultural landscape are indissoluble, because the landscape reflects the history, the traditions, and the customs of the settlers of the East part of Antioquia. The territorial importance of this area has been constant in many diverse historical moments due to the character of the place as a "passage" (place of transit) in the construction process of the nation and instrumental in the configuration of a regional identity. In this context, the landscape has been the "backdrop" and the sustenance and support of the human spatial transformations.

Geographically, Marinilla is located in the area historically called "Juntas", a term that indicates 'meeting place' and articulation of paths that sought the appropriation of resources, mainly mining, but which required other resources such as agricultural and outsourcing services. The image of the "paisa", as are known the natives of the Antioquia region, and within them, the "Marinillo", is identified with the expansion of an occupation model that struggles with the adverse geography and takes advantage of the wealth of natural resources. Marinillos are well known as accomplished merchants and traders throughout the region.

The municipality has been historically associated with an idiosyncrasy of "vigorous" people and merchants that favored the processes of occupation and the battles of independence from Spain. The old urban center has been declared as a Colombian national patrimony since 1964 and it has been the scene of dramatic changes of its traditional central square in the last decades, with the passive attitude of the authorities, who have condemned these important real estate to tourist sites where only some religious buildings are maintained (Figure 1), and "where architecture has been replaced without aesthetic references by a new form of construction associated with the growing tourist demand, demystifying the presumption of styles, and drawing attention to the 'consumption' of heritage as well as clear and abusive use of regulations and declarations" (González, 2016)

On the other hand, the rurality developed into exceptional landscape conditions of smooth hills, with a variety of vegetation coverings, and with a structure of small family plots (Figure 2). The vernacular architecture that traditionally responded to the bioclimatic conditions with traditional techniques that considered the resources of the zone, are now replace by an unreflexive architecture that does not value the existing heritage.

These conditions confirm the problems faced by most cities with heritage values in developing countries: social inequality and the city-countryside disjunction stimulating the installation of tourism without articulation with the multiple dimensions of the territory in strategies that allow their promotion through social management and to serve as a resource for territorial planning that make it possible to solve spatial and landscape imbalances as well as the protection of their patrimonial values.

Figure 1

Typological changes of the protected historical center by commerce and tourism use. Source: The authors.

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That is to say, in relation to the problems associated with economic, social, political, educational, productive, among others, it is also appropriate to consider a number of values of the municipality of Marinilla as physical–natural–environmental, landscape, cultural and heritage. These values are worthy of being considered as important resources that can be integrated to the economic activity through tourism and also, to promote their conservation as productive assets, due to their intrinsic heritage qualities and values.

It is fundamental to consider the promotion and socio-spatial management of the landscape and the territory in its double character of cultural and natural heritage in order to consolidate solid orientations that include the perception and significance of the local character for its implementation (starting from a spatial identification of the territorial changes over time), and oriented to look for the historical coincidences of the landscape transformation and its possible manifestations. In this sense, the study proposes the revision of a spatial transversality as a starting point for the characterization, because the analysis will to establish the value of the landscape from the relations of its components, because the territorial singularity must be recognized and then be valuable to finally be managed by the community. (Pérez, L. C., Español, I. 2009)

The transversality that concerns us, is composed of two road corridors: the Medellín–Bogotá highway (national road system), that crosses the municipality, and the detour of a secondary road corridor that connects the municipality with one of its historical neighbors, El Peñol. From that junction, a "micro–basin" landscape is formed by the paths Salto Arriba and Salto Abajo, the northwest slope of Las Cuchillas Reserve and its descent to the Río Negro basin and the Guatapé dam. This transversality is reviewed in the perspective of landscape dynamics and its condition of passage, path and connection, that has accompanied the cultural landscape. Therefore, the various scenes through this communication channel, reveals veiled contents of the economic model and a dialogue with multi-scale spatial phenomena.

First of all, the real estate pressure affects the landscape in terms of perception and valuation of the landscape heritage by the transformations of the scenic background. Secondly, tourism affects occupation processes, promoting typological changes in architecture, reclassification of land and the provision of tourism services. The discourse of competitiveness, territorial marketing and patrimonial marketing are favored by connectivity and accessibility, generating social transformations that streamlining the structure, and form, identity of the landscape. Finally, socio–spatial management is the possibility for action that, under the pressure of the economic model, allows its valuation and safeguard it, based on the right to the landscape (and its use), representativeness and understanding of the conflicts ranging from impacts in the landscape itself, to other aspects of an environmental and social nature. This last conflict introduced dramatic changes in some

Figure 2
Rural zone occupation in small family plots. Source: The authors.

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paths under the influence of armed sectors in the internal conflict that forced a re–structuring of the spatial dynamics in the last three decades.

In this sense, "the cultural landscape is considered as an extended analytical and conceptual category that allows a review of the historical and symbolic transformation of the territory, which includes physical issues in accordance with anthropic action and whose spatial evidences are the product of a process of historical reasoning of living, and therefore, a social construction in development and cultural production" (Montoya, C., Patiño, E., Escobar, L., González, LF. 2016) This approach, includes of the following assumptions:

-The laws of territorial organization in Colombia has entitled the right to the landscape implicitly, in a good part of its normativity, but has not articulated it to territorial planning. At present, the revision of spatial complexities beyond municipal limits, makes possible the use of the cultural landscape as a complement, from and for the decision making, since it could identify landscape imbalances due to its relational perspective with multi–scale, multi–temporal changes and significance, which currently escapes the objectives in urban and regional planning.

-Although several studies have dealt with the impact of national roads and historical regional dialogue, second-level inter–municipal corridors that articulate the rural terms of municipalities, tend to become suburban corridors with no urban services and attributes, and with a high landscape impact: already occurs in the route Rionegro-Marinilla and begins to show signals of the interaction of real estate pressure, tourism industry and the discourse of competitiveness in the Marinilla–El Peñol corridor and its effects, that are hardly revised for the advance of social management of the territory.

-The cultural landscape includes in its perspective the scenic background, the main receptacle of these vectors of change where historical and symbolic transformations in their encounter with the economic dynamics, threaten the dialogue between the cultural identity built in time and the landscape, and establishes a direct relationship with the transformation of the habitat and the landscape environment.

-At the time of the analysis context, there are two transcendental facts: the national road infrastructure program Autopistas de La Prosperidad (Prosperety Highways) in 2010, and the final stage of the conflict that allowed the return of people and tourists to the area between Marinilla, El Peñol and Guatapé.

The consolidation of these facts, gives a new suburban character to the intermunicipal routes of secondary level and shows a tendency for change in the rural area towards urbanization of first and second housing, but without endowment of services or urban attributes, with some impact on the landscape and the persistence poverty of a large part of the original rural population.

Methodology

The research project "socio-spatial management of the territory from the cultural landscape of Marinilla" proposes a conceptual and methodological structure from the Cultural Landscape perspective for the social management of the territory–based on strategies of spatial and landscape analysis–as a result of social and cultural constructions, which relies on tourism as an activity for the economic take–off of the region and guarantor of development.

The analysis is developed in a landscape transversality to constitute a complex vision of the territory to start a relational analysis for what the constitutive elements of spatial phenomena were identified through the variables: real estate pressure, tourism, discourse of competitiveness and, in this occasion, socio-spatial management. By the type of relationships suggested within the cultural landscape , these are revised from the physical–spatial, symbolic, productive, political, and anthropic dimensions with scaled changes. The spatial characterization includes the revision of the constituent elements of the landscape and the new maps through a descriptive, interpretative and pro–positive methodology that combines tools of geographic information systems with analytical info graphics and multi temporal and multivariate analysis, to obtain relational

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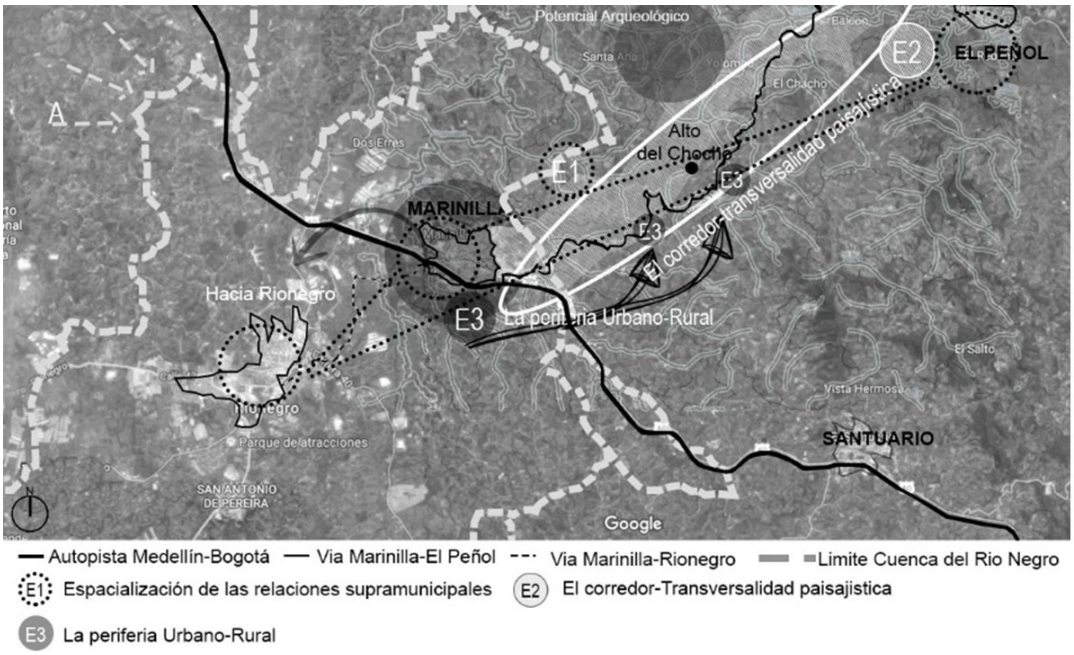

Figure 3

Analysis scales. Scale 1 (E1) Spatialization of supra-municipal relations, (E2) Landscape transverse corridor, and (E3) The rural-urban periphery.. Source: The authors.

information (Montoya, C., Patiño, E., Escobar, L., González, LF. 2017).

The spatialization, definition and analysis of the variables and dimensions reviewed in the various scales of landscape transversality, resumes the application of the conceptual and methodological proposal of the case study Santa Fe de Antioquia , and applies to the context of Marinilla with a particular variation: the point of analysis is not part of the generational matrix historical center–environment, but focuses on rurality where the landscape is constrained by the advance of the economic model and the perspective of socio–spatial management that is added as a measure for the valuation and safeguarding of the landscape. This second case of application, allows to change the specific weight of the dimensions that constitute a conceptual pendulum, a consideration that can only take place after an approach to the cultural landscape of the area of study with plenty of field work for the verification of the state of the documentation (Cartography of the territory ordering, special plans of patrimonial management, historical aero photos and cartography, literary narrative and pictorial narrative).

The spatial scales of analysis are as follows: the first revises the supra-municipal relations between Rionegro, Marinilla and El Peñol, and the historical value of the corridor in regional relationships from the beginning of the occupation to the present day. The second scale includes the Marinilla–El Peñol corridor whose main tensions are the economic character of the national highway that interact with the urban area, and the natural landmark of the Peñol Stone with the Guatapé dam, both main tourist attractions since the seventies. This corridor was updated with the expansion and adaptation of the national road in the “Roads for Prosperity” program. The third and last scale presents the spatial transformations of the last three decades generated in the meeting of the urban and rural areas, emphasizing the trends of change in land use and, consequently, in the landscape of the place. (Figure 3: Scales of study).

Measurements and analysis

Scale 1: Spatialization of supra-municipal relations. Although it has been emphasized

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so far in Marinilla, the valley of San Nicolás, cannot be analyzed without establishing historical spatial realities with the Aburrá Valley and the Western Valley, where the first capital of the colonial era, Santa Fe de Antioquia, is. In spite of the geographical, climate and resource differences, spatial connections between the three valleys and natural landscapes are decisive. There have been dynamics of occupation and settlement according to the territorialities and power over resources (mining, forestry, agriculture and livestock) throughout its history. Recently, with the appearance of national infrastructures such as dams, roads, and tourism potential promoted by the richness of its landscape resources, there is an impact in urban and rural scenarios, and generate a palimpsest landscape that awaits for an update.

The evolution of the landscape of the study area has been described in terms of prosperity since the seventeenth century (Jimenez, O. 2010). The region of Antioquia understood as countries, landscapes, paisano and paisa includes communication in its perspective. The Juntas road, besides leading to the Samaná and Nare river basin, was associated with the possibility of discovering new territories and articulating these small 'countries' to culture them during the seventeenth and eighteenth centuries, and constituted routes that, from their narrative, did not only reconstruct the landscape of the moment, but associate places with spaces, and these to societies and cultural landscapes (Figure 4).

This gradual process of settlement, economic growth, impacts on the landscape, environmental and social conflicts, has found in recent decades "an important milestone for the case of the San Nicolás Valley: the Medellín–Bogotá highway and the Guatapé dam The 1970s are a process of occupation previously unknown in the region around access to goods and services that is not restricted to urban centers but the rural terms affected by the same works. This infrastructure becomes insufficient more than thirty years later, when the depletion of the soil in the Valley of Aburrá–especially in Medellín–moves the urban growth to the East, to be now the "second floor" of the Medellin's first residence. In 1985 the José María Córdova international airport was added to the Rionegro municipality, but it mainly served the metropolitan area of the Aburrá valley. With the Medellín-Bogotá highway, which in the beginning was associated with the sunday tourist image of the "Eastern Circuit", it came present with the promotion of projects of first residence of high standing and with architectural and "urban" typologies that focuses on commercial services and where the mountain landscape is only an accessory.

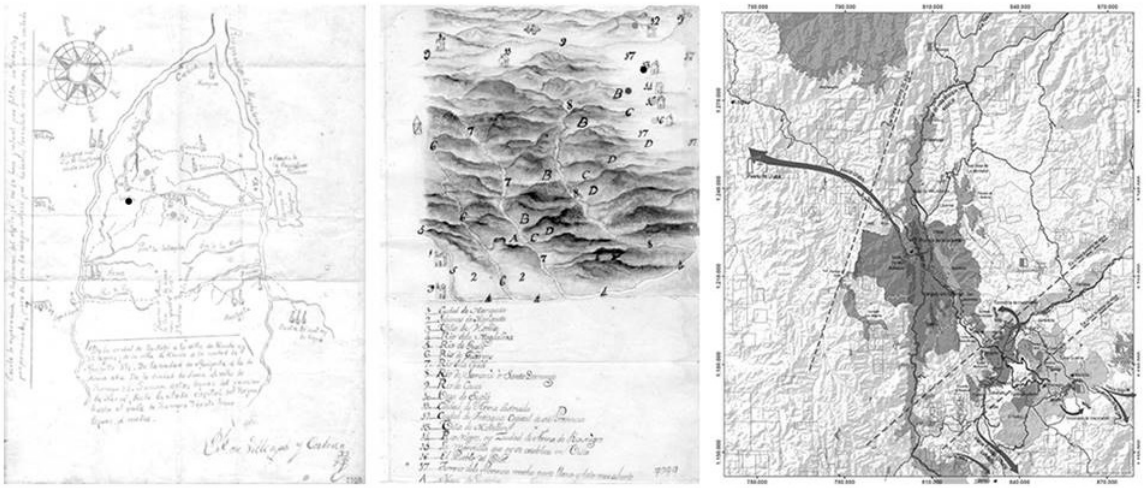

Figure 4

Mosaic of historical spatial relationships. First, Road Plan between the cities of Sanfé and Antioquia by Pedro Biturro Pérez in 1781 (left). Second, a Plan to open a phat from Marinilla to Mariquita order by the Governor Francisco Silvestre, dated in 1875 (center), both from Archives of Antioquia; and finally, Regional Landscape (Montoya, C., Patiño, E., Escobar, L., González, LF. 2017) on the right.

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Scale 2: Landscape transverse corridor. This corridor presents the interaction of the previously cited variables with the scope, resulting in a complex network of spatial relationships associated with the dynamics of commercial connectivity, passenger traffic, tourist spaces and the use of resources. In this sense, a proposal for an urban–rural continuum of human habitats can not be detached from this review (Lynch, 1976). The transverse landscape reflects the national ways and its changes to inter municipal with a suburban environment bordering the road and the historic center, which, at the same time, to the secondary corridor to El Peñol, allows the ecological continuity of the rurality of two neighboring municipalities, as well as the reserves of national protected areas and the Nare River Basin. The landscape conditions and visual basins are highly varied and with alerts on changes caused by the mentioned facts.

The physical–spatial dimension (Fs) refers to physical and natural sustenance–relief, hydrography, vegetation and climate–understood as an ecosystem; that is, its potential condition for the site in interaction with anthropic actions and whose conditions of dialogue determine the actual conditions, value, uniqueness and "use" of the landscape in general. In it lies the constructed elements and the model of occupation. Within the protected areas system, it is important to emphasize the National Forest Reserve Nare, as well as the DMI (Distrito de Manejo Integrado de Recursos Naturales) La Selva and the DMI Peñol–Guatapé, which together with other areas make up the ecological structure of the sub region, rich in water resources.

The symbolic dimension (S), which articulates the evidence of historical significance, reflects the links between the memory of the collective place and the accumulated material and immaterial values. This structure involves the declaration of real estate, the valuation of its heritage, historical construction, and cultural heritage. This system links the immaterial ties with the built space and traditions, now recognized as intangible heritage. In the declared urban centers of Marinilla and Rionegro are highly valued for their spatial qualities of urban and architectural characteristics product of a colonial layout whose center is the town square, that begins to blur before the attack of commerce and tourism and from where emerges the main constructions that hosted the most renowned and illustrious characters who accompanied and achieved the national liberation and independence proclamation, as well as high value religious estates.

The productive dimension (Pr) establishes links between the exploitation of resources and the sustainability of the territory and synthesizes the relations between the local productive activities with the management of the water resource and the use of the land. This synthesis provides a reading of the landscape as a cultural fact. To this urban spatial structure is added the rural occupation where the work of the countryside has been constant in the use of the territory and has become a spatial symbol of popular traditions. This environment begins to mutate in the face of the risk represented by the change of vegetative cover for production by others outside the place, subject to market conditions and with a dispersed urbanization of an industrial, recreational and service character, showing imbalances of the rural with its surrounding landscaping, thus contributing to a growing deterioration and loss of its natural heritage values.

The political dimension (P) identifies the roles of the various actors and their interference in the facts that motivate spatial changes in the territory, whether in terms of normative, political participation, and/or economic. It identifies the type of relations between the relevant actors with associated projects and programs and interprets from the normativity established for the occupation of the territory a specific weight that is given to the landscape. This system has the responsibility to establish the dialogue between what the territory says about itself and the planning discourse. It is evident in the main programs, management and strategic projects, which seek to strengthen and insert the territory within the national and international markets, reinforces them for greater competitiveness and economic, industrial, tourism and service development.

The anthropic dimension (A) links the

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reading of the cultural landscape to the human and technological actions that interact and transform the natural environment, thus revealing the conditions of dialogue and balance of the existing habitat. It consists of processes of housing occupation, growth and/ or transformation trends, local favorability, and environmental effects. It is the mark of the cultural force in the territory.

Consequently, the physical–spatial dimension is considered superior to the character of the problem studied. The political and symbolic dimensions continue to stress the figure in view of the socio–spatial management and it depends on this link. Finally, all are articulated by adding the productive and anthropic dimension (Figure 5).

Scale 3: The urban-rural periphery. In this scale of analysis we can read the peculiarities of cultural landscape transformations, especially the landscape and tourism variables after the period of major socio–spatial changes due to the construction of the national infrastructure, the middle phase of the conflict And the trend of change in the post-conflict phase. The survey of cultural landscape units in the Medellín-Bogotá Expressway, combined mapping, fieldwork with on-site surveys, reading of scenic landscape components, targeted interviews for perception and valuation, and support in graphic sections with the main elements of the landscape singularity among which the use of the land, the impact of the tourism in the architecture of the scenic bottom and the image of the landscape stand out. (Moreno, C. 2016; Correa, M. 2016)

Four landscape units were defined: UP1 corridor with industrialized rurality, UP2 related rurality areas, UP3 urban-related urban areas, and UP4 contiguous areas of recreational rurality (Figure 6).

For all units, correlations were identified between land use and landscape identity revealing architectural geo symbols (Contreras, 2015), which are not always associated with vernacular architecture but with the architecture that accompanies new land uses such as industries, services, commercial premises, hotels and restaurants necessary for tourism, generating an impact from the perception and the valuation. For each case, new geo symbols appear associated to productive activities and these are the main indicator of changes in landscape identity that are not the same for local and foreign viewers (Moreno, C. 2016). In UP1 the industrial chimneys appear and in

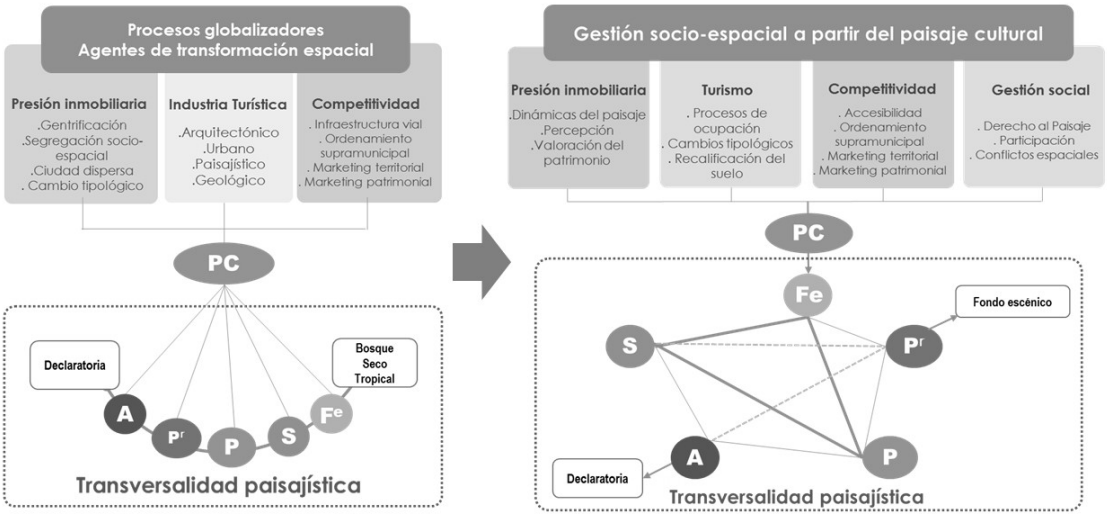

Figure 5
Changes to the conceptual pendulum according Marinilla´s case study (right). Source: the authors based on the Conceptual Pendulum (left) (Montoya, C., Patiño, E., Escobar, L., González, LF. 2017).

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UP 3 the service infrastructure to the side of the road with new commercial uses in previously agricultural land, while rural vernacular housing remains the most valued in this new landscape of UP2 and UP3 and conflicts with the image that begins to outline the new social housing real estate projects that revalue soils for their location, denying with their architecture, values of technology and a space for adequate reflection. All of them with the scenic background as a common denominator (Moreno, C. 2016)

In UP2 and UP4, the impact of the typological transformation of vernacular architecture and its relationship with soil productivity is analyzed, resulting in a correlation between the architectural style and the use of housing (recreational, productive) with the new compositional elements And land use (Correa, M. 2016). The agricultural activity in the small family plots, of the UP2 is almost entirely manual (82%), it is accompanied by a rural architecture and the compositional elements of the rural peasant housing in the region are maintained (Correa, M. 2016). While in UP 4, with its own architecture of tourism marketing, it presents the patterns of the market without reminiscences to the cultural landscape. In these places, the land occupation for the implantation of housing and recreational spaces is close to 95% and the rest for agricultural activities (Correa, M. 2016). In the same landscape unit, buildings with rural architecture use housing 62%, recreation 18%, and agricultural activity 20%.

Of these landscape units, UP 2 and 4 are replicable to the sector of the corridor between the Salto Arriba and Salto Abajo sidewalks whose main vector of change focuses on tourism and where socio-spatial management is a pressing need for the situation of balance of the scenic background as indicator of the capacity of transformation of the landscape in the different scenes.

Conclusion

The transverse landscape shows in its structure, plans, basins, image and valuation, landscape changes and the testimonies of the cultural landscape. Hence, the need for a territorial review from corridors, because in it is the character of their identity and hopes to value the landscape as a cultural heritage.

In singular landscape environments, the

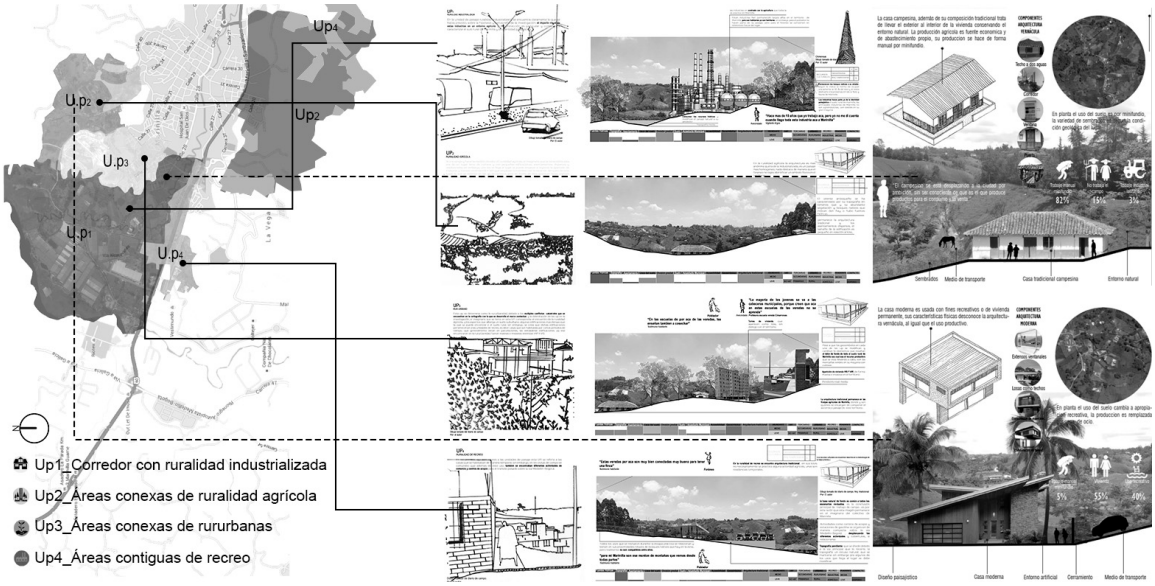

Figure 6
Lansdcape Units. UP 1 UP1 corridor with industrialized rurality, UP2 related rurality areas, UP3 urban-related urban areas, and UP4 contiguous areas of recreational rurality. Source: Moreno, C (2016) and Correa, M (2016).

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effects of globalizing processes are greater because according to the scientific consensus from the cultural landscape, most of our landscapes are cultural facts (Martínez, 2009); Therefore, in direct relation with the way of constructing our territories. In this way, the analysis hopes to establish the favorability and viability of the insertion of a tourist structure for the social management of the Municipality of Marinilla along landscaped corridors, allowing the design of scenarios, which collect in the best possible way, the integrality of the cultural landscape and consider the elements of its landscape diversity as identity values. In order to do so, we review the spatial variability of the Marinilla landscape, since it is the character of its identity and hopes to put the landscape as a sine qua non condition for the conservation of its cultural heritage.

The spatialization of a detailed characterization of the areas bordering the Marinilla–El Peñol corridor and the resulting landscape units will also be the result of role, perception and assessment exercises among the various actors that currently influence the interacting landscape dynamics with resources, especially the water resource. Consequently, the tourist and economic initiatives that are expected to promote from the social management of the territory, will have to articulate a reflection of conflicts by this resource, necessary for agricultural production as the main land use on which falls the landscape value of this cultural landscape.

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Stages of territorial configuration in the non-planned occupation of the Huerta de Murcia, 1929-2015

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Abstract. *The "Huerta de Murcia" is an agricultural area of about 10,000 Ha in size, originated in the ninth century, and linked to an extensive network of canals dependent from Segura River. Such system provides a much divided and fragmented agrarian morphology, around the city of Murcia, in the southeast of Spain, basically dedicated to the agriculture. The city of Murcia has experimented an important growth in the last five decades, substituting hundreds of hectares of agrarian land, into urban. But even more important than this, the periurban area has suffered along the past 90 years a periurbanization process, caused by the unscheduled appearance of buildings. Most of them have emerged in the last 4 decades, whose use is mainly family housing and holyday homes, and have not been planned by standard planning procedures. This causes a spontaneous phenomenon of dispersed territory occupation. The paper shows, through an analysis methodology based on orto-photographical series and cadastral data, the existence of different stages along the studied period (1929-2015). These stages are substantially different each other in two ways: the patterns and zones affected by this process, on one hand, and the intensity of this process, which vary along each studied period, on the other hand. The analysis of these patterns, as well as a proposed classification, and the quantification of the process in each period, are the subjects of the paper, which allows authors to set appropriate relations between the city of Murcia and its periurban territory, to afford the globalization age.*

Keywords: Huerta de Murcia, non-planned occupation, territorial configuration.

Introduction

Certain peri-urban agricultural territories, located mainly around cities with a high demographic growth and intense migratory flows, have been altered in recent decades by a process of dispersed occupation, mostly with isolated single housings but also other urban uses. The intensity and the morphological characteristics of this peri-urban transformation share some common characteristics: low control of urban planning prescriptions, high spontaneity and frequent self-construction. At present there is a lack of accurate knowledge of the processes of these transformations and of the resulting morphological patterns. The objective of this paper is to achieve a better understanding of the territory in transformation, so that a better urban planning could be developed, preserving the rural heritage.

This work is centered in the study of the process of informal occupation in the Huerta de Murcia, at southeast Spain. It is a phenomenon that can be appreciated especially since the 1950s, reaching worrisome levels in the last decades of the XXth century. The process results in the old agricultural field fabrics becoming a rururbanized fabric, with a high rate of single housings rate, not guaranteed minimum urban standards and endangered

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viability of agricultural activities.

The method of this work begins with a global analysis of the entire Huerta de Murcia area is performed, divided into homogeneous landscape units. Later, a study is systematized by combining the orthophotographic series available in the Territorial Information System of the Region of Murcia (www.sitmurcia.es) and the cadastral cartographic data (www.sedecatastro.gob.es). Using both sources, and through operations in GIS software, a global image of all buildings in the Huerta is obtained in each of the historical periods, according to the different orthophotographs.

This methodology allows establishing qualitative and quantitative conclusions about the analyzed transformation. The specific aim of this paper is to show the results of the qualitative analysis together with those of the quantitative analysis. So, it is possible to characterize the different periods and stages, obtaining in each one of them graphical patterns and intensity data that allow conclusions to be drawn from each period.

The results of this work will help to reverse or, at least, paralize the unsustainable process of transformation towards a diffuse city (Indovina, 2000).

Geographical and cultural context.

La Huerta de Murcia is a region located around the city of Murcia, in the Southeast of Spain. It was set up as an agricultural environment in the Muslim colonization in 825 A.D., with the creation of a irrigation system of canals, started in a water dam over the Segura River, that run through the valley where it was founded the city of Murcia.

An agrarian landscape of great aesthetic, cultural and patrimonial values were created from the complex network of canals of irrigation (carrying the water to every plot and collecting the excess to lead it back to the river) with allows facing the climatic adversity characterized by aridity and torrential rains. There are numerous studies of the Huerta de Murcia in the last 40 years, firstly from the fields of geography (Calvo, 1972; Zapata et alt., 1975; Andrés, 1987) and more recently from urbanism (Roselló y Cano, 1975; Cano, 2009; Ros and Garcia, 2016).

The urban - rural duality has remained for more than 1000 years, during which a slow and continuous process of transformation has taken place in. Until the middel of the last century, the rural component linked to the agriculture activity was dominant. Howewver, since the 1960s, begin to occur two actions that tilt the balance toward the urban component.

The first of these actions is the unprecedented growth of the planned urban land of the city of Murcia and the pleiad of urban areas that are also located in the valley. These new growths multiplied the urban land of the existing city, with more than a thousand years, in just a few decades. This is, undoubtedly, a phenomenon similar to thus happened in mayority of Spanish cities at the time, due to the migrations from rural to urban areas, as well as the spectacular population growth linked to the improvement of economical, social and political conditions.

The second action has its origin in a slow, almost invisible but inexorable process, motivated by the change of habits of life of citizens. The residents in the city liked to get out of it and with private vehicles, find in the area of the Huerta de Murcia a place to its residence, a few minutes from the city, with lower land prices than in the planned low-density urbanizations and possibilities of a bigger contact with the natural environment.

The described area of the Huerta de Murcia is immersed in a wider territory of continuous irrigated lands associated with the valleys of Segura and Guadalentín rivers, which make up one of the most extensive areas of traditional peri-urban agricultural lands in Spain.

There are few studies to date that have analyzed this phenomenon in its entirety, although some of them do so in part, and can be compared with similar studies in other European areas (Calvo, 1972; Ferrario, 2009; Entrena, 2005).

Agrarian morphology and landscape units.

Once the region has been contextualized, and prior to the explanation of the methodology of the work carried out, it is considered necessary

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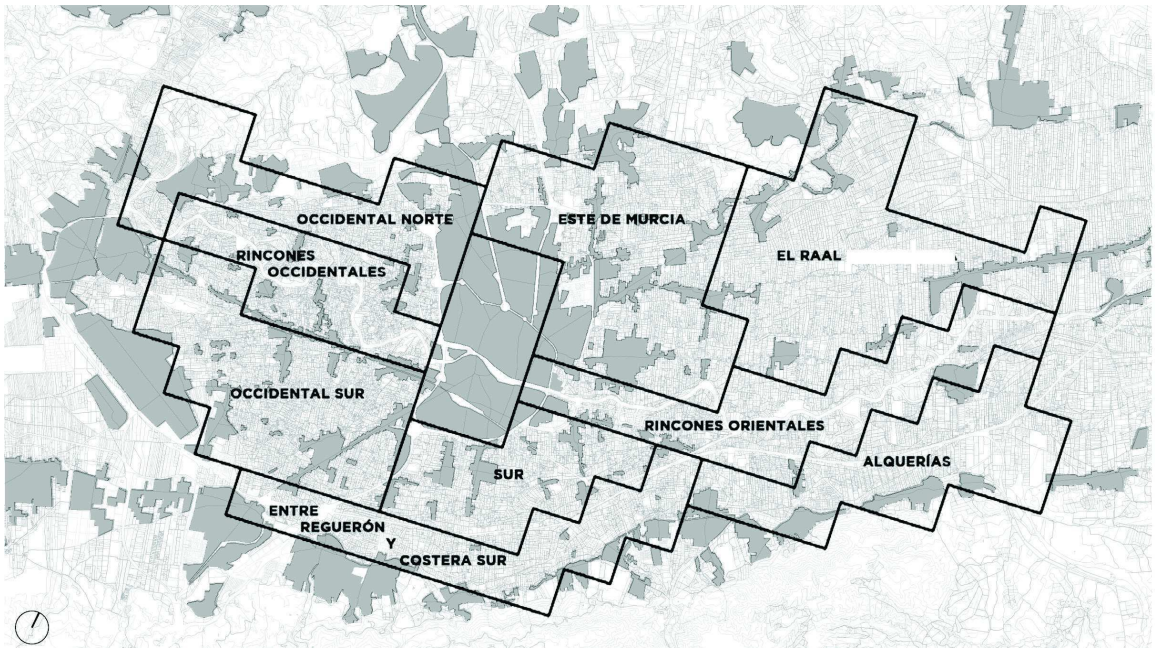

Figure 1.
Homogenous landscape units of the Huerta de Murcia, with urban nuclei in grey.
Source: Ros y García, 2016.

to highlight the singularity of the agricultural morphology of the Huerta de Murcia. Contrary to habitual simplifications of the Huerta, there are different landscapes coexisting in the valley, wich have been considered in this work.

The agrarian morphology currently present in the Huerta de Murcia is derived from a long process of transformation, from its beginnings in the 9th century. Geographical studies (Calvo, 1972) have usually divided Huerta into three morphologically differentiated areas, due to different factors.

The Landscape Strategy of the Region of Murcia (2011), has defined fifteen homogeneous landscape units within the landscape area called Huerta de Murcia. These units are based on a previous study by Mata and Fernández (2004). For each unit the constituent elements are established: geoforms, hydrography, vegetal cover, land uses, elements of the agrarian structure, settlements, and road network; as well as quality indicators. From these elements, values of quality and fragility of the landscape are obtained.

In this work, the landscape units have been used because they include in its definition the form of the agricultural plots, which also have a strong role to determine the single housing occupation as well as the urban planning regulations.

Methodology

The first phase of the work was done as a pilot study case (Ros and García, 2012), analyzing a west fragment of the Huerta. This first phase served as a basis for exploring the methodological techniques to study the patterns and causes that had marked the transformation of the Huerta de Murcia.

This pilot study was carried out on the available orthophotographic series, and afterwards, and manually, the construction and plots were associated with each of the studied periods. Once all the data were extracted, the surfaces were numerically analyzed by periods and urban patterns were searched.

The second phase of the project has extended the scope of study to the entire Huerta de Murcia, within the limits defined historically, from its beginning in the Contraparada dam to the Vereda Real path, which is the boundary with the province of Alicante. In this global study we have analyzed the process of recent transformation of the traditional agricultural

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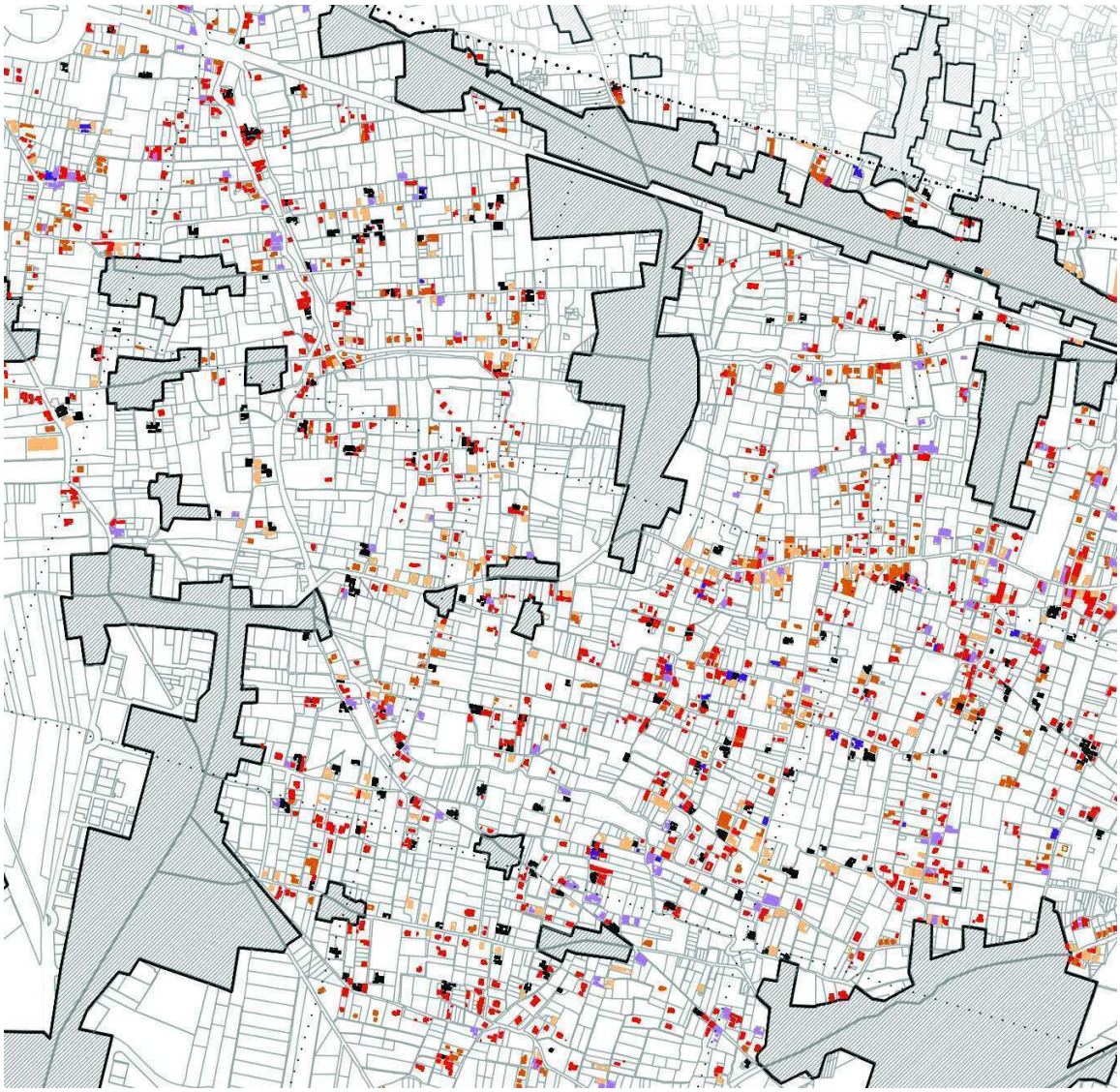

Figure 2.
Construction in a fragment of the Huerta de Murcia classified by period. Source: Ros y García, 2016.

fabric of the whole Huerta de Murcia, excluding only the present urban areas.

The exclusion of the urban areas leave out the "substitution" of the agrarian plots with new urban fabric, focusing the study only in the "transformation" over the agricultural fabric by the construction of housing buildings.

Once the area of study has been delimited, the methodology of work has been the following one:

-Download of orthophotographs of the study area from years 1928, 1946, 1956, 1981, 2002 and 2015.

-Download of cadastral cartography corresponding to the study area, including as a significant data the height of the constructions and obtaining by GIS software the plot area, the footprint area and the built area.

-Integration of both cartographies, and date assignation to each cadastral construction (verifiyng its fidelity to reality) to the oldest ortophography in which this construction appears in.

-Extraction of cartographies with the constructions existing in each ortophotography that remains till ourdays, distinguishing the ones that appear in the period till the previous ortophotography.

-Extraction of quantitative data, creation of data tables and graphs.

With the results of the previous steps, it was done a quantitative analisys of the occupied

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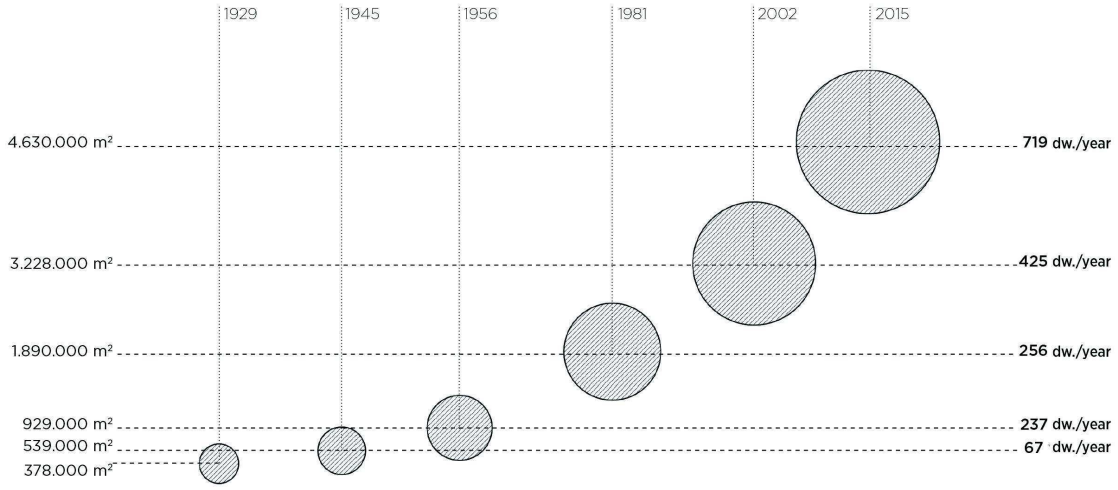

Figure 3.
. Quantitative evolution of the occupation in the Huerta de Murcia. Source: Ros y García, 2016.

area in each period. Under the hypothesis that the process had not had the same intensity in all the areas, the surface of the Huerta was divided into different fragments:

-A grid of 1x1km cells, the one used by Eurostat (http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_grids) that allows a direct comparison between cells, being all of the same size.

-A serie of homogenous landscape areas, formed by the union of the previous cells, that correspond with the units defined in the Landscape Strategy of the Region of Murcia (2011) for the landscape of the Huerta de Murcia.

The last part of the method found, through subjective analysis of plans with the constructions of the different periods, growth patterns in the different periods and areas of the Huerta.

Quantitative results of the occupation process.

The most relevant data extracted from the global study are:

-The total footprint area of the constructions scattered in the peri-urban agricultural area of the Huerta de Murcia increased from 291.946 m2 in 1929, to 3.643.865 m2 in 2015, more than 12 times the initial occupation.

-The built area (considering the different heights of the constructions) grew up from 378.928 m2 in 1929 to 4.630.297 m2 in 2015, also more than 12 times the initial area. The growth rate of each year over the previous one, calculated by interpolation of the periods, remains constant around 3.4 %. However, as these buildings accumulate, these percentages represent larger and larger quantities: from 10.000 m2 built each year between 1929 and 1945, to an annual increase of 107.800 m2 built between 2002 and 2015 (area enough for about 1000 houses).

-The growth of the built area can also be analyzed as an estimation of the number of dwellings. To do this, instead of applying the usual ratio of 100 m2 per dwelling in the urban areas, they were used two ratios of 150 m2 and 200 m2 per dwelling, more representative of the typology of isolated single-family dwellings existing. Both data, compared with the number of plots with some type of construction obtained from the previous analysis; allow observing that there is a continuous growth in the rhythm of construction. Starting at about 50 dweeling per year in the period 1929-1945, the growth increases until an approximate balance of about 500 dwelling per years in the period 2002-2015, that is, a rate ten times higher than the initial one.

-The floor space index in the Huerta (excluding urban nuclei) has reached values of 0,076 m2/m2 in the Huerta Sur, 0,068 m2/m2 in Rincones Occidentales and 0,056 m2/m2 in

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Huerta Sur. However, areas such as Huertas de Alquerías barely reach 0,0182 m2/m2.

-It must be highlighted that, despite the apparent "saturation" of some traditional Huerta areas, in the last period, 2002-2015, the increase is still slightly higher each year compared to the previous one in all areas, even the most saturated.

-The relationship between footprint areas and built areas remains constant in practically all the series analyzed. The value of this ratio (built area/footprint area) is around 1.26-1.28.

The main purpose of this paper is to show a characterization of the different stages of the occupation of the Huerta de Murcia, both quantitatively and qualitatively (patterns) so that each phase can be understood in itself and in its importance in the configuration of the current morphology.

Characterization of the different stages.

The main purpose of this paper is to show a characterization of the different stages of the occupation of the Huerta de Murcia, both quantitatively and qualitatively (patterns) so that each phase can be understood in itself and in its importance in the configuration of the current morphology.

1929-1945-1956.

The period is divided quantitatively into two phases. In the first phase from 1929 to 1945, exists an annual rate of built area of 9.997 m2, which is equivalent to an annual rate of new dwelleings that barely reaches 50 units. In the second phase, from 1945 to 1956, a rate of 35.485 m2 was built each year, equivalent to 177 dwellings built per year.

Regarding the morphological patterns, the constructions in 1929 were located along two differentiated linear elements: the main roads and the main irrigation canals. Almost three decades later, in 1956, there are very moderate growths located mainly along the main roads. However, some areas of homogeneous dispersion begin to appear in the western Huerta.

Therefore, this period can be characterized as "low intensity, low dispersion and predominant linear pattern".

1956-1981.

Quantitatively this is a period in which there is a stabilization of the new built area rates, reaching 38.438 m2 built per year (around 319 new dwellings), which is similar to the rates of the second phase of the previous period.

With these rates of occupation, in the 25 years till 1981 the presence of dwellings was very important. They followed patterns of locations of homogenous dispersion at the west and south of the city. At East, however, the dweelings were built along secondary roads, perpendicual to the primary.

The characterization of this period is of "medium intensity, high dispersion, and secondary linear patterns".

1981-2002.

The numerical data reflect a significant increase of the occupation rate, reaching 63.720 m2 per year, about 319 dwellings.

The location patterns followed by the new

Table 1. Built area and new dweelings annual rates for periods.

Period	Built área annual rate.	New dweelings annual rate			New constructions in the period.	New construction annual rate.
	m^2	*100 m^2/dw.*	*150 m^2/dw.*	*200 m^2/dw.*		
1929 - 1945	9.997	100	67	50	927	**51,5**
1945 - 1956	35.484	355	237	177	2.059	**187,2**
1956 - 1981	38.438	384	256	192	3.469	**138,8**
1981 - 2002	63.720	637	425	319	3.593	**171,1**
2002 - 2015	107.849	1.078	719	539	5.996	**461,2**

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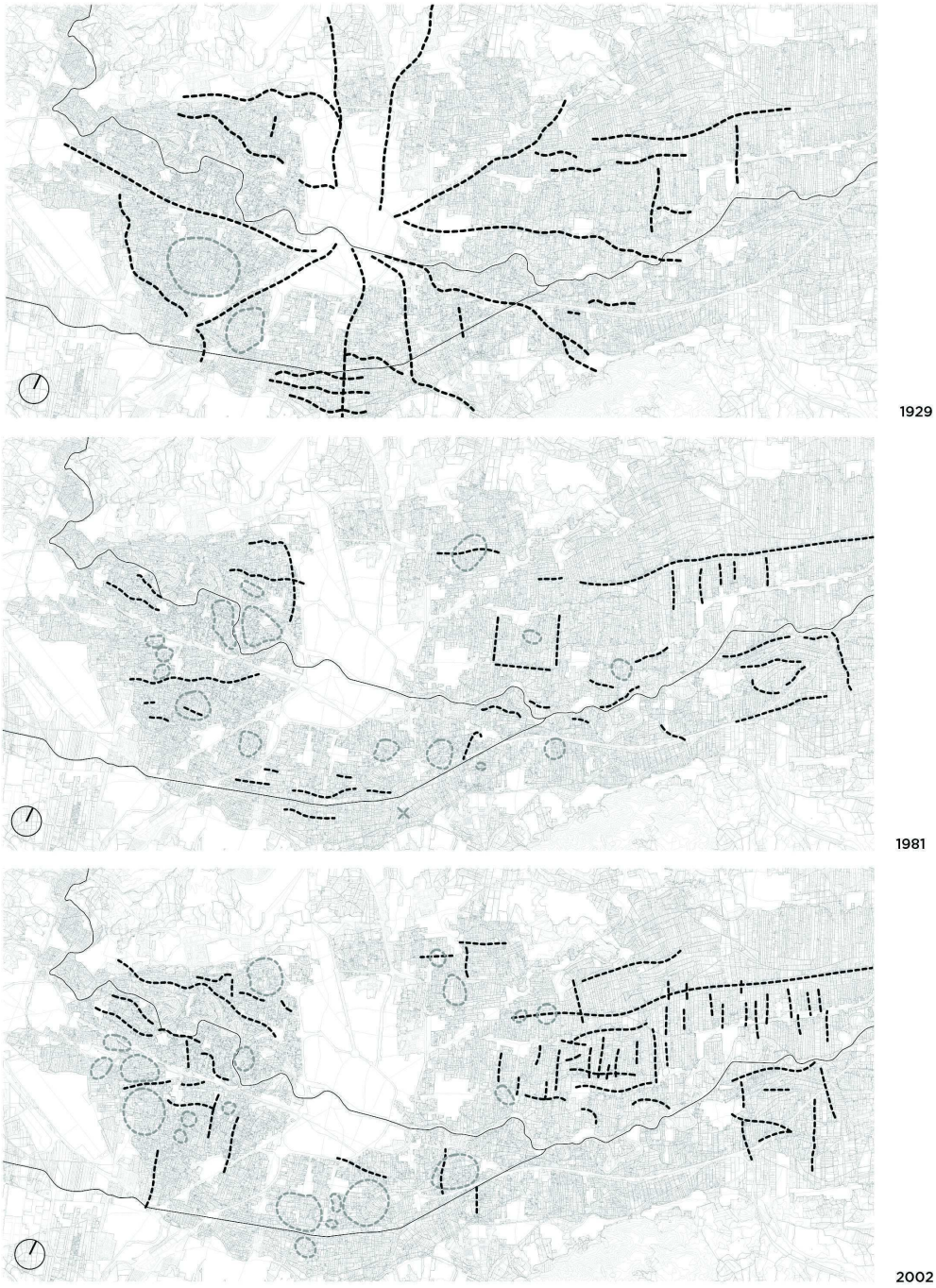

Figure 4.
Location patterns of new dwellings in 1929, 1982 and 2002. Source: Ros y García, 2016.

housings were diverse in this period, as they needed to search for new areas in a territory highly saturated of constructions. So thus, new dweelings with linear patterns appeared in a second line of the main roads at east Huerta and in secondary or even terciary roads in the west. In respect to the dispersed patterns, some wide areas of homogenous dispersion can be observed in the south of the city (instead of the west, were the saturation avoid this pattern).

This period is characterized as "high intensity, high dispersion and mixed saturation patterns"

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2002-2015

Again, there is another qualitative increas of the intensity of the occupation, reaching the annual rate of built area value of 107.849 m2, which triggers the new dwellings up to 539 per year. As it was mentioned, this means a multiplication by more than ten in relation to the values of the first section of the period 1929-1945.

The occupation patterns in this period were a strong combination of disperse and linear in almost of the areas in the Huerta de Murcia. The study, therefore, is reoriented in this last period, analyzing the portions of "productive Huerta" that have survived until 2015. These portions become a keystone for the future of the agrarian root of a highly saturated landscape, as they preserved the productive, cultural and etnographical values of the historic Huerta.

These portions of productive land are a series of isolated areas, of smaller size in the West and the South Huerta and larger in the East. Their conservation can serve as a basis for urban, ecological, social and patrimonial project strategies for Huerta de Murcia.

The final characterization of this last period corresponds to "very high intensity, very high dispersion and high combination of patterns".

Resulting morphology in the Huerta de Murcia.

The study has also identified up to 6 different forms of dwelling grouping in the agricultural plot of the Huerta, resulting of the overlapping of the different patterns described:

1.Rectangular cells of occupation in the East Huerta, next to the urban nucleus of Murcia. Based on the layout of the agrarian plot fabric, more geometric and regular than the existing in the West, the dwellings occupy the main roads in West to East direction and the secondary ones that cross them perpendicularly, preserving in their interior groups of agricultural plots. In the areas closest to the city, the dwellings also occupy these interior spaces in a dispersed and homogeneous pattern.

2. Fishbone structures along the main roads the East Huerta, closer to the border with Alicante, and in the Huerta Sur. The most important communication routes of the valley (note those of Orihuela, Algezares, Santo Ángel and La Alberca) concentrated buildings linearly. The saturation of this roads caused that the perpendicular paths that arise from them are occupied also by constructions, forming a structure in fishbone.

The densification of some of these structures has formed urban nuclei with similar lineal structure: El Raal, Barrio del Progreso, San Benito...

3.Irregular cells in the west Huerta conformed by buildings along its perimeter roads, of irregular layout, and bags of agricultural parcels in its interior. As in the eastern part, in the areas closest to the city of Murcia the interior of these cells is also occupied by houses and other constructions in a dispersed way.

4.Isolated mixed structures. In the Rincones del Segura area, close to the river in the west, there are unique situations where the meanders form areas delimited by the river. In these areas, the clear boundary that establishes the river causes that several linear groups and some small nuclei of population mix each other to conform complex structures which are linked in several points to the main roads of the Ñora and El Palmar roads.

5. Irregular permeable cells. In the Huerta Oeste, nearer to the city of Alcantarilla, the building also follows the main roads (La Nora, Camino Hondo and Albadel, as well as the old ways of Alcantarilla and Aljucer) and forms irregular cells, but with a lower intensity . Thus, these cells have a lower level of consolidation of the perimeter buildings, allowing a greater permeability with the agricultural bags inside.

6.Finally, it must be comented that in the Huerta de Murcia exists also point patterns of occupation, mainly located at road crossings. The elementary groups of houses built in the first century in this way, grew up forming many of the small urban nuclei currently considered as urban. Due to this urban character and the completly sustitution of the agricultural plot fabric, these environments have been left out of research.

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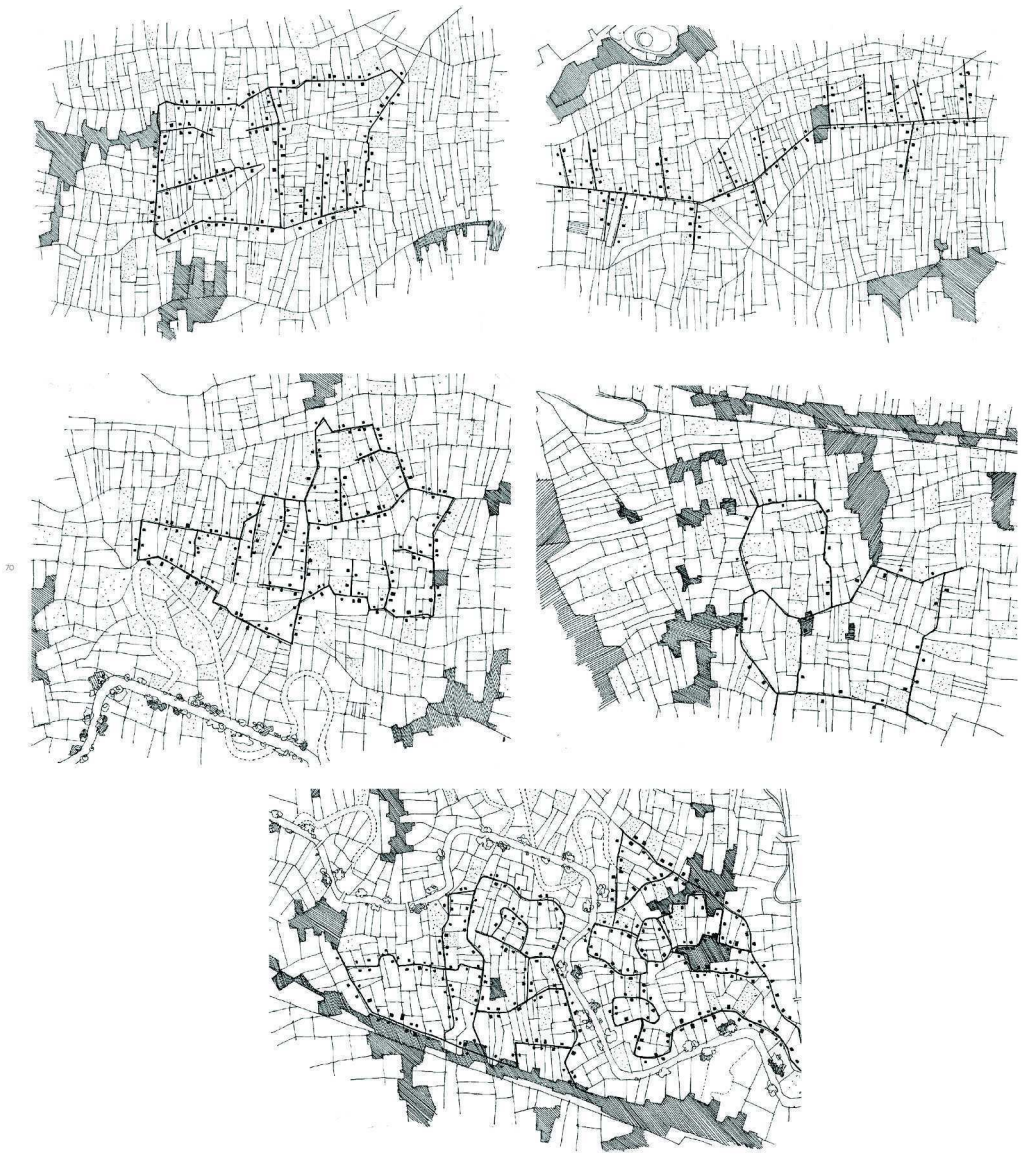

Figure 5.
Resulting morphology schemes of construction occupation. From left to right and up to bottom: rectangular cells, fishbone structures, irregular cells, irregular permeable cells and isolated mixed structures, irregular permeable cells. Source: Ros y García, 2016.

Conclusion

The conclusions of the quantitative analysis and the morphological qualitative situations give the following conclusions:

1.The dispersed occupation of the periurban territory of the Huerta de Murcia is a spontaneous model result of individual actions of citizens from the near urban centers, who establish their new residence in the area.

2.It is a model of occupation sustained over time, that, since 1929, has not known any period of recession o slowdown.

3.Although the different periods defined responds to the availability of orthophotos, it is clear that each ofne reflects different values in occupation, dispersion and patterns. So thus, it is possible to characterize each one of them according with this parameters.

4.In spite of being a spontaneous process, not regulated in the urban planning, the study have revealed that exists some patterns in the location of new constructions that define each period:

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a)occupation at the edge of main roads of agricultural fabrics,

b)occupation at the edge of secondary roads and canals,

c)occupation in a second line of the main roads (besides the first dwellings in the edge),

d)occupation in small punctual nuclei, at the intersection of main roads,

e)areas of homogeneous dispersion (mainly in the west and south areas of the Huerta),

5.The overlapping of these different patterns of occupation in time and space define the present morphology of the rururbanized territory of the Huerta de Murcia. Five differents types of forms have been found and defined: Rectangular cells, fishbone structures, irregular cells, isolated mixed structures, irregular permeable cells.

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Neoliberal hegemony and the territorial re-configuration of public space in Mexico City

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Abstract. *Sustainability, ecological modernization, citizen participation, public space and rights are concepts that have acquired great importance in international political discourses and that have figured in indicators, guidelines, programs and policies, at national level, giving rise to a urban planning from administrative units or "zoning", which instead of showing the different structures, forms and functions of cities as a whole, what has generated is a fragmentation of urban space. In a certain way, the implosion of these themes shows the success of capitalism in a period of neoliberal hegemony, since it becomes a smokescreen to hide the class differences superimposed on global discourses of modernization and development, as well as the transformation of natural resources in products, the capitalization of nature and the transformation of politics into management. The text seeks to reflect on the territorial configuration of public space in the light of emerging urban policies and programs in a neoliberal geopolitical context based on two axes of analysis: in the first analyze the neoliberal imposition models on how to construct public space and in the second will analyze the institutional bases, programs and policies of intervention highlighting their objectives, limitations and contradictions that help to understand the material and immaterial forms that the public space adopts at different scales in Mexico City through of the socio-territorial relations that are constructed in a process of mutual reciprocity.*

Keywords: public space, neoliberal hegemony, México City, territorial configuration, urban police.

Introduction

In the last decades, globalization and neoliberalism have promoted to a urbanism that adapts the construction of the city and new urban "forms" to the compression of space-time driven by late capitalism through the acceleration of economic processes, increasing commodification of cultural symbols and the very transformation of the subjective experience of space-time (Harvey, 1990). In this historical context began to question the functions of urban spaces under the argument that the space of places, typical of modern urbanism, lost prominence and importance in front of the space of flows that pushed the postmodern urbanism, where everything moves and Nothing is fixed (Narciso, 2014). It begins to transnationalize the forms of city making based on models imposed by the hegemonic economy of the capitalist countries (Parnreiter, 2015), implicit in ideological discourses "that shifts the economic and territorial decisions of the state apparatuses to the centers of management of the Transnational capital, regional agreements, or the anarchic terrain of free competition between large corporations, oligopolies or multinational economic agreements "(Pradilla, 2009: 118). This mobility of policies and programs of urban intervention have generated important changes in the processes of reproduction and

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recomposition of the social geographies of the city, especially from a re-invention of public space and how this became an element of Socio-spatial transformation, which conceals all the asymmetries of neoliberal policies of interference. The result was the loss of spaces of coexistence, sociability, encounter, recreation and identity and, consequently, greater segregation and social exclusion as well as a sharper division and separation of class and of different social groups. In this line of thought, the words of order and prominence are expressed in renewal, restructuring, regeneration and urban retraining, since they were considered as hegemonic political instruments and ideas that contribute to social cohesion and the integration of excluded or vulnerable sectors , Capable of counteracting the uncontrollable fluidity and territorial uprooting of late capitalism. Making a city becomes an electoral project, a form of social legitimacy of political powers and an ideological product and discourse of social control in which urban projects in different geographic latitudes reproduce converging in them the immediate objective of attracting new Capital, both social and economic, where public space gains special prominence, becoming part of any political agenda of both federal, state and local governments. Thus, the present work seeks to reflect on the socio-spatial construction of public space based on one side of the different neoliberal narratives expressed in it and on the other as expressed in a particular partisan political context of Mexico City. However, and as Brenner, Peck and Theodore (2009) well mentions, "neoliberalism", especially in the broad field of heterodox political economy, seems to have become a concept of rogue - promiscuously omnipresent, but inconsistently defined, empirically imprecise And frequently disputed. It is therefore important to define the basis of the approach from the neoliberal paradigm in which the relationship of its characteristic economic process and public space is determined through two main axes: the geopolitical reproduction of ideologies oriented to the global market; And the institutionalization of transnational frameworks of social reproduction through political discourses that are territorialized in public space.

The Neoliberal Imposition Models in the Constructed of Public Space

Cities from the 1970s became the main nodes or strategic axes of neoliberal policies for the reconversion of contemporary political-economic space, in the reform of projects that have had an impact on different territorial scales, defined by the contexts Local, institutional, political regimes, regulatory practices and geopolitical influences. As a basis for overcoming the crisis, the State takes a much more authoritarian stance and determines radical changes in the policies of the bourgeoisie and the states, which has produced significant changes in their territorial, regional and urban structures, and in the nature and magnitude Of the contradictions they express (...) (Pradilla, 2009: 91). Thus, today's cities are embedded in a highly uncertain geo-economic environment, characterized by monetary chaos, speculative movements of financial capital, global localization strategies by large transnational corporations, and rapid intensification of competition between interlocutors (Swyngedouw, 1992). In the context of this deepening of the "global-local disorder" (Peck and Tickell, 1994), most local governments have been limited - to some extent, regardless of their political orientation and national context - to adjust to the levels High levels of economic uncertainty through participation in short-term forms of interspatial competition, spot marketing and regulatory undercutting to attract investment and jobs (Leitner and Sheppard 1998). Meanwhile, the reduction of national welfare state systems and national intergovernmental systems has also imposed new fiscal constraints on cities, leading to significant budget cuts during a period when local social problems and conflicts intensified Together with rapid economic restructuring. We point out that, throughout the developed capitalist world, cities have become strategically central places for the irregular progress of neoliberal restructuring projects, for their constitution and trend resistance. Cities define some of the spaces in which

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neoliberalism takes root, a geographically variable project, but interconnected translocally. It is also in the urban context that the repeated failure of neoliberal policies and some sporadic resistance to them occurs, which also makes visible certain potential limits of the neoliberal project (Brenner, Peck, Theodore, 2009). The central location of cities in the Fordist-Keynesian systems of production and reproduction define them as key (if not 'white') arena for neoliberal dismantling strategies, but their strategic significance as a loci of innovation and growth, and as zones of Delegated governance and local institutional experimentation, also place them at the forefront of neoliberal progress. (Brenner, Peck, Theodore, 2009). The concept of space becomes so imperative, especially to think the current state of architecture and urbanism, because as disciplines of urban space and the city are key to understand the development of an economic model based on maximum reduction of Intervention of the State and the free market and in which "urban infrastructures are necessary for the accumulation and neoliberal regulation, even when in the process they are simultaneously undermined and devalued; Cities are placed on the frontiers of the formation of neoliberal policies, while at the same time they are places of concerted resistance to neoliberalization "(Brenner et al., 2009: 7). Thus neoliberal programs have been internalized in urban policies and in the way the urban space is constructed, mobilizing spaces of the city for both market-oriented economic growth and consumption practices of the elites, while ensuring Order and control of excluded populations (idem). Thus, public space becomes part of discursive narratives that seek to conceal reality through its ideological character and that everything seeks to coordinate.

Material and Immaterial Forms of the Public Space in Mexico City

Over the last three decades, cities have become strategically decisive arenas where neo-liberal forms of creative destruction have been deployed. The preponderance of cities in the Fordist-Keynesian systems of production and reproduction has influenced its definition as a key (if not "white") arena for neoliberal dismantling strategies, but its strategic significance as a loci of innovation and growth, and Areas of delegated governance and local institutional experimentation, also place them at the forefront of neoliberal advancement (Brenner et al, 2009). In this context, local governments have adjusted (with some imposition or by deliberation) to international-cut policies, and have incorporated some territorial relations to strengthen local economies by means of a "shock treatment" of deregulation, privatization, Liberalization and greater fiscal austerity. Thus cities (from different geographic latitudes) have become territories and "institutional laboratories for various experiments in neoliberal policies,

Figure 1.

a. (left) New slogan of the City that emphasizes the idea of democratic citizen participation Deciding Together. Source: Author. b. (right) The new image of the city is spread throughout all areas of the city especially in those with greater popular influx such as the Balderas metro. Source: Fernanda García

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such as territorial marketing, the creation of business zones, the reduction of local taxes, the promotion of public partnerships -private and new forms of local promotion "(idem). In Mexico City, this possibility of reproduction of urban space is spatialized and legitimized through urban policies that demand a universalist discourse, respect for human rights, collective interest, democracy and plurality. However, this strategy is also part of the government's inability to resolve the different conflicts and problems that arise due to different governmental and private interests, under the current institutional system; That is, where there is no democratic participation, where there is a lack of transparency in decision-making processes, where the media are highly efficient in concealing and deterring real problems and where corruption reaches exaggerated levels. Faced with those conflicts, which are generated in the City, the government implemented different strategies and concepts, including its great political project that "the city is in very good condition." Or, as the head of government mentioned: "We are going to take a great investment stretch so that the city is well paved, that the benches are well worked. I want to change the image to Mexico City. Leave a pretty city[1]. "For that reason his work has been incessant in the projection of a new idealized image based on various elements that are made visible in the public space and that emphasize the sense of belonging and social identity of a city / society, projecting towards the future through a democratic, conciliatory and plural discourse.

In this idealized projection of a city and a claim to identity, integration and law, the public space of the city is re-emerging in different urban policies and programs that seek to reduce socio-spatial inequalities strengthen community identity and rehabilitate the social fabric. "At the same time that it promotes the shared participation of neighbors and public servants to improve the public spaces that allow to streng then the Social Capital that the capital deserves". Among the different programs are: "First the Pedestrian", "Streets for All", "Your City Re-Want", "Safe Steps", "Ecoparq", "Pocket Parks", "King Pedestrian" and "Under Bridges"[2]. For example, the program "Your City Wants You ": "aims at citizen participation in the improvement and conservation of public space and community relations"[3]. Its objectives are to strengthen collaboration between the population and the authorities, through actions to clean up and restore public spaces and to contribute with small-scale actions to the improvement of neighborhood coexistence, community identity and the recovery of values such as respect, tolerance And civics, contributing to sustainability, urban aesthetics, respect, cohesion and the re-composition of the social tissue[4]". This program was especially highlighted, since it was widely propagated by the media an image in which the head of government appeared painting the zebras of the streets as part of this program".

Some issues arise from this program. For example, why did the painting of pedestrian zebras become public works and a government project? If the government offered municipal

Figure 2.

a. (left) The head of the capital government painting a pedestrian zebra. Source: http://mexicoparalosmexicanos.blogspot.mx/2015_09_01_archive.html. b. (right) The head of the capital government painting a pedestrian zebra. Source: https://ciudadpedestre.wordpress.com/2014/08/18/el-jefe-de-gobierno-pinta-y-luego-cruza-un-paso-de-cebra/

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Figure 3.
The head of the capital government posing for a photo after a zebra painted as the cover of Abbey Road by the Beatles.
Source: https://ciudadpedestre.wordpress.com/2014/08/18/el-jefe-de-gobierno-pinta-y-luego-cruza-un-paso-de-cebra/

public services that are part of its attributions and responsibilities whose legal basis is found in the Political Constitution of the United Mexican States, which defines the areas in which the municipality is responsible for the care according to article 115[5]. Would it be necessary to do as much media as painting zebras? Even, would there be the need to pose for a photo as a tourist postcard (Figure 3)?

This shows, on the one hand, a complete ignorance of the city by the authorities, but, on the other hand, the inability of the government to solve the real problems, seeking to dissuade its responsibilities through the spectacle and the mediatization of interventions Which in no way contribute to the quality of life of the inhabitants of a city where 28.9 percent of the inhabitants live in poverty according to the Human Rights Commission of Mexico City.

This type of action, once again, serves to conceal works of impact (such as large road infrastructure), which go against the same discourses of social integration, even because they have a differentiated territorial distribution in the city, What is done is not for everyone, nor in the same way. Why are these kinds of differentiated manifestations made? What do these types of interventions respond to? This type of actions is reproduced in a contradictory way in the city, such as "Under Bridges", which focuses on the residual spaces generated by the construction of vehicular bridges in Mexico City, aiming to convert them into interconnection points: "The scheme of operation of the low bridges is 50 percent of public space, 30 percent of commercial area built and 20 percent of free area that is used as free or controlled parking." However, there have been several criticisms of this program, since it has become a government business that has led to the privatization of public space, by concessions to commercial renters, which makes them tertiary spaces of services and commerce.

However, the program that has undoubtedly had the most impact in political-media terms, and which has been part of the speech of the capital government even as part of its electoral campaign, have been "Pocket Parks." This is a program that consists of: "the recovery of urban spaces and roads that are either remnants or underutilized, to convert them into areas for community enjoyment, in addition to generating positive impacts on mobility, promoting pedestrianization of spaces and The universal accessibility, as well as an improvement in the environmental quality, the urban image and the integration of the social tissue"

Pocket parks have become part of a discourse that legitimizes intervention by a "fictional" interventionist government and conscious of its arbitrariness because "in any society the production of discourse is at the same time controlled, selected and redistributed by a certain number of Procedures that have as function to conjure the powers and dangers, to dominate the random event and to dodge its heavy and fearsome materiality "(Foucault, 2014).

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Figure 4.
Pocket Park Examples.
Source: http://www.verdmx.org/proyectos/parques-de-bolsillo/

It should be noted that all these programs are managed, implemented and administered, either wholly or in part, by the Public Space Authority (AEP). This organization was created in 2008 thanks to the then head of the capital government, Marcelo Ebrard. The AEP is a decentralized body of the Ministry of Urban Development and Housing of the Government of Mexico City, which has gained more attention today, and it can be said that it is the main organ that intervenes and manages the public space. Its objective, according to the governmental discourse of the AEP, is: "to promote initiatives for the urban environment and that translate into the active construction of the social space for urban identity; develop emblematic rescue projects that could trigger an improvement in the quality of life of the inhabitants; and the creation of these spaces, is fulfilled with another of the concerns of the citizens, expressed in Decisions for Cologne, in order to make Mexico City a livable and friendly place[6]".

These interventions are projected into a discursive framework that are assembled in interventions that do not really bring anything new, but rather are discourses that reproduce transversely to different governments in Mexico (Narciso, 2014). Interestingly, however, these interventions are concentrated in the profitable urban areas of the middle and upper classes, as can be seen in the maps (Figure 6).

Clearly the public space has gained a greater "attention" on the part of the current capital government, since the number of interventions has increased. Nevertheless, an unequal socio-spatial distribution can be observed, since the majority of the interventions have been carried out in the delegations Miguel Hidalgo and Cuauhtémoc, in the latter especially in

Figure 5.
Interventions of the Public Space Authority. a. (left) Walk of the composers - 2nd section Chapultepec. Miguel Hidalgo. b. (right) Historical Center.
Source: Public Space Authority

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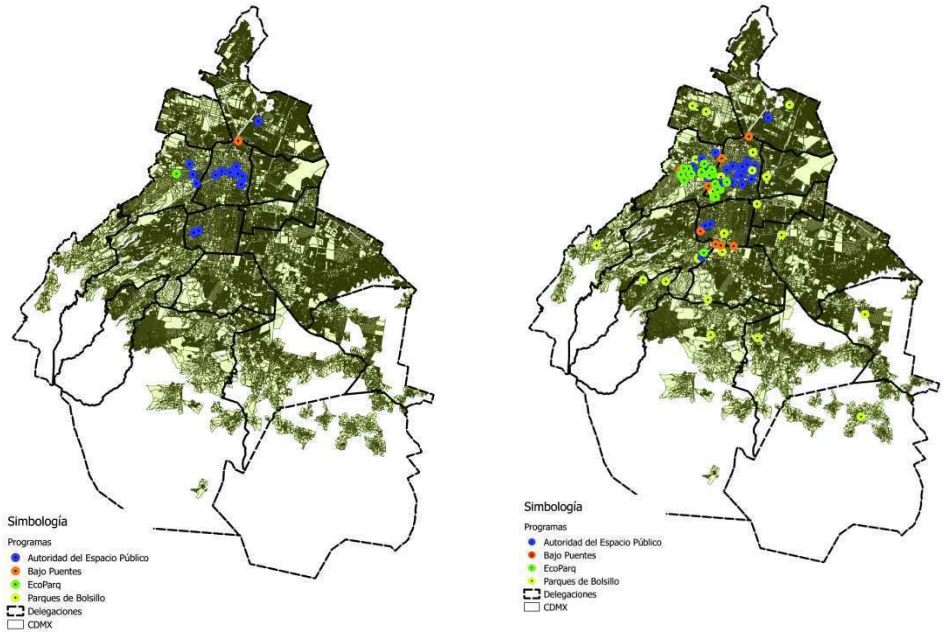

Figure 6.
a. (left) Interventions in the Government of Marcelo Ebrard.
b. (right) Interventions in the Government of Miguel Angel Mancera.
Source: Produced by Rubi Estrada.

the colonies Roma, Condesa and Hipódromo, just in the Delegations and colonies where the floor area is among the highest in the City. For its part, what we can observe is a timely distribution of pocket-sized parks, which leads us to question: how is it possible that in the Iztapalapa delegation, with a population of almost 1 900 000 inhabitants, has been carried out A single intervention of a pocket park? In that sense, what are these programs responding to? Why this unequal distribution of interventions and public resources?

Some Reflections to Re-think the Public Space

Symbolically, public space hides a series of ideologies that have transformed it into a decorative element but, above all, an element of domination and social control that translates into demagogic discourses, which provoke the illusion that what is done is for The social integration, appealing to the rights that each one owns. For this reason, in the pre-eminent speech of defense of the poor and rescue of the social fabric, as a human right, public space has topped the political agenda, and is anchored in a cultural framework of ideological social salvation that does nothing more than follow Reproducing a status quo, which widens the gap between social classes.

This type of intervention consists of a way of reinventing the city as part of the neoliberal model linked to two ideological purposes: on the one hand, the insertion in a global framework of cities by the need to attract and maintain a more than adequate elite (Massey, 2008) and on the other hand, the domestication and control of popular sectors through the imposition of space-time forms that oppresses reality in myths constructed and represented through cultural scales. Urban space has become a material extension of what in reality is ideology, in the classical Marxist sense, that is, masking or fetishization of real social relations and presents the same will that every ideology shares in existence as an object (Delgado, 2011: 29). Governments start from the social function of ideology as the set of beliefs and ideas or representations that stimulate and foster cohesion and identity among members of a social group to exercise, as the case may be, a domain or active subordination between

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The remaining groups of society (Karp, 1988), but what they do, in fact, is to increase social inequalities and social fragmentation. Thus, public space becomes an ideological device of social control and capitalist accumulation because, as Foucault (1980) points out, in any society there are manifest relations of power that permeate, characterize and constitute the social body, and these relations of power can't be established, consolidated or implemented without the production, accumulation and operation of a discourse. However, what are generated are a symbolic violence and the construction of illusions towards the lower-income classes.

Notes

1 Interview with Forbes magazine, "The Alpha City of Miguel Angel Mancera", Mexico, April 20, 2013.

2 This program began with the government of Marcelo Ebrard, but has acquired greater importance in the current government.

3 Taken from: http://www.excelsior.com.mx/comunidad/2013/06/08/902998.

4 Taken from: http://www.excelsior.com.mx/comunidad/2013/06/08/902998.

5 Guide to municipal public services, National Institute for Federalism and Municipal Development, Ministry of Interior.

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Can our cities be planned? Does the function follow the form? The New York experience

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Abstract. *Do we need urban planning? For a better future, for a better territorial integration, for attending collective demands? New York is at the other side of the usual answer. Manhattan is an example of the versatility of a single pattern, drawn on a paper over a territory with very different features. When it comes to reality, it uniforms it, and fills it with progressive, unattended and renewed demands, with no more plan than the one that is demanded by an efficient economic system. Its urban plan (?) has just attended, quickly, private demands, giving flexibility to ground uses and GFAs, with no more worries than its functionality. As the only stable issue, as simple and clear as possible, has been the link between urban space and territory through a universal but fixed pattern. It allows free deals between developers and authority, respecting very few regulations, to enable changes, constructions, knocking offs and rehabilitations far from the European style urban plans. Which is its future in a democratic and free society? A government based constantly and with transparency on assemblies, not in a Plan, that can assure equal treatments and fair deals of the initiatives towards the community? Some of the proposals accepted in Manhattan, where the urban shape at its simplest stage of a horizontal pattern unchanged in its 200 years of existence, show us the success and failures of this system. Adapted from the beginning to a traded world, it has no bad urban nor social conscience. This frame matches perfectly the precapitalism of its founders with the demands of a contemporary globalized society.*

Keywords: Manhattan, New York, Urban planning, Versatility, Uniform pattern.

Introduction

This is in fact a rhetorical question and could be rephrased as follows: why and for what should we plan our cities?

The orthodox answer is placed on the administration, and has been increasingly broad: to attend to its future and plan its orderly urban development, to achieve a better territorial integration, and also to approach the collective needs of its population and, in a more social way, to answer the basic needs of those that do not have the means. A different, more recent answer, that comes from the strengthening of the market society and private initiatives, puts aside the administration, relegating it to a subsidiary role as a law guarantor.

If there are not goals and means at its disposal, that is to say, if there is no plan, what use are they in the cities? For a long time to have a Plan was a goal in itself, as an acknowledgment of good city government2. Reality gave us contradictory examples: there are many Plans without a plan, that respond to simple technical and administrative skills, or that are just presented to guarantee a plus value and real estate business in the city, one of the most lucrative activities in today's modern society. On the other extreme, the so called constituent Plans, are formulated gathering

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thousands of goals, some of them contradictory, with no order, priorities nor possibilities of carrying out their proposals, and so they have become another urbanistic fiasco.

Having an urban Plan in cities with a social democratic and free market system is somewhat about reaching a balance that is almost impossible to achieve between public goals and the intervention capacity of the Administration. How far should urban planning reach, and how should it be done? It certainly cannot be a deterministic Plan, with a final image of expected actions; it might be, in any case, an open Plan, with different alternatives and open scenarios, where governance, transparency and public participation would play a key role.

The best intervention made in a city –in our European culture- has consisted in having a Plan with very specific objectives concerning public utility and some general urban development lines, that may be up for modification in its small print, or in extreme cases, revised via some specific administrative steps. Thus, our best urban practise stands somewhere between a series of plans half utopian, half well-intentioned, that aimed to regulate land market and construction, and programmed relevant actions from the administration, and, on the other side, some very innocent plans in regards to the Market and its punctual real state demands, due to a lax regulation and a legal framework that allows for it to change. Meanwhile, social interest, better cities, and the quality of life of its inhabitants have escaped those goals.

Well, the Manhattan case, shows an heterodox answer of a Plan that consists of city plans and regulations that date back to the XIX century in a market society which content was –and is- to generate a urban grid where it is possible to, later, write the city speech freely, its future, with no regulatory constraints, where private investors chose –and choose- the place, rhythm and destiny of the land and the buildings and asked –and still ask- public representatives, the city government, to explicitly approve any action.

The big apple Plan was a support grid of multiple streets and blocks, homogenous from the formal point of view and with no limit in its extension, that covered the whole island from North to South. It did not set any distinctions for pre-existing evidences –except for one old, small road- and its regulations allowed to urbanize them as needed, leaving facilities and services to the place and time when they were demanded and its installation was profitable. Any block could be dedicated to any kind of use or activity that their owners and developers decided, and if there were not appropriate, there were no problems to change or replace them. Here, function follows form, as a product of a pre capitalist society, with a very developed practical sense.

This orthodox urban planning pursued welfare, beauty and life quality, and design followed some theoretical demand expectations. The big fight to make this idealistic tale fit has provoked many thoughts and doctrinal adjustments. The main one is that we have gone from designing the future city to simply trying to survey, control and channel the strengths that drive its own development.

The Manhattan case

We will focus on Manhattan, one of the New York City's five district. Lewis Munford lucidly described its planning in a very graphical way: "the original city planners put in place some control systems to avoid its own scape, and maybe it will never scape". A design strategy, in the end, that refers to another text from Italo Calvino ("Invisible cities", 1972) where we are told that the reality of the city it contained within its boundaries like the lines of a hand, its scratches, its marks.

The Commissioners Plan was an orthogonal grid laid out in 1811 on top of the more than 5.880 Has of the Manhattan island (with average size of 21,6 by 2,8 km), which has remained nearly unaltered for over 200 years, while the city grew exponentially and shaped modern New York, the metropolis par excellence.

In the years of its implementation, during its transformation from drawing to reality, there were few changes; among them the replacement of a large number of blocks by a huge open park, Central Park (1853), not planned by its planners. In the same manner, some spaces were open to leave room for large

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facilities such as Railway Stations, Columbia University or Lincoln Center.

Also during the process of its implantation and urbanization some small local squares were created, once proven its influence on the revaluation of the surrounding real estate. And after this, only minor adjustments were made, like the proposals for the renewal of Downtown, Midtown and other neighbourhoods, that were in some cases accompanied by Reform Plans. Because the grid pattern, once put in place (and once the logical initial problems with the owners were overcome) has proved strong in its essence and flexible in its implementation, especially in a place of the world as challenging, dynamic and very much provisional as New York.

There have been some important value judgements regarding the very idea of the grid, and old idea in fact, that has been widely used in the creation of new cities throughout history. For Le Corbusier, the Manhattan grid was, due to its uniformity and lack of structure, the biggest catastrophe for new urban planning in the beginning of the XXth century. Moreover, he was the one who proposed superblocks and hierarchized patterns; the density –he claimed- of the blocks and constructions at street level, prevented the city to have open spaces. His idea of a city of superblocks with towers surrounded by parks, was the opposite. Koolhaas ("Delirious New York"), on the other hand, offers the most well-known plan eulogy, both of its general principles and of the buildings that it generated.

The Plan was `presented in 1807 by the Commissioners: Governor Morris, De Witty Rutherford, with engineer John Randel, as a "report" with plans and observations, and it was approved in 1811. It contained a huge pattern of 155 streets (E-W direction) and 12 avenues (S-N direction), perpendicular to the others. Which resulted in more than 2.323 blocks that covered the whole island, from the South harbour to river Harlem in the North, as a massive patchwork with no considerations to topography or pre-existing structures whatsoever. The blocks were horizontal rectangles of 60m width between streets and 188 to 240m width between avenues. The old New Amsterdam (the original Dutch harbour area, the Downtown) was reduced, to the South, to a different mesh, smaller and less rigid, around the old road to the harbour, Broadway Avenue. And a small exterior village, the Greenwich Village, was swallowed after establishing a short avenue with the same name, after which the historical core was left.

The Plan kept the trace of the "Broad way", a road to the outskirts on the North, reluctantly accepted as an "uncomfortable presence" or "erratic diagonal", as different authors called it. It crossed avenues in several points, up to 79th street where it merges with one of them. It remains as a diagonal, not exactly conceived to shorten distances –as it occurs in European extensions-, that, precisely due to its strange geometrical trace, has created integration conflicts at every cross and some important problems, but also at the same time, the most interesting renewal cases. Some of them are excellent urban examples: Union Square, 4th, Flatiron building Madison 5th, Herald 6th, Times square, 7th, Columbus Circus, 8th avenue.

The authors rejected the ongoing fashion of baroque lines, with star-shaped avenues and streets, because they presented execution problems and created inefficient blocks. Therefore, the shape was not selected lightly. On the contrary –they argued- "straight angles allow for straight house plans, easy to build and easy to use"; and that the rectangular blocks allowed, because of its shape and size, one "generalized cellular solution and an easy subdivision".

The Plan, simple and easy to understand, aimed to serve a rapidly growing demographic (from 120.000 to 1.200.000 inhabitants in fifty years; today Manhattan island has 1.600.000), with a practically unlimited land offer and many kinds of possible plots, and was, in the end, a pattern that "if not the best, it was the one which less inconvenient had for its owners" where "housing and houses (have) straight sides and angles, the cheapest to build and the most convenient to live in" (Commissioners, 1811).

A proposal based in the principles of new capitalism: maximum offer, identic and general for everyone, and few and flexible urban conditions. If someone hoped for a justification

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related to the use, ways of life, personal relations or health standards, they would not find it. "Any consideration related to economy, intercommunication, financial future, health or aesthetics was left out of it" (J. Harder, 1898)

The urbanization process, as we advanced, brought some new issues in the grid: two avenues were added and different squares were created, before the introduction in 1853, as we said, of Central Park, with 341 has, approximately 6% of all the urbanized area. Le Corbusier stated about it: "it is not a city conqueror but its prisoner"

Its urban consolidation was fast, mainly after the boost that entailed for Manhattan the creation of the new municipality of New York (1898), gathering the nearby districts –outside the island- of Bronx, Queens, Brooklyn and Staten Island. The island accommodated up to 2.000.000 inhabitants in the highest residential peaks; streets were open and hills dug out, in order to build, demolish and rebuild buildings and warehouses to make room for houses opening streets, dismantling hills, building, demolishing and rebuilding; warehouses were replaced by apartments and hotels, houses and churches by skyscrapers, in a process of "creative destruction" (Shumpeter) that characterize it.

The 30m wide avenues and 20,50m wide streets (the main ones being 30m wide), had a simple correlative numbering that reinforce its isotropic and abstract character. Its sidewalks were at least 6m wide (sometimes up to 23m) and 4.30 in the former and the latter, generous and useful sizes for any kind of use, and below them the technical services.

Traffic density and the high frequency of accidents, together with the high cost of an underground transport system, invited to the creation of elevated platforms for trains, especially for freight trains. Three large stations were built and, with an evident economic and technological effort, (the soil is granitic), an extensive subway network was finally open –in the early 20's-, that eventually resulted in the gradual dismantlement of the high lanes. This network, the largest in the world, connected to the train and public bus networks, also extremely large and completed by an omnipresent taxi fleet of 13.000, results in the fact that today –an unusual fact in the U.S.- more than 75% of its inhabitants do not have an own car.

Some adjustments were introduced that were directly caused by the road connections: first the bridges that stretched the grid in a specific direction; in 1848 to save Harlem River to the North, then in 1883 Brooklyn bridge to connect with the new neighbourhood at the other side of East River, and later Williamsburg Bridge (1903) and Manhattan Bridge (1909). The East Bridge was later connected by a tunnel (1904), followed by others. The renovation the of docks, the new tunnels and bridges towards the rest of the municipality and the State, a stimulated wager on the change of use in several areas and the recent creation of social housing complexes ("Projects") and parks on seafront of the city (on both sides of East and Hudson rivers) and the urban voids, have not and still do not challenge the validity of the urban mesh.

Finally, there has been logical adjustments to the road system and some removal of specific turns, in most cases motivated by the Broadway "wandering diagonal", a distressful subject, and origin of urban innovations in Manhattan. There have not been general reconversion proposals –except for some university projects as we will see-, nor any kind of new voids openings, traffic closing or pedestrian transformation, so common in Europe in the late XXth century. Not even in residential neighbourhoods.

Some innovative proposals

Midtown

Among the urban interventions carried out during those 200 years of the grid, that are interesting for our analysis of this heterodox approach, we must highlight the important change of use, building and image of the original pattern produced in Midtown and 42nd street. We could extend the citation to the Downtown, extremely shocked by the terrorist impact in 2011, but we do believe that the intermediate area of the city is a better and less conditioned example.

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In the 80's, Times Square area – the "Crossroad of the world" as it has been called-, with, again, Broadway Ave. crossing it, was a problematic area. Generally speaking, the Midtown was at the centre of attention during those years due to the pressure of new uses, with some depressed areas and other overcrowded.

After some preliminary reports, the Municipality Urban Department presented a Urban Development Plan, "Midtown Development Project", MDP (1981), a very complete document whose objective was to move the pressure from the East, full of offices and activities, to the West and South. It did not affect the famous grid, as it did the blocks and its building capacity conditions.

This Plan was a step further in the way urban interventions should be done in NY, creating a self- management organ, tax exemptions, a more free layout of the inside part of the blocks, and at the same time it simplified –it stated- the excessively extensive municipal regulations. It was something more than a report with use recommendations.

The Plan established:

* A delimitation of strategic differentiated areas of expansion, stabilization and conservation.

* Creation of an Economic Development Corporation of New York

* A bundle of tax and investment measures in West Side infrastructures

* A proposal of stabilization of the East Side to slow down its growth.

* An program of implementation of the Theatre District to preserve the theatres

* A FAR (Floor Area ratio), building capacity, different in the East and West areas

* Some investments in urban mechanical systems up to $ 817,4 million, an unusual budget in Planning implementation.

* A simplification of the ordinance system, which was considered excessive.

The 1981 Plan finally benefited a voluntary internal change of the grid, with the creation of pedestrian networks crossing blocks or "arcades" and "squares" (with a minimum surface of 150m2 and a 12m side, and a front to the street proportioned to 3/1 in relation to its depth), leaving to the developer an allowed construction coefficient gain 6 or 8 times the given ground; some interventions of urban acupuncture where its public character is underlined and that have been mostly successful.

42nd Street

It is the most well-known urban intervention in Manhattan where the application of the "Midtown Development Project" was carried out in a more evident manner.

Times Square, in the crossing of Broadway with 7th Ave., was in the XXth century the place for celebrations (end of the war and the successive New Year's eves) and leisure for New Yorkers and visitors. Its theatres and night lights made recognisable Broadway Avenue as the "Great White Way". In the 70's it had deteriorated in both its offer and image. MDP covered 5 Has around the crossing of said street, and has been considered in the city as a Plan model, because it counted on the support of the private sector, it had investments and financial incentives and it approached the transformation of the Midtown from the public sector.

In 1990, the Corporation in charge of urbanization received the authorization to close down any inconvenient activity. In two years, 2/3 of them disappeared. During those 20 years, this action created many problems, but the private initiative for renovation never took off.

In 1993, the Administration in order to remake the Plan, hired Robert Stern, an architect with wide knowledge about NY and its historic architecture and who had worked for the Walt Disney Co. This way "42 Street Now!" was born, a plan for the urbanization of the 42nd street (report written in 1993). The Plan was called "Learning from 42nd Street", because of its relation with some of the principles of "Learning from Las Vegas", by Venturi and his collaborators.

With this idea, the 42nd street Plan intended, rather than to change its spatial features, to rebuild the popular perception of the street. His author stated: "On 42nd street, the lesson is to have fun. We are not making Disney, we are trying to bring a little sense of surprise, emotion, adventure". "It has been the most democratic

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of our fun places: theatres, restaurants and shops for entertainment and tourism, placing 42nd Street as a symbol of American culture and democracy".

Lastly, the Plan included a bet on small operations on public space that because of its unusual character are interesting, and as we understand, complementary to the 1981 Plan. Some street entrances, the always unpredictable Broadway Ave. crossing by, are closed to the traffic and provided with urban furniture, and fast food and drink kiosks. Those are successful actions as Times Square today is lively and full of people. Would it have been the case if the bet on public space had been stronger?

With those premises, it is not strange that Alexander J. Reichl, beyond the Times Square case, relates so firmly urbanism to politics and economy; the politic speech to economic interests and city policies to the political speeches. And where urban form, if it is compatible with those interests, becomes it support.

Urban form consistency

Adjustments in the pattern have been made in Manhattan, as we said. They have been mainly motivated by traffic density and transportation problems, congestion –when it has reached the limit- and because of the presence, both "uncomfortable" and hostile, of Broadway Avenue, the only exception to the initial grid made by the Commissioners Plan. It has increased the number of streets and squares, "pierced" and "repelled" its blocks, but in any case the physical implantation of the original grid has proven strong and very resistant to change. A sort of resilience that allows to come back to the original state after integrating change and exterior influences.

Thus, It is possible that the most durable and characteristic features of the city of New York are, at the same time, its condition as a permanent, open urban laboratory and its Cartesian grid of streets and avenues. Streets and avenues, not public spaces. It is a Plan, therefore, with goals and means… and management, heterodox, but which has resulted to be useful for its goals.

It should be mentioned, as a counterpoint, the Master Plan "PlaNYC, a greener, greater New York" (2007-2011), that brings us closer to proposals for regenerating the urban scene and conviviality, very different from the previous ones. Its incidence in the big questions regarding the future of the city (land, water, transportation, energy, air and clime change) and its bet for housing, for open spaces and abandoned plots, to "improve streets and sidewalks, adding new green streets and public spaces in every community", are questions that had not yet approached until then.

We have mentioned some other proposals related to the urban form that did not succeed. Specifically, the ones that were shown in an exhibition celebrated at the MOMA in 1967 integrating renewal designs for the residential neighbourhood of Northern Manhattan, made by the university team of Rowe and Schumacher at Cornell University.

Finally, it is worth mentioning the fact that the identification –or more accurately the recognition of the city- of inhabitants and visitors with its grid is evident. Even though it has very few spaces with high urban quality; this made Rowe himself to say that " where the grid remains neutral, its major 'qualities' can only be found in the most recognizable spaces (the continuous seafront, Central Park, Lower Manhattan, West Village, Broadway)".

Therefore, we are not discussing urban significance. NY constitutes the best proof than in any uniform grid, personal identification is mainly related to a conceptual or intellectual order; because the apparently endless network not only avoids selective and differentiated politics, but also human perception. We might wonder if in an urban metropole the size of NY there is room for the collective appreciation of its urban signs The recent exhibition in Valencia "Lost in the city" (2016-2017), is based on the individual vision of the places through their personal significance, rather than the existence of collective meaning.

Let us at least speak of the handicap that represents an isotropic, straight pattern that makes necessary a previous division of the city into smaller parts, in order to be able to apply selected urban politics, as the Midtown and 42nd Street cases, previously mentioned.

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If function follows form, is it necessary to plan?

The case of New York, despite its importance, is an isolated case regarding the subject of the appropriation of the urban shape for different uses. Let us remember that new American colonization cities of the XVIth and XVIIth centuries had some strict regulations for the localisation of their inhabitants and for the segregation of public uses. However, their patterns were identical and their uses have changed with time. And in some other urban forms, predetermined and universal, such as the XIXth and XXth Spanish century urban extensions –the case of the Cerdà extension in Barcelona being the most emblematic-, some of the housing uses for the bourgeoisie are complemented by industrial and communal uses, using the same pattern of blocks and also have changed. This is still the case of Poble Nou, today 22@ district. And, we have to understand as well the current proposals of superblocks in both districts.

As a conclusion, the ability of the form, when it is simple and of enough dimension, to adapt to social uses, different and subsequent –not predetermined or even predictable- that a city requires throughout its evolution. The island of Manhattan, once flattened or filled (depending on the area), has been easy to divide in lots, and its urban form has been relatively indifferent to the uses that hereinafter are located. We must also highlight a certain resistance to change, once form is materialized, because of the cost that its re-urbanization would entail (not because of its buildings or of the compatibility with new uses of its lots) and the impact on ownership rights. New York is a paradigmatic case.

Then, an approach led by the administration, facing a liberal economic system of open market, with free circulation of people an in constant competition of its characters, today globalized; does it need to remain just an urban template?

Is this what planning is? It the answer is positive, we should face with no delay the doctrinal reformulation of our Plans. It would, undoubtedly reduce the tribulations, the elaborate doctrines and even our most thorough proposals. (Peñín, 2010)

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City and territory
in the Globalization Age

2. Urban form and social use of space

Spatial Structure in Chinese and Japanese Cities: A Comparative Study of the Supergrid and Superblock Structure

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Abstract. *Supergrids and Superblocks form an urban structure that extends across large areas of many Chinese and Japanese cities. The grid structures consist of wide roads at a city scale and define Superblocks, each with a network of narrower streets. This paper investigates the form-function interrelationships of these structures from morphological perspectives against a backcloth of theory that stresses an integrated network of streets as the prerequisite for a convenient and synergetic environment, with a specific focus on road/street networks, and mix and distribution of functional activities. Both qualitative and quantitative methods (including space syntax) are used to investigate four Superblocks from two pairs of Chinese and Japanese cities: Xi'an and Kyoto, and Nanjing and Osaka, from three aspects: integration, connection and interaction. The focus of this paper is on the Nanjing-Osaka pair and the findings demonstrate clear but divergent patterns between the two cities, which are indicative of general differences between Chinese and Japanese Superblocks: there are very strong interrelationships between the street network and distribution of activities in the Japanese Superblocks, but these are much less evident in the studied Chinese Superblock and this results largely from the extensive Chinese cultural practice of building walls around compounds. It reveals some structural disadvantages, leading to congestion of traffic and functional activities in some strategic locations in Chinese Superblocks. It also highlights some crucial qualities in the structures of many Japanese Superblocks that can provide inspiration for China's future urban development and possibly for cities in other parts of the world.*

Keywords: Supergrid and Superblock, Urban Morphology, China and Japan,

Introduction

Cities present themselves with two important features through their spatial structures: one is generated by the socio-cultural life at local scale displaying differences, while the other is generated by economic life at global scale demonstrating a more generic function[1] of cities (Hillier 2001, p.10). At the same time, cities are also 'means-ends systems in which the means are physical and the ends are functional': 'physically, (they) are stocks of buildings linked by space and infrastructure', and 'functionally, they support economic, social, cultural and environmental processes' (Hillier 1996, p.149). As a result, cities become 'palimpsests that emerge from multiple layers of creativity, erasure, history, politics, economics and technical invention' (Dovey 2016, p.14).

While socio-cultural influence is an underlying power that configures urban morphology in the past, it is not the fundamental force that supports the operation of a city in the contemporary era. Under the shift of paradigms of what an ideal city should be like, the avenues of thinking about the principles of creating good urban structures also have been changed (Marshall 2009).

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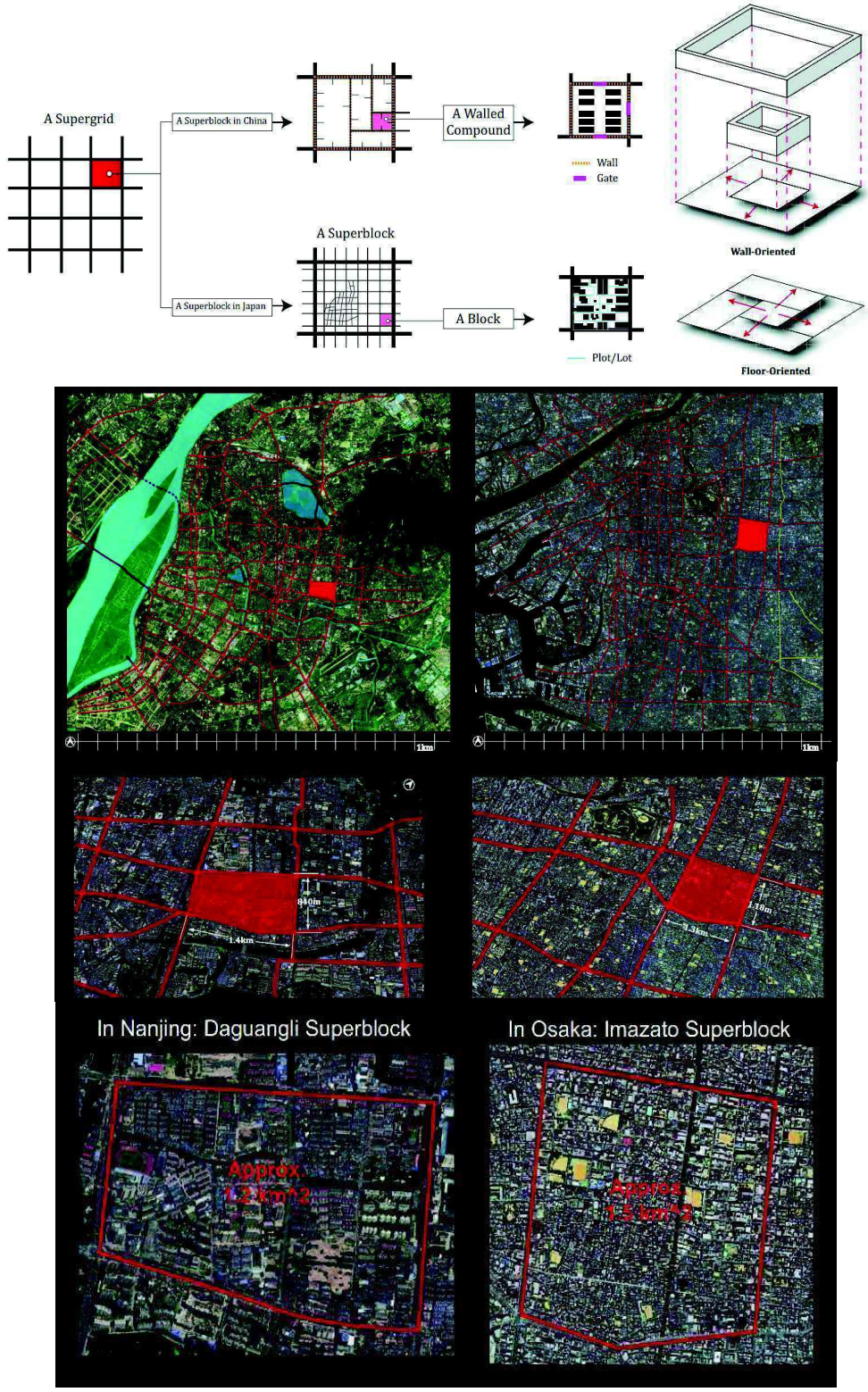

Figure 1.

a. Diagram Illustrating the Supergrid and Superblock structure in China and Japan in relation to the Wall (China) and Floor (Japan) oriented Spatial Conception (Chen 2016).

b. Locations of the Study Sites in the Supergrids on Global/City (b1), Glocal/District (b2), and Local/Superblock (b3) scales respectively.

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A group of theorists, including Jacobs (1961), Alexander (1965), Hillier (1984 & 1996), Bentley et al. (1986), Deleuze and Guattari (1987), Gehl (1987 & 2010), Arida (2002), Salingaros (2005) and Marshall (2005 & 2009), are framed collectively by this study as the Interconnection Theory and sets the theoretical and methodological bases for this study. They are concerned with interrelationships between built form (building and space) and function (movement and activity) in cities, and denote that modern cities are supposed to be places where good socio-economic performances, such as trade and exchange, and government services, which are the fundamental functions of a city, take place. They require an effective city form and structure to support them - to assist in the generation and facilitation of socio-economic movements and activities.

Building upon such understanding of cities, this thesis uses those theories to investigate the Supergrid and Superblock structure. This study also argues that it can be considered as an eastern-rooted urban structure that has the power of assisting or deterring different types of functions depending on particular configuration. While both China and Japan share many aspects of culture and have experiences of urban development that are based on the Supergrid and Superblocks as a representation, which is culturally incarnated, codified and utilized in dissimilar ways under a strong Eastern Areal thinking. A multi-dimensional (Isozaki 1979 & 2011) and multi-directional (Shelton 2012) spatial conception are nurtured in responsible for the formation of a multi-directional Supergrid as the overarching global network for cities. At the same time, cultural differences between the two countries also result in a more wall-oriented spatial conception in China and a more floor-oriented conception in Japan (Ashihara 1983 & 1989, Zhu 2004, Zhu 2010), which further contributes to the different spatial structure of Superblocks in Chinese and Japanese cities respectively (see Figure 1a).

This paper is aimed to discuss the interrelationship between the physical form and social use of space of the Supergrid and Superblock structure through the understanding of the interrelationship between street network and distribution of activities in Chinese cities and Japanese cities. Comparative case study is the major method with a morphological mapping as a tool to convert and organize data into maps. While four Superblocks are selected for research, this paper only focuses on the discussion of the two of them from Nanjing and Osaka as a pair. Figure 1b indicates the locations of the two sites in the Supergrid at global/city (b1), glocal/district (b2) and local (b3) scale respectively.

Literatures and Theories

The central ideas of the Interconnection Theory are threefold: 1) cities are organized and complex systems that are composed of a number of interconnected formal and functional systems through multiple links; 2) The interplay between street structure, movement and activities are the nucleus of the interconnection between form and function; 3) Integration, Connection and Interaction are the three fundamental principles that a well-functioning city structure needs to be able to generate socio-economic synergies as Jacobs' (1961) 'organized complexity'. Without a well-designed physical form that provides connections for movement and facilitates interactions between different parts and across multiple scales in cities, problems will occur: 'extreme compartmentalization and dissociation of internal elements of any organized object will lead to destruction' (Alexander 1965, p.17).

Starting with Jacobs's writing about the complexity and interconnection of cities, Alexander supports her idea by visualizing a semi-lattice organizational structure with the overlapping functions. Both of them prepare the way for other theorists and their studies about the interrelationship between form and function of city structure. On one side, Hillier extends their ideas by introducing the concept of spatial configuration and space syntax as a method of measuring the connection and integration of different parts of a city through its network of spaces (largely streets). This has influenced and complemented by Bentley et al. and Marshall. While Bentley et al.

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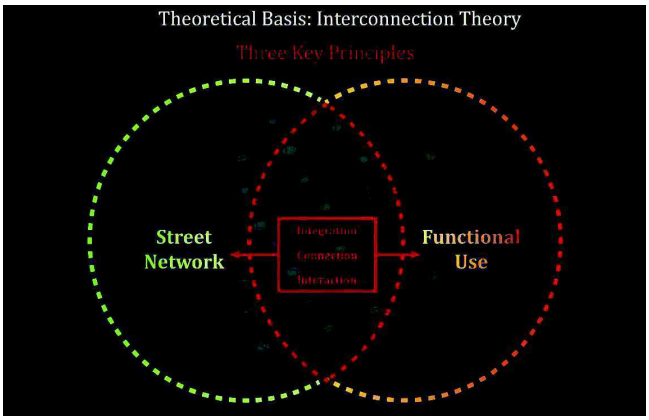
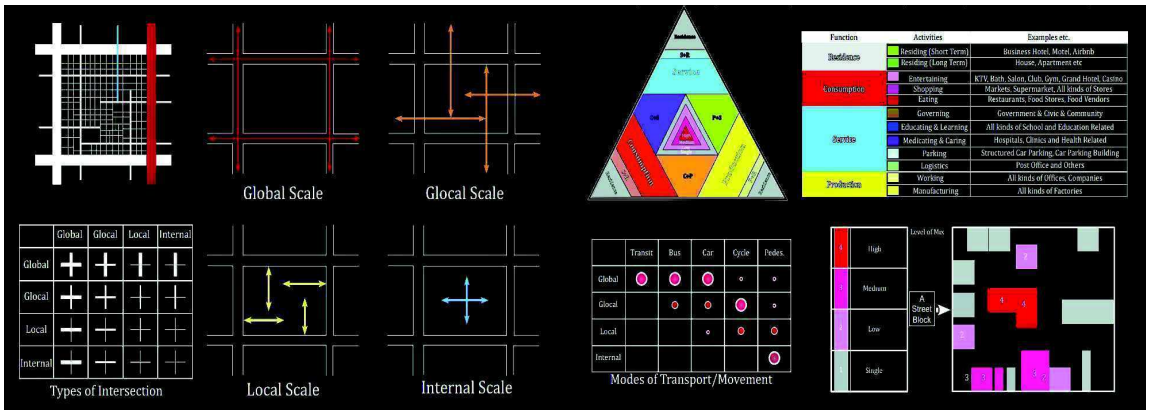


	Jacobs 1961	Alexander 1964	Hillier 1996	Bentley et al. 1986	Deleuze & Guattari 1987	Gehl 1987	Arida 2002	Salingaros 2005	Marshall 2005&9
Integration		●	●●	●	●	●	●	●	●
Connection	●	●	●	●	●	●		●●	●●
Interaction	●●	●●		●	●	●	●●	●	



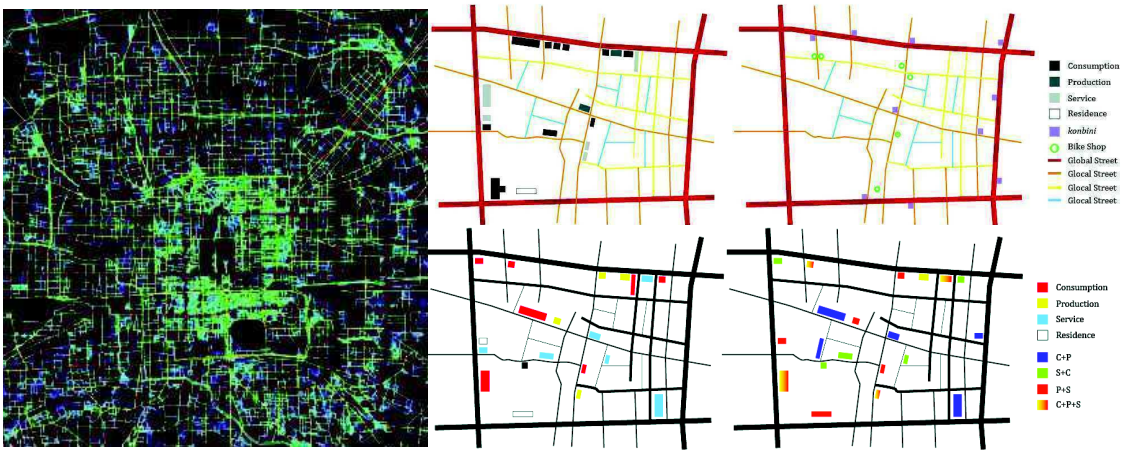


Figure 2.

a. Diagram of Three major principles for creating a good urban structure
b. Diagrams showing the Method for mapping street network and functional activities/uses
c. Example Maps of Integration (left), Connection (top right) and Interaction (bottom right) by using the Proposed Methods.

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simplifies Hillier's method of assessing the permeability of street structure, Marshall develops Hillier's method and creates a route structure to complement the disadvantages of Hillier's method. Delexue and Guattari 1987 on the other hand provides a much more abstract and philosophical understanding of the multiplicities of assemblage and rhizome of cities' complexities, and it echoes Jacobs' complex organism and Marshall's evolving eco-system.

In different ways, Jacobs' and Alexander's ideas were also adapted by Arida and Salingaros. Arida applies the metaphor of quantum physics to complement Alexander's idea by accenting on the importance of interactions and overlapping of different functions, while Salingaros applies the analogy of the human brain to supplement Alexander's idea, emphasizing the importance of multiple-connections between human activities that can sustain self-organization of ordered and complex city networks. The two interpretations of the importance of connection and interaction in cities both echo and clarify what Jacobs had claimed and accentuated in the first place: cities are 'organized complexity' and they are 'replete with unexamined but obviously intricate interconnected and surely understandable, relationships' (Jacobs 1961, p.452).

Not only is there a strong connection between different theorists, each theory from the group has a different emphasis on what kind of principles and built form can contribute more to the stimulation of movement and activity (see Figure 4). While Jacobs emphasizes the short block and a mixed environment, Alexander focuses on a semi-lattice movement structure with overlapped functions; Hillier claims the connection of spatial configuration at multiple scales; Salingaros accents on the multiple links between different nodes; Arida places stress on multiple interactions between elements through a dualistic lens; while Marshall focuses on most desirable types of street pattern. Gehl is different again exploring form and functional integration at a micro scale.

Methodology

With such theoretical basis as discussed above, this study develops a method to investigate the Supergrid and Superblock structure by using the comparative case study as the major approach. While morphological mapping is the underlying tool that is used to map and analyze the structure and characteristics of the selected sites, it is created by this study based on the Interconnection Theory and on-site field survey. The collected morphological data are converted to maps that can be classified into two sections: 1) Investigation of the street network pattern and the distribution of different types of activities. They are classified and mapped by using the two proposed frameworks as discussed below; 2) Investigation of the Integration, Connection and Interaction of the selected Superblocks. Hillier's Space Syntax is used to measure Integration, while Connection and Interaction are measured by superimposing functional activities maps on top of street network maps to reveal certain interrelationships between the two. This paper only discusses the findings from the Nanjing - Osaka pair.

Section One: Mapping the Street Network and Functional Activities

The Structural Framework for Mapping the Street Network: This Framework is used to map the street network of the selected Superblocks by using the methods from Hillier and Marshall's theories of street connection, and their mapping techniques plus some inspirations from Bentley et al. 1986, Salingaros 2005, Marshall 2005 and Shelton 2012. Different types of connections (roads, streets and gates) are classified into four major categories (see Figure 2b1):

-Global Road: Wide arterial roads that form the Supergrid that are typically more than 25m wide

-Glocal Street: Streets that connects neighboring Superblocks by go across Global roads. Global sidewalk streets[2] are also included as part of the glocal street network.

-Local Street: Usually are streets within a superblock that create direct access to global roads at the edges. Gates that are directly connected to the global roads are included in local street network and are called local gates/

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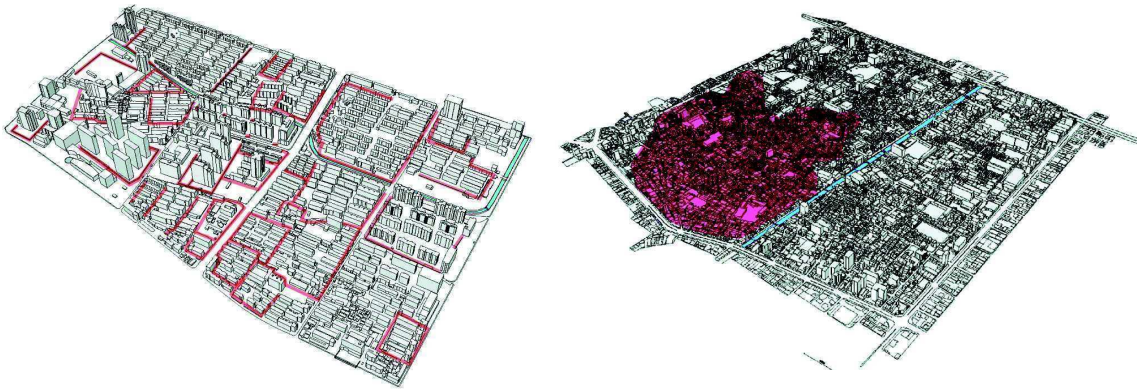
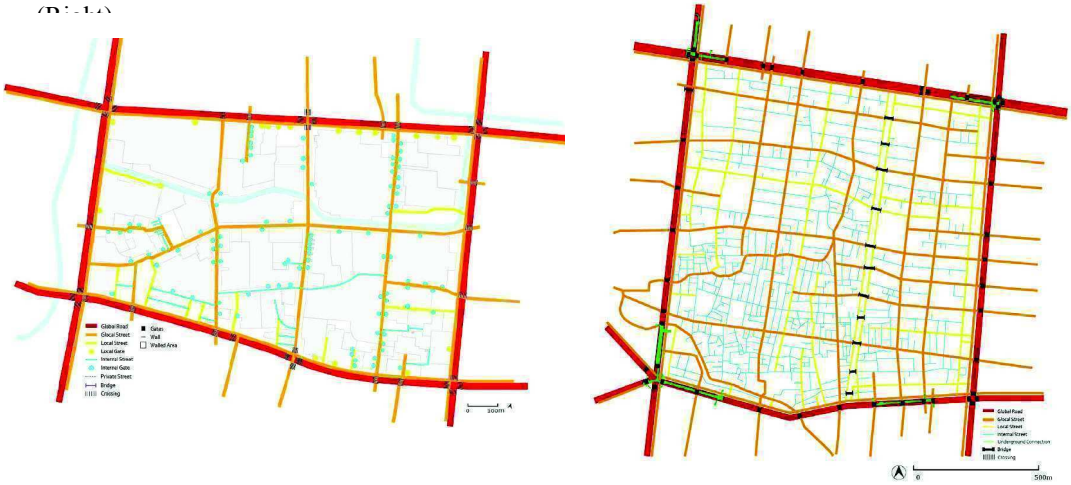
a. 3d Model: Daguangli Superblock in Nanjing (left) and Imazato Superblock in Osaka (right)



b. Street Network: Daguangli Superblock in Nanjing (left) and Imazato Superblock in Osaka (right)



c. Functional Use: Daguangli Superblock in Nanjing (left) and Imazato Superblock in Osaka (right)

Figure 3

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cul-de-sacs. Streets are indicated as yellow lines while gates are in yellow dots on maps
-Internal Street: Local streets that are internal and do not connect directly to the edges of a Superblock. Gates that are not directly connected to the global roads are also part of the internal street network and are called internal gates/cul-de-sacs. Streets are indicated as blue line while gates are in blue dots on maps.

The Functional Framework for Mapping (see Figure 2b right): This framework is used to build a functional system to map the different uses of space/types of activities. Inspired by Hoek's (2008), Nes, Pont & Mashhoodi's (2012) and Dovey's (2014) Triangle models and Jacobs' critics, this research creates a Function Mix Model, which classifies different uses and activities into four major categories. Each category contains a number of uses/ activities, which are color-coded and used to convert data into maps to show the spatial distribution of activities and the mixes of uses within Superblocks. Moreover, these different uses/activities are also further converted into maps with another color-coding system: single (grey), low (pink), medium (dark pink) and high (red), which represent four levels of intensity of the mix of activities on both horizontal and vertical level[3]. This is used to show the distribution of the intensity of functional mix (see Figure 2b2).
-Consumption represents a number of wealth-using activities that is related to the use of any commodity or service in cities, such as all kinds of shops, restaurants, entertainment.
-Production: represents a number of wealth-creating activities that is related to the production of commodity or service in cities, such as offices, factories.
-Service: represents a number of activities that is related to the assistance of consuming, producing or living activities in cities, such as all kinds of schools, hospitals, hotels, banks.
-Residential: represents a number of activities that is related to living and residing.

Section Two: The Interrelationships: Integration, Connection, and Interaction

Integration: Use Space Syntax to measure the level of integration of the street structure of selected Superblock in each city based on street maps (Hillier 1996). UCL Depthmap software is used to run the analysis and generate maps and integration values (see example map in Figure 2c.left).
Connection: Superimpose the Street Network maps with Functional Use maps, which are classified into consumption, production, service and residence (see example map in Figure 2c.top right).
Interaction: Superimpose the Street Network maps on top of the Maps that show the distribution of different intensity of the mix of different type of activities on horizontal and vertical level (see example map in Figure 2c.bottom right).

Measurement and analysis

The two selected Superblocks are indicated as 3d models in Figure 3a, and they clearly indicate two very different morphologies of Daguangli and Imazato Superblock. The model on the left indicates a number of buildings (1164 in total) in large footprints standing in spaces that are grouped collectively by a system of wall and gate structure (the red lines). In comparison, Imazato illustrates a large number of very small buildings (9651 in total) that are tightly built next to each other are stitched by an extensive network of streets and little space in between. The area in red has a finer grain in comparison to the other parts. In general, the models show two morphological representatives: a relatively more bulky built form with coarse grain size in the Chinese Superblock in contrast to a flatter built form with very fine urban grain size in the Japanese Superblock respectively.

The Street Network (see Figure 3b): Such different morphologies can also be understood from the mapping of the street network of the two study sites in Figure 3b. While the glocal street network has the highest street density and internal streets are counted as having the largest in number, the maps also clearly indicate that the predominant type of connection is the glocal-internal sub-network for movements in both Superblocks. However, the Daguangli Superblock indicates a system

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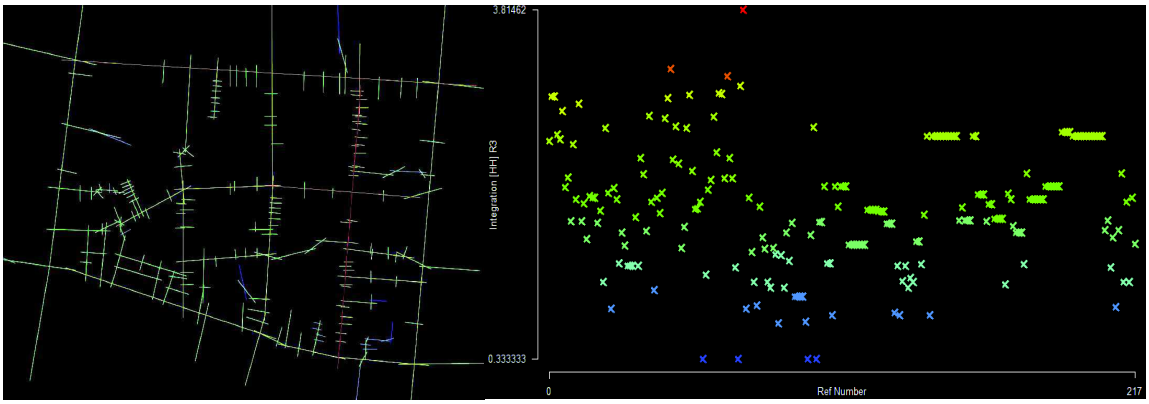
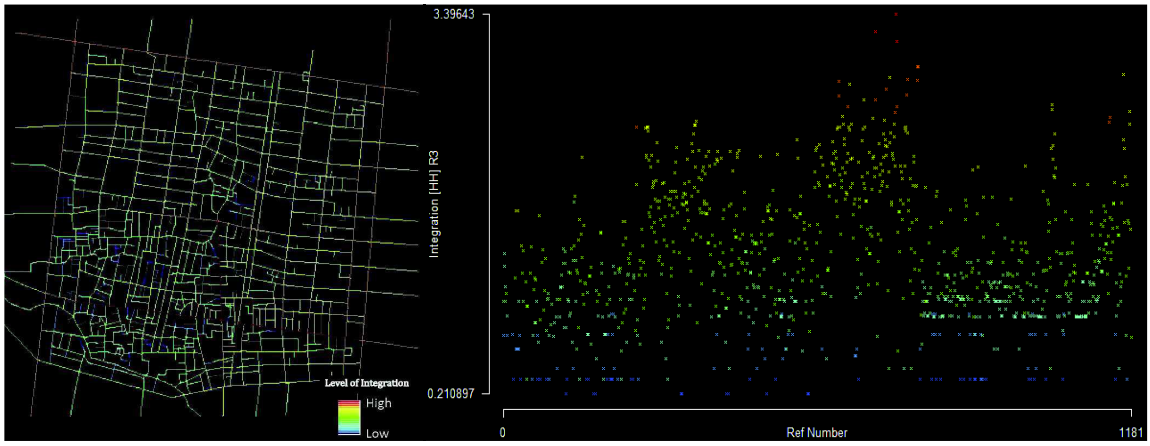


a. Daguangli Superblock in Nanjing and Integration Values in a Scatter Plot



b. Imazato Superblock in Osaka and Integration Values in a Scatter Plot

Figure 4

of wall structure (the grey areas) co-existing with the street network and it forms the 'Global-Local and 'Glocal-internal' as two major sub-networks for movement. Most local (yellow) and internal (blue) streets are actually cul-de-sacs (indicated as dots in maps), which are the gates of many walled compounds. In comparison, the Imazato Superblock illustrates a network of regular and irregular streets that is constructed by the four different types as multi-directional grid. Most internal streets (blue) are concentrated in the south-west quarter of the Superblock, while the other three types are much distributed across the site. According to Marshall's study of street patterns, the former indicates a much-limited connectivity whereas the latter is much better connected. The wall and gate structure in the Chinese Superblocks play the role as part of the street network by controlling and managing the flow of people. In comparison, the wall structure that does not exist in the Japanese Superblock has no effect on the street network, which hence still plays the determinant role in controlling and managing movement and activities.

Functional Use of Buildings (see Figure 3c):

Figure 3c indicates eight types[4] of functional activities and their distribution in the two study sites. Similarly, different types of activities show a very clear and strong mix in each Superblock on both horizontal and vertical level. Such functional mix resembles the type of environment that Jacobs' 'Greenwich', which can facilitate a number of diverse and active activities to take place and are rehearsed into a street choreography. The maps also illustrate very clear differences. The Superblock in Nanjing shows a clear separation of the residential and non-residential uses, and the concentration of all types of non-residential activities/uses are mostly located on the

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edges and enclosing the residential function into eight segments. In comparison, the functional distribution of Imazato Superblock indicates a much-dispersed distribution, and the concentration of consumption type of activity can be found as a linear shopping street. Another important difference is that the Imazato Superblock has a lot more production type (yellow) of uses and activities, which is very limited in the Daguangli Superblock. Moreover, more mix of different type of activities, especially the mix of consumption and service types, can be found in Daguangli rather than in Imazato Superblock, which is consistent with the flatter built form as found in Imazato.

Integration: Space Syntax and Movement Economy

Figure 4 indicates the space syntax analysis of the two Superblocks by using the measure of R=3. According to Hillier's theory, the level of integration is in a positive relationship with the magnitude of the intensity of activity and movements. This means that more movement and activities can be found along the streets as indicated in red, orange and yellow than in green and blue.

The results indicate that the two street networks indicate a much higher level of integration in the Imazato than Daguangli Superblock in general. Similarly, the global roads on the four edges are not the most integrated roads in the local network. Both of them have higher concentrations of less integrated streets (mostly internal streets) in their southwest quarters, which also imply less connectivity and fewer movements and activities in the areas.

However, more streets can be found having higher integration value in Imazato than in Daguangli Superblock in general. All global and most of the Glocal and Local streets are measured as more integrated as in red, orange and yellow colors in the former site, whereas those streets are mostly measured as green and blue in the latter site. This also implies that the movement and activities are distributed more evenly across the Imazato than Daguangli Superblock, and this is mostly consistent with

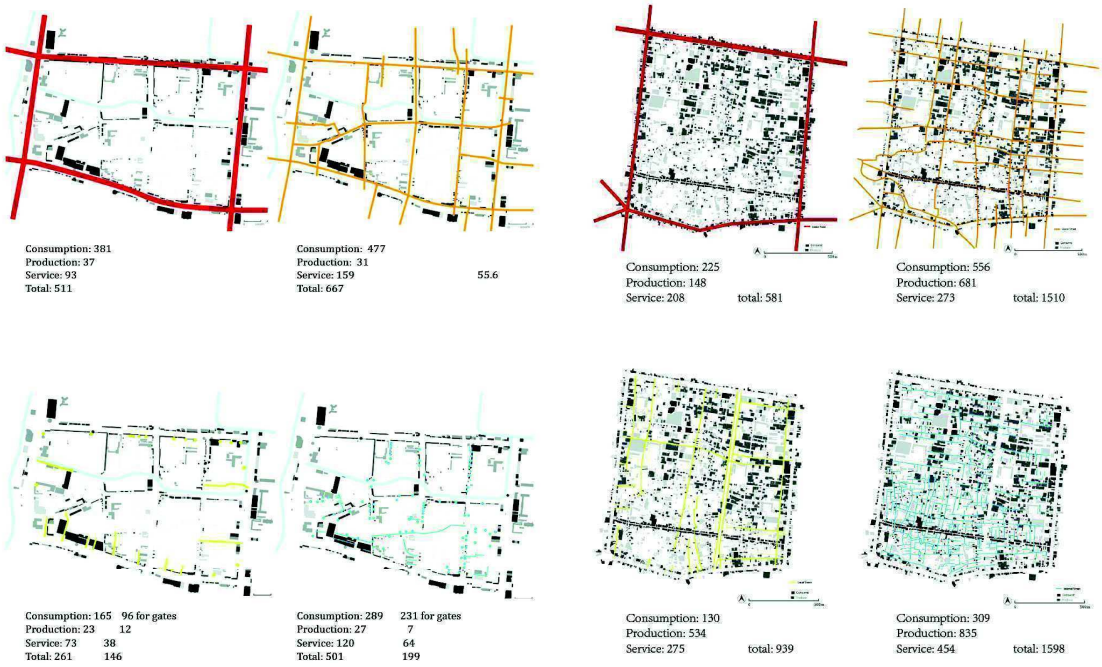

Figure 5

a. Connection between Four types of Streets (Global, Glocal, Local and Internal) and three Major Non-Residential Functional Activities/Uses (Consumption in Black, Production in Grey and Service in Light Grey) in Daguangli (left) and Imazato (right)

b. A Table showing the number of activities along each street type, the number of activities per street density and the density of each street type.

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the distribution of activities as indicated before. More interestingly, the general integration value shows a wider range in the Daguangli (0.33-3.81) than in the Imazato Superblock (0.21-3.39). This again implies a network with more evenly distribution of the connections and activities in the latter than in the former.

Connection: Street Network Pattern and Functional Use of Buildings.

Figure 5 indicates the relationship between three non-residential type activities (consumption, production and service) and four street types (global, glocal, local and internal). The common distribution pattern of both sites is that various activities more tend to concentrate along the glocal streets, and more activities can be found along glocal and internal streets type of connection in both Superblocks. Moreover, based on the number of activities per street density (No./km/km2), the data also shows a stronger relationship to glocal streets. However, it then indicates a strong relation to global roads by excluding the global sidewalk streets, but the difference in numbers between the two types of street is very close. From the maps and data, this indicates very strongly that the glocal street network in both Superblock has a very strong relationship to different types of activities, followed by the global roads. However, the difference between the two Superblocks is that the relationship changes in the Daguangli Superblock, and this is because of the existence of the wall and gate structure. The total number of activities and the number of activities per street density also both indicate a stronger relationship to internal streets by including the internal gates followed by local streets and gates. Because of the absence of such structure in Imazato, there is no change of the relationship.

		Nanjing	Osaka
No. of all non-residential activities	Global Roads	511	581
	Glocal Streets	667 (+511)[5]	1510 (+581)
	Local Streets	115/261	939
	Internal Streets	199/501	1598
No./km/km^2	Global Roads	138	181.56
	Glocal Streets	131(235)	146.17(202)
	Local Streets	82/186	131.3
	Internal Streets	113/286	40.5
Street Density	Global Roads	3.7	3.2
	Glocal Streets	5.01	10.33
	Local Streets	1.4	7.15
	Internal Streets	1.75	39.47

Figure 6 indicates the distribution of the level of intensity of the mix of different functional activities in a 50mX50m grid and how it relates to the street network. The two maps on top and bottom illustrate the intensity distribution on horizontal and vertical level respectively. The similar distribution pattern indicates that the higher intensity of the mix on horizontal level is more concentrated along the global roads and glocal streets in both sites, and the intensity of the mix on vertical level is concentrated along the global roads.

However, the Imazato Superblock clearly indicates a much more distributed intensity of the mix of different types of activities on horizontal level. In comparison, Daguangli Superblock has a clear separation between the higher intensity (dark pink and red) and low intensity (grey), the areas with higher intensity tend to enclose the low intensity into about eight areas. On vertical level, the distribution patterns share a similar pattern as

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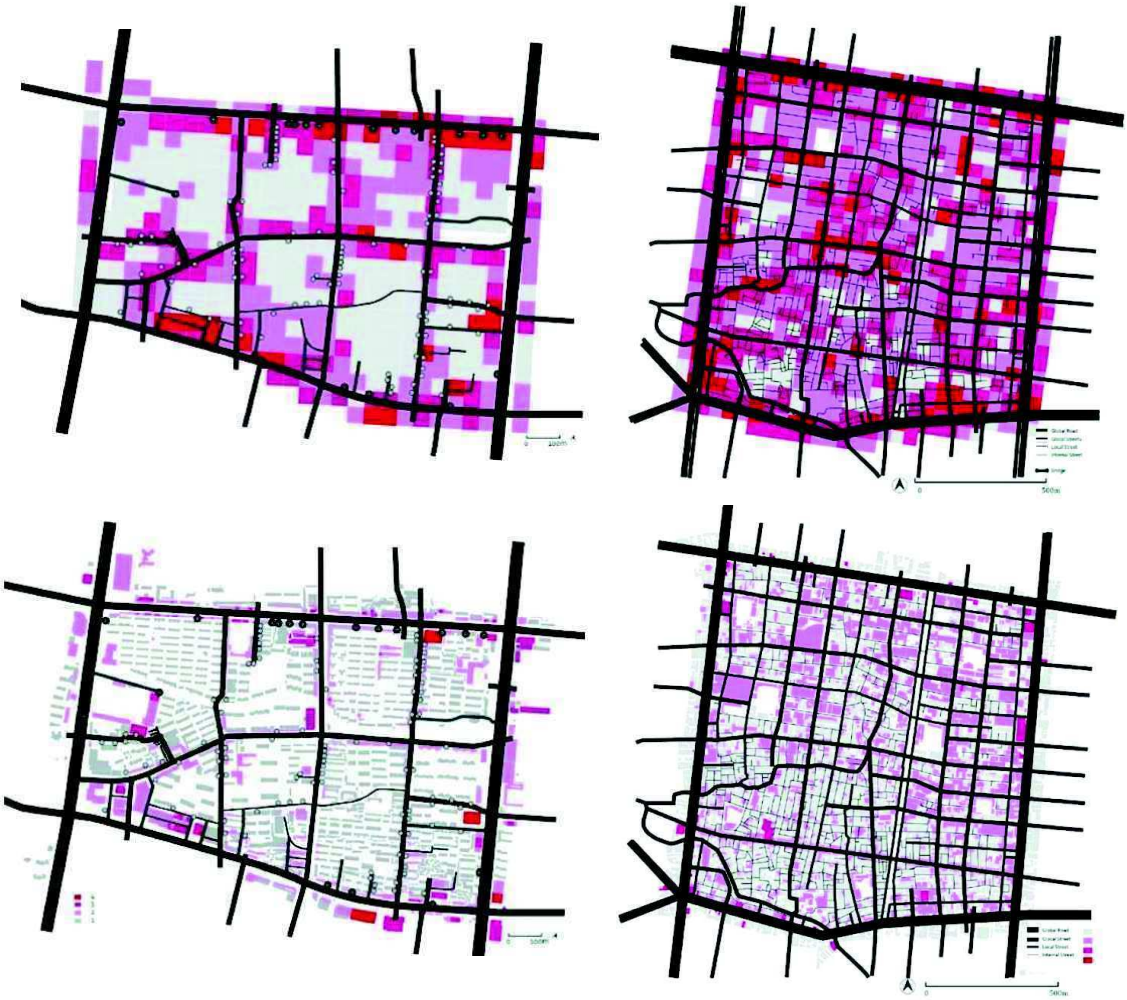

Figure 6

Distribution of the Intensity of the Mix of Functional Activities on Horizontal and Vertical Level in Daguangli (Top) and Imazato (Bottom) Superblock

found in the horizontal level. The intensity of the mix of different types of activities is also very concentrated along the global roads and glocal streets creating eight areas in Daguangli Superblock, whereas the intensity is more dispersed across the whole site with a higher intensity of the mix in general.

Conclusion

This study demonstrates a comparative investigation of the Supergrid and Superblock structure in China and Japan. This is based on a number of studies since the 1960s that argue that the importance of having an effective urban structure to support and maximize good socio-economic performances (trade and exchange) and services by generating and facilitating functions like human movement and activities. Based on those theories, this study creates a number of morphological mapping methods to map the street network and functional uses/activities of two selected Superblocks from the city of Nanjing and Osaka to understand the interrelationships between the form and function of such structure through integration, connection, and interaction.

Among many findings, three major messages can be summarized from the investigation: 1) under the influence of a wall and gate structure, clear but divergent patterns are displayed in the two Superblocks. Strong interrelationships between the street network and distribution of functional use/activities can be found in the Imazato Superblock in Osaka,

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but a stronger relationship between the gates of walled compounds and functional activities is discovered in the Daguangli Superblock in Nanjing. This reveals two very different spatial organization principles, which are influenced by wall and floor oriented spatial conception as argued by this study, and they can represent the characteristics of the form-function relationship in Chinese and Japanese structure; 2) Different structures of connection within studied Superblocks have a deterministic impact on the spatial distribution of human activities and land use. Both Superblocks indicates that Glocal type of street indicates stronger relevance to all non-residential activities, while global road shows a stronger relationship to the consumption type activities in particular. Moreover, the glocal-internal gate type of connection in Daguangli Superblock indicates a stronger concentration of activities around gates, where flows of movements are controlled by those exchange points. In comparison, activities are more evenly distributed along the glocal-internal street type of connection in the Imazato Superblock; 3) While the wall and gate structure in the Chinese case has resulted from a cultural influence, it is also responsible for a less integrated and connected street network within the Superblock with clear concentrations and separations of different uses and activities around the gates, which are located along the global roads and glocal streets. This structural design puts a great pressure on the global roads by creating a lot of congestions created by human movements and activities. In comparison, the Superblock in Japan shows much-distributed activities and uses with a well-connected grid pattern. This indicates a structural advantage of the Superblock structure in the Japanese case that China can learn from to assist the re-design of the Superblock structure and to release the pressure of over-concentration.

Acknowledgement

All maps and data are collected and created by the author, who is partially funded by the University of Sydney for the on-site fieldwork in the two cities.

Notes

1 Modern cities present themselves with a common 'generic function', by which Hillier fathoms: 'it is the spatial implications of the most fundamental aspects of human use of space that is the fact of occupation and the fact of movement. At this generic level, function imposes restraints on what is spatially viable, and this is responsible for what all buildings have in common as spatial designs (Hillier 1996 p. 8)'.

2 Global Sidewalk Street is the name of a type of street that is flanked along the global roads. It is mainly used for pedestrian and various activities to take place. This name is adopted from the study of Gokiso Superblock in Nagoya, Japan from Shelton 2012.

3 Horizontal level refers to the functional use of the ground floor of each building on site, whereas vertical level refers to the functional use of buildings on different floors.

4 The eight types include: Consumption, Production, Service and Residence as four primary types. The other four types refer to the mix of consumption and production, consumption and service, production and service and the mix of consumption, production and service. This is indicated in Figure 1.b2.

5 The numbers in orange color indicates the number of activities by including the global sidewalk street as part of the glocal street network. The numbers in green color represents the number of activities by including the activities around local and internal gates.

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Analysis and application of mountainous city profile methodology. A case study on Yuzhong Peninsula of Chongqing

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Abstract. *Established in the thesis of urban morphology, this essay focuses on morphological analysis and space research in urban scale by employing the methodology of city profile ,hence providing a new perspective of urban design on mountainous city. In the case study of Chongqing, the profile line is selected covering the range from riverside park to Hongyadong historical district and the surrounding areas. Reticular formation is applied for comprehensive analysis on space construction and humanity system of the sequential city profile. The final target is to provide theoretical foundation for urban design with regional features, according to prototype extraction of main blocks.*

Keywords: Urban morphology, city profile, mountainous city, urban design, theory research

Introduction

Contemporary research on urban morphology usually concentrates on two perspective: synchronicity and diachronism, both of which are established on planar analysis. When these theories are applied to mountainous cities, it will emerge errors in research of urban social space. For this special kind of city quite different from plain city, analysis on one perspective in figure-ground relation will have limitations, considering the complications of urban structure and environment. The Theory of Architectural Typology by Leon Krier explains that the city should be considered as a growth tissue and its basic unit should be every block in the city. The focus in research should be reduced from a huge block into a human scaled one. It is widely acknowledged that urban space is formed with two component factors- physical space construction and residential culture . space environment construction includes the land-use pattern and functional decomposition, while residential culture covers history , Folk-custom Scene and citizen quality. As a result, this essay will explain these two factors on the basis of vertical analysis of the city profile mentioned above.

Methodology

Concept for City Profile Methodology

Putting an imaginary plane in a particular urban space, cutting the block, building, facility around this cut line and then we can get the interface, in which we can also find the residents' social and cultural properties .we call the interface or the sectional picture as the City Profile. The City Profile can faithfully reflect the continuous and gradual change of the selected regions, thus obtaining the characteristics of the timeliness and spatiality.In a city profile, the imaginary cutting plane could be a road throughout different blocks. More details, including block scale, building form, open space and chaotic street life nearby, could be recorded in the interface. Once the selected road is a continuous gradual change line, the city profile could represent the characteristic of synchronicity and diachronism.

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Reason for sample selection

The sample for city profile should satisfy the demands below. Firstly, the city should hold typical characteristics of mountain topography. Secondly, the city covers adequate kinds of active blocks for model extraction. Thirdly, the city's urban dimension and architectural composition is deeply influenced by mountainous terrain. This essay will demonstrate the application for city profile in Chongqing, which is the central city in southwest China and also a well-known mountainous city. The cutting line will cover a range from riverside park to Hongyadong historical district ,including Shibati residential district and Jiefangbei central business district.

Research method

Foundation of Urban Morphology

A city's components, not only physical part or social humanity part are constructed in a rather complex system with complicated variable rules. regardless of which kind of culture or landscape, a city is made up of "element "and "composite structure of elements", which are also the key point of the essay. Another important theoretical foundation of this essay is the Theory of Architectural Typology, which believes that urban analysis can be employed in two steps- type selectivity and type conversion. The essay is emerged from this method and unfolds over several steps. the first step begins at analysing and synthesizing the urban space in "element part "and "composite structure part of the element", which is devoted to prototype extraction. The next step is making translation on prototype extraction and summing up design experience. The last step is applying this method to urban design in a specific city with adequate considerations for modernization construction and regional features.

Research element for Mountainous City Profile Methodology

City profile study takes block as the basic unit, which embodies urban space integrity. The interface emerges after the cutting of a city block, which can be resolved into bottom interface, perpendicular interface and top interface three levels.Details and information on the interface represent the present status of a city and will be analyzed. Bottom interface demonstrates the relationship between site and foundation, including natural and manmade terrain, landscape, Living riverbank which not only bear the weight of various outdoor public activities, but also reflect the level of urban construction, regional characteristics and specific culture. AS the most important part, perpendicular interface concentrates on space between different buildings, for example, the physical space for buildings, streets ,public squares and so on, which impact the block atmosphere with community vitality. The top interface displays the building skyline, which is related to the roof form and building height, showing the comprehensive features of the block.

2.3.3Composite structure of element

This essay is developed from two main theories. On the one hand, Alexander R.Cuthbert holds the opinion that internal diversity between different districts is the result of long time urbanization, showing a continuously varied structure. On the other hand, it is widely acknowledged that urbanization process is consist of landscape urbanization and humanity urbanization (population growth and citizen diathesis).Study on composite structure will be established in construction principle and differences on landscape and humanity urbanization.

Case study and analysis

Selection reason for Chongqing

Located between two rivers(Yangzi river and jiangling river) with various kinds of landscapes and long history, Yuzhong peninsula used to be the centre of main Chongqing. The street and house distribution are greatly influenced by the mountainous topography, especially zones from Shibati to Hongyadong historic conservation district. The region for case study has four kinds of blocks belonging to different urban fabrics and landscapes of a mountainous city, with relatively high theoretical research value. the General Plan of the research is shown in figure 1 below.

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Figure 1. the General Plan of the case

Feature of selected case

Generally, on both sides of the city profile, the landscape belongs to are riverfront areas with broad vision but high density of buildings. At the same time, the Shibati old district remain the original texture of old zones ,where buildings here are constructed with self-reliance and operated independently without planning. As it moves toward the center district called Jiefangbei CBD, high buildings stand up like a forest, traffic is crowded and green land is reducing.

Riverfront park block

Landscape urbanization

The bottom interface shows the feature of riverside green space with ecological environment and artificial public square interpenetrating and interacting into each other. In the city profile, we can see three levels from riverine wetland, riverside park to city express way, with a height difference of 8 meters and 19 meters. Along side the river, there are a lot of small scale exercise yards and shipping wharves, where the available space are closely affected by ebb and flow of Yangzi river. The perpendicular interface mirrors the building distribution of the shipping company and its warehouse in low density. On account of the larger vehicle flux and drivers' requirements for food and daily necessities, there are many stores and restaurants along the express way and under the viaduct. The top interface presents a clearly decreasing trend in the skyline.

Humanity urbanization

As a main port and inland city of China, Chongqing's economic growth is primarily driven by logistics. limited by the mountain and terrible land traffic, shipping on Yangzi river used to be the main traffic route for commercial transportation before rail transport being popularized in 2010. Although affected by the impact of rail transport, truck transport and air transport, which are considered better than shopping in efficiency and price, Shipping still plays essential role in commercial transportation and especially, tourist industry , benefiting from Cruise Tour in Three Gorges tourism. Unfortunately, more remarkable, the operating frequency and quality for riverside green space are not good with obstacle of the express way and viaduct.

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3.3.3 Prototype extraction

In conclusion, the riverside space with excellent landscape as well as uninterrupted views of both city and natural beauty can be transformed into public parks in four patterns, tidal flat, dyke, multi-layer dyke and square in stairs(Figure 2).

Riverside residential block

Landscape urbanization

The bottom interface obeys the geomorphic feature of flatland with a relatively flat slope. In the perpendicular interface of the profile, there are high-rise buildings with business stores on ground floor, straightly open to the express way and back against the cliff. In area far away from the riverfront park, quantities of old-fashioned multiple floor residence increase, most of which are in brick-concrete structure. What's more, there remains some traditional vernacular pillar-supported dwelling in wood construction and this kind of construction is also a main architectural style with centuries-old history in southwest china. In the top interface, we can find that, high-rise blocks are far enough together for more public green space and less shadow, but old buildings remained are close together, leaving space just for walkable streets. The skyline first increases sharply in high-rise buildings, but declines gradually as moving inland towards old residential areas(Figure 3).

Humanity urbanization

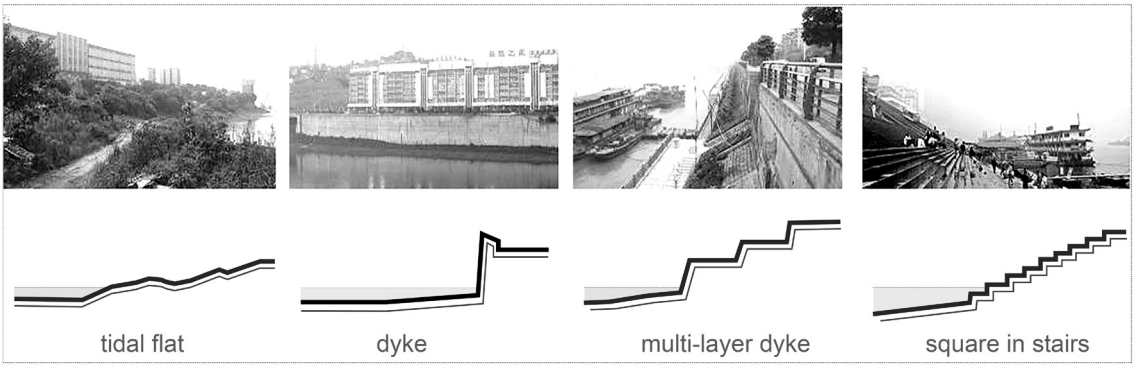

Figure 2. prototype extraction for riverfront park

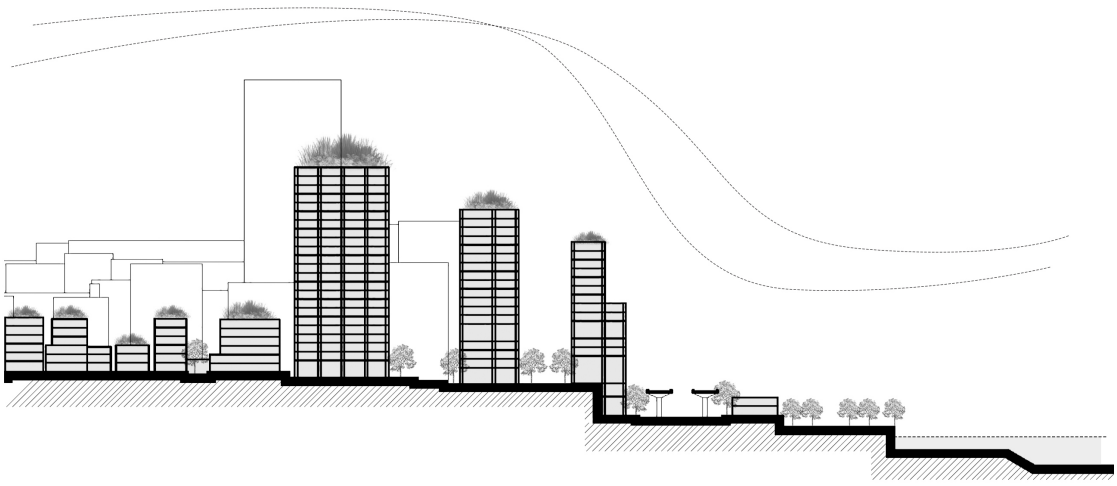

Figure 3. City profile of riverside residential block and Shibati residential district

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Subject to commercial reasons, national defense regulation and the demand of Modern building principles, high-rise buildings located near the river with best views pursuit of high volume rate. In old residential areas, where available land for construction is narrow and have quit a lot limitations, most self-established buildings belong to neighborhood committee and have not been function replaced and updated. The requirements for adaptation for local topography and resolving problems on lighting and ventilation impact the final shape and feature of these residence houses.

Prototype extraction

In general, the block landscape has been transformed by artificial excavation and reconstruction according to natural topography in four ways. In area where high-rise building stands, the whole slope is excavated and filled totally into flat land for foundation. For small cottage and ordinary multi- storey residential house, which are usually constructed in steep and broken mountain, methods of semi-filling and semi-excavating are to be employed. Another popular choice is learning from experience of vernacular pillar-supported dwelling and making little change on the original landscape. When it comes to the combination of buildings and terrain, we extract 16 kinds of prototype and they are presented in figure 4.

Shibati residential district

Landscape urbanization

The bottom interface is similar to basin space, where the main part is depressed as the boundary is increased gradually to the same height of the peripheral region. This block is constructed along a walkway in steps with a height of nearly 18 meters and a length of 300 meters, which is the closest path for pedestrians to get from the foot to the top of the hill. The perpendicular interface of the profile expresses the scene of busy daily street life along the path. Buildings distributed among the path are almost two and three story houses with sloped roofs, most of which are faced to the path. The function of these facade are stores dealing with community service and retails in the same styles. These stores and residential buildings remain a little weathered as it being constructed and still follow the principles including four items :variety and unification, scale and dimension, rhythm and cadence, balance and unbalance. The styles and scales of the constructions vary quit a lot ,making the whole path clutter and confusion. Public space, like some courtyards and alley-ways, is the most active part of this block ,most of which are in a size of 4 to 6 meters, where the old and young can wash and drying weather under the tree, the residents and tourists can enjoy majiang game and snacks here. The top interface shows a picture that the skyline is relatively flat with traditional tiled

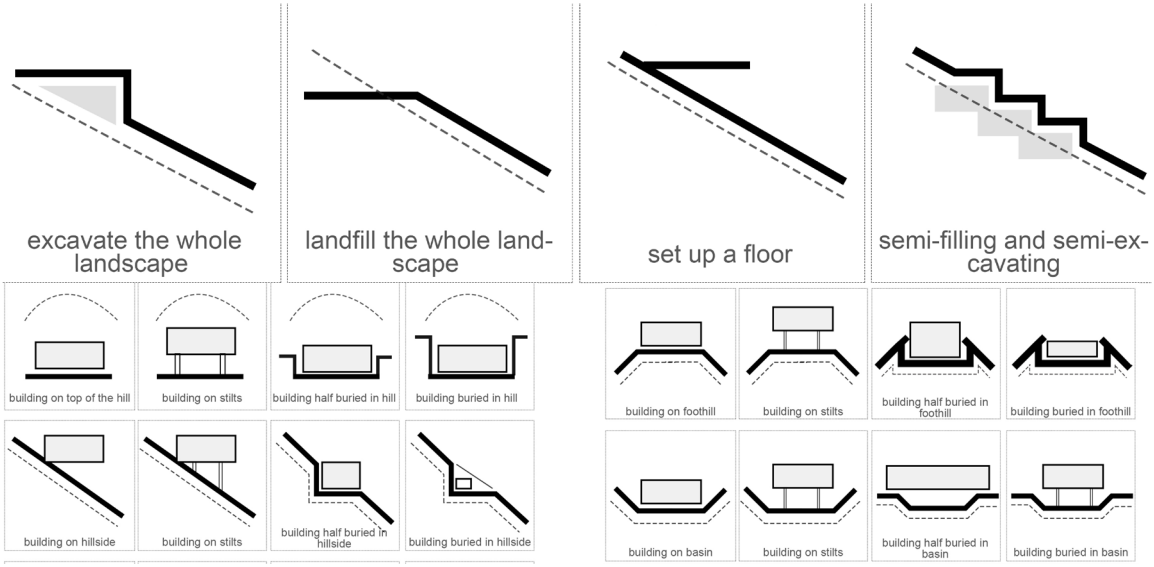

Figure 4. prototype extraction for transformation of landscape

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roof, compared to the high buildings and large mansions nearby.

Humanity urbanization

The walking path of Shibati used to be the only connection between the old town and the top CBD block for pedestrians and witnesses the urban transformation of Chongqing, regardless of little impact from modern vehicles. The large influx of people and their demands for living and leisure supply have brought prosperity to the district. However, Shibati rapidly declines in modernization process due to the bad traffic and complex property relationship.

3.5.3 Prototype extraction

The landscape and architecture form are quite similar to old residential block, so we can follow the same reference after adapting to the local topography.

Jiefangbei CBD block

Landscape urbanization

The bottom interface shows the typical characteristics of flat space while the height near jialing river declines slightly. Jiefanbei CBD block is the earliest, biggest central business district of Chongqing and this area is built under modern planning at the beginning. The perpendicular interface presents this characteristics clearly. The building annexes under 24 meters are in service for pedestrian street and retail commerce, while the towers on the are in the function for financial offices or luxury hotels. Blocks and architectural layout follow the same principles with similar features, only parcel areas are flexibly constructed. Buildings in huge volume generally gather at the field with large construction density and small spatial scale. Most high-rises stand back to the annex, thus leaving more space for roof garden and reducing the sense of oppression for pedestrains. In the middle of this block is a central square where the Emancipatory Tablet stands and this place is also the central and symbol for main urban area of Chongqing. There are also several little grounds dispersed around the Emancipatory Tablet in a distance of 100 to 200 meters away from each other. On account of abundant architectural details, elevations and roof forms, the top interface have plentiful stratifications(Figure 6).

Humanity urbanization

Jiefangbei CBD is the result of modern urban planning, whose block scale, shape and characteristic are all under the same principle to suit the demand for motor traffic, leading to the loss of adequate possibilities in free development. Fortunately, preferences and develop conditions of different owners make efforts to a more changeable block.

3.6.3 Prototype extraction

How to create neighborhood and enhance street vitality is always the priority target of this kind of modern block and generally there are three patterns : street under motor vehicle guidance, street under pedestrian guidance and street under guidance for coexistence of people and vehicles. Since there are a large number of similar studies on modern block construction in theory and practice, this essay will do no further discussion.

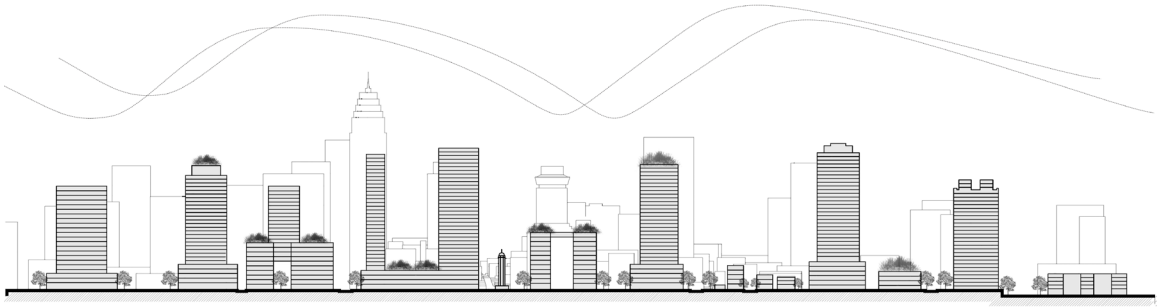

Figure 5. City profile of Jiefangbei CBD block and Hongyadong historical district

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Hongyadong historical district

Landscape urbanization

The bottom interface reproduces the cliff landscape with a height of 100 meters. The upper part of the block is a abrupt slope in 70 to 80 degree, while the next part is a rather flat slope in 30 to 40 degree. The original buildings here are vernacular pillar-supported dwelling in wood constructions. The transformation and protection project remains the structural style but change the material into steel and concrete. The whole historical block is formed with several small buildings and looks like a huge architectural complex, which can be clearly seen in the perpendicular interface. To enrich the building image with a large volume, more construction skills in traditional residential house are adopted, including setback, split-level and overhanging and each house is equipped with sloping roof. As buildings blocking most landscape and composing the side space of jiangling river coastline, the top interface mirrors a distinctive sense with rich levels of roofs, flat form, green garden and pedestrian walk path.

Humanity urbanization

After the renewal process of Hongyadong, this block has already abandoned its original function concerning residence and casual living. Urban designers apply new functions such as restaurant , tourism and trading on small commodities to this block to attract more people and investment.

Prototype extraction

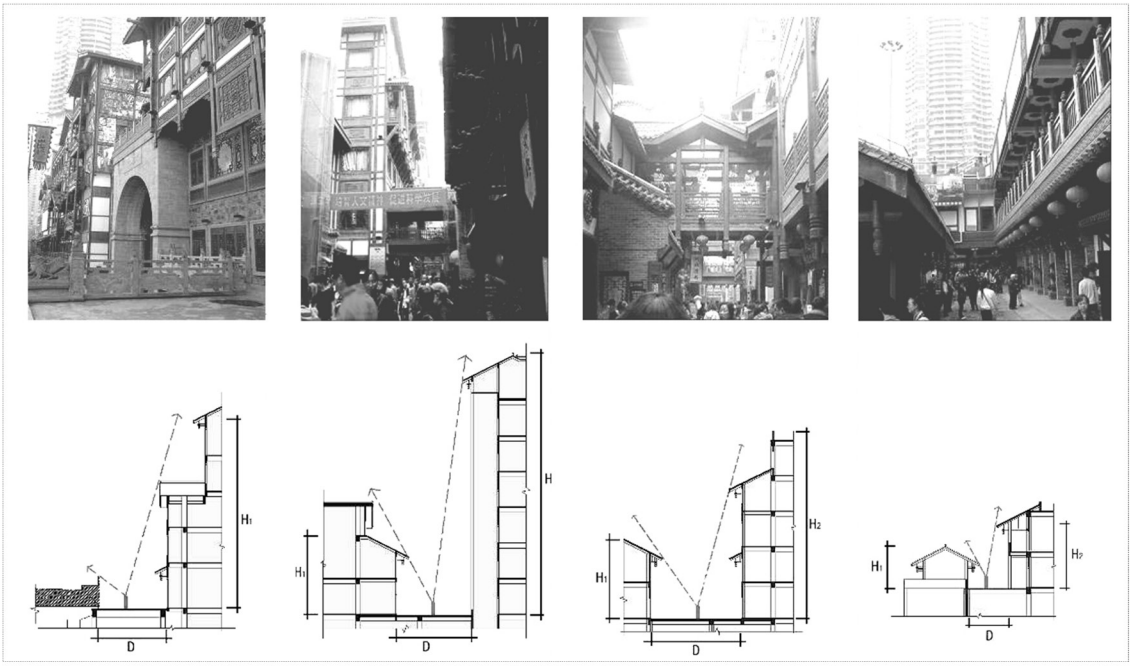
Street becomes the main part for community vitality and four patterns(Figure 6)can be extracted after the research.

Conclusion

Application principle for City Profile Methodology in urban design

Design should concentrate on requirement for nature and citizen. More attention should be paid for natural landscape and Reduce the reconstruction of the topography in large scale. Due to various living habits and folk cultures of different people, more research and analysis on citizens' social psychology,behavior character and aesthetic judgment should be employed before actual construction steps.

Processing strategy on a specific block



prototype extraction for Hongyadong historical district

Figure 6. prototype extraction for Hongyadong historical district

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Riverside residential block
The key issue for mountain residential district emphasizes on the foundation settlement and entrances and exits on ground floor. Most of the activities emerge near the traffic node, which helps creating the community vitality, so more public facilities could be set on the ground floor. The underground parking have clear and straight access to gymnasium , swimming pool, BBQ area, children playground and outdoor fitness area. Considering the limitation of available land, high-rise tower could be set back for more terraces on the roof.

Riverside green park
On behalf of the beautiful scenery, more greening park and open space should be built and let the greening integrate into city land. For park with high altitude difference, more guard bars should be built around dam and reduce obstructions that block the river sight. For intertidal zone ,more steps and water docks equipped with teahouse and stores would be appropriate, making advantages of ferry terminal and tourism ships.

Jiefangbei CBD block
The sense of order and dimension do work in enhancing the feeling of well-being and positive relationships in CBD .There needs a the landmark or square should in the central and the surrounding areas should not exceede the scale and height of the symbol.

Other points
More considerations about the complexity of mountainous city should be taken into considerations in urban design as dealing the whole city as a overall issue. Blocks with different features are to be designed in relevant solution separately. While at the same time ,how to deal with the connected regions and boundaries become important if we want to avoid feature mutation and confusion. Regulations should be followed to point out the emphasis area, second-emphasis, common area and other area.

Disadvantages
Although the City Profile Methodology remedies of limitation of plane in urban design in a more intuitive and simple way. It just provides an illustration means in vertical design. It can not afford precise information on urban humanity, historic content and geographic ecology, which also make a difference to the final result. Limited by the author's own academic accumulation and lack of experience in specific research of the case, this essay need further investigation and practical feedback in future.

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The Hybrid Block as Urban Form

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Abstract. *In this paper we analyze the hybrid block as an urban form of synthesis, in which the open order of modern urbanism is superimposed on the closed order of traditional urbanism. In this model, proposed for the first time by Hilberseimer in his 1924 Hochhausstadt (Highrise City), housing and work are not separated but overlapping on mixed-use buildings, where the dwellings are located in slabs or towers shaped as isolated volumes, whose design responds to its own internal logic, based on functional criteria (rational distribution of rooms, orientation, ventilation, sunshine, views...). Those volumes emerge from a compact built-up podium for commercial or office uses, aligned with the perimeter streets and responding to the external logic of the urban fabric. This configures an urban form in which both hybridization of architectural forms and hybridization of uses are obtained, recovering the multifunctional character of the traditional urban block, which had disappeared in functionalist urbanism. The paper examines the reasons that can explain the exclusion of this urban form from the repertoire of elements of modern urbanism, and analyzes the validity of the hybrid block, as an strategy to recompose or reinterpret the urban block, assuming high density and collective housing as a basic typology for the construction of the city.*

Keywords: Hybrid Block, Urban Form, Mixed Use Buildings, Open Planning

Life and death of mixed-use buildings in modernist housing.

In the traditional city, housing and work shared the same building: the productive activities, such as the workshop of the craftsman or the spaces for the commerce, were on the ground floor and the dwellings were placed above. The only existing residential type was the single-family house, linked to its plot, to the land.

This situation changes in a radical way in the industrial city, where collective housing, with rental apartments in multi-storey buildings, consolidates as predominant typology and basic element of an urban fabric composed of city blocks. This type integrates in the beginning a non-residential ground floor, intended for offices or shops, but the productive activity (factories) progressively moves out of the city due to the need for more space and to improve its link with the transport networks.

The facades of the buildings in the urban city block are aligned with the street, configuring a closed continuous envelope. The interior of the block may have more or less free space, depending on the historical period, the local building tradition and the degree of densification reached in each city.

In any case, the buildings in the closed urban city block are mixed use: the ground floor (and sometimes the mezzanine) has a non-residential destination (offices, shops) and the upper floors are allocated to dwellings, socially stratified until the use of the elevator became widespread. The privacy gradient increases as we ascend: shops open to the public and to the street at ground floor, mezzanine offices and dwellings above.

This type of mixed use building was condemned without palliatives and drastically

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expelled from the city of the modernist architecture. This expulsion can be explained by a series of confluent factors, some of which are related to urban concepts while another ones are of aesthetic order.

The first of these factors is the emphasis placed on housing by the modernist movement, to the detriment of other urban elements. The functionalism focused adequately on solving the problems that affected the conditions of habitability in the industrial city (overcrowding, insalubrity and lack of free spaces). But the emphasis placed on the residential reached to such an extent that residence was considered as the basic element for the construction of the modernist city, neglecting other constituent elements of the urban reality traditionally linked to housing, mainly the shops and working places located in the ground floors of residential buildings.

This attitude can be explained in part by the fact that the object of modernist urban design in its founding period was mainly the residential suburb, the siedlung or colony of worker´s housing, where a commercial activity comparable to that of a traditional urban fabric was not foreseeable. The model of garden-city that is at the origin of the German siedlungen of the 20s did not contemplate mixed use buildings, since its basic residential type was the single family house with a private garden.

The second factor, complementary to the previous, is the generalized application of the parallel concepts of zoning and functional specialization in modernist urbanism. This means, on the one hand, that the city is subdivided into zones for different uses, and, on the other, that buildings are designed from inside to outside, according to the form-follows-function principle.

The mixing of uses is considered as an anathema in the CIAM theories about urbanism, such as the 1933 Athens Charter. In the city of modern architecture, therefore, housing and commerce cannot coexist in the same building: shops, restaurants and other establishments disappear from their traditional location under the dwellings, and these tend to occupy also the ground floor, configuring uni-functional buildings, exclusive for residential uses.

The traditional model of shops along commercial streets is replaced by another where shopping is concentrated in buildings designed for that exclusive use (markets or commercial centers). As a consequence, the street is deprived of much of its activity, to the point that it can hardly survive as a living urban place if its only role is as a space to park cars and give access to housing.

A third factor that explains the exclusion of mixed use buildings in modernist urbanism is related with the proposed disposition of the buildings with respect to the streets, not aligned but independent of them, with access through pedestrian paths inserted in green spaces. This separation between buildings and streets turns the streets into mere roads, and makes unfeasible, even if it is postulated, to place commercial spaces on the ground floors of these buildings, since they would have a difficult supply and, moreover, no one would pass in front of them except the residents themselves.

This organization of the ground plan makes the mixed building impossible in modernist housing complexes. If the residential buildings are separated from the street and immersed in the green, the dwellings´ habitability conditions may be improved, but at the same time shops are isolated from the flow of people necessary for any commercial activity.

A fourth factor, of a compositional or aesthetic nature, reinforces this: for modern architecture, the heavy basal body of classical buildings is unbearable, aberrant: there are no structural walls anymore, and the pillars must be seen, making ostentation of the new structural techniques made possible by the use of rolled steel and reinforced concrete. On the ground floor there is occasion to express the triumph of the new, and the building on pilotis proposed by Le Corbusier in his famous cinq points perfectly expresses the machinist aesthetic, the lightness and the break with the classic composition. Ville Savoye, at the scale of the private house, and the Unité D'Habitation, at the scale of collective housing, propose just the same relationship with the land: not to touch the natural landscape, but to settle the buildings on it instead, leaving it almost intact. There is no possible shop under a building so conceived.

The only urban proposal of its time in

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Figure 1.

Ludwig Karl Hilberseimer. Highrise City (Hochhausstadt): Perspective View: North-South Street, 1924. Ink and watercolor on paper, Approx. 97.3 x 140 cm. Gift of George E. Danforth, 1983.992. Architecture and Design collection. Chicago Art Institute.

Europe in which housing and working are not separated but overlapping on mixed-use buildings is the Hochhausstadt o High-rise City, designed by Ludwig Hilberseimer in 1924, which, as opposed to the successful proposals of Le Corbusier and the Charter of Athens, was ignored by its contemporaries and discarded by its own author. Hilberseimer's Hochhausstadt, however, marks the birth of the hybrid block idea in the modernist urbanism, so we will analyze it in detail in the next section.

The hybrid block in Hilberseimer´s *Hochhausstadt:* a forgotten model in modernist urbanism.

Ludwig Hilberseimer designed in 1924 an ideal city, the Hochhausstadt (High-rise City or Vertical City), which differs from all other urban proposals of that time in Europe because it is the only model in which housing and working are not separated but overlapping on mixed-use buildings.

The proposal for the Hochhausstadt, published in 1927 in the book Grosstadt Architektur, consists of three drawings only: a schematic plan and two perspective views of a south-north street and an east-west street. This images of the High-rise City have been used frequently to show the dehumanized character of the modern city and the stark horror of the metropolis, expressed in the anonymous and absolutely uniform architecture.

But the Hochhausstadt, if we can see beyond the raw images, is a precise urban model that does not imply a rupture with the urban tradition, but rather a reinterpretation of that tradition from new parameters.

Hiberseimer proposes in his Vertical City a rational organization (inspired by the high-rise building of American cities but opposed to the chaos of those) and isotropic (opposed to the hierarchical order of Le Corbusier´s Ville Contemporaine), which takes the form of a homogeneous orthogonal grid. This grid is formed by blocks of 100x600 m, with its long side in a north-south direction, and streets of 60 m wide. The length of the block is given by the distance between metro stops.

Assuming high-density and collective housing as project premises to build the Grosstadt, Hilberseimer's Vertical City consists of two overlapping cities: underneath

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the commercial city and round circulation; above, the residential city and the pedestrian circulation. Urban and interurban transport services run underground.

The endless grid of rectangular blocks of the Hochhausstadt is composed by the repetition of an only building type, composed of isolated slabs for dwellings on a non-residential base structure built as a conventional city block.

The lower part of the block, five storeys high, is intended for commercial and working uses, which occupy the perimeter of the block in a strip with a depth of 15 m and transverse built strips that separate seven interior courtyards per block.

The upper part of the block, intended for residence, is composed by two linear slabs, 15 storeys high, arranged longitudinally in a north-south direction, 10 m depth and with a setback of 8 m with respect to the alignment of the commercial base. The space of this setback, extended on the street by a cantilever of 2 m, is used for pedestrian circulation. The linear slabs are thus separated from each other at regular intervals of 70 m, both on the sides of the street and inside the block, being the street width equal to the height of buildings.

In the Hochhausstadt, dwellings are located in slabs shaped as isolated volumes, whose design responds to its own internal logic, based on functional criteria (rational distribution of rooms, orientation, ventilation, sunshine, views...). Those volumes emerge from a compact built-up podium for commercial or office uses, aligned with the perimeter streets and responding to the external logic of the urban fabric.

This configures an urban form in which both hybridization of architectural forms and hybridization of uses are obtained, recovering the multifunctional character of the traditional urban block, which had disappeared in the functionalist urbanism of the 20s.

The hybrid block as an urban form associated with the contemporary city is thus configured in the urban proposals of Hilberseimer as an urban form of synthesis, in which the open order of modern urbanism is superimposed on the closed order of traditional urbanism.

The Hochhausstadt model was left dead as an urban system for residential complexes, because it did not fit into the strict functionalist zoning doctrine, which did not allow the mixing of housing and commerce in a single building.

However, the hybrid block will have more fortune as a model for central urban areas, characterized by a high demand of surface for commercial and office uses. As early as 1925, Cornelis van Eesteren used this model in his project for Unter den Linden in Berlin, as well as in his 1926 studies for the reorganization of the center of Paris. Hilberseimer himself proposed in 1930 a modified version of his Vertical City for the center of Berlin, in which the linear slabs are eight-storey office buildings, located on a two-storey base that occupies the whole block. But although the organization of the volumes is similar, at a reduced scale, than the one presented in the Vertical City, this does not occur with the uses: instead of the mixed use block of the Hochhaustadt, in the project for Berlin the block is destined only to shops and offices, and housing is excluded. The architectural hybridization, with the linear slabs superimposed on a compact basement, is not joined by a functional hybridization, so horizontal zoning persists, losing the main virtue of the Vertical City: the overlapping of housing and working.

The recovery of the hybrid block in the 60s: platforms, megastructures and multifunctional urban centers.

From the beginning of the sixties, the strict orthodoxy of modernist functionalism is progressively abandoned in favor of urban models based in a mixture of uses, where complexity and multi functionality are perceived as a necessary factor to recover the urban character and the traditional street life in housing complexes. This is the position advocated by Jane Jacobs in her very influential book The Death and Life of Great American Cities (1961), which marks a turning point in contemporary urbanism.

The horizontal separation of activities induced by zoning regulations, which segregate the four functions identified in the Athens Charter (dwelling, working, recreation and circulation), had already been questioned in 1959 in the CIAM of Otterlo by the new generation of architects grouped in the Team

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Figure 2.
Michel Holley. Proposal for a vertical zoning: living-working-circulation. From: Holley, Michel (2012). Urbanisme vertical & autres souvenirs (Somogy éditions d'art, París).

10, such as Aldo Van Eyck, Jaap Bakema or Alison and Peter Smithson. That same year, the project for Front de Seine contest in Paris by Raymond López, Henry Pottier and Michel Proux, with Michel Holley, laid the foundations of what in France will be known as urbanisme de dalle (urbanism of platforms), a model where the horizontal zoning of the CIAM is abandoned, and functionalism is reinterpreted by proposing a vertical zoning, in which functions overlap vertically: the roadways in the subsoil, the shops and work areas on the surface and housing high above, emerging from the new artificial and elevated floor plan of the dalle. This model represents a recovery of the hybrid block as an urban element, and derives directly from the one proposed by Hilberseimer in his Hochhausstadt, with two main differences: the use of subsoil for traffic and the building typology of the volumes that emerge from the base structure, which are now towers instead of linear slabs.

Other architectural and urban proposals that seek to recover multi-functionality in the 60s, such as the Pampus Plan for Amsterdam by Bakema and Van den Broek or Cumbernauld town center, are based on the concept of megastructure, a term coined by Fumihiko Maki in 1964 to designate one of the possible ways of creating collective forms (the other two methods are the compositional form and the grouped form). The megastructure, according to Maki, is a mega-form or structural support, in which are housed smaller units that can be added or removed. This concept contradicts the idea of block, understood as a discrete unit that by repetition configures the grid, the urban fabric. The concept of megastructure, therefore, allows to create hybrid buildings, but not hybrid blocks.

In the United States, Victor Gruen, who paradoxically had been the creator and main designer of the 1950s suburban shopping center, follows Jacobs´ questioning of the functionalist zoning in his book Centers for the Urban Environment (1973), where advocates a new commercial model based on the vertical overlap of uses: the multifunctional urban center.

The aim of a multifunctional center is to combine as many urban functions as possible in a compact structure that uses the land intensively to obtain the maximum gross surface area for human activities, occupying as little terrain as possible. The concentration and superposition of functions allows shortening the distance between them, and minimizes the cost of forced mobility. Gruen shows as examples of this new model his projects for Midtown Plaza (Rochester, 1962) and Tête Defense (Paris, 1970), and the Barbican development of Chamberlain, Powell and Bon (London, 1969), among others.

The organizational principle for the volumes in the multifunctional urban center follows what Gruen calls the "platform principle". According to this principle, all functions that can best be performed under controlled air-conditioning and lighting conditions, together with all services, public transport and parking

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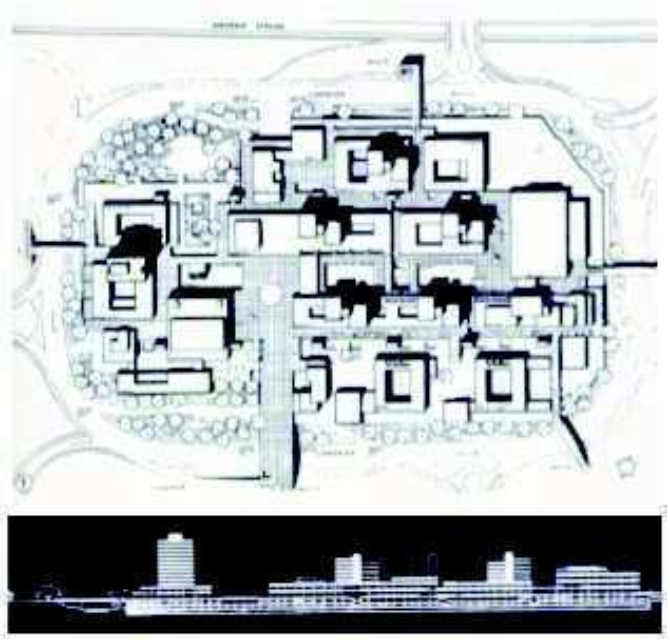

Figure 3.
Nordwest Stadt Centre. Frankfurt. Plan and general section. H. Kampffmeyer, Frankfurt Planning Office. From: Gruen, Victor (1973). Centers for the Urban Environement. Survival of the Cities (Van Nostrand Reinhold, New York).

facilities, can be located in what Gruen calls "base structure", that can start with two or three basement levels and finish with two or more levels above grade. This base structure constitutes a compact and homogeneous volume, which is destined for the most part to lucrative uses, along with the pedestrian spaces like squares and galleries that serve them. As in the French dalle, the upper limit of the base structure forms a "platform" which is not necessarily a flat surface, but can be organized as a series of terraces at different levels, linked together. This platform doubles the surface of the plot, creating a new floor plan, pedestrian and landscaped, from which the volumes corresponding to urban functions that need natural ventilation and illumination, for physical or psychological reasons, emerge: hotels, offices, civic or administrative buildings, apartments, which may have different heights and shapes on different floors.

In short, what Gruen proposes with its multifunctional urban center, as Holley does with his urbanisme de dalle, is what we can call a "hybrid superblock", a building complex of a much larger size than that of an urban block, and without plot subdivisions. This proposal, unlike the megastructural ones, has a possible fit in an existing urban fabric, since it implies only a concentration of plots to achieve a punctual extension of the size of the grid.

The arise of the neo-hybrids: mixed use and urban congestion in the contemporary city.

The hybrid block is the urban form selected by Rem Koolhaas in his 1972 render, The City of the Captive Globe, a fantastic city created to represent and celebrate Manhattan's "culture of congestion". The drawing, included in Koolhaas´ book Delirious New York (1978), shows a grid of compact and uniform city blocks surmounted by heterogeneous buildings, such as the RCA Building from the Rockefeller Center, the towers of Le Corbusier's Plan Voisin, and all kind of heterogeneous structures (El Lissitzky's Lenin's Tribune, a fragment of the Berlin Wall, scenography from Doctor Caligari´s Cabinet …). Though Koolhaas´ City of the Captive Globe and Hilbersimer´s Vertical City seem very different in appearance, and are distant in time, they share a common guiding principle: the use of the hybrid block as basic element to build the urban fabric.

In The City of the Captive Globe Koolhaas proposes in a metaphoric way an urban model in which unity is provided by the city blocks below and diversity is accommodated in the structures emerging over them. That synthesis of discipline and freedom is the main feature of what Koolhaas calls "Manhattanism": the grid acts as a control mechanism in the horizontal land plane and the vertical direction is the domain of anarchy. The base structure can be thus considered as an extension of the urban discipline of the grid to the first storeys of the building, and above the volumes are free.

The first general interpretation of the hybrid type is due to Joseph Fenton, who agrees with Koolhaas as to the reasons that explain the dual character of the hybrid type: it was "a response

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Figure 4.

Rem Koolhaas, Madelon Vriesendorp. The City of the Captive Globe Project, New York, New York, Axonometric, 1972. Gouache and graphite on paper, 31.8 x 44.1 cm. Gift of The Howard Gilman Foundation, Object number 1206.2000. Department of Architecture and Design. Museum of Modern Art, New York.

to the metropolitan pressures of escalating land values and the constraint of the urban grid. With horizontal movement restricted, the city fabric moved skyward. The building form became taller, larger than ever before“ (Fenton, 1985).

Fenton identified three different categories of hybrid buildings: Fabric, Graft and Monolith. In the Fabric and Monolith hybrids, programmatic elements are subsumed within a continuous building envelope. On the other hand, the Graft hybrid expresses its functional components, either volumetrically or in its elevation (Fenton, 1985). The hybrid block, as we have described it, could be somehow considered as a Graft hybrid building which occupies the land surface of a complete urban block.

In the debate on hybridization since the 1980s there are two trends, one urban but with a regressive approach, linked to what has been identified as “postmodernity”, and another that we could call retro-futurist or neomodernist, which is inspired by the American culture of urban intensity of the early twentieth century, and implies to a certain extent a celebration of congestion.

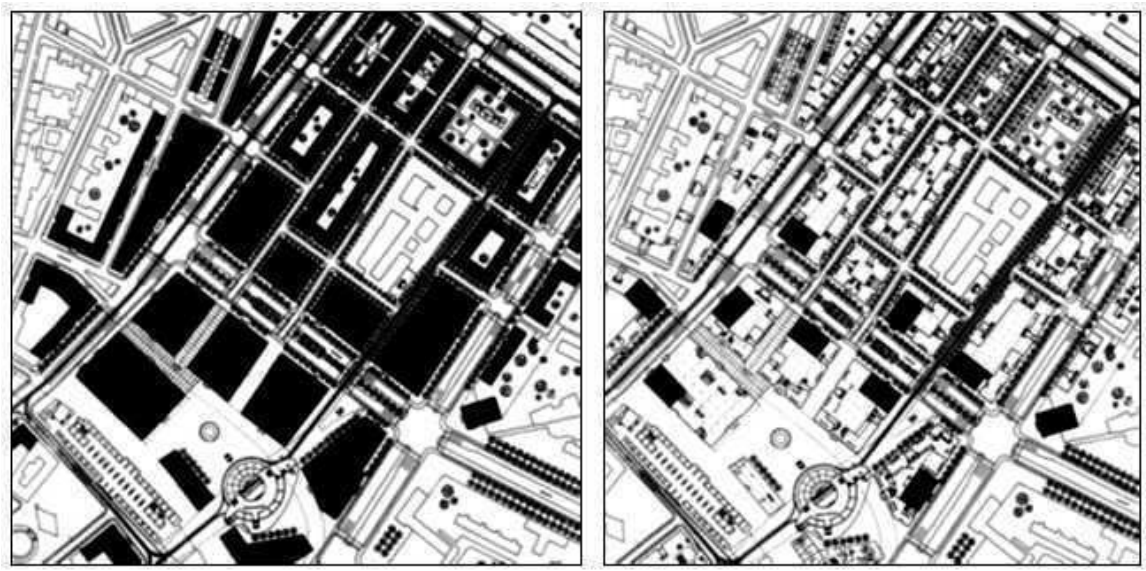

Figure 5.

Masterplan for Alexanderplatz, Berlín. Hans Kollhoff and Helga Timmermann, 1993. Ground floor and upper levels floor. From: Pérez Igualada, J. (2005): Manzanas, bloques y casas. Formas construidas y formas del suelo en la ciudad contemporánea (Universidad Politécnica de Valencia, Valencia).

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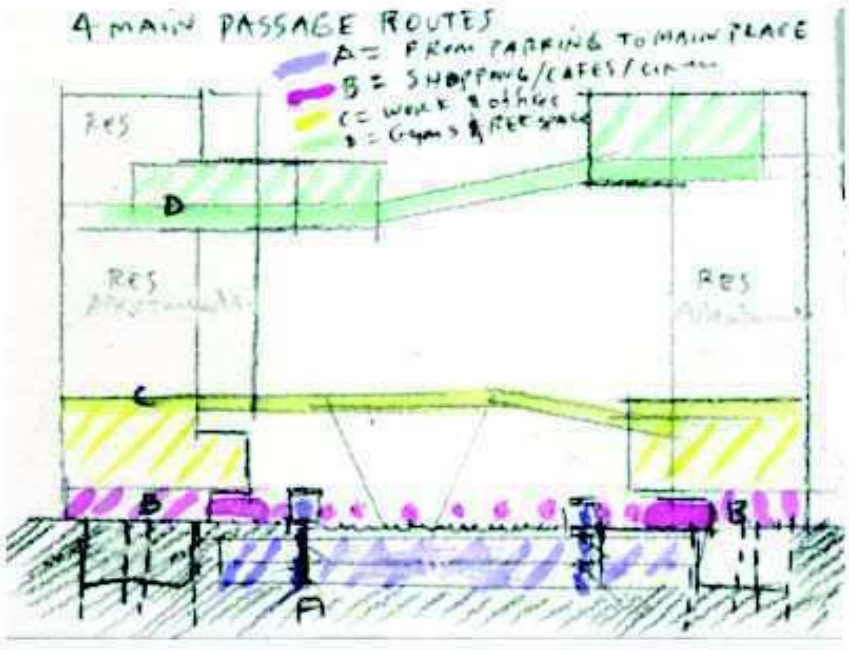

Figure 6.
Linked Hybrid block in Beijing (2003-09) by Steven Holl Architects. Sketch. From: http://www.stevenholl.com/projects/beijing-linked-hybrid

The hybrid block proposals that come from postmodernism look back at the traditional closed city block, which reappears in the designs of Rob and Leon Krier, Maurice Culot and the group of architects gathered around the magazine Archives d´Architecture Moderne.

From the 90's onwards, the discredit of postmodernism, together with a recovery of an urban design based in the open planning postulated by the modernist avant-gardes, will favor a renaissance of the mixed use building, within the framework of an attitude towards urbanism which we can call neo-modernist, an attitude which is no longer that of the urban planners of the modernist movement nor that of those who wanted to appear controversial with them in the 80s. Some relevant examples of it are the Linked Hybrid block (Beijing, 2003-09) by Steven Holl Architects and De Rotterdam building in Wilhelminapier (Rotterdam, 1997-2013) by Rem Koolhaas-OMA.

Conclusion

Parcellation is the procedure to subdivide the land in plots from the legal point of view. From the physical point of view, what interests us, however, is how this subdivision is expressed materially, how it is perceived visually and what it means in terms of urban form. In other words, what interests us when we approach the subject of the occupation of the land from the point of view of the urban form is how the floor plan is materially constructed.

In order to construct the floor plan in contemporary open-planning housing complexes, two procedures can be used. The first is to delimit clearly the properties with elements such as fences, hedges, enclosures, etc. The second procedure is associated with the use of the urban element we have called hybrid block. In short, this element consists on a base structure for non-residential uses, that works for urban purposes like the old compact

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city block, and isolated building volumes for residential uses emerging from that base, designed according to rational criteria of orientation, ventilation, sunshine and views.

The non-residential base is a podium that acts as a transition element between the housing volumes located on it and the surrounding streets. As a built-up link with ground level, the base is an element capable of responding to the demands of the urban context, the irregular geometries present in it and other conditions, such as property limits. This is possible for two reasons: on the one hand, by its autonomy with respect to the typology of the isolated volumes located on it, since the plan of the base does not need to match with the one of those volumes; on the other hand, by its non-residential destination, which makes it much more flexible than housing to absorb conditions derived from the context.

The hybrid block can configure an urban landscape made of closed blocks of small height on which volumes of all kinds emerge, creating a skyline varied and visually rich and stimulating, that changes according to the observer´s position, with portions of sky always looming between slabs and towers, very different from the monotony induced by the uniform cornice in the traditional closed city blocks.

The boundaries between the public and the private are also clearly defined in the hybrid block: the private surfaces of land are built on the ground floor, either in full or in its perimeter, leaving private free spaces in form of internal gardens or courtyards. The free open space between slabs, which was a problematic space in modern urbanism when the footprint of the slabs reached the ground, has disappeared on the ground floor in the hybrid block, and exists only above the built-up base, as a platform linked to the slabs. This platform separated from the street is a private space, a new artificial floor which can be designed as a communal landscaped space (a green roof).

The footprint of the hybrid block, thus, is identical to the one of the traditional closed city block, so the streets can continue to play its structuring role as main elements of the public space. Examples of it are Hans Kollhof's proposal for Alexanderplatz in Berlin (1993), which is a reinterpretation of the Rockefeller Center model, and also the anonymous block composed by a pair of slabs over a commercial plinth, common on the periphery of many European cities.

The hybrid block, though recovering the modernist urban tradition, is not linked to the functionalist schematics, but incorporate instead the will to create an adequate urban form thorough a creative synthesis between project of buildings and project of spaces.

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Social risk map. The design of a complementary methodology to vulnerability indexes applied to urban regeneration activity

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Abstract. *Conception of urban intervention in the city is increasingly mutating from a physical urban renewal to an integrated urban approach. That is to say, measures concerning physical urban renewal should be combined with measures promoting education, economic development, social inclusion and environmental protection (European Commission, 2014). Current methodologies applied to the analysis of potential distressed areas are based on quantitative variables. The combination of these variables into a matrix characterizes the areas of the city that are subjected to different grades of intervention in terms of urban vulnerability and social exclusion. However, literature demonstrates that there are still few tools capable of measuring spatially which areas are the most sensitive to the decline in social relations within the city. Research on social maps suggests that potential attractors and risk areas can be identified from the design of a methodology based on the social perception of the public space. The application of this methodology to different case studies at the neighborhood level shows the correlation between urban vulnerability approach (quantitative) and social perception (qualitative). Indeed, perception and characterization of social risk areas empowers current urban vulnerability indicators for the integrated urban approach. Findings validate the utility of this methodology for the implementation of this model to cities and illustrate the social sphere of analysis as a platform from which to assess risk in urbanized areas.*

Keywords: Urban degradation, social exclusion, qualitative methods.

Introduction

The quantity, quality and location of new housing in the city concerns affordability, urbanity and social equity. Principles for regulating urban redevelopment and regeneration that enable more housing construction are necessary. Current methodologies that guide this activity often are based on socio-demographic, economic, residential characteristics and environmental features. The combination of these variables into a matrix characterizes the areas of the city that are subjected to different grades of intervention in terms of urban vulnerability and social exclusion. However, the experience in planning practice gives little empirical evidence about where, how and why redevelopments occur, and the odds that a given residential area is renewed and regenerated are not always directly correlated to the highest levels of vulnerability or social exclusion that these methodologies attempt to identify.

From 70s onwards, it is argued that studies focused on the social indicators approach. To expand on their efforts, they needed to understand the social structure and residential function within the city 'from a more systematic rather than common sense point of view' (De Miguel, Díez y Medina, 1976). This work constitutes first sociological analysis references applied to planning experience in Spain. In this regard, the extant scholarship has examined whether this model might contribute enhancement of urban vulnerability analysis

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methodologies. Studies has demonstrated understanding of vulnerability and social exclusion operative notion from those matrix of indexes referred gives emphasis to poverty, inequality, scarcity items and the tendency from which they have been passed down through the family unit.

Urban policies and measures for the distressed urban areas enhancement address a strategic change two decades later. The European context fosters and funds a specific line of action in which vulnerability notion is reviewed (Alguacil, 2006). In this regard, this is a critical shift, as the interest relies on setting the spatial limits of not only declining economic development areas, but social inclusion and environmental protection as well (OCDE, 1998; European Commission, 2014). Dwelling size, consumption rate are not ignored but reinforced by other urban scale variables: open space areas, environmental landscape, road networks, accessibility and proximity to complementary uses to the residential ones. Further, studies focus on the definition and measurement of different grades of intervention in order to provide an urban area gradation for their effective urban regeneration. Some of this contemporary research on the urban area gradation intends priority areas to be targeted analysis model by underlying physical, social, economic and political factors (The Ministry of Public Works and Transport, 1990; Hernández Aja et al., 2013). An enhancement and review of this methodological approach is documented with regard to the analysis of specific urban regeneration neighborhoods (Bruquetas, M., Moreno, F-J., Walliser, A., 2005). In any case, main action does not delve into the family unit but the urban scale.

In this context, criteria for the declining areas become the key point from which urban policies are designed and the reference that enables planning practice in terms of urban regeneration activity (Atkinson, Cantillon, Marlier and Nolan, 2002). However, more research is needed to determine how these criteria interact to shape the dynamics of urban intervention in terms of urban vulnerability and social exclusion. A better and updated knowledge in terms of methodological tools and procedures from where to design urban regeneration programs (from a physical urban renewal to an integrated urban approach) becomes a contribution to achieve useful policy goals of integrating distressed urban areas.

Álvarez-Mora and Roch (2010) find that evidences for the implementation of urban regeneration actions refer not only to the physical degradation of dwellings and buildings or new public space and facilities, but to the increase of social inequalities and resources, such as poverty, low educational level, social exclusion or economically distressed communities. They point out that these approach demands long-term actions for the effectiveness of the integral urban regeneration. Temes (2014) argues that social exclusion notion requires a methodology based on a statistical multivariable analysis in order to determine a more effective and efficient set of synthetic indicators in terms of integral vulnerability. Ruiz and Alfaro (2017) have documented that the adaptability degree of the variables that characterize integral vulnerability is important issue that should take its place in methodologies on integrating distressed urban areas selection and policy analysis. The authors find evidences that some other complementary tool oriented towards their enhancement in a long-term perspective is required when distressed urban areas that do not correspond to the ones in which the adaptability degree is highest. That is to say, the study provides information on whether urban regeneration activity should include some other complementary actions to the physical degradation of dwellings and buildings or new public space and facilities.

However, little research has directly studied integral vulnerability from a social sphere of analysis. Yet, research on social perception as a qualitative approach is scant. At the beginning of the decade work provides some support for the construction of social exclusion measurement tools from a social work perspective (Raya, 2010). Connections are establishes between shaping social support networks in a discontinuous urban spaces (Muster and Murie, 2004) and the role of neogeography and digital divide (Haklay, 2013; Rana y Joliveau, 2009). A better understanding of the influence of social relations within the

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city is important because it would add to our knowledge of the underlying mechanisms that social exclusion distributes unevenly across urban space.

Research on social spheres highlights the importance of social support networks (family unit, neighbors or ethnic minorities) as a priority resource in dealing with processes of social exclusion. Because it especially influences social welfare and employment opportunities, the attention to them cannot be ignored. Decrease of family unit, individualization and reduction of mutual dependence in daily life can contribute to the weakening of these social support networks.

In this article we focus on the need to characterize and measure these social support networks from an operative and the field observation perspective in which they take place. Cartography turns into a proper tool in order to evaluate and measure the strength of social support networks so as to conclude potential risk that will affect anyone in a specific urban context. We investigate this question through a qualitative analysis of how social support networks that were identified from a social perception point of view operate in Zaragoza area. Consistent with previous research (Cámara, León and Ruiz, 2016) we find a positive relationship between urban vulnerability approach (quantitative) and social perception (qualitative). Indeed, perception and characterization of social risk areas empowers current urban vulnerability indicators for the integrated urban approach.

Research on social maps

A georeferencing analysis raises thematic information from field work the possibility to identify how these social support networks shape. Social Risk maps and Geographic Information Systems (GIS) turn into an essential tool to visualize social life in a built urban environment. Initially, some experiences that introduce social map notion refer to the implementation of quantitative multivariate analysis in the socio-territorial study of local cases (Torres, 1993). Recently, this social map

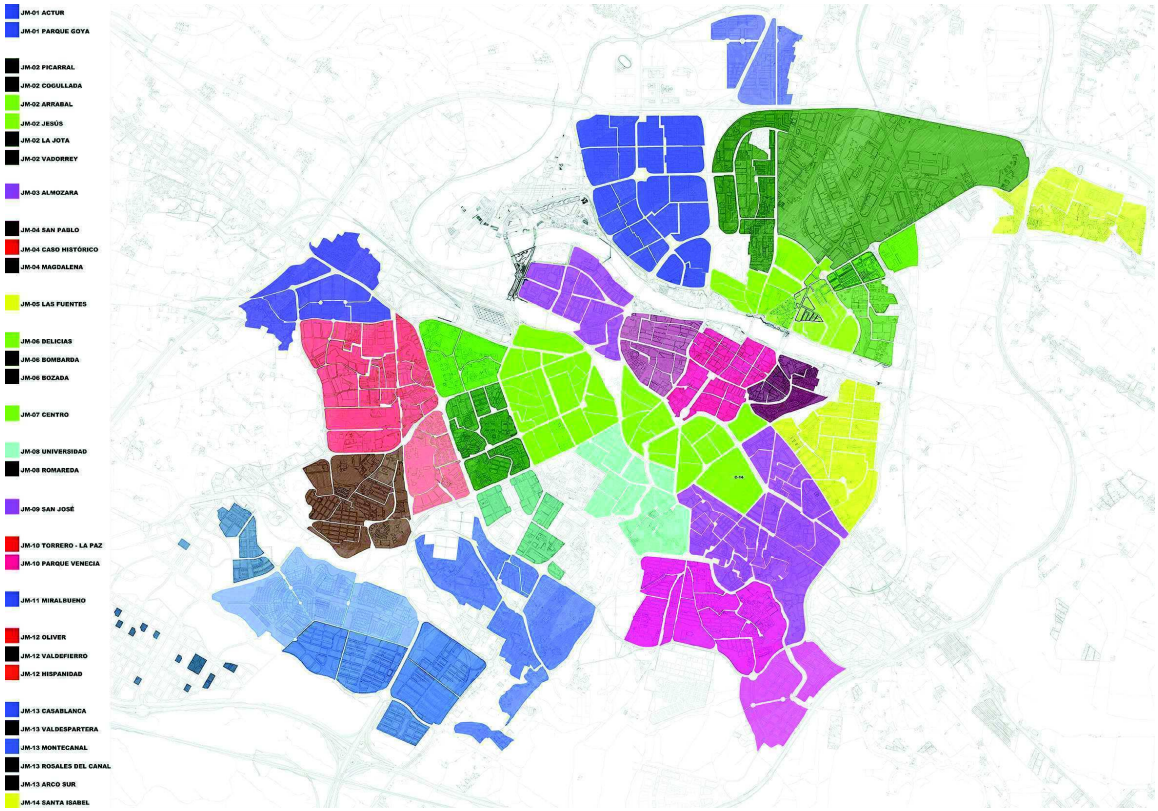

Figure 1.
Neighborhoods and districts in Zaragoza.

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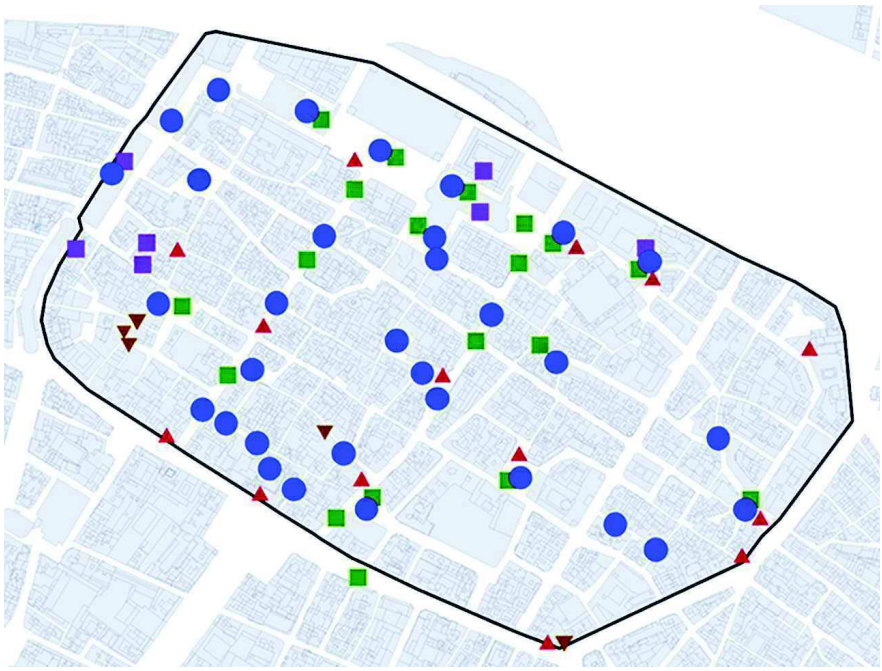

Figure 2.
Social Perception map from Historical Core neighborhood in Zaragoza.

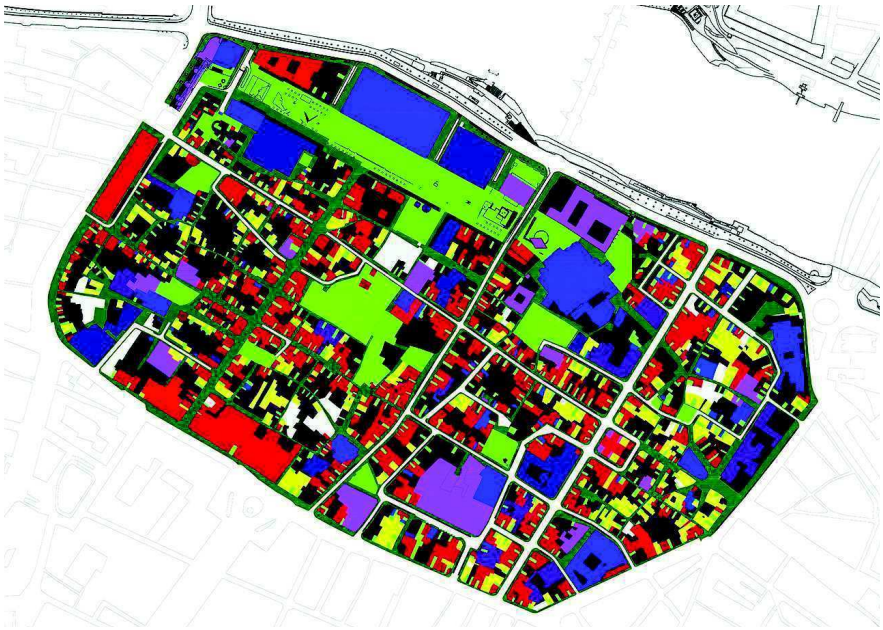

Figure 3.
Urban morphology map from Historical Core neighborhood in Zaragoza.

approach has been specifically intensified through the study of how urban areas interact in terms of unprecedented volumes of data (Goodchild, 2016). In this article we investigate the correlation between demographic, socio-economic and residential quantitative approach and social perception qualitative one. Indeed, perception and characterization of social risk areas empowers current urban vulnerability indicators for the integrated urban approach.

Neighborhood social perception

The methodology takes into account primary units of analysis. In this regard, it is not considered the administrative divisions (district, postal code, census tract) in which public databases are organized but the neighborhood unit. It is at this level where subjective identity hegemonic formations take place, where spatial belonging sense arises.

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Additionally, it is at the neighborhood level where, from a social perspective, common daily relations draw minimum spatial unit from where to achieve self-sufficient necessities. This autonomy, in terms of social reproduction, is not only recognized as the required non-specialized daily goods and services, but as the social networks that underlie in daily life as well. Indeed, lack of services and retail markets and shops in a specific urban area makes people expand their social network to a different area where these services and retail activity take place, so that these items turn into urban attractors for a wider social support network.

We study the city of Zaragoza for the application of social perception approach. The city is divided in 32 neighborhoods, officially corresponding to the 14 districts referred in Figure 1. 1.922 samples were collected corresponding to all studied neighborhoods from June 2013 to November 2016.

Measurement and analysis: data and methods

Social risk impact and measurement is undertaken from a qualitative perception focusing on results not only from a statistical point of view, but also on why situations take place and what are the social consequences of those situations. The study develops two lines of research in order to get this aim.

On the one hand, we design a report of how public space works in each of the neighborhoods. Data is constructed from an observation script together with structured interviews to key informants (García-Bueno, 2017). This sample is designed on maps (Figure 2) in a way that can be compared spatially to visibility, ground floor activities and uses in the city (Figure 3). Main content to be analyzed in order to characterize social support network and social risk at the neighborhood level refers to four categories: urban attractors, spontaneous or institutionalized neighborhoods activities, social conflicts and non-accessible or physically damaged urban areas.

-Urban attractors are understood as specific urban environment areas that usually work – either continuous or temporarily– as meeting places and enhance social interaction. However, these urban attractors do not always denote a positive effect to daily social networks; they also can generate a negative impact. It is considered negative when they match with social risk areas, that is to say, when people presence in those areas is perceived as a threat to the others (marginal, illegal or scandalous behavior). Likewise, lack of urban attractors in a neighborhood may mean inexistence of social networks and, as a consequence, a potential social risk factor.

-The study of neighborhoods activities allow us to distinguish those organized by neighbors themselves (spontaneous) through autonomous organizations from those organized by public administration (institutionalized). In any case, these activities focus on public space itself, that is to say, they constitute the social production of that referred space at the neighborhood level.

-Detection of social conflicts allows us to understand insecurity perceptions from those who inhabit the neighborhood or from those who interacts with people from that neighborhood. Real insecurity effects caused by either real or perceived social risks turns an area into a stigmatized place and makes it negative in terms of social networks and daily life activity.

-Criteria from where to identify non-accessible or physically damaged urban areas correspond to those areas in which urban continuity is not guarantee, there is a lack of visibility, or where derelict buildings, abandoned areas, urban voids and vacant plots locate.

On the other hand, given the performative character of social network strengthening, this first line of research is complemented with the design of a synthetic index so as to evaluate the subjective perception of inhabitants. This index is defined as Subjective Potential Urban Self-Regeneration Index (SPUR). It refers the strength of social support network, the urban appropriation of space by the neighbors and the capacity to prevent social exclusion.

One innovative feature provided by this index delves into the idea that public space is not an indifferent to reality, homogeneous and geometric mass in which excluded communities

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should be integrated, but a socially produced space by these communities (Lefebvre, 1974; Logan and Molothc, 2007). As a result, it is social networks that shape public space the ones in which existence or lack of social exclusion notion should be investigated. SPUR index does not focus on public space as a physical item. It underlines social networks ─within the neighborhood and the entirely city─ capable of providing a certain degree of self-sufficiency for the daily life social reproduction.

Database is obtained from field work where inhabitants' daily habits have been analyzed. The design of the survey comprises 36 questions grouped in different thematic areas. The unit of analysis for the survey is the neighborhood level. Taken into account that there are no population statistics at the neighborhood level (only at the census tract and district levels), the study refers the district level as the reference that guarantees the size of samples of finite population to be made for each of the neighborhoods (Cámara, León and Ruiz, 2016).

Yet, to measure social production of space, we build three partial indexes. These indexes are constructed from a response to different items that ask about the grade of public space appropriation, the grade of social self-sufficiency and the grade of social services satisfaction (Figure 4). The sum of these three indexes is used to determine whether

Partial index	Thematic area	Variable
Public Space Appropriation Index (PSAI)	Neighborhood	Identification degree with the neighborhood
		Lives in the neighborhood
		Works in the neighborhood
	Oopen space	Parks, quantity and quality
		Squares, quantity and quality
		Real / Ideal public space property
	Culture	Inhabitants chance to propose activities
		Public administration chance to propose activities
		Possibility to carry out activities in an enabled / any public space
	Security	Day / night security perception
	Other neighborhoods	Willingness to move to another neighborhoods
Social Self-Sufficiency Index (SSI)	Consumption	Shopping frequency in the neighborhood
		Commercial retail quantity and quality
	Social relationships	Number of friends and acquaintances in the neighborhood
		Leisure frequency in the neighborhood
		Association belonging
		Location of associations
		Assessment of the cultural agenda
Social Services Satisfaction Index (SSSI)	Culture	Cultural centers quantity / quality
	Consumption	Number of shopping centers
	Health and assistance	Degree of primary care centers coverage
		Degree of elderly communities coverage
		Degree of child communities coverage
		Degree of immigrant communities coverage
		Degree of other unprotected communities coverage
	Transport	Degree of connection to the center in public transport / private vehicle / walking / bicycle
		Degree of connection with other neighborhoods frequented by public transport / private vehicle / walking / bicycle

Figure 4.
Variables required for the construction of SPUR index

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Figure 5.
Comparison between vulnerable –left- and no vulnerable –right- social perception map from different neighborhoods in Zaragoza.

the neighborhood is perceived as an area with a high Subjective Potential Urban Self-Regeneration or not.

Results and discussion

The comparison between declining areas according to National Observatory of Urban Vulnerability (quantitative approach) and the social risk areas that have been identified according to the methodology implemented in this project (Social Perception maps). Results give evidence that vulnerable neighborhoods do not correspond univocally with those in which more risk and social conflicts have been identified from a supportive social network point of view (Figure 5). Similarly, some of the neighborhoods in which there is a greater concentration of risk areas are not included in the

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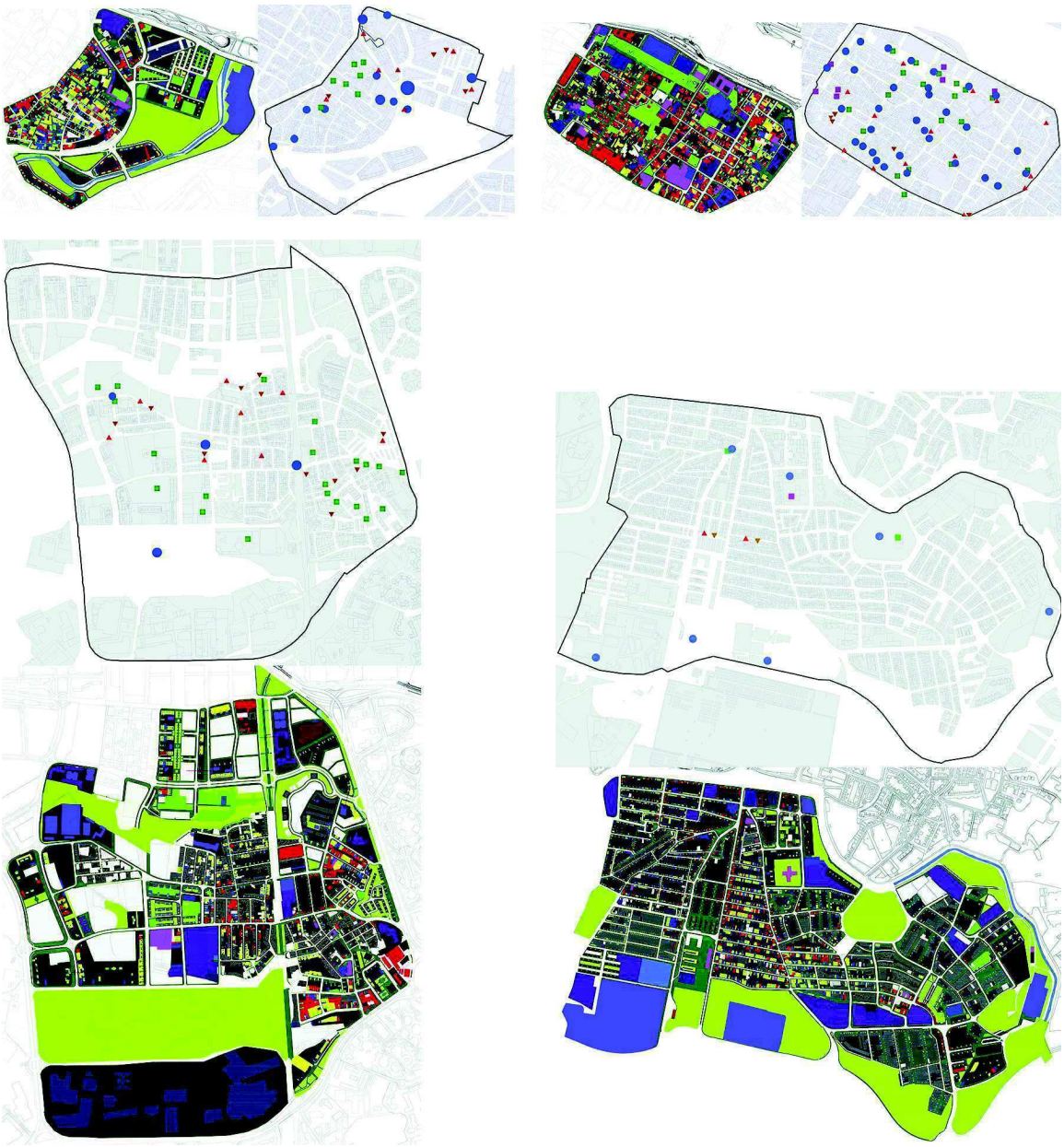

Figure 6.

Comparison between vulnerable –left- and no vulnerable –right- downtown –up- and peripheral –down- social perception and urban morphology maps from different neighborhoods in Zaragoza.

vulnerable neighborhoods catalogue provided by the National Observatory. Therefore, there is no direct correlation between social risk areas and the vulnerability status provided by the National Observatory. This result provides support for the perspective that demographic, socio-economic and residential statistics are not capable of explaining themselves potential urban self-regeneration of the public space in a neighborhood. Similarly, risk and social conflict areas prevent the creation and increase of supportive social networks. An increase of distance of urban attractors together with the fragmentation of the urban morphology, explain this fact. In other words, city does not provide socially neutral areas. If there is a no urban-attractor affected urban area, then, it will progressively turn into a risk and social conflict area.

Further, relationship between social risk areas and ground floor activities and uses in the city (commercial retail, facilities,

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open space, residential dwelling) provides evidence that urban attractors locate mainly in squares and facilities- pedestrian streets in downtown areas of vulnerable neighborhoods. However, no vulnerable neighborhoods provide a concentration of urban attractors basically in downtown commercial streets. Moreover, risk areas locate to a greater extent in residential dwellings ground floors in downtown areas of vulnerable neighborhoods. Concerning downtown areas of no vulnerable neighborhoods, risk areas locate barely in both vacant commercial retail and vacant plots.

This relationship between social risk areas and urban attractors remains the same with regard to vulnerable peripheral neighborhoods. Interestingly, it mutates with respect to peripheral no vulnerable neighborhoods. The interaction is depicted in Figure 6. Risk areas in peripheral no vulnerable neighborhoods locate in vacant plots and vacant commercial retail but they do not locate in residential dwellings ground floors. Meanwhile, urban attractors locate in a more homogeneous way, around open space, facilities and main commercial activity of the peripheral non vulnerable neighborhoods.

Conclusion

Based on the related research Social Risk Map applied to Zaragoza, at first sight, vulnerable neighborhoods do not show a decreasing trend of social support networks in comparison with no vulnerable neighborhoods. The scenario is more complex.

Vulnerable neighborhoods are not always where the social risk areas concentrate or where the more non-accessible or physically damaged urban areas locate. In fact, some of the neighborhoods that are not included in the vulnerable neighborhoods catalogue provided by the National Observatory of Urban Vulnerability demonstrate an intense social support network and active neighbors in terms of proposing activities. Besides, some vulnerable neighborhoods give evidence of a social support network as weak as the one from no vulnerable neighborhoods. This raises the possibility that relationship between social capital, social heterogeneity and urban vulnerability of social exclusion is not lineal nor direct. Social capital activation in a neighborhood is possible. However, social support networks requires a guaranteed accesibility to material resources through external to the community distributive mechanisms. This consideration appears to be subjected to the effectiveness of National Observatory of Urban Vulnerability analysis. Taken this into account, an alternative or complementary methodology applied to to the analysis of distressed areas may define new urban patterns. This patterns aim to identify complex relations between social capital, heterogeneity and urban vulnerability in the city. Social risk map methodology has been designed from a social perception point of view and has demonstrated to detect some specific positive patterns for the social network enhancement. Findings presented in this article have important implications for regulating urban redevelopment and regeneration. Social perception and relaciones vecinales de cotidianeidad are thought as a reliable basis for a later modeling of this activity.

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Comparison of urban form based on different city walls between Quanzhou and Newcastle upon Tyne

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Abstract. *Quanzhou in south-eastern China was built in the Sui Dynasty, having more than 1,000 years of history. Its urban development led to the triple walls in a different period of time. Its unique landscape of multiple walls is a one of the Chinese ancient city patterns. However, the massive stone-built city wall pattern like Newcastle also has more than 1000, years of history in western cities .City walls maintain the preeminence as the city's most powerful fixation line. The expansion of the wall in Quanzhou shows how the time-space changes, while Newcastle' s fringe belt is relatively stable, which forms a different urban form. This article mainly compares the following aspects: (1) The development of Quanzhou fringe belt; (2) Differences of fringe belts between the multiple walls city and the sole wall city; (3) Differences of land use in intramural zone between two cities. This paper analyzes the differences of fringe belts caused by city walls between Quanzhou, (China) and Newcastle, (England), and their influence on the urban form between the East and the West.*

Keywords: Chinese ancient city, multiple walls, fixation line, fringe belt, intramural.

Introduction

With the rapid changes of urban landscapes in most parts of the world, more attentions have been paid on urban morphology over the past two to three decades (Whitehand,2016). The concept of the urban fringe belt is 'arguably the most important single contribution to urban morphology' (Whitehand, 1987). Over the past few decades, the fringe-belt concept has been formed and widely used in the research of Western urban morphology, and it attracts more researchers to focus on the application of the fringe-belt concept in non-Western world. Some of the urban morpho-logical methods in European countries have been used to the exploration of Chinese cities (Whitehand and Gu, 2007a), such as the research of the ancient city of Pingyao. Since then, there has been an increasing attention to the cooperation between traditional urban form in China and Europe (Conzen,2012). J.W.R. Whitehand, Michael P. Conzen and Gukai chose Pingyao China with Com, Italian for comparison. Both of cities possess well-preserved historical urban environments that reflect the urban development traditions of their respective cultures (Conzen,2012). The comparative study is an important breakthrough in the application of Conzenian theory in China and it also make a bridge on the understanding of the dynamics of urban landscapes in different world regions.

This study, which compares fringe-belt development in China and Europe, attempts to provide explanations of the relationship between urban landscapes and city walls. Newcastle upon Tyne with a long history, is a typical city with a single city wall, and the wall has no obvious expansion. Quanzhou is the representative of traditional Chinese cities with multiple city walls. Although the multi-walls are not completely coexisting state, the moats outside the walls have been retained. The main content of this comparative study is the intramural parts of fringe belts, and the key points focus on the different urban landscapes

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under the influence of the single fixation line in Newcastle and multiple fixation lines in Quanzhou.

The continuous histories over one thousand years of the two cities provide a useful context for studying the evolution of the fringe belt from a historico-geographical perspective. Many important questions arise in this context: How did the city wall, as a fixation line, influence on urban landscapes? What are the similarities and differences in the fringe belts formed by multiple fixation lines and single fixation line? Which features of fixation lines have persistent effects on cities today whether in China or the West? According to Conzen's theory, this study analyzes the fringe belt of Quanzhou and Newcastle upon Tyne, and discusses the related questions.

Historical geography of Quanzhou and Newcastle Upon Tyne

Quanzhou

Quanzhou is located in the southeastern part of China, in plain, closed to Jinjiang River with an outlet to the sea (Fig.1). Despite some previous forms of human occupation developed since the Neolithic Age, the history of Quanzhou as a town began in AD 718.

With the development of Song Dynasty and Yuan Dynasty, Quanzhou as a port city gradually ushered in a prosperous period. Marco Polo who visited Quanzhou in its heyday proclaimed it to be one of the greatest ports in the world. However, its importance waned as succeeding dynasties discouraged and then prohibited maritime trade in Qing Dynasty. An open "bright city" gradually transformed into a closed siege because of the need to adapt to coastal defense.

Quanzhou's economy is facing recession in the Qing Dynasty. Urban construction is no longer expanding. The existing Quanzhou ancient city zone basically maintains the shape of the Ming and Qing Dynasties. Quanzhou city walls have been modified for many times since ancient times. The impact to the city construction was obvious by using the three walls of the city structure in the Tang, Song, Ming and Qing Dynasties. Quanzhou is listed as the historical and cultural city of China, although experienced the demolition of the city and the new China after the establishment of the great development, the overall structure of the ancient city is still clear.

Newcastle Upon Tyne

Newcastle upon Tyne has a long and proud history, documented since Roman times. It is the regional capital and the largest economic hub on the northeastern coast of England(Fig.1).

Behind the protection of these fortifications, Newcastle developed as a merchant and trading community. The most significant commodity in the medieval period was wool, and then the coal trade dominated the market after the 14th century. Newcastle played a major role during the 19th-century Industrial Revolution. Heavy industries in Newcastle declined in the second half of the 20th century. Traditional forms of employment have largely been replaced by more retail and service industries.

Newcastle's traditional urban plan shows the salient features of the European medieval town, and it has been almost completely preserved to the mid-eighteenth century. The city center was largely rebuilt in the 1830's led by the Town Clerk and architects. The town walls had last been used defensively in 1745 and parts were demolished from the 1760's. The changes in its plan caused by the industrial revolution became transformative rather than additive. This left some traditional features as inherited outlines acting as a morphological frame for subsequent alterations but obliterated others(Conzen,1981).

The fringe belts of Quanzhou

The difference between geography and urban planning in China and Europe is enormous. Most cities in Europe have a lot of information on the history of urban material development, while the planning and mapping of Chinese cities is very limited. The city planning for Newcastle dates back to the 1820s, and the city's historical geography maps from the mid-19th century are particularly detailed, showing

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Table I.
Basic information of city walls

	Founded	Period (Built the Wall)		Circumference	Area (within the wall)
Newcastle upon Tyne	1080AD	13-14th century		3.41km	0.62km²
Quanzhou	700AD	Inner	9thcentury	3.63km	0.82km²
		Middle	13thcentury	8.85km	4.07km²
		Outer	14thcentury	10.83km	5.55km²

the development of the entire city's core plots and buildings. In contrast, for Quanzhou, the ancient city planning records are mainly local chorography, which describes the record and intention of the main map without accuracy. Due to urban renewal and planning development, two more detailed maps of the core of Quanzhou city were drawn in 1922(Fig.3) and 1983(Fig.4), which could be used to carry out relevant urban morphological studies and to create important cross-cultural morphological comparisons between the East and the West research basis.

Table I illustrates that the walled area in Newcastle and the area within the inner wall of Quanzhou are similar in size, providing a basis for comparison. However, due to the presence of the middle wall and outer wall of Quanzhou, the effects of them on the inner fringe belt cannot be ignored when doing comparison.

During more than 1200 years, the ancient city walls continued to expand and change. From the beginning of the 1920s, the outer wall was intermittently demolished, and it had completely disappeared on the ground to the late 1930s. One of the great features of the Chinese city walls is the coexistence of multiple walls, resulting in multiple fixation lines (Fig. 2. a, b, d). Although only the outer wall was left after 1353 (Fig. 2. f), the fringe-belt features formed by the early fixation lines were present. Some of them developed into roads, and a large number of moats were retained as water systems. Under the influence of multiple fixation lines, how the fringe belt exert influence on urban landscape is a new issue worthy of discussion and attention.

In this paper, three walls are chosen as the fixation lines, which have a profound impact on the urban landscape. Owing to the existence of triple fixation lines, the formation and development of fringe belt has its own unique characteristics. Multiple fixation lines formed their own fringe belts which closed to each other, unlike three fringe belts (Inner fringe belt, Middle fringe belt and Outer fringe belt) in Como. In the following analysis, the fringe belt formed by the inner wall (AD 718-977) as the fixation line is defined as the first fringe belt; the fringe belt formed by the middle wall (AD 906-1353) is defined as the second fringe belt; the fringe belt formed by the outer wall (AD 1658-1922AD) is defined as the third fringe belt.

First fringe belt. The inner wall was built in Tang Dynasty to strengthen fortifications and protect the ruling class and the core settlements. Like many traditional Chinese cities, the urban layout is based on the standard of the Kaogongji, which has a description of the ideal city. Government agencies are located on the north side of the city, with markets and residential areas on the south side. After thousands of years, the traditional city forms defined by city fortifications and gridded streets are still visible.

As can be seen from the map drew in 1922, there are obvious fringe-belt features in the north and southeast. In the map of 1983, the most obvious change is the construction of Zhongshan North Road to improve the accessibility and makes the real formation of the crossroads. The new road cut the area of the original government agencies in north, and divided the large block into several small plots. With the richness of public life, new facilities

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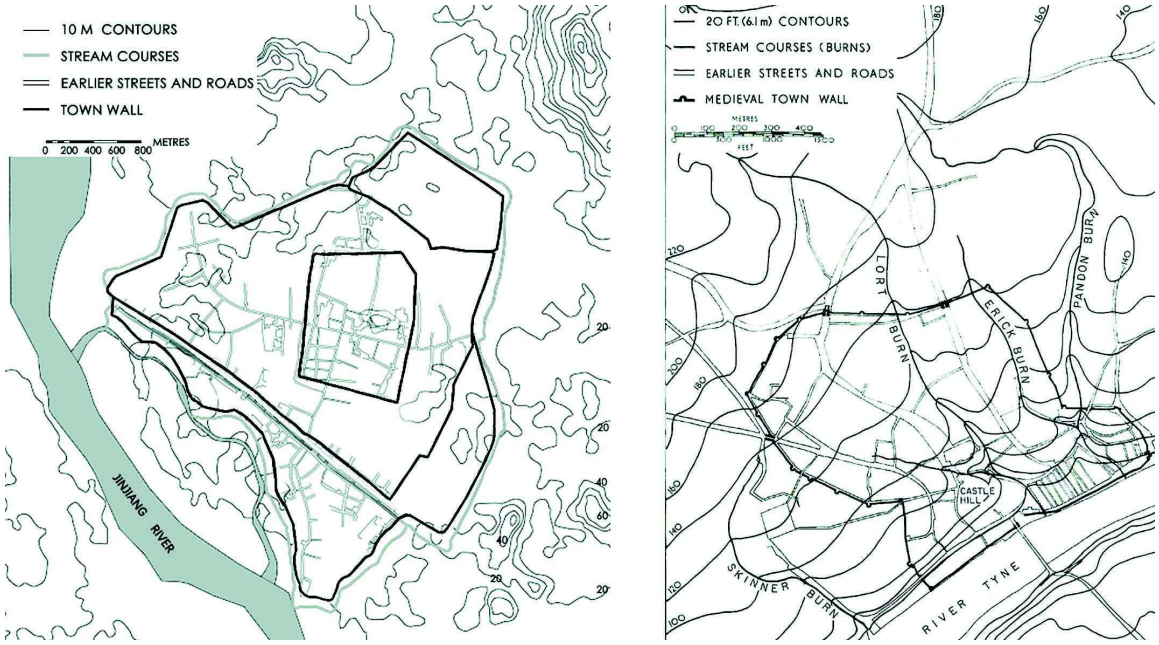

Figure 1.
The site of old town: Quanzhou (left), Newcastle (right) (Conzen,1962)

such as schools, parks and hospitals are become necessities.

Second fringe belt. The middle wall was built in Song Dynasty about five times the size of the inner walled area. Handicrafts and commercial prosperity with the increase in population makes the city to break through the original space and expand the walls. There are three main planning features: Firstly, taking into account the needs of defense, there is a certain space between inner wall and middle wall to avoid direct attack, especially in the north area. Secondly, in the southwest, a commercial street located outside the wall is the main economic activity area in Yuan and Song Dynasty. To meet the needs of maritime traffic foreign trade, the city opened three gates in southwest. Thirdly, the expansion of the city walls is related to military defense and economic development, and is also closely related to religion. In the turbulent era, the ruling group believed in Buddhism and donated a lot of fertile land to temples for peace and blessings. In order to protect the temples, some temples were surrounded by middle wall. The map of 1922 shows that the second fringe belt is mainly composed of low-density villages, cultivated land and temples.

With the continuous development of the city, the middle wall in southwest was removed in 1353 and converted into residential area, but the moat outside the wall retained. The area gradually developed from the extramural of the inner wall to the intramural of the middle wall, and became a deputy center with fringe-belt alienation. As the second important commercial street, Tumen street and Xinmen street combined with a traditional axis to become "丰" shape, which constitutes the framework of Quanzhou. The 1983 map shows that the southwest of the second fringe belt facing commercial redevelopment has ceased to be the actual town fringe, while other parts still maintain the features of the fringe belt.

Third fringe belt. The outer wall was built in Ming Dynasty, having a profound effect on modern cityscape. On the basis of middle wall, the direction of urban expanses to the south, north and east of the city. In the 12th century, the national political and economic center moved to the south, attaching great importance to overseas trade. Thus, a stone wall built along the river enclosed the business district, and protected the inhabitants and foreign businessmen. A few hundred years later, due to the relocation, a large number of coastal residents moved into the north of the city, and formed a low-density residential area. In the

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Figure 2.
The process of city wall evolution in Quanzhou

east, an important reason for the expansion is the gradual increase in the surface of the earth due to the movement of the crust. In the 15th century, the core of the city has been completely changed. The economy declined, while military defense has occupied an important place. Thus, a large area of open space for military practice was added in the south of the third fringe belt.
In the 1922 map, it can be seen that in the northwest, the third fringe belt is consistent with the second fringe belt. While the northern and eastern parts of the third fringe belt are in a sparsely populated state, essentially connected to the intramural of the second fringe belt. Only in the southern area, there is a clear feature of the third fringe belt separated from the second one. In the 1983 map, the fringe belt features in north are noticeable while other parts have been very mottled.

Comparison and interpretation

The differences between single and multiple fixation lines to urban development

The development of fringe belt formed by single fixation line is limited to a relatively narrow area, while the extramural development is more dynamic and coarse-grained, attracting more land use. In Newcastle, due to the development of CBD, the invasion of the wall brings the extramural in closer contact with the CBD. The fringe belt, ultimately, comprises part of the CBD Frame. The effect of fixation lines on the fringe belt is greatly reduced.

The early development of Quanzhou is driven by the expansion of the wall, resulting in that the area inside the wall covers all the functions of the city. Quanzhou's triple fixation

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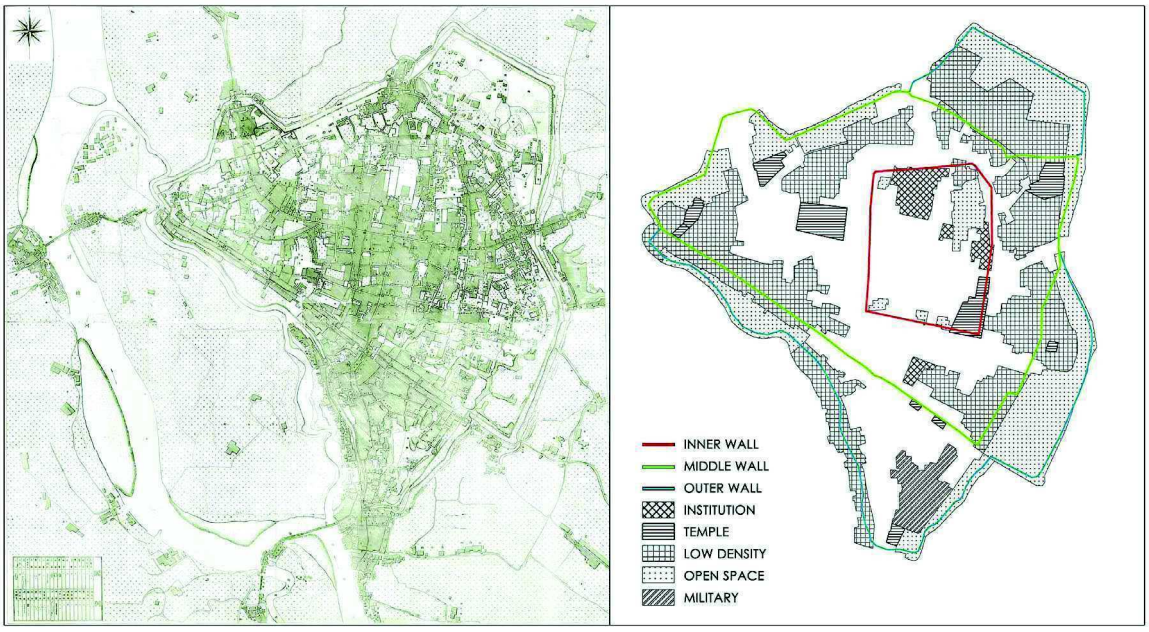

Figure 3.
Quanzhou in 1922.

lines have affected the development of the city. Once the extramural of the inner wall became the intramural of the middle wall, and once the extramural of the middle wall became the intramural of the outer wall. This phenomenon led to the fringe-belt growth inside the outer wall proceeded more piecemeal. Because of the existence of multiple walls, city development of Quanzhou is more compact.

The land use of fringe belt in earlier times

Originally, Quanzhou was built for political purposes, and Newcastle was for military reasons(Fig.5). Quanzhou city wall is almost completed at the same time with the city, reflecting a top-down city planning ideas. In earlier times, the fringe belt of Quanzhou was made up of government agencies, religious sites and open space. Because it is an important political and religious center.

In Newcastle, institutions tended to be among the most space-using land uses. Except in the harbor area□the intramural had rather large plots containing prominent buildings, such as the 'New House' and 'The Nuns' in the north. Two cities shared some similarities in the land use of fringe belt in the early days.

The changes of fringe belt in modern times

Since the 1950s, the consolidation of the inner fringe belt has shown a greater proportion in Newcastle. All of these represent a new stage in which functional segregation and marginal zone growth are no longer spontaneous, but within the more favorable framework of modern urban planning control. Quanzhou is also the case, listed as "historical and cultural city" in 1986, when the protection of urban landscape increased. The government repaired a group of old buildings and also moved a large number of factories out of the old city. And in the outer wall of the northern, the government planted 12 meters wide green belt to protect and strengthen the existing green area.

It can be seen that the development of early cities is greatly influenced by the fringe belt, while the planning of the city since modern times leads to the changes of fringe belt.

Conclusion

The multiple fringe belts formed by multiple fixation lines are worthy of study in the definition of fringe belt. The fringe belt

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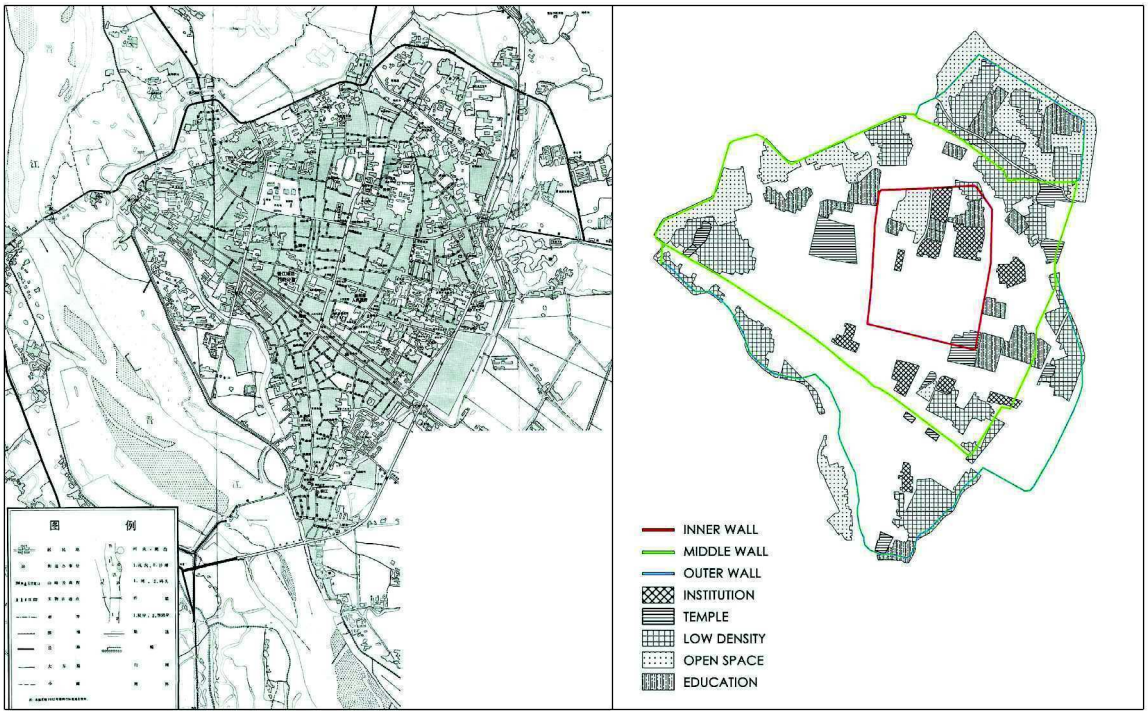

Figure 4.
Quanzhou in 1983.

separates residential growth areas of different historical periods (Whitehand, 2001). The walls fixation lines define the extent of the residential area to some extent, even for a classification of the inhabitants. The fixation lines of ancient China are the product of urban expansion, and the appearance of fixation lines often occurred. It is a new fringe belt model compared with Conzen's theory. Some cities in Europe also have appeared fixation lines, but basically, a new fixation line was constructed after the old one demolished gradually. And it need a long time span to accomplish above-mentioned process. The influence between the new fringe belt and the old one is untight.

Comparing with the cultural backgrounds of the two countries, the reasons that led to the huge differences in fringe belts of the two cities were more closely related to the operation of the social policy and the market economy. The development of Newcastle CBD, which leaded to the transformation of the city, made the fringe belt be a part of the framework of developing CBD; City function of Quanzhou has not gravely changed. The fringe belts were full of residential areas, and meanwhile, a large number of public construction had landed.

Studying the planning and development of historical cities can help to analyze the shape and structure of urban landscape. A complete interpretation of the economic, political and social processes of urban development is a great significance to the planning and development of future cities.

Acknowledgement

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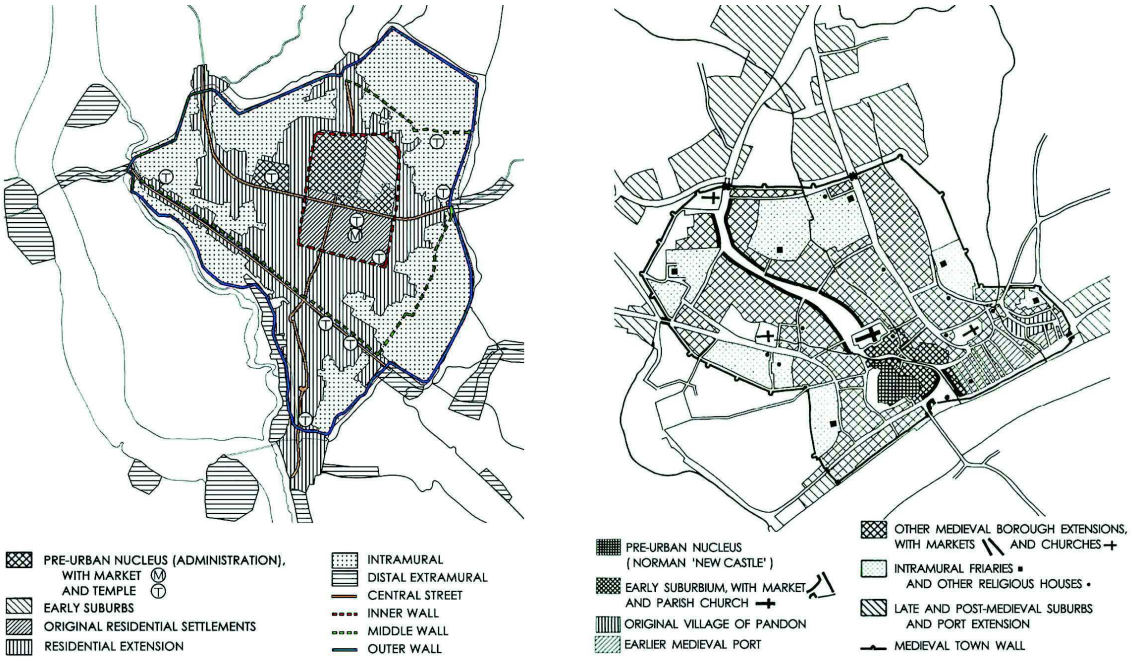

Figure 5.

The plan components of old city: Quanzhou (left), Newcastle (right) (Conzen,1962).

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Plot systems and property rights: morphological, juridical and economic aspects

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Abstract. *The importance of the plot (also referred to as 'parcel', 'lot' or 'property') as one of the fundamental elements of urban form is well recognized within the field of urban morphology. It has been described as a basic element in the pattern of land divisions that works as an organizational grid for urban form. A distinctive feature of the plot is its ambiguous character: it is at the same time a legal unit defining property rights, a spatially defined physical entity and an institutional tool designating land use in urban planning. In urban space, these dimensions act together to drive the evolution of built form. In this paper, we will investigate the entanglements of the morphological, juridical and economic definitions of the term. By resolving these we may better address and compare the vital layer of plot systems in different urban contexts and identify common fundamental aspects of the notion of plot systems and private properties. What we more specifically aim to capture with this comprehensive concept is the relation between urban form and legal and socio-economic space, where the plot can be identified as an element that creates a generic affordance for occupancy, in contrast to mobility, in cities of most kinds. The intended outcome of the paper is to contribute to unveiling the complex nature of the plot systems, bridging between spatial and non-spatial dimensions of cities, that is, more precisely, a potential to establish, not least, a stronger interface between the urban design and urban planning practices.*

Keywords: Plot systems, exclusive property rights, land ownership, spatial capacity, real estate development, urban design.

Introduction: the ambiguous character of the plot

The importance of the plot (also referred to as 'parcel', ´property or 'lot') has been widely recognized within the different schools of urban morphology as one of the basic organizing elements of urban form along with buildings and streets (Moudon, 1994; 1997; Whitehead, 2001). What makes the notion of 'plot' so distinctive, is its fundamentally ambiguous character: it is at the same time a legal unit defining property rights, a spatially defined physical entity and an institutional tool designating land use in urban planning (Kropf, 1997). The multi-layered character of the plot enables it to serve as a complex interface between architectural, economic and legal dimensions of urban space; an inherent complexity that calls for a multi-disciplinary approach that links urban design to many other aspects of urban planning. In this paper, we will discuss the concept of 'plot systems' in the fields of urban morphology, property law, regional economics and real estate development in order to bring together key aspects of plot systems, well formulated within each field but seldom referenced between each other. It is not the intention to give a detailed review of the concept within each field, but rather to identify

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key factors as a first step towards a more comprehensive conception of plot systems that may serve as a basis for a more informed urban design practice.

Within the community of urban designers there is an underestimation of the importance of the legal framework for urban design projects (Porta & Romice, 2010): rather than investigating the processes that produced certain kinds of traditional urban environments, today often highly valued, where the plot system often is instrumental, the attention is usually drawn to the physical products of such processes, that is, their built form (e.g. Akbar, 1988), which has led to misconceptions and planning failures (e.g. Marcus 2000). Scholars studying the legal dimensions of cities, on the other hand, tend to forget that 'properties' have essential spatial boundaries (Babie, 2013), most often designed by architects or planners.

When it comes to regional economics, where the strong link between the differentiation of property structures and the process of economic specialisation often is emphasised (Webster & Wai-Chung Lai, 2003), the problem of the materialisation of these mechanisms, that is, the translation of urban planning to urban design, is most often not addressed. Related to this are similar implementation deficits in the practice of real estate development, which involves issues of scale, flexibility and economic resilience, often based on subdivision strategies at different scales (Love & Crawford, 2011). It is important therefore to reflect on the possible consequences of each approach and stress the fact that the configuration of plot systems plays a critical role in the evolution of the built fabric as well as its flexibility over time.

Hence, the aim of the paper is, first, to contrast the conceptions and uses of the idea of plot systems in different fields and to outline a broader conception that would take into account various aspects of this notion. Secondly, to in particular discuss the importance of such a conception in the practices of urban design and real estate development.

The paper begins with an overview of the morphological aspects of plot systems, followed by the notion of the spatial dimension of private property rights in legal literature, the evolution of private property rights in relation to economic processes and the concept of the plot-based approach in real estate development. The paper ends with a discussion on the potential for a more substantial definition of plot systems after which its' potential power to inform more adaptive and performative urban design approaches will be outlined.

Morphological aspects of plot systems.

Within the different schools of urban morphology (Moudon, 1994; 1997; Whitehead, 2001; Porta & Romice, 2010) plots are recognized as basic elements of urban space, along with buildings and streets. Conzen (1960) discussed the fundamental ambiguity of the plot, being at the same time a physical and a legal entity as well as a demarcation for land use planning (Kropf, 1997). He further described the plot as the basic organisational element of urban form through its pattern of land division (Moudon, 1994). This relates to what Marcus (2000; 2010) described as the concept of 'spatial capacity', where the scale, size and configuration of plots within a plot system constitute particular affordances for diverse owner strategies that in turn may influence socio-economic diversity in cities.

Conzen further introduced the concept of 'burgage cycle': the evolution of built space over time, bound by the spatial and legal framework of the plot. This concept relates directly to the idea of adaptivity of built form over time (Moudon, 1994).

Siksna (1998) and Vialard (2012) in their studies of the modification process of plot and block patterns, discovered that there are certain block sizes that are more resilient to land use modifications over time than others. Smaller blocks within regular grids absorb changes better, but at the same time, there are still certain types of buildings and land uses they do not allow due to their particular shape and size. Large blocks are more flexible in this sense, but their fragmentation or amalgamation can have a negative effect on the street network, because the transformation of their complex shapes often results into the formation of dead-end streets, incisions and blocks within the block (Vialard, 2012). Siksna and Vialard

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mainly study block patterns, however, these observations may also be applied on the scale of plots. Vialard and Carpenter (2015) further studied the relation between plot morphology and building densities and pointed out, that larger plots of a more complex shape cause lower building densities (Vialard & Carpenter, 2015).

Also in the French school of typomorphology we find the plot recognized as a primary element of urban form, together with buildings and streets (Moudon, 1994). Importantly, Panerai et al. (2004) defined the urban block not as a separate architectural element, but as a group of interdependent building plots bounded by a street network and mentioned the importance of a dialectical relationship between the plot and the street network and the role that plot systems play in providing spatial and legal conditions for the evolution of built space over time. The definition of the urban block is thus not as a unit designed as such, but is merely something that emerged through the long process of densification of interrelated plots bounded by the street network.

Porta & Romice (2010) built on the concepts introduced by British and French typomorphologists, but extending it into a discussion about the pitfalls of contemporary urban design practice based on the New Urbanism movement, pointing out that plot-based urban design is a key tool contributing to the flexibility of the urban fabric over time.

There is one important addition to the aspects discussed above. We have referred to the plot as a unit of control, corresponding to the common division of urban space into public and private, where plots generally are spaces controlled by private interests, while surrounding spaces, constituting the street network, generally speaking, is a public interest. Instead of the legal division of urban space into public-private, Marcus (2000) proposes to use the concept of generic function as introduced by Hillier (1996) which divides urban space into, on the one hand, a continuous and publicly accessible space of streets and squares, on the urban scale mainly used for the generic function of movement of different kinds, and on the other hand, a discontinuous space constituted of blocks divided into plots that generally, but not always, are inaccessible to the public and primarily used for the generic function of long term occupation. The first duality, public-private, can then be explained by the latter, movement-occupation, due to the fact that all long-term occupation, such as housing and work places, need to be accessible, why the street system, almost by necessity, becomes a public interest (Marcus 2000).

The meaning of plot systems as the space of interaction between plots and buildings (the space for occupation) and the street network (the space of movement) is extensively addressed by Vialard (2012) in her study of plot and block frontages. She pointed out that

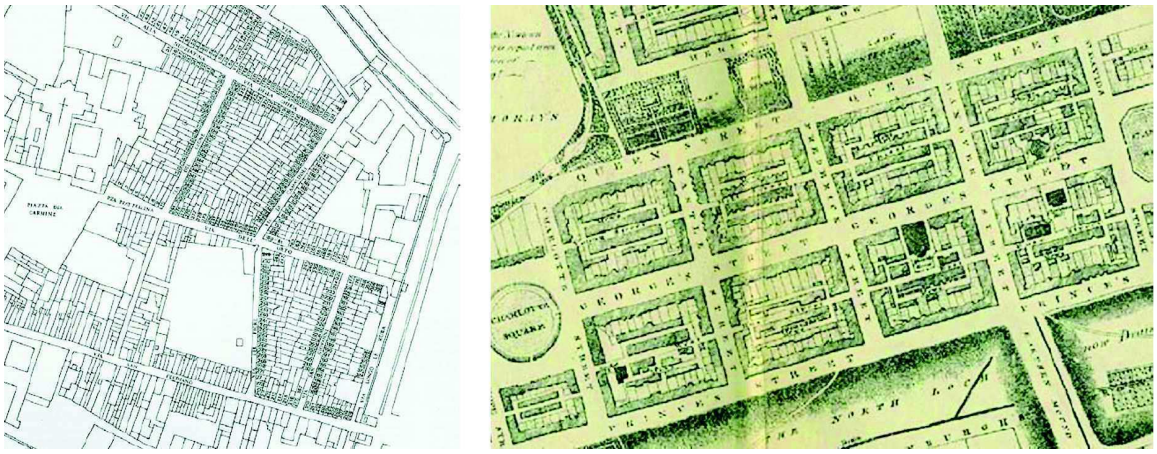

Figure 1.

Historical examples of plot-based urban development. On the left: The San Frediano estate, Florence, an urban development between mid-13th to mid-14th century (G.L.Maffei); on the right: Ainslie's map of Edinburgh, 1804 (D. Howell, G. Black). Source: Porta & Romice, 2010.

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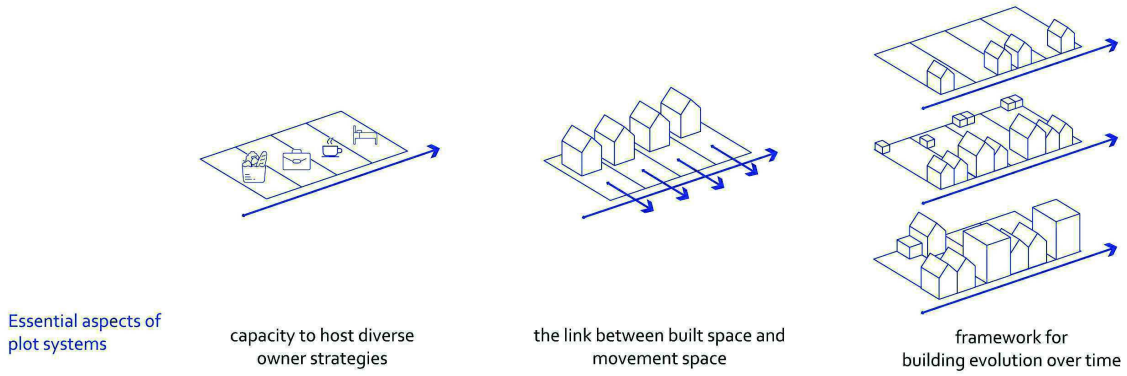

Figure 2.
Aspects of plot systems discussed within the field of urban morphology.

the property limit of the plot is influenced both by building and the street and works as the interface that links the global structure of cities (street network) to local design decisions (buildings within a plot) (Vialard, 2012)

Distinctive features of plot systems in urban morphology can be summarised as follows (Bobkova et al., 2017). First, as a basic unit of control, the plot provides a fundamental link between spatial and non-spatial entities (Marcus, 2000; Kropf, 1997). Second, the plot serves as a connection between built space and space of movement, because it binds a building to a movement network (Panerai et al., 2004; Vialard, 2012). Finally, the plot provides the framework for the evolution of built form over time (Conzen, 1960; Panerai et al., 2004; Terlouw, 1999; De Meulder, et al., 1999).

Other perspectives on the plot systems

Private property rights: the spatial dimension

In legal literature, there are two traditions existing that discuss the concept of private property. In the first, classical view, private property is defined as the bundle of rights that the owner has over the owned (Alchian & Demsetz, 1973). In the second tradition, the fundamental aspect of any private property is defined as the right to exclude. Legal geography scholars (Merill, 1998; Bromley, 1997, 2007; Babie, 2013; Braverman, et al., 2013), argue that the first definition of property leads to a 'formless' approach and becomes meaningless when divorced from spatial practices and representations. Within this view on the property as a 'bundle of rights', it is understood mainly as an "authoritatively established collection of use rights" that includes "the list that is currently recognised by law […] or by established practice and convention" (Merill & Smith, 2001, cited by Bromley, 2016): the concept of property becomes a label that has been granted to an owner, and ignores the aspect that the basic characteristic of property is the right to exclude others.

In the second tradition, the property right is understood as the right to exclude, it is implied that critical characteristic of property is not the relation between the owner and the owned, but the relation between the owner and other owners in reference to things owned (Bromley, 1997).

The critics of the view of property as a 'bundle of rights', are concerned that legal scholars tend to turn their attention away from the owned, away from the very materiality of property and focus instead on representation, culture and discourse (Bromley, 2007). Babie (2013) argues that rights exist, operate and are limited by physical and social space. The concept of property as the 'right of exclusion' is closely related to the concept of the boundary, where ownership is a process of dividing things and drawing borders between them in order to separate one property from the other. Hence the concept of property as the right to exclude is essentially spatial. According to Barthes (cited by Bromley,1997) "ownership depends on a certain dividing of things: to appropriate

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is to fragment the world, to divide it into finite objects subject to man in proportion to their very discontinuity; for we cannot separate without finally naming and classifying, and at that very moment, property is born". There is a range of studies based on this concept, about the geographies of property and the concept of property boundary, that focus mainly on empirical studies of particular conflicts, such as inner-city gentrification often grounded in a critique of distinctively liberal spatialities. (Braverman, et al., 2013; Bromley, 1997).

It is important to note that while legal geography scholars recognise the importance of the 'spatial turn' in legal thought and call for multi-disciplinary approaches that would engage social sciences, history or political sciences (Braverman, et al., 2013), far less attention is paid to architectural space itself, where physical boundaries of properties are drawn and materialised. There seems to be a neglect of the fact that land as property typically is subdivided into cadastral plots during urban development processes, and most often by planners or architects.

Evolution of property rights in relation to the economic process of knowledge specialisation

Webster and Lai (2003) draw further from legal geography studies and link the evolutionary process of exclusive property rights subdivision to the process of economic progress and knowledge specialisation (Webster & Wai-Chung Lai, 2003). While they do not directly discuss the spatial form and the configuration of properties, i.e. plot systems, it is implicit in their argument that changes in the pattern of economic activity and ownership also involve particular spatial changes. The subdivision process here is inextricably connected with the urbanisation process; urbanisation itself is a continuous process of property subdivision and differentiation.

Webster (2003) describes the urbanisation process as a process of knowledge specialisation, and points out how land plots with well-defined exclusive rights first developed in towns and were generally smaller and more regular in shape than rural land parcels. He further describes how both the size and shape of land parcels (i.e. exclusive property right) has evolved by aggregation and fragmentation both by voluntary exchange or by government design, in the effort to ease the process of buying and selling land, aiming for owners with the knowledge and inclination to use it in more productive ways (Webster & Wai-Chung Lai, 2003). He further introduces the idea of the subdivision and combination rules, where the reassignment of properties is due to a change in resource values and transaction costs, and leads in turn to either subdivision or amalgamation of properties.

Plot-based approach in real estate development: different perspectives

Even though plot-based land development is recognized by scholars as the one that can allow for flexibility in the evolution of built form over time (Porta & Romice, 2010; Terlouw, 1999; De Meulder, et al., 1999), stimulate higher user diversity (Marcus, 2000; 2010) and be a primary tool and driver in urban development (Love & Crawford, 2011), in urban practice the parcellation map is rarely seen as a vital part of master planning; rather most contemporary large-scale urban development projects typically follow the model of block-based development (Love & Crawford, 2011). Love and Crawford (2011) name several subdivision strategies for real estate development and provide arguments why plot-based development is preferable when it comes to long-term economic resilience, or generating a diversity of developers on the market.

Such subdivision strategies for real estate development are summarized as follows: district-based, block-based, street-based, plot-based and building-based (Love & Crawford, 2011). With district-based subdivision, the land is released as a parcel which here means the development unit) containing several blocks and usually managed by a single mega-developer. Block-based strategies are the most common pattern for contemporary large-scale development, and can be traced back to the New Urbanism tradition (Porta & Romice, 2010). In street-based strategies, a development plot consists of two half-blocks along a central

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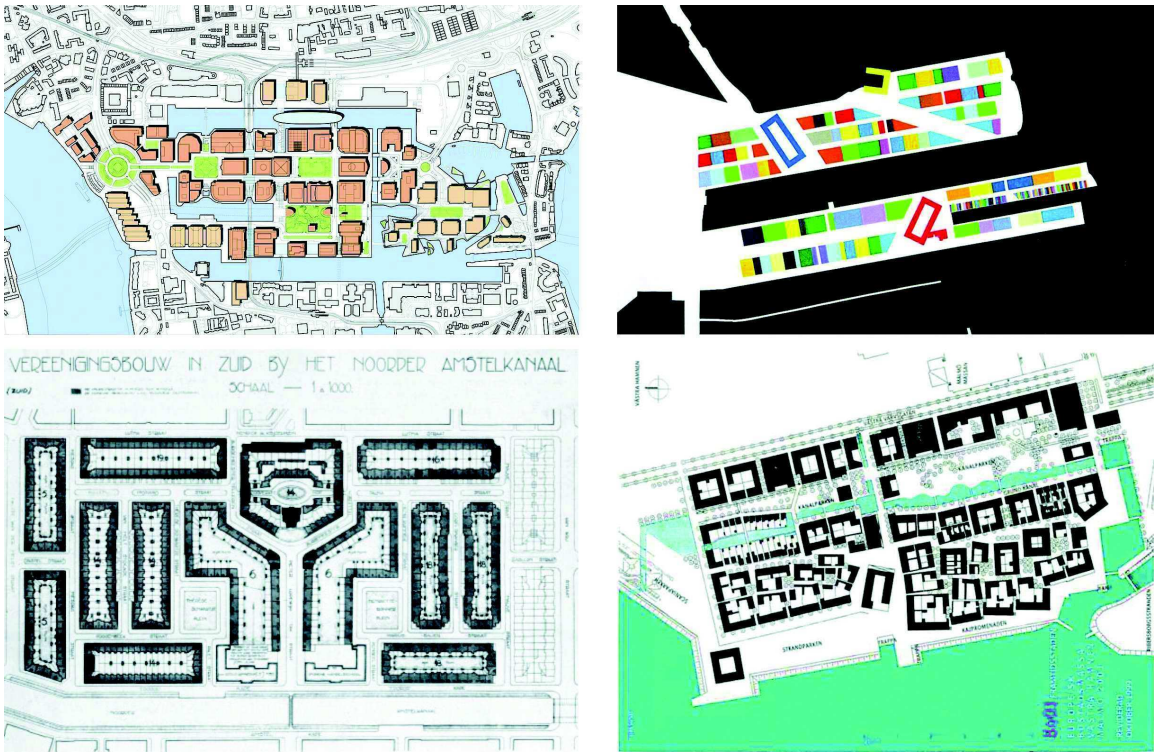

Figure 3.

Different subdivision strategies for real estate development. Counter clockwise: 1. Block-based, Canary Wharf masterplan, London, SOM (www.som.com), 2. Street-based, Amsterdam Zuid plan, Berlage (Panerai et al., 2004); 3. Plot-based, Borneo Sporenburg, Amsterdam, West 8 (www.archello.com), 4. Building-based, Malmo BO01 (www.northernarchitecture.us).

street. In plot-based strategies, a block is divided into several parcels, each of which can be released to a different sub-developer. In building-based subdivision models, cadastral plots are usually drawn following the design of an architectural configuration of buildings.

Hausleitner and Nycolaas (2012), elaborate further on this and introduce a more complex system of units that comprise urban blocks. These are physical units, which can be divided into design, construction and distribution units, and administrative units that consist of cadastral, ownership and maintenance units (Hausleitner & Nycolaas, 2012). The physical and administrative units together form an interdependent system, and can shape complex unit organisation, where, it is proposed, the physical units are easier to change when they coincide with the administrative units. They also refer to different development models described above, and point out that the size of administrative units tended to increase over time due to the upscaling of the development mode and demand for more space for different uses (Hausleitner & Nycolaas, 2012).

Developers often seek to maximise market flexibility by demanding large development units, few constraints on the programme mix, and loose design guidelines. Love and Crawford (2011) outline several drawbacks to this approach. The first is the scalar challenge. If an ideal large tenant (for example, biotech company or financial firm) is to be captured, then the development plan of one block will consist of one building in it. This is in turn likely to result in a monoculture of uses for each block, no matter how carefully the ground-floor mix might be designed. Also, a mix of microscale uses is difficult to design top down, because they usually emerge bottom-up in a self-organised manner when the appropriate legal and spatial framework is there. Another drawback of large-scale subdivision strategies is the lack of diversity of developers on the market. Only large-scale development company can participate in the realisation of

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such large-scale plans, and market competition is therefore limited which even economically is risky, because due to the unwieldy size of this kind of development, realisation of plans often takes more time than anticipated, or may even result in abandoned projects (Love & Crawford, 2011).

Plot-based development models, on the other hand, although allowing for higher economic resilience and more actors on the market, bring certain difficulties related to governance. A fine-grained subdivision model places more stress on the management process, where hundreds of owners or developers are filing for reviews and approvals. In the end, therefore, it may be easier for local authorities to support larger subdivision strategies (Love & Crawford, 2011).

Conclusion and discussion: forgotten aspects of plot systems.

The importance of the plot systems and the notion of exclusive property rights, is extensively discussed in the fields of urban morphology, property law, legal geography, urban economics and real estate development. But as earlier argued, these studies appear to exist in parallel, where usually one particular aspect of plot systems is emphasised, while other dimensions remain left out.

The power of plot systems to structure urban space and to potentially afford more agents in the process of urban development, has been recognised in urban morphology, but is still underestimated in the urban design practice that in recent times is dominated by the New Urbanism movement (Porta & Romice, 2010). However, this attitude is equally present throughout the era of modernistic planning. Legal scholars, in contrast, appear to overlook the essentially spatial character of private properties. Although it is addressed in a range of legal geography studies, the materialisation in architectural space of the notion of property boundary are not directly dealt with. When it comes to the economic dimension of urban space, a very strong link is drawn between the process of subdivision of properties and knowledge specialisation. This connects to the notion of spatial capacity where it is proposed that the configuration of plot systems affords more or less diverse owner strategies and, hence, also contributes to socio-economic diversity in cities.

Ambiguity is the very nature of the plot systems. It appears to be essential for the urban design perspective to 'connect the dots' from different theories in order to formulate a more comprehensive concept of 'plot systems', closely linked to 'property rights'. Plot systems work as a fundamental structuring element of urban space, and serve as a critical interface between its different layers that include architectural (urban design),

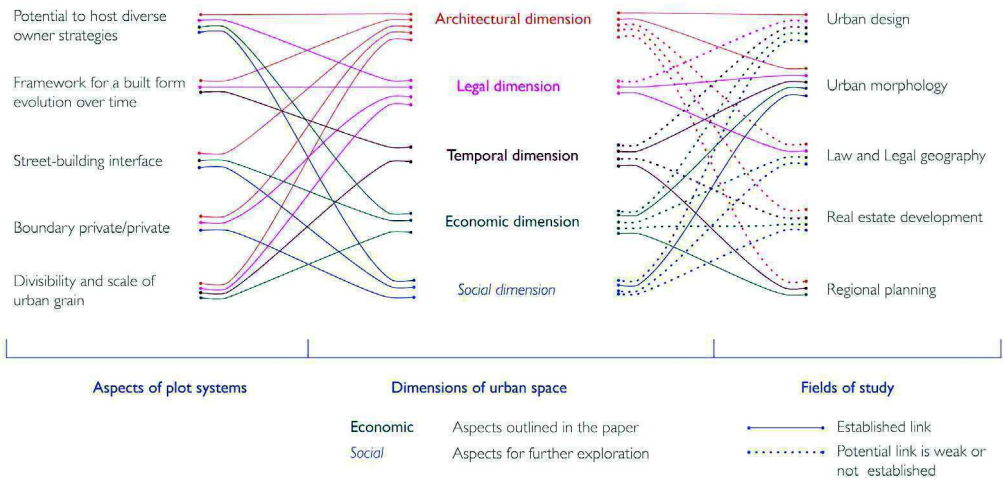

Figure 4.
Relation between critical aspects of plot systems, dimensions of urban space and fields of study

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legal (property law), temporal (real estate), economic (urban economics) and social (urban sociology) dimensions (see figure 4). Its spatial configuration, as well as the complex interplay between all the above-mentioned aspects, and the many matches or mismatches between them, preconditions the emergence of particular socio-economic performances of cities.

The fact that within several schools of urban morphology the plot system, instead of blocks, are emphasised as framing the evolution of built form, is specifically important in relation to urban design. Contemporary urban design is in this sense deeply rooted in modernistic planning and furthered by the New Urbanism tradition, where the reviving of the traditional urban street in combination with the block-structure reproduce the modernistic ignorance of the plot system (Porta & Romice, 2010). This results in urban space that formally resembles traditional historical towns, but fails to perform accordingly (Marcus, 2000).

The authors of this paper believe that discussing and acknowledging the many and complex aspects of the plot system opens up for establishing better connections between spatial and non-spatial dimensions of cities. More precisely, we want to emphasize the need for architects and urban designers to acknowledge, that it is not only the built form, but the layer of land divisions that contributes to complex social-economics processes in the city and also to how built form itself performs and evolves over time. And addressing the planners, economists and developers, we want to point out, that it is important to recognise the spatial dimension of properties, that potentially allows for a more clarity in land ownership, higher economic resilience and flexibility over time. The concept framework presented here will serve as a basis for a more extensive literature review, where each above-mentioned aspect will be explored in greater detail, and also, the relation between plot systems and social dimension of space, will be added.

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Self-organisation and meaning of urban structures: case study of Jewish communities in central Poland in pre-war times

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Abstract. *In spatial, social and cultural pluralism, the questions of human intentionality and socio-spatial emergence remain central to social theory. The correlation between individual preferences, values and intentions, and actual behaviour and actions, is subject to Portugali's theory of self-organisation. The key feature in how complex systems `self-organise', is that they `interpret', the information that comes from the environment. The current study explores the urban environment formerly inhabited, and largely constructed, by Jews in two central Polish districts: Mazovia and Lodz, before the tragedy of the Holocaust. While the Jewish presence lasted from the 11th century until the outbreak of World War II, the most intensive development took place in the 19th century, together with the civilisation changes introduced by industrialisation. Embracing the everyday habits of Jewish citizens endows the neighbourhood structures they once inhabited with long gone meanings, the information layer which once helped organise everyday life. The main thesis reveals that Jewish communities in pre-war Poland represented an example of a self-organising society, one which could be considered a prototype of contemporary postmodern cultural complexity. The mapping of this complexity at the scale of a neighbourhood is a challenge, a method for which is addressed in the current paper. The above considerations are in line with the empirical studies of the relations between Jews and Poles, especially in large cities, where more complex socio-cultural processes could have occurred.*

Keywords: Urban morphology, meaning, complexity, outdoor space, socio-spatial configuration, self-organisation.

Introduction

The current study explores the urban environment formerly inhabited, and largely constructed, by Jews in two central Polish districts: Mazovia and Lodz, before the tragedy of the Holocaust. While the Jewish presence lasted from the 11th century until the outbreak of World War II, the most intensive development took place in the 19th century, together with the civilisation changes introduced by industrialisation. The unique character of the urban structures in many locations of central Poland deserves to be attributed to their former Jewish citizens. This objective however requires an in-depth understanding of the culture which created them. This paper provides a summary of the larger research on the idiosyncrasies of former Jewish neighbourhoods in central Poland in the pre-war period (Hanzl 2017).

Embracing the everyday habits of Jewish citizens endows the neighbourhood structures they once inhabited with long gone meanings, the information layer which once helped organise everyday life. Much has been written on the research into material culture, a method has been derived from several disparate yet seminal theoretical works in social anthropology, urban morphology and

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complexity studies. As a result, the study has revealed a set of features relevant to the neighbourhoods populated by Jews in pre-war times, describing their particular character which is repeated in most Polish towns and neighbourhoods. Apart from depicting changes to civilisations as a result of time span, which for Polish Jews lasted ca. one thousand years, we need also to take into consideration the complexity stemming from, on the one hand the enrichment of professional opportunities, on the other acculturation and transformations of religious life as a consequence of the development of Hasidism and reformed Judaism, as well as changes resulting from the rich political life.

Methodology and thesis

One of the main goals of the project is to define a methodology for the description of idiosyncrasies of urban outdoor spaces in relation to the cultural background of their inhabitants, aimed at enabling an understanding of the relations between urban scapes and the human behaviour which they embrace. The relations between social activities, urban culture and urban form have been studied simultaneously, using research methods from anthropology and urban morphology as well as insights from complexity studies.

As Jews in the period preceding the World War II were an extremely divergent group, the classification has been conceived to allow the explanation of various forms of cityscapes developed from the same cultural background through adoption of habits and lifestyles connected with the ranges of cultural assimilation. It allows one to distinguish the conscious and formalised forms of equipment of public spaces from the unconscious order of space (Figure 1). In spatial, social and cultural pluralism, the questions of human intentionality and socio-spatial emergence remain central to social theory (Portugali 2000, p.142). The correlation between individual preferences, values and intentions, and actual behaviour and actions, is subject to Portugali's theory of self-organisation (2000). Compared to Gidden's structuralism, which focuses on society and groups, the point of departure for Portugali (2000) are individuals and their personal choices. The key feature in how complex systems `self-organise', is that they `interpret', the information that comes from the environment (Portugali 2006).

The main thesis reveals that Jewish communities in pre-war Poland represented an example of a self-organising society, one which could be considered a prototype of contemporary postmodern cultural complexity. The mapping of this complexity at the scale of a neighbourhood is a challenge, a method for which is addressed in the current paper. The above considerations are in line with the empirical studies of the relations between Jews and Poles, especially in large cities, where more complex socio-cultural processes could have occurred

Research outcomes

Complexity and self-organisation

Along with the progressing modernity and industrialisation, the homogenous traditional Jewish culture was gradually replaced with a palimpsest of intellectual threads and traditions. The traditional society offered a livelihood in a highly defined and hierarchical structure, but with the abolishment of the noble economy and the increasing industrialisation, this former stability was lost. Deprived of this economic base, with the changing conditions of local communities no longer providing sufficient support for their poor, Jewish masses were forced to look after themselves. Population growth and the shrinking market for their services in locations they had lived until then, together with the opportunities which opened up thanks to the development of industry and the growth of new administrative centres, forced crucial changes in Jewish society. This was the situation when, with the progressing development of secular education, and thereby individualism, more and more actors started planning and re-planning their individual activities, looking for new routines. The Jewish population, accustomed to adjusting to the decisions of governing bodies, in the period of transition from a high context culture to a low

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context one, again easily adjusted, however, this time their choices were based more on individual and family decisions than those of the community.

In the case of Lodz and Mazovian districts, urbanisation intensified in two crucial periods: The Middle Ages, when towns were laid out under German town law, and the beginnings of the industrial era - around the thirties of the 19th century. In the latter, the government of the Kingdom of Poland began activities towards the industrialisation of formerly rural or forested parts of Gubernia Piotrkowska. Thus, when looking at the town plans, we may see mainly elements coming from these two periods. People who occupied these layouts chose, more or less deliberatively, their place of living and erected structures which not only suited their requirements and contained the economic activities they performed but were also subject to various limitations and rules. Against the backdrop of economic activities, individual decisions were made, following individual preferences and systems of values, as well as the outset preconditions, such as economic capacities. We may presume that there was opposition between the highly centralised hierarchical and, to a large extent, oppressive nationalist practices of planning, and "the highly distributed, diffused and decentralised urban tradition" (Portugali 2000, p.247).

The model defined by Portugali (2000, p.243) as a new order-parameter plan is applied to the current case study; the constant migrations and adaptations to the situation of the already established or newly-formed urban centres being a typical reality for Jewish citizens in pre-war Poland. Both scenarios which Portugali distinguishes remain relevant here. On the one hand Jews adapted to the reality of towns they arrive to or, in the language of complexity studies, they became enslaved in the system of norms which ruled in the place before their arrival. On the other hand, they affected this new reality, adjusting it to their needs and the system of rules and values appropriate to their own culture. Their activities triggered transformations, their active involvement fostering urbanisation processes. We may also establish a time-scale, as some larger and shorter processes coexisted in the system. Cities which had served as primary or secondary administrative centres for years, were permanent magnets for Jewish communities, who had lived there since the Middle Ages. These processes provided the background for the much speedier development of industrial towns, some booming then declining very rapidly, others observing a more stable development, or, like Lodz, growing into a metropolis. The main synopsis of the database model of the Jewish population in the current Mazovian and Lodz voivodships in 1921 has been developed based on census data (Figure 2).

The idea of self-organisation is crucial, as it shifts the understanding of agency. In a historical sense, it has been, up to now, recognised that a society, especially the Jewish society in pre-war Poland, had very little influence on the actual appearance of cities, or at least did so in a way that was hard to define. Looking at the same historical facts from the perspective of self-organisation, we start to recognise their role in the urbanisation process. As particularly mobile citizens, Jews significantly altered the dynamics of urban growth. Performing the range of professional activities they did, they undeniably influenced local economies. They also influenced the form of dwellings and tenements, which, originally universal and adaptable, had to now accommodate Jewish families, with their specific habits. Among the neighbourhoods they picked to live in, there were linear structures, more concentrated ones, and even those which adopted much more contemporary models of dispersed urbanisation. In certain settlements, differing models developed one next to another, representing different cultures of the usage of space.

Types of culture: high context versus low context cultures

The current study provides the initial framework to map the spatial distribution and investigate the morphology of Jewish settlements in central Poland. The data collected reveals the

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following features which differed between towns and neighbourhoods:
-acculturation level and attitude towards religion,
-main professional profile of a settlement or of a neighbourhood,
-size of a community.

Additionally, these characteristics changed over time, with new layers resulting from industrialisation and the development of modern administration overlapping with the former urban centres coming from the period of merchant urbanisation (Lefebvre 2003 and Portugali 2000, p.312). At the turn-over of the 19th and 20th century, an utterly new phenomena emerged within Jewish society with the development of the awareness of the benefits and dangers of industrial cities; the quest for healthy living, identified then with escape from cities, led to the development of summer resorts and so called garden cities.
The loss of the former stability as a result of industrialisation led to a dissipation of traditional society defined structures. First and foremost, the primary feature which characterised the form of neighbourhoods inhabited by Jews between the wars was the lack of homogeneity. The variety of Jewish cultures at the time found its reflection in the variety of urban settings they inhabited. While the meaning of some elements remained virtually unchanged through the ages, new threads appeared, not just acculturation and modernisation, but also as a consequence of the huge development of the Hasidic community, or thanks to the influx of Russian Jews at the end of the 19th century for example.

The transition from a high context culture towards a lower definition of context was reflected in the form and distribution of urban structures. Jewish Orthodox and Hasidic culture in Poland in the period before World War II was a high context one. The more assimilated groups inhabited much more heterogeneous neighbourhoods, located in parts of cities founded under the architectural rules of Classicism, geometry played the mayor role in shaping plans. While there were usually many shades and taints of everyday culture, depending on the actual origins, profession, religious group, and so on, this basic distinction was quite explicit and rigid, and the division strict. In more traditional neighbourhoods, the former planning was preserved, with denser network of more winding streets, backyards often being isolated from the surrounding space, etc.

In smaller towns, the Jewish communities were not big enough to develop more heterogeneous lifestyles. These traditional religious communities conducted their strict, religion-based lives of the former “shtetl”-like culture. Some of them did so unconstrained by the close vicinity of large urban centres. In metropolitan cities, like Lodz and Warsaw of the beginning of the 20th century, the richness of the variety of everyday practices led towards the overlaying of spatial threads on top of others.

Spatial order and meaning

A range of features confirm the impact of a system of norms and specific semiological connotations belonging to the Jewish culture on the urban settings they inhabited. First, a trait which strikes when reading descriptions of Jewish traditional neighbourhoods by various authors is the utterly different attitude and evaluation of these settings’ aesthetic values by Jewish and non-Jewish authors. Hubka (2005) attributes the dense, non-geometric spatial layout of Jewish districts in small towns of the eighteenth century to the incremental growth and restrictions placed upon the Jewish community through legal regulations. Not only did the old shtetlech continue, steadily transformed and adjusted to modernisation, but their layouts were re-established in the new places where the orthodox communities moved. Along with this displacement to larger urban centres, Jews, tightly attached to their traditions, continued their former habits and recreated the former settings in new places, often, due to the changes of architectural forms, with different materials and physical structures.

The three main spheres of Jewish life feature sacrum, profanum and domestic space. In the first sphere of sacrum, the focus was initially on the synagogue, which later expanded to several

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additional structures, at first beit midrash, then yeshivas and shtibl. With time, the development of the Hasidic movement and the growth and diversification of Jewish society, further fragmentation progressed and the role of the synagogue was partly transferred to numerous prayer houses. The concentric nature of Jewish spaces is particularly apparent when looking at synagogues' courtyards, which, set back inside a block's interior, gathered around itself all the necessary community institutions. Traditionally, synagogues did not presume to have any sort of formal representation in the public realm, they often remained secluded and hidden inside urban blocks. With time, their functions were dispersed, but the main rules of spatial organisation remained. Along with Jewish integration into Polish society and progressing acculturation, synagogues assumed a more imposing appearance and became visible and dominant in public space.
In the profanum sphere, the focal point was the market place, Jews tended to settle in the proximity of the main square, which attracted them by catering to their economic needs. However, commercial activities were never limited to the market only; they extended to the neighbouring streets, passages, gates of tenements surrounding public spaces and shops and workshops in the proximity and further. Not only did this refer to commercial aspects but also spaces of production, manufacturers' workshops, small factories, etc. In some places this network of exchange and production spaces could even extend to neighbouring smaller towns, such as in case of Łódź and Brzeziny.

The third focal point was interior streets, courtyards and, in later times, backyards (Figure 3) where daily life took place. Specific forms of dwellings, often very small and hosting a variety of activities, forced people to use backyards as an extension of private space. The role of the backyard and its contribution to the outdoor space of the community may be considered as the centre of neighbourhood life. It focused on domestic activities, but served also as communal space, this way enhancing the relations within the community.

Meaning - pragmatics

Further analyses conducted in the current study comprised an attempt to understand the meanings conveyed by built structures. The conscious portion of the message delivered by the built environment through signs understood in a given cultural context (Eco 1997) refers to the pragmatics of outdoor space, understood as activities which take place in a given site (Rapoport 1990, p.38).

In the category of fixed features, a special place belongs to buildings which, due to their specific functions, conveyed explicit and easy to read meanings. The discussed neighbourhood hosted both edifices and facilities which served to satisfy the needs of the Jewish community, the specific features of which were regulated by norms. These structures may be divided into the same three groups which were provided above as the main focus of Jewish every-day life: sacred-religious, profanum and domicile. While in traditional Jewish culture all the community facilities were inherently associated with religious life, along with acculturation, this trait changed and the functions separated.
Along with fixed ones semi-fixed features, for instance advertisements, outdoor space equipment, small architecture, etc., and informal, non-fixed-features, could also communicate the ways of life in this environment. Service and commercial activities were the easiest to decipher, the more so that the customers using the services, were not only of Jewish origins. Wherever the requirements of outdoor commerce imposed the necessity of large open spaces, they were occupied by stalls and stands, usually ordered but still competing for the attention of passers-by. Very judicial management of space, little space without a prescribed use, and frequent overlapping and synergy of different uses of the same space completed the above picture. The space for commerce was not restricted to the main square, it was present in the neighbouring streets and passages. Jewish streets abounded with advertisements, placards, commercials, external stalls, etc. Often shifted to the centre of the pavement, the stalls of street vendors competed for the attention of passers-by. Commercial streets and squares, together

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with neighbouring backyards have usually been depicted as cramped and cluttered with merchandise. The abundance of border space facilitated the placement of numerous objects of outdoor commerce, such as stalls, stands, etc. Their presence and arrangement was subordinated to the needs of circulation inside and to the best exposition of merchandise, with stalls formed rows along internal alleys, protruding as much as possible into the walking space. All these semi-fixed and non-fixed but somehow permanent features easily defined the meaning of spaces and the structures next to them.

Proxemics

Next to articulated, pragmatic messages, which conveyed cues on the culturally established activities, additional conditions were communicated through the forms of urban settings: their scale, distribution of structures, rhythms, corrugation of facades, types of ceilings and pavements and other elements defining urban forms. This unconscious part of communication through the intrinsic organisation and arrangement of urban forms, contributed to the specific spatial order of Jewish spaces.

Proxemics yields further understanding of the nature of relations between the human environment and behavioural patterns (Hall 1966, 2009). The short interpersonal distances had their reflection in the preferred scale of physical outdoor space created by Jews. Hence, as a rule, in traditional Jewish neighbourhoods the streets were narrower than elsewhere. Limited scale prevailed in the majority of pre-war traditional Jewish neighbourhoods, especially featuring in internal streets, passages, alleys, nooks, etc. The scarcity of available space meant that all places, even the smallest, were intensively used and often crowded.

The city, seen in Hillier's (2012) opinion as a system of visual distances, with large streets and avenues of higher connectivity and exposure, in traditional Jewish perception must have appeared alien and external. The aforementioned narrowness of backyard passages and presence of numerous directional differentiation provided the notion of concavity. Hence, the facades closed the perspective and assured a perceived and felt enclosure inside urban blocks. For their collective life, Jews seemed to build their own city within a city, consisting of passages of smaller scale and focused inwardly. In cases when the grain of urban blocks was finer, such as in Bałuty in Łódź, some streets functioned as part of internal space. However, Jewish quarters were not closed completely, they protruded into their surroundings with purely functional spaces of commerce and services. Instead however of looking for social integration with the external Polish community, Jews, literally and metaphorically, turned their backs, with their communal life revolving around enclosed spaces inside. The communal institutions either were located inside urban blocks or were hidden within an urban block. This seems to be in direct contrast to the patterns common for surrounding cultures, where public squares were designed as places of communal, urban life. With progressing acculturation, the contrasts diminished and many customs and ways of building converged, the phenomena referring initially to reformed synagogues, which took on the appearance and landmark position modelled on Christian churches.

Conclusions

The observations made in the current study confirm the thesis that Jewish communities in pre-war Poland may be considered an example of a self-organising society, one which could be considered a prototype of contemporary postmodern cultural complexity. The model of a new order parameter plan (Portugali 2000, p.243) entirely applies, Jewish citizens in pre-war Poland used to migrate and adjust to external conditions, either enslaved in the system of norms which ruled in the place before their arrival, or adapting it to their own needs. The meanings conveyed by built structures, which ruled their choices, reflected three main spheres of Jewish life which were: sacrum, profanum and domicile.

What's more, the presented analyses have

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proved the existence of a separate spatial order specific for the distinguishable Jewish traditional culture which once developed in Poland. Two different cultures using the same spaces perceived and evaluated spatial order differently. When describing cultures, Hall (1966) distinguishes two basic categories; that of a more concentric or a more linear nature. I believe this was one of the key differences between traditional Polish and Jewish organisation of space in pre-war times, Jewish culture being of a more concentric nature. The initial layout was in both cases the same, and in many situations consisted of medieval patterns of towns founded under German law, however, as shown in the current book, other layouts were also adapted - the Jewish quarters could develop inside a block of Baroque settlement (as the example of Góra Kalwaria confirms) or the development might begin from the founding of a town, such as in Otwock.

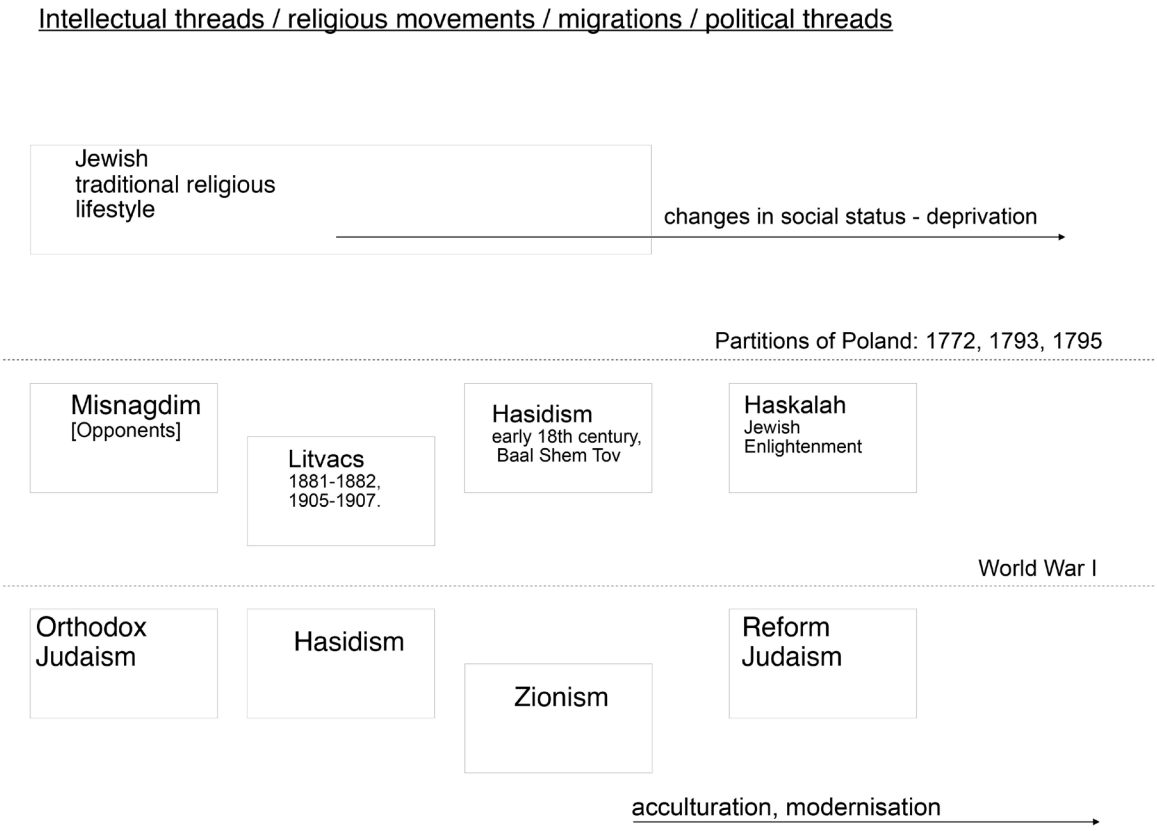

Figure 1. An attempt at a visual classification of the diversity of Jewish culture in pre-war Poland.

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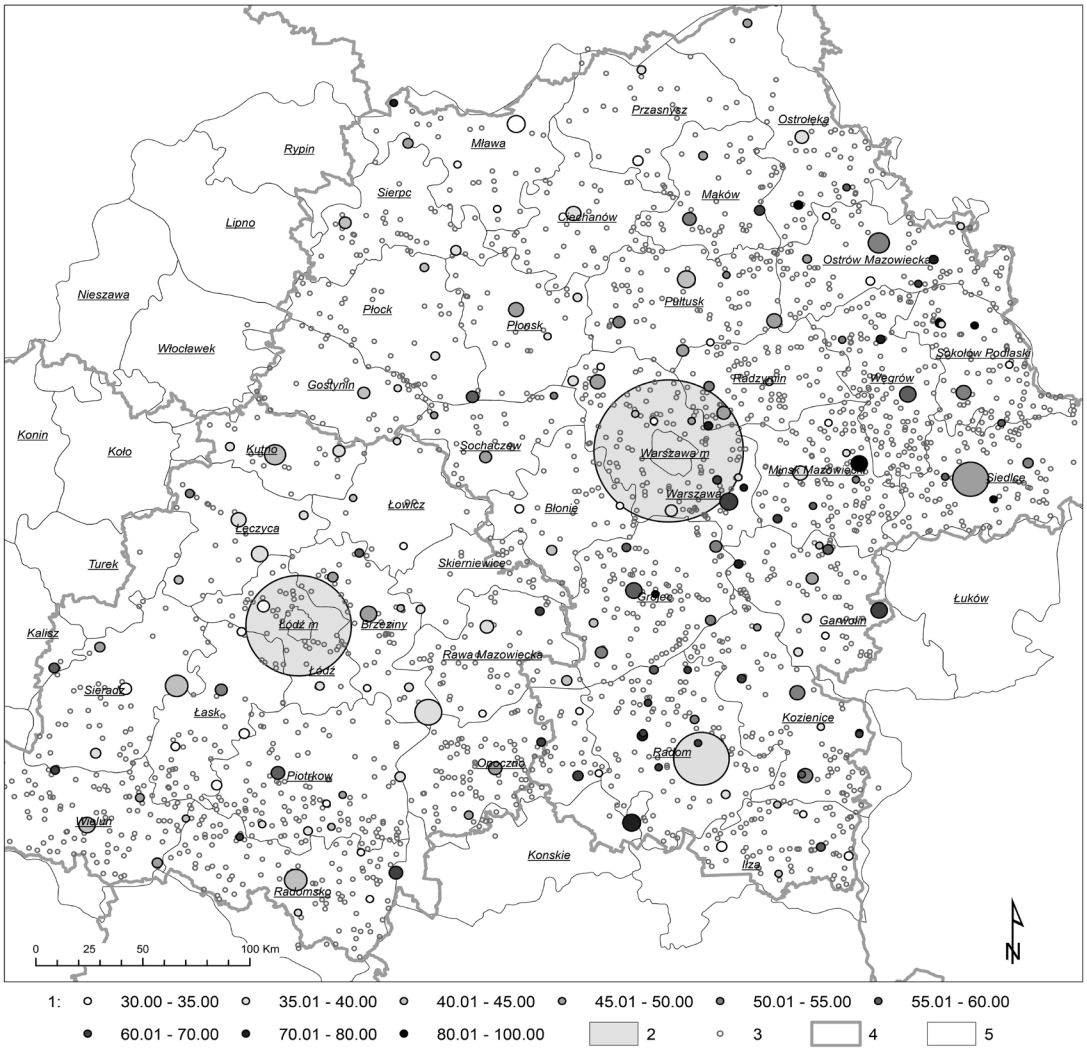

Figure 2. Settlements with over 50 Jews where they provided for 30 and more percent of the total population (GUSRP 1925). 1. percentage of the Jewish population in towns and villages, dot sizes describe the size of a Jewish population, 2. regional centres: Warsaw, 3. remaining towns and villages with a Jewish population, 4. contemporary voivodeships borders, 5. pre-war county borders.

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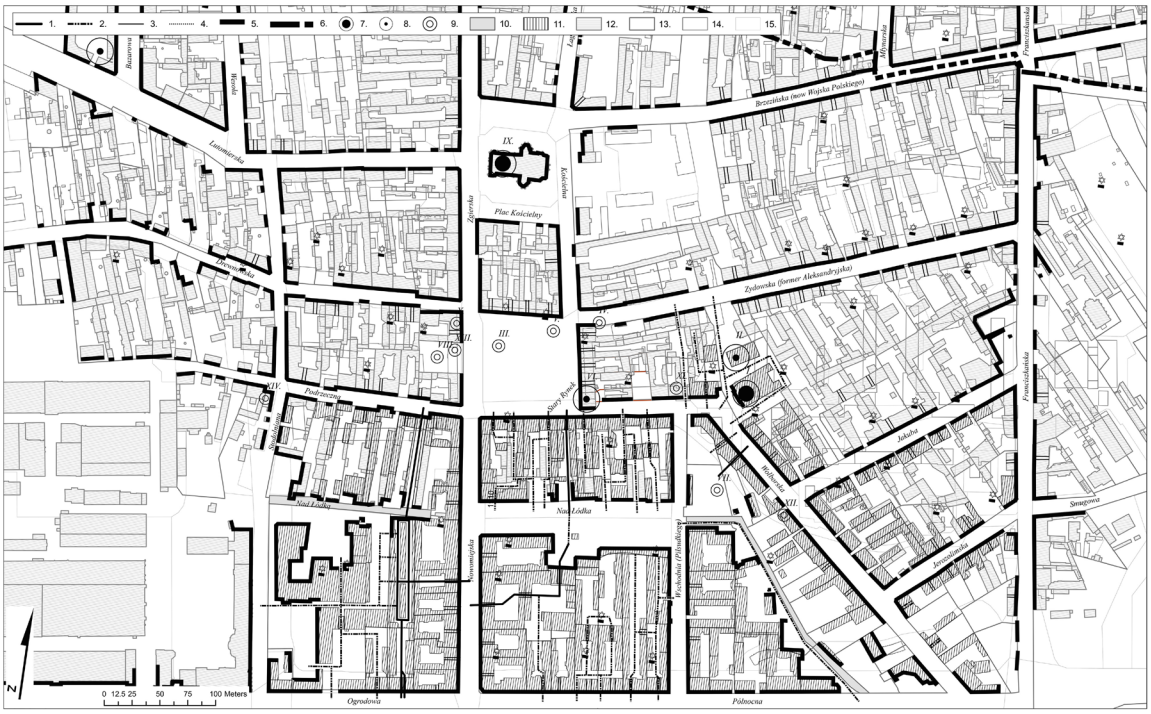

Figure 3. Old Town - an analysis of the form of the public realm. Section 2b. The sociometric layout of paths and alleys has been presented on the backdrop of the reconstruction of the formerly-existing quarter between Nad Łódką Street, Stodolniania Street and Północna Street in Łódź. The quarter, inhabited mainly by Jews, was demolished by Germans in 1939. The reconstruction has been done for the purpose of the making of a large-scale model of the quarter by a team of the Museum of the History of the City of Lodz: M. Gruda, A. Brajter, B. Polewczyk, modelling team: B. Michalski, S. Matusiak. 1. main confirmed commercial paths, 2. remaining internal paths, hypothetical, 3. location of gates in tenements, 4. unconfirmed gates, 5. street facades, 6. administrative border of Lodz before World War I, streets, 7. distant landmarks, 8. landmarks, 9. other significant locations, 10. prayer houses according to Rykała (2012), 11. river Łódka, 12. buildings' layout based on the model reconstruction 1939, 13. buildings' layout based on German maps of 1939, source State Archives of Lodz, 14. plot borders 1939, 15. buildings 2000, 16. plot borders 2000.

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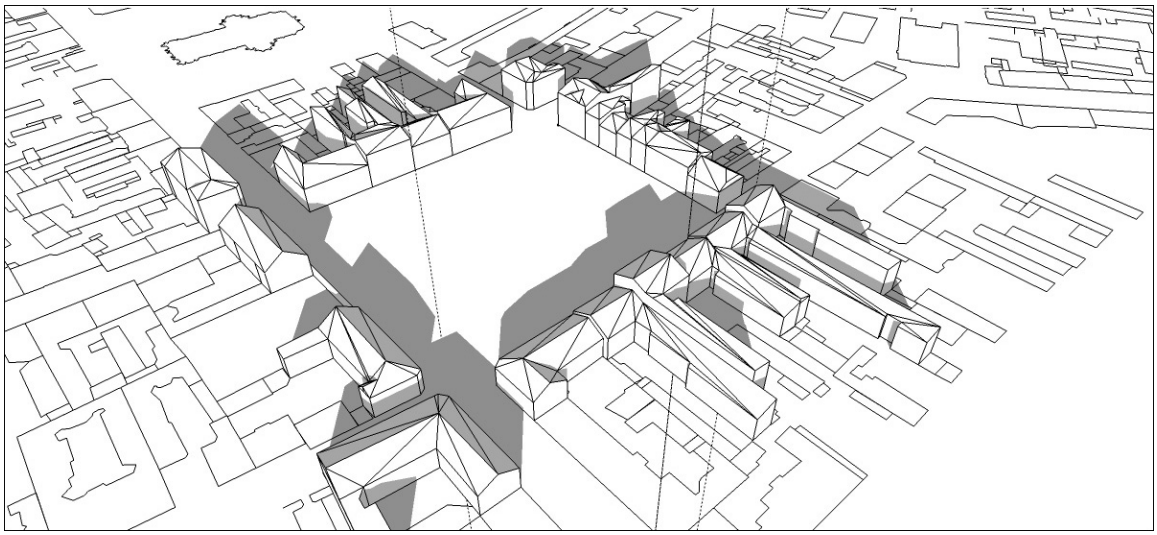

Figure 4. The Old Market in Lodz – a reconstruction of its state before World War II.

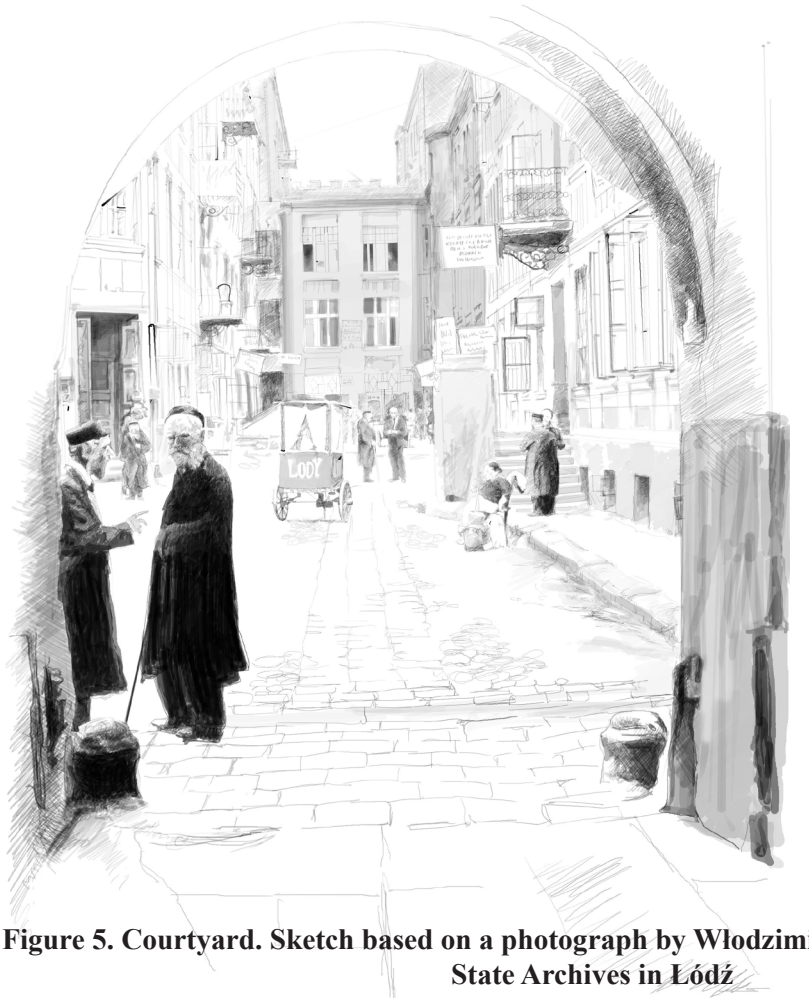

Figure 5. Courtyard. Sketch based on a photograph by Włodzimierz Pfeiffer courtesy of the State Archives in Łódź

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Figure 4. Facades of streets in the part of Nowe Miasto with a large share of the Jewish population. Inventory by students from the Institute of Architecture and Town Planning, Lodz University of Technology, as part of the course: Urban Inventory, BArch., tutor M. Hanzl, works of students: W. Depczynska, A. Jaruga, A. Kowalczyk, A. Pawlowska, N. Rucinska, M. Wroblewska, K. Zasada, A. Żuchlinska, A. Zbrojewska, J. Sobczak.

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The transformations of the peripheral urban form in Brazilian listed heritage coastal cities and their morphological typologies: Classification and concepts

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Abstract. *This paper presents the results of my PhD research in architecture and urbanism, which analyzes an urban form and its use as a territorial planning tool. The object of study was the protected historic cities listed on the Brazilian coast, which have restrictions on building construction. These cities are influenced by urban flows, the impact of the metropolitan dynamics, and contemporary transformations. The research discusses the rigidity of the building legislation in the urban perimeter of these cities, while urban transformations and informal growth take place in peripheral areas in varied forms, types and arrangements. It aims to identify, classify and conceptualize the morphological types that appear as urban occurrences and consolidate as dispersed informal nuclei. Such urban occurrences are due to the building restrictions, the lack of territorial planning, and the contemporary globalized model of life, which shapes social inequality in urban expansion. The research methodology consisted of a perimeter survey of the 27 heritage listed cities on the Brazilian coast, according to the parameters obtained by New Brazilian Forest Law (12.651/2012) and Brazilian Urban Land Parceling Law (Law 6.766/1979). Also, imagery collected by Google Earth was used to identify urban formations that deviate from legislation, similarly to the object of study. As a result, 16 types of urban forms were classified, which consolidated as nuclei of dispersed formations and were linked to an informal urban structural network. Also, territorial planning guidelines were designed, using the analysis of urban forms as a tool for urban transformation.*

Keywords: Heritage cities, Brazilian coast, urban morphology, urban occurrences, informal nuclei

Introduction

The presented study has as object of research the informal urban form of the peripheral areas in the protected historic urban settlements of the Brazilian coast and their relation with the urban territorial planning. It takes as object of research the historical cities located in the Brazilian coast, proclaimed by the Instituto do Patrimônio Histórico e Artístico Nacional (The National Institute of Historic and Artistic Heritage- IPHAN) protected historic settlements. They are represented by 27 cities between the North and South regions, where five of these are proclaimed World Heritage by United Nations Educational, Scientific and Cultural Organization-UNESCO.

Considered in the research as building-restrictive territories, they have a rigid legislation under its territories with the objective of diminishing and stopping the urban growth. On the other hand, phenomenon or impacts that occur in the peripheral areas of these cities, under the form of informal growth, can be observed. Thus, this study inquires analyzing the urban formations that come

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up from informal occupancy. As its base, the building legislation about the division of the urban grounds and gives other providences, as determined by the Law 6766/79, and the New Brazilian Forest Code, Law 12651/12, that displays the protection of native vegetation […] and gives other providences.

Is considered informal, all the occupancies, center parts, constructions that fixed in the territory for research purposes, without the construction licensing, or that do not meet the basic requirements of the Law. Characterized by large or absence of blocks; irregular tracing with damages to circulation; absence of free areas, squares, public and institutional equipment, infrastructure and paved thoroughfare; beginning of constructions in unstructured divisions; occupancies in sandbanks, beaches, riparian forests, river courses and groves; deforestation; invasions and privatization of areas of public property.

Were named as urban occurrences and defined as urban centers that come up from occupancies or unlicensed plans and grow informally in the urban ground. "Excites an uncontrolled, informal and even illegal growth, that does not meet any economic development" (Panerai, 2006). The study also shares the idea of non-exclusive phenomena of urban formations that emerge from the disorder or from the lack of urban planning, but from a formula of urban control made under a legal basis that prevents the city from "growing with grace, justice and beauty" (Rolnik, 1997).

> There is where one of the most interesting aspects of the law lives: apparently, it works as a type of mold of an ideal or desirable city. […] But, when establishing permitted or prohibited forms, it also defines under and out of the law territories, or, in other words, configures regions of full citizenship and regions of limited citizenship – translated by Author. (Rolnik, 1997).

The set of urban occurrences configure in the object of study the form of periphery. Grouped or isolated, dispersed or condensed, they have urban and rural character and are directly related to the urban structure of the cities. They are urban forms with a particular way of occupying the Brazilian territory in its core. It was important to understand and conceptualize two reference points in the research, the structure and the concepts of the urban form and the historic city of the Brazilian coast as protected patrimony.

Formal and Historic Aspects of the Urban Plans

The urban plan is made of buildings, uses and their distribution in the urban space. It can be conceived through urbanistic planning followed by rigorous planning criteria or by vernacular crafts developed by the culture of generations. The urbanistic plans are conceptions and construction or modifications of cities projects. They organize the cities' tracings, the position of the main buildings and direct the form of the edifications and the urban growth. This way of thinking the space and transforming it was originated in the history of the cities which were established based on the commercialization and production of exceedance. The development of the writing and of the sciences, the control of the labor force, the technological capacity of transporting raw material, the domain of the natural space and the manufacture of utensils pointed to an urban revolution that gave birth to new ways of building a city, classified in its differences and functions. (Morris, 2004).

The irregular plan, called organic, is characterized by presenting an apparent irrationality on the implantation of the building. It is not orderly, with narrow, sinuous circulations, giving the sensation of a labyrinth. The result of this plan reflects the inexistence of a previous planning with wide and planned thoroughfares. Representative in the Islamic cities, in the cities with the Roman origin organic growth, in medieval cities, in the burgs of military bases that acquired commercial functions and in the cities that grew from existing villages (Morris, 2004; Carvalho, 2003).

The orthogonal plan is named after: rectangular, hypodamic, grid point and chessboard. They are plans where the streets cross each other in perpendicular angles,

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creating the sensation of order in the space. Its origin comes from the history of the formal Greek cities, which main characteristics were the relation established between its main buildings, the acropolis, the wall, the agora, the suburbs, the areas for recreation, culture, religion and the port that made the industrial section of the docks (Morris, 2004). The know-how of building cities mastered by the Greeks was transferred, by Vitruvius, in its conception of ideal city of circular plan, meeting the standards in relation of harmony, regularity and determination (Carvalho, 2003). These plans are presented repeatedly in cities conceived along the XVIII and XIX centuries in the colonization, mainly by Spaniard and Portuguese ones.

The regular plan is recovered in the renaissance period through the geometrical and radial plans, named radio centric plan. It is characterized and idealized around central points, such as markets, churches, monasteries and squares. It presents roads formed by streets that come from the center and thoroughfares that make circles, far from the center point. It is noticeable that the regular tracing of the bigger streets surrounding the centers superpose the old walls that were demolished in order to make the population growth in the medieval cities possible. Thus, new walls could be built far from the center to protect the medieval city. We can highlight the creators of the regular plan: León Battista Alberti (1404-1472), with contributions on the planning area, More (1478-1535) presenting the geometrical city in Utopia, Vincenzo Scamozzi (1552-1616) developing the formal balance of the design without presenting an absolute symmetry and putting his ideas into practice, such as the city of Palma Nova in Italy (Goitia, 2001). Also, with traces of the regular plan, there were the baroque cities, characterized by the ideal plans and by the embellishment of the cities. The renaissance period, "when the planning of the cities started being faced as part of the discipline of architecture and had to follow the same mathematical criteria of rigor of the mathematical base" (Teixeira, 2012).

The linear plan, organized along a passage, such as streets, avenues or seashore. They are plans that bring difficulty on the transportation and communication between opposite points due to their distance. And the juxtaposed plan, characterized by the presence of different arrangements superposed in a city. They are commonly present in cities with a bigger history of urban transformations, where the different urban plans of the territory are represented by distinct moments of urban growth (Morris, 2004; Carvalho 2003).

Besides the five plans of reference on urban morphology, Carvalho (2003) contributed and conceptualizes, in his studies, other four morphological types. The classic plan, where there is a mixture between the orthogonal and the regular plans, as the example of the Greco-Roman, renaissance and baroque cities. The garden plan, made of examples of rural tradition as the garden cities and urban dwellings. The modernist plan, represented by the modernist planned cities, having as main reference the models of La Corbusier. And the urban-bucolic plan, represented by urban fragments on the countryside, making a disperse city of closed condominiums and suburbs, reflecting the current city.

The Historic City of the Brazilian Coast, Growth and Control

They are urban centers that that had their origins on the Portuguese city plans. They are born from two types of conceptions, one connected to the spaces of vernacular structures and other connected to the mathematical and geometrical bases. Built in different historical and geographical contexts, it is possible to find, in their plans, the roughest components and the components of the most informed technique (Teixeira, 2012). The Brazilian cities of the Portuguese colonization period had their importance as Brazilian cultural and artistic heritage preserved through preservation policies of the historic heritage.

They are protected through restrictive building laws and standardizations that put them as important historic cities, guaranteeing the structural, formal and landscape integrity of these urban settlements. They were potentialized as places, meaning and image, recognized as cultural, touristic and leisure

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territories, in spaces of natural value such as beaches, rivers, dunes, lagoons, bays and native forests, pervading historic-valued houses.

Recognized as tourism territory, the speculation of the Protected Urban Settlements provided other dynamics of populational, consumption and estate fetish fluxes. Urban dynamics and practices of use and consumption put the conservation and preservation of the cultural and natural heritage at risk. It is possible to observe that they are cities that experience the full populational growth (Instituto Brasileiro de Geografia e Estatística, 2016). They became attractive to tourism, service, acquisition of a second house by vacationers and urban speculators demands.

They experience the degradation and deterioration of the territory problems, caused by the unjustified and excessive of its spaces in phases of exploration, engagement of the society, economic development, consolidation and stagnation. They take cities of touristic potential to their declining or rejuvenation, according to the ordering, territorial and touristic planning (Butler, 1980). They foment a new form of city, made of informal occupations. It is understandable that the growth of the peripheric city in informal cores is not exclusive to the protected urban settlements of the Brazilian coast, but the size of the phenomenon in them is intensified by the populational fluxes, by the restrictive laws and by the demand of consumption of the city as an object of tourism and leisure. The diffuse, scattered, multi-cored growth is a phenomenon that is present and characteristic of the contemporary cities, where the city seems to dilute through the territory (Reis, 2006).

The identification of the peripheral urban plans in the historic cities of the Brazilian coast was the main objective of this study. Its typologies and classifications characterized by the explosion of informal and irregular urban plans. With references on the study of the urban plans, and its bases on preservation and urban development, the study can help the identification of the urban occurrences in the peripheral areas of the protected urban settlements of the Brazilian coast.

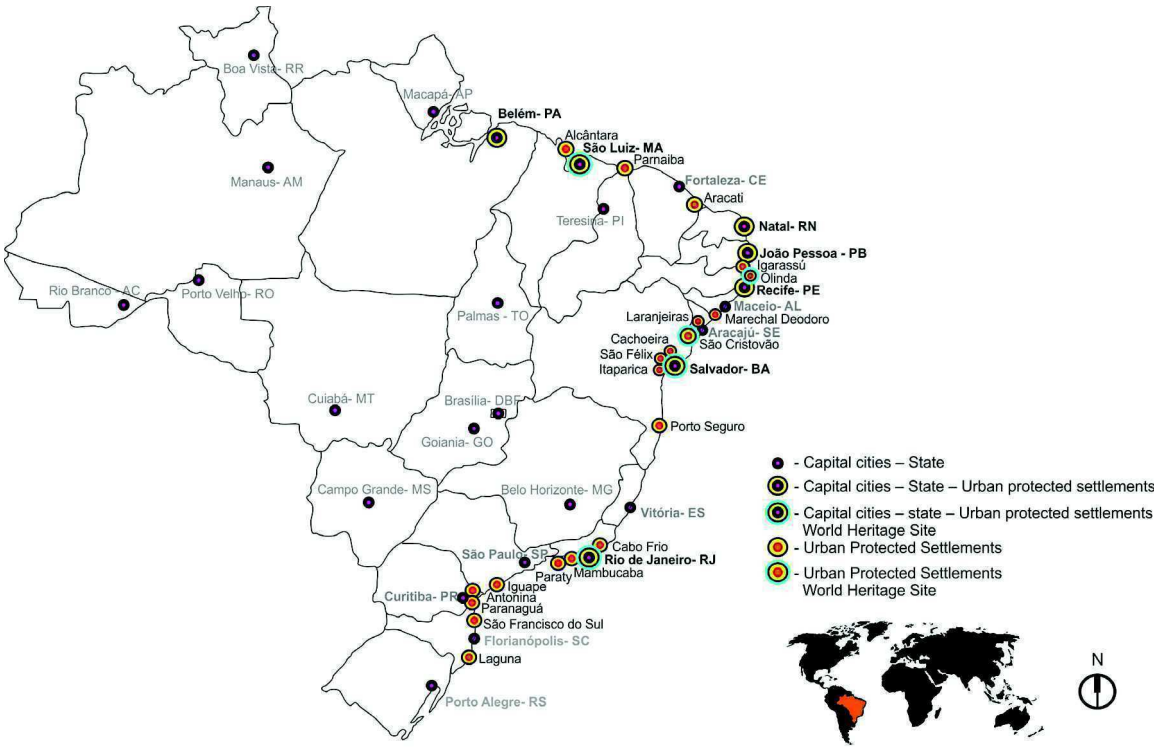

Figure 1.
Urban Protected Settlements of the Brazilian Coast – Object of study.

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Methodology

The methodological process was built from the definition of the object of study and in the affirmation: "The building laws influence in the peripheric and informal growth of the city". With a look upon the historic city of Paraty, in the southern coast of the state of Rio de Janeiro, we can notice a city growing in peripheric urban occurrences in a disordered way, out of the building parameters.

With the building legislation, restrictive and preservationist, the peripheric areas were not contained. It was possible to observe that the phenomenon of the urban occurrences was related to the application of the building laws. In this direction, the cities that had their behavior through the building law like Paraty's were identified as objects of study.

The protected urban settlements located on the coast, bays or canals with direct connection to the sea became the object of study, making a total of 27 cities on the Brazilian coast, from North Belem (PA) to South Laguna (SC) (IPHAN, 2016; UNESCO, 2017), (figure 1).

The method of identification and classification of the urban occurrences happened through visualization of air images on Google Earth Pro and conceptualized by the fragmentation of the plan in structures of articulation, to look for answers to the observations of the study.

Thus, it is noticeable that similar urban plans are repeated in the peripheric areas in the object of study.

They are urban formations characterized by the irregularity in the plans and in the implantation of the site.

To collect images of irregular urban formations, the observation and gathering of images was made, based on the urbanistic and preservation parameters defined by the Law 6766/79 and by the Law 12651/12.

Used as a method of image capture, the "scan", in which the municipality is divided into quadrants and after is subdivided and scooped with Google Earth Pro, allowing the visualization, the collection, the selection and the classification of informal urban forms.

Measurement and analysis

This paper presents as result a set of urban forms analyzed to the formation of peripherical areas of the protected historical settlements of the Brazilian coast. They were ordered in tables, classified in 16 types of urban forms and arranged in 4 groups.

Group I (G.I): Irregular occupations that use the structures and the environmental resources for the installation of residential groupings. They are out of the urban order, Law 6766/79, Arts.2nd, 3rd, 4th and 5th, and Law nº 12.651/12, Art. 4°, (figure 2).

Group II (G.II): Occupations that grow in irregular arrangements, taking up free spaces in their entirety. They are common in traditional communities or cores in development process. They are out of the urban order and incur in the articles, Art. 2nd; 3rd and 4th of the Law 6.766/79, and Art. 4th of the Law nº 12.651/12, (figure 3).

Group III (G.III): Urbanistic projects implanted without license or consent of the public administrators. They are characterized by the absence of public and leisure areas. They are out of the urban order and incur in the articles Art. 2nd ; 3rd; 4th and 5th of the Law 6.766/79 and Art. 4th and 7th of the Law nº 12.651/12, (figure 4).

Group IV (G.IV): Occupations that grows in multiple and diversified arrangements, consisting in different types of urban occurrences. They are types of intervention and incur in the articles: Art. 3rd; 4th and 5th of the Law 6766/79 and in the Art. 4th of the Law nº 12651/12, (figure 5).

Conclusion

This article presents the discussion about the building legislation on its restrictive aspects and consequences to the urban growth. The article also allows the identification of new urban forms and settings that are similar to the ones of the old cities, approaching the illegality over the protected settlements of the Brazilian Coast. Self-constructed; Standardized into preliminary plans; planned to be beautiful; organic or confused; multiple; their differences

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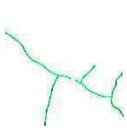
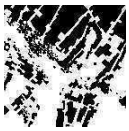
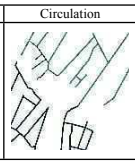
Figure 2.
Urban Occurrences, Group I.

Type: Strangulation of watercourses and springs.

Definition:
Urban structures that extend over the protection zone of watercourses through urban growth tend to eliminate the native vegetation at the riverside protection areas, causing the strangulation of the spring. They are caused by urban pressures in all directions of the stream bed, presenting the channelization and the extinction of water volume as consequences.

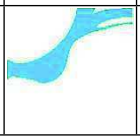
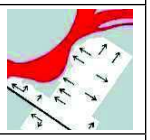
Articulation structures:

Satellite	Occurrence	Vegetation	Water	Built Mass	Circulation	Modified Soil	Concept
							

Type: Large structures

Definition:
Buildings and morphological structures of major impact, located in areas of permanent preservation and native vegetation. They use the existing roads and are characterized by producing extensive areas of waterproofing in the soil, with building blocks, courtyards, accesses, circulation and paving. They cause impacts on the environment and city landscape. Expands in the territory, modifying the soil and using preservation areas and natural resources of the environment.

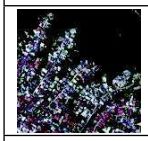
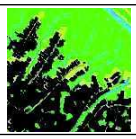
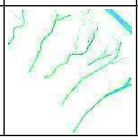
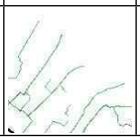
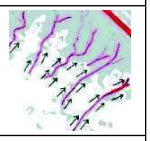
Articulation structures:

Satellite	Occurrence	Vegetation	Water	Built Mass	Circulation	Modified Soil	Concept
							

Type: Channels Occupation

Definition:
Precarious structures of territorial occupation. Follows river canals as articulated soil base. Urban growth is consolidated paths in parallel to the channels, breaking limits on native vegetation. This sort of occurrence enables the urban density, making the proper infrastructural implementation more difficult, resulting in consequences to the environment such as disposal of waste in the soil and the discharge of sewage into the canals.

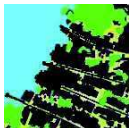
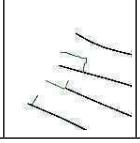
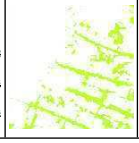
Articulation structures:

Satellite	Occurrence	Vegetation	Water	Built Mass	Circulation	Modified Soil	Concept
							

Type: Peripheral protection river areas Occupation (FMP).

Definition:
They occupy the peripheral protection areas of rivers, lakes and ponds, consolidating their built mass. Using the water resources as housing structures, they tend to eliminate the native vegetation of the FMP, growing in distinct areas of the city, forming buildings of different standards, low, medium and high, through landfills, decks and stilts. Presenting poor infrastructure, they pollute the river bed and its banks with solid waste and sewage.

Articulation structures:

Satellite	Occurrence	Vegetation	Water	Built Mass	Circulation	Modified Soil	Concept
							

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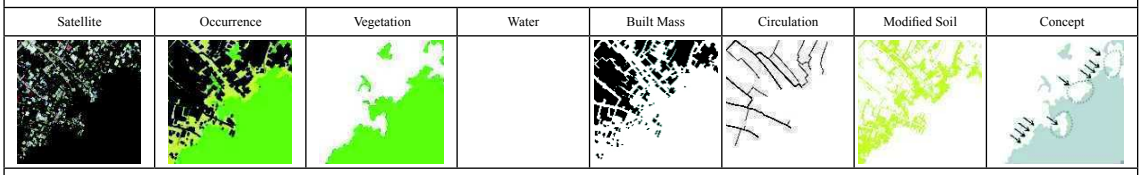
Type: Hills occupation

Definition:

Urban structures that extend from the urban tissue through different sorts of circulation accesses and distributed in the topography of the site. Present lower density of built mass and significant precarious urban infrastructure as it distances from the consolidated urban tissues moving upon to the site. It can be observed that the urban growth is restrained by places with extensive difficulty of access, opening paths into more accessible areas on the topography of the site, occupying new plateaus. They are mostly formed by slums, condominiums, farms and facilities related to tourism and leisure.

Articulation Structures:

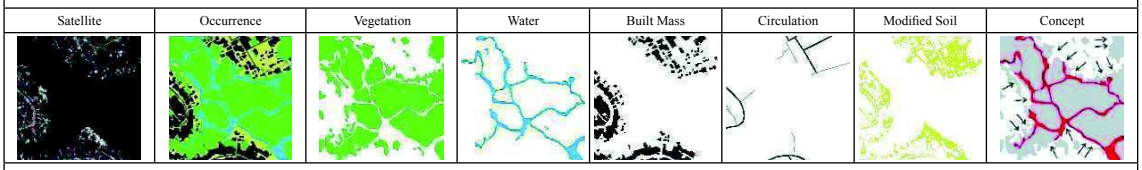


Type: Mangrove occupation

Definition:

They are urban structures sorted by advancing over mangroves, through landfills or stilts. They are consolidated according to the natural mangrove drawing, guided by the site contour. As the urban tissue moves away from the mangrove, an extensive density of soil occupation can be observed. Its formation brings traditional characteristics of populations and communities of native origin that uses the mangrove's natural resources as livelihood.

Articulation structures:



Type: Beaches, sandbanks and Sand Dunes Occupation

Definition:

They are urban occurrences constituted in beach plains. They Extend as the road tissue expands and the soil subdivision, presenting poor infrastructure, compromising the site's environmental quality. They overlap areas of sandbanks, dunes and beaches, extinguishing local ecosystems. Sources of real estate dynamics, these urban structures are used as a product image and market of a lifestyle linked to leisure. It can be observed the creation of leisure spaces, hotel and vacation residences.

Articulation structures:

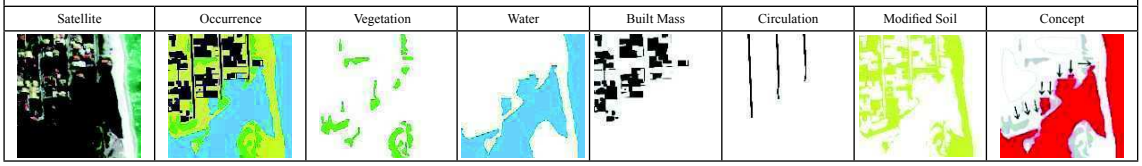


Figure 3.

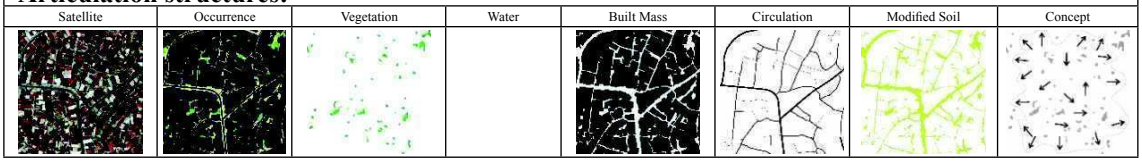
Urban Occurrences, Group II.

Type: Urban Settlements

Definition:

Formed by urban mass consolidated in the physical space, with diversified and mixed use. Receives growth pressures continuously, favoring urban density, and the natural site elements. The urban density in the settlements is connected to a more complex hierarchical thoroughfare network. Its informal growth causes the arrangement of residual spaces nearby they built mass.

Articulation structures:



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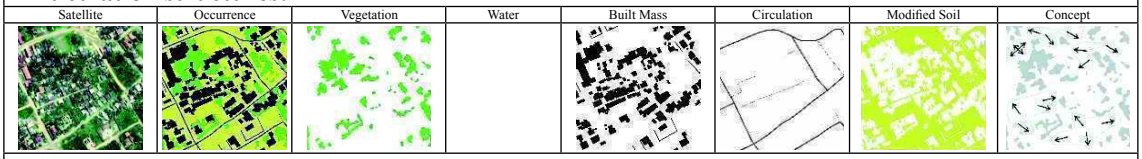
Type: Low Density Urban Settlements

Definition:

Urban formations previously delimited by road structures, lots divided into private fractions of different shapes through walls or land clearing. They have low vegetation due to deforestation of the initial land division. Different patterns of houses are noticed in the low-density portions, and lower standard houses in the parts where increases the density of the settlement. The settlements of informal buildings are characterized by the absence of infrastructure, irregular forms of occupations and new informal pathways, which consolidate in the denser spaces. They cause environmental damage, eliminating its natural resources and tend to become urban settlements.

Articulation structures:

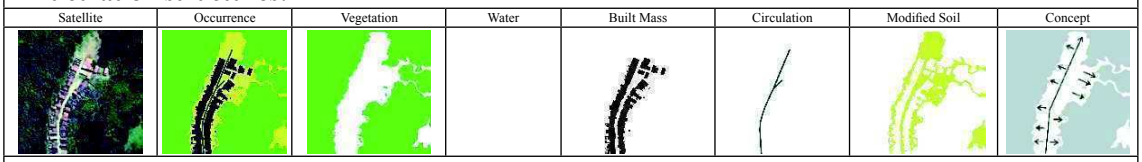


Type: Linear

Definition:

Urban structures guided by a main access thoroughfare or through an important road flow in the urban tissue. Characterized by linear growth and its expansion at the back of the lot, also forming privatized spaces in condominiums. They also can consolidate between two strategic access points in the city, such as highways in parallel to the sea and beaches. In areas restricted to buildings, such as forests or the preservation areas.

Articulation structures:



Type: Traditional Occupation

Definition:

Spontaneous and traditional lower density structures. They are accessed by main roads and internal pathways, connecting buildings and main points of the community. Characterized by occupying spaces in a rational way, allowing meeting points in the center and references for the community, such as beaches, rivers and lakes. There are examples of indigenous, *quilombola* and *caiçara* communities, among others that have in their forms of implantation, references of traditional communities.

Articulation structures:

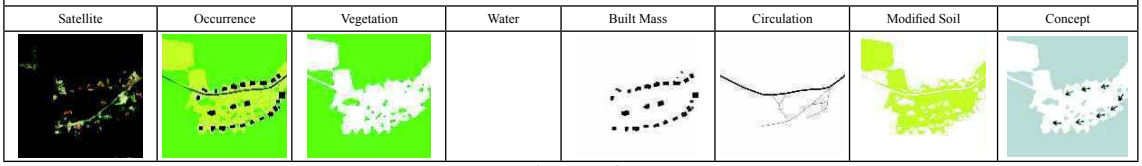


Figure 4.

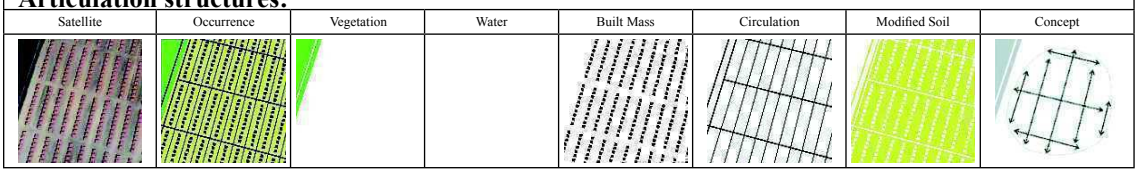
Urban Occurrences, Group III.

Type: Settlements

Definition:

Urban interventions of housing assistance promoted by the state. They present the form of sequential housing settlements with absence of places of leisure, squares and Green areas. They are deployed on lower-cost lands, in locations far from urban centers where basic infrastructure is precarious or absent, and on environmentally sensitive locations to the deployment of large settlements.

Articulation structures:



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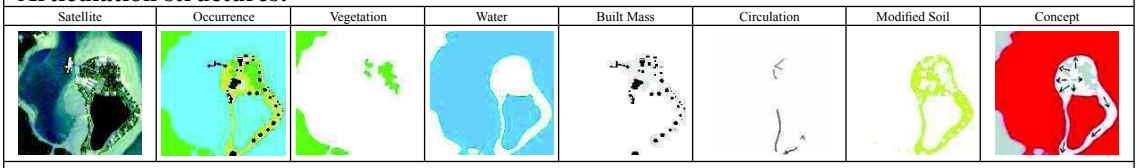
Type: Enterprises

Definition:

Bold interventions in implantation, planned by architectonic projects and real estate marketing. Use the landscape and natural resources to produce artificial spaces of natural resemblance. Low constructive density spaces, few access routes and internal circulation. They interfere with the natural space through landfills, modifications in river beds, marshes and beaches, opening or closing the navigable channels by dredging. These sorts of urban occurrences are common for the hotels and leisure facilities, Summer houses, horizontal condominiums and theme enterprises.

Articulation structures:

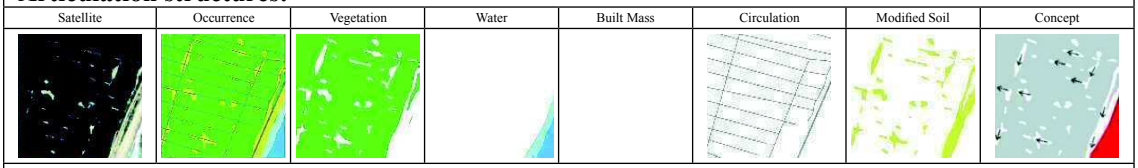


Type: New allotments implantation

Definition:

Urban structures that arise at the urban growth and real estate speculation through a pre-existing main road. They are deployed in sites lacking basic urban infrastructure, free lands with predominant vegetation in permanent preservation areas. Defined by a regulatory plan, they break the natural limits and design of the land, gradually modifying and waterproofing the soil by the process of implantation of the new allotment. In cases of high standard allotments, the interventions pursue leisure, the natural esthetics and well-being as strategic real estate marketing elements.

Articulation structures:



Type: Clandestine Allotments

Definition:

Urban structures sorted in fractions and lots, divided into regular or irregular spaces and subdivided as population grows. They are implanted under precarious conditions, without urban infrastructure interfere directly in the soil and subtraction of environmental resources. The lots have its access and delimitation made by extended streets that supports the growth. Construction of wall defines the individual territories. They are allotments lacking public facilities such as squares and institutional areas. They present different patterns and use of buildings, deployed without urban parameters.

Articulation structures:

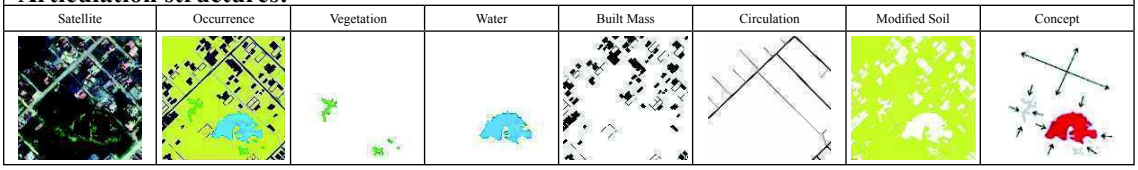


Figure 5.

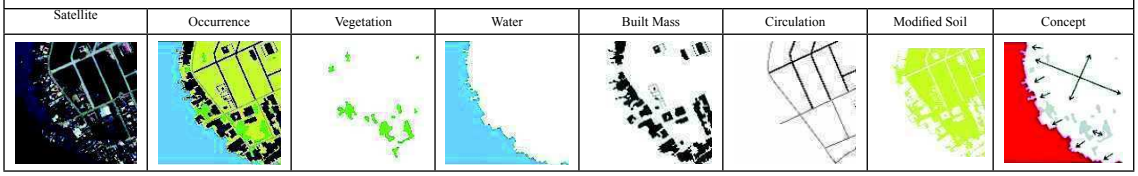
Urban Occurrences, Group IV.

Type: Mixed Occurrences

Definition:

Overlaps of urban occurrences that affect the same space. Different morphological arrangements represented by groups I, II, III, IV, combined in mutual forms can be observed.

Articulation structures:



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are known by the contemporaneity in the cities they produce.

The result was the construction of an instrument of urban analysis through an analytical picture of the illegal urban form. This article enables to identify, analyze and direct the urban growth in cities with realities similar to the object of study.

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Urban form and vacant shops: can one explain the other? A case study in Portugal

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Abstract. *Shopping is much more than a wealth-generator in post-modern societies; it is intrinsically linked with the way people experience the city and an indivisible part of their day-to-day social experiences. Consequently, the literature has gradually recognized that commercial geographies are not just a consequence of economic market logics. It has been proven that there is a relationship between store-types and urban morphology, and that commerce is an important catalyst for urban regeneration and revitalization. Thus, the urban form can also be a cause for the lack of success of a shop. The amount of vacant shops has been signaled as an important problem in urban areas, affecting the structure and the identity of neighbourhoods, and reflects the negative effects of the economic-crisis. Strategies to overcome this problem are usually economically-oriented and fail to capitalize on the new-found relationships between store-success and urban morphology. Thus this research wishes to test whether there are indeed correlations between specific morphological features and the existence of vacant shops, and consequently to discuss how changes in the urban environment can contribute to overcome, and even prevent, such cases. The geographical distribution of vacant shops in a sample of Portuguese cities was set against morphological variables such as building age or centrality in the network. Positive association was found, for example, between new developments and vacant shops, questioning the need for more store space in certain areas; and, particularly outside central neighborhoods, between open shops and high travel-through (rather than highly central) segments.*

Keywords: commerce; medium-sized cities; urban morphology; space syntax; urban planning

Introduction – The relationship of commercial activity with urban morphology

Today, the evolution in store types, purchase options and the shopping experience as a whole (Hart and Dale, 2014, Pecoraro and Uusitalo, 2014) has changed the laws of store-attractiveness and hence re-shaped the geography of urban retail systems (Saraiva and Pinho, 2017).

Consequently, although the market necessities still explain in great part the geo-economic trends of the commercial sector, the features of urban spaces have of late been recognized as also having a strong correlation with the location, characteristics and ultimately the success of shops (Saraiva and Pinho, 2017). Indeed, commerce is now recognized as a driver of urban development and regeneration (Findlay and Sparks, 2009, Barata-Salgueiro and Erkip, 2014).

Several authors (see review in Saraiva, 2013) have uncovered how the concentration of certain store types in specific areas can influence, or be influenced by, the spatial and morphological (re)configuration of cities.

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Yoshida and Omae (2005) and Jostens and van Nes (2005), for example, have noted distinct morphological characteristics, highly inter-correlated, of blocks, buildings and building-to-land ratios in commercial locations. Saraiva (2013), however, has questioned this allocation of non-changeable morphological features to all commercial buildings. Analyzing the entire urban perimeter of Portuguese cities, the author notes that most commercial variables have even distributions between the various types of buildings and blocks. Only when separating between particular retail types are morphological distinctions made clear. For example, around 90% of all fashion shops are located either in central main streets or inside peripheral shopping centres. Consequently, store patterns are correlated to the configuration of urban hierarchies and their intrinsic connectivity though micro and macro networks.

This last point has been particularly explored, with several authors comparing commercial patterns with transport/ accessibility configurations at various scales. In these studies, morphological elements are generally characterized through connectivity, either distance to closest intersections or the weight of the store's street segment in the network, according to concepts like those of 'integration' and 'betweeness/choice' of Space Syntax.

For Jingman (2009) and van Nes (2005) the city's commercial centres are unequivocally in syntax centres, both at a local and a global scale. But the same author has found a weak co-occurrence between integration and shops in Berlin (Joosten and Van Nes, 2005) and Porta et al (2009) suggest that the strongest correlation is with global betweenness, not integration. Indeed, for Hillier and Iida (2005) there will be a gradation according to the necessities of each store type, something which is confirmed by Sarma (2006), Villain (2011) or Saraiva (2013). Anchor, multi-purpose or multi-comparison stores may need to be at central locations but functions whose movement is just attracted coincidentally are more dispersed and may opt for strategic locations with high through-movement potential or serving local catchment areas. On the other hand, convenience and first necessity stores are transversal, correlating with to- and through-movement, and centrality and segregation, as they drift towards residential neighbourhoods.

Furthermore, in suburbia or smaller cities other patterns can occur as a natural consequence of their form and structure. Highly integrated streets but with intense vehicular traffic may be unattractive for stores, which may select other locations, closer to market. And outside central locations, stores could even function better in high 'choice' axes (leading to the city centre) or, if they require space but have strong self-attraction potential, in network segregated locations (Saraiva, 2013).

The problem of vacant shops and the research hypothesis

Works such as that of Brázio (2013) in Portugal or Michou (2013) in Greece have displayed how much the proliferation of vacant shops can have a high impact on the configuration and identity of urban areas. Retail decline and vacant shops have unequivocally been related to urban, market, and consumer tastes' change, and used as proxys for analyzing gentrification (Baker and Wood, 2010) and the consequences of recession (Katyoka and Wyatt, 2008, Wrigley and Dolega, 2011).

Three main causes are identified for vacant shops. First, the competition of large scale establishments, catering to the postmodern convenience-oriented society (Baker, 2002, Reimers and Clulow, 2004). Second, the decline of the viability and vitality of downtowns in terms of sociality and well-being (Hickman, 2013, Burns and Willis, 2011), environment/ economic deterioration (Whysall, 2011, Ferreri, 2015), unemployment (Gospodini, 2012), and the lateness of the return of consumers' and investors' confidence (Whysall, 2011). And third, there is the possibility that a given area may in fact not have the structural necessity for more shops, something with is hardly considered outside private locations (Saraiva, 2013).

Only a few authors actually regard vacant shops as healthy, as when they are deemed as a necessary step in the regeneration of city

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areas (Cachinho, 2014). Short term vacancies associated to continuous changing of tenants may indicate and above average economic activity and increased competition (Katyoka and Wyatt, 2008). The promotion of temporary, creative and sustainable spatial re-use of these spaces (Ferreri, 2015, Ziehl and Oßwald, 2015) may stimulate development and attract capital.

However, although there are many document cases of successful retail-led regeneration processes (Findlay and Sparks, 2009, Barata-Salgueiro and Erkip, 2014), the emphasis of planners and designers on the particular case of vacant shops is mostly placed after-the-fact. Vacancy rate is sometimes part of the range of indicators that describe the urban and economic rise and decline of a given area (Colin, 2010, Balsas, 2014), but is rarely regarded as an instrument for change. If, as the literature has shown, a particular retail environment can strongly contribute to increase the resilience and vitality of a certain urban area; then an unsuitable urban environment can also contribute to the lack of success of a shop. With that in mind, this study tests if there are correlations between specific morphological features and the appearance of vacant retail sites, and consequently contributes to the understanding of how morphological changes can contribute to overcome, and prevent, such cases.

Figure 1.
Location of the case study cities in Portugal

Methodology

This study stems from a wider research project that analysed the relationships between commercial spaces and urban form and structure in four Portuguese medium-sized cities (Saraiva and Pinho, 2017). The four cities; Vila Real, Aveiro, Leira, Évora (Figure 1) were selected due to their different locations in the country, sizes, number of inhabitants (between 20-60 thousand) and roles in the respective regional urban hierarchies.

The case study area comprised of the official urban perimeter limit set by each respective municipal plan. This area was further divided, for analysis sake, in two parts; the 'city center' – corresponding mostly to the downtown area and the historical city nucleus; and the remainder 'periphery'. An extensive data collecting process was performed at store/building level (see Saraiva, 2013).

Commercial spaces were catalogued by activity type, morpho-functional insertion in the building and street, and status (open or vacant). Vacant shops were divided into closed or empty. Closed shops still maintain billboards outside and/or products inside, but have closed due to licensing, financial or even personal problems. Empty shops are completely vacant, with many having never been occupied at all since construction.

Streets were characterized according to their type, width and accessibility (measured through Space Syntax). Blocks were characterized according to typology (full to hollow) and land-use mix. Buildings were characterized according to their type, amount of use, height, area, and age.

A total of 7.898 individual shop spaces, in the four cities, were thus georeferenced. Of these 1.312 (around 17%) were catalogued as vacant. First, statistics related to vacant shops were crossed with geographical and morphological patterns of each city. Second, a closer attention was given to the location of vacant shops in relation to a Space Syntax analysis of street segments.

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Cities		Vila Real	Aveiro	Leiria	Évora
Intervention area (m^2)	**City**	**23.662.406**	**17.856.603**	**36.259.245**	**13.474.660**
	% City Center	13,1%	13,3%	10,6%	7,9%
Number of shops	**City**	**1.397**	**2.221**	**2.505**	**1.735**
	% City Center	68,2%	56,5%	56,0%	48,4%
% of Vacant shops	**Total**	**9%**	**18%**	**20%**	**15%**
	Empty	3%	15%	14%	9%
	Closed	6%	3%	6%	6%
	% City Center	81,4%	57,4%	54,6%	40,4%
% of vacant shops in post1975 buildings	**City**	**60,6%**	**50,6%**	**72,2%**	**50,9%**
	City Center	62%	31,2%	66,8%	2%
	Periphery	54,2%	76,9%	78,9%	84,9%
Number of floors of buildings with vacant shops	**City**	**5 (24%), 2 (20%) and 4 floors (17%)**	**3 (26%), 2 (17%) and 4 floors (17%)**	**4 (24%), 5 (22%) and 3 floors (20%)**	**2 (36%), 3 (28%) and 1 floor (22%)**
	City Center	5 (25%), 2 (17%) and 4 floors (16%)	3 (32%), 2 (19%) and 6 floors (19%)	4 (23%), 3 (20%), 5 and 6 floors (15%)	2 (53%) and 3 floors (35%)
	Periphery	2 (33%), 4 (21%), and 5 floors (21%)	4 (18%), 3 (17%), and 5 floors (17%)	5 (28%), 4 (24%) and 3 floors (19%)	1 (31%), 2 (25%) and 3 floors (23%)
Building and street integration of Vacant Shops	**City**	**Next to other store spaces in the ground floor (gf) of a residential building (60%)**	**Next to other stores in the gf of a residential building (41%) or a building with homes and services (25%)**	**Next to other stores in the gf of a residential building (48%) or a building with homes and services (27%)**	**Next to other stores in the gf of a residential building (43%)**
	City Center	Next to other stores in the gf of a residential building (63%)	Next to other stores in the gf of a residential building (55%) or a building with homes and services (20%)	Next to other stores in the gf of a residential building (43%) or a building with homes and services (32%)	Next to other stores (52%) or isolated (20%) in the gf of a residential building
	Periphery	In a purposely built structure (25%), or in the gf of a residential building without adjacent stores (21%)	Next to other stores in the gf of a residential building (41%) or a building with homes and services (35%)	Next to other stores in the gf of a residential building (55%) or a building with homes and services (21%)	Next to other stores in the gf of a residential building (37%) or a building with homes and services (20%)
Most common activity type identifiable in 'closed' shops	**City**	**Restaurants/ Cafés (18%) and Services (11%)**	**Restaurants/ Cafés (7%) and Home products (5%)**	**Services (10%) and Restaurants/ Cafés (8%)**	**Restaurants/ Cafés (15%), Services and Home (both 6%)**
	City center	Restaurants/Cafés (16%) and Services (12%)	Restaurants/Cafés (7%) and Services (4%)	Services (10%) and Restaurants /Cafés (9%)	Restaurants/Cafés (15%) and Home (12%)
	Periphery	Restaurants/ Cafés (29%) and Food & Beverage (21%)	Restaurants/ Cafés (6%) and Services (5%)	Services (10%) and Restaurants /Cafés (8%)	Restaurants/ Cafés (12%) and Services (6%)

Table 1.
Characterizing data of case studies and vacant shops

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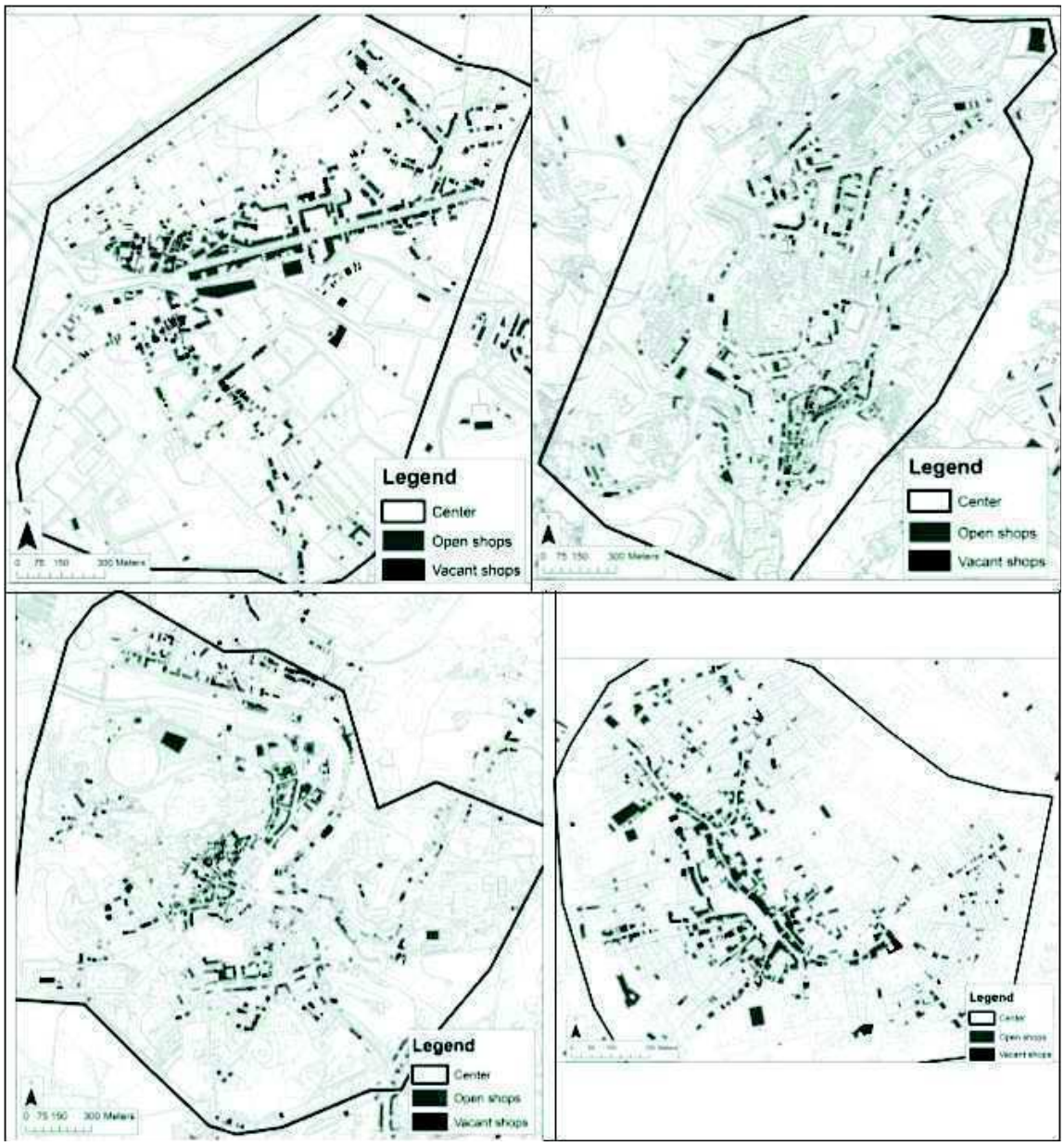

Figure 2.
Vacant shops in the city centres of Aveiro, Vila Real, Leiria and Évora

The pattern of vacant shops

Table 1 shows that around 10-20% of all shop spaces in the four cities are vacant. These are mostly located in commercial rows adjacent to other stores on the ground floors of 3-4 floor buildings with upper residential or service occupation, and predominantly constructed after 1975 (50-70%).

In city centers, vacant shops are mainly either in the traditional areas, such as old historical blocks, composed by a more condensed street network and smaller building heights; or in larger axes of higher multifunctional buildings of recent construction (Figure 2).

In the first location vacant shops are mostly associated to smaller, second-level commercial streets, adjoining major traditional commercial hubs, which have now been replaced by close-by newer, wider, more accessible and integrated shopping streets/multi-commercial establishments. It is also here that most closed shops were found, a clear side of downturn in historical centres.

On the contrary, the second location is mostly constituted by empty shops. It can be

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Figure 3.

Model and aerial photograph of the commercial island in Cónego José Pereira Lacerda Street in Marinheiros, Leiria; showing vacant shops (aerial photograph taken from www.bing.com)

inferred that here the increase of commercial offer may have been unjustified, particularly as in many cases bustling commercial arteries are, literally, around the corner. This may also well explain why Évora's city centre has the smallest percentage of vacant shops (40%): as it is a world heritage site, there is hardly any new construction therein. And it may also explain why Vila Real is the only city with more closed than empty shops. Its traditional historical centre is still the most important commercial hub within the city, and the newer area North of the centre (where most empty shops are located) has not presented and excessive, or excessively competitive, offer.

Most stores which were catalogued as closed (previous occupation was established) are related to first necessity products such as restaurants, cafés and supermarkets; to products for the home, and to Services, either commercial or cultural-related (Table 1). Almost 1 in every 10 'Restaurants & Cafés' and 'Food & Beverage' shops in all four city centers was catalogued as closed, as were home-related shops in the centers of Leiria and Évora (9% and 13%) and 'Leisure and culture' shops in the center of Vila Real (13%).

The peripheries contain little less than half of the vacant stores in all cities but Vila Real (19%), whose peripheral contains several semi-rural areas, hence little new construction and few shops. Not considering this outlier, a remarkable correlation was found between vacant shops and post 1975 buildings; 77% in Aveiro, 79% in Leira and 85% in Évora. Most are located in what Saraiva and Pinho (2017) called 'commercial islands'; concentrations of shops on the ground floors of recently constructed multi-family buildings in otherwise entirely residential neighborhoods. Although these 'islands' have tried to respond to the shortage of commercial establishments in these areas (formerly served by few traditional small-scale shops), hardly any is with full commercial occupancy, even those in large residential concentrations. In fact, some display indisputable signs of dereliction. For example, in the Marinheiros' district in Leiria (Figure 3), 9 out of the 15 shops available are vacant, despite the fact that this is one of the most densely populated residential neighborhoods just North of the city center. In Évora, where the periphery has evolved precisely as a series of pockets of residence along expansion axes, the amount of vacant shops in these conditions is the highest.

Consequently being close to market is not necessarily a guarantee of success. In fact, the only store types apparently successful in 'commercial islands' relate mostly to first necessity (newsstands, coffee shops, hairdressers…).

Outside the main residential suburban areas, vacant shops are harder to find, but the total amount of store spaces is also few. Closer to the border of the urban perimeter the smaller and traditional commercial structure (often less than 10 stores) serves a proximity purpose and thus was unaffected by the appearance of new residential neighborhoods and respective 'commercial islands'. Only when these are built too close to the traditional network can

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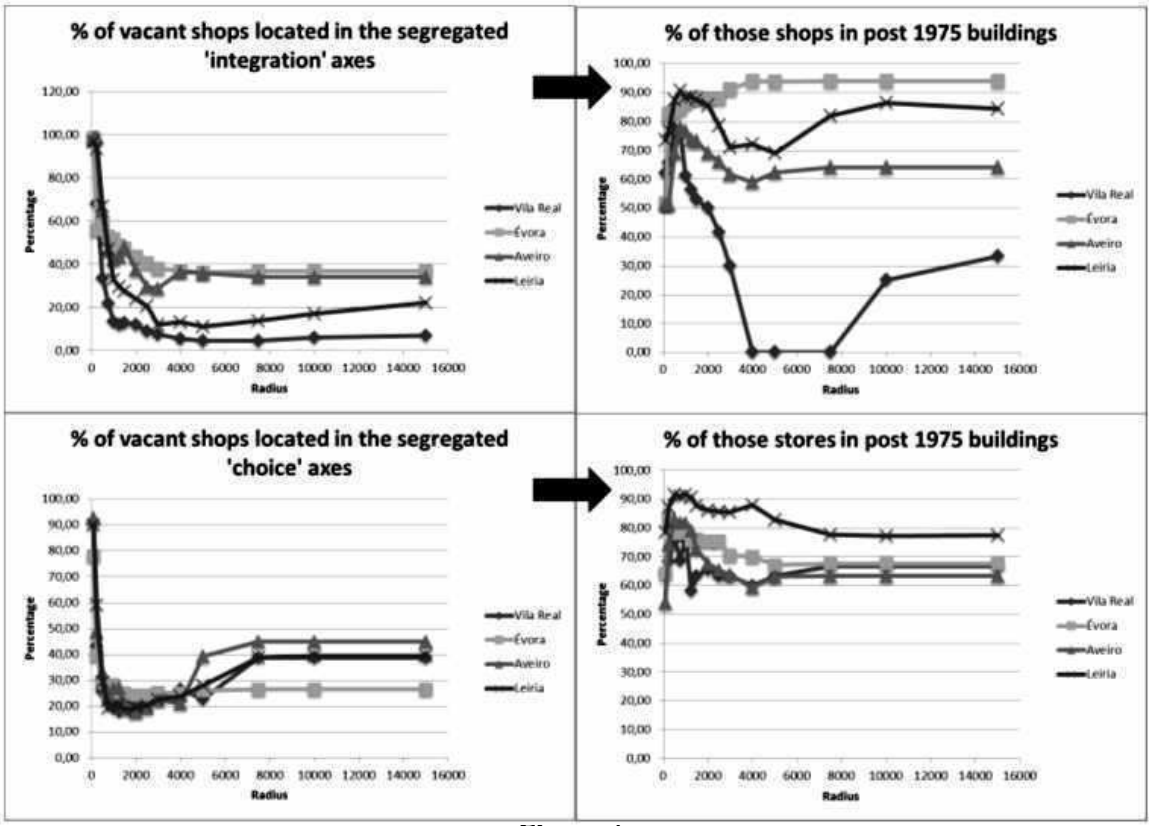

Figure 4.

Percentage of vacant shops located in segregated axes, both for 'choice' and 'integration', and the respective percentage in post 1975 buildings

they become a competitive alternative. In Leiria, 7 out of the 12 shop spaces in a one block radius around the peripheral train station are vacant. But this neighborhood is the area of Leiria with the greatest residential/commercial development in recent years.

Consequently, in peripheries closed stores are mostly associated to restaurants/cafés and the proximity services mainly found in 'commercial islands' (Table 3). Noteworthy is that one fifth of all closed stores in Vila Real's periphery relate to 'Food & Beverage', denoting the competition of larger supermarkets. 'Leisure and culture' and 'Fashion' establishments also have a tendency to be found closed, both sub-activities par excellence of modern multi-commercial 'box' formats.

Vacant shops and accessibility

A Space Syntax segment analysis was performed at various radii. The segments were then divided (using Jenks' 'Natural Breaks') into six quantiles, ranging from the most central (first) to the most segregated (sixth).

Contradicting what has been acknowledged for larger cities, the first noticeable result is that, excluding the local scale (very small radii), less than 40% of vacant shops are actually located in segregated segments (Figure 4).

The correlation is lowest in Leiria and Vila Real, particularly in terms of 'integration', and in Évora for 'choice'. This can be related to the intrinsic form of these cities. Vila Real and Leiria's peripheries are composed of former satellite villages that slowly become part of the urban perimeter, and thus contain local central streets (natural destinations) where shops are located. On the other hand, Évora has expanded through rays-of-the-sun axes (travel-through thoroughfares) from the city center, and so even commercial 'islands' have much better connection (higher 'choice') than centrality.

Other noticeable result is that with the exception of Vila Real for 'integration' (above mentioned reasons apply), over 60% of these vacant shops in segregated segments are in post 1975 buildings.

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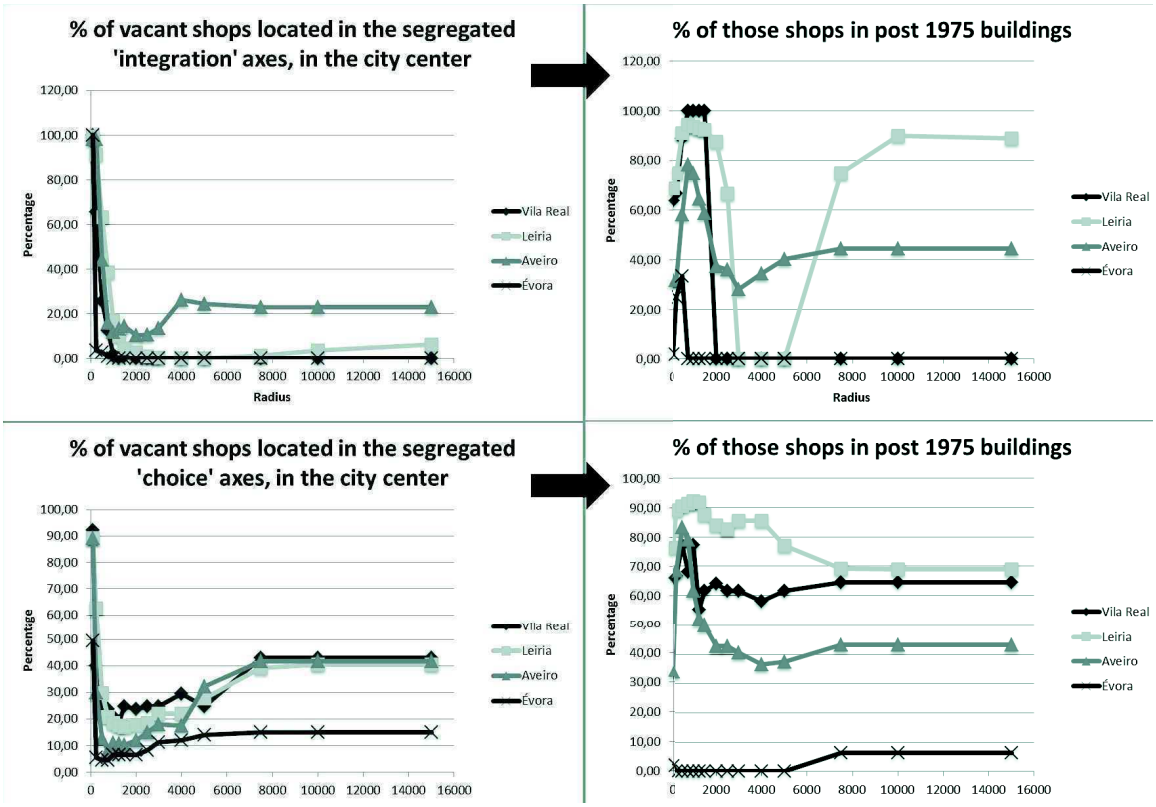

Figure 5.

Percentage of vacant shops, in the centers, that are located in segregated lines, both for 'choice' and 'integration', and the respective percentage in post 1975 buildings

Looking specifically at the city centers (Figure 5) it is confirmed that vacant shops do not have a strong association to segregated segments, with values close to zero after a 1 km radius except in Aveiro (20%). This reinforces the notion that these medium-sized city centers are clear overall destinations, even at larger distances, and that shops are mostly located in those centrality axes.

Locally, most vacant shops in segregated segments are in post 1975 buildings. Globally, values drop considerably, particularly in the range between r= 3.000-5.000 where the potential of centrality of the city centre is maximized (Saraiva, 2013). At higher radii, almost 90% of Leiria's centre shops in segregated 'integration' segments are in post 1975 buildings, namely newer residential developments at the edge of the centre area. In Aveiro this value is about 40%.

For 'choice' the number of vacant shops in segregated segments is higher, which may corroborate the notion that center shops prefer to be in destinations rather than in distributors. With the exception of Évora's smaller world heritage center, with a retail structured around main axes, the cities display strikingly similar patterns. Locally, 10-20% of vacant shops are in segregated 'choice' segments, with this number increasing to around 40% at higher radii. Again, the new residential/service/commercial sites constructed in segregated areas at the edges of the center boundary are the ones which display greater difficulty in finding tenants. Proving this point is the fact that the percentages of these stores in post 1975 buildings is higher (between 70-80%) precisely in the two centers with more shop spaces in newer buildings: Vila Real's and Leiria's.

In peripheries (Figure 6) and for 'integration', at radii under r= 2.000, more than three quarters of vacant shops in Évora and Aveiro, and over half in Leira and Vila Real, are in segregated segments. Furthermore, with the obvious exception of the outlier Vila Real, over 80% of vacant shops are in buildings constructed after 1975. 'Commercial islands' outside local

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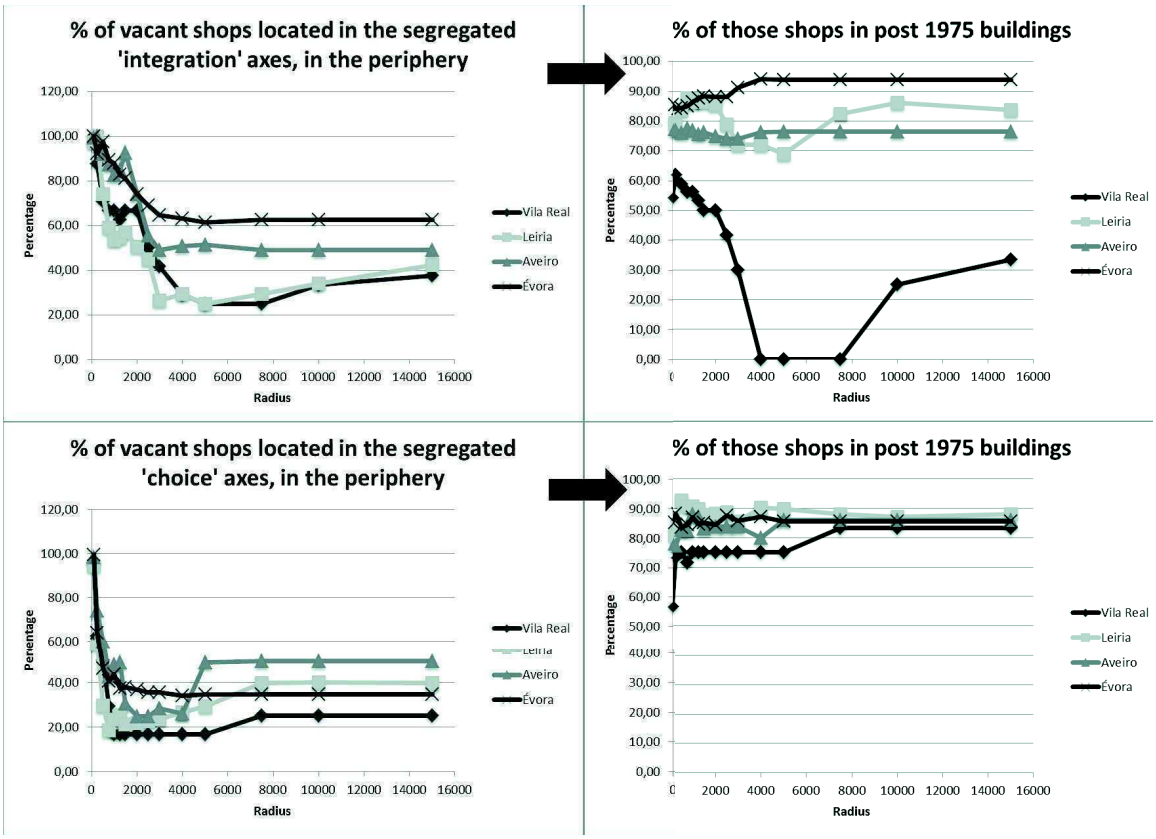

Figure 6.

Percentage of vacant shops, in the peripheries, that are located in segregated lines, both for 'choice' and 'integration', and the respective percentage in post 1975 buildings

centralities thus constitute the hot-spot of vacant shops in the peripheries. Globally, between 40-60% of vacant shops are in segregated 'integration' segments. The value is greater in Évora, where most commercial islands are within peripheral residential neighborhoods, hence farther from to-movement axes. When a greater portion of the city is more accessible (between r= 3.000 and r= 7.500) all of Vila Real's periphery vacant shops are in pre-1975 buildings. This is because there are very few new buildings with store spaces in the farthest areas of the urban perimeter.

For 'choice' there are between 20-30% of vacant shops in segregated segments at a local scale and between 30-50% at a global scale. The main commercial locations of the suburbs are generally located near through-movement thoroughfares leading to the city center. Aveiro, with the highest value globally (50%) is precisely the city where these connecting axes are fewer. Another evidence is the overwhelming amount of vacant shops in post 1975 buildings in the segregated axes of the suburbia. With the exception of Vila Real for lower radii (75%), this number is, for all radii and all peripheries, superior to 85%. Again these seem to relate to commercial islands and other commercial developments which have not complied to what seems to be the periphery's golden rule: shops need to be located close to high 'choice' segments.

Conclusion

It is generally acknowledged that the reasons for the appearance of vacant shop include the economic crisis, the competition from big 'box' malls and outdated commercial rent laws.

However, there could be other motives. In Portugal, the suburban expansion of the 1990s and municipal policies which stipulated that buildings of a certain size, regardless of

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location, had to contain shop spaces, has led to an excess of offer and consequently to a profuse dispersion of shop spaces (Saraiva and Pinho, 2017). Retailers, unaided by proper commercial planning, opened their shops where they would or could and many commercial locations such as suburban 'commercial islands' or older downtown streets became a derelict scenario of vacant shops.

What this paper has shown is that the importance of the morphological insertion of a shop within a city cannot be neglected. Different shops have different necessities and not all need to be close to market. The way they relate to the building fabric, the network structure and the land-use mix are also important. A high number of shop spaces on a high-density suburban residential neighbourhood may be excessive, if residents only need first necessity establishments and will perform other types of purchase elsewhere. Vacant shops are intrinsically associated to buildings of relatively recent construction (past 40 years), but also because this construction has led to an exponential increase of commercial area available for rent. It should be questioned whether such area is necessary, taking into account the social and urbanist consequences of vacant shop strips.

The common assumption of Space Syntax literature that stores will underperform in segregated axes may also not be entirely true in suburban areas or smaller-sized cities. A less than expected correlation between segregated segments and vacant shops was found (20-30%). This is because most store spaces are in the centres, places where the principal axes of commerce have always a high 'choice' and especially a high 'integration'. Indeed, the case study city centers are clear overall destinations, even at larger distances, and shops need to locate mostly in those centrality axes, highlighting the durability of secular commercial streets. But in peripheries, the correlation is much more perceptible, namely for 'integration'. Open shops are found much more on local than on global centralities, but primarily they are attracted to the distributing travel-through axes.

As Katyoka and Wyatt (2008) state, vacancy may seem a relatively simple concept/problem, but it actually takes on a complexity that needs to be unravelled before drafting and implementing national and local policies and development strategies. Decision makers should be concerned with the undesired spatial and socio-economic consequences of commercial transitions. But as Teller (2008) points out, it is much easier to control commercial mix within a private space than in the street. However, mechanisms should be devised to understand for each specific store type not just the economic and geographical, but the urban and hierarchical retail conditions that may guarantee its success. With this goal in mind, the permissiveness of construction in general and of licensing commercial establishments in particular could be substituted by a more comprehensive and demanding vision of how commerce behaves in cities that would ultimately be much more beneficial to urban spaces.

Acknowledgements

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Spatial distribution of economic activities in heritage cities: The case of the historic city of Toledo, Spain

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Abstract. *This paper presents the initial results of an ongoing research on the spatial distribution of economic activities in Spanish heritage cities. The study investigates the influence of spatial accessibility and proximity to monuments on the location of businesses in the historic city of Toledo. The research includes two surveys of the entrances to monuments and ground floor businesses within the old town, and uses space syntax techniques and tools to determine spatial accessibility. Then, a GIS model of the street segments of the city registers this information. Statistical analysis suggests spatial accessibility and proximity to monuments have a significant impact on the distribution of business in the old town and investigates further to understand and quantify this effect. However, it does not find strong correlations between the considered variables nor a suitable model to explain the differences in business intensity across the street segments within the historic city of Toledo.*

Keywords: urban morphology, urban economics, space syntax, land uses, heritage cities

Introduction, research objective and case study

Cities are socio-physical entities on a continuous and continuing evolution. For the case of historic cities in Spain—also in Europe and many other world regions—this process of readjustment has been going on now for over two thousand years. After this time, far from reaching any sort of equilibrium, many old towns suffer serious social and material decline. Among these ancient human settlements, our society recognises heritage cities are the most valuable fragments of built environment. As such, they deserve our greatest efforts to assure they survive as urban tissues in the best shape. To guarantee their endurance and sustainability it is important to lookout their socio-economic status even better than their monuments.

To date, existing studies on the economy in historic cities have been formulated without invocating space. It has been widely considered that space is a background to human activity. Quite differently, space syntax approach considers space "as an intrinsic aspect of everything human beings do" (Hillier & Vaughan, 2007: 208).

Previous research claim that the spatial configuration of the street layout has an important effect on pedestrian movement (Hillier, 2002; Hillier et al., 1993), the location of prominent urban elements (Hanson, 1989; Karimi, 2000), and the distribution of land uses types and densities (Froy, 2015; Kim & Sohn, 2002; Lee & Kim, 2009; Min, Moon, & Kim, 2007; Narvaez, Penn, & Griffiths, 2013; Shen & Karimi, 2017).

This research investigates the spatial logic of economic activities in heritage cities with high tourism activity, using space syntax theories and tools. The main objective is to understand the distribution of ground floor businesses, or,

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in Conzen's words, their "pattern of urban land use" (Conzen, 1960: 4).

Based on previous research and observations (Troitiño et al., 1998; Zárate, 2007; Ruiz-Apilánez et al., 2015), the hypothesis is that high spatial accessibility and proximity to monuments might be important to understand the location of economic activities in heritage cities, such as the historic city of Toledo.

Toledo is the capital of Castille-La Mancha and was the imperial capital during the 16th century. Currently, it has a population of 83,000 people. 11,000 inhabitants live in the old town. The study focuses inside the walls of the city, covering an area close to one square kilometre. The old town has an organic medieval street network. The river Tagus surrounds it on two thirds of its perimeter and it has limited connections with the rest of the city, which has been mostly developed since the mid-20th century. It shows a great number of monuments—including buildings such as the cathedral, the town hall, and university buildings, as well as other constructions such as walls, gates, and bridges—and, since the late 1990s motor traffic is restricted in most of the street network.

Research methods

This section addresses two main issues. First, how this study contemplates the three investigated aspects of the urban tissue within the historic city of Toledo: (1) the distribution of businesses located on the ground floor, (2) the spatial accessibility of streets, and (3) the location of monuments. Second, how this study analyses the relation among these three factors.

In the first place, the method determines a set of variables that represent the three investigated aspects. The following paragraphs describe these variables in detail but, before, it is important to explain the method needs to define a spatial element to which all variables are linked. This spatial element is the street segment. In this research, street segments are generated after an axial map, using Depthmap software. The axial map comprises the whole city of Toledo, being the old town a part of it. The street segment model (Figure 1) is an updated version of an earlier one that was tested in previous research, e.g. Arnaiz et al. (2013) and Ruiz-Apilánez et al. (2015). Since motor traffic is restricted in the old town—most streets are only accessible to neighbours

Figure 1.
Street segment model of Toledo. The historic city (in black) surrounded by the rest of the city (in grey)

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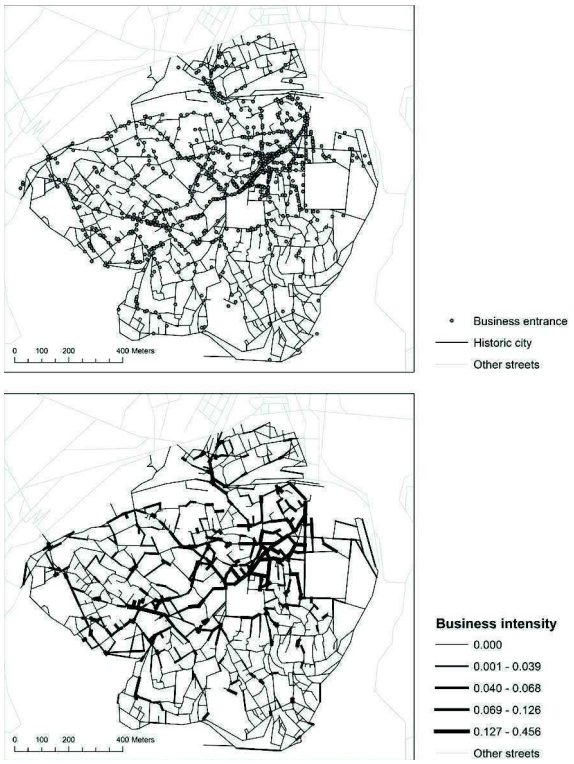

Figure 2.

Ground floor business in the historic city of Toledo. Above: location of business entrances. Below: business intensity (number of business entrances per metre of street segment)

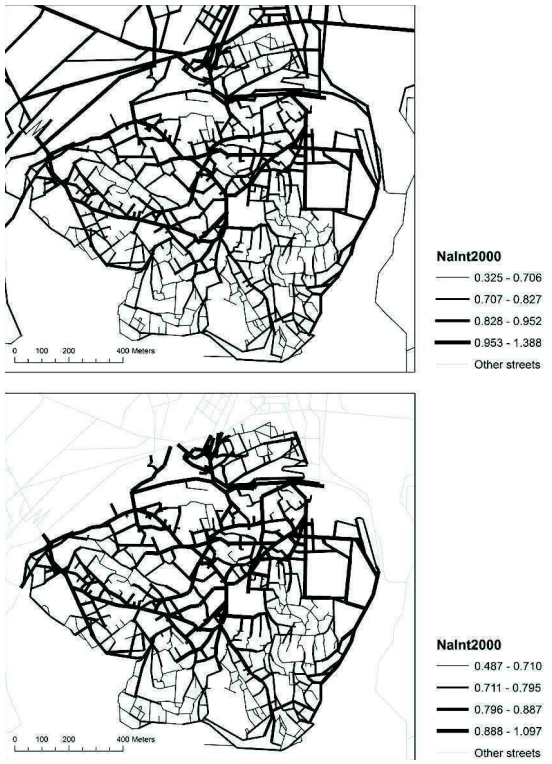

Figure 3.

Spatial accessibility in the historic city of Toledo. Above: space syntax variables are obtained considering the whole city. Normalised integration (r = 2000 m). Below: statistical analysis only considers the street segments in the historic city. Normalised integration (r = 2000 m) for the street segments in the historic city

and deliveries—movement within the historic city is mainly on foot. Consequently, the current model includes all the streets and accesses reserved for pedestrians, including two escalators in the north and northeast edges of the historic city. The method uses GIS to register the information regarding the three variables by linking them to the street segments.

This study deals with the location of businesses through the variable 'business intensity'. To calculate this variable, the first necessary step is to register the location of the ground floor accesses to these businesses (Figure 2, above). Then, each entrance is assigned to the adjacent street segment. Most entrances are linked to only one street segment, but there are a few exceptions, such as entrances on street corners, that are assigned to two street segments. As a result, each segment has a number of business doors linked to it. Businesses intensity is the result of dividing the number of entrances between the length of the corresponding street segment. This variable mostly represents the retail intensity of each street segment (Figure 2, below).

To consider the position of these entrances within the street network, the street segment model is analysed using space syntax techniques and tools. The method assigns a set of spatial variables to each street segment, including normalised integration and normalised choice (for radii 500, 1000, and 2000 metres, and radius n, which considers each street segment in relation to the full model). This series of variables represent the spatial accessibility of each street segment. Integration and choice are the two fundamental space syntax measures of "accessibility for to-movement" and "through-movement potential" (Hillier & Vaughan, 2007: 212). The calculations of the space syntax variables consider the full model

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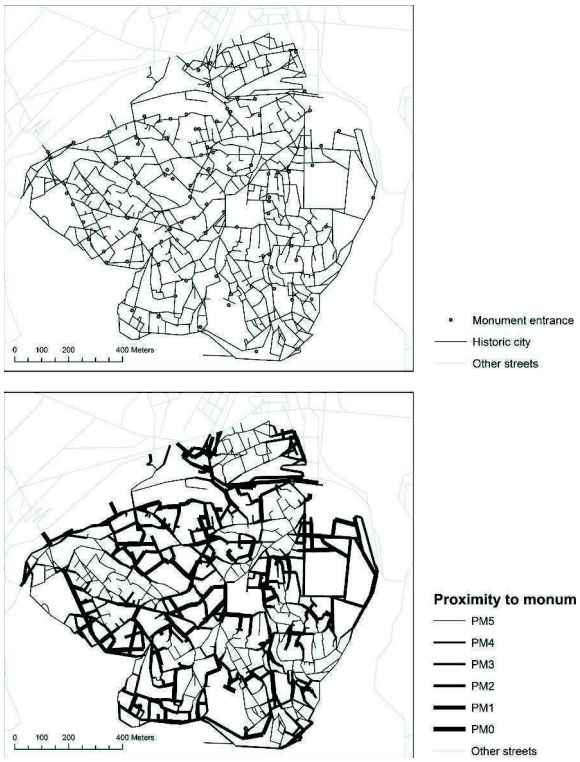

Figure 4.

Presence of and proximity to monuments in the historic city of Toledo. Above: location of monument entrances. Below: proximity to monuments.

although the statistical analysis only considers the segments within the historic city (Figure 3).

There, statistical analysis will show moderate-high correlation between the eight space syntax variables, being normalise integration (r = 2000 m) the space syntax variable that better explains the location of economic activity. Therefore, in some phases of the analysis, the spatial accessibility of the street segments is characterised only by this one variable. The following section further describes this matter.

To study the role of monuments, the method defines the variable 'proximity to monuments', which provides a measure of how distant a street segment is to a monument entrance. To determine the variable it is first necessary to register all entrances to listed monuments in the historic city (Figure 4, above). The study includes all listed monuments in the old city—at national, regional and local levels. This factor (categorical) variable classifies the street segments in six groups, from PM0 to PM5 (Figure 4, below).

Street segments with an entrance to a monument belong to group PM0. Street segments connected to any of the preceding segments (PM0) fall into group PM1. Street segments linked to a segment of the preceding group (PM1) but not in the first group (PM0) belong to group PM2. Correspondingly, the method determines the street segments that go to groups PM3 and PM4. Street segments not included in any of the five preceding groups (PM0 to PM4) constitute group PM5.

Thus, this variable indicates if a street segment either gives access to a monument (PM0), is one to four segments away from a monument entrance (PM1 to PM4), or is more than four segments away from a monument entrance (PM5).

Once the three aspects are characterised by the three kinds of variables—economic (businesses intensity), spatial accessibility (space syntax variable/s), and historic/touristic (proximity to monuments)—the method applies further statistical analysis to investigate the relation between these variables.

The first two parts of the study, which deal with the location of businesses, include two complementary analyses. The first one studies the corresponding variable as dichotomous, displaying only two possible values: zero or one. Zero means the street segment has no access to businesses on the ground floor; one means the street segment has one or more entrances to businesses. The second investigates the continuous numeric variable 'business intensity'—number of entrances to ground floor businesses, considering both sides of a given street segment, divided between the length of the segment. In the historic city of Toledo, when different to zero, this variable shows positive values from 0.003 (approximately, one entrance in 300 metres) to 0.456 (approximately, one door every 2 metres, or 45 entrances in 100 metres).

Each of the three following sections discusses the results of analysing the relation between: (1) location of businesses and spatial accessibility; (2) location of businesses and location of/proximity to monuments; and (3) location of/proximity to monuments and spatial accessibility.

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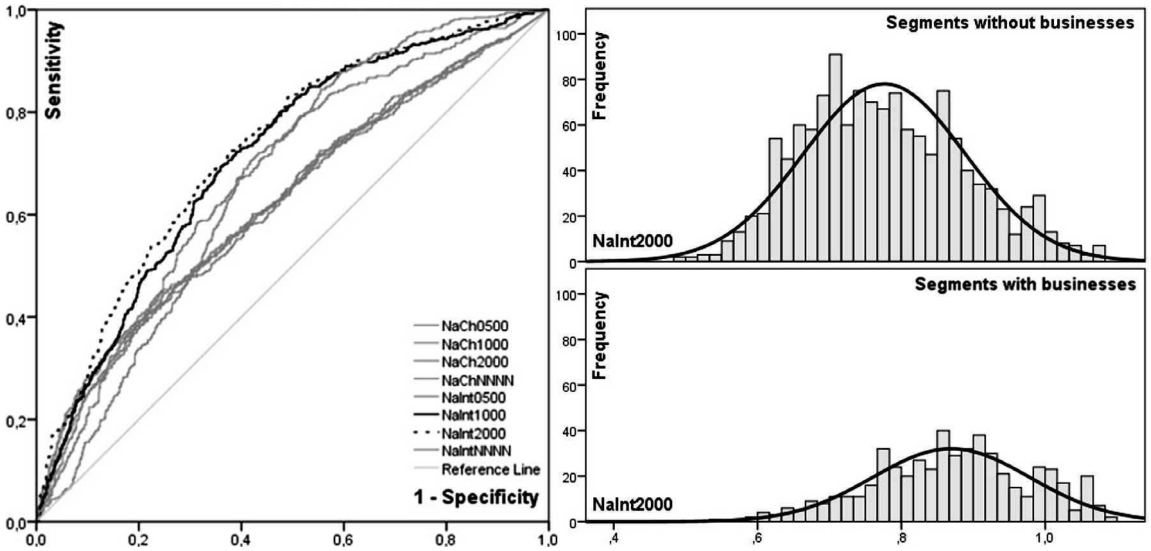

Figure 5.

Left: ROC curves for businesses prediction using space syntax variables as indicator (normalised integration and choice for radii 500, 1000, and 2000 metres, and radius n). Right: histograms and probability density functions of spatial accessibility (normalised integration, r = 2000 m) for street segments with (below) and without (above) businesses.

Location of businesses and spatial accessibility

This section investigates if the spatial accessibility of a given street segment affects the presence and number of businesses on the ground floor of the adjacent buildings.

In the first place, the study differentiates between two groups of street segments within the historic city: street segments with entrances to businesses and street segments without them. Then, statistical analysis explores if there are significant differences in accessibility between these two groups. The study considers a set of eight space syntax variables: normalised integration and normalised choice for radii 500, 1000, and 2000 metres, and radius n (each segment in relation to every other segment of the model).

Two-sample t test examine whether or not two independent populations—segments with and without businesses, respectively, 527 and 1321segments in the old city—have different mean values on these space syntax variables. The results show that the differences are significant for the eight investigated variables ($p < 0.05$ in all cases), with higher means for the streets segments with businesses.

Then, considering each of the space syntax variables to be the independent variable, statistical analysis investigates if any of these spatial variables can discriminate between the two kinds of street segments (with vs. without business entrances). For this purpose, the study generates receiver operating characteristic (ROC) curves (Figure 5, left).

The area under the curve (AUC) indicates the probability that the given independent variable—the one used to plot the curve—properly classifies the street segment as a segment with/without entrances to businesses. The test accepts probabilities higher than 0.7. This is the case of integration, r = 1000 m (AUC = 0.709), and integration, r = 2000 m (AUC = 0.725). The latter is the spatial variable that better discriminates between the two kinds of street segments.

For example, setting a cut-off value of 0.79 for normalised integration (r = 2000 m), sensitivity and specificity values are 0.75 and 0.60, respectively. In this context, sensitivity is the ability of this spatial variable to correctly classify a street segment as one with business entrances; while specificity is the ability of this spatial variable to correctly classify a segment as one without business entrances (Figure 5, right).

Once the analysis has shown there is an effect of the spatial variables on the economic variable, in the sense that some of the former

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can discriminate between street segments with businesses and without them, the study intends to understand this influence between variables better.

To address this question, the next step was to evaluate possible correlations between business intensity and the defined set of space syntax variables. However, Spearman coefficient (SC) values show weak correlation between business intensity and six accessibility variables (SC < 0.3), and weak-to-moderate correlation between business intensity and the other two: integration, r = 1000 m (SC = 0.34), and integration, r = 2000 m (SC = 0.37).

There are two other remarkable facts regarding accessibility variables in the old town. First, there are high correlations (SC > 0.7) among integration variables (0.739 < SC < 0.937) and choice variables (0.895 < SC < 0.998). Second, given the same radius of analysis, integration and choice variables for the same radius of analysis (500, 1000, and 5000 m, and n) moderate correlations (0.529 < SC < 0.600).

Since the analysis rejects any linear regression model, the study investigates other possible models. The search begun by plotting the scatter graphs for business intensity vs. each one of the space syntax variables considered in the analysis: normalised integration and choice, for radii 500, 1000, and 2000 metres, and radius n (Figure 6). However, no one shows any recognizable pattern. This fact suggests that spatial variables are not enough to explain the location of business in the historic city of Toledo.

Given the impossibility of finding a model based on the considered space syntax variables, but knowing that integration, r = 1000 m and r = 2000 m, discriminate between street segments with businesses and street segments without them, the study further investigates the relation between business intensity and integration, r = 2000 m, since it is the spatial variable that better explains the location of businesses in the historic city of Toledo.

Further statistical analysis recodes normalised integration, r = 2000 m, as a factor (categorical) variable. The recoding assigns each street segment to one of four groups (IntQ1, IntQ2, IntQ3 or IntQ4) depending on the

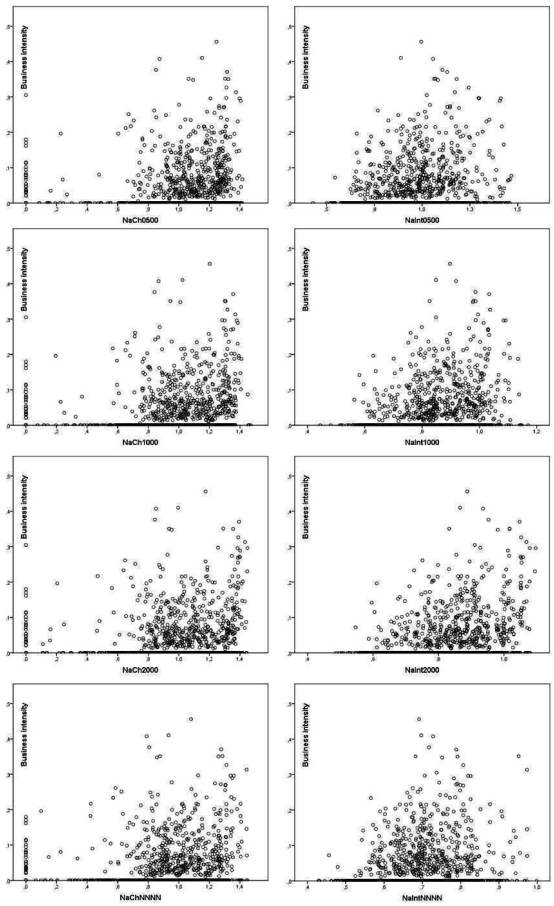

Figure 6.

Scatter graphs for business intensity vs. the eight space syntax variables considered in the study (normalised integration and choice for radii 500, 1000, and 2000 metres, and radius n).

quartile it belongs according to its integration value. IntQ1 corresponds with the first quartile (street segments with lower integration values) and IntQ4 corresponds with the fourth quartile (segments with higher integration values).

Then, the study searches throughout an ANOVA analysis a model that explains business intensity based on the quartile of the street segments. Levene test indicates the variances of the four groups are significantly different (L = 153.5; p < 0.05). Welch (W = 68.5; p < 0.05) and Brown-Forsythe (B-F = 1112.6; p < 0.05) tests show there are significant differences among the mean values of the four quartiles. The predicted business intensity values for a street segment belonging to groups IntQ1, IntQ2, IntQ3, and IntQ4 are 0.006, 0.015, 0.027, and 0.058, respectively.

Last, Games-Howell test indicates there are significant differences (p < 0.05 in all cases)

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between the mean values of business intensity for every pair of groups (IntQ1 vs. IntQ2, IntQ1 vs. IntQ3, IntQ1 vs. IntQ4, IntQ2 vs. IntQ3, IntQ2 vs. IntQ4, and IntQ3 vs. IntQ4).

Since all the means are significantly different from each other, it is possible to state that business intensity is actually different among these four groups of street segments. In fact, the actual business intensity of the segments in the top quartile, IntQ4, suggest that the most integrated street segments (the top twenty–five per cent) do support some significant business activity. The observed mean business intensity in those segments (0.058 entrances per metre) corresponds with almost six business entrances in a hundred metres.

Location of businesses and proximity to monuments

The section on research methods has already presented how this study divides the street segments of the historic city in six groups based on their proximity to monuments, ranging from PM0 to PM5. Group PM0 include every street segment with direct access to a monument; segments in groups PM1 to PM4 are one to four segments away from a monument entrance, respectively; and those in PM5 are further away from any monument.

As in the preceding section, the statistical analysis that investigates if the presence of or proximity to monuments influence the location of businesses begins considering the latter as a dichotomous variable that only classifies street segments in two kinds: those with one or more business entrances and those with none. Then, the study examines the percentage of segments with and without accesses to businesses for the six groups of street segments (PM0 to PM5) depending on their proximity to a monument entrance.

Cramer's V test ($p < 0.05$) indicates there is association between the two investigated variables. Moreover, the percentage of street segments with business entrance gradually decreases from group PM0 (62.2 %) to PM5 (19.1 %). The percentages for groups PM1 to PM4 are 4.9, 31.1, 28.2, and 27.9, respectively. The analysis confirms that, in the historic city of Toledo, the number of businesses in a given street segment depends on its proximity to a monument entrance.

Second, the study investigates if it is possible to explain this relation better using an ANOVA model. To do so, economic activity is represented by the variable 'business intensity'—a continuous numeric variable defined as the number of entrances to businesses on both sides of a given street segment, divided between its length.

Levene test shows the variances of the six groups are significantly different ($L = 3.461$; $p = 0.004$). Welch ($W = 2.993$; $p = 0.011$) and Brown-Forsythe (B-F = 2.621; $p = 0.023$) tests show there are significant differences between the business intensity medians of the different groups, depending on their proximity to monuments. The predicted business intensity values for a street segment belonging to groups PM0 to PM5 range from 0.036 to 0.020. This means that the density of businesses entrances is eighty percent higher on the street segments with access to a monument that in those segments located more than four segments away from a monument.

Conversely, Games-Howell test indicates that the only significant difference between the mean values of business intensity happens between groups PM0 and PM5 ($p = 0.034$). This suggests that the concentration of businesses in street segments with access to monuments is clearly higher than the average concentration of businesses in street segments more than four street segments apart. Business intensity along those street segments in between does not vary significantly. The next most significant difference occurs between PM0 and PM1 ($p = 0.073$)—the segments that give access to monuments and the adjacent segments.

Spatial accessibility and proximity to monuments

This section discusses the analysis of the relation between the location of monuments and their spatial accessibility within the street network, for the case of the historic city of Toledo.

First, the study investigates if the street

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segments providing access to monuments show higher spatial accessibility (normalised integration, r = 2000 m) than the rest of the street segments of the historic city. To do so, first, street segments are divided in two groups: those with access to a monument and those without access to any. The two-sample t test confirms that street segments with access to a monument are significantly more integrated than the rest of the segments in the historic city—being the confidence interval (γ=95%) positive (0.005, 0.055). However, the mean integration for a street segment with access to a monument is 0.83 while it is 0.80 for a segment without access to a monument. Therefore, the differences in spatial accessibility are statistically significant but less than four per cent higher for the segments with an entrance to a monument.

However, since this study has already classified the street segments in six groups (PM0 to PM5), depending on their proximity to a monument entrance, statistical analysis can further investigate the relation between spatial accessibility (normalised integration, r = 2000 m) and the location of monuments (PM).

The analysis studies if an ANOVA model can explain the differences in integration among PM groups. Levene test shows the variances of the six groups are significantly different ($L = 2.992$; $p = 0.011$), and Welch ($W = 20.92$; $p < 0.05$) and Brown-Forsythe (B-F = 18.98; $p < 0.05$) tests show there are significant differences between the integration means of the different PM groups. The predicted normalised integration (r = 2000 m) values for a street segment belonging to groups PM0 to PM5 are 0.831, 0.836, 0.819, 0.803, and 0.765, respectively.

Games-Howell test indicates that mean integration values are significantly different ($p < 0.05$) between group PM5 and the other five (groups PM0 to PM4), as well as between PM1 and PM4 ($p = 0.017$). This implies that street segments with access to monuments and those linked to them (PM0 and PM1) are significantly more integrated than those street segments two or three segments away from a monument (PM2, PM3 and PM4). Moreover, the average integration of the latter (PM2, PM3 and PM4) is significantly higher than the average integration of the rest of street segments in the historic city (PM5).

If regrouping the street segments according to the significant differences between the means of PM0 to PM5 revealed in the preceding tests, further statistical analysis shows that mean integration for the new groups formed by PM0 and PM1 (PM0-1); PM2, PM3 and PM4 (PM2-4); and PM5 are 0.834, 0.814, and 0.765, respectively. Statistics show they are all significantly different between each one of the new groups, although the differences are not so relevant, 2.4 per cent between PM0-1 and PM2-4, and 6.4 per cent between PM2-4 and PM5)

Conclusion

The main objective of this study has been to understand the distribution of ground floor businesses in heritage cities with high tourism activity. Based on previous research and observations the study has investigated the influence of spatial accessibility and the proximity to monuments in the location of economic activities, in the historic city of Toledo, Spain.

This study confirms there are significant differences in spatial accessibility and proximity to monuments between street segments with and without businesses. Therefore, the analysis suggests that both variables affect the location of ground floor business.

The analysis reveals that, in the historic city of Toledo, integration (r = 1000 m, and r = 2000 m) is useful to anticipate weather a street might support economic activity or not. The study shows there is a specific probability that a random street segment of the historic city has businesses if its spatial accessibility is greater than a certain value. For example, the probability that a street segment with businesses has normalised integration (r = 2000 m) above 0.79 is 0.75; while the probability that a street segment without businesses has normalised integration (r = 2000 m) below 0.79 is 0.60. Other characteristics of an urban tissue might explain the location of businesses better, either alone or in combination with the ones investigated here. Urban morphology

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would benefit from further research on this area since the investigated variables are not enough to understand the distribution of economic activities. The analysis shows weak correlations between business intensity and any of the examined space syntax variables (normalised integration and choice for radii 500, 1000, and 2000 metres, and radius n). It does not find an accurate model to explain the location of businesses in the old town based on space syntax variables or the proximity to monuments.

However, considering normalised integration (r = 2000 m) the study finds significant and remarkable differences in the means of business intensity among the street segments of the different quartiles. Similarly, when the analysis investigates the effect of proximity to monuments, the results show significant and notable differences between the mean business intensity of the street segments with access to a monument and those more than four street segments away.

When studying spatial accessibility, the most integrated twenty-five per cent of the street segments shows a mean business intensity of 0.058, while the mean of the remaining least integrated seventy-five percent is 0.016, which is less than one business door in a hundred metres. When analysing the proximity to monuments, the concentration of businesses in street segments with access to monuments is 0.036 while the average concentration of businesses in street segments more than four street segments apart is 0.020, which is one business door in a hundred metres.

Considering street vitality in relation with business intensity, mean business intensity values (0.016 and 0.020) suggest that the average seventy-five per cent least integrated street segment, as well as the average street segment located more than four segments away from a monument entrance are inactive, according to Gehl's active-to-inactive classification of buildings' ground floors (Gehl, Kaefer, & Reigstad, 2006).

To better understand the impact of monuments, future research could extend this study in two ways: (1) expanding the street segments classification of PM5 in PM6, PM7, and so on, considering the precise number of segments that separate them from a monument entrance; (2) differentiating monuments in different types—e.g. attending at the number of visitors or users, their actual use, etcetera.

About the location of monuments and spatial accessibility, the study revealed statistically significant differences between the accessibility of the streets segments with access to monuments and the segments without access. Street segments also show significant differences in their integration (r = 2000 m) level, depending on the number of segments away they are from a monument entrance. However, the differences are relatively moderate.

Ongoing research is already applying the same methods to investigate the location of businesses in other Spanish heritage cities to contrast the results obtained for Toledo. Additional studies in different countries and world regions to compare and see how generalizable are the findings presented in this paper.

Acknowledgments

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The loss of semi-public spheres within the Vienna urban parterre system. Cause and effect study

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Abstract. *As proven in the preceding pilot study the historical Viennese StadtParterre (urban parterre) originally presented an extensive, intriguing network of interior and exterior urban spaces: streets, building ground floors and courtyards. It included an essential semi-public sphere with no clear-cut boundary between inside and out. Rather, doors and windows were left open most of the time so that ground-floor premises were easily accessible to the 'public flow'. Original photos from the period attest to this: the ground-floor facades were permeable— semi-public or private uses extended from the interior out to the street, and conversely. In addition, many of these so called 'Gewölbe' were connected with basement floors or cellars underneath, which meant a further extension of the urban parterre and in most cases the (commercial) use of the street-facing premises also included the interior courtyard. Today, courtyards within the Viennese Gründerzeit areas mostly accommodate garbage cans or dumpsters; their soils are sealed and a considerable part of the urban parterre lies idle. Intensive, diversified use nowadays is rare: street, ground floor and courtyard—all being different parts of one essential urban system—are not mutually supportive, their interlinked use-pattern falls apart and diverges. The paper discusses reasons and socio-urban effects of such a dis-linked, malfunctioning urban parterre structure by among others comparing it to the original historic state. First and foremost, though, it debates to acknowledge the significance of the StadtParterre for the functioning of a city—a fact that has somewhat fallen into oblivion lately.*

Keywords: StadtParterre (Urban Parterre); Use Structure Analysis; Urban Space Research; Vienna

Introduction

The presented paper focuses on the architectural structure of Vienna's Gründerzeit GZ areas,[1] a rigid urban grid structure that emerged in the period between 1848 and 1918, when an enormous influx of new residents made Vienna's population grow from 440,000 to 2,2 Million, thus making it—by that time—the fifth-largest city in the world. Despite busy construction activity (due to significant population increase in *resent* time), buildings and tracts from this epoch still make up a large portion of the Viennese cityscape.[2] By accurately analysing the field's tectonic and social fabric and by mutually aligning the historic and the today status, conclusions are drawn that will generate a solid and detailed knowledge of its current architectural form and systemic potential.

There is a strong and direct relationship between street space and structure and use of the buildings' ground floors.[3] In addressing urban-development issues, it certainly is necessary to consider the totality of the urban parterre as a consistent urban zone of public, semi-public and private spaces. The concept of the *StadtParterre* therefore includes both built-up and non-built-up areas; it covers the *street* as well as the adjacent *houses* and *courtyards*.

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Thus the different parts of the urban parterre are treated as entity, so that their interrelations can come to light.[4]

Surprisingly the existence of an urban parterre and its significance for the functioning of a city has somewhat fallen into oblivion lately. The reason for this may be that conventional 3D city models—used ever since their launch in the noughties in urban planning and research—do not represent intricate, small-scale, multi-layered, and ramified ground-floor structures in a convincing manner und thus obviously prevent us from perceiving them in a broader functional perspective.

Methodology

In our on-going research project (as well as in the precedent pilot study) an effective new modelling type was evolved, which represents the *StadtParterre* in an utterly precise microstructural form. The Comprehensive Ground Plan Survey (CGPS)—a detailed survey method familiar since Canigga's and Muratori's work in the 60s, when by putting floor plan next to floor plan they ultimately depicted the delicately structured fabric of cities—was taken up and developed further: to the *Three-Dimensional Urban Parterre Model (3D-UPM)* (Psenner 2014a).

For creating a UPM, relevant documents at the building authority archives are photographed and analysed (plans as well as manuscripts containing information about business licenses, utilization taxes and certain fees). Historical and current data collected by these means is verified on-site and subsequently modelled on the basis of the digital cadastral map.[5] As a result, two model implementations are created: one showing the current condition and one equivalent to the 1910-status. At the same time, so called house biographies are drawn up for each plot of land, which account for all structural changes and changes in usages over the years.

Vienna *StadtParterre* – theoretical approach

The Vienna urban parterre is being explored in terms of an exemplary neighbourhood in the 9th district, an archetypal GZ area totally rebuilt in the late 19th century: it covers three adjacent roads (A, B and C)[6] and altogether expands a length of almost one kilometre. Preliminary research was informed by an in-depth theoretical and historical approach, covering the following subjects:

-impact of relevant legislation: building regulations, commercial code, public health care and road traffic regulations, tax incentives, urban planning, etc. (cf. Psenner 2014a, 2014b, 2013, 2012a, 2012b);

-architecture: elaborate study on the unique architectural type of the 'Viennese GZ-Stadthaus' (townhouse), which was by no means exclusively residential, as one might presume from today's perspective (cf. Psenner 2012a);

-urban planning: due to the thread of inundation and in order to facilitate traffic (what was meant to efficiently promote economy) a topographical "levelling of the city of Vienna" was carried out throughout 19th century.[7]

In order to better read the streets' position within the larger urban fabric, the *biography of the street* was extensively researched, including detailed information on layout (topography and urban planning), architectural development (historical and current building plans on the selected lots) and over time use structure development of ground floor and basement premises. Trading documents, business licenses and tax regulations are evaluated in order to enable the modelling as well as the drafting of *house-biographies* for each single building in the chosen field.

The *StadtParterre:* system and components

Including all additional relevant ground floor data, the spatial representation of Vienna's *StadtParterre* (UPM) facilitates a conclusive analysis of the (use) structure and potential of the ground floor zone and relates it to the uses and functions of the *street space*. Thus, interrelations can be identified, problematic situations considered and dealt with in a broader context.

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Figure 1.

UPM showing the research field - use structure analysis for historic status (around 1910). © Psenner

Building ground floor: 'Gewölbe'[8]

Analysis and findings on the historical structure:

One important aspect of the Viennese GZ ground floors is their generous ceiling heights (3,20-4,95 m). The large amount of space thus offered is a special asset, not least because it opens up possibilities for a variety of uses, lending itself not to a specific market segment, but to a broad range of prospective occupants (Psenner, 2012a). During GZ, Vienna's economic, social, and urban fabric was characterized by a large number of small-scale businesses, many of them workshops or manufactures, preferably located on the ground floors of tenement blocks. By that time the city had an incredible range of registered businesses[9], but only few of those actually had more than ten workers.[10]

Around 1910 the *StadtParterre* sample examined here accommodated a highly varied range of businesses: several restaurants, coffee houses and wine spirit shops, general stores, bakeries and pastry shops, underwear, linen or shirt sewers, linen cleaner's, carpenters, butcher shops and smoked meat productions, dairies, various printing houses, production of cork goods, frame and moulding makers, glaziers, etc. and a myriad of other retailers and manufacturers, also one pharmacy, a necktie sewing school and three temporary synagogues.

As the average apartment size was rather small[11] (around 35 m^2), residential functions were often moved out of the private units. Also, only very few apartments had real kitchens, or pantries and other food storage facilities, so that shopping for perishable goods was an everyday chore. These circumstances also account for the relatively large number of eateries/coffee houses/liquor stores (seven on a stretch of only 190 meters) as well as grocers and other small retailers.

Current situation – use status:

Despite their proximity to a high-level shopping road, two of the examined streets (A and B) display supply road characteristics: here the street-facing ground floor premises originally mainly accommodated workshops, manufacturing and trade businesses; while residential use (if so) was mainly found in the premises facing the courtyard. The third street (C)—a secondary street—displayed a balanced distribution of trade-, manufacturing- and residential use in the ground floor zone. An utterly intense ground floor use had subsisted until the late 1980ies, but then was scattered by vacancies, underuse, storages and garages; and lately was permanently disrupted by massive breaches of use patterns: i.e. a sharp rise of number and size of ground floor garages. This development is mainly effected by the Viennese parking space regulation *(Stellplatzverpflichtung)*, which requires new extensions or even minor restructurings to provide additional parking spaces on the lot—one parking space per 100m^2 flat space. Over the last twenty years rooftop conversions became more and more attractive, that way this antagonistic law—dating from 1938—was

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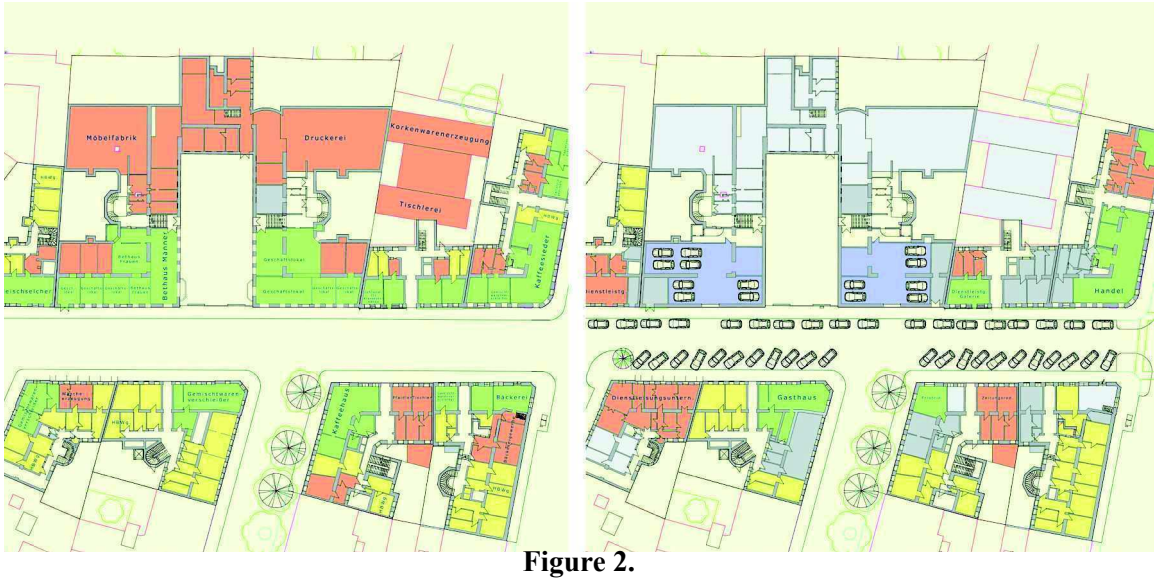

Figure 2.

Comparison of use structure: historic (left) and today (right): Urban Parterre Model UPM, © Psenner. UPM uses colour codes—e.g. green for semi-public spaces and spaces with high user frequency, such as shops, coffee houses, studios; orange for work spaces, such as offices, workshops, factories; yellow for housing; grey for garages and storage spaces; light grey for vacancies—to identify the type and intensity of use. © Psenner

applied all along.

Since 1910 many flats had been merged to fewer but bigger ones, which clearly augmented the per capita living space from 4m² (sic!) to about 39 m². In consequence fewer people enliven the urban sphere and less semi-public space is constituted.[12] A clear decline in so-called semi-public usages on the ground floor can be derived from comparing the two models (see fig. 2). The point is realizing and utilizing the advantages of the distinctive structural ground floor feature; not least because the spaces available hold an enormous potential for a growing city.

Façade-design: permeability and shading

A morphological use structure analysis shows that ground-floor *facades* once provided a *permeable interface* between public and semi-

Figure 3.

Historic permeable facades, 'Sonnenschutzplachen' (flexible, textile awnings), left: Wiednerhauptstraße around 1905 (source: https://www.facebook.com/238341929694182/photos/a.404818156379891.1073741941.238341929694182/601364410058597/?type=3&theater); right: Währingerstraße around 1910 (source: http://www.bildstrecke.at/Alle/Images/detail/6649?page=4&filter=w%E4hringerstra%DFe&filterCategory=Alle)

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public spaces. Business portals[13] and alley doorways created *visual and real* permeability and thus generated an intense interchange between the different spheres. Original photographs of the time substantiate to this: ground floor façades were pervious: private ground floor uses extended into public street space, and conversely, the 'Gewölbe' were open to the public.[14] Another highly important aspect is shading: so-called 'Sonnenschutzplachen' (flexible, textile awnings) once allowed for individual shading.

When analysed in terms of their permeability with regard to the *actual engagement* of the street-level environment, we must state that nowadays ground floor façades are mostly closed and impermeable and that they do not provide temporary shading possibilities at all.

Courtyard and souterrain / cellar

Historically seen the (commercial) use of the street-facing premises also included the interior courtyard; today, courtyards within the Viennese GZ areas mostly accommodate garbage cans or dumpsters, their soils are sealed; thus a considerable part of the urban parterre lies idle. Intensive, diversified use nowadays is rare: street, ground floor and courtyard—all being different parts of one essential urban system—are not mutually supportive, their interlinked use-pattern falls apart and diverges.

Many of the ground floor premises were connected with basement floors or cellars underneath, which meant a further extension of the urban parterre. These connections now have nearly all vanished and, contrary to its original function, the Gewölbe are now being used for storage. The Viennese *StadtParterre* is becoming increasingly less attractive.

The Sidewalk

Analysis and findings on historical and current use-structure:

In the GZ epoch, the *trottoirs*—"trotter" meaning to *roam about* in French—on both sides of the street had been assigned no less than one third (!) of the total street width (Kortz, 1905 cit. in Psenner, 2015a). But the sidewalk did not at all end with the curb; it rather extended out to the street, as street was seen as being space for everyone's use.

The holistic approach embodied in the term *StadtParterre* shows the primary function of the sidewalk in its true light: easily and directly accessible, the sidewalk is the most important area of interaction in the public realm, a space where people can meet and move among, or simply observe, each other relatively freely. Not least, it is the site of integrative interaction between minorities and majorities in a diversified society (Psenner, 2011: 203). Clearly, it should be possible to engage this multi-functional urban space in all sorts of ways, provided that it is adequately dimensioned. At present, however, the average 1.7 to 2.2 meters between building fronts and parked cars are reserved for *moving* (pedestrian) traffic—§ 78 of the Austrian Road Traffic Regulations prohibits *'hindering pedestrian traffic by stopping for no reason'*; also, using the sidewalk *'for other purposes than those of street traffic'* is still conditional on administrative approval (RTRA §82 and §83, cit. in: Psenner, 2004: 133, 2014a: 137).

This lack-of-space problem[15] also has to be seen as a consequence of a deliberate shifting of rights of use: while more and more street space was assigned to cars, pedestrians found themselves reduced to increasingly narrow walking lanes. In the years after WWII, sidewalks were built with a minimum width of 1.25 meters (according to Austrian building standards, 1956). On initiative of the city administration, these narrow post-war sidewalks have been increasingly widened in recent years, with additional bulges added at street crossings, so that the pavements are now offering a little more space to walk and stand, but this still is a far cry from the comfortable fourmeter sidewalks as are common in other cities (ed. New York City, Barcelona etc.). But the clear passageway is in the end drastically reduced again by signposts and the noses of parked cars.

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Street

Analysis and findings on historical and current use-structure:

Vienna's earliest specific legal directions for traffic regulation were laid down in the *General Roads Act* and in the *Road Police Regulation* of 1875. Clearly, the focus here was on the individual so that *parking in the street* at night was simply prohibited for safety reasons and, in case of violation, was punished with '*imprisonment between 3 and 14 days'* (Psenner, 2014b). The law also contained an explicit prohibition against 'molesting pedestrians and residents by splattering street mud'.[16] This clearly shows that street users on foot were given preferential treatment; their safety and wellbeing was stipulated and protected by law. But legislation shifted away from this initial philanthropic emphasis and was over time amended to protect vehicles, not least because car production as well as modern, fast and efficient traffic were seen as boosting the urgently needed economic recovery in the post-WWI period. Against these 'economically convincing' arguments, the needs of pedestrian increasingly moved to the background.

The NS Road Traffic Ordinance (Straßenverkehrsordnung StVO) of 1938 provided the most significant shift in the hierarchy of street users.[17] The motorisation of the 'Volk' and the 'promotion of the motor vehicle'[18] was the overall goal and the StVO was intended to serve this aim. Naturally parking in street space was now approved, with minor restrictions, a situation not very different from today. After WWII the New Austrian StVO was passed, which actually consisted in a simple renewal of the 1938 law and maintained the privileging of motorized traffic. It was not until 1960 that humans once again moved into the centre, replacing traffic as the focus of attention. But the course had been set for rapid expansion of motorized individual transport and research of the time provided

Figure 4.
Sidewalks: drastically reduced passageway by signposts and the noses of parked cars. ©Psenner

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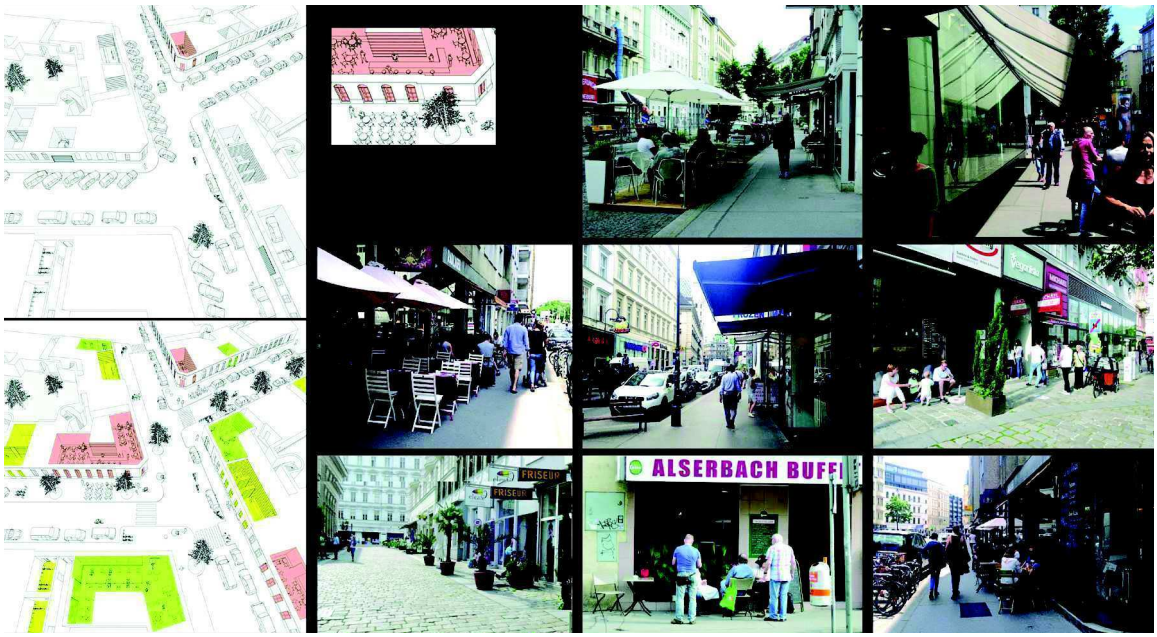

Figure 5.
A typical GZ-road—once and now; source: Wien Museum, working dokument, © Psenner

'compelling' arguments for the economical relevance of the motorized individual mobility (Psenner, 2015a).

This historical and political shift in street-use rights must be borne in mind in any discussion regarding the legitimacy of the car's occupation of public street space today. Cities with a significantly different cultural history and, consequently, a different approach to the issue offer alternative solutions (i.e. Tokyo): street space not blocked up by parked cars is free space and remains available to all; enlivened public space in turn brings additional security; its users develop a personal relationship with the place and aesthetically manipulate it.

Consequently, today the analysed streets are heavily obstructed by cars: 60% of the public space is constantly occupied by private goods = cars. It is needed to say that the average 'automobile' is moving 40 minutes per day, the rest of the day time the car stays parked in public space (Posch cit. in Psenner 2014b).

Conclusion

The morphological use structure analysis (of the street level environment in question) showed that, historically seen, the *StadtParterre* was a ramified, varied, much used and hence engaging space-system, which involved an essential semi-public zone and that ground-floor *facades* provided a *permeable interface* between public and semi-public spaces. But nowadays intensive, diversified use is rare: street, ground floor and courtyard—all being different parts of one essential urban system—are not mutually supportive, their interlinked use-pattern falls apart and diverges.

Successful regulatory measures in urban planning, administration, and economic policies depend on sound and detailed knowledge of the actual architectural structure as well as the current actual—and potential—use of the street-level environment. The Urban Parterre Model UPM does provide this information in an easily accessible and locally contextualized form. Thus, the development potential of the street-level environment can be clearly identified to inform urban planning.

The basic prerequisite for a calibrated and socially just transformation of the urban parterre lies in recognizing the systemic approach. This includes pointing to the (hidden) secondary consequences of a mislinked *StadtParterre.* Which finally enables direct conclusions, i.e.: vacancies and underuse of ground floors of buildings in Vienna are not least a result of surface-parking-ridden street spaces (Psenner 2012, 2011a, 2011b, 2005).

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Figure 6.

The complex micro-analytical possibilities of UPM facilitates morphological analysis and conclusions regarding the actual use-structure and the use-potential of the StadtParterre by visualizing the spatial and functional interrelation between ground floor, courtyard and street. It allows to document vacancies and other issues relating to street-use and to analyse the contributing economic, traffic and social factors. Such systemic modelling of built-up environment and taking inventory of historical, current, and potential ground-floor uses provides a basis to put Vienna's street-level environment in a long-term development perspective as a practical guideline for future interventions in various neighbourhoods and for the (re-)designing of individual street complexes; by enabling actual and conceptual place making. © Schremmer/Wimberger/Psenner

Although science has long been calling for substantial state intervention in the organization of urban individual traffic, policy-makers and the administration have not yet brought themselves to take clear steps. The car-centred use of street space which increasingly affects adjacent ground floors of buildings, entails another highly detrimental development. The (indirect) link between motorized individual traffic and urban-structure problems of ground-floor use has been pointed out here.

Notes

1 The GZ structure evolved as part of Vienna's urban expansion caused by industrialization as well as corresponding historical and political developments. The architectural style of the GZ period (also known as historicism) can be read as an expression of the aesthetic tastes of a rising and economically powerful bourgeoisie. It mainly consisted in large tenement–townhouses and was widespread in 19th century central Europe.

2 Still one of four apartments in the city is located in a GZ building. (Psenner, 2011: 196)

3 See Psenner: "Wahrnehmung im urbanen öffentlichen Raum": in identifying criteria of public-space perception, the author focuses on architecture as a determining factor. Ever since this 2004 survey the interrelation between street space and buildings has been thoroughly studied. (Psenner 2011; 2012b; 2014a; 2017a)

4 Detailed articles by the author on this issue: Psenner, 2011, 2012b, 2014a, c, 2015c, 2017a.

5 The modeling was realized by using the building planning software Autodesk Revit®, which allows a coordinated and consistent model based planning approach.

6 For data protection reasons, all information about the studies of the Viennese StadtParterre in question are anonymized.

7 Cf. Psenner 2017 'Wiener Null' - Levelling the City of Vienna" lecture at EURA Conference 2017; Cities locked in networks, Warszawa Poland (22.6.2017).

8 The technical term „Gewölbe" was used for ground floor rooms with alley doors

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directly facing the street. They showed a high use frequency (shops, doctor's offices, coffee shops…) and thus formed a semi-public zone that was directly connected to the public space of the street (Psenner 2017a).

9 Among the businesses registered in the Establishment Census of 1869 we find: the Pfaidlergewerbe (shirt sewer), Paramentenerzeuger (vestments manufacturer), Banderzeuger (ribbon maker), Bettwarenerzeuger (bed linen maker), Naturblumenbinder (florist), konzessionierter Spirituosenschänker (licensed liquor dealer), Brunnenmeister u. Brunnengräber (well digger and builder), Büchsenmacher und Schwertfeger (gun and blade smith), Bürsten- und Pinselmacher (brush maker), Deichgräber (ditch digger/trencher), Nadler Webkammmacher u. Drahtwarenerzeuger (needle, weaving comb, and wire products maker); Federnschmücker (plume feather decorator); Flaschenbierfüller (beer bottler), Fragner u. Greisler (grocer), Hafner (stove fitter), Kamm- u. Fächermacher (fan and comb maker), Gemischtwarenverschleißer (general store operator), Kanal- und Senkgrubenräumer (sewer and cesspit cleaner), Kostgeber (landlord or landlady), Lohnfuhrwerker (haulage contractor), Sauerkraut- u. Saure Rübenverschleißer (sauerkraut and pickles merchant), Seiden- Schön- u. Schwarzfärber (dyer), Tuchscherer (cloth-shearer), Wirkwarenerzeuger (knitware manufacturer).

10 This highly diversified industry with mostly medium and small companies constitutes a specific structural characteristic, which also continued to prevail throughout and after the economic crisis that came in the wake of the stock-exchange crash of 1873. Enterprises that employed a larger workforce were mainly all located in the suburbs.

11 The ordinary GZ-tenement flat, called Garçonnière, consisted in one big and one smaller room (with no daylight). Big Families not only lived but worked there; whereby the beds were mostly used by several occupants in shifts: so called 'Bettgeher'.

12 The study involves an insight residents' and visitors' frequency analysis. Since official data about this factor is not available, relevant information is collected from participant observation analysis.

13 A delicate structure of wood and glass was located in front of the wall, by thus appropriately staging this sensible zone: enhancing permeability, accessibility and weatherproof presentation of goods.

14 This brings to mind other urban cultures, where the StadtParterre still functions this way: i.e. Italian cities.

15 GZ Vienna features extremely narrow and deep street canyons: with—conforming to the historic building regulations—minimum street widths of 9 meters (1859) and later on 16 meters, the building regulation effective from 1870 allowed for a maximum building height of 25 meters. (cf. Psenner 2011: 200)

16 Federal law and Viennese Road Police Regulation § 20 cit. in Psenner, 2014b and 2015a.

17 The German StVO 1937 (a revision of the Reichs-StVO 1934) was implemented in Austria in the year 1938.

18 Gülde 1938, cit. in Psenner, 2014b.

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The "demonstration city": a model from a global architectural process

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Abstract. *This research springs from the idea that the human-built environment, from its origin until today, is the result of a constantly developing process. Throughout this progression, one can observe the evolution of the courtyard house as if it was an architectural organism, that has now followed more than two thousand years of unfolding of human building, from the formation of the fence (interpreted as a primitive construction) till the latest innovations of housing and urban research (latter combining elements of various cultures and ages). As society has been growing and changing – recently more rapidly than ever before in history – so has the development of courtyard house, always in tight correlation with the population's ever changeable needs. From this analysis arises a hypothesis about the dynamics of this process (a theory already established by Muratori), of which ideas materialized in practice have been most profitable for contemporary urban design. Organized within a model called "demonstrative city", the resulting layout is a blueprint of a simplified urban environment. This system serves as a tool capable of inserting the beneficial aspects extracted from this research into the urban environment, which further confirm the validity of these results. For this reason the "demonstrative city" can't be considered as a project, but more so as a simulation of urban reality. Establishing this as a tool in architecture will be the first step to its test in the urban project.*

Keywords: Architectural process, courtyard house, urban morphology.

Introduction

The research briefly summarized here - which was carried out as part of the DiAP Department of Architecture and Design's PhD in Architecture and Construction (DRACo) at "Sapienza" University of Rome, supervised by Professor Giuseppe Strappa and published in the volume Architettura di recinte e città contemporanea. Vitalità del processo formative delle strutture a corte[1] - moves beyond an analysis of the formation and transformation process of the courtyard house organism (identifying logical, constructive and spatial changes that are still relevant) to the most avant-garde urban planning criteria.

This investigate analyzes the designing possibilities given from an housing type that, from its origins till today, diffused itself all over the world. In this case the globalization, in the positive significance of the term, could be considered not only a contemporary phenomenon but also an historical one linked either to the invasions of the Roman Empire and its consequent diffusion of his "way to live" than to the extremely flexibility of the courtyard house to resolve the cultural dwelling needs of very different kind of cultures: from the Chinese Buddhist culture, to the Muslim of north Africa and Asia, to the Mediterranean cultures[2]. In my opinion, because of its diachronic and diathopic spread out this type could be studied

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to solved project problems starting from the consideration that the critical design moment is a process, as a process is the formation and transformation of a building type. The case of the courtyard house is maybe the only process which take the whole development of human history and in the this process we can analyze each typological results, giving us several possibilities of conceiving the domestic space and his relationship with the urban space.

Methodology: the patio house process

Starting from the consideration that the environment transformation by humankind is the result of a process that stems from the basic tectonic actions of fencing off and covering, and that these led to contemporary examples of urban architecture (Strappa, 1995), we can identify courtyard houses as a perfect case study of this. This form of dwelling has proved itself able to evolve and meet the changing needs of the society over time, both when such areas have undergone growth and expansion as well as contraction, continually updating itself and adapting to new conditions, ending up by perhaps constituting the only example of an architectural form that has been able to cross all the different cycles of transformation undergone by the constructed world.

The analysis initially addressed those moments in the process that generated the courtyard house form that derived from "spontaneous" changes (with, however, all the provisos that such a term demands), i.e. those associated with Man's natural disposition towards recognizing, repeating and updating of principles found in the constructed landscape. Nevertheless, the "spontaneous" world increasingly exhausted its fundamental role, particularly after the industrial revolution, at least in the Western world and as far as most of the components that make up the urban environment are concerned, giving rise to construction developments that were increasingly linked to an architect's critical contribution.

It was thanks to this heightened critical approach that the courtyard house was updated during the course of Modernist experiments, giving rise to many diachronic variations and new patio forms that were also the result of a process (Strappa, 1989) of continual changes based on new research conducted with the urgency of changing needs.

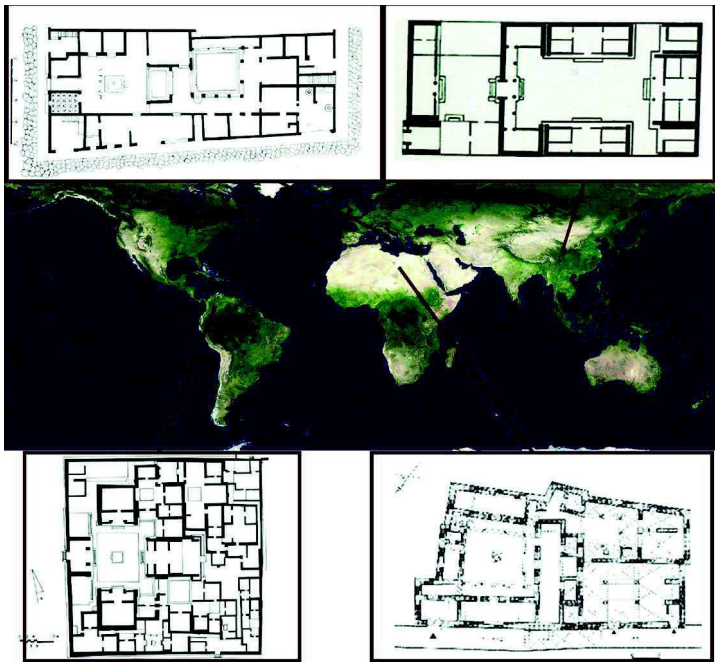

Figure 1.
Spreads out of the courtyard house

Thanks to the influence of the Modernist movement, this housing typology was exported in different geographical areas, and starts his globalization process. In some cases, as in latin America, the modern products find the typological process results whose morphology derives from several spontaneous transformations who adapt the housing structures to the new way to live the house and the city. An important meeting between the spontaneous courtyard houses and the design products of the modernist approach is the case of the PREVI Lima Design Contest. In this contest were invited ones of the most important European and North-American architects and it were specifically asked to define a new neighborhood made by buildings directly connected with

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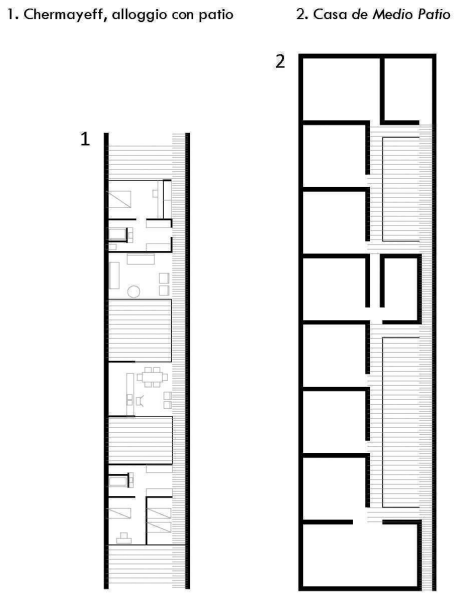

Figure 2.
Confrontation between the 'linear patio house' and the casa de medio patio

the housing culture of the country. In general, Lima and Latin America is deep linked with the courtyard house, imported in the country during the Spanish colonial period (XVI sec.). The type it was imported is a structure close to the Roman Domus type producing very low-density urban fabric. From the end of XIX century, during the European immigration, this structures supplies a densification process called from F.E. Diez[3] of "reduction-. multiplication". It means that the houses, in order to host a greater number of inhabitants, reduced their dimension dividing into two parts the casa de patio, forming the casa de medio patio o casa chorizo[4]. This is the main type in Lima during the PREVI contest and is the type studied from the participant to respond to the request of the competition.

In the same period another planimetric configuration, in strong analogy with the spontaneous development of the Latin American casa de patio, comes from a process that follows the development of the row-house type but is also recognized in the housing body of the "linear patio" type, intended as an element of the row group that develops the area of pertinence within the body of the building. This type of building has been developing in the Western world since the publication of the studies of Alexander and Chermayeff in Community and Privacy[5], which define a binuclear patio type developed in different variants. These studies identify six areas of public and private life and evaluate the relationship between the concept of house and the city starting from the definition of the requirements arising from the need for privacy. The critical points, starting from the analysis of the relationships, stay always in the transition space between the public and semi-public as well as between the semi-private and the private. From a design point of view they determine a range of solutions which are defined as: filters, bearings, diaphragms, dams, transition points.

The product, resulting from these studies, consists of a building structure that contains some characters in analogy with the results of the spontaneous Latin American[6] process and therefore used by many authors to meet the demands of the PREVI competition taking place in Lima in 1969. This competition marks a very important step for the research on housing and becomes the operating base of many project results among which, a great number of experiments which are based on the linear patio type as a typology related to the local architectural tradition. The publication of the results of PREVI competition marks the moment of the greatest spread of this type of building which will be developed in many regions while keeping constant its morphological characters even in the most contemporary examples. When the analogy with the Latin American process is mentioned, the reason is the use of the patio as the centralizing element of the type that allows to look out the entire unit housing to its interior and to filter the relationship with the other units in its totality.

Alexander and Chermayeff use the patio in the same way by shifting the problem from the relationships between the residential units to the relationships between the various rooms of the house.

The theoretical proposal of the two architects embodies a systematic simplification of these filters, that is solved by many authors in a field

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of spatial subdivision (instead of visual) of the environments both in sleeping and the living area.

The linear patio type is an interesting study case because puts in relation two housing organism deriving from two different process: the spontaneous one and the critical one. In this case both typologies are modern, considering that the casa de medio patio were greatly used in '70s in Latin America.

A different consideration derives from the comparison between the modern patio type and the original courtyard house. In this case modernist architects take inspiration from an important characteristic of the courtyard house and re-interpreted this element designing an housing type whose nature is completely changed. The characteristic who remains in both typologies is the fence who allows the house to be totally turned into the inner open-air space. But the important difference between them, is the significant of the inner open-air space which in the courtyard house is the real distributive center which connect every rooms of the house instead in the modern patio house it becomes an optional space and the distribution is completely conceived within the house.

Both the linear patio house and the patio house achieve resounding success and we find many examples of these typologies all over the world: from north Europe to Spain, from China to United States and Latin America, till north Africa. Although many of the countries, in which these modern typologies have been spread out, own some heritage, in their housing culture, deriving from the courtyard house, these typologies were able to enter in the way to live of many places not accustomed to this kind of housing structure, just really thanks to the influence of Modernist movement in the world.

These updated architectural forms should be studied, in that they are features that can create urban fabric, analysing the various ways they bring people together and their relative urban possibilities.

The "demonstration city" an experiment on the building process

Having started with this preparatory study phase, we were able to formulate a few theories regarding the development of this process, based on research carried out by the Muratorian school. These results were standardized as part of a model, dubbed the "demonstration city", which attempts to simulate particular aspects of the constructed world using a selected series of simplifications, as with all scientific experiments. The resulting theoretical model selects moments and phases in the process under examination, relating them to synchronic conditions, so as to verify its in vitro suitability as part of an urban system of average complexity. The "demonstration city" should not therefore be considered a complete design but rather a partial simulation of urban reality, a theoretical work-in-progress laboratory designed to develop a contemporary courtyard house process and the possible specializations that, thanks to fusions and adaptations, can produce new construction forms on an urban scale.

Nevertheless, it should be made clear that the transition from interpretation to design necessarily involves a certain amount of abstraction, so that the behaviour of buildings, groups and forms can be generalized and used, within certain limits. It is clear that this transition presupposes, as with every branch of

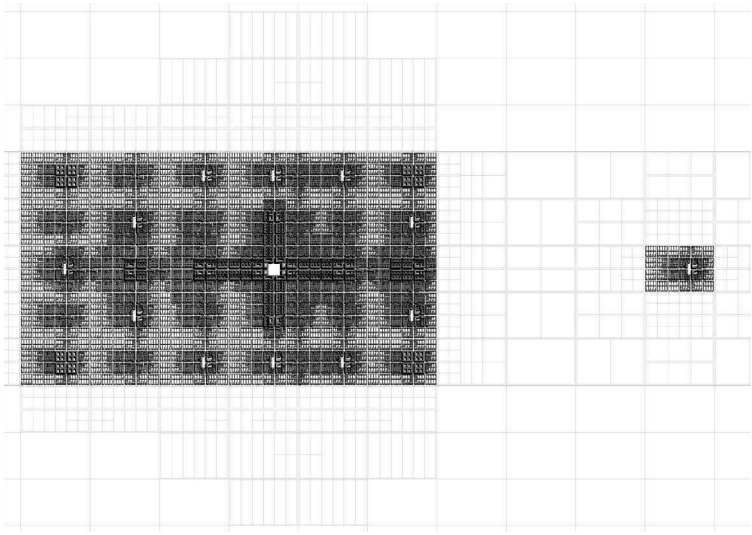

Figure 3.
The 'demonstration city'

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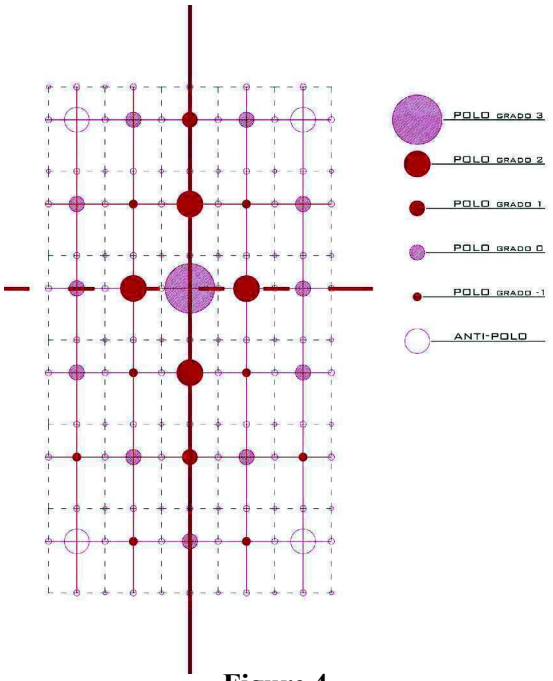

Figure 4.

Logical scheme of the formation of the 'demonstration city' conceived as a macro fence. Within the principal fence the neighborhoods are formed as micro-fence based on the same characteristics: a principal axis and a secondary axis which form a polarity

science (or even just of knowledge), a series of simplifying hypotheses that whittle down the data - gathered from real circumstances and taken into consideration - to what is considered essential, for the purposes of the research. It also entails accepting that the general pattern that emerges will itself be an abstraction.

I have dubbed this abstraction a "demonstration city" in order to highlight its very oversimplified nature compared to constructed reality as well as its value as a proposal compared to some (and just some) features of urban buildings, whilst being well aware of the fact that a city can be founded on the principles of enclosure and binding together, but needs a different level of complexity if it is to become a real organism, which must be achieved by combining other fundamental components, such as infrastructure, parks etc.

This "non-design" hypothesis, which in some way is contrary and complementary to Muratorian re-planning methods, requires further explanation. The analysis of the process that evolved the courtyard form, whether it was "spontaneous" or the result of a critical town planning process, would seem to show that it has been able to meet urban needs at given times, from the level of population density to identifying buildings that can incorporate specialized non-residential functions that are essential in making sure a city works properly. Such results emerge as part of this process at times that are often quite distinct from each other, in order to meet the various different needs of changing societies. More specifically, we can state that, if on the one hand, many of the processes analyzed (particularly typological processes) can seem entirely outdated nowadays, on the other hand we must accept - based on our experience of modern cities - that urban history does not head forward in one single, gradual direction; it identifies a process that takes place in stages and many of the features identified in past transformations reappear in an updated version, as innovative and contemporary answers to new urban needs. As far as this aspect is concerned, we may refer, for example, to recent trends that propose the "recycling" of existing building stock with a view to restoring it and adapting it to new functions and purposes. It should be noted that at this current time of economic crisis, innovation can consist in this sustainable re-use of existing building stock, in line with a practice that had been widely employed, for that matter, in the sixth century, with the conversion and re-use of ancient "architectural material": turning temples into Christian churches, transforming parts of the urban fabric consisting of residential buildings into more organic systems that went into making non-residential constructions. The recycling of existing building stock is just one example of a return to past construction practices and the list could become much longer if we were to analyze, for example, the expedients employed to reduce air pollution or make buildings more energy-efficient.

In this case, the analysis of the evolutionary processes affecting the courtyard form revealed various different aspects that could be linked to the urban fabric's contemporary needs. Starting from the beginning of our analysis and going over the main moments in these processes, we can highlight a series of aspects and characteristics that are now essential when

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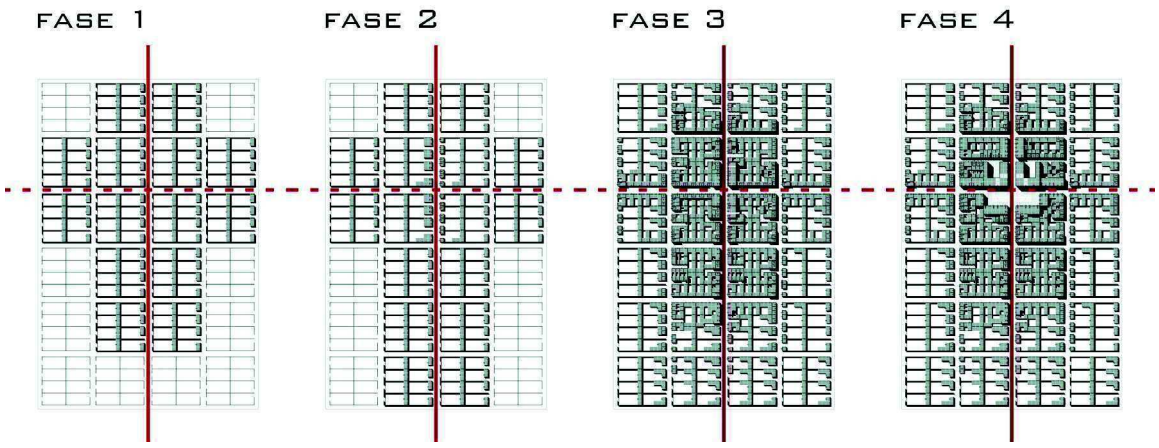

Figure 5.
Logical formation of the micro-fences conceived through the densification of the fabric according to the proximity to the polarity

planning modern urban areas.

The transformation of the domus (Caniggia, 1976) into a commercial base is in itself a highly modern characteristic. Today, the best newly-designed urban areas tend to mix commercial and residential buildings and avoid the development of mono-functional urban organisms, that de facto become overcrowded or empty, depending on the particular times of day when they carry out their purpose (or not, as the case may be).

If we proceed with our analysis of this process, we end up by studying the onset of multiple occupancy (Caniggia, 1976). In this case, as before, this can become a valid reference in order to meet contemporary needs. Clearly, we are not referring to the grouping together of single cells where an entire family resides in just a few square feet of space, but rather how such buildings can teach us to determine shared space. Living in an insula meant sharing social areas and service areas (the courtyard) and today this way of living is being experimented in the co-housing projects of northern Europe's most avantgarde buildings. Today, co-housing constitutes a system that can optimize space, meet the needs of new households and new lifestyles, save energy and ensure eco-sustainability, all as part of the same project. The system of insulae and their medieval evolution could therefore prove to be a valid logical and structural reference that, for its part, boasts the merit of representing a building that is the result of a change that was dictated by social and economic necessity, honed by events that repeated themselves continually until they formed fully-developed organisms that could entirely meet the needs of that particular time. If we continue to consider the multiple occupancy process, we can glean useful indications as regards the structure and relationship between public, semi-public, semi-private and private areas and how the relationship between them often needs to be mediated according to the different functions of a dwelling but must be entirely appropriate to it.

In continuing with our research, we ended up with a study of commercial buildings that was based on the concept of enclosure and, in particular, an analysis of the relationship that exists between apartment blocks and buildings derived from the courtyard house form (Strappa, 1989). We noticed that this relationship is based on a distributive and structural analogy (such as Palazzo Romano created from the adaptation of row-housing) but in some cases it can be a direct kind of process-linked relationship, as in the case of Como's Palazzo, for example. If we hope to glean guidelines for contemporary urban planning, such a reference could seem unsuitable. However, yet again, we are not looking at the Palazzo as a building but rather as an architectural organism, and therefore its structure and its rationale. From this point of view, we can therefore detect the Palazzo

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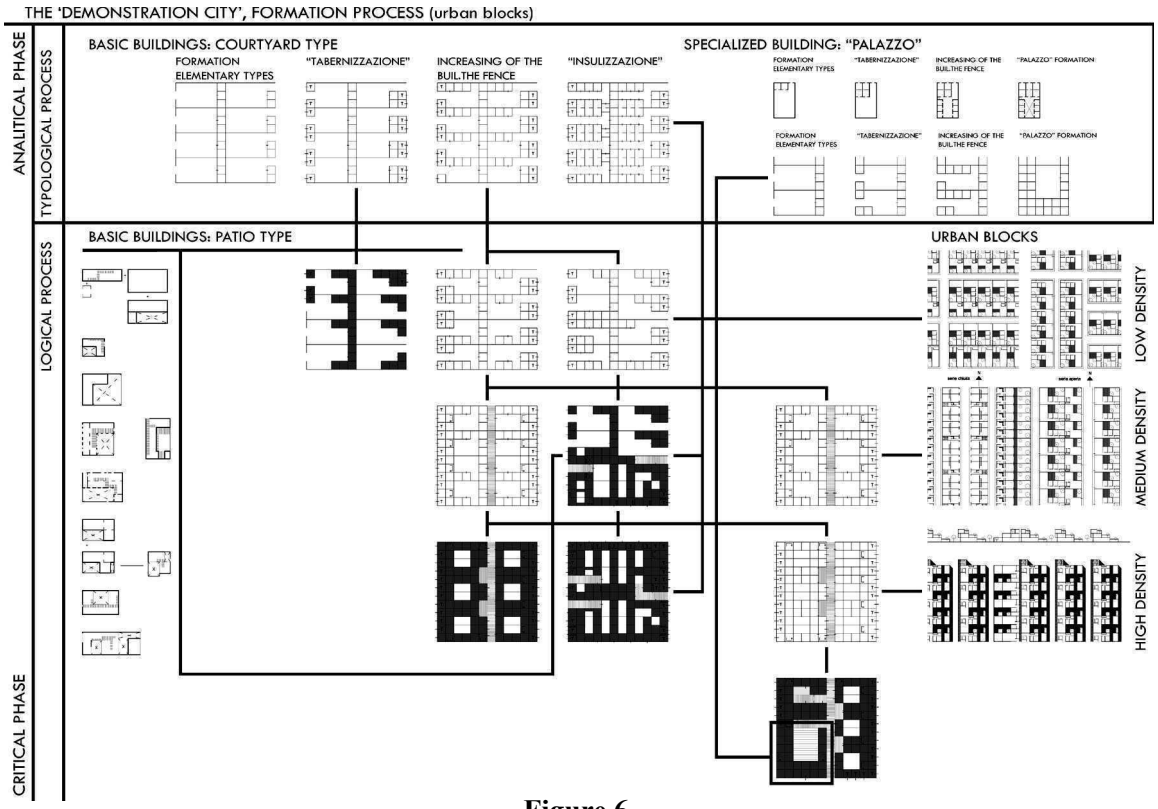

Figure 6.

Formation scheme of the urban blocks. In the scheme are shown the connection between each process analyzed and its results in the model of the 'demonstration city'

form in a number of contemporary examples (Strappa, 2014) of commercial buildings and evaluate the ways they may meet current needs.

There's no doubt that the permanence of the Palazzo's characteristic features is significant proof of the value of such an organism, as it has been providing urban solutions for over six centuries now, but perhaps an even more interesting fact is provided, yet again, by the relationship that this type of building creates with its urban surroundings. If we consider the Palazzo as an organism produced by a process, we cannot ignore its main stages. We have already seen how it is the result of the adaptation and fusion of basic elements, like all non-residential buildings. This fusion de facto revolutionizes the urban area within the city block, conferring the new commercial building with important features. If the building has been formed in response to the concept of urban fabric that becomes part of an architectural form, it follows that the spaces it creates contain a public connotation in their DNA that is hard to find in other types of buildings. This intrinsic fact makes areas in the Palazzo easily traced back to public or semi-public places, indicating an extreme level of flexibility from this point of view. It is in this way that the building's courtyard becomes a city square, whether it is inside or outside (depending on the level of coherence that the form achieves within its development process) or, by keeping the same structure, constitutes the central area of a form that leaves public areas (virtually speaking) at its doorstep.

Conclusion

The experiment linked to this research attempt to propose yet again, in an organic and synchronic way, many of the stages described above, blending them in such a way as to link them to the contemporary needs of urban space. We believe that a strict isolation of the results of this analysis, which can be used in contemporary urban planning, would be a risky method that could end up

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producing an incoherent patchwork of facts that have no meaning when detached from the structure that made them, over and over again, part of a complex organism made up of a combination of inseparable systems. In order to avoid risking such an outcome, we have attempted to identify a method that starts with those useful facts but nevertheless keeps them linked to the urban systems, at least from an organic and structural point of view, from which they cannot be separated. The aim is to verify the planning potential of a process-led interpretation of buildings and evaluate the real contribution that an understanding of the mechanisms transforming urban organisms can make when creating a logical and structural basis for the expansion and transformation of urban and non-urban environments. As with any scientific model, the basis of such a tool presumes the existence of a method of analysis and a system for data collection that allows the forecasting of how inferred results will develop. Based on such provisos, the "demonstration city" can be considered a model based on simplifying hypotheses generated by the observation of reality that on the one hand constitute its scientific basis and on the other hand distance it from the idea of "design", in the architectural sense of the word. It should be clearly highlighted that such a model, the initial result of an open form of research, contains - I believe - enormous potential, as well as limitations caused by the very concept of a "scientific model". In this particular case, the environmental as well as infrastructural systems were simplified, both structural aspects of urban areas and their fabric, concentrating only on urban and functional data linked to the idea of an organism based on the concept of enclosure. The verification of the design's influence on urban reality will therefore both allow us to evaluate the extent to which the model works and to find tools to reduce the level of abstraction, expanding functional characteristics and terms.

Notes

1 Amato A.R.D. (2017) Architetture di recinti e città contemporanea. Vitalità del processo formativo delle strutture a corte (Franco Angeli, Milano)

2 Amato A.R.D. (2017), Op. Cit.

3 Diez F. E. (1996), Buenos Aires y algunas constantes en la transformaciones urbanas, (Editorial de Belgrano, Buenos Aires)

4 From the casa the medio patio the densification process follows unitill to define high density and multi-storey buildings. See Diez F.E. (1996) Op. Cit.

5 Chermayeff S. (1963), Spazio di relazione e spazio privato: Verso una nuova architettura umanistica / Serge Chermayeff, Christopher Alexander; Traduzione di Giuliana De Carlo (Il Saggiatore, Milano)

6 Strappa G. (1995), Unità dell'organismo architettonico, note sulla formazione e trasformazione dei caratteri degli edifici (Dedalo, Bari)

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An Analysis of the Applicability of Conzenian School in China: Exemplified by Shangqiu

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Abstract. *Urban morphology has been studied extensively in western countries, while the related researches had been carried out late in China and the researches on urban morphology evolution characteristics of China are rare. Scanty case studies like Pingyao showed that the characteristics of urban form and its evolutionary process of China was different from the western. This paper review the existing researches and take Shangqiu as a case city to study urban morphology evolution characteristics of Chinese cities, preliminary analyze China's special social and economic characteristics as well as its urban morphology process from the double fringe belts, plot and block patterns of Shangqiu. Through the research on the evolution of Shangqiu's urban form, this paper aims to preliminary delimit the morphological period of Shangqiu, explore the evolution mechanism of Shangqiu, summarize evolutionary characteristics of Chinese cities and reflect urban morphological approaches in western academic system.*

Keywords: Shangqiu, Urban Morphology, Chinese City, Evolutionary process

Introduction

With the theories and approaches of urban morphology established and developed based on European cities, the major research force of urban morphology is still in Europe so far. The Conzenian approach has good explanatory power for the morphological development of European cities, but its universality needs further study for cities in different cultural context. On the one hand, the degree of data perfection and the contribution to system integrity of Alnwick town is difficult to reach for other towns. Therefore, does Conzenian theory and approach still suitable for the cities which are lack of historical documents and maps or difficult to identify the morphological features? On the other hand, for Chinese cities with completely different political and cultural backgrounds(Whitehand, 2007), their development is affected by a large number of administrative and planning factors, so the applicability of Conzenian approach, theory and terminology need more tests.

Based on the case study of Pingyao and Zhishanmen carried out by J.W.R. Whitehand and some other research, Chinese cities are different from the western cities mainly in three aspects(Shi, 2014):

Firstly, the development process of Chinese cities is quite different from that of western cities, which is obviously reflected in the different morphological periods of Chinese cities compared with western cities. Usually the morphological periods include three, coinciding with the important time nodes in Chinese modern history. The first one is the generalized feudal times before 1949 with very low productivity and deficient data. Then is the typical socialism city transforming

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period(1949-1978). And the last is the period with great change of social economic system of reform and opening up after 1978. The rough delimitation of morphological periods is related to the complicated and diverse urban landscape and limited by the lack of literature or map sources of China. Due to the preference of historical view and the gap in mapping technology, the literature of Chinese cities rarely records the information about cities' evolution, which is however required for morphological research. Therefore, for the urban form of earlier time, the large-scale town plans and other requirements for Conzenian approach cannot be met. Thus, detailed division of morphological period is hard to conduct.

Secondly, Chinese cities are greatly different from western cities in terms of their driving forces of evolution. On the one hand, in both the feudal period and the period of socialist construction after the founding of new China, planning and administrative forces are the most important factors in urban development. On the other hand, China lacks effective protection for private property rights. This makes the revolutionary planning, proposed by Conzen(Conzen, 1960), more likely to happen during the city construction under unified planning, resulting in the phenomenon that the evolution process of some Chinese cities is often faster and larger on scale than that of western cities that are based on private property rights and fair trade.

Thirdly, the connotation of morphological elements of Chinese cities is greatly different from those in western cities, for which the fringe belt is typical to annotate. In European cities, fringe belt indicates a zonal region with distinctive morphological and functional features formed in urban fringes at certain period(Conzen, 1960), often intuitionally related with the city wall. However, in ancient China, the city wall is usually built firstly according to the planning, and the urban expansion from the kernel takes a considerable period of time to reach the city wall. In other words, the city wall does not necessarily indicate the fringe belt, at least the inner fringe belt. At the meantime, the method of distinguishing fringe belt through big plots or public buildings become less valid since many Chinese cities are planned to be grids and religious institutions are set according to etiquette. On the other hand, in the period of socialist construction, many cities established new centers outside the old one answering to the need of development and the old city was eventually incorporated into the new urban area with the development of metro, making the old city as well as its fringe belt become the fringe belt of the current city as a whole.

Research on Urban Morphology in China

With the spread and development of morphology theory in China, studies on Chinese cities by Chinese and foreign scholars have increased a lot in recent years, resulting in a large number of research achievements, mainly empirical researches and literature review of the western theory.

The scholars introducing Conzenian theory to China mainly include Gu Kai, Tian Yinsheng and Song Feng. And the Conzenian empirical researches on Chinese cites include Jeremy's series work on Pingyao, Peking University research group's work on Lushan Mountain landscape, Zhang Jian's work on historical blocks in Guangzhou, etc. The researches have made important contribution to the development and application of Conzenian School in China, but because of the complexity of cross-cultural morphological research, some also exposed defects made by Chinese and foreign scholars in the study of China urban morphology. For example, in Zhishanmen case study, due to the difficulty of intercultural urban morphology research and the lack of understanding of Zhishanmen's historical function and the operator of urban form evolution in socialism China, the conclusion is not rigorous enough. In addition, in the case study of Pingyao, some morphological terminology like fringe belt are different in form with those in western cities. Otherwise, because the common lack of detailed historical materials and precise historical maps, Conzenian approach is not completely fit in Chinese cities, thus amendments and development for current theory and approach are needed for researches on Chinese cities.

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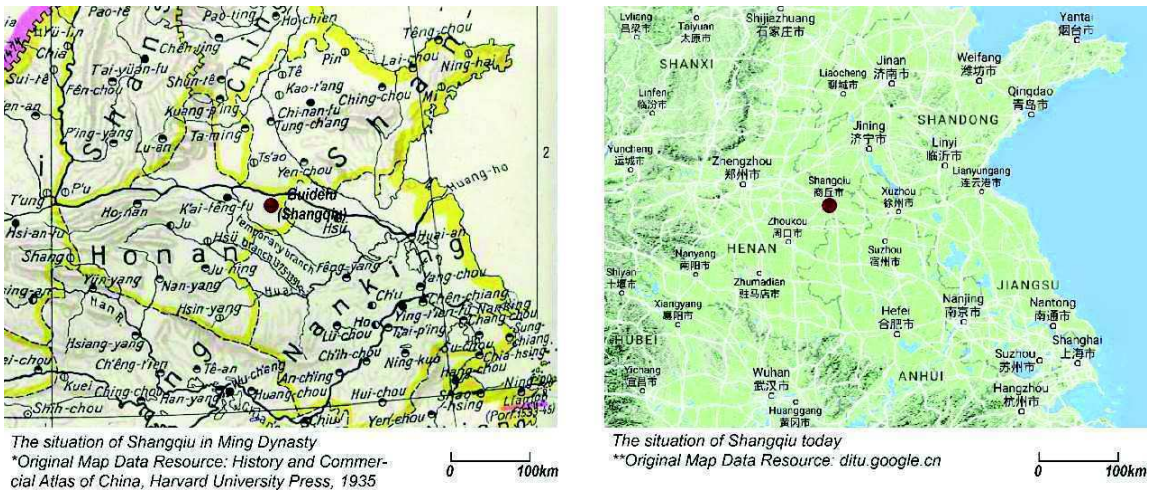

The situation of Shangqiu in Ming Dynasty
**Original Map Data Resource: History and Commercial Atlas of China, Harvard University Press, 1935*

The situation of Shangqiu today
***Original Map Data Resource: ditu.google.cn*

Figure 1.
The situation of Shangqiu

The Typicality and Representativeness of Shangqiu

The object of this study is the ancient city of Guidefu in Shangqiu. Shangqiu, the history of which can be dated back to the Xia(about 21 century B.C.-16 century B.C.) and Shang(about 16 century B.C.-11 century B.C.) Dynasties of more than 2000 years, and then becoming the capital of Shang Dynasty, plays an important role in the early regime of China. This important role benefits from the flat and fertile land and the bred of the Yellow River, long-termly being the city of best construction, most concentrated population and most developed economy, as well as a hotly contested spot for military. This advantage enhanced after the Grand Canal was excavated in Sui(581-618) and Tang(618-907) Dynasties and connected the North and the South via Shangqiu. Its development reach another peak in North Song Dynasty(960-1127), becoming an important shipping corridor and the provisional capital of Bianliang(the capital of North Song Dynasty).

With the decline of Han regime and the southward of economic center, the Central Plains region including Shangqiu, lost the position of national political and economic center after the South Song Dynasty(1127-1279). While Shangqiu still retained the position of prefectural city as well as the political and economic center in the region of eastern Central Plains, during which it was moved and reformed by wars and floods, shaping special urban landscape in the ancient city area.

Now, the preserved ancient city of Shangqiu is Guidefu city built in Ming Dynasty(1368-1644) of 1510. More than 500 years of city development provides a good case for the study of China urban form. Firstly, the morphological structure, fringe belt and fixation line of Guidefu city are fully reserved. Secondly, Shangqiu, with double "velvet glove" walls, is of a good representative in the Central Plains and one of the few ancient cities whose walls and gates are completely preserved in China. Both inside and outside the city have retained the traces of social and economic changes in the material space since Ming dynasty. Thirdly, after 1949, because of the great changes of social system and administration, Shangqiu experienced the process of separation and transfer of the city kernel.

Shangqiu Case Analysis

According to the morphological differences of Shangqiu ancient city in different social and economic conditions in different historical period, the nearly 500 years since 1510 can be divided into three morphological periods. They are the earlier and the heyday period (before 1949), the socialist construction period (1949-2000) and the period of rapid economic development (after 2000), during which the

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morphological characteristic and evolutionary impetus are different. The third period of Chinese cities is usually the reform and opening up period after 1978. The reason of choosing 2000 as the beginning of Shangqiu's third morphological period is that in 1990s, the driving forces of Shangqiu's development is still the administrative forces, only after 2000 did the commercial forces come into stage, coincident with the rapid development of economy and tourism.

The Earlier and the Heyday Period

Early City

Guidefu city is not the result of planning in advance, but due to the flood in 1502, after which the old city was totally destroyed and the governor decided to construct a new city near the site. It took 8 years to construct Guidefu city of the similar area to the old city, whose south wall was exactly at the position of the old city's north wall. The new city was 75km to the east of the provincial capital, 900km from Beijing (the capital when the city was built) and 1100 of waterways.

According to county records, the wall is 4.35km in circumference, about 7m wide on the top and 10m wide at the bottom, with 13 lookout towers and 32 alarm stations on it. The wall has four gates, called Binyang on the east, Dieze on the west, Gongyang on the south and Gongchen on the north, and two water gates, one on the west of Gongyang Gate, another on the east of Gongyang Gate.

Guidefu city is made up of three parts: the inner city wall, the moat and the outer city wall or the embankment. The 250,000m2 moat and the 9km outer city wall were constructed later than the inner city wall. The outer city wall played the role of resisting the enemy, met the needs of flood control in flood areas of the Yellow River, while the moat protected the city and stored floodwater. In fact, this kind of structure played an important role in a certain period of time, but after the weapons and war

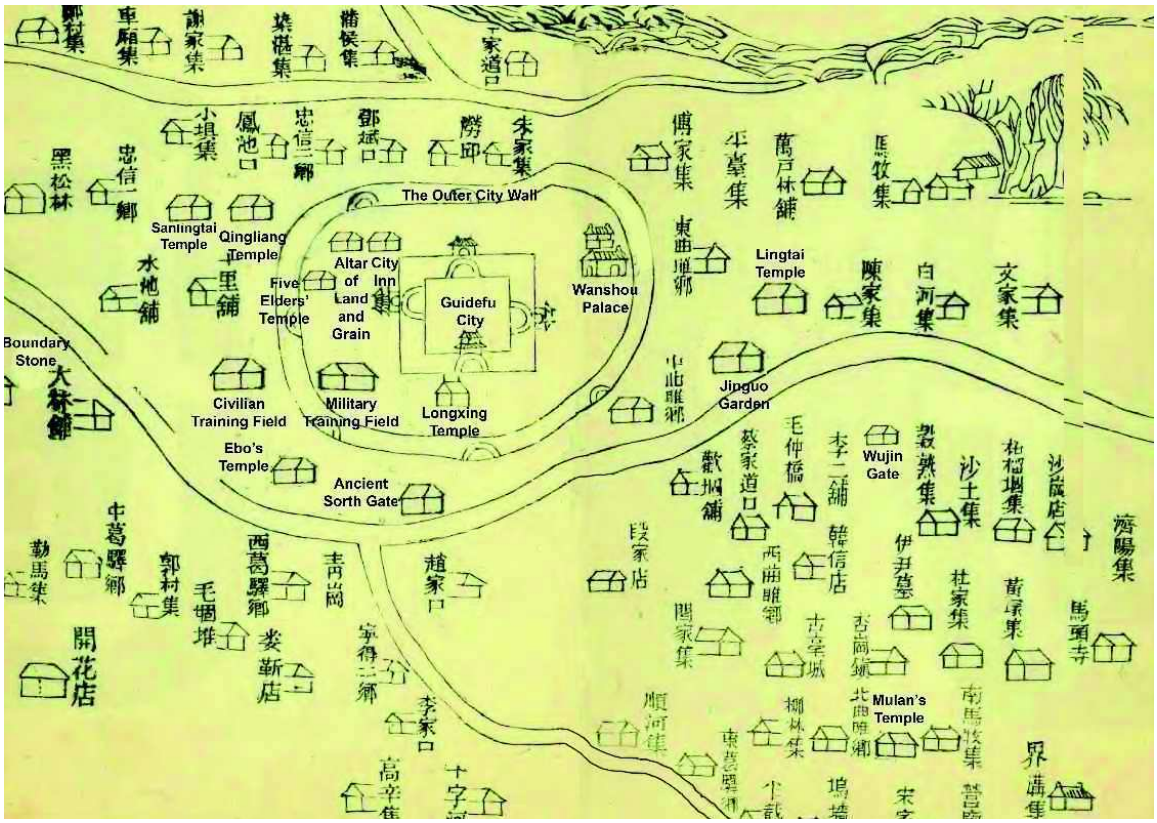

Figure 2.
The landscape of Shangqiu in Qing Dynasty.

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form changed in late nineteenth century, their function became limited and unnecessary. In respect of flood control, although the moat, outer city wall and the terrain of high center but low circumference released the pressure of small flood, there was flood inside the city wall sometimes, even boat could sail in the city, as the county records described. A large body of water retained after the elimination of flood and the typical county landscape in northern China of water, reed, boats and lotus could still be seen in early twenty century.

Urban Landscape in Early Period

The landscape inside Guidefu city has undergone profound changes, showing high similarity with the early Pingyao ancient city. In the period of construction, the construction of houses and the wall is synchronized, while inside the inner city wall some traces of space along the wall or post construction are founded, not being used as roads. Therefore, in the early stage of urban construction, the location of the city wall was not the edge of the built-up area, which was similar to the characteristics of Pingyao's early fringe belt. There are prefectural city government, county government, court, procuratorate, Confucian Temple, schools and ancestral halls in the city, while other plots are occupied and used by ordinary citizens. The layout of streets is basically the same as today. The fringe belt at this stage were similar to those of early Pingyao, distributing inside the city. Because of the chessboard pattern of blocks and the non-circle distribution of institutional land in the city, the belt was not apparent.

Important changes occurred in the middle and late Qing Dynasty. During this period, the original street structure remained unchanged, chessboard-shaped streets divided the area into neat and bustling neighborhoods. At the end of the Qing Dynasty there were 88 county roads in total, which were in chess-like distribution. The improvement of the street system coincides with the identity of the political center of Shangqiu, and has a very active economy. The difference was that most of the blocks at this time were occupied by a single plot, forming a different situation from the fringe belt in Pingyao. These plots were mostly houses for the dignitaries, each occupying half a block to one block, and some families even have multiple properties, occupying the vast majority of neighborhoods except government agencies, religious institutions, public institutions and so on. They merged small plots as their own family homestead with the power and commercial operations, and these large houses were in the form of traditional Chinese courtyard. Compared to the limited living space the city left to civilians, a humble surrounding residential area formed inside of the city wall.

Characteristics of the Early Fringe Belt

In this period, the fringe belt of Shangqiu showed a strange feature. On the one hand, the large number of large plots in the city were distributed in such an orderly way that the method of identifying the fringe belt through the large plots became invalid. Instead, the characteristics of large plots corresponded to the core of Shangqiu county. On the other hand, there were 54 towns outside the city, distributed in all directions outside the ancient city. The widespread distribution of towns showed that the urban economic life and housing construction had broken through the constraints of the two fixation lines, which extended to the outside of the city. But this practical sense of the urban fringe was not characterized by the large land and institutional land, except the religious and memorial sites which already existed for a long time, Yingtian Institute and so on. This made it need further distinction and discussion that how to define the fringe belt of Shangqiu at this stage.

This trend, which had some differences from the existing characteristics of the fringe belt, changed again in the late Qing Dynasty and the beginning of the Republic of China, turning to the similar characteristics of the fringe belt in the early industrialization of Pingyao. At the end of Qing dynasty, after the establishment of modern industry and the spread of western ideas brought by western missionaries, the city had carried out the construction of a large number of modern factories, churches, schools, hospitals which centered on Shangqiu ancient city.

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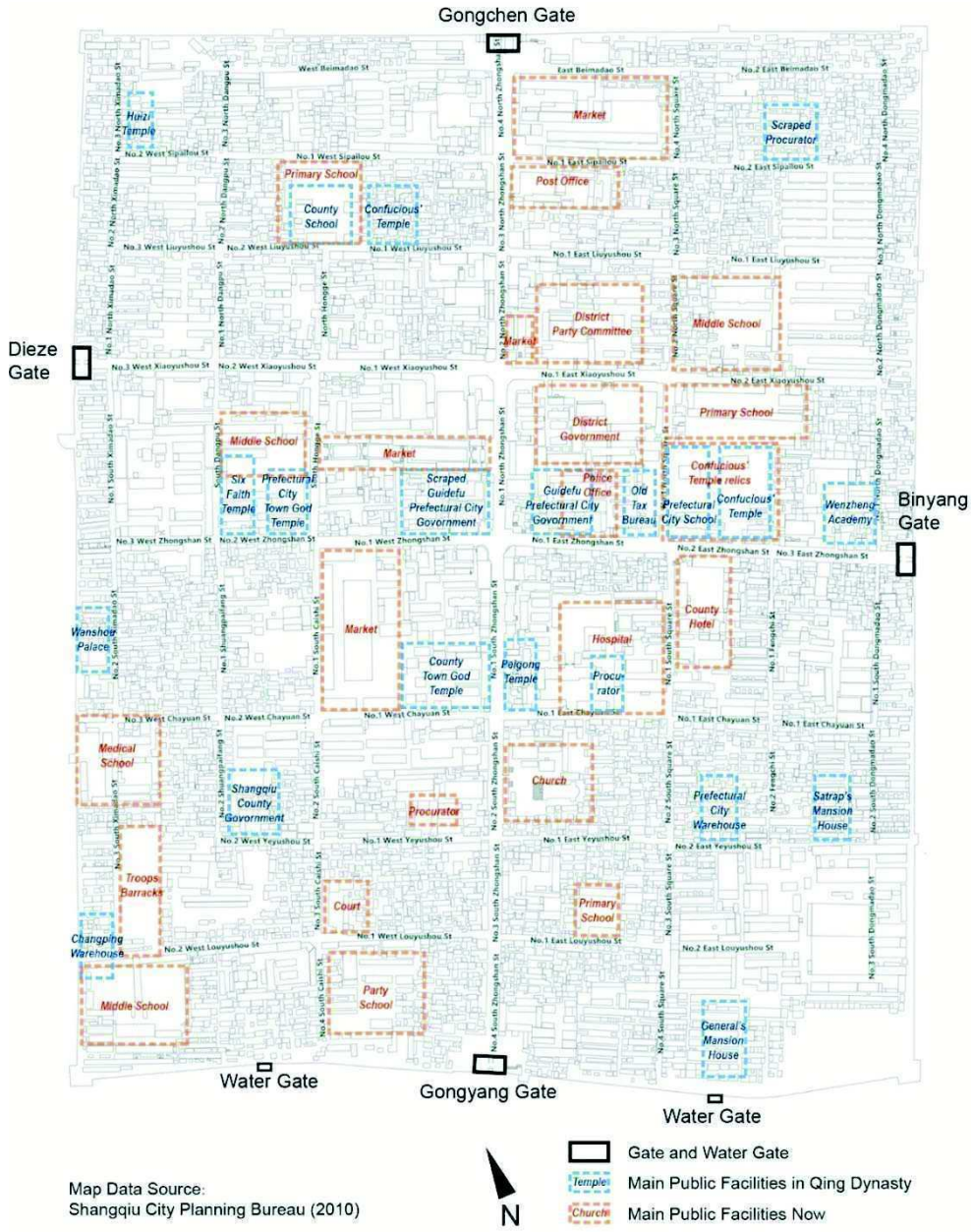

Figure 3

The distribution of public institutions inside Guidefu City in Qing Dynasty and today.

There were indications that the development of Shangqiu during this period experienced a process from developing inside of the walls to being partly restricted by the walls and then to breaking through the walls, in which the characteristics of the early fringe belt were not preserved completely, but were covered or filled by the large-block institutions and residence which were not easy to identify. Until the socio-economic institutional changes at the end of Qing Dynasty, a new round of large factories, schools and other construction made the ancient city of Shangqiu reshow the same characteristics of the fringe belt as Pingyao and some Western cases. The ambiguity and reappearance of this fringe belt reflected the impetus of urban form evolution, including the administrative system and property right, which were different from the western marketization and property rights. The property rights were weak in China, which made the pattern of construction before the emergence of the wealthy class who could

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buy the complete plots could not possibly be preserved in the early period.

The Period of Socialist Construction

The construction and destruction of the ancient city

In 1949, the People's Republic of China was established, bringing the revolutionary transformation of the social economy. The original mixture of feudal society and capitalist society was gradually replaced by new socialist construction. Its economic relations and social structure changed at the same time, and unique spatial characteristics were left behind during this period. But at the beginning of this change, remarkable spatial changes did not happen immediately with the establishment and implementation of the socialist system. On the contrary, during the early period of the establishment of the system and a long time after that, the rate of changes were as slow and gradual as the previous hundred years.

During the early period of the establishment of the socialist system, the social structure and economic relations changed first. Since the new regime eliminated the remnants of capitalist political and economic relations as much as possible, it was not legal for the private courtyards in the city to be declared, which were confiscated and used as government agencies and other public utilities, or assigned to urban residents who were average in economic condition but clear in political condition. Around 1960, the construction of the city was still strictly subject to the unified plan of the government, and the landscape did not change a lot inside and outside the city. The architectural style of the Soviet factory which was different from the ancient city walls and the new surrounding houses also supported that the construction scale of this period was not big to some degree.

During the Great Cultural Revolution, although some of the cultural relics remained destroyed by wanton destruction, the overall pattern of the city had not been greatly damaged, and most of the city housing was preserved because confiscated by government agencies. But with the end of the Cultural Revolution, urban residents who had been forced to live in the countryside (in other words, exiled) returned home, but their original housing had been reassigned to other people for political reasons, making this part of the residents lose their homes and had find new houses. At the same time after the reform and opening up, the rural surplus labor force coming into the city increased the demand for housing and pressure for land supply. Under such pressure the government had to acquiesce in the filling the moat from outside to inside and house construction, and some settlements were even built on the embankment of the outer city. Just in a few years, the original thousands of acres of water were reduced to only a few hundred acres, leaving only the south side of the water surface close to the original area.

1959
*Original Map Data Resource:
Group Planning of Ancient City of Shangqiu,
by Tongji University, 2009

1991
**Original Map Data Resource:
Annals of Shangqiu County,
SDX Joint Publishing Company, 1991

2008
***Original Map Data Resource:
Group Planning of Ancient City of Shangqiu,
by Tongji University, 2009

Figure 4
The change of built-up area and water area of Guidefu City.

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Figure 5
The condition of buildings inside Guidefu City.

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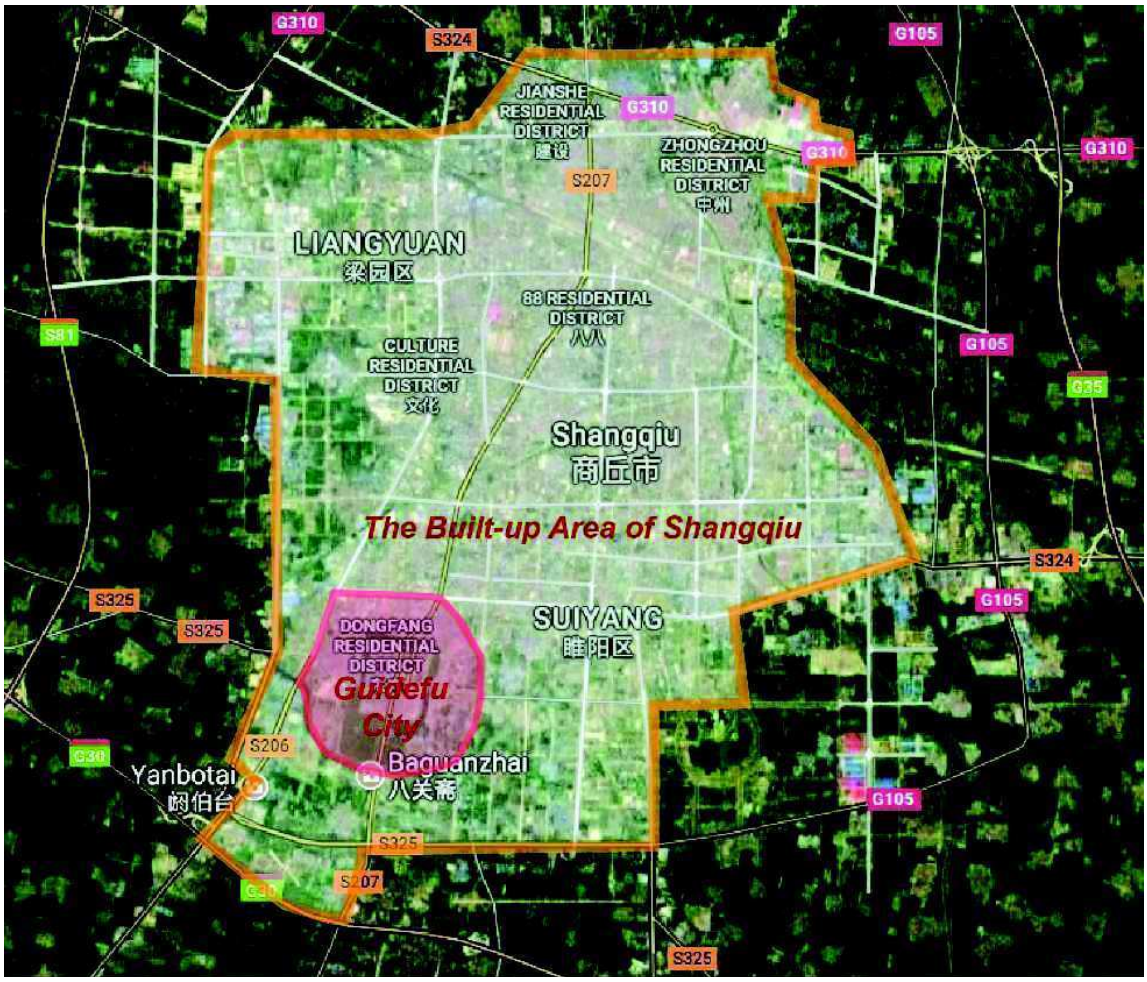

Figure 5

The relationship between the ancient city and the modern urban area.

The dramatic changes of the pattern of the city began in the early 90s of last century, when Shangqiu ancient city had not been included in the National Major Cultural Relics Protected Unit and its historical and cultural value had not been recognized yet. So the demand for the reality of utilitarian went beyond the old pattern and lifestyle. The urban large-scale transformation began. New administrative officials started the demolition and construction, during which broadening the North-South Street was the most important representative. The original North and South Street was as wide as the gate, but with the demolition and reconstruction of all the buildings on both sides of the street, the street was widened to two to three times, and antique buildings were rebuilt on both sides of the street. Except the old buildings occupied by government or institutions were retained, most other courtyards were demolished and re-constructed, and even the Catholic Church, a cultural relics, was reconstructed. This greatly improved the urban density of residential buildings, corresponding to the repletion process.

The transformation of the core of the city and fringe belt.

From the regional scale, Guidefu City completed the process of transforming from the old core of the city into the part of the fringe belt of the more large-scale new city. This change is not the result of natural evolution that city develops and changes along the original site and natural development path, but through the role of the administrative force from the construction of socialist color with Chinese characteristics.

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Established in 1969 as an administrative unit, Shangqiu Area manages Shangqiu City, Shangqiu County, which was based on Guidefu City, and multiple administrative units. In the 1990s, the developing mode of this kind ended with the combination of the city, county and district. The newly developed city became the core of the wider range of city. This kind of development model of urban form had resulted in the new stage that the new urban core was established independently outside the old city and the old core became part of the new city with the characteristic of fringe belt. The original edge of the old city core became a part of the urban fringe of the new city as the new city became bigger.

In this context, on the one hand, the ancient city became the southern suburbs of the city. On the other hand, the concept of ancient city tended to be the historical and cultural protection entity unit surrounded by the old city walls. It exists more as an independent unit in the southern part of the city and no more had the meaning of completed city functions which separated the urban and rural area as the fixation line. Because the southwestward development of Shangqiu has been obstructed by the existence of the ancient city, the contact of this direction had to detour around the ancient city.

The Period of Rapid Economic Development

After tourism has added huge economic benefits to some ancient towns such as Pingyao, Taierzhuang, and Wuzhen, the locals, especially the governors have gradually paid more attention to the tourism value of Guidefu city. The representative urban pattern and completed long history become hot spots to attract tourists. But how to place the long history of the ancient city into the physical space to get the prosperity of tourism industry, city governors, planners, the protectors of ancient city and the professors of urban morphology have different ideas.

In the new tourism project planning, the constructions inside ancient Shangqiu city will be replaced by well-designed streets and antique buildings which can reflect the style and features of ancient Guidefu city, except for some protected constructions. At the same time, in order to restore the pattern of the ancient shangqiu city, the moat between the outer city wall and brick city will be restored to the original water area as far as possible, which means tens of thousands of people living in the river area will be transferred to the centralized resettlement area by the government. In a larger scale, the new development center is selected in eastern direction of Shangqiu ancient city which is closer than the original distance to the city core. The infrastructure construction and population agglomeration followed by the new selection of city core will change the existing pattern of the whole Shangqiu city. As a result, the situation of Shangqiu ancient city being the boundary zone of Shangqiu may change again according to further development.

Figure 7
The remove of the buildings inside and outside Guidefu City.

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*Data Resource:
Constructive Detailed Planning of Guidefu City in Cultural Tourism Industrial Parks in Ancient City of Shangqiu, by Tongji University, 2014.

**Data Resource:
Conceptual Planning of Cultural Tourism Industrial Parks in Ancient City of Shangqiu, by China Architectural Design Institute, 2016.

Figure 8
The tourism plannings of Guidefu City.

Conclusion

Among Chinese urban morphology researches, Conzenian Theory and Approach are faced with the lack of data and different culture backgrounds, it still has important guiding role in Chinese urban morphology research. While when applied for cities with different social and cultural backgrounds, the use of Conzenian Approach has limitations and differences. So we need to do the examination of its applicability and modify the existing theory according to the different object of the study. When based on the discussion of Chinese urban morphology evolution and empirical analysis of ancient Shangqiu city case, the researches have the following preliminary conclusions:

1. The different temporal resolution exists in the division of the morphological period.

In the division of the Chinese morphological period, there is often the phenomenon that the longer the time from now, the longer the form period is and the more blurred the boundary is. Two reasons have caused this phenomenon. On the one hand, despite many dynasties have changed, the urban form did not fundamentally change in the history of the development of ancient city. Until the modern China, the social and economic environment began to frequently replace, the city goes through unique urban form period. On the other hand, with the details of the literature and map data increasing along the development of time gradually, only in a very short time scale, there is enough information providing enough strong research support. So, the division of the morphological period is also subject to the availability of information restrictions.

2. There is no direct relationship between Chinese urban fringe and city walls.

City walls are often the earliest elements of ancient Chinese cities with a long period of stability. However, in the early stages of urban development, the internal walls of the city are often not filled with the constructions which will retain more space for the following development. At the same time, the characteristics of ancient Chinese city edge belt and large land, institutional land are different from those of western city edge belt. Because the layout of large institutions land, including ancestral temple, government and school has strong relationship with feng shui, they are not always placed in the edge area of the city. As a result, the lands with the characteristic of the urban fringe in Chinese ancient city tend to be the representation of a specific period of administrative decrees and legislative system under the urban construction.

3. Administrative order plays an important role in the evolution of Chinese urban form.

Because of the recognition of public power and the lack of individualism in Chinese cultural traditions, administrative orders inevitably affect the development process of Chinese cities. Administrative orders play an irresistible role in Chinese cities from the site selection, planning, construction and dressing

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processes. Checkerboard street pattern and the land structure which doesn't maximize the economic benefits won't exist under the Western private property protection system and the operation of the market mechanism of the city. After the founding of new China, although the administrative order is not always different with the direction of the city in the free development, administrative orders of city build, migration, and reconstruction are still one of the most important factors in the evolution of form of China

The process of the evolution of Chinese morphological cities has different processes and results from the western cities. China's long history and varied cities also provide a broad space for urban morphology research. The study of the evolution of urban form in China will enrich both urban morphology theories and methods.

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Extending the concept of the morphological frame: A case study of Tangshan old military airport

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Abstract. *The concept of morphological frame is important in urban morphology, but it has been discussed much less than other critical concepts, such as the fringe belt and the fixation line. Passing its features on as inherited outlines, the morphological frame contains not only the linear fixation line, but also ground plan and three-dimensional aspects. In this research, the linear, ground plan, and three-dimensional morphological frame of Tangshan old military airport during the expansion of the city after the removal of the airport is identified. The former boundary roads of the airport exert obvious influences on the division of plots. The former arterial roads also function as a linear morphological frame. In relation to the ground plan, property rights and plots containing important buildings have an impact on the consequent town plan. The distinct feature of the morphological frame of the airport is its three-dimensional constraint, i.e. the vertical clearance requirement, which restricted the height of surrounding buildings. The impact of this institutional limit can last a very long time owing to the high cost of demolishing the old surrounding buildings or adding extra storeys even if the limit ceased to exist with the removal of the airport. Based on this case study, this paper refines and extends the connotation of the concept of the morphological frame and further discusses the relationship between three kinds of it.*

Keywords: China, morphological frame, three-dimensional view, airport

Introduction

Morphological frame is an important concept in urban morphology field. Although there are more discussions on fixation line, the definition and connotation of morphological frame may be much more general. The concept of morphological frame contributes a lot to the analysis and explanation of the connection between former existence and later development pattern in townscape. Even though there are some extension and deeper research on morphological frame after Conzen's definition, due to the limitation by the time and region background—a small service center in Europe of 1960s—and the particular attention to ground plan of Conzenian school, some important aspects of morphological frame are still not elaborated yet such as its tridimensional features. In this article, the concept morphological frame will be refined based on the research of Tangshan old military airport of China.

Concepts and definitions

Morphological frame was put forward by M.R.G. Conzen in 1960 in his works Alnwick, Northumberland: A study in town-plan analysis. The initial definition of morphological frame is "an antecedent

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plan feature, topographical outline, or set of outlines exerting a morphological influence on subsequent more or less conformable plan development, and often passing its features on as inherited outlines" (Conzen, 1969).

In the research of Alnwick, Conzen referred to morphological frame in several places. In the part of borough extension, Conzen mentioned that the Bow Burn acted as a morphological frame which introduced an only informal element into the plot pattern of Pottergate area, especially the easternmost burgage laying right alongside the brook. The Bow Burn could be defined as a linear morphological frame, which impacts the morphology of the division of plots.

When analyzing the pattern of fields, a lot of former elements were remained as residues in later plan. In Conzen's words, "at successive stages the field pattern surrounding the Old Town appears as a formative factor in the evolution of the street-plan", "it serves as s guiding framework for subsequent development, determining the topographical detail of later plan features". Even though the fields were assimilated by the town, due to property rights and economic considerations, the boundaries and field lanes usually served as a limit of later plan-units. This kind of morphological frame is different with the linear one as street, but as a former ground plan restrains the later one. So, it could be defined as planar morphological frame.

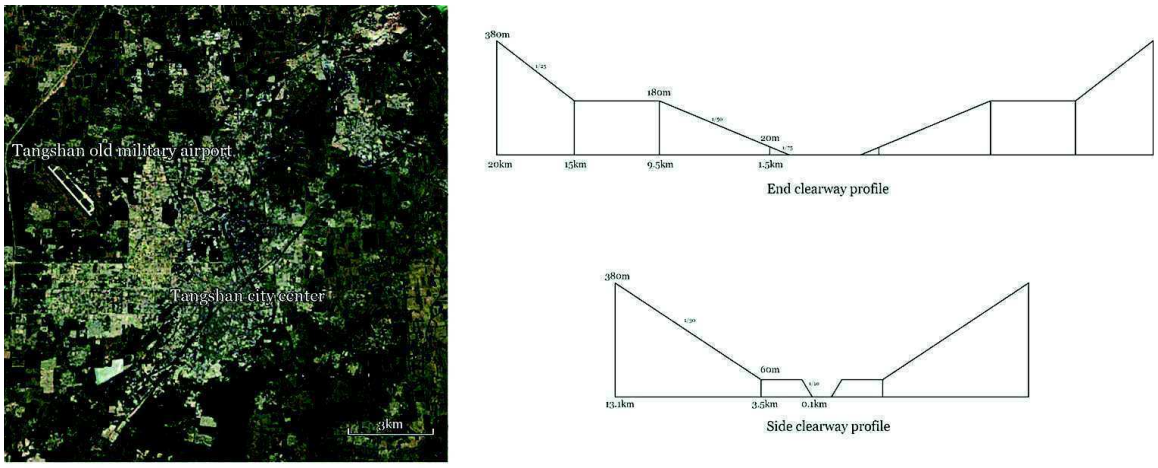
Generally, these two kinds of morphological frames affect later town plan simultaneously. For example, in the case of Alnwick, the road and the Easter Piece field act as morphological frame together to the single-sided ribbon on the east side of the ancient field-lane leading southward from Green Batt. The real boundaries like roads and rivers and more intangible limits such as property rights both restrain the ribbon development in this case.

Besides these artificial frames, rapid gradient changes or rivers could also exert influences on later town plan, which are called "topographical outlines" by Peter Larkham and Andrew Jones. For instance, in the case of an Italian city Como, the location and morphology of frame is restricted a lot by the adjacent hills and lake (Whitehand et al., 2016), i.e. the Alpine mountains and Lake Como both act as topographically morphological frame to the city Como.

Whether Conzen or later researchers all focus on the planar properties and impacts of morphological frames, without little attention to tridimensional ones. What's more, because of a more rapid urbanization and a much stronger government than western countries, it is necessary for Chinese cities to investigate the morphology changes after the removal of morphological frames.

Tangshan old military airport

Tangshan, located in northeastern Hebei Province, is one of the center cities in Beijing-Tianjin-Hebei metropolitan region. Although



1-a 1-b

Figure 1.

The location and airport protection overlay of Tangshan old military airport.

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Tangshan old military airport was built before the foundation of People's Republic of China (1949), it was repaired and enlarged in 1950 to protect Beijing and support North Korea during the Korean War. In 1976, one of the most tragic earthquakes in the history of China hit Tangshan, which killed nearly 250 thousand people. The military airport wasn't severely damaged so that it played important role to contact with outside world including transporting the injured and supplies.

After Chinese economic reform, most Chinese cities including Tangshan developed fast and expanded a lot. As a result, the distance between Tangshan city center and the military airport is so close that the airport restricted the construction of the city especially the northwestern direction because of its requirements about clearance condition (Figure 1-a). To solve this problem, the Tangshan government and Beijing air force came an agreement about the relocation of military airport in November 1995. According the agreement, the new military airport would be located in a rural county of Tangshan. In 2004, the new military airport started using and the old one was handed over to the government and transferred from military use to urban construction land.

As to the limit of the airport to the city, the Tangshan old military airport was a military class two airport in China, and according to Chinese Military Airports Clearance Regulations, its clearance area should begin from the both edges of taking off and landing strip, and extend 1500 meters as a 15% gradient (Figure 1-b). Because Tangshan old military airport was northwest southeast direction,

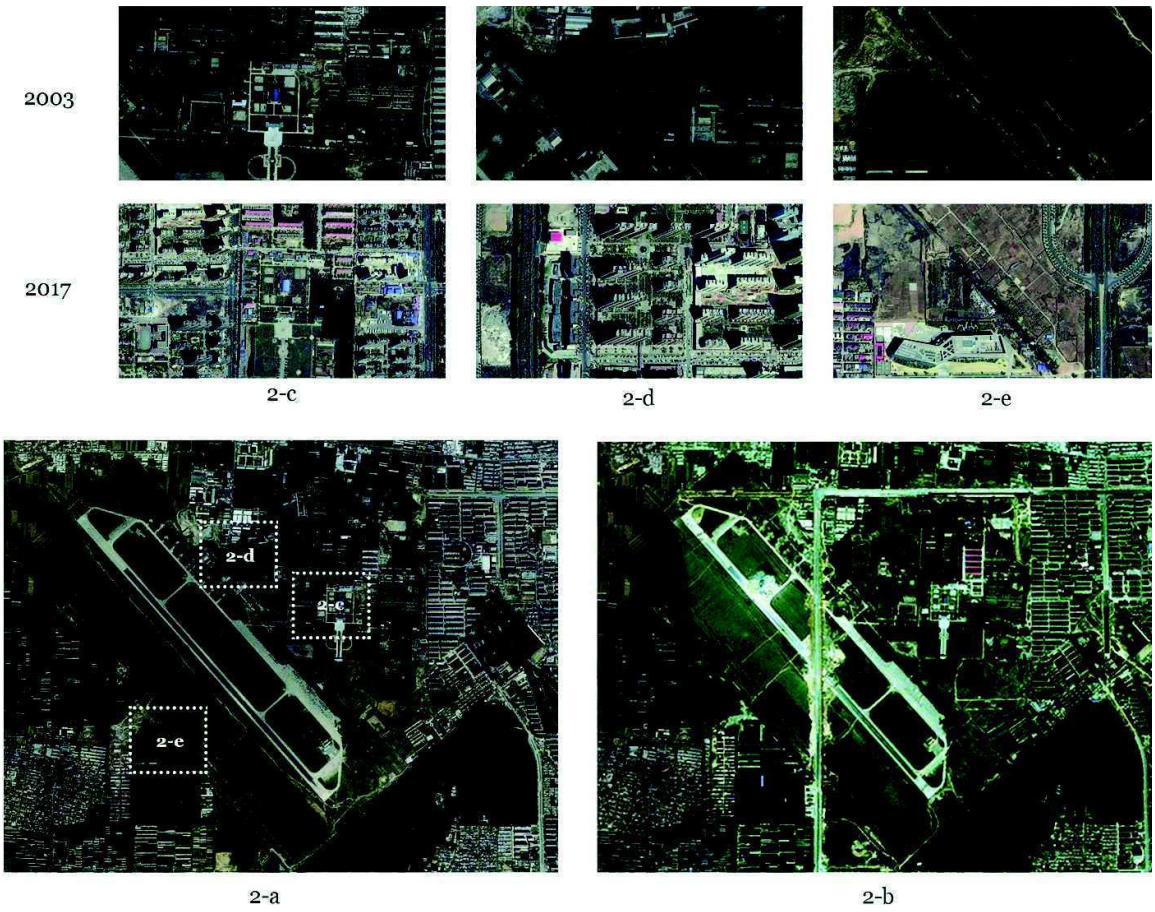

Figure 2.
Street plan changes
2-a. The old airport in 2003; 2-b. The old airport in 2005; 2-c. Dali North Road; 2-d. Lanes in the North; 2-e. Boundary lanes in the Southwest

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the city construction was constraint in this direction. As a result, before the relocation of the airport, there were almost no tall buildings in clearance area.

Due to the features—the clearance requirement and the process from being used to abandoned—of Tangshan old military airport, it is a good case to study for morphological frame research.

Changes of this area since relocation of the military airport

To illustrate the changes clearly, we choose three satellite images of 2002, 2009 and 2017 from Google Earth. The satellite images could give us a direct view of the development in a certain area, and further offer us a way to distinguish the plot pattern, fixation line and morphological frame etc. Another advantage of satellite image is that we can estimate the height of buildings from the length of the shadow when there's no available data and the target area is too large to record the height of individual building on the spot.

In the whole developing process, the street plan first changed. With the construction of Youyi North Road and the extension of Changning West Street in 2005, a general street pattern was founded in this area. After the construction of roads, the lands along the road were also developed, with a totally different style and morphology compared to the older buildings. Generally, the southeast and northeast part which is near the built-up area of the city developed earliest, then the lands with low intensity of development in the center of this area were developed, and the southwest part that is near rural area was the last part to change. The change of streets, plots and buildings in the area are tightly connected with each other in the rapid development, which is influenced not only by the former morphological frame but also later capital investment and policy impetus.

Street plan

Although street plan is thought as the most stable element in urban morphology based on the research of Alnwick, the road network changes more rapidly in the old military airport area after the relocation of military airport in 2004. Due to the particularity of airport, there were few roads inside this plot except those small ones affiliated with buildings or acting as boundaries, which provided the possibility to re-build road system in this area.

In the renewal of street system, the new road especially the arterial roads construction first happened, i.e. the construction of Youyi North Road and Changning West Street (Figure 2-b). Considering the different direction between airport construction and city main roads, respectively northwest-southeast and north-south, the internal street texture of airport should be changed to adapt the need of city expansion. Although Youyi North Road actually is affected by field pattern outside the airport, i.e. its south part is upgraded from former field lane, it is totally new in the area of airport, regardless whatever existed in its way. What ensured the performance of this drastic change is the strength of government. After meeting the airport relocation agreement, Tangshan government put forward an airport new district plan instantly, including more than 20 square kilometers lands northwest Tangshan containing the airport area, and this new district was later renamed as Phoenix New District. This could explain why the two main roads directly broke former street plan and formed a new frame.

Besides the new roads construction, some planned secondary roads in this area are upgraded from existed lanes, which means that the existed roads are re-built and widened on spot to cater with the plan. For example, Dali North Road was upgraded from an internal small lane in previous airport living quarters due to the same direction with the plan but a not enough width and a bad construction condition (Figure 2-c). This kind of change doesn't influence the existed division of plots, so that it hardly affects surrounding buildings and further cut down on the expenses and improve construction efficiency.

Roads removal is also a major change in this area especially the southeast and north part (Figure 2-d). For instance, in the south part, a new living district thoroughly blots out the

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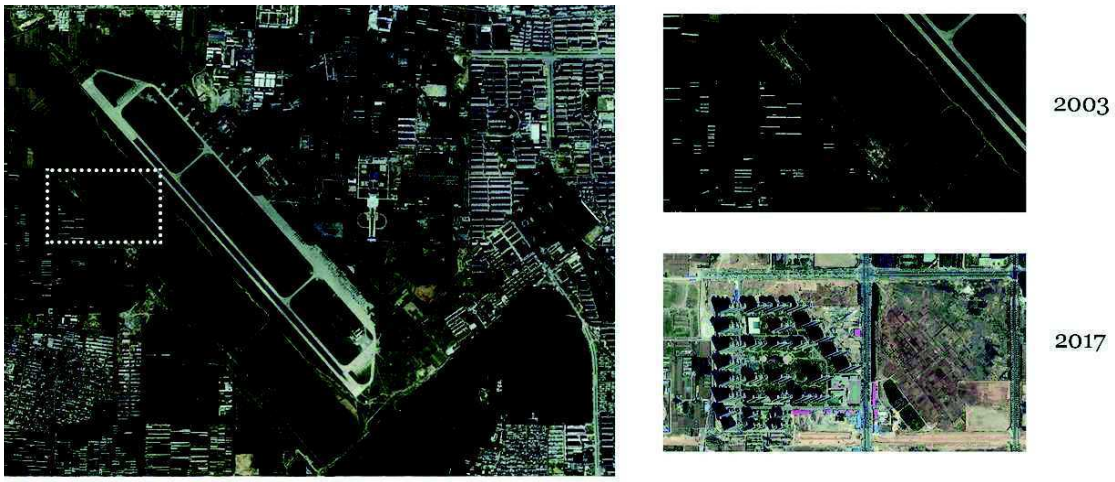

Figure 3.
Plot pattern changes
3-a. The old airport in 2003; 3-b. Jidong Shiyou Jiayuan

former lanes and rebuilds its own. Those don't accord with the plan and with no buildings beside have a greater possibility to be removed because of a low cost and resistance.

Comparatively, there are also some roads without any change inside the airport. We can distinguish two kinds of these roads. One is those roads acting as temporary boundaries with one or both sides un-renewing such as the southwest boundary of airport (Figure 2-e). They are easy to be removed or changed with the development of this area. The other one is those roads affiliating to certain buildings such as the old auditorium, which are usually very small and only used by the building itself. Maybe these roads could be reconstructed but they are not upgraded and widened.

Plot pattern

The change of plot division is usually concurrent with that of street plan. If the street is remained or upgraded, the plot division would not change drastically, while when former roads are removed and new roads are created, the plots would be re-divided by the new roads. Overall, the land development sequence was relatively consistent with the road construction, and showed the feature of arterial ribbons in early period.

One particular and interesting case is the plot of Jidong Shiyou Jiayuan (East Hebei Petrol Garden). This plot was divided obviously by the former boundary road and field lanes (Figure 3). Due to the lack of related documents, we could not get detailed information about the construction of this residential area, but the building completion sign could inform us that this district was completed in 2008 so that we could deduct that this land might be leased between 2004 to 2006, just after the relocation of old airport. From current satellite image, we can see that although this residential area is located in the cross of two arterial roads, there are still irregular shaped open space between the boundary of it and the roads, which is not common in a city. Considering this plot is not in the old airport but an adjacent village, this phenomenon may be related to the different land sources i.e. the rural collective land expropriation and the land transferred from military use to urban construction using. When the land was leased the two arterial roads hadn't been built, so the plot division could only refer to field lanes, resulting the current irregular plots this area.

Building fabric

Since the relocation of airport in 2004, a lot of new buildings grew up rapidly due to the removal of clearance requirement and internal street plan in former clearance management area and old airport land, and these new buildings are fairly different from old ones in height, density, volume and direction.

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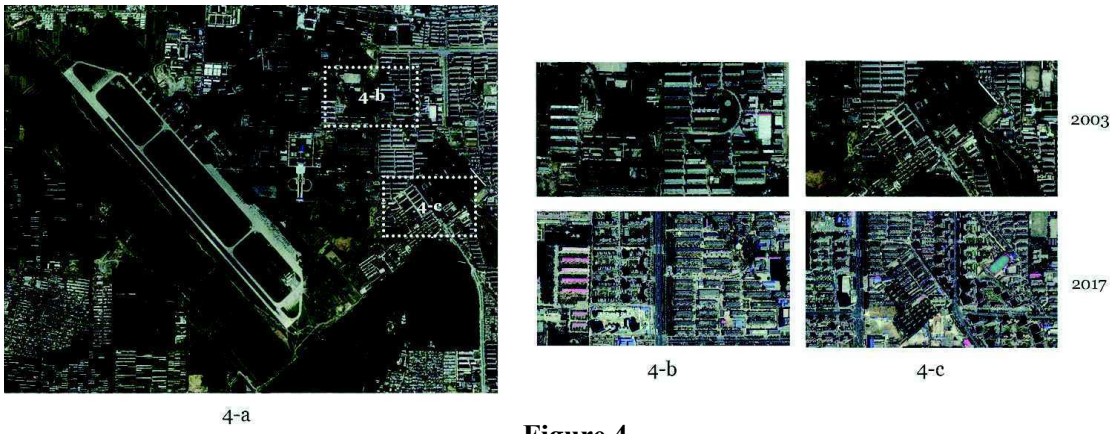

Figure 4.
Building fabrics changes
4-a. The old airport in 2003; 4-b. Xueyuan North Road; 4-c. Airport Road

From the aspect of building height and density, there are some obvious differences among the buildings on the two sides of Xueyuan North Road (Figure 4-b). Xiangrongli Community, already existed before the relocation of airport, is located on the east side with low-rise and high-density features while Yijing Wenyuan which was built after 2009 sits on the west side with relatively higher rise and lower density.

The volume of new buildings tends to be larger than older ones. For example, there were fields and low-rise and volume buildings before in north part of this area but now are big-volume buildings. These buildings are usually used as government office such as taxation authorities, procuratorate, court and bureau of public security. A big square and open space in front of buildings is also a characteristic of these plots.

One interesting change in this area is the direction of buildings beside Weiguo North Road and the old Airport Road (Figure 4-c). Before the relocation of airport, the Airport Road played an important role in regional transportation so that the Lantian Lou Community is along this northwest-southeast road. After the construction of Weiguo North Road, the current arterial road in this region, the importance of Airport Road declined, resulting the new buildings like Biyu Huafu along Weiguo North Road, although the existence of Airport Road still limits the shape of plots and the arrangement of buildings.

Morphological frame of the airport: linear, planar and tridimensional

The changes mentioned above are tightly connected with morphological frames. Some morphological frames are the residuals of old airport while there are also some from new built buildings or streets. According to the different features, we could classify the morphological frames into three categories i.e. linear, planar and tridimensional.

Linear morphological frame is the most common one which mainly contains streets and boundaries. The later plot division is not only affected by the residual streets and boundaries but also the new built roads. For example, the plots beside older Airport Road are divided along with this old “irregular” road, which causes the special arrangement of buildings inside plots. The new built roads like Youyi North Road also restricts shape of plots and other features of morphology forcefully. The plot division of Jidong Shiyou Jiayuan mentioned above is a particular case that the former morphological frames i.e. the field lane and airport boundaries exert long-term and strong influence on the later urban plan although this plot division is no longer accordant with the main roads.

Planar morphological frames, or also can be called as ground plan, have strong impacts on the later plan development and construction. We can still put our eyes on the case of Jidong Shiyou Jiayuan here because after the construction of this residential district which

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was influenced by the linear frames, it becomes an existed planar frame that could restrict and affect surrounding construction conditions such as plot division or later ground plan. Both linear and planar morphological frame contributed to the formation of the irregular shaped open space between this residential district and Changning West Street. Due to the different land property of Jidong Shiyou Jiayuan and the open space, this irregular shaped plot division would last for a long time. Another example is the village plot in the cross of Changhong West Street and Guangming North Road. Maybe the villagers didn't meet an agreement with the government on the compensation for demolition, this small village blocks the connection between these two main roads.

In this case, there is also a tridimensional morphological frame of airport i.e. the clearance requirement. The tridimensional frame is not like the visible ones that have direct physical influence on later town plan but an intangible regulation on the construction. For this area, before the relocation of airport, the clearance requirement acted as a tridimensional morphological frame, strictly limiting the height of surrounding buildings. Since there was a height control, the previous buildings tended to be low-rise and meanwhile the density would be higher to compensate the height. After the relocation of airport, the clearance requirement was also removed in this area, that is, the tridimensional morphological frame "disappear" suddenly. The new buildings in old airport could be higher than before because there's no longer strictly height control but with a lower density due to the requirement of lighting and floor ratio etc. So, the height limit could also constrain and influence the building fabrics such as the building arrangement and density.

From the satellite images, the height of buildings could be estimated by the shadows so we could depict the change of surrounding buildings by modeling. We select images from 2002 and 2015 to compare the differences in the former clearance requiring area, which is shown in figure 5-a We can find that after the airport relocation more than ten years, the surrounding buildings are still almost low-rise. In figure 5-b, there are few changes along the aircraft runway extension line. Although the strong limit to building height is removed instantly, the old buildings influenced by it would not grow higher in a short time because of a very high cost to rebuild or add storeys. On comparison, in area where the cost to break the limit is relatively lower and benefit is higher such as previous vacant lands or farmlands, new and much taller buildings would grow up fast. The new residential districts in old airport and the farmlands southeast the old airport are two examples.

The differences between tridimensional morphological frame as mentioned here and the other two kinds are clear. The tridimensional frame is not a touchable one but usually a regulation, that is, the linear and planar (ground plan) have physical impacts on later plan but tridimensional one exerts an intangible control. What's more, because the regulation property of the tridimensional frame, it is usually tied with some specific buildings or areas. Once the building or site is removed or the function is abandoned, this property would also disappear. So, after the relocation of airport, the intangible tridimensional morphological frame disappeared instantly while the physical linear and planar ones could continue existing for a relatively long time.

As to the rate of breaking through the limit

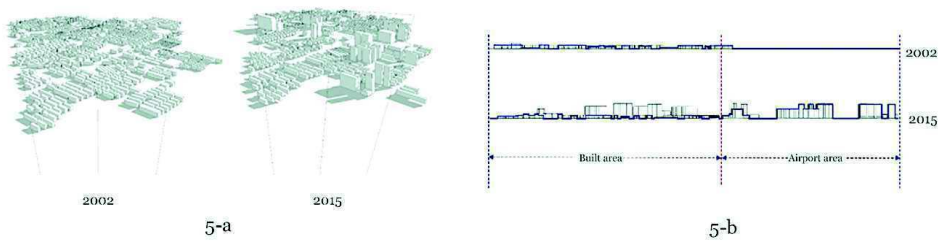

Figure 5.
Spatial model of old airport clearance area

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of former frames, there also a difference. The physical frames could be broken through easily just by demolishing and rebuilding. Although some residuals would function as morphological frames to restrict the later construction, most of physical existence would be destroyed with a relatively high speed. In comparison, although the tridimensional limit disappears thoroughly after relocation, the spatial expression of former morphological frame could be distinguished from the old buildings in a long time because the old buildings would not be pulled down and rebuilt taller soon on account of the very high cost.

Actually, these three kinds of morphological frames function together on influencing later town plan, and they also connect with each other. The linear morphological frame like street could constrain the plot division, which may later function as a planar morphological frame. The shape of plots and the tridimensional frame could impact the height and the arrangement of buildings. They function together to decide the regional urban morphology.

Conclusion

From this case, the connotation of morphological frame could be extended to tridimensional aspect, and this aspect is becoming increasingly important with the rapid development of building technology and more and more stress on spatial regulation today. There are tremendous tall buildings in modern cities which is quite different with 1960s' Alnwick whose buildings were commonly low-rise, and this means some concepts including morphological frame should be refined.

Besides the case of airport, the height control around some historical sites to protect the historical and traditional features such as the Old Summer Palace (Yuanming Yuan) is also an example of tridimensional morphological frame. Generally, the height limit regulation is compulsory as long as the building or site exist. So, from another viewpoint, the tridimensional frame can be regarded as an indigenous property connected with the function of a building or site. Once the function changes, the tridimensional morphological frame also change or disappear. In this respect, the concept morphological frame does not only express as physical existences but also spatial regulation carried by certain buildings or sites.

Under Chinese background especially the governmental background, representative as a strong government, the stability of linear and planar morphological frames i.e. the streets and ground plan is not so good as western cities such as Alnwick. Having a relatively stronger power, the government can usually make significant changes in a large area according to the city plan. And of course, the cost is also taken into consideration in this process. In Conzen's research, the cost (not only the monetary) is the main factor that decides the stability of street plans, while in this case, the different cost is also the main reason why street plan changes fast and the old buildings show a slower change. The administrative power is strongest in the construction of regional framework like main roads, but the government also takes the existed lanes into consideration in minor plan to reduce cost and unnecessary influence. So the stability of plan elements and the strength of morphological frame is closely related to the cost.

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The shaping process of urban form under a socialist system: Townscape diversity and its formation in Sanlitun, Beijing

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Abstract. *The difference between socio-economic systems is an important factor in the diversity of urban form. M. R. G. Conzen (1960) established a framework for urban morphology in the context of a British social system and culture. It was suggested that this did not necessarily apply to cities affected by revolutionary planning measures. China, which is markedly different in social system and culture from Britain by most standards qualifies as revolutionary, at least in the post-war period. Sanlitun in Beijing, China, is an interesting case for comparison with British cities. It was a site containing few buildings during the initial stage of new China, but subsequently became the 'Second Embassy District' where many embassies gathered. Now it has become a commercial core district and cultural meeting place of Westerners and Chinese. The townscape of Sanlitun, which has experienced a number of socialist construction periods reveals the process of changing urban form under a socialist system. Identifying morphological periods, the changing process of townscape development in Sanlitun is articulated. Morphological units are delimited. They clarify the variations in Sanlitun's landscapes and their formation. Based on these, this paper reflects on the shaping process of townscape under different socio-cultural systems, and further considers the universality, applicability and particularities of Conzenian theory.*

Keywords: socialist system, townscape, urban form, M. R. G. Conzen

Related Background

To discuss this issue, we choose the Sanlitun area of Beijing as our case. Sanlitun has experienced different periods of socialist construction and has retained a relatively complete space remain, which can show us the evolution of urban form under the socialist system.

Before discussion, we should clarify 'Socialist System', 'shaping process' and the reason to choose Sanlitun as the case. The present social system can be divided into the socialist system and the capitalist system speaking in general. Unlike the Cuban, North Korea or the former Soviet Union, China's socialist system had experienced a more tortuous development, and ultimately formed the socialist system with its own unique characteristics, which is different from others. The comparison of urban form in different social systems will help us to explore more general theories about the interpretation of urban landscapes under different systems. On the other hand, the shaping process of urban form refers to the operation and transformation of urban space. We call it socialist practice, or practice of socialism, which means all the activities that human beings can transform nature and society with purpose and initiative. Under the socialist system, the operation and practice of space can be divided into two kinds: one is built or reconstructed on the original urban landscape, the other is built on a blank

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space. The difference between the two kinds lies in the evolutionary of the construction and development of urban landscape. On the basis of the original urban landscape which is not completely removed, either building or rebuilding will retain the characteristics of urban landscape during the last stage. But the spatial practice on the basis of the blank and no urban landscape will reflect the influence of the social system in the specific historical period to the greatest extent, and the typical representative is Sanlitun. In the early days of the founding of the people's Republic of China, Sanlitun did not have large-scale urban development and retained a relatively complete agricultural landscape. It was a "blank land" and was suitable for the study.

In conclusion, Sanlitun area of Beijing, which has been called "the trend vane", "bar street", and "the cradle of Beijing night life" has the following advantages as a case study. The first reason is experience simplicity. There is no urban construction before the founding of the People 's Republic of China, so the study of changing process of urban form in Sanlitun can reflect the social practice under the socialist system characteristics better. The second reason is experience particularity. Sanlitun is the place where Second embassy districts stand and it is the birthplace for original source of western culture. The last one is experience integrity. Sanlitun has experienced different periods of socialist construction and has retained a clear physical space remains, which is an excellent case to explore the townscape evolution and social changes.

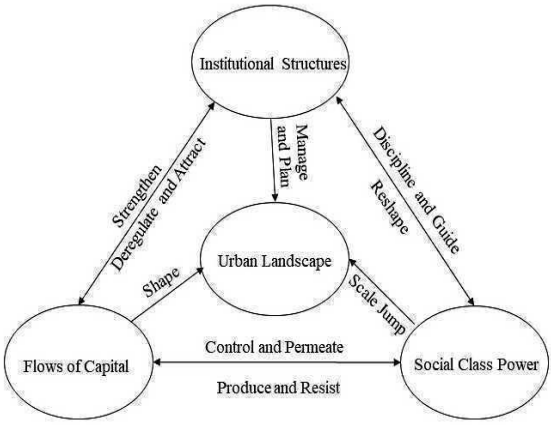

Figure 1.

After analysis of urban form, we use the theory production of space to interpret the dynamic mechanism of the townscape evolvement. To clarify the spatial practice under the socialist system, we must pay attention to not only the view of geography but also the view of social science system. A more appropriate interpretation theory is Harvey's improved theory of production of space, which integrates space and society together instead of the dualism of traditional space and society.

Theory production of space, put forward by French thinker Lefebvre in 1970s, has revealed the relationship between space and factors which shape it in social, political and economic fields. The theory not only has a profound impact on urban studies, but also on geography, sociology, Marx doctrine politics, economics, literature, art, architecture and other fields. Lefebvre constructed the theory production of space, which took the urban space as the product of capitalist production and consumption activities as the core viewpoint. After that, many geographers were influenced by Lefebvre's thought, and further, extended or perfected their theories. Among them were David Harvey (1973), who made a critical interpretation of the classical doctrine of Marx, and put forward the theory of "Urbanization of Capital" based on Lefebvre's thought. In the three stages of capital circulation, over accumulation of capital leads to more investment into urban environment and social service. The theory, however, confined to the social and economic spatial process of production, ignoring the role of political power and institution played in the process. In this study, the institutional structures represented by government and authorities' regulation of society should be introduced to complete the new cycle.

This study interprets the dynamic mechanism of evolution of urban landscape and adopts the theory production of space. The theory this study uses is based on Lefebvre the production of space and David Harvey's Three Stages of Capital Circulation theory. From the theory, the government and authorities' regulation of society represented by institutional structures, the reunion of social class power represented by the masses of society, and the flows and

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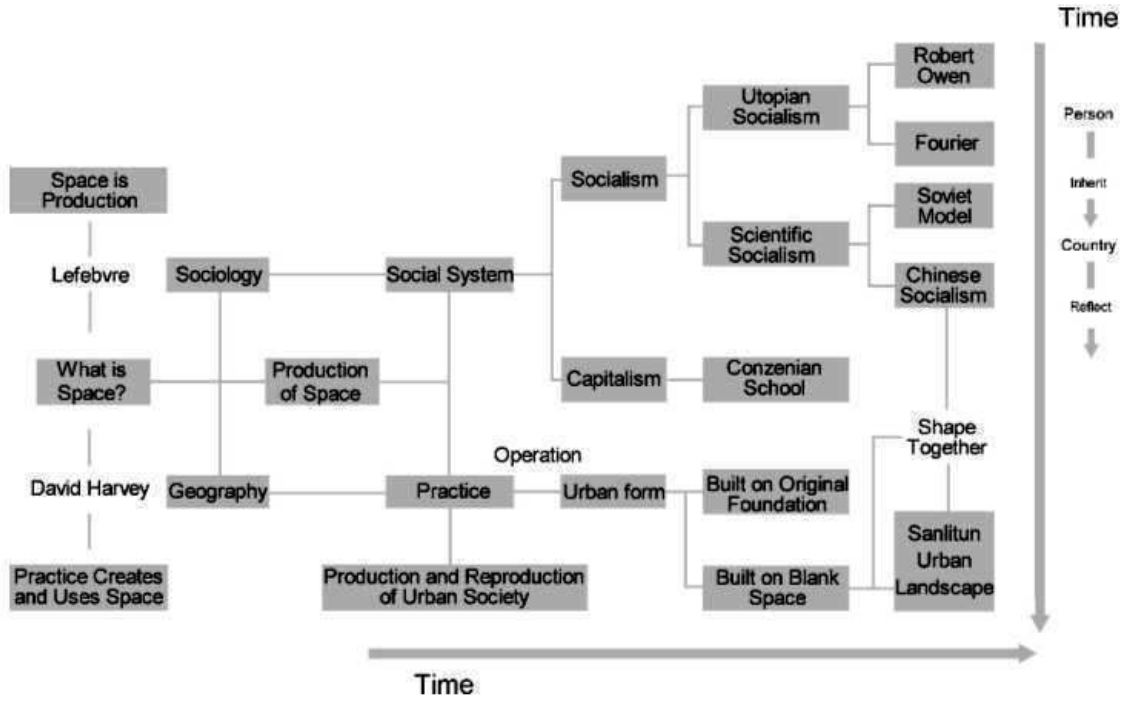

Figure 2.
Pedigree diagram of research

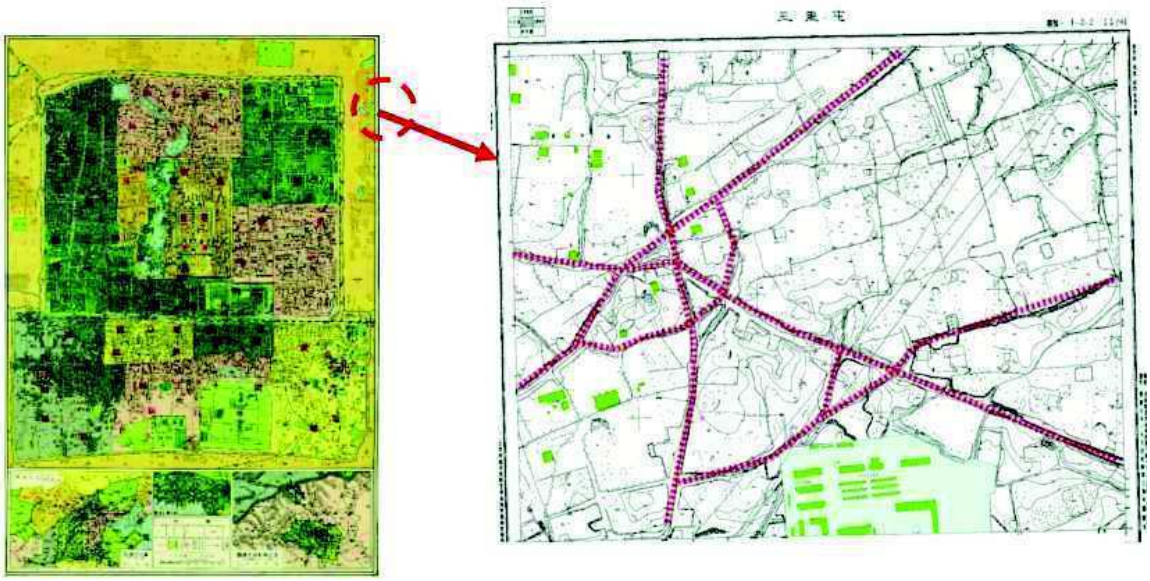

Figure 3.
Natural Form of Sanlitun in June, 1955

accumulation of capital represented by capitalists with finance corporations. The urban landscape is summed up as the interaction of the three.

Location Conditions

The location of Sanlitun determines its social and economic status in Beijing, and further determines the possible direction of its development. This paper first analyzes the regional conditions of Sanli tun from two aspects: the natural base and the social economic condition.

This map measured by Bureau of Surveying and mapping in Beijing in June, 1955 showed us a natural form of Sanlitun. The red dashed

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Figure 4.
Sanlitun Political Location and Economic Location.

line was used to draw up the natural ravines that were not artificially converted. The green blocks were used to mark the buildings that existed at that time. In terms of physical geography, it was a normal and insignificant farmland outside Beijing Xizhimen three miles away, but its flat and fertile land which was suitable for construction and the location close to the center of the old city gave it a development potential.

From the political point of view, the Zhongnanhai in Beijing city as the political center, formed a political influence on line relationship with Sanlitun, the first embassy district and the third embassy district. Compared with the old city center as a national political center, Sanlitun is the political power of international communication region. It is more international than the center of the city, and has more open political and cultural atmosphere.

From the impact of Sanlitun and its important economic centers nearby around the city, Sanlitun expanded outward to be the new center next to the original one of Xidan and Tiananmen Square. From the perspective of location, it had the opportunity to become the new Beijing City Service center. Later, because of the organic evacuation, the protection of the old city and the expansion of the economic center in Beijing, Sanlitun became the most important center in the economy instead of the former.

The later political and economic decision-making, which include location of the second embassy district and eastward move of economic center of Beijing, had a further change on its location conditions.

Morphological Periods

According to the history of macro social changes and the history of urban construction in China, the social change has experienced two tremendous turning points since the founding of China. The first turning point was 1949 in which top-down planning of urban construction prevailed in this planning economy period. The second turning point was 1978 in which commercial city development organized by economic market dominated in reform and opening up period. Combined with the history of Sanlitun, we have made a brief division of morphological periods of Beijing, which has been called (i) Pre-modern agricultural landscape period (1949~1952), (ii) Socialism initial accretion period (1952~1982), and (iii) Socialism redevelopment period (1982~now).

(i) Pre-modern agricultural landscape period (1949~1952)

During this period, China was in the early days of the founding, and had not carried out a large-scale transformation plan.

Morphological frame: The morphological frame in this period was an original natural frame dominated by irrigation canal system which was the expansion of natural waterways.

Plan unit (I): River irrigation system organized two kinds of plan elements of the agricultural production: one were the numerous farmland unit, including the farmland as production and the farmhouse scattered around. The other were few sacrificial unit, which occupied a number of special locations to provide special public service for the whole community - ritual activities.

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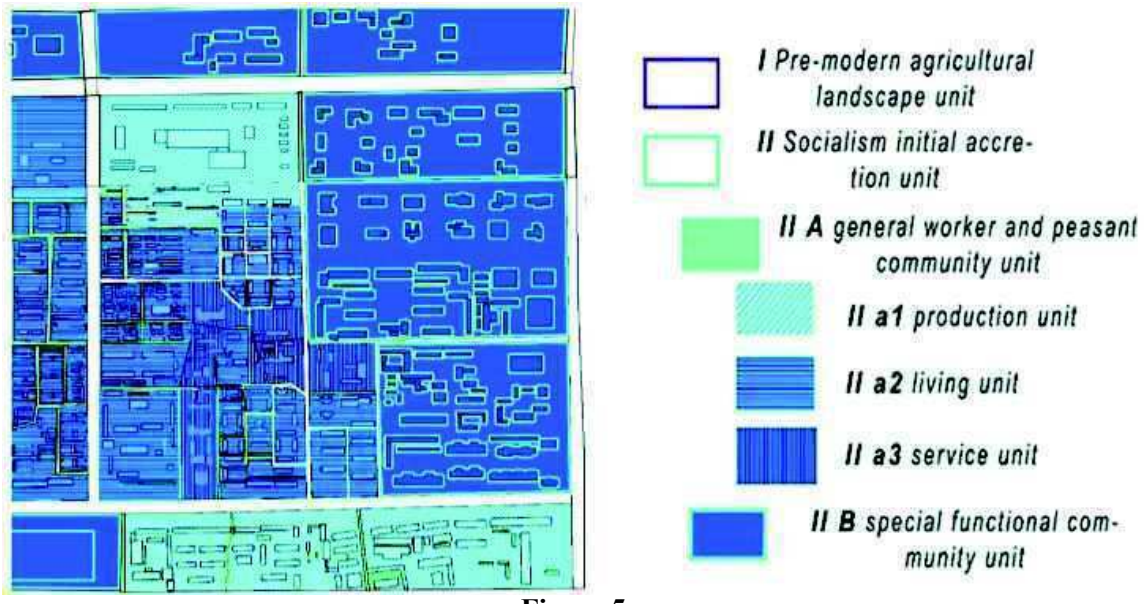

Figure 5.
Plan-units of Sanlitun during Socialism Initial Accretion Period.

Plot pattern: Farmland unit was formed by an irregularly shaped farmland and some farmhouses which were in the middle of the land. The irregular farmland mosaiced together, which was connectted by the whole system of irrigation canals. Sacrificial unit always occupied an isolated ground, such as the intersection of mountains or canal, and also had a lager building for ritual activities.

(ii) Socialism initial accretion period (1952~1982)

With the construction of the capital city, the area entered the Socialism initial accretion period. Under the new planning system, the core of the old city of Beijing stepped into the period of accretion, which reflected in new morphological frame and new plan unit.

Morphological frame: From the morphological framework, the irrigation canal, as a primitive framework, was completely wiped out and replaced by a rapidly constructed network of straight grid patterns, and the natural fixation line river was also regulated.

Plan unit (II): In order to reorganize the social life quickly and effectively, a new basic unit called ”Danwei” appeared. One Danwei integrated all aspects of social production, living and public service facilities. A large and fast copy of this basic unit was the model for basic construction during this period. In Sanlitun, this unit was divided into two parts because of the difference between function and morphology: the gerenal worker and peasant community unit (II A) and the special functional community unit (II B).

The gerenal worker and peasant community unit (II A) were typical morphological unit of this period. There are three different types: a community in which the plant was used as a production unit (II a1), a community in which the workers and peasants village was used as a living unit (II a2), and a community in which affiliated schools, hospitals, and community management station were used as a service unit (II a3).

The special function unit (II B) refered to the embassy district and the corresponding police department. In fact, they could also be viewed as a unit, all of the consulate and the police unit were the “production unit”, the Diplomatic Apartments were the “living unit”, and corresponding Armed Police hospital and kindergarten were the “service unit”. But such unit, due to the special nature of the production sector, made it distinct from the normal community.

Plot pattern: The three different unit in the gerenal worker and peasant community unit lay in a combination arrangement. They were

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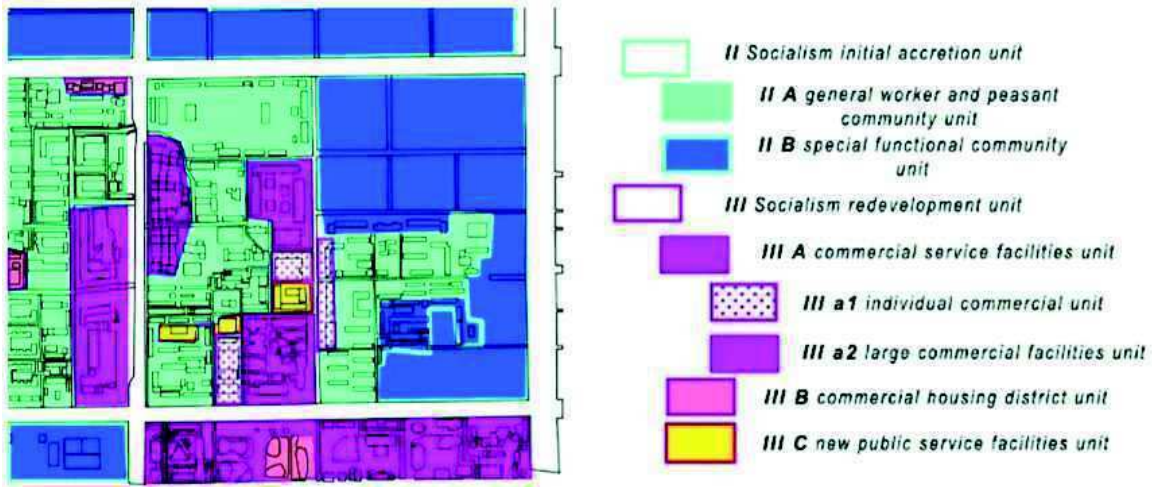

Figure 6.
Townscape -units of Sanlitun during Socialism Redevelopment Period.

close to others in space and in a higher building coverage.

The buildings in special function unit were larger, and the plot`s boundary was clear and relatively close. Its concrete construction pattern is closely related to its function.

(iii) Socialism redevelopment period (1982~now)

With the transition from the planning economy period to the market economy period, the urban construction of Beijing fully responds to the market economy, Sanlitun stepped into the Socialism redevelopment period.

Morphological frame: The basic frame of the grid road system had not changed, but the left undone path of the previous period has completed the final construction.

Plan unit (III): During this period the status of the two types of unit were different. The special function unit were relatively static, and the gerenal worker and peasant community unit had emerged alienation. This alienation was mainly due to the disintegration of Danwei system, making the city's production, living and service unit no longer closely related to Danwei as a core. Every alienation unit is divorced from the original community, and has commercial characteristics in function. They entered into a larger market, and through the market organization and deployment, a commercial redevelopment would be previled. From the planned economy to the market economy, the biggest change is the organization mode of production: the original way of community organization is transformed into enterprise organization.

The alienation process of these unit could be divided by the land redivided and the land redevelopment. From the land redivided process, the unit alienation could be divided into three different types: the production unit`s alienation, the living unit`s alienation and the service unit`s aliention. Since the industrial goal of Beijing had transformed from heavy industry to the third industry, the original factory shut down and its plot went into redevelopment of land overall. The production unit had been alienated to commercial service facilities unit (III A) and commercial housing district unit (III B). With the change of welfare housing distribution system to commercial housing system, the living unit also faced with a commercial redevelopment, which also had been alienated to commercial service facilities unit (III A) and commercial housing district unit (III B) . But the redevelopment of the community had shown the characteristics step by step. The frontage which had the highest commercial value redeveloped first, and then gradually moved to the inside of the land. The service unit`s aliention was not showen at the material level, but at the level of the service, from the community dedicated service, into the urban public service system. The new service facilities were called new public service facilities unit (III C).

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From the land redevelopment process, the old production and living unit were transformed into new production and living unit, which were commercial service facilities unit (III A) and commercial housing district unit (III B). To the commercial service facilities, because of the differences between production subject and production organization mode, they could be divided into two different new unit: the individual commercial unit (III a1) and the large commercial facilities unit (III a2). The individual commercial unit (III a1) is self-employed business gathered spontaneously from bottom to top, while the large commercial facilities unit (III a2) is large-scale commercial development led by government from top to bottom.

Plot pattern: For the plot pattern, the redevelopment for the land of commercial reflected a linear development and expansion along the street, and for the land of living reflected centrality, which formed a habitation-centric pattern where service industry expanded around.

Types of Plan-unit

From the perspective of townscape evolvement process, the geographical structure of the plot has been clearly demonstrated in front of us. Through the differences in the formation period, the townscape is divided into three major parts: the pre-modern agricultural landscape unit (I), the socialism initial accretion unit (II), and the socialism redevelopment unit (III). The pre-modern agricultural landscape unit (I) has not existed any more in this area.

During the socialism initial accretion period, the basic morphological frame of the plot has been established, and two types of plan-unit has formed: the gerenal worker and peasant community unit (II A) and the special functional community unit (II B). These two types take Danwei as a common ground: production, livelihood and public service can be organized as a whole in Danwei, a resident of Danwei may fulfill his all requirements in Danwei. The Danwei communities under these socialist practices form a typical urban landscape in Sanlitun: The collective production space enclosed by a high wall; the central building or administrative office as a symbol of the leadership of the Party (such as the empty political art troupe and armed police units), or Danwei community centeral in a production plant with the service facilities such as kindergartens, hospitals, activities room surronding around. The characteristics of the urban form at that time are highly integrated and low differentiation, which is related to the planned economy period. The different point is that the special functional community unit is diplomatic or military district which has a unique and significant stability. According to the differences of social function, the gerenal worker and peasant community unit (II A) can be divided into the production unit (II a1), the living unit (II a2), and the service unit (II a3).

During the socialism redevelopment period, the socialist economic system transformed from planned economy to market economy. Housing commercialization and privatization reform has weakened Danwei system gradually. The combination of production and livelihood in Danwei is gradually separated by the alienation in market economy. The living units gradually become the community system - the new commercial housing estates, which is characterized by low integration and high degree of differentiation, forming a new type of public service facilities and space. The production units alienate into commercial service facilities. Different development subjects lead to different commercial facilities with high degree of differentiation and diversified development of organizational functions.

The morphological frame has remained unchanged, and the alienation of plan unit has appeared. The special functional community unit (II B) have remained unchanged, the secondary unit of gerenal worker and peasant community unit (II A) alienate partly. The new unit called the socialism redevelopment unit (III) can be divided into three major parts: the commercial service facilities unit (III A), the commercial housing district unit (III B) and the new public service facilities unit (III C). The commercial service facilities unit (III A) can be divided into two different new secondary unit: the individual commercial unit (III a1) and the

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large commercial facilities unit (III a2).
To sum up, different morphological periods, different functions and different development patterns of plan unit are intertwined, and interact continously, reshaping the urban landscape in Sanlitun which makes it full of diversity and uniqueness. The diversity of urban landscape in Sanlitun is embodied in two existing periods——the Socialism initial accretion period and Socialism redevelopment period (II/III), and the existing plan unit between the gerenal worker and peasant community unit (II A) and special functional community unit (IIB), the existing plan unit between individual commercial unit (III a1) and large commercial facilities unit (III a2).

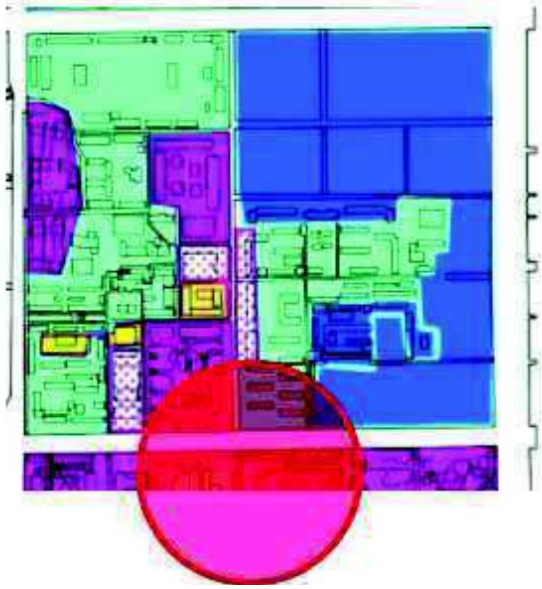

Figure 7.
Sanlitun Village—the Most Complex and Contradictory Plot

Dynamic Mechanism

We choose the most complex and contradictory plots (it is the interface of the gerenal worker and peasant community and embassy district, and it is the place where tha Bar street stands), Sanlitun Village and its surronding areas, as our study object.

During the two turning points, the relationship between the three actors have significant difference. During the period of the socialism initial accretion, government and authorities supervised the masses of society in the production and living space from top to bottom. In a completely unified action, the construction and production of new urban areas have been rapidly established. During the period of the socialism redevelopment, masses of society carried out redevelopment for the Bar Street spontaneously at first, which had an influence on the scale jump from region to city, even to the whole country. With the government stepping in, the original public domestic service facilities were guided and transformed into foreign service facilities. In the later period, the housing authority designated by the governmet guided owners of capital as new actors to step in. Some parts of land ownership had been transferred, and the owners of capital will rebuild community service facilities for a large commercial village. The capitalists were involved as a new actor. Under the supervision of the government, masses of society and the capitalists compete and cooperate with each other, and realize the commercial development of Sanlitun in the process of conflict and interaction.

In a relatively complete manner, we use the theory of "production of space" to interpret the evolution of urban landscape. It is obvious that, in the pre-modern agricultural landscape period, government and authorities took the main power of shaping urban landscape. However, the social class power took the main role in Socialism initial accretion period. Further, in Socialism redevelopment period, those three powers influence each other to shape the urban landscape: under the supervision of the government, masses of society and owners of capital both competed and cooperated with each other. The process of commercial development of Sanlitun was achieved in conflict and interaction. As a matter of fact, the nature of the dominant forces of all periods is determined by the current social system. In Pre-modern agricultural landscape period, governmental regulation leads the urban development; In Socialism initial accretion period, due to the Danwei system, the government leads masses of society to complete the development from bottom to the top; In Socialism redevelopment period, the practice entity shifted to sole proprietorship,

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bar street as a typical example, and large capital modern company. As the reforming and opening-up policy took place, and socialist economy system came into being which led to the demolishment of Danwei system and introduction of the foreign culture. Under the supervision of the government, masses of society and the capitalists compete and cooperate with each other. And that explains why those three powers could find a balance. In summary, in whatever period, the space development and practice cannot be discussed without mentioning the socialism structure.

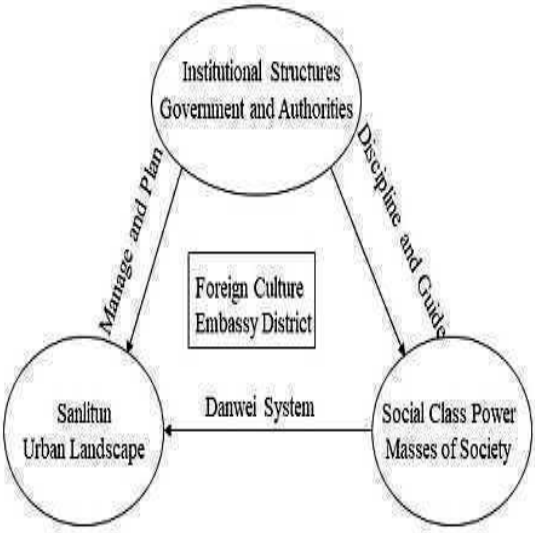

Figure 8.

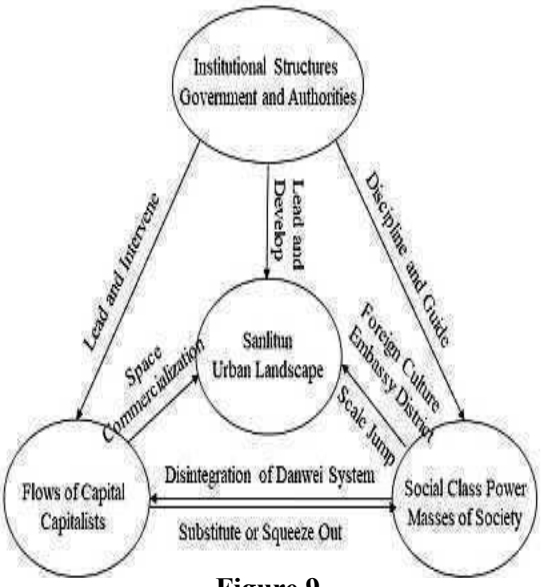

Figure 9.
Analysis of Dynamic Mechanism of Urban Landscape during the Second Evolution.

Also, the practices of space development in different periods all have unique features. Social system determines the different leading and developing forces in different periods, thus completing the spatial practice and morphological transformation in different periods of Sanlitun.

So, in the evolution of urban landscape, the social system is always controlling the form. It controls the main power of decision and development in different periods, so that Sanlitun was reformed. As a reflection of the requirements and features of socialism system in each historical period, the changes of urban form in Sanlitun could reflect the change of social system. In a nut shell, we believe it is the evolution of the social system that pushes the development of Sanlitun in terms of urban landscape.

Conclusion and Prospect

By comparison the urban landscape of Sanlitun reflects the characteristics of the Socialist space practice as follow: the first one is institutional. The space practice in Sanlitun reflects Chinese social system deeply. From the people's commune, the system of Danwei, SOHO to the bar street, we can see different requirements of the socialist system for the different periods, so it can be said that the space practice of Sanlitun is unique to the others. The second one is delay. The spatial practice realized in Sanlitun is roughly the same as that on the national level, but lags behind in different degrees at the time level. The third one is cultural particularity. Compared with other domestic socialist practice, although in the same social system, Sanlitun still has its obvious morphological particularity: the influence of foreign culture. The concrete manifestation is the embassy district and the bar street. Magnified by the social class power, they attracted the capital in the socialist market economy and formed the present urban landscape of Sanlitun in the process of shaping urban form. Therefore, foreign culture plays an important role in the space practice of socialism in Sanlitun. Based on the above basic characteristics, the article continues to reflect on the particularity of the

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urban form under socialist system in cross-cultural comparison.

The first one is fixation line and morphological frame. Fixation line is defined as a strong, protective and linear ground, such as a wall that marks the traditional, static edge of an ancient town. The field of Alnwick was recognized as the morphological frame since the middle ages. After several hundred years, its ownership and boundaries had been adjusted, but until now, there are still some reservations and remnants, which have become the boundary of plane-unit today. In Sanlitun however, the irrigation system as the framework of original agricultural landscape was rapidly and completely erased. Instead, a strict network of grid road system and a man-made river course form a new morphological frame with a history of only twenty years. The new morphological framework is very mighty and almost breaks the old one. In fact, this kind of reform movement, which was led by the government for the general public from top to bottom, was very common in China. The reason is the social background of China at that time: the highly centralized planned economy system. Whether the people's commune in the countryside or the system of Danwei in the city is a special form of organization that meets the needs of concentration. Only under the Chinese socialist system, production, resource allocation and product consumption can be regulated in all aspects by the government. Then the government had the superiority of the socialist concentrating power in major affairs to quickly broke through the original farmland framework, and efficiently led the general public to rebuild the city.

The second one is the durability of town plan, pattern of building forms, and pattern of urban land use. From the point of view of time attributes, M.R.G Conzen thinks that town plan has the strongest stability, pattern of building forms is the second, and pattern of urban land use is the most variable. The street is the most refractory element of the town plan. But in fact, he did not distinguish between the morphological importance of the same category. As a whole, the stability of the street structure is stronger than the building texture, but the streets also have grades. Low grade road stability may not be higher than high-grade buildings. But in view of the development process of Sanlitun, we can find a special presence - Embassy district. The pattern of maintaining its particularity and stability from beginning to end remains unchanged, and has not been disturbed by external changes.

Morphological period	Spacial practice	Dynamic mechanism	Nature	Foreign culture	Socialist system
Pre-modern agricutural landscape period	Primitive irrigation canals and fields	Government and authorities	Government and social system lead development	/	
Socialism intial accertion period	Danwei system	Government leads masses of society	Danwei system	Embassy district: the source of foreign culture	Social system restricts the form and determines the different spatial practice
Socialism redevelopment period	Community system—New commercial housing estates, commercial facilities and public service facilities	Under the supervision of the government, masses of society and the capitalists compete and cooperate with each other	Reform and opening up policy; Socialist market economic system	Bar Street: an important component of consumer space	

Figure 10.
The Dynamic Nature of Spatial Practice in Sanlitun during Different Periods.

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The Embassy district is even more difficult to change than the streets. This indicates the strongest stability and mighty of town plan should be discussed under the distinction between region and importance.

Through this case study, we can find that M.R.G Conzen's theory is universal, but still needs us to reflect. For example, geographical features in Sanlitun had been removed thoroughly in a very short time. In contrast, the embassy district shows strong resistance to change, which makes us reflect on the degree of form persistence in systematic form complex. Also, during Danwei period. the method of dividing morphological units is still open to questions. Because of the integrity of Danwei system, the living, production and service unit should be considered as a unit of a whole. Therefore, in order to develop urban morphological theories, we should pay more attention to cross-cultural comparative study in urban morphology.

According to the above summary of content, what Sanlitun urban landscape reflects the most important particularity of urban form is the nature of revolutionary, which is the fundamental feature of socialism spatial practice of with Chinese characteristics. The nature of revolutionary specificly manifests that the succession of urban landscape can be completed quickly beyond the limitation of time and space, and has a distinctive institutional brand of the times. The evolution of revolutionary planning measures in Sanlitun is essentially due to differences in cultural institutions. Conzen once mentioned that the morphological theory was excluded from cities affected by revolutionary planning measures. After China and Sanlitun experienced revolutionary socialist transformation, they also found the practicality and particularity of Conzen ‘s theory. Therefore, in order to improve Conzen`s theory, we should pay more attention to the importance of cross-cultural comparative study in urban form.

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Explaining the relationship between changes in Iranian lifestyle and metamorphosis of urban form of residential environment in contemporary Iran. Case study: Mashhad

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Abstract. *Humanity settlement are formed as a result of decisions and actions of different people and become as a form of an identity of integrity. So urban form is influenced by desires, values, beliefs, and human activities, so the study of urban form is the study of its constituent human values and expression of physical aspects of their lifestyles. Before contemporary periods, urban form in Iran, continuity based on former patterns of changes, which was gradual, but after the beginning of the influence of west, one of the most important challenges of urban form in Iran is in the form of short-term changes. Changes occur in a cycle of destruction and construction. This paper use the way of content analysis investigate to texts, document to study form and typo-morphology of residential environment in the city of Mashhad. In the periods of one hundred years shows there is a direct and significant relationship between changes of Iranian lifestyle and metamorphosis of urban form, so that by sequential developments of Iranian lifestyle in a short time, the urban form is responded and metamorphosed and again is created in a new form.*

Keywords: Urban form, metamorphosis, lifestyle, residential environment, Iran

Introduction

Humanity settlement design deals with the selection of a solution amongst all possible solutions. The selection usually matches with the culture of its inhabitants and makes locations discrete from each other. These sustainable choices usually establish a particular style in life or environment (Rapoport quoted to Catanese, Snyder,1979). Therefore, the physical aspect of urban areas is the impact and effect of human intensions and activities and the study of urban structure is the study of the human values that shaped it. In other words, the urban tissue is not only the historical document of its construction; but, it is also the document to the life style of those who made it and lived in there, Moudon believes that although morphology focuses on the study of city as a physical environment, it implicitly establishes a link between spatial and phisical elements of city, and the social and economic forces which shaped the city (Moudon, 2000). In other words, houses and humanity settlements are the materialistic explanation of life style, i.e. life style establishes symbolic essence of them (Rapoport, 1969). On this basis, the main purpose of housing deals with the establishment of a compatible environment, consistent with human lifestyle (Pourdeihimi,

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2011). Therefore, this paper tends to investigate the evolution of typomorphology of residential environments in the city of Mashhad, on the one hand and on the other hand it investigate the changes in Iranian lifestyles in the contemporary era, and to determine and explain the relationship of changes in Iranian lifestyles with the metamorphosis of the urban form of residential environments in contemporary Iran.

Methodology

This paper applies qualitative method. Documentary study was used for data collection. Typo-morphology was applied to recognize and analyze urban for of residential environments. At last, content analysis method was codified to analyze the interrelation of changes in Iranian life style with the metamorphosis of the urban form of residential environments in contemporary Iran.

Measurement and analysis

In this section, the changes in contemporary Iranian lifestyle are analyzed; analyzing the changes in residential tissues in Iran, it then investigates typo-morphology evolutions of residential environments in Mashhad:

Changes in Iranian lifestyle in contemporary era:

Lifestyle is consists of two words: "life" and "style". The word "lifestyle" in the dictionary meaning of which is a combination of individual and group life or culture (Webster Dictionary, 2004) and it is defined as a particular way of life of a person or group (Oxford Dictionary, 1990). It is more than a hundred years that the concept of life style has been emerged (Veblen 1899, Weber 1922 and Simmel 1904); but in recent decades and especially with the emergence of consumerism in societies, this concept has got new definitions and it has given a much of the social sciences. Various scholars in the social sciences have presented different definitions of lifestyle. Studies show that these definitions are in a wide range; on one end of which is Alfred Adler who defines the lifestyle on individual basis and defines it based on psychology; on the other hand of which is Max Weber who defines lifestyle based on sociology and the concept of social stratification. In the middle of the aforesaid ranges, there are some scholars such as Simmel, Bourdieu and Giddens who search the lifestyle in both individual and collective aspects. Analysing the evolution of lifestyle concept reveals that lifestyle in traditional (pre-industrial) societies was unity-oriented and based on social integration (Benedikter, 2011). In these communities, the basis for the social identity of an individual dealt with his assigned characteristics (Abazari, Chavoshian, 2002) and the social was not separated from the political, economic and the culture and the focus was on political issues (Azadarmaki quoted from Hajiani, 2007). In modern industrial society, productive activity and the role individuals in production system are the foundations of social identity of individuals, which led to the emergence of the social class concept in this period (Abazari, Chavoshian, 2002).

In this period, the economy got importance, because modernity bears more economic nature, in comparison with political, social and cultural aspects (Azadramaki quoted to Hajian, 2007). But in recent decades by changing in the role of individuals in production system, to their role in the consumption system and the emergence of individual consumption behavior, a new concept of lifestyle has emerged (Abazari, Chavoshian, 2002); the social and cultural affairs got importance and the middle class was established; it is not retractable like pre-modernistic society (Azadramaki quoted to Hajian, 2007); thus, it led in forming a diverse and pluralistic societies. This interprets that a society with less diversity and less development has less distinct and independent lifestyles; where higher public acceptance of lifestyle, the community becomes more free, more democratic and more open (Benedikter, 2011).

In order to understand the changes in contemporary lifestyles of Iranians, we should consider its historical tissue. Before the modern era, Iranians has been having eventful historical environment of insecurity, instability, and chaos as much as it provided the field of

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authoritarianism. In this way, people selected how two live to remain (Farasatkhah, 2016). Piran knows the key to understand the rich history of Iran in the dialectic of construction and destruction, and also, centralization and decentralization; he believes that the Iranians in the historical past obeyed authority and violation of individual rights in the light of security (Piran, 2005). It appeared that the dialectic between construction and destruction turned the historical periods of the short-term Iranian society subject to the theory of short-term society. Katozian applied the words "Old House" to show the short-term Iranian society. Most of old houses have not more than twenty or thirty years in age; they often have proper structures and they may be renewed using measures of conservation; but the reason which leads to their conviction and finally makes the building worthless and attends to the value of land is the architecture of the buildings which is not according to the latest fashion and friendly style. So instead of modernizing and increasing the available capital, the entire building is destroyed and other building stands instead of which (Katozian, 2014).

The basic contents of lifestyle in Iran may be searched and traced in the emergency of the middle class. Over the last century, Middle class designed the foundations of changes and also acted as the change agent (Azadramaki quoted to Hajian, 2007); the role of this class in two main events of the contemporary history of Iran was notable: one, the constitutional movement at the beginning of the century and the second one, was the Islamic revolution in 1978; despite all the political perceptions, both revolutionary movements reflected the national efforts to embrace modernity (Mirsepassi, 2014). Azadramaki regards the Iranian lifestyle as a way of expressing social and cultural distinctions affected by the four elements consisting the middle class, generation, gender and urbanization. These four intervened elements result in attendance of new forces in consumption market and it affects the social life of Iranians in transaction. He emphasized on the plurality, silence (resulted from the suppression of the middle class in contemporary Iranian history) and the influence of family and religion (A hidden life form in family and religion) as lifestyle characteristics of Iranian life style (Azadramaki quoted from Hajian, 2007).

In order to find Iranian lifestyle trails, we may discuss a process that "consumption" and the policy to face this concept are at the center of this process. The concept of consumption in Iran is not so positive meaning, and importantly, the concept of "consumerism" is more common than the consumption in Iran. On the one hand, consumerism expresses the concept of "lavish" and on the other hand, it represents the culture of Western societies. Although the wave of anti-consumerism was intensified after the revolution, it rooted in pre-revolutionary intellectual traditions (Kazemi, 2016)."Returning to the principle" discourse that social thinkers and authors such as Jalal Al-e Ahmad and Ali Shariati represent it, is an attempt to adapt universal Western culture with the native culture of Iran (Mirsepassi, 2014) that the fight against Westernization led to criticism of the new middle class lifestyles and their consumption around new demands such as freedom and democracy as identified. But middle class who were called Westernized by Jalal Al-e Ahmad, is the class which attends to Western symbols and it is seeking comfort. This timid class attends its appearance and beauty; on the other hand of the continuum, religious ideology, ascetic religious-revolutionary strategy is that counters consumerism and condemns it (Kazemi, 2016). This approach represents a revolutionary Islamist lifestyle which is influenced by Islam's emphasis on Islamic values to the rejection of Western consumerism (Azadramaki, Shalchi, 19 ..,). And this is where consumerism has spread; people with new ways of living, thinking and action and accustomed standard of moral and aesthetic judgments had changed (Kazemi, 2016). Figure 1 shows the continuum of Iranian lifestyle.

So, different and sometimes contradictory currents make the community as cultural arena of struggle and conflict. Global cultural changes in interact with social developments in Iran, Iranians diverse lifestyles and the second is changeable and unstable. Iranian society is the arena of different lifestyles competition to impose the legitimate definition and standard of life. Two post-modern lifestyles

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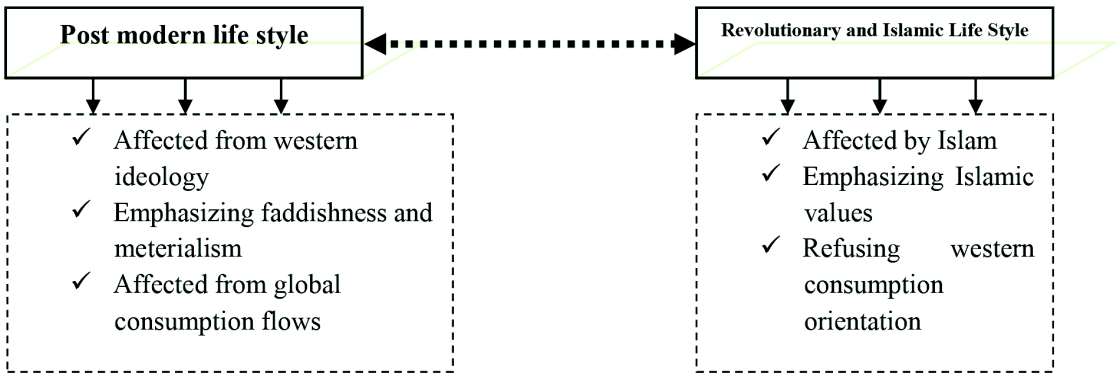

Figure 1.
Appendix to the Iranian Lifestyles

and conservative revolutionary struggle and competition are the both ends of the continuum. These lifestyles are against each other. In this, they have both identity and the identity of the legitimacy of the resistance identity is at the same time. Conservative national identity such as identity, legitimizing and at the transnational level acts as resistance identity. On the contrary, the legitimacy of the global identity of postmodern identity against the official culture acts as a resistance identity (Zadarmky, Shalchi, 19).

Typo-morphology

Typo-morphology is a combination of two words morphology and typology. Typology deals with the approach to classify types according to their function in their places. Landscape design of buildings and urban projects can be categorized according to common objectives or structured form. Classification and application of building types are designed based on specific issues of interest to designers. It involves a set of values (Lang, 1987). Rappaport believe that a concept deals with the type, class or group of people or groups of objects indicating certain characteristics in common features and these features will distinguish them from other groups of objects. He believes that typology attempts to put a set of complex objects in a regular series to achieve greater publicity for recognizing and planning (Rapoport, 1990). Radeberg believes typology is utilised to describe urban structure in terms of various features, analytical instruments and the link between environmental data and economic-social species which is defined as a planning tool by providing in-depth understanding urban types (Radberg, 1996).

On the other hand, scholars have explored the inner structure of cities from various fields of urban planning through urban morphology studies and also the main skeletal structure. Morphology, as defined by Carmona, is studying forms and types of human habitats which provides a better understanding of development and changing processes of local patterns for urban designers (Carmona et all, 2012). Madanipour (1996) defines morphology as systematic form, shape, map, structure and functions of physical aspects of cities and the origin of the tissue over times. Moudon also believes that the morphology concentrates on the tangible results of social forces and the economy, and tends to study the consequences of ideas and goals when they form on the ground and shape our cities (Moudon, 1994) as the definitions coming out of the various elements. Table 1 shows morphological elements of the city in view of morphologists.

Typo-morphology divides the urban tissue into homogeneous and integrated areas through the selection of appropriate elements out of tissue referring to criteria for analysis. Each of these areas that have been based on elements from other distinct areas called morphological species. More than having focus on form and architectural style of buildings, Typo-morphology concentrates on the relationship between buildings and areas of focus include (Daneshpour, Moradi, 2012). Kropf knows the three main components of Typo-morphology as follows: Position of the piece, the design of

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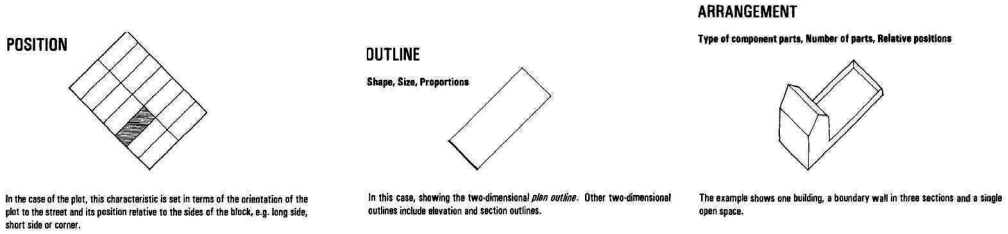

Figure 2.
Characteristics used in describing elements of urban form, taking the plot as an example

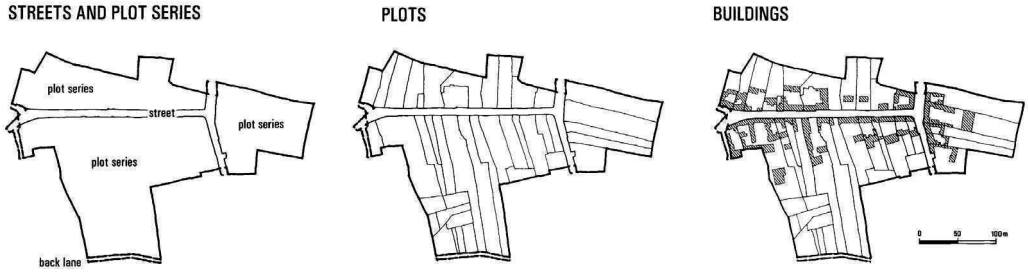

Figure 3.
Urban tissue shown at increasing levels of resolution.
The example is La Petite Rue from the village of Mery-la-Bataille, France

the piece, the arrangement of components in the piece (Kropf, 1998). He combines German and Italian schools of morphology and presents the theory of urban tissue. According to the theory, urban tissue is the physical synthesis of all components. It is an organic whole that distinguishes clearly visible on the surface. Higher resolution results in showing more details. At the most general level, the tissue can be described as the organization of streets and blocks. Describing a structure with all its details means description of its components and organization; including seating, layout and internal organization.

-Position: represents the relative position of element than other elements

-Outline: description of the external borders in terms of shape, size and proportion

-Character: Organization of components, the number of components and their relative position

In this theory, typology is based on outline plan, structural components and internal organization and districts which are distinct in physical areas, are also distinct in terms pf historical aspects (Mirmoghtadaee, 2006). Figure 2 shows characteristics used to describe the elements of an urban form. This example shows the characteristics of a parcel. Figure 3 also shows the urban tissue in different resolution levels.

Moudon offers a framework for Typo-morphology studies. Accordingly, Typo-morphology studies are classified in three categories:

-Volumetric properties of artificial structures according to related to open spaces used for defining artificial landscape

-Land and its division as a link between the building scale and the scale of the city

-Study of the urban landscape as a kind of evolution on the assumption that the urban landscape defines the time (Moudon, 1994).

So, Typo-morphology assessment is the essential tool used in evaluating urban areas which shows different stages of growth and progressive development of the city, the relationship between buildings and types of parts, building blocks and streets (Daneshpour, Moradi, 2012).

Developments of residential tissues in Iran

Up to the end of the Qajar period (1299 AH), Iranian cities developed with a consistent growth and spread pattern. During this period, the market

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is still the main door and the backbone of the city and neighborhoods survive as semi-independent location in the heart of the city. These ancient areas lost their old connection with similar villages, despite the fact that they still kept their societies (Habibi, 2003). By the end of the Qajar and early Pahlavi, the changes intensified. This was the main indicator of state-building era (Abrahamian, 2016). Accordingly authoritarian modernization got priority by the Pahlavi government in its modernization agenda but public socialization and acculturation failed to accompany society. And "modernity in society" changed to "modernization" which fell under the authoritarian of government (Farasatkhah, 2016). The Pahlavi government showed a curtailment of history, society and the city definitions which were not only contradictory and mutual; but contradictory to suggest: the contradiction between the concepts of culture and Western culture, the contradiction between the continuation of historical discontinuity historical conflict between traditions old and new ways of living environment (Habibi, 2003).

During this period, the city became a place for the exposure of all the protests and socio-cultural differences and physical-space which extends with no criterion in all directions. This process was implemented through unplanned land occupation as the main element of transactions and the type of architecture was strongly related to principles of modern architecture and in most cases, it was against biological methods and even climatic terms.

The city of this place is the number of blocks of a city defined by streets around without any lifting of physical space-gathered together (Habibi, 2003). This approach also continued during the era of the second Pahlavi and it was developed by the strength of the government and the formation of a new middle class, style of residence is changed. Thus, in the late 40's and early 50's, number of apartments increased. Increase of urban population, deficiency and expensiveness of land in urban areas, high costs of serving large-scale city, low price of apartment in comparison with villa housing (Nasri, 1995) on the one hand and the simultaneous introduction of latest developments in the apartments with family and the loosening of family ties and relations and fitness of apartment with modern type of family are the main reasons for attraction to the apartment (Nadimi, Olia, 2014).

The transition from Pahlavi Era with the dominant pattern of public modernization in the period after the revolution was the dominant pattern Islamization of state (Farasatkhah, 2016). Upon the occurrence of the Islamic Revolution, internal migration to major cities rose (Kamrava, 2012). The first five years of the revolution, the country, especially in big cities faced with a deficient municipal administration; so, in an ideal atmosphere for the realization of the principles of the constitution on the provision of housing, various organizations including Housing Foundation began the separation of land for transferring them to applicants (ibid. 73), controls and restrictions on urban areas were eliminated.

Housing developed in suburban areas; tenants and nomadic migrants started settling in suburban regions due to suffering from heavy rents. Much of housing acts were for personal use (Ahari quoted from Ghanbari, Zaheri, 2010). Urban structure in the first decade after the revolution was experiencing horizontal expansion. In this era of war and reduced oil revenues and increased demand for housing, land preparation plans have started. But, these plans have failed to achieve the patterns derived from the values and trends in society and schools of thought often imported models and comprehensive plans of cities and settlements before the revolution (Kamrava, 2012).

Developments of building tissue after the Islamic Revolution illustrated the crisis of legitimacy in the city and the consequent crisis of authority and the financial crisis in the cities of Iran on the one hand and the rejection of Western models in all political and social aspects and consequently in Urbanization patterns on the other hand, have not offered an alternative model; and we were faced with a void in urban development patterns. In this era, serious conflicts and contradictions emerged between the values and ideals of Islam and forms of urban systems. This contradiction emerged in mass transfer and non-residential standards in towns and cities, often for unplanned developments and plans in developing urban plans based on the exploitative and speculative

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tendencies (Kamrava, 2012). Table 2 shows changes in the residential tissue in Mashhad.

Typo-morphology of residential areas in the city of Mashhad

According to studies, Typo-morphology of residential tissues in Mashhad was performed at the macro level and the middle level and in three types of tissues include old, middle and modern, as developed in the following tables:

A. Old Tissue (historical):
Table 3,4 show:

-Up to 1931, establishment of Hazrat square was the most important change in old tissue

-Since mid-30s, decaying procedure of tissue began slowly.

-In a 40 years period, from 50's, the following change was occurring in old tissue; considering the thoughts affected by modern age, green ring was made around the shrine and a major part of old tissue was destructed.

-After a 30-year-old, the old tissue experienced its most important shift period. From the 70s onwards, typo-morphology of tissue underwent significance changes in the three large-, medium- and micro- scales. Without evidence of the past with it. In large-scale, geometry and logic of tissue were undergoing changes. In middle scale, the size become coarse-grained with aggregate of remaining fine grains causing previous periods and in micro-scale, tissue confront with increasing density and number of classes.

B. Middle Tissue
Table 5,6 show:

-Middle texture from the beginning of its formation (50's) has started its growth with the dominant geometric-chess pattern; until recently, typo-morphology of middle tissue had been having no change in middle and large-scale; but at the micro-scale as of 60's onwards (after a period of 40 years), we have faced with increasing density and increasing number of floors and using of apartment patterns.

C. The new tissue
Table 7,8 show:

-The new tissue started its growth in chess geometry style since the late 70's. In small scale, it follows four patterns of villas, apartments, residential complexes and high-rise building. The trend in new tissue begins less than two decades later. These changes were in two groups: maintaining typo-morphology of the lot along with increasing in dense and number of floors along with changing pattern from villa to apartment and on the other hand, integration of parts along with increasing in dense and using high-rise pattern.

Conclusion

It sounds that the dialectic between construction and destruction, according to the theory of short-term society has changed historical periods of Iran to short-term periods. Studies show that in modern times, and after Iranian confrontation with the West, construction and destruction periods became shorter. Changes in Iranian society over the last century including for constitutional revolution, social-political events of Pahlavi era, the Islamic Revolution confirms this. Another important difference between short time period of contemporary history and earlier period is changes are spreading along physical aspect of urban area. This means that each time the Iranians change their life style, topology of city reacts and in the wake of the devastation, the city is created again in a new form. So the old society creates old city in the heart of old town, old house arises. Thereby, topology of a city shows cycle of destruction and reconstruction and it is permanent. Figure 4 shows short-term changes in lifestyle and residential Typo-morphology of residential tissues of Iran.

Review of the Figure 4 shows that before the era of being affected from the West, changes in lifestyle and residential tissue shows the continuation of past patterns based on the gradual transformation. But after this period and especially the first Pahlavi era to the next, new ways of living can be raised in opposition to the ancient traditions, relying on authoritarian modernization.

This new approach is based on the rejection of past values; and demands its new form. That is why the city undergoes changes and destructs

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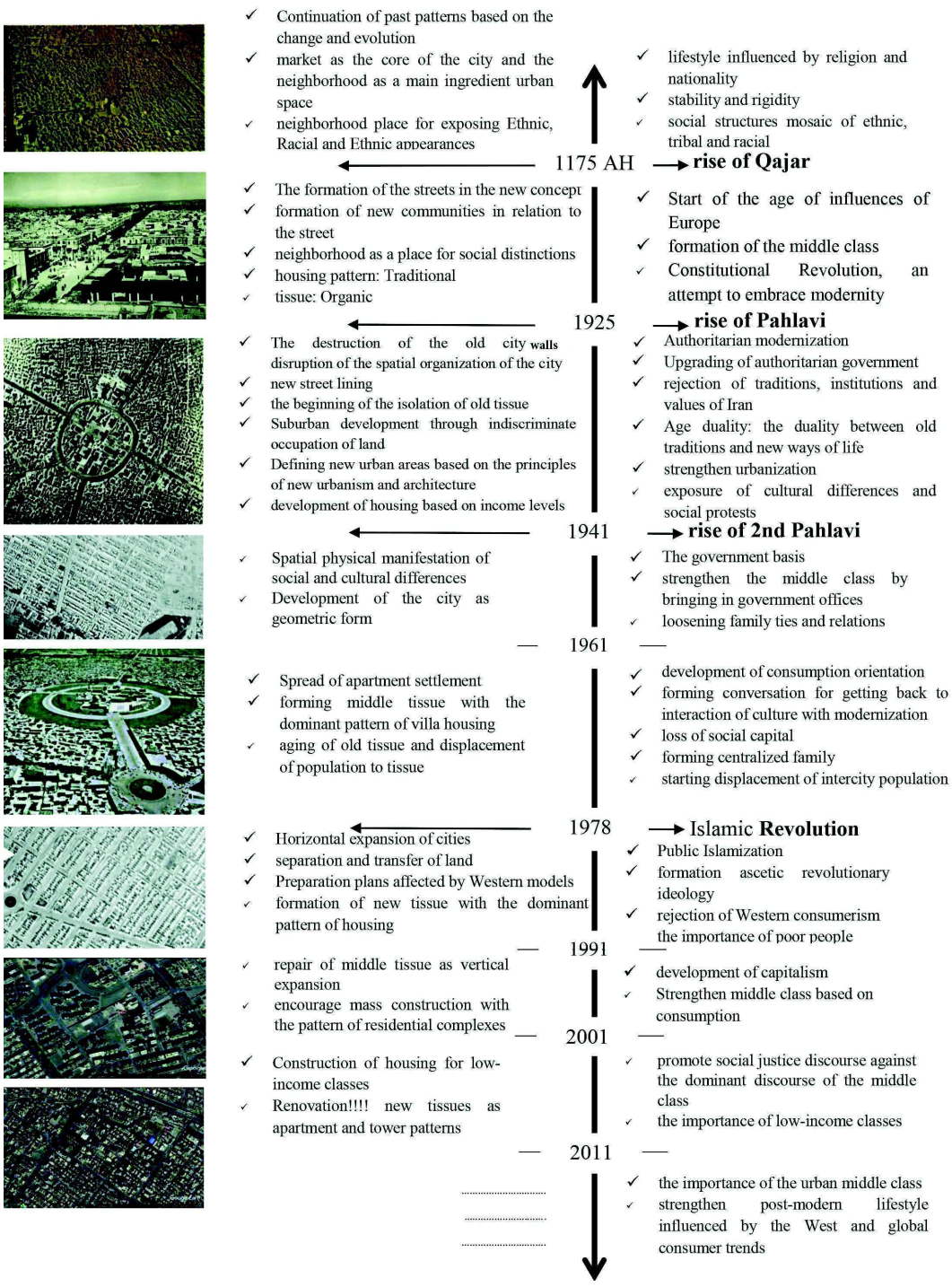

Figure 4.

Short terms of change in lifestyle and typo-morphology of residential tissues of Iran.

old tissues and makes its new spatial structure.

From this time onwards, the city get placed in the vicious cycle of destruction-construction. In the second Pahlavi era, the lifestyle of the middle class does not tolerate old tissue and searches for life in new tissues; new tissues are the result of suburban life development and form in grid and mostly in villa type. Since the second Pahlavi era, apartments' ownership act was approved and changed the Iranian lifestyle which led in changes in lifestyle and development of apartment lifestyle.

On the other hand, developing pre urban region resulted in the isolation of old tissues

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as well. The Islamic Revolution led to deny ideology and all the other trappings of the West. Immigration of low class people to cities forced the state to supply housing and assign lands to them in suburban areas and resulted in horizontal expansion of cities. But, after the war and with the government's economic policies, once again the importance of the urban middle class appeared. Middle tissues changed their pattern from villa to apartments and underwent horizontal development and underwent mass construction policies in external developments.

In the third decade after the revolution, the discourse of social justice formed for supporting the low income people, and in the sphere of housing, started the construction of Mehr social housing out of the cities; although at the same time, and particularly in the fourth decade after the revolution, it seems that middle class may not be ignored anymore. In the same time, by strengthening of postmodern life style affected from the West and global movements of consumption, housing pattern of new tissue has changed its pattern from villa to apartments and towers.

Therefore, cities undergo destructions and reconstruction in short-terms of 20-30 years and change and transience originate without any sense of time in city.

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Appendix

Table 1: morphological elements of the city in view of morphologists

Theorist	Urban Typo-morphology Elements
Conzen, 1960,1969	✓ land use ✓ building structure ✓ Segmentation pattern ✓ street pattern
Remy Allain , 2004	✓ elements: the Conzen elements ✓ structures: their own way of organizing the elements: tissue ✓ logic: ideology or decision which helps to create any structure
Maller, 1998	✓ linear elements: pass ways and borders ✓ surrounded elements: by square and streets ✓ bulky and macro elements: blocks and parks ✓ marginal elements: the coast, railways
Kropf,1998	✓ urban tissue: the most important concept in Typo-morphology ✓ elements: the streets and block / plates / buildings / rooms and spaces / walls and ceilings (building parts) / materials ✓ Different elements are connected in a hierarchy.

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Table 2: Developments in residential tissue in Mashhad

Historical term	Changes in residential tissues
Qajar era	✓ main elements: the shrine, upstream and downstream streets, Arg, neighborhoods, markets, fort ✓ main areas: upstream and downstream streets, Mirage, Noghan, Eidgah, Chaharbagh ✓ build communities based on housing patterns and ethnic and traditional affiliations ✓ tissue type: Organic
1931 1st Pahlavi	✓ Mess of urban space organization and the structure of old neighborhoods of the city with the construction of Hazrat square and Tehran and Tabarsi streets destruction of the fort of the city ✓ Changing farms and gardens to residential areas ✓ Changing housing pattern and social tissue based on income levels and reducing ethnic relations ✓ construction of the first four storey building
1941 1st Pahlavi	✓ Mess of urban space organization and the structure of old neighborhoods after the establishment of Shohada Square, Daneshgah and Arg streets ✓ establishing administrative centers and modern resort on the edge of Shohada Square and Daneshgah and Arg streets ✓ the creation of new urban functions and activities in accordance with changes in lifestyle, such as theaters, cinemas, solarium, factories, universities, railway, airport ✓ Development began in the West and Southwest inspired by Western models and in chess form
1954 2nd Pahlavi	✓ continuing development of the city to West and Southwest inspired from Western models and chess form ✓ Destruction of the villages around the city ✓ restructuring of extended families to core ones and moving from central and historical tissue to the new tissue ✓ replacement of immigrants in aged tissues and starting the aging process in historical tissue ✓ first serious intervention in historical tissue by establishing Hazrat Square (the green ring) ✓ formation of new residential tissues in one or two floors affected by climate
After the Islamic Revolution	✓ continuing development of the city to West and Southwest inspired from Western models and chess form ✓ Destruction of the villages around the city ✓ Starting land preparation plans in early Islamic Revolution ✓ growth of marginalization and informal suburban settlements ✓ renovating historical tissue with new patterns ✓ Avoiding horizontal expansion of the city in the first decade after the revolution and beginning middle tissue maintenance plans for vertical expansion

Table 3: large-scale typo-morphology classification for old tissue

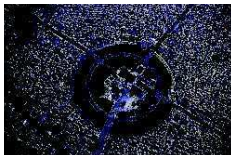
Studied era	study the evolution of textures	Block forming logic	Logic, arrangement and lining	Form and size of blocks	Operation
Old tissue in 1931 Old tissue in 1975 	Initial core of urban form	Organic	Organic	Irregular geometry, fine grains	Increase degree of residential and commercial mix-use by approaching to the shrine.
Old tissue since 1991 	Initial core of urban form	Regular geometry	Regular geometry	Regular geometry – coarse grain	At the edge of the main roads, commercial-residential and internal parts of residential tissue.

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Table 4: middle-scale typo-morphology classification for old tissue

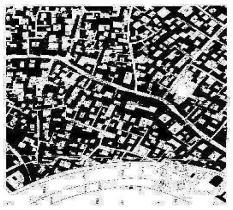
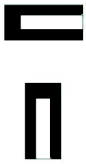
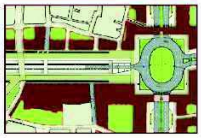
Studied era	Topology pattern	Form and size of parts	Operation	Arrangement of parts of building
		Parts have non geometrical forms	In internal parts of tissue: residential building on the edge of the main roads, increase the degree of mixing commercial with residential land uses by approximating to shrine.	Mass covers a large part of the lot.
		Parts have non geometrical forms Direction of parts is effective in classification	In internal parts of tissue: residential building on the edge of the main roads, increase the degree of mixing commercial with residential land uses by approximating to shrine.	It has separated part from the main building
		Parts have non geometrical forms Direction of parts is effective in classification	In internal parts of tissue: residential building on the edge of the main roads, increase the degree of mixing commercial with residential land uses by approximating to shrine.	It does not have separated part from the main building
		Parts have non geometrical forms Direction of parts is effective in classification	In section within the tissue of: building on the edge of the main roads of the mixing commercial with residential proximity to the shrine increases.	It does not have separated part from the main building
Since 1990s		Parts have non geometrical forms Parts are affected by street form	At the edge of the main roads, commercial-residential and internal parts of residential – commercial tissue.	setting of mass in lot based on lot form and as street side

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Table 5: Large-scale typo-morphology classification for middle tissue

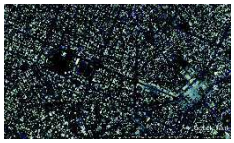
Studied era	study the evolution of textures	Block forming logic	Logic, arrangement and lining	Form and size of blocks	Operation
middle tissue in 60's  today's middle tissue	Middle period of urban tissue growth	Grid-geometry	Grid-geometry	Regular geometry – average grain	Residential

Table 6: Middle -scale typo-morphology classification for middle tissue

Studied era	Typology pattern	Form and size of parts	Operation	Arrangement of building components in lot
since 35th decade	 	Parts have geometrical forms Direction of parts is effective in classification	Residential	Mass with occupation criteria of 60% was arranged in lot

Table 7: Large-scale typo-morphology classification for new tissue

Studied era	study the evolution of textures	Block forming logic	Logic, arrangement and lining	Form and size of blocks	Operation
	Last period of tissue growth	Grid-geometry	Grid-geometry	Regular geometry – average grain	Residential

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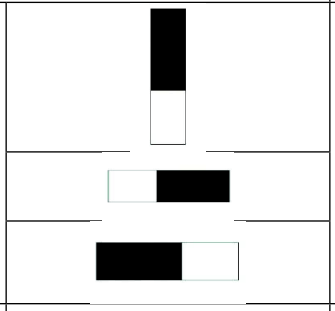
Table 8: Middle-scale typo-morphology classification for new tissue

Studied era	Typology pattern		Form and size of parts	Operation	Arrangement of building components in lot
	Apartment pattern		Parts have geometrical forms Direction of parts is effective in classification	Residential	Mass with occupation criteria of 60% was arranged in lot
	Residential complex		Parts have geometrical forms Direction of parts is effective in classification	Residential	
	Highrise construction		Parts have geometrical forms Direction of parts is effective in classification	Residential	

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Between the heritage and the contemporaneity of the industrial city of Alcoy

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Abstract. *The ARA plan, acronym for Architecture and Rehabilitation of Alcoy, was the response to a collective desire of change and to the need for the renewal of an industrial city with a deeply rooted bourgeois and working-class base. The impulse and credibility that made possible the conception of the ARA plan came from a series of projects that consolidated seriously damaged zones of the historic center, and secondarily from the economic commitment of the Generalitat with urban projects of great disciplinary interest that, at that time, had the character of pioneers for their modern procedures of intervention on the inherited city. The common framework of Plan ARA hosted many urban proposals very different in their methodology. However the sense of their cohesion in the city was evident because behind them there was a thought of order necessary for the consolidation and modernization of the urban patrimony that future challenges would ask for. The most relevant architectural project was the renovation of the neighborhood of La Sang, which won the FAD Architecture Award in 1999, but for the citizens the evidence of a remarkable change came with the construction of the public parks. Since that moment the people perceived that an ambitious and clear idea of the city was giving shape to their daily domestic outer spaces. Unfortunately a mix of political and economical issues truncated or set aside important ongoing projects so the completion of the ARA plan was never reached and the aspiration of becoming a strategic city was forgotten.*

Keywords: City renewal, urban patrimony, industrial city, heritage modernization

The awakening of a town

Alcoy is an industrial city that flourished in the nineteenth century with the increase of working class population and the construction of a set of bridges that established a service plan in order to eliminate the limitation of its topography. Its urban structure is made up of a medieval historical part with its menestral inheritance, two nineteenth-century extensions and a dispersed industrial infrastructure in these two extensions as well as along the rivers. The city has a factory worker base, an industrial bourgeoisie and a petty bourgeoisie that prefers the business of trading rather than the effort of production.

The ARA plan of Alcoy was the project of the collective desires of a city that wanted to awaken and thrive from the lethargy imposed by history to an autonomous position within the province of Alicante, like a Greek polis. Architecture and Rehabilitation of Alcoy baptized an acronym covered with a desire for affirmation, because it had to be 'ara' (now) the right instant, the expected moment that no longer would postpone to show the quality of its heritage and its renewed impetus.

During the democratic transition in September 1978, the public baths belonging to the Monte de Piedad are demolished. They were a property annexed to the recently demolished house of Beneficencia and inheritance of the workers' past, but the destruction is perceived as an act of barbarism associated with the

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mercantile value of the lot and not of the building. This new criteria of the institutions in front of the historical remains alerted about the defenselessness of the city's heritage and, in a way, it was the trigger that pushed the new mayor of the city in the 1979 elections, Mr. Jose Sanus Tormo, to assume the role of guardian of the city and become aware of the need to value and invigorate its urban qualities.

After the first democratic elections, an alliance was established between the power of management, personified in the political figure of the mayor, and the power of thought and action present in the architect Vicente Vidal. Both are aware of the historical opportunity of intervention on the city and look for models of intervention in historic centers in Europe.

This inquiry leads them to Italy during Easter 1979. There, architect Pier Luigi Cervellati shows them the political action and methodology of intervention in the historic center of Bologna, whose vitality is explained by a strong industrial establishment in its urban area, where the different social forces and their various interests are added to the general problem of the housing sector in the city, of which the historical center is a particular case. On the one hand, the interest of citizens to live differently and at lower prices under a citizen organization that responds to their social needs. On the other there are the interests of real estate capital that tend to a growing accumulation based on speculation. As a solution to these imbalances only public intervention can curb speculative tendencies by forcing private construction to lower or moderate their prices.

The first rehabilitation was carried out in 1982 on the ensemble of Plaza de España and Plaza Mayor promoted by the Ministry of Culture with an aproximate budget of 400.000 €. This job was initially commissioned to Rafael Moneo but he declined the offer in favor of Vicente Manuel Vidal Vidal who had his professional office in Alcoy. With the massiveness that needs a square linked to the gunpowder ritual celebrated during the local festivity of Saint George, the project resized and paved the plaza, the sidewalks and the streets while giving a new layout to the central surface that put together the Calderon theater, the cafes, bars and the City Hall. It also introduced a line of seven oaks that end in a small old source and recovered the cobblestones hidden under layers of asphalt. The square was finished with a modest hydraulic motif whose intention was to recall the industrial origins of the city.

For the Plaza Mayor, the annexed volumes that occupied the space of the square were removed and the deteriorated ashlar arches were remade using the same local stone in order to have the same degree of oxidation and coloration. It was a way of recognizing the ethics of the material and the trade to avoid pastiche and to give solidity to the facades. For its illumination, and with the vocation of being a public hall due to its restrained dimensions and volumetric proportion, four luminaries were placed hunging in the intersection of their respective catenaries.

This first work was felt by many inhabitants as the transition from a state of abandonment in a damaged city to a situation of change brought by democracy in which the sense of the public property was felt as something for oneself but usable by all.

As a first test for the green areas needed in the peripheral areas there was a first budget of 200.000 € for the park in the North area of the city. An outdoor amphitheater was built emptying a ravine filled with rubble and, above it, a modest bridge gave continuity to the two streets separated by the ravine already clean of debris and carefully landscaped

Two sectors of municipal property almost in ruin, the Fraga tower in Buidaoli and the Barbican in the Raval Vell were the ideal places to try the procedure collected in Bologna against the deterioration of the city. The IVVSA comissioned Vicente Manuel Vidal Vidal and Luis Alonso de Armiño Pérez (both professors of the Polytechnic University of Valencia) the rehabilitation of those zones with a program of social housing. The completion of this works definitively helped to forge the credibility of architecture in its role of renewing the historical fabric of the city.

Barbican street is formed by the buildings that used the outside face of the rammed earth wall 2.7 meters width as the supporting wall. Over time, in an operation that hybridized walls and buildings, its users excavated the wall to get the hygienist complements lacking in the working-class dwellings. Consequently, when defense was no longer necessary, the

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Figure 1.
North facade of the barbican wall of Alcoy. ©VVV

wall had to be maintained as it had associated a relevant domestic use of bathrooms and kitchens. In this intervention it would have been easier, for practical reasons, to replace the houses rather than to restore them to a current domestic program, but for historical reasons it was important to keep the wall so, as a kind of payback, the wall protected the houses attached to it (figure 1).

As for the institutional program the building of the Bank of Spain was transformed into a Culture house. It is a neoclassical building made by the academic Luis Menéndez Pidal with drawings whose copies in 1/66 scale detail the whole stonework of the facade. The authority that confers this level of precision avoided the temptation of manipulating it. So the building welcomed the program of a house of culture without giving up the urban character consolidated during its permanence. The project was carried out by Vicente Vidal Vidal with Rafael Silvestre García as a local collaborator.

Another work that kept the life of an institution with high volumetric autonomy in the city was the Municipal Archaeological Museum Camil Visedo i Molto, a project of Javier Feduchi Benlliure that transformed the Old Town Hall of Alcoy to house the showrooms and offices of the Museum of Archeology.

At the same time the urbanization and infrastructure works of the historic center were executed. Concern for the center became a priority when it was found that the potable water network had losses of more than one-third of the water flow, with the danger that it posed to the stability of the land on which the houses of the historical Center stood. For this reason, in addition to the renovation of roads, sidewalks, scuppers, tree grates, benches, litter bins and lampposts (Figure 3), a subterranean network of galleries was built to organize the urban services of water, electricity, sewers and rainwater. Only the telephone company did not agree to share that location with the other services and the phone network was arranged on the vault of the gallery.

These works consolidated the trust in the architecture as a catalyst of the desires and the individual efforts of all the actors involved. In fact it seemed that from a very different point of departure the goal to be achieved, the renewal of the city, could be read as a common desire that was being introduced collectively

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in the society, with real advantages for a large sector of the population.

After defining the areas in need of intervention, Mayor Jose Sanus proposes to the Generalitat Valenciana to summon a group of national and international architects of recognized professional background to undertake the projects of revitalization of the historic center. The debate on the historic city was at that time being developed by the most committed theoreticians of the Italian schools and by the most active urban planners such as the Porto school with Alvaro Siza as the most visible head and those of the urban planning laboratory of the UPB directed by Manuel de Solà-Morales. Also the urban proposal of Alan Colquhoun and John Miller in Cavendish Road shows another contemporary approach to the work on the city that also coud be rehearsed in Alcoy. With the fresh contribution of their experiences on the city, the participating architects discussed in different sessions in the City Hall the rough nature of sewing the deteriorated historical centers as a current issue that the European cities must confront in their many facets.

The ARA plan

The ARA plan (Architecture and Rehabilitation in Alcoy) was finally presented in 1991 (figure 2) emerging as a mature vision in the european line of complete urban projects on specific areas of the city in order to move away from the rigidity and formal indefinition of a General Plan. The projects were framed in three groups: periphery, edges of the historical center and interior areas. Within this classification parks, slopes, river beds and gardens, public and private housing, and institutional buildings were to be found.

The architecture works were published in 1992 in the Lotus magazine n. 71 dedicated to other urban approaches such as the Nexus World operation in Fukuoka and the planning of Dudok for Hilversum. The five projects exposed, La Riba, Portal de Riquer, Buidaoli, Beniata and Sang were the visible face of the ARA plan since the personal production of its authors was the guarantee that the Administration of the Generalitat needed to trust in the plan.

Beyond the question of whether to subordinate to a coordinating authority or to enjoy individual freedom of action, this general architectural vision was made from the autonomy of each project whose common link was to build a city with a strong character of unity. If we admit that the architect's concern is that his projects must have validity to exist, this objective is simpler when it is framed within an understanding or common plan in which architecture must face the updating of the inheritance received in the contemporary world. This property of architecture of becoming a truth in progress needs a thorough recognition of the territorial and urban boundary conditions of the project as well as the economic agents that render it possible. The ARA plan was to coordinate not only public investment in institutional and housing projects but also the inclusion of consolidated real estate developers who should understand and accept the new way of approaching the awakening of the city as a complex collective and spiritual creation of the civilization of which they are part.

Parks and gardens

Except that of Batoi, the parks were raised in the study of Vicente Vidal and Luis Armiño. They all had a high degree of difficulty in their execution due to the pronounced topographical mark of the peripheral areas of Alcoy.

Batoi park, with an area of 5.3 hectares, was designed to arrange the access from Banyeres road and link the most peripheral district of Alcoy with the west of the city integrating the limits of the Collao football field. The architects involved were Vicente Alcácer, Luis Casado, Vicente Colomer, Javier Soriano, Fernando Ricart and Arturo Sanz.

Romeral park, designed by architect Francisco Picó Silvestre, was intended to be not only a provision of a green area of 6.4 hectares for the neighborhood of Santa Rosa but also, in a more ambitious bet, a extension of the teaching facilities of the Romeral school. After more than twenty years of intensive use it still maintains the freshness of this gentle transition between the classrooms and nature.

Viaduct park. Architects Jose Cabanes and Margarita Valor built not only a linear park

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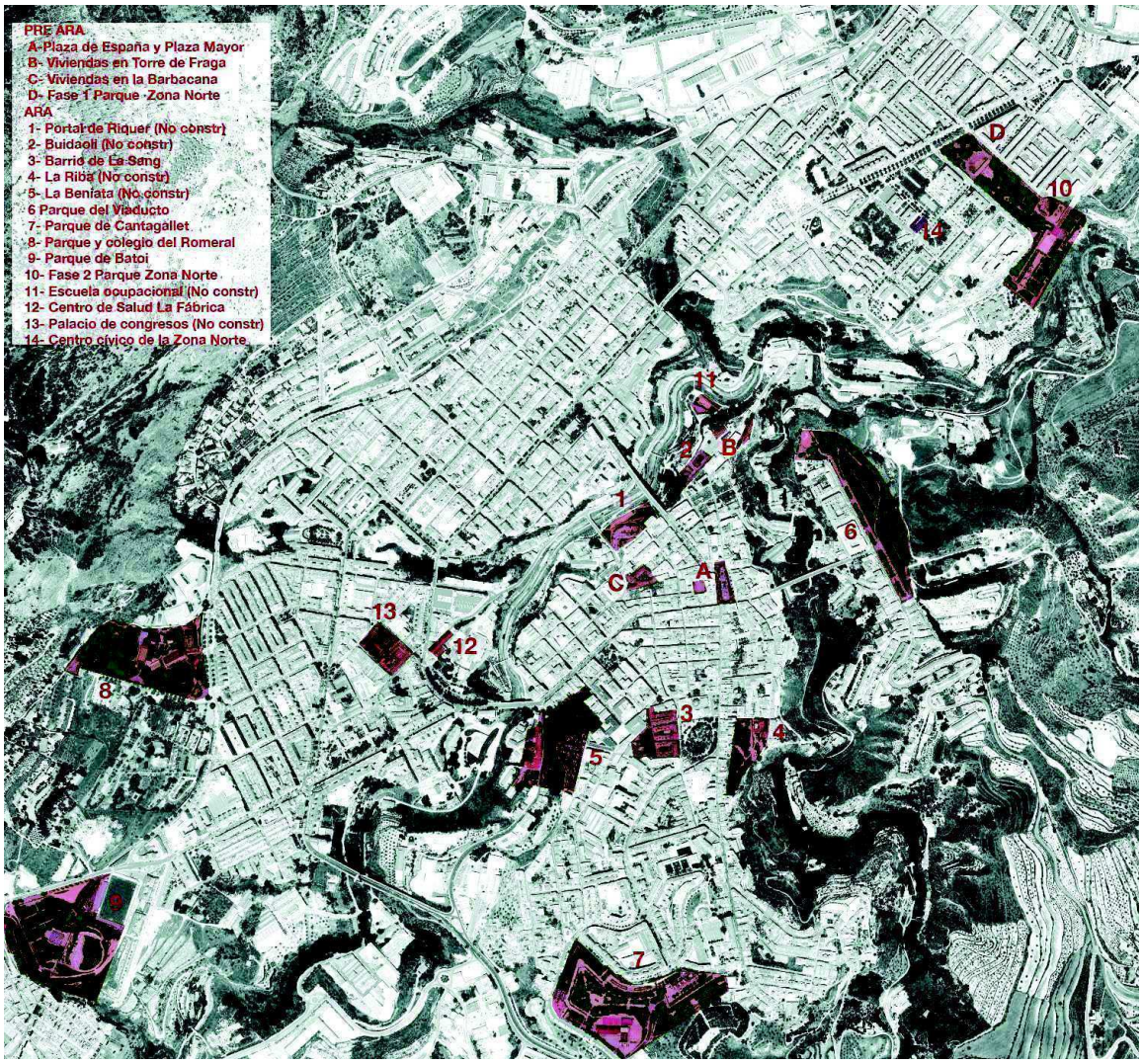

Figure 2.
Location of the ARA plan projects and the previous ones. ©VVV

of 4.2 hectares on the spur of the slopes that fall on to the rivers Molinar and Serpis but consolidated those slopes and edges that had been sliding towards the riverbed continuously.

Cantagallet park, designed by architect Javier Pérez Igualada, consolidated and urbanised 6.2 hectares of the highest area of Alcoy in its southern access embracing the institute Pare Vitoria and ordering vacant spaces for a future rational disposition of buildings.

Housing projects.

Historic center PERI. With even a greater importance than the projects of the ARA plan, in 1989 the Special Plan of Interior Reform (PERI) of the Old Town was elaborated to be able to regulate the interventions and give coherence to all the urban fabric of Raval Vell and Raval Nou. This plan, designed by Carlos Meri Cucart, was a silent and highly ambitious proposal to regulate and clean up the historic plot. It contemplated a reduction of the buildability because it subtracted depth in order to eliminate excess of interior volumes and liberate interior space of the blocks. The lost surface could be recovered by the proprietosr elevating the height to courtyard to the same height of the cornice. In spite of the rational clarity that the drawings of sections, elevations and volumetries showed, the plan was rejected by the neighbors and proprietors since it was shown to public light.

The only project that was built was

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Figure 3.
First floor plan of La Riba project, by Colquhoun and Miller Partners.

the neighborhood of La Sang through the Valencian Institute of Housing (IVVSA). The other proposals did not achieve the enthusiasm of the public and private agents that should promote it.

La Beniata. This project of the Milanese architects Renato Rozzi and Carlo Carozzi wanted to bring together the wooded mass of the back gardens of the patrician houses that had been built in the 19th century and were becoming institutions. Slopes that suffered continuous landslides had to be consolidated and the housing volumes proposed the connection between the low area served by Alicante street and the upper level garden.

La Riba. The Riba area comprises the land between the bourgeois buildings of San Nicolas Street and the slopes of the Molinar River. This area was prompted by interests to promote housing so the the study of Alan Colquhoun and John Miller prepared a preliminary project that echoed those interests offering a high density building. Colquhoun preferred a more propositional and flexible strategy for a truly contemporary project, so he disengaged himself after his visit to the place. There was no longer any possibility of changing course since the private promoters had a great greediness for edificability (Figure 3).

Buidaoli. Architect Francesco Venezia had published a museum in the magazine Casabella and, through that first work, he was invited to participate with a project that had to solve the elevation to the river Barxell from the left side of Saint George's bridge, just as Alvaro Siza solved the right side in the Portal de Riquer. The project extracted from the Italian Tendenza a compositional consequence of the elevation of Saint George's bridge and introduced an intensive parking program, as well as a complex operation of emptying and consolidating the limit of the historical city with elevated platforms like squares that had residential buildings on top. (Figure 4)

Portal de Riquer. This proposal by Alvaro Siza was the one that had more odds to become real due to a strategy of specific little interventions on the ruined buildings linked to the wall that put in value the volumetric ensemble with the rest of the wall that has a residential use. Siza never wanted to eliminate the masses on the walls as they weight stabilized the slopes. The project aims to preserve the walls because they are modest walls that were never thought beyond their use as a limit to regulate the taxes for goods entering the town. The door of the wall maintained the most primitive and more current version that is the ascending baroque perspective. Those old towers, edged and fenestrated, that emerge from the sides of the river Riquer or Barxell are the compositive base that Siza shows like an architectural material

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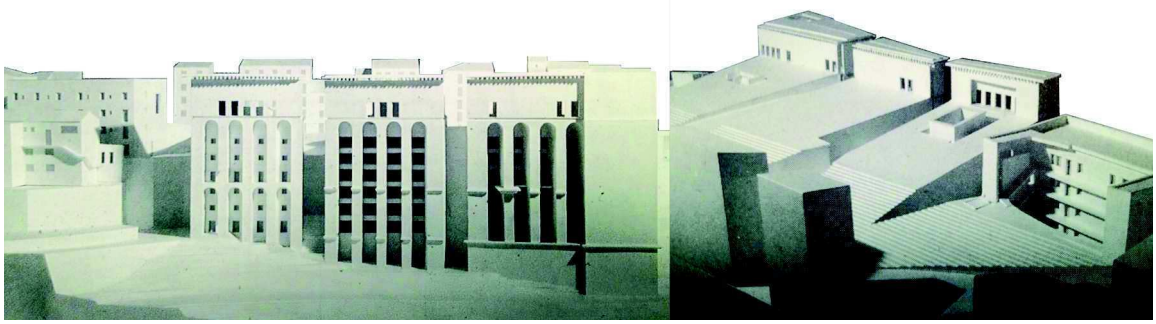

Figure 4.
Buidaoli model, by Francesco Venezia.

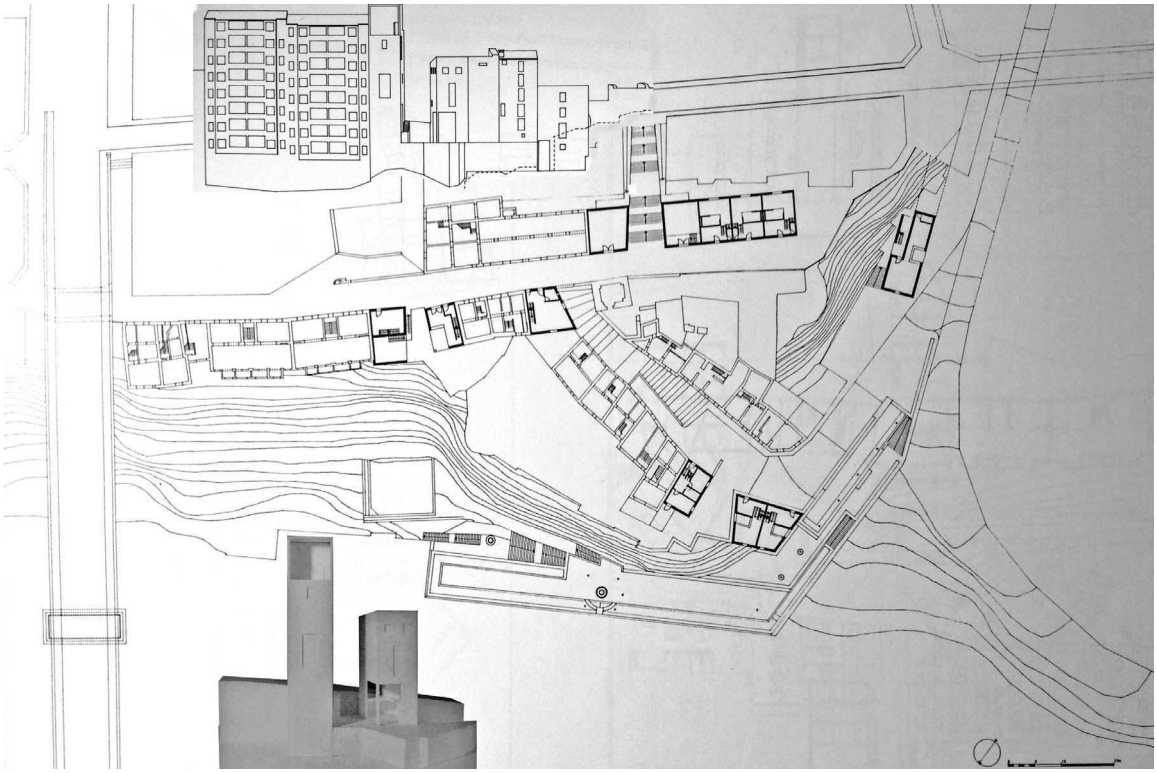

Figure 5.
Plan and Model of Portal de Riquer, by Alvaro Siza

rescued and put in a contemporary value. Only the patching and consolidation of the hillsides was carried out. (Figure 5).

La Sang. The project was developed simultaneously between Alcoy and Barcelona by Manuel de Solà-Morales, Vicente Vidal Vidal and Juan Lorenzo in 1992 (Figure 8). It is the only legacy of the ARA plan that has had the repercussion once imagined as it got the FAD prize of architecture of 1999 . The project went through the difficulties of the licitation with a reckless budget low of 30%, of the bankrupt of the building company and the abandonment of the work during three years (Figure 6)

The propositional value of the Sang project assumed the historical memory of the working class neighborhood and the current urban reality. These principles were based on the preservation of the pedestrian streets, the evolution of the turbine stairs of the ruined previous houses, the acceptance of the car's servitude with the parking lots under construction, the mixing of residential use with commercial activity, the constructive restriction to two single window modules, the freedom of pure visual composition of the elevations, the acceptance of the internal gardens and its communication with the general garden as well

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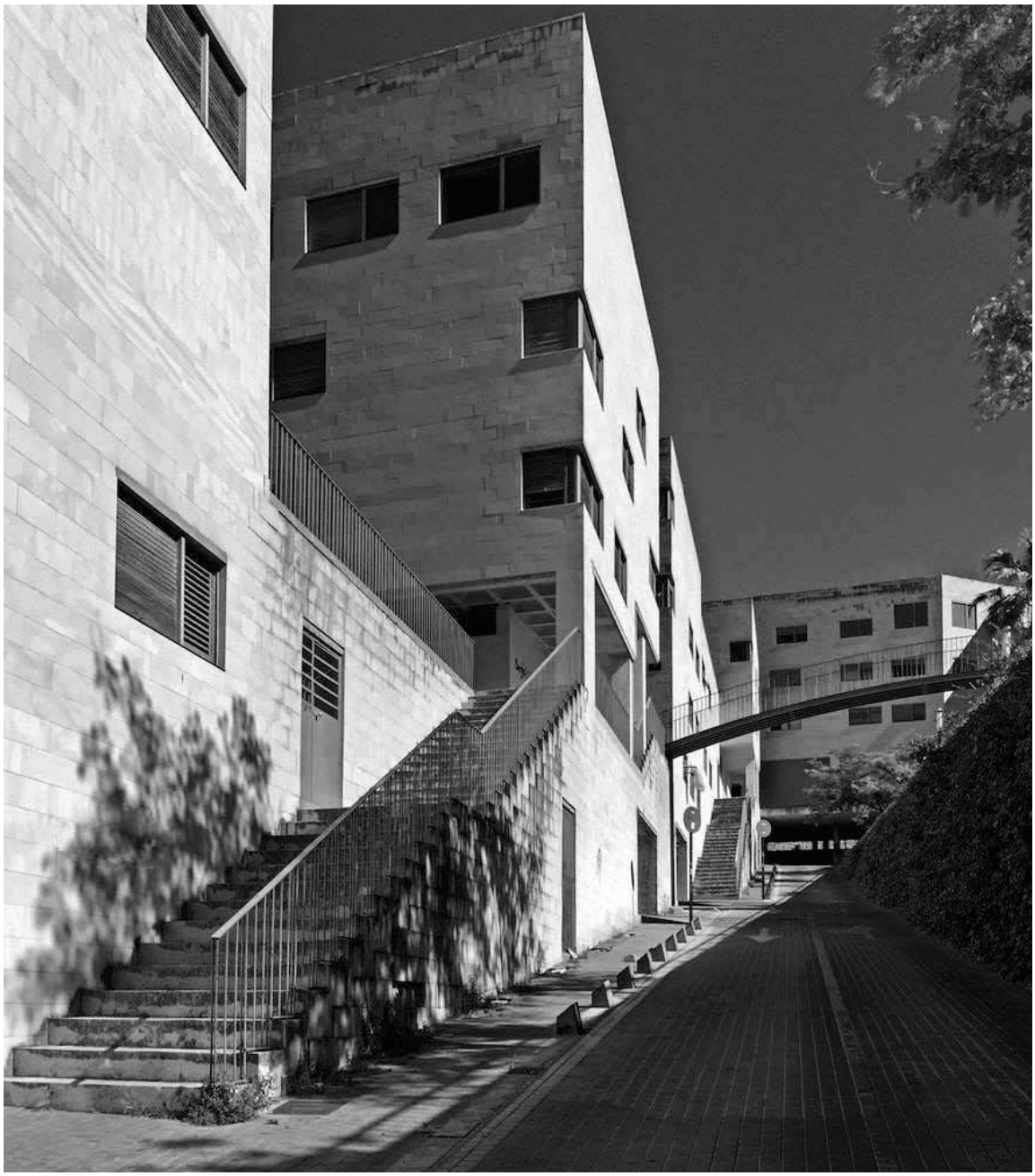

Figure 6.
View of La Sang ramp, in the neighborhood of La Sang, by Manuel de Solà-Morales

as the conservation of the mass character of the construction in Saint Matthew Street.

For the coherence of this approach there can be no interference between the access road to the garages and the road inherited from pedestrian streets and commercial streets. All these reasons gave rise to the audacious solution of opening the ramp of La Sang, that with a 14% of slope, connected Gurugú street with the entrances to the garages and, through a secondary ramp, with Sant Domènech commercial street.

Failure to carry out the rehabilitation project on Saint Matthew Street rendered hopeless the elusive principle of completeness pursued. No longer will the mixture between the solidity of the old restored buildings and the robustness of the new dwellings be perceived. The defense of the city's heritage is not only to keep the buildings protected but to improve or preserve

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the real quality of the manufactured ones that build their streets and that are the decantation of the work and life of the ancestors who inhabited those buildings. It is not a question of defending an inbred iconic conservation that only appreciates the last thin layer of what the eye does not see, but of claiming the rough effort of the construction and its ability to collect the witness of time by invoking its memory with the honesty of touch, either by hand or by the experienced eye.

With the shift of municipal government the houses of great typological uniformity that formed Saint Matthew Street were demolished and sold to the local promoters. This explains the emergence of the chamfers and the low quality of the façade material, provoking the sensation of a rough theatrical stage and destroying the perception of solidity of the volumes and of the sockets of existing ashlars from century XIX. This banal solution mutilated the complex urban operation of La Sang and although, over time, the loss of quality is masked by the distraction of everyday life, an explanation must be given because, as Manuel de Solà-Morales said, restoration and rebuilding are different terms of the same problem.

Institutional projects.

Romeral School. In operation since 1992 the school was projected in 1986 by Vicente Vidal Vidal and Luis Alonso de Armiño. It is inserted in the park of the same name and configures through its southeastern limit the north ring that links the neighborhood of Batoy with the Uxola. The games court was set on top of the tank of water that serves the neighbourhood.

Francisco Laporta Sportscenter. Architects Vicente Colomer, Luis Casado and Vicente Alcácer ordered the accesses to the sports area and covered several tracks of game inside a expressive and sharp volume

La Fábrica Health Center. Again Colomer, Casado and Alcácer reconverted the former factory of Bernabéu in a healthcare center that's been intensively used since then.

The Font Roja (Red Fountain). The old ruined hotel and the chapel of the Font Roja were rehabilitated with a project of Carlos Meri Cucart. The chapel was conserved and the building would host an institute of the nature to study the botany, fauna and geology. The emergence of its clean and edged volume perpendicular to the slope of the mountain is affirmed with a fascade of Almorquí stone that modulates the fenestration and was used as a formwork in the reinforcement of the old concrete walls en masse.

The Professional School. This non-built project of Vicente Vidal and Luis Armiño reused the ashlar walls of the recently burned factory of tacos of the river Barxell to house a center of professional retraining of adults in unemployed labor situation.

The Auditorium and Palace of Congresses. The unbuilt project of Javier Feduchi Benlliure was a more complex cultural center and occupied a block of the metallurgical industry where had been the sections of foundry, forges, boiler, lathes and warehouses. The shift of autonomic government replaced it by the rehabilitation of the old Calderón theater.

Civic Center of the North Zone. This work by Carlos Meri is a neighborhood facility that integrates diverse social groups in a clean building of stone and marble.

Plaza de España. In 1992, promoted from the Generalitat, Santiago Calatrava arrived to remodel the Plaza de España with a project that was adhered to the ARA Plan. In addition to resurfacing the whole square maintaining the previous alignments, the project emptied the central tray of the square and built a subterranean exhibition room lit up through the roof. The budget exceeded more than thirty times the cost of the previous remodeling of the square (of 1982) and time proved that it became an unexpected end of the ARA plan

Behind the scene of the urban form

In spite of the mistakes, all the efforts, means and wills committed deserve attention. From the experience transmitted by the interventions in Bologna, the thesis defended by the local government in the regeneration of the city was the acquisition of lots to avoid speculation in the places where it was going to invest. This made it possible to complete the operation of public parks, leaving some building areas for other uses, such as educational or public housing. However, it did not channel private promotion

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to the places that needed restauration as local developers continued to build on their property lots where they could achieve higher capital gains. After a methodical acquisitive work the ARA projects had municipal land ownership to provide administrative coverage and coherence of action to the proposals. Within the consolidated fabric, once the streets of the historic center were updated with the galleries of urban services, the PERI was the instrument to regulate the interventions conserving the external envelope and releasing the inner space of the block.

The experience of the urban interventions in Alcoy reveals two modus operandi acting on the city, one strong and the other weak, and that they face each other in their antagonism or cooperate to complement each other. The strong one which is responsible for the shape and disposition of the masses, and the weak one is manifested in the intention and clarity of the architectural solutions. Despite acting on the urban medium with seemingly autonomous objectives, they need to cooperate in order to complement its various scales of action and assert with craftmaship and coherence the successive layers that make up the city.

The strong interaction pursues the transformation and growth in urban areas and does not stop to reflect on the historical memory or on the quality of the urban spaces or of the new buildings. The economic engine that drives the growth of the city is the necessity, but at the same time is a golden opportunity whose flashes are the claims of wealth, the pretension of status, or the anxiety for recognition. Individuals not particularly sensitive to the sense of citizenship channel their economic empowerment towards achieving their personal interests disguised under the collective interest and, therefore, their powerful transference to the urban scale produces banal solutions that the city assumes withot criticism.

By contrast the weak interaction is sensitive to the urban environment and housing as they are appropriate spaces that the human being needs for the balance of his identity. Therefore it acts slowly and slightly, driven by that argentiferous sand of beauty in which the architect strives hard at his work of finding the formal coherence, reconverting destroyed or alienating vacant spaces throughout the city in areas with quality for coexistence, whatever anonymous the life of its interpreters can be. However it can not satisfy the collective interest of everybody, but rather a fraction, because its scale is that of the intrinsic order of housing and public spaces whose use is linked to something that has no mercantile exchange. Thus, by producing a material without revenue we can not associate the weak interaction to the growth of the city, but to its improvement.

The case study of the ARA plan shows us that when these forces no longer act separately and truly cooperate within the limits of their respective scales is when the collective interest makes sense. In an advanced civilization degree it is when the individual becomes his own antagonist and draws away his personal interest in favour of a general necessity becoming a citizen and identifying himself with his polis. A city whose growth and continous transformation is carried out in response to these two forces, will move away from the banality of the urban form and will approach to the concinnitas, ie, the orderly balance of the different layers of consistency that the works of architecture demand through criteria of truth.

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Dealing with mass housing estates legacy: The need of specific diagnoses from an urban design perspective

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Abstract. *In the recent international debate about mass housing estates built during the decades of rapid urban growth after World War II, different approaches coexist. It has only been in the last years, that urban planning and urban design perspectives have been considered in depth. In the case of Spain, some global and local visions complement more specific approaches, such as the ones focused on the obsolescence of dwelling typologies and urban forms. Our starting point is that Spanish collective housing estates (polígonos) constitute a huge legacy which needs accurate diagnosis. Our research has been developed from an urban design perspective, focusing on urban forms and open spaces. The goal is to add some nuances to certain excessively generic interpretations, trying to find indicators, some of them measurable and other empiric, that allow a suitable evaluation of each specific case, beyond too subjective approaches. In this way, systematic diagnosis could provide more appropriate knowledge for the urban regeneration, recovery or reactivation of these estates. This paper addresses with a European comparative perspective some case studies of Spanish housing estates (polígonos) built in Madrid, Barcelona and Zaragoza between 1950 and the 1970s. The quality of the urban projects and the obsolescence or resilience processes has been tested by contrasting the original situation at the time of their construction with their current state.*

Keywords: Collective housing, mass housing estates, modernist urban forms, modular housing blocks, high rise apartments, polígonos de vivienda, urban design.

Introduction. Mass housing estates and modernist urban forms

In the recent international debate about mass housing estates built during the decades of rapid urban growth after World War II (1950s-70s) different approaches coexist. Some of them focus, from an architectural and historical perspective, either on the 'best examples' (AA. VV., 2009) or on the problems which resulted from the adoption of the CIAM and the Athens's Charter principles (Hall, 2014, 19). It has only been in the last years, that urban planning and urban design perspectives have been considered more in depth (Urban, 2012; Wassenberg, 2013).

What do we mean when we speak about collective housing, mass housing estates, modernist housing estates, modular housing blocks or high-rise apartments? As there are many possible interpretations, it is necessary to define well the subject of study. We understand housing estates as sets of dwellings associated with social housing as well as for middle-class. Therefore, we are considering social housing and even other private residential developments (Grupo ADUAR, 2000). Possibly in France is where the new urban form of collective housing schemes is better understood: "rather than a form of housing construction, the term 'grands ensembles' designates a form and a landscape characterized by the grouping of blocks and towers on a space subject to the rules of zoning" (Dufaux and Fourcaut, 2004,

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45). This is a form of urban growth which, with the high-rise housing boom of the period, broke with the continuous extension patterns of the European city, both in the North and in the South, in the West and in the East (Monclús and Díez Medina, 2016).

The evaluation of the experience and legacy of European mass housing estates built in that period has drawn different interpretations. On the one hand, it has been recognized as a successful response to the huge housing crisis and demand after World War II. In addition, the logic of the market, the industrialization and the technocratic management were also important factors. So that the success of the Athens Charter could be seen a consequence of the dynamics of the building sector and the enthusiasm of technocrats, engineers, economists, developers… and, of course, architects. Moreover, rather than the Charter, we should realize that all this new spirit was very present at the time. It was the imposition of the 'hard modernity' options and the rejection of the existing city as something 'disorderly' or 'obsolete', which led to include the ideology of the Charter in the official planning documents after the War (Díez Medina and Monclús, 2017, 68–69).

On the other hand, the review of this legacy fifty years later leads to speaking about failure to a certain extent: obsolescence of typologies, urban spaces and building technologies, as well as loss of environmental quality (García Vázquez et al., 2016). The general view is that the modernist design and modernist urban types that were on the basis of most of the projects were responsible for that failure. However, the results were not so homogeneous. The fact is that diversity of housing estates in different countries and cities – and even within a single city, namely the value of the specific aspects of each case, deserves a more precise approach.

Spanish housing states in the European context

The phenomenon of the mass housing developments built in Europe during the period considered here has been analyzed by the history of urbanism with different interpretations. Generally, the urban quality of some notable[1] examples is recognized, as well as the 'failure' of other cases more or less emblematic[2], both designed by prestigious architects. The Spanish case is not so different in terms of the contrast between the results of different experiences. Despite some quality examples have not aged poorly[3], many other cases[4] experience important problems of various kinds.

The nature and role of CIAM urbanism has also been the subject of a large number of studies and interpretations (Gold, 2007; Mumford, 2000). In Spain, as in other European countries, critical visions of CIAM's functional urbanism appear since the 1960s, as opposed to other claims from the movement of the Modern Movement (Do.co.mo.mo), which have highlighted the values of certain collective housing projects[5]. At this point, some questions arise: Are the Spanish housing estates (polígonos) a typical example of the urban forms associated with the "high-rise housing boom" of the 1960s and 1970s that spread throughout Europe? Why have some housing estates experienced processes of urban obsolescence while others are relatively successful? What has been the role of urban design in their operation, from the initial options associated with urban planning projects and plans that define the arrangement of the sets?

From an urban and morphological perspective, some studies allow us to value important parallels with the experiences of the rest of Europe (de Terán, 1978; Monclús and Díez Medina, 2017). For example, in the generalized step 'from the urban block to the building block' (Panerai et al., 1986), which occurred after a few transition and experimentation years during the postwar period. Spanish polígonos also have the character of autonomous, 'concentrated' pieces, that is to say, they are units built in unity, in the face of the gradual growth of residential extensions that dominated in Spanish and European cities until the middle of the 20th century[6].

With the broad perspective of the intense international debate, enriched with numerous contributions at the local level, it is interesting to consider the impact that the principles of modern urbanism had on the reality of the construction of Spanish collective housing

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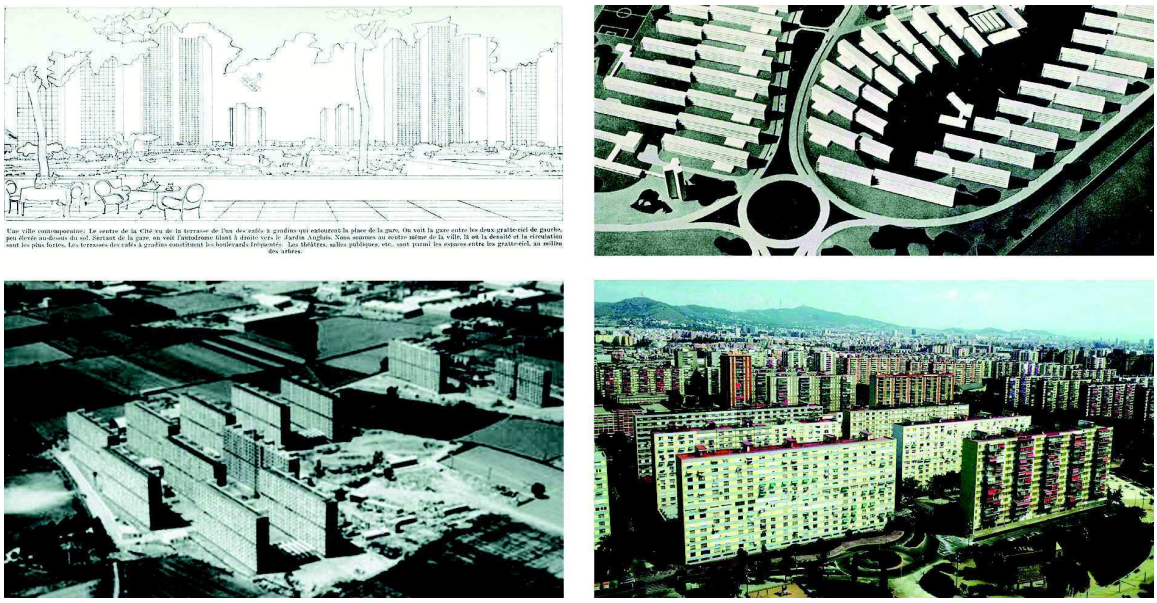

Figure 1.
'Theorised' urbanism versus 'real urbanism': Ville Contemporaine, Le Corbusier (1922); Bellvitge (Barcelona): original project (model), the housing estate under construction and today.

in the decades of great urban growth after the 1950s. As a starting point, among the numerous critical assessments of the functionalist urbanism of the CIAM and the Athens Charter, we can pick up the synthesis of Ramón López Lucio when he points out a series of principles - explicit or implicit - "that have configured a good part of the periphery in European and Spanish cities"[7]. We intend to check to what extent the problems are common or how can be fine-tuned in the diagnosis. The objective of our study is to qualify the generalized criticisms, trying to overcome the topics and making a more accurate assessment according to the specific situation of each polígono studied, since the variety of cases and situations demands it.

Urban design and urban quality in Spanish housing estates (polígonos). Some diagnoses from a morphological perspective

Keeping in mind the differences in scale of the three cities considered (Madrid, Barcelona, Zaragoza), representative of what happened in other Spanish cities, it is necessary to take into account what was the accelerated urban growth in Spain between the years 1950 and 1975, with annual rates higher than 3% in the 1960s (Guardia et al., 1994, 13). The selection that has been made to analyze the Spanish case - 32 polígonos located in these three cities - aims to be representative of the reality of urbanism built in front of other selections based on the outstanding architectural quality of the sets, such as those of Do.co.mo.mo.

Based on the analysis of the 32 specific cases of Spanish polígonos we have selected in our research[8], we here discuss 10 commonly accepted principles as critical aspects of modernist housing estates, questioning the relevance/usefulness of generalized criticism.

01 Size. Is size decisive for urban quality?

It should be noted that the size of the housing estates increased during the period under consideration, going from the promotions of a few hundred homes in the 1950s to several thousand in many of those built in the 1960s and 1970s. The urbanistic criteria regarding size were linked to the growing demand and the viability of the promotions.

In the sample analyzed we can verify this oscillation[9] (Figure 5). Although there is a tendency to identify the larger ones with the ones that present the most problems, due to the acceleration in the construction processes and the standardization of solutions generally associated with mass growth, this is not always the case. Can we therefore say that size is a

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Figure 2.
Figure-ground plans of the 32 housing estates analysed. Graphic documentation elaborated by Sergio García within the framework of the project UR-Hesp. © Authors

condition associated with poor urban quality of the poligonos? Not necessarily. Bellvitge, for example, has a much larger size (9,780 homes) than the Ciudad Meridiana (4,000 homes), and its urban quality is not inferior but the contrary.

The size, in relation to the urban quality of the poligonos, is a parameter that is directly linked to other aspects, such as the variety of urban forms, the road system or integration in the existing urban fabric. Therefore, to consider it decisive at the time of determining the urban quality of a whole would be, at least, generalist.

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			Construction year	dwellings (dw)	hectareas (ha)	dw/ha	Floor Area Ratio (F.A.R.)	Coverage	Height Index
Madrid	PU	Entrevías	1957/1966	8.395	83,3	101	0,91	27%	3,4
	PU	Virgen de Begoña (PA)	-1959	1528	13,6	112	1,19	24%	5,1
	PU	Caño Roto (PD)	1959-63/68	1.907	20,0	95	0,82	28%	2,8
	PU	Fuencarral (PD)	-1960	1.839	21,0	88	0,86	26%	3,3
	PU	San Vicente de Paúl	1961	2.034	14,6	140	1,09	30%	3,6
	PU	Virgen de Loyola	1962	762	4,7	162	1,01	24%	4,2
	PU	Gran San Blas	1962/70	10.442	95,0	110	0,87	20%	4,3
	PU	San Cristobal de los Angeles	-1962/65	4.175	31,4	133	0,85	14%	4,5
	PR	Estrella	1963	6.094	33,5	182	2,09	26%	8,1
	PU	Almendrales (PD)	-1966/73	1.437	11,6	124	1,02	23%	4,6
	PU	Grupo Juan XXI	1966	502	3,2	157	1,40	31%	4,7
	PR	Saconia	1967/79	2.900	28,0	104	1,40	23%	6,1
	PR	Barrio del Pilar	1968/75/78	19.641	92,0	213	1,81	23%	7,7
	PR	Parque de las avenidas	1969	4.536	33,3	136	2,00	25%	7,7
	PU	Moratalaz	1969/73	9.424	126,9	74	0,80	16%	5,1
	PU	Cuartel de Montaña	1970	2.328	18,9	123	1,16	24%	4,7
Barcelona	PU	Trinidad	1953-55/57-	3.095	25,5	121	0,92	20%	4,6
	PU	Sudoeste del Besós	1959-61	4.843	34,5	140	1,15	24%	5,0
	PU	Montbau	1960-65	2.296	19,2	120	1,03	19%	5,2
	PR	Sant Ildefons	1960-	11.536	45,3	255	1,71	24%	7,0
	PU	La Guineueta	1962-63	2.500	22,7	110	1,03	19%	5,5
	PU	Sant Roc	1962-	6.634	46,2	144	1,13	20%	5,7
	PR	Ciudad Meridiana	1964-	4.000	37,3	107	0,80	15%	5,2
	PU	La Paz	1965-	2.499	16,0	156	1,68	20%	8,1
	PR	Bellvitge	1968-	9.780	65,4	149	1,38	18%	7,7
	PU	La Mina	1971-	2.644	17,1	155	1,56	19%	7,0
	PU	Ciudad Badia	1972-	5.372	64,0	84	0,82	15%	5,6
	PU	Canyelles	1973-	2.651	23,6	112	1,38	18%	7,8
Zaragoza	PR	Salduba	1958	230	1,0	232	1,35	27%	5,0
	PU	Alférez Rojas	1961	656	5,1	129	1,02	22%	3,9
	PR	Polígono Romareda	1961	2224	29,0	77	1,11	23%	5,5
	PU	Balsas de Ebro Viejo	1964/75	1.534	12,6	126	1,12	25%	4,2

PU Public
PR Private

Figure 3.
Data table of the 32 polígonos analysed in Madrid, Barcelona and Zaragoza. © Authors.

02 Density. Does density matter?

There is no unitary criterion that relates the densities and edificabilities of the polígonos to their urban quality (Ezquiaga, 2015). In the sample analyzed we can see significant differences between densities below 100 dwellings/ha (considered low for housing estates, but that would be 'average' or even high for traditional city standards), those ranging between 100 and 130 (medias) and those higher than 130 (high)[10] (Figure 5).

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The interesting fact for our argument is that in the three cities analyzed the average densities of the polígonos are not higher than those of the urban plots that are configured according to more conventional principles in other neighborhoods that were growing gradually in those same peripheries during that period. On the other hand, due to a series of circumstances, the density of the Spanish polígonos is higher than that of other Europeans[11], which offers more possibilities of increasing urban intensity and increasing diversity (Ferrer i Aixalá, 1996). The possible problems, either of overcrowding or of urban vitality, of the Spanish polígonos can not be attributed to their density, as is usually done, by not properly linking this information to the urban forms of blocks and towers in height.

03 Coverage. Is modernist estates coverage that low?

One of the issues that better characterize modern functionalist urbanism formed by isolated or open edification – high-rise blocks and towers - is the scarce coverage of the ground, with the radical inversion of the proportions between public and private spaces with respect to urban layout of the traditional city[12]. Only in some cases, as in the non-residential building plynths, the coverage is analogous to that of the traditional city (Pérez Igualada, 2005, 213).

The measurement of this parameter is more complex than it seems. Generally, only the footprint of the building is measured. If we want to differentiate housing estates with an abundance of spaces with undefined domains (interblock spaces) or even semi-public and private, we must take into account the variety of forms of land occupation, with spaces for housing, roads, parking, etc. (Fernández Per et al., 2015). Adapting A. Ferrer's categories to 'urban spaces in-between buildings', we consider the following groups: 'compact' (occupancy greater than 25%), 'average' (between 15% and 25%) and 'disperse' (less than 15%)[13].

Taking into account these considerations, compared to the usual generic interpretation that considers the coverage around 20% of the building, a certain diversity can be seen in the occupation of the land, which supposes different situations to consider in the formulation of treatment strategies of 'empty and full' (Figure 5).

04 Peripheral location. Is peripheral location a mark of identity?

In general, it can be said that most of the polígonos were located in areas with low level of urban accessibility. Therefore, during the first years, these residential complexes were very peripheral; they were characterized, above all, by their isolation with respect to the existing urban plots, with limited acces to services and infrastructures. On the other hand, the housing estates played an important role in the colonization of the periphery, as "pioneering enclaves that prepared the subsequent development of private bordering promotions" (Publich Housing, Grupo ADUAR, 2000).

Indeed, as anticipated, subsequent urban growth has substantially changed the relative position of many housing estates. Some now have a 'pericentral' position, since they no longer differ substantially from other forms of urban extension configured as 'first peripheries'. It is true that the equipment and infrastructures arrived later, but also contributed to a greater integration of the polígonos. In the sample analyzed, most polygons now have a relatively acceptable level of accessibility. Although it is also true that some are still autonomous parts of the consolidated city, which has not yet absorbed them, such as Ciudad Badía or Ciudad Meridiana in Barcelona or San Cristóbal de los Ángeles in Madrid. In these cases, the trend towards marginality is higher (Figure 4).

05 Enclave character. Are housing estates isolated islands in the urban fabric?

It is also of interest to consider the level of integration on a lower scale, that is, the relationships between the housing estates and their immediate surroundings. This is where the initial strong contrasts with the surrounding urban plots are appreciated, which in some cases have been diluted in a process by which they have fully incorporated into the city. In this process we must take into account the arrival of new cultural and sports facilities, social services, densification in adjacent

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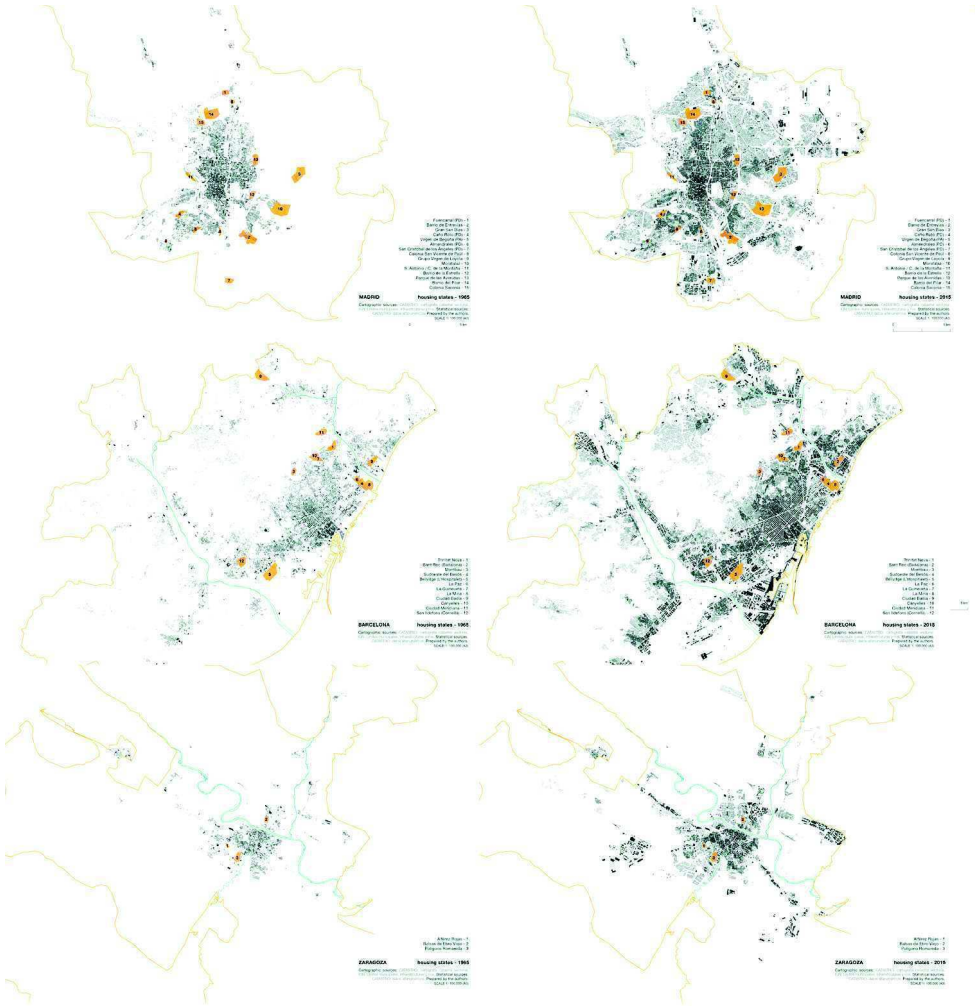

Figure 4.
Madrid, Barcelona and Zaragoza plans with the 32 examined polígonos in 1965 and in 2015. Graphic documentation elaborated by Sergio García within the framework of the project UR-Hesp. © Authors.

sectors, sometimes with the consolidation of neighborhood commerce. Road connections in the perimeter of the housing estates have also improved generally, as we saw in the previous section, so that the initial conditions of isolation are no longer so obvious. Howerver, many of them are still bounded by road infrastructure (San Cristóbal) or conditioned by their difficult topographical location, sometimes with a single access (Ciudad Meridiana). By analyzing in detail the evolution of adjacent urban fabric, we can verify the degree of physical integration of the polígonos[14].

Therefore, the low-scale study of the plot connecting the housing estates with their immediate surroundings is directly related to the evolution of the city and to the original urban forms that have sometimes favored and others have made integration difficult, the casuistry of cases being too diverse to be generalized (Figure 5).

06 Road system. Is the road system too specialized and hierarchical?

In the housing estates, as a consequence of the negation of the 'corridor street' and the 'closed city block', the canonical rationalist model is proposed: hierarchy of the road, with vehicles and pedestrian circuits that respond to nuclear and tree-like schemes, has a structuring character, but loses it when it is projected independently, apart from the other components of the urban structure, disregarding the functional implications and their formal relationship with them (Ferrer i Aixalá, 1996,

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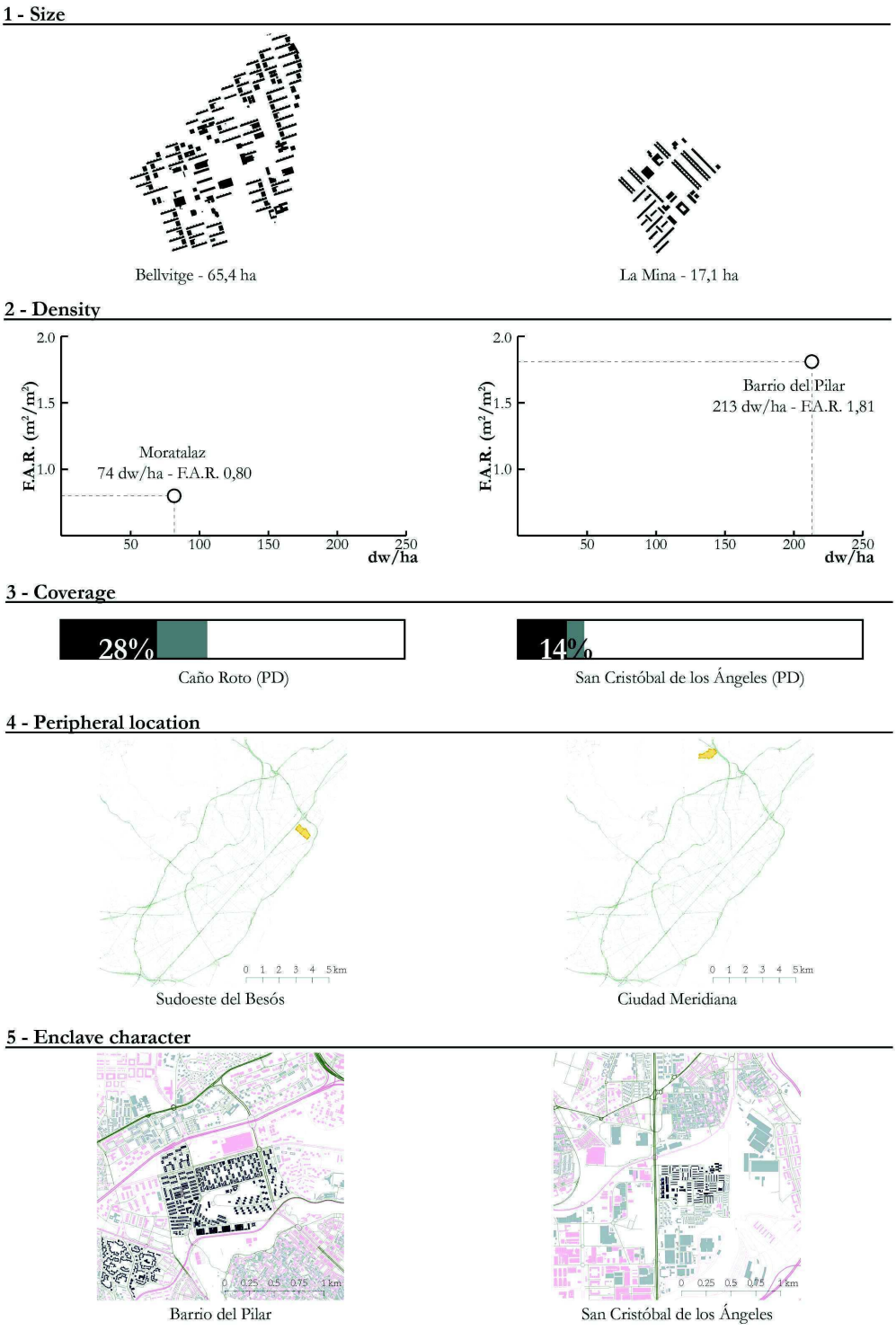

Figure 5.
Sample of some indicators studied in some specific polígonos which allow accurate diagnosis: size, density, coverage, peripheral location, enclave character. Graphic documentation elaborated by Sergio García within the framework of the project UR-Hesp. © Authors.

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57). On the other hand, "the section of the traditional street - with sidewalks, driveways and car parks in a single profile - is divided into independent sides that are separated from each other" (Rodríguez-Tarduchy et al., 2011, 135). Hence the 'little urban' character generally acquired by sets in which the functionalist scheme is more rigidly applied[15].

Considering the type of road system, at one end would be the housing estates that adopt an 'tree-like' structure (tree-like in terms of C. Alexander), that is, strongly hierarchical, and in the other those that start from a mesh or reticule in which are arranged the buildings, aligned or not to the roadways or to the streets and pedestrian routes. In any case, it is not so evident that urban quality depends directly on the more or less hierarchical character of the road system as its layout and design in relation to building (Figure 5).

07 Urban layout. Are monolithic tower and slabs responsible for poor urban quality?

Compositional poverty, the repetitive and monotonous urban forms of the housing estates and the monolithic arrangement of parallel blocks or isolated towers are the result of a commitment to the seriation and standardization of modern architecture and urbanism[16]. Exceptional testimony is the 'massive' housing complexes, which rise in the outskirts of cities[17]. From a formal and landscaping point of view, it is true that these housing estates, with the volumetric set of blocks and towers, present powerful images, especially at a distance. However, many of the criticisms of such ensembles point precisely to the excessive reliance on these visions 'from the air', almost always expressed in scale models.

From these functionalist principles, it is necessary to say that, while in some polígonos very few typologies and forms of aggregation are used (Bellvitge ...), in others several solutions are tested with articulated blocks (Saconia) or multiply the types and heights in order to achieve greater complexity and escape the monotony that results from repetition. Now, that is not a guarantee of success since it often falls into banal and arbitrary orders, thought as geometric exercises of composition in plan or in volume. It is also important to assess the relationships between occupancy and heights, in correspondence with compactness, parameters that are more difficult to quantify but which are fundamental for understanding the quality of urban forms[18] (Figure 5).

08 Open spaces. Are open spaces a no man's land?

For many authors, and also for the inhabitants of the housing estates, the existence of green spaces of greater extension than other neighborhoods is considered as one of the most positive aspects, but also a source of problems. The corollary of the alteration of the proportion between built-up areas and free space in the housing estates (see point 03) is the consequent hyperinflation of the 'green'. In fact, the partial plans developed under the 1956 Land Law had to zonify 10% of the total area as an urban park (A. Ferrer, 37). However, by adding 'interblock spaces', as well as private or community spaces, a much higher proportion is achieved. Such planning makes it difficult to maintain the character of 'green spaces' they had in the original projects[19]. Hence the criticism of these 'brown' spaces (open spaces) or 'gray' (car parks) (Díez Medina, 2015, 188–215).

Again, a variety of situations can be seen. At one end, there are some cases in which there is an overdrive of supposedly green spaces that are not so (San Blas, San Cristóbal, Sant Ildefons). However, there are also others in which large parks or wooded strips are an important element in the image of residential complexes (Loyola, Moratalaz, Salduba). The problem arises when these green areas are underutilized or do not act as an articulating elements. (See figure 2)

09 Land uses. Are housing estates bedroom communities?

Housing estates are usually characterized by a high level of functional specialization, due to their almost exclusively residential dedication. Either due to the nature of the initial projects, or due to problems of obsolescence in the types of equipment, the critical denomination of 'bedroom communities' has become widespread (Virgen de Begoña, Ciudad

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Figure 6.
Sample of some indicators studied in some specific polígonos which allow accurate diagnosis: road system, urban layout, open spaces, land uses, housing plots. Graphic documentation elaborated by Sergio García within the framework of the project UR-Hesp. © Authors.

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Meridiana, Ebro viejo). However, it must be considered that the Land Law of 1956 incorporated the land reserves for endowments, based on the conceptions of nuclear urbanism and the neighborhood units. The minimum standards of assignments for educational centers, services of public interest, etc., were added from this law to those corresponding to free spaces. Despite this, they frequently arrived late. Problems derive rather from the provision of these facilities, which often became real barriers, rather than elements of centrality and urban activity, as they were expected to be (San Blas plot G, Ebro Viejo)[20].

However, in other cases there have been shops and equipment of different types installed that have significantly activated urban life. Parque de las Avenidas, some 'superblocks' of San Blas or Romareda have much more urban life than the neighborhoods created in their surroundings on conventional urban plots. Again, the variety of cases makes it difficult to generalize criticism.

10 Housing plots. What is the impact of the 'disappearance of plots'?

One of the most relevant phenomenon that involves the application of the principles of functionalist urbanism and new forms of real estate production, with the imposition of the open block or the residential tower, is the disappearance of the plot as a support for building and the city block in the plot as a unit of composition. "The plot plan, which had sustained architecture until the middle of the XVIII century, disappears and the housing estate replaces the city block as a unit of composition and production" (Rodríguez-Tarduchy et al., 2011, 220). Therefore, the polygons are not structured anymore on the idea of plots or city blocks, which entails a considerable change in the way in which the building relates to the ground plane.

In the 32 polígonos analyzed, there are quite different situations. It is true that in many cases there are no other plots than those of the projection of the blocks (Alferez Rojas) and the towers, the rest being public space, being destined to road, equipment or free spaces, and being interblocking spaces the most confusing in terms of their ownership, therefore their maintenance (Entrevías, Ebro viejo). In contrast, in other cases, blocks and towers are associated with a private domain plot: this is where you can see more complex forms and intermediate spaces with different degrees of control, such as associated plots in Romareda or Estrella.

Conclusion/Epilogue

The criticisms generated by the modernist housing estates regarding the recognized rigidity of modern functionalist urbanism and the monolithic nature of urban forms are convincing. However, generalization is not very useful when a valuation that allows to determine possible strategies of intervention is sought. In this sense, what is important is to recognize the diversity of the obsolescence processes - and also the least considered of "resilience" or adaptability - that is evidenced in the analysis of the sample of 32 Spanish polígonos that has been carried out.

From an urban planning and an urban design perspective, the following questions arise: why do some polígonos age better than others? Depending on what factors? What role does urban design play in such processes? Which are the parameters that can help to control the problems and to take advantage of the opportunities that each of them offers?

More than forty years after the construction of these polígonos it is possible to understand the role that a series of factors of different order play in urban quality: from the relation with the urban plot, to the paths (more or less rigid and hierarchical), road systems, the size and layout of open spaces, the degree of segregation of uses, the characteristics of the plots, etc. The study of these factors in the analyzed sample allows to identify the most problematic situations, associated to the rigidity and lack of complexity of the initial options of its urban design, as opposed to others more resistant, flexible or more easily adaptable.

The identification of problems and opportunities in different cases allows us to think of strategies that can be very diverse and complementary: operations of densification and filling of gaps, when feasible, which in certain cases may favor a greater urban

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intensification; diversification of housing typologies; introduction of new non-residential uses; redevelopment and re-qualification of interblock open spaces; reconsideration of the plot plan to improve the control and maintenance of free spaces; improvements in the connection of the road system and pedestrian routes with surrounding urban areas, in those cases in which the enclave condition has not been overcomed; quality landscape treatment. All this, logically, in addition to the necessary interventions of rehabilitation of the buildings (improvement of energy efficiency, installation of elevators, etc.).

In any case, only by making an intentional diagnosis and analyzing the specifics of each case in depth, it will be possible also to refine the possibilities of regeneration and intervention strategies.

Acknowledgments

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Notes

1 Such as Churchill Gardens in Pimlico, London (1946–62), a true laboratory of high quality urban forms, or of the Roehampton flats in West London (Alton East and Alton West, 1953), an expression of the 'Corbusian dream' in the UK; also Pouillon exceptional grands ensembles in Paris, among them Résidence du Point du Jour (1957-1963); or Hansa Viertel in Berlin (1957-61).

2 Among others, Park Hill in Sheffield (1954-61), Bijlmermeer in Amsterdam (1968-1975), Gropiusstadt in Berlin(1966-1975), Tolouse-le-Mirail in Toulouse(1961).

3 Montbau in Barcelona(1960), Fuencarral in Madrid(1957), Salduba in Zaragoza(1958).

4 Ciudad Meridiana in Barcelona(1964), San Cristóbal de los Ángeles in Madrid(1959-??), Balsas de Ebro Viejo in Zaragoza(1964-75)…

5 In some cities, the urban characteristics of the polígonos of that period have been analyzed in a more or less systematic way (Bataller Enguix et al., 2004; Ferrer i Aixalá, 1996). There have also been important studies carried out from the perspective of the rehabilitation of the 'social housing slums' (García Vázquez et al., 2016). However, comparative visions are still scarce, whether among polygons in different cities or in the same city, that provide a systematic assessment of the diversity of urban situations and forms.

6 The definition of the Urban Geography Dictionary corroborates this reading: "The poligonos in Spain are, for the most part, concentrations of residential open building blocks" (Grupo ADUAR, 2000)(DGU, p.).

7 Among them: the double negation of traditional urbanity, that is to say, the negation of the corridor street and the closed urban block (manzana); the division between 'circulation' and 'recreation' and 'housing'; the commitment to the modern residential city as "a set of exempt and narrow linear blocks (without courtyards) arranged in parallel, transverse to the axis of road traffic"; the conception of the residential building as an isolated object, exempt by its four facades, independent; the erosion of boundaries linked to the disappearance of the plot; the radical inversion of proportions between public and private spaces; the hyperinflation of the 'green' (from 80%/20% to 20%/80%) (López de Lucio, 2013, 82).

8 The cartographic analysis has been mainly made from cadastral sources, historical cartography and current IGN, ... In addition, direct visits and own reinterpretation have produced thematic cartography as per the selected in figures 4 and 5.

9 Madrid's housing estates range from almost 20,000 homes in the El Pilar neighborhood, to 502 in the Juan XXIII group, with an average size of 4,610 homes (in the 16 analyzed); In Barcelona, they range from 13,055 from Bellvitge to 2,620 from La Paz, with an average size of 4,791; In Zaragoza, the range goes from 2,224 of Romareda to 230 of Salduba, with an average size of 1,161 homes.

10 Thus, in Madrid, in the 16 housing estates considered, the densities range between 74 homes/ha of Moratalaz and 213 dwellings/

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ha of the neighborhood of El Pilar (although large parks and general systems are counted in the first one), the average of 126 dwellings/ha. In Barcelona, the densities of the 12 selected polygons range from 85.7 homes/ha of Trinitat Nova to 203 dwellings/ha of Sant Ildefons, with a mean of 126.55 dwellings/ha (128.2 dwellings/ha according to the study of 32 Barcelona polígonos of A. Ferrer (Ferrer, 1974). The highest densities occur in slightly less than half of the polígonos, while those that are around 100 and 130 dwellings/ha dominate.

11 For example, they tend to be larger than those of the large French grands ensembles (Dufaux et al., 2004) or the English housing estates, with certain exceptions (Gold, 2007, 220).

12 While in the latter the ratio between built areas and open space (streets and squares, as well as parks) is 80% to 20% respectively, in the poligonos the proportion is inverse (in line with Colin Rowe's well-known figure-ground image, including housing, equipment and tertiary) (Bataller Enguix et al., 2004; Díez Medina, 2015; Ferrer i Aixalá, 1996).

13 In this way, we can contrast situations such as the 'compact' housing estate of Caño Roto (29%), Entrevías (27%) or Besós (27%), which present a larger footprint, compared to 'average' like San Blas (20%) or Montbau (19%), or the 'disperse' like San Cristobal (14%), Ciudad Badía (15%).

14 Sometimes, industrial uses have changed to residential (old Ebro); some empty urban spaces of the environment have been occupied by equipment and infrastructures (San Blas), while others have been left unoccupied (Caño Roto); some perimeter roads have become insuperable barriers (Entrevías, Fuencarral, San Cristóbal) or topographic barriers (Ciudad Meridiana) that have accentuated this enclave character; or have contributed elements of connection and continuity with other neighborhoods (Estrella, Moratalaz, Guineueta, Sudoeste del Besós, Ebro viejo); some have a mixed character, being integrated to the city but isolated by some of its edges (El Pilar, Almendrales, Alferez Rojas); in other cases, from the outset the polígonos were born with a vocation of integration in an urban plot in which their growth was foreseen, with a design that favored it, so that its status as enclaves has been canceled with time (Montbau, Besós, La Paz, San Vincente de Paúl.

15 Considering the wide range of solutions of road structure found in Spanish polígonos, we can classify them according to the three categories established by Amador Ferrer (1996, 190): 'branched' (Bellvitge, Moratalaz), 'isotropic mesh' (Romareda, Sudoeste of Besós), 'hierarchical mesh' (Guinegueta).

16 They also sought optimal orientation and solar gain criteria, as well as the possibility of cross ventilation as a fundamental criterion.

17 "(…) like regiments on the plans of a military school" (Urban, 2012, 45).

18 Thus, the neighborhood of El Pilar proves to be very compact, not only because of the occupation of land (23%) or density (213 homes/ha), or its average height (7,7), but also because of its urban planing. Some of the most successful examples are those in which control of the scale of buildings and spaces is achieved. Caño Roto, Saconia in Madrid, Montbau in Barcelona, Salduba in Zaragoza, among others (generally recognized by Do.co.mo.mo). Not by chance, these are the smaller ones. It is however more difficult to find bigger pieces in which a morphological complexity is obtained that allows the comparison with the urban plots of the traditional city. In some polígonos, such as Moratalaz or Gran San Blas, the different plots were solved with different projects, allowing each 'superblock' to be analyzed separately.

19 In relation to the 'green spaces': "The original project of these slums, based on the precepts of the Athens Charter, contemplated the integration of nature in the urban environment through large expanses of free space on which buildings were placed. However, at present, the natural ecosystem of these slums lacks diversity of vegetation" (García Vázquez et al., 2016).

20 The analysis is based on the quantification corresponding to square meters (m2)of residential area and assigned to other activities according to data extracted from the Cadastre.

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Introverted and knotted spaces within modern and contemporary urban fabrics: passages, gallerias and covered squares

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Abstract. *Passages, gallerias and "urban" atriums are morphological configurations of a prevalent phenomenon within modern and contemporary cities, in which there has been a further evolution of the specialized urban fabric. The urban and social changes caused by the Industrial Revolution have modified the relationship between public spaces and urban fabric, by defining new connections between urban organism and covered places -usually devoted to commercial or tertiary functions-. French passages and British arcades have had an active role within the existing fabric, relating their own architectural structures to the buildings (existing or new ones) and to the pre-existing vehicular system. In both those types it is possible to recognize a common morphological substrate, that is a radical answer to analogous problems: passages, arcades, and gallerias are covered walkways due to the modern necessity to have gathering places and commercial areas far away from urban traffic and sheltered from weather. The covered pedestrian walkways experienced in Paris, London, Munich are the first examples of a morphological process that can be called "introversion of the routes", that has been intensified also within the urban dynamics of contemporary cities. Architectural experimentation has led to the construction of unconventional public spaces that, both in linear organical systems (passages, gallerias) and in nodal organisms (urban atrium), are integrated within the urban fabric. The aim of this research is to illustrate the typological development of passages, gallerias, and covered squares, identifying the processual nature of those public spaces and projecting them into a new urban vision.*

Keywords: Knotting, commercial building typology, covered squares, urban organism, introversion of the routes.

The inner city of arcades and passages
(by Pina Ciotoli)

Covered walkways like French passages, British arcades and Italian gallerias have developed starting from the 19th century[1] all across the European cities and, towards the end of the century, they also became popular in North America. These architectures are mainly due to the deep urban, social and economic changes triggered by the Industrial Revolution, that modified the relationship between public spaces and urban fabric, by defining new connections between urban organism and covered places -usually devoted to commercial or tertiary functions-. Particularly, it is important to point out the mutation of the functional and perceptional role of the street, which is mainly occupied by vehicles and is no more capable to show a "centralized" nature. According to the morphological definition of the road given by Gianfranco Caniggia and Gianluigi Maffei (Caniggia, Maffei, 1982), we can state that the main axis of the 19th century city are generally

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related to a "splitting" function (Ciotoli, 2016), in fact they are unable to center around the road, the formation of specialized buildings or specialized tissues. In fact, following the thesis of Gianfranco Caniggia, we are able to distinguish between the aggregative and spatial components of the buildings, on the basis of their specific location in the city. Therefore, we can identify specialized buildings – and consequently specialized fabrics –, into nodal or anti-nodal types –, according to their disposition in the central or peripheral areas of the city (for example, a fabric made of offices has different characters and nodality degrees compared to an industrial fabric) (Caniggia, Maffei, 1982). So, according to this "distinctive location", every building, axis or urban space is able to deduce its own specific structure from the history and time. Also, it is important to underline how, within the urban model, we are able to distinguish a hierarchy between all these components, based on the difference between nodal and anti-nodal axis. We should contextualize all those morphological elements according to the urban centrality of peripherality, so if a road has a specific vocation, like a commercial function, the parallel paths will have a secondary role into the urban hierarchy. We can assert that the covered commercial pathways built in the 19th century, behave like centralized axis in which "the space and its legibility through motion (…)" is related to "the reaching of a node or pole starting from another node or pole" (Strappa, 1995). For all these reasons, it is necessary to distinguish centralized axis from splitting lines; first it is important to say that "the term 'line' is not related to the idea of movement as well as to the readability of the urban structure. Usually the splitting lines, while connecting the internal features of organic systems, close off architectural spaces through the identification of unique spaces, although complementary and necessary for the entire organism", (Ciotoli, 2016). In the particular case of modern European cities, we can observe both these conditions: splitting lines are usually destined to vehicular traffic, instead centralized axes are the ones conformed within the urban fabric and used as commercial streets. This transformation, increasingly linked to the dynamic flows of modern metropolis, has contributed in determining the need of citizens for gathering places expressively dedicated to pedestrian traffic, and therefore sheltered from the weathering. The requirement for covered and closed spaces led to the construction of many interior pedestrian walkways with commercial functions, elements that have an active role within the existing fabric, since they relate their architectural structures to the buildings (existing or new ones) and to the pre-existing vehicular system (Ciotoli, Falsetti 2017).

Introverted spaces
(by Pina Ciotoli)

Arcades and passages, built in Great Britain and France since the 18th century, can be considered as architectural responses to the metropolitan need of having commercial places far from chaos and vehicular traffic. Johann Friedrich Geist has been one of the first researcher to dwell on the meaning of the term arcade, and on its relative diffusion (of the term and of the architectural type) throughout the world. According to Geist, "the word "arcade" is used (…) to translate the German Passage, a word which expresses the transitional nature of this building type. The German term comes from the French passage, which was used as early as the 18th century to refer to the narrow private streets which divided and connected the interiors of larger building blocks. The root is passus, the Latin word for step, conveying the element of movement, of passage through a space. It has numerous meanings in common linguistic usage: street, roadway, thoroughfare, alley, transit, crossing, part of a book or musical composition, measured gait of a horse, or, in French, the sense of passage de la vie. All these meanings, either spatial or temporal in emphasis, have one element in common: they express transition, threshold, passing, measured distance, or disappearance. Something occurs, comes to pass; movement becomes an event" (Geist, 1983).

For the purpose of a morphological interpretation of this phenomenon, it is important to underline how these structures

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are able to synthesize the so-called process of "internalization of the paths" (Maretto, 1993), for which the distribution of the building is related to the role of the overturned path in the urban fabric. Through this process, the inner road -of the arcade and of the passage- carries out the role of a linear component that catalyzes the congestion and the movement through the gallery. At the same time it defines the kind of aggregation of this typology, since the single units of the building are concentrated along the sides of the covered road, by emphasizing in this way the distribution and the volume of the arcade/passage.

Furthermore the covered street is involved in a process of inversion of the functional dynamics of the metropolis, by realizing a sort of transposition of the modern fervor in a linear architecture; in fact, thanks to the the process of "internalization of the paths" the building framework tightens an organic relationship within the morphology of the urban fabric (in which the inner road is projected).

The inner micro-city of arcades and passages reveals an interesting typological dualism: the controversial relationship between public fruition and private property as well as the intense connection between indoor and outdoor spaces.

It is necessary to underline how these "parallel systems" are involved in the definition of new urban scenarios in which the interior facades of the stores rework the composition and the proportions of the nearby external palaces.

In the reduced dimension of this architectural type, it is interpreted -and reproduced in scale- an idealized view of the 19th century metropolis.

As already mentioned earlier, for a morphological interpretation of this typology we can state that if the streets of the 19th century increasingly demonstrate a "splitting" function, being unable to concentrate around their ways specialized buildings or specialized fabrics, instead French passages and British arcades are "linked to the housing unit on which they are built. For this reason, the cadastral unit should be considered together with the road system, as the founding element of urban space" (Lemoine, 1989).

Figure 1.
Royal Opera Arcade, London. Source: Survey of London: Volumes 29 and 30, St James Westminster, Part 1, ed. F H W Sheppard (London, 1960), British History Online.

Moreover, since covered commercial pathways use to develop within the existing fabric, they can act like an architectural knot (Falsetti, 2016), by linking together new architectures with the existing ones; in fact the inner pathways can be considered as an ideal matrix in the creation of a new kind of space, in which commerce, gathering places and social relations coexist and are related to the urban fabric (Ciotoli, 2017).

Urban Knottings
(by Marco Falsetti)

If the phenomenon of introversion of the routes was evident for the formation of passages and arcades, an analogous process can still be identified in other architectural examples, in which, the formation of specialized fabrics and buildings is defined through the prevailing action of commercial pathways. In particular we can find that the linear conception of

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Figure 2.
Lowther Arcade, London.
Source: http://londontopia.net

the market space has often led to the rise of peculiar and complex building structures that, over time, have reached an autonomous, typologically codified extension.

The market-type has in fact evolved processually, from the linear dimension of a path, to whole buildings, organisms that often, due to the progressive extension of the phenomenon, have taken an urban character, involving large sections of fabric: galleries, malls, bazar, passage, arcade, shōtengai have thus been defined according to these aggregative logic, by permanently translating into matter a provisional idea.

These "knotting" processes[2], transformations of originally temporary and open elements - like commercial paths- into buildings, have structured, with different levels of complexity, by developing the typical characters of the fabric in which they were settled. In fact, in the absence of an architectural organism suitable to contain the functional principle, it develops by forming "special" places, lacking a typological determination, but that reflect the characteristics of the place where they are located.

The relationship between knotting and urban fabric is complex since it can be considered, at the same time, cause and effect of the structure of the latter. The knotting can be analyzed as a "specialization" of the building, of the fabric and of the territory (Falsetti, 2016), since it concerns the dialectic between special buildings and urban fabric as stated by Gianfranco Caniggia and Gianluigi Maffei in their essay "Lettura dell'edilizia di base" (translated in English as "Architectural composition and building typology"): "the location of the special buildings in the fabric is both cause and effect of the structuring of the same, and it changes in time and space, with the processuality of the fabric they belong" (Caniggia, Maffei, 1982).

And yet the typological migration of a functional path within the fabric, and the transformation that this involves, is a more ancient phenomenon: starting from the huge colonnaded streets of Syria and Jordan, (Apamea, Gerash, Palmira and Antioch), a whole class of semi-internal urban spaces, linked to the market type, has evolved. The great fortune of such typologies - which structure huge open spaces- in the Mediterranean area, has produced, over time, different families of typo-morphological specialized fabrics like suqs, arastas and bazaars, whose characters have remained unchanged until today.

If we observe nowadays the "Souk Midhat Pascha" in Damascus, we can note how it substantially coincides with the ancient Roman street "via recta", still largely used with a commercial function. The segments included in the market-space, developed, through the centuries, a sort of knotting, and once covered, they became a hybrid form of "building-fabric". In the Islamic world the phenomenon generally assumes more complex traits, phagocytizing various building typologies like mosques, madras, private palaces, mausoleums and baths. In these cases, a further form of knotting occurs in the building scale, especially where there is a change in the direction of the routes, through the creation of large nodal elements that are vaulted or surmounted by domes, as also noted by Geist

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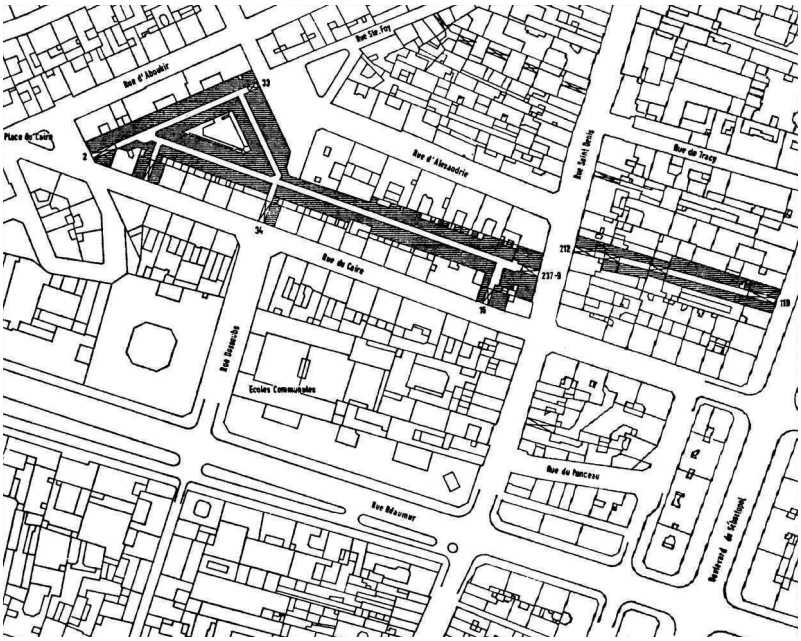

Figure 3.
Passage du Caire, Paris. Source: Geist, J.F. (1983) Arcades: a history of a building type (MIT Press, Cambridge MA).

about the bazaar of Bukhara: "the profile of the streets changes constantly, sometimes enclosed by walls, lined by open shops, or engulfed in large, vaulted bazaars. The streets wind their way between closed blocks constructed in symmetrical and asymmetrical patterns. This example demonstrates that the bazaar need not to be a single building but can also be a main thoroughfare with vehicular traffic" (Geist, 1983).

We can say that the two processes of introversion of the paths and knotting, both related to the formation of commercial spaces, are emphasized at the end of the 19th century, when the advent of vehicular traffic subverted the traditional modes of living the leisure and tertiary activities, forcing them to "retreat" inside the urban fabric. Commercial galleries, department stores and malls represent, in this sense, the architectural response, typologically codified, to this mutation of the outdoor space.

In the 19th century Paris, this condition caused the migration of external pedestrian flows into the interstitial space between the plots, resulting in passages, elements of a wider aggregative typology -the urban knottings- in which the building fabric thickens near the inner paths. It is in fact the passage, which represents the most emblematic form of urban knotting, that assumes, in modern times, the role of primary element for the life of the city and for the configuration of its social spaces.

Nonetheless, although modernity has profoundly transformed the places of leisure by conforming them to its own languages, the aggregative modalities have always been related to archetypal anthropic dynamics, similar between the different cultures. It is not a coincidence that Geist points out that "the sequences of widenings that can be found, with different dimensions and shapes, along the gallery, the inner complexity and the externally closed and introverted structure of the 19th century block, represent the prototype of some recurring types in the evolution of commercial space" (Geist, 1983).

In the knotting process, the archetype of the internal commercial road - produced by the revolution of an original external urban path - defines the formation of a series of hybrid organisms, endowed with both characters. Even in a different and far context like the Japanese one, the diversification of role between the external urban spaces -dedicated to the viability- and the internal urban spaces -dedicated to trade- produces linear organisms linked to the morphology of the city (Osaka, Tokyo, Hiroshima etc) but always connected to

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Figure 4.
Fünf Höfe, Munich. Source: https://commons.wikimedia.org

the formative dynamics of the 'knotting".

In this case, the most interesting aspect is that –even if shōtengais are something tightly connected to the Japanese culture- the phenomenon is architecturally comparable to other examples, even when the geographical context changes. Similarly to the passages, most of these pathways are in fact obtained by "overturning" the commercial function (originally present on a main urban axis) within an urban fabric, often on the roadway of a path, parallel to the generator one, but hierarchically lower. Differently from passages, however, shōtengais do not occupy the residual space within the lots, but use to colonize a roadway, which specializes in situ involving in this process the surrounding fabric (usually residential), which modifies its nature. As a result of this transformation there is in fact a densification of the road segment, which is connected to the urban fabric, by "covering up" and creating a new organism. In this sense, the shōtengai modifies its own "external" status, becoming an internal place, architecturally connoted (interior façades are recreated even if without the splendor and lexical wealth of the passage) and covered by windows and skylights, similarly to the western examples. Because of its size, however, the shōtengai never reaches a typological autonomy but, similarly to the bazaar, it determines the specialization of an urban fabric that preserves all the characteristic features of the basic building it is made of, while actually being configured as an inner place, distinct from the rest of the city.

The exceptional nature of shōtengais is established precisely due to the relationship with the building fabric, primarily because the residential function (often present), it is not found in other similar forms of commercial fabric; moreover, in many segments it is easy to see how residences and shops are oriented orthogonally to the commercial route, from which it follows that they were built starting from this path and not previously, suggesting

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the generative autonomy of the shōtengai in relation to the urban form.

Conclusion

In conclusion, we can observe how the diversification of roles between outer urban spaces - related to traffic - and internal urban spaces - linked to commerce - produces linear organisms, connected to the morphology of the city, but similar to each other since they both are an expression of a common human need. Even today, the contemporary city requires internal places in which to satisfy the need related to trade and sociality, since the outdoor spaces, as "traditional" squares, are almost disappearing in some contexts, while in others – as for example in Eastern Asia and in North America – they do not constitute a prevalent component of the urban fabric. The international diffusion of the mall as a contemporary bazaar is an emblematic example of the typological crisis faced by the commercial fabric and of the possible future developements.

Notes

1 It is important to clarify how, even before the massive diffusion of the commercial covered walkways in London, Brussels, Paris, Munich, etc, it was widely used the so-called halle (hall in English), a covered market characterized by a polar configuration. The Italian researcher Donatella Calabi underlines that the term "halle" refers to a "(...) covered construction (in the past it has had also an open shape) related to trade or commerce, storage, bargaining, and exhibition, in which many sellers exercised their activities. The halle was widely spread between the 12th and the 13th century, especially in France, England and the Netherlands but, considering the Eastern bazaar, we can find a good number of examples also in the Mediterranean countries" (Calabi, 1993).

2 "The term knotting indicates the architectural outcome of connecting together the different elements of a structure, in order to form a spatial knot within the architectural, or urban, organism. The knotting summarizes the arrangement of the 'building matter' around a center, following which, a knot -at the same time spatial, constructive and distributive- is originated. An example can be observed into the processes that preside over the formation of the Roman palace and their subsequent developments, as well as in the modern postal buildings, also generated through a knotting of paths, overturned around a central space. The knotting, which metaphorically refers to knots, is the outcome of a process that can be appreciated and defined only once it is concluded; the same dynamics presides over the formation of some specialized buildings, for which we can recognize a pre-formative phase (which contains the conditions for the final definition), some transitional phases of the new organism, and the codified type" (Falsetti, 2016).

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Evaluation of generating mechanism of residential building patterns in contemporary cities. Case study on Xi'an and Nanjing

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Abstract. *Residential area occupies a large portion of urban land, so it is very important to understand the characteristics of the residential building patterns and how such patterns, normally parallel multi-story and high-rise slab apartments in various cities of China, are formed. The residential building patterns vary according to the living behavior, climate consideration, environmental requirement and market demands. Our previous studies have shown that sunshine regulation is by far the most important factor in the generation of the residential building pattern since 1980. This paper attempts to make a comprehensive evaluation to see the generating mechanism of the residential morphological patterns. Ten residential plots from two cities, Xi'an and Nanjing, located in different climate zones are evaluated. Five factors, namely, the type of the apartment, plot FAR, land coverage, sunshine regulations and spatial characteristics of plot pattern, will be used as comprehensive evaluation indicators in the comparison. The study reveals how these factors interplay in the generation of the observed plot patterns and which factor is the most important in this process. If the sunshine regulations were the key factor, how different the plot patterns in different climate zones and latitudes would have varied. Through evaluating generating mechanism we could find out the key generating factors, which is useful as the references for design.*

Keywords: Residential building pattern, generating mechanism, living behavior, floor area ratio, sunshine regulations

Introduction

In the study of urban morphology, M.R.G Conzen holds that fundamental elements of physical built form are streets, plots and buildings. This has formed a morphological system of a complete body to a complete set though still with some ambiguities. The clarification of those relationships opens the way for potential advances (Kropf,2013). Plot is not the only generating factors of human settlements (Kropf,1997). Therefore, it is important to identify what the other generating factors of urban residential fabric are. This paper aims to study the generation mechanism of residential building patterns in context and in association with other aspects of urban form to supplement the classical theory.

With the development of China's urbanization in the past 30 years, the urban forms of the cities in China have undergone tremendous changes. The rapid growth of population in China has led to the increasing demand for residential buildings since the reform and opening up in 1978. At the same time, China has introduced and modified the housing standards. The residential fabric, which occupies the largest proportion of China's urban land, has gradually exhibited regular morphology characteristics, most of which consists of multi-story and high-rise buildings whose patterns are usually parallel-

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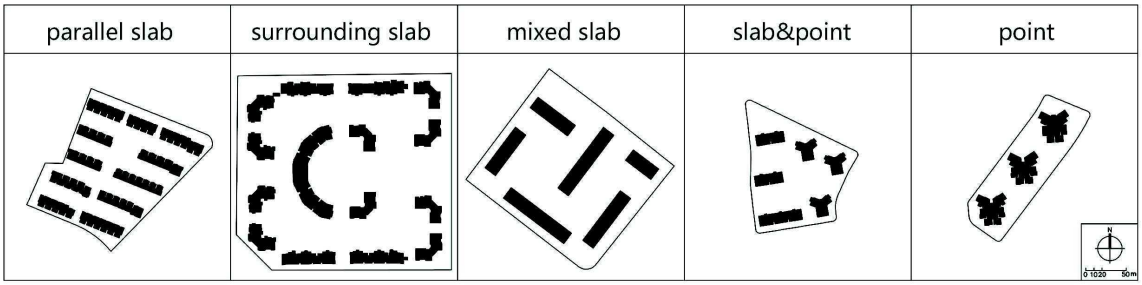

Figure 1-a 5 Residential Patterns in China

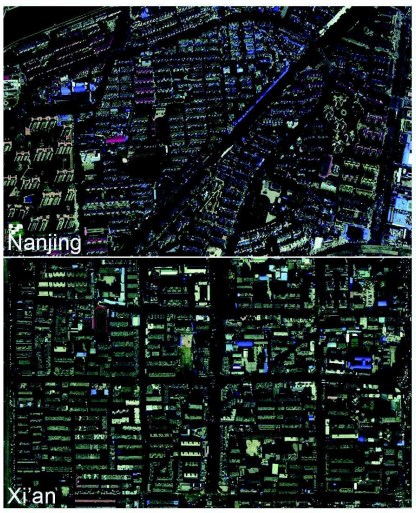

Figure 1-b Residential Fabric in Two Cities

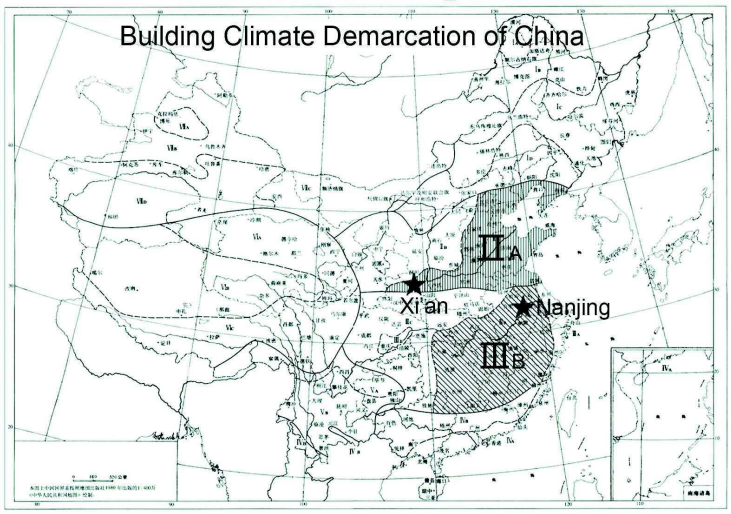

Figure 1-c Locations of Nanjing and Xi'an on Climate Demarcation Map

Figure 1.
a. 5 Residential Patterns in China
b. Residential Fabric in Two Cities
c. Locations of Nanjing and Xi'an on Climate Demarcation Map

slab or scattered-point in various cities of China. Therefore, it is essential to understand the characteristics of the residential building patterns and how such patterns are formed with regard to the study of contemporary urban morphology of China.

Related studies on the various generating factors of residential patterns fall into three groups. First, marketing demands which was indicated as the floor area ratio of plot are directly related to the height of residential buildings (Zhang, and Ding, 2012). Second, it has been proven clearly traditional living habit is an essential generating factor in the construction of traditional housing while living behavior in contemporary China mainly influence the shape of residential buildings (Liu, 2012). Third, climate environments, good sunshine and natural cross ventilation, are considered when arranging the residential buildings. Strict sunshine regulations which contribute to better living conditions greatly influenced the patterns since 1980s in China. These factors are interacted each other and emphasized differently. However, it is not clear how to quantify all these different factors. A large number of studies in China show that the sunshine is an important factor affecting the distribution of the pattern. However, it is not clear whether the sunshine is the most important factor or not and how it works in the generating mechanism. This paper attempts to find some relations between these factors and building patterns. It will not only contribute to the accurate study of urban morphology, but also provide a reference for more precise fabric formation of the residential plot.

The mentioned three factors, marketing demands, living habits and climate environment, may affect the housing patterns, which therefore need to be examined. With regard to the marketing demands, the amount of residential construction, which can be quantified by the floor area ratio (FAR) on the same area plot,

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is increasing with the development. However, residential buildings tend to get the maximum profit on the basis of meeting the requirements of the relevant laws and regulations even in different regions. In this case, the key factor in the process of generating residential patterns is then examined. Living habit and climate environment (sunshine and natural ventilation) can represent region characteristics of one city. To compare the different habits and climate environment, two major cities, Xi'an and Nanjing, which are located at completely different part of China, are selected. This paper attempts to explore the generation mechanism of Chinese contemporary settlements through the evaluation of these two cities.

Study Material

Residential building in China mainly consists of slab-type and point-type, and they are arranged as five basic patterns as shown in Figure 1-a: only parallel slab-type, surrounding slab-type, mixed slab-type, mixed slab and point-type and only point-type.

According to the statistics result of 2056 residential plots in Nanjing, the most residential plots are of parallel slab-type accounting for about 65% (Zhao,2012). Meanwhile, at the beginning of the founding of PRC in the 1950s, the residential patterns in Xi'an, the northern part in China, highly influenced by the Soviet Union, were mainly the surrounding slab-type. With more and more emphasis on good sunshine and ventilation condition from the

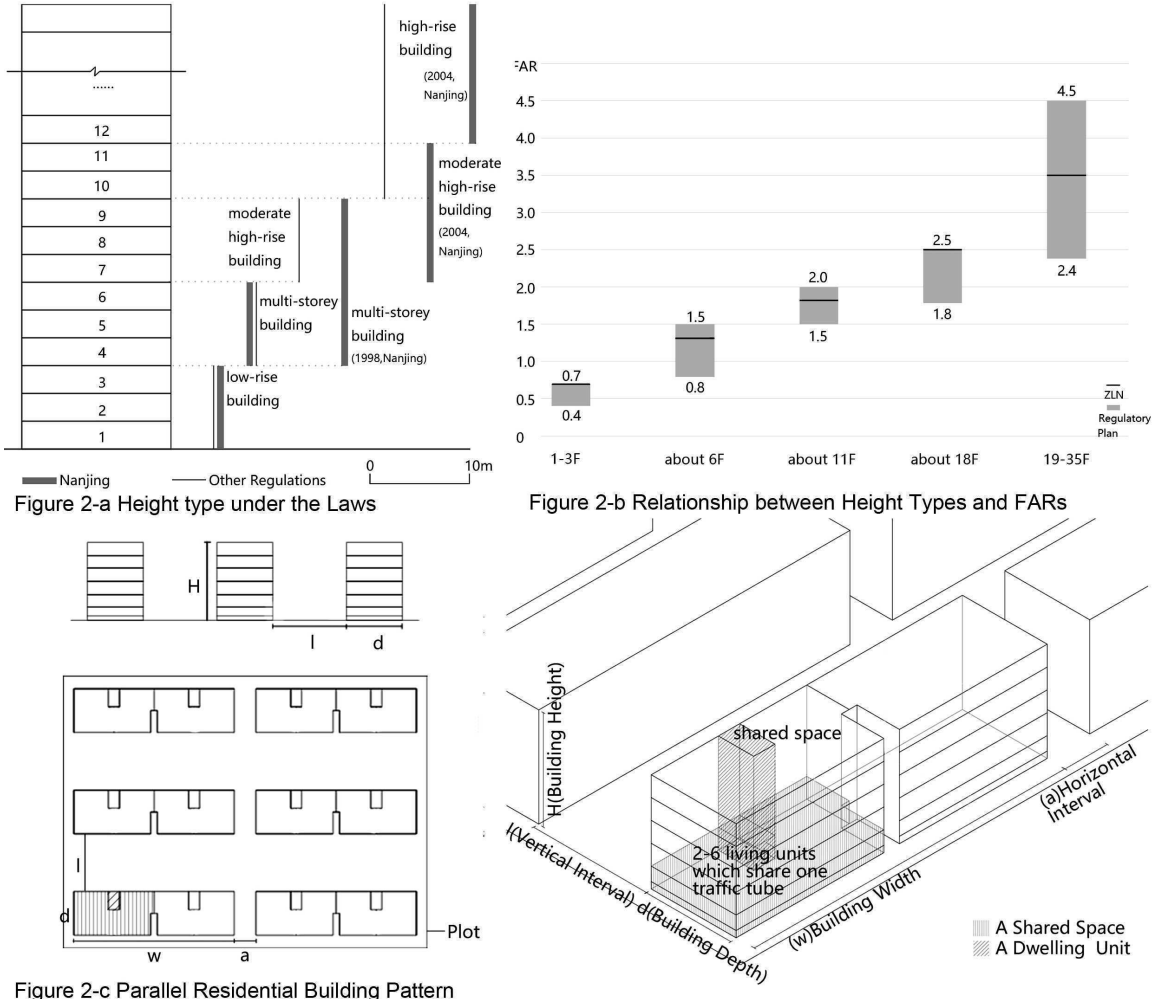

Figure 2-a Height type under the Laws

Figure 2-b Relationship between Height Types and FARs

Figure 2-c Parallel Residential Building Pattern

Figure 2.
a. Height Type under the Laws
b. Relationship between Height Types and FARs
c. Parallel Residential Building Pattern

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1980s, now the surrounding slab-type drops to less than 20%, while the parallel slab-type accounts for more than 60% (Cui, 2013). It is interesting that the parallel slab-type has become the majority of settlement patterns in both Nanjing and Xi'an as shown in Figure 1-b.

Nanjing and Xi'an are located in different climate zones of China as shown in Figure 1-c, with completely different latitude and longitude. The latitude of Nanjing, located in southern China, is low, while it of Xi'an, located in northern China, is high. Nanjing has higher requirements for ventilation because of its humid climate. Xi'an is cold in winter, so it has a higher demand for warmth. Meanwhile the sunshine regulations and laws are different for both the solar elevation angle and sunshine duration since the different latitude and longitude of the two places.

Market Demands

Due to the restrictions on the fire safety laws when construction which stipulates what kind of staircase and elevator shafts are required for diverse floors of residential buildings and vertical traffic conditions, Code for Design of Civil Buildings divides the residential layer interval. 1-3 floor is low-rise residential building, 4-6 floor for the multi-story district, 7-9 floor for the moderate high-rise and more than 10 for the high-rise. Xi'an local norms is the same as the national laws. Nanjing local norms in 1998 stipulate 4-9 floor for multi-story while in 2004 4-6 floor is multi-story, 7-11 is moderate high-rise and more than 12-floor or 35 meters is high-rise residential building (Figure 2-a). Parallel slab-type residential patterns in Xi'an and Nanjing approach to the maximum layer under the fire safety law to get the most benefit, so about 6- story account for the most of multi- story, about 11-story and 18-story for the high-rise. It shows a clear regularity which has a certain reference value on selecting the cases below.

The FAR of the plot as an index of the characteristics of the land, to a certain extent, can reflect the market demands. In the compiled various types of residential land in the detailed planning which is under the existing China's urban planning and regulatory system, the FAR and the residential building height show a certain degree of correlation, a certain FAR has a corresponding height type, which was proved also on Zhang's paper on 2013 as shown in Figure 2-b.

So the relationship between market demands and residential patterns has been clarified, but the effect of living habits and climate environment on the parallel slab-type pattern is still worth discussing. Firstly, one floor of a slab residential building is constituted by 1-5 dwelling units, one of which are characterized by 2-6 living units and a shared space including stairs or elevators. A slab building was determined by the value of its height(H), building width(w) and depth(d). When it combined in parallel together on a plot, the vertical interval(l) and the horizontal interval(a) are taken into account (Figure 2-c). Then, what values are affected by the living habits and climate environment, and when the plot area is certain, what the relationship between these values and the FAR of the plot.

Living Habits

In this study, we choose 12 parallel slab-type residential patterns which were constructed after the year of 1990 each in Nanjing and Xi'an. In all these cases, the plot contains only a single type of height type. No low-rise type was selected since few of them exists in reality. Each city has 6 multi-story type, which are around 6-floor, and 6 high-rise type broadly, which mostly consists of 11-floor and 18-floor residential buildings as shown in Figure 3-a.

Due to the impact of family planning policy, a typical Chinese family has about five persons with two or three generations living together, which requires 2-4 rooms. The case study of Nanjing has been proven that there are two types of the entry way to a living unit of a slab apartment, namely axis pattern and central pattern. Both entry ways require passing through a public apace in order to reach any private room. According to the similar way of entering home and the composition of function, the depth of a living unit varies between 11 and 20 meters (Liu, 2012). Living habit affect the depth of the housing building, then how the habits of different regions impact on the

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depth of a slab building. In order to clarify this question, the paper aims to do the comparison analysis of all the residential buildings in the cases.

First of all, find and count all 46 kinds of building depth which appear in 24 cases, compare Nanjing and Xi'an. Then, find out the various depth values in the 12 multi-story cases, compare Nanjing and Xi'an. Finally, compare the difference of monomer depth values between multi-story and high-rise cases. (Figure 4-a)

The following observations can be made from the statistical results:

a. Considering all types of building, the values of floor depth change in the range of 10-18 meters. Nanjing's vary from 10 to 16 meters while Xi'an's vary from 12 to 18 meters. The majority of Nanjing's is in 12-13 meters while that of Xi'an is in 15-16 meters. Without considering the floor numbers, the average depth value of a building in Xi'an is about 2-meter thicker than that in Nanjing.

b. Considering the multi- story type, the depth values approximately change in the range of 10-16 meters. Nanjing's vary from 10 to 14 meters while Xi'an's from 12 to 16 meters. The general trend is the same as considering all building types.

c. The multi-story's depth values range from 10 to 16 meters while the high-rise's data change from 10-18m. In general, the high-rise building is thicker than the multi-story building in both cities.

To summarize the above results, first of all, the depth value of Xian's building is bigger than Nanjing's on average. The variation is about 2 meters. To elucidate the reason behind this variation, a similar comparable living unit in Nanjing and Xian each is chosen for fully comparison. Both units have the same east-entry way and have of 3 bedrooms(B), 1 living room(L), 1 dining room(D), 2 washrooms(W), 1 kitchen(K) and 1 or 2 balconies as shown in Figure 4-b. Each unit is south oriented and obeys the rule that every space has its own window. However, the size of rooms in Xi'an is bigger than that of in Nanjing. The living habits in Nanjing and Xi'an are similar, so the room function is similar. But the room size of Nanjing is slightly smaller than the room in Xi'an. This could be due to Nanjing's wet

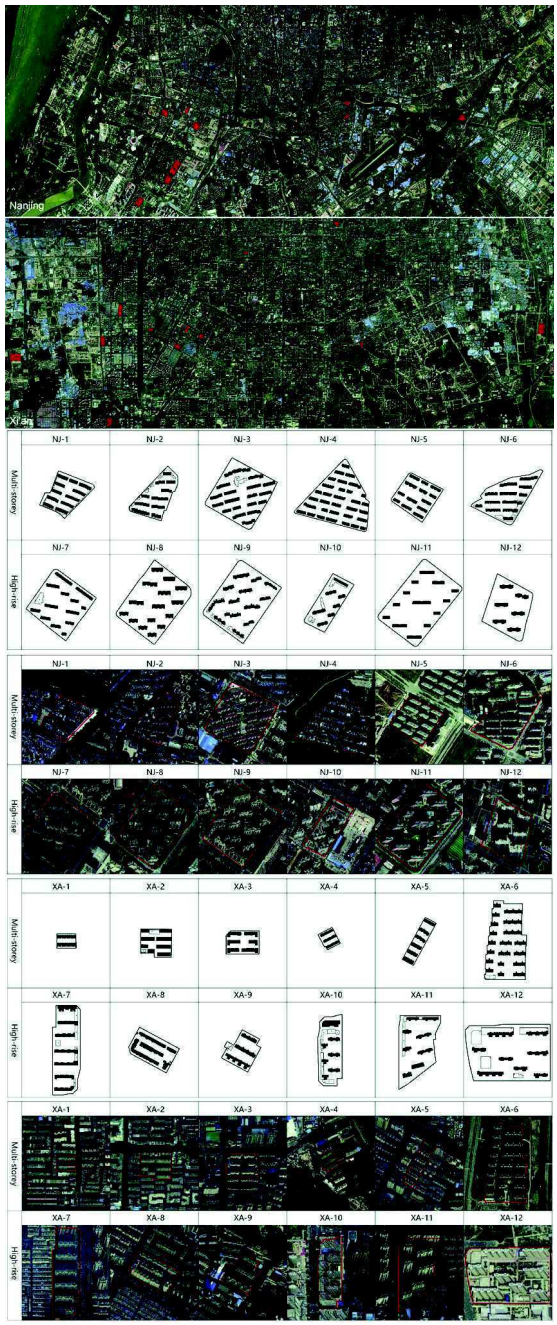

Figure 3.
All the study cases in Nanjing and Xi'an

and rainy weather. The thinner the building is, the more ventilation it can get. Xi'an is colder in Winter so the building generally is thicker to keep warm. Therefore, the difference in weather makes the depth of a single slab residential building in Xi'an, on average, is thicker than that in Nanjing.

Secondly, high-rise building is usually thicker than multi-story building. This difference is usually the result of fire safety

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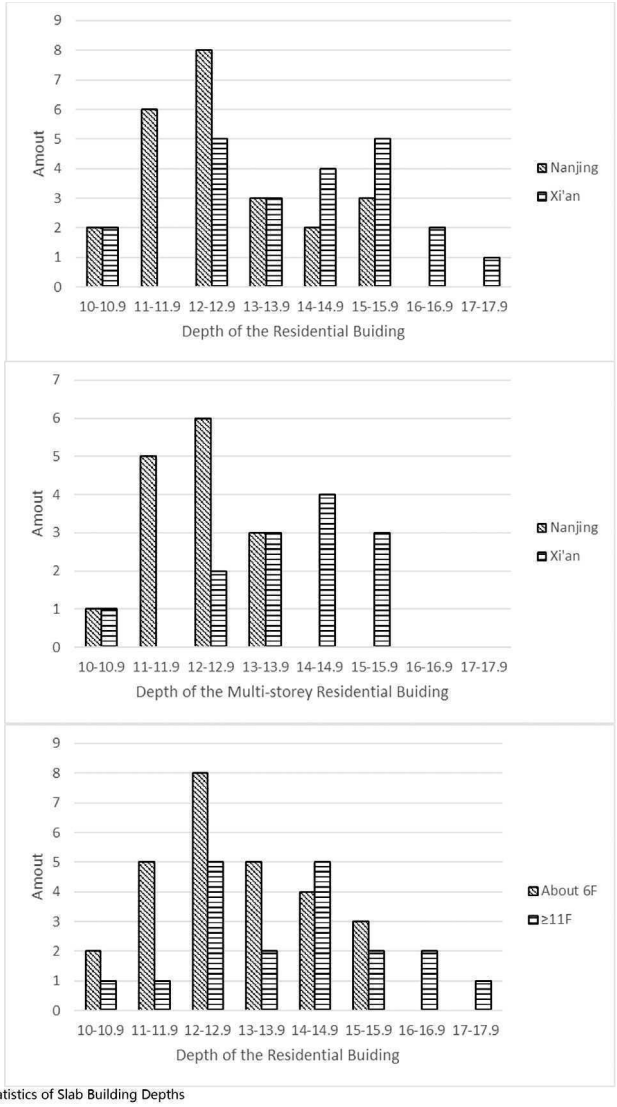

Figure 4-a Statistics of Slab Building Depths

Nanjing Living Unit

Xi' an Living Unit

Figure 4-b Contrast of Living Units in Nanjing and Xi' an

Figure 4-c Dwelling Units of Different Height Type

Figure 4.
a. Statistics of Slab Building Depths
b. Contrast of Living Units in Nanjing and Xi'an
c. Dwelling Units of Different Height Type

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and vertical traffic regulations. A high-rise dwelling unit can hold 4 or more apartments along with a shared space while a multi-story dwelling unit usually holds only 2 apartments along a staircase as shown in Figure 4-c.

Thus, the depth of a slab-type building changes according to the height type and the living habit. When the height type changes, the depth change is usually due to the number of living units and the different fire safety regulations or laws. When the living habit changes, the depth value of a slab building varies to accommodate the habit such as the weather consideration.

Climate Environment (Sunshine)

It is well known that living habits determine the depth value of a single slab residential building, however, it is not clear what role the climate environment plays in the generation mechanism. Quota targets of urban planning or the first time stipulated clear regulations on the vertical interval between two parallel slab buildings with south-north facing. After that, the current norms have strict rules for the vertical interval(l) between two slabs when they are south oriented. Although building's ventilation is closely related to the vertical interval as well, there is no clear standard for the relationship between them.

In the detailed local urban planning codes, the local governments consider many factors including regional solar elevation angle, effective sunshine duration, local economic level and the development of people living conditions. In order to simplify the calculation of the vertical interval in the residential pattern, an index called the coefficient of the buildings insolation interval (i) is usually used. Insolation internal is defined so that the shadow of one building at noon does not block the window of the other parallel slab building. The sun is always on the south side of the building in China as shown in Insolation interval (l) can be calculated as h/ tanα as shown in Figure 5-a, where α is the solar elevation angle, and h, is the height of the first build to the bottom windowsill of the blocked. In practice, the coefficient of the buildings insolation interval (i=l/h) is used to calculate the insolation interval under the same situation. If the "i" value is bigger, the insolation interval decided by the sunshine condition will be bigger. Given a fixed plot area, the less number of buildings can be arranged.

This paper tries to evaluation the sunshine conditions in reality for the 24 residential patterns we have selected earlier in Nanjing and in Xi'an. All these patterns were built in the years from 1991 to 2014. If most of the real data from those building is in compliance with local regulations, we could say that sunshine determines the vertical interval in the residential building patterns.

First of all, the detailed regulations on sunshine of two different cities need to be sorted out clearly. Nanjing in year of 1987, 1995, 1998, 2004, 2007, 2011 formulated and modified sunshine regulations. At the same time, Xi'an introduced its own sunshine regulations in year of 1987, 1993, 2005, 2006, 2012. All the medium index for each regulation change and for both cities are listed in Table-1. In 2012's Xi regulation, "i" value as a function of sunshine angle is listed as in Table 1-b.

It can be seen from the table that the change of "i" value, i.e., i=h/l, in 1987 and 1995 in Nanjing is reflected in the effective height of the building, and the similar trend can be found in 2005 and 2006 in Xi'an as well. To compare the reality with the regulations, it is essential to distinguish the difference of real building height (H) and the sunshine calculation height (h). From the regulation in Table 1-a, it can be seen that the sunshine regulations were getting stricter as the land value kept increasing during these years. As the orientation of a slab building deviates from south to east or west, the "i" value also produces a reduction as shown in Table 1-b.

Secondly, we need to count and analyse the vertical intervals and "i" values in the real cases. To do that, first we select the most unfavorable insolation interval position in each case and find out the construction year. Then, investigate whether H or h is used and calculate "i" value by the equation i= l/h (or H) in reality according to the detailed rules on sunshine regulations. After that, do the statistics of actual "i" value and make a comparison with the theoretical "i" value to find out the percentage of cases which conform to the specifications in total. Finally,

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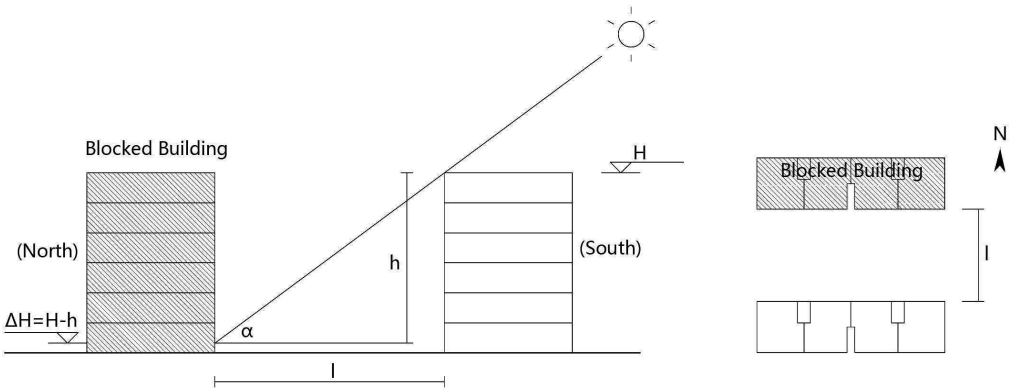


Figure 5-a The Situation of Insolation Interval and "i" Value Calculation

Nation	1987 *1h sunshine duration on Winter Solstice*	1994 *1h/2h sunshine duration on Major Cold*
Nanjing	*i=1:1.36*	*i=1:1.3-1:1.33*
	1987 i=1:1-1:1.2 (< 1h on WS)	1995 i=1:1-1:1.2 (< 1h/2h on MC) 2004 i=1:25-1:1.3 (< 1h/2h on MC better than 1995)
Xi' an	*i=1:1.48*	*i=1:1.31-1:1.35*
	1987 i=1:1-1:1.5 (≤1h on WS)	2005 i=1:1.31-1:1.35 (=1h/2h on MC)

Figure 5-b National and Regional Sunshine Regulations

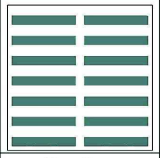
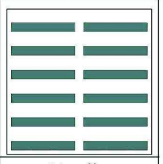
Pattern			
Location	Xi' an	Nanjing	Nanjing
i	1:1.0	1:1.0	1:1.3
d	14m	12m	12m
h	15.9m	15.9m	15.9m
l	15.9m	15.9m	20.7m
Sunshine Duration	< 2h(min)	< 2h(mid)	< 2h(max)
FAR	2.58(max)	2.22(mid)	1.9(min)

Figure 5-c Hypothetical Pattern according to the Laws

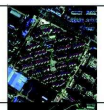
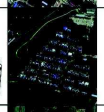
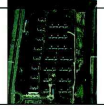
Pattern		Plot Area(㎡)	Actual "i" value	d(m)	h(m)	lmin(m)	Sunshine Duration	FAR
	 NJ-3	48313.4	1.36	12.7	15.9	21.7	> 2h(mid)	1.34(mid)
	 NJ-4	50967.9	1.30	12.6	15.9	20.7	≤2h(min)	1.56(max)
	 XA-6	52231.6	1.56	13.9	15.9	24.8	> 2h(max)	1.36(min)

Figure 5-d Three chosen cases to Verify the Hypothesis

Figure 5.
a. The Situation of Insolation Interval and "i" Value Calculation
b. National and Regional Sunshine Regulations
c. Hypothetical Pattern according to the Laws
d. Three chosen cases to Verify the Hypothesis

find out the percentage of it in multi-story and high-rise groups.

Of all the building types, 71% of them meet the sunshine regulations. For the multi-story type, 83% meet the regulations while, for high-rise one, only 58% meets the sunshine regulations.

The sunshine codes published by Nanjing in 2004 pointed out that moderate high-rise slab buildings can also use the "i" value as a measurement. So this paper compares the high-rise buildings also. However, in all cases, there are not only moderate high-rise buildings but also more than 18-floor high-rise buildings. With the floors increase, the type of residential building monomer has changed. The impact of sunshine on housing has become more complex, so, the coefficient "i" value is

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no longer the only index that influences the intervals. Therefore, it can be concluded that sunshine is the key factor to determine the vertical interval between slab buildings in the parallel multi-story residential patterns.

Then, how does sunshine affect the slab multi-story housing patterns? The national sunshine codes prescribe the rules by specifying the minimum sunshine duration hours at the most unfavorable position of a building on Winter Solstice (December 22nd) or Major Cold (January 20th). In the national code, although Nanjing and Xi'an belong to different climate demarcation (according to Building Climate Demarcation Map of China, 1993, Figure 2), both cities are required to meet sunshine regulations. In 1980, national code put forward laws on the insolation interval for the first time. The law requires at least 1-hour sunshine inside a bottom living unit of a building on Winter Solstice locally. In 1987, more details regulations were added to the law, saying that at least 1 room in a living unit should have 1-hour sunshine duration on Winter Solstice. In 1994, the sunshine specification stipulates at least 2-hour sunshine duration in a room of a living unit on Major Cold. Because the solar elevation angle is bigger than that on Winter Solstice, it was adjusted to reduce the standard though the duration seems to be longer. Although the requirements in specification are the same, Nanjing and Xi'an differ in local effective sunshine duration, solar elevation angle. Local planning bureaus in accordance with national norms develop local implementation details or technical rules. In theory, local bureaus try to calculate the "i" value to meet the sunshine duration regulations through the established standard models according to its local geographic location.

To meet the 1-hour sunshine duration on Winter Solstice in 1987 national code, the theoretical "i" value is 1.36 in Nanjing, but the details in local code set "i" equal minimum 1 and maximum 1.2 while in Xi'an the theoretical one is 1.48, the local "i" from 1 to 1.5. In this case, planning a new residential pattern only met the minimum "i" to get more profit. At that time, there was almost no urban residential area to meet the requirements, it is clear that the standard of 1 -hour sunshine duration on Winter Solstice is too strict. In 1994, nation code set that at least 2-hour sunshine duration in a room of a living unit on Major Cold. The Nanjing "i" should be 1.33 while in 1995 "i" is 1.2 and in 2004 "i" is 1.3 in new district to approach the national code. Meanwhile, Xi'an's should be 1.35 and its details regulations in 2005 meet the standard. (Figure 5-b) In order to reduce the coefficient of the insolation interval, local codes tend to reduce the sunshine duration inside the living units as possible. Sunshine regulations and laws are affected by changing the number of sunshine hours to control the vertical intervals in the slab multi-story residential patterns.

So, it can be assumed that if arrange the same height slab residential patterns on 2 same area plots in a place which has a certain living habit, if the buildings have less sunshine duration, in theory, the vertical interval between buildings is smaller, the FAR will be bigger. It should be considered that the depth of a monomer in Xi'an has been proved thicker than that in Nanjing when comparing them. According to the code, establish three residential patterns of 6-story with same area plot in Xi'an and Nanjing. One pattern of i=1 in Xi'an and Nanjing accounts for two of i=1 and i=1.3. Set the most popular size 200*200 meters of a plot, depth of 12 meters for Nanjing slab building while 14 for Xi'an as proved, 88-meter building length of 4 dwelling units for one dwelling unit is about 22m (Zhang Lina,2012). (Figure 5-c) It can be seen that when the plot area is the same, when sunshine duration in Xi'an is shorter than Nanjing for that they have a same "i" value and Xi'an located in the higher latitude, the FAR of Xi'an is larger. And as the sunshine specification of Nanjing changes with the year, when the sunshine duration adds, the FAR will decline when the plot area is fixed. If the assumption is true, it can be proved that in actual, sunshine hours that a living unit can be shined will directly affect the FAR of parallel multi-storey residential patterns. Longer sunshine duration results in lower FAR.

Three patterns which are similar in plot area from the 24 cases to verify the assumption was chosen. One of the 3 cases is in Xi'an and other are in Nanjing. Court the d, h, "i" values, sunshine durations and FARs of these cases and make a table. We can see that when the plot area is certain, sunshine duration and FAR are

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in inverse relationship just as the assumption. (Figure 5-d)

Conclusion and Discussion

As the rapid expansion of urburn redisential area, it is important to understand the generation mechansim of the residential patterns.This paper tries to find out the effect of market demands, living habits and climate environment on the generation mechanism of housing pattern. Based on the relevant regulations, this paper studies the slab settlements in Xi'an and Nanjing and compares them with indexes such as the depth of the living unit, the coefficient of the vertical interval between buildings, sunshine duration, FAR and so on. The conclusions are as follows:

•First, the FAR, which can reflect market demands, and the residential building height are directly correlated, i.e., a certain FAR has a corresponding height type.

•Second, the height type and the living habit influence the depth of a slab building in parallel residential patterns.

•Third, sunshine condition determines the vertical interval of buildings in multi-story parallel settlements even in different regionswhich has different sunshine duration.

The results can be used as reference in for the future study of urban morphology and exploration of its generation. While, sunshine and natural ventilation become increasingly important in climate and environment. And many people are studying the indexes of them and their correlation with patterns. In this paper, we have come to the conclusion that the sunshine has affected housing through the sunshine index. However, the impact of wind environment on settlements is rarely mentioned in regulations, and there are no good measures and policies related to ventilation. The residential patterns may change once ventilation indexes are defined by laws in the future.

Back to Kropf's theory on ambiguity of plot and building, it can be seen that once the given region has fixed living habits and clear environmental indicators in laws, the regular residential building pattern is traceable. This paper not only contributes to the study of the generation mechanism of residential patterns, but also to some extent responds to some theoretical studies.

Back to Kropf's theory on ambiguity of plot and building, it can be seen that once the given region has fixed living habits and clear environmental indicators in laws, the regular residential building pattern is traceable. This paper not only contributes to the study of the generation mechanism of residential patterns, but also to some extent responds to some theoretical studies.

Acknowledgements

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Code for Design of Civil Buildings (GB 50352-2005)
Code for Planning and Design of Residential Area (GB50180-93)
Code for Design of Residential Buildings (GB50096-2011)
Code of Design on Building Fire Protection and Prevention (GB50016-2006)
Interim Provisions on the Management of Urban Construction in Nanjing (1987)
Details of Nanjing Urban Planning Regulations (1995,1998,2004,2007)
Technical Regulations for Urban Planning Management in Jiangsu Province (2011)
Xi'an Urban Construction Planning and Management Regulations (1987)
Xi'an Urban Planning and Management Regulations (1987)
Details of Xi'an Urban Planning Regulations (2005)
Technical Regulations for Urban Planning Management in Shaanxi Province (2006)

Appendix

Table 1-a "i" values in the Sunshine Regulations of Nanjing and Xi'an

Nanjing			Xi'an		
Year	New City District	Old City District	Year	New City District	Old City District
1987	H:l=1:1.2	H:l=1:1	1987(1993)	H:l=1:1.1-1:1.5	
1995(1998)	h:l=1:1.2	h:l=1:1	2005	H:l=1:1.35	
2004(2007)	h:l=1:1.30	h:l=1:1.25	2006	h:l=1:1.35	h:l=1:1.31

Table 1-b The Reduction of Insolation Intervals of Various Directions

Angel(deviates from south)	0-15°	14-30°	30-45°	45-60°	≥60°
Vertical Interval	l	0.9l	0.8l	0.9l	0.95l

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The role of the plot in engendering environmental quality: From unplanned favelas to the planned subdivisions of new blocks

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Abstract. *This work discusses the importance of the site in the morphological structuring of urban centres. Studies on the implantation of the city of Belo Horizonte, located in the state of Minas Gerais, show that the occupation of the city occurred initially in the valleys. This was due to the favourable conditions of the topography, which allowed an orthogonal layout in the central area. In spite of this, since the city's foundation, the most rugged areas have been occupied by favelas, whose layout differed from the dominant pattern. As flat areas became scarce, the hilly regions, possessing long strips of land, were also subdivided and exploited due to their substantially lower land prices. Although the favelas sprung up spontaneously and the new settlements were planned, both had similarities in the layout of the streets which were adjusted to the steep contours and the geological conditions of the terrain. At the same time, the plot defined another configuration in the subdivisions, in which the building was occupied by only a single family and, in most cases, the building was separated from the street by high walls. As a consequence, the relationship between public and private space became severely compromised. In the case of the favelas, the formal inexistence of the plot is demonstrated in the juxtaposition of the dwellings, in which each residence is constructed above another in extremely confined space. The relationship with the street also differs in these places, since the 1st floor often freely connects to the street, integrating the dwelling with the public space and thus contributing to the social life of the community. This is furthermore in contrast to the previously noted walled environments characterising planned areas. The analysis of these parameters could profitably be utilised in new designs that appropriate some of the popular solutions better suited to the environment, and in turn, integrate them into public policy.*

Keywords: Belo Horizonte, site, settlements, urban growth, urban fabrics

Introduction

Morphologists contend that the urban form is a product of historical periods representing, and influenced by, political, economic and social facts that transform and modify the form's configurations which, in turn, contribute to defining specific morphological periods. It is also widely thought that such periods often amalgamate on the site, forming layers, many of which become lost or poorly identified. These periods, however, can be recognized as a successive continuum of urban fabric that obeys urban patterns and norms which have materialized over time. The identification and study of urban fabric, resulting from social and economic inequalities, is relatively rare because the urban form in traditional studies

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has become established and the urban fabric has been reduced to smaller variables.

Thus, developing countries can be the subject of innovative research in which the work carried out can help to assess the relevance of applying the concepts of urban morphology to situations that are not well explored. Such sources and examples can be found and observed in Brazilian cities. On the one hand they exhibit, formal and planned spaces, manifesting regular urban fabric, containing single or multifamily dwellings, inserted into well-defined plots and blocks, well served by infrastructure. On the other hand, however, they are replete with the unregulated spaces, located in areas of risk that form dense urban fabric, with reduced plots and badly delineated blocks which form continuous patches on the landscape.

Although the phenomenon is present in several Brazilian cities, this work presents and discusses its appearance in those planned in the nineteenth century and suggests that planning, for the most part, has been aimed at areas accommodating the economically better attended social classes. However, significantly and in spite of this, it is possible to observe that the urbanization resulting from the collective and spontaneous decision making of the favela manifests similarities to the planned areas and that the former could even bring innovative social qualities to those areas destined for high income social classes.

In order to research such tendencies and phenomenon, the Brazilian city of Belo Horizonte was duly chosen as a case study. Designed to be the capital of the state of Minas Gerais at the end of the 19th century, the planned metropolis was expected to grow within pre-established and projected limits of 200 thousand inhabitants (Barreto 1996). The city has however spread with little planning, expanding at an extremely rapid pace as a result of both private/individual decision-making and political input. Consolidation, since foundation in the 1890s, has produced multifaceted space, presenting fabric planned for different urban areas and destinations. It has also included a designated marginal space for workers who built the city, marginalized by the planners.

More specifically, this paper has analysed the process of land subdivisions in Belo Horizonte and the forms of building settlement on existing plots, thus facilitating an evaluation of their impact on the urban landscape. As such, the morphological concepts from the traditional schools of M.R.G Conzen (2004) and Caniggia e Maffei (2001) were applied. In addition, observations on favelas and spontaneous appropriations were based on the classic studies carried out by Brazilian researchers, such as Maricato (1982, 2015), Rolnik (2015) and Bonduki (1999). Also referenced were studies that were remarkable for their formal aspect and implications in relation to the landscape, such as Santos (2008), who contributed to revealing the social aspects inherent in urban occupation, Pereira Costa (2004), Perna (2012), Gimmler Netto (2014), as well as, research undertaken by the Landscape Laboratory. Such references have thus contributed significantly to this text and allowed reflection on the forms of urban fabric and their environmental and social quality.

The urban form of Belo Horizonte and its development

As previously mentioned, the main characteristics of Belo Horizonte have emerged through zoning and land subdivision. With a population that has grown to around 2.3 million inhabitants (IBGE 2011), the city was implanted across two geomorphological domains consisting of gneissic-migmatitic rocks and specific sedimentary sequences manifesting lithological diversity. At the junction of the two domains, there is a depression that divides the sub-basins, along which the river (Ribeirão Arrudas) runs, dividing the city between east and west. Several smaller tributaries are connected to this watercourse, which acts as the main hydrological system of the settlement (Ferreira, 1997).

The urban plan of the new capital was subdivided into three large zones: the rural, the suburban and the urban zone and conceived in an orthogonal pattern. The zones were designed to serve different purposes in a total urbanized

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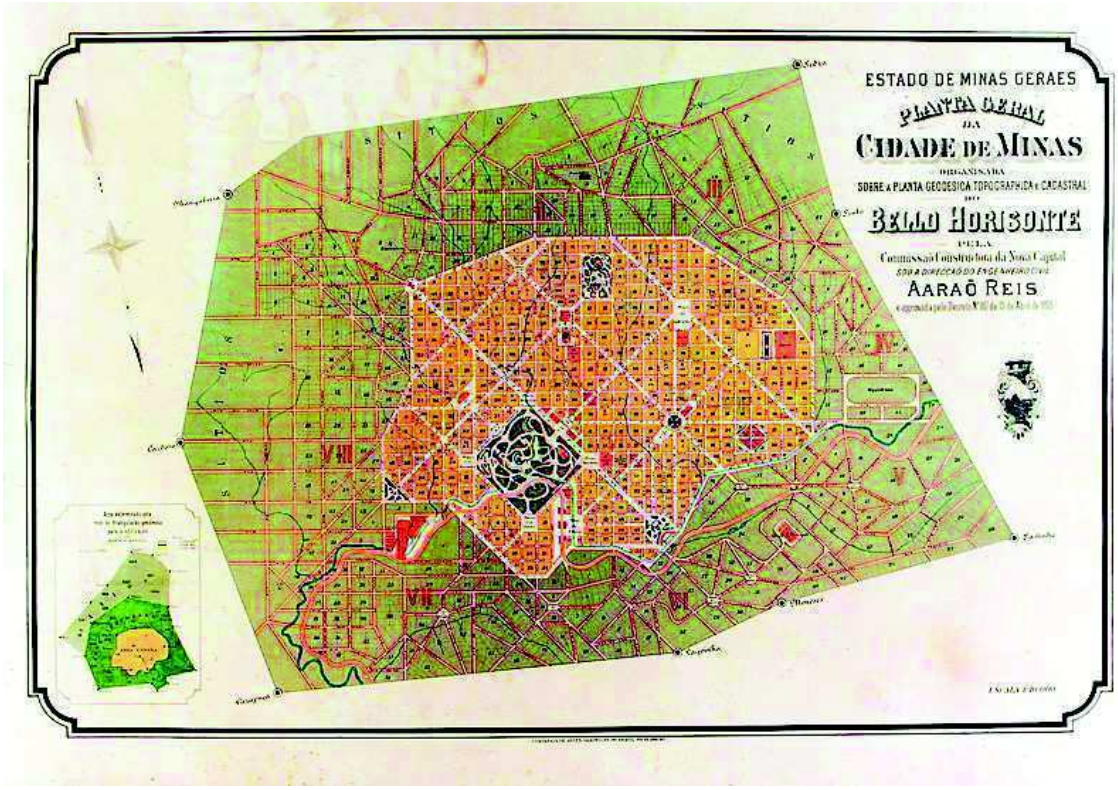

Figure 1.
The rural, the suburban and the urban zone of Belo Horizonte

area of 1200 hectares. The general planning of the new city was based on the positivist philosophy popular in that era. As such, and in relation to Urbanism, this stressed the use of metrics, rectification and geometric figures, resulting in a design of urban forms settled on an ortogonal grid. (PLAMBEL, 1986). Technology was considered to offer feasible answers to physical constraints. In order to address these issues, the technocratic leaders of the new capital undertook projects, such as the channelling of streams and the grounding of natural depressions for the construction of plazas and a monumental axis (Pereira Costa, 2004).

However, the development of the city was not uniform as it was prone to wide administrative and management differences and ideology. This resulted in an attempt to control the capital with a poorly structured administrative and technical state that met the formal requirements of controlling expansion and the demands of construction, in compliance with developers. The solution found was to govern with developers, with the resulting definition of the area of intervention - the suburban area. As there were no defined rules and structured urban parameters, everything was subsequently defined by entrepreneurs.

Thus, the original project of wide roads and regular plots, designed in the urban area, was adapted to the suburban area. The construction of a railroad branch in a westerly direction, parallel to the river, induced new occupation. This was reinforced by the construction of transhipment stations along the railway axis, the vector of which led to the emergence of small nuclei that gradually consolidated themselves as districts destined for the residence of the working population, distant from the original urban area. (PLAMBEL, 1986). The streets had their width reduced and parcels dismembered, whilst requirements for the development of green and institutional areas were put on hold and would only be resumed in the 1940s, when much of the urban quality had already been compromised (Landscape Laboratory, 2010).

Subsequently, the expansion of the city, in its specificity, has also revealed the most recent process of urban land appropriation in Brazilian

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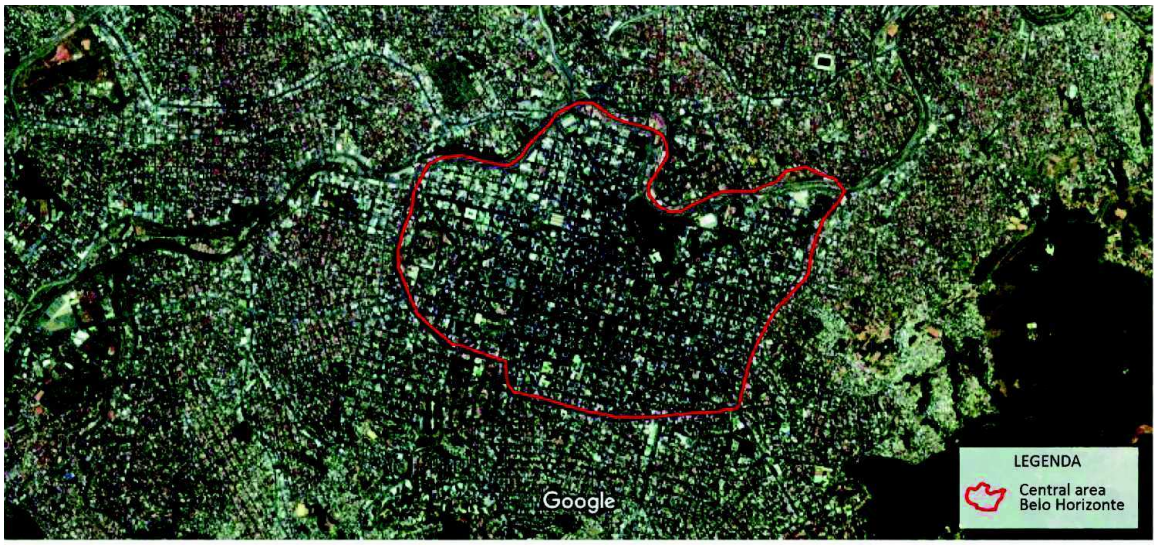

Figure 2.
Different urban fabrics in Belo Horizonte

cities: the occupation of the metropolitan borders. In these areas of expansion, diversified types of occupation are characterized by heterogeneity and segregation, such as industry, low-income occupation and closed condominiums, the latter destined for single-family, high-income housing (Macedo, 1999).

This process reveals the logic of the metropolitan real estate market which encapsulates changes in lifestyle and consumption and the discourse of an escape from the city and its accompanying violence, together with the search for an idealised contact with nature.

Such duality, printed on the patterns of urban fabric, reveals how the state deals with the management and provision of public services. The formal urban fabric receives a wide range of facilities, in contrast to the informal sector which remains scarcely provided for.

The urban form

The urban zone was structured so that activities were implemented with a view to accommodating the administrative and residential function of the civil servants who worked there, the area being circumvented by an inner ring road (Barreto1996). The main central area is then located within this road known as Avenida do Contorno. This same region acts as the main centre of the metropolitan core and is currently classified as the hypercentre of the capital. Two other centres have played the role of commercial and commercial sub-centres both of which act as cores for local retail business. (Pereira Costa et al, 2010).

The roads leading to the two sub-centres characterize the two main highways installed along the waterways, one that flows west and the other to the north (Secretaria Municipal de Coordenação de Política Urbana e Ambiental, 2002). The west and north axis comprise the most significant growth expansion vectors and represent areas where industries are concentrated beyond the industrial city and have spread along the main axes connecting Belo Horizonte to São Paulo and Brasília. The northern vector has also witnessed expansion boosted by the settlement of cement extraction industries which in turn have required road networks and transportation facilities.

Two other smaller axes lead to these expansions: one extends to the south and east, while the other, to a lesser extent, appears in the northwest and northeast and comprises favelas and other outlying areas of the city. Another axis consists of a highway that expands to the south (Belo Horizonte-Rio de Janeiro) whose borders house high-class single-family houses.

In summary, the city, as presented by its 2017 structure, manifests a layout in stark contrast to

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the original publicly planned metropolis, being contemporaneously controlled by the private sector.

The Belo Horizonte type - morphological process in 2017

The morphological process resulting from political, economic and social pressures has taken the form of four urban types of fabric, which, in turn, have unfolded into several other types. The objective in this paper is to discuss the two types of models of urban expansion and to compare them, as well as those types resulting from the foundation and expansion of the city.

The original type

The first type originated from the formation of the city and was implanted in an urban plan consisting of 120-meter-long blocks, subdivided into 10 plots each with a frontage of 12 meters and accommodated in 12-meter-wide streets. Models of six differentiated houses were built according to the functional hierarchy of the civil servants who came from Ouro Preto (the state's former capital) to live in Belo Horizonte. The basic type was built on two floors, aligned to the street and remained unchanged until the 1940s, when changes in urban legislation occurred.

From this period, and as a result of the legislation, new types emerged, mainly for commercial uses, allowing greater occupation density and three-story high multifamily use. A growing number of additions at the rear of the plots led to the appearance of outhouses which could be rented and amounted to 40% of all irregular constructions. (Plambel, 1986).

These findings led to the formulation of new models, implanted in a Land Use and Occupancy Law, which combined, in a mathematical model, the occupancy index of the lot x type of use allowed. According to Plambel, the old pattern did not take into account the functions, variety and diversity of urban life, thus it proposed a combination of occupation and land subdivision for a given zoning (Pereira Costa, 2004).

The planning laws of 1976 and 1985 led to modifications in the use of buildings, typologies, in their volumes and in the increase in high rise developments in the urban and suburban zones. This period was characterized by the emergence of larger, high rise buildings, adjoining of the plots and densification of the urban landscape. The landscape was thus transformed and the relationship between public and private space was lost due to the construction of walls and the presence of commerce on the first floor of such developments. Growing urban violence has subsequently led to the elevation of walls, often of transparent glass panels that allow the visual permeability of the residents with the public space, whilst access to private units only occurs via control mechanisms, watchtowers and video cameras.

These aspects can be observed throughout the city, comprising the urban and suburban areas. In the formerly rural areas, residential types of one to two storeys are the main forms that reproduce the occupancy standards of the 1940 decree, but the ratio of public and private space is similar to that observed in the old urban and suburban areas. The great majority of the territory is structured by this urban fabric. There are, however, two other phenomena that stand out. One of them appears at the foundation of the city: the spontaneous occupations destined for the low income population. The other is the result of the demands of the upper middle class, which has sought privacy and security in more distant places. In both cases the conditions have materialized on similar sites and deployments, but with differences in type of deployment batches and in infrastructure and construction standards.

The urban fabric of the spontaneous settlements

Favelas emerged in the vacant areas near to amenities under construction and dictated by the socioeconomic conditions of their residents and precarious planning patterns that, did not take into account, the need to shelter the

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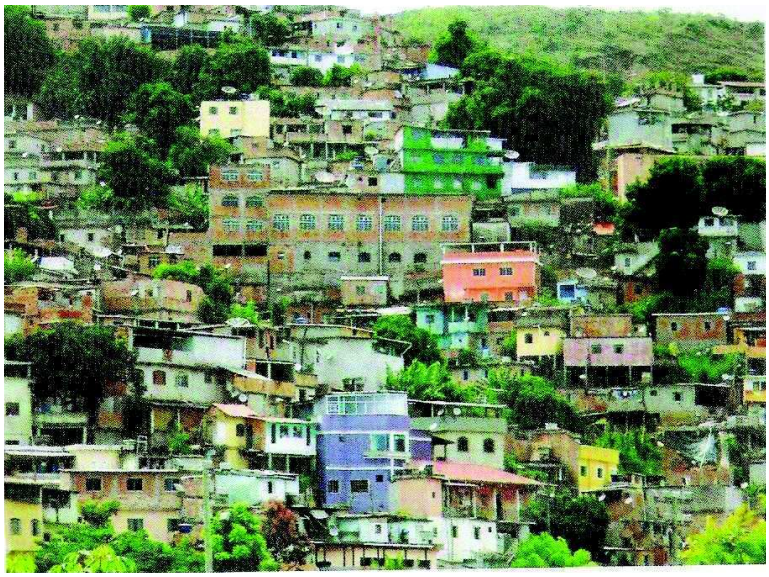

Figure 3.
Spontaneous occupation area

workforce, indispensable for the implantation of the new capital, in the construction of public buildings and road infrastructure (Libânio et al, 1986). Moreover, because of the tolerance of the authorities, coupled with the need of the inhabitants to be close to their workplace, settlements have expanded as the city has grown and consolidated itself as urban fabric within spontaneous occupation areas.

This fabric, located on slopes, is the result of a type of occupation that occurs by means of an axis which joins the road from the official road system and leads to the top of the hill, the main street being installed on the ridge (Caniggia and Maffei, 2001). It also divides the settlement into two slopes whose subdivision forms streets parallel to the ridge, follow the contour of the contour lines and form long blocks. The layout of the street has consequences for pedestrians, as the blocks force them to travel long distances before reaching a street or their houses. To minimize this inconvenience, people tend to take shortcuts through the properties of others, thus creating a system of uneven paths. Moreover, due to the formation of the terrain, to the topography and to the steep slopes, these paths can exacerbate the risk of landslides.

The plot pattern

Most of the plots are aligned with the streets parallel to the ridge. As the street follows the contours of the site, these plots are located above or below the street. In areas with geo-morphological characteristics not recommended for housing occupancy, there may be damage, as residents tend to cut into the land to build their houses on a single level. This leads to soil instability and brings risks of landslides and flooding due to poor drainage. (Pereira Costa et al, 2010). At the beginning of the occupation, the houses are predominantly single floor dwellings, with few houses having second floor additions.

The basic type

The typical house, acknowledged by Caniggia and Maffei (2001) as the basic type, is about 30 m² and consists of two bedrooms, a small kitchen and a bathroom, all covered with asbestos tiles. Plots are reduced, presenting an average area of 70 m². The construction of the dwellings takes place in the middle of the plot, in alignment, with small areas/corridors, at the rear and side of the dwelling, located close to the limits.

During the first phase of the house, a narrow area of about 1.00 m, on average, is left along one of the sides of the plot and is occupied at later stages of the expansion. The implementation of plots on slopes does not

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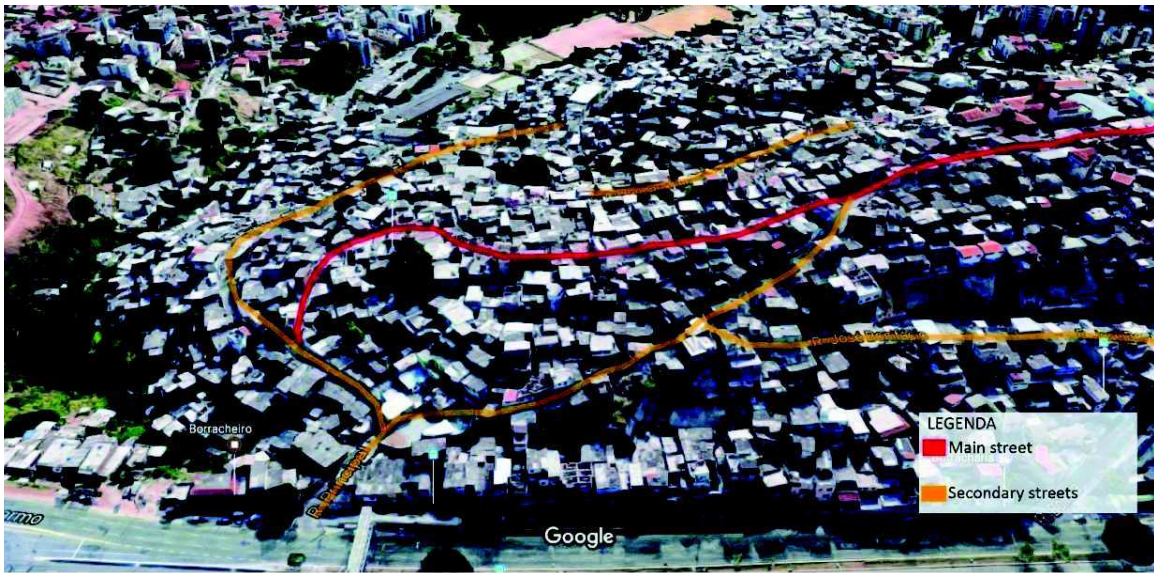

Figure 4.
Main street on the top of the hill

favour the use of the confined internal space for leisure activities or domestic services. As a result, many of these activities take place on the street and the street becomes an extension of the house. When the occupants feel secure and realize that they will not be evicted, they invest time and the little money they have to build better homes and new additions and decks are duly added.

The transformation of the basic type

The first cell of the dwelling is a hut after which families erect some kind of fence marking their domain, the fragility of which is emblematic, the demarcation being a largely symbolic gesture. After completion of the first core, the addition of one or two rooms to the original construction begins, and, later, another floor may arise. The construction system is simple and includes a concrete slab as cover, whilst the structure of the second floor is initiated by pillars with steel rods protruding from the standing structure, so that additional floors can be added, according to the future needs of the family. The possibility of extending the original dwelling to the sides or above is a fundamental necessity, whose purpose is to house the family or an additional source of income. The final step of the construction process is to transform the previously constructed roof slab into the so-called "varanda paulista". It transforms the old terrace into a covered free space on the last floor of the building. This element is used as a domestic service area on weekdays and for social use and dances at neighbour and family gatherings at weekends. It also represents an enclosed area where the traditional socialising and collective street functions can now take place, the families turning to the private so as to escape the public street space appropriated by gangs and drug dealers.

Late twentieth century segregated fabric

The other urban fabric that stands out is a result of the metropolitan expansion. This occurred with greater intensity in the late twentieth century, integrating low-density, upper-class residential neighbourhoods, structured along extended blocks and located in neighbourhoods or condominiums adjoining the city domains. Such urban phenomena are not normally part of a cohesive urban whole and may be considered as fragments of a situation unrelated to the municipality in which they are located. The direct benefits to the municipality's population, such as jobs and taxes, are limited. The effect such fabric produces on the urban landscape is very similar to that of the favelas in their initial form, but with reduced density (Perna, 2012).

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The principle that guides the design of the urban plan refers to the figure of an axis which leads to the crest and is adapted to the relief by means of penetration routes that circumvent the slope. In this fabric, the street system takes the form of a series of parallel roads drawn in terraces, which form long blocks. Plots have regular proportions. If compared to the favelas, they would constitute the area of the glebe, perpendicular to the road system, which brings the need for cuts and landfills for the construction of housing units. In these places, large lawns are valued, with the residential units being pushed back from the boundaries, whilst the land cuts are contained by high walls to prevent landslides and erosion.

The residential unit is composed of a dwelling implanted at different levels, with intermediate floors, garages for several automobiles and leisure amenities: swimming pools and tennis courts in the gardens, all surrounded, with strict access control and restricted access to the domains. And yet, due to the planning ideology of exclusion and segregation, the use of strategies and mechanisms for urban security, as manifested in the segregation itself, is not perceived.

Final considerations

Belo Horizonte, as manifest in 2017, is very different to the city envisaged in the original concept and plan, its evolution being the result of both public and private actions. It can be observed, as morphologists acknowledge, that the urban form is a product of historical eras subject to political, economic, and social pressures that influence therein the morphological periods. The facts reveal that in Brazilian cities, such as Belo Horizonte, there are formal and planned spaces with regular fabric containing single or multifamily dwellings, structured on defined plots and blocks with adequate infrastructure. At the same time, there are unregulated spaces, many of them located in high-risk areas that form dense urban fabric with small plots and poorly delineated blocks that fit the terrain forming continuous patches.

This work has then attempted to present and discuss the appearance of such phenomena and has demonstrated that planning has always been aimed at the economically better served sectors. On the other hand, when observing the urbanization, resulting from collective and spontaneous decision making, it is possible to observe that the urban plans are similar to those of the planned cities and that they sometimes bring interesting social qualities, unknown in those developments destined for the high income social classes.

Thus, it can then be observed that the urban fabric has been transformed and all forms present, at their core, the contradictions and social maladies that have fallen upon Brazilian society, in the form of urban violence. This has in turn required the great majority of inhabitants to use strategies and mechanisms to increase security, which has sadly and invariably led to the loss of the social use of the spaces on the streets and to the control and segregation of private space.

Finally, and more generally, it is hoped that this research can contribute to assessing the pertinence of applying morphological studies in situations which have been little explored. Thus, the identification and study of urban fabric, resulting from social and economic inequalities, could constitute a source of further fruitful investigation. It may also reveal that such research can be innovatively and productively applied in countries exhibiting similar phenomena and, consequently, further contribute to developments in the study of Urban Morphology.

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Self-organization in planned Danwei and Dayuan: A case study of the transitional Houzaimen neighborhood of Nanjing in urban China

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Abstract. *The dualism of top-down planning versus self-organization has dominated the paradigm on the evolvement of urban morphology. However, the coexistence of the both can be observed in different scale phenomena, such as the locality of city, states, or even global contexts. In the network of the global economy, urban places as spatial effects of globalization result from negotiations between international capitals and local powers. At the same time, the transitional city form also responds to changing regulations under the state socio-economic regime. Due to economic competitiveness, the entrepreneurial turn in the municipal governance reflects the role shift of local authorities from passive regulation operators to active agents for investment attractiveness and high fiscal incomes. Those changes have particular impacts on city planning while self-organization emerges in urban places. Thus, we study the socio-economic strata within contemporary urban China's territories to discover dynamics of urban morphology, interacting factors and quantitative signatures for self-organization apart from top-down interventions and finally to reveal the place-shaping mechanism. In the well-reserved Houzaimen neighborhood of Nanjing, the extremely close system-"danwei" and "dayuan" has gradually changed into the new community-"xiaoqu". By site surveys and measurement approaches, the recognized pattern in residential ownerships, the allocation of commercial activities, accessibility and connectivity of residential areas, and fractal distributions in urban fabrics can help to compare self-organizing xiaoqu with planned dayuan for systematic openness and complexity towards sustainability. Meanwhile, dimension spectrum of the fractal structure reveals the mechanism of city evolvement. The result shows the open system fostering self-organization has higher value of fractal dimensions than the segregated one, while it may not necessarily be highly connected "small-world networks". In addition, the identical fractal structure discovered in dayuan proves self-organization can emerge from the planned system.*

Keywords: top-down planning versus self-organization, danwei and dayuan, Space Syntax, city fractals, the systematic openness.

Introduction

As a mega-system, city functions with dynamic participants interacting simultaneously (Barthelemy et al., 2013; Batty, 2007). It then brings up a fundamental question on how city evolves into the place where we live every day. Scientists find non-causality in systematic evolvement, which gives a clue to understand the complex system and its evolutive principle, that is, in most circumstances, outside pressures on the system cannot determine its inner behaviors, but stimulate the system to self-organization. Clearly, this pressure-response pattern can refer to top-down planning as the outer force stimulating self-organizational responses.

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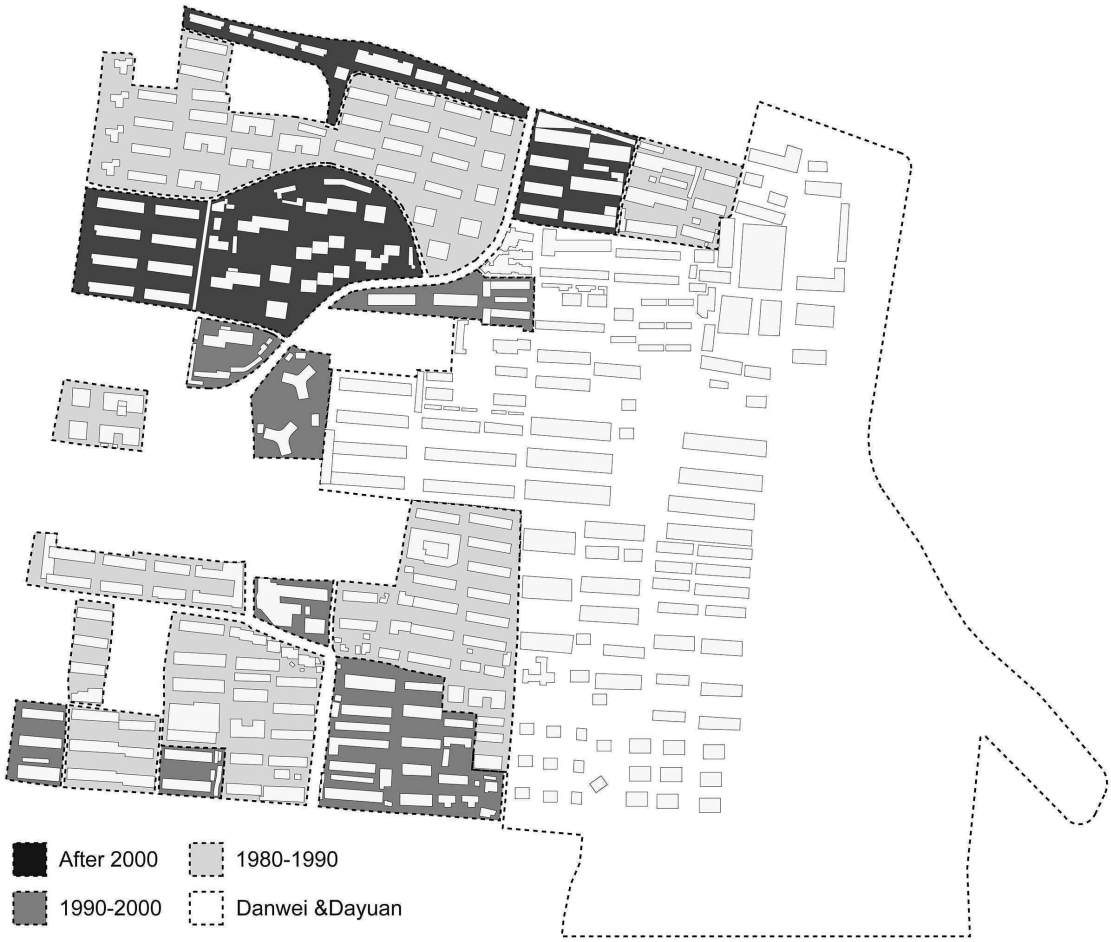

Figure 1.
The changing phases of Houzaimen neighborhood.

Regarded as self-organization, city emerges from its segmental activities (Allen and Sanglier, 1981; Batty, 1995; Portugali, 2000). Ledrut (1968) suggests discontinuous urban morphology in historic cycles has symbolized meanings in both social and cultural aspects. Such spatio-temporal fragments as subcultural mosaics compose dynamic urban society with influx and outflux of population among different regions. Thus, urban places with the presence of globalization have replaced "the duality of national-global" (Sassen 1998).

The study object

The fragmental space we pick for study purpose has to meet a certain requirements, for instance, a long-term evolutive locality has developed subcultural fabrics in "small-world networks" (Barabási, 2002; Salingaros, 2005). In figure one, Houzaimen neighborhood is divided by residential sections of specific periods shown as colored zones in dashed.

Houzaimen neighborhood stems from danwei system of Mao's era, has survived in social and spatial movements. Varying in functions, "the socialist work unit" (Bray 2005)-danwei and its residential section-dayuan, "a large courtyard" in Chinese term that means "the enclosure or a walled residential compound", consist of residential settlements for staffs, academic and research institutions, military bases with living quarters, etc. As social praxes of multi-origins, danwei and dayuan have carved the contour of urban China.

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The genealogy of danwei system

As one of socialistic urban theories in early time, "An ideal communist city" written by Soviet scholars, has become the theoretic archetype for real socialist cities and later been adapted to danwei system in urban China. Likewise, influenced by Perry's "the neighborhood unit" (Perry, 1929), the spatial composition of courtyard buildings written in city planning and architectural standards has been applied to dayuan all over the country. Although being part of danwei system, dayuan can exist outside the boundary of danwei.

Under a planned economy favoring the political intervention, such a function-divided entity as danwei with close, reproductive and hierarchical characteristics can find its analogy in a high-modernist planning of 19th century. The latter one has often been recognized for anti-urbanism, i.e. La Ville Radieuse by Le Corbusier, and the reason that causes "fragmentary spaces in urban landscape" (Hillier, 1998) and in result the social segregation in contemporary urban discourses.

The dynamics of urban spatial organization

Since 1980, China's economy has been activated by top-down reforms implemented in state economic policies. Besides, the booming economy in the next decades has also benefited from the economic globalization and resulted in urban development. The participants identified as local authorities, a free market, and civil society, have played important roles in both social and spatial praxes. Among them, the dominant player is municipal government, who has gradually accommodated its new role in "governmental entrepreneurialism" (Harvey, 1989) motivated by the city land economics, local fiscal incomes and the reform of the revenue sharing between the central government and the local one, and the competitiveness among cities (Friedmann, 2005).

The emergence of a free market has drastically changed the urban economics. In a market economy, the city land has become "a source of incomes" (Vance, 1971). Thus, following the rule of "land-rent gradients" (Vance 1971), the city land economics eventually cause dispersive urban functions with increasing urban population.

Later, state enterprises, private corporations and residential neighborhoods fill in the vacuum of vanishing danwei and dayuan as representatives of the former system, and seek for an expansion. A large amount of inexpensive lands in suburban are rational choices for the new development of research centers, industrial parks, residential settlements, etc, and inevitably result in urban sprawl.

Although driven by different interests, the local government encourages private investments on Central Business Districts as either the recreational version of "city beautiful" or the commercial version of "theme parks", and in return provides supportive policies and munificent compensations for the relocation and urban development.

In civil society, the everyday life has been subordinate to danwei system until social changes and economic reforms take place. After the state law has admitted the ownership of real estates and private properties, the house as a commodity can be traded in and out on the market. As a result, the home trading has dramatically increased in past several decades due to urban migrants attracted by jobs and the social trend towards small family households.

Because of the functionalist zoning plan, the residence has long endured a lack of commodities for basic living conditions within the residential area. Corresponding to the state policy for economic pivot, economic reforms proceed with many state-owned danwei dismissed from national economy, at the same time, private commercial activities are booming. For individuals excluded from danwei system, they have to live on home business in the residential neighborhood.

Later in the neighborhood, grass-rooted movements awakened in company with the commercial campaign for "breaking street walls and opening small business". As a manifesto of the individual against the dominating zoning plan, the phenomena of street-wall business associated with the new residential unit-xiaoqu have turned the courtyard house next to the street wall into mixed-use home business.

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Consequently, the flourishing commercial street in history has recurred with the street door for customers and the owner's house at the rear.

Methodology

We have already discussed how the transition in urban China happened before with many factors acting simultaneously. As for Houzaimen neighborhood originated from a highly planned economy and commanding society, how does city evolves and sustains in segmental pieces?

The systematic complexity with the naturally formed fractal structure is associated with self-organization towards the open system. Then it brings another question on whether the openness and fractal distributions of urban spaces are correlated to systematic sustainability. Before delving into answers, we have to clarify the definition for self-organization and top-down planning, and then identify self-organizational activities in urban contexts.

Top-down planning versus self-organization

The notion on a planned system with incompatible self-organization reflects the dichotomy of "top-down planning" versus "self-organization" in classic urban theories. Taken as an extreme example, the statical and close system has no room for self-organization, because neither communist society nor laissez-faire economy has compatibility.

In the meantime, self-organization may take place in either planned or market economy, for Chen (2003) suggests that social, political and economic regimes in diversity to some extent have various self-organizational capabilities with a proportional top-down planning in the system. Such ability largely relies on the systematic openness, because only self-organization can exist without top-down interventions. Besides, central planning antithetical to self-organization can be an unnecessary restraint.

The Identification of self-organizing behaviors

The ambiguity in both categories needs to be clarified. We can easily identify high modernist city or villa spontanée, however, the "edge" sometimes blurs in terms of "self-organizing planning" (Portugali, 2000), which is rather part of self-organization than under a planning procedure.

Therefore, the definition for self-organization depends on the scale or urban contexts we discuss. Urban places can be both self-organizing and under the guideline of urban planning. For instance, Houzaimen neighborhood has been constrained by the zoning plan of Nanjing city; likewise, it grows piece by piece at times. Consequently, we see urban spaces as coupling phenomena over a range of scales.

It is also fundamental to identify self-organizing behaviors from interfering forces. For instance, despite being a remote player in local activities, economic globalization derived from massive network effects or environmental exchanges among micro-systems connects a number of localities in the global networks.

Entropy and city evolvement towards sustainability

According to second thermodynamical law, an isolated system will collapse by reaching the maximum entropy. On condition that a well-organizing urban system is open enough to exchange materials, energies and the information with environments, it will reduce the systemic entropy. Therefore, openness for spatial organization will determine systematic sustainability.

Moreover, the self-organizing system known as an organic organization has the fractal structure in common (Mandelbrot, 1983). Fractal dimensions for geometrical fractals also reflect systematic complexity. According as the fractal structure is able to optimize the flux efficiency (Shannon 1948), Bejan and Lorente (2011) prove it maximize the systematic efficiency by the utilization of minimum entropy. Therefore, the system

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Figure 2.
The axial map of xiaoqu (the light color zone) and danwei (the dark color zone) in Houzaimen neighborhood.

in fractal structure will sustain within its life cycle.

Thus, the "openness" and "fractal distributions" associated with self-organization are two vital elements for sustainable city, and both can be measured by social and spatial parameters.

Measurement and analysis

The quantitative approaches in the empirical study prove fundamental for social studies and its physical environments. Because multiplex social behaviors often refer its spatial effects to social spatiality or spatialization of social organization, the interconnection we find between human behaviors and physical space will help to measure aggregated human behaviors on condition that physical spaces can be measured. In the following part, the comprehensiveness towards social spatiality is represented by a series of spatial indexes in physical environments.

Universal distance

The concept of distance has been defined as the length between two points in specific units. Most use the metric units for the measurement of the spatial system. However, "universal distance", based on Bill Hillier (1998), is "a generalization of the idea of depth", which in the graph can be the number of links between two nodes or the number of axial lines as "steps" between one line and another.

In space syntax theory, the invented axial lines as a walkable line define "convex map" of the space. As one of many geometrical properties of the space, "the mathematical definition of convexity" according to Bill Hillier and Julienne Hanson (1984:97), is "no

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tangent drawn on the perimeter passes through the space at any point". The axial map is composed of minimal axial lines throughout the space. The convex units may not be the same, but it is no less than axial lines. In the following study, we neglect the difference between them and treat the both equally.

The openness index

The study has developed an integrative measurement for the open system called "the openness index" based on four hypotheses, which are the allocation of small business, the condition of home trading activities, accessibility and connectivity of residential units in compared areas of dayuan and xiaoqu. The openness index consists of two variables: "human activities in social space" such as commercial activities and "social spatiality" by evaluating urban space accessible to all and interconnected.

The table one shows the deployment of subcultural units based on historic phase and divided by xiaoqu and dayuan. In the chart, except for the existing dayuan in danwei system, most of dayuan built by dissembled danwei back in the 1980s and 1990s have later become xiaoqu by selling residential ownerships to the residents, while the newly developed residential community has come into being after 2000.

On the one hand, due to the collective ownership, danwei cannot rent or sell its occupied urban lands for commercial purposes. Thus, for dayuan in danwei system, the home trading market only opens when danwei exits. On the other hand, the ownership of properties is essential to systematic accessibility. Opposite to private residential xiaoqu, danwei has claimed itself as public property. Dayuan with security access control barely privileges a certain groups of people. Contrarily, xiaoqu as a private residential property is accessible to all.

Connectivity

The concept of connectivity embodies two aspects: social networks of human connections can extend globally and function beyond the spatio-temporal reality; in spatial networks, physical links in limited distances are important for everyday life. We only discuss connectivity topologically.

In graph theory, the connectivity index refers to the number of links divided by the number of nodes. Moreover, topological properties of spatial networks will affect the value of connectivity (Zhao, 2017). We apply universal distance to study connectivity, and then the index measures the number of total connectivity of axial lines divided by the number of axial lines. According to Jiang and Claramunt (2002), "the connectivity of an axial line measures the number of lines that directly intersect that given axial line". As a dual map, the axial line and intersection can be translated into the node and link, respectively.

$$\varepsilon_L = \frac{\sum C_L}{L} \quad (1)$$

Both results of connectivity have reached the benchmark for the mesh topology at three (Zhao, 2017), while the value of xiaoqu

Table 1.
Four parameters of the openness index: the street-wall business, home trading activities, accessibility and connectivity.

residential sections	*dayuan*	*xiaoqu*		
years of construction	in *danwei* system	1980-2000	1990-2000	after 2000
street-wall business	No	Yes	Yes	Yes
home trading activities	No	Yes	Yes	Yes
accessibility from the public	No	Yes	Yes	Yes
connectivity	3.9		3.0	

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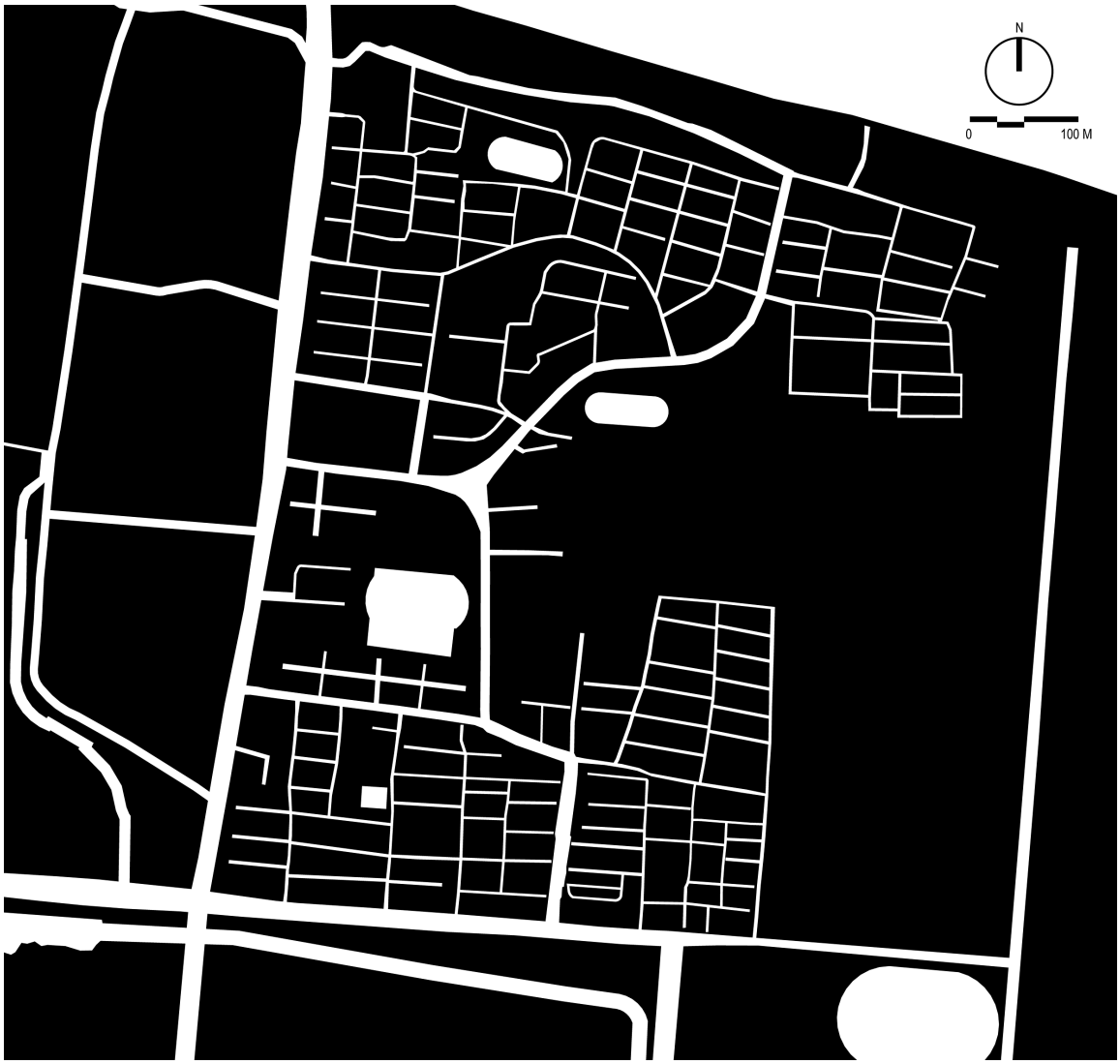

Figure 3.
Urban fabric of xiaoqu in Houzaimen neighborhood that consists of streets and open spaces.

(ε_L=3.0) closes to the tree structure without topological rings (ε_L<3.0). The topological tree has nodes connected by less links than semi-lattice with topological rings.

Allen Jacobs (1995) has recorded similar patterns of 'organic cities', but in a large scale, i.e. Ahmadabad in India, Cairo in Egypt, etc. In comparison, such a checkboard road system as dayuan found in ancient Roman cities derived from barracks, colonial cities, or modernist cities can easily fit the difform site and expand to any direction.

As a signature index for topological networks, connectivity seems irrelevant to either self-organizing system or planned one, however, hierarchical tree structure is the typical fractal structure associated with self-organization while the semi-lattice does not have the same attribute.

Given that the system has more access from outside, it will increase inner connectivity, and vice versa. The study shows that the value of connectivity in dayuan (ε_L=3.9) is much higher than xiaoqu, and the latter one has more access from the public. We cannot prove the link exists between systematic connectivity and its openness, for the information provided by the connectivity test does not support the argument. Although connectivity may not be the sufficient parameter for the openness index, we can still evaluate the systematic openness by other parameters in social domains.

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City fractals and the inverse power law

As a geometrical approach, the fractal describes "the hierarchical distribution of elements in space" (Frankhauser, 1998). Hence, city fractals (Batty and Longley, 1994; Frankhauser, 1994; Salingaros, 2005) study urban morphology and evolvement on the ground of the fractal theory. Many studies suggest city as the wholeness has only one fractal dimension. According to other authors (Ariza-Villaverde, Jiménez-Hornero and Ravé, 2013), multi-fractal is the nature of urban morphology. Due to the spatiality of city fractals, heterogeneous urban fabrics in different areas, locations, scales, and fractal dimensions are comparable.

Based on the equation for the inverse power law, we can calculate the fractal dimension. For two-dimensional urban fabric, the marginal value is either one or two, which symbolizes a line or a planar graph, respectively. Based on the mathematical definition for dimensions, a complete, planer geometry has the integral dimension of two, while a discrete planer composed by segmental pieces has the fractal dimension below two but above one. According to previous study, the value of 1.5 as a turning point shows the random state of the system, the value under 1.5 reveals the systematic simplification. When the value goes above 1.5, the system tends to be robustness and complexity.

$$P(x)=Ax^{-m} \quad (2)$$

In the distribution map, the sequential variables exhibiting the spatial hierarchy, while the curvefitting reveals the condition of self-organization. Recent urban studies (Salat, Labbé and Nowacki, 2012) have utilized the width of street as the cause factor x in the function and length of street as distribution of P(x) to study city fractals based on street networks.

Furthermore, Carvalho and Penn (2004) reveal fractal properties of the axial map. Given that the depth in the axial map replaces the distance in metric units, the connectivity of the axial line and the quantity of lines with the same connectivity can replace the street width and length in the equation, respectively. The

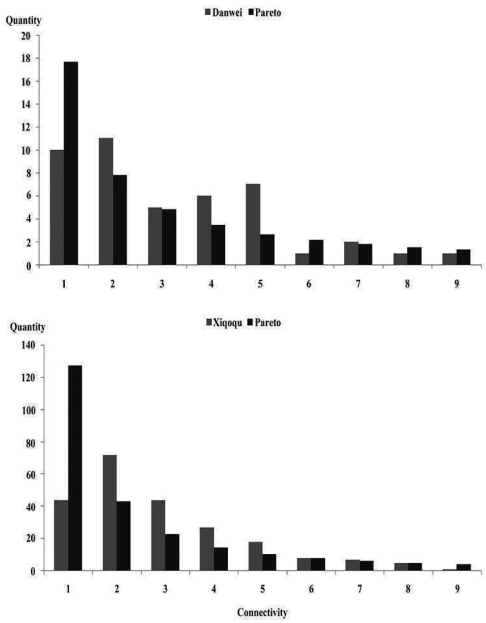

Figure 4.

Pareto distributions (the dark color column) compare with fractal distributions (the light color column) in the same urban area; the connectivity of the axial line is from one to nine. neighborhood that consists of streets and open spaces.

x-axis of coordinates in the following graph presents the connectivity of the axial line and y-axis relatively shows the quantity of lines with the same connectivity. The graph tells how spatial fractal distributions of connectivity in actual urban spaces visually match Pareto distributions in different colors.

Based on the initial measure produced by Depthmap program, the connectivity of xiaoqu is from one to thirteen with ten and twelve missing, and for danwei, it is successively from one to eleven, and suddenly jumps to twenty. For comparison purpose, we use the same scale factor x for both study areas, thus in the following graph, the x-axis only shows connectivity from one to nine.

Because segmental pieces within a certain range of spatial scales compose of urban fabric and the element in smaller scale have a greater probability of quantity based on Pareto distributions, in the equation, the less connectivity is, the more heavily it weighs in fractal distributions. Thus, the missing connectivity in large scale may not significantly affect the result.

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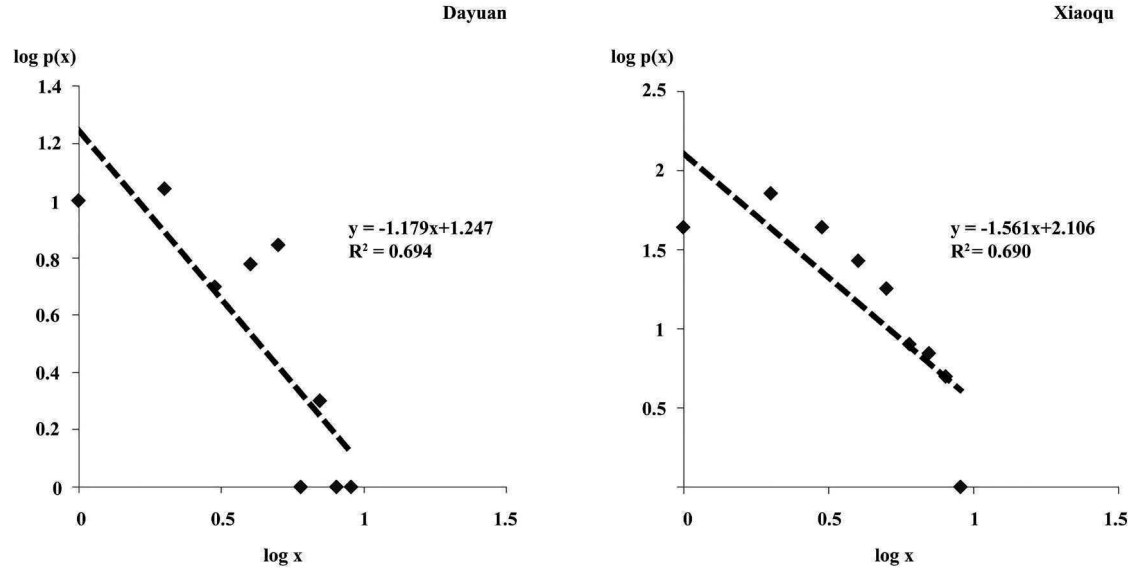

Figure 4.
The comparison of bi-logarithmic regressions between danwei and xiaoqu.

The fractal dimension and bi-logarithmic regression

We apply "a bi-logarithmic regression" (Salat, Labbé, and Nowacki, 2012) to find out the fractal dimension for the potential fractal system. By logarithmically transformed into a function of a linear regression, the coefficient of "A" and the exponential "m" in the primal equation will be replaced by the constant for log (A) and the slope of the new function.

The following graph shows that the fractal dimension of dayuan (m=1.18) is much lower than xiaoqu (m=1.56), in other words, the latter system is more complex with higher fractal dimension. However, dayuan (R2 = .694, P<.001) better fits Pareto distributions than xiaoqu (R2 = .690, P<.001) does. The result of regression test is seemingly against visual distributions in the previous graph.

Simpson index

By using alternative Simpson index (Salat, Labbé, and Nowacki, 2012), we can measure the degree of heterogeneity in spatial distributions as the variation from Pareto distributions. According to the equation, the lower value of Simpson index results from the less difference between the data in comparison. Given that the city is perfectly geometrical fractals, the value of Simpson index will be zero.

$$S = \frac{\sum_{i=1}^{Cat}\left(\frac{a_j - A}{A}\right)^2}{Cat} \quad (3)$$

For the partial fractal structure (connectivity from 1 to 9), xiaoqu (S=.395) is lower than dayuan (S=.454), which means in the same structural scale xiaoqu is closer to Pareto distributions. However, the result differs in regression test. Thus, we take connectivity with full range of scales and rerun the test.

For xiaoqu (m=1.84, R2 = .781, P<.001 S=.485), the whole system is more complex than the part. The contradiction exists in results between the regression test and Simpson index. In the regression test for xiaoqu, the number of R2 increases with a higher fractal dimension while the Simpson index goes to the opposite direction.

In the case of dayuan (m=1.08, R2 = .746, P<.001 S=.368), if we eliminate 20 that seems out of scale from the system, the new result (m=1.21, R2 = .759, P<.001, S=.389) will show the same pattern as xiaoqu regarding the interrelations between the fractal dimension and its distributions.

In conclusion, we find Simpson index does not work for the fractal distribution test. The result shown in the coefficient of A proves the boundary of xiaoqu is approximately ten

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times of dayuan while the study area in metric units for xiaoqu is almost twice of the latter. For the smaller scale elements, they have higher distributions in the fractal structure. The different study area will significantly affect the value of Simpson index or the regression result, though the curve of Pareto distributions seems smooth in the graph.

Convex space coverage

In convex map, the basic unit for the axial line defines each convex space. The actual "area"(refers to a universal area) of fractal structure can be measured by the coefficient A in the equation for the inverse power law, and the area "A" as "fractal area" differs from the study area in metric units. The density of the fractal area equals the reciprocal of convex space coverage, which are:

$$\text{convex space coverage} = \frac{\text{Convex Space}}{\text{Fractal Area}} \quad (4)$$

The high value of convex space coverage represents a less integral or segmental system. The index can eliminate the variation of the study area that affects the result of regression test. We find the fractal dimension has statistical significant correlation with convex space coverage ($R=0.98$, $p<0.001$).

Conclusion

The study identifies three facets for city evolvement, which are "participants", "mechanism" and "sustainability". The "sustainability" is an ultimate goal for the existent including city forms. Self-organization as the crucial "participant" in sustainable urban morphology causes the system in fractal structures to be open. Besides, the "mechanism" of city evolvement can find its quantitative signature in fractal dimensions.

Sustainable city form: the openness and fractal distributions

Self-organization is the key element for systematic sustainability. We find both social and spatial proofs in the openness index and fractal distributions of urban fabrics. In terms of the openness index, the anticipated social spatiality can be detected in comparable urban fabrics: self-organizing xiaoqu is more open than planned dayuan. We also find low value of connectivity of topological tree structure in the self-organizing system rather than hierarchically social space. Although the social logic can explain such spatial consequences, the network of self-organizing system does not require the highest connections within the system, and instead, it always finds the most efficient way in self-connection as the part of self-organizing process and in result the fractal structure.

Fractal distributions as optimal structure are close to Pareto distributions. We discover the contradictions in test results by different approaches. As a result, Simpson index does not work for the evaluation of fractal distributions. Because the regression test shows that self-organization exists in the planned system, we can develop two possible arguments as follow. First, the result is null for the fractal structure is independent of self-organization. In fact, the fractal structure results from self-organization. The second argument that dayuan is self-organizing system also violates its social formation. Otherwise, the only logic conclusion is that the dayuan system is not only spatially self-organizing but also socially planned.

Table 2. Fractal distributions and related index: fractal area, fractal dimension, regression square, Simpson index, and convex space coverage.

		fractal area	fractal dimension	R^2 p<.001	Simpson index	convex space coverage
xiaoqu 354,538 m^2	the full scale	167.88	1.84	.781	.485	1.36
	the part of scale	127.64	1.56	.690	.395	1.77
dayuan 201,343 m^2	the full scale	15.49	1.08	.746	.368	3.03
	the adjusted scale	18.07	1.21	.759	.389	2.55
	the part of scale	17.66	1.18	.694	.454	2.49

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Although a rarely close system-dayuan starts under a top-down planning, it has long evolved into spatial-beings in dynamic urban contexts.

Systematic complexity and mechanism of city evolvement

The fractal dimension can measure the systematic complexity. We find that as the fractal structure self-organizing xiaoqu is far more complex than planned dayuan, likewise an integral system is also more complex than the part. Our research on fractal dimensions of heterogeneous urban fabrics proves that the statical mono-fractal does not exist in urban spaces. When the simply planned system ($m<1.5$) has evolved towards complexity ($m>1.5$), it inevitably goes to chaos with self-organization emerging in segments (the fractal dimension closes to 1.5).

In addition, there is no statistically significant correlation between the fractal dimension and fractal distributions ($R=0.27$, $p<0.05$). When we rule out the unreliable data from results, the tendency of these two indexes can be identical within the individual system, but it lacks of the sufficient proofs due to limited data. In conclusion, there is no significant link between systematic complexity and self-organization. The fractal structure only exists in self-organization no matter whether the system is complex or not, in other words, it lives through all phases of urban morphology.

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Citizen participation plan for *València Parcs de Barri*

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Abstract. *The multifunctional role of neighbourhood scale parks is vital within the urban system. They are not neutral spaces in terms of the functions attributed to them by the social collectivity. This causes them to be analyzed, evaluated and projected in interdependence with the physical and social environment where they are located or can be located. València parcs de barri is a web platform that arises from a teaching project developed by the Teaching and Research Group TUR (urban planning workshop), within the studies of Degree in Architecture at the Universitat Politècnica de València. It is born worried about the improvement in the project decisions of the neighbourhood parks. It considers that these public spaces have not been designed with sensitivity towards the social function that they fulfil. This social function is established by the daily uses that the population makes and what the park means to them. Among the objectives of this platform are to open the University to society, involve students in a social project and listen to the user. In addition, it is necessary to diagnose and design the parks with and for the subject-user, because this is the true protagonist of the public space. This paper collects the need to establish a plan to be followed by València Parcs de Barri in the coming years. The plan is a road map that defines the strategic lines and phases to be followed in a community based research project, applying the methodologies of participatory action.*

Keywords: Citizen participation, planning, neighborhood parks, valenciaparcsdebarri

Introduction

The way to organize the relationships between people and their environment has a lot to do with space-temporal perception of the social community about the convivial environment where the daily interaction between its members takes place.

Taking into account that it is in the "neighborhood", as Lefebvre (1967) pointed out, "where the space and time of the inhabitants take form and meaning within the urban space", the social function that supplies fulfill at this level is vital and therefore also will be that of urban parks on a neighborhood scale. Neighborhood parks, like other urban green spaces "are not qualitatively neutral spaces (...), they are characteristic places, differentiated in their contents and forms, as well as in their ecological, urban and social functions" (Vélez, L. , 2009: 33), so they must be analyzed, evaluated and projected in interdependence with both physical and social environment where it is located or can be located.

This leads us to reflect on the plurifunctional role of parks and specifically the social function they fulfill, specially the neighborhood parks, within the urban system. These are collected in multiple scientific-technical documents that echo on public policies in different European countries.

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Relating the plurifunctional role assumed by these urban spaces and observing the reality of urban-territorial transformation processes occurred in recent years, characterized and noted Verdaguer, C. (2012: 7) by a process of "decision making that has been produced on a great distance from those who are now suffering, and following logics very alien to the needs and desires of citizens", is now more than ever encouraged the participatory action in research, planning and transformation of the coexistence spaces that our cities, in an attempt to break with the traditional top-down decision-making. Thus, there is currently a broad social, scientific and institutional consensus in relation to the need and importance of promoting, boost and articulati ng active citizen participation in urban regeneration processes.

This implies a change in the forms of management and administration of the public, as well as reinterpretation of the role of the expert or researcher "who should be able and willing to question their own cognitive framework in the encounter with other interpretations of reality, other visions of the world "(Schlierf et al., 2010: 194), advancing in the democratic task.

The social functions of the park and citizen participation

Among the social functions that are attributed to urban parks and by extension to those located in neighborhoods we can highlight the following:

a) Articulation of the urban neighborhood: To the extent they constitute points of reference to guide us, acting as "nodes", which makes a localization strategy necessary from the point of view of mobility and accessibility.

b) Way of social integration: Its node function implies otherness, that is, the recognition and shared use between different social strata (age, sex, purchasing power, educational levels, origin, etc.), which have to be studied since their perception of this space and the use attributed to it, as well as the demand for internal equipment thereof, will vary.

c) Supports for citizen participation: Due to their porous nature, they can accommodate multiple uses: sports, education, dissemination of ideas and citizen mobilization actions in favor of improving the quality of life in the neighborhood, fostering social dynamism.

d) Elements of social structure: So far as its physical location, design and plurifunctionality affects or allows to structure the citizen in their knowledge about the urban environment, announcing values that are present in the configuration of the social image of the neighborhood, and in the appearance and attachment in the collective imagination of identification's feelings with the place and even in a hallmark of its own.

From all this derives its democratizing function, which is why it is considered that in its configuration and transformation, social agents and non-associated citizens must participate actively, since they are the consumers and users of the urban public space, enjoying or suffering its functions and dysfunctions.

The active participation of citizens and their groups in collaboration with researchers is aimed at the construction of knowledge collectively, from and with the social bases, so that the neighborhood community, which is the one that daily experiences the neighborhood ─unit of reference of the context that occupies us─, enters to form part as a subject in the investigation and not as an object of the same.

This approach to community-based research ─Community Based Research─ should be accessed by integrating the methodology of participatory action research (IAP), considered "as a method of work that gives meaning to praxis in the field" (Flas Borda (2008), Colmenares (2012)), whose utility is to build participation, working on consensus to reduce conflict and collective unrest.

This vision nurtures the foundations and objectives pursued by the birth of the project 'València parcs de barri', which we address in the next lines.

València parcs de barri platform

In 2011, within the Degree in Architecture studies that are taught at the School of Architecture of the Politecnic University of València, a teaching project starts from the

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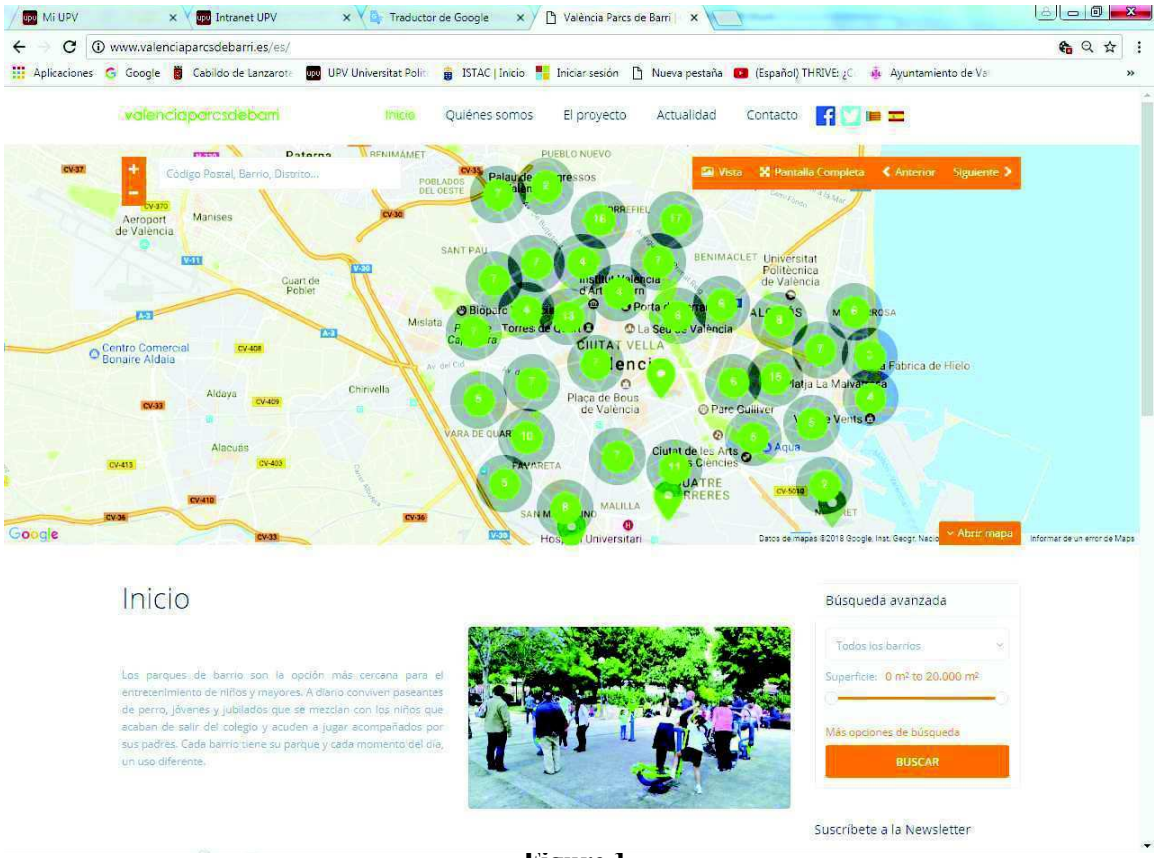

Figure 1.
València Parcs de Barri platform.
Source: Image extracted from the web http://www.valenciaparcsdebarri.es/es/

Teaching and Research Group TUR (urban planning workshop) that combines the teaching and learning of the urban form with professional practice and research, that is, while the students learn the tools of the urban architect subsume the theoretical content of the subject to the research praxis, is becoming a scientific observer of the public built space and its social uses.

In the last five years the vast amount of information collected about the neighborhood parks of the municipality of Valencia within this teaching project ─about its design, accessibility, equipment, social profiles of users, etc. has enabled València parcs de barri to become a reality.

The web platform valenciaparcsdebarri arises from the concern for improvement in project decisions of neighborhood parks as they are public spaces, considering that most of them suffer from sensitivity in their designs towards the social function they fulfill, marked for the daily uses that their users print

Thus, among the objectives of this platform are to open the University to society, involve students in a social project and listen to the user, diagnosing and designing with and for the subject-user, true protagonist of the public space, so the methodologies and characteristics of participatory action not only make sense, but their knowledge and use becomes necessary throughout the learning and research process.

With these objectives, the direction of this platform raises the need to draw a roadmap where the strategic lines and the phases to follow in a teaching and research project based on the community.

Citizen participation plan for 'Valencia parcs de barri'

Based on the principles that drive the emergence of this platform, the objectives it intends to achieve and taking into account the procedures

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it has already put in place, the next step to move forward would be the articulation of a citizen participation plan, referred to its field of action, the neighborhood parks, which combines training as a technician and as a researcher for their students ─as part of an educational project in which they are still involved─, while at the same time establishing an action strategy, in the medium term, to integrate a new actor in the project: the subject-user of the neighborhood parks, through the incorporation of new citizen participation mechanisms.

Colmenares, A. (2012: 107) points out that, in a general way, three phases are established within a research-action-training process of this type: 'the diagnosis, the construction of action plans, the execution of said plans and the permanent reflection of those involved in the research, which allows redimensioning, reorienting or rethinking new actions in response to the reflections made.

Thus, the Participation Plan for the area that concerns us must establish the guiding principles that move it and the strategic lines of work that enable the diagnosis involved, from which suggestions for action are built, for the improvement of neighborhood parks, not only from technical perspectives but also incorporating the user into its definition, thus integrating the function attributed to them by the collectivities: diagnosis participated first and, subsequently, design or redesign between the parties involved: technicians, students and citizens.

Participation Plan

The guiding principles, the strategic lines and the phases to follow will be the following:

Guiding principles:

They refer to values to be promoted, but they also serve as the basis for the methodologies to be applied.

─Teaching ability: in the teaching-learning process of the future architect in the participatory construction of urban service projects and in the assumption of the values that it implies.

─Open direction: constant interaction

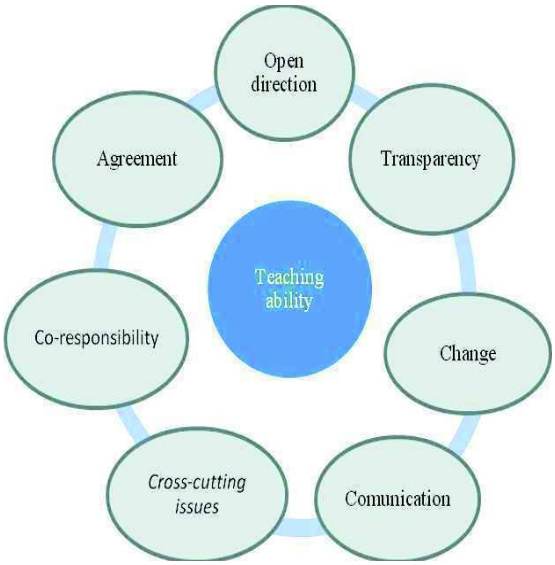

Figure 2.
Guiding principles

institution-citizenship; social commitment with the results of participation; opening and expansion of channels for citizen participation.

─Transparency: constant, accessible and understandable information for different audiences; accountability to citizens; guarantees of response to citizenship.

─Change: incorporation of knowledge of the social bases; continuous learning (review, evaluation and modification of contents, procedures, etc.) in the search for a better quality of life.

─Co-responsibility: conscious and consistent decisions taken together; aware of the interdependencies between the decisions taken in each area.

─Cross-cutting issues: axis of encounter between different topics and problems.

─Communication: transfer of information to the citizen; bidirectionality institution-citizenship; adaptation of technical-scientific information to the citizen.

─Agreement: opinion, reflection, criticism and tolerance; equity and agreements that benefit the whole; incorporation of different social realities.

Strategic lines:

a) Territorialization. With the purpose of working in a participatory manner, in the more than 200 parks that make up the network of

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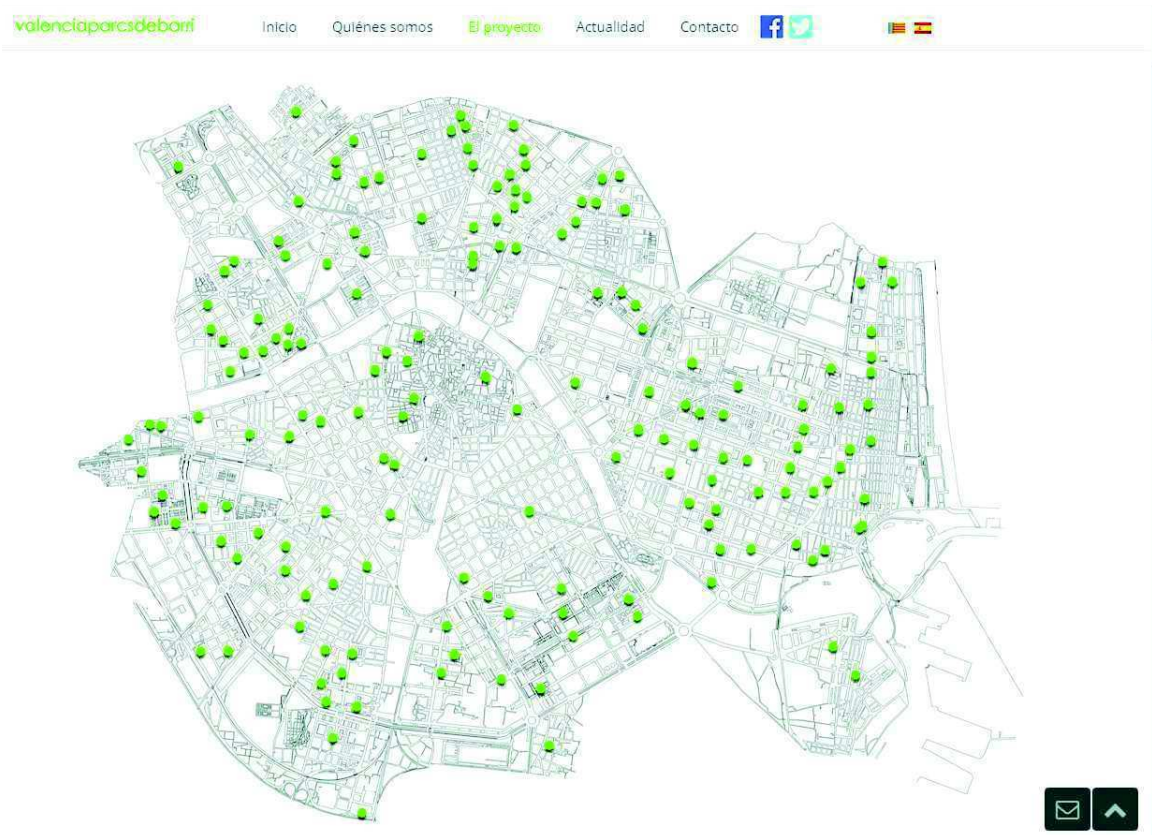

Figure 2.
Map of parks in the neighborhood of Valencia
Source: Image extracted from the web http://www.valenciaparcsdebarri.es/es/

neighborhood parks in the municipality of Valencia, a work program has to be established that defines the criteria and the times to follow for long-term term, cover the entire spectrum of parks in the application of tools for the production of knowledge and proposals for action in a participatory manner. So that it can be coordinated with the teaching rhythms.

b) Educate in action-participation tools. As part of the training of the student body as a researcher and of the citizen as a party involved in it.

c) The participation of citizens as a strategy. Deployments of instruments with which to collect collective knowledge and produce action proposals in a participatory manner using both, quantitative and qualitative social research techniques. The tools to be applied can be organized in the following way:

─Quantitative: surveys and surveys of general topics (currently launched) and specific, in order to know how many people opt for differences, obtain ratings on the park and user profiles.

─Qualitative: application of observational, implicative, reflexive and conversational techniques necessary for the physical and social dimension of the object of study (the neighborhood park), gathering reflections on different aspects from the own experience of the protagonists ─the residents─, who they allow to improve the diagnoses and later to open sessions to build action proposals in a collective and participated way.

d) Communication strategy:

─Identification of social actors in the radius of influence of the neighborhood park. The objective is that the information reaches everyone, so different groups (associations, informal groups, etc.) can amplify and disseminate information.

─Establishment of scenarios for participation. Advance in the communication strategy through telematic means already developed and in combination with mechanisms to carry out meetings, with direct face-to-face

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interaction, which strengthen the process and the links.

— Development of a discursive strategy. The communication both by telematic means and in the processes of participation must be done by means of the use of an inclusive and didactic language, that allows that the information is accessible for all the population, always avoiding the use of sexist language.

Phases to follow

The Phases to follow in a community-based research project for València parcs de barri are:

1.Establishment of the objectives of the plan and assumption of regulations in relation to fundamental rights, transparency, good governance and participation.

2.Establishment of an action program for participation with a territorial base, which programs the coverage of the spectrum of neighborhood parks that exist in Valencia.

3.Introduction and involvement of students in the project.

4.Specification, development and application of participatory procedures adapted to general or specific objectives, to the area of influence of the park and to the socio-demographic characteristics of the neighborhood.

5.Analysis of results and technical integration.

6.Dissemination of results.

7.Evaluation and reflection of the process by the intervening agents.

Conclusion

Neighborhood parks are not qualitatively neutral spaces, but play a multifunctional role in the articulation of everyday urban life and the social integration of its inhabitants in it, covering relevant functions in the construction and maintenance of the social fabric of the neighborhood and by extension from the city.
The analyzes and evaluations that direct the design decisions and designs of these public green spaces of our cities, have traditionally suffered from sensitivity towards the social function they fulfill and that is marked by the daily uses that the citizen prints to their physical surroundings. Thus, there are increasing voices that demand the construction of knowledge collectively, where the user-subject enters to be part of the research but not as an object of it.
València parcs de Barri, born under a teaching project developed by the Teaching and Research Group TUR (urban planning workshop), within the Degree in Architecture studies taught at the Politecnic University of València, assumes, within the same Community Based Research, involving its students in a social project of direct interaction with the user of the parks of our neighborhoods, diagnosing and designing with and for him.

In order to reach this goal, and to continue advancing in the task that is proposed, it is now necessary to draw up those strategies that serve as a guide in the coming years, so the next step must be to articulate a plan for citizen participation, coordinated within your project and for your research project about neighborhood parks.

Consequently, said plan departs from the established principles such as: transparency, transversality, co-responsibility, consensus

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and change; together with the establishment of strategies in three directions: education for participatory action, deployment of instruments to work with social agents and citizens, as well as the establishment of scenarios that encourage encounter and participation.

Through this platform you will get a meeting place between technicians-urban planners, students and citizens, giving voice and recognizing the possibilities of contribution of the social bases in the project decisions of the neighborhood parks of the municipality of Valencia, and integrating different interpretations of the same reality.

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Urban form and social cohesion: the socio-morphological definition of the residential fabrics of the Metropolitan Area of Barcelona

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Abstract. *Social inequality has become of great importance nowadays, and it is in metropolitan areas where it appears to be more intense. Thus, inequality becomes unavoidable when rethinking the contemporary cities. To get a grasp of this phenomenon, for the first time in the metropolitan area of Barcelona, a common look between urban morphology and social cohesion is made. The goal is to describe the socio-morphologic structure of the metropolitan territory, which is the result of combining both categorizations and maps of the existing sociological and morphological aspects. For such purpose, a two-stage methodology has been used. The first stage develops the quantitative and qualitative criteria to overlap the two existing maps, and stablishes the areas that will be considered the new socio-morphologic fabrics. The second one applies the areal interpolation method to assign this socioeconomic and/or demographic information to these new fabrics. The result of this combination is a categorization of twenty-one types of fabrics that describes the socio-morphological metropolitan reality. This new categorization sheds light on a tight relationship between urban shape and social cohesion, both conditioning each other. Moreover, the new map shows socio-morphological similarities between distant areas and announces common urban strategies to achieve a larger urban equity. The interest of having this new approach increases when thinking in the new investigation lines that will be derived from there. One of them would be the evolutionary reconstruction, which will allow visualizing processes and ease the understanding of certain phenomena to foresee urban blight.*

Keywords: Barcelona, Urban fabric, Socio-residential areas, Socio-morphological structure.

Introduction

Social inequality has taken on a great deal of importance in western societies, especially after the onset of the major economic and financial crisis in 2008. It is a problem of great urban importance, since it is a phenomenon that is most intensely apparent in large cities. According to Secchi (2015), social inequality now comprises the new urban issue, and so he places it as a factor that must necessarily be taken into account for the process of (re)construction of today's metropolises. Unfortunately, the Barcelona metropolitan area has not been immune from this problem, which has been exacerbated by the effects that have arisen with the most recent economic recession. The steep rise in unemployment and limitations

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of the social welfare system have contributed to a significant escalation of poverty and social inequality in this conurbation in recent years, reversing a lengthy process of social cohesion that had begun with the reinstatement of democracy (Sarasa et al., 2013).

However, urban inequality goes beyond social inequality and its territorial shaping. Urban inequality implies consideration of the territorial effect in the reproduction or the worsening of social inequality (Harvey, 1977). In that connection, in addition to differences in income levels among the population, we need to take into account factors such as housing maintenance costs, living conditions, the quality of the residential environment, connections serving residential areas or the degree of conflict affecting public spaces, among others. From that standpoint, the urban territory constitutes a substantial portion of the structure of opportunities available to its residents, in part determining their living conditions. Intervention in this socio-territorial dimension is crucial to attaining improved urban cohesion.

Given those urban "disorders" characteristic of capitalist cities, in the 1970s Lefebvre (1969) coined the notion of the right to the city, in defence of the ability to conceive and (re) construct a different sort of city, focussed on people and distanced from the chaos generated by the insatiable pursuit of profit maximisation. In that connection, urban planning and urban policies are key instruments to correct and monitor those pernicious processes in the production of urban space and to make cities fairer and more inclusive places to live. The concept of urban cohesion, in contrast with urban inequality, furnishes a theoretical and practical construct that fits with those objectives. Adopting the notion of urban cohesion from politics and social science's standpoint involves a paradigm shift that, while not diametrically opposed to the more conventional approaches to analysis and act against urban inequality, it does represent an expansion and improvement on those approaches.

In that regard, during the course of 2016 and within the framework of the preparatory work on the Barcelona Metropolitan Urban Master Plan, the Barcelona Institute of Regional Metropolitan Studies (IERMB), working jointly with Master Plan Drafting Service of the Barcelona Metropolitan Area Urban Planning Services Department (SRPD), drew up a background document to provide guidelines for urban planning and urban policies. This was an interdisciplinary effort, accomplished jointly by architects, geographers and sociologists that, among other factors, contributes information on the socio-morphological structure of the Barcelona Metropolitan Area that had not previously been available, showing the relationship between the social status and the urban form of residential fabrics on a socio-morphological map. The preparation of that information was the result of the implementation of a cartographic synthesis of the morphological dimension and the social dimension of the Barcelona metropolis. That methodological innovation will help to continue expanding knowledge as to how physical and social factors interact in the urban context, thereby facilitating the decision-making process on matters of urban planning.

Methodology

The methodology used to outline the socio-morphological structure of the metropolitan area involves three separate phases, elaborated upon below: categorisation and map of the socio-residential areas of the Barcelona

Table 1.
Sociological variables used

Sociological variables	
Location	
Size and population	
Factors linked to social status	-Income level -Education -Unemployment rate
Life course	-Type of dwelling
Geographic origin of population	
Factors linked to ease of access to housing and living conditions	-System of holding -Dwelling size -Building condition -Availability of heating
Ease of access to facilities and green zones and recreational areas	-Non-compulsory education -Compulsory education -Provisions -Health care -Social services
Ease of access to collective public transport system	

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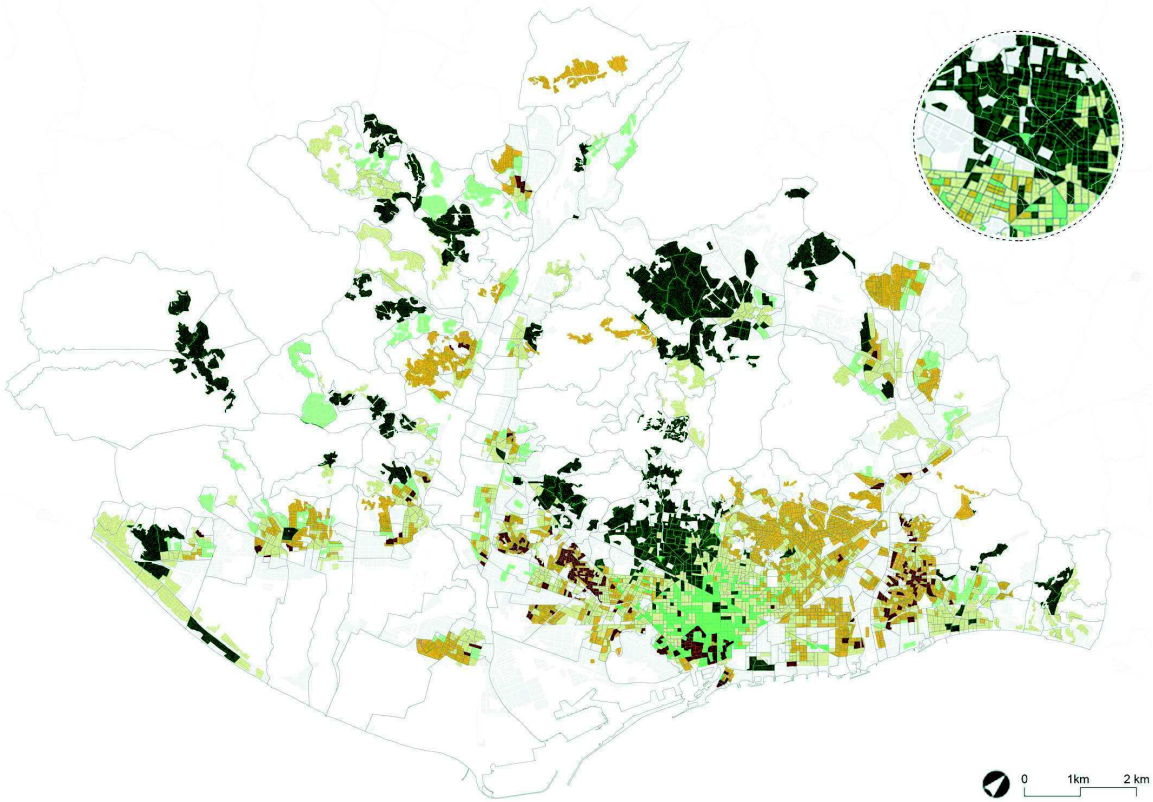

Theoretical socio-residential areas typologies	*Socio-residential areas resulting typologies*
Luxury housing	Middle and upper classes residential areas
Gentrified city	New urban middle classes neigbourhoods
Suburban city	Areas of families with children influx
Tenement city	Mixed areas with intermediate classes predominance
	Working class neighbourhoods
Ethnic enclaves	-
Abandoned city	Old or deprived areas

Figure 1.
Map of the socio-residential structure of the Barcelona metropolitan area (IERMB, 2011)

metropolis in 2011, made by IERMB; determination of morphological categories and the corresponding map of residential fabrics of the Barcelona metropolis in 2016, made by SPRD; and combination of the two studies to arrive at the new socio-morphological categories that, along with the map, explain the socio-morphological structure of the Barcelona conurbation in 2017.

1) Categorisation and map of socio-residential areas of the Barcelona metropolis in 2011 (IERMB)

The starting point for analysis of socio-residential differentiation in the Barcelona metropolis consists of knowing its structure and how it has arrived at that structure. The theoretical basis adopted were the socio-residencial typologies developed by Peter Marcuse and Ronald Van Kempen, which is highly sensitive in matters of the relationships between social structure and urban territorial morphology (Marcuse, 1993; Marcuse and Van Kempen, 2000, 2002). Based upon these typologies, analysis of census figures and cartographic data and a survey on living conditions and habits of the population (Table 1), the socio-residential categories in respect of the scope of the study and the corresponding map were established (Figure 1).

The method followed comprises two phases. The first involves construction of a typology of socio-residential areas that serves to structure

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the territory being studied based upon a sequence of analysis of main components and automated analysis of classification. In the second phase, the different types of socio-residential areas are described and analysed based upon the combination of social information provided by the survey and territorial information based upon GIS layers.

A brief description of the different types of residential areas follows:

-The Middle and upper classes residential areas are those comprising the higher social levels and where larger and higher quality dwellings predominate. Over two thirds of the population are managers or professionals and almost half receive high incomes.

-The New urban middle classes neigbourhoods have emerged in recent years and they correspond above all to processes of transformation of the metropolitan social structure in the post-industrial and globalised context. Here the predominant profile is that of qualified professional, with a substantial component of foreigners living alone or in couples without children, in rental accommodation.

-Those Areas of families with children influx emerged around the turn of the century. The main trait is predominance of home-owner families who have moved there recently and with mortgage debt. They are of a temporary nature and they are directly associated with the patterns resulting from the real estate boom between 1997 and 2007, influenced by easy credit conditions.

-Those Mixed areas with intermediate classes predominance are highly heterogeneous and they are home mainly to semi-qualified employees in services, although there is also a noticeable presence of qualified workers, mainly white-collar, Catalan-speaking office workers.

-Those Working class neighbourhoods arose as suburbs of Barcelona to house many of the immigrant workers from the rest of Spain. They house the majority of the unqualified population, particularly industrial, blue-collar workers, although with the evolution of deindustrialisation, they have been gradually replaced by unqualified employees in services.

-Those Old or deprived areas comprise old city centres, neighbourhoods with substantial urban planning deficits and run-down urban areas that house the population with the fewest resources, in both financial and social terms. One-person households predominate here, with ageing population or unqualified and more precarious unqualified workers, both nationals and foreigners born mostly in poor countries.

2) Categorisation and map of residential fabrics of the Barcelona metropolis in 2016 (SPRD)

In spite of the large size of the Barcelona metropolitan area, 636 km², a substantial portion of the residential territory comprises repetitive patterns and forms that may be treated as fabrics. The subject of this work is the identification and conceptual and graphic definition, from a morphological standpoint, of the contemporary residential fabrics of Barcelona metropolis.

The morphological classification was made taking into account 5 compositional principles, along with the use of graphic and alphanumerical figures (Table 2). The

Table 2.
Morphological variables used

Morphological variables	
General data	-Land -Built up area -Population -Number of zones and average size of zones
Physical factors of the urban context	-Road width -Ratio of built-up area to road -Occupied and open spaces -Heritage -Average block size -Topography -Vegetation
Functional factors of the urban context	-Ease of access -Connectedness -Private areas -Public areas -Facilities -Green zones and roads
Physical factors of height of the plot and building	-Height -Year built -Compactness -Buildings permitted -Length of façade -Land occupation -Average built-up area -Size of plot
Functional factors of plot and building	-Population density -Dwelling density -Dwelling size -Residential use and other uses

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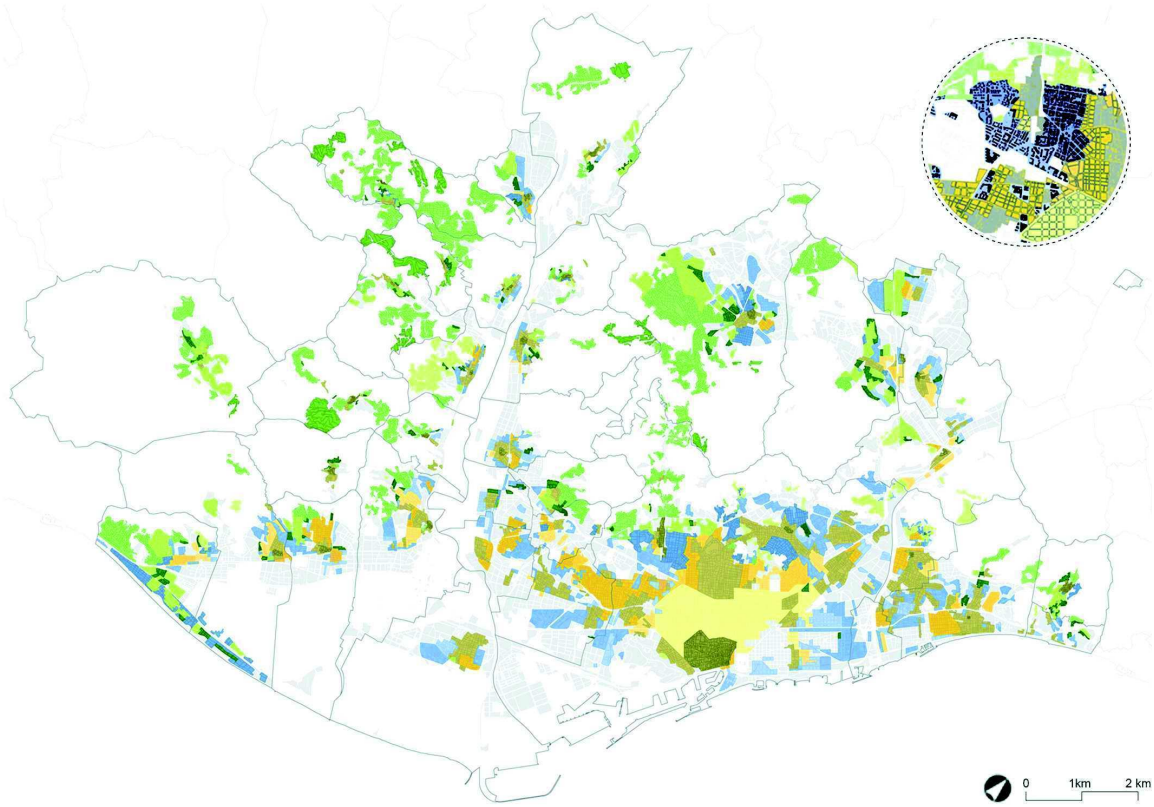

Synthesis in 2 categories	*Diversity in 4 categories*	*Complexity in 14 categories*
Compact city	Historical zones	Old city
		Suburban fabric
	Expansions	Suburban fabric
		Axial
		Orthogonal
		Cerdà
Dispersed city	Multi-family dwellings	Independent organization
		Unitary organisation not aligned with roads
		Unitary organisation aligned with roads
	Single-family dwellings	Detached
		Rustic
		Irregular
		Regular
		Mixed

Figure 2.
of residential morphological fabrics in the Barcelona metropolitan area (SRPD-AMB, 2016)

first principle is transferability, inclusion of knowledge from preceding works, relating to morphology (Busquets, 2015; Solà-Morales, 1993; Vilanova, 1997). The second is significance, each category must have qualitative and quantitative importance. The third is hierarchical structure, ordering the set of categories in ranked division. The fourth is unique nature, the categories must be mutually exclusive. Finally, completeness, the classification must include all the residential fabrics of the metropolitan area.

In conceptual terms, there are three levels of categories, in three large groups that complement each other, to allow precise description of the variables of the metropolitan residential morphological reality (Table 2). Within the categories of Compact City and Dispersed City, there is a great deal of morphological diversity, and a number of groups are established to supplement and qualify them: metropolitan plurality and complexity in four and fourteen categories, respectively. The essential factors are the following:

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-Primitive fabrics: Balance between occupancy and space; a peculiar urban fabric; proximity, friction and variety; strong personality; diversity of uses and activities. The subcategories of Old City and Suburban fabrics are differentiated mainly in terms of regular or irregular layout, identity and facilities, densities and age.

-Expansions: Balance between occupancy and space; geometric layout; repetition and homogeneity; highest density and compactness; and greatest diversity of uses. The four types of Expansions are differentiated mainly by geometrics, density, street widths, topography and accessibility.

-Multi-family dwellings: dominance of open spaces; plots are larger; building typology of multi-family dwellings; high proportion of green areas and public facilities, but lack of identity points. The different subcategories are differentiated mainly in terms of density and land use, organisation of volumes, systems land use and quality of open spaces.

-Single-family dwellings: open spaces dominate; dwellings are single-family; lowest density; low degree of consolidation; predominantly monofunctional character. Subcategories are differentiated by topography and accessibility, roadways, density and land use.

In respect of the graphic demarcation and the corresponding map (Figure 2), the scope of the study extends to the actual built-up area and the degree of precision is given by the small scale, at plot level, to arrive at the consistent areas resulting from the grouping of city blocks.

3) Categorisation and map of socio-morphological fabrics of the Barcelona metropolis in 2017 (SRPD + IERMB)

The availability of the sociological and morphological maps presented allows us to draw a map of the overall territory being studied that juxtaposes those two factors. That combination must address two complexities: the criteria for superimposition and data reassignment.

The objective of the first phase is to determine the criteria for making the combination of the basic demarcations while maintaining the sociological and morphological essence. While the map of socio-residential areas has the demarcation of census tracts as its basic unit, the map of morphological fabrics has the layout of lots of the topographic base. Therefore, the following three decisions are taken into account:

1.Demarcation of socio-morphological fabrics: The reference unit taken is the demarcation of the 14 morphological fabrics, on the grounds that they are more representative of the territorial reality than the demarcation of census tracts, which are strictly administrative. However the names of the 4 morphological categories are kept instead of the 14, to avoid excessive complexity of the resulting categories. This allows us to arrive at smaller fabrics and therefore a more consistent relationship with smaller-sized census tracts. In those cases where the divisions based upon morphological criteria still give very large fabrics in relation to the census tract, they are subdivided, using, first of all, the division into neighbourhoods based upon their boundary condition consolidated and validated over time, and subsequently, in the few cases where it has been necessary, the boundaries of the census groups or census tracts have been used.

2.Definition of social status: Based upon those divisions, it was agreed that socio-residential area taken as dominant should be the one with over 60% of a socio-morphological fabric. Of the 975 polygons, there are 91 cases where that percentage is lower and it is determined that at most they may be defined using two social variables. The two with the highest percentages are taken, since in any event the sum of the two is always higher than 60%.

3.Definition of the representative categories and assimilation of the non-representative categories: There are categories that represent such a small proportion that they cannot be considered as such. The cut-off point is established at those with either fewer than 6 units or that represent less than 6% of their morphological category. There are 25 categories found to be so, and they are assimilated in accordance with the following four criteria. First of all, “Primitive” is assimilated into “Expansions”, and taking into account their

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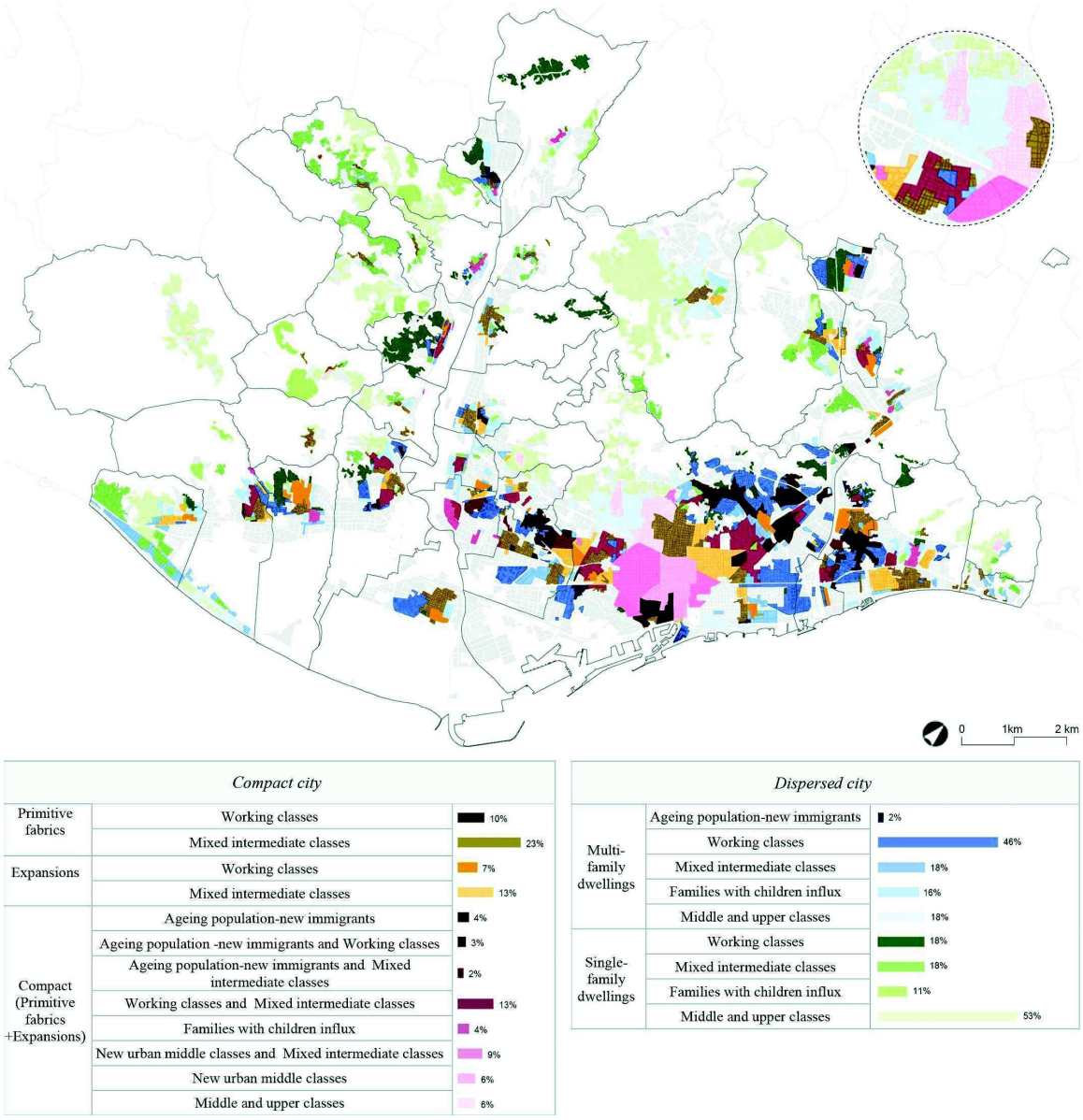

Figure 3.
Map of the socio-morphological structure of the Barcelona Metropolitan area with graphs of the proportion of land for each of the categories in relation to the categories of Compact, Multi-family dwellings and Single-family dwellings (SRPD-AMB, 2017)

shared status of compact city, they are named "Compacts". Next, sociologically speaking, in those cases where one of the two categories is "mixed intermediate classes", the other category is given priority, since the category "mixed intermediate classes" is the least conclusive of the six. Then, proportionally speaking, in those categories where one of the two is nearly 60% and the second is materially less, they are assimilated into the category closest to 60%. Finally, in exceptional cases, agreed qualitative factors have been established for assimilation, taking into account knowledge of the territory and its social factors

The second phase, addresses re-assignment of the morphological and sociological information to those new zones. The statistical estimation method used to characterize the 21 types of socio-morphological fabrics falls within the scope of areal interpolation methods. Basically, this method allows proportional (re)assignment of the socio-economic and/or

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demographic information available for source zones to other target zones. In this case, the information was transferred from census tracts to socio-morphological fabrics. Specifically, the method used in this study was derived from the Cadastral-based Expert Dasymetric System (CEDS) (Maantay, Maroko and Herrmann; 2007: 77-102, and Mora-García and Marti-Ciriquian; 2015: 305-314). The underlying logic of the CEDS is that the population of the census tracts is broken down according to residential gross floor area in the Cadastre, to then regroup the population in the target zone. The formula used to make the (re)assignment of the information is the following:

$$NHab_{parc_{viv}} = \frac{SCRes_{parc} \cdot NHab_{sc}}{\sum SCRES_{sc}}$$

Where NHabparc_viv is the number of inhabitants per cadastral parcel in accordance with the number of dwellings; SCResparc is the residential gross floor area in the cadastral parcel; NHabsc is the number of inhabitants in the census tract; and ∑SCRessc is the total gross floor area in the census tract.

The outcome of that combination is the socio-morphological map of the Barcelona metropolitan area showing the resulting twenty-one categories[1] used to describe for the first time jointly the physical and sociological aspects of the conurbation (Figure 3).

Measurement and analysis

The outcome of the combination methodology allow us to advance our socio-morphological knowledge based upon two factors: detailed description of each of the twenty-one socio-morphological categories and the reading of the resulting socio-morphological map.

The explanation of the 21 categories takes into account the morphological and sociological variables explained (Table 1 and Table 2), with special emphasis on the factors that intentionally accentuate the differences between them in order to ascertain the link between urban form and social cohesion. In that connection, the following two exemplary factors are noteworthy:

1.Certain morphological traits differentiate categories that belong to the same morphological category and are sociologically distinct. For example:

-Single-family dwellings for Middle and Upper Classes and Single-family dwellings for Working Classes: although both are Single-family Dwellings, they have different morphological indicators. For example, in the second case, the parcels are smaller by almost one half and the population and dwelling density are almost double.

-Multi-family dwellings for Ageing population-New Immigrants and Multi-family dwellings for Mixed Intermediate Classes: although both belong to Multi-family dwellings, the social status involve factors such as the fact that there is much higher building density in the former with less identity (fewer heritage listed) and more irregular topography.

2.There are characteristic sociological traits among categories that belong to the same sociological category and are morphologically distinct. For example, in Compact with Families with children influx and Single-family Dwellings with Families with children influx, although they belong to the same sociological category, unsafety in the Single-family Dwellings category is considerably higher, while connectedness is notably poorer. In addition, the non-Community population is below average in the Single-family Dwellings category while it is twice as high in the Compact category.

Both cases point up the very close relationship between sociological and morphological factors.

On a different subject, the reading of the map and its categories allows us to note, at first sight, the fact that Compact city has a higher sociological diversity than Dispersed city. For example, Single-family Dwellings lacks both Ageing Population and New urban classes, and Multi-family dwellings lacks New urban classes. Those facts, along with the need for a larger number of sociological categories and more heterogeneous categories to explain Compact city in comparison with Dispersed city, support that hypothesis.

On the other hand, in territorial terms, we can clearly identify the larger pieces making up the present-day urban structure of the

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Barcelona conurbation. The core portion of the downtown area is increasingly dominated by the new middle classes, with certain pockets of lower-income population. The other two zones of Middle and upper classes found in the city centre are connected to that core area. Adjacent to the downtown area there are transitional areas with a high degree of mixture of social make-up, which, within the residential system, are located between the Middle class residential areas and Working class residential areas. Beyond those transitional areas we clearly find two Working class hubs along the Besòs and Llobregat rivers. Finally, we find three low-density areas predominantly inhabited by Middle and upper classes. The largest one is located beyond the Llobregat hub. The second, more centrally located, comprises different areas of Esplugues de Llobregat and Sant Just Desvern, Vallvidrera (Barcelona) and certain developments in Sant Cugat and Cerdanyola del Vallès. The third such area is the smallest and located to the northeast, stretching in part from Badalona to Tiana and Montgat.

The following paragraphs set out a description of the social standing and territorial distribution of each of the major morphological groups and the resulting twenty-one categories: Compact, Multi-familw dwellings and Single-family dwellings.

In the case of the Compact City, a substantial portion of the land (80%) is occupied by some category with Intermediate and working classes (Figure 3). Within that high proportion, the Primitive and Expansion with mixed intermediate classes occupy the greatest surface area (36%). In second place we find, notably, that the Expansions, characterised as Working classes and Mixed intermediate classes, make up the third most important category in the compact city (20%), followed by Historical with working classes (10%). In respect of location within the territory, observation of the map allows us to note especially the following factors:

-The areas of Compact with Ageing population-New immigrants are found mainly in the municipalities with the highest populations and those most centrally located.

-The areas of New middle classes are located centrally and within Barcelona. Consequently, the central compact forms are the most likely to undergo processes of gentrification.

-The areas of Middle and upper classes are concentrated above Diagonal, in the upper part of Barcelona, Esplugues and Sant Just Desvern, as well as in Tiana.

-The areas of Intermediate classes are scattered, with presence in all the municipalities. While those located farther north are mostly isolated, along the coast they tend to border on other categories, mainly with areas of Working classes.

The areas of Multi-family dwellings are associated mainly with Working classes (46%) (Figure 3). However, there are also areas in similar proportions with Intermediate classes, Families with children and Middle and upper classes (16-18%). Finally, we find Ageing population-New immigrants in a much smaller proportion (2%). Insofar as concerns location within the territory, a critical analysis of the map leads us stress the following factors:

-Areas with Working classes, Ageing population-New immigrants and Families with children influx are found in practically all the municipalities and they show certain distinctive aspects of location, situated mainly on the edges of urban centres and often with a certain relation of conflict with infrastructure elements that sit uneasily within an urban environment.

-Areas with Families with children influx are found in practically all the municipalities except Barcelona. They are located mainly on the periphery of urban continuums, but, unlike the previous category, they lack the relation of conflict with infrastructure elements.

-Areas with Mixed and intermediate classes and Middle and upper classes are located both on the periphery and within the urban continuum, but in all cases with a certain distance from the most undesirable infrastructure elements and proximity to public transportation services. They are differentiated by the fact that the former are found in a large number of municipalities, while the latter, on the other hand, are only found in Barcelona, Sant Cugat and Castelldefels.

Within the areas with Single-family dwellings, there is also a predominant social category: Middle and upper classes (53%) (Figure 3). In second and third place we find

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areas with Working and intermediate classes (18%) and areas with Families with children influx (11%). In respect of location within the territory, we see the following factors:

-Areas with Middle and upper classes, those with Families with children influx and Mixed intermediate classes share their location in respect of the rest and are found mostly isolated from the urban continuum. On the other hand, they diverge in certain aspects, such as the fact that the areas with Middle and upper classes are largely located near the main metropolitan infrastructure elements, although in a relationship of harmonious co-existence with them, as they are located underground or buffered, while the others tend to be located in topographically more elevated zones, with views and on the sunlit side.

-Unlike the foregoing, the areas with Working classes are mostly located contiguously with the urban continuum, mainly in two situations: either in areas involving a conflictive relationship with infrastructure elements, which act as barriers, or in topographically elevated zones in the shade and with a poor degree of connectedness.

Conclusion

The combined social and morphological scrutiny within the context of the Barcelona metropolis allows us to discern the close relationship between urban form and social cohesion. There can be no doubt that the two factors condition each other, and thanks to the new socio-morphological map and the definition of the twenty-one socio-morphological categories presented, we can now determine that link in greater detail. In addition, the new map points up socio-morphological similarities between zones distant from one another and suggests shared urban strategies to encourage greater urban fairness. All in all, it supposes progress in awareness of the metropolitan reality that may become capital, to continue expanding that awareness and to consider key factors for improving its future.

In that connection, we must stress the future lines of research that will be derived from this new material generated. On the one hand, one of the opportunities could be the possibility of performing a more detailed diagnosis of urban cohesion. Working with quantitative indicators of socio-spatial criteria assessing the need for action in each of the twenty-one categories could provide guidelines for determining the most appropriate tools for transformation and the areas for priority intervention. On the other hand, taking into account the availability of sociological data from 1991, 2001 and 2011 and having established the methodology for combing the data on physical and sociological factors, another future line of research could be to address the time aspect. Reconstruction of the evolution of the socio-morphological structure will allow us to broaden the possibilities for analysis and to visualise processes, facilitating the understanding of certain phenomena and may generate knowledge to help foresee or prevent certain problems.

Notes

1 Denomination of socio-residential categories is changed when combined with morfological categories. Equivalent to: Middle and upper classes residential areas turns into Middle and upper classes; New urban middle classes neigbourhoods into New urban middle classes; Areas of families with children influx into Families with children influx; Mixed areas with intermediate classes into Mixed intermediate classes; Working class neighbourhoods into working classes; Old or deprived areas into Ageing population-new immigrants.

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Heterotopic space characteristics of urban village in China: Take Guandongdian district in Beijing as an example

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Abstract. *For the first time in the history of China, more of its mainland population are living in cities than in rural villages. The land acquisition and real estate development have caused rapid disappearance and decline of a large number of traditional villages, resulting in 'urban villages' in China. They seem chaotic, but contain rich and colorful social life. The living environment is really harsh, but people always maintain close relationship with each other. They are different from neither the modern urban nor traditional villages, but they have their own unique vitality. Such heterogeneous space is always a symbol of historical change and cultural collision which, according to the French philosopher Michel Foucault, can be called Heterotopias. In order to study this heterotopic phenomenon, the triangular area of Guandongdian district in Beijing has been chosen as the object of this case study. With the in-depth investigation of interviewers, observation, statistics and sketches, this paper is trying to interpret the characteristics of the heterotopic state of the urban village from three aspects of social form, urban morphology and architectural feature. Eventually, in order to keep the complexity and diversification of urban village, several strategies are put forward for reference to future transforming practice.*

Keywords: Heterotopias, space characteristics, urban village, Guandongdian, diversification.

Introduction

In the process of rapid urbanization in China, the expansion of urban space is far beyond the pace of social development, resulting in a common phenomenon "urban village". They seem chaotic, but contain a rich and colorful social life; despite the infrastructures are in poor condition, but the residents maintain a close relationship with their neighbors; they are totally different with modern city and traditional villages, but they have their own unique vitality. Such heterotopias space is often a concentration of history development as well as cultural collision. They are easily isolated from the mainstream urban life because of its different forms of urban space, and are a very special kind of Heterotopia existed in the modern city.

Theoretical Framework

Heterotopia Theory

Foucault argues that "heterotopia" mainly has six features, namely, commonality, difference, contradiction, heterogeneous time, preset switch and bipolar space. The heterotopia is always relative to the existence of utopia: utopia is only an imagination, while heterotopia is quite real; utopia represents a perfect world, while heterotopia means a world of chaos; utopia is absolute, but heterotopia is relative. If the utopian put forward by Thomas More shows the political and aesthetic demands of modernity in the pre-modern society, Foucault's Heterotopia concept shall call for the social reality and cultural imagination formed in the process of modern postmodernism.

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In the Heterotopia theory, space should be associated with time and be more clearly defined by the objective environment outside. In all the classification and description of architecture, we are used to paying more attention to the internal space but little to the external parts. However, it is precisely the external space who gives a positioning to the internal ones, just like we use the streets, doors and other external elements to describe the location of a cafe. The Heterotopia describes a place where it can not exist independently. It demands to be positioned by another one, the "utopian", which is opposed to it. It highlights the cultural, ideological, or cultural divide between different groups of people. And it belongs to those people who are repressed, excluded, or even damaged by the prevailing social order.

Urban Village

In the narrow sense, the urban village is also known as the 'village in the city'. It refers to the ones where farmers are still living in the village houses even after it has become a residential area in the process of urbanization and all or most of the arable land was requisitioned. Broadly speaking, the urban village can be defined as residential areas of low living standards. In the process of rapid development of the city, it lags behind the pace of the times and away from the modern management system.

From the nature of the concept of the heterotopia, we observe that the phenomenon of urban village has many heterotopic spatial features. From the perspective of time, the old elements are likely to be eliminated in the development of the city, while the new elements will be established instead. For a specific time node, the rationality of the past is now becoming unreasonable. Just because it is no longer reasonable, it is inevitably eliminated and isolated, becoming the island in the city. However, from today's view, these island left behind by the society are exactly the best view point for us to observe the history.

Figure 1.
Overlooking the site

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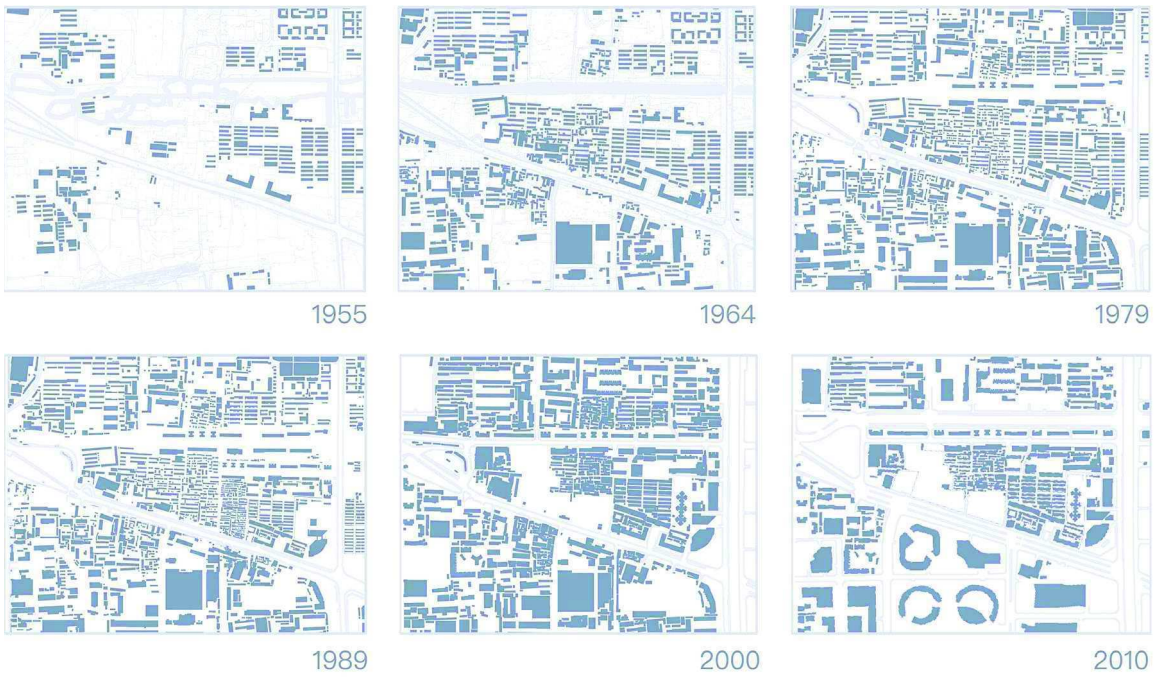

Figure 2.
Topology map of the triangle area and the surroundings from 1955 to 2010

Background: Guandongdian Triangle District in Beijing

As is known to all, Beijing has especially regular city planning, majestic central axis and countless ambitious buildings. Despite of this, when taking a closer look at its streets network, we will still find some interesting ramps. Guandongdian triangle area is one of these interesting cases, continuing to change during the long history of the urban construction and social relations.

Located in the west of Chaoyang District in Beijing, Guandongdian triangle is near the transfer station of the Metro Line 6 and Line 10. It is west to Xiangjunnanli, east to the East Bridge Road and the Dongdaqiao Workers Stadium, south to the Guandongdian North Street and south to Chaoyangmenwai Street. Chaoyangmenwai Street is a tilt street from the northwest to the southeast, leading to the triangular shape of Guandongdian area. The location of this tilt street can be very important. During the Ming and Qing Dynasties, it performed as the transport path. The foods went along the waterway from Tongzhou to Beijing, and then transported on the land to Chaoyang Gate. Even until today, this street is still leading to Tongzhou. (Figure 1, 2)

Before the founding of new China, Guandongdian area is a part of Gaobeidian village, mainly formed by farmlands and farmhouses. Then after 1949, there are supposed to build new dormitories of 3501 People's Liberation Army and fishery company, so the original farmhouses ware all removed. In addition to that, the farmlands have also been destroyed for a number of bungalows. According to historical records, the east-west waterway had not been filled with roads until the time between 1964 and 1979, forming the existing Chaoyang North Road. Nearly in the same period, the triangle area was divided into two parts. The shantytowns at west side belong to Huashiying village, while the the neat single-storey buildings at the east side are the old 3501 dormitories. As one of the few triangular areas in Beijing's lattice-like city, Guandongdian has witnessed the rise from the peasant household and the collective dormitory to the surrounding CBD high-rises from the 1950s till now.

From the economic, cultural, planning and other academic level, most scholars are regarding the urban villages of chaotic forms as a negative phenomenon to be criticized. Some scholars have summarized five negative

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impacts of all the urban planning, land revenue, municipal public facilities construction, industrial structure and social stability which are mostly led by urban villages. Starting from this, they further explore transformation strategies. But objectively speaking, the phenomenon of urban village is a typical and special example of urban development. Its typicality lies in its wide distribution, while its particularity lies in their social progress brought about by special historical phenomenon which is directly related to the rapid urbanization as well as the influx of the rural population into the city. Therefore, the study of such cases and analysis of their spatial characteristics could have possibly help us to deeply understand the nature of space, and finally provide references to the further transformation strategies.

Heterotopic characteristics

Social morphology

From the perspective of social composition, Guandongdian area is detached from the development of modern society to a great extent. It is far behind the pace of social progress, and even contradicted with the new urban construction strategy. From this point, there is no doubt that the urban village of Guandongdian is unenlightened and limited. The surrounding cities have been developing so fast that a clear isolation zone appears between the urban village and the mainstream cities. Also, there exists difficulties of dismantling of local blocks and obvious separation on both sides within the urban village community.

With a large number of migrants pouring in, the residents in a certain part of Guandongdian become quite different from the ones in another part. In Huashiying area, there are mostly temporary tenants nowadays, which are of great mobility. In order to seek survival, these foreign populations have developed a complete industrial chain, perfectly meeting the requirements of low - income populations. According to the statistics, this chain consists of 11 clothing shops, 17 restaurants, 33 markets and 14 other necessity shops. Within such a small urban village, its industrial structure is rather complete and various, completely forming a micro closed society. In contrast, the 3501 dormitory on the east are mostly residents of generations. They have been living here for at least three generations. Compared with Huashiying area, its social composition is relatively simple. Many of the tenants here are the original aborigines, so the neighborhoods are very familiar with each other.

Nevertheless, it is such a chaotic scene that breeds the the fruit-vegetable shops and those tiny breakfast shops at the streets. These city-oriented formats give birth to a vibrant public communication space. At around 8:30 every morning, when the people working in the surrounding CBD walk out from the Hujialou subway station, many of them deliberately get into Guandongdian area in order to have a cup of milk and a pancake in the breakfast shops, and then rush into the office building. At noon, these business people will cross the venue, looking for cheap restaurants with their friends. And after work, they may come to the fruit-vegetable stores or butcher shops on their way home for lower price than the regular supermarket. Overall, Guandongdian urban village has provided affordable living supplies for the workers who are eager to save money. It is now a logistics platform for the people in the high-rises around. Correspondingly, the business people have brought a steady stream of passengers for these inferior industries. Their relationship can be described as mutually beneficial and win-win situation.

Urban morphology

The heterogeneity of the urban level is mainly reflected in the scale of open space such as the streets, street corners and the edged space.

At the beginning of their construction, different communities have been mutually exclusive. They have no interaction with the original textures, so the junctions can be really hard. For example, there are no rules for the distribution of houses in Huashiying areas. Lack of management and planning, there happens spontaneous additions or alterations all the time. On the contrary, the 3501 dormitory built after it strictly follows the planned layout of the determinant. Except for the original

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Figure 3.
Activities at street corners

chaotic between the communities and the roads, the illegal construction by the tenants are increasingly blocking the access. Although the floor area rate is quite low, but the building density is really high. Before 20th century, the city block planning in China didn't seriously consider the passages of motor vehicles. The roads within a block are people-oriented, and much of the street scales are no more than two meters' width. But as the development of the times, the electric bicycles, electric tricycles and some private cars are pouring into the blocks. During lunch and dinner hours, crowds of delivery cars pass through the field, driving so fast that bringing a great threat to pedestrians. There are also many office workers living nearby would prefer riding a bike through the venue. Apparently, such a narrow street has been unable to meet the needs of modern city traffic. In other words, the motor vehicles are destroying the suitable environment of a block for the pedestrian.

In the research process, we focus on the space form generated when the collision occurs between different textures. We found that those space corners which are seemingly irregular or difficult to use are somehow the ablest to stimulate the interaction between people's activities. In fact, it is the high density of the buildings planned at the beginning that leads to such a tense urban public space. However, humans are creatures having the instinct of social interaction. They never stopped their eager for the public communication space. Even if the conditions are limited and do not allow a comfortable space for communication, people can create conditions for organizing activities by themselves. On the one hand, the street corners have a natural advantage to stimulate the public activities of the city which provide a place for communication. For instance, their functions are hardly fixed and the space are fully opened to the public, so that the activities occurring here can be easily observed and

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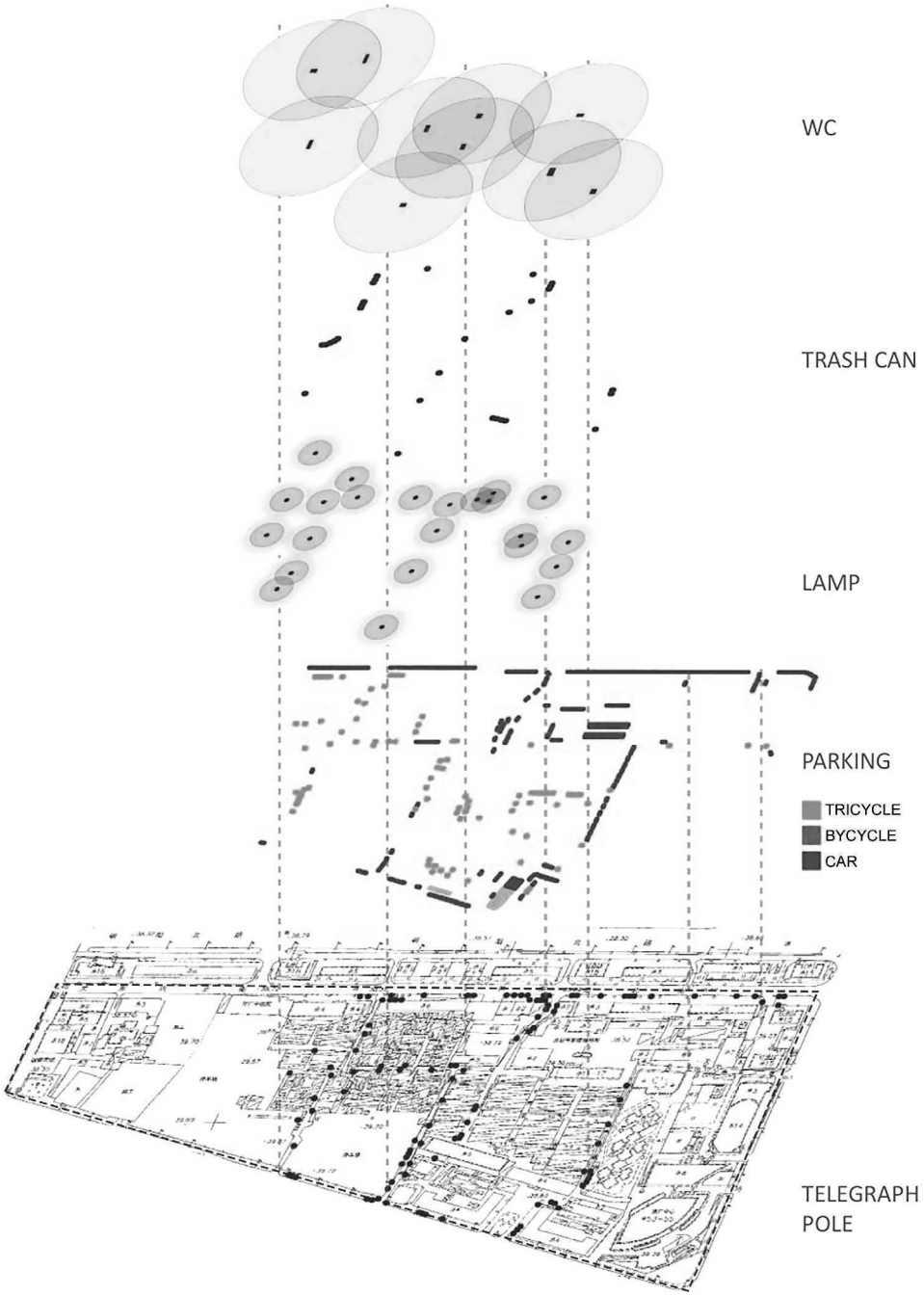

Figure 4.
Urban elements in the site

shared. Residents and their neighborhoods are free to occupy the place, never subject to their class or economic conditions. Since the corner space can be easily arrived, it often becomes a focus of a certain area. However, there is no denying that the corner space also has obvious flaws. They are in the formation of the visual center, but at the same time, usually become traffic nodes with significant risks. More over, it is hard for them to meet the needs of comfort because of the lack of leisure facilities (Figure 3).

In addition, the infrastructures in Guandongdian area are of serious damage and backward. The public toilets can not be cleaned up in time and their cleaning situation is worrying; the sanitation of street corners and public toilets next to the trash directly and

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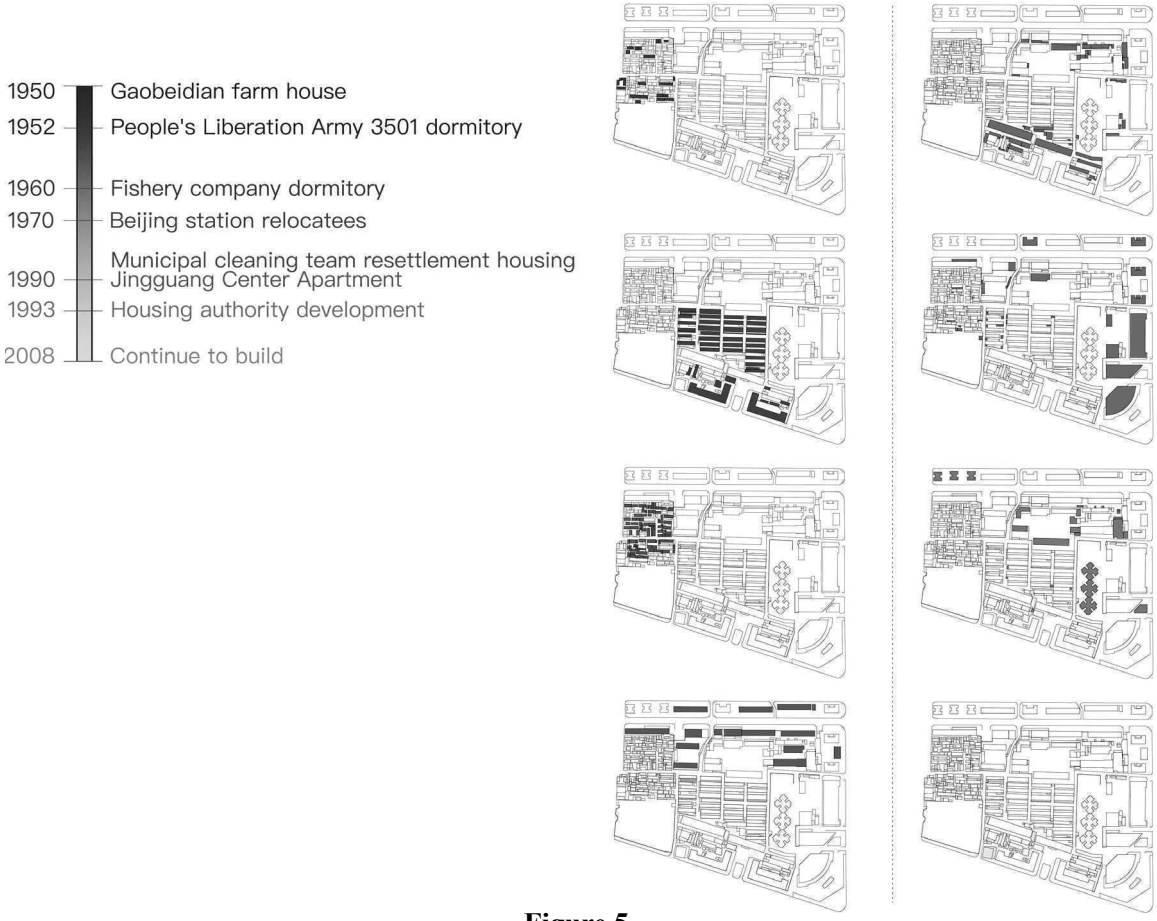

Figure 5.
Building ages on the site

visibly impacts the daily lives of the citizens; the limited quantity of street lamps lead to frequent traffic accidents at night; a large number of motor vehicles occupy the sidewalk as parking space, for there is no centralized parking place; poles are mostly woods on the stone seats, the woods are seriously rotten; countless wires entangled in the air with the popularity of network and bring about potential dangers (Figure 4). These negative conditions are urgent to be concerned about in the future transformations.

Architectural characteristics

From the architectural level, the urban village gathers in the buildings of various ages, just like a vivid history museum (Figure 5). Whether it is gradually dilapidated 3501 dormitories, fishery company dormitories, Beijing station demolition houses, or the hotel apartment Jing Guang Center constructed in the nineties which still maintain its high quality, all of them represent a certain era from their building structure, materials, style. Even from the view of today, despite that their initial function has ceased to exist, but the basic structure of the building makes them still identifying. The residential changed into shops, the streets were occupied by food markets, and the appearance of the buildings have also undergone great changes. The buildings of the 3501 dormitory area are single-storey townhouses with brick-and-white structures. Their windows are small, and the distance between each two is less than half the depth of the building which directly leads to poor ventilation (Figure 6). In the early 1990s, the Jing Guang Center at the southeast corner of the venue was completed and brought a great obstacle to the dormitory area. Jing Guang Center is of the 52-story on the ground part, reaching 209 meters' high. It is a set of five-star hotels, senior office buildings as well as luxury apartments for the integrated

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building. Such two opposite elements are only 100 meters away, the current consumption level and living quality in 3501 dormitories is much lower than the latter. The former volume rate is about 0.5 while the latter is up to 35, which means that despite the hardware conditions of the dormitories is far behind the Jing Guang Center, but per capita possession of land area is much higher than the latter. It is predictable that if this urban village could be fortunately preserved in the future, then it is likely to become a place charming and suitable enough to walk.

The architecture layout in Guandongdian is of great diversity. A row of residential buildings along the Chaoyangxiejie is arranged parallel to the the city's main street. After the Tangshan earthquake, the structures of the buildings were carefully reinforced and the red and white appeared on the facade. On the other side, the gray-based buildings are located beside the 3501 dormitories, facing the south direction. At the interface of these different types of buildings, there is no transitional treatment. It has created the negative space between the buildings, affecting the street style. More than this, it could possibly become the breeding of crime because the corner is dark and inaccessible. Few conversations happen between the building blocks out of the difference in age and background. All the single-storey, multi-storey and high-rise buildings symbiotic here, creating a sense of drama.

Transformation strategy

The ultimate goal of interpreting the heterotopias spatial characteristics of urban village is to guide the city's village renovation more effectively. And the purpose of transforming the urban village is to make it integrated into the modern urban space. For the village itself, the transformation of space is the requirement of improving the living environment and creating a good place to live. The problem of living environment originally

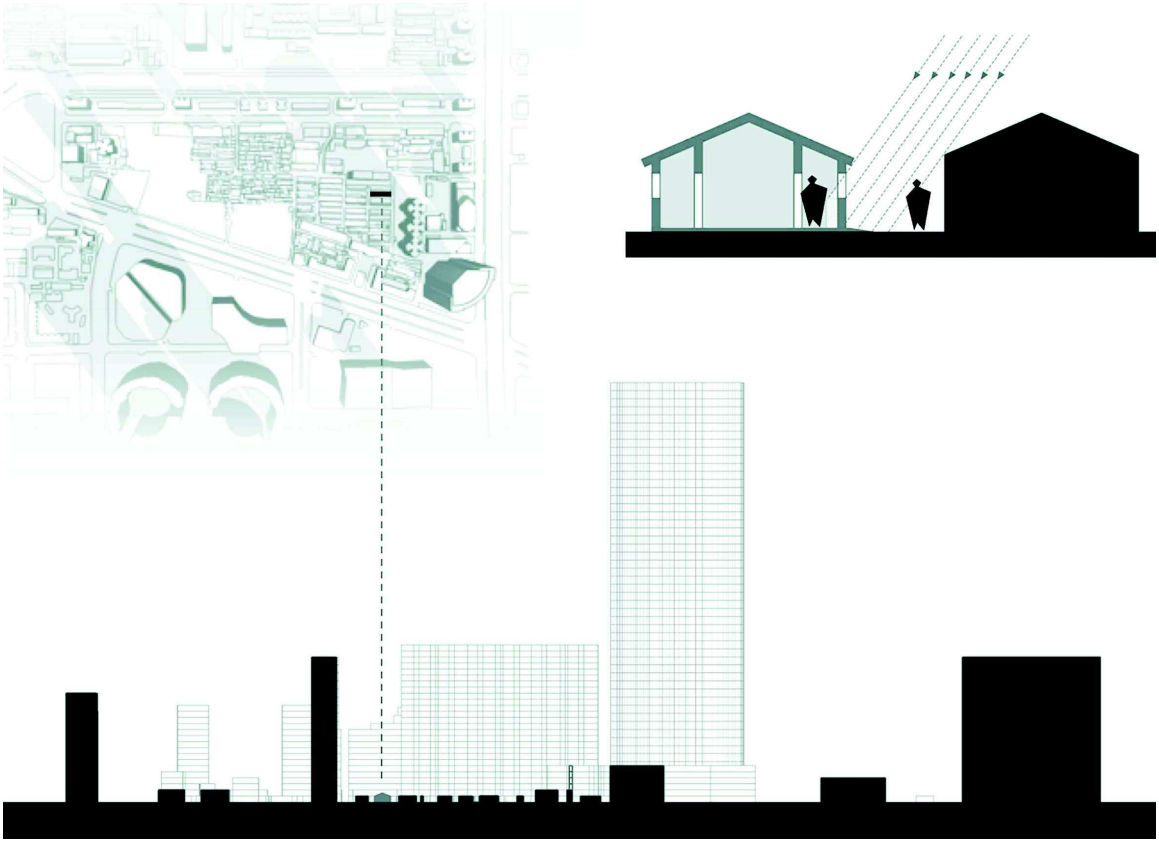

Figure 6.
Light condition of a certain house of 3501 dormitories

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comes from the space, so the final solution must also be implemented into the space.

In public space, people will be largely affected by the psychological and behavioral effects. According to their own purpose and psychological state, most people are free to choose a comfortable place to stay. Therefore, it is important to design the corresponding facilities in the public space. From the research and analysis, the street corners can be regarded as unique places in the urban village and always the spontaneous choice of the residents for gathering. Its advantages must be preserved and made full use of, while its defects on stability, safety and comfort aspects should be solved at the same time. When it comes to urban design, municipalities and architect groups need to take necessary measures to properly intervene. For example, the pavement materials and color of street corners can be high lightened to distinguish from the street area, the lighting of the corner area requires unified transformation, and the slowdown zone could be set on the street close to the corner.

For architectural individuals, their symbolic significance is much higher than the practical value. Today, the Huashiying area and the 3501 dormitories in Guandongdian are almost unprotected and repaired, and the building structures have been in serious problems for a long time. For the future city, such a low-density block is likely to produce incredible opportunities such as supporting the residents to start their own businesses, setting up creative workshops, appropriately introducing some high-quality services. These measures may inspire architects and community residents to cooperate in building renovation, promoting the enthusiasm of residents to participate in enhancing building quality and ensuring the daily maintenance of the buildings partially by themselves.

In general, the transformations of urban village are supposed to adhere to the existing format as the core of the city, to respect the citizens as the main body and to recognize the architects as assistants in the transformation and regeneration mechanism, and finally encourage the community coordination under the guidance of the government.

Conclusion

As time goes on, the living space of urban village is constantly varying. The nature of the heterotopia is ‘different’, which represents the recognition and respect of urban complexity, the critique of utopian perfection in urban planning, and the negation of indiscriminate brutal demolition. The ‘difference’ in the urban village is that it has triple heterogeneity at the social, urban and architectural levels. Heterotopic theory has provided an interpretation of this heterogeneous space whose variety of social structure and urban space form a common phenomenon of urban village. Although not the mainstream of the city, but it has a unique vitality and cohesion. In the process of rapid urban development, we have the obligation to protect their individuality in social culture.

The urban village is part of the modern city. It exists in the form of a village, but is located in the city textures. For this reason, if the urban village hopes to develop into a positive space, it has to make full use of its great advantages of low density, be open to the city and provide service for the city. It not only means to change its role from the small self-enclosed society into a strong logistics service area, but also to organize a safe and comfortable public communication platform for both the city and the buildings. Only in this way can the urban village maintain a unique heterogeneity, and meanwhile change the negative space into a positive one, create tremendous value for the modern city.

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The social structure and physical form of the state-owned farm in North-East China

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Abstract. *The northeastern state farms, as the state farm group with the biggest size and the largest number in China, play an important role in cultivation and guarding the frontiers. As a special enterprise with the nature of socialist ownership by the entire people, state farm has been influenced greatly by national policies in spatial form evolution and has formed a special evolution mechanism. In this study, 290 Farm was taken as the example, with policies and system at different historical periods as the clue, to discuss farm spatial form evolution under the influence of policies and systems. It has been found that at different historical stages, policies and systems influence the plane layout, form of residential area and division of farmland by influencing population quantity and distribution, land usage right affiliation, land use and allocation of the farm.*

Keywords: state-owned farm, policy, social structure, physical form, urban morphology.

Introduction

Alnwick, Northumberland: A Study in Town-Plan Analysis occupies an important position in the history of geography. The theories and methods in this book fundamentally illustrate some common laws of urban morphology and build an outstanding framework for the analysis of townscape. Subsequent studies also proved that this theoretical framework can be successfully applied to cities with larger scale and more complicated history.

Although Conzen's theory is highly adaptable in the study of some western cities, the urban morphology with different background of culture and institution varies a lot. Therefore, it is necessary to do some research on cities with different background to enrich the theory of urban morphology.

M.R.G. Conzen has mentioned the importance of the morphological studies of Chinese cities in his article called Notes on Urban Morphology: Its Nature and Development. "China is important because it has had such a long run of urbanism going back very far into the past, and because of its peculiarity in political history", he said. From feudalism to socialism, China shows its differences of in two aspects: culture and institution. As the object of this study, the state-owned farm is one of the typical cases in spatial socialism practices of China. It is a specific settlement with public ownership and the organization form called danwei (danwei, a special Chinese unit). In the farm, workers are engaged in agricultural production under the guidance of the national government. And the government would adjust the policies according to the development of society and economy, leaving this influence in the morphology. This paper takes the state-owned farm as the object and analyzes the policy changes and morphological evolution of the 290 farm after 1949 to explore the morphological features and action mechanism of Chinese socialist spatial practices. It is of great significations to the confirmation and extension of the theoretical method of urban morphology.

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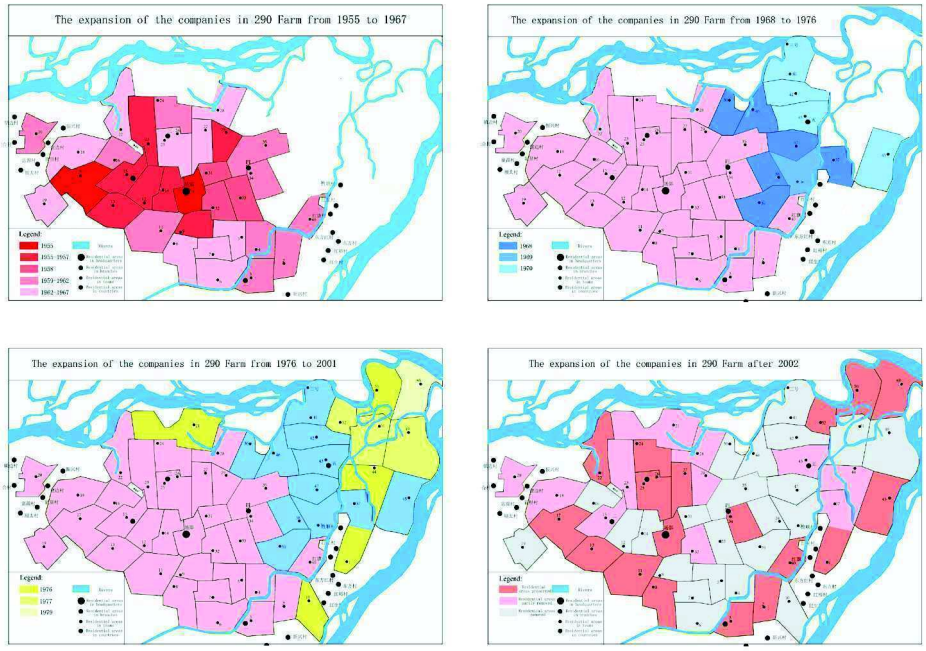

Figure 1.
The Expansion of the 290 Farm

The Study of the 290 Farm Case

The Period of the Construction of Farm

Policy Evolution

In 1952, the national government put forward a basic policy which stated that agricultural development was a fundamental prerequisite to ensure industrial development and the accomplishment of all economic plans in the First Five-Year Plan. In March 1952, the Central Committee issued an order that transformed part of military forces into agricultural construction troops, requiring them to "standby for agricultural production". According to the order, the troop serial number of the No. 5 Regiment of the No. 97 Division of the No. 1 Field Army of CPLA was formally altered into No. 5 Regiment of No. 2 Agricultural Production Division of CPLA. In October 1955, No. 290 Regiment was transformed into the 290 Farm, and remained its military organization.

In 1955, the National Defense Force implemented the three major institutional reforms. As a result, the task of the entire No. 2 Agricultural Production Division was changed and they were sent to develop the Great Northern Wilderness. In addition, the former battalions were transformed into farm branches and former companies were transformed into production teams. Meanwhile, organizations of former battalions were reformed into corresponding organizations of state-owned farms.

In the course of the Cultural Revolution, the national government issued the Establishment of the Shenyang Military Region, Heilongjiang Production and Construction Corps instructions in 1968. To build the army, 290 Farm was converted into N0.2 division No.8 regiment in March, 1969. The branches of the farm were transformed to battalions and the production teams were transformed to companies. Be affected by Cultural Revolution and the tensions between China and the Soviet Union at that time, the government thought that the main task of the corps was to cultivate the garrison. As a result, they decided to take the road of political construction, denying the original experience. The army form disrupted the original production command system of farms. Farm production was evolved into a militarily unified command. The farm didn't pay attention to economic efficiency,

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which brought great losses to the agricultural construction.

In 1973, problems in the system of the Heilongjiang Production and Construction Corps gradually got government's attention. In October 1973, Heilongjiang Production and Construction Corps got out of the People's Liberation Army, but it retained the paramilitary system. In February 1976, the government issued the Implementation Plan for Reforming the Production and Construction Corps System. It clearly pointed out that the Corps were reformed to farms. In April 1977, the No.8 regiment of the Heilongjiang Production and Construction Corps was revoked and changed to farms. Finally, the farm system was restored.

Land Expansion

Before the arrival of the officers and soldiers, the land of the 290 Farm was wasteland. The troops get stationed and selected some highlands and other locations with favorable conditions as reclamation points, and they carried out the reclamation around the points. They firstly established headquarters and the No. 17 Company. Then they selected appropriate lands to be reclamation points around the headquarter area and reclaimed around the points. The "Headquarter-Company" system formed on the whole.

In 1958, more than 1150 soldiers of Chengdu Military Region and their families came to the 290 farm. And they selected the wasteland in the eastern part of the residential area to start reclamation. After the establishment of People's Commune in 1959, Fujin County placed fourteen production teams under the management of the 290 Farm. Some of them were transformed into all-People-Ownership, while some remained their Collective-Ownership. Therefore, there were two kinds of ownership within the farm. In order to facilitate the management, No. 5 Branch and No. 6 Branch were established. In 1962, those who joined production teams returned to Fujin commune again. After the Farm bowed out of Collective Ownership, the six branches were cancelled soon. From 1961 to 1967, land reclamation was mainly conducted around the existing residential area and spread into the surrounding area. And reclamation on the western part of the Farm was basically completed in 1967.

During this period, land expansion was conducted around the branches. Reclamation tasks were mainly conducted westwards, southwards and northwards, while eastwards reclamation was comparatively less conducted.

During the Cultural Revolution, reclamation and guarding of the frontier was the main task of the crops. So the speed of land expansion improved a lot during this time. On the one hand, the crops set up new companies. On the other hand, some companies continued to carry out land reclamation. Until 1970, crop's westward expansion gradually stopped, but some companies' own reclamation expansion is still ongoing. During this period, when the new companies and the expansion of the companies are in the process, the scope of the company was gradually determined. The study found that the scope of each company will be subject to the following conditions: natural barrier (such as rivers, trees, deep ditch and other natural obstacles), artificial barrier (such as roads and drains), restrictions on existing settlements and policy restrictions.

From 1976 to 1979, the farm continued to expand to the northeast. After this expansion, five fields' area was greatly increased. The total farm area reached 801 square kilometers. Hereto, the farm's land expansion is basically over.

Residential Areas

The statistics found that some of the company's settlements were in the central part of the company, facilitating the contact between the settlements and farmland. But some settlements were on the edge of the companies. This is because the reclamation points were determined through reconnaissance. The troops preferred to choose favorable conditions as the reclamation point and settled down here. In other cases, there are some settlements or the remains of the settlements before they came here. While these settlements were assigned to the 290 Farm, some soldiers settled down and reclaimed the wasteland here. As what mentioned above, the companies formed different boundaries

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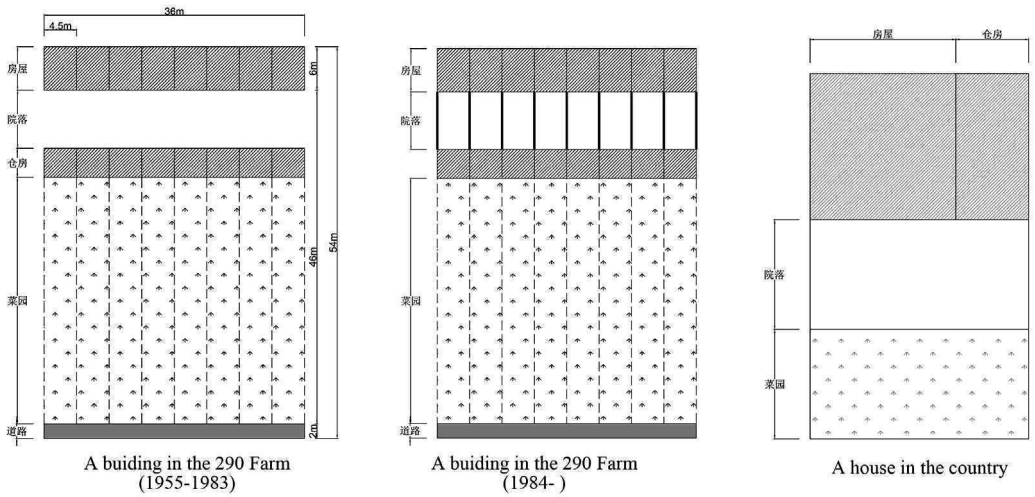

Figure 2.
Residential Buidings in the 290 Farm and Neighbor Countries

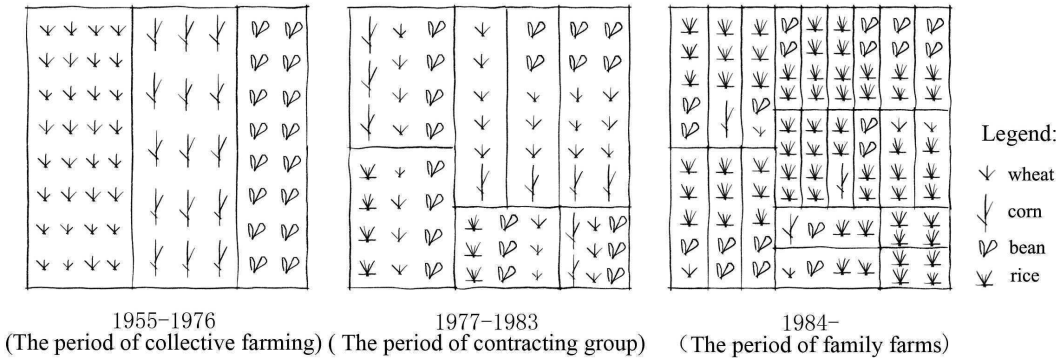

Figure 3.
Change of Land Division in the 290 Farm

according to natural barriers, artificial barriers and existing residential restrictions in the process of land reclamation, which results in the different forms.

As land expanding, the residential buildings of companies were built in rows. Dong (one building which consisted of 8 houses) was the basic unit of residence and each Dong comprised eight houses, in which eight families resided. Two adjacent units were 48 meters away from each other. Most of the buildings face the south. Every building was 36 meters long and 6 meters wide. There was a storehouse and a vegetable garden on the south side of each building. The storehouse stored agricultural equipment and other household items, and the gardens were used to grow daily vegetables. The storehouse was adjacent to the garden and there was an open courtyard between the house and storehouse, which was shared by eight families. The courtyard became a place for the neighborhood to communicate with each other, and some of the courtyards played the role as roads.

The basic unit of residence in village also consists of a house, a vegetable garden and a courtyard, but it is quite different from that of the Farm on the form. Each unit is mutually independent because it is built by one family. There would be wall or narrow space between adjacent houses. Residents decided the size and pattern of housing by themselves.

Farmland Division

Before the Cultural Revolution, the same kind of crop tends to be planted in contiguous areas densely. Besides, all companies divided their

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members into different roles according to work types, such as sowing workers, machinery workers, transplanting workers, reapers. Each role undertook different work in different period of farming, and was responsible for one link of the whole land cultivation. They cultivated all the lands of the company together. So during this time, the land division presents large plots.

In 1969, as the original experience of the farm was completely negated, stationed in the garrison was the main task of the farm. During this period, the production and management of the farm had evolved into a unified command. The farm was managed regardless of cost and income. A large number of water conservancy facilities were constructed in the farm without adequate design and planning in each company, which exerts notable influence to the land division of the farm.

Road Pattern

After the troops stationed the district in 1955, they first repaired two original roads. In 1956, road which connected Hezhu Village with the headquarters was accomplished. In 1957, the road which connected Suidong Village with the headquarters was built. Roads which connected companies and the farmland were relatively sparse.

In 1963, the 290 Farm began to build roads in accordance with the national standards. Meanwhile, the Farm started to pave the roads which connected headquarters and the companies, and the roads which connected companies and the farmland. The field road also developed at the same time. Since then, "arterial road, sub-arterial road, field road" pattern gradually formed. The road plays a key role as a morphological framework in the morphological changes of the farm. During the expansion of settlements, field road tends to be transformed into the new road of the residential area. Besides, the original farmland boundary becomes the boundary of the plan-unit during the expansion of the settlements and the road system won't be erased.

The Period of Worker's Family Farm (since 1984)

Policy Evolution

In the course of social development and the spatial practice of socialism, the public ownership is also reforming.

From 1979 to 1983, the government began to reform the management system of the state-owned farm. In 1979, the national government approved a document called Interim Provisions on Financial Contracts for Farmers' Enterprises, carrying out the financial responsibility system with Independent accounting, self-financing, profit retention and losses without compensation. And in 1981, the distribution on the basis of labour was carried out. Then the farm published several policies to develop both collective and individual economy. And in 1982, the farm begun to implement various forms of contract, including team contracting, joint household contracting and professional-group contracting, which laid a foundation for the worker's family farm. This period is called the "transition period" or "contracting group period".

In November 1983, the state published the Opinions on the Establishment of Farmers ' Households on State-run Farms. And in 1984, the document called Articles of Association of State on the Worker's Family Farm (Trial Draft) stipulated that workers' family farms should be under the leadership of the state-owned farms and they should be based on household units. They were economic entities with family business, fixed taxes and self-financing. In December 1984, the 290 Farm issued the Trial Contract Responsibility System in 1984 and begun to construct the worker's family farms. Since then, the two-tier management system of "Big farm and small farms" in combination of centralization and decentralization was gradually established.

In 2002, State Economic and Trade Commission issued Reply to Agreement on Setting up Heilongjiang Great Northern Wilderness Agriculture Limited Liability Company, and 290 Branch of Heilongjiang Great Northern Wilderness Agriculture Limited Liability Company was officially

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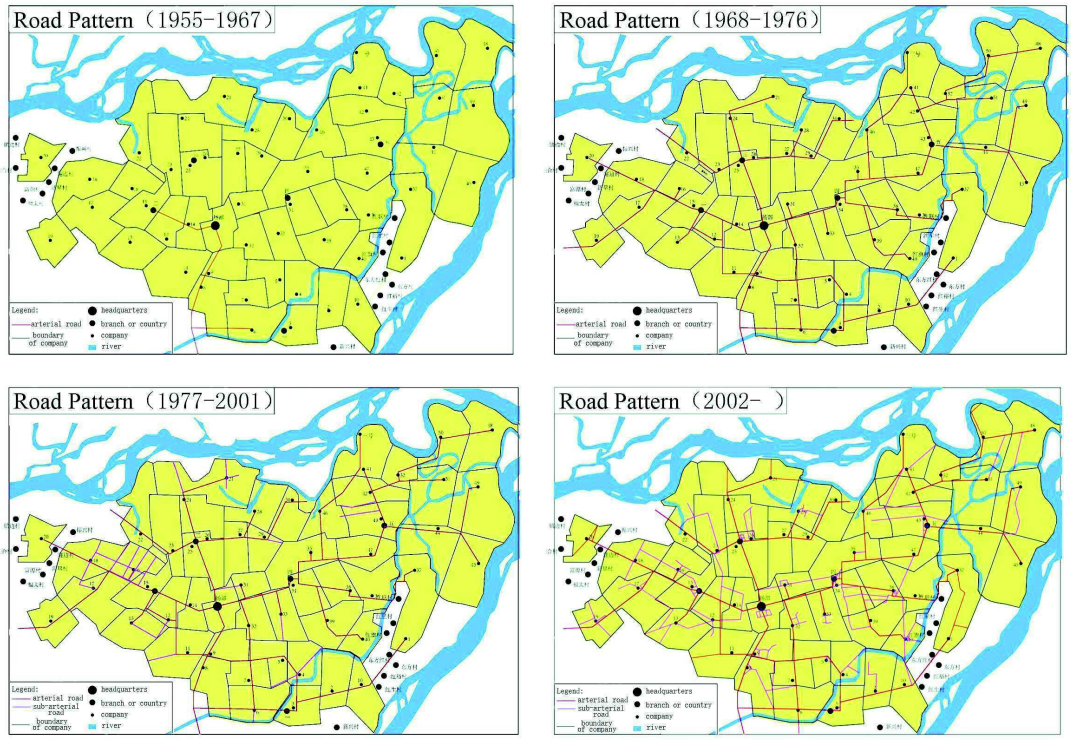

Figure 4.
Change of Road Pattern in the 290 Farm

established. The farm and the branch company were separated in terms of institution, functions, staffs, assets and finance. The farm is the administrative unit, which is in charge of management of the farm, and the branch office is the state-owned enterprise.

Land Expansion

As for the land recession, because of the large gap among the headquarters and some companies in economic development, a large number of residents moved to the headquarters in 2009-2012, leaving some residence deserted. The removal was also encouraged by policies. Since most buildings in companies were dilapidated and out of repair, the government issued several policies such as the Policies of the Renovation of Dilapidated Houses, Integral Moving Plan and Implementation Project, Construction Plan of New Residence Area and so on. As a result, 29 residential areas have been abandoned or transformed into farmland by 2012.

Residential Areas

As for the Residential areas, after the reform of worker's family farms, the independence and autonomy of the family were highlighted, which could be reflected in the building form. One of the most obvious change was that some workers built walls on both sides of the open space between their houses and warehouses to stop others from passing through the space, thereby strengthening the privacy and independence of their own courtyards. Besides, building form may also be changed. On the one hand, some residents did some additional construction or renovation in their courtyard. On the other hand, new houses were no longer strictly in accordance with the standard size. It made farm's forms become much richer. However, the farm's residential areas were still relatively uniform compared with the village.

Farmland Division

As for farmland division, the reform of the worker's family farms had brought great

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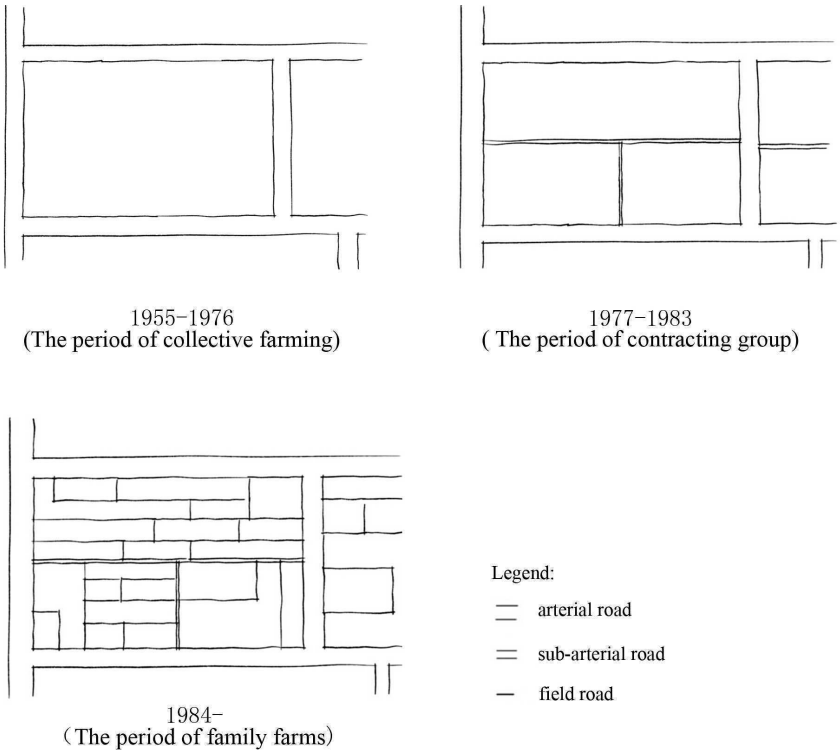

Figure 5.
Change of Field Roads in the 290 Farm

changes in the way of production of the farm. It required the farm to redivide the land and reallocate them to the worker's family farms. And the family farms further divided the land and planted different crops. As a result, the farmland became more fragmentized and the same crop is no longer distributed in continuous land. What's more, the field roads increased rapidly due to the fragmentation of farmland. In return, field roads made land division much clearer.

In addition, the plantation structure has also changed. In 1983, with the reform of the worker's family farm and the improvement of the worker's autonomy, people preferred to grow rice and other crops with high profits. So the farm transformed some dry farmlands to paddy fields. It is noteworthy that in the process of land redistribution, paddy fields' borders and layouts did not change, but it made new boundaries of some dry farmlands. The second change happened around 1995. Rice production developed rapidly to make a higher output. To promote the growth of paddy fields, the farm constructed many canals. The canals deepened the boundaries of the farmland blocks and some canals may become new boundaries of blocks.

Road Pattern

As for road pattern, the number of roads increased constantly. And reconstruction of the exiting roads also continued, increasing the farm's traffic capacity. However, the main road pattern remained unchanged and still played an important part in the morphological evolution of the farm.

Conclusion

Conclusion 1: under the different culture and institution background, the urban form of different countries has a great difference.

As China is a country of socialist public ownership, there are many differences in culture and institution between China and other cases (such as Alnwick), such as the "Dan Wei", state-owned land, collective farming and so on. These differences are reflected in the form of residence, farmland and road pattern, which

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is a significate addition to urban morphology study.

Firstly, the farm had a unified planning and fixed mode at the beginning of construction. As a result, the building fabric and farmland pattern of farm are quiet orderly, which are different from western cities.

Secondly, morphological evolution of the farm is influenced by policy and system to a large extent. Some common laws which were illustrated in other cases of other countries, such as "Burgage cycle", "Residential repletion", may not be applicable. Even though some phenomena seem similar, the inherent causes may be different. For example, in Alnwick, building coverage would decrease at the recessive phase of burgage cycle, due to an economic recession. In 290 Farm, there was also a massive relocation in 2008, making several residential areas deserted. However, this is because of the large gap among the headquarters and some companies as well as encouraging policies.

Thirdly, because of the sudden change of national policies, the form of farm always changed suddenly.

Conclusion 2: as the institution in different periods, the urban form in one country differs a lot.

In the long-term spatial practice in China, the institution also changes constantly due to the development of social productivity. Then, the changes of institution and culture influence the morphology. So it is necessary to divide morphological period on basis of institutional factors when analyzing the farm's morphology. And the theoretical framework that was built in the study of Alnwick is still of great significance under the background of public ownership in China.

In the case of the 290 Farm, at the first stage, the 290 Farm was gradually constructed. As the land expanded rapidly, a large number of houses were built in rows. As a result, the farmland division was tidy and the pattern of road preliminary formed. At the second stage, the worker's family farm was established. In terms of morphology, some residential areas were deserted; the residence's form became richer; the farmland division became more fragmentized and the number of roads increased.

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Between territories: Incremental changes to the domestic urban interface between private and public domains

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Abstract. *In this paper we investigate incremental changes to the relationship between private and public territory on the micro-morphological scale of the dwelling-street interface. This interface lies on the edge between two distinctively different spatial domains, the house and the street, and provides a buffer which may be adjusted to aid the transition from private to public territory. The structure of the space impacts both domains: it provides a fit transition from the private dwelling to the public territory, creates a space for probabilistic encounters between inhabitants and strangers, and maintains the liveability of the public street. The aim of this paper is threefold: Firstly, we recognise morphological differences in the structure of the interfaces and the way the transition from private to public territory was envisioned and designed in different societal periods. Secondly, we study incremental changes to the interface, representing individual adjustments to the private-public boundary, in order to recognise common types of adaptations to the existing structure of the interface. The history of changes to each individual building and building-street interface was traced by analysing planning applications and enforcements publicly provided by the city council. Lastly, we compare the capacity of each dwelling-street interface to accommodate incremental change to the public-private transition. We argue that studying the incremental change of the interface and the capacity of each interface to accommodate micro-scale transformations aids in the understanding of the complex social relationship between an individual and a collective in the urban environment.*

Keywords: Urban morphology, micromorphology, urban interface, incremental change

Introduction

As established in urban morphology, urban form consists of elements – e.g. buildings, plots and streets (Conzen, 1960; Kropf, 2009) which apart from their own form and properties, establish a certain relationship with each other. The space, which is a result of this relationship can be defined as an urban interface, providing and maintaining the relationship between two different territories. In this paper, we discuss a specific case of an urban interface created as a result of a relationship between a house and a street, which we call the dwelling-street interface (following the naming convention introduced in Palaiologou et al., 2016). The concept of the dwelling-street interface was widely discussed as an important element for maintaining liveability in the street, maintaining important relationships between inhabitants and strangers and enabling individuals to exercise control over the private-public boundary and the way they transition between those two territories (Whitehand et al., 1999; Brown et al., 1998; Skjaeveland and Garling, 1997; Lawrence, 1987; Gehl, 1986; Jacobs, 1961, Palaiologou et al., 2016). Even though the importance of the urban interface is discussed there are very few morphological studies of the interface.

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In the book The Environment and Social Behavior: privacy, personal space, territory, crowding Altman argues that the balance between the private and public in our relationship with other people is in a constant flux (Altman, 1975) and is undergoing constant changes and adjustments to fit our current needs for privacy or social contact. In urban form, the frequent changes and shifts to the spatial interface are not always possible but different approaches to the concept of the relationship between the private house and public street are visible not only in a variety of interface forms from different morphological periods, but also in incremental changes initiated by inhabitants themselves. The comparison of the spatial interfaces designed by speculative developers and those altered by inhabitants creates a discussion on the gap between architects' understanding of the spatial relationship between the house and the street and inhabitants' personal outlook. The structure of this paper is as follows: Firstly, we provide a short historical overview of Gosforth, a district of Newcastle upon Tyne. Secondly, we discuss the morphology of the dwelling-street interface and describe the types of interfaces observed in the sampled area. Finally, we discuss incremental changes to the interface and provide an overview of the difference between designed dwelling-street interfaces and those incrementally adjusted by inhabitants. We conclude with a paragraph on the capacity of different types of interfaces to accommodate change.

Case study and methodology – Gosforth

The development of the urban form in Gosforth (a district of Newcastle upon Tyne, UK) is intertwined with the rise and fall of the mining industry. The demand to meet the accommodation needs of the working class miners and, after the decline of the mining industry, the emerging middle class led to the rapid expansion of speculative housing estates. The developing residential urban form can be divided between five morphological periods, each connected with speculative developments with varying housing typologies and different outlooks on the relationship between the street and a dwelling. The first speculative housing estates were built in the 1890s and were situated between the urban nucleus of Gosforth – Bulman Village – and the nearby Coxlodge Colliery. The estates were made up of terraced houses and Tyneside flats[1] providing accommodation mostly to the mineworkers. Development of speculative estates prioritising accommodation for the growing mining workforce continued throughout the 1910s. Between the 1940s and the 1970s the mining industry began to decline and speculative developers shifted their focus to the emerging middle class, building new estates consisting predominantly of semi-detached houses. Since the 1990s the dominant housing typology in the district changed to detached housing and tree-like suburban estates are currently the most common speculative estate type.

To trace the similarities and differences between the structure of the dwelling-street interface we collected information on the geometry of the interfaces based on historical plans and Ordnance Survey maps. To understand the logic of the relationship between the street and the house and discover underlying interface types, we studied plans and focused on geometry, layout and configuration of the convex spaces. The treatment of the relationship between the street and the dwelling, represented by each of the interface types from different morphological periods, might be disconnected from the way in which current inhabitants view this relationship. If the space is not fit to accommodate necessary needs, the inhabitants will most likely address the problem and incrementally adjust the configuration to suit their personal requirements. To track the changes in the geometry of the interfaces we studied planning applications and building permissions accessed through the Newcastle City Council's planning database[2] and documented any change to each property in the sample. However, this method had a few limitations. Not all changes to the geometry require planning permission and/or building permission, as it depends on the dimensions of the proposed extension, location in relation to the house and distance to the boundary of the

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property. Moreover, the registry of applications in the Gosforth area only dates back to 1975, which means information on changes to the geometry before that point is lost. In order to overcome those limitations, we documented changes in geometry based on a comparison between historic and the latest Ordnance Survey maps. To confirm data collected from both planning application and plan comparison we conducted an on-site observation study and documenting the changes to the interface.

The morphology of the dwelling-street interface

The dwelling-street interface is a spatial outcome of the relationship between a house and, through the adjacent street segment, a complex street network. Through the interface, the house and the street meet, interact with and affect each other. Being a spatial by-product of a connection between a house and a street, the dwelling-street interface is not an element on its own, as it would not exist without a house and a street; therefore it cannot be studied in isolation. The relationship between a dwelling and a street can be categorised based on the number of connections between a house and the street network. In the studied area we distinguished three general types, where a house is connected to the street network through: one, two or three street segments. The one house-one street relationship is common to the semi-detached and detached houses where front façade is facing only one street segment. The one house–two streets relationship can be seen in terraced houses, where both front façade and back exterior wall are facing a street. Additionally, we can observe this relationship in corner semi-detached and detached houses. The one house–three streets relationship can be found in corner terraced houses, where three exterior walls of a house are facing different street segments. Based on this distinction and the types of exterior wall adjacent to the street segments, we distinguished three types of the interface: front, side and back. As discussed, the distribution of front, side and back interfaces varies between housing typologies. The front interface appears most consistently and is the most numerous out of all the types; therefore will be the focus of this paper. The study of the side and back interface while equally interesting will be addressed in future work.

The structure of the front interface can be divided between constant and variable elements. The two elements that are part of every front interface are the building exterior wall and plot boundary. They demarcate the edges of private domestic and public territories. The building exterior wall restricts access and visibility into the domestic territory, while the plot boundary controls the access but allows strangers to look inside. In the majority of cases studied in Gosforth (98.52 per cent of all houses) there is, additionally, a convex space (or set of convex spaces) introduced between the house and the street. In the paper we include this convex space between the building exterior wall and

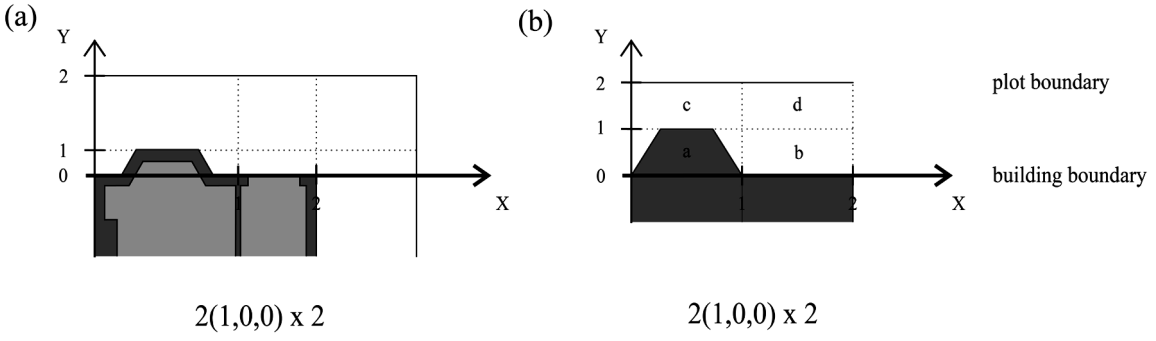

Figure 1.

(a) Plan of a front interface with grating marking convex spaces (b) 'Dimensionless representation' (Steadman, 1983) of the same plan. The type of the interface presented in the diagram is marked as 2(1,0,0) x 2 where, 2 x 2 describes number of convex spaces on the X and Y axes and the numbers in brackets show the number of bay windows, porches/alcoves and garages. This type of the interface is categorised as medium complexity.

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plot boundary as the third constant element. The varying elements can be divided into two groups: extensions of the domestic space into the semi-private area with e.g. a bay window or a porch; and extensions of the semi-private area into the domestic territory with e.g. alcoves. The relationship between those different elements creates a structure consisting of private convex spaces, extending the domestic territory to the outside and the semi-private convex spaces, which introduce the connection of public territory to the private property. The complexity of the interface structure varies with examples where the privacy-orientated territory dominates the interface, on the other hand, there are houses where this relationship is reverted and the semi-private space penetrates into the house. The number and types of convex spaces between the house and the street set the complexity of the connection between those two territories. The structure of the interface not only describes how complex the entry to the house is, but also the capability of the interface to accommodate activities which can generate a random encounter between the inhabitants and strangers. In British housing typologies the houses differ in their position on the plot, which, in the case of semi-detached and detached housing creates a space between the side of the building and the plot line. In determining the interface typologies we have not included the side space as an element because it unnecessarily enlarges the number of the types. The information on the position of the house on the plot was preserved and used further in the analysis of changes to the interface.

In the Gosforth area we observed a total of 51 types of front interfaces distributed between all three housing typologies. We presumed that each housing typology creates a unique interface with adjacent streets, but we found that the majority of interface types are shared across at least two housing typologies. The houses with interface types unique to the housing typology constitute 14 per cent of all houses, while the houses that share interface types among all three housing typologies constitute 59 per cent of all houses. In Gosforth there are 29 interface types unique to the housing typologies and 4 interface types that are shared across all typologies. This could suggest that the relationship between the house and the street is not connected to the housing typology, but only if we treat a housing typology as a building only, without considering its position on the plot.

Furthermore, we distinguished four categories of interface typology based on the complexity of the layout and the position of the exterior wall. The first category is the simplest example of the interface with the domestic territory ending on the exterior wall and not encroaching onto the semi-private area. In this case, there is one convex space separating the house and the street with one step between the public and private territory. The second category describes the interface where the domestic territory extends into the semi-private space with e.g. a bay window or a porch. This extension divides the convex space between the house and the street and creates an additional step between those territories. The third category introduces a reversed scenario, where the semi-private territory steps into the building as e.g. an alcove, and introduces an additional step past the exterior wall. Finally, the forth category, describes the types where the domestic territory expanded so greatly it created a new iteration of the exterior wall, one step closer to the street. All of the categories discussed above are present in all of the housing typologies. An overview of the most common front interface types divided between the four categories and main housing typologies is shown in Figure 2.

Incremental changes to the dwelling-street interface

The perception and treatment of the relationship between the private and public territory is shifting with the changing socio-cultural background. The dwellings and their interfaces built, for example, in the 1910s, refer to a wholly different cultural environment and some of the design decisions might not be applicable to current attitudes. In order to match the present-day perception of the relationship between the private and the public, the interface had to be incrementally adjusted by inhabitants.

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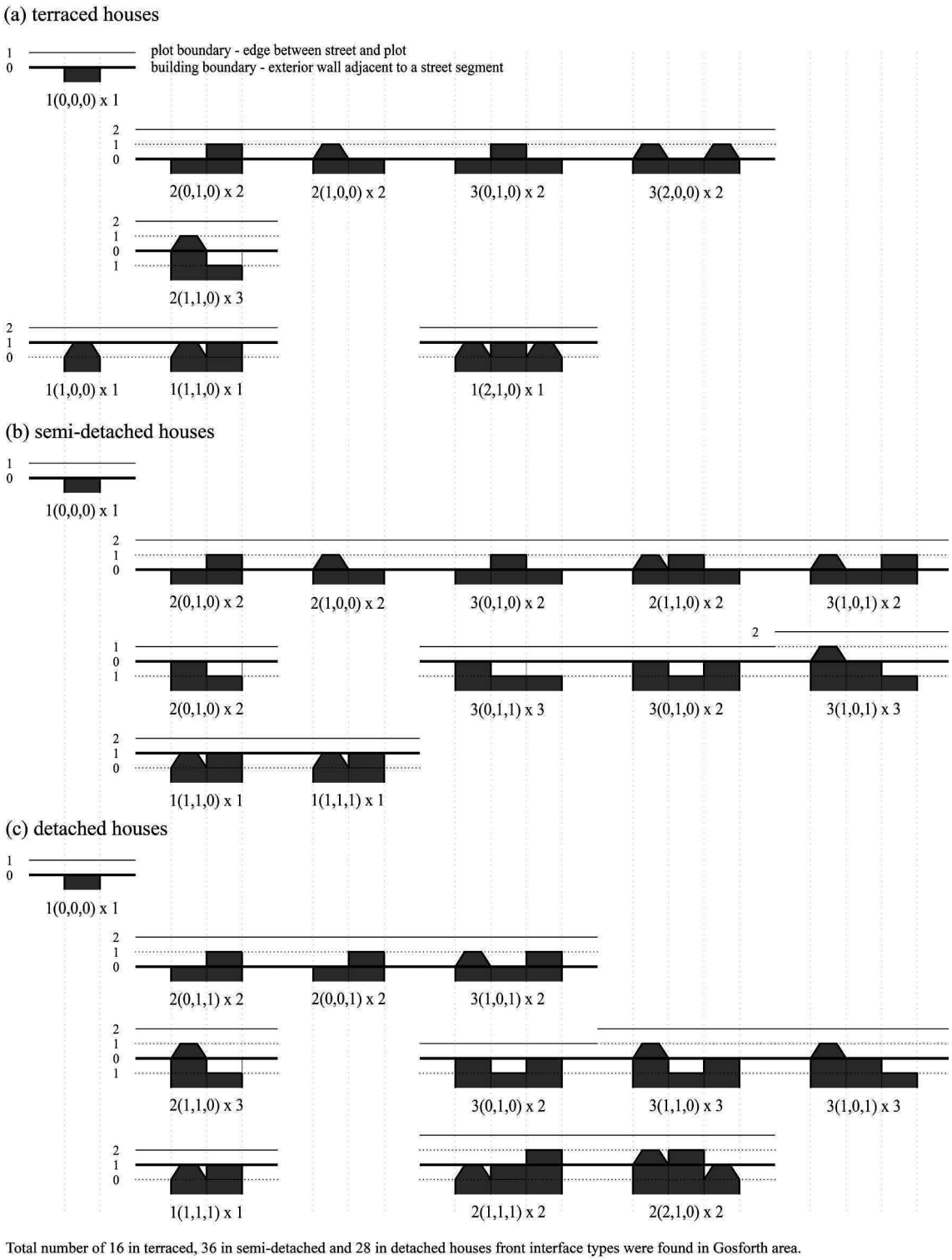

Figure 2.

Atlas of the common front interface typologies. The solid space represents the private domestic territory, while the void space represents the semi-private space visible to the public from the adjacent street.

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The types, patterns and distribution of these changes are the main focus of this paragraph, which is followed by a discussion on the capacity to accommodate change amongst interfaces in different housing typologies. We distinguish three types of incremental changes applicable to the front interface: change that resulted in a lower complexity of the space between the house and the street, change that did not affect the complexity of the space and change that raised the complexity of the space. Additionally, we differentiate between addition and subtraction from the geometry. We are concerned only with changes to the geometry, therefore we did not include any changes to the access points in the analysis.

The overall number of changes to the front interface varies between the housing typologies, with 10 per cent of the terraced houses, 63 per cent of semi-detached and 36 per cent of detached houses being incrementally adjusted over time. In all housing typologies the majority of interface types changed at least once, showing that each interface type has the capability to accommodate change (see Table 1). However, the study showed that only 25 to 30 per cent of all interface types amongst all housing typologies underwent the majority of changes to the front interface. Although most interface types are capable of change, only a few types are flexible enough to accommodate different types of changes.

In terraced housing the original interface typologies can be divided between spaces with low complexity (e.g. 1 x 1), medium complexity (e.g. 2 x 2) and high complexity (e.g. 3 x 2). The complexity of the original interface type correlates with the type of change introduced by inhabitants. The low complexity types rarely changed but when the change was introduced it resulted in higher complexity of the interface. The interface types with medium complexity accommodated the largest variety of changes and led to both increasing and decreasing of the complexity of the interface. Finally, change to the interface types with high complexity resulted in a lowering of the complexity and a simplification of the access to the house in most cases. The majority of incremental changes were applied to the interface types with medium complexity.

The most popular change was a reduction of the porch, which depending on the interface type resulted in lower or higher complexity of

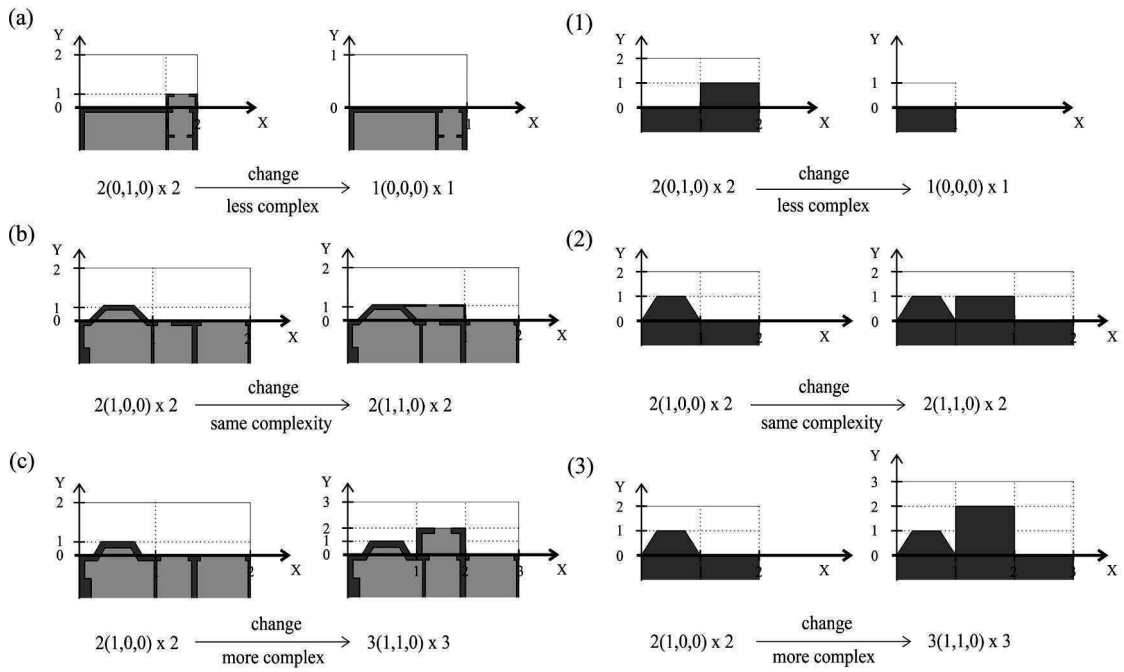

Figure 3.

Three categories of changes to the front interface that either lower the complexity of the interface (a), do not change the complexity as in (b) or raise the complexity as in (c). Diagrams (1), (2) and (3) show the same changes but in dimensionless form (Steadman, 1983).

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Table 1.
The table shows data regarding changes to the front interface. The interface of the semi-detached house seems to have the highest capability to accommodate the change with the highest number of total changes and highest variety of changing types.

	Terraced	**Semi-detached**	**Detached**
Total number of:			
Houses	2300	2258	311
Changes to the front interface	231	1433	112
Proportion changed	*0.10*	*0.63*	*0.36*
The number of:			
Original interface types	15	28	14
Original types changed	11	27	13
Proportion changed	*0.73*	*0.96*	*0.93*
Types that cover 90% of changes	4	7	4
Proportion changed	*0.27*	*0.25*	*0.29*
Types that disappeared	1	1	0
New types introduced by change	1	8	14
Current front interface types	15	35	28
Number of changes that resulted in:			
Lower complexity	82	605	92
No change to the complexity	13	534	8
Higher complexity	136	294	12

the space between the house and the street. The reason for this change can be two-fold. The internal layout of the terraced house already provided an entrance hall and having additional space in form of a porch seemed redundant. Moreover, the porches were wooden and proved to be difficult to maintain and prone to damage or decay, which might have been a reason to remove them. In semi-detached housing the division of interface typologies follows the one established in terraced housing. We also see a similar correlation between the type of the change and the original complexity of the interface with the interfaces with medium complexity accommodating the largest number and variety of changes. When the structure of the interface had high complexity (e.g. 3 x 2, 3 x 3) in 90 per cent of the cases the complexity was lowered, while in the interfaces with low complexity change resulted in higher complexity. The variety of changes was the most numerous in semi-detached housing with more than 95 per cent of the changes were achieved by addition to the geometry. The most common change to the semi-detached interface was the addition of a garage in the space to the side of the building. The second most common change was addition of the porch, which might have been motivated by the lack of the entrance hall in the internal layout of the house and the need for space that could mediate the transition from public to private. Even though the complexity categories of the interface fall in line with the terraced and semi-detached examples, the majority of original front interfaces had a high complexity (e.g. 3 x 3, 3 x 4 or 3 x 5). Most of the changes were found to simplify the interface between the house and the street by adding geometry to the existing building. The most common change was the addition of a porch in order to lower the complexity of the threshold. In some cases this change could be motivated by lack of the entrance hall in the internal layout of the house, but there were cases when the entrance hall was part of the layout and it was extended

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Figure 4.
Examples of incremental changes to the front interface in the Gosforth area. The original typology of a semi-detached house without any changes (on the left). The addition of the garage to the front interface, which did not affect the complexity of the interface plan (in the middle). The addition of the porch to the front interface divided the interface into 3x3, compared to the 2x2 in the original example, which introduces more steps to the entrance of the house (on the right).

to the outside to simplify the complex structure of the detached front interface.

Conclusion

In each interface type, regardless of the housing typology, at least one case was incrementally adjusted by the inhabitants, which shows that each type has the capability to accommodate change if necessary. However, the frequency of changes within those types varies greatly, with some interface types being more likely to change while others rarely changing. The complexity of the original interface type seems to dictate what type of change the interface is capable of accommodating. Interfaces with low complexity (e.g. 1 x 1), when changed, are more likely to increase in complexity, while interfaces with a high complexity (e.g. 3 x 2), when changed, are more likely to lower in complexity. The interfaces with medium complexity seem to accommodate the largest number and variety of changes and incremental adjustments can lead to all categories of complexity. Thus, the decision made during the design process might determine how adaptable the interface is to accommodate future, unforeseen change. Moreover, the introduction of a space to the side of the building seems to increase the probability of change to the interface and gives the inhabitants a choice of whether to expand or not. The space, however, has to be wide enough to provide enough room for expansion. As seen in detached houses in Gosforth the spaces to the side of the building are very narrow such that any type of expansion is unlikely. Addressing the capability of the building to change and grow during the design process is critical because housing stock does not change often enough. This is visible in the example of terraced housing and the rising popularity of cars. The introduction of the car meant that there was a need to accommodate a place to store it. In the case of terraced houses it could only be stored in the back yard, however narrow access routes – back alleys – were unfit causing residents to park on the street in front of the house. This need introduced a previously unintended environment and changed the function of the existing space. Thus, considering the capability

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to accommodate change in any form, might prove beneficial when there is a need to adjust the designed environment without affecting spaces in a negative way.

Notes

1 A housing type specific to Newcastle and Tyneside, a terraced house divided into two flats, with one dwelling situated on the ground floor and second dwelling on the first floor.

2 The database available on the Newcastle City Council website - https://www.newcastle.gov.uk/planning-and-buildings/planning-applications/search-and-comment-on-planning-applications. Accessed: 13.06.17.

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Understanding cycling in Quito through the lens of social practice theory

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Abstract. *In Quito, the relatively recent development of infrastructure and programs to promote cycling has become central in the discussion for sustainable mobility. Moreover, considering that the scheme 'Ciclopaseo' has been an important dominical event for many families over a decade if compared with the low rates of cycling in the modal share, questions surge about the effectiveness of all these measures. This paper investigates the appropriateness of cycling in a city with geographical, morphological, social, and cultural challenges for practitioners. The use of Social Practice Theory provides a theoretical framework to understand holistically the daily mobility of two groups: a representative sample composed by University students, gives a specific target for policy making; while a parallel sample puts into perspective the validity of the results. SSPS and ArcGIS are used for the analysis of primary data collected with Google Forms. Overall, the analysis of each one of the elements of practice explains a dimension of the self-reinforcing barriers to cycle. It is revealed that the construction of meanings in daily travel, especially cycling, is based on instrumental factors such as travel time and distance, but non-instrumental factors related to safeness and security weigh heavily in travel behaviour, creating psychological barriers to cycling. It is concluded that reshaping the meanings of cycling is necessary by the construction of a culture of 'road user behaviour', the creation of physic-temporal-symbolic spaces to build cycling skills, and later transform the transport system, road infrastructure, streetscape, and the social rhythms of Quito into cycle-friendly spaces.*

Keywords: Quito, Ecuador, Social Practice Theory, transport behavior, cycling

Introduction

As many other rapidly urbanized cities in Latin America, Quito was shaped by a capitalist modernity explosion between the 1960's and 80's, resulting in an extense, fragmented, hypercentralised, and polarized medium-size capital in the middle of the Andean Range (Carrion and Erazo, 2012). Here, where a neoliberal agenda addressed transport and the urban form, the pronounced topography or the erratic weather seem the smallest difficulties for commuting by alternative modes than car. The aim of this paper is to illustrate the main limitations and opportunities of cycling in Quito, bringing to the discussion if it is a realistic mode of transport. As in previous studies of cycling (Spotswood et al., 2015; Aldred and Jungnickel, 2014), Social Practice Theory (SPT) conceptualization of practices in elements by Shove et al. (2012) provides a framework to understand the complexity of cycling, mobility and public space.

Cycling in Quito

Quito is a city with a stark legacy of past car-oriented plans that encouraged informal growth and suburbanization, sprawling the city

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and segregating society (Carrion and Erazo, 2012). As Dimitriou (2011) highlights, these space-time geographies of marginalisation are partly originated from the lack of integration between land use and transport planning. Thus, mobility and the urban form were captured in a self-reinforcing system of automobile depence and exclusion conceptualized by Urry (2004) as the system of 'Automobility'. The first formal plan was implemented in Quito by 1945, the 'Odriozola Plan' was designed under the guidelines of modernity that fitted with the objectives of the wealthiest classes. It polarised the city simbolically and physically, where the poor occupied 'the south' and the rich 'the north' (Carrion and Erazo, 2012). Furthermore, the adaptation of the city to the car systematically segregated the sectors of population which could not afford such mean of transport. This not only limited their right to move and access to public spaces, services and opportunities, but reinforced the unequal distribution of road-space for other modes of transport (Gordón, 2012).

Before the first 'ciclopaseo' organized in 2003, Quito lacked physical, temporal or symbolic spaces for cycling. Thus, ensuing Bogota's 'Ciclovía', Quito stablished the dominical closure of roads to be occupied by pedestrians and cyclists, this initiative was named 'Ciclopaseo' (Mogollón and Albornoz, 2016). As a matter of context, Quito stretches approximately forty kilometres from north to south and, as above mentioned, its society is meaningfully divided between the North and the South. However, this weekly event connects and provides a place of encounter between this two poles (Figure 1) when roads are transformed into the biggest recreational space, where varied citizens and multiple activities meet. Roads became the public space to collectively experience the city and meet 'the other' (Borja and Muxí, 2003), consequently, the Ciclopaseo opened a window to claim the right to the city and free mobility for many citizens as not was done before.

However, is hard to claim that cycling is becoming a popular practice in Quito after almost 15 years of 'Ciclopaseo', which was implemented to popularise the bicycle as a mode of transport. Today it is still not considerably used for this mean (Pinto et al., 2015). According to the 2011 mobility survey, the bicycle only represented the 0.3% of the modal share. In contrast, it is revealed that car use will grow further. Instrumental reasons of access and convenience could explain the 'auto-motives', but various non-instrumental reasons shape travel behaviour as well (Schwanen and Lucas, 2011), as car use could be strongly related to affective and symbolic motives of globalisation and status (Steg, 2005; Sheller and Urry, 2000). Moreover, the disproportionate levels of car-infrastructure investment and the inefficiency of the public transport system, seem enough to consider the uprising 23% of the trips made using private vehicles (MDMQ, 2014) as a signal of the forthcoming car dependent city (Dimitriou, 2011). This type of urban environments neglect alternative modes of transport and exclude from the urban life those who do not own a car (Adams, 2001; Urry, 2004).

In this car-dominated society, alternative modes like cycling seem to have all the odds against to be considered as a convenient transport option, therefore the number of utilitarian cyclists remains low despite the recent development of programs and insfrastructure to promote non-motorized transport. Even though the popularity of the 'Ciclopaseo' proved that citizens are capable to use the bicycle and find adavantages as avoiding traffic, the car is preferred for daily travel as it has become more affordable and provides more accesibility (MDMQ, 2014). However, as Puga (2016) argues, the transport limitations in Quito are not just a matter of access, but a problem of free mobility, highlighting that the barriers to cycle among women, which can be extended to anyone, are not situated in the quality of infrastructure, which is essential, nor in the 'social acceptance' of cycling, but in the urban images generated by a men dominated society; which could be used as an analogy of a car dominated society that imposes meanings to the urban mobility (Aldred and Jungnickel, 2014).As a result, understanding why the use of the bicycle for daily transport is not popular, requires a different understanding of choices.

Social Practice Theory (SPT)

SPT is a form of cultural theory where

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Figure 1. ('El Ciclopaseo')

both, the object of analysis and the place for social change are the practices 'carried' by its performer, rather than focus on the individuals, interactions, structures or systems (Reckwitz 2002). To put the theory in perspective, when contrasting SPT with individualistic psychology-based models of behaviour like Azjen's Theory of Planned Behaviour, Schwartz's Norm-Activation Model or Triandis' Interpersonal Behaviour Theory, SPT recentres the subject of focus from the individual's intentions (of the cyclist) towards the social and collective organization of practices (like cycling or driving) (Spotswood et al., 2015).

Commonly in SPT, practices are analysed

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as an array of embodied elements. A helpful conceptualization is presented by Shove et al. (2012), where practices are interwoven sets of materials (objects, infrastructure), meanings (images, symbols), and competences (skills, capabilities). Practices 'evolve' when the 'connections between elements are made, sustained, or broken' (p.14). Moreover, Shove et al. (2009) and Pantzar and Shove (2010) invite us to consider 'time' as another element of practice since 'time-space is central to the organization of social life' (Schatzki, 2009, p.35).

Methods

A combination of qualitative and quantitative data was collected to build a database according to the elements of practice using structured surveys with a combination of Likert-type scale and open-ended questions. The survey was distributed among two samples. A students group (N1=110, n1=43) composed evenly by people from public and private universities, which was selected as a target for policy making; and a parallel group of non-students (N2=323, n2=81) to strengthen the statistic approach (Figure 2). The analysis was carried out using cartography, descriptive statistics and correlations with ArcGIS and SPSS softwares, respectively. Spatial patterns were identified by mapping the survey answers with GIS in order to identify links between the perceptions about cycling and the origin and destination of daily trips. The distance between the respondents' home and destination was estimated using Google Maps.

Findings

Materials

Overall, the 45.5% of the students (Ss) and 48.2% for the parallel sample (Ps) own a bicycle, suggesting that, as the first important 'material' consideration, the low rate of cycling in the modal share is not a matter of bicycle accessibility. In the students' sample, just the 11.4% of students (Ps: 16.8%) have certain access to bikeways, towards a 22.7% with partial access (Ps: 24.1%) and the 63.6% (Ps: 56.7%) which find difficult to use a bikeway in their travel route. In both samples, when asking if bikeways are convenient for daily travel, the spatial patterns of accessibility are similar but the quantity of positive answers is lower. Thus, the accessibility to a bikeway does not guarantee its use if the connection towards the destination is deficient. In sum, the 38.6% of the population of both samples do not have access to bikeways and when scoring its convenience, more than 50% (Ss:50%, Ps:55.4%) of population remark that the bikeways are not convenient for their travel route. Particularly, people living in the south, far north, sloped areas and eastern valleys are isolated from the actual cycle infrastructure (Figure 3). Related to cycle parking, on average the 45% of both samples have parking in their usual destination, but the 72.7% of the students, and the 53% of the parallel sample consider that occasionally is possible to find safe cycle parking in other destinations. Such insufficiency in the material elements of the practice contribute to low rates of cycling as the survey confirms that bikeways (Ss: 56.8%, Ps: 57.8%) and safe cycle parking (Ss: 56.8%, Ps: 59%) are considered very necessary to encourage cycling as a commuting option. In terms of technology, the type of bicycle is important for around the 43% of population (Ss: 31.8%, Ps: 54.4%).

Meanings

The results in both samples confirm that safeness (Ss:59%, Ps:66.2%) and security (Ss:68.2%, Ps:54.2%) are remarkable limitations for cycling, which were categorized by the respondents as difficult to very difficult factors for bicycle commuting. In terms of personal wellbeing, cycling is highly accepted as a healthy practice (Ss:66.7%, Ps:54.3%) and the most popular adjectives to describe cycling were economic (Ss:64.3%, Ps:49.4%), ecologic (Ss:54.8%, Ps:54.3%) and nice (Ss:47.6%, Ps:43.2%). In contrast, anybody characterizes it as safe. This highlights that fear prevails over the perceived benefits for health as around the 55% (Ss:45.2%, Ps:65.4%) of the surveyed

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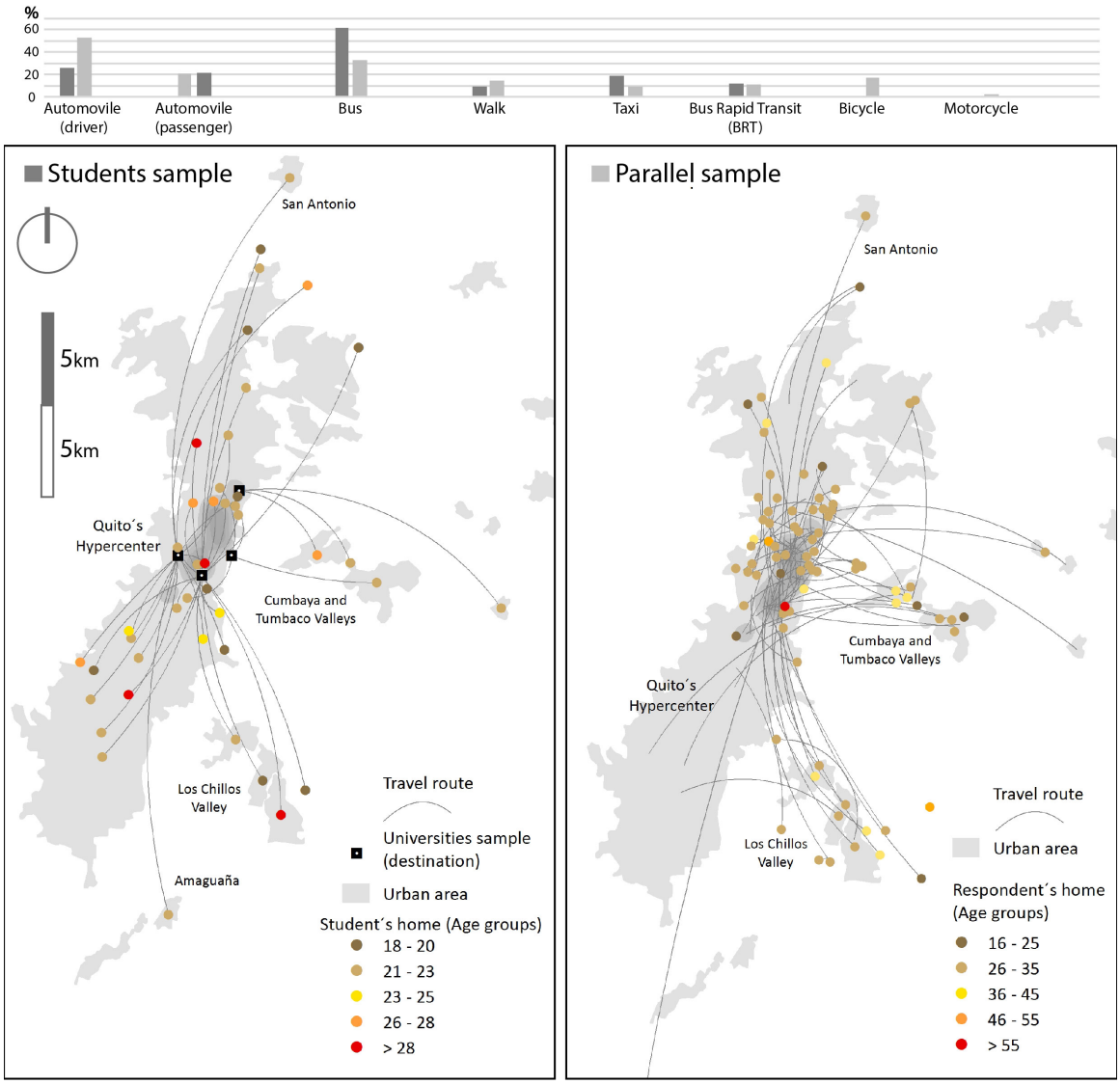

Figure 2. (Samples and the modal share)

feel unsafe and in risk when commuting by bicycle. An overview of the characterizations of cycling is presented in Figure 4.

Furthermore, car drivers tend to have a negative perception of cycling ($p<0.05$, $r=0.184$) and people who own a bicycle a positive one ($p<0.05$, $r=0.228$). Students are more positive when qualifying cycling as a mode of transport, something that may be considered when promoting its use in educational programs. Considering the modal share (Figure 2), the differences between the students and the parallel sample are representative in the use of public transport (Ss:61.9%, Ps:33.3%), and the automobile (drivers) (Ss:26.2%, Ps:53%), reaffirming the idea that the car is a symbol of better economic situation. The car is a good desirable to acquire when the population earns money or gains economic independence (competence). Another important meaning for cycling is commitment. After infrastructure and transport integration, commitment (and fitness) was rated in third place as necessary to very necessary (Ss:72.8%, Ps:78.3%). This supports the idea that cycling i s not only limited by the external factors (as infrastructure) but by the user's attitude -sustained by the "cause" of cycling itself- towards the challenges of using a bike in an urban environment. In fact, sustainable practices are a matter of commitment, where world views and the idea of modernity play an

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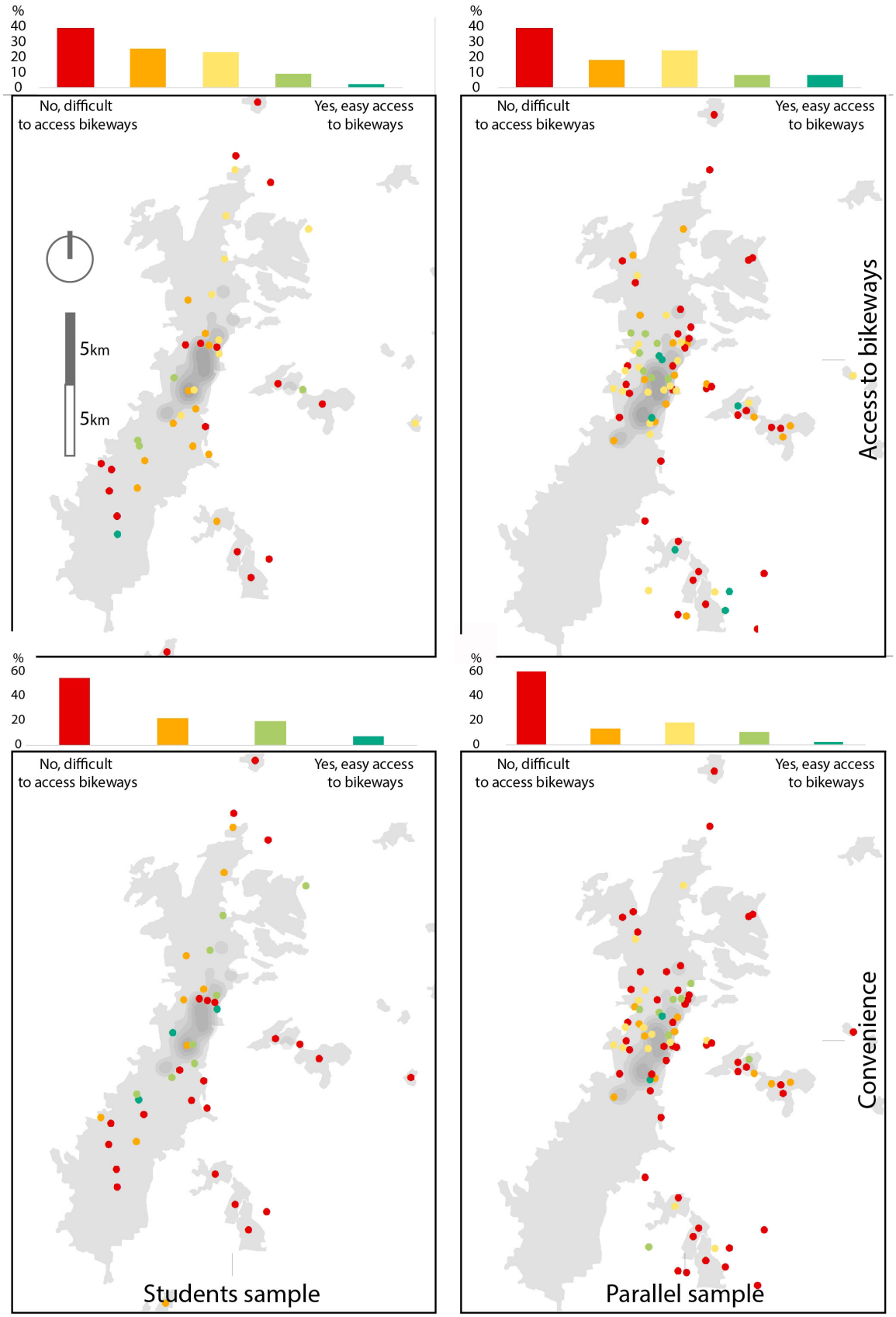

Figure 3. (Accesibility and convenience of bikeways)

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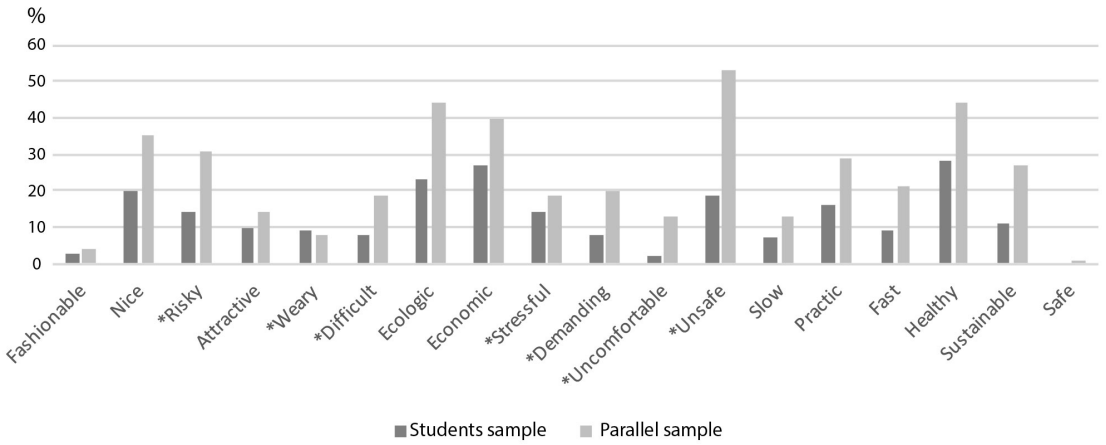

Figure 4. (Perceptions of cycling compared)

important role in travel behavior.

Competences

Although the rates of bicycle ownership suggest that an important group of people 'is competent' to ride a bicycle, only the 17% of the parallel sample travel daily by bike (Ss: 0%). The lack of cyclist commuters can be explained by the lack of physical fitness. As above mentioned, fitness (Ss:65.9%, Ps:75.9%) (and compromise) was rated as necessary to very necessary after availability of bikeways and parking. Physical fitness is required to cycle in Quito as most commuters should travel long distances and in some cases, cross steep terrain. Figure 5 shows the distance traveled by the respondents (5.A) represented in the origin of the travel route (home) and its distribution in the topographic landscape (5.B). After safeness and security, distance is the third aspect considered as a limitation (difficult to very difficult) for cycling (Ss:56.9%, Ps:44.6%), followed by topography (Ss:56.9%, Ps:44.6%). Most of the respondents which consider that distance is not an issue live in the hypercentre or near it. It was found that as distance increases, the use of bicycle decreases ($p=0.01$, $r= -0.257$). Although, is worth to highlight that people living in the southeast valleys and some in the hypercentre does not consider distance as a limitation. This supports the fact that the perception of distance as a limitation is a matter of skills, as not all feel capable of cycling long travel distances. The same analysis can be extended to the people living in the sloped areas which consider that topography is a limitation.

Time

Results corroborate that the hypercentre is the main destination, and respondents who live further from it tend to spend more time traveling. A positive correlation was found between the perception that the availability of time is necessary for cycling with the necessity of a flexible schedule ($p>0.01$, $r=0.444$), which was considered an important limitation ($p>0.01$, $r=0.248$). Moreover, a positive correlation was found between the perception of distance as a limitation and the necessity of time ($p>0.01$, $r=0.283$). Differences were found between the 2 samples. The 22.7% of students and the 7.2% of the parallel sample consider that their actual schedule makes cycling impossible; but both agree that a flexible schedule is necessary to very necessary (Ss:44.6%, Ps:54.5%). Compared with the schedule, both samples differ as well in their perception about the availability of time as a necessary aspect to choose the bike as transport (Ss:31.8%, Ps:68.7%). It appears that for students, schedule is the main limitation and for the working population the time availability. This is understood by the fact that students have more irregular timetables than the population that usually have the standard working schedule. In some cases, perceptions about time seem to be independent of the travel distance and travel time, as people living in the north and the southeast valley consider that schedule is not a limitation (Figure 6). Here

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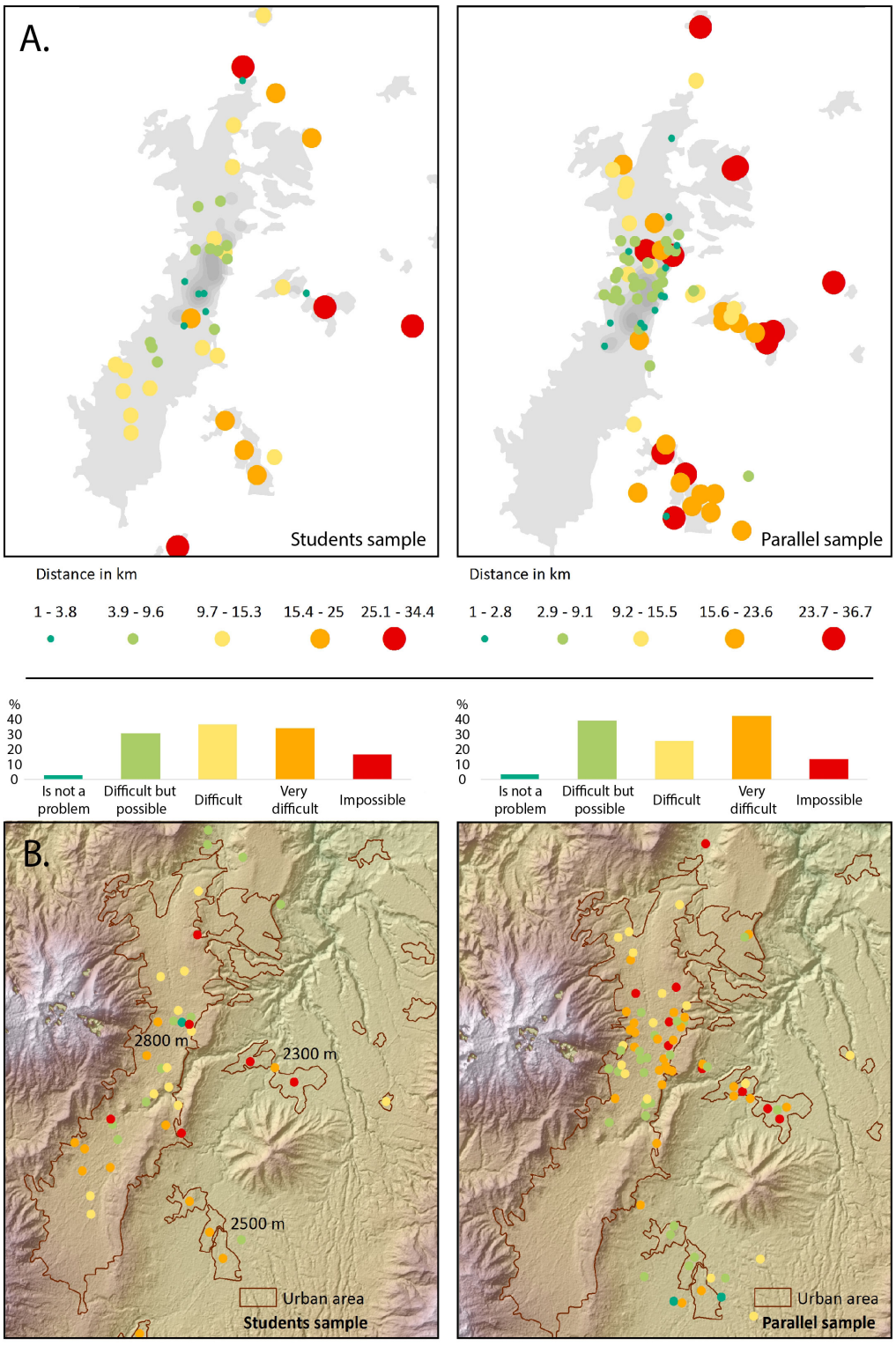

Figure 5. (Distance and topography as limitations for cycling)

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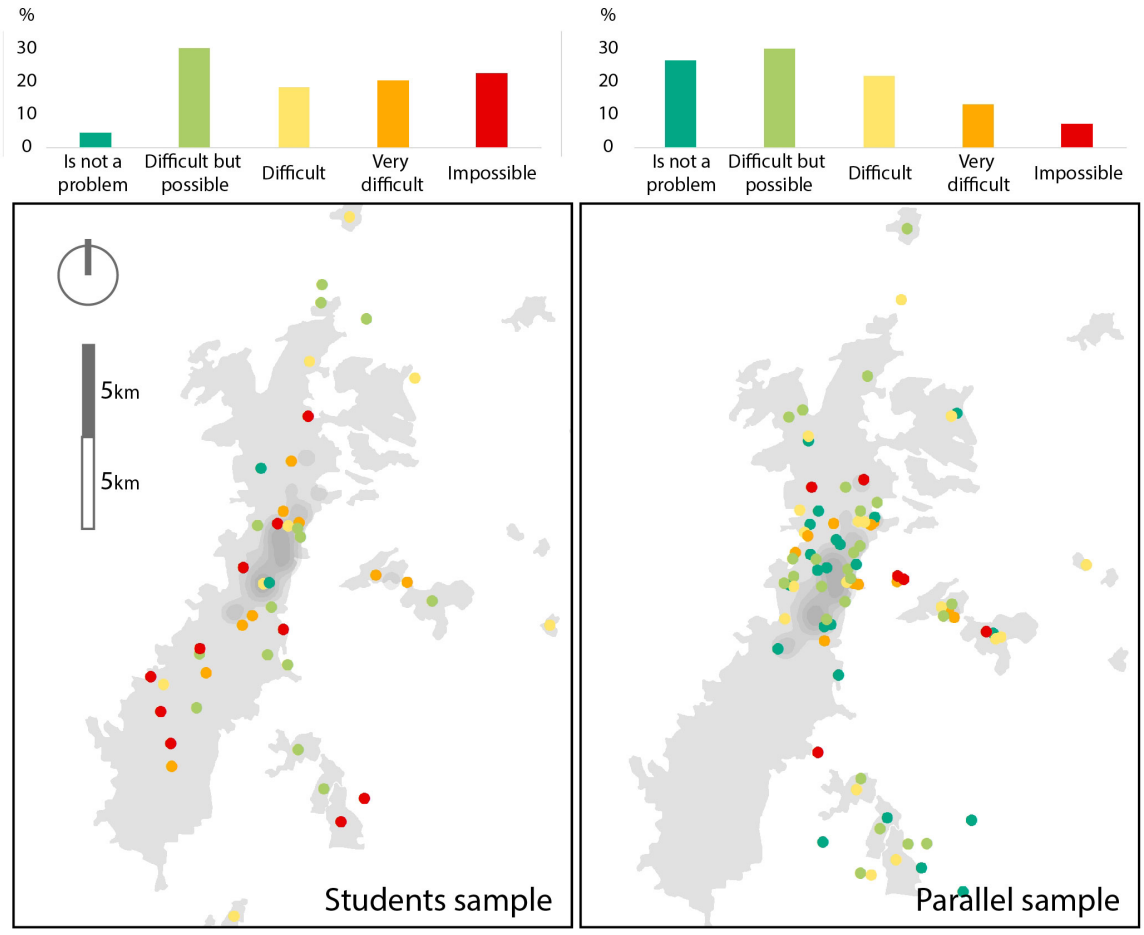

Figure 6. (Schedule as a limitation for cycling)

is important to highlight that although all the correlations presented in all these results were significant, they were not higher than 0.3, as travel behavior is something that is not only explained by linear correlations but by several factors that are matter of perception.

Discussion

In brief, when analysing cycling by the elements of practice, it is revealed that each of them explain a dimension of the limitations to use the bicycle for transport, which start with the perception of cycling (attribution of meaning) as dangerous due to the lack of a culture of 'road user behaviour', plus the absence of safe bikeways and secure cycle parking (the required materials). Overcoming the fear to cycle (needed skills, competence), is beyond the existence of infrastructure. Besides, using the bicycle as transport seems to hardly fit in the social rhythms of modern lifestyles.

Cycling is a mode of transport that almost anybody considers 'safe', yet a majority describes it as a 'healthy' practice. The perceptions of risk associated to cycling are not only reinforced by the absence of infrastructure, but more serious to the current 'road user behaviour', characterized by a lack of respect to cyclists in shared spaces with cars. The level of access and convenience of cycling infrastructure is deficient; bikeways and the bicycle hire system are limited to the hypercentre, neglecting a majority of the population who live in the peripheries and suburbs. In this scenario, the integration of the bicycle to the public transport is a possible solution to 'increase the accesibility' to the bikeways, and as longer distances pose limitations to cycle, this integration may allow cyclists to cover greater distances. Also, the use

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of public transport will result more attractive and accessible (Pucher and Buehler, 2012b).

As Cities with sloped topographies or variable weather conditions like Quito might pose extra challenges to cyclists, the integration of public transport and the bicycle is fundamental in the promotion of both systems. Beyond widespread bikeways along the city, a more effective solution is the strategic construction of local networks around the urban centralities and connect them with public transport. For that, the city will require of socio-technical transitions, transforming public spaces and the transport system to accommodate the bicycle (Ibid.).

However, achieving a socio-technical transition to the bicycle is beyond the provision of essential infrastructure; but its absence emphasizes the biggest barriers to cycle related to the safeness and security problems, the lack of a generalized 'road user behaviour', and the stigmas of who is competent to ride the bicycle. Using some of the concepts in Aldred and Jungnickel (2014), it is necessary to construct a 'cycling culture' that is open to everybody. In this sense, it could be said that the 'Ciclopaseo' effectively seeded the practice of cycling in Quito. It broke the image of the cyclist who is part of an elite with special skills by allowing citizens to discover their cycling competence to cross the city from one end to the other. However, despite this event allowed to reimagine Quito's mobility and public space, it has barely evolved since its origins; limiting the scope of cycling to leisure and sport.

Also, the results exposed that, usually, the time required to commute by bicycle limits many people to chose this alternative. The schedules of modern urban life do not seem to be adequate for the use of the bicycle in daily travel, especially for students and some people who cannot freely organize their time. Additionally, it is a fact that the urban environment is primarily designed for the car, posing extra time requirements for cycling.

Conclusion

Understanding mobility trough the perspective of SPT exposed a new insight on the limitations and opportunities of cycling in Quito. Overall, the analysis of each element of practice explains a dimension of the self-reinforcing barriers to cycle, which are based on instrumental factors such as travel time, distance and (the absence of) infrastructure. But non-instrumental factors related to competence, safeness, and security also weigh heavily in travel behaviour, posing psychological barriers to the use of public and non-motorized transport.

The opportunities for an effective socio-technical transition to the bicycle are a combination of schemes, public space development, and the essential integration of the public transport system. Besides the necessary infrastructure, policies should be focused first on the transformation of meanings associated with the public space and non-motorized transport. Both should become symbols of safeness and security despite the privatized car-oriented environment. Moreover, cycling can be a way to sort out the delays and problems caused by traffic.

Distance reductions and decentralisation seem hard to achieve now, but the adequate construction of meanings in cycling is key for an effective modal shift. Rebranding travel-time could be the solution, by changing the perception that time is lost when traveling, to one that time is invested in an agreeable experience and a healthy life style. This could make of cycling an attractive option, and contribute to shape more liveable cities.

Quito needs to redifine its urban time-space for daily cycling. To start, social rhythms could be reprogrammed in work/study places to the temporal requirements of cycling. However, it is a complex solution that requires further analysis. For now, the reader is invited to think in temporal transformations like the coordination of social/familiar/individual schedules that do not impose additional restrictions to cycling, but that provide a specific time-space for daily cycling, like a 'ciclopaseo' during weekdays.

After all, the question standing is if this measures will take the bicycle out of the stigma of being an unreal 'European solution' for transport, and become part of a real transition to sustainable mobility in Quito.

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Clothing consumption practice and its impact on the transformation of "public space" in Vía Primavera, El Poblado, Medellín

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Abstract. *Vía Primavera is a fashion district in El Poblado neighbourhood that has become a public referent of city life in Medellin – Colombia, a space that is shown as inclusive and accessible to all types of collectives. This paper is part of a research which purpose is to understand the connection between the public space with its moral and physical organization and the exclusion processes that the clothing conspicuous consumption generates in Via Primavera. The analysis of this connection is subjected to a mutual play between prior structure and agency and the crystallization, or not, of its existence through an interrelation. In the same way, a concern about the city models resumed in the national and local development plans, and its relevance as the ones that set the social and economic ideal of public spaces arises. An ideal that contradicts with practice, where exclusion processes through consumption practices bring a tension in what is supposed to be public, breaking with its inclusive and collective character.*

Keywords: Spatial transformation, Fashion consumption, exclusion and inclusion processes, Development Plan.

Introduction

This article presents some results of the research: Fashion, city and economy, circulation and circulation spaces in Via Primavera in Medellín, Colombia.

The research1 addresses the consumption and circulation of fashion and gastronomy impact in this district, originally residential and, later, commercial. All this, through the consumption practices generated there and the spatial transformations that have shaped the place. These transformations has transcended the physical character of the constructions towards social and economic transformations, originating new ways to inhabit it.

In this study, concepts about fashion and consumption, fashion and space, and space and consumption are discussed. All of them together impact the space that is being studied, providing and orienting towards a new character.

Through interviews, urban and architectural analysis and authors' analysis, a methodology that seeks to show, according to each theme, its influence and tendency and to anticipate the problems that can be generated, is constructed. This article exposes how Medellin's antecedents as a fashionable city, in addition to conspicuous consumption trends (present today after so many years), trigger physical transformation and change the social dynamics with the reconstruction of the original residential neighbourhood and its architectural and urban particularities, leading to tendencies arising from the change of use. Tendencies that have unleashed a conception of it, that in its beginnings was unthinkable for the city but is crucial for the present moment, because of its location as a hotel and gastronomic centre

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as well as its strong economic definition and tendency.

From the city of textiles to the city of fashion

One of the main economic activities of Medellín has been the textile industry. In 1965, its greatest economic occupation was concentrated in this productive sector, taking this tradition to the present days. That allowed that, at the end of the last century, not only the most important textile factories of the city were built, but the design of the main working-class neighbourhoods, which constituted much of the residential and urban fabric of the city. Textile industry had a growing development since its foundation until the mid-1980s, when a veto of the United States tried to curb its development. This obstacle became an opportunity to group the main actors in the sector to have a national and also an international representation.

The reason of starting an industrial activity in an almost inaccessible valley (Valle de Abrurrá) where is placed Medellin, was justified in the fact of being able to supply the region and not rely for textile inputs from abroad, who came with very high costs to the city. In spite of the difficulties in the beginning of the textile activity, the nascent industries took advantage of the same condition that interfered accessibility in and out of the valley: the difficult geography provided with abundant falls of water the river of the central valley (Medellín River) that provided energy to the first factories that settled on its banks (Londoño Yepes, 1983).

INEXMODA was born in 1984 to compete in the Latin American and global market related to production and fashion services (INEXMODA, 2005). It has had a great development as a business, with two annual fairs that are iconic in the region; Colombiamoda (A fair that is based on business, fashion trends and shared knowledge) and Colombiatex (textile, input, machinery, chemicals for Clothing and home sample). The development in the fashion design area also had a significant impact and supported the growing industry, with fashion and clothing design schools, as well as institutes, where a cradle of designers and own production of fashion products was constituted.

Over time and with the opening to global economic dynamics, the textile industry sustained an important transformation. Textile production began to compete with the global market, and production, marketing and design emerged to complement the industry's productive system.

In recent years, emerging brands began to place in different areas of the city, showing greater presence in the design district of Vía Primavera named that way by the pioneers of this initiative who referred to an appellation of the city (Medellín the city of eternal spring). The objective of this design district was to associate a large number of fashion brands that were producing and marketing original design products in the same sector.

Eventually, the process was supported by the most important merchants' guilds of the city, which saw in this initiative an opportunity to organize themselves and other merchants to promote a character focused on independent brands interested in joining the project and encourage their participants to collaborate, more than to compete. This initiative took place in El Poblado neighbourhood, on 37th street, where the first clothing stores own by independent designers appeared, moving away from the typical consumption dynamic that was in Medellin until Then: the mall.

El Poblado, from a Little settlement to a new centrality

Vía Primavera is located in the 37th Street, in the border between Lleras and Provenza neighbourhoods in the centre of El Poblado, one of the most traditional neighbourhoods of Medellín. Even though at the beginning it was a small settlement and it was not part of the urban perimeter of the city, as Medellín grew and the necessity of a bigger urban field was required, it became part of the city because in 1945 due to its urban and economic potential for a future development. (Figure 1)

The Lleras (1937) and Provenza (1956) neighbourhoods are projects that were built by the same state agent (BCH – Banco Central Hipotecario)2 with almost 20 years of

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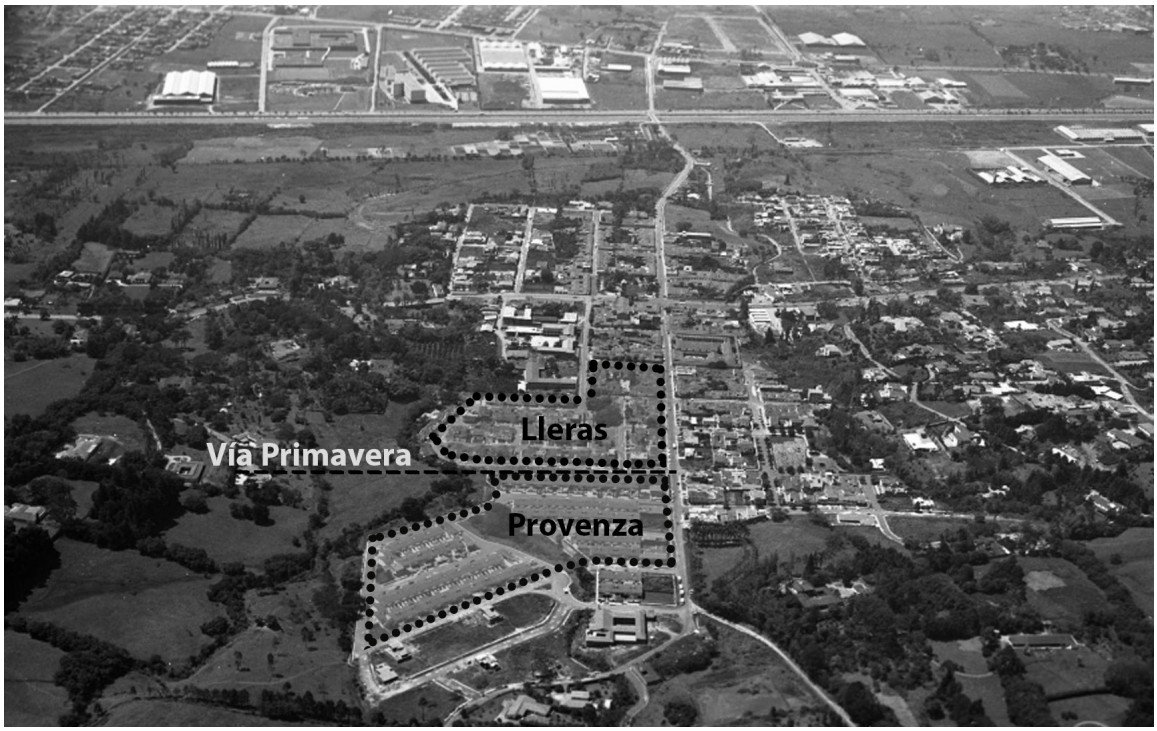

Figure 1. Aerial view. Vía Primavera, Lleras and Provenza neighbourhood. Source: Photograph archive Piloto Public Library. Photo by Gabriel Carvajal Pérez, 1963.

difference, have multiple differences such as typologies and urban disposition.

The Lleras neighbourhood consisted of a traditional neighbourhood design for the time, with a very important base of a park with most of the houses around it focused on a strong relation with the street and the interior exterior relation. Houses were approximately XX m2, so many rooms designed for large families - according to their time.

Provenza neighbourhood, on the other hand, reflects the influence of the modern movement that Medellín adopted not only for its buildings but also for the design of the pilot plan that would define the future development of the city, elaborated by Wiener and Sert in 1950. Proveza hosted another type of urbanism, defining narrow lots for a better use of the land and rationalized the soft slope terrain in which it was located. Its architecture was framed in a measured architecture, for a family not so numerous, with a much more interior relation and simpler and defined volumes and proportions, an area of approximately XXm2, and adjusted program, simple but flexible structure system and more controlled spatial boundaries. (Vélez Ortiz et al. 2010) (Figure 2) Due to its rapid urbanization since the 30's of the previous century, El Poblado has had different models of territorial development and has been built under variable criteria. The perception of its built environment is a reflection of these constant changes that its planning has been caused by trying to satisfy the growing demand -even today- of inhabiting its territory. This massive and disorderly urbanization has brought some consequences, such as the lack of vial infrastructure, lack of adequate public space and lack of services, in a neighbourhood completely dependent on the car despite the constant efforts to equip it to mitigate the consequences of its accelerated growth.

Particularly in the area called El Poblado (center), where the Vía Primavera is located, has been assigned with the category of Centrality because it is inscribed in the polygon Z5_CN4_9. The Centrality System is defined as (Alcaldía de Medellín. Concejo de Medellín, 2014):

The Centralities are places of the territory with a strong capacity of attracting of people, where there is place for high exchanges of

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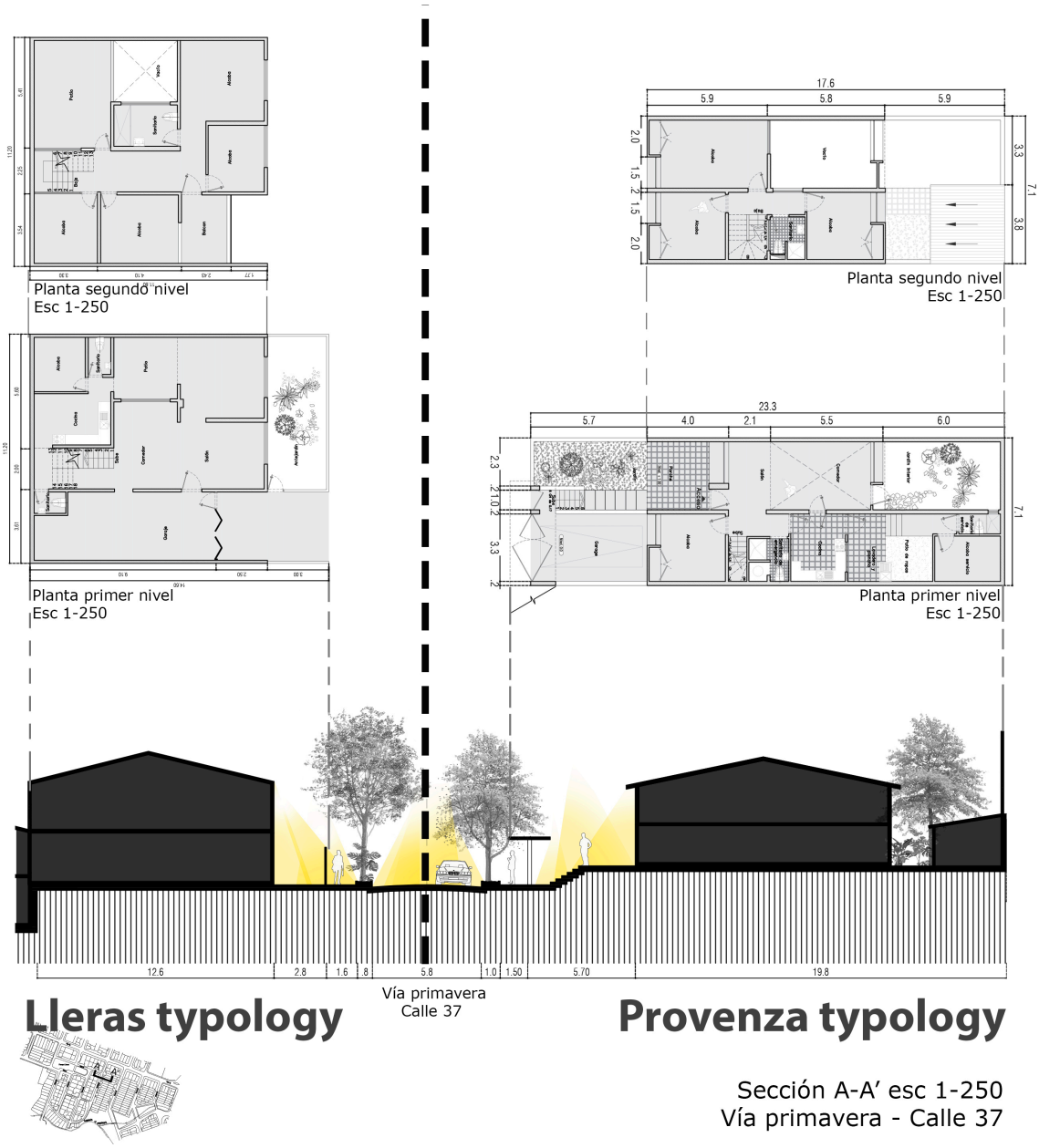

Figure 2. Lleras and Provenza houses typology. Ground and first floor, street section. Source: Authors

goods and services that act as multifunctional spaces of different scales.

The Centrality subsystem is a polycentric network of multifunctional spaces of different scales, where the public and collective systems are synergistically articulated with the urban and rural socio-economic structure, mix of uses and intensity in the occupation of the land, generating spatial and functional tension in the territory, according to its capacity for the provision of services and generation of flows of people and exchanges of goods.

The centralities, not only provide services to the communities, they are also essential in the production and development of social capital, science, technology and innovation. (p. 295)

The Centrality of El Poblado (Z5_CN4_9) is defined as a Centrality of first order, of City scope and is classified under the character with economic emphasis. This classification has influenced the changes in the sector since 2006, in a process of adaptation to the regulations

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to accomplish the assigned character. It has brought as a consequence the gradual change of use, replacing the original sense of the residential neighbourhoods in places that mixes different uses, mainly commercial and services and gradually producing changes in the architectural typology and in the future, in urban morphology.

Consumption practices

The decision of the municipality to define a polygon as a centrality in this place brings as consequence the change of use, and with time the physical change. In the case of El Poblado centrality, towards the end of the nineties, a vocation oriented to places of entertainment and gastronomy began to consolidate, which being in an exclusive neighbourhood of the city had shades of prestige. This place is called Zona Rosa and initially was a symbol of exclusivity and class.

The expansive effect of the Centrality, brought changes in the street of Vía Primavera, which consolidates as a commercial walkway where other type of businesses make their appearance, such as gastronomy business and bars, activating the place not only during the day, but also at night. Inhabitants completely change, families become consumers -mostly young people- that looked for an offer of clothes and accessories -initially- different from the one that can be found in a mall, and also the possibility of exhibit themselves and being seen.

This kind of commerce oriented to the passerby who seeks something exclusive and wants to be seen, acquires nuances of a phenomenon associated with the Theory of the leisure class (1899) formulated by Thorstein Veblen, sociologist and economist of the nineteenth century, and that consists in the recognition of certain social groups through the ostentation related to the consumption practice as an expression of their economic power.

This is how conspicuous consumption is validated in the development of consumption habits necessary to be able to exercise this socioeconomic practice, which also acquires its value when it is taken to the public sphere to demonstrate domain over others through the exhibition of what is acquired; individual expressions become public through collective actions. (Veblen 2005).

The ostentation, Veblen spoke about, was directed to acquire luxury goods to gain prestige. Today, this phenomenon has changed, transcending the ostentation of goods to establish a product symbolism with social intentions referred to ways of doing and being of certain groups which purpose is to gain recognition and social prestige (Kawamura 2004). (Figure 3)

El Poblado is one of the neighbourhoods where the wealthy people of the city of Medellin settled. Both in the Zona Rosa and in Via Primavera, these practices of exposure to acquire prestige and status are present. The fact of living there, is a social symbol of status, but also it is to visit these places and, especially, to be seen in there. Many times people don't even go to consume in this place, instead, they go just to expose themselves. That way, Via Primavera becomes a stage and a gateway for the acquisition of a social status; about this, Veblen says (2005):

In the modern community, there is more frequent attendance to places where a large number of people that are unknown to each other in daily life congregates -places such as churches, theatres, dance halls, hotels, parks, shops, etc.- In order to impress the temporary observers and preserve the own esteem; while under observation, the signature of the individual pecuniary strength must be written in characters which every passerby can read. (p. 93)

The city becomes the sphere where the socioeconomic practices exercised by man and his interaction with others and their ways of living; and fashion and the facade as a link to forms or ways of life (Park & Burgess 1984), this is how the relationship with Veblen is linked, who gives to these forms and ways through the process of imitation that is no longer that a form of communication that emphasizes the differentiation and that Park understands by competition.

The loss of the bonds of the primary groups in the urban environment in which we live and the increasing acceleration of mobility

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Figure 3. Vía Primavera, street view towards Provenza side. Source: Authors.

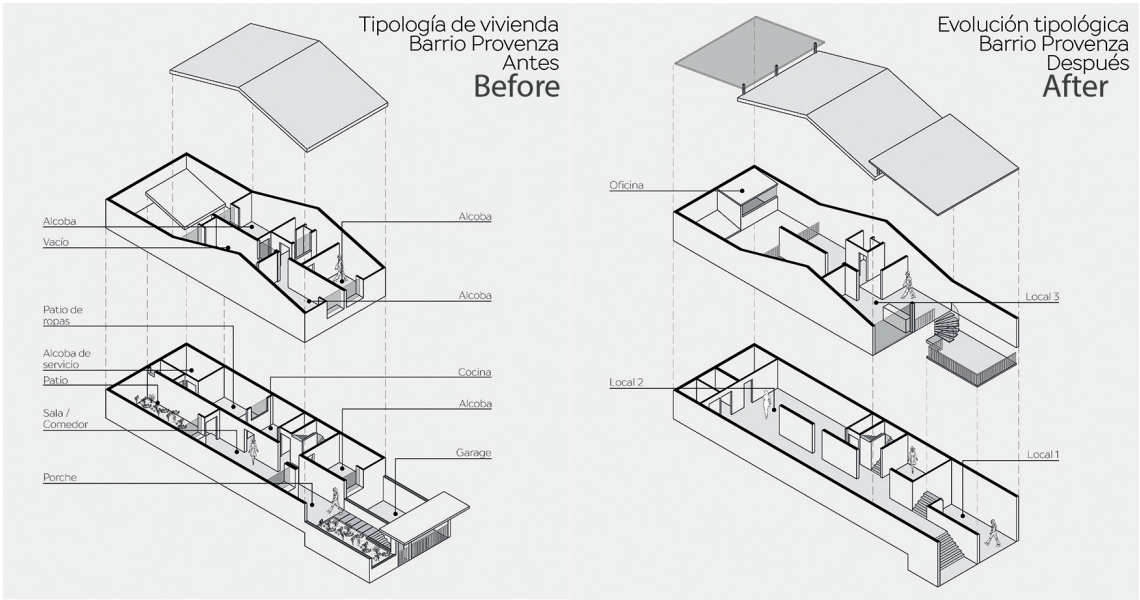

Figure 5. Spatial transformation. Provenza house. Source: Authors.

has surrounded the realities of strangers who depend on external signals. The opportunities for association and connection between different individuals, and even social groups, have increased; even so, they have acquired a transient and not stable character. In modern society and its eagerness for urbanity "the status of the individual is largely determined by conventional signs -by fashion and the "facade"- and the art of life is basically reduced to skating over fine surfaces and to a scrupulous Study of style and forms [Manners]" (Park &

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Burgess 1984). According to this, each of the members of a society plays a specific role, through which it knows itself and others in a given context, manages to move from a state of individuality to a character that allows it to be recognized in a collective.

In relation to the above, due to the phenomenon of the city in which secondary social relations excel, individuals tend to divide and specialize more and more, and also to rationalize their actions, that is, to order them as they are carried out, so that they become more and more practical and technified. This is why Park calls cities: the social forms that predominate in modern civilizations, where each individual concentrates on a single task, and in order to succeed in every action he performs, he develops rational methods, technical means and specific competences.

Imitation and competition are two processes that according to theorists Thorstein Veblen and Robert E. Park organize and define the behaviour of individuals in a modern society that is constantly readjusted. In this section, the role of consumption and its relationship with clothing products is pointed out; two elements in which these processes are implicit, and which become social mobiles in the measure in which the interests are directed towards the search of prestige or social esteem. Competition, through which the characteristics of imitation are visible, brings with it tensions that are expressed through processes of inclusion or exclusion in a given space; this is the Via Primavera, in the city of Medellin. This last phenomenon will be transversal throughout the chapter, indicating the adoption and validation of habits crystallized in ways of life (being and doing).

In this sense, it is this socioeconomic practice, a condition linked, not least, to the spaces in which it is contained, explained from the same and from the material and even moral contents that are acquired in them. It is evident then that the space is a category transversal to the subjects specified previously, and those that will come. In this sense, the city and practices such as consumption, are transformed to the extent that new spaces take on meaning.

With Veblen's economic theories of fashion and consumption, disciplines such as economics and sociology begin to address socio-economic processes such as the consumption of clothing products, and begin to refer to them as symbolic systems that establish social differences. According to this, the mere fact of consuming does not express any symbol if there is no witness who recognizes and validates what is being exposed. The dress here plays an important role since it is related to private property, since it becomes an artefact that fulfils the function of making visible the distinctions of value between individuals or groups. (Veblen 2005)

However, from what has been previously conceptualized as fashion, clothing products support the expression of the economic and social culture of a population, and are those goods that; by means of the social change that happens due to the processes of imitation; make it possible for value distinctions to be considered as ways to achieve esteem or social or personal prestige.

It is worth noting that in the framework of consumer practice, there are multiple elements that can be part of it; even so, the emphasis on dressing products lies in the immediacy with which images and ways of life communicate, to be in sight. In Vía Primavera, the consumption of this type of goods is an important part of its economic activity; since its formation as a corporation, and its introduction to the Textile / Clothing, Design and Fashion Cluster, clothing products have become a means by which not only specific economic status is evidenced, but the individual is also recognized as a public; this is due to their participation in specific collective activities in that space, such as consumption practice (Park, 1996).

In this way, when in the city of Medellín we talk about Vía Primavera, a constant reference is made to certain values of inclusion and collectivity, values that have the possibility of being expressed, or not, in space, through the clothing product, making readily apparent, ways of life of social groups, which are validated according to the manner in which these clothing artefacts are consumed and exposed.

The "public space" that configures Vía Primavera has been previously structured and imagined with an inclusive city model; Even so,

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its public character can not only be determined by the discourses found in institutional reports; it is also a structure imagined and organized by different practices, such as the consumption practices of clothing products.

It is important to reiterate that once certain consumption habits are adopted, processes of exclusion arise based on whether or not they belong to a given context; this is because interactions and behaviours are stipulated by a collective, and who behaves differently, is not allowed to give attributes or qualities to space; that is, you cannot access it. (Park, 1996) (Archer, 1988).

According to the above, this practice, in a space like Vía Primavera, causes cultural and economic dynamics to be centralized, and in which and through which private interests find expression, determining a way of being and making them Generates imbalance and social instability (Archer, 1995). This space has been imagined with values of inclusion and collective integration, where each individual or group has the possibility to express themselves. However, the way it is consumed in Via Primavera ends up contradicting those intentions, and the discourse that names it as a space to which all the population can access, is fractured.

According to Manuel Delgado in his text "Virtuous Circles: New Languages for Social Exclusion" (2005), inclusion and exclusion are a particular complexity; the boundaries that separate one from the processes of another are porous and their crosses are subtle. Depending on the meanings given by speeches and practices and how tensions between them are resolved. As the structure is interdependent of the agency, the process of exclusion is the process of inclusion. In relation to this, in Vía Primavera they are recognized as stressing processes to the extent that the way in which public space is thought and organized legitimizes certain strategies and behaviours that, at times consciously or unconsciously, exclude from the "public space" everything What for being alien, is problematic for them. (Delgado, 2005)

Conclusion

In Vía Primavera, two different phenomena converge so their transformation will be carried out, on one hand, the normative definition of the polygon where it is located and on the other, the consumption practices that are beginning to take place both by the prestigious character of the neighbourhood, as by the type of commerce -fashion and gastronomy- that is located in the place.

The consumption practices have altered the social behaviour of the place, on one hand, they displace their original population to accommodate new inhabitants, but also, on the other hand, the fact that Vía Primavera focuses on the sale of fashion and gastronomy in a place that has the connotation of exclusive, runs a great risk of becoming an space of exclusion.
Although the two typologies of housing present in the sector -Lleras and Provenza neighbourhood- are quite different from each other by the different historical and urban moments in which they are born, the transformations to which they have taken place are more uniform than it seems. On both sides of Vía Primavera, the transformation gradually began, first with the subdivision of its spaces, garages that became stores or disused rooms that became offices or art galleries. These modifications have generated some striking spatial changes.

The commercial success of the place has brought with it, in addition to visitors, investors with greater capital power to invest, which has caused that the dwellings -that mostly are of their original owners- are intervened of important form, giving them a different character to the original. (Figure 5). But the transformation in the last 3 years -since the new Local Plan has been in force- has precipitated, to the point of not only transforming the existing typologies, adapting them for commercial or service uses, but also replacing them with completely new architectural pieces, as well as the architectural and urban unity that existed before.

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Figure 6. New arquitectonic building over Provenza side. Source: Authors.

Notes

1 The research project consists of research groups GIDVT (Research Group on Clothing Design and Textiles) and GAUP (Research Group in Architecture, Urbanism and Landscape) of the Faculty of Costume Design and the Faculty of Architecture of the University Pontifical Bolivarian.

2 The Central Mortgage Bank was a state entity in charge of financing and executing programs of urban and architectural development in different cities of Colombia.

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Reading Nablus' urban print: Towards an understanding of its morphology

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Abstract. *Nablus old center stands as a typical Arab city with a relevant geographical location. Successive historical periods distinguish its history - from Canaanite to Roman, Byzantine, Islamic, Crusader or Ottoman - till nowadays. This cultural diversity has layered chronological strata on its urban fabric. Therefore, diverse historical characteristics reflected in the city's urban morphology have undergone continued physical and functional transformations, not only gradually by time and various socio-cultural, economic or political factors, but also radically by earthquakes and war destructions. Present-day Nablus' physical image echoes a palimpsest of urban/social identities and an asset for a very sensitive collective memory. This paper examines the formation, evolution and constitution of the old city of Nablus by a retrospective analysis that searches the morphological momentum for each phase in articulation with a reflection around its historical meaning for the city. Methodologically, this study is conducted on both urban and architectural levels, surveying street hierarchy and plot distribution. This understanding will be extremely important for an accurate perception of this tissue in order to advocate for a concerned idea of the city's reconstruction, following recent urban annihilations. At a time when urban rehabilitation pushes plans for quick and immediate results, reading Nablus' urban morphology can work as the lacking tool for an instructed and operative regeneration.*

Keywords: Nablus, Palestine, urban morphology, urban evolution.

Introduction

Cities can be read through its urban form and the built environment is a physical representation of people's everyday life, it is socially constructed and where several activates take place. Thus, it can act as a mediator that stores the socio-cultural signs (Halbwachs, 1950) and celebrate the society values and meaning (Moudon, 1997a). However, as a result of continued and dynamic interaction; between people and their place, built environment is under a constant evolution and transformation. With time, layers of history have accumulated in the urban fabric. Specifically, this can clearly be realized in traditional old towns, which were constructed in a more sensitive way to meet human and functional needs than in the contemporary time (Youssef Hoteit, 1993).

To this regard, scholars have insisted on studying and analyzing urban form together with the socio-cultural context, as they are two aspects of one phenomenon. For long, urban morphology was seen as a tool for understanding the creation and transformation of the urban form. Morphological analysis were undertaken to understand the historical roots and the development process of the built environment as well as to identifying the constituent parts that compose a city today, either on the urban or on the architectural levels, in addition to that, highlighting the motivations behind the evolutions and transformation of the urban fabric. However, urban morphology

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must be a multidisciplinary approach that associates different perspectives for a deeper reading and understanding of the urban form. (Moudon, 1997b).

Nablus' is a historical Palestinian city, which has a very high cultural value. Since its establishment, it passed through many urban transformations as a response to several historical and cultural changes. Today, the city has a vital and lively historic center, where people live and undertake several commercial and trade activities. However, these days, the city urban fabric faces several urban challenges either by development and rehabilitation projects or even by annulation. Nevertheless, throughout time the city has always showed flexibility in adjusting changes for each historical period, while keeping signs of each of them. So far, when all the urban development project push forward its plan, reading the city urban morphology gives the opportunity to understand not just the current urban form but further` it can be a tool for better understand and perceive the urban fabric for further promoting urban transformation.

Methodology

For a systematic reading of Nablus urban form, this paper highlights the main historical developments and their influence on the transformation of the urban fabric. Moreover, in order to read the urban form, the study conducted an urban morphological analysis on both urban and architectural levels in Nablus' old town, resulting in an updated survey that takes in consideration street hierarchy, plot distribution and residential quarter structure. On the one side, this analysis wishes to explain the built environment of Nablus, showing the roots of its establishment and transformation. Meanwhile, it hints on the relation between culture and urban fabric. This understanding contributed to have a more accurate perception of the city tissue and the roles behind its metamorphosis. Moreover, it highlights some principles that can be useful for thinking about further development. This composition of the urban fabric explains the planning continuity in Islamic cities. It is not enough to see the old town as an artefact but as a structure that contains a complex of meaning and value that lead to constructing it (Nasser, 2003).

Nablus historical background

Nablus is one of the oldest Palestinian cities. It is located in the north, on a strategic position in a narrow valley between two high mountains, making it the most important opening in a mountainous range. This position has always granted the city a lot of importance as it became not just a junction for several ancient trade roods, but also a cradle for different civilizations, which obviously influenced the society's culture as well as its urban fabric. The history of Nablus goes back thousands of years ago (Al Fani, 1999). Although the current urban fabric reflects a typical example of an Arab-Islamic city in its unique urban form and architecture, it has kept different signs from each historical period, collecting many valuable buildings spreading in its fabric.

In the middle of the third millennium BC, the Canaanite established the first permanent human settlement in Nablus (Al Fani, 1999). Yet, the current location goes back to the Roman time, when the Emperor Vespasian destroyed the old city and built a new one in the middle of the first millennium around 72-73 CE, called Flavian Neapolis. The Roman city developed on three different stages as many Roman signature buildings were added to its urban structure, such as a theatre, a hippodrome, a basilica, and thermal baths (Tuqan e al, 2011).

Later in 636 AC, the Arabs conquered the city and from that time on, it continued under different Arab-Islamic rule, namely Ayyoubed followed by the Mameluke, and eventually the Ottoman rule, except for a crusader interruption in the 12th century. During these times and due to the pronunciation of the word "Neapolis", it later became "Nablus". So, under such different Islamic periods, Nablus flourished and grown, not just as an important commercial-trade center, but also as a producer for several goods, notably soap and olive oil. Socially speaking, its population was a mix of Muslims, Christians and Samaritans (Tuqan et all, 2011).

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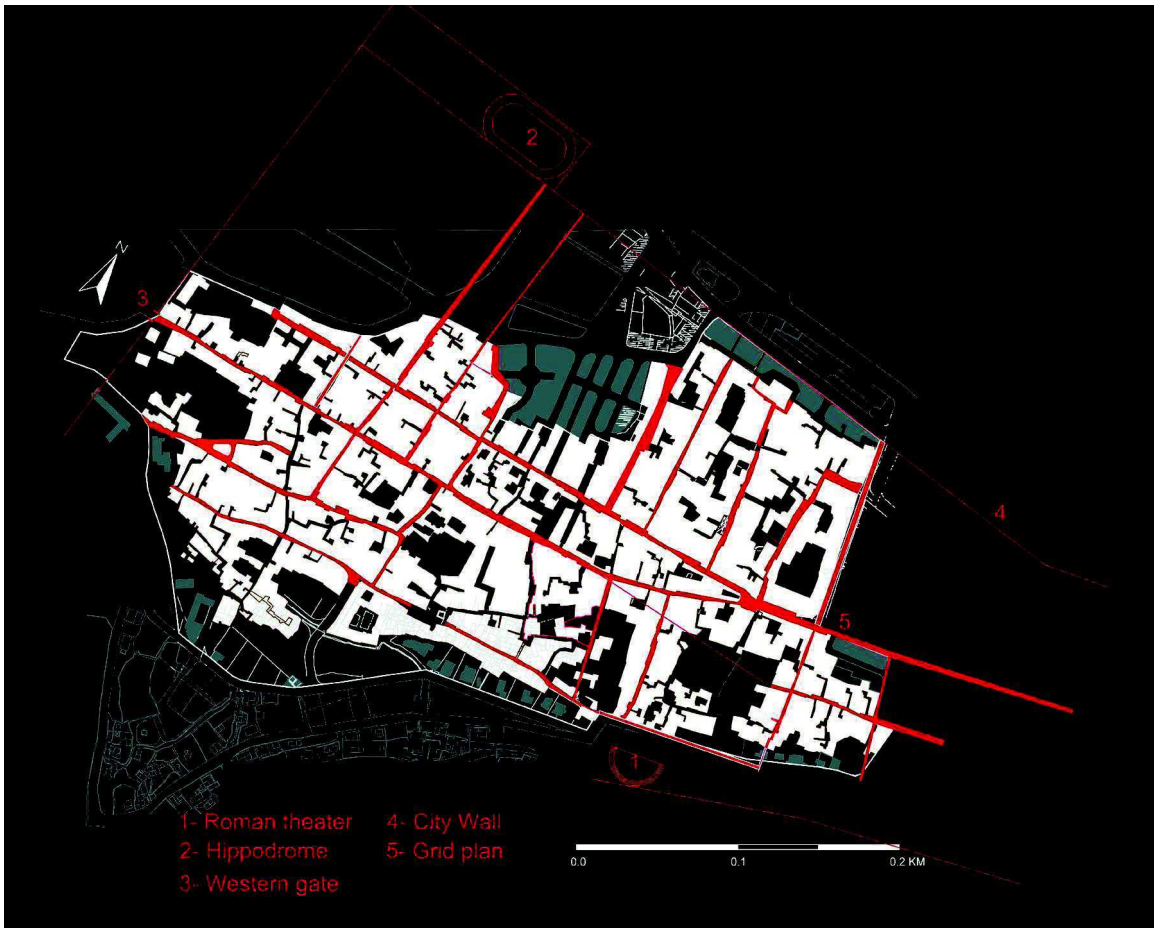

Figure 1.
Roman street layout of Flavian Neapolis (Nablus), according to Nablus, Enduring Heritage and Continuing Civilization. 2011. [6]

However, after the collapse of the Ottoman Empire, the city went under the British mandate and, in 1927, it was hit by a major earthquake, which destroyed a great part of its urban fabric and many of its historical architecture and landmarks were lost forever. This catastrophic event led to an expansion of the city beyond its traditional historic borders. Between 1948 and today, the city lived under different political scopes: from Jordanian rule to Israeli occupation and current Palestinian administration.- More recently, , the city has witnessed an unstable political situation, with a climax in 2002, year of another invasion and consequent destruction of the historic center, severely affected (Al-Dabbeek et al, 2002).

From a rigid grid to an organic plan

Like most of the Roman cities, Nablus was first established based on a grid plan that consisted of an east-west main axis called Decumanus maximus, passing through the old town and intercepted at right angles by many secondary street, dividing it almost into equal blocks (Figure 1). The Roman domination of the city saw three stages. The first was the construction of three quarters in the south; then, around 131 AD, Emperor Hadrian built another three quarters in the south; and finally, Emperor Phillip expanded the city to the west in 244 AD and added a new quarter. However, the trace of the Roman plan can be noticed in the present street network and several archeological remains spread all over the city (Tuqan et al, 2011).

After 636 AD, when Arab rulers conquered the city, Islamic culture was slowly inserted in the society and affected the urban fabric (Tuqan e al, 2011). Gradual transformations

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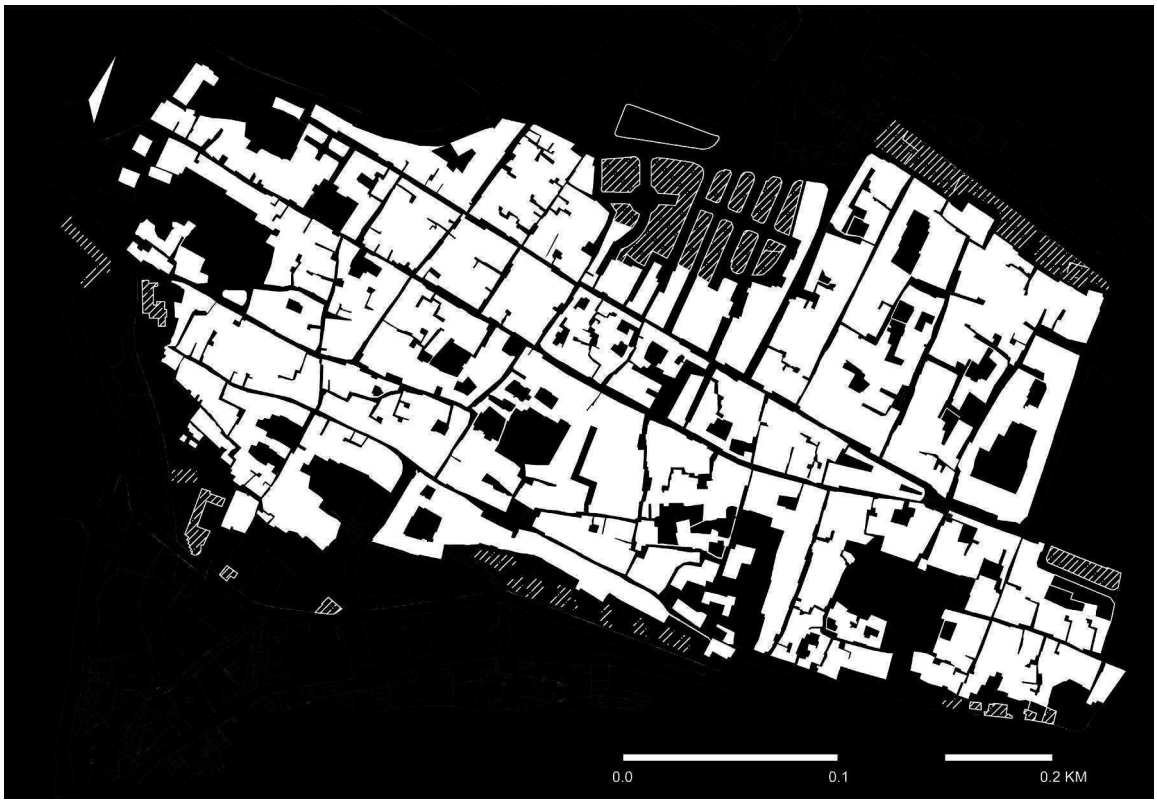

Figure 2.
The existing urban fabric of Nablus old town

started to occur in the city to fit novel cultural and functional requirements since the transformation occurred in the frame of the Roman urban layout. Common rules extracted from the Islamic culture, such as privacy and respect to the others right, regulating the main public and private spaces, led to major urban/ architecture transformation and resulted in a unique arrangement of dense and cluster urban fabric (Hakim, 1986). Thus, streets straightness started to bend and in the residential quarters, they were even closed with houses gathering around a dead end artery forming a small square called "Housh". As a result, a strong rigid grid plan was transformed into an organic and flexible one in Nablus plan (Petruccioli and Pirani, 2002). (Figure 2)

Today, Nablus urban fabric is still composed of six residential quarters (Figure 3), having two main commercial streets passing the city east-west; meanwhile, significant architecture emerged, whether public, religious, residential or symbolic monuments such as mosques, traditional soap factories ("Sabannat"), Ottoman palaces, churches, Turkish baths ("Hammamat"), Caravanserais ("Khanat") and extended family houses ("Housh")(Arafat, 2012). (Figure 4)

Space hierarchy and the "Housh", a cultural urban print

On the urban level, it is possible to observe two main characteristics: first the variation of the spatial hierarchy; secondly, the transformation inside the residential quarter to form the semi-private square called "Housh".

Space hierarchy varies from openly public in the commercial area frequented by everybody, to exclusively private in residential areas, which is reserved for the local inhabitant. These act as devices serving the social order in its desire for privacy, exclusion and filter of people's movement and accessibility. Between them lies a 'buffer' zone that can be considered as a semi-private or semi-public. Each level of space hierarchy has its arrangement and rule of transformation, character, function, width, architectural elements and level of accessibility, which are all specific to differentiate these

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Figure 3.
Quarters in Nablus old towns.

areas and serve its order (Taher et al, 2015). (Figure 5)

The two main public streets extend east-westwards through the entire city. Located on the trace of the old roman main streets, they host the main commercial center ("souk") and provide a place for economic, social, and cultural activities. These two streets are characterized by their openness, light and vitality, a big part of them being covered to provide protection. Buildings on these streets are multi-stored; often-residential units are placed on the first floor with indirect entrances from a side entrance or through a set of stairs. These major canals connect important city elements such as public baths, the market or the main mosque. (Figure 6)

Meanwhile, another secondary street network, varying from public to private, connects different quarters. The semi-private/ public spaces are another level of hierarchy connecting both public and private spaces. In most of the cases, they serve a light commercial use. Buildings on these streets are multi-stored. Often residential units are placed on the first floor with indirect entrances from a side entrance or through a set of stairs.

On the contrary, the nature of the residential street - cul-de-sacs - is different. Mainly they are private streets within residential quarters. Their width is narrower than the public street, allowing for the neighborhood residents only. The private street function within a quarter is played by a "Housh" most of the times. These lanes work as filter corridors. (Figure 6)

From main streets to cul-de-sacs leading to each house, Islamic urban culture is significantly more related to social aspects of private life than to geometrical questions of regularity. "Housh" in Nablus show a tendency to conduct the pedestrian towards less public and more private areas of circulation. On the one hand, it grants accessibility for residents and, on the other, it restricts mobility by keeping strangers and outsiders out and ensuring safety and privacy for its residents. Residential streets act

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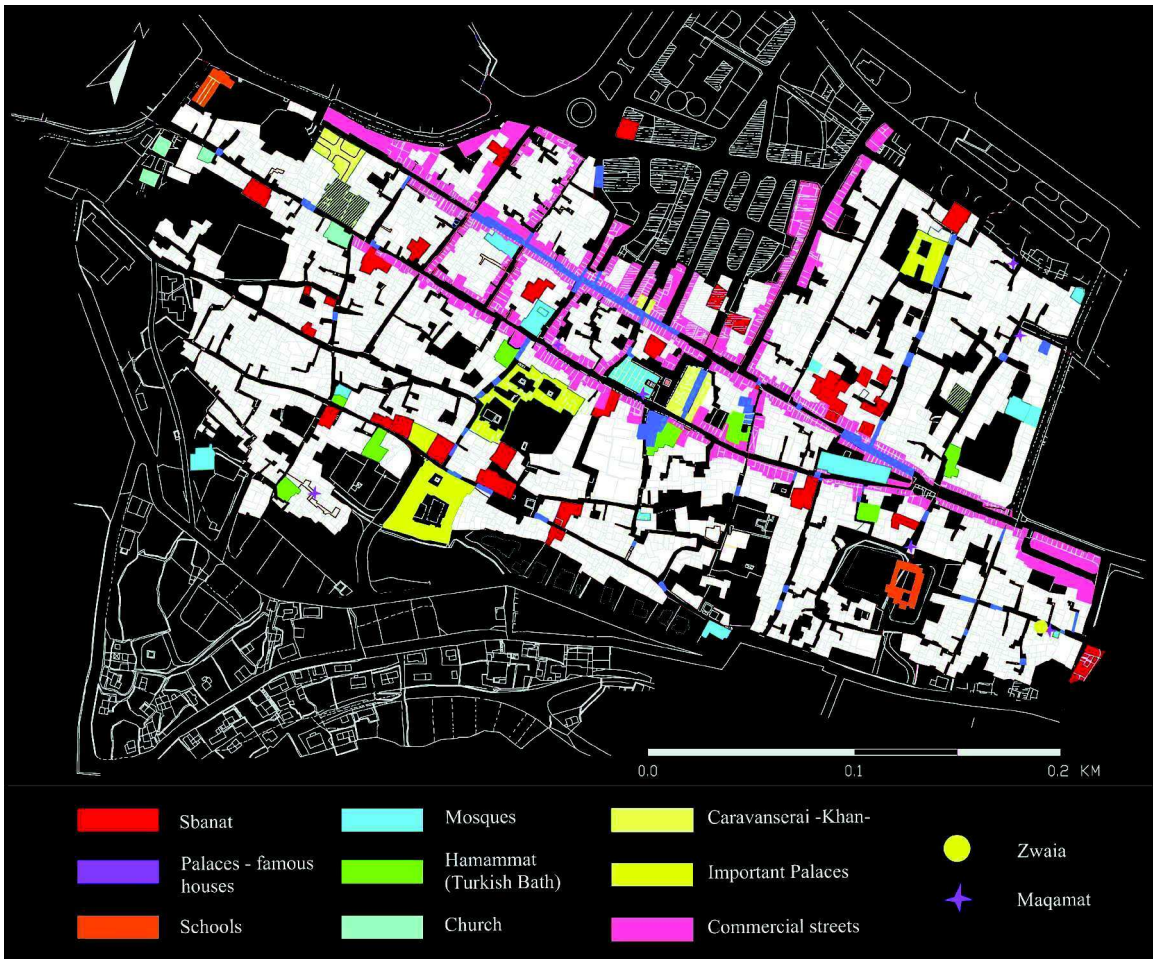

Figure 4.
Land use map in Nablus old town.

as devices serving the social order in its desire for privacy and exclusion, serving as platforms for social activities among neighbors and providing safe sheltered areas (playgrounds) for children to play, for example.

This distinguishable transformation has occurred in the spatial configurations inside the residential quarters. Houses plans have evolved taking into account privacy and neighbor's rights as main urban criteria. In the same arrangement, groups of houses were gathered around such semi-private space, and probably resulting from the closure of an open street or square to serve the privacy and intimacy purposes. Traditionally, it was shared by people from the same family and gets the family. However, the "Housh" as a semi-private space can be considered an outside extension of the houses themselves, used as a garden or an exterior space, where many private and social activates can take place. Besides, it provides a safe place for children to play under the eyes of a monitor.

On the architectural level, obviously, residential spaces referred to the social criteria too. The application of these criteria is sufficiently flexible though, having been considerably affected by neighbors' agreements, ownership, personal desire or functional and contemporary necessities. Houses plans have also evolved to consider privacy and neighbor's rights. Privacy is reflected in the building composition and orientation towards internal spaces (courtyard), while its openings were minimum to the streets. When that happens, they are high or small or treated with architectural elements to keep the internal privacy. Thus, behind the walls, a new private world can be found. So, whereas the public space belongs to everyone, stepping

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Figure 5
Nablus Streets Hierarchy.

inside a house gate means discovering a new world only accessible to residents or guests.

Conclusion

Today, the urban fabric of Nablus old town is the sum up of all of the historical layers as well as the interaction between people and their place. The old town was developed through different periods of civilization. Not just the social, cultural, economic changes have affected its urban form, but also natural and manmade disaster had influence on its urban fabric. From the roman grid plan, the city was transformed to suit Muslims culture after the 7th century AD. However, centuries of Islamic cultural domination have endured a continuous process of adaptation of the classical urban heritage as a response to cultural and social requirements. Since then, socio-cultural criteria led a profound urban transformation while keeping the trace of the original city.

The field survey shows that the urban fabric of Nablus can be understood in the frame of a tight dialogue between social behavior and the traditional built environment, which generate the source of value that legitimizes its physical structure. This frame allows the city to flexibly adapt to peoples cultural and functional needs and recreate its identity. Privacy and respect to the neighbor right were among the main principles that affect the urban morphology of the city: residential quarter street character, function and levels of accessibility.

Cultural urban history can play a fundamental tool and resource for reconstruction processes by reading the city urban morphology. It is important to advocate for a concerned idea of intervention, especially following urban annihilations. In fact, from 'urbicide' to recent economic challenges, any further development

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Figure 6.
left: "Housh"; middle: Semi Public street; right: Main commercial street "Souq".

or rehabilitation process should embrace a strong cultural vector in its method, the only way to guarantee a smooth social continuity. Regarding this, socio-cultural criteria work as a paradigm to inform the transformation and this couldn't be more true in Nablus' old town.

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Urban sprawl and citizen participation. A case study in the municipality of La Pobla de Vallbona (Valencia)

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Abstract. *The accelerated urban growth of the last decades in Europe has caused, especially in the Spanish Mediterranean coast, a paradigm shift in much cities, moving from a mostly compact urban form to a more diffuse one. The concept of city has changed so much that even in a lot of dispersed municipalities, it becomes difficult to define its limits. This change implies not only ecological and economic impacts, but also, social effects. Urban sprawl makes difficult social interaction and reduces the community feeling, and therefore, social cohesion and identity. This produces also changes in the relations of citizens between them and with the city council. The research propounds a discussion about the challenges that the urban sprawl causes for the application of participative models in the decision making, understanding them as basic criterion of good government. We analyze a case study to extract the complexity of articulating processes of citizen participation in territory with high dispersion based on a project carried out in the municipality of La Pobla de Vallbona (Valencia) on participatory budgets. It analyzes the results of the process carried out in relation to the urban model, the morphology of their urban pieces and spatial structure, and the demographic and social characteristics of the municipality. The question is identifying the problematic for the articulation of participative processes in territories with this idiosyncrasy. Finally, the article suggests a series of strategic lines as starting points to achieve participatory processes in the city characterized by urban sprawl.*

Keywords: Urban sprawl, citizen participation, municipality, La Pobla de Vallbona.

Introduction

Historically, the city was the spatial expression of urban fact. It was characterized mainly by size and density, but also certain social characteristics, such as heterogeneity, "urban culture" and degree of social interaction (Capel, 1975). The city, as opposed to the rural one, was a space of interrelations occurring in the public space. This approach to the city was valid for the tradicional city before, when mobility was less and most urban functions were produced intramural. Now, although there are some exceptions, it is difficult to establish the limits of the cities. In many case, in actually city, it is very difficult to answer to questions such as where urban ends and where rural begins.

For several decades in Europe, in Spain and the Mediterranean basin, there has been a paradigm shift in the city model. In much of the territory, it passed from a traditionally compact city to a dispersed one. The growth of the dispersed city has been particularly important in Europe (EEA, 2006, EEA, 2016) as well as in Spain where there has been an intense process of land consumption, accompanied by a growing dispersion. This process is known as urban sprawl. Artificial areas has increased between 1987 and 2006 of 52%. This trend,

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in spite of the end of the housing bubble, continued until 2010, as a consequence of the inertia of some artificial processes initiated during the last phase of upward cycle. In the case of the Valencian Community, the period 1987-2005 also shows a strong expansion of urban land, especially in the coastal zone (Zornoza, 2013). Evidently this growth has not been homogeneous and has resulted in a strong space specialization giving different urban models, from more sprawled to more compact city models. There are broadly two types of urban dispersion, located in very different areas (Gielen et al., 2017): first, municipalities, operating as dormitory-city, in the metropolitan areas of the three provincial capitals (Valencia , Alicante and Castellón de la Plana); second, large tourist areas, associated with sun and beach tourism, very seasonal and formed by detached houses, mainly in the coastal zone of Alicante and North of Castellón, as well as the south of the province of Alicante (Figure 1).

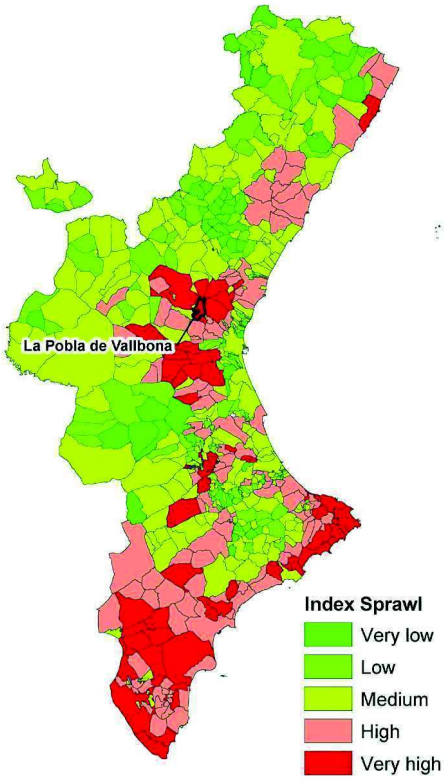

Figure 1.
Sprawl index
Source: Gielen et al., 2017

These sprawled municipalities have specifics demographic and social characteristics. Urban sprawl correlates with high population growth (Figure 2) and positive migration rates (Figure 3). Many of them have doubled their population in 20 years attracting new residents from other municipalities, regions or countries, as the migration rates indicate. They have a relatively young population. The citizen usually has little identification and connection with his municipality of residence. This is due to two factors: first, many of them were born in another municipality (the relation "place of residence"-"place of birth" has important effects in municipalities with urban sprawl); second, there is usually a separation between the place of residence, work, leisure, studies, etc., so that the mobility increases considerably. In fact, most of the actual cities are now difficult to understand without using the functional areas concept, understood as the interaction space of people in the territory.

The urban sprawl is a great challenge for a new public management where the coordination of social actors and institutions is an essential part to establish and fulfill objectives collectively discussed. It presupposes "building in a participatory way and collectively reflecting in order to be more operative and transformative" (Montañés, 2009: 14). Thus, participatory processes for decision making, together with transparency and accountability, become one of the fundamental axes of a Good Government. Indeed, in the area of the Valencian Community, the Law 2/2015, of April 2, of the Generalitat, of Transparency, Good Government and Citizen Participation, advances towards the participative democracy, assuming the society as co-producer of knowledge and of public policies and as a generator of public value; and citizenship as the subject of public action, and not only the Government and its administrations. The law 2/2015 also calls, in his article 44.2, to the creation of regulated mechanisms for citizen participation in budgets.

With these basic principles and taking into account that in the processes of participation it is necesarry "a strategy so that all the group realities, present in a locality, can formulate problems and provide solutions to them"

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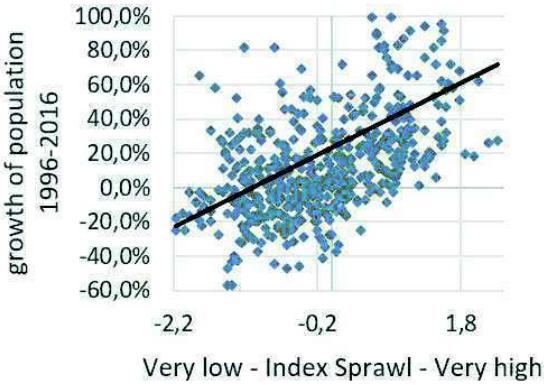

Figure 2.
Population growth versus Index Sprawl

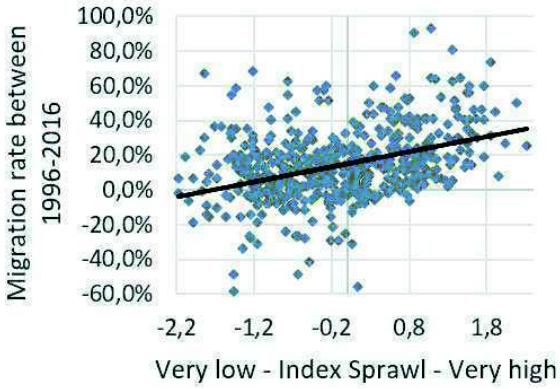

Figure 3.
Migration rate versus Index Sprawl

(Montañes, 2009: 44), the central question is: how to generate those processes in a physical and social space characterized with urban sprawl. In this king of city, the interaction between its inhabitants is very limited due to the dispersion of settlements, conditions of accessibility and physical connectivity have led to socio-spatial segregation and their population lacks feelings of belonging and identity with the municipality where they reside.

Undoubtedly, participatory processes are strongly conditioned by the developed territorial model. Thus, the urban form is surely an important first variable to take into account in the methodology for citizen participation. So the goal of this research is see how it can be articulated a process of citizen participation in a territory with high dispersion. To do that we analyze a case study to extract the complexity of articulating processes of citizen participation in municipality with urban sprawl based on a project carried out in the municipality of La Pobla de Vallbona (Valencia) on participatory budgets.

Territorial and socio-demographic characteristics of La Pobla de Vallbona

La Pobla de Vallbona is a municipality in the Valencian Community, located at 19 km from Valencia within its metropolitan area. It has an area of 33.10 km² and a population of 23,403 inhabitants, according to the Continuous Municipal Register for the year 2016 (Source: National Statistics Institute, INE). The population density is about 700 hab./Km². The municipality counts with numerous settlements of population since there are 43 nuclei of population according to the INE. Population age is low with a high proportion of young people and active population greater than other municipality at provincial and autonomic level. The territorial model of the Pobla de Vallbona has a very dispersed urban form, characteristics of sprawled city (Gielen et al., 2017). The discontinuous urban area (urbanization of single-family dwellings) is much superior to the surface of the main nucleus, corresponding to the sum of the historical and enlargement area. The area of discontinuous urban land represents 84.40% of total residential urban area and single family dwellings more than 75% of total housing. The housing density is relatively low: 0.80 m2 of residential roof per m2 of residential urban surface. In addition, 77% of the residential zone is further away from 500 meters from the center, which is a significant proportion (Figure 4).

The distribution of the population between the urban parts shows something similar. 50% of the population resides outside the main core of municipality, in discontinuous urban areas (Table 1)

This situation can be explained by the internal migratory balances, which are positive from a long time and whose main contribution is made by the population coming from the Valencian Community (between 94% in 2000 and 77% in 2015), forming a demographic profile without socio-cultural linkage to the municipality.

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With these basic characteristics, the municipal government undertakes, in 2017, the preparation of budgets, as a local participatory initiative, where the protagonists are the population, who will be able to make investment proposals and decide on the destination of a part budget reserved for this purpose.

Methodology

The methodological design to articulate the participatory process has been made ad hoc, taking into account the territorial and population characteristics of La Pobla de Vallbona. Traditionally, the factors considered in the methodological design are: population size, sociodemographic profile, access to the internet and the degree of digital knowledge. In addition, in this case, the dispersion of the population on the territory has been included. Here, it is important including a variable as the territorial dispersion because of the effects this variable causes in the social cohesion, the identity and the feeling of belonging of the citizenship with the municipality. These social and cultural elements can condition the typology and the degree of citizen participation. The distance and physical disconnection of the houses in dispersed territories can become a symbolic, social and cultural disconnection of the citizens.

The citizen consultation of investments in urban centers, hereinafter referred to as "participatory investments", is a participatory mechanism that allows the citizens registered in La Pobla de Vallbona to be involved in decision-making on the execution of a part of the municipal budget destined to make investments and increase the democratic quality of public institutions. In 2017, the budget for participatory investments is 132,000 euros, which it is around 25% of the municipal budgets allocated to investments.

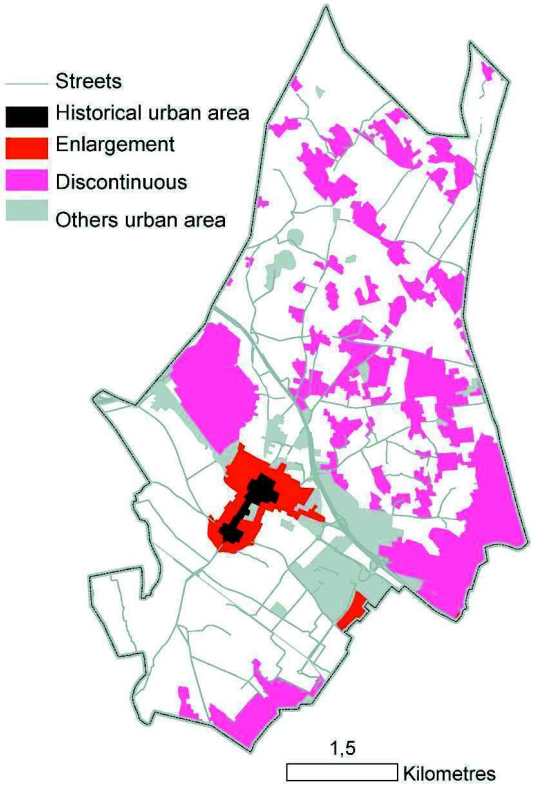

Figure 4.
Territorial Model according to SIOSE land use data for the year 2011.
Source: Instituto Cartográfico Valenciano

Then, this budget has been distributed in 7 municipal areas in which the municipality has been sectorized: 3 zones in the urban area (South zone, Northeast zone and Northwest zone) and 4 zones composed by urbanizations (North zone, South zone, zone East and West). As shown in Figure 5, the division comprises different scattered settlements which do not form a compact unit.

Each zones has a quota economic for the participatory investments. This amount is established according to the catastral tax provided by each zones and a fixed one calculated according to the number of urbanization or urban settlements involved

Table 1: Distribution of the population. La Pobla de Vallbona, 2016

Total	Central core	Rest of settlements
23,218 hab.	11,596 hab. (49.94%)	11,622 hab. (50.06%)

Source: Nomenclator: Continuous Population by Urban Unit. INE

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Table 2. Migratory balances. La Pobla de Vallbona, 2000-2015

	Year			
Geographical area	**2000**	**2005**	**2010**	**2015**
Valencian Community	422	650	389	345
Other Spanish Regions	27	45	8	-7
Foreign	-	156	-27	109
TOTAL	449	851	370	447

Source: Residential Variations. Migratory balances by geographical area. Valencian Institute of Statistics (IVE).

(537 euros per urbanization). This fixed amount acts as a correction factor to have account the effects of territorial dispersion.

To articulate citizen participation has chosen to offer two channels of participation: the virtual channel and the channel face. Both channels are offered in parallel and inclusive manner (a face-to-face participant can participate virtually and vice versa). The decision to offer these two channels of participation is taken in order to adapt the participatory process to demographic, social, cultural and occupational characteristics of the population registered in the municipality and provide facilities to citizens. The goal is of course to encourage participation in participatory investments.

This participatory process is structured in six consecutive phases containing: information and submission process, preparation of investment proposals, feasibility study proposals, public debate and prioritization of the proposals, voting and monitoring and evaluation process.

-Phase 1. Information and submission process.

Figure 5.
Sector division of La Pobla de Vallbona.
Source: https://participacio.lapobladevallbona.es/inversions-en-2-minuts/

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In this first phase the participatory process is presented to the public in different channels. First, the process is presented in a local channel "TelePobla" through an interview with the councilor for Citizen Participation. Second, a participation website is activated with a complete participatory investment information. Third, information leaflets (presentation, calendar, etc.) are distributed in public buildings and municipal schools. Finally, on January 25 2017, the process, its phases and its scheduling are publicly presented to the general citizens.

-Phase 2. Preparation of investment proposals

The objective of this second phase is to think about problems and needs of the municipality and start with the development of investment proposals, either made individually by the web, or carried out in face-to-face workshops. This phase has been organized in face-to-face sessions, in each sectors described. There were five participatory workshops, one of them in the urban area (joining the three sectors in one) and the others four in sectors corresponding to urbanizations (sector North, South, East and West).

The implicative technique, called nominal groups, used in this workshop, look to define the problems and needs of each sector to guide the design of proposals, accorded by participants. The result has been the development of a set of investment proposals, with his estimation and location in space. In parallel, in the participation website designed ad hoc, a similar process was opened, where the same information has been requested as in the face-to-face workshops.

-Phase 3. Feasibility study of proposals.

In this third phase, the economic, legal and technical feasibility of the proposals submitted by the public is analyzed. A commission was created, composed by the Municipal Auditor, the Secretary of the Council, the Councilor for Citizen Participation, as well as Urban Planning, Information Technology and Citizen Participation Technicians. Finally, the feasibility study results are presented on the website of participation and in a new session of workshops.

-Phase 4. Fase de debate y priorización de las propuestas viables.

The goal of this phase is to present, discuss, prioritize and adjust the proposals resulted of the previous phase. Newly, 5 workshops located in the different sectors were organized, in the same spaces as those in phase 2. On one hand, it were presented, debated, prioritized and adjusted viable proposals. On other hand, it was discussed too the non-viable proposals and the reasons for their rejection. As in previous phase, a same process is included on the website, although also opening here a virtual discussion forum.

-Phase 5. Vote process

At the end of the discussion phase, 4 days of voting (face-to-face and virtual) are established, from March 21 to 24, 2017. In order to vote, it is essential to be registered in the municipality and 16 or more years old. Each voter has 10 points that he can distribute to different proposals or concentrate in a single proposal, whether in his sector or in another sector. The results was published on the website and in a face-to-face session on March 29, 2017.

-Phase 6. Monitoring and evaluation process

To facilitate monitoring of the zone selected proposals, a new website was created where the state of the works are presented on real time. Once the investments are completed, the evaluation of the participatory process and the result of the investment is carried out. The objective of monitoring is to know the weaknesses, strengths, threats and opportunities of the process as well as to propose improvements for future participatory processes. To do this, three discussion groups with different profiles were created. The selected profiles has been designed according to the degree of participation in the process (a group with participants, another with voters and a third with no-participant people).

Measurement and analysis

The results of participation are presented in the first edition of participatory investments in La Pobla de Vallbona.

The budget for this participatory investments was 132,000€, which represents a 25% of the investments budgets of municipality. This quantity have been distributed in 7 municipal zones as appears in Table 3.

The workshops have been carried out

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Table 3. Number of proposals

Sector	Number of proposals	Budget
Urbanization North	10	18,150€
Urbanization Western	4	16,500€
Urbanization Eastern	9	25,300€
Urbanization South	8	16.300€
Central urban area Western	4	11,950€
Central urban area Eastern	8	18,000€
Central urban area South	10	25,800€

Source: Participatory investments in La Pobla de Vallbona

Table 4. Number of proposals

Number of votes	438
Number of virtual votes	181
Number of personal votes	257
Total population	19,704
Percentage participation	2,22%

Source: Participatory investments in La Pobla de Vallbona

Table 5. Participation according to age group

Percentage of participation	Age group
8.4%	less than 26
10.7%	between 26 and 35
35.4%	between 35 and 50
26.7%	between 51 and 65
18.7%	over 65

Source: Participatory investments in La Pobla de Vallbona

in each of the sectors, looking for a better approximation of the local administration to the citizens. 84 persons participated in the workshops, 21% in the workshop of the urban center and 79% in the different workshops done in the urbanizations.

The number of proposals made, virtual or in person, have been 104, although only 54 of these proposals have passed the feasibility study and to the fourth phase. These proposals are distributed as in the Table 3.

In the voting phase, as shown in Table 4, the number of voters was 438, which meaning a little participation rate of 2.22% of the population: 41.3% have voted virtually and 58.7% have done so in person.

The voter profile was 55% of women and 45% of men. In Table 5, it can be seen the percentage of participation according to age group of persons who has voted. The participation of young people in the process is low.

Analyzing the distribution of the vote, 54% of voters are registered in the central urban area, while 46% are registered in some urbanization. Participation in the workshops in urbanization areas is much higher than participation in the urban center area. The greater participation registered in the workshops in urbanization areas is due to two possible causes: the existence of more urban problems and the perception of the citizen of the disaffection of the municipal politicians and technicians over a long time. At the time of voting, informal coordination has been observed to guide the vote of neighbors. Indeed, participation was increased when it is the citizen who moves his neighbors.

Anyway, the communication of the process

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does not seem to have been effective: Much of the population was not aware of the participatory process. From the workshops realized, it can be deduced that:

1. There is a lack knowledge of the citizen about the cost of the public urban space and of the times and deadline of the municipal administration.

2. It exists a constant search of culprits and little co-responsibility in the existing problems of the municipal reality.

3. There is a low participatory culture and distrust of politicians and municipal technicians.

As result of fifth phase, seven proposals were selected. In each sector, one proposal wins and is selected. The number of proposals issued of the fourth phase is different according to sector, as shown in Table 3, as well as the obtained results in the vote phase (Table 6). Total points given to sector are bigger in western and south urban central areas, although some urbanization as the south sector one obtain a very high vote. The amount points for the selected proposals present big differences. The selected proposal in the urbanization north win with 52 points, while the central urban area south one have obtained 895 points, a difference of almost 20 times more.

Conclusion

Participatory investments are an opportunity to define the way how the municipality should be developed. In turn, it is an opportunity for the processes of citizen participation in itself, since being present in the decision making on the municipal investments is a motivating element. In addition, the participatory process is a pedagogical element: it helps citizens to reflect on their reality, problems and possible solutions. It approaches the citizen to the reality of the municipality and to municipal management.

In the specific case of the dispersed city, citizen participation presents also an opportunity for the resolution of problems caused by sprawl, both at the urban and social levels. At the urban level, it allows a reflection and analysis of the costs of the territorial model as well as the search of agreed and shared solutions between managers and citizens who's living in the urbanization. And at the social level, participation can serve as a tool to foster social cohesion and integration, create collective identity and a sense of belonging to La Pobla de Vallbona.

As the process carried out on La Pobla Vallbona demonstrates, it is necessary a specific

Table 6. Result of vote

Sector	Selected proposal	Points to Selected proposal	Percentage to Selected proposal	Total points of sector
Urbanization				
North	Concrete works in "Rincons" streets	52	25,6%	**203**
Western	Multifunctional track in the park area	197	61,7%	**319**
Eastern	Improvement of the signaling of the curve road between San Luis and "La Sima" civic center	204	52,4%	**389**
South	Building of a dog recreation area	328	45,6%	**720**
Central urban area				
Western	Tree plantation to create shade in the roundabout of the "Bàscula"	81	50,6%	**160**
Eastern	Canine park	291	51,6%	**564**
South	Improvement of sidewalks and paved of "Pilar" Street	895	45,8%	**1,953**

Source: Participatory investments in La Pobla de Vallbona

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design of public participation in a dispersed city, because his peculiar territorial and social characteristics.

First, urban sprawl can be associated often to younger and immigrant people. This is the case in La Pobla de Vallbona, where the population predominated is relatively young and in age of forming families (La Pobla de Vallbona, 2017: 64). The presence of young people can be an interesting opportunity for the implementation of processes participatory to use digital channels, but with less interest in a face-to-face interaction. In addition, this kind of population, living in a municipality as La Pobla de Vallbona in the metropolitan area of Valencia, has a little linkage with his territory. Most are immigrants, coming from others municipalities or a different region of the Valencian Community, while the foreign contribution is significant low and very oscillating, with emigration in last years. In addition, the residents in La Pobla de Vallbona, usually, are persons who move a lot, working, buying and enjoying leisure outside, having a more intense functional relationship with other municipalities.

Second, dispersed model increase distance between urban patches, given a disconnected model. Urban sprawl responds to a set of factors: a lack of urban planning and control by the municipal politicians and technicians, the devastating effect of the real estate bubble and lack of co-responsibility of the citizenship, among others. As a result, the dispersed city developed creates an antithesis model for which the city was conceived. In short, urban sprawl is an aberration as urban model: city loses sense according to its first essence as a supplier of services and public interaction space. It is necessary a new model of participation in this kind of space.

The proposed model of participation has allowed a satisfactory solution to the problems of urban sprawl in order to carry out participatory budgets in the municipality of La Pobla de Vallbona. The proposal divides urban area into different sectors to reflect as better as possible distribution of the population in the territory, allocate a budget to each area, with a fixed amount, and finally, choose a winning proposal in each sector, regardless of population, to make sure that all of the sectors obtains its return of the participatory budgets. Even though urban sprawl, the proposed model has achieved the participation and involvement of the population by organizing the workshops to urbanizations and dividing the budget according to the different sectors.

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Void of Power

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Abstract. *The history of built environment reflects the rise and fall of political systems, their conflicts, the social contradictions and ultimately, the state of being of a particular civic society over time. Former symbols of power, such as ancient monuments, palaces and churches still express today their symbolic, economic, cultural and political value which constituted in different ages the motivation for their being. Today these are replaced by new symbols of contemporary economic forces which through skyscrapers express global tendency and power movements. While physical edifices are easily recognizable as being expressive embodiment of power and political systems of their time, less visible, yet equally potent, are the shifts and voids in power relations. To fully comprehend the role of architecture in expressing and supporting power structures, it is important to question the concept of architecture as a mere act of presence (the construction) and consider instead the void and its complementary aspects: the absence, the erasure and the ideological need for demolition, as expressions of power. This paper therefore considers power within the parameters of void, which extend beyond the notion of "tabula rasa" that has characterized many urban transformations over the years. By considering the emblematic case of Via dell' Impero (void), analyzing various 'iconic' works of architecture for their role in expressing power of institutions and individuals and adding to the recognisability of place (construction), and identifying dispersion as an underhanded way of exercising power, this paper proposes a more complex reading of urban transformations (dispersion of people via gentrification). It offers moments of reflection and a shift in research focus in terms of how the void is used today to express and support present power relations.*

Keywords: Fascism, Power, Rome, Urban Transformations, Void

Introduction

It's a Sunday dawn in Rome. Cars and air are still, filled with a mist of an early morning. A lonely jogger cuts his way through Via dei Fori Imperiali, the vast road that was once known as Via dell' Impero. 80 odd years earlier this same street was filled with crowds cheering 'Duce!' … 'Duce! ... Duce! … (Figure 1).

The perception of the western city as a physical manifestation of power through landmarks and monuments dedicated to key religious, political, economic and/or military entities persisted well beyond the middle ages and into the second half the 19th century until Baron von Hausmann's redevelopment of Paris transformed the city and its image by means of adopting boulevards as an urban strategy aiding military defence against riots. Less importance, however, was attributed to the perception of the urban space and fabric[1] since the city was defined and identified by a number of monuments representative of power. For most part these were churches and monuments from the antiquity – expressions of power through the positive form, an example of which, in particular concerning Rome, is the area of Via dell' Impero, the subject of this

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Figure 1. Photo of Via dei Fori Imperiali today, source unknown.

urban analysis and a significant composition of monuments built over centuries.

In this paper, we propose that the idea of presence is not only related to physical presence, but also through the prolonged permanence over time with monuments being adapted and reused by new and emerging forms of power. This introduces the idea of a palimpsest focusing on integrated relationship between presence and absence constituted by a process of preservation and transformation (Manieri Elia 2001). Through such a process traditional styles were adapted to express contemporary qualities to be then overturned and reabsorbed into the realm of tradition eventually leading to their full or partial destruction as unfashionable relics of the past. In the light of this, we suggest that demolition and void are equally potent expressions of an act of power with both of them having the same capacity to also act as generating devices.

More specifically, in Fascist Italy as early as 1920's Gustavo Giovannoni (1931, 1995) proposed the strategy of diradamento or 'thinning out' of the existing urban fabric, as an acceptable compromise between pure urban preservation as advocated by John Ruskin (1880, 1988) and necessity to move with times and progress. While Giovannoni's theory can be seen as positive within the context of urban sanitation and improved health and living conditions, its more sinister aspects see it being used by the Fascist movement to justify its urban interventions.[2] The implementation of Giovannoni's theory, supported by Piacentini's theory of urban demolitions, the so called sventramenti, led the office of High Commissar order tearing down a number of urban sites in Rome during the 1930s, projects that to this day have left a noticeable void - the Void of Power.

Geographical, morphological and symbolic context of Via dell' Impero

Via dell' Impero is located at the base of the northern side of Capitoline and Palatine Hill. It crosses Celium Hill on the eastern side where the Colosseum is located. The area is often referred as the area where the earliest settlement of Rome was established and which became 700 years later the area occupied by the expansion of the Republican Forum into

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the Imperial Fora. Today Via dei Fori Imperiali[3] connects the Colosseum (former site of Nero's Domus Aurea) with the Capitoline Hill and presents itself as an extension of Via dell Corso (former Via Lata) and Via Flaminia converging with Via Cristoforo Colombo down to the EUR.

The arrival of Via Lata to the Capitoline Hill was important because it was one of the major roads of ancient Rome leading directly to its administrative, political and economic centre. The symbolic importance of the name Capitoline Hill has often been cited to derive from the very word capitolium, which itself is derived from caput meaning head. The term capital also derived from the word caput meaning governing something – a thing from what everything else descends. While Capitoline Hill is a clear manifestation of a palimpsest, it is a completely antithetic counterpart to the monument that is the Colosseum. In fact, while the latter absorbed all the historic transformations without changing its morphological identity, the Capitoline Hill is a result of a superimposition of several monuments over time. The original Temple of Capitoline Jupiter for example is overlaid with a number of other monuments such as the Church of Santa Maria di Aracoeli erected over an Augustine alter where the first emperor of Rome received a prophecy of the coming of Christ, and thus celebrating the victory over the pagan religion by the Catholic Church (Benevolo 1992).

Virtually abandoned during the middle ages, the Capitoline Hill was revitalised by Michelangelo's 1539 design for Piazza and Palazzo di Campidoglio (Bacon 1974, Panella and Tugnoli 2015) commissioned by Pope Paul III for the purpose of welcoming French King Charles V. Following the 1861 unification of Italy and Rome becoming its capital in 1871[4], other significant additions occurred between 1885 and 1911 when the monument to Vittorio Emanuele II, designed by Giuseppe Sacconi, was realised on the northern side of the hill. The convoluted, and at times grotesque, history of the monument's construction is symptomatic of the uncertainty of the new kingdom's image and with it of the absence of its real power (Brice 1986).

The above mentioned attempts to connect with the ancient Roman symbolism of power through built form were recognised by various statesmen throughout Rome's history, and they continued to some extent after the unification of Italy through the construction of the new ministerial palaces and, during the Fascist regime, the realization of railway stations, post offices, etc. Mussolini, rather than just follow the suit, decided to also implement the divergent strategy of 'productive demolition' (Bredekamp 2005)[5] focusing on pure erasure, which led to the full destruction of the remnants of the old Fora[6] as discussed in the following section.

Historical causes for Mussolini's rise to power and urban setting as a mediatic experience

Giovan Battista Nolli's map (1744) when compared to Antonio Tempesta's map of Rome (1593) describes the state of the city as substantially unchanged between 17th and the end of the 18th century. Starting in 1798, a large number of urban projects were discussed during the French occupation of the Roman Republic and launched after 1871 to elevate the urban structures of Rome to the level of European capitals such as Berlin[7]. The sum of all of these efforts is clearly visible in Rodolfo Lanciani's map (1900) whose surveys identify three overlaid layers of the city: the archaeological Imperial Rome, the present day Rome and any future developments proposed by the Kingdom of Italy.

The strategy of 'productive demolition'(Bredekamp 2005) started in Rome long before Mussolini took power. Following the examples of Hausmann's Paris (1853-1870) and Vienna Ringstraße (1857-1865), it is only at the turn of the 20th century that such an approach became an urban strategy for shaping the Italian capital merely through the erasure of the existing as initiated by King Umberto I of Savoye. This intent progressively became evident in a series of city planning schemes developed between 1873 and 1931[8], indicating an overlay of the existing ancient

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structures and proposals for their demolition and reshaping. These schemes, however, lack a systemic approach to the city development and generation of the new identity of the capital. Many of these transformations will in fact happen only partially as demonstrated by the void left next to the monument dedicated to Vittorio Emanuele II, the first King of Italy, built in 1911 for the 50th anniversary of the Italian unification. The opening of Corso Vittorio, Via Nazionale, Via Cavour and the incomplete demolitions of Piazza dell'Oro and Piazza della Moretta among others are further examples of this planned destruction, which adopted the eradication of the existing urban fabric. Far from reaching the synthesis of public space, built fabric and monuments these interventions were incapable of generating either a unified architectural style or an image for the new Rome as an expression of the House of Savoy legacy (Figure 2).

Mussolini built on the prior development strategies initiated by Umberto I taking advantage of the lack of power and demonstrated political weakness of Vittorio Emanuele III[9]. Unlike the Italian monarchs, Il Duce saw in Rome a mediatic potential as a historical backdrop to assert the connection to Imperial Rome by staging military rallies. Specifically concerning Via dell' Impero, the opportunity for it to serve as a parade ground was provided by the celebration of the tenth anniversary of the March on Rome. The works for the realization of Via dell' Impero, albeit not included in the city planning scheme yet to be approved by the government, started in 1930[10] and were sped up and completed in 1932 when the road was inaugurated on the 28th of October celebrating the decennial of the Fascist regime (Figure 3). The urban void created by Via dell' Impero became an international stage set in 1934 when the recently appointed German Chancellor Adolf Hitler came to visit Rome. Looking at the plan it is clear that Mussolini's planners, the architect Marcello Piacentini and the archaeologist Antonio Muñoz, lacked vision

Figure 2. Demolitions of Historic Centre of Rome from 1870 to 1970 from Benevolo, 1992 p.12.

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Figure 3. Fori imperiali from Roma ieri e oggi. https://www.romaierioggi.it/wp-content/uploads/2014/06/zona_archeologica.jpg

as to how this urban intervention was to impact the city life for the future. Initially, Mussolini was not interested in the antiquity, but being surrounded by examples demonstrative of the presence of power from the Imperial Rome, he saw a potential to use these as identifiable points of his power and a way to project the glory of the former onto the new empire. For this reason, the Fascist governorship commissioned Via dell' Impero without any detailed drawings as to where the project will go, or plans of scientific archaeological excavations of the area being completed. Thus the project proceeded under the direction of Corrado Ricci and Muñoz with no real urban consideration being given to the wider area of either the historical or contemporary Rome (Insolera 1993, 130).

Mussolini Urbanista[11]

"Farete largo attorno l'Augusteo, al teatro Marcello, al Campidoglio, al Pantheon (…). I monumenti millenari della nostra storia devono giganteggiare nella necessaria solitudine".[12]
Benito Mussolini

A further confirmation of their impetus will to destroy can be seen in Muñoz project for the 'Liberation' of the Mausoleum of Augustus, which he started in 1934 in collaboration with the architect Vittorio Ballio Morpurgo, and in Marcello Piacentini's demolition from 1936 of Borgo Vaticano, which made space for Via della Conciliazione to celebrate the Lateran Pacts.13 While Hausmann had at least a vision for a new Paris, in the case of Rome the only idea proposed by the archaeologists Ricci and Muñoz was to make space for the glorious ruined past to emerge silently triumphant in a metaphysical and imaginary 'new Rome'.

Via dell' Impero is conceived as a grand parade ground and a visual connection between Palazzo Venezia, the official residence of Mussolini, and the Colosseum. Mussolini's main scope was to create a big void surrounded by archaeological ruins turning this site into a monumental mediatic stage set. He understood the power of cinema and its suitability as a medium and propaganda machine to instil the Fascist ideology into the masses. To achieve his perfect stage, Mussolini ordered the demolition of the Velia Hill, which for the large part of its existence was a consistent portion of the Celium Hill, one of the seven hills of Rome and its geographic core since the city's origins. The numerous documentaries featuring the transformation of the eternal city by Istituto Luce, founded by Mussolini in 1924, further support the argument that for the Fascist regime, and Mussolini in particular, mediatic experience was the driving force behind the urban interventions in stead of elevating Rome to the level of development expect of a capital city in line with aforementioned Berlin, Paris or Vienna, and even less so to the grand dreams of a new world capital that Hitler had for Germania (new Berlin). If anything, the mediatic scope of the Via dell' Impero can be compared to Albert Speer's Zeppelin Field (1934) which equally served as a stage for mass rallies and performances designed to strengthen, in this instance Nazi myth and ideology (Figure 4).

Selecting the Colosseum as the culminating end of the Via dell' Impero was a populist choice as it through its monumentality expressed the grand ambitions of the Fascist regime. Contrary to the popular belief, the Colosseum was not widely loved by Roman citizens, but its monumentality was embraced by the Fascist

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leading to its selection as the key structure of the antiquity to serve as the propaganda piece and a mediatic setting projecting the glory of the new empire. This constitutes the paradigmatic shift from political power traditionally being expressed through architecture to the seductive performance of power on an architectural and urban stage to unite the masses behind them. In doing this, Mussolini started a process of deliberate erosion moving from the profound sense of place and deep experience connected to it to a superficial event where the social interaction is disassociated from the space and the values formerly embedded in it.

Conclusion

As a way of concluding, the significance of void as an urban form is essential. Having said that, they also can create a number of challenges that depending on time and resources available may create urban conditions difficult to resolve. Lessons that the historical examples such as Via dell' Impero for example teach us could not have been handled successfully with the tools and frameworks available to the city planners from the 1950s and 1960s. While on the one hand, authors such as Saverio Muratori and Gianfranco Caniggia contributed to a great deal of attention being given to presence of the historical urban fabric and building types and the importance of their preservation (Manieri Elia 2001), on the other, 'the value of differences, of alterations, and of the evolving contextual dynamics' (Manieri Elia 2001, 242) as elements of the authenticity of the built environment remain underexplored. This is due to an idea of preservation that became increasingly rigid over time ultimately failing to see the city as a cohesive organ, but as a series of isolated and selected monuments instead.

The rigidity of preservation was certainly a reaction to the Fascist regime and the void of decisional power it created, which progressively became a political excuse for postponing decision making regarding all the urban voids left behind after the war. Consequently Via dell' Impero and the old Fora transformed into an urban archipelago increasingly alienated from the rest of Rome. The only ensuing change was the renaming of Mussolini's road into Via dei Fori Imperiali until in 1980 the then mayor of Rome, Luigi Petroselli, took a different approach to the problem of the re-signification of the historic public space versus its absolute preservation. Before his death in 1981 Petroselli approved the demolition of Via del Foro Romano, a suspended road that cut the Imperial Fora in two parts and launched the project of the archaeological zone building on Leonardo Benevolo's earlier proposal to remove Via dei Fori Imperiali and turn the recovered archaeological area into the Parco dell' Appia Antica. The closure of Via dei Fori Imperiali to traffic on Sundays was the first and the last step undertaken due to untimely death of Petroselli which put an end to any further planned interventions. Subsequently, the city council of Rome reapproved the return of the military to annually celebrate the foundation of the Italian Republic on the 2nd of June on Via dei Fori Imperiali thus allowing tanks to once again parade between the Basilica of Massenzio, the Forum of Augustus and the Colosseum.

The consequence of this disruption have not been captured by the post-war city planning schemes such as the one from the 1962 and its subsequent variations. It was not until the year 2000 that the new city planning scheme of Rome (Manieri 2001) introduced a shift in the cultural and theoretical frameworks, from object to context, from historical centre to historical city, and from static to dynamic strategies of preservation and transformation embracing the notion of void. The focus of this scheme is not only on buildings and infrastructures as has been the tradition up to that point, but is more wider is scope adopting systemic approach that is considering historical layers determining the identity of both build fabric (solid), public space (void) and infrastructure of any kind which can be seen as spaces in between (Figure 5).

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Figure 4. Parade at Via dell Impero. https://comunitaolivettiroma.files.wordpress.com/2011/11/16-la- topolino.jpg

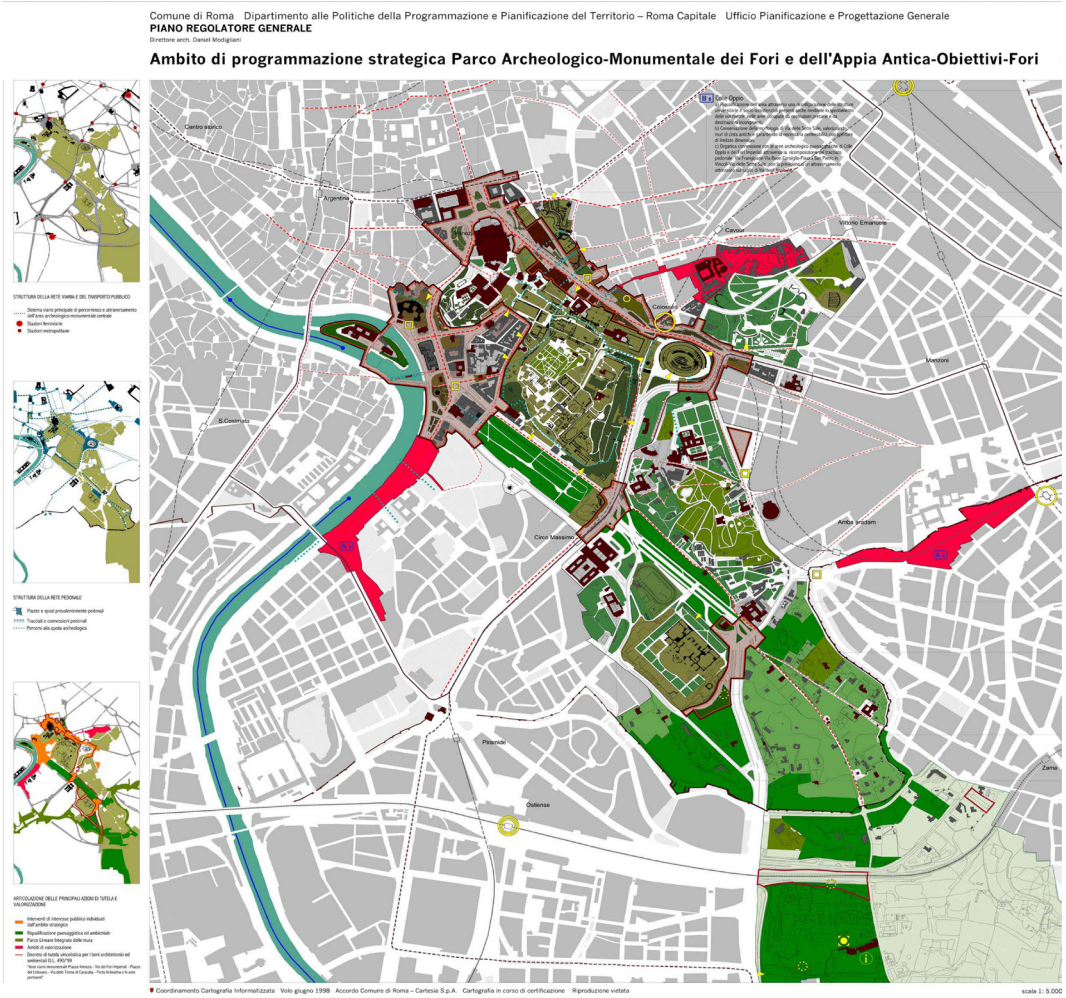

Figure 5. City planning Scheme of Rome the area of Via dei Fori imperiali proposed to be part of the archaeological park of Appia Antica. http://www.urbanistica.comune.roma.it/images/uo_urban/prg_adottato/i5_04.pdf

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Notes

1 Since the establishment of the modern city, in the Renaissance and baroque age and prior to the French revolution, most of urban developments ideologically prioritized buildings, monuments and objects over the void space, taking advantage of the existing streetscapes and relegating the road infrastructure to a pure instrument for circulation. Pius II's unfinished plan for Pienza (1459-1462), Sixtus V's urban redevelopment of Rome (1585 – 1590), Julius II invention of Via Giulia and Paul III' creation of the trident in Campus Martius are clear examples of urban structures where the urban space is instrumental to connect physical new and existing landmarks. Even the long tradition of the Italian piazza owns its ideological value to the presence of a built counterpart, acting as a space for a proper contemplation of either the Cathedral or Palazzo (or both), which are the real protagonists expressing the local or the central power. It is only starting the XVII Century in France with Louis XIV that the square is elevated to a primary role in expressing bigness and power per se.

2 As a matter of fact, Mussolini, in his first speech held on the 31st of December 1925, openly launched an idea of liberating the monuments of Rome from centuries of decadence further stating that from Piazza Venezia one should see the Colosseum (Insolera 1993, 118).

3 The former Via dell' Impero was renamed Via dei Fori Imperiali in 1944 after the liberation of Rome by the allies.

4 Rome is conquered by the Bersaglieri on the 20th of September 1870, while the unification of Italy was declared nine years prior to the fall of Rome, in 1861, posing the problem of which relation was to be established between the new born Kingdom of Italy and the Church State (the so called Questione Romana).

5 Bredekamp (2005) proposes the principle of productive demolition to analyse the process of making St Peter's Basilica. An interesting parallel can be traced with Arnaldo Bruschi's book Il San Pietro che non c'e which focuses on the unbuilt proposals for the St Peter's Basilica which equally influenced the history of its making.

6 Imperial Fora was largely demolished and compacted with dirt so that nothing of the old Fora remains underneath the road. Via dell' Impero is cutting right through the Fora.

7 Commenting on the outcome of this political project, Italo Insolera (1993, 331) builds on the statement concerning Rome by Charles de Brossess' (1739) 'This city, albeit big, does not look like a capital at all', concluding that 'This capital, albeit big, does not look like a city at all'.

8 The City planning schemes of 1873, 1883, 1909, its major amendment in 1925 and the final version approved in 1931 present a number of large areas marked for destruction two to three times bigger than the area marked for reconstruction. According to Benevolo (1992) and Insolera (1993) this was a clear strategy set in place to facilitate building speculation in the historic centre by means of a pact between the established power structures and the private capital.

9 The unification of Italy led to many problems. Firstly the question of the southern Italy which was not industrialized and whose gold reserves had immediately been transferred to the northern region of Italy over which the House of Savoye ruled to fix its economic deficit. Secondly, the persistence of the Catholic Church in maintaining its part of power in Rome as a traditional spiritual and stately ruler. And thirdly, the inability of the Savoye family to rule. These factors, among others, contributed to Vittorio Emanuele III effectively creating a void of power thus allowing Mussolini to come and take over.

10 In 1929 Piazza d'Aracoeli was demolished to create more space around the monument to Vittorio Emanuele II completely changing the perception of Michelangelo's Campidoglio. In 1930 a significant section of the Alessandrino quarter, including Via del Priorato, Via San Lorenzo, Via Alessandrina and many others, were demolished tearing down more than 5500 rooms and forcefully moving thousands of inhabitants from this low-income section of the city to Borgata San Basilio, which was at the outskirts of Rome and equivalent to a modern day slum.

11 Cederna, 1979

12 http://roma.corriere.it/notizie/cronaca/16_maggio_22/mussolini-urbanista-no-uso-l-

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architettura-soggiogare-197d3338-1f6a-11e6-8875-c5059801ebea.shtml?refresh_ce-cp

13 Signed in 1929 by Mussolini and Pius XI to reconcile the Italian state and the Vatican after the incident of the Bridge of Porta Pia.

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Rethinking urban design problems through morphological regions: Case of Beyazıt Square

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Abstract. *It is highly vital to recognize the relation between urban morphology and urban design studies in city planning and urban design practices. Beyazıt Square, which is the center of the city of Istanbul, could not be integrated to the other parts of the city either configurationally or socially although many design projects have been previously planned and discussed. In this study, the Historical Peninsula of Istanbul is observed as an essential unit of the traditional path reflecting each civilization, namely Roman, Byzantium, Ottoman and Republic of Turkey that have been settled in the region. Transformations in urban blocks in Beyazıt region are elaborated through a series of morphological analyses based on the Conzenian approach of urban morphology. Morphological regions of the Historical Peninsula are identified and Beyazıt region is addressed in detail in terms of the transformations in urban block components, that are; street, plot and buildings. The effects of surrounding units which are the mosque, university buildings, booksellers and Grandbazaar on Beyazıt Square are discussed according to the morphological analyses that are applied to the region. Previous design practices and the existing plan of the area are observed through the analyses including town plan, building block, and land use patterns. It is revealed that existing design problems in Beyazıt Square come from the absence of urban morphological analyses in all planning and design practices. Through morphological regions as well as the conservation plans, urban design projects can be reconsidered.*

Keywords: Historical Peninsula, morphological regions, urban blocks, urban design, Beyazıt Square.

Introduction

Historical towns of the globalizing cities have been facing the risk of disidentification. As a result of socio-economic developments, political forces and changing urban dynamics in the cities, a fast and constant transformation in urban form has become inevitable. The morphological approach of M. R. G. Conzen which is centered on historical development of towns reached its zenith through morphological regions. Morphological regions represent urban form patterns which have homogenous characteristics based on plan type, building type and land use. Whitehand states that: "A morphological region is an area that has a unity in respect of its form that distinguishes it from surrounding areas. However, the boundaries between regions vary in strength" (Whitehand, 2001, p.106). Morphological regions are facilitators. This methodology is studied in not only morphology based researches, but also planning studies and design practices.

In this study, method of the morphological region revived in the case of the Historical Peninsula that represents composition of Islamic urban codes constructed on Byzantium traces and transformed through modernization

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period of Turkey. In order to understand design problems in the urban form, Beyazıt Square and its morphological relations with the connecting urban pattern is analyzed. Design project proposals for Beyazıt Square and spatial interferences applied from time to time are reviewed in terms of morphological analyses of surrounding building blocks. Based on the identification of morphological regions in the area, social and physical characteristics of Beyazıt Square are discussed.

The Historical Peninsula of Istanbul has various urban layers in which different samples of urban form can be observed. The city of Istanbul is rooted in the 7th century B.C (IBB, 2009). The town named as Byzantium had a typical Greek town model in which Acropolis was at the top of the town and a gymnasium, stadium and temples were settled between acropolis and the Marmara Sea. Even though there are no physical remains from the Byzantium Period, the topography of the town helps to understand the main expansion (Kuban, 1996; IBB, 2009). The city became the center of East Rome in the period of Roman Empire. Therefore, named as Costantinople the borders of the town expanded and urban form was developed on two router axes: Via Egnatia (later named as Mese in Byzantine Empire; Divanyolu in Ottoman Empire; Ordu Street in Republic of Turkey), and the topography line which was constituted from the conjunction of the highest points of the plateau. Mese, being the axis of transition of the king and the traders, built the spin of the town. Constantine's forum and Tauri's forum (which is reformed as Beyazıt Square later) were located on this axis. The walls of the city reached its limits in the Byzantine Empire Period. This expansion created a society including ruling class, trader class and working class with the highest population ever till that time. Walls of the Historical Peninsula are still under conservation. After Ottoman's conquest of Istanbul, with its increasing population of Muslim society, the urban form of the city was reorganized despite the preservation of main buildings such as churches. Although religious rules shaped the life of citizens, cosmopolite structure of the Empire allowed all regions and ethnical groups to live according to their customs. Also, it is avoided to construct new buildings that block the view or access of present owners owing to two scopes, namely privacy and respect to the others (Kuban, 1996). Since the new neighborhoods are built and the city expanded beyond the walls through years, changes in the form of the Historical Peninsula brought new land utilizations. Both town plan and land use transformations directly affected the open public spaces such as streets and squares. Beyazıt Square was designed based on its surrounding urban form and socio-cultural requirements of the city in early periods of the republic.

It is a critical decision to design a public square which has strong historical background and morphological extensions. As a result of enduring transformation of the city of Istanbul, decision making process to design (or plan) any part of the Historical Peninsula is scrutinized within the actual conservation principles.

Morphological Regions of the Historical Peninsula

Conzenian approach of morphological regions is explained in the orders that are mainly grouped in 4 by Conzen. The first order represents the Old Town as a whole. Also, fringe belts or residential accretions can be involved in first order. The second order predominately shows the main plan units, urban quarters or small residential accretions. Third order reveals intermediate plan units or street units. Lastly, the fourth order signifies the minor plan units, building fabric cells or morphotypes.

Streets, buildings and plots constitute the town plan on which Conzen principally works. In town plan analyses, town plan/urban block components changes in certain periods are identified. Conzen's town plan analysis is mainly seen in his study on Alnwick (1960). In this analysis, the insurance maps of Pervititch that were created in 1935 and the last base map (2011) of the Historical Peninsula that is obtained from Fatih Municipality are superposed in order to observe urban block changes from the early Republican period to the early years of the 21st century. Each town plan analysis is created in order to draw hierarchical

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morphological orders. First order shows the old town as a whole as well as second order regions show the main plan units based on the analysis.

Constituting its basis as town plan analysis, which is also Conzen's most significant morphological research method, the Historical Peninsula of Istanbul as a whole constitutes first order due to its persistence as a multi-level urban fabric beginning from the Byzantium period till today inside of the city walls. Primarily walls of Theodosius are taken as the region boundary. In the second phase, according to the direction of urban development, urban fabric configurations, major structural divisions, historical process and the regions within definite identities are taken into consideration as well. Consequently, 15 regions are founded inside of first order whereas 4 other second order regions are identified outside of the city walls where filled coast areas are located (Figure 1).

A base map in scale of 1/5000 is used for settling the first draft of the first and second regions. Subsequently, several maps of different periods are superposed in the same scale in order to determine the technicality of the orders. The map showing significant urban development in Byzantium, Kauffer map of 1789, 1914 map that was drawn in scale of 1/25000 for showing urban blocks, the general street network map of the years between 1925-1950, and Google earth maps of the years of 2005, 2014 and 2017 are used as base maps.

To understand the scale of building block and public square relations; third and fourth order regions are elaborated. Town plan analysis, building fabric analysis and land/building use analysis, which Conzen explains as three-fold urban components, are made.

Beyazıt Square next to Ordu Street and other linked urban blocks are analyzed by emphasizing the changes in urban block components from 1935 to 2011 (see Figure 2). Buildings constructed before 1935 and those built between 1935 and 2011 are dissociated. Streets are classified based on the buildings constructed before 1935, between 1935 and 2011 and also physical changes between reference periods. Plot change cannot be analyzed in this regard due to data incompleteness. General land use of buildings according to the data of 2011 is also defined.

According to the map, it is seen that especially the built environment around Beyazıt Square, at the north side of Ordu Street, is constructed before 1935. On the other hand, the south side of Ordu Street is mainly constructed after 1935. Moreover, Ordu Street itself demonstrates one of the most significant changes in urban pattern. Expansion of the street has generated new neighborhoods within its borders.

As a result of this analysis, morphological regions in Beyazıt are defined (see Figure 3). Considering proposed orders for Historical Peninsula, second, third and fourth orders of morphological regions are determined. Since second order regions represent urban quarters with main plan units, it is only seen as passing through Ordu Street by dividing the study area into two. Within third order regions, urban blocks are grouped according to historical persistence or change. Also, layouts of urban blocks and land uses are considered. Therefore, within the study area boundary, approximately 16 different regions of third order are founded. Inside of these regions, some specialized buildings or building blocks are referred to as morphotypes which indicate fourth order. Building block size, grand physical changes or any significant differentiations among other urban blocks became determinant of the fourth order as can be seen from the map. In this sense, faculties of Istanbul University are bounded due to its huge block size. Simkeşhane and Hasan Paşa inns are also bounded because of significant changes in blocks.

In Beyazıt, masonry buildings are seen around Beyazıt Square, including Beyazıt Mosque. The area below Ordu Street contains buildings with concrete materials except for some religious buildings and old inns with masonry materials. At this region, buildings with 2 or 3 floors predominate in the area and the number of floors is not more than 7. As seen from the map of morphological regions (see Figure 3) the third and fourth orders are determined considering the development of similar formations of building fabrics. In third order regions, building materials become the most effective factor; since they represent the

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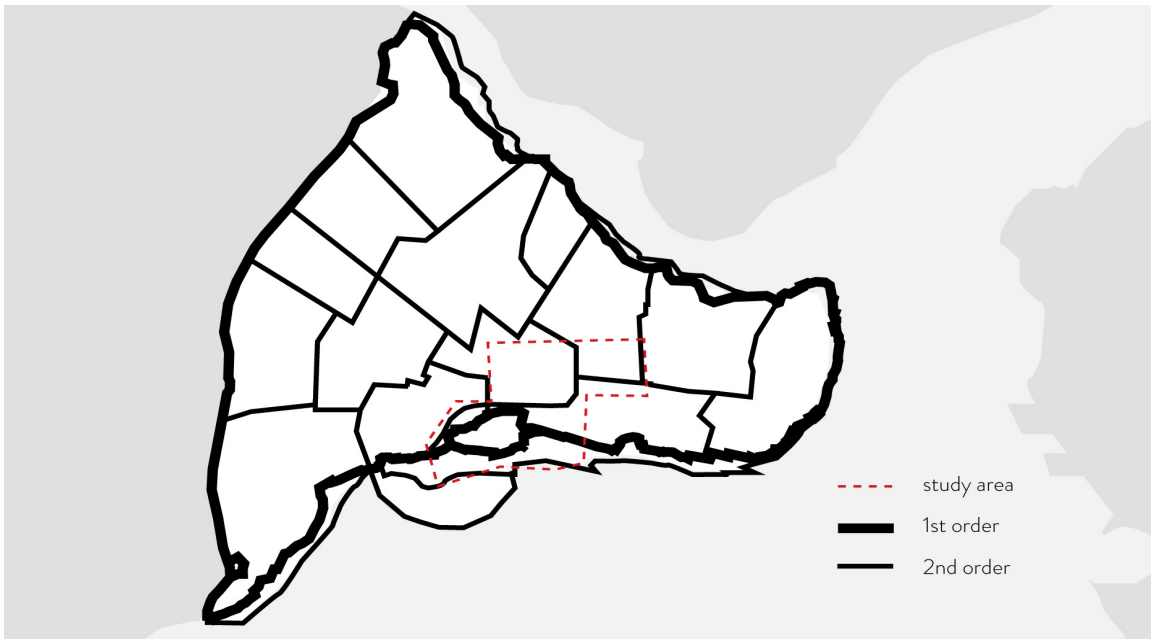

Figure 1. 1st and 2nd order morphological regions in the Historical Peninsula

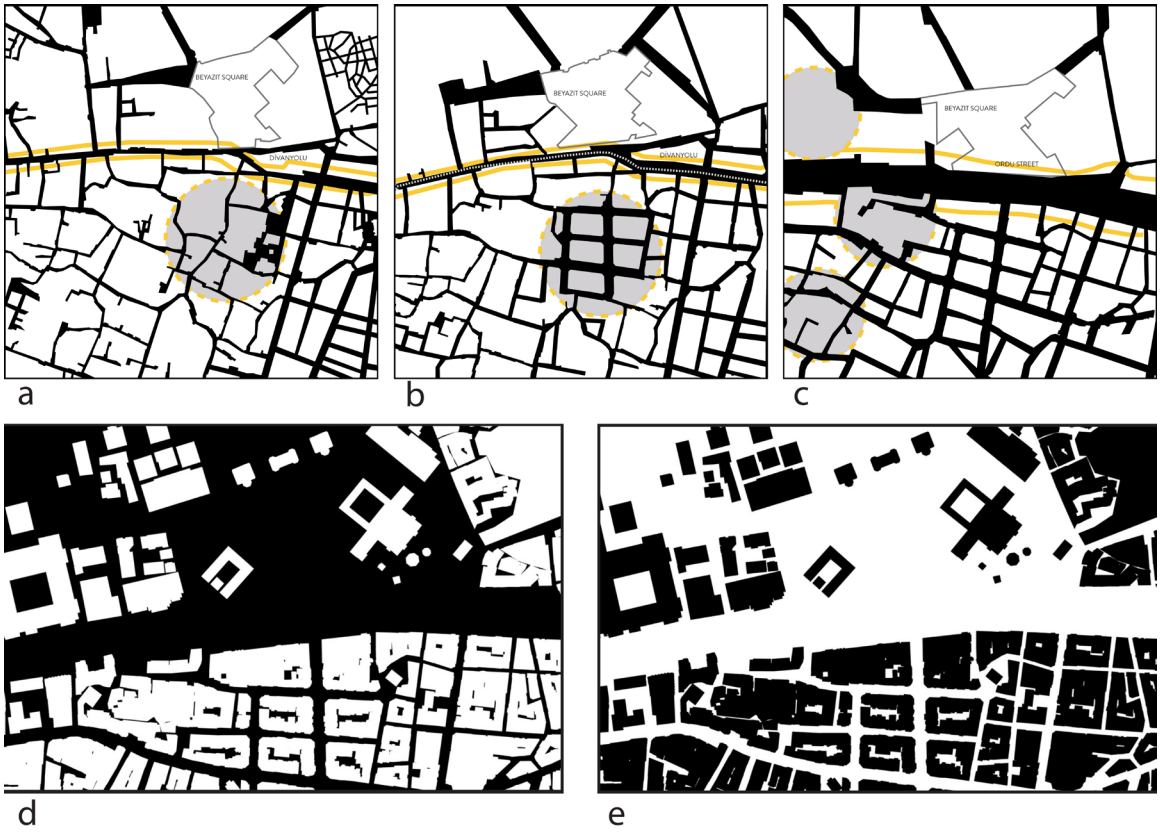

Figure 2. Transformation of street and building patterns in Beyazıt based on a) Ayverdi map in 1875-1882 b) Pervititch map in 1935 c) 2011 base map d) voids of 2011 e) solid of 2011

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historical evolution of the urban pattern having known that masonry buildings were generally constructed before 1935. Thus, regions are drawn according to the majority of masonry buildings at the north side of Ordu Street. Below the street, a high density of concrete buildings creates another region. Fourth order regions are determined based on the number of floors. It is observed that floor numbers begin to increase from 5 to 7 in different parts of the area, which can be seen particularly in grid urban block patterns rather than organic ones.

As it is seen from the map of land and building utilization of Beyazıt (see Figure 3), educational region, where Istanbul University is located, constitutes one region at the north side of the map. Below Ordu Street, commerce buildings group as a region such as Grandbazaar region. Around Beyazıt Square, buildings with cultural activities, some administrative utilizations and religious regions are enclosed in third order. Distinctive utilizations of buildings within homogeneous regions, which are in this study area mostly religious uses, are also revealed.

Designing Beyazıt Square

Beyazıt Square is placed on the third hill of the seven hills of the Historical Peninsula of Istanbul. Like all squares, Beyazıt Square has witnessed many activities such as meetings, celebrations, trading, festivals, executions, demonstrations and so on throughout the history. It records the memory of the city. Leading the movement of people from the main roads to Istanbul University or from Grandbazaar to the mosque, the square is also an archeological area which is open to exploration continuously. However, it has been one of the problematic public spaces in terms of design processes for ages.

In Roman period, Beyazıt Square was named as Forum of Theodosius (before that it had been named as Forum Tauri by Constantine I) which was located on the space between Beyazıt Mosque and madrasah of today. It had a triumphal column in the middle like other Roman forums and it was connected to Mese. There was a triumphal arch which was erected on the west side of the forum. Today's area of Istanbul University (faculty of letters and sciences) had been the place of three Basilicas of Byzantine Empire. Around the forum, civic buildings like churches were built.

As Istanbul was conquered by Ottomans in 1453, Old Palace was built at the north side of the forum, which is the highest point of Beyazıt. Mint of Ottoman (Simkeşhane), bazaar areas and Grandbazaar were formed at this period. In the 1500s Beyazıt Mosque and külliye (Islamic social complex) was constructed and the square became the center of Istanbul. In the 1800s the mosque was integrated to Beyazıt Square. In the 19th century, the square was used as a bazaar/ exhibition area (Kuban, 1998). The square was one of the most significant meeting places between the Old Palace and külliye. It was also the only open space that was integrated into the Grandbazaar.

Beyazıt Square was designed and planned many times in the early Republican period. Between 1923-1924, a fountain pool was placed in the middle of the square and tram line entwined around the pool (Kuban, 1998). Later, motor vehicles dominated the area. In 1933, the Old Palace building was given to Istanbul University. Traffic flow was removed from Beyazıt Square and it began to serve as a public square again with the plan of Prost in 1937-1938. In Prost's plan of Istanbul, as many other proposals on street widening, there was a road widening proposal on the east part of Divanyolu up to Çemberlitaş. However, it was not executed. At the beginning of the 1940s, the Faculty of Letters and Sciences was built. The building became a new morphotype with its huge size and architectural style in the urban fabric. The significant changes in these areas were seen in mid 1950s. In the years of 1956-1957, known as Menderes period in Turkey, Divanyolu (Ordu Street) was widened from 9,5 m to 30 m. That development in the main spine of the Historical Peninsula brought the destruction of many historical buildings as well as some urban blocks. In order to widen Ordu Street, north facades of Simkeşhane (old royal mint) and Hasan Paşa Inns which were facing the square were demolished (Figure 4). Furthermore, with the enlargement of Ordu Street, Beyazıt Mosque, the bath, and some

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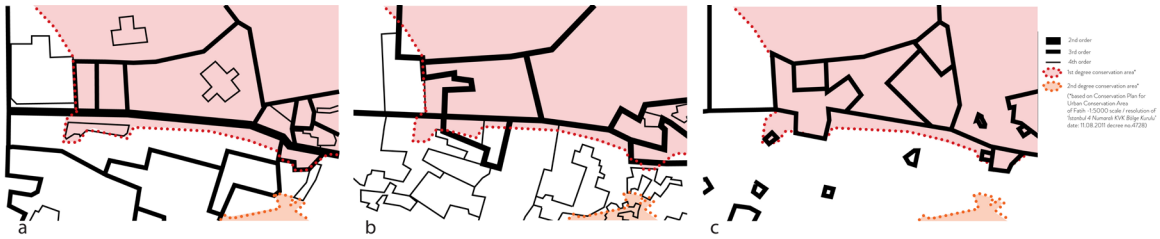

Figure 3.Morphological regions of Beyazıt a) based on town plan b) based on building material c) land use

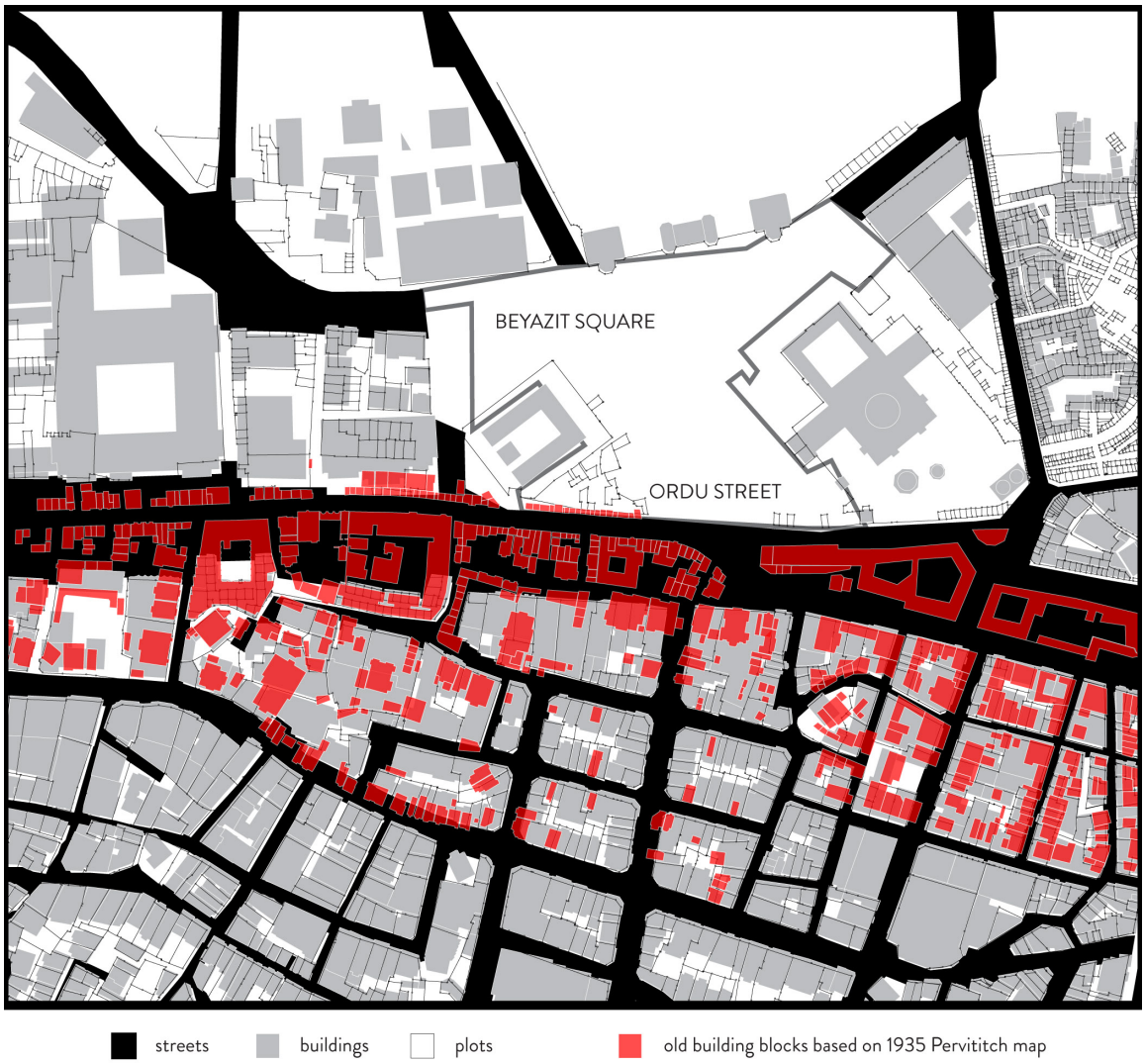

Figure 4. Demolished buildings between 1935 and today in Beyazıt

other commercial buildings began to stay in the upper level whereas Ordu Street was developed in the lower level. Thereafter, new commerce and business buildings began to be built up in the area.

In the 1960s, several projects for Beyazıt Square were added to the agenda as a result of previous construction activities which were disappointing. Prof. Piccinato, Prof. Högg and architect Turgut Cansever were designated to work on new design projects for the square. The project of Cansever was accepted for construction among these three design proposals. In Cansever's project, the whole square was pedestrianized. The conflicts between the direction of the mosque and the

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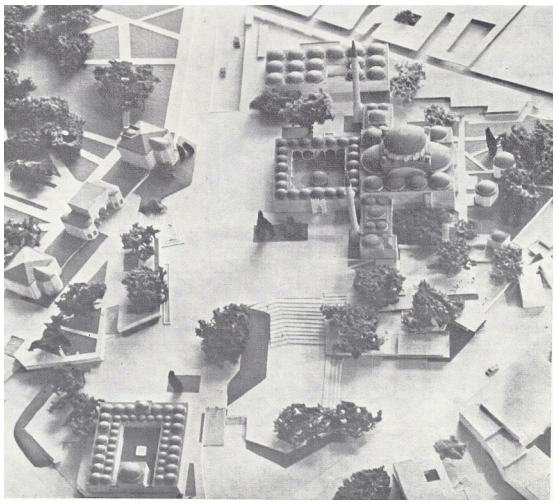

Figure 5. Model of Beyazıt Square designed by Turgut Cansever

university buildings were resolved through orienting the main perception of the design on kiblah. The trees on the square were preserved, new trees were proposed in front of the door of Istanbul University and a series of 2-storied buildings in use of eating-house, bookstore or coffeehouse were designed to separate Ordu Street from the mosque and its surroundings. He resolved the elevation problem of the square through the stairs that were planned between the mosque, külliye and Ordu Street (see Figure 5). On those days, this project generated a discussion between architects on the excuse that the project should have not been applied since the master plan of the city was uncompleted. In the end, the construction of the project was suspended. Neither the shops and the ornamental pool were built nor the proposed trees never planted in the square. There were also delays on the construction materials. Instead of the brick and mosaic pavements which were harmonious to the building material of surrounding built form, rough stone blocks were used for the ground of the square.

After 1980s, urban design competitions were organized for Beyazıt Square. In 2010s an underpass construction started even though it was on the contrary of the assize of the preservation board. Today, a new design project is being applied to Beyazıt by demolishing the stairs which are oriented to create distinct spatial forms in the square. It leads the flow from Ordu Street to the center of the whole space. It expands the boundaries of the square having a plain void that blurs the relation between the movement and the buildings.

Conclusion

Morphological regions that are identified through the analyses signify that the region has many differentiated units that are separated by other homogeneous units. This constitutes a heterogonous pattern in the area. Each morphological region should be considered as a unique unit to design within itself and as a tool of a larger design project. This study demonstrates that design projects applied on Beyazıt Square are not taken based on morphological characteristics of the surrounding urban pattern.

The analyses and the discussion above mentioned illustrate the emphasis of morphological analyses in urban design practices. Urban morphology should be evaluated as an essential methodology in urban planning and design studies. Designers should comprehend all the units that compose the whole urban pattern. Fragments of the whole and the whole of the fragments can be meaningful as long as the socio-cultural aspects related to the land utilization are recognized. The Historical Peninsula requires to be read as whole. The organisms which transform throughout the history and revitalize the sense of belonging in the town have to be conserved before redesigning activities. Urban morphology becomes more of an issue in this kind of projects. On the other hand, designing requires both spatial and socio-cultural considerations. Thus the current design approaches should be skeptical with regard to morphological foundations. In the context of Beyazıt Square; we should ask whether it is a square of the city or a void of built environment.

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Obsolescence of urban morphology in the historic center of Villena (Spain). Spatial analysis of the urban fabric in the ISUD/EDUSI candidature

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Abstract. *The Integrated Sustainable Urban Development strategy (ISUD in English and EDUSI in Spanish) is an urban planning tool that the Spanish municipalities with more than 20.000 inhabitants elaborate to opt to be funded by the European Regional Development Fund (ERDF) in the 2014-2020 period. The Villena municipality, located at southeast Spain, developed this tool in order to have a holistic and integrated vision of the situation of the city from the urban, social, economic and environmental points of view. As a part of the analysis performed to develop this strategy, a spatial analysis of the urban fabric of Villena was carried out. This study employed concepts from the typomorphological schools of Italy, England and France (Moudon, 1994) as well as from the research on relation between density and urban form (Churchman, 1999, Berghauser & Pont, 2009, Steadman, 2014). The data and cartography of the Spanish Cadaster, processed with SIG software, allowed the study. The spatial analysis included different variables of the built environment, including building height and age; plots size; open space ratios, not-built plots; type of built-plots according to height and built surface; and compactness of the fabrics. The results of this analysis showed a relationship between the morphological variables and the problems identified in the citizen participation meetings carried out for the elaboration of the ISUD. The identified aspects of urban morphology obsolescence allowed proposing strategies of action to update the built environment to current demands.*

Keywords: Integrated Sustainable Urban Development, agrocities.

Introduction

This paper presents the experience of the use of morphological studies in the elaboration of the Integrated Sustainable Urban Development Strategy (ISUD) of Villena, in Alicante (Spain). The proposed strategy was funded with 1,400,000 (of 2,800,000 total budget) in the first call of the competition organized by the Spanish Government to distribute the budget of the 12th Axis of Sustainable Development Operational Program, in 2016. In this first call only 82 of the 269 proposals were funded, while in the second call open in the end of 2016 only 41 proposals of 184 were selected.

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The morphological analyses were a part of the diagnosis phase in the development of the strategy. Particularly they allowed deepening in the spatial causes of certain issues identified as weaknesses by the local administration and the activities of citizen participation carried out. In consequence, the morphological studies were focused on the analysis of the obsolescence of the urban fabric of the historical centre.

Villena in its context

Villena is located in the Penibetic valleys, protected by the sierras of Salinas, Peña Rubia or El Morrón, and with the sierra de la Villa as the base where the urban core sits. It communicates the Mediterranean coast with the north of Andalusia and the interior plateau. The river Vinalopó flows through the territory, as a vertebrate axis that forms the region of the "Alto Vinalopó" in which a brackish lagoon existed even until 1803.

With a municipality of 345 km2 Villena is the second largest municipality of the province of Alicante. Its strategic location in what is known as the 'Corridor of Vinalopó' or 'Corridor of Villena' provides it a significant role in the connections between the interior and the coast. Moreover, the 11 municipalities bordering Villena belong to three autonomous communities and four provinces, making Villena not only an interior-coast crossing point but also a strategic territorial enclave. Another of the most valued resources in Villena is the fertile agricultural land in the southern part of the town, near the historic centre and with a strong cultural link with it.

The city is organized in neighbourhoods which have been part of the collective memory for a long time: San Francisco, Las Cruces, El Rabal, Las Virtudes, La Paz, La Encina, San Antón, El Grec, El Carril, El Mercado, Banda de Música and Paseo Chapí. Other areas are La Zafra and Sierra Salinas. La Morenica and Bulevar Maestro Carrascosa are two neighbourhoods located on the Villena axis, which have been growing due to the progressive increase in population. The delimitation of the historic center includes the entire neighbourhood of Rabal and a small portion of the neighbourhood of San Anton.

Urban morphology study as a tool in the ISUD Strategy of Villena (Alicante, Spain)

The European Commission launched in 2012 the Europe 2020 Strategy to establish a vision that encourages a Smart, sustainable and inclusive growth for the 2014-2020 multiannual financial framework. This framework distributes the European Structural and Investment Funds amongst the member states through an association agreement that distributes the funds through different regional and pluri-regional operational programs. The Spanish Government established at the European Regional Development Funds the Intelligent Development Operational Program (POCINT in Spanish) and the Sustainable Development Operational Program (POCS).

The Integrated Sustainable Urban Development Strategy (ISUD) is a new tool developed by the Ministry of Finance and Public Administration of Spain to distribute the budget of the 12th Axis (urban axis) of POCS. The Ministry launched a grant call through a competition to ensure that all the Spanish municipalities bigger than 20.000 inhabitants which aimed for the European ERDF funds meet all the objectives established by the European Commission. The first call was launched through the order HAP/2427/2015, on November 13th 2015, and the second call was launched through the order HAP/1610/2016, on October 6th 2016.

Thorough the competition and the elaboration of this strategy, the European Commission ensured that all the town councils were working from a strategic approach (long term), analysing and evaluating continuously objective indicators. In this way, the results of the investment funds could be measured and checked, and the perception and interest of the inhabitants could be taken into consideration to define the strategies´ goals.

The citizen participation process of the ISUD strategy was ruled in the Ministry call. The first step of this process was to create a website and social media to spread the ideas and make an open survey. On the other hand, an urban diagnostic event was organized, using the SWOT methodology (Strengths, Weakness,

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Opportunities, Threats). Then, a second participation event was celebrated, where all the proposals were revised and the most urgent among them prioritized to improve the situation of the city of Villena. This participation should be transversal (open to all the inhabitants), but it was also intended to be sectoral through all the relevant socio-economic groups (tourism, agriculture, youth, business…).

One of the conclusions identified in this participation process was the need to concentrate the actions in the most deprived areas: the historical city centre and San Francisco neighbourhood. Both areas had a damaged urban, economic and social fabric, reason why many of the proposals were oriented to the recovery of these historical urban plots to make them meet the needs of today's city lifestyle.

For a better understanding of these areas, it was decided to analyse all the specific morphological features to get some indicators that could show and explain their obsolescence. The change in the forms used during the 20th century in the peripheries of European cities led to an increase in studies of urban morphology in its last decades. Within these studies, schools of typomorphology created a very useful body of concepts and definitions to describe the form of the city. Moudon (1994) distinguished three distinct schools, located in Italy (around the works of architects Muratori and Caniggia, among others), England (around the Urban Morphology Research Group of the University of Birmingham, led by geographer Conzen) and France (in The School of Versailles around the architects, Jean Castex, Philippe Panerai and Charles Depaule). His readings of the shape of the city come from three basic principles:

The interpretation of the city as an organism formed by interrelated elements that create components of larger scale.

The consideration of the historicity of the city, an organism built over time under different needs and situations.

The consideration of the urban space as the result of a social construction whose purpose is to satisfy the spatial needs for social practice (Lefebvre, 1968).

In an urban organism structured in a graduated and progressive way over time, the definition of the elements that compose the fabric at each of its levels is the essential aspect when confronting its analysis. Different authors of the schools of urban typomorphology have agreed to identify the built plot as a determinant element of the urban fabric form, as it happens in the works of Conzen (1960), Muratori (1960), Caniggia (1979) or Panerai (1980).
The use of the built plot as a starting point allows interpreting, with a certain economy of resources, the relations between the built space and the open space in different scales. Taking as an example the analysis of the Gothic fabric of San Canciano by Muratori, he points out how the dense and varied plots, the individual demands and the layout of the canals lead to "a rich interconnected and interdependence Gothic urban structure" (Muratori, 1960).

Shortly after these first schools of typomorphology began the investigation of the qualities of urban form from spatial analysis. In this research line, density quickly acquired a central role to study the way in which the form is perceived (Alexander, Reed and Murphy, 1988, Churchman 1999, Uytenhaak 2008, Berghauser and Pont 2009; Boyko and Cooper, 2011). Their attention has focused on the analysis of how the way in which buildings are organized alters the different meanings of density: perceived, physical and measurable. They were, therefore, working in the same line as the schools of typomorphology.

Using these principles of the schools of typomorphology, an analysis of Villena's urban environment was made, focused on:

The characteristics of the built plots.

The proportion between built and open spaces, with an approach on the aspects that could indicate the obsolescence of the historic centre area.

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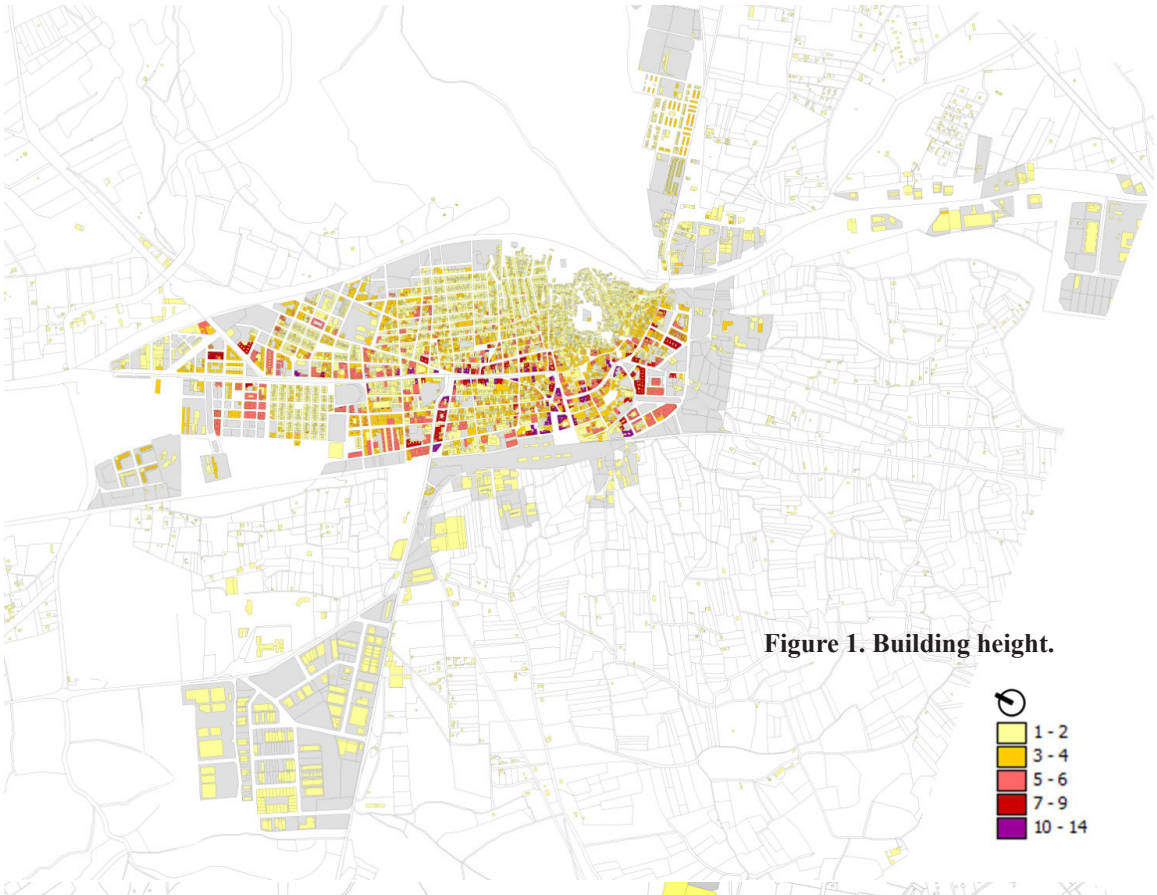

Figure 1. Building height.

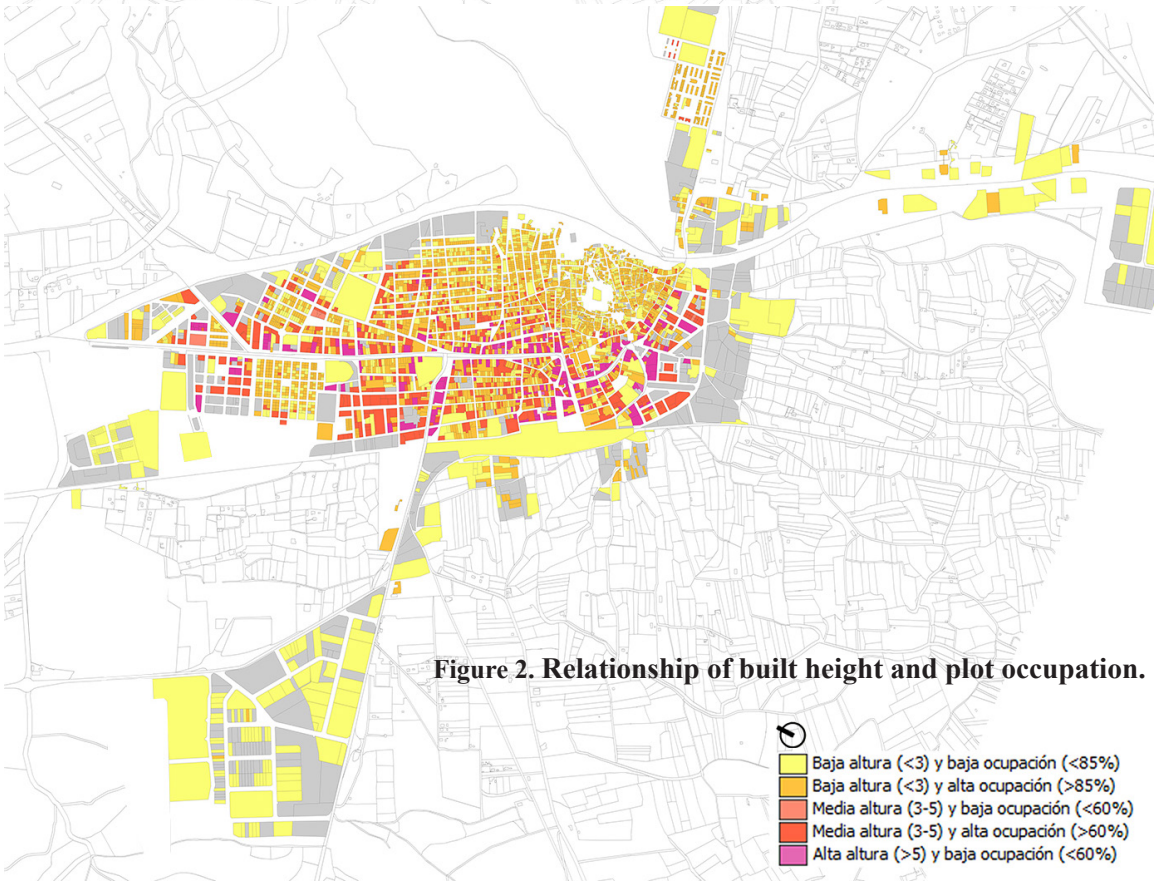

Figure 2. Relationship of built height and plot occupation.

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Obsolescence of urban morphology in the historic center of Villena

In the last decades Villena´s urban development was encouraged by the costs in the new peripheral land for growth, lower than in the urban core, where the profitability of private investment was smaller. On this situation, Villena has grown to the north and south, while infrastructures (the highway A-31 and the railway line) have acted as barriers for the east and west expansion.

The expansion in this north-south direction was larger towards the north, as the agricultural lands in the south (that are also flooding areas) prevented the growth. The urban area has practically doubled since the mid-twentieth century, this growth coinciding with a period of economic development.

Derived from this urban development, the city has at the axis that links its north and south limits the buildings which are in a best condition. When moving away from this main axis the building deterioration grows up, and it is particularly concentrated in the historic centre.

The historic centre sits on a hill crowned by the Atalaya castle, which is protected by its cultural interest. Nevertheless the orographic and historical facts created a complex urban fabric that added to the building typology implies high costs in the rehabilitation/consolidation process. Besides, the displacement of the population to new housing areas outside this old core caused the abandonment of a significant amount of buildings. Currently, the historic centre could be divided into two areas, top and bottom of the hill.

The bottom part has higher occupancy and better conservation status, although its construction technology lacks of the current standards. The situation of this part is stimulated by the proximity and connection with the rest of the city and services, since the historical centre has been losing its commercial activity at the same time that its population.

Meanwhile, the top part has serious problems of accessibility due to its street structure adapted to the terrain. This handicap, together with the ones described below, reduces the private investment in the area and makes its recovery more expensive.

Another notable weakness of the historic centre is the obsolescence of the basic urban facilities, which are outdated or even inexistent in many areas.

Characterictics of the built plots

The analyses of the characteristics of the built plots were centred on their age, their size and their relation between built heights and occupation. The first two items revealed situations that compromise the urban environmental quality of the historic centre.

The analysis of the height of the buildings clearly shows the great road axis N-S (Constitution Avenue) and also the transversal axes that part from the main axis towards the West, which are the exits of the city to the agricultural lands.

The historical centre forces the turn of this main axis to the west. This turning point is key to the development of accessibility strategies that helps the integration of the historical centre into the main functional area of Villena. However, the west and south limits of the historic centre are composed of higher buildings that difficult the access. It can also be observed that these areas (Corredera and Nueva streets) are disassociated with the fabric of the historical centre.

It is also clearly identified the isolated situation of the San Francisco neighbourhood, its disconnection and its physical discontinuity with respect to the compact urban fabric of the city centre.

The analysis of the relation height-occupation at the built plot level showed a diversity of types, from which some characteristics related with the habitability of the dwellings were extracted. In the historical centre and in the San Francisco neighbourhood the dominant types are buildings of less than 3 heights occupying practically the whole of the plot, which implies, in most cases:

The coincidence of the facade of the building with the plot boundary and, in consequence, the existence of rooms in the ground floor that open directly to the street, affecting their privacy.

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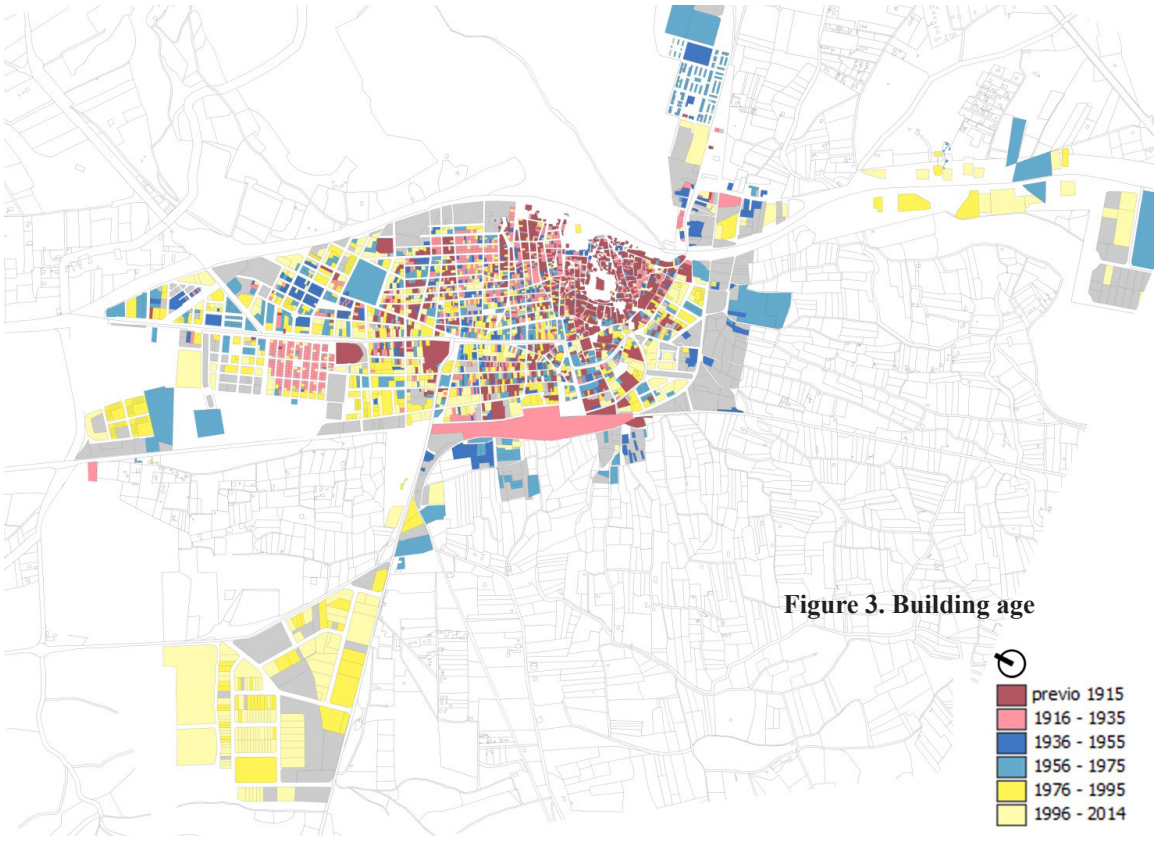

Figure 3. Building age

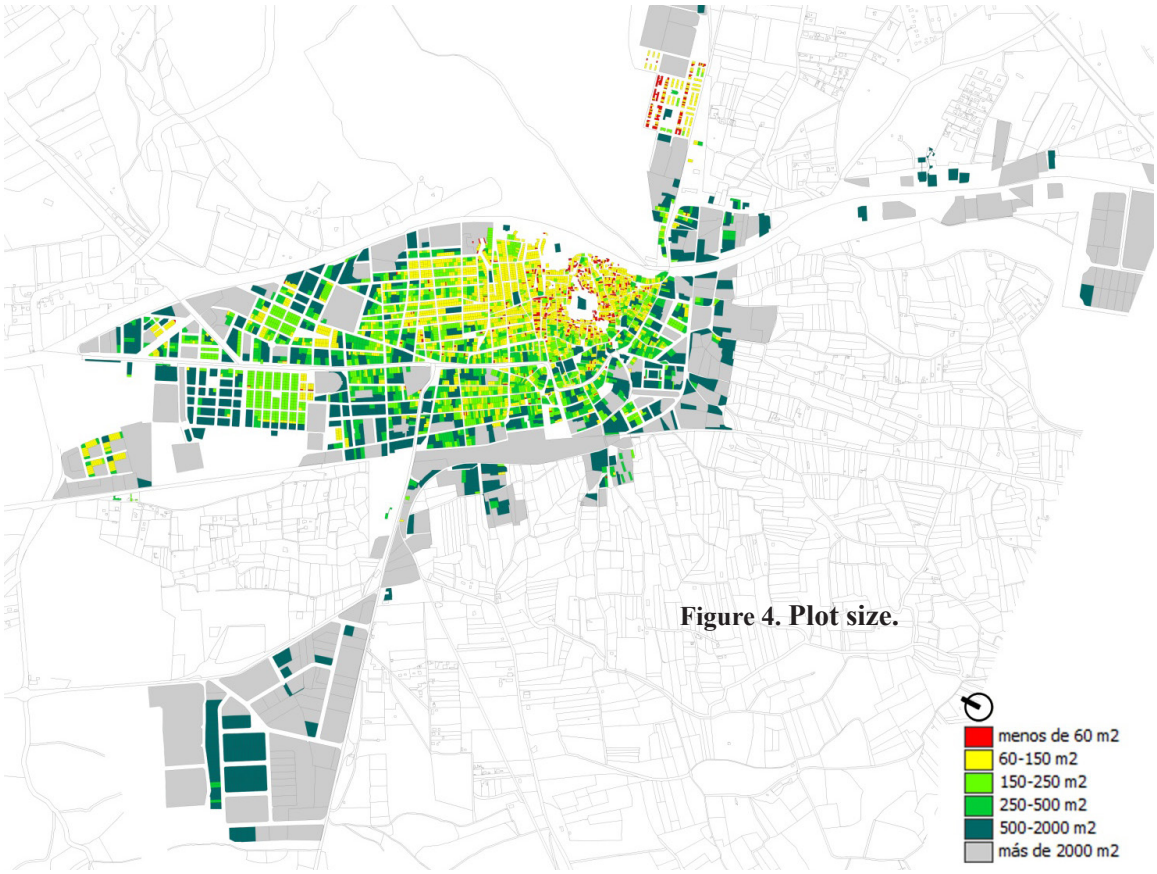

Figure 4. Plot size.

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The very reduced dimensions of existing backyards, which makes difficult the lighting and ventilation of the interior spaces.

In buildings of more than three heights, dominant in the rest of the urban area, the plot is also almost completely occupied. Considering how the built plots are added to each other and the lack of open space in these environments, the ventilation and sun exposure of many rooms is not updated to current standards. This makes more necessary the generation of a public space of quality that compensates the deficiencies and avoids the abandonment of the central area.

The analysis of the building age showed a marked lack of renovation in the historic centre. This characteristic was found in the citizen participation sessions as one of the features that caused the decrease of the quality of the urban environment. The morphological analysis allowed the delimitation of thee area affected by this problem.

Finally, the analysis of the plot size revealed a very dangerous concentration of plots smaller than 60m2 in the historic centre. This weakness was also highlighted by the agents involved in the elaboration of the ISUD strategy. It causes a lower quality of the dwelling and it is a hard condition in the rehabilitation of the area.

The north part of the historic centre is composed by plots from 50 to 150m2, which also decrease its appeal to the necessary renovation and prevent the incorporation of non-residential uses. The absence of facilities and shops in this fabric was revealed as a factor that contributes to the displacement of all Villena´s activity to the Constitución Avenue, accentuating the disconnection of the historic centre.

Relationship of built and non-built areas

The analysis of the proportion between built and un-built spaces yielded information more difficult to perceive. Especially significant were those on the ratio of free space per built area, which were related to the weaknesses of some areas whose buildings were under moderately satisfactory conditions. In addition, it was revealed the potential of the historic centre as an area provided with open spaces, located around the castle. This exceptionality, with respect to the rest of the urban centre, determine the incorporation of this space as a key piece in the ISUD strategy.

The analysis of open public space available in a 250m radius area around each building also clarified the causes of some weaknesses identified in the citizen participation sessions.
Due to the railway and highway at East and West of the city, the areas in contact with these infrastructures become “corners” or “cul-de-sac”. These areas are represented in purple in the figure, with a very low amount of open space in their immediate environment. In the ISUD strategy it was considered that providing these areas with a greater amount of open space would help to alleviate the negative effects of the infrastructures that constrain the urban area.

On the contrary, the historic centre was perceived as an opportunity space, due to a greater availability of open space.

The analysis of the public space in a radius of 250m per square meter built was made to weight the data of the previous analysis according to the density of the fabric. The scarcity of open public spaces per dwelling (less than 15m2/dw) in the Constitución Avenue, especially at the southern corner of the Plaza de María Auxiliadora stands out in this analysis. The open space around the Castle is the closest to all the highly saturated urban centrality.

In contrast, in the San Francisco neighbourhood the ratio of open space per dwelling is higher than in the rest of the urban area. The use of open blocks in the mid-twentieth century urban complexes was accompanied by large amounts of public spaces. However, many of them were never developed because of the insufficient resources to face its construction and
maintenance. To deal with this problem, a privatization of these open spaces has been proposed in other cities as a strategy to improve their quality and their utilization.

With the analysis of the compactness and density a vision of the characteristics of the urban fabric was obtained. The figure shows in purple the very compact tissues (between 50 and 70% of the floor occupied), in red the

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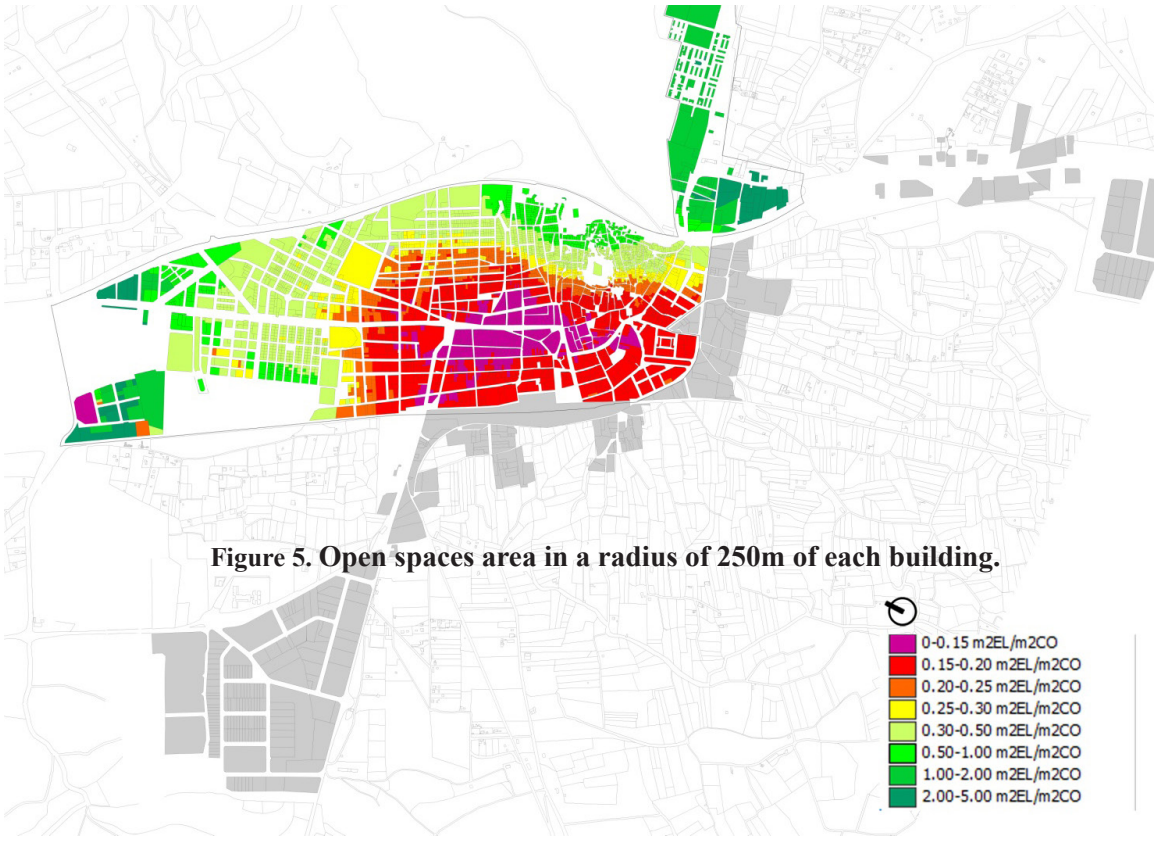

Figure 5. Open spaces area in a radius of 250m of each building.

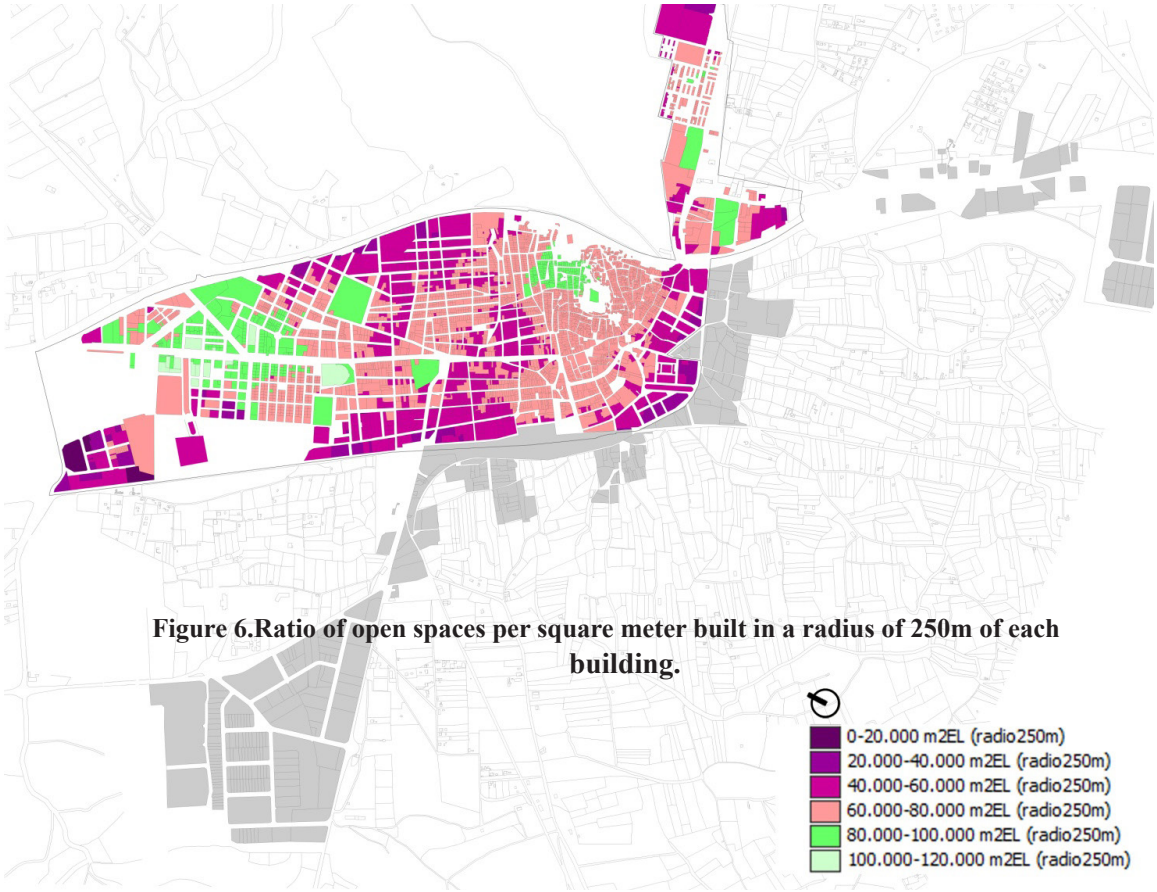

Figure 6.Ratio of open spaces per square meter built in a radius of 250m of each building.

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compact ones (between 35 and 50%), in green the little compact ones (between 20 and 35 %) and in yellow the less compact (less than 20%). Most of the urban area is very compact, which makes the quality of the available public space essential.

According to this analysis it was considered interesting to locate new open spaces in the central area, given the shortage of these in it. In the historical centre the improvement of the open space around the Castle was considered, becoming this space in a expansion area of the compact fabrics. In the same way, the irrigated agricultural spaces, by its proximity, could act as leisure and expansion areas that compensate the compact urban areas.

Finally, an analysis of the non-built plots was carried out, being considered spaces of opportunity for the actions defined in the ISUD strategy. Most of the empty plots are in those areas close to the infrastructures where there is a shortage of open space. The possible construction of these plots would make the open space available even smaller.

The non-built plots existing in the historic centre are an opportunity for the incorporation of new uses and users to the area. In addition, as a result of municipality policies to promote the revitalization and reactivation of the area, there are several plots and empty buildings of municipal ownership.

Integration of urban morphology analyses in the ISUD strategy of Villena

The information obtained in the morphological analysis was employed in the definition of the specific actions of the ISUD strategy, which were presented for funding. Some of the most notable relations between analysis and actions are:

The non-built plots analysis allowed to identify that its distribution matched the perimeter of the city and crossed throughout the historical centre. Thanks to this comprehension, many projects came out to help to reduce the impact of the contact between the urban fabric and the infrastructures of the highway and the railway. Also, it was proposed a green space network crossing the historic centre, connecting the main natural and tourism resources of the city.

The analysis of the built plots served to identify habitability problems of the dwellings both in the historic centre and in the San Francisco neighbourhood. A high concentration of houses smaller than 60 m2 and of old buildings (from twentieth century beginning) at the city centre showed the need to renovation of the building in the area. Several action lines were proposed to help and encourage the physical renewal of the urban fabric.

The analyses of the accessibility to open spaces showed some advantages of the historic fabric that commonly were considered with the worst urban condition. It generates a series of actions focused on improving the importance of this fabric in the open spaces network

Conclusions

The use of morphological analysis in the development of the ISUD strategy of Villena was considered as a tool to contrast the results of the SWOT analysis realized with local authorities and in the citizen participation first phase. The morphological approach allowed to deep in the reasons of the weaknesses detected, understanding the influence of spatial configuration of the urban fabrics. The results obtained from this urban form study helped to develop the actions included in the ISUD strategy, which were validated again in a second phase of discussion and citizen participation.

The characteristics of the built-plot, the way that they are grouped and the relationship between the interior and the open spaces centred the analysis, coinciding with the founding typomorphological schools. However, in this case the study was based on quantitative variables (calculated thanks to Geographic Information Systems) that measure different proportions of built and un-built space, which link the method with the studies of urban configuration through density.

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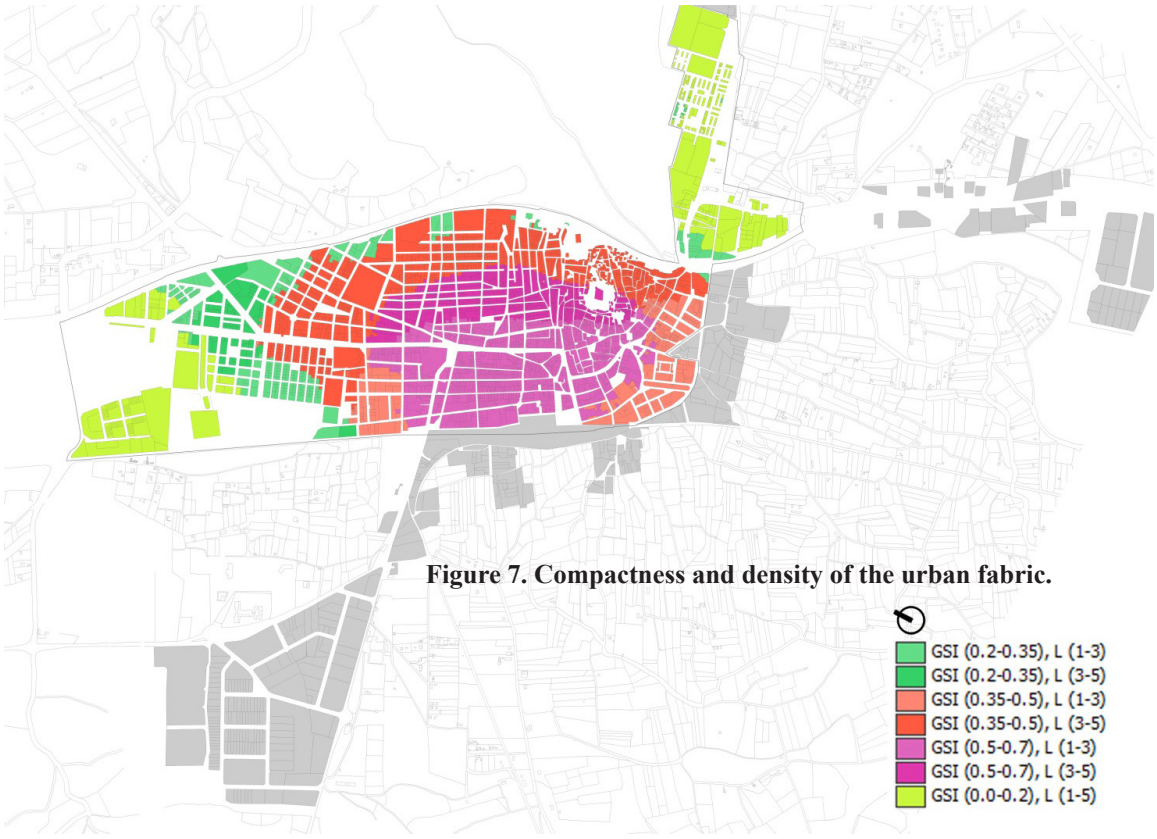

Figure 7. Compactness and density of the urban fabric.

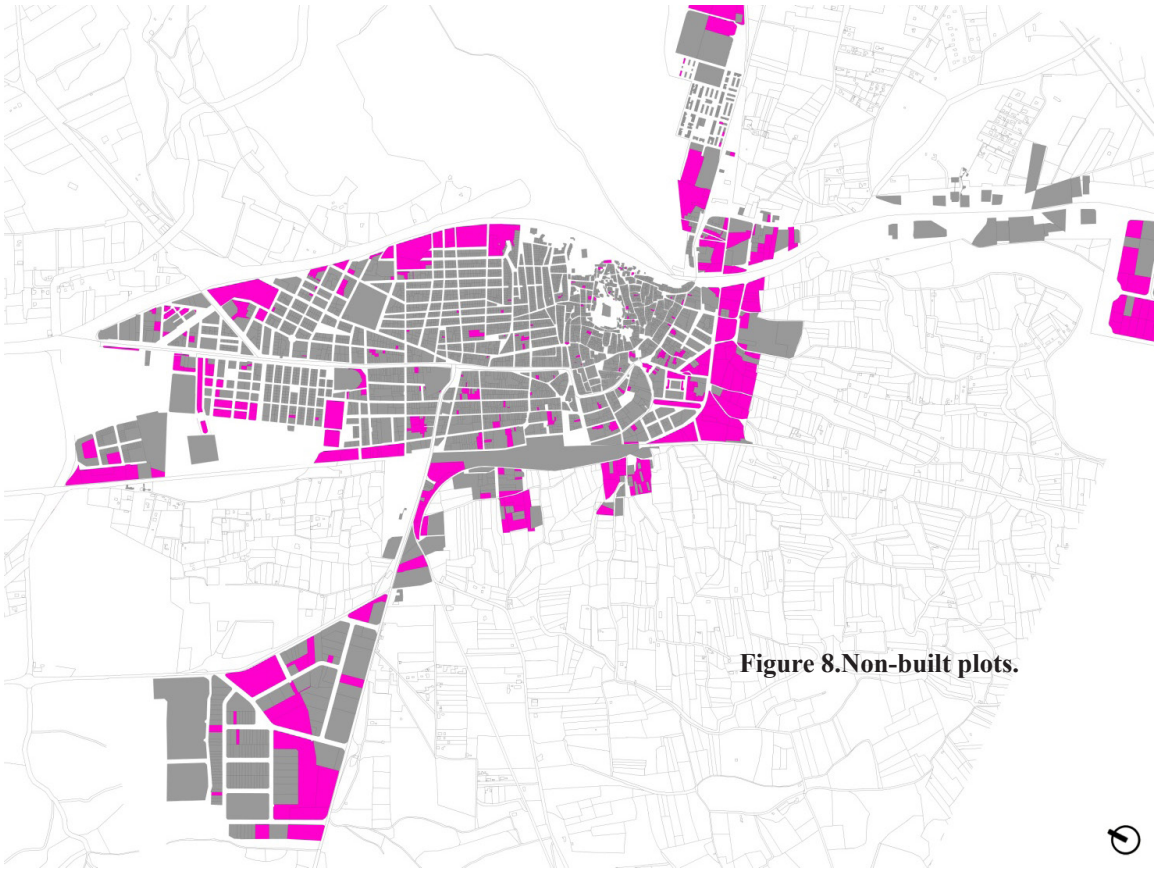

Figure 8.Non-built plots.

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Practices and forms of open space at territorial scale: A comparison between Matera and Valencia, two cities crossed by minerals rivers

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Abstract. *A scientific reading of the transformations of Matera starting from the urban re-activation in a social and spatial perspective in its neighbourhoods. The redevelopment of urban voids starts by the metaphor of the ecological network in an urban scale to update the connection system of open spaces in the light of new practices and flows, for an innovative idea of urban resilience. The key role is re-see the neighbourhood: (i) on a local scale, focusing on the practices and customs, in the centre like in the industrial areas, starting processes of recovery and reuse but also of innovation (that result from the opportunity to be the European Capital of Culture 2019); (ii) on a urban scale with the transition space and threshold, identifying those natural and mineral signs representing a transition of porosity. The value of the "suburbs" enters as re-starting for rebirth of the city projects counting on the creativity of practices into the open spaces. The reformist project of Matera as original "laboratory" of architectural and urban experiments changes. Neighbourhoods were born from the same idea of "vicinato" (neighbour) but adapted to a new social identity, able to work on embryos of community, in the same way in Valencia in which natural elements (Turia) lead to rediscover the sense of belonging and making community. In both cases, urban policies are oriented towards innovative and spontaneous processes able to change the urban approach to a multi-purpose city although representative of culture and identity.*

Keywords: Matera, Valencia, Neighbourhood, Urban regeneration, Requalification of urban voids.

IIntroduction

Valencia and Matera are cities crossed by mineral and natural rivers. On the one side, there are the third most populated city of Spain and, on the other side, there are a small town in southern Italy that has known for its unrepeatable urban shape, Sassi, which in the last few years, has been proclaimed European Capital of Culture 2019. The point of contact between Valencia and Matera is their ecological networks as multipurpose elements, generative metaphors of the city and interpreters of a non-osmosis system, although strongly evocative of a continuity of the urban green system.

In the following, we adopt, like system of reading, the presentation of the main characteristics of the individual cities, respectively Matera and Valencia, and then describe the analogies, derogations and, for a better comprehension, the confrontation. This comparison derives from the intrinsic condition of the two cities focusing on the conformation of space and practices that these spaces receive; all to favour the sliding systems (water, green, open spaces).

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For the city of Valencia, the configuration of space depends on the water but with the difference represented by a stiffening of the system, through the hydraulic transformations that led to the deviation of the Turia watercourse (Plan Sur). An important event influences Valencia's urban history: the flooding of 1957. In the same period, the city lives an accelerated growth of the population density. Demographic growth, if a right planning did not support it (providing to an increase of the infrastructure with the simultaneous design of public equipment) would have been problematic. The propose of redevelopment of the riverbed, the Plan Sur, initially was only an hydraulic project. Soon, however, the modifications, introduced in the urban structure, changes the layout of the city's general plan. In fact, the Plan General de Ordenación Urbana (general plan of the city - from there referred as the "PGOU") was adapted to Plan Sur and was defined a macro-plan of road and hydraulic infrastructure.

The plane becomes radio-centric space model articulated for six radial routes and five circular ring, two of which are historic, the first above the ancient wall and the second for the transit. Two transverse elements complete this structure with the main road axes: one flanking the ancient Turia's riverbed, the other passing the beach of Malvarosa.

Certainly, the decade of the 60s, can be considered as that of the creation of the metropolitan area of Valencia. The process of change and transformation was double: the central city grows (developing as a service and coordination centre of the entire area) and present an evolution of other activities. In conclusion, this produced the consolidation of the metropolitan scheme with the consequential overturning of the first urban footprint.

For Matera, Sassi are a great "waterless" hydrographic system. The Piano Regolatore Generale, plan of the city by Luigi Piccinato (from now, for simplicity, indicated with the acronym "PRG" or "Piccinato Piano") consider the park system and the morphology of the territory, for the first time in 1956. The PRG is prepared on the initiative of the Ministry of Public Works with skeleton made up with four new districts built for the displacement of the Sassi, and the accomplishment of the rural villages provided in the "Piano generale di bonifica del territorio comunale di Matera" (masterplan for reconstruction of Matera municipal area).

Main assumption of Matera's plan is the progress of the quality of life of residents through revision, recovery and upgrading of: caravans and pedestrian infrastructures, provision of existing services, green areas with the realization of equipped public spaces and environmental recovery. In this new planning, there are the transformation of the space also based on the evolution of the inhabitants and the users of it. Green is not a geometric system, represented by the only planning of a regular grid (e.g. Bari or Barcelona), which identifies the expansion of the city, but through the study of the land morphology, following its natural course.

Starting from the forms described above, the work wants to explore the open space system of the two cities, comparing them as connections of nature streams and practices. This can help to redesign an ecological network (as a way to favour the connections of naturality in the city) between urban and extra urban, but also how to facilitate and improve social connection. It is not enough to linger on the ground surfaces present in the two cities, such as the Jardín de Turia for Valencia and Gravina (with its Murgia Materana Park) for Matera, but focus to the forms of space identifying into the voids the ideal-typical matrices of green, water and open space.

Green represents the element of conjunction of spaces, in all their form and size, inside the city centre, in the peri-urban and e nearby the agricultural area. It is watershed between different landscapes. However, this kind of spaces contains element that does not oppose resistance and that can be crossing creating seamless landscapes and ecological network. The space is not really stiffening up and the way to live them but calls for interactions with the creation of "new permeable squares".

Water is the element that connects and, in its natural conformations, changes geography and the way of living space (Plan Sur), creates new forms of aggregation or marks a limit (Gravina stream) to urban expansion and urban crossing. Overcoming this limit is an important

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opportunity for tourist development of the territory (Tibetan bridge).

In both cities, public space should not be understood as the simple residual of dense industrial urbanization. Neither it must be confined only to road fabric, to a few band spaces, to the edge of the urban fabric, but it should represent a constituent element of fringe of naturality. Therefore, it is necessary to look at it as a continuous, articulated and integrated system that develops from the scale of "vicinato" relations (neighbourhood) to the scale of large environmental systems. This helps to promote the spread of the enjoyability of public spaces to the whole community and to raise up the urban quality; also through their unusual and creative use, that offers a new and alternative city vision.

Methodology

The method is a comparison, in the urban design, of two cities, Valencia and Matera, between open spaces, urban texture and natural morphologies. The methodology approach is urban planning considering the space of practice.

For Valencia, we start from a historical and urban reconstruction where the processes that led to the evolution of the city were studied, focusing on the correlation between existing urban space and new forms of expansion.

Space value is important because it binds to the size of natural and anthropic flows. For this reason, starting from the comparison between full-empty in urban areas, we develop a taxonomy of urban texture, identifying permeable, semi-permeable and impermeable spaces.

The complexity of public spaces is evaluated in the intrinsic conditions of relationships, in quantities and traces due to flows of influence and, based on the results, is performed a grouping of spaces similar by form with different attitudes or not really appreciated for their quality, but referenced in the neighbourhoods.

Classification considers spaces grouped into: i) landscapes surface that reconfigure an urban area through the green; ii) proximity spaces that identify the public-private dimension in the city's spatial areas; iii) void-to-fill that suggests methodological proposals and possible lines of intervention; iv) regenerated spaces that identify rehabilitated areas but not completely solved because they are not the result of a participated urban planning;

We studied the "public city" through a conceptualization that was able to define character and set of common problems. The proposal consists in a reading of the open space and, from a visual analysis of the neighbourhoods, we see space dimensions, focusing on parameters such as size, distance and permeability.

The subdivision based on the size concerns the activities. Extra-Small or Small spaces are proximity spaces where activities doesn't exist; but this doesn't mean that the Medium or Large spaces are structured in a way to favour that because also that can have any significant critical issues.

The parameter distance between the various spaces leads to the consideration of neighbourhood relations in a way to link the activities that develop in them. This creates a network of spaces and underline the possible preferential routes. We shouldn't think that the transversal element, that marks the city, justifies the not-presence of small open spaces because, in each area, that kind are necessary to facilitate the creation of a system made of punctual elements.

Permeability parameter represents the texture of space in a gradient that expresses a percentage of the amount of impermeable, semi-permeable and permeable elements that rises to interpretive categories, which express the opportunities and the problems in function of their correct fruition.

Next stop is a depth study in which we can read the various returns of the idea of live-ability of open space, through the study of some examples.

These spaces read the taxonomies, roles and performances to find a new connection between modern, contemporary and historic city; going beyond the intended uses, but considering suggestions that can better articulate the living conditions to live in the contemporaneity, the community, and the neighbourhood.

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For Matera, we made a similar work starting from an urban study and focusing on the role of the historic suburbs. The following study develops in several strictly connected and dependent phases. The first is a punctual relief of the existing, focusing on: settlement system, urban structure and open spaces (intended as soil quality).

Then there is a critical comparison phase with plan predictions through an analysis of what is planned and/or is implemented by urbanistic plans and projects on a peri-urban, urban and district scale (Carta Idrologica and Carta di uso del suolo contained in Piano Strutturale Comunale, Sistema del Verde e della Mobilità Lenta contained in Regolamento Urbanistico).

Following there is an investigation about open space practices choosing some significant and doing hearing and practice analysis to get a complete description helpful for the last phase of project imaginary.

The assumption of this logic is regeneration from which start with sustainable and equitable projects from environmental and social point of view. We try to use this study to improve the quality of open spaces through an operative ecological network. With it, the natural sign configures the city, following the fibre of the territory in a continuous rediscovery of elements that overcome the rigidity of urbanization in the light of habitability and comfort of open spaces.

Measurement and analysis

Starting from the method used, the results obtained share landscape relationships, new town planning choices, city forms and public space.

To build landscape relations and new urban planning choices, in a city like Valencia, the river becomes urban material losing its power of element of nature, to build landscape relationships and new town planning choices, and creating a crossroad that is represented by Jardin de Turia: green space, generating axes for the road map, vertebra and centre of the city. However, the creation of this element is not enough to provide for the requirements of other kind of spaces. An impressive range that evokes that of Matera neighbourhood. In fact, Matera from the Gravina to the Ecological Network, through the new "Sassi", is a city with a large amount of green peri-urban and urban, poorly connected to equipment that allow the slow circulation. Stream and Murgia can become places to cross, connections to the city, new urban rivers and green axes. Everything is to compensate the inefficiency of open spaces, which stop the concreting of the soil, taking advantage of these elements as an opportunity for development of green and slow mobility.

The city's forms for Matera and Valencia are the result of the correlation between the existing urban space and the new forms of expansion in a biunivocal correspondence that sees, on the one hand, the definition of new accumulation centres and, on the other, the consolidation of the historical town.

In the case of Valencia, the city evolved according to dependency criteria, specifically following ramification process that saw the explosion of new spaces. In fact, the city recorded an exponential urban growth, determined by the substantial industrial development, which had a significant impact on the subsequent evolution of the territory. In particular, in the last sixty years, Valencia grew significantly in a radial way, broadening itself almost spreading in all directions. The form the city is that we know today.

As regards, Matera's urban development follows the criteria of articulation according to a expansion for decentralized cores. The " Legge Speciale per lo sfollamento dei Sassi" (special law for the evacuation of Sassi's area) imposed at two-thirds of the inhabitants to leave their homes due to unhealthy conditions. A painful process, however, that led to the birth of new neighbourhoods designed by important architects (Ludovico Quaroni, Carlo Aymonino, Luigi Piccinato), making Matera an exclusive laboratory of architectural and urban experimentation. The new districts tell the story of a new city. Spine Bianche, La Martella, Serra Venerdì and Borgo Venusio give a new method of doing architecture making the city a field of sociological investigations, before, and planning proposals, then. The rebirth of the city result more evident with the conquest of the

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city Heritage Unesco Designation in 2009 that leads to the idea of "Matera, resilient cities" and those same spaces become an attempt to qualify urban voids.

In general, the shape of the city changes in the local and urban sphere, according to a contribution that, locally, sees neighbourhoods playing a key role, focusing on their practices and uses, and introducing processes of recovery, reuse and innovation derived from generational and anthropic transformation of the cities.

The open space of the public city, for Valencia and Matera, can sometimes appear inconvenient or a stand-alone system within the archipelago of settlements that constitute the contemporary urban void. The differentiation of contexts forces, however, to pay particular attention to the open space created by the modern city in the last century, which has changed its role, progressively, expanding and emerging, like choice consequent to the character private and public of independent building volumes. The public-private correlation generates the concave and convex interpretative categories seen as conceptual figures that help to rewrite the space from the redefinition of habitats-forms, helping to read the dimensions of interior and exterior as city conditions: empty-full, urban margins-deep signs.

The empty one, for example, assumes value in relation to the full one as a connection between the urban parts. In other words, empty-space gains sense in how to relate to the full, defining the modes of use, times and frequencies that support it and hosting new practices.

Empty space, therefore, becomes a positive category of space, capable of helping the interpretation of the city over its public and semi-public parts. In the urban sphere, empty space establishes two modes of relationships: the space between the parcelling houses and the pertinence space of streets and public buildings, which is more open and porous. On an extra-urban scale, the empty gives to the city the opportunity to define land project through the theme of transition from city to countryside and urban borders to peri-urban space, elaborating the meaning of this passage through better planning of urban signs.

Conclusion

The public city is an opportunity to re-valuate the role of open space and the future scenarios of urban regeneration, on the one side as an inner resource, on the other side as a possible occasion of crossing and encounter by different urban populations.

These hypothetical future projects based on development of possible ecological networks that advantage natural and anthropic flows and give sense to the public space. For this reason, looking at the spaces that take part in the concave-convex comparison, they can be considered respectively like elements of the network: the primary connections (represented by the tree system and the ecological corridors) and the secondary ones (the stepping-stones that localize the passage from one system to another). The ecological network has the role of making the city more permeable (from green corridors, to natural migratory flows, to agricultural naturalness), but, above all, it shows the potential of population movement inside the open spaces and habitable greenery, creating flows of naturalness and actions that accentuate the identity of the spaces.

In view of an open space development, it's necessary enter in consonance with practices and their actions is essential to grasp the meaning, inside the friction between physical and social space, of the daily experience that has been lost with modernity and which represents the concept to which aim most of recent projects.

The way to rethink on spaces generates a series of strategies that lead to the consideration of public space as the one the inhabitant's experience. There are breakthrough strategies that create discontinuity elements in open space perimeters. These elements "break", with the punctual opening operations, the border between the public neighbourhood and the urban context. In other cases, there are reactivation strategies of transition space, by intensifying the use character through overlapping jobs or by temporarily adoption of spaces that do not cover a continuous cycle.

All this leads to say that open space does not only have a predominant identity, but in some cases, has the potential to make available

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spaces to occupation phenomena or "do-it-yourself" practices that redefine relationships and possibility of use in the different ways of restitution of perceptual continuity or of crossing the open space.

To do this, it is necessary to take an investigation, sometimes subjective, focused to what there are in the area, to the equipment and to the traces that the social practices leave. All this, for the purpose to understanding the requests to give technically relevant answers and to define the possible innovative treatments.

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Urban form and the social use of space

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Abstract. *The essential purpose of any Urban Project is to shape Public Space. Buildings role, no matter their architectural qualities, is to shape that void and give it character. The failure of CIAM´s urbanism was its disregard for public space, merely a left over emptiness between isolated building blocks and highways. A good instrument to understand this fact is the Figure/ Ground plans that show in black and white the basic shape of buildings and voids. In the traditional city, the public spaces have a clear definition, a presence of its own. In a CIAM design, the public realm is shapeless, with no hint about either use or limits. These concepts are broadly accepted today, but two adverse conditions affect entire populations: 1. In poor Countries, there is an urgent need to make slums part of the city structure and services, with little budget left for public space. 2. In Asian Cities, mainly in China, immense areas are demolished overnight; its historic fabric replaced by endless rows of anonymous high rise blocks amid elevated traffic structures, with no place left for pedestrians.*

Keywords: Urban project, Public space, Urban form, Figure ground diagrams, Squares.

Introduction

Cities, no matter their age or location, are collective creations of human toil and spirit. Today, an important and growing percentage of world population live there.

It is the most sustainable way to dwell in planet Earth, provided the use of public transportation and clean energy increases, pollution is controlled, and consumption and waste –especially in rich countries– decreases. It is clear, although difficult to believe for many, that Manhattan is more sustainable than suburban sprawl.

The best choice is compact cities –either small towns or world metropolis– with democratic governments, good transportation, varied housing and adequate educational, health, security, recreational and cultural services.

Then, let´s consider what makes a good place to live. One of the best answers is the quality of its public space.

The form and use of public space is as much a cultural as a physical construct, which varies in different cultures or periods. Similar forms do not imply a place will house the same activities. Successful projects in some places are not so in others, owing to its disregard for local conditions, but it may also happen that places can be used in quite a different way than the one designed for.

This text concerns mainly with Western public space, its development, and some design criteria, which may be useful to project or evaluate an urban scheme.

In traditional cities, public spaces have a clear definition, a presence of their own, while in many areas built after 1950, the public realm has no discernible shape to indicate its use or limits. Good architecture does not always help, as demonstrated by the no man's land between the Concert Hall, the National Library and the Art Gallery in Berlin.

It may then be assumed that one essential aspect of any urban project is to shape public

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Figure 1.
Royal Crescent, Bath

space. It is a conscious decision. Buildings define that void, give it character. Architecture, good or bad, is architect's concern. When questioned about cities they have visited people mention places and activities and only some monuments, like Eiffel Tower or Sidney Opera, symbols of their respective cities, are worth recalling.

Some history

In the beginning was the street

It may sound biblical, but surely the street is the first structure that combines directional movement and enclosed public space. No village can exist, no matter how small, without at least one path that allows access to sheltered private space and gives a common place to meet. The pattern may vary from the irregular lines adapted to the place´s topography or defense, to the geometrical clarity of Hippodamus de Miletus grid or the Roman cardo and decumanus, but it always marks the birth of a city.

Many European cities have uncertain beginnings, and their older sections show a haphazard street pattern, unless they originated in Roman settlements. The opposite happens in the New World. In South America, they were founded under the precise dispositions of Council for the Indias (Consejo de Indias). In North America, the colonists´ strong common sense made them usually chose a basic grid to organize their new villages.

Nomadic tribes of hunters camped in a loose circle around a fire, or safer still, inside a cave, those being the best ways to defend from enemies and wild animals alike. The street and the first settlements were born as soon as keeping herds, and later growing crops, began.

In fact, our first social experiences are associated with crossing the home's safe threshold and discovering in the street the rich and sometimes dangerous reality of the outside world.

Then came the square

The public square is probably one of the most wonderful inventions of Western culture. It may be taken for granted, but it is still quite

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alien in the Eastern world. In Beijing, both Tiananmen (1949) and the Access Square to the Forbidden City (Ming Dynasty, 1420 AD) are ceremonial spaces, as the last one was immortalized in Bertolucci's film, The Last Emperor. In the East,

gardens are the essential open space, and were in the past restricted to king and court

In contrast, Greek Agora and Roman Forum were the realm of citizens, where they met, did business, discussed public affairs and gossiped.

Forms of government and the relative strength of political, economical or religious powers changed, as did the unstable balance between God and Man's prevalence, but streets and squares are still the basic urban structures in our cities.

O tempora, o mores - Tulius Cicero

The methods and tools to open these spaces change both in time and place, as do their use and character.

The Medieval Townscape

Medieval Streets were narrow and followed an irregular pattern, even if they continued an older Roman settlement, as in Rome, Florence and Siena.

Squares, when opened in front of churches or city halls were often small and irregularly shaped, well suited to a population often decimated by war and plague. That made it difficult to have a complete grasp of cathedrals, whose towers were visible only at a distance, a situation similar to that of high rise structures today, like Lloyd's building in London.

When squares occupied existing voids, as did the Piazza Navona, built over the old Domitian Circus or the amazing Piazza del Campo in Siena, on the former site of the Roman Forum, their design was more regular, their geometry more precise. In both cases, however, access was intricate and through narrow twisting streets.

Here Comes the Renaissance

Some of the most brilliant minds of human history lived and worked in Italy during this brief period. They changed the world, but the cities they lived in did not change much. The ideal city they conceived, a perfectly geometric space defined by equally perfect classical buildings, was present only in paintings and drawings. Perhaps the most expressive images were two imaginary perspective views of "Baltimora" and "Urbino", by a painter of the Piero della Francesca school.

The Rise of Absolute Monarchies

The demise of feudalism and the consolidation of nation states, mainly France, Spain, England and the Vatican State, started a process of change in the design of new more formalized public spaces, built in shorter time spans and intended to demonstrate the power of both king and country.

Between 1550 and 1650, the popes were Rome's true urbanists, with Sixtus V (1585-1590) as the most inspired. They opened new streets and widened existing ones, restored the water supply system and built most beautiful and popular public spaces.

It is enough to mention just three: Piazza del Campidoglio, designed by Michelangelo in 1536, Piazza del Popolo, part of Sixtus V's Plan of Rome, and Piazza di San Pietro, completed in 1667 with the magnificent Bernini colonnade.

Although the land needed for these works came partially from demolition of older buildings, the new spaces were integrated into the street network.

Giambattista Nolli's Pianta Grande di Roma of 1748, presented in great detail the city map, where public space: street, squares and the interior of churches and palaces´ courts was white, and private buildings black. This criterion to represent the city´s solids and voids would become one of the most useful design tools, until –of course- the recent coming of Google Earth.

In Paris, geometric perfection was still more important, a Bourbon´s trademark. Not only did the plan had to be regular, but also the square's façades had to be exactly alike.

The required space was carved out of the compact built mass, while keeping the random access from existing streets. Once inside the

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square, the change was abrupt, provoking a strong feeling of strangeness. This ideal was clear in Place des Vosges (1612), Place Vendôme (1702) where the continuous façade was built before the actual buildings behind, and Place de la Concorde (1772).

The same design scheme was used in the construction of the Plaza Mayor in Madrid, finished in 1619 and the Plaza Real of Barcelona, even if built in the middle of the 19th century.

It is also interesting to note that Italian piazzas had no trees or planting while the French ones usually accepted some well pruned trees. To find greener squares one has to cross the Channel.

London and Edinburgh

Cities in Britain had a different growth pattern, owing in part to the scarce presence of defense walls, – water being a better deterrent for invaders, excepting Vikings– and the presence of manor houses with ample parks next to central areas. In London, after the Great Fire of 1666, a design competition was held and won by Cristopher Wren, but it was abandoned due to the legal and economic difficulties inherent to the process of opening new streets and modifying old property lines.

Between the 17th and 19th centuries, development of the Great Estates transformed the properties of the Crown, a few important families, and corporate bodies, into new and elegant neighborhoods, with a clear street pattern, compact townhouses and –mainly– green private fenced squares. They bore the prestigious names of the original families: Bedford, Cavendish, Portman, Montagu and were open only to the neighborhood residents. This peculiar system turned out to be quite successful. It defined a clear sequence of well-proportioned public spaces with good urban architecture. It also prevented random demolition and, above all, produced some beautiful sequences of urban form, crescents and squares, which reached its apex in the small town of Bath.

In Edinburgh, a similar more orderly process took place. The old city, tightly built around the castle mound was overcrowded and unhealthy. With uncommon rationality, the city bought the land needed for its expansion and in 1767 held a competition. won by James Craig. The design was organized trough a sequence of broad tree lined avenues and squares. Works proceeded accordingly, under strict norms that regulated building heights and materials.

The 19th Century

Industrial revolution turned inventions into manufactured goods and commercial development, creating economic growth and relative peace. It was also a time of wealth concentration, inequality and urban poverty. Cities population increased at an accelerated pace, while public services were almost non existent and sanitary conditions and overcrowding turned slum dwellings into cells lacking ventilation and light.

Big cities faced the need to expand by incorporating land outside the old walls, long made obsolete by the fire power of modern weapons.

This era saw the rise of the engineer in industry and service infrastructure. but also, like John Paxton and Gustave Eiffel, in the design and construction of entirely new building programs for Railways, Grand Central Stations, Bridges, and Exhibition Halls.

The relevant aspects of urban expansion were:

•Rigorous plans with detailed dimensions for street and sidewalks, building materials, service ducts etc.

•Importance of Urban Projects in decision making procedures.

•New public transport: trains, trams and later the underground.

•Public Buildings for Government, Education, Commerce and Leisure (opera houses became a prestige symbol).

• New public parks located in the old royal gardens, hunting grounds or public land (New York's Central Park).

Napoleon III and the Paris of Baron Haussmann

There can be little doubt that the ambitious plan that Napoleon III and Baron Haussmann

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conceived and executed from 1852 to 1870 was one of the most successful and influential ever deployed. A new vision of the city was literally cut out from the old built fabric, opening avenues and streets complete with water, sewage, gas and drainage and even façades, as well as the Boulogne and Vincennes parks and the Garnier opera house, opened in 1875. New building types were also introduced, like "A la Belle Jardinière" department store, 1867, which enhanced the city's image as fashion capital.

In short, Paris became the mirror all capital cities wanted to look at and had an influential role in their future.

Other Cities, other Plans

In 1860 Barcelona initiated works on vacant army land following the brilliant Ildefonso Cerda plan. It was based on a grid of large regular blocks with broadened corners, which increased light and transformed the sidewalks in pocket squares.

In 1909 Chicago wished to become the "Paris of the Prairie" under the guidelines of the Daniel Burnham and Edward Bennett plan.

Buenos Aires, which since 1900 considered itself the "Paris of the South", opened new avenues and created the extensive Palermo urban park. The new ideas were synthetized in the "Plan de Estética Edilicia" (1925) of Carlos Noel.

New York followed its own path. In 1609, the Dutch settlers had instructions from the West India Company to produce in the Southern end of Manhattan a very ordered street scheme. It never was. Two centuries later, the Commissioner's Plan of 1811 established the rectangular pattern of streets and avenues which exists today. Its flexibility allowed in 1853 the inclusion of the 2.8 km2 Central Park, designed by Frederick Law Olmsted and Calvert Vaux.

The book "An Atlas of Rare City Maps, Comparative Urban Design, 1830-1842" by Melville C. Branch includes 40 beautifully detailed drawings of –mostly– European, North American, and Asian cities. Drawn in the same period, they allow to compare the development and design of the cities rendered. Among others, two aspects show strong cultural differences:

•Constantinople (Istanbul) and Calcutta. The first one, with no Western presence, is a compact mass of twisted narrow streets and no open public spaces. The second one has a similar street pattern, but the urban fabric is cut by broader, straight streets and avenues, built by the British Administration/ occupation.

•The three American cities, Philadelphia, New York and Boston are organized by a regular orthogonal street pattern, although in Boston the grid is adapted to the river costal front.

The 20th Century

As in the 15th century, the last decades of 1800 and the first years of 1900 concentrated an unusual number geniuses who seemed to share a common vision. Darwin, Einstein, Freud, Marx, Picasso, Joyce, Stravinsky and Le Corbusier –to name but a few– set the foundations for the following hundred years.

Abstraction was the rule. Music rejected melody, literature disregarded storytelling, painting and sculpture no longer concerned with realistic forms and architecture abandoned not only ornament but also the traditional city model.

Between two World Wars

New city planning adhered to a dogma based on hygiene and speed, which resulted in use segregation, highways, and endless –but not always useful– green open spaces. This ideal was shared by all modern architects, from Le Corbusier to Mies van der Rohe and Walter Gropius at the Bauhaus.

The first Congrès International d´Architecture Moderne (CIAM), strongly influenced by Le Corbusier, met in 1928 at La Sarraz. The Athen's Charter, signed in 1933 at the second CIAM Congrès, established city planning principles and was unanimously supported until the 1950's Team 10 rebellion. The better known urban projects of that period were the 1923 Le Corbusier's Plan for a Contemporary City of three million people and the 1925 Plan Voisin for Paris.

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The failure of CIAM urbanism was not its lack of design excellence, even vision, as Le Corbusier's proposals and buildings clearly demonstrate, but its disregard for public space, merely a leftover emptiness between isolated building and highways.

Clearly one of the best achievements of Modern Architecture was fluid open space, seamlessly interconnecting a building´s interior and exterior. Nowhere is this concept better expressed than in Mies van der Rohe´s masterpiece, the 1929 Barcelona Pavilion.

Nevertheless, this idea proved a failure when applied to the design of large scale social housing or office building projects, based on endless rows of blocks that had no clear relationship either with the circulation pattern or the open spaces enclosed. In most cases they were alien to the city and had no identity, a situation aggravated by the strict zoning policy put into practice, which segregated housing from work, education, leisure and even mobility.

By the end of the fifties, it was generally assumed that large scale planning had failed to give an acceptable answer either to the reconstruction of European cities devastated by World War II, or to the upgrading of the central areas of American cities, deserted by middle class flight to suburbia.

The 1960´s Change of Paradigm

Team 10, started in the 9th CIAM Congrès in 1953 to evaluate the failure of the 1933 Athens's Charter principles used in the reconstruction of European cities after WW II. The most prominent members were Candilis, de Carlo, Bakema, van Eyck and the Smithsons. Their aim was to combine CIAM´s ideals with the characteristics of traditional city. It was doomed to fail, as did the Smithsons' invention of streets in the air, an integral part of almost all social housing in Britain at the time.

Four influential books condensed and advertised the ideas that were to change city planning and social policies. The first two dealt with urban form, the last two with the social use of public space.

Aldo Rossi: L´Architettura della Città - 1966

The text assumes the city to be one with its architecture but also with its own history, so that the remaining traces of old structures are part of the present and may give clues to its future, thus ignoring the timeless ideal of the modern town.

Rob Krier: Urban Space - 1975

It proposes to organize the city along a sequence of public spaces, integrating well-proportioned infill buildings with monuments in a coherent whole. It also presents a sort of morphological catalogue of urban form and some competition projects.

Both publications strongly influenced urban thinking at the time, notwithstanding Rossi´s obsession with institutional ´800 Italian Architecture and Krier's exclusive preference for German Baroque public space.

The next two books were both written in 1961 and are concerned, from different professional viewpoints, with the way cities were lived and enjoyed.

Jane Jacobs: The Death and Life of Great American Cities

She was a journalist and architectural critic at the New York Times and participated in a crusade against a road trough Greenwich Village -where she lived- proposed by the all-powerful planning head, Robert Moses. They won, and from that moment she was a leader of protests against Moses´ highway projects, which deteriorated public space and communities.

Gordon Cullen: Townscape

His beautiful drawings, showing everyday life in traditional public spaces, showed how to integrate modern constructions and activities into existing towns. He was the leader of the Townscape movement which grew around the Architectural Review Magazine, to oppose intrusive urban renewal actions and highways.

Cullen's publications and thinking had a strong influence in changing urban policies in

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the following decades and reflected society's reaction against them.

On the other hand, the rejection of modernism also produced postmodernism, a sadly poor, if probably inevitable, return of architecture to an improbable past.

The Regeneration of Inner City.

By the end of 1960, France´s President Georges Pompidou realized the importance of locating great public buildings in deteriorated areas, emptied by the removal of service or transportation structures. His first step was to open an architectural competition for the design of a new Contemporary Art Museum in Les Halles neighbourhood. Won by Piano and Rogers brilliant design, the Centre Pompidou was a success since it opened in 1977. President Françoise Mitterand followed this policy with enthusiasm, and imposing structures were built for the new Bastille Opera, the Finance Ministry, the National Library and La Villette Park, none, however as widely acclaimed as the Pompidou.

The French called Terrain Vague the large plots of land emptied in central city areas by the displacement of services, railway yards and even port docks. The policy of locating big urban developments in those spaces was soon followed in the Western world. Although these areas had irregular shapes, especially railway yards, it was possible to integrate them successfully into the near street´s grid.

What now?

The situation is not the same everywhere. The consequences of climate change are felt globally, but their impact on each region and country are different. So are their actions and commitment. The Paris Consensus recently signed may be a first step in the right direction, especially with China's agreement, a fact sadly unbalanced by Donald Trump´s disaffection and the potential consequences of the Brexit.

Everybody is aware that present consumption, pollution and waste levels are not sustainable even in the short run: cities will have to change.

Unfortunately, Asia, and especially China, have opted for an oversized CIAM model to solve the pressing need to house millions of new city dwellers. Isolated buildings twenty or more stories high are linked by highways, leaving no accessible public space, or even sidewalks.

Nevertheless, some positive trends can be detected almost everywhere:

•Promotion of mixed use areas in all neighbourhoods.

•Inclusion of social or subsidized housing in new developments.

•Improved design of huge service infrastructures as waste disposal or energy plants.

•Limitation of private car access and increase of pedestrian areas in the central city.

•Banishment of new city highways.

•Creation of new urban parks.

•Support and extension of mass transit and the high design quality of new facilities.

•Landscaping of river borders for public use.

In the USA, the disenchantment with suburban living has reversed the sprawl trend to more sustainable compact towns and developments, Main Street nostalgia included. Even if some projects built by the Walt Disney Corporation fall in the kitsch category, this trend can only be celebrated.

The Smart Growth Manual written by Andres Duany and Jeff Speck is a clear and well-illustrated handbook that condenses the knowledge and experiences of the New Urbanism movement. Although it can't be applied literally to different cultures, it will help elaborate proposals in a different milieu.

The New Millennium Challenges

While problems are being solved in central city areas, the biggest and most pressing issues have moved to the edges, in the conflict ridden periphery settlements.

The Developed World

Average middle classes can no longer afford to live in the city -be it Paris, London, New York or

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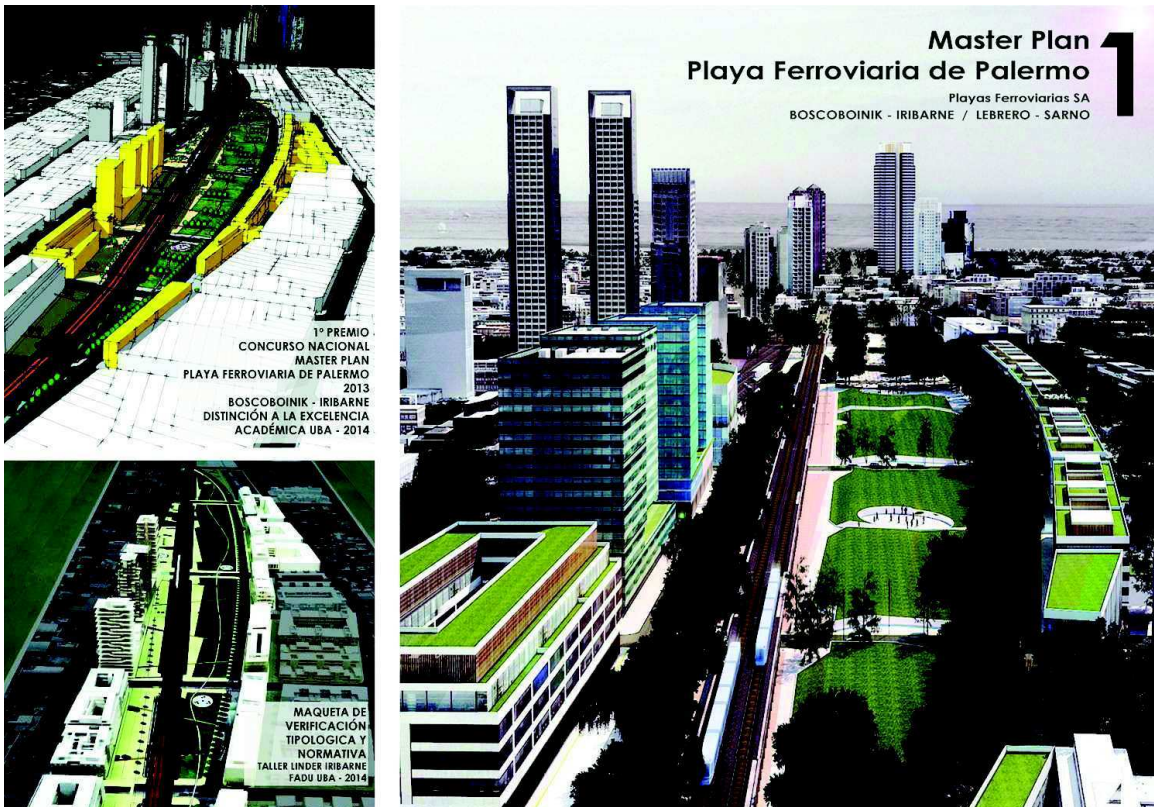

Figure 2.
Master Plan for Development at a Former Railway Yard in Palermo, Buenos Aires. General view

Vienna- since even their less attractive districts have been gentrified. That means teachers, policemen, firemen or nurses travel long hours from home to job. The situation is worse for marginal, often immigrant population, as they live even further away and housing, education and transport are worse.

They share, though, the syndrome of single use communities:

•Lack of public space and cultural facilities.

•Anonymous planning and architecture, based on repetitive medium rise blocks, and track housing in the USA.

•Low densities which prevent community life.

•Lack of attractive landscaped leisure and sports areas nearby.

The first and obvious answer would be to provide them the same or better services enjoyed in the city. The second and less obvious one could be to increase density and create interesting public space with a new street and squares pattern.

It is possible to find fresh ideas in Rodrigo Perez de Arce Urban Transformations and the Architecture of Additions.

Conclusion: Too much unused open space

The developing world

Poverty –even misery– and social exclusion exist not only in the far away suburbs but also at the inner city. Whether called slums, villas miseria or favelas their shortcomings are the same:

•Lack of basic utilities: water, sewage, drainage and paving.

•Lack of accessibility and public transportation.

•Overcrowding.

•Lack of adequate health, education and leisure facilities.

The first answer is to provide all the missing essential utilities and services. Equally important is to make the settlement part of the city. It is not an easy process, since it involves opening some new straight streets through the existing passage maze. That allows ambulances,

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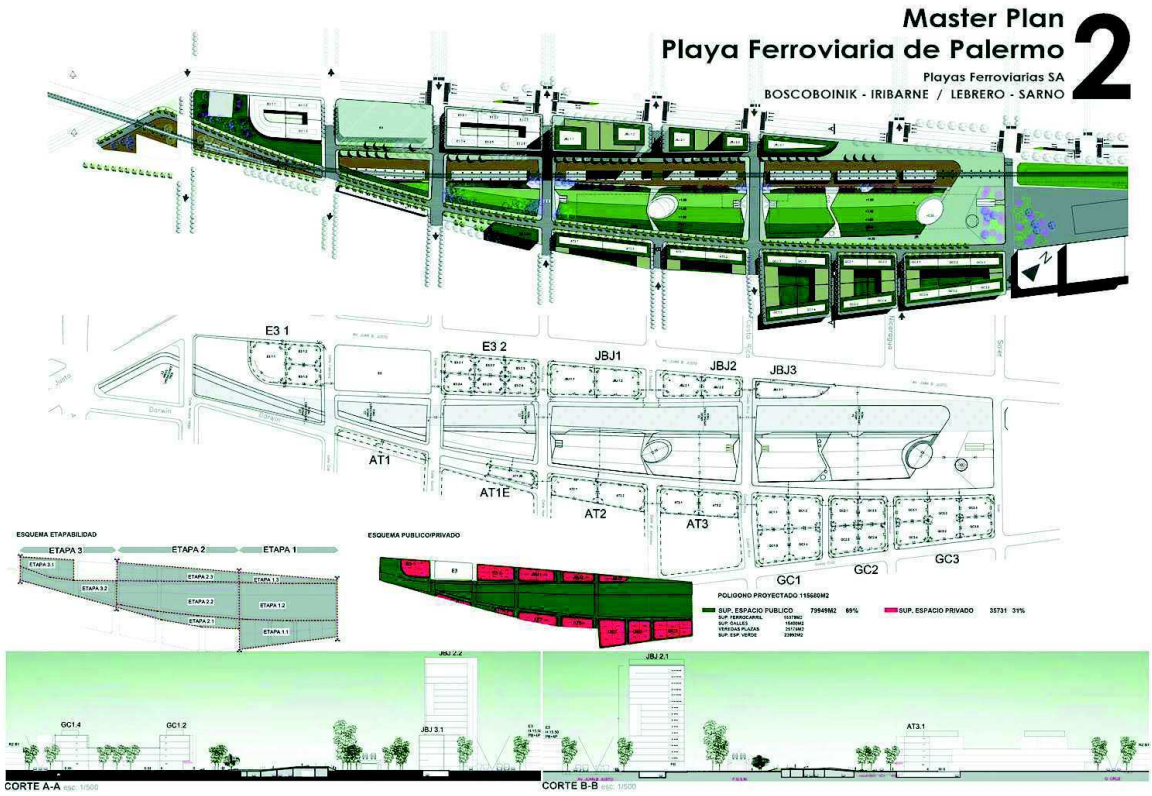

Figure 3.
Master Plan for Development at a Former Railway Yard in Palermo, Buenos Aires. Plans and section.

fire engines and police cars access, and makes space for utility ducts. It is also important to make previsions for public leisure and sports space, but also –as in Medellin– for some outstanding cultural or educational facility.

If the settlement is far from the city, public transport is required to drive its social and economic integration.

Conclusion: Too little open space

Most cities do not clearly fall in any of this two categories, specially those with over ten million population, where both realities coexist.

El País, Babelia" section (May 27th/ 2017) publishes the article "The Megalopolis have a future" ("Las megalópolis tienen porvenir") which includes Norman Foster and Alejandro Aravena contributions. Notwithstanding different world situations, some clear ideas are generally accepted:

"Cities with good living conditions are rather compact and have easy pedestrian accessibility, good public transport and ample parks and public civic spaces. . .. They are comparatively dense and its historical evolution is rooted in European traditional concepts. . . They use less energy than extended low density cities as Los Angeles, totally depending on private car use . . . According to a study by Climate New Economy (La Nueva Economía del Clima) urban sprawl costs America one trillion dollars a year".

Different authors also agree on the need to adapt general ideas to local conditions. Two recent projects by Foster + Partners Office, Masdar new city in Abu Dabi (UAE) and the Master Plan for Dharavi in Bombay (India) show this ideas in two widely different Asian countries.

Buenos Aires has a clear urban structure, good public space, transport and resources that coexist with poor areas, both in central locations as in marginal suburbs. Today public works deal mainly with transport, waste disposal,

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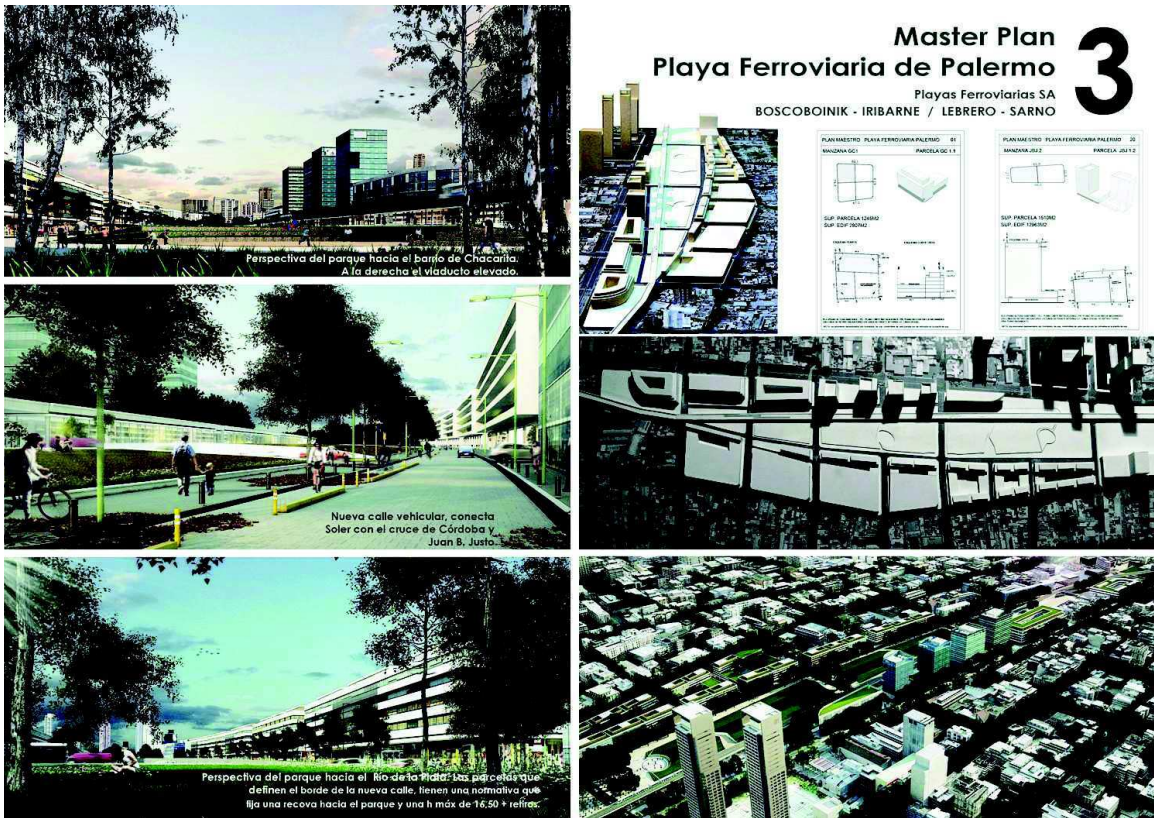

Figure 4.
Master Plan for Development at a Former Railway Yard in Palermo, Buenos Aires. Partial views

public space and shanty towns improvement, but also public – private development projects in areas left empty by obsolete service and utilities removal.

The work enclosed is a medium density, mixed use development for an upper/ middle class fast growing area of Buenos Aires. Its design is based on the ideas presented in the text.

Master Plan for Development at a Former Railway Yard in Palermo, Buenos Aires

This project was the winning entry at a 2013 National Ideas Competition for the development of the unused railway yard Palermo, at a growing neighbourhood in the north of Buenos Aires. The area is ten blocks (1 km) long, between one and three blocks wide and its net area is 11,5 ha (115,000 m2). It is divided in two sectors by the railway tracks, which will be elevated in the near future.

•Architects: Mario Boscoboinik and Jorge Iribarne

•Design decisions:

*Open a unified green public park 1 km long at the wider Southern sector, its shape inspired by Bath crescents, enclosed by 16m high buildings, with arcaded ground floor.

*In the Northern, narrower sector place a sequence of five 50 m high towers which grow from a 16 m base.

*Under the elevated tracks there will be shops and restaurants connecting the avenue's sidewalk with the park.

•Key data:

•Land area allotted to streets, sidewalks and ublic park…80,000 m2 (70%)

•Land area allotted to building footprints…34,500 m2 (30%)

•Building floor space…99,000 m2

The project received the following awards:

•2014: Academic Excellence Award, Universidad de Buenos Aires.

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•2016: First Prize in Urbanism Award, Sociedad Central de Arquitectos (SCA) and Consejo Profesional de Arquitectura y Urbanismo, Buenos Aires.

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Study of morphological structures of historical centres as a basic tool for understanding the new conditions of social habitat. Quito, Suzhou, and Syracuse

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Abstract. *In the age of globalization, architecture (through an identity crisis) is directly connected with the loss of progressive recognition of morphological studies of city and territory, in a gradual replacement with real-time views of phenomena and urban facts. The satellite gaze finally flattens the interpretation ability of living spaces that were the prerogative of the morphological studies. The actual complexity of cities and territories escapes from the architect's eyes as they increase their technical capability to know details. The season of great renovations and methodological studies that had powered the 1960s, 70s and 80s seems hopelessly distant. Studies on social, economic, and environmental components of the cities and territories (infrastructure, public space, environmental networks) are so proliferated without actually being supported by adequate interpretations of their physical-spatial dynamics. The result: a substantial failure of architectural design to express human habitat visions. It is imperative a theoretical and practical effort to pick up the threads of an interrupted conversation, and return where these studies have expressed their richest potential: the historical centers, the places with most dense and rich heritage. Historical centers of cities like Quito, Syracuse and Suzhou have settled and stratified the morphological structures of several different settlement patterns. As a result, architecture has demonstrated an ability of description and interpretation. Reflecting on how this goal was reached in these cities (by means much less powerful than the current) settlement will be able to bid the morphological component of urban and regional studies and architecture project as a fundamental tool for understanding the human habitat.*

Keywords: Historical centers, habitat, public space, architecture, heritage

Introduction. Three listed cities

There is no doubt that in the globalization age new ways of defining the "meaning of the city" are being experienced. They are different from other morphological studies that were practiced in the period of their greatest development (Aymonino, 2000). At the heart of this new condition is the issue of "recognition" of exceptional values (Unesco Report, 2016), no longer referring to the local specificity of individual contexts, but extended to a planetary

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scale. In this changed perspective, a decisive role is certainly played by the choices of UNESCO sites on the World Heritage List, and in particular by the complex procedures accompanying the entry and maintenance of the sites in this exclusive list (Unesco Report , 2016)

Leaving aside the crucial issue posed by the "dizziness of the list" and its paradoxes, which will be time to come back (Eco, 2010), the theme taken in the title from the morphological exploration of three urban realities can be researched. The three cities are included in the UNESCO list in three different moments and on three different continents: the historic center of Quito in Latin America (1978), the classic gardens of Suzhou (1997-2000) In Jiangsu province in the east of China, the city of Syracuse and the Necropolis of Pantalica in the heart of the Euro-Mediterranean basin (2005).
Methodology. Places of memory, voids and territories

If we observe these three cases with essentially dynamic instruments of morphological and urban studies, the evidence that emerges, clearly shows the substantial staticity of the criteria with which they were included in the UNESCO list. In Quito, Suzhou and Syracuse/Pantalica, the dialectic between the dynamics of urban and static forms of capital appreciation criteria is responsible for the communities that inhabit these same places and the way they experience in their daily lives their exceptional diversity ("Heritage" entries by P. Ciorra and C. Younes in Recycled theories, 2016).

To prevent these consequences from being the basis of the process set up by UNESCO and ICOMOS, delivering in future items of heritage without established humanity or stubbornly hostile communities to the inclusion of their election sites in the list certifying their universal value, it is necessary to re-allocate urban studies to a fundamental role in the process of recognizing the physical-environmental and historical-cultural meaning of cities. In this perspective, the most striking cases are only the pretext for extending this method of investigation of identities and differences (D'Alfonso, 1995) to all components of human settlements, knowing that at least two symmetrical paradoxes lie on the dizzying list UNESCO promoted: on the one hand, the risk that it runs out of prematurely, and on the other, the risk that it never ends, potentially including every fragment of the anthropic landscape in an indefinite perspective.

Of these two paradoxes, the first describes a regression of universal culture that can only be anticipated by the expression of dystopia (by J. Swift, Gulliver's travels, published in 1726, to G. Orwell, 1984, published in 1948), the latter, instead, looks to its announced of the affirmation of an allegorical dimension of heritage (Choay, 1992) potentially capable of impregnating everywhere on the planet, with the same uncontrollable effects Jorge Luis Borges attributed to the application of Royce's map (Borges, Del rigor of the ciencia, 1946).

In an era when mapping of terrestrial space through satellite view is revealing the superficial consistency of every corner of the planet (J. Brottom, The History of the World in 12 Maps, 2016), confining in a corner the specific demonstrative capabilities of urban morphological studies (P. Virilio, L'espace critique, 1984), this second paradox appears to be the most insidious.

For this reason, the proposed methodology assumes a specific point of view, used as a probe to detect the complexity of the cases analyzed and to open to their reinterpretation in design terms. Thus, for the analysis of the historical centre of Quito, it is proposed to analyze the urban public space from the definition of "places of memory" as a system of itineraries, crossings and monuments (Augé, 2009).

Similarly to the analysis of the classic gardens of Suzhou, it is proposed an insight to a place of memory formed by the dynamic transformation through space and time of the life in the void, where emptiness and absence (considering this concepts dense and complex) can be expressed spatially. It has been assessed through the lens of the concept that "sense" of a place can be preserved despite its changes and transformations. (Ricci, 2000).

Finally, to investigate the city of Syracuse and the Necropolis of Pantalica, the relationship between the archaeological density of urban space and the rarefied composition of the vagues terrains, recurrent on the edge of the

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city, has been recalled, evoking the dialectics of two famous contributions by Saskia Sassen And Ignasi de Solà - Morales, devoted to the interpretation of the concept of "territory" (Solà Morales & Sassen, 2003).

Measurement and analysis

The case of Quito. A dichotomy regarding the places of memory. If the construction of "places of memory"1 implies a long and slow process through time, it can be assumed that a historical centre is in its essence a place of memory. However, in the selection process of the ideal zone for being studied, exceptions were identified. For this city, there has been analysed three public spaces in the limit between the historical centre and the centre-north zone. These spaces (located in the transition to the modern zone) have particularities that singularize, through historic layers and contemporary interventions, the transition to another city model in time and space. The studied zone is characterised for being a "knot where the old city and modern city meet" (Peralta & Moya, 2007) in which three public spaces are highlighted:

The first space is a strong preexistence of the colony: the Plaza San Blas (16th century), a symbol of the religious footprint imposed in the Spaniard colonization with one of the oldest churches of the city. In its origins, it sheltered indigenous meetings. From the 18th century, it has suffered several interventions. The most recent, attempt to integrate urbanly with a void (the second space of study) through the unification of the floor of both places with the same materials in a unique level.

The second space is a "square" as a result of a contemporary intervention (21st century), that started off with the demolition of a historical building: the National Library. It is a void that has intended to gain identity through an sculpture and a trendy green wall. Nevertheless, it is a kind of incidental space that lacks of defined authenticity, due to the demolition of a cultural and historical symbol, that was moreover, part of a logic of urban morphological structuring. The demolition propitiate the production of a banal space, far away from a dynamic transformation of the place in order to connect it with contemporary necessities; a non-place in terms of Augé. As Ignasi de solá Morales anticipated, it is not only the system of habitable spaces with its topographical, historical and social determination, it is fundamental a meeting place of formative activity, it means, to understand public spaces as places of interaction and stratification of the context.

The third space is La Alameda park, a historic milestone, witness of political and morphological transitions. The superposition of historical layers is appreciated through the Astronomic Observatory building (nineteenth century) located in its heart, or a series of iconic buildings of Quito's modernity (twentieth century) in its perimeter.

Since the heritage approach is more often associated with "doing" (practices or techniques such as restoring, rebuilding, revitalizing, etc. or management processes) than with "thinking" (critical discussion of the nature and symbol of heritage), observing these three spaces constitutes a tool for the analysis of contemporary places of memory, transcending from idealism to realism. Following the same sense of Augé's proposal, the chosen sites have been analyzed from three concepts: public space as itinerary, intersection, and monument. The urban space is individualized through an urbanistic approach on the one hand, and a perceptive approach on the other hand. Both components contribute to recognize its identity and synthesize categories of analysis. Thus, the urban space can be studied and classified according to geometric and anthropologic parameters that are translated into a line, an intersection of lines and a point of intersection. In the geographical scope, these three places are seen through three concepts: itinerary, crossing and monument. (Augé, 2009).

The urban space presupposes a community or groups of people who act in it. These actions generate flows of individuals moving inside it. In the historical centre of Quito many routes connect places of interest, such as Guayaquil street that connects the Sucre National Theater to the Quito Observatory in La Alameda park, or the Basilica of the National Vote that through

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the Francisco de Caldas street connects with Plaza San Blas. It is evident that there are "axes or paths that connect one place with another, which have been traced by men" (Augé, 2009). In the same portion of the city it is possible to identify points of convergence of paths or itineraries, it means, events along the way (Lynch, 1960) and where the possibility of occasional and voluntary human activities is greater (Gehl 1991, 2014). Plaza San Blas is the meeting point of the routes described above. However, there is another public space next to it, defined by the area of the demolished National Library, a space that was created ignoring the community practices; therefore, it suffers a lack of identity strength.

In fact, the presence of monumental architecture expresses the identity strength of urban space. The public places characterize these spaces by the memory of historical events and by their events during the year. Therefore, the temporal characterization, despite being discontinuous, gives these spaces a strong identity component that wants to be tangible expression of permanence or, at least, duration in time (Augé, 2009). Then the space of San Blas expresses a clear dichotomy between the generational continuity, determined by the presence of the itinerary, crossing, and monumental architecture (church of San Blas), and the contemporary urban void pending of a monumental event now absent (National Library).

With this background, it is necessary to consider the identity of Quito's heritage, specifically in the studied area, through the practice of "recognition" that can lead to an identification of the value not only patrimonial but human from the point of view of the social habitat. These are the criteria that led Quito to its declaration as a World Heritage Site2 in 19783:

ii): The influence of the Baroque school of Quito was recognized in the cultural domain, especially art – architecture, sculpture and painting – in all the cities of the Audiencia, and even in those of the neighbouring Audiencia.

iv): Quito forms a harmonious sui generis where the actions of man and nature come together, to create a unique and transcendent work of its kind.

Thereby, it is an scenario where, in addition to the built value, Quito is emblematic of a marked interconnection between man and the natural and urban landscape, under temporal and spatial aspects. So the dichotomy of San Blas, demonstrates the necessity to valorize historical and social memory to strengthen the processes of identity in connection with contemporary needs. A true tradition is not a testimony of an outdated past, it is a living force that animates and informs the present. Far from implying the repetition of the past, tradition implies the reality of what lasts, a heritage that is received with the condition of making it fruitful, before transmitting it to the new generations. (Stravinsky, 2003).

The case of the classical gardens in Suzhou. Manifest and partial synthesis of the space-time relationship in the East.

The stratification as a superposition of the layers of urban memory, simultaneously shows the transformations of the settlement, it is the writing of its urban biography. They are layers of a dynamic system whose complexity must be investigated in the relationships between the different forms placed in time and space, paying attention to complex spatial connections capable of generating conditions of constant disorientation. The stratified topography interpreted as opening, flexibility and overlapping is increasingly interwoven, articulated and complex, produces interpretations capable of narrating the urban structure, its defects and potential, reveals the meaning of "place", places of "urban memory". Through layers it is possible to reconstruct a dynamic network of interconnections, a permanence system that narrates a plurality of events and urban memories, built with history and memory. The evolutionary and metamorphic stratification of the city protects the value of its urban memory and the link with the memory of the site. Soil is a substantial part of the architecture of a city, broad and varied "stratified matter" possessing "discontinuous continuity." In these transformations we read the passage of time and how to mark things: to understand the current reality, we also have to

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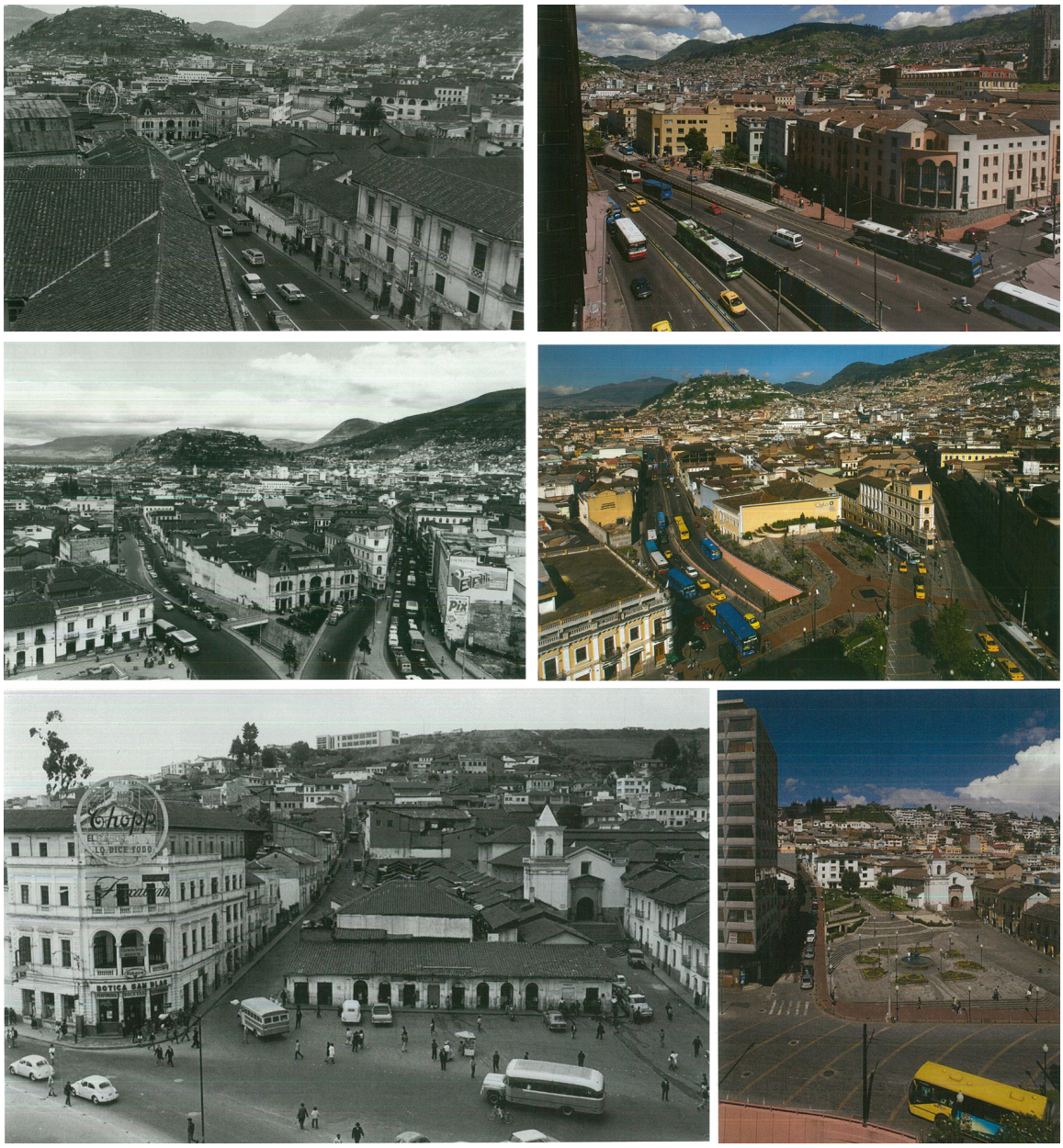

Figure 1. BEFORE AND AFTER. Morphological changes in the zone of study: 1960-2008. Source: Salvador, J. (2009). Historia de Quito "Luz de América". Fonsal.

understand the meaning of these mutations in terms of the project, so as to guide our future decisions consciously. The gardens of Suzhou are a privileged text of urban writing by layers, intangible memory of time and space. The urban morphology of Suzhou is constituted by a preexisting structure of elements of permanence that is well summarized once again in the concept of layers. The layers refer to the spatial transformation, the passage and the forms of connection in an extremely interesting physical-cultural context.

The interpretation of the Suzhou millenary organization by layers reveals a plurality of forces and assemblies, an overlap of layers that allows "to capture the connections that unite permanences and transformations..., the sense of novelty of many stays and continuity in apparent transformations: the preservation of the "sense" of a place despite its changes and transformations " (Ricci, 2000, p.145).

The nine gardens of Suzhou, humanity

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Figure 2. Up: Fragment of four maps of the study zone. 1751, 1736, s. XVIII y 1748. Source: Salvador, J. (2009). Historia de Quito "Luz de América". Fonsal. Pp. 138,139. Down: Current state of the zone. Source: Bing maps 2017

heritage protected by UNESCO, open an important reflection regarding to the meaning of urban memory. Of course, there is no doubt about the ability to delineate traits, signs, meanings in the ground to immediately become evident urban memory. But the theme and reflection that opens in front of the Suzhou gardens is apparently in complete contradiction with regard to the ability to witness the "material" memory. The gardens of UNESCO, as can be read in the official statement, are patrimony of humanity, substantially for its intangible value, linked not only to its extraordinary architecture, but especially to

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its meaning, as well as its weak and ephemeral content in continuous transformation. The Suzhou gardens reveal the value of time and empty space, open to new meanings of what is recognized as heritage.

The incredible experience in the gardens of Suzhou leads us to reflect deeply on the meaning of emptiness. In the specific case of Suzhou, the void is presented as a condition of possibilities, thus forms can be generated. Therefore, it is not background or scene, but space itself. To better explain this concept, we can think for example of the sukiya, in which the void becomes a present and active element, an agent of purification of the unnecessary, and a device that allows one to concentrate on the essential. The void transforms space: it has the power to reveal and improve the relationship between the elements of composition. Here the use of emptiness is neither contingent nor casual, but represents a very precise choice: to intentionally leave an unfulfilled space, that means the allowance to leave space to the imagination in order to complete it.

The deliberate and conscious use of the void in Suzhou gardens, legitimate the surrounding presences, allowing each element to possess its own autonomous and independent sphere, thus avoiding the creation of overlapping, giving life, nevertheless, to a peaceful compositional harmony, which conveys a sense of depth. Oriental culture, dedicated to the essential, the silence and the light, invites us to reflect on the distance and relationships that are established between the elements, about their relationship rather than their nature of ornament. Objects and furniture, for example, are placed according to "weak" logic, and yet manage to create a tension and a beauty that "fills the void" enchants and surprises.

"It is a receptacle of halftones and shadows, white spaces that are not to be covered immediately, but enjoyed as they are, an infinite number of arts that aim not at the aesthetic product but at the act of space" (Calza, 1982, p.109). In this context, literally, it is understood as spatium, fracture, pause. As in music, where the pause has the same value as a note, also in architecture, the vacuum should not be a space to be occupied: a space can be empty, but be dense. In summary, Suzhou gardens are a manifesto of the space-time relation in East, that take us to deeply reflections on the necessity of material of memory. They make us at the same time think about a necessary sensitivity capable of recognizing a value evident in the "weak" and intangible, but capable of tracing possible future scenarios. The Suzhou gardens show that emptiness and absence can be expressed spatially. They are an example and partial synthesis of oriental culture, impregnated with a spatial logic to make non-existence visible. In Suzhou, non-existence is a patrimony of humanity.

Figure 3. The persistent Suzhou gardens. From left to right: Shadows of bamboo. Nature and artifice, eternal struggle. The void as space, the white wall completing with time. Photos: Juan Carlos Dall'Asta

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The case of Syracuse and the Rocky Necropolis of Pantalica.

The excavation campaigns, which bring to light archaeological finds, produce feedback on the morphological dynamics in urban spaces: firstly because they reverse the direction of anthropic stratification, secondly because they cause tears, fractures and gaps in the territorial palimpsests (Gritti, 2016).

In this perspective, the UNESCO site that brings together the city of Syracuse and the Rocky Necropolis of Pantalica is a case of extraordinary importance to understand the meaning and implications of the relationship between the historical and archaeological heritage and the suburbs of urban peripheries, where spaces with uncertain destiny live together with natural resources often neglected. The Syracusan UNESCO site system is the largest complex of settlements in the Euro-Mediterranean basin: it includes rock settlements, Greek-Roman colonies, early Christian and medieval settlements, expressions of Arabic, Norman, Aragonese cultures, and finally a formidable synthesis, operated in the Baroque period, on Ortigia Island to remedy the effects of a natural disaster (Cavallari, 2002).

Inserted in natural landscapes of rare beauty, which integrate the system of the Iblei Mountains and the coastline with the most distinctive features of biodiversity across Eastern Sicily, the city of Siracusa and the Rocky Necropolis of Pantalica can be considered morphologically as part of a single territorial system integrated by the presence of the source, the course and the mouth of the Anapo river (Grande, 1996).

The whole Syracusan territory is characterized by a structural relationship between environment, landscape, topography and geomorphology, which sees the undisputed protagonism as the hydrographic grid. Over several millennia of history, human settlements in the Syracuse area have been shaped by research, regulation, and water management to the extent that the main factors of identity and difference in the territorial context depend directly or indirectly on the relationship with water.

The Necropolis of Pantalica (Bernabò, 1990) and the city of Siracusa (Voza, 1999) have been arisen and developed in places where this complex hydrographic basin begins and ends, on the surface of the courses of the Anapo and Ciane rivers and, in the subsoil, from an even larger pattern that descends from Mount Lauro, crosses the gorges of Calcinara and the high Anapo Valley , feeds the Pantano Grande to the gates of the city, reaches the island of Ortigia and flows into the natural coves identified as Porto Grande and Porto Piccolo.

A work of exceptional historic-archaeological value has sealed this relationship: the Galerni aqueduct. Built from 480 BC, perfected in Roman times according to the Vitruvio dictates, maintained in efficiency until the eighteenth century, this formidable example of architecture and hydraulic engineering that captures clean water from the sources of the Anapo river and the Calcinara torrent, to take it to Siracusa, is still partially operating along a route that under full use has reached 40 km. (Sequenzia & Todini, 2013).

Despite these historical evidence, the declarations that have set up the UNESCO site and the criteria that have enshrined its exceptional nature, are devoid of any reference to the relationship with water and human works that have made it possible to use it4. This negligence, only partly mitigated by the contents of the Management Plan (Syracuse and the Necropolis of Pantalica, Management Plan, 2005) is not negligible and has many implications, even with regard to morphological issues in this contribution.

As in the countryside around Rome, so also in Syracuse it can be seen that some of the main archeological areas, now located in peripheral contexts of the city, share their space with vast portions of the ground, seemingly lacking in quality and structure and mostly excluded from urban and rural use strategies. In these places, the problems arising from mismanagement of environmental resources are almost always evident.

Following the course of the Anapo river in the direction of the mouth, along the boundary defined by the southern remnants of the Dionysus walls, a precious ecosystem is therefore threatened by high dangers,

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which can be detected in close proximity to recent antropic interventions (reclamation, channeling, embankments) conditioned by previous systems of regulation of hydrogeological equilibria on a territorial scale. Thus, exceptional elements of the city's historical and archaeological structure are subject to floods, along with suburbs of the urban periphery, where they have chosen to waterproof the soils, despite the indications of ancient toponomastics being unmistakable in this sense by identifying the cards as well as Pantano Grande, a Pantano Piccolo. Indeed, the picture of the complexities triggered by the wrong choices is at present even worse, due to the downward drainage of debris along the river basins of Anapo and Ciane and the high level of pollution of the waters that reach the sea in the basin of Porto Grande.

In human settlements that boast a millennial history, the features of exceptionality are often related to singular manifestations of degradation and abandonment of settlements, according to historically determined cycles. This condition is repeatedly repeated in the pages of "Territorios", the book in which Ignasi de Solà-Morales spelled out the concept of "terrains vagues" and in which Saskia Sassen introduced the theme of social and cultural relations between the physical dimensions of Inhabited space and their inevitable fate of archaeological finds of the future (Solá Morales & Sassen, 2002).

Even in the light of these considerations, the most careful and in-depth morphological studies, those who read the city as a dynamic system, have emphasized the relationship between the topography of urban and rural centers, the use of environmental resources and resilience of established communities. The case of the UNESCO sites of Siracusa and Pantalica shows that this attention must be expressed in a historical perspective and must refer to a dimension that can not be ignored by the architectural and urban design without which the list's paradoxes are likely to make only the best intentions for the enhancement of the heritage of mankind only efficient but not effective.

Conclusion. Layers, memory, time and space

When talking about the three cases it can be appreciated that despite its diametrical difference in many senses, there are interconnected topics: layers, memory, time and space. In the process of reflection in which this three cases are parallel studied, we can find that the built, the demolished and the banal void vs. the charged void are always attempts to invigorate the historical model and its given morphology.

Quito's historical northern limit, Suzhou gardens and Syracuse-Pantalica express examples of physical, temporal and cultural stratigraphy. The three cities show the value of a tangible and invisible memory that is detected in the reading of urban and architectural transformation, sometimes wisely intervened and catalogued, sometimes not. Although the three cases are different, the habitat transformation is a substantial component to understand, in a discontinuous reading process between the layers, the identity path of the project.

The three case studies show the responsibility of the historical urban structure in the formation of the local memory and the social habitat. Rescuing the analysis of the cities, it emerges the need to read the urban morphology of the historical centres as a dynamic system, a meeting place between the population and its physical environment that builds a reciprocal and mutant experience due to its volumetric elements and its empty identities.

In the three cases it has been identified that, as Alison and Peter Smithson said, architecture and urbanism are inseparable, because the buildings encapsulate urban ideas and the urban systems are the means by which buildings function effectively (Smithson, 2005). As a compliment, it is mandatory to be concerned with the life and the dynamics in these places of memory, a life that, even if it is related to people or nature, is constantly changing and renovating its essence through time and space.

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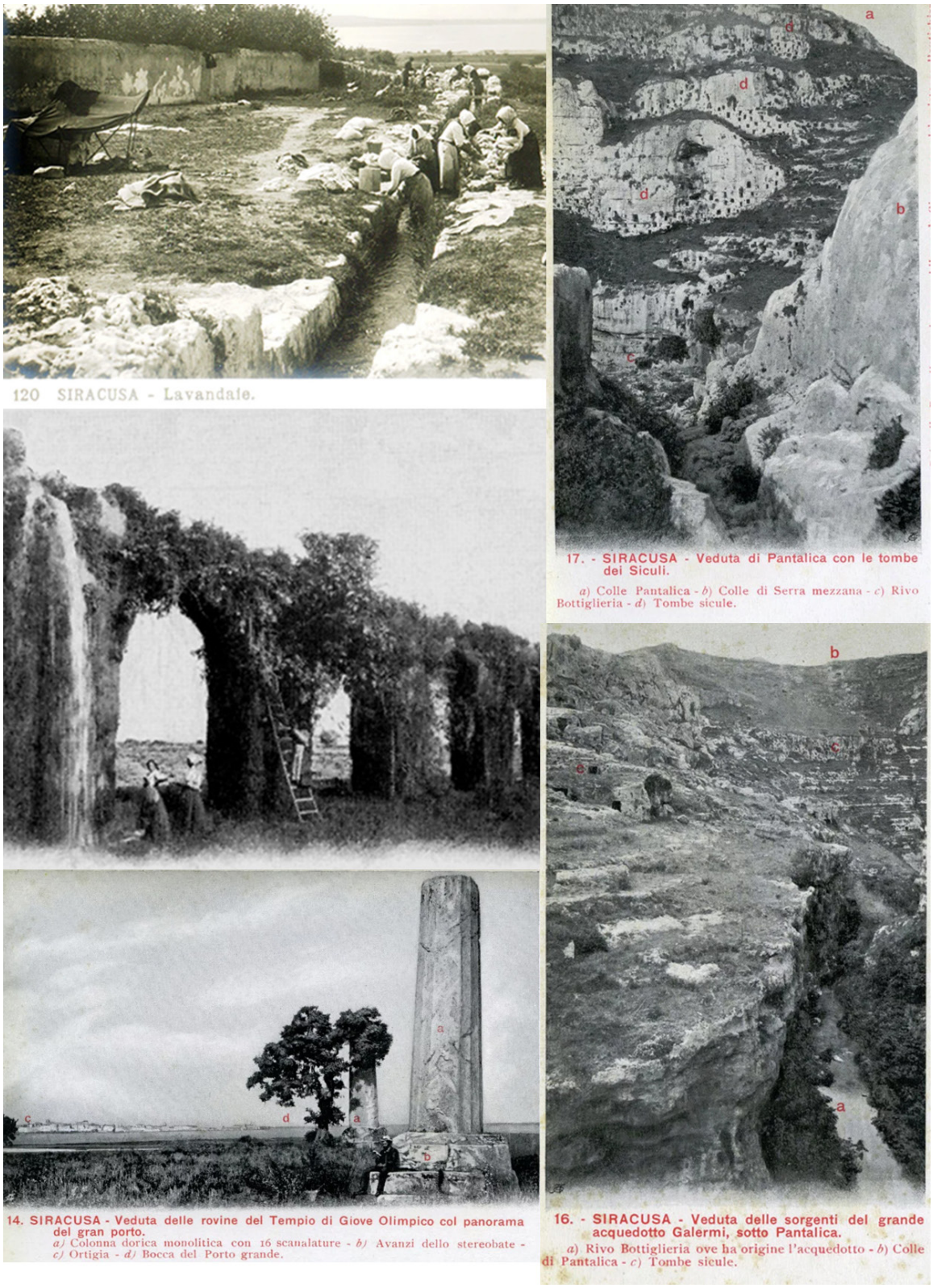

Figure 4. Collage of ancient postcards from Syracuse

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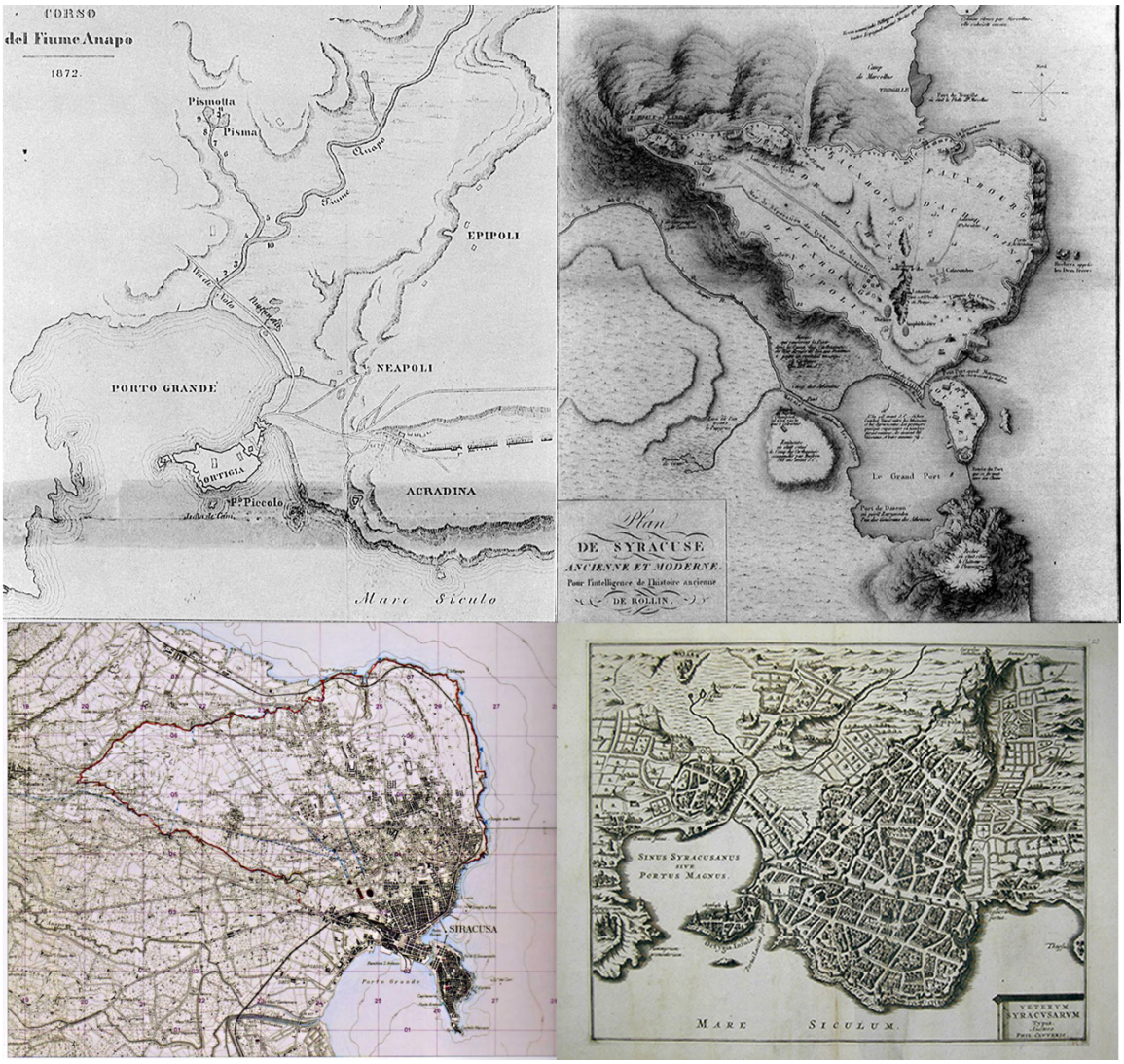

Figure 5. Collage of ancient maps from Syracuse

Notes

[1] In addition to the considerations for constructing these "places of memory", proposed by Augé, we must take into account what David Lowenthal exposed: 'it is not an inquiry into the past, but a celebration of it ... a profession of faith in a past tailored to present-day purposes'. (Rodney, 2010)

[2] http://whc.unesco.org/en/criteria/. "ii) to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design". "iv) to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history"

[3] http://whc.unesco.org/en/list/2.

[4] http : //whc.unesco.org/en/list/1200

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The urban form in the city of Tulcán, Carchi, Ecuador

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Abstract. *Tulcán, located north in Ecuador is the capital of the Carchi Province. It is a city especially commercial and agricultural whose urban morphology responds to historical, environmental and administrative circumstances since 1851, date on which the "cantonization" takes place, begins the formation of the capital city with an urban structure formed in checkerboard that welcomes the traditional nucleus of the typical city of the ecuadorian highlands. With the development of this city, isolated neighborhoods are born out of the original urban fabric that expand in the territory, following the main road connections, eventually to fill the internal space with a morphology of contrasts, as each neighborhood or new occupations are structured individually without thinking as a city of integral formation. The longitudinal growth of the city was marked from its beginning by the river Bob, to the north-west, and the river Tajamar to the south-east; that keeps the city within natural limits, which also provide certain environmental and landscape benefits; however in the last few decades the city has had a significant growth that threatens an unattended and constantly expanding periphery to these environmental resources. We are facing a heterogeneous city, with problems and possibilities and attending to the idea that the city is an unfinished work, integral and sustainable urban regeneration is the basis for a reordering and a new urban approach. Therefore was proposed to study three strategic lines: the existing city, its internal circuits of connection and the adjacent nature. Establishing initial uses in the city, to occupy the predominant urban void and thus to activate the public space. Restructure mobility, which will strengthen the use of new peripheral road infrastructures to reduce motorized circuits in the interior, thus promoting the use of bicycles and the creation of pedestrian routes. Finally, environmental resources will again have the value of landscape and ecological wealth producing around the city a green infrastructure that contains growth and is a link of this with the countryside.*

Keywords: Tulcán, Ecuador, urban, landscape, history.

Introduction

Tulcán is the capital of the Carchi Province and is located at the northern Andes over the inter-Andean alley of Ecuador, next to the border with Colombia. It's at approximately 3000 meter altitude over sea level.

Its territory has levels with moderate inclinations, medium hills and flat surfaces. Further has a cold equatorial climate of highs altitudes, with a temperature of 10 to 12 °C that favors to the development of agriculture and livestock activities typical of the zone, besides with the presence of rivers that forms bi national river basins and promotes productive activities. The city includes two urban counties: Gonzales Suarez and Tulcán, distributed longitudinally in the territory. In the last decades there has been a growth of the city in a way that has become distorted and landscapes have been degraded due to urban developments that with their isolated projects consume the soil

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and natural resources only for a commercial purpose. The accelerated transformation of the soil is undoubtedly, an obvious reality that threatens mainly the agricultural landscape, the natural surroundings of the city and therefore the quality of life of its inhabitants.

Methodology

This investigation begins about a general study of the urban form of Carchi Province's cities, to determine repetitive patterns of urban growth processes.

Thereafter, the investigation centers into a morphological study of the urban form at the Province's capital, Tulcán City, which presents different important singularities that are object of study to understand the Ecuador's highlands cities reality and in that sense, propose urban strategies for a restructuring and improvement of those.

Measurement and analysis

The urban growth

The urban study development involves an analysis of different aspects that allow the growing of a determined city in a specific area.

This analysis establishes historic and current circumstances into all fields that were or are able to generate growth and the mode by which a city plans it´s expansion. It depends of distinct management issues, about politics, administration, social, economic and cultural topics.

The forms of urban growth, should be a result of municipal actions to improve the cities, nevertheless in Carchi Province this kind of actions can´t represent an advance because these are individual and secluded acts.

The city wasn't thought like collective, that's why the growth morphology shows a lack of urban planning, that is a basic objective in this topic. Adaptation of new circumstances make necessity of growth, in terms of a response to the vehicle use, bigger edifications and industrial areas, which become into vital aspects of the urban space.

Carchi Province urban growth

Carchi Province was established in 1880, those days principal activities were livestock and agriculture, so primary environment had experienced a severe change from the beginning of development of the cities; this transformation has evolved over years with the progressive colonization of territory.

Populations take forms from the environment

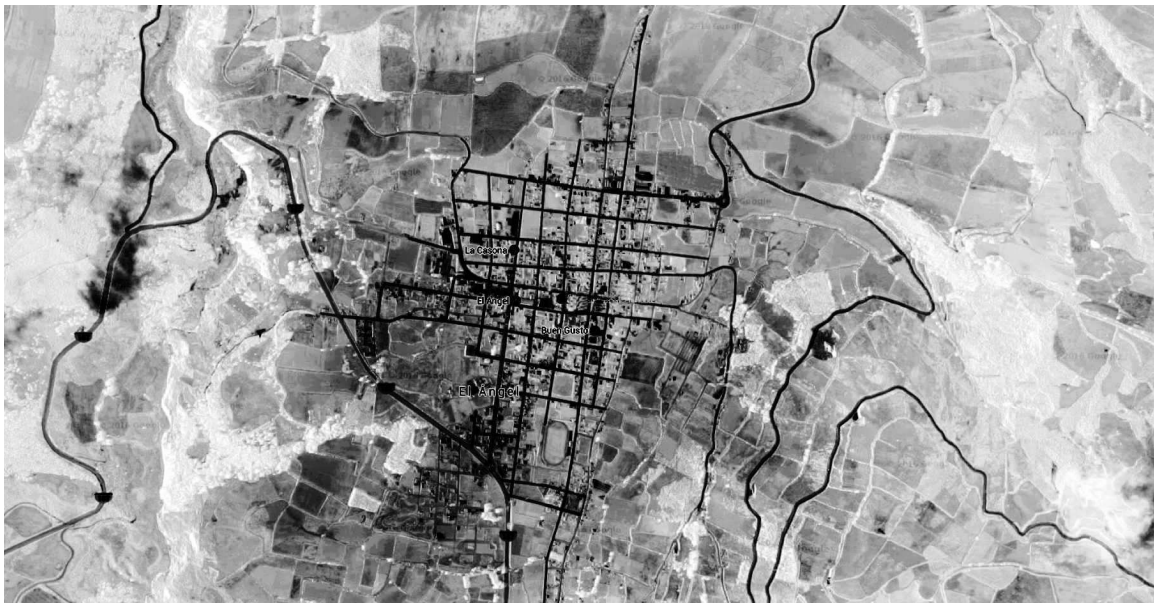

Figure 1.
Aerial view, Ángel city. Carchi

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where they are located, they give rise to various physiognomies in relation with the zone, and the next image shows the agricultural soil like a limit with the Province's cities.

"*..Nature is itself an immutable object, nevertheless, history and ethnology show us with all evidence that human eye is the place and medium of an incessant metamorphosis.*"

Referring to last quote, we are facing a landscape created by humans, where the intrinsic relationship is necessary between this and memory of inhabitants.

Agricultural activity, in the cases of the small populations and large cities, most of times is pretty near, making impossible to identify a limit between city and field; relating in this mode, city activities with agricultural activities without planning, in this point, distinct uses of soil begins to interfere causing incompatibility problems, because every activity has different dynamics that come to be developed in the same area of the city.

Therefore, a new peripheral urban plot begins to be formed, as an element of the consolidated city that is detached and finds place next to the field, making a forced integration that depends of the union of low quality buildings, without an architectural identity and presenting a building typology that not characterizes the city, neither the countryside with the activities and buildings typical of agriculture.

In the studied cities a growth pattern was shown without planning and its inevitable to notice some repetitive conditions like the followings:

-Each city or town has well shaped folk centers, where are the principal endowments and equipment's, also it has road structure and a very clearly building typology, generally this are traditional houses with local materials, wood, clay, bricks, making an landscape integration between the constructions and the environment, this way of proceeding was fundamental in the old cities.

- Recognize the course of the years through the walls of a city is inevitable, once the formation of traditional centers was done, it begins to occupy rustic soil in the most cases, which is transformed on urban ground. Therefore, a new urban typology arises, where the growth takes place in a ground easy to be occupied, not taking into account the developed activity in the mentioned site. At the same time the building typology tends to have less important or quality and the new urban plot has an inexpressive image, in comparison with the essential image that the city had years ago.

- We could deduce that the growth way of the Carchi Province's cities are basic adaptations to the zone topography, these are isolated actuations where city governments determine after the construction, modes to provide basic services, either on industrial areas, familiar residences in a rural zone.

This is how the urban development has been generated in this cities, and probably in all the country (Ecuador), giving as a result more problems than solutions. Big towns, independently of their size, have same growth scheme with different intensities.

The result of this short analysis about the growth pattern is the expansion without planning and with it the appearing of the peripheral city, like this area which expands uncontrolly, increasing problematic dramatically.

Peripheral zone has in its components a very importance agent, the rural soil. It could or couldn't be formed for agricultural activity and then begins to be part of the urban soil, contradicting their use and interposing rural with urban activities; it's worth to say that this kind of activities aren't compatibles.

The urban form of the Tulcán City

When we speak of urban growth we are used to refer to the great metropolis, this because of their political, social or historical importance, have undergone great transformation processes, the same ones that are now analyzed and many of them are a reference of urbanism and the "contemporary city". Such growth models generally show cities that have spent so much land and the accelerated processes of urbanization have exceeded the limits in relation to the surrounding territory.

In this perspective, it is worth mentioning the minimal or almost inexistent urban interest in the development of smaller cities, which have grown slowly but still have a population increase, an urban expansion and consumption

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Figure 2.
Urban growth plan. Source. Own elaboration, based on historical data

of land generating as well as happens in big cities, new needs.

The social change and migration of rural inhabitants to cities, regardless of their sizes, is the phenomenon that has caused urban growth. This, add to improvisation and lack of planning gave as result the new growth typologies. Then, if we talk about Barcelona, Paris, Quito or in this case, Tulcán, the periphery is undoubtedly the portion or portions of land do not become part of the cities as such, and remain in ambiguity and lack of urbanistic perspectives.

Rural migration and economic activity have been the main factors for urban growth, however, and compared to other cities in Ecuador, Tulcán has not suffered an exaggerated transformation since its greater conformation. This due to the migration of its young inhabitants, people from 18 to 30 years, sometimes go to other cities because of the lack of opportunities and looking for a higher education many others times. That is the reason it has remained the same in shape and urban structure.

In the last 20 years, the growth and morphological transformation of the city has been greater, taking into account the presence of public and private universities, which has caused a decrease in emigration mentioned above, on the contrary, the increase of educational institutions has changed the conception of the city, because now it welcomes students at a regional level. These considerations set us in context about the reality of the city, where there is a not accelerated but important growth, with isolated projects, where the city is gaining urban area in the immediate agricultural environments, expanding a lot itself, that now, is also necessary to expand the systems of public transportation, networks of basic services, in short, the well-known problematic of the contemporary city.

In general, and with the data obtained, a morphology of a very basic city is shown, it grows by the phenomenon of tension of places of interest. It does not show a study of urban growth model, neither some kind of planning, only isolated decisions based on specific needs. Since the years 2000 to nowadays, the city continues to be established with the same methodology, consuming rural soil and reducing productive activities. At present, there is a greater concern for peripheral areas, resulting from the new processes of urban dispersion from the formed centers.

This type of growth forms the urban structure through points of interest, which have their field of expansion getting together with each other, which refers to the conformation of blocks and neighborhoods in the city, compacting, on one hand, the central city and, in the other one, deriving on the immediate territory.

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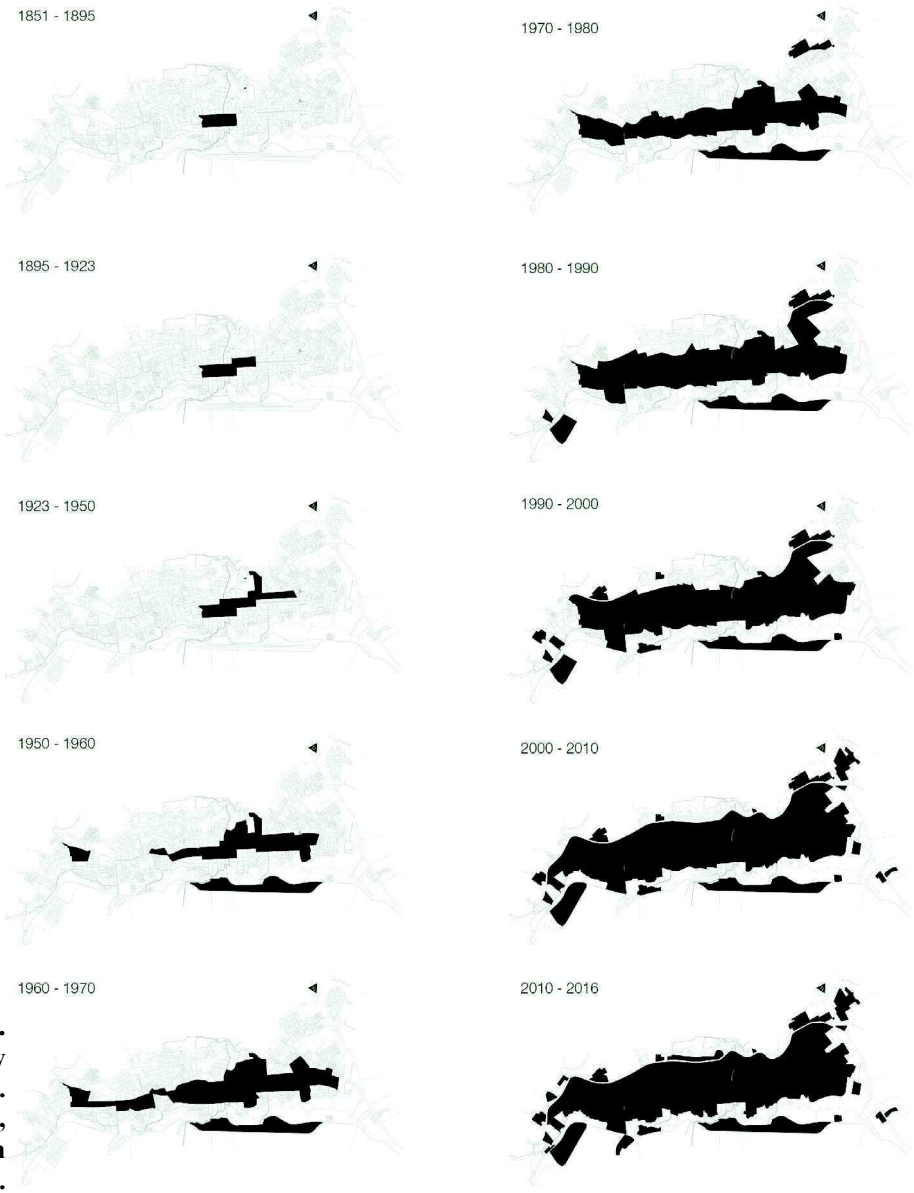

Figure 3. Phases of city growth. Source. Own elaboration, based on historical data.

This is how Tulcán, being a small scale city, is currently very complex, because the urban growth, that it has had and continues to have, cause major complications within a small territory. And the absence of planning, or the very superficially work done, is not adapted to the current urban development. The city grows without order, and it is when the concept of peripheries and the reality that they have, is born, especially the problem they present with the rural environment.

In terms of urbanism, the periphery is not something new, in fact, it might be one of the most analyzed, criticized and studied concepts since the middle of last century when most of the world's cities in Europe, America and part of Asia, had a powerful development that caused the urban dispersion and with it, the term periphery.

For many authors the periphery is also the suburb, suburban areas, which give name to the dispersed and fragmented city, diffuse city, the city without end. That is to say the term periphery encompasses the contextualisation of contemporary urban realities.

The existence of peripheries in a city demonstrates a social, economic and cultural change that is reflected in its physical form, this is how Tulcán ceased to be a centralized city to possibly become a diffuse city. Since the organized structure of center and compactness is lost with each urban action, therefore it

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is possible to understand as the city and its "parts", what forms the urban totality, where the peripheries are unstable areas in which various structures and ideas of city are merged, they become spaces in which different types of organizations are conjugated, meaning, it brings a new type of urban idea.

"... The peripheral, the space of the periphery, is not the one that awaits its metamorphosis in canonical space, in traditional space. It is not simply a transitory state awaiting its normalization. On the contrary it is a mutation that affects the very foundations of the territory of the urban: another different city " .

Therefore the periphery ceases to be part of the traditional city, however it is what complements it; the new projection of urbanism understands the periphery as a separate system that materializes with the excessive use of soil.

The existent city

The city has spaces and several characteristics, either in places where the edifications should be maintained for their architectonic and historical value, or well places with new buildings generally without architectonic value and finally the natural spaces in and out the city that allow the connection or the inhabitants with nature.

Thus, the urban landscape is the combination of all of these elements, which makes us understand that the public and private actions establish esthetics and quality of this landscape, in other words, the intervention of the citizen in the city esthetics is related with improvements corresponding to the objects of their properties.

The Tulcán City doesn't count with norms and codes able to allow homogenous actions for treat the different types of building typology, also actions are carried out individually by

Figure 4.
Tulcán city, Behind, Chiles and Cumbal volcanoes.
Source. www.panoramio.com. Bernardo Andrade Tapia

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the owners and in few occasions, organization takes part in the community and neighborhood generating many details, colors, heights principally in houses. Nevertheless, the administrative and governmental buildings "are contemporary" with a scale, form and materials which do not belong to the culture of the city or to the historical profile.

In the periphery neighborhoods, the esthetic has a lower quality because there are some zones where we found damage buildings and a reduced public space, especially in the Bobo and Tajamar riversides, with the corresponding environmental problems; these are factors that negatively affect in the contemplation and protection of these natural spaces.

Every city sector has its own configuration and even an adaptation way to the environment, related with the origin and characteristic of the zone. The perception of Tulcán City's downtown, full of commercial activities, equipment's and a certain "quality" of public spaces result very different to the peripheral neighborhoods, which are disconnected and unattended.

Then, urban landscape is determined by citizens mainly by their quotidian movements related with the city use, according to economics, educational and social activities.

Therefore, the city's downtown can be identified like the most active center in terms of commercial zones; in this sector we can also find the principal administrative buildings around the central square.

What concerns to trade, it´s about first floor shops without esthetic, they are like old houses garages or warehouses, where are adapted for sell many kind of products as clothes, food, home appliances and etcetera. These products are shown many times in the sidewalks, generating most part of time interruptions for pedestrians.

In the south of the city, due to the existence of educational and public buildings, recently it has been developed a commercial axis, where soil use is mixed between houses and commercial activities. These considerations, specially mixed use for commerce and dwelling use, generate in the city active sectors full of users with multiple dynamics, leaving the rest of the city into a passive mode where, in many cases, it's unattended because of the absence of activities and users.

Strategy of action on the city

We must consider the integral rehabilitation of the city's downtown, because there we find buildings that are architecturally acceptable whether they are traditional or modern, many of them underutilized for only commercial purposes. These constructions should serve as a house upper-levels and street commerce in the ground floor, thereby activating public space and the spatial relationship between building and sidewalk in favor of pedestrians; it is said that, the better the quality of public space or outdoor environments, the more activities will be developed in addition to the daily ones. Users will decide to stay, completely changing the idea of a sidewalk of only transit into a place of encounter, rest, relationship and purchases among other human activities.

On other hand, it is about addressing the housing issue, with urban developments that incorporate in its approach equipment that diversify the activities and the use of urban land in addition to thinking of proposals what regenerate the public space and detonate new uses in the city. The new housing concept must also think about neighborhood environments, interpersonal relations, making people care not only of the physical structure but social structure and this way provoking a strengthening of the community and democratic processes that could happen for its administration and maintenance.

Finally, to achieve an urban regeneration in the City of Tulcán, it is necessary to rethink the layout of semi-industrial areas and propose equipment according to the new road infrastructures, provoking active cores, designed in such a way to regenerate the surrounding area, its public space and in general urban life.

Mobility in the city

Analyzing the urban morphology of Tulcán City, is also necessary to understand the way

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it is structured in matter of road infrastructure, because is determinant at landscaped issue in the territory as much as and in the city.

As was mentioned above and since its inception, Tulcán extends in the territory in a longitudinal way, generating long main and secondary road corridors, among which, we have those that cross internally the city and the roads that surround it, the same can be considered as limits of the city.

Road infrastructures are now the main systems in cities, since they determine their form and their growth, as well as other aspects, that is, they transform the urban and rural landscape, these are elements that provide connectivity between towns, facilitating commercial and social economic relations. Nevertheless the environmental cost is high each time a new path is opened or existing ones are branched out.

This characteristic of dilating the space for mobility and specifically for the automobile is, without a doubt, a peculiarity of the dispersed and contemporary city since its new settlements, distant to the centrality of the city, need to connect physically to achieve the daily activities of its inhabitants.

In Tulcán, mobility is an issue of constant concern, as we are talking about a city that developed without planning and therefore its road and public transport system is the result of this lack of planning; the current municipal administration executes the construction of a fast-track road on the north-west side, connecting the main road nodes to both, the north and south of the city, this action remains on construction and due to speculation and opportunistic actions, new housing cooperatives are created alongside the route that are established in agricultural land.

Finishing the construction of this road, in addition to the existing one on the south-east side with similar characteristics, Tulcán would have a long road ring that would conceptually stop urban growth. However the absence in landscape approaches and the lack of protection zones cancel out all possibilities of the new infrastructures.

In the interior of the city, the issue of mobility is even more complicated, the deficiency of public transport and its poor benefits to users provoke the proliferation of private mobility, filling the streets with vehicles and consequently usurping areas for pedestrians and public space.

Strategy of action on mobility

Tulcán needs an integral method to regional mobility, perhaps a system of networks that develop and enhance the reasonable management of the territory, the landscape and the city.

The proposal of road networks involves the transformation of territory, the intrusion of external and artificial agents into the natural landscape, is why practical measures are needed for better approaches at the landscape level.

Finally, as was mentioned above, public space is the base of mobility in the city and as such, must provide the necessary amenities to its user, this mode their regeneration is inevitable within a mobility plan. Urban furniture plays an important role from bus stops, signs, places of rest and shade among others, which are aspects that motivate the citizen to walk and avoid the use of private vehicles.

Integral mobility also consists in a radical change in the use of the city, so that within the neighborhoods there must be itineraries that allow the coexistence of different modes of mobility, without any of them becoming vulnerable.

The city and environmental resources

In the city of Tulcán we find two hydrographic systems, the rivers Bobo and Tajamar, have limited and led the growth of the city. These natural elements, both, water and its basins are threatened by considerable pollution.

It is very remarkable how the city-nature relationship is indefinitely complicated, in this case it could be said “the urban system affects the landscape and the rural environment (the transformations of urbanization, buildings, engineering structures) ...” . In other words, the adaptation of the city to the modern era, produces geomorphological and geodynamic

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changes; mainly the soil and its topography is susceptible to drastic changes, by earthworks for road works or informal construction in many cases, that even alter the slopes necessary for the normal operation of these hydrographic systems. Otherwise, we have pollution caused by drains of nearby dwellings, also other urban waste and chemicals in sectors used as waste lands. This affects especially to the aesthetic of a unplanned city, that is about to reach the limit in matter of use and exploitation land. In an overall view of the current state of the sectors mentioned, it can be stablished that urbanization processes put pressure on the environment, consequently degrading its environmental characteristics and the possible regeneration aids that these could contribute to the city. Moreover it is valid to say that the environment also presses the city as happened with urban growth for example, in addition several cases of landslides could be mentioned, caused by the increase in the flow of rivers, thus demolishing part of buildings, roads and spaces built for the city; that means mutual interactions between the city and the natural elements exist, that is why it is useless to raise a city or parts of it without nature, because sooner or later and in any condition that they could have, a link will be developed that will determine positive or negative changes on both sides.

Strategy for action on environmental resources

For a coherent planning is necessary to think of the "Structured City" concept analyzed by Agustín Hernández Aja (professor of the UPM in the article that bears the same name), referring to the improvement of the quality of urban life produced by the organization of the existing urban structure which must guarantee mainly social cohesion and care of the environment, for that reason it is imperative to incorporate the concept of sustainability into city planning.

However, currently urban planning, in the city of Tulcán in particular, takes into account a very limited field of information, simple cadastral bases, very basic studies of dispersion of the city, thinking only of the economic development which prevents seeing the city as a whole. Resulting in minimal generation of infrastructure of public space, slight interventions in infrastructure, planning that completely denies the importance of the environment and the improvement of the mobility and transportation system.

Taking this situation into account, it is possible to think of an urban project for Tulcán, that takes care of a multidimensional space in which it is necessary to join systems and articulate infrastructures networks that not only attend the tangible, but, the true needs of the city and the inhabitants. This way an "Urban-ecological Rehabilitation" could be stablished , taking as physical instruments the green spaces of the banks of the rivers Bobo and Tajamar as urban edges that give way to recreation spaces with a high potential landscape and conservation. Also, thinking in the networks or communications to the interior of the city, because the restructuring is not only in the environmental aspect but it is an integral set of actions that formulate a true urban change. Planning therefore must seek urban planning resulting from citizen participation and environmental management.

Conclusion

This investigation has compiled the necessary information about the Province of Carchi, in subjects about his global structure, like the relation and develop of population cores in the territory and its relation with the surround, concluding that, inside the regional scope or province's territory, Carchi has been structured by an unique national road which has urban sets in development along it, changing a natural surrounding into a series of locations without a previous planning.

With the graphic study of Tulcán, it's concluded that the growth of one city implies an irreversible transformation of the territory and of all the elements which conform it, in this case, the lengthwise growth had been transforming the agricultural space into urban space, and in many cases these don't reach a necessary density, resulting urban voids that leave the productive activity to be absorbed to

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the city without having an utility.

With the study of the morphology of the city of Tulcán, is possible to reveal that this grows in small portions named housing cooperatives, which have been located outside of the limits considerate as urban, creating an unattended periphery, a concept better known as a dysfunctional spaces in the cities. However in the case of Tulcán, for its scale and social and economic conditions, this periphery doesn't have a serious degree of dysfunctionality, giving place to the possibility of a restructuration with the elements that conform it, like dwellings, road infrastructures in small scale and specially with the natural surround which it joins.

Finally, this work gives the opportunity of visualize the physic potentialities that Tulcán has, both at the territorial and local level. The study and the analysis reveals an scenery in which, with the adequate policies and good management, the city could be renewed in all its aspects, reaching a balance that allows an environmental, economic and social sustainability, improving the quality of life of its inhabitants and above all, to recover and maintain the essence of the city as the agricultural landscape.

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DiverCity. Urban perception of sociocultural minority groups

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Abstract. *The project "DiverCity" consists in an intersectional perspective on urban spatial diversity and examines the urban perception of sociocultural minority groups with an interdisciplinary approach. The topic of peaceful means of coexistence has been a matter of fact since the early beginnings of colonization and urban settlements. But, in spite of social changes, especially in recent times, the debate about social life seems more rooted in politics than in every day's practice. In the meanwhile, various populations create different solutions and concepts of coexistence. These dynamics are in the general interest of the project named "DiverCity". In particular, the project investigates social minority groups and their perception of urban space. This is studied in large and small cities, hereby exemplified in Lüneburg and Hamburg compared to each other. The examined minority groups are Muslims, Disabled, Homeless and Homosexuals. With methods of empirical social research, especially through semi-structured interviews and participating observations, the urban and spatial perception of these groups were examined. This is caused by the the interest of how minorities experience urban life in Germany and which are their main problems to later design solutions form the urban planning point of view. The theoretic background, the motivation of the investigation process and the results of the empirical studies will be presented. In addition, the planned extension of the project in European and Latin-American contexts will be explained.*

Keywords: Urban diversity, interculturality, urban spatial perception, participatory observation.

Introduction

Motivation and objectives

The project ""DiverCity"" deals with an intersectional perspective of urban diversity and explores diverse forms of urban lifeforms with an interdisciplinary approach. This is realized mainly from a cultural, socio-scientific and urban, i.e. urban-planning perspective.

The United Nations estimates that by the year 2050, the number of people living in cities will increase to 70 % of the world's population. This leads directly to the main question of the project:

How can people live together with increasingly diverse life drafts and cultural socialization experiences in a comfortable and peaceful way? The current migration entails a deep diversification of ethnicity, language, nationality, gender relations, age, social status and personal legal positions. The diversity of the past and the one brought by present immigration are meeting each other, cultural traditions are interwoven with young and migrated cultures into a complex system. This evokes the question of how to deal constructively with the current challenges of growing diversity and how different groups of society create and manage the social diversity in their very individual ways of life.

Ultimately, it is a common goal to contribute to a more equitable approach to diversity with the development of new strategies. The origin

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of this focus of investigation is based on the realization that most research about space, cities and gender, urban related sociology, migration and diversity are increasingly realized by intersected perspectives. However, so far neither the social space' dimensions of intersectionality have been comprehensively theoretically understood, nor has the analytical linkage of the axial principles of gender/ sexuality, class, ethnicity and body been empirically investigated. The research project "DiverCity" aims to contribute to this objective.

Since the dynamics of social diversification have been little investigated so far, the project contributes to provide exemplary research on social similarities and differences in urban spatial patterns. This is also to be understood as a basis for later following investigations.

State of Research

The coexistence of people of different social, ethnic and cultural backgrounds and their attitude towards religion and sexual orientation create a remarkable diversity which is particularly relevant for the recent migratory movements and which changes the perception and design of urban spaces. The sociocultural diversity characterizes the atmosphere of urban life like no other. (Bukow 2007, Dieckbreder 2015, Läpple2011) Whether "diversity", "multiculturalism", "globalization" or "integration", all these slogans are objects of numerous research areas, which have the common goal to enable a more peaceful social life (Leibetseder 2008).

The perspective of the young research field of urban perception thereby allows a multi-directional approach that examines perceptual reactions to social and structural urban life (Here, above all, the individual feeling of quality of life is meant. This especially by observing verbal and nonverbal communication as well as individual well-being and unease). In the present case, this is viewed from the perspective of selected sociocultural minorities. The question of how to deal constructively with current challenges of growing diversity is thereby raised. Secondly, the question about which conception of space values for which minority groups and how the urban space is appropriated individually by them, are fundamental aspects of the project ("Appropriation" here does not mean a commercial possession. It refers to the individual way of getting familiar with the space). They are are integrated in the intention of developing new design strategies for an improved dealing with urban diversity.

Most of the research ultimately has focused mainly on macroperspectively oriented studies aiming on the prevention of discrimination (Gombos 2015; Nii Addy, 2003;

Rottleuthner 2011) or the promotion of integration through political-institutional measures. An example here is marked by the recent research on homeless people (Kokot 2004; Panier, 2006; Blum1996; Girtler 1980; Höhmann 1971) or by the investigations involving the integration of religious groups, mainly islamic (Kermani 2015; Haug 2014; Hafez 1999; Bötticher 2009) or disabled persons (Düber 2015; Cechura 2015) This is valid both in the german and international investigation context.

The gender specific ‚spatial appropriation and spatial perception has been mainly adressed by Martina Löw in her basic work on spatial sociology. Later, in collaboration with Ruhne, she specified the positions of the prostitutes in public perception (Löw 2001; Löw, Ruhne 2011).

However, investigations that focus on urban perception and appropriation of space are hardly ever present, and if, only in the philosophical-epistemologically oriented field of cultural-comparative aesthetics. In most of the cases the history of certain places here is explained by observing the cultural backgrounds; later on these contents are transferred to an examination of which perceptions characterize the aesthetic understanding and the formative language of certain cultural groups and how this affects spatial perception.

Some of these contents are integrated in the proyect „"DiverCity"“ (Wood 1985; Sieferle, Breuninger 1999; Zukin 1998; Zimmermann 2006; Schoon 2007; Gibson 1973). Nevertheless none of them offers an empirically oriented approach to cultural perception of spaces or even urban spaces.

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Even though the research on gender, space and city, that has developed itself out of feministic criticism of anderocentric urban planning (FOPA), has ultimately been broadly developed (Dörhöfer, Terlinden 1985; Becker 1991; Bauhardt, Becker 1997; Frank 2004), the results generated are still little reviewed (Bauriedl 2013) in the mainstream of urban research and urban sociology. Correspondingly, the perspective on gender relations is very marginal also in studies on the effects of increasing social diversity and differentiation. To a certain amount, these research objects are investigated in research about intersectional percpectives on urban diversity studies. However, so far neither the social space dimensions of the intersectionality concept have been comprehensively theoretically investigated, nor has the analytical linkage of the axial principles sex/sexuality, class, ethnicity and body with the category of space empirically been profoundedly examined (ibid.).

For example, there is little knowledge about how spaces of uncertainty and anxiety in cities, which do also exist form the point of view of a gender perspective (Ruhne 2011), are changing under the conditions of increasing social diversity and differentiation.

And what ist the situation of diversity in coherence with urban planning parctices? The design of public spaces, in particular of squares, is mostly done by planners, sometimes also in participatory procedures with citizens. (Burckhardt 2004; Reicher, Kemme 2009; Selle 1996) In practice, however, these procedures are not shared by all groups of social diversity (Terlinden 1990). Next to that, the approach of participation in design questions does not always lead to solutions which are perceived as aesthetically sustainable.

William H. Whyte's deals with the design of public spaces in his work published in 1980. On the basis of numerous comparative field studies, he compiles a design catalogue for planners, but does not explicitly take into account the different needs due to social diversity. Yet, in his numerous publications, Jan Gehl ocusses on the quality of life of urban spaces for people, however also without entering into the different groups of social diversity also without recording their definitions of quality of life (Whyte 1980; Gehl 2006).

However, in order to urban areas meeting the needs of increasing sociocultural diversity in nowadays' societies, the knowledge and the response to the functional and aesthetic needs of all social groups, especially of social groups that so far not have been taken into consideration, is of significant importance. This is a fact mainly based on the reason that urban spaces are not only functional spaces, but also places of social identification that have a semiotic level (Sieverts 1999; Schubert 2005). Yet this can be very different for the respective actors. In order for places to be accepted on a wide range, they must address as many users as possible; they should offer a welcomming atmosphere, promote communication, and, ideally, offer space for further developments as well as of the city itself than within aspects of integration and inclusion. Places define themselves through an emancipatory potential of cities, which can enable spatial participation and social inclusion at the same time (Mitchell 2003) .

With the interdisciplinary approach, the project "DiverCity" offers the possibility to find answers far beyond the purely functional aspects of the planning. By analyzing the perceptions and usage forms at different levels (perception of individuals, theory, function, design), it offers highly diverse solutions for future urban spaces.

The motivation for the research perpective of the project „"DiverCity"" is originally based on the concept of the "Spatial Turn" (Bachmann-Medick 2009; Belina, Michel 2008; Döring, Thielmann 2008), which defines the "space" as a physical-geographic area that is a result of social relations and gendered minting. This type of definition of the space is especially important for the experience of urban spaces, as it shows that the functionality of the space is dependent on the communication and relationship quality that it produces and vice versa.

So the overall perspective of the research project is based on the idea that the urban space is a result of interhuman relationships. Hence the built urban structures should to follow the necessities of the individuals as built spaces, in

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particular urban spaces, stimulate and interact with behaviour of the individuals living in it in a specific way and always based on mutual interactions (Richter 2004).

Objectives and linkages to theoretical base

The project "DiverCity" locates itself in the context of sociologic and gender research on the relationship between power and inequality in urban public spaces. („Space" here ist not only understood as geographical category, but as a place, where persons and cultures interact with the physic-materialistic part of places and thereby represent it in a symbolic-discursive way). This is based on the backgrounding question of how increasing social diversity in central urban districts can shape and overcome the challenges of social integration and stimulate a fair participation in urban life. The project therefore aims on capturing qualitatively and intersectionally the perception of space by members of minority groups, it examines the appropriation practices by the users, it observes their ways of empowerment, polarization and exclusion, all exemplified in the cities of Lüneburg and Hamburg. It furthermore asks for the interactions between the categories of social action, of the symbolic-representative and of the material-physic, all being parts of the urban public spaces.

The concept is based on the usual assumption in urban sociology that space is symbolically charged. Gender-based relations of power play an importat part in every spatial constellation. They are reflected in spatial design and production and also in the perception and appropriation and utilization of spaces. The relations of power are inscribed in the physical structures of spaces, as well as in their symbolism and discursive representation, manifesting and materializing themselves in the social interactions of the active individuals. Urban structures thus offer and limit possibilities of appropriation of urban space, as well as offering and limiting possibilities of designing. All in all, they reflect gender relations and represent sexual identity. These concepts are an important base for the overall projetc's design and it's objectives.

Main Questions of Investigation

The central interest of the project lies in the exploration of the perceptions of urban space by minority groups mentioned in the following. The ways of individual appropriation of space as well as facilitations and obstacles of their individual lifes outline the main interest of the investigations as these aspects reflect the applied reality of diversity in urban settings. I.e., the subjective assessments offer an empirical data basis on how diversity is recently handled in urban spaces and which dynamics are shaping the minoritie´s perceptions.

Within the project, the urban perception of the following four minority groups were examined:

1. Muslims
2. Homeless
3. Disabled
4. Homosexuals

The aim of the project is to identify the perception of urban space by the minorities. It so provides an innovative and, at the same time, fundamental contribution to the current debate on intercultural urban perception research and helps to find out how to deal with globally increasing diversity.

Methodology

The project methodically uses diverse ways: it captures, observes, and visualises situations and interactions in an innovative and qualitatively social-empirical way and develops design strategies. Therefore, it defines concrete spatial planning approaches based on interdisciplinary cooperation and it provides the development of new theories.

The basic methodological structure of the entire project is inductive and allows discovering new and unexpected dimensions and results. This is different from large numbers of deductively oriented studies, which merely check existing theories by means of hypothesis tests. Taking into account already existing results, it is fundamentally necessary to systematically develop new theoretical perspectives based on empiricism and not only vice versa, as it is done in so many examples.

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The empirical methodology of the project reflects the inductive character of the overall conception. It develops itself through a methodical process outlined in the following five steps:

1. Collection of existing theoretical data, 2. dialogical survey procedures (eg interviews), 3. Observations (participatory / non-participatory), 4. Evaluation and 5. Theoretic synthesis and 6. Development of new theories.

In this article, mainly the results of the empiric investigations will be outlined as this ist the recent phase of the project that has been realized since the 2014 in the cities of Hamburg (1.814 597 inhabitants) (www.hansestadtlueneburg.de/Home-Hansestadt-Lueneburg/Stadt-und-Politik/Rathaus/Zahlen-Daten-Fakten.aspx) and Lüneburg 76.449 inhabitants, (ibid.), compared to each other.

Both cities are situated in northern Germany at a distance of 50 kilometres from each other. The University of Lüneburg and the university of Hamburg work in cooperation, offering the empirical part of the research project as a seminary class for bachelor and master students of urban planning (Hamburg) and building culture (Lüneburg).

The empirical investigations were made throughout semi-structured interviews and participating observations by several groups of students who realized their participation in the project by a seminar which lasted for 6 months (4 hours weekly, plus workload for homework (3hrs weekly), plus empirical examinations at compact classes on weekends).

The groups (25 persons each semester, starting in October 2014, running until now) were taught the theoretical basements of the project and realized a profound study of the minority groups; later on the interviews and participations were carried out by groups of 4 students each.

The interviews were all semi-structured, lasted 45-60 minutes, accomplished with 6 members of each minority group in single interview-situations (1 interviewed person, 1 interviewers, 2 protocollants, all video-recorded) and evaluated by qualitative content analysis.

The participating obervations were realized by two persons in the situation of particpating observation and two observers observing the persons who were in the role of a minority member. By that, observations from the inside experience as well as from the outisde perpectives were assured. Each group observed during 8 days (12 hours each), passing through a structured itinerary in Hamburg and Lüneburg. Every itinerary concisted in 20 situations/ places, e.g. „riding a bus“, „go to a shopping center“, „eat and drink in a café“, etc. and each observation process was documented in a structured protocol. The results were evalutaed by a qualitative analysis of the contents.

Results

The project has been running since October 2014 as at the University of Lüneburg as at the Hafen City University in Hamburg. The results were compared to each other in order to exemplary determine differences between big and small cities in Germany. All results are transferred to the equality officers of both cities, so every result is taken into consideration by the corresponding urban planning committees.

In the following, the results of the empirical investigations will be explained in short summaries:

The first remarkably result in all studied minority groups (1. Muslims, 2. Disabled, 3.Homeless, 4.Homosexuals), lies in the fact, that genereally the recent individual urban perception is heavily influenced by experiences of discrimination. This does strongly influence the appropriation of urban spaces in every individual’s sense. As especially in the exemplified cities of Lüneburg and Hamburg in Germany a good integration state has generally been assumed before realizing the investigations, the results, to various extents, are fairly surprising.

Whether “island formation”, i.e. the formation of culturally or socially shaped, isolated accumulations of certain minority groups, or individual coping strategies such as delimitation, resignation, acceptance of detours, extended waiting times, or rejection - all this has become apparent in the numerous study sets.

In the following, the individual results from

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the four examined groups will be presented:

1) Muslims:

For the muslim minority group, the results of the investigation were particularly significant: Discriminatory gazes and disgusting comments occurred with great frequency during all the participating observations.

Even in the semi-structured interviews, the image of lack of integration had subsided, many muslims reported that they were marginalized and not taken for serious. Constant connection with terrorist interpretations continued to be a major factor affecting members of the muslim minority in Germany.

Muslim-dressed (wearing burkay with face covering) test persons were often asked to immediately leave from semi-public places like shopping centers or shops in the central parts of the cities of Lüneburg and Hamburg. In Hamburg was happening slightly more often than in Lüneburg, but also in Lüneburg, in most of the participating observations, muslim women were rejected in shops, did not receive help by the staff or were simply ignored.

However, in shops, at some level service professionalism could be registered: muslim women noticed significantly fewer negative comments than in public spaces or in means of public transport. Especially in buses in Lüneburg and Hamburg, comments about wearing a burka and covering the face happened every few seconds. Very often strongly negative looks on the groups of women could be registered. Respectful reactions also happened, but stayed very rarely. The persons who passed through the participating observations mostly mentioned the psychic exhaustion they felt, being confronted to that amounts of discrimination during various days. Hearing negative comments, receiving severe looks all the time and constantly hear that they would be opressed women made it very difficult to endure the observations.

2) Disabled:

The group of people with disabilities (examined as wheelchair using persons, blind and deaf persons) mainly showed experiences with reflected their limitations in everyday's urban life. The interviews in generally outlined problems with urban and infrastructural structures, in most of the cases a lack of wheelchair accessible train stations, shops or gastronomic offers. This also became apparent during the participating observations. First of all, physical exertion and fatigue became was higly noticeable, as well as increased expenditure of time in coping with everyday activities. Numerous subway stations e.g. are not wheelchair-accessible in Hamburg and require renovations.

The physical and psychological requirements of power, which are highly necessary for coping with everyday life, marked a highly noticeable factor.

Furthermore, it became apparent how people with disabilities suffer from the impossibility to communicate on the same level with non-disabled people, due to the simple fact that throughout their sitting position thereare physically lower than others and therefore do not participate on an equal level in social life. This, also confirmed through the interviews is remarkable point of perception of urban life of the disabled. Similar results happened for blind and deaf persons.

Although the willingness to help of non-disabled citizens could be noticed several times, many distant views and behaviors were to be registered. The constant rejection affect people with disabilities psychologically very hard and costs a lot of personal power and energy. As in the case of the muslim group, the question of how to develop and change urban structures that would improve the communication between disabled and non disabled became prominent.

3) Homeless

Similar results apply to the "homeless" minority group. By their outer appearance, which in most of the cases is not well maintained, the persons belonging to the minority find themselves confronted to strong discrimination and are socially excluded.

In the interviews, e.g., it became clear that the facilities offered for overnight stays from the city of Hamburg during the winter months, are insufficient. The homeless shelters are not frequently used by the minority members, since conflict situations among the users prevail in a way here, that makes staying at the accommodations almost unacceptable for most of the interviewed persons. The city of

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Hamburg does not offer anything to handle these conflict situations, e.g. by social workers or psychologists. So a lot of homeless decide to stay outside, for example under bridges.

But as the city of Hamburg doesn+´t apreciate these persons here, watercourses and artificial, large stones were installed. This makes the physical and psychical situation of the minority group much more difficult and increase their perception of not being welcomed in the city.

Social-integrative measures such as streetworking (social workers who offer support for homeless people living on the streets are called „Streetworkers“ in Germany) alleviate the situation in a deliberate manner, but hardly really contribute to an improved subjective sense of integration for the individuals.

The participating observations made this evident: the experience of exclusion was dominant in all gathered results, hopelessness and lack of perspective had to be registered in every participating observation situation. Furthermore, a lack of communication between the needs of the city of Hamburg and the minority members was predominant. In Lüneburg, however, the situation in comparison to Hamburg was better: the city offers a place for the homeless to stay, people living on the streets couldn´t be found. Anyway, the interviewed persons in Hamburg did not wanted to change their places as in Hamburg as they felt less visible in Hamburg than in a small city like Lüneburg.

4) Homosexuals

The group of homosexuals made the most positive experiences within the four groups of comparison. It became clear that there is a lot of openness prevalent in Germany. Especially in the urban surroundings of Hamburg, openness and friendliness until partial admiration and curiosity about homosexual couples is dominant.

In the interviews, however, it became clear that the persons who are homosexual passed through a very hard process until they decided to do their comming out. This reflects, that there are still high borders and a long way to go, until homosexuality is profoundedly accepted. A lesbian couple e.g. told, that they do find it hard to openly show and live their homosexuality, as intense looks and a lot of negative clichees are still part of their everyday's life experiences in urban surrounding. Laughter, diminuision, not being taken in serious are experiences which are predominant in the examined cities. In Hamburg less atention could be noticed in the participating observations, but surprised reactions e.g. in the situation when two women asked for marriage rings, were always noticeable.

Here, like in the other three examined minority groups, the city offers very less information or events to better integrate the minority and improve the perception of the city.

Same-sex couples or singles felt left alone, as the consulting services are mostly for persons in the phase of their comming out; later on there are some gastronomic offers, who do create a space, but not really integrate the minority, so their refelcted impression from the interviews. Homosexuals would feel better, if measures of integration would be improved by increased education of the society. What can be done from th epart of urban design is still in process of the project, nevertheless first models like same-sex traffic light figueres already exist and are well perceived as from the minority group as from non-minority group members.

Conclusion

Remarkable for all studied minority groups were the differences between Hamburg and Lüneburg. It could be detected that the individual urban and spatial perception of the minority groups are not corresponding tot he amount and tot he character of established integration measures. Nevertheless, there is a lot already done for the minority groups, as well as in urban design than als from a sociocultural point of view. But, all that has been described in the introduction part, i.e. that institutional measures made on the base of political decisions, seems to be true: the real needs of the individuals themselves are not sufficiently heard and put into practice. The communication with the minority groups is still very less developed, an intensification of investigations that are realized empirically and are based on peoples experiences is a strong need for further examinations.

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To improve urban design planning and to better meet the individual needs of the users, it is essentially important to increase urban planning solutions, that increase communication, dialogue and interactivity between the future users. Built structures that bring people into contact with one another, that reduces fears of comunnication and offer possibilieties to easier get to talk to someone and help to develop closeness to other people would significantly help to improve the minorities' perception of urban surroundings.

How can architecture and urban planning help to intensify communication among people, especially between different sociocultural groups? Developing solutions for exactly this taks will be a mission for future forms of highly diverse and at the same time peaceful urban living. It is also a part oft he „"DiverCity"" project which still is in progress.

The discipline of architectural psychology has started to develop first models and solutions meeting these issues within the last decade. However, to better support the practical part of planning processes, there is an urgent need of further interdisciplinary investigations about diversity in urban life forms.

This defines the reason why the project "DiverCity" intends to expand to other regions worldwide, for hence being able to compare the worldwide dealing with diversity.

It also reflects the importance of empiric based investigations: they allow to get results and develop questions and new theories, which from a barely discursive analysis of history and theory could not offer the same, wide range of results.

As a first step, the project will be realized in Argentina, as with it´s history of immigration, there is a lot of century-long experience of dealing with a highly diverse population. The comparison of a small and big city as basic structure will be repeted, as well as the overall "DiverCity"' project design. It ist the aim for the future to expand the project globally and develop knowledge and strategies to get along with diversity in a better way and, on the practical side, to develop corresponding urban design solutions.

As a summarized result of the realized empiric investigations, it can be assumed that built structures like wheelchair accessible infrastructure or centers of consideration and help are a good base, but the real need is defined through a strong requirement of interaction between minority group members and non-minority group members.

Structures that facilitate communication can be observed in various examples, like playgrounds for adults or sport's places in urban surroundings. However, concepts that specially meet the requierements of minorities, such as physically handicapped persons, homeless or religious groups that suffer a lack of integration as well as homosexual or other sexual groups, are rarely existent. It is one of the main objects of the process of the project „"DiverCity"" to design and plan solutions meeting especially these urgent needs.

Technical innovations such as wheelchairs, that allow standing positions and by that enable disabled persons to communicate with noin-disabled on the same physically level, is an example. But there are to develop especially urban strutures that increase the self-esteem of minority members and lead non-minority persons to a better understanding of the society they are living in.

Secondly, education in school and media and cross cultural/sociocultural events that increase communication and contact can aso be defined as urgently to be increased measures. Of course there are exitsing numerous initiatives yet, especially in the media world; so the actual challenge here would be to overcome the separation between the digital and physical world and to bring theories in to active realization. The improvement of that bridging processes is also a future mandate; an assignment also to be carried out by interdisciplinary research and also trandsdisciplinary investigations processes.

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Evolution of the urban form in the British new towns

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Abstract. *Even if the urban experience of the British New Towns, created after the New Towns Act of 1945 as a solution to the problems derived from the superpopulation of great cities such as London, is already far in time it can still offer us some lessons. Lessons which could help us when intervening in current process of development and transformation of the urban form. This article analyses these experiences from its morphology, studying their formal characteristics and the organization of the several uses of the city, as well as the diachronic evolution of their criteria of spatial composition. Their urban forms evolved with time and were the result of many strategic and design decisions taken which determined and transformed their spatial and physical profiles. The analysis of the essential characteristics and strategies of each of the phases of the New Towns, applied to the configuration of the urban form of some of the New Towns, the ones which gather better the approach in each of the phases, will allow us to make a propositional diagnose of their different forms of development, the advances and setbacks; a comparative analysis of different aspects such as mobility and zoning, local and territorial relations, structure or composition. The conclusions of the article pretend to recognize the contributions, which come from their urban form and have them as a reference for new urban interventions in the current context, with new challenges to be faced from the integral definition of the city.*

Keywords: New Towns, Morphology, Britain, Urban Form, Urban Structure.

Introduction

> "New Towns are cities or towns that are designed from scratch and built in a short period of time. They are designed by professionals according to a Master Plan on a site where there was no city before. This distinguishes a New Town from a 'normal' city that gradually grows and evolves over time. Also, New Towns are mostly the result of a political (top-down) decision. The building of a new city 'from scratch' is a heroic enterprise that challenges the architect or planner to find the ideal shape for the urban program according to the state of the art planning ideas. A New Town is always a reflection of one moment in time and the ambitions of that moment."

This definition of the New Towns by the International New Towns Institute (INTI) shows the importance of the Master Plan and the search for the ideal shape for it according to the planning ideas of their moment of creation. The ones studied in this paper are defined in the glossary of the New Towns Record (Burton & Hartley, 2003) as the ones developed after the New Towns Act of 1946 and subsequent amendments, and to a comprehensive town plan. These were created as a solution to the problems derived from the superpopulation of big cities such as London, and their physical and spatial characteristics were the result of a series of strategical and design decisions. These experiences essayed new urban models which were later taken as an example by other countries for the development of their new

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cities following similar objectives, as in France or Nordic countries.

Despite being distant in time, this urban experience can still offer lessons and reflections when intervening in the transformation and development of the urban form. The work carried out in the New Towns gather experiences in different urban and territorial contexts and has offered a different answer in each situation, from the more suburban proposals to the creation of new cities, through the reform of consolidated and degraded fabrics.

This paper analyses them from the point of view of their urban form, studying the formal characteristics, the organization of the different uses within the city, as well as the diachronic evolution of their spatial composition criteria.

The first New Towns built mainly followed the characteristics stated in the Reith Report (HMSO, 1946 a) and in the later New Towns Act (HMSO, 1946 b). The scale of the new cities, the location, the uses and zoning criteria (urban centres, residential units, industry and work centres, education, green areas and transportation networks), areas and the distances of and between the different uses, the social structure or the treatment of the landscape, among other aspects were defined in them.

However, the urban form of the New Towns, developed between 1945 and 1970, evolved over time, incorporating new aspects and concepts resulting from research carried out in parallel got adapted to the particular context of each one of them, correcting errors and introducing elements which would transform their urban shape, such as new forms of mobility. The critical analysis of the previous experiences was established also as an unavoidable process before the formulation of new developments.

According to the Town and Country Planning Association (TCPA, 2014) the New Towns can be classified into three Marks or generations according to their chronology and the laws that allowed to create them.

The New Towns of Mark I (1946-1950), which include fourteen New Towns designated between 1946-50, had a population from 20,000 to 60,000 inhabitants. Eight of them, Stevenage, Crawley, Harlow, Hemel Hempstead, Welwyn, Hatfield, Basildon and Bracknell, were located beyond the London Green Belt and followed Abercrombie's recommendations of the Greater London Plan and the Reith Report.

This first generation of towns inherited the initial idea of Howard's Garden Cities, though not in the concept of social cities, which was

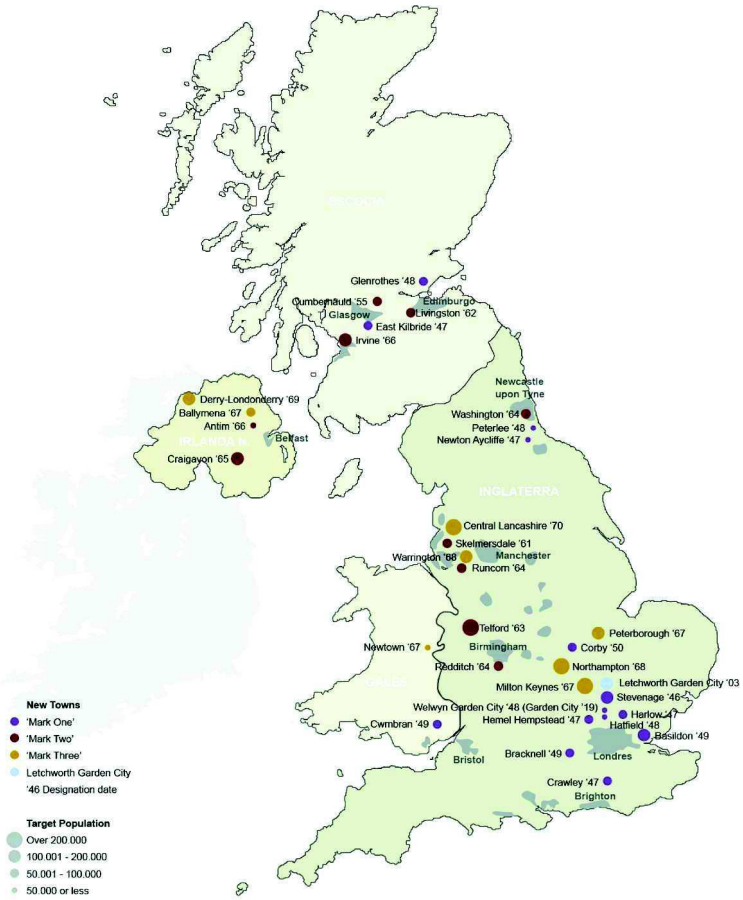

Figure 1.

Location, size, designation date and British New Towns classification. Source: own elaboration from data extracted from the images found in (TCPA, (Town and Country Planning Association), 2014).

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not reflected in the Reith Report. Although they were also conceptually distant in some respects, they were slightly larger than Howard´s ideal size (32,000 inhabitants), and were based more on the need for new housing than on the community organization of the new inhabitants.

These cities had to be balanced, self-sufficient, with a heterogeneous population and a provision for employment, housing and the necessary facilities and open spaces. Had to be located at about 40 km from London and 20 km from other metropolis, so that they could achieve a minimum trip duration to the capital city, thus contributing to the planned decentralization of it.

The urban structure is marked by a very strict zoning, the uses are distributed almost unmixed. Two main centres can be distinguished, the industrial and the urban centre, connected by the rail and the main roads that communicate it with other cities. Around these cores the residential units are distributed, and the free space available between the mentioned uses, both interior and exterior, is occupied by green space. The layout and relationships between the elements of the city and the centre were determined by foot distances.

The centre of the city, were the offices and most commercial services are located, is

Figure 2.
Images of the urban centre and residential areas 1_Harlow, 2_Cumbernauld, 3_Milton Keynes. Source: photos of the authors.

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normally placed in the geographic centre of the territory to be occupied. It is pedestrian and protected from the passing traffic, and where the pedestrian paths converge a large central square is located with elements such as a clock tower or other unique buildings to emphasize its importance, giving it the necessary centrality and representativeness.

Regarding the road system, in the interior of the city there was almost no hierarchical differentiation, although the functional separation of road and pedestrian traffic is considered. The neighbourhood units are separated by traffic routes that connect them to the urban centre, but without crossing it.

Being considered industrial cities, the industry dominates the structure of the city and is located in strategic places, adjacent to the railroad and to the main road accesses, inside the limits of the city.

Residential units are designed in detail creating more or less compact clusters, based on the concept of the Neighbourhood Unit coined by Clarence Perry. Each one of them owns its communal centre with stores, a church and school that, in general, are in the centre of the neighbourhood unit, with a pedestrian access. These are used to divide the city into recognizable parts, to achieve it the units are related to each other by green spaces. The number of neighbourhood units varies between three and ten, and the population of each of them between 3,000 and 10,000 inhabitants, and with a density of 75 people per hectare.

The building typology follows the English tradition, with two-level houses either in rows or paired, with private gardens and served by a Radburn type road system, that separates the roads and culs-de-sac from the pedestrian areas. This was the type of housing that everyone who had suffered from the lack of space in the overcrowded suburbs of the beginning of the century wanted to have in the New Towns, although some buildings were also built in height, as it will be seen later.

The green areas, with large parks and field extensions is the background on which the rest of the functions of the city are located and developed, or in other words, the base that complements the spaces between the different parts of the built city. Green areas connect the pieces of the city, emphasizing the contrast between the urban elements and the territory. Vegetation is concentrated or dispersed in small areas throughout residential areas. These areas are also considered as a space for future expansion and a way of preserving the surrounding landscape. The design of the landscape, as it could not be otherwise, assumes the tradition of the English School.

The New Towns of Mark II (1951-1966) are of a greater size and located at a greater distance from the metropolis, in the case that its objective of creation is to cause the decongestion of the main city, as some of them were expansion of existing towns. Among other this Mark includes, Cumbernauld, Livingston, Telford, Washington or Irvine.

They are more compact, in their urban structure, of higher densities and the separation by uses is less rigid. These New Towns took into consideration the increase of vehicles used by its population and the previous problems of the congestion of the cities, which led to changes in the design of its structure. For this reason, the city adopts a linear shape.

A very compact urban centre predominates in the middle of the city, with separate traffic, the parking is located below the centre to avoid it being surrounded by traffic. It can be reached on foot from any point of the city, so now all residents will go to a single centre. It accumulates more commercial facilities and services, giving it more importance so its capable of generating more activity and making the city look like a single entity, something which was criticised in the previous towns. The idea of creating local centres in different neighbourhood units is abandoned,

The road system was designed with a higher hierarchy, following the ideas of Le Corbusier, Alker Tripp and Abercrombie. The separation of traffics is even greater than in its predecessors. The principle of the separation of traffic is performed at different heights, and was applied to the whole city and not only to residential units. The design was made considering the pedestrian and private traffic, not so much the public transport, as it did not need a sophisticated provision due to the compactness of the cities.

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The industrial areas got dispersed around the city occupying smaller surfaces, although were associated in the same way to the roads of a greater importance.

The concept of self-sufficient neighbourhood units is set aside, and a compact residential continuum is built, with a density in Cumbernauld of 205 inhabitants per hectare. Some houses are incorporated in the centre of the city, mixing its uses.

The architecture used a more modern language than the previous New Towns. The green spaces, as the city was more compact were concentrated in the limits of it, conforming a green belt.

Finally, the ones of the Mark III (1967-1970), including as Milton Keynes, Northampton or central Lancashire, with a proposed population of 250,000 up to inhabitants, are distinguished by the existence of large pre-existences which influenced their forms and locations (Madani-Pour, 1993). The general characteristics presented in them could be summarized in the following points.

Regarding the urban structure, the rigidity in the uses present in the first generation was relaxed by the need for flexibility, a physical structure for the development of the city was designed, so that it could be modified according to future needs. The increase in the number of vehicles coupled with an increase in population in these New Towns played a determining role in their urban form. It is attempted to create a non-hierarchical and homogeneous city; a road grid was established and some fixed elements were arranged in it.

The centre of the city is dominant and several dispersed sub-centres are associated with of the units or districts and are located at their boundaries. When a city already existed, the centre was situated in it or adjacent, completing the existing centres.

Mobility remains a central issue, New Towns, rather than being independent entities, need to be integrated into their region. For the road system, new concepts of networks and possible hierarchies of the roads are studied. A clear and strict hierarchy of the road, primary, secondary and local networks of access to housing is created. Isolated superblocks are created along the road and the segregation of conventional, pedestrian and car traffic with public transport is produced. Due to the change of scale in the size of the settlement and its population, the different parts of the city are connected by means of a fast transport, and are no longer designed according to the distances on foot.

In some New Towns, the public transport is the generator of a more linear urban form and this type of transport becomes more important. This is adapted to the pre-existences and topography of the designated area taking the form of an eight (Runcorn), circular, linear (Redditch) or grid (Washington) shapes to

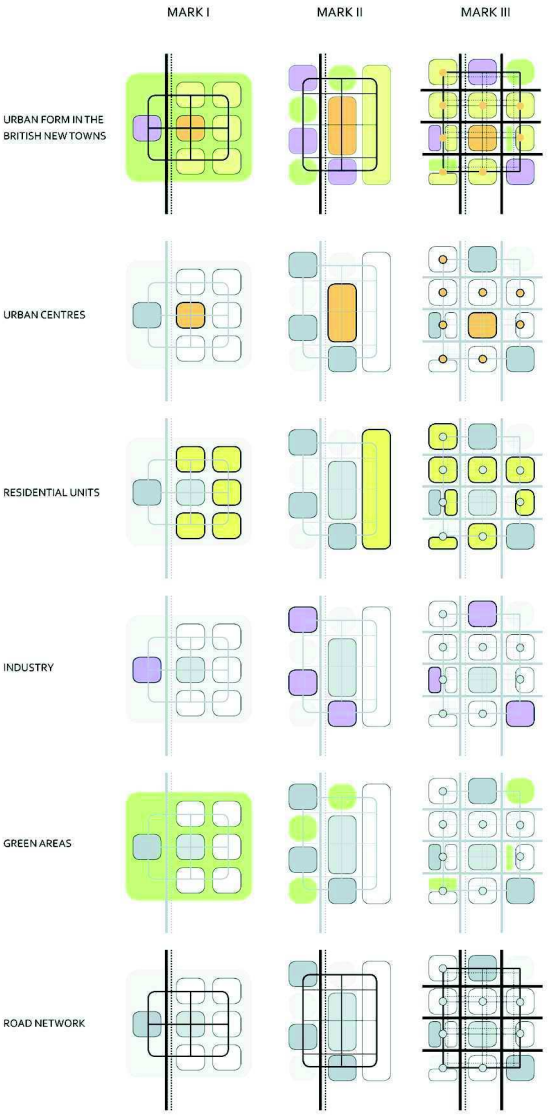

Figure 3.
Schemes showing the evolution of their forms and distribution of uses in the New Towns. Source: own elaboration.

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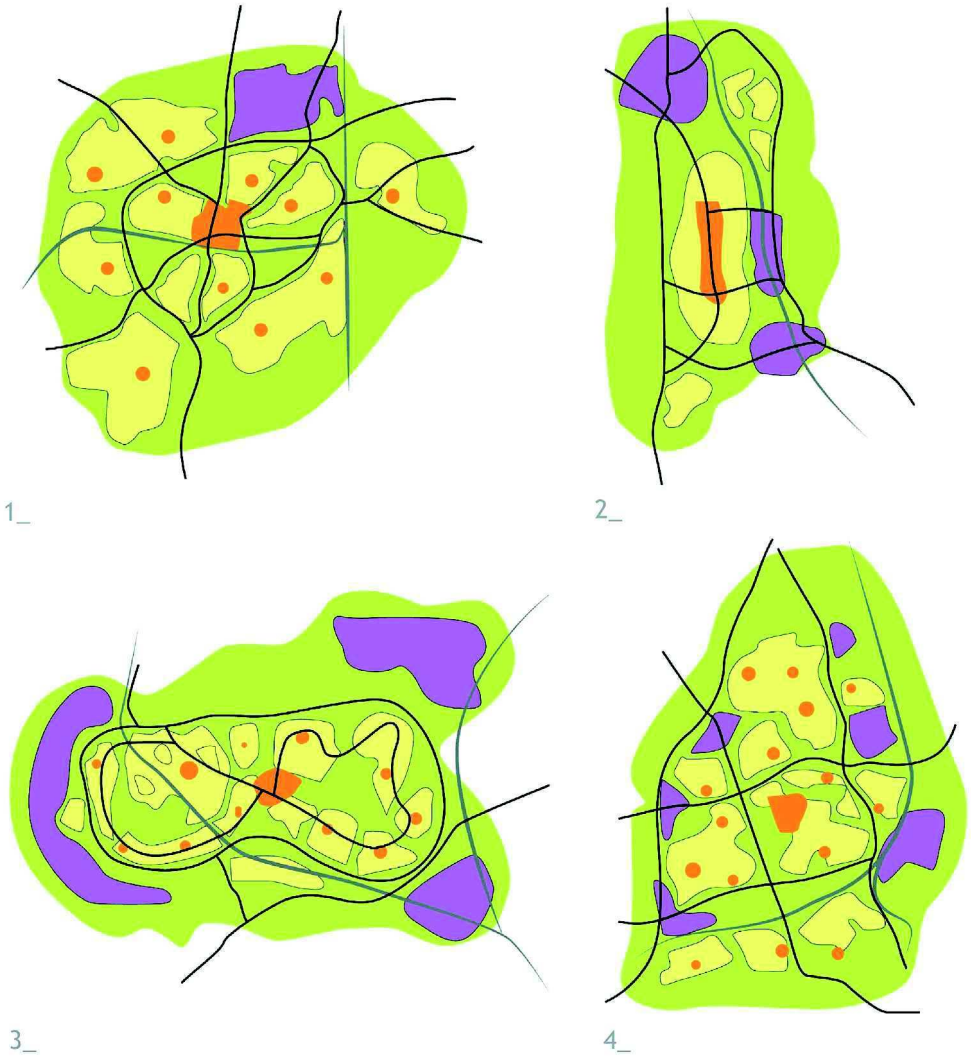

Figure 4.
Schemes of New Towns representative of each of the four phases.
Phase 1: Crawley. Phase 2: Cumbernauld. Phase 3: Runcorn. Phase 4: Washington.
Source: own elaboration from the plans of the towns.

connect the residential areas with the centre. There is a lot of importance to private transport and to try to connect all the points of the city in an efficient and fast way. The transportation stops of the superblocks are the focus of the area that surrounds them and are accessed by foot, by car or taxi. Districts are distributed around these, so that they are accessible from all points on foot.

Later, the form of the road network adopted by several cities was the grid, allowing a better connection between the points of the city, as they are larger and with a larger population. It aims to obtain an equivalent accessibility from all the parts of the city and give its inhabitants the same options. The areas created to withstand heavier traffic, as industries, were scattered throughout the city and usually located near the nodes of activity. This was possible since the type of industry was less polluting than in previous times.

Residential areas are grouped into separate units or districts of limited size, which divide the city into different residential areas that can be independently constructed at each stage of development. Each one becomes an urban entity in relation to the others in a linear way, in response to the greater need for accessibility

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in both public and private transport. It tries to find the minimum element, the residential unit which can be repeated and constitute the city is by the sum of them. Each unit consists of several housing groups.

Radburn's idea is applied to the superblocks, the result is still similar to that of Clarence Perry but the facilities are not located in the centre but in the limits of the neighbourhood and associated with public transport stops.

The size of each unit is determined by on foot distances and by local facilities. The maximum walking distance is about 500 meters, 5 to 7 minutes' walk. Public transport stops are located every 800 meters. The population of the units created depends on the desired capacity for the primary school, varying between 2,000 and 4,000 inhabitants. The density also varies depending on the location of the unit, denser if it is closer to the bus stop and less dense if it is further away, as it is accessed by car.

However, this is not the only classification recognized among specialized literature. If we focus on their morphology, we can classify them according to criteria focused on the urban form and less on the legislation that gives them official support. Thus, based on the classification made by Ali Madani-Pour (1993), we can distinguish four phases of development and design that cater to the different social and mobility needs during the 25 years of interventions.

The first opted for an isolated city, distributed in a radial way, with an urban centre located in the geometric centre of the city and the industrial areas located near the railway. The residential areas followed the characteristics of the Neighbourhood Units and the local centres were in the middle of the unit. Green areas have a great presence and connect the different uses. New communities are taken care of and many green and open spaces are offered, in contrast with the dense and overpopulated cities from which they came. Two examples would be Harlow or Crawley.

The second phase, which includes cities with larger population and size, takes a more linear form given the increased use of the vehicle and changes in mobility, its residential areas are compacted in response to the criticisms received in the first New Towns. Urban spaces and the non-built or green spaces contrast clearly. Urban centres are densified and developed at different levels separating pedestrian and vehicle traffic. Industrial areas are dispersed in the city. Cumbernauld, Hook or Thamesmead belong to this stage.

The third would be the result of a synthesis of the first two. Neighbourhood units are used again but developed radially and connected by

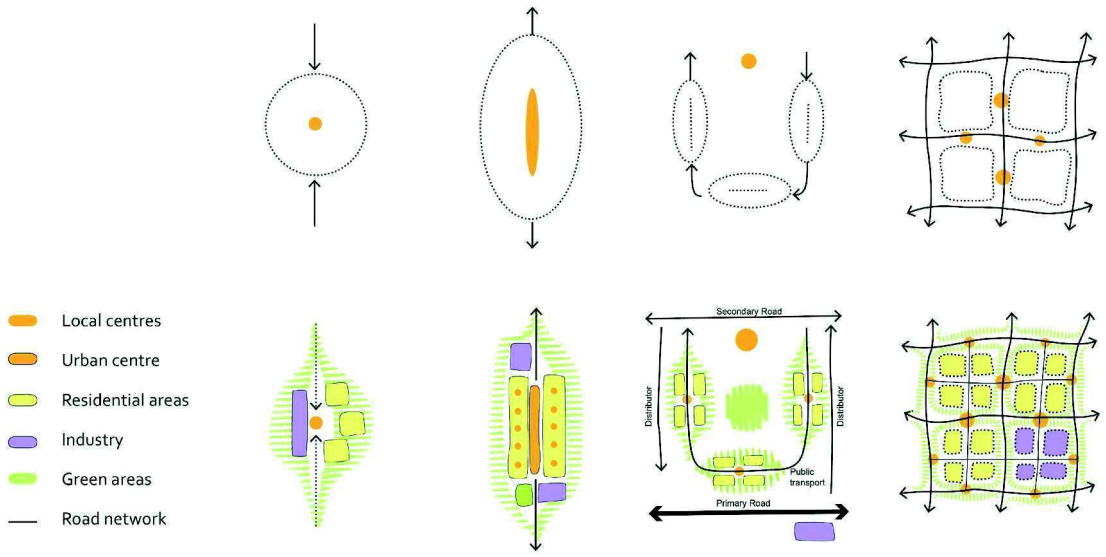

Figure 5.
Schemes of the phases of the development and design of the four phases.
Source: redrawn from the schemes which appear in Madani-Pour, (1993).

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means of the public transport network, placing the facilities associated with their stops. With examples like Runcorn.

Finally, the towns of the last phase, seeking a greater flexibility and freedom of choice than their predecessors, due to the increase of mobility and use of the private vehicle, introduce an open road grid where the urban fabric is freely inserted. Local centres are located on the edges of the neighbourhood units. Its most paradigmatic example is Milton Keynes.

Conclusion

The reflection on the essential characteristics of each of the phases and their analysis, has allowed us to make a diagnosis of the different forms of development, of the advances and setbacks of the British New Towns. We have been able to evaluate comparatively the strategies of mobility and ordering of the uses and their local and territorial relations, the order and composition structures.

The conclusions of the communication recognize the contributions of the New Towns in their different phases, from the different proposals of urban form, and its validity as references of a new urban form in the current context.

For example, one of the recent studies published on the New Towns (TCPA, 2014) states that they have indeed been successful, being among the most advanced and successful communities demonstrating the strength of their plans.

"The New Towns and Garden Cities are among the UK´s most successful and progressive communities. […] The New Town approach has demonstrated the strength of the masterplan, the key role of community development, the role of mass public investment in urbanisation (repaid with interest) and speed of delivery. (TCPA, 2014)"

They have been considered at different moments in their history as successful urban experiences as a whole (DGLC, 2006). In addition to meeting most of the main objectives, they have offered another set of benefits to the communities and their inhabitants, as well as lessons on town planning and architecture.

Territorial and local planning scales

The new towns tried to promote the rational distribution of population flows and activities to implement new territorial equilibriums to avoid the characteristic dysfunctions of large agglomerations. The territory is conceived at a regional and national scale, not only local, and solutions are planned accordingly.

Urban structures and public spaces

A control of the form and distribution of uses faithful to the principles of the urban culture from which they evolve and the moment in which they are designed underlie in the New Towns. The relation systems between the elements of its structure: road, greens, facilities, plots, buildings, free spaces, ensured the legibility of the whole and the achievement of the general interest objectives. Its configuration was materialized through the urban project and the landscape, thus avoiding the disaggregation of the urban space and the aggression on the territory, in opposition of expanding the cities infinitely.

As for the mix of uses, they incorporate areas of centrality which accommodate the collective and productive use spaces in well-communicated locations. Transport networks have been recognized for their good accessibility and for delaying road congestion. (TCPA, 2014)

Town and country relationships

The New Towns were cities linked to a territory and often participated in the rural world to the extent in which they recognized the existing heritage values and the environmental qualities. They also inherited from the Garden City the respectful movement from the traditional city to the countryside.

Nature and city

New Towns try to maintain and emphasize the natural features and the elements of the landscape that their designated area has, as

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well as integrating them in its green structure as a decisive and determinant factor of the character the city had to assume. In addition to the existing green spaces in the area, new ones of a different scale are created and associated with the city. The artificialization of the urbanized land was compensated with the incorporation of natural elements and green zones, an aspect which was internalized in the projects as a starting point.

One of the greatest achievements of the New Towns (TCPA, 2014) was the creation of generous gardens and public parks where the population could rest and enjoy the direct relationship with nature and the countryside. In general, the proportion of green spaces for collective use to develop joint activities and for outdoor sports is much higher in the New Towns than in other traditional cities with similar populations.

Urbs & civitas. Communities created

The new towns intended to cover the basic needs of citizens under their capacity of being both a resident, a consumer of spaces, and a citizen, a member of a self-organizing participatory democracies. The inseparable relationship between the two terms, physical and social, allows to defend certain compromises in the shaping of their projects which tilted the form and the functional and citizen coordination of their districts and neighbourhood units.

Sustainability

Regarding sustainability, a relatively new concept, the New Towns far from being obsolete, are an example to follow as they meet many of the premises that are required to new urban development's today. The number of green areas and the relationship of landscaped areas with other urban functions, control of population growth, relations of respect for nature and the immediate territory, social balance and equal opportunities, among others, are basic issues in which New Towns have responded to the commitments of sustainable settlements.

One of the fundamental questions in the design and efficiency of the plans for the New Towns was to put demographic limits, to avoid what happened in the cities from which their settlers came from. Through planning and design, architects and town planners were in charge of improving living conditions and creating the new opportunities that a model settlement could offer to its inhabitants. In both the New Towns and the previous models of the garden city, urban planners and managers went for a rational and unitary urban structure.

Undoubtedly, within the discipline, the New Towns constitute a further step in the search for solutions to the problems that the city of its time posed. In that historical sequence, we have seen the moment in which they arise and how they are inspired and inherit concepts from past experiences such as the Neighbourhood Units, the postulates of the Garden City and the Modern Movement. They take these experiences and reinterpret them in the aspects that they consider more valid, as well as advancing on other issues that in the end will be decisive and, somehow, representative of a way to solve urban demands. As for example, the way they face the conditions of the territory and how to integrate in a landscape, or the functional and compositional relations between the parts which are going to define the urban ensemble.

These contributions applied to different locations and at different times have given rise to very varied solutions: neighbourhoods with garden city typologies or other more compact and with high buildings, sizes and urban forms variations, population, densities, distances to the metropolis or residential unit sizes.

New urban morphologies were tested in the New Towns, incorporating the modifications resulting from the revision and improvement of the model previously used, as well as the alternatives offered by the architecture and urbanism of the time to solve the inherited conflicts. Having relative commitments, in terms of the prevalence of consolidated urban morphologies on which to grow, allowed them to respond with freedom to: the greater rationalization of mobility and transportation systems, the priority of public spaces, equitable and egalitarian distribution of services and facilities, establish healthier environments, modern and better equipped accommodation,

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as well as providing more democratic employment and participation opportunities.

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City and territory
in the Globalization Age

3. Reading and regenerating the informal city

Towards informal planning: Mapping the evolution of spontaneous settlements in time

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Abstract. Cities are the largest complex adaptive system in human culture and have always been changing in time according to largely unplanned patterns of development. Though urban morphology has typically addressed studies of form in cities, with emphasis on historical cases, diachronic comparative studies are still relatively rare, especially those based on quantitative analysis. As a result, we are still far from laying the ground for a comprehensive understanding of the model of change of the urban form. However, developing such understanding is extremely relevant as the cross-scale interlink between the spatial and social-economic dynamics in cities is increasingly recognized to play a major role in the complex functioning of urban systems and quality of life. We study the urban form of San Pedro de Ate, an informal settlement in Lima, Peru, throughout its entire cycle of development over the last seventy years. Our study, conducted through a four-month on-site field research, is based on the idea that informal settlements would change according to patterns similar to those of pre-modern cities, though at a much faster pace of growth. To do so we first digitize aerial photographs of four different time periods (from 1944 to 2005), to then conduct a typo-morphological analysis at four scales: a) building, b) plot, c) block, and d) settlement (comprehensive of open space and street network). We identify and classify patterns of change in the settlement's urban structure using recognised literature on pre-modern cities, thus supporting our original hypothesis.

Keywords: Lima, Informal Settlement, Urban Morphology, Pattern Analysis, Glossary

Introduction

Cities are complex-organized (Jacobs 1961) adaptive systems (Garcia 2013) and have always been changing in time according to non-linear and largely unplanned patterns of development. However, these patterns still remain little investigated (Kellett and Napier 1995).

In the current geological era, the Anthropocene (Steffen et al. 2011) where population living in slums1 is expected to grow from one to two billions by 2050 (UN-Habitat 2003), the social and ecological stability of urban systems in general, and that of unplanned settlements in particular due to the higher exposition to environmental hazards (WUP, 2014) is undermined by the application of large-scale, design-oriented planning strategies.

Life in every complex system is characterized by development, growth and decay, and can be understood as a continuous oscillation of phases, such as: growth (r), conservation (k),

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release (Ω) and reorganization (α) (Allen, et al., 2014, p. 579) In ecological theories this takes the name of adaptive cycle (Holling 1973) and is a process that can be applied to the study of urban systems.

The equilibrium of cities is constantly perturbed by social and technical progress increasingly operating at a global scale, and their development is marked by a series of crises and recoveries in response. Overall, it has been shown that historic cities prove to be more resilient (ibid), and thus to better persist and respond to such changes than modern ones (Gunderson 2001).

We identify the need for morphological analysis of informal settlements as a way towards understanding how their physical form aides them through such phases, and help advance a science of urban form. To do so we build on a previous study (Porta et. al 2014) quantitatively demonstrating the radical change which has occurred in the city structure since the advent of modern and postmodern paradigms of city-making, and which has identified the absence of this alteration in scale (p. 3398) in contemporary informal settlements. The study actually proves that there has been a shift in the length of Main Streets from the '400metre-rule' of traditional spatial patterns to its double in post-modern environments (ibid).

So far, studies aiming at understanding the adaptive cycle of urban systems have been conducted on individual urban elements, such as: a) the Building (Caniggia and Maffei 2001), b) the Burgage cycle (M. Conzen 1969), c) the Block (Moudon 1989) and d) the Sanctuary Area (Dibble 2016). However, no study has been conducted on the settlement scale yet.

One of the main obstacles to the development of scientific knowledge in the field of urban morphology and thus expanding the understanding of adaptive cycles further, is the lack of agreement and terminological consistency (Whitehand 2007).

The purpose of this paper is thus twofold: on the one hand it aims at demonstrating that there are similarities between patterns found in informal settlements and those of historic cities, identifiable through Pattern Analysis, a visual identification of the changing morphology of urban elements; on the other hand, it aims to develop and build such analysis on solid and recognised definitions.

The first part of the paper proposes a systematization of terms by reviewing and comparing literature across disciplines and come up with a Glossary that is supposed to lead to more valid universal definitions (Fig. 1).

The second part conducts a pattern Analysis of urban form in the informal settlement of San Pedro de Ate in Lima, Peru, throughout its entire cycle of development over the last seventy years. With a highly centralized administrative and burocratic system and a current population of eleven million inhabitants, fifty per cent of whom live in the peripheral hillside settlements in extreme poor conditions, Lima is representative of Latin American rapidly-growing predominantly urban areas which have become home to masses of migrants looking for better living conditions and jobs opportunities (Matos Mar 1984).

Methodology

This paper is part of a broader work including three types of investigations of San Pedro de Ate: Pattern Analysis, Longitudinal Analysis and Morphometrics, which, combined together, provide a comprehensive framework of analysis. Pattern Analysis identifies morphological patterns and their transformations in time at the settlement scale; Longitudinal Analysis describes the adaptive cycle of the settlement through a comparison between the case study and San Bartolomio, a neighbourhood of Venice (Muratori, 1959), with the aim of detecting patterns of similarity, despite their extremely different paces of growth. Finally, Morphometrics is a process that entails the study of the measurements of urban form (Dibble 2016, xi) and allows for the quantification of previously identified patterns through a series of indicators that are key to understand the morphological transformations happening at the settlement scale.

However, the current paper focusses on Pattern Analysis alone, which consists in the investigation of San Pedro's most representative urban phenomena, such as the

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Betweenness Centrality (C_B): *Strategic spaces that are located on the short routes between a pair of spaces in the network*[****](p. 258)

Block: *The contiguous portion of land comprised of Regular Plots, Internal Plots, Internal Ways and/or Open Spaces which is normally bounded by Streets or possibly by certain geometry of its configurational sub-elements*[*]

Building: *a permanent, built structure with some form of enclosure defining the borders of usable space*[*]

Built Front (*Building Line*[°]): *corresponds to the linear extension of the frontage of a Plot, a Street or the perimeter of a Block which has a Building within a 4m offset of the Street edge*[*]

Building Footprint, *also* Covered Area *(Building coverage*[°]*) the portion of land occupied by a building*[*]

Closeness (C_C): *The proximity of a space to all other spaces using shortest path*[****](p. 258)

Internal Plot*: are those Plots which either: 1) are accessed from a Street but do not face that Street; 2) face a Street but do not have access from a Street, or; 3) neither face the Street nor have access from a Street*[*]

Internal Way: *the space developed to serve as a thoroughfare internal to a Block*[*]

Internal Street: *The Streets which are internal to the Sanctuary Area; such Streets can be Local Mains or Local Streets*[*]

Land-use: *the type of activity which is realised inside a certain Plot*[*]

Local Main: *A Street that has a significance in the more immediate Street Network and which does not traverse more than two Sanctuary Areas*[*]

Local Street: *The Streets with the least significance in the Street Network, that are relevant usually only within the Sanctuary Area*[*]

Natural Area: *An area which is an undeveloped ecological feature, i.e. wooded areas, rivers, lakes, etc.*[*]

Multiple Centrality Assessment (MCA): *a methodology for geographic network analysis. It provides a different perspective from Space Syntax in that: (1) it is based on primal, rather than dual, street graphs; (2) it works within a metric, rather than topological, framework; (3) it investigates a plurality of peer centrality indices rather than a single index. In the MCA analysis e*very street network is made of *Edges* and *Nodes*. Where edges are streets and nodes the intersections between streets [**]

Open Space: *A planar element of space that may be bounded, but is not developed to maintain a particular Land-Use, does not have defined Access and/or does not have the geometric properties to become developed in a meaningful way*[*]

Plot (*Burgage*[°]): *a developed piece of land, somehow delineated from other pieces of land that do not pertain to that particular Plot*[*]

Regular Plot: *those which face a street and have a primary access directly from the street*

Sanctuary Area (SA): *The area usually bounded by Urban Main Streets. This area may sometimes be bounded by the geometries of other urban elements but may not be bounded by any other type of Street. The Sanctuary Area is comprised by Natural Areas, Internal Streets and Blocks, and the relative sub-components thereof*[*]

Straightness (C_S): *being central as being more directly reachable by all others in the network*[**] (p. 708)

Street Edge (*Building Line*[°]; *Pertinent Strip*[°°]): *series of one or more plots served by the same street and bound to the centrality of the street it sits on*[***]

Street Network: *The set of all Streets relevant to a certain place, district or city. The concept of a Street Network implies a hierarchical relationship amongst different types of Streets and both physical and theoretical aspects of network*[*]

Urban Main: *A Street that has the largest significance in the overall Street Network*[*]

[*](Dibble, 2016; p. i-ix)
[**](Porta et al., 2006; p. 705)
[***](Feliciotti et al., 2017; p. 5)
[****](Dempsey et al., 2010)
[°](Conzen, 1958; 1960); [°°](Caniggia & Maffei, 1997; 2001)

Figure 1. Suggested Glossary of urban terms (and corresponding nomenclature from the literature)

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extreme densification, through the analysis of the settlement changing patterns at four different scales: I. the Street, II. the Block, III. the Plot and IV. the Building, by means of both synchronic and diachronic studies (Caniggia and Maffei 2001), over a period of seventy years.

Dataset was created with the help of a cadastral plan of 20132, on the basis of which aerial photographs3 of four different time periods (t1: 1949; t2: 1967; t3: 1976; t4: 2005) were digitized. Therefore, preliminary to the dataset creation, was the identification of a legend where elements of the urban form were defined (Fig. 1 and 2) and drawn (Fig. 4): Sanctuary Areas, Urban Mains (street), Local Mains (street), Locals (street); Buildings (block), Plots (block), Internal ways (block) and Open spaces (block).

Because San Pedro de Ate has developed outwit formal planning procedures, it followed historic, pre-modern cities patterns: the larger the component, the slower the change – this holds across the settlement, street layout, block, plot, building typology and functions. Thus the rapidly-changing nature of buildings and functions needs particular attention, for it is highly representative of larger transformations.

Glossary

This section sheds light on the definitions proposed in the glossary (Figure 1) which are relevant to the Pattern Analysis and lays particular emphasis on the criteria used to identify each of the urban element, such as centrality, density and accessibility, all representing important parameters for urban design practice.

Streets are classified according to how central, and thus important, they are in the city network, from the most central - Urban Mains, to less important - Local Mains, to the least significant – Locals. Furthermore, Blocks, defined as the portion of land bounded by streets and comprising Buildings, Plots, Open Spaces and Internal Ways, are defined according to their composition and density. Plots, usually described as units of property (Conzen 1969), are instead considered according to the accessibility degree and thus distinction between Regular Plots – facing the street, and Internal Plots – not directly facing the street, is essential.

Moreover, the focus on smaller, fast-changing urban elements explains why in the glossary particular emphasis has been laid on the definitions of building types (Figure 2), advocating the need for a systematization of criteria used to identify them (Figure 3). As a matter of fact, commonly adopted classifications take into account a broad range of features: i) land use (Caniggia and Maffei 2001), ii) architectural period often coupled with the iii) geographical location (M. P. Conzen 2004), iv) sociological criterion (Thienel 1973), v) building regulations (Forster 1972) and vi) architectural layout (Beresford 1971). Therefore, in this plethora of features, we operate a violent reductionism and propose a definition of building types which is consistent, fixed in time and purely based on morphological characteristics.

Our definition of building type is based on two main urban indicators: a) urban density, expressed at two levels: i) the presence and position of the stairs in the building, determining whether the house is single or multi-family; and the ii) number of dwelling units, according to which a multi-family dwelling can be simple, double or multiple. The second factor is the b) arrangement of the buildings in the urban block, descriptive of the urban layout. Figure 3 is thought to help the reader through this logic reasoning, while Figure 2 represents a graphic glossary of each of the identified building types.

Analysis and discussion of findings

In this section we will regularly refer to Figure 5, where development of the four identified elements (a, b, c, d) over the four time periods (t1, t2, t3, t4) is represented.

Pattern I: Street (Figure 5a)

In order to conduct analysis on the street patterns of the study area, it is essential to also take into account the Street Network at the city

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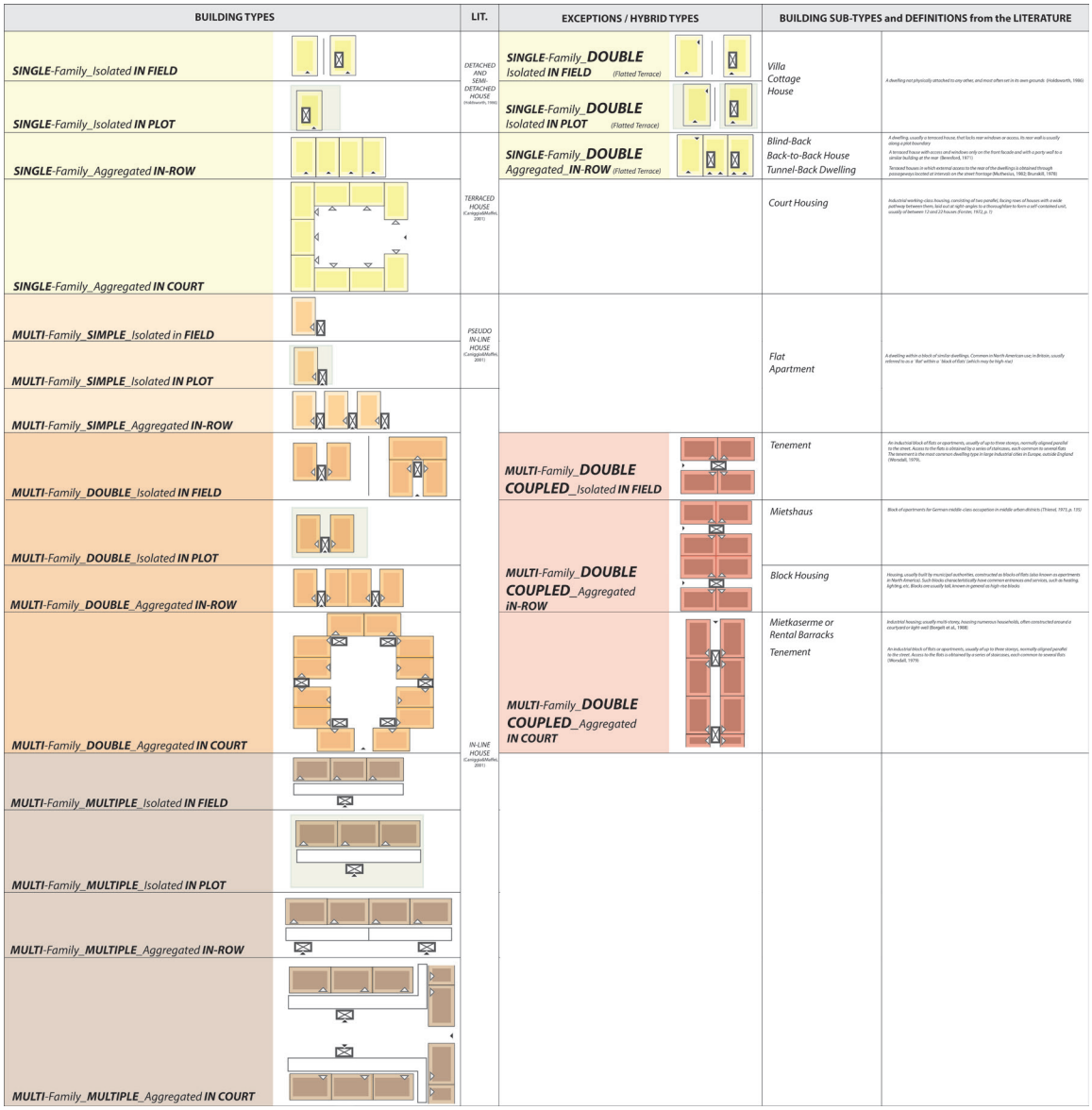

Figure 2. Graphic Glossary of Building Types

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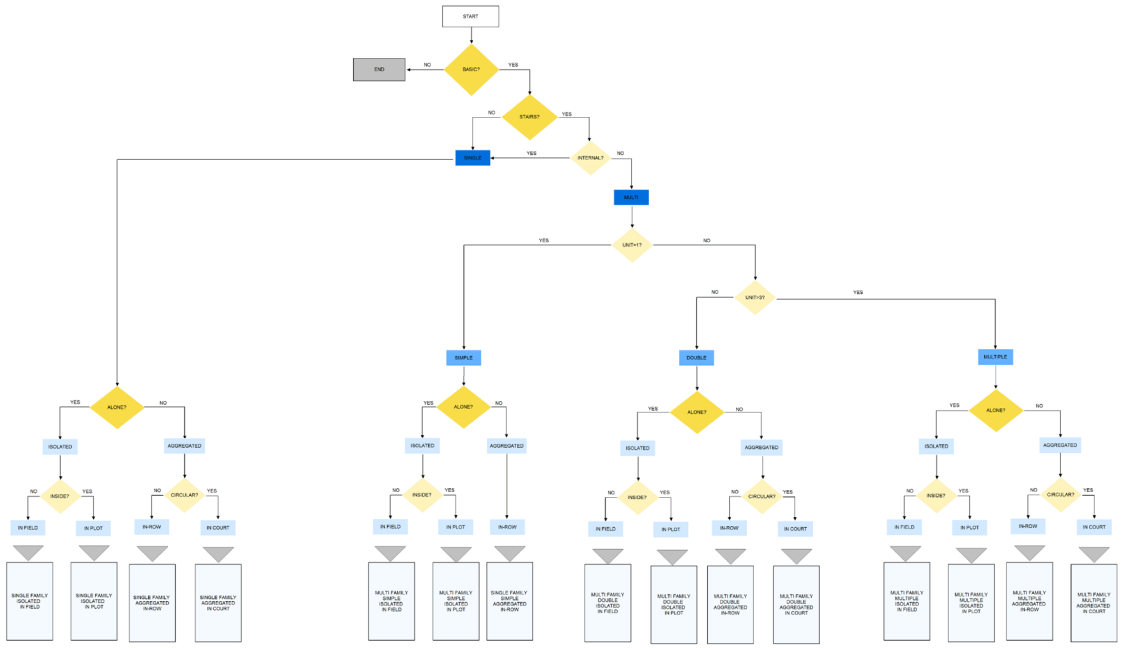

Figure 3. Process of Definition of Building Types

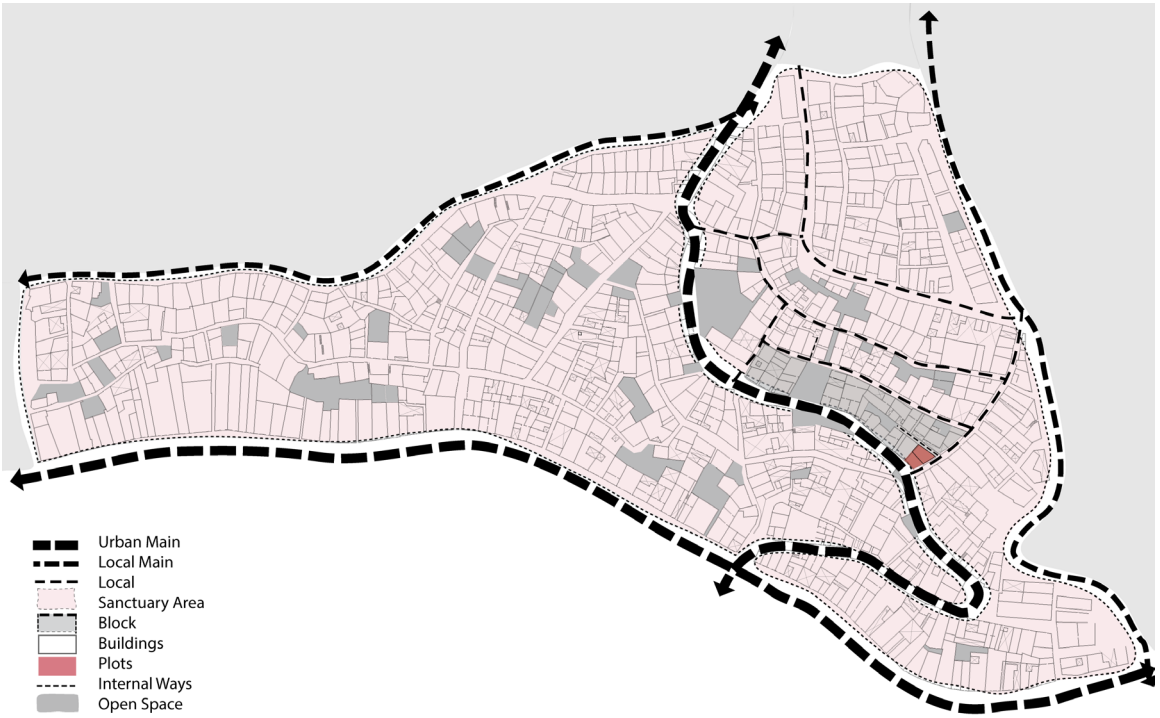

Figure 4. Study area with identification of urban elements of analysis

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scale. This permits to properly understand the structure of San Pedro de Ate in the general and more complex context.

As a matter of fact, the street network is analysed through the MCA (Figure 6) tool (Porta, Crucitti, and Latora 2006) which, based on the idea that some places are more important than others because they are more central (ibid, p. 705) introduces metric instead of topological measurements to calculate streets centrality both globally - the city network (Figure 6a), and locally - the subnetwork (Figure 6b), and identifies two main types of centrality: Betweeness (CB), Straightness (CS).

CBglob shows the main streets in the city network, connecting the main commercial and administrative hubs, such as the boulevards crossing the city from north to south (Via Expresa, Av. Brasi and Av. Ugarte) and from west to east (Av. Benavides, Av. Javier Prado Oeste and Este, and Av. Venezuela). While CB calculated at the local scale displays the settlement bounded and also crossed by Urban Mains, each no longer than 400metres. From this analysis we can infer that the settlement is made of four Sanctuary Areas.

CSglob highlights the main city hubs: the historic centre which gravitates around plaza de Armas, the district of Pueblo Libre and San Miguel where the main Universities and commercial hubs are located; the districts of Miraflores, San Isidro and Barranco (along the coast), modern and commercial areas, centre of the administrative and governmental power, as well as home to the upper-class. While CS at the local scale identifies San Pedro as a peripheral area which is nevertheless directly linked with main commercial and industrial hubs.

Now, focusing on the subnetwork development in time (Figure 5a), the most evident pattern is the emergence of Internal Ways, thus the proliferation of culs-de-sac to improve blocks inner accessibility. However, while formal, and usually more central, areas present a high level of griddiness (Moudon 1989), with a clear grid-iron layout, neighbourhoods which emerged from unplanned patterns, normally on the outskirts, show a typical distorted grid system (Marshall 2005) made of the combination of tributary and semi-gridded streets (ibid), with a prevalence of T over J junctions, similar to what Moudon has defined as medium-grid and culs-de-sac (2005) structure. The result is peri-central unplanned settlements with a more compact, dense and in some cases less permeable urban tissue, which is typical of historic cities.

We can conclude that very diverse patterns of street network emerge in different areas of the city, which is the reason why San Pedro de Ate is perceived as a peripheral neighbourhood when considering the whole network. As a matter of fact, the settlement shows a high level of centrality, for it is crossed and surrounded by Urban Mains, the main traffic thoroughfares allowing for the flow of goods from the harbour to the highlands and vice versa, key to the development of the local economy (Ferndandéz de C, en Mattos and Ludeña 2011). Therefore, informal does not absolutely mean marginal and unimportant.

Pattern II: Blocks (Figure 5b)

Blocks can be understood as the space resulting from the intersection of streets (Carmona 2010) and despite their tendency to preserve their form over time, they do change according to broadly recognised patterns.

In terms of blocks, the physiognomy of the settlement has undergone a massive development between t1 and t2, but remained quite stable since then. As a matter of fact, if in 1949 San Pedro was only made of seven blocks, in 1967 it already accounted for forty-seven blocks, the same as today.

Each block, identified by a letter (A, B, … N; A', B', … N'), is different in size and shape and with very organic and uneven forms. Despite their irregularity, though, it is possible to detect some common patterns of change, which are observable in Figure 5b: (i) blocks in t1 emerging at the edge of the settlement along the Matrix Route (Caniggia and Maffei 2001), tend to get larger, more compact and denser in time. While (ii) blocks that developed later in time (between t2 and t4) closer to the centre of the settlement are usually smaller and much more fragmented due to the progressive consumption of the street area and to the emergence of internal ways (mainly culs-de-sac) which have somehow carved them up over time to increase accessibility. This pattern is in

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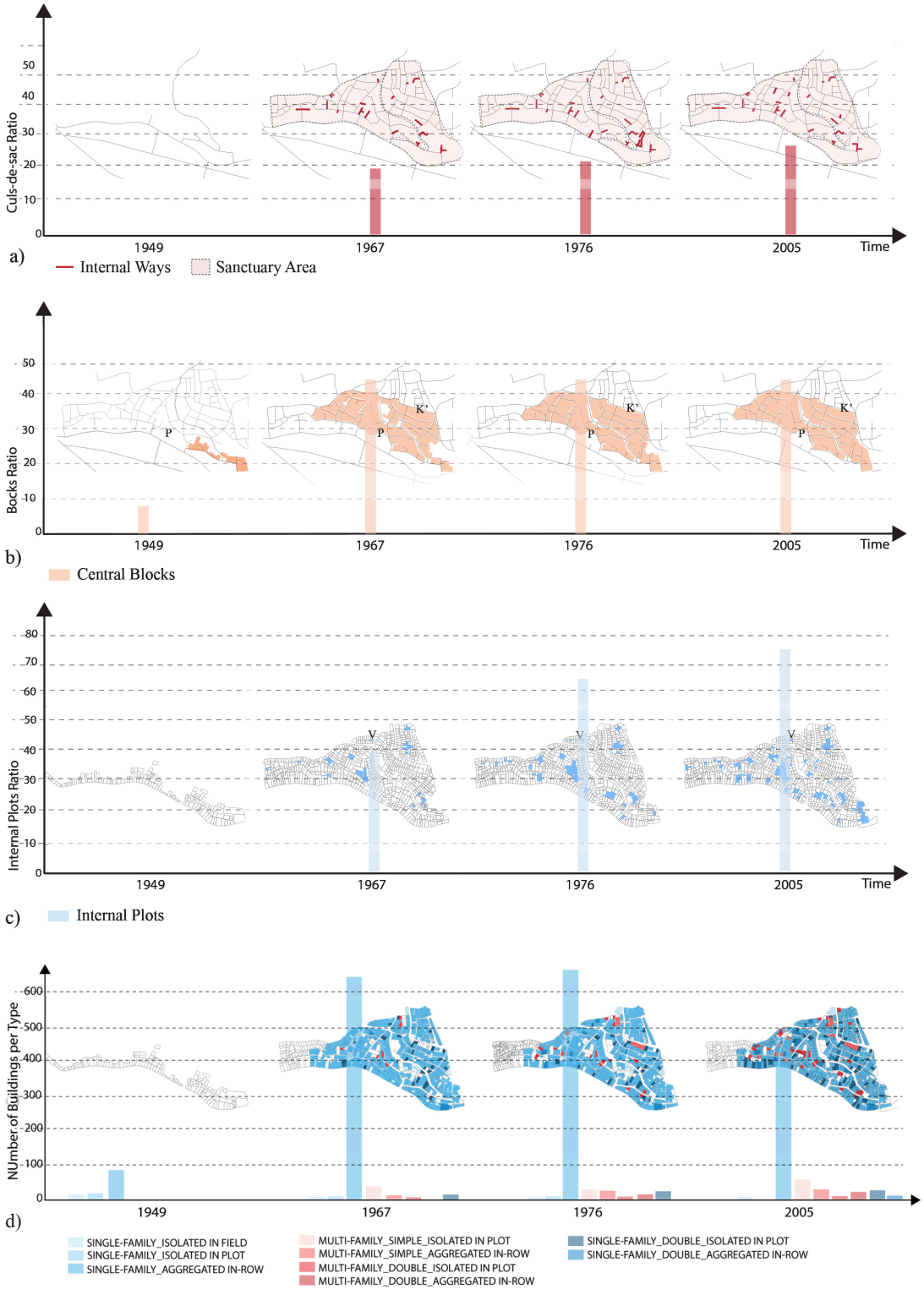

Figure 5. a) Block changing patterns in t1, t2, t3, t4, b) Plots changing patterns in t1, t2, t3, t4, c) Buildings changing patterns in t1, t2, t3, t4

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line with Krier' observation of organic cities, where the smallest and typologically most complex urban blocks are found at the centre (1992, 197).

If we now look at one block within the study area (P) and trace its development over the four identified time periods (t1, t2, t3, t4) we are able to detect some recurrent patterns of development. In t1 the block perimeter is not yet shaped and we observe the emergence of Street Edges with plots perpendicular to the existing street (Kropf 1996). ii) In t2 a second street edge emerges opposite to the first one and the block perimeter gets larger, reaching its current boundaries. This configuration creates an empty space in the middle of the block. iii) In t3 the empty inner space is filled with new internal plots and the block perimeter is modified by the emergence of internal ways, giving access to the internal plots. This pattern reminds of the typical pre-Haussmannian rectangular block with a dense edge front and an empty interior space (Panerai, P., Castex, J., Depaule, J. C., & Samuels 2004). However, it differs from the usual behaviour of central empty spaces which usually get larger proportionally to the expansion of the block (Krier et al. 1992). iv) In t4 the block shape is consolidated and variations only occur at the plot level, according to the changing social and economic patterns.

Some blocks (e.g., K'), however, maintain an almost rectangular, or anyway more regular, shape and present just two, sometimes even one - Serie Aperta - (Caniggia and Maffei 2001) street edges, one opposite to the other.

From these observations we can infer that the urban tissue is compact, dense and quite stable in time, with a peak of change between 1949 and 1967, due to a massive densification. In general patterns found in pre-modern cities are confirmed with some clear differences due to the extreme densification process still on-going in the settlement, e.g., triangular blocks show a double street edge when block width reaches 12-15 metres, rather than 30metres of those typical of Haussmannian period (Panerai, et al., 2004).

Pattern III: Plots (Figure 5c)

In order to investigate the spatial arrangement and configuration of plots and of their morphological development in time, we first need to operate a taxonomical distinction between Regular Plots, and Internal Plots. Internal plots, which often present smaller and more irregular polygonal shapes, are usually the result of the increasing densification process; thus they represent an important indicator of density. As a matter of fact, the number of internal plots is progressively increasing in time: t1 = 0, t2 = 55, t3 = 57, t4 = 87.

Despite their slightly faster pace of development in comparison with block and street layout, plots are still considered to undergo little variations. Actually some of the plots in t1 have always maintained their original size, which is usually much larger than that of more recent ones.

Plots were originally 'laid out' perpendicularly to the route (M. Conzen 1969) so that access was made possible directly from the street, and has progressively become more irregular in both position and shape due to the adaptation to the steep and irregular topography and to the emergence of inner ways.

Furthermore, we observe that the development of plots size is a non-linear one. As a matter of fact, plots within a block can either increase in number - thus reducing their size through processes of subdivision (ibid) - or decrease in number and increase in size by means of amalgamation (ibid). An example of this behaviour is block V, which only emerges in t2 with twenty-two plots, then accounts for twenty-five in t3 and twenty-three in t4.

To sum up, we can observe that the plots variations recall those of historic cities, since they undergo the same non-linear metamorphic processes described by Conzen in his studies of English market towns (1969). However, essential to the identification of plots transformations is the distinction we operate between Regular and Internal plots. As a matter of fact, the increasing number of internal plots represents a fundamental indicator of density, which is not negligible.

Pattern IV: Building Types (Figure 5d)

Due to their fast-changing nature, buildings are considered the simplest yet most complex urban element, and thus capable of reproducing urban

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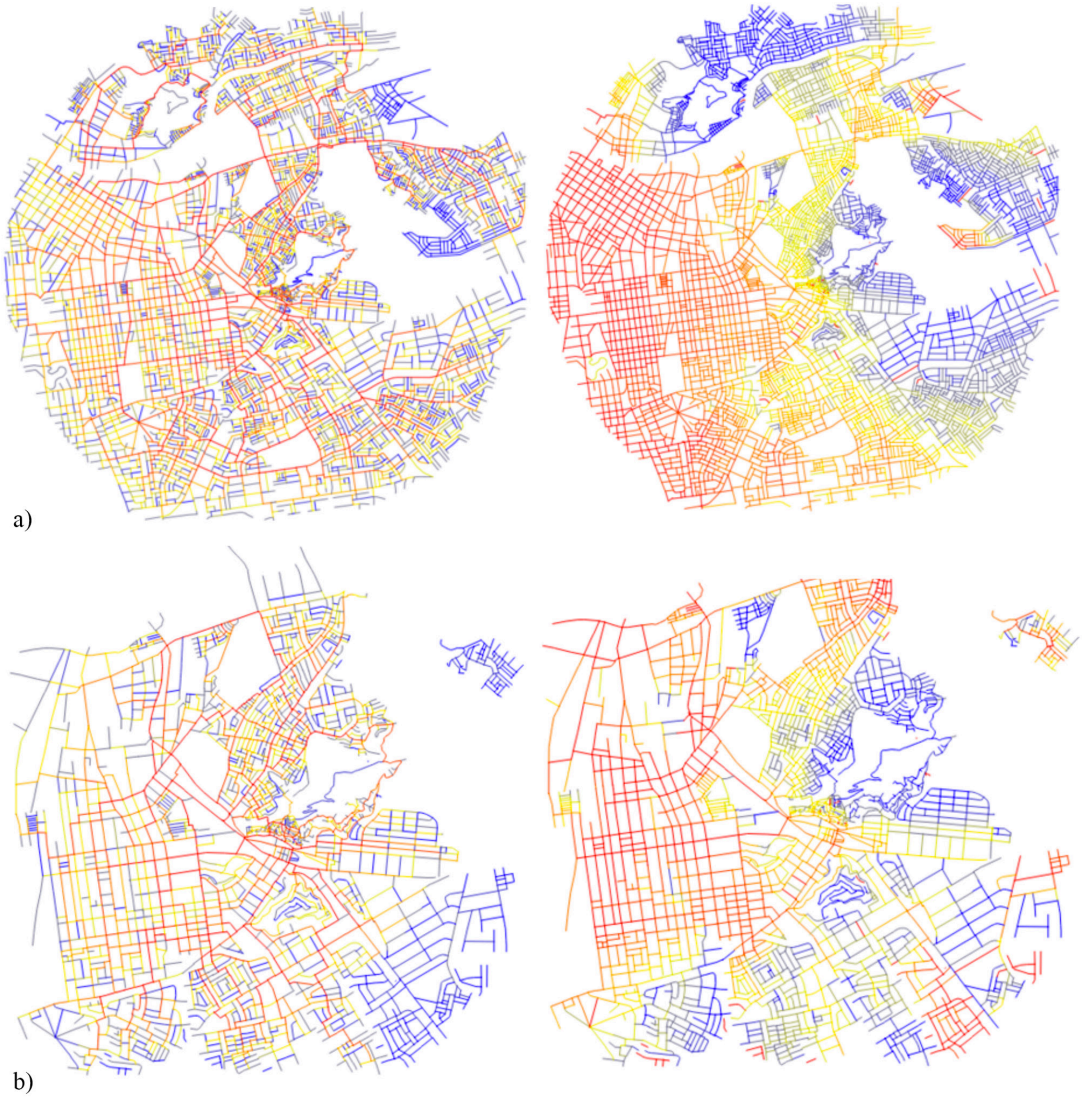

Figure 6. MCA Analysis of Lima Street Network according to the whole network (a): (from left to right) Betweeness (CBglob); Straightness (CSglob); and the subnetwork (b): (from left to right) Betweeness (CB); Straightness (CS).

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transformations and complexity at a smaller scale. This is why, based on the legacy of the Italian School of Building Typology (Cataldi, 2003), which claims to explain global socio-economic changes through the understanding of buildings variations, this paper investigates building types and their alterations over time. To do so we rely on our definitions proposed in the Glossary (Figure 2).

If we look at the changing building types over the four identified time periods, it is possible to recognise some fundamental patterns which are representative of the continuous transformations at the settlement level.

As a matter of fact, while there has been a prevalence of Single-Family-Aggregated In-Row dwellings throughout the whole period, the proliferation of Multi-Family houses (simple and double) only happened in the last three or four decades as a symptom of the extremely accelerated urbanization and the increased complexity. This finds an explanation in the development and expansion of the surrounding markets and industries that favoured the housing demand.

Another interesting indicator of increased density is the emergence of a hybrid building type that we name Single-Family _ Double, which similarly to the Flatted Terrace4 (Muthesius, 1982) presents one flat per floor with separate accesses. This type has mainly proliferated in the last couple of decades as a speculative building (Moudon 1989), for it allowed families to generate income by renting half of their house.

By observing the settlement changing structure (Figure 5 from a) to d)), we can identify two main patterns: i) the initial fast development of the urban layout within the first three decades verified by the emergence of Streets, Blocks and Plots immediately reaching the current extent; and ii) the persistent transformation of the urban tissue through smaller variations at the Building level stretched over time. So if on the one hand the investigation of larger-scale, slower-changing components is representative of the massive urbanization happened globally since the mid-twentieth century, the study of smaller-scale, fast-changing elements is descriptive of the socio-economic transformations happening at a local level.

Conclusion

The paper proposes a systematisation of terms, based on a significant review of relevant literature, and on the problems caused by the lack of such agreement on terms. It is from this more coherent and consistent systematisation of terms that initial work on Pattern Analysis, Longitudinal study and Morphometrics was used as a complete methodology on one case study, to extract observations, draw parallels, and advise on how this work might help with future interventions.

We suggest that such understanding of the urban form can be used to support alternative planning strategies in both formal and informal environments as alternatives to large-scale, pre-defined and less context specific interventions on a global scale; on the other hand, by associating informal settlements with historic cities, considered as highly resilient and adaptive environments, it challenges the idea according to which informal settlements have always been considered as negative environments by following a line of thought that comes from Turner (Turner & Fichter, 1972).

The understanding of the city structure and its development in time through the combination of qualitative and quantitative analyses in time, must be considered as a necessary step if we wish to develop sustainable planning policies and restore the social and ecological stability of cities. As a matter of fact, Pattern Analysis is useful to detect the changing patterns of each of the identified urban elements as representative of city transformations, e.g., the fast-changing nature of building types which reproduces in itself the complexity at the city scale. Longitudinal Analysis gives the opportunity, through a comparative study to identify the cycle of urban systems through crises and recoveries. And Morphometrics wishes to quantify and measure the previously identified patterns towards a systematic understanding of urban form, in order to detect similarities, rather than diversity between organisms.

If on the one hand, this paper proposes a series

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of tools to conduct morphological analysis towards a science of urban form (Romice et al. 2017), such as a systematic glossary of urban terms and a comprehensive methodology; on the other hand it gives further demonstration of the existing similarities between the urban structure of contemporary informal settlements and that of traditional cities. The two objectives are strictly interconnected and offer a solid basis on which to develop healthy and responsive planning strategies.

Notes

1 Environments with the highest concentrations of poor people and the worst shelter and physical environmental conditions (UNHSP, 2003, p. VI)

2 COFOPRI: Organismo de Formalización de la Propiedad Informal – Informal Property Formalization Agency, Peru

3 Servicio Aerofotografico Nacional (SAN) – National Aerial Photographic Service, Peru

4 A terrace of houses comprising one flat on each floor. Access is obtained through separate front doors, either along the street or from a courtyard (p. 130-137)

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The changing pattern of urban form: Example of Tripoli, Libya

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Abstract. *This paper will start with a short historical background of Tripoli, and identify the periods of growth by using an evidence of maps, photos, sketches, to illustrate and the schematic of changes, then will identify the problems for the historic city in the particular era. The paper will focuses in impact of Modernism, nature, scale and speed of change – physical environment (streets, plots, buildings, land uses) and social change (uses, occupiers).*

Keywords: Historic Tripoli city, urban form, urban change, problems

Introduction

Several studies of urban planning and architecture have explored how the physical form of Tripoli has altered over time. While this work is informative, relatively work has explored how the traditional city of Tripoli has changed over time. This paper will concentrate on explaining the historical characteristics of urban form of the 'old' city. In particular, the paper discusses the changes made to the city because of Ottoman, Italian, British influences, before briefly exploring, the impact of modernism t hat occurred during the post-colonial era. The paper finishes by discussing the political influence of law in the Gaddafi era and how this has affected the historical city.

Tripoli Location in Libya

The old city of Tripoli is a Libyan North African city, it's the nucleus that has evolved from it the whole city, which founded by the Phoenicians between fifth century and seventh century until the mid-nineteenth century (the city of 2700 years old) when spread urban development outside the city walls under Ottoman rule.

From the Arab era in 643 to the Spanish and Maltese era 1510-1551 AD

After the collapse of the Byzantine Empire, the conquest of Constantinople and the arrival of the First Ottoman era, from 1551 to 1711 AD, we can observe some key physical elements which are landmarks in Tripoli's old city , such as the western wall, Darghout mosque, and Darghout baths, built in 1604. In general, the First Ottoman era is considered important with regards to rebuilding and strengthening the city. A new tower was built (tower of Darghout) to the north (port entry); another tower was established right in the middle of North West wall and was named Tower of turab (earth). This is illustrated in a map from 1675 (Figure1) and several other drawings dating to the 17th century (Code of the old Tripoli city, 2010). The following a sketch is from 1675 belonging to Sir John Siller of the city of Tripoli following the Ottomans' rebuilding and organizing, three mosques with three circular minarets: the great mosque (close proximity to the current site of Ahmed Pasha mosque), Darghout mosque and Sidi Salem mosque. Contrary to the 1559 map, this map shows a network of streets in a vertical shape, it also shows that the west wall has changed to become straight between the gate

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of Zenata and the tower of Sidi Al-Haddar.A sketch from 1686 shows the defense wall of the city. From the right to the left, we can see the tower Sidi Al-Haddar, Turab tower, Darghout tower and Mendrik tower in its circular shape. One can also observe the minaret to the right of the picture (more likely belonging to the Sidi Salem mosque) and minarets of some mosques in the middle.

The Alqurmanli era of 1711 - 1835 AD

The Qaramanli era started in 1711 with the dynasty founder Ahmed Pasha (ruled between 1714 and 1745). One main achievement is the building of a mosque bearing his name between 1736 and 1738. The Qargi mosque was built between 1833 and 1834 and is considered the last landmark built in theQaramanli era.A drawing of the prayer hall inside the great mosque in Tripoli, signed by the explorer Domingo Badia, also known as Ali BehAbbasi, from 1806. In 1783, the population of Tripoli was 14000 people including Muslims, Christians and Jews, locals and foreigners (Code of the old Tripoli city, 2010).

The Second Ottoman period 1835-1911 AD

The Qaramanli era ended in 1835 and the city reverted to Ottoman rule. This time their rule lasted until 1911. According to documents dated 1882-1883, there were 25000 residents, 4000 of them were Jews and 3000 foreigners, in the wilaya (region) of Tripoli. The west city had the highest population density and was the biggest in the wilaya (Code of the old Tripoli city, 2010).The city was surrounded with walls. There were three gates: khandaq gate and manshiya gate (double gate) to the south, the new gate to the west, and sea front gate to the north. During that time, Tripoli had six neighbourhoods (Code of the old Tripoli city, 2010).

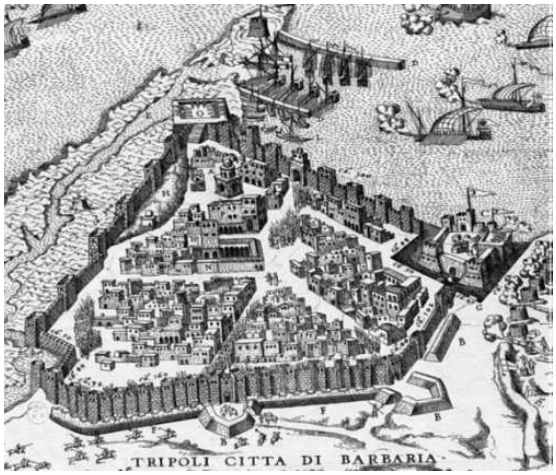

Figure 1.
A drawing of Tripoli dated 1559 shows a European military attack. (code of the old Tripoli city, 2010)

European influences, 1830-1911

The regency of Tripoli, as a province of the Ottoman Empire, was influenced by the European economic penetration of the Empire in general and that was the first influenced and by its own domestic conditions in the second half of the nineteenth century.

European states pressured the Ottoman imperial authority to give European traders concessions to trade freely in the empire. By the late seventeenth century, major European countries such as England and France established commercial consulates in Tripoli (Dyer, 1984).

In 1887, strong European capitalist states began to divide the world into spheres of influence.

In the 1860s and 1870s Tripoli's major trading partners were England, France, the Ottoman Empire, Egypt, Tunisia, Austria, the United States and Germany. During most of the second half of the nineteenth century, England was the regency's leading trading partner.

However, by the end of the nineteenth century, Italy became Libya's second major trading partner. The Italian policy of cultural and economic penetration was organized through the Italian consulate and Bank Roma (the Banco di Roma). Between 1876 and 1911 the Italians built 12 schools in Libya, including a high school. An Italian-sponsored press was founded in 1909 (Ahmida, 1953). The bank began to penetrate the economy of the Regency first by opening branches in most major cities and towns. Second, it invested in real estate

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by buying 400,000 acres of land. Third, the bank loaned money at low interest rates at 9percent compared to the 20-60 percent charged by some local Jewish moneylenders. Fourth, it sponsored olive-oil and esparto processing factories, flour mills, an ice-cream factory, and a printing house. (DMT, Malaf al-'A'ilat1913). At the start of the twentieth century, the old social structure began to change, a consequence of the development of capitalism. The decline of the Sahara trade pushed this process further, and four classes emerged in Tripolitania. At the top of the hierarchy was merchant's class, which tied to British and Italian capitals and a salaried class which owned land and was linked to the Ottoman state administration. At the bottom other class formations were laborers, which are tribesmen, or the wages laborers in towns (Le Gall, 1986).

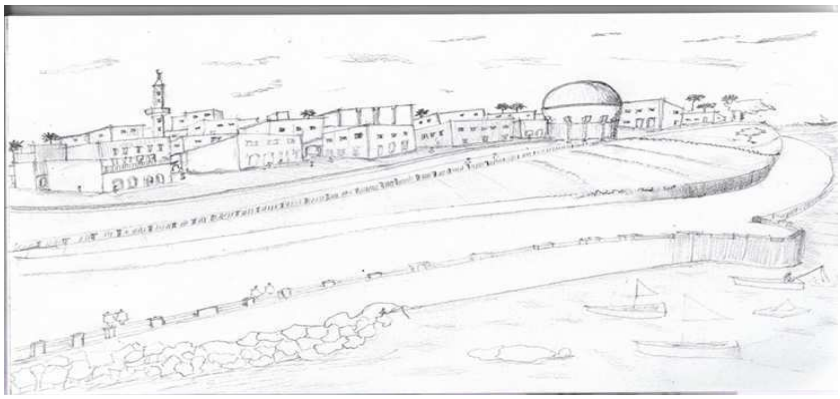

Figure 2.
Illustration of SidiHadar Street, after demolition of the soldiers of Italians monument at the western waterfront and replaced by water tank in (1957). ''Sketched the author" (derived from photo taken in 1957).

Tripoli city, the capital of the Ottoman administration, grew as a major economic market of the Regency. The Ottoman state expanded into the hinterland and ensured security and trade more than it had the previous century. European business ventures and investments began to become known by 1885; Tripoli city began to develop modern business institutions. The city had 20 bakeries, 22 mills, 1,019 shops, 40 wholesale stores, and 9 British and 11 Maltese firms.

Economic and political ties between the city of Tripoli and the hinterland also strengthened. The city provided political and economic services to people of the hinterland.

The public buildings and markets became important to vicinity people. These new urban institutions began to replace tribal institutions, the result of military defeats and the extension of the Ottoman administration. The economic and political importance of Tripoli was have led to decline of the hinterland trade, which forced tribes to migrate to north Libyan towns. Migration was in the service of finding new jobs especially in British and Italian businesses in Tripoli city (new Italian town outside the historical city wall) (Ahmida, 1953).

The Twentieth century

After France took control of Tunisia in 1881, and the British colonization of Egypt in 1882, the Italians started their invasion of Libya in October 1911 and continued for 32 years until 1943 (Ahmida, 1953). At the time of the Italian invasion, the old city of Tripoli was still surrounded by walls, but the "ottoman city" has already expanded outside these walls in the south and east directions. The Italians demolished the remaining walls on the north side and sea front side, the east side along avenue of SidiImran, for harbour extension, with sections of city wall pulled down to provide hard-core for the development - A railway is built to access the harbour, also a road was made laid out south-east of the Saraya Al- Hamra . May 1943, the end of the Italian occupation, from 1943 to 1951Tripoli was under British administration. (Code of the old Tripoli city, 2010). In December 1951, independence of Libya and economic stability was assured by grants in aid from Britain, United States and several European countries. (Carol, 2001).

After the discovery of oil in 1958 and increasing growth ratio, which occurred in the second half of previous century in Libya, which in general influenced the urban fabric

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and traditional architectural form of Libyan cities, starting from capital city to majority of other Libyan cities, where the modern buildings which established after 1950 have been lost the local traditional identity, and became more modernism, and have become a strange in the existing urban architectural and form, especially the buildings located within the historical cities. This is happened in most all oil-producing Arab traditional states city, which mentioned by Ben Salah in 1980. (Cited in Al-Gabbani, 1984, p.275). We must recognition that, there are large influences of Western life-style on Libyan a traditional life-style. Also, incomplete and unclear building regulations, which maybe gave to local architects, wide range in their products, which produced negative changes (Code of the old Tripoli city, 2010).

September 1/1969
(starting Gudaffiera regime).

March 2/1977

Tripoli city became as a political and administrative centre and the main economic and academic in Libya. In 1978, a new law came out, which is law No. 4 of 1978: ''Law No. (4) For the year 1978 on the determination of some provisions concerning real estate ownership. Article (4) ''A citizen cannot be own more than one property, even if he is married to more than one wife''. (Law No.4, Socialist Real Estate Registry, 1978)

In that year, Muammar Qaddafi decreed that no Libyan could own more than one property. All rental houses were subsequently reallocated to tenants or confiscated by the state. In 1986, he abolished land ownership all together. (Mary Fitzgerald and Tarek Megerisi, 2015). However, in the recent time where local newspaper in Tripoli, (Libya's Al-Shat newspaper reported in November 2010, just 3 months before Libyan revolution 2011) published an article entitled "The right to housing between the compensation of those affected by Law No. 4 of 1978 and the damage to beneficiaries?" written by lawyer Faiza Al-Basha. Al-Basha talked about the successive complaints of citizens who were assigned the homes of citizens who owned by other citizen in accordance with the provisions Law No. 4 of 1978, where the report talked about some general provisions of real estate ownership and its amendments. Where Most of them settled for more than three decades in houses allocated to them under legal procedure of that law'' (Libyan press 17/11/2010, as seen on 09/06/2017)

February 2011
(Libyan Revolution)

''It's been trying to attempts to reform Libyan property laws after the 2011 uprising In the immediate aftermath of the revolution, property rights were considered a high priority. But without a wider reconciliation framework, a fully functioning judiciary, and state monopoly of force, Libya's neophyte lawmakers failed to make any progress (Fitzgerald and Megerisi, 2015). We should not forget the Islamic principle of ensuring social harmony could be a useful one for any resolution process. Also, hastily crafted legal remedies could trigger new violence due to the overlapping layers of grievances (Fitzgerald and Megerisi, 2015).

Problems for Tripoli historic city and Impact of Modernism

The long and rich history of Tripoli has generated a significant number and variety of heritage buildings. Many structures have seen use, re-use and modification over the time, and it is mixture of multi period, built heritage that gives Tripoli a unique character in Libya. In general the Medina (old Tripoli city) is protected under the Libyan law, specially the heritage buildings and structures that are listed historic monuments. Starting by arch of Marcus which is the oldest of these landmark buildings in the city is the Roman arch of Marcus Aurelius. Also, others include sections of the city walls of the Umayyad and Abbasid periods; mosques dating from the 14th century; the turrets of the Saraya Al-Hamra dating from the early 16th

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century and mosques, madrassa and hammams dating from the later 16th century onwards. The more recent landmark monuments date from the Karamanli and second Othman periods and include a similar range of significant buildings. (Code of the old Tripoli city, 2010) Also, there are a great number of buildings are not so well protected, are poorly maintained and are visibly deteriorating. Although the topographical development of the Medina is as yet imperfectly understood, the ancient street network, with elements of a Byzantine or earlier Roman grid still forming a recognisable part, has evolved through time and is a precious survival. Also, the history of the city is reflected in the street network and it is important that the ancient alignments are preserved. Moreover, it is this very combination of ancient street alignments, the line of the city walls (even where the walls no longer survive), the gates, the landmark and listed structures. the more recent buildings of character, the mixture of public and private space, the suqs, mosques, Madrassa (schools), churches, hammam (public baths), funduqs (Hotels) and workshops; the sheer variety of architectural forms and of decoration, reflecting both Arabic and European traditions and influences, that makes the Tripoli Medina such a unique and special place. There is much to discover about the development of the old city and of its stock of historic buildings. If the redevelopment and revitalisation process is to be successful, careful planning, study and analysis will be required to pave the way for future interventions (Code of the old Tripoli city, 2010).

Photos (Figure 4) show no respect to building regulations (buildings height, building materials ,etc.) within old city. Also, establishment some of buildings and facilities that contribute to change urban fabric of the historical city, also, the establishment of strange walkway to protect pedestrians from vehicle (negative change).

The following figures (Figure 5 and 6) show the changing in the existing urban fabric by opening and linked the narrow streets to each other or demolishing old properties in secret and without seeking legally advice, which will causea major problem in the structure of the old city in the future.

Figure 3.
City physical dynamic (changing in the urban form)
1930 - 2001 - 2009

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Figure 4.

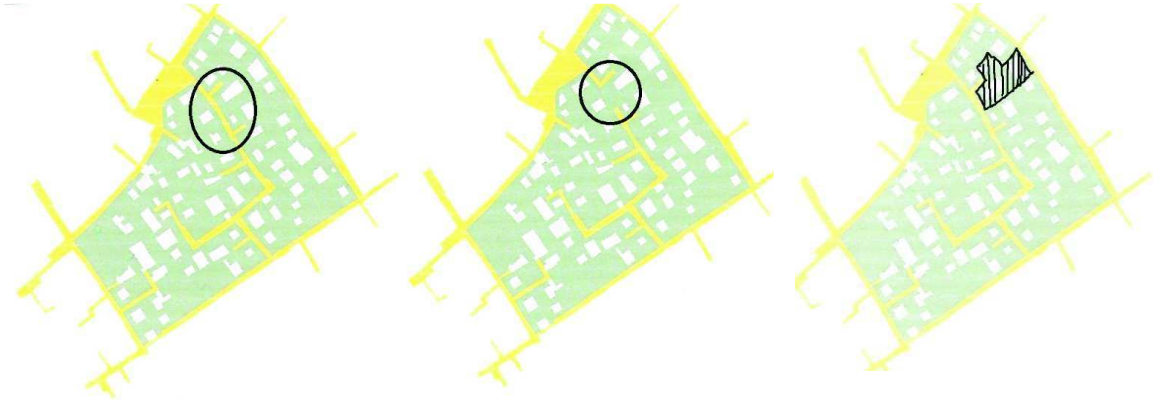

Figure 5.

Conclusion

Clearly, this law is a major significant recent political influence, but the question is here, does this law affect the condition of the properties and the state of the traditional city of Tripoli or no? If yes, then many questions and investigation must be act based open that. Also opening debate about property rights could even become part of Libya's recovery. Also, it could give Libya best chance, to development in to economic, political social which it will reflect in to urban morphology. Finally the Code of the old Tripoli city, project in 2010 did not mention any suspension related to this law or the negative influences from it. Up to present time there is no study have been made related this law in term to influence it to urban form and current state of the properties and streets condition within the historical city of Tripoli. It's significant to broaden study in this field, to improve the social environment in Libya.

Figure 6.

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The primary role of routes, in interpretation and design. An experiment in San Martin de las Flores' self-built fabric, San Pedro de Tlaquepaque - Guadalajara, Jalisco-Mexico

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Abstract. *The experience of interpretation and design on the mexican self-built fabric of San Martin de las Flores in San Pedro de Tlaquepaque, Guadalajara, Jalisco-Mexico, is presented here as an instrumental case of study for a discourse about the primary role of routes in the interpretation and design of urban built environment. After a brief introduction about the value of routes, with their actual physical and virtual ambivalence, the paper focuses on the presentation of the interpretative work on the formative process that characterizes the settlement, then, on the presentation of a design proposal at the different scales. The core of the proposed study was elaborated at the Taller Internacional de Arquitectura y Urbanism Ciudad Cercana - San Pedro Tlaquepaque 2016 - INTHAB Instituto Tecnologico del Habitat, by a group composed by Prof. Arch. Giuseppe Strappa -"Sapienza" Università di Roma (co-ordinator), Arch. Vincenzo Buongiorno -"Sapienza" Università di Roma, Arch. Claudia Mora Reig - Universidad politecnica de Valencia and Andrea Gonzalez - Universidad de Guadalajara. In the adopted design philosophy, according to which interpretation and design tend to coincide, an interpretative tool such as the analysis of the routes' pertinence strips, occupies a primary position and also becomes a 'new' tool for a design that is vitally permeated and structured by the anthropic act of walking. The goal of the paper is the experimental demonstration of a project mode that responds to the language crisis with the reduction of the expressive/authorial tone. This reduction is obtained by restarting 'in vitro', as in the scientific laboratory, the formative process of the urban settlement read and interpreted on the living body of the city. For the construction of an organic and coherent anthropic environment.*

Keywords: Roots, Pertinence strips, Urban fabric, processual project, self-built, Mexico

Introduction

Routes, ancient and modern global networks.

The act of walking on a route, with its ritual(istic) value, has always been the heart of an ancient global dimension, far ahead of the economic and political globalization of the 21st century. From the stratae of ancient Rome, to the tracks of the nomadic populations in the deserts, routes are always organized in a network, with nodes and connection hierarchies, but always strictly interconnected.

A globalization, that one of the streets, similar but different from the contemporary one, which is dominated by virtual and abstract routes, streams and data flows. The latter is dominated by a separate and virtual reality, populated by figures like symbolic analysts and creatives[1], filled with a 1 ll the abstract dimensions of contemporary living and working. The contemporary globalized world, its political and economic system is astonishing and symbolic, prefers the emergence and

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iconic image. In a semblance of democratic horizontality and fair distribution of networking possibilities, promotes the pyramidal model instead of that of the network grid.

Modernity and routes.

The routes faced a recent, but still lasting, history of lack of care and unattractiveness; the history that saw the modern movement considering the road as a purely functional element designed just for the displacement of people or goods from a production pole to a consumption center and vice versa. Thus denying its value of urban fabric generator.

A chronicle of abandonment of the road in its great potential, which has seen the advent of the great flows of inescapable traffic, the streets becoming the dividing lines[2] of the modern built environment, with a subsequent medieval accumulation of urban life in large autonomous units, "romantically" isolated in tame urban green forests.

The spread of the car as a mean of transport, firstly in America at the beginning of the twentieth century and then in Europe in the middle of the same century, marks a critical moment in the history of routes. The urban street, centralizing axis[3] of the dense fabric of the historic city, place of pedestrian crossing commercial exchange, in the overcrowded urban context of the American horizontal city, and later also in the new urban centers in Europe, becomes a dividing line, a pure channel of transport between polarities, abstract and detached from the fabric.

The formation of new building typologies is strictly connected with the crisis of the routes: the commercial mall, the heir of 19th century European passages and arcades, was born in the American sprawl suburban city to propose a new urbanity, a centralizing axis in a territory already dominated by dividing lines[4];

The routes chronicle sees, in the period between '60s and '70s of 20th century, the rising of some critical reflections such as those by B.Rudowsky and J. Rykwert[5], that, expressing the critical spirit of their special historical period, put, after a long time, at the center of the disciplinary debate the question on the role of paths and the pedestrian usability of urban space in design.

The tradition of urban morphology studies, researching on urban form, on the structure of relationships between elements and parts of the city and its fabric, in a modern era of oblivion, sheds light on routes as important generative elements in the construction of the urban environment.

In a century of iconic and seductive images like the 20th, characterized by an almost exclusive dominance of the singular, "new" architectural and urban visions, designed departing from the assumption of Tabula rasa, urban morphology discipline goes searching for the 'spontaneous' process, 'The formation of the city, the profound structure of the phenomena, since the first study experiences on European historical centers, like those on Rome and Venice. Thus, research in the past, not for the singular and blazing image, potentially replicable or imitable, but rather for an internal view of the formative process, which, by setting aside the dynamic of affirmation of creative personal intentionality, looks at inertial and silent transformation of reality.

Methodology

The following interpretative study aims to highlight the primary and generative role of routes, the first act in the area, in the construction of the urban settlement. For this, the disciplinary interpretation instrument 'pertinence strip'[6] is used in its validity for the interpretation of the formative process and its potential for design use. The adopted perspective is that of a project that arises from the formative process, read on the living body of the city and reintroduced 'in vitro' as in a scientific laboratory[7]. The interpretative study and the project described below, refers to the urban fabric of the settlement of San Martin de las Flores, located in the Guadalajara's conurbation in the state of Jalisco-Mexico.

The core of this work, in its first elaboration, was developed at the Taller Internacional de Arquitectura y Urbanism Ciudad Cercana - San Pedro Tlaquepaque 2016, organized by INTHAB Instituto Tecnologico del Habitat, by a design team coordinated by Prof. Arch. Giuseppe Strappa -"Sapienza" Università

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di Roma (coordinator), Arch. Vincenzo Buongiorno -"Sapienza" Università di Roma, Arch. Claudia Mora Reig - Universidad politecnica de Valencia and Arch. Andrea Gonzalez - Universidad de Guadalajara.

Measurement and analysis

Interpretation. San Martin de las Flores in San Pedro de Tlaquepaque, Guadalajara, Jalisco - Mexico

Territorial scale

San Martin de las Flores is located in the territory of San Pedro Tlaquepaque, a city in the Guadalajara conurbation, and tells us about a formative process where routes and movements have a relevant role. Tlatzigonzingo (in the nahuatl language: a place rich of vegetation and flowers), San Martin de las Flores occupies a dominant position on the valley of the river Ladrillera, which in its name already denounces the driving role of the river and its furnaces for the production of bricks, almost exclusive construction material of the settlement.

Surrounded by the hill chain at the north of the Cerro de la Cruz, the urban settlement rises at the confluence of two important cross-ridge routes (fig.1), as confirmed by the ancient Spanish and pre-Spanish colonial historical chronicles[8] and cartographic documents[9]:

-The camino de San Martin, current Calle Independencia, confluent in the largest Camino real, a route that connects Guadalajara to the capital Mexico City;

-The camino a Tonalà, that connects San Martin with the ancient city of Tonalà, seat of the pre-Hispanic royal power. This route, now interrupted in the section corresponding to the urban center, can be reconstructed through the analysis of pertinence strip and the comparation of historical cartographies (figs. 1,3a).

Urban Fabric scale

The urban settlement rises at its dawn, and before the colonial quadricular implantation, along the two paths mentioned above, as the emanation of them in their respective pertinence strip (fig.1).

The analysis of the urban fabric through its pertinence strips allows to verify the generating role of a single path in the urban fabric and its hierarchical position with respect to the other paths. It also allows to observe clearly that the urban block, basic or specialized / knotted, is in a close relationship of dependence with the urban fabric and even more with the route, the real formal fabric generator, through its pertinence strips.

In this process, after the formation of the routes from the recognition of soil suitability and orographic movement to host a route, the act of edification as further "transformation of matter, can be interpreted as a specialized modification of a part of territory, a specific technical and economic phase within the human settlement process: individual finalization to be followed by collective finalization and organic synthesis."[10]

Thus, the building assumes its relative position within a wider organic process in which the anthropic phenomenon of the path continues to permeate, formally and structurally, the fabric that it produced in its specializations: the first urban settlements were born with the development, along a path, of a stable cultivation that needs continuous care, protection of crops with fences and agricultural lots that became building urban lot by time.

In San Martin de las Flores the driving force of the territorial routes is dramatically clear also in the complex relationship of integration and deletion that they have with a critical and superimposed urban design (fig.1), the colonial quadicule.

The analysis of pertinence strip (fig. 3a) reveals a first nucleus, the oldest one, that comprises the religious center with the two churches of the Spanish Franciscan Mission, the former hospital and cemetery, along the Camino San Martin and Camino at Tonalà and at its intersection, followed by the settlement in the upstream area of the Camino at San Martin, on solid soils, more suitable for stable construction and then gradually downstream along the two current routes call Narciso Mendoza to the east, Pino Suarez to the west, up to the rio Ladrillera and the brick handicraft furnaces, where takes place, almost synchronically, the transformation of matter into material for the construction of the urban fabric.

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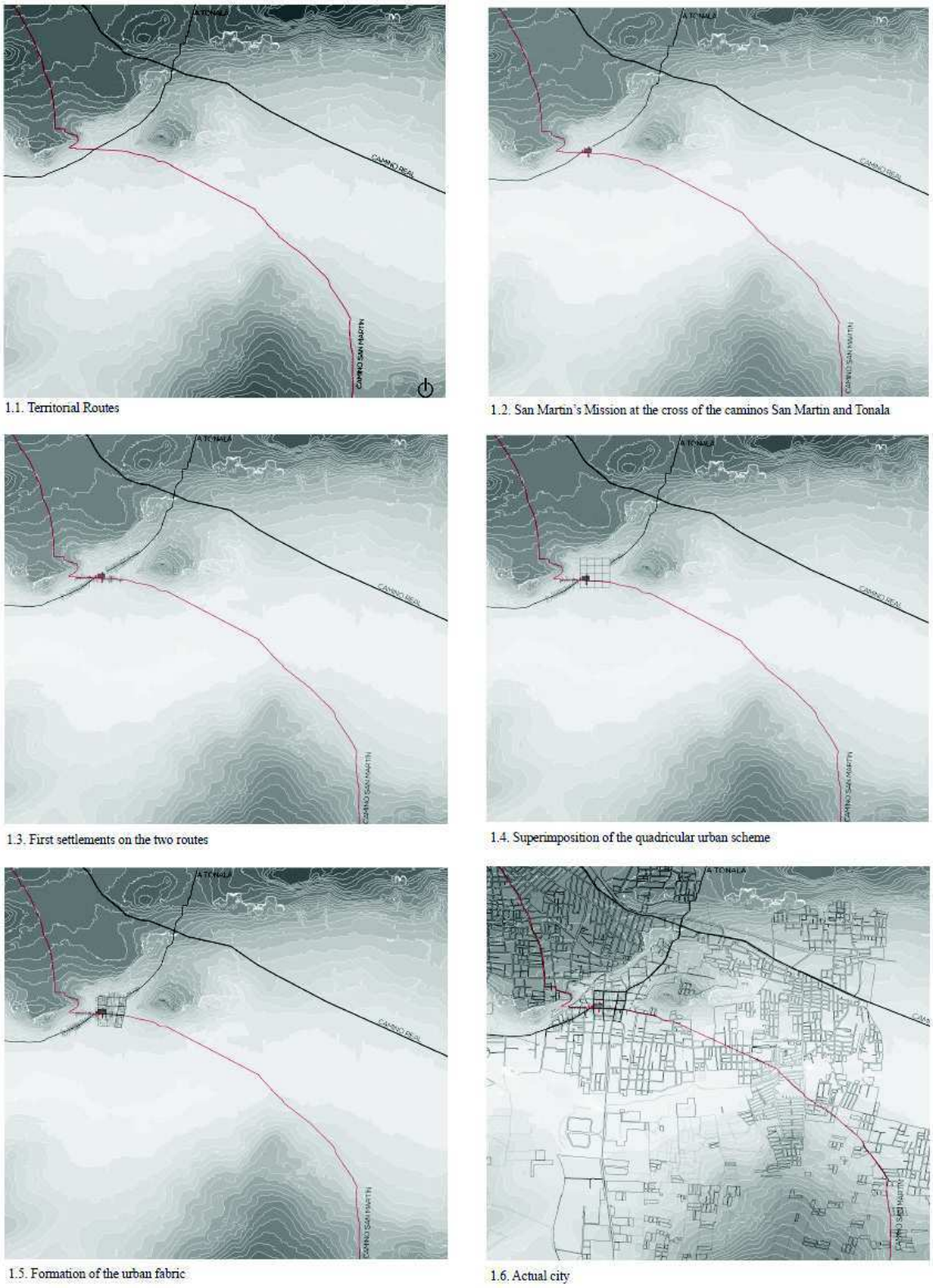
Territorial roots, phases of the settlement development



1.1. Territorial Routes

1.2. San Martin's Mission at the cross of the caminos San Martin and Tonala

1.3. First settlements on the two routes

1.4. Superimposition of the quadricular urban scheme

1.5. Formation of the urban fabric

1.6. Actual city

Figure 1.
Territorial interpretation

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The current route hierarchy sees as Route 1 - the Camino San Martin, current Calle Independencia.

The Camino a Tonalà, that in other times could have been the Route 2, instead, is now interrupted by the overlapped quadrilateral mesh, which with its orthogonal orientation is set on the Camino San Martin, sanctioning its far superior hierarchical role for its ability to connect with the new power seat of modern colonial state (Guadalajara), at the expenses of links with Tonalà, center of pre-hispanic power[11].

Then there are the Routes - 2, calle Narciso Mendoza to the east and calle Pino Suarez to the west, historical seats of the daily 'informal' market ('Tianguiz' in nahuatl language), which from the historical nucleus go down to the Valley of the river Ladrillera and its brick furnaces.

The coherence of the fabric and its consistency can also be observed from the study of pertinence strips: in San Martin's case the fabric has very narrow meshes and is very dense next to the Route - 1/historical nucleus, then gradually becomes wider getting to the river. It is also possible to verify the constant observance of the settlement rule and to detect anomalies or variations: in San Martin, the entire fabric has a good consistency, the pertinence strips belonging to the opposite sides of each block are contiguous without discontinuities or interposed batch in the transverse direction. An abnormal behavior, however, can be found in the urban block at the south of the historical nucleus, the block delimitated by calle Independence, calle L. Càrdenas, calle Lòpez Mateos and calle Pedro Moreno. Here, in fact, the strips belonging to the north-south routes are not contiguous, but separated by an abnormal and atypical oblong, north-south oriented, big lot. The role of this lot is difficult to understand, as there are no documents on it, except for records of the cadastral register in which it appears as mostly unregistered property (fig. 3b); during the research work, in the interviews with the local inhabitants association, this lot is told to be a collective 'corral', an area that, as long as the lots attested to the north - south routes are unified and not subdivided, serves as a space

2a. Territorial design plan

Z.0 - New urban node at the cross of the quadricular streets grid and the diagonal camino a Tonala; Z.1 - Pedestrianization of a part of calle Independencia - camino San Martin and unification with the public space of the historical square (continuous pavement); Z.2 /Z.3/ Z.4 - Continuos pedestrian space: historical square - market building cross - school patio square - new public square bounded by arcades and updated/transformed patio houses and polarized by new public equipment building; Z.5 - New public equipment: kinder garten, care houses for elderly; Z.6 - Urban fabric densification: urban public garden - sport equipment; Z.7 - Urban fabric densification: new housing; Z.8 - Urban fabric densification: houses transformation; Z.9 - New waterfront urban public space; Z. 10 - New urban fabric - extension of the existent urban settlement; Z.11 - New public equipment

2b. Territorial design sketch

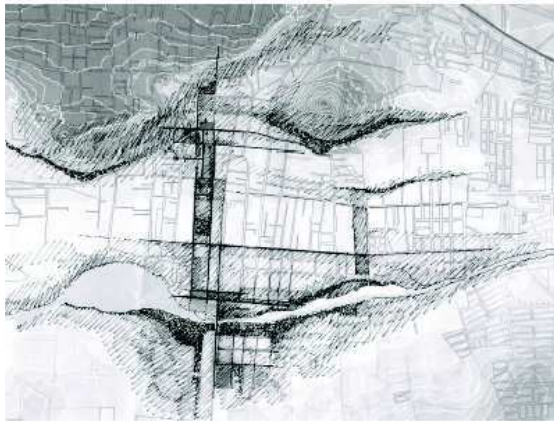

Figure 2.
Territorial design

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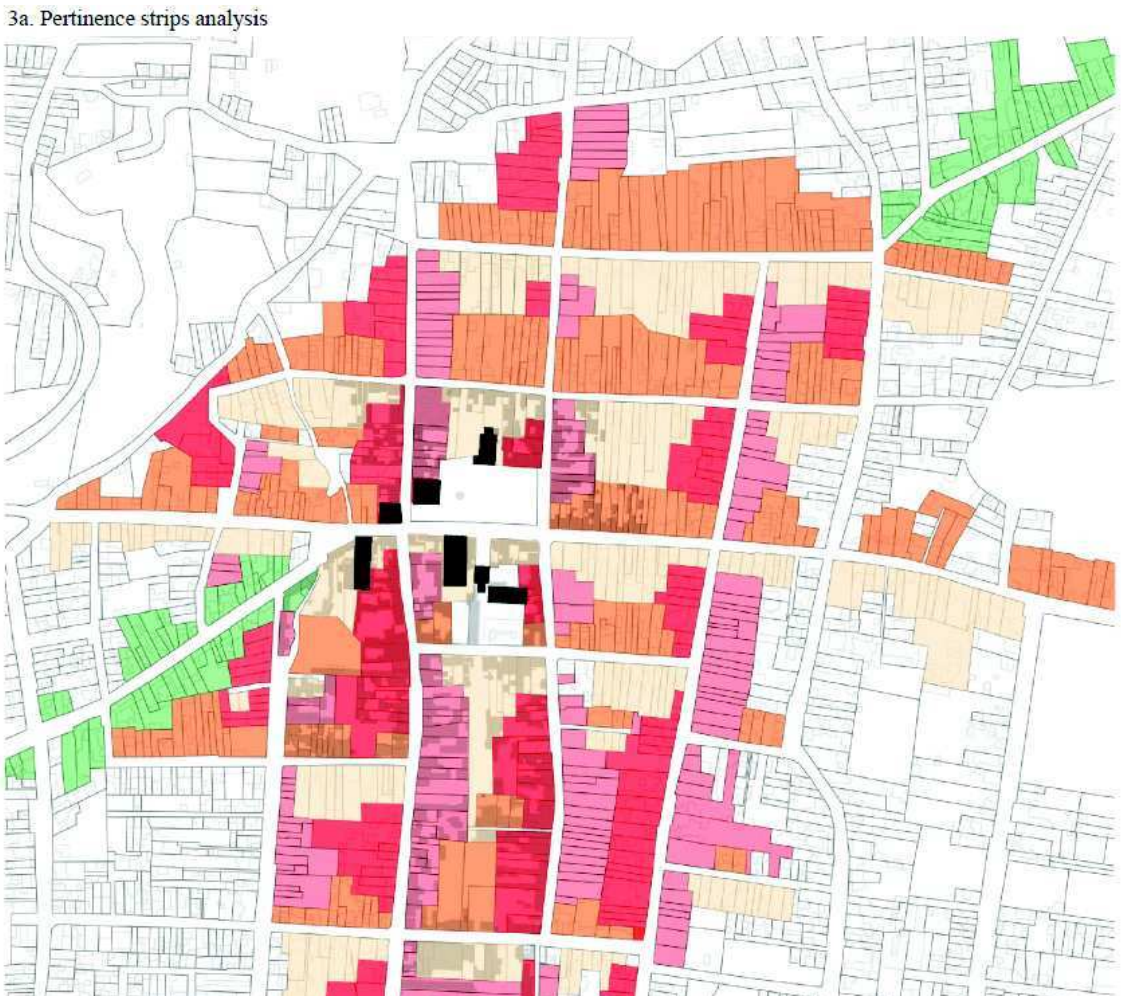

Figure 3.
Urban Fabric Scale - interpretation and design

for breeding animals and for the cultivation; when the side lots are subdivided to allow the construction of new housing units, the atypical lot is transformed into an urban route, for giving access to the new lots. However, this hypothesis does not seem to exhaust the doubts. If such a logic was to be applied to the settlement, it should also be seen in surrounding blocks; moreover, the central position of this lot, close to the historical nucleus, together with the unique dimensions of the block from all the others, leads us to speculate that it can be the residual trace of some urban project, not fully implemented, in which this lot is the place of a specialization.

Building Scale

The fabric is characterized by the Patio house type, organized by the schematic sequence: workshop/storebedroom-patio-kitchen-patio corral (smaller patio for breeding and cultivation)-border lot wall (fig. 6a). The construction technique presents the specific characters of the Latin American and Mexican self-built context, that can be found in the wide self-construction manual literature[12].

The construction technique generally used is masonry in brick elements, produced in furnaces located in the Ladrillera river valley. Walls are innervated by a cage of reinforced concrete curbs, put at irregular and significantly variable distances from one building to another (figs. 5a, 5b). The building process sees firstly the construction of separate sections of the wall spaced each one from each other of about 10-15 cm; this distance is the dimension of the reinforcing curb that, once built the formwork (by using the two vertical surfaces of the wall portions and wooden boards), will be reinforced

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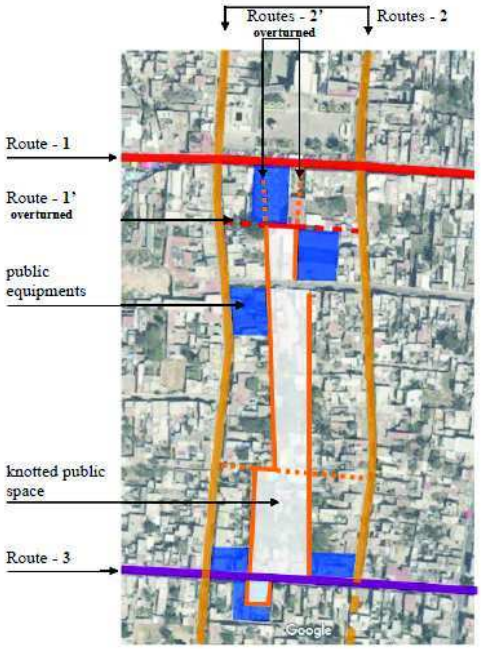
4a. Plan

A municipality offices; B. library; C. Market; D. New public space in connection with the school patio; E. arcade, public urban space with flexible use, result of the overlapping of the urban routes into the block; F. public equipment, multi-use building; G. hypostyle space with retractable roof; H. square, open air public space; I. Proposal of substitution and updating of the housing building; J./ K. public equipment, multi-use building; L. public equipment, handicraft exhibition building; M. commercial spaces;

4b. Urban fabric roots' overturning strategy scheme



3c. Project axonometry

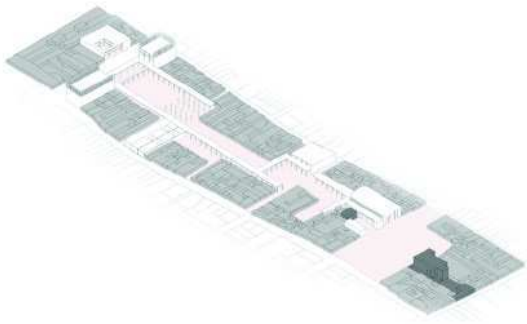


Figure 4.
Urban Fabric Scale - design

and cast. This sequence is also valid as regards the realization of the horizontal curbs, where, instead, each portion of wall can be built only after having built the horizontal curb.

It's possible to observe an about 2.5 meters horizontal distance, between masonry reinforcement vertical curbs; horizontal curbs mark and strengthen the architectural organism tectonic knots: spandrel, belt course, architraves and openings of windows or

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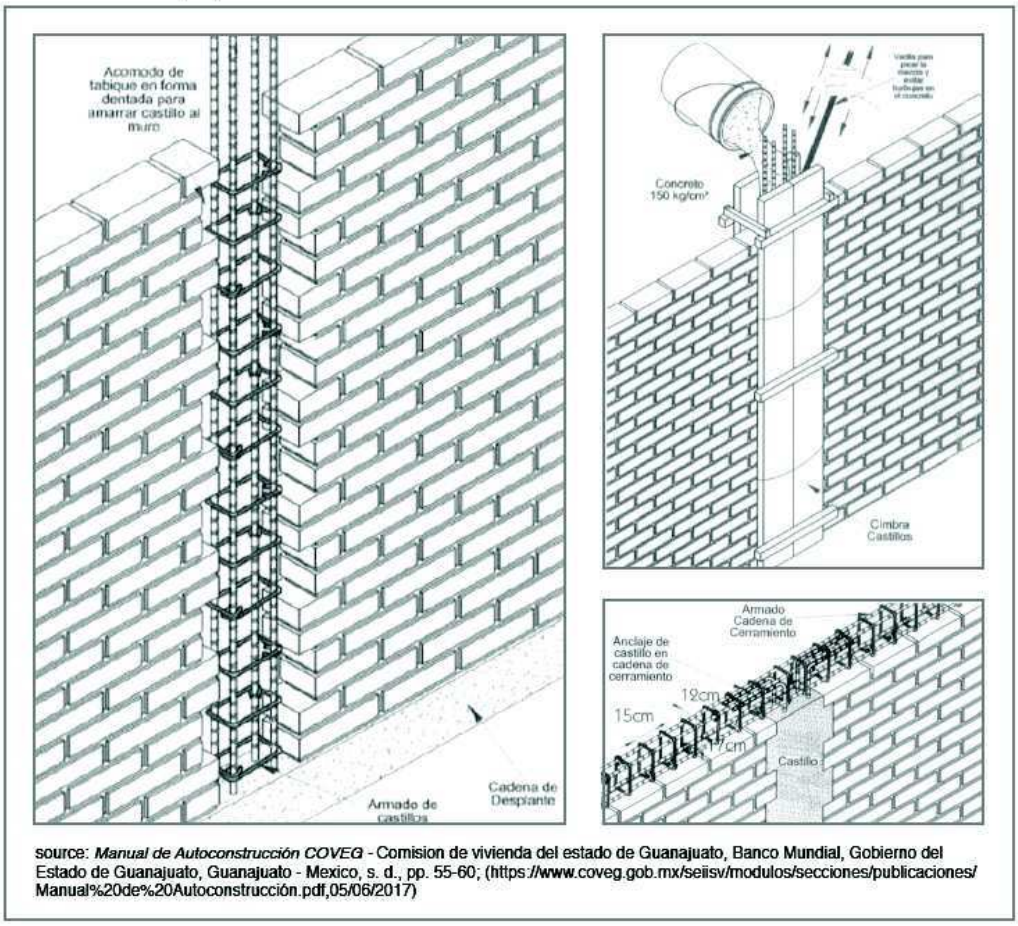
5a. Construction technique process



source: *Manual de Autoconstrucción COVEG* - Comision de vivienda del estado de Guanajuato, Banco Mundial, Gobierno del Estado de Guanajuato, Guanajuato - Mexico, s. d., pp. 55-60; (https://www.coveg.gob.mx/seiisv/modulos/secciones/publicaciones/Manual%20de%20Autoconstrucción.pdf,05/06/2017)

5b. Construction technique examples (Ladrillera river brick furnace and reinforced masonry buildings)

Source: Photographs by V. Buongiorno;

Figure 5.
Building Scale - interpretation

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doors. It's interesting to note that, although this constructive sequence could be similar to that of some anti-seismic reinforcement techniques of walls with wooden frames, in San Martin something different happens: the big difference is not in the new material, the concrete, which replaces the wood, but rather in the organization of the elements; the wooden reinforcement system provides an elastic behavior through elements that are regularly spaced and connected together; in the self built mexican world, instead, the plasticity of the concrete rather than the elasticity of wooden frames rules. Instead of an elastic wooden frame, such as that of the portuguese 'gaiola pombalina', in the self-built reality of San Martin the builders prefer a complex and irregular one: a plastic single masonry mass where the discontinuities and irregularities of the frame-network of curbs can be seen on the one hand - if the builder is not able to control 'formatively' and intuitively - as the premise to a static error, on the other hand as a guarantee of strong unity and plasticity, and of the ability to expand the architectural organism over time, crucial in the dynamics of self building usually developed in several 'tranches'.

The routes of San Martin de las Flores are part of an organic and solid realitymulti scalar in which these paths, fabrics and specializations constitute, in a multi scalar dynamics from the urban scale and through the fabric to the construction at the building scale, all together a large specialization of the territory.

In this reality, as it is the general case of self-built context [13], the 'verbal' value of the home, in terms of personal, economic and social development possibilities is much more important than the absolute exchange value, the 'substantive' value that, to be quantified, requires abstraction from the context and needs the destruction of the organic balance of the built environment.

The project - Routes as catalysers in the transformation process of urban fabric.

Territorial scale

Assuming the basic structures of the existing fabric, the matrix routes and the colonial 'grid' as organically absorbed, the project works along the paths that, orthogonally to the camino San Martin, from the historical nucleus lead to the river Ladrillera. On these routes, exchange and communication axes between the urban settlement and the brick furnaces area, the proposal is to build a new bearing axis, hierarchically subjected to the territorial axis of the camino San Martin, which can structure and serve the urban settlement and its surroundings.

On this backbone, bordered by the two calles Narciso Mendoza to the east and Pino Suarez to the west, it is proposed to complete and densify the fabric, by using the same patio house type found in the surrounding fabric. Going down to reach the riverfront, by crossing it the new backbone reaches and structures a new urban settlement on the opposite side. (fig. 2)

Urban Fabric scale

At the fabric scale, routes are still main actors of the transformation project: to the south of the historical square, by using the atypical lot bounded by calles Independencia, L. Càrdenas, Lòpez Mateos and Pedro Moreno, that becomes the center of the project area (fig. 3c), it is proposed an overturning of the mentioned urban routes within the block, sanctioned by the physical presence of perimetrical arcades, that by crossing generate an urban knot (fig. 4b). The arcades host new marketplaces and act as catalyst for the public and commercial transformation of the adjacent residential lots; arcade paths are polarized by a public equipment (as kindergartens, multi use halls, libraries, etc) and by the bigger polarity of the historical square, reachable through the current market building. The latter, currently degraded, is reactivated for commercial use and acts as a passage between the historical square of the Franciscan mission and the new open-air commercial and civic open space (fig. 4a).

Building Scale

The fabric in its individual building units is transformed by an updating strategy.

The project indicates the hypothesis of updating the Patio house type, coherently to the new needs and uses and suggests also a

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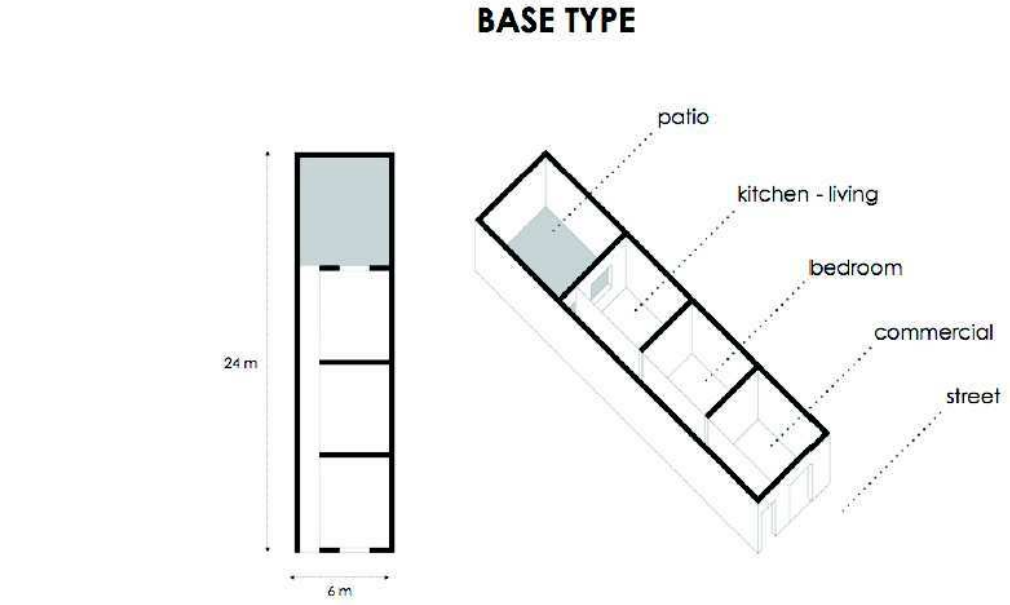
6a. Base type interpretation - plan and axonometry



6b. Patio house type specialization and update schemes - plan and façade

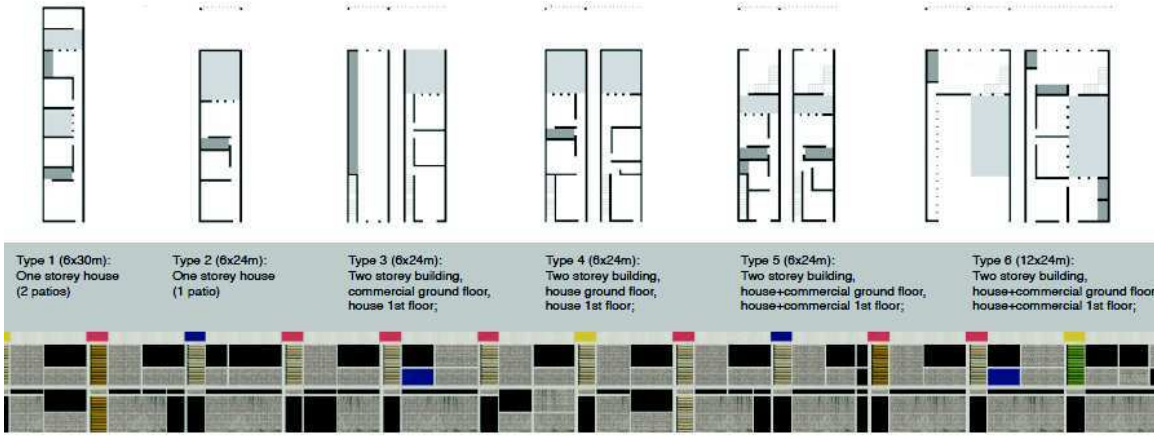


Figure 6.
Building Scale - interpretation and design

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commercial specialization (fig. 6b). A diagram of facades reflects on the contemporary linguistic potential of the constructive system found in San Martin (fig. 6b).

Conclusion

Approaching Spontaneous consciousness.

Looking at the routes as driving lines for transformation and designing into the existing fabric is a strategy that allows to operate the necessary approach to spontaneous consciousness dynamics[14], to the urban fabric formation process, right from its primary generative element, the route.

This strategy emancipates the architect from the contemporary tendency to conceive the project as exception and polarity tout court, from the crystalline perfection of the single architecture, that aseptically occupies the territory.

Organic solidarity between territory, fabric and specialization.

The proposed strategy works for the construction of an urban environment as a body that is solidly structured on routes and is generated according to a processual dynamics.

In this horizon, the urban fabric and its specializations are generated not by the brilliant arbiter of the single author, following a practice globally accepted in the actual world of brands, but by a constant formative process, even if with variations and exceptions, in which the anthropic act of walking on a route has a primary role. The place of specializations, the urban commercial-community knot of this Mexican case, grows from the ground as concretion and sublimation of the base mesh, from the existing fabric, and is an organic and irreplaceable part of this.

A language response.

The perspective that the experience of interpretation and project on San Martin shows is that one of a project that almost inertially follows spontaneous formative processes; as every modern project is authorial for being an interpretation of the reactivated process; at the same time it limits critical interventions to a minimum quantity, maximizing quality and intensity; a project that in the babelic language crisis15, opposed as an antidote a reduction, almost ecological censorship of expression.

Notes

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burials remains found next to Cerro de la Cruz, now exhibited in the ethnographic collection of the Musée du quai Branly in Paris (L. González Ramírez, San Martín de las Flores: tierra de antaño, Tlaquepaque, Jalisco, 2010);

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13 J. F. C. Turner, Abitare come Verbo, in J. F. C. Turner, R. Fitcher (a cura di), Libertà di costruire, Il saggiatore, Milano 1979;

14 G. Caniggia, G.L. Maffei, Composizione architettonica e tipologia edilizia: 2. Il progetto nell'edilizia di base, Marsilio, Venezia 1987; at the page. 19 the author writes about the need to approach the spontaneous consciousness, by doing a parallel with literature in which Dante in the Divina Commedia, that "di fronte allo stanco permanere di un latino statico, perché per secoli solo scritto e non più parlato, come lingua letteraria, si appropria del 'volgare' frutto del millenario lavorìo di un popolo che 'sbagliando' sistematicamente nel parlare latino aveva ormai concluso il trapasso / In front of a static Latin, because for centuries only written and no longer spoken, appropriates the 'vulgar', product of the millennial work of people who systematically spoke wrong in Latin (trad. by V. Buongiorno)", operates, as few others big authors (sua as Verga, Pasolini…) a re-approach to the 'spoken' language. When the literary official written language is empty, these few authors go back to dig into the spoken, living and pulsating language. They are looking for a reconnection with a solid and solid base, to construct on it new "literary buildings" that are congruent and responsive, reflecting the reality of language. Then, Caniggia through the transposition of this dynamic to architectural field explains the urgency of reconnecting the project, product of crisis and critical consciousness, to a spontaneous, organic, and processual dimension.

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Central Lancashire New Town: The hidden polycentric supercity

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Abstract. *From 1962 Lancashire, in England, became the focus of a major renewal scheme: the creation of a 'super-city' for 500,000 people. The last and largest New Town designated under the 1965 Act, Central Lancashire New Town (CLNT) differed from other New Towns. Although influenced by the ideals and example of Garden City model, its master plan followed new and proposed infrastructure to connect the sub-region's poly-centricity. By unifying and expanding existing towns and settlements it aimed to generate prosperity on a sub-regional scale using the New Towns Act, rather than creating a single new self-sufficient urban development. CLNT's scale, poly-centricity and theoretical growth made it unique compared to other new town typologies and, although not realised, its planning can be traced across Lancashire's urban and rural landscape by communication networks and city-scale public and civic buildings. With reference to diagrams for the British New Towns of Hook, Milton Keynes and Civilia, this paper will contextualize and evaluate CLNT's theoretical layout and its proposed expansion based on interdependent townships, districts and 'localities'. The paper will conclude by comparing CLNT's theoretical diagram with its proposed application and adaptation to the sub-region's topographical physical setting.*

Keywords: Lancashire, New Towns, urban centres and pattern

Designated in 1970 Central Lancashire New Town is significant because it was the last and largest of the third generation new towns proposed in Britain between 1967 and 1970 and it demonstrated an unprecedented application of the New Town Act. Set within rural Lancashire, CLNT is a part-realised sub-regional complex based on an interconnected series of urban townships. Inspired by the context's existing poly-centricity, it focused on small towns and villages surrounding Preston, Chorley and Leyland and involved the creation of substantially new communities as well as the controlled expansion of existing settlements. Prepared by Central Lancashire Development Corporation following extensive consultation, its strategy for delivery over a period of 30 years was released prior to a public inquiry as an Outline Plan in 1974 (Pearson, 1974). This master-plan prepared by Robert Matthew Johnson Marshall and Partners accommodated a predicted population increase from 253,000 in 1966 to 503,000 in 1991 over 51,460 acres, 44,187 acres of which had been identified as suitable for development. Four key criteria needed to be satisfied – the integration of new and existing developments to promote urban renewal including raising the quality of existing development and maintaining a clear contrast between town and country; the phasing of construction in self-contained locations which have appropriate urban character; the integration of all forms of private and public transport, whilst segregating vehicles and pedestrians; land use should accommodate changing circumstances and eventual growth

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beyond the predicted population intake but not necessarily within the designated area.

The concept of planned decentralization to relieve Britain's inner city overcrowding had been introduced in 1940 by the Barlow Report but it was not until after the Second World-War that the principle of population displacement to facilitate the redevelopment of Britain reignited interest in new towns. A New Towns Committee, established in 1945, considered their delivery and configuration and the passing of two revolutionary Acts – the New Towns Act 1946 and the Town and Country Planning Act 1947, followed. The first series of new towns, the Mark 1's (1946 – 1961), were low density, self-sufficient, satelite extensions of their parent conurbations. An example, Harlow (1947), designed by Frederick Gibberd (1908-1984), is an experimental town designed to accommodate an independent isolated community of 50,000 people 23 miles from London (Rodwin, 1956). Influenced by Ebenezer Howard's Garden City ideas, Harlow's layout was characterised by its civic core surrounded by defined neighbourhoods, each with a local centre. Probably informed Raymond Unwin's (1863 – 1940) garden suburbs achieved prior to the First-World War, Harlow's layout had been prepared based on the theory that a modern town's individual character should be informed by its site's topography and natural features. Main means of transport (road, rail and water) followed the line of a valley along the north site boundary and this was overlooked by thirteen small housing clusters, each separated by landscape. Two industrial areas, sited in close proximity to main communication lines, were disected by the outer radial road system that, by being intersected by roads at right angles, aimed to provide direct access from the central core to the neighbourhoods (Gibberd, 1947).

In the County of Lancashire the requirement for a regional strategy to accommodate Manchester's overspill had existed since 1947 and Leyland had been repeatedly identified as a potential Mark 1 new town. It was considered favourable due to its good communications to Manchester via north-south rail routes and the proposed M6 motorway. It also had high levels of employment in the motor manufacturing industry, primarily at British Leyland, and land availability to provide residential areas and amenities (Lancashire archives, 1968). By 1951 the Preliminary Plan for Lancashire had included Leyland as one of three new towns across the northwest region and had proposed that, by accommodating 32,900 people mainly around Worden Park, Leyland's population could be trebled. The Preliminary Plan included a map that indicates Leyland's proposed layout conformed to the Mark 1 formula, as demonstrated at Harlow. The proposed M6 motorway restricted its eastern edge and connected to a radial peripheral road system that linked two industrial areas. Despite being included in the Preliminary Plan, the three new towns at Parbold and Garstang, Leyland were later omitted from the approved Lancashire County Council's development plan of 1956.
Because the Mark 1 new towns proved to be too suburban in character, the second wave, the Mark 2s (1961 – 1966), intensified use by being larger and denser. Although not accomplished, the layout for the new town at Hook (1961), based on the planning of Cumbernauld, remained influential throughout the 1960s. At less that one mile wide and with a predicted final population of 100,000, its concept was a compact city in a garden. Separate neighbourhoods, as witnessed in the Mark 1 towns were abandoned and replaced by a dominant central hub in a linear configuration. Rather than working with the topography as seen in Harlow, a pedestrianised lid covered the valley to segregate pedestrian and vehicular movement. This provided a platform for high-density urban housing for 60,000 residents surrounded open space and, to offer choice, civic amenities were duplicated at frequent intervals. Residential privacy was achieved by offering low single-aspect housing with gardens opening onto walkways. Outside the core, concentric bands of residential areas with decreasing density met a green belt of recreation space. Underneath the pedestrianised deck a sub-terranian grid of distributor roads linked the new town to the regional road network, the town's three peripheral industrial areas and its parking for 800 cars (Architects' Journal, 1961).

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The third generation new towns (1967-70) explored the potential of multiple urban or neighbourhood centres to reinforce unity. Milton Keynes (1967) and Central Lancashire New Town (1970) are two examples that adopted this principle through different urban diagrams. Milton Keynes was designed to accommodate a population increase from 44,000 to 250,000 by the turn of the century. Spanning rolling Buckinghamshire farmland, it is located on the main high-speed railway and motorway between the North of England and London. It's net and fill layout based on a one-kilometre grid of two-lane roads promoted dispersal and the spread of vehicular traffic across the town was encouraged by scattering employment, education, health facilities, recreation, housing and retail. Two parklands weave through the city and cycleways link urban layouts with landscape. There were no defined self-sufficient neighbourhoods, instead each area defined by the lattice was treated as an individual place for 5,000 people, known as a township, and local centres were positioned to form high streets where adjacent places touch. The initial phase, planned to be completed by1980, adopted a linear format running north to south with a spur to the east to link an industrial area with the M1 motorway. This concentrated growth on the existing towns of Bletchley, Wolverton and Stony Stratford, allowing them to unify first (Bendixson, 1969). Simultaneously the idea of inter-related growth was being explored in Lancashire by exploiting the region's existing towns' interdependency and expanding or strategically injecting centres along key communication routes to ensure residential and industrial areas were distributed to minimise peak journeys. Proposals were based on the work of Scottish architects Hugh Wilson and Lewis Womersley who, by experimenting with forms of linear expansion at Northampton (1968), had promoted a three-strand system based on wide bands of development along lines of communication. By 1960 Manchester and Merseyside's tremendous overspill problems had only been partly solved by neighbouring counties and local authorities receiving population and it was not long until the discussion of a new town at Leyland for Manchester and also Preston reignited (Brooke, 1960). In 1964 the County Planning Officer prepared a 'Preliminary Technical Report on the Future of Central mid-Lancashire' that focused on the Preston-Chorley-Leyland area (Coates, 1964). At the time Preston was an administrative and communications centre serving a wide hinterland with its port, service industry and retail facilities. Chorley was a compact small self-sufficient market town with parkland to the West and Rivington Reservoirs and Anglezance Moors to the east. Leyland had experienced rapid incoherent growth as an important flourishing manufacturing and industrial town. The three towns had a combined population of 250,000 and all were in close proximity to improved north/ south main infrastructure routes.

Similar to Ebenezer Howard's utopian objectives, the preliminary report described a pattern of land use that aimed to provide well-positioned and sufficient industry, open space, compact amenities and public services. Journey times could be limited to 30 minutes to open country, 20 minutes to work and 10 minutes to local shops and school. The following year Richard Crossman, then Minister of Housing and Local Government, commissioned Robert Matthew Johnson Marshall and Partners (RMJM) to develop the technical report and undertake preliminary studies for a fourth new town at central Lancashire. Entitled Study for a City, the report marks a long evolutionary process and period of consultation to determine the location and form of the new town as well as its impact on adjacent settlements. Defined by agricultural belts to the north and west, hills and moors to the east and Wigan's coalfield to the south, the geographical area, the 'sub-region', considered for the designation area included Preston, Leyland and Chorley and was dissected by the M6 and M61 motorways.

CLNT's sub-regional strategy underwent three stages of refinement. Initially RMJM's proposals are a diagrammatic, represented out of context as a theoretical urban pattern that aimed to balance the growth of employment, housing and transport and reinforce the social, economic and geographical characteristics of Lancashire. The notional urban pattern was based on four community types of differing scales: the entirety, the city (300,000 – 500,000

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people); townships (60,000 – 80,000); districts (15,000 – 18,000) and localities (4,000 – 5,000). Arranged as a linear ladder-like complex the initial format comprised seven inter-connected townships connected by a three-strand system of dual carriageways and public transport routes to promote evenly distributed free-flowing travel with minimal congestion. A framework of green belts and woodland would define each community's individuality as well as create visual barriers between housing and employment areas. It also provided a network of footpaths between open spaces and the countryside. RMJM proposed a multi-centred growth strategy to disperse economy, employment and amenities throughout the city, giving each area a clear function and equal potential. This was thought to be advantageous as the array and number of facilities could increase in line with population growth. Dual carriageways linked the township's residential and industrial areas to the motorway and an express bus route joined the centres. Within the townships distributor single carriageways enabled lateral and radial vehicular movement between industrial and residential quarters and the town centre. This was supplemented by local public transport supported by a town's central interchange with car parking. Multiple pedestrian routes linked the town centre, its park, districts and outer recreational space. Infrastructure also separated the township's inner core (the nucleus occupied by the town centre, parkland and smaller community districts with local amenities) from an outer ring of further districts including industry located on the periphery.

RMJM's initial scheme for CLNT adopted Wilson and Womersley's initial approach for industry and infrastructure and also based the districts' layout on a superblock model that segregated pedestrian and vehicular movement. Each district had centrally positioned local community facilities such as schools, nurseries and greens that were accessed by footpaths and public transport, with industry positioned adjacent to main roads. New urban housing respected the urban grain and included blocks of two-storey maisonettes mixed with smaller units, concealed ground-floor car parking and pedestrian access above. Similar to Hook, the challenges of undulating rural landscape, such as valleys and watercourses, would be over come by spanning a network of pedestrian decks and express bus routes across existing topographical features. New recessed service roads would carry heavy transport. Because CLNT involved the expansion of existing housing, predominantly rows of terraces, RMJM remodelled the block layout to reduce traffic flow, incorporate footpaths and replace existing small scale industrial units with play spaces and garages.

The clarity of the notional city diagram became diluted when applied to existing sub-region's conditions. The seven townships span between Longridge and Chorley with Preston as the main administrative, retail and service industry core and transport interchange. To the east, beyond the M6 motorway two greenfield new towns at Grimsargh and Longridge would accommodate 122,000 people, a significant population increase. These would specialise in education and recreation with Grimsargh also being a centre for welfare and Longridge an entertainment hub. South of Preston, the expansion of Walton would provide a further township for administration and education. Chorley's population would increase to 51,000 to become a culture and entertainment centre and Leyland, which RMJM identified as having most potential to expand and acquire new functions, would increase to 70,000, to become an education zone also requiring a new social and shopping area, possibly outside the present urban area. A lower density expansion at Cuerden would form a recreation centred district. The study concluded the area was capable of accommodating around half a million people.

In November 1973 the Development Corporation published a draft outline plan that required £900 million investment (at 1973 prices) from both private and public funders. 72,000 new homes were to be built in villages of about 3000-5000 people, grouped into districts of approximately 20,000. Substantial recreation areas were planned for the Ribble and Lostock Valleys including facilities for watersports, equestrianism and a zoo. These proposals then progressed into an outline

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master plan published in 1974, which was based on providing seven new district centres and eight new major employment areas across five townships (Grimsargh, Preston, Walton, Leyland and Chorley) by 2001. Facilities are not uniformly distributed, instead they are allocated according to hierarchy with Preston, Chorley and Leyland being prioritised.

Ideas of dispersal were progressed further at Civilia (1971), but these were combined with a return to the centralisation model. The planners, Michael Rowley and Rodney Carran, proposed linear expansion along a concentrated spine leading from a single central urban hub that was to act as a growth generator. This high-density area would have a population of half a million and would have local centres injected at strategic points. A low-density lattice, as employed at Milton Keynes, was laid across this, capable of accommodating a similar population (De Wolfe, 1971). The study of theoretical diagrams to manage growth was hindered in 1976 when the national funding for new towns was revaluated as Ministers were concerned that inner city areas were starting to suffer economically. As a result, CLNT's population increase target significantly reduced to 23,000 people. During the 1980s new towns were privatised and CLNT's Development Corporation was dissolved at the end of 1985.
Over a period of thirty years the strategy, configuration and scale of a new town for central Lancashire changed leaving an interesting architectural legacy dispersed across the region. In recent years the fate of CLNT's city-scale architecture has been debated, such as Preston Bus Station designed by the Building Design Partnership (1959-70), the largest bus station in the UK and second largest in Western Europe. This was CLNT's transport interchange that later became part of a wider retail, entertainment and office complex linked by raised walkways and subways to segregate pedestrian and vehicular movement. This included the Guild Hall and Charter Theatre by RMJM (1969-73), commissioned to commemorate the 1972 Preston Guild. Prior to CLNT's designation, Preston Corporation had commissioned Grenfell Baines and Hargreaves in 1959 (who later became Building Design Partnership in 1961) to design a new bus station and 500 capacity car park. The initial brief aspired to collate the town's dispersed termini of bus services. As the idea for a New Town in central Lancashire developed over the next six years, the size, role and importance of the bus station increased to create a prestigious public building that would be 'unrivalled in size and facilities in England [and] the Continent' (Architects' Journal, 1970). On completion the Architectural Review (1970) concluded that the building's 'imposing scale seems doubly right for a future mini-metropolis'. 171metres long, the bus station can accommodate 80 double-decker buses nose-on and 1100 cars on split-level decks above. Cantilevered curved edges of the concrete car decks create ribbed canopies to protect passenger platforms from weather. A central spine of passenger facilities and offices divides the ground floor concourse into two large waiting halls.

In Leyland a new district centre was commenced. Built projects include the Magistrates' Court and Library, 1970, on the northern side of Lancastergate, by Lancashire County Council Architects' Department. The Magistrates' Court is a dominant grey brick box topped with two copper roof pyramids and, adjacent to it, is the library, a single-storey brutalist building. A wide external staircase dominates the court's street elevation that has been articulated with a band of vertical concrete fins to define the windows and six single-leaf entrance doors. The staircase was designed to acknowledge an unbuilt pedestrianized shopping and entertainment precinct of two-storey buildings surrounding two civic public squares. Traffic along Lancastergate would be restricted to buses only and the area would be reached by a dual carriageway to the west.

At Cuerden the headquarters of Central Lancashire New Town's Development Corporation was first building constructed for the city following the new town's designation in 1970. The Development Corporation had selected Cuerden Hall, a historic building of local interest set within mature grounds, for its location as it is diplomatically placed in the centre of the designation area with no apparent favouritism to Preston, Chorley and Leyland. At the time Cuerden Hall was occupied by the armed forces and was due to be vacated

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in 1973, when it was to become a public amenity. Designed by RMJM, the building is noteworthy due to its rapid construction and its simple and elegant expression. The close working relationship of architect, engineer and quantity surveyor and the careful selection of materials enabled it to be completed in four months (Architects' Journal, 1972). Unified by a generous flat roof, the external envelope comprises a lightweight prefabricated timber and glass external walls set back from a framework of standard rolled steel sections to form a shaded cloister. Internally, two permanent central service cores subdivide an adaptable office space that offers views into the landscape. Originally the building employed an interesting use of colour. External uncased steelwork was painted yellow to contrast against the mature trees and shaded external walls. Internal block work partitions were left unplastered apart from cork-lined walls in the meeting rooms and the service cores which were plastered and painted red.

Although Central Lancashire New Town's part realisation was not as initially conceived, its theoretical model is relevant because it addressed the planning of a sub-region, rather than a single town or plot. Significantly its ambition was to provide a large-scale development composed by an inter-related series of self-contained communities, each with a clear identity or function, separated by a network of green space. It displayed ideas previously explored at Hook and Milton Keynes and later revisited at Civilia. Its presecence today can still be traced by its legacy of its city-scale buildings scattered across the region.

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Urban Art and place. Spatial patterns of urban art and their contribution to urban regeneration

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Abstract. *Cities face several challenges regarding public space and urban regeneration. Some of them are the depersonalization and lack of interest of citizens in their own city, privatization, gentrification, technologization and gender-insecurity. Public spaces lose their character as articulator and generator of human relations, while in neighborhoods lose their role as the basic unity of community and urban identity. Nowadays, many bottom-up strategies have arisen as manifestations of neighborhoods inhabitant's will that produce cultural diversity and civic engagement, with a placemaking effect. Urban art is one of them. While social and economic products of urban art have been studied, the spatial manifestation and impact of art has been largely absent from the discourse of urban morphology. Spatial conditions in cities are not just representational of social practices like art, but form and perpetuate these practices through structuring patterns of movement, encounter and separation in the city (Cartiere & Zebracki, 2016). This study aims to discover the spatial relation between urban art display and the network of public spaces, and whether this pattern has a role in neighborhood regeneration. Using Space Syntax analysis and spatial clustering combined with a survey of geographically located public urban art (extracted from social networks data), land prices and land uses in Shoreditch, London, relations between urban art, the spatial layout and regeneration processes will be stablished. Further research can look at other bottom-up strategies for regeneration and relate them to the urban form.*

Keywords: Urban Art, urban regeneration, placemaking, spatial analysis

Introduction

Cities face several challenges when it comes to public space. One of them is the depersonalization and lack of interest of citizens in their own city. It has been said that the design of modern cities has undermined their capacity to support a vital public culture (Goheen, 1998). Other problems observed are privatization (Kohn , 2004), technologization and gender-insecurity (Gumpert & Drucker, 1994). Public spaces then start losing their character as articulator and generator of basic human relations.

Many strategies have risen as a response to this scenario. Some driven by government, others by citizens, some large scale, some smaller scale. A term has come up to name small scale strategies to increase citizen's enhancement: Tactical Urbanism.

Tactical Urbanism is a bottom-up approach to neighborhood building and activation using short-term, low-cost, and scalable interventions and policies. Tactical Urbanism is used by a range of actors, including governments, business and nonprofits, citizen groups, and individuals. It allows immediate reclamation, redesign and appropriation of public space. This vision, from the local, helps cities and citizens together explore a new form of citymaking, one

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that can envision long-term transformation but also adjust as conditions inevitably change. The power of Tactical Urbanism lays in being able to create tactile proposals for change instead of plans or computer-generated renderings that remain abstract. (Lydon & Garcia, 2015).

One of the currents in of Tactical Urbanism is Public Urban Art, understood as any form of art manifested in public space. Arts-based Placemaking is an integrative approach to urban planning and community building that stimulates local economies and leads to increased innovation, cultural diversity, and civic engagement. Since creativity fuels place value, the benefits of using arts and culture to tap into a place's unique character extend well beyond the art world. (Project for Public Spaces, 2015).

'Street art creates shared narratives between people, ideas, and the city. Street artists are actively engaging in place-making activities (…) Value and meaning are not inherent in space or place; instead they are continuously created, reproduced, recreated, and defended' (Conklin, 2012)

But, before being used as a tool in placemaking processes, public art is a manifestation in and on itself. In urban terms, art has a part on genderization, politization and commodization of cities. The city, in this view, is a sociological entity consisting purely of patterns of social relations. This is not at all wrong, but it is incomplete. The spatial manifestation and impact of art has been largely absent from the discourse of urban morphology (the study of the shape and layout of urban form). Spatial conditions in cities are not just representational of social practices like art, but form and perpetuate these practices through structuring patterns of movement, encounter and separation in the city (Cartiere & Zebracki, 2016). To summarize, both public art as a phenomena on itself and as a tool for regeneration have not been analyzed in total depth in spatial terms. Understanding public art from both perspectives can lead to a better understanding of how people live and appropriate of their cities.

Graffiti and Urban Art

For nearly 50 years researchers have investigated graffiti culture worldwide, and it is pertinent to say that the process of analyzing artistic practices is difficult because it attempts to create order from arbitrariness and what constitutes art is fundamentally subjective (Conklin, 2012). In those terms, it can be said that modern graffiti has many origins. Some say even prehistoric

'Early humans were drawn to express themselves by drawing on cave walls, producing the first evidence of guerrilla art. People have always felt the need to share and express themselves in a public way, sometimes by telling a story or posing a question, many times by presenting a political ideology' (Smith 2007, 11) in (Visconti, Jr, & Borghini, 2010)

More recently, from the late 1960s, street writing became popular amongst young people in Philadelphia and New York. In 1971 the New York Times published a story on graffiti that helped spreading it to other cities. The relation of graffiti to the Hip Hop movement and certain manifestations of culture like music videos helped launching it globally. (Honing & MacDowall, 2016).

Urban Art Classification

The distinctions between classes of public art can vary as much as scholars who work on the subject. There are no agreements, not from the most formal art market positions, nor from the artists, many of who are not even recognized as such, even if they are considered professionals (Klein, 2016). For example, Visconti, Jr & Borghini, (2010) mention 6 categories: tags (nicknames and signatures), highly stylized writing, sticking (pasting drawings and symbols in public spaces, stencil, poetic assault (writing of poetry on public spaces) and urban design (aesthetic practice practiced to improve public architecture and urban style). Some of these categories have to do with the technique involved in making the work of art, others, like urban design, have a rather ambiguous definition. Honing & MacDowall (2016) speak about a distinction between graffiti (words and tags) and street art, which focuses on images, often with a political edge and also familiar topics from mainstream culture (like celebrity faces and advertising icons).

For the purposes of this research, four

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categories of urban art will be established: tags and signatures (regardless of how highly stylized them might be). It is worth saying that tags usually come in a cryptic language, easily understood only by those within the movement. However, the importance of tags lays in the fact that is the primary way of engagement with the city that the artist can make: to notice a place and to put a mark of presence on it. The second category would be murals (also known as public art or street art), as drawings of a certain complexity with a more common pictorial language for transmitting a message. The use of color and a more common iconography make this type of art more "digestible" for the general public. The third category would be sculptures, as any form of expression in public space that has depth or requires a third dimension. The fourth and last category are pre-printed papers, whether they have a political stand or a graphic. These is a faster, less risky way of engagement for the artist. Nevertheless, papers have a certain presence within the art scene.

Urban Art as a creative tool for placemaking and regeneration

Street art has the ability to cause reactions, given that the public always has an opinion about an artwork's existence, message, and artistic value, amongst others. Whether it is to support or condemn the act, the important thing is that it causes a reaction. Rafael Schacter (2008) calls this property of street art agency, defined as 'the ability to capture, hold and transform cognitive operations of its spectators and participants' (Conklin, 2012).

Many scholars nowadays speak about culture-led regeneration (Evans, 2005; Tavano Blessi, Tremblay, Sandri, & Pilati, 2012; Treskon, 2015), tactical urbanism (Landry, Greene, Matarasso, & Bianchini, 1996; Lydon & Garcia, 2015) and creative placemakig (Borrup, 2016). All these currents refer to a form of engaging with the city and building a sense of place from the citizen's perspective. Public art can take part in these movements, given art's property to capture attention and to produce sensations, it becomes a mechanism of relation of both, artists and spectators, to the city. Moreover, Stevens (2007) points that one of the fundamental functions of public space is being a setting for informal social play, which is largely neglected aspect of urban experiences and comprehends activities that are 'spontaneous, irrational or risky, and which are often unanticipated by designers, managers and other users' (Stevens, 2007). Spontaneity and risk are both aspects related to the practice of graffiti and street art. To follow with the inherent value of art as argument, art's provocative, challenging and inconvenient nature make it useful to transform perspectives, create new narratives, and ultimately, to support urban resilience by bringing issues of social justice, social cohesion and social equality to the table (Goethe Institut, 2014, 20).

It is necessary to consider all sides of an aspect, in respect to art as a tool for regeneration. The presence of art and artists in a neighborhood has been linked to urban regeneration and community-enhancing processes, but also to gentrification. Ley (1996) affirms that urban artists are 'colonizing arms' of the middle classes, identifying and revalorizing de-valorized inner-urban residential zones through cultural capital and aesthetic contributions (Cameron & Coaffee, 2005). These revalorized areas then become attractive to young professionals and finally become highly attractive to a class with higher economic capital, that ends up destroying the character of what was initially valorized by the artist (Cameron & Coaffee, 2005).

Finally, street art and graffiti have an internal logic to function and community is also built amongst artists. Klein (2016) speaks about the friendship between artists, who bond working on things that not necessarily relate to mural interventions, which makes sharing a wall much more than to paint together for a photo. Furthermore, respect and territory are important for graffiti practice, both gained as the painter 'marks' harder locations with his work.

Urban art as a crime

The propagation of graffiti produced moral panic and fear of crime. Those who oppose graffiti cite the broken windows theory, which states that allowing minor misdemeanors encourages more serious crime and a downward spiral of urban decay because visual

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disorder (e.g., graffiti, broken windows, public intoxication, trash, abandoned cars, etc.) create an atmosphere that attracts criminal offenders, who assume that residents are indifferent about their neighborhood (Conklin, 2012; Link & Sampson, 2017). Although the theory has never been proven with quantifiable evidence, and nowadays that vision is changing and graffiti is being revalorized, some stigmas still remain.

In the United Kingdom, graffiti and wall painting are treated as a crime. The law understands as graffiti any inscription, marking, writing, painting or drawing, illicitly scratched, scribbled, drawn, cut, carved, posted, pasted sprayed or painted on any surface. Under the Criminal Damage Act 1971 (CDA 1971) and the Clean Neighborhoods and Environment Act 2005 (CNEA 2005), sentences for graffiti range from a conditional discharge from the magistrates' court for minor damage, to up to 10 years imprisonment by the Crown Court where the damage caused is more than £10,000. To try to avoid being punished, artists must be careful of the time and place where they paint. With the years some strategies have risen, like painting commissioned by the owners of a building, or in the frame of organized festivals, or with companies that mediate between owners and artists. Although some mechanisms exist, there is still no legal structure to protect painters.

In this perspective, it remains unclear how urban artists behave in spatial terms. In a research made by (Friedrich, Hillier, & Chiaradia, 2009) the term 'Anti-social behavior' ASB was applied to many incidents that can be described as sub-criminal, the authors found that ASB can be correlated to physical syntactical properties of the environment, in relation to movement and intervisibility. However, it remains to be seen how graffiti and public art particularly behave.

Methodology

The study is based in London. The process has been divided in two phases. The first phase points towards understanding the spatial behavior of urban art and graffiti within the urban grid. The second stage aims to relate the presence of art with economic and social factors that can be linked to urban neighborhood regeneration. Hence, three main questions drive this research

What is the spatial relation between the display of urban art and the urban grid?
Are there any spatial patterns?
What is the role of urban art in neighborhood regeneration?

For the spatial behavior of urban art, Space Syntax methods were used to relate art display patterns to the internal properties of the urban grid by assessing the relation of urban art with Integration (centrality) and Choice (betweeeness) measures with the street segment as the unit for observations. Considering the current state of graffiti and urban art as a crime, the initial hypothesis that was attempted to prove is.

There is a topological logic in the display of urban art that takes place somewhere away from the most integrated streets.

To assess the role of urban art with neighborhood regeneration, Treskon (2015) proposes a methodology to evaluate the impact of art projects in a community through the improvement of social and economic outcomes. Some of this measures were taken into account for this study, aggregating them to the unit of analysis, and statistical correlations between the variables were performed, to stablish the relation between them. The variables considered to assess regeneration are prices paid per property (flats sold in the area of study, which are the most popular type of property in the area), land uses related to art (art galleries, museums, community and cultural centers, book stores, theaters, cinemas, restaurants bars, cafes and night life), and crime rates (anti-social behavior, burglary, robbery and vehicle crimes). It is hypothesized that:

There is a positive relation between the quantity of land uses related to art per street segment, prices paid art presence

There is a negative relation between the presence of art and the incidence of crime

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Data collection

FLICKR API

Online social networking and sharing services have generated large volumes of spatio-temporal information about the physical environment and social phenomena (Li, Goodchild, & Xu, 2013). 'Nowadays, a substantial part of the available social media data has a geographical component, in which locations are stored in the form of a geotag or as a textual description' (Drift, 2015). In order to trace urban art concentrations in London, geo-located points were downloaded using the FLICKR API under certain parameters for analysis, allowing to make use of available data at a big scale to study a social phenomenon with a spatial manifestation. The parameters used were the following:

Photos taken from 01/01/2014 to 31/12/2016
The photos had the tags urban art, street art, public art and graffiti

Points were downloaded with a radius of 3km from the point
Lat: 51.5212106 Long: -0.0740046, close to the center of London to allow to assess the state and spatial distribution of public art at an urban scale.

This social network platform was chosen for having an open-data policy and a user-friendly API, which make it easy to access and use information. To narrow down the amount of information to begin studying the phenomena, it was decided to work with the most recent situation of urban art, which is why the data corresponding to 2016 was chosen for analysis.
On-site Survey of Urban Art

In order to assess downloaded data, and also to have more precision on the location of the points that allowed a more in-depth analysis, a survey of the existing situation of urban art was made. During a series of walks through the area of study, using a mobile phone GPS with the app OSM Tracker for Android, that allowed to take pictures and create automatically a GPX file with the points. The GPX file was converted into a GIS shapefile and then edited the points manually to correct location imprecisions that might have been derived from the GPS use. Also, the points were classified according to the literature review, and in some cases (when possible), details about the artists were added.

Data for social and economic outcomes

The data used for stablishing a relation between urban art and regeneration was obtained from several sources. Land use patterns for the ground floor were downloaded from Google using the Google API, obtaining a set of geolocated points. Property prices per post code and their location were obtained from the HM Open Registry Data services. Crime data with geolocation was obtained from the open datasets of the Metropolitan Police. All these geolocated points were added to the closest street segment for analysis, and all collections of data correspond to the year 2016.

Determining a Case Study Area

A Kernell Density Map performed with a radius of 800m showed clusters of urban art in the city using the FLICKR downloaded points taken in 2016. Based on the clusters, the main and more central cluster corresponded to the Shoreditch area. The limit of the area of study was defined by following the street pattern surrounding the main cluster, leaving out the limit of the City of London. The reason to do this was taking into consideration how the street art phenomena works in the perspective of the interviews performed previously: the City of London is a highly monitored area by police and CCTV, which is why the phenomena wouldn't develop naturally on this space (Figure 1).

Measurement and analysis

Spatial Patterns

Urban Scale

A segment analysis of Integration radius n was performed and compared to the initial clusters obtained in the Kernell Density map. It showed, in accordance to the literature review, that urban art clusters tangentially touch some of the most integrated lines in the system, however, they are not crossed by them, except for the central cluster that corresponds to Shoreditch. (Figure 2)

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Neighborhood Scale

At a neighborhood scale, Metric Integration analyses at different radiis were performed (100, 200, 400, 800, 2000m). The one chosen for deeper analysis was Integration 400m, because it was the local measure that better related to the pattern displayed in the public art survey.

Then, to follow the hypothesis about a topological phenomenon happening somewhere away from the integration core, a Step Depth analysis was made for both, graffiti and murals from the most integrated line in the system. This analysis showed that 79% of murals take place 1, 2 and 3 steps away from the most integrated line. It also showed that 92% of graffitis were located 2, 3 and 4 steps away from the most integrated line in the system. (Figure 3)

After, the points of art that were located over the 50% highest values of Integration 400 were taken out, leaving still the majority of observations. A scatter plot that presented the relation between Integration 400 values and the graffiti and murals count showed that 96% of graffitis and 94% of murals were located in segments with the lowest 50% of Integration values (Figure 4).

Social and economic outcomes related to regeneration

The analysis consisted in stablishing a set of relations between the variables. A correlation matrix showed a significant relation, between the concentration of land uses related to art and the presence of murals. There is an interesting correlation between land uses related to art, and Integration measures at 800 and 2000m radii. Also, the chosen set of land uses relates significantly to the property prices for flats. As for the relation with crime, the strongest and more significant coefficients were related to the location of land uses as well, and surprisingly, contrary to the initial hypotheses, the relation between crime and land uses is positive. Finally, a relation between the surveyed urban art and the data obtained from FLICKR shows a stronger link with surveyed murals, allowing to presume that what is reflected in social networks is more related to murals than to graffiti. (Figure 5)

Counting from the top of normalized Integration radii 2000m, which is the one that showed better correlation with land uses, it is worth to note that 50% of the count of land uses related to art are within the top 79% of integration. In the same interval, are also 25% of the murals, only 13% of the representative values for flats sold, and a variation of 21 to 34% of the selected crime types. In spatial terms, it means that crime, for example, is not located near the most integrated segments of the layout. I also means that land uses related to art, a type of "cultural economy", have a certain spatial link to the presence of murals in the most integrated segments, a surprising result, given that mural painting is not a legal practice. (Figure 6)

Conclusion

What the analysis shows in terms of spatial patterns is how urban art is a phenomena that happens slightly away from the most integrated segments of the urban grid, both in local and global scales. The relation with the 400m radii also allows to conclude that is something that happens at a pedestrian scale. The fact that murals are found 1, 2 and 3 steps away from the most integrated core, while tagging or graffiti manifest 2, 3 and 4 steps away, show a matter of social and public acceptance between what is conceived as urban art. This fact is supported by the statistical correlation between the survey of urban art and the data obtained from the online platform FLICKR. But this also shows a level of acceptance from public perspective to certain kinds of street art, which can be well used for creating public policy towards culture-led regeneration.

As to what refers to social and economic outcomes, the link between land uses related to art and the presence of murals indicates that public art and cultural economy are spatially related as well, which is encouraging when considering these variables from the regeneration perspective. The relatively low relation between integration values and land uses with land prices deserves a deeper look,

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Figure 1. Area of study excluding the City of London to the south-west extreme

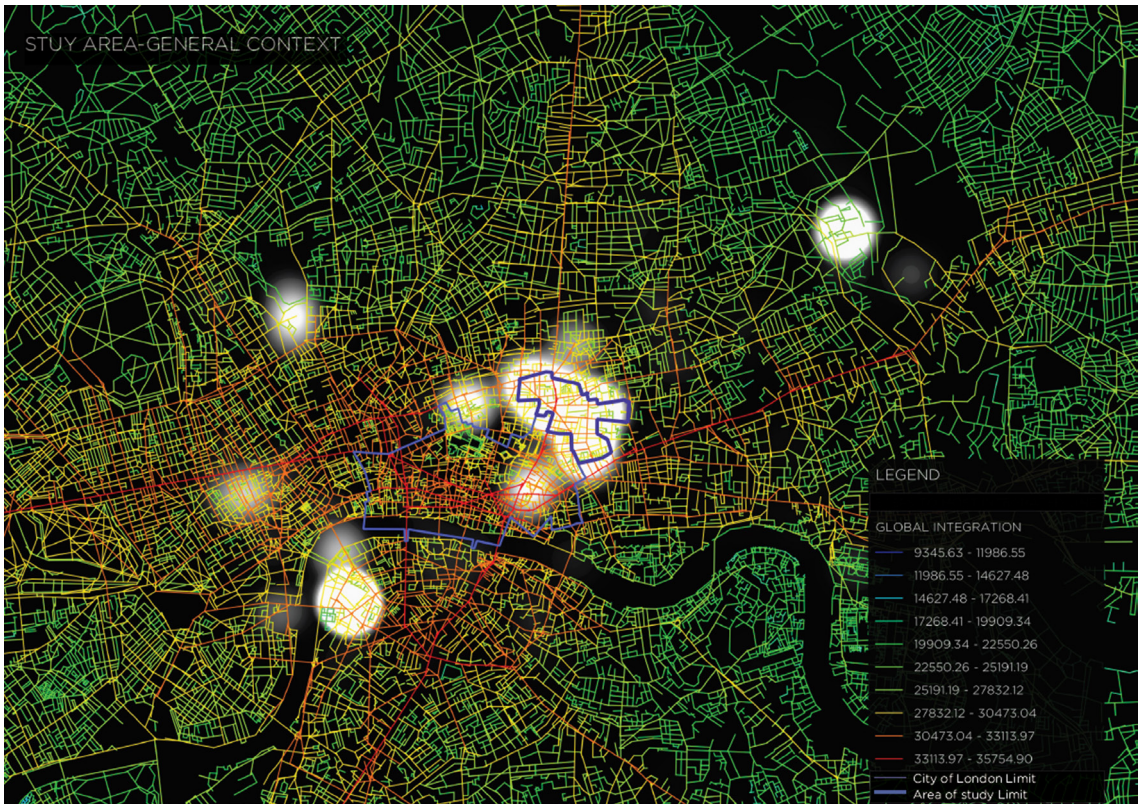

Figure 2. Clusters of art points and Global Integration map, showing how clusters touch the most integrated lines in the system only at the edge.

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Figure 3. Step Depth analysis for graffitis and murals.

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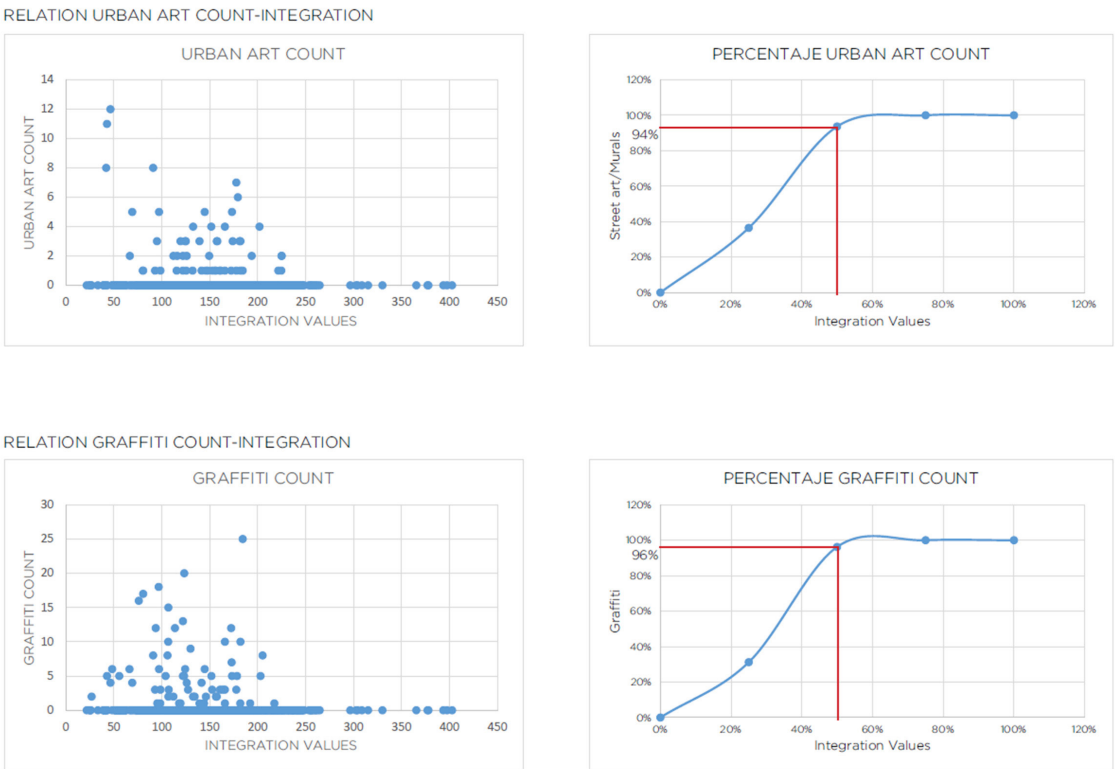
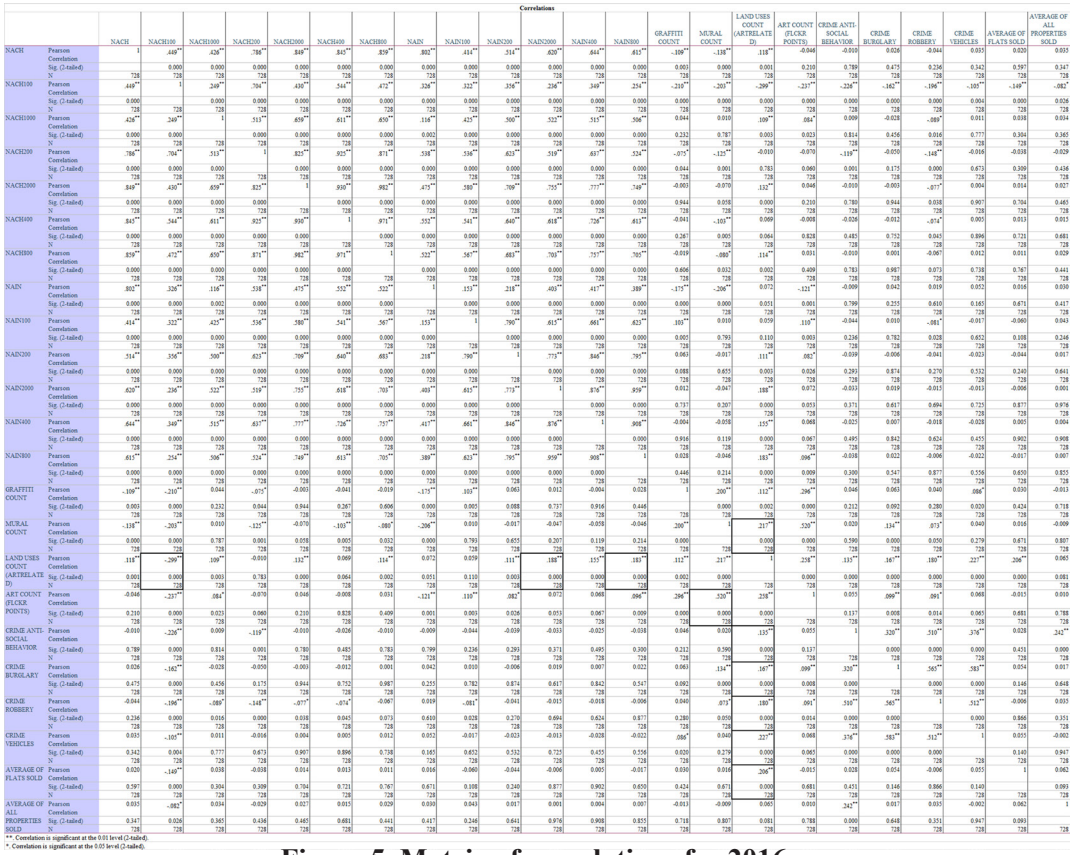


Figure 4. Relation between graffiti counts, public art counts and Integration.



Correlations

		NACH	NACH100	NACH1000	NACH200	NACH2000	NACH400	NACH800	NAIN	NAIN100	NAIN200	NAIN2000	NAIN400	NAIN800	GRAFFITI COUNT	MURAL COUNT	LAND USES COUNT (ARTIRELATED)	ART COUNT (FLICKR POINTS)	CRIME ANTI-SOCIAL BEHAVIOR	CRIME BURGLARY	CRIME ROBBERY	CRIME VEHICLES	AVERAGE OF FLATS SOLD	AVERAGE OF ALL PROPERTIES SOLD
NACH	Pearson Correlation	1	.449**	.426**	.786**	.849**	.845**	.859**	.802**	.414**	.514**	.620**	.644**	.613**	-.109**	-.138**	.118**	-0.046	-0.010	0.026	-0.044	0.053	0.020	0.033
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.001	0.210	0.789	0.475	0.236	0.342	0.597	0.347
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NACH100	Pearson Correlation	.449**	1	.249**	.704**	.430**	.544**	.472**	.326**	.322**	.356**	.238**	.349**	.254**	-.219**	-.203**	-.299**	-.237**	-.228**	-.165**	-.196**	-.105**	-.149**	-.085*
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.026
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NACH1000	Pearson Correlation	.426**	.249**	1	.513**	.659**	.611**	.650**	.116**	.423**	.500**	.522**	.513**	.506**	0.044	0.010	.109**	.084*	0.009	-0.028	-.089*	0.011	0.038	0.034
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.232	0.787	0.003	0.023	0.814	0.456	0.016	0.777	0.304	0.365
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NACH200	Pearson Correlation	.786**	.704**	.513**	1	.825**	.871**	.538**	.536**	.623**	.519**	.637**	.534**	-.015**	-.125**	-0.010	-0.070	-.139**	-0.050	-.148**	-0.016	-0.038	-0.029	
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.001	0.783	0.060	0.001	0.173	0.000	0.673	0.309	0.436	
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NACH2000	Pearson Correlation	.849**	.430**	.659**	.825**	1	.930**	.982**	.475**	.589**	.709**	.755**	.777**	.749**	-0.003	-0.070	.132**	0.046	-0.010	-0.003	-.077*	0.004	0.014	0.027
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.944	0.058	0.000	0.210	0.780	0.944	0.038	0.907	0.704	0.465
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NACH400	Pearson Correlation	.845**	.544**	.611**	.925**	.930**	1	.971**	.552**	.541**	.640**	.618**	.726**	.613**	-0.041	-.103**	0.069	-0.008	-0.026	-0.012	-.074*	0.003	0.013	0.013
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.267	0.005	0.064	0.828	0.485	0.752	0.045	0.896	0.721	0.681
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NACH800	Pearson Correlation	.859**	.472**	.650**	.871**	.982**	.971**	1	.522**	.567**	.683**	.703**	.757**	.705**	-0.019	-.080*	.114**	0.031	-0.010	0.001	-0.067	0.012	0.011	0.029
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.606	0.032	0.002	0.409	0.783	0.987	0.073	0.738	0.767	0.441
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NAIN	Pearson Correlation	.802**	.326**	.116**	.538**	.475**	.552**	.522**	1	.152**	.219**	.493**	.417**	.389**	-.175**	-.206**	0.072	-.121**	-0.009	0.042	0.019	0.052	0.016	0.030
	Sig. (2-tailed)	0.000	0.000	0.002	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.051	0.001	0.799	0.255	0.610	0.165	0.671	0.417
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NAIN100	Pearson Correlation	.414**	.322**	.423**	.536**	.589**	.541**	.567**	.152**	1	.790**	.615**	.661**	.623**	.105**	0.010	0.039	.118**	-0.044	0.010	-.081*	-0.017	-0.060	0.043
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.005	0.793	0.110	0.003	0.236	0.782	0.028	0.652	0.108	0.246
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NAIN200	Pearson Correlation	.514**	.356**	.500**	.623**	.709**	.640**	.683**	.219**	.790**	1	.773**	.846**	.795**	0.063	-0.017	.111**	.082*	-0.039	-0.006	-0.041	-0.023	-0.044	0.017
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.088	0.655	0.003	0.026	0.293	0.874	0.270	0.532	0.249	0.641
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NAIN2000	Pearson Correlation	.620**	.238**	.522**	.519**	.755**	.618**	.703**	.493**	.615**	.773**	1	.876**	.959**	0.012	-0.047	.188**	0.072	-0.033	0.019	-0.013	-0.013	-0.006	0.001
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.737	0.207	0.000	0.053	0.371	0.617	0.694	0.723	0.877	0.976
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NAIN400	Pearson Correlation	.644**	.349**	.515**	.637**	.777**	.726**	.757**	.417**	.661**	.846**	.876**	1	.908**	-0.004	-0.038	.155**	0.068	-0.025	0.007	-0.018	-0.028	0.005	0.004
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.916	0.139	0.000	0.067	0.495	0.842	0.624	0.455	0.902	0.908
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
NAIN800	Pearson Correlation	.613**	.254**	.506**	.534**	.749**	.613**	.705**	.389**	.623**	.795**	.959**	.908**	1	0.028	-0.046	.183**	.096**	-0.038	0.022	-0.006	-0.022	-0.017	0.007
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.446	0.214	0.000	0.009	0.300	0.547	0.877	0.556	0.650	0.855
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
GRAFFITI COUNT	Pearson Correlation	-.109**	-.219**	0.044	-.075*	-0.003	-0.041	-0.019	-.175**	.105**	0.063	0.012	-0.004	0.028	1	.200**	.112**	.206**	0.046	0.063	0.040	.086*	0.030	-0.013
	Sig. (2-tailed)	0.003	0.000	0.232	0.044	0.944	0.267	0.606	0.000	0.005	0.088	0.737	0.916	0.446		0.000	0.002	0.000	0.212	0.092	0.280	0.020	0.424	0.718
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
MURAL COUNT	Pearson Correlation	-.138**	-.203**	0.010	-.125**	-0.070	-.103**	-.080*	-.206**	0.010	-0.017	-0.047	-0.038	-0.046	.200**	1	.217**	.520**	0.020	.134**	.073*	0.040	0.016	-0.009
	Sig. (2-tailed)	0.000	0.000	0.787	0.001	0.058	0.005	0.032	0.000	0.793	0.655	0.207	0.139	0.214	0.000		0.000	0.590	0.000	0.050	0.279	0.671	0.807	
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
LAND USES COUNT (ARTIRELATED)	Pearson Correlation	.118**	-.299**	.109**	-0.010	.132**	0.069	.114**	0.072	0.039	.111**	.188**	.155**	.183**	.112**	.217**	1	.258**	.135**	.167**	.196**	.227**	.208**	.065
	Sig. (2-tailed)	0.001	0.000	0.003	0.783	0.000	0.064	0.002	0.051	0.110	0.003	0.000	0.000	0.000	0.002	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.081
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
ART COUNT (FLICKR POINTS)	Pearson Correlation	-0.046	-.237**	.084*	-0.070	0.046	-0.008	0.031	-.121**	.110**	.082*	0.072	0.068	.096**	.206**	.520**	.258**	1	0.055	.099**	.091*	0.068	-0.015	0.010
	Sig. (2-tailed)	0.210	0.000	0.023	0.060	0.210	0.828	0.409	0.001	0.003	0.026	0.053	0.067	0.009	0.000	0.000	0.000		0.137	0.008	0.014	0.065	0.681	0.788
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
CRIME ANTI-SOCIAL BEHAVIOR	Pearson Correlation	-0.010	-.226**	0.009	-.119**	-0.010	-0.026	-0.010	-0.009	-0.044	-0.039	-0.033	-0.025	-0.038	0.046	0.020	.135**	0.055	1	.320**	.510**	.378**	0.028	.242**
	Sig. (2-tailed)	0.789	0.000	0.814	0.001	0.780	0.485	0.783	0.799	0.236	0.295	0.371	0.495	0.300	0.212	0.590	0.000	0.137		0.000	0.000	0.000	0.451	0.000
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
CRIME BURGLARY	Pearson Correlation	0.026	-.165**	-0.028	-0.050	-0.003	-0.012	0.001	0.042	0.010	-0.006	0.019	0.007	0.022	0.063	.134**	.167**	.099**	.320**	1	.565**	.583**	0.054	0.017
	Sig. (2-tailed)	0.475	0.000	0.456	0.175	0.944	0.752	0.987	0.255	0.782	0.874	0.617	0.842	0.547	0.092	0.000	0.000	0.008	0.000		0.000	0.000	0.146	0.648
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
CRIME ROBBERY	Pearson Correlation	-0.044	-.196**	-.089*	-.148**	-.077*	-.074*	-0.067	0.019	-.081*	-0.041	-0.013	-0.018	-0.006	0.040	.073*	.189**	.091*	.510**	.565**	1	.512**	-0.006	0.035
	Sig. (2-tailed)	0.236	0.000	0.016	0.000	0.038	0.045	0.073	0.610	0.028	0.270	0.694	0.624	0.877	0.280	0.050	0.000	0.014	0.000	0.000		0.000	0.866	0.351
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
CRIME VEHICLES	Pearson Correlation	0.035	-.105**	0.011	-0.016	0.004	0.005	0.012	0.052	-0.017	-0.023	-0.013	-0.028	-0.022	.086*	0.040	.227**	0.068	.378**	.583**	.512**	1	0.055	-0.002
	Sig. (2-tailed)	0.342	0.004	0.777	0.673	0.907	0.896	0.738	0.165	0.652	0.532	0.725	0.455	0.556	0.020	0.279	0.000	0.065	0.000	0.000	0.000		0.140	0.947
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
AVERAGE OF FLATS SOLD	Pearson Correlation	0.020	-.149**	0.038	-0.038	0.014	0.013	0.011	0.016	-0.060	-0.044	-0.006	0.005	-0.017	0.030	0.016	.206**	-0.015	0.028	0.054	-0.006	0.055	1	0.062
	Sig. (2-tailed)	0.597	0.000	0.304	0.309	0.704	0.721	0.767	0.671	0.108	0.240	0.877	0.902	0.655	0.424	0.673	0.000	0.681	0.451	0.146	0.866	0.140		0.093
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728
AVERAGE OF ALL PROPERTIES SOLD	Pearson Correlation	0.033	-.082*	0.034	-0.029	0.027	0.015	0.029	0.030	0.043	0.017	0.001	0.004	0.007	-0.013	-0.009	0.065	0.010	.242**	0.017	0.035	-0.002	0.062	1
	Sig. (2-tailed)	0.347	0.026	0.365	0.436	0.485	0.681	0.441	0.417	0.246	0.641	0.976	0.908	0.855	0.718	0.807	0.081	0.788	0.000	0.648	0.351	0.947	0.093	
	N	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728	728

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 5. Matrix of correlations for 2016.

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Percentage NAIN 2000 Values	Percentage Count Land Uses (Related to art)	Percentage Count Murals	Percentage Average Price (Flats)	Percentage Crime Anti-social Beahvior	Percentage Crime Burglary	Percentage Crime Robbery	Percentage Crime Vehicle
100%	0%	0%	0%	0%	0%	0%	0%
84%	25%	3%	13%	14%	10%	8%	9%
79%	50%	23%	13%	34%	31%	20%	21%
71%	75%	46%	46%	61%	59%	48%	48%
40%	100%	100%	100%	100%	100%	100%	100%
0%	100%	100%	100%	100%	100%	100%	100%

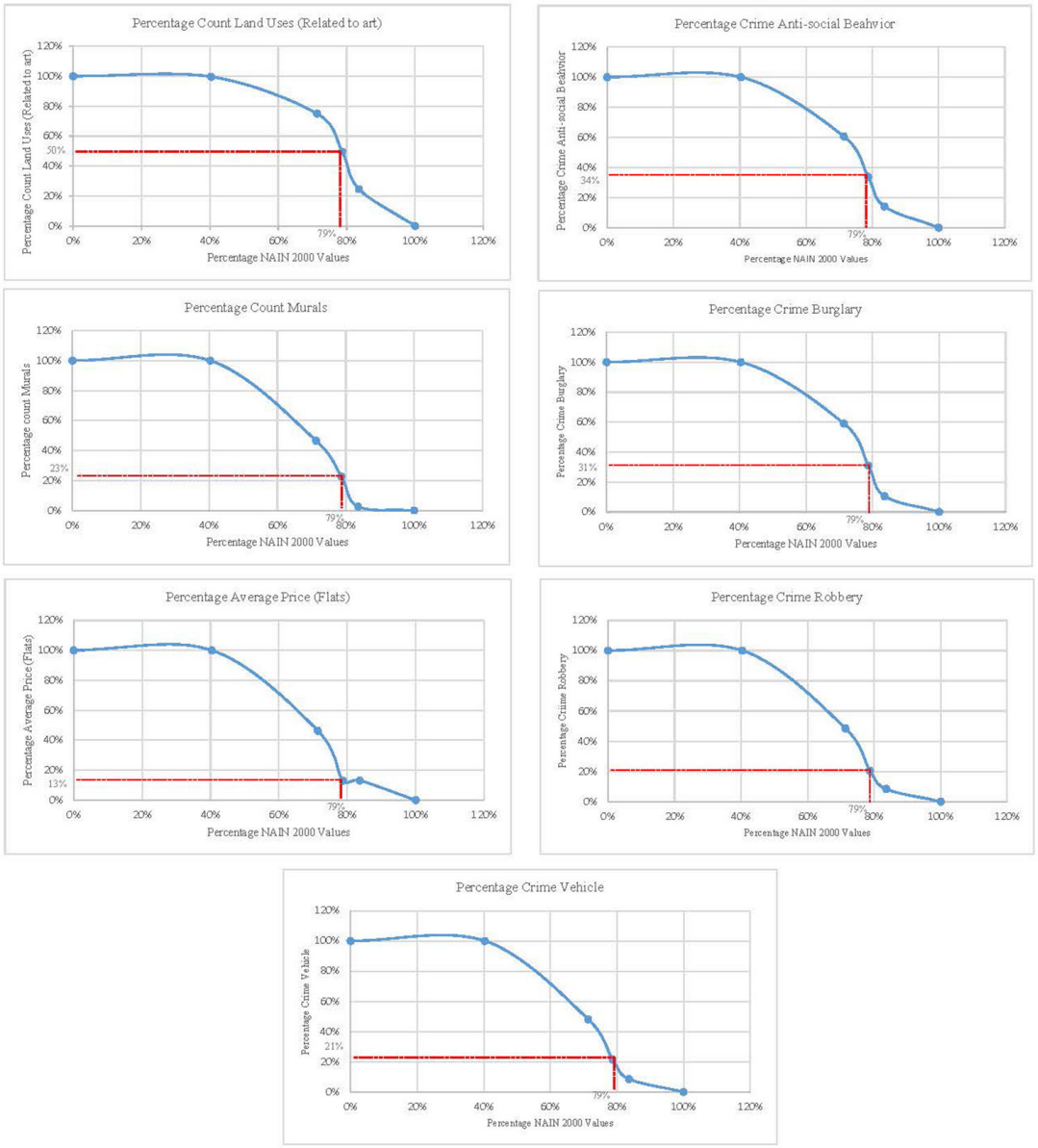

Figure 6. Relation between socio-economic variables and Integration for 2016.

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given the fact that it might seem to contradict what literature often states. As this is a part of an on-going research, a portion of future effort will focus on clarify this effect.

Amongst the lessons learnt during this research, is the need for available open data at a postcode or household disaggregation level, given the fact that some social and economic variables related to regeneration were left out because the available data was found at a larger scale, blurring the depth of analysis that Space Syntax allows at a street segment level.

Future research could look at other bottom-up mechanisms related to the urban grid and their dynamic as a regenerative tool. Also, other aspects of urban art could be researched from a spatial perspective, like the message it delivers in terms of political statement or protest.

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Land regularization and quality urban spaces

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Abstract. *The policy of urban land regularization in Brazil has its legal basis expressed in the Federal Law no. 11.977/2009. This norm contemplates a multidimensional understanding of the conditions necessary for the integration of illegal settlements into the formal city. It goes beyond the granting of land title, since it establishes that the urban, environmental and social dimensions must also be taken into account in the regularization projects. Thus, quality of life and environmental quality aspects are expected to be present in the regulated areas, this is not verified by official surveys, where basic service deficiency and environmental impacts are identified. The present study aims to objectify the evaluation of these projects, verifying which elements contribute to the urban and environmental spatial qualification, providing a qualified feedback to the projects. As method, we explored measures necessary to the establishment of the regularization process in the urban and environmental dimensions and reviewed concepts of quality of life and environmental quality to identify measures related to them. An evaluation framework was organized and used to analyze a project considered a successful example, the 'Cantinho do Céu', in an area of Protection and Recovery of Water Supplies in the city of São Paulo. It was possible to verify how the implemented interventions are related to the regularization dimensions defined in law and with quality of life and environmental quality aspects. This 'Cantinho do Céu' project presented a proportionality between the environmental and urban dimensions, which partially explains its success.*

Keywords: Quality of urban space, Urban land regularization, Environmental quality and Quality of life.

Introduction

In Brazil, urban growth's ascending curve, associated with the Public Power's small capacity to produce efficient responses, resulted in a low quality urbanization, marked by a housing, infrastructure and mobility deficit with a high rate of informality. Brazil's urban population grew 58% between 1980 and 2000, while the population in favelas and irregular precarious land subdivisions grew 279% in the same period (Bueno, 2005).

The population, facing a lack of regular housings, occupied different areas which were unoccupied, for being inappropriate under either the urban or environmental perspectives, and, thus, faced major environmental problems in these informal settlements. These are areas that, due to their environmental fragility and precarious deployment, face risks related to landslides, floods and erosive processes.

These occupations' morphological characteristics vary in function of the physical sites, the income rates and the way in which the occupation started. When they emerge spontaneously, they become more unorganized and precarious, while, when they are implemented through irregular or clandestine1 allotments, they present a better spatial organization. Although they compose a varied set of typologies, these areas are still similar in their contrasts to the legal city, not following

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the urban and environmental normatization and presenting social, economic and environmental problems (Ávila & Ferreira, 2016).

When these occupations are already consolidated2, the simple removal of the residents is usually not a viable option, due to the fundamental social right to housing3, breaking of neighborhood ties, level of anthropization reached and the lack of other city areas with the same degree of accessibility to move them.

In view of these considerations, the establishment of the residents in the site need to take into account the urban, environmental and social dimensions, before promoting the property's regularization. Exclusively guaranteeing the land registration represents neglecting the occupations' precarious conditions and their risks. Nevertheless, promoting only urban improvements, leaving out the land registry in favor of the resident, perpetuates the insecurity of the ownership and a whole chain of social problems (Alfonsin, 1997).

The legal basis that dictates the regularization process in Brazil take into consideration these issues, through the Federal Law no. 11,977/2009, which consecrated, in its article 46, the concept of multidimensionality in the land regularization, which follows:

The land regularization consists in a set of judiciary, urban, environmental and social measures, which aim for the regularization of irregular settlements and the land ownership of their occupants, in order to guarantee the social right to housing, the full development of the urban properties' social function, and the right to an ecologically balanced environment.

On May 31st, 2017, Brazil's Senate approved the bill of the President's initiative Medida Provisória 759, which changes the above mentioned legislation. This law will revert this multidimensional concept and reduce the necessary procedures of the process of land regularization. However, because of its recent approval, it is difficult to further analyze its impacts.

Even though this multidimensional concept is still in force, the disseminated data and evaluation about land regularization processes are still limited to the study of 'number of granted land titles' and 'beneficiary families' (Ministério Das Cidades e Aliança das Cidades, 2009). This scenario may signal either an emphasis on the juridical dimension in detriment of the others, or an omission in the evaluation of the other dimensions. None of these situations is ideal.

Starting from the premise that the complete evaluation of the undertaken regularization actions still does not occur as fully as it could, this work proposes a qualitative evaluation methodology of the urban and environmental dimensions of the regularization process. These two dimensions were chosen due to the understanding that they are more directly related to the changes in territory and over which actions could come to promote an improvement on the quality of life and the quality of the environment for these irregular settlements.

With this purpose, this research was divided in three sections. The first one, the theoretical framework, analyzes actions expected of the environmental and urban dimension and the concepts of quality of life and urban environmental quality in order to systematize the parameters found in a form of an analysis table. The second introduces the methodology for implementing this analysis table in the evaluation of an area which has undergone a regularization process. Finally, the third one presents the analysis and results of a study case.

Theoretical Framework

The urban and environmental dimensions of land regularization and its legal basis

The regularization process and its operationalization are complex and difficult to understand. Due to the extensive set of laws that dictate it in Brazil4, its dispositions are found in the form of an entangled group of definitions, principles, conduction of studies and administrative procedures. In order to clarify this process, a study by Bezerra and Chaer (2014), which attempts to systematize the stages of the regularization process, and the process' legal basis were reviewed to help the construction of the regularization process diagram, shown in Table 1. This was

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important to clarify which stage has a greater impact on territorial organization and, in this way, can mostly influence the environmental and life quality of the settlements. The stage identified with these characteristics is the 'Urban Design', which will be the focus of the evaluation elaborated here.

Starting from a study by Chaer (2016), which listed actions comprising the dimensions of the land regularization process after an extensive study on the legal basis, we assembled the required actions related to the environmental and urban dimensions in the 'Urban Design' stage. It must be taken into account that the legal basis of the regularization process highlights the importance of qualifying the informal occupations by keeping, wherever and whenever possible, the existing characteristics and avoiding removals or evictions. This principle is supported by instruments that make usual urbanistic rules more flexible to the existing conditions of these settlements, which makes the assembled required actions basic.

The required actions related with the environmental dimension can be arranged in two groups: (1) required actions to adapt the elements of land division to the site's natural conditions and (2) required actions for the promotion of environmental balance, in the sense of minimizing the pressure over the natural resources (Chaer, 2016). This is shown in Table 2, right column.

The required actions related with the urban dimension can be separated in two groups: (1) required actions to adapt the elements of land division to the basic necessities of the inhabitants and (2) required actions of basic infrastructure5 supply, like public illumination, sewage treatment, drainage of pluvial waters and water and electricity supply (Chaer, 2016). This can be seen in Table 2, left column.

Actions associated with quality of life and environmental quality

The concepts of quality of life and environmental quality, under the perspective of the city's physical dimension, is supported by a broad but contradictory literature. In any case, taking the diversity of researchers, government institutions and international organizations theories, a search for a synthesis of what is current was made.

There is no consensus on the historical origin of the application of the concept quality of life to the city context. One of its first appearance goes back to the XIXth century, on the work of Max von Pettenkoffer "The value of Health to a City", which is closely associated to the social hygiene movement (Guimarães, 2005). However, this term began to be more widely used in the end of the 1970's and the start of the 1980's, associated with subjective, qualitative and appreciative aspects of urban environment, based in the individuals' and groups' perceptions in relation to the quality of life. In this same period, this concept received a large influence from the concerns with natural resources, the environment and social inequality.

The 1990's were marked by important conferences in the area of environment and human settlements, where emerged an aggregator concept of ideas of greater articulation between the natural and anthropic processes and where the idea of quality of life and environmental quality were underlying. Since then, the concept of sustainability starts being advocated by different areas of knowledge, as one that encompasses social, natural and economic aspects.

Through this union of fronts, the concept of quality of life increasingly becomes the key element of the concept of environmental quality (Nahas, Pereira, Esteves and Gonçalves, 2006). The interdependence between them comes from the fact that the 'life' of the term 'quality of life' is bounded to its nourisher environment, of the term 'environmental quality'. According to Kliass (2002), urban environmental quality is the attribute of the urban environment, which guarantees the life of the citizens within patterns of quality, both in the biological and sociocultural aspects.

However, since the urban and environmental thematic come from different epistemological trajectories, their matrices of values and ways of thinking lead to actions grounded on differentiated principles and logics. Conflict has been more recurrent than consensus.

To help in the evaluation of programs which aim at the promotion of quality of life and

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environmental quality, the translation of these concepts into operative terms is important. Recently, studies of Santos & Hardt (2013) attempt to systemize actions that would fit in the concept of environmental quality and urban quality of life. In these studies, environmental quality was analyzed through the natural system characteristics, which includes aspects related to the nature's balance state, while quality of life was analyzed using characteristics of the anthropic system, which includes aspects of the territorial and socioeconomic contexts (Santos e Hardt 2013).

The natural system encompasses components of the physical order, such as climate, air, water, soil and subsoil, and the ones of biological origin, like fauna and flora. While the anthropic system encompasses actions related to the use and occupation of the soil, offer of infrastructure, urban services, sociocultural conditions and productive sectors.

It is possible to make a connection between these systems and the dimensions of regularization, associating the natural system with the environmental dimension and the anthropic system with the urban dimension. From this association, it was possible to seek complementary actions in the urban quality indicators of UN-HABITAT (UN-Habitat, 2009), Geo Cidades (PNUMA, 2004) and of the Brazilian Institute of Statistical Geography (IBGE, 2012). The result of this gathering, crossed with the regularization dimensions, is shown in Table 3.

Methodology of Analysis

Studying the Brazilian legal requirements for regularization processes and some indicators of urban quality, it was possible to assemble objective measures to guide the evaluation of the urban regularization projects. These measures are disclosed in Tables 2 and 3.

Both tables present the urban and environmental dimension and were divided in three types of general measures: (1) measures of adequacy of occupation and land use, (2) measures of provision of infrastructure and (3) measures of promotion of environmental balance, which is only related to the environmental quality. Table 2 presents the required measures, which are basic actions expected of the project, so it follows the legal requirements. While Table 3 presents complementary measures that can improve local living and environmental conditions.

The use of these tables can assist in evaluating if any of the different dimensions has greater emphasis in the projects, if some group of general measures occurs more than others and if the implemented measures are only those required or also the complementary ones. Both types of measures are necessary for putting the land regularization in practice in an effective way.

Case Study: Núcleo Cantinho do Céu

The project selected for evaluation was the Núcleo Cantinho do Céu in the south zone of São Paulo, Brazil, next to the left bank of the reservoir Billings, an environmentally protected area for sources of clean water supply. It has a significantly dense occupation, mainly composed by low income families, being a source of pollution to the reservoir (Cheriato, 2012).

This study case was selected because it covers problematics in the different analyzed dimensions and because its urban design has been considered a case of improvement in both life and environmental quality.

The urbanization works, which started in 2008 and are still on course, are a part of the reservoir program - Programa Mananciais, which has as objectives controlling the hydric pollution and improving the life conditions of the inhabitants of the region, through urban infrastructure interventions. The urban design embraces the whole neighborhood perimeter, which is composed of three neighborhoods: Cantinho do Céu, Residencial dos Lagos and Jardim Gaivota.

By analyzing the preliminary design, developed in 2007 by the consortium JNS-HagaPlan, and the detailed design developed by the urban design office Boldarini Arquitetura e Urbanismo6 it was possible to observe several of the measures applied.

According to the environmental legislation

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in Brazil, a range of 50m surrounding the banks of the Reservoir should have the housings removed. Nonetheless, the design studied compensation conditions, extending the protection range in some areas, in order to avoid the clearance of others. The new Permanent Preservation Area (Área de Preservação Permanente – APP) has an area larger than the one mandated by the environmental law and, also, an ecological park was created for environmental compensation of the non-cleared areas.

Some removals were still necessary and, to define which, technical criteria were used with the observations of: impossibility of sanitary sewage system; clearances of the drainage lines; complementation of the road system; elimination of risk areas; and clearance of areas for urban equipment and for creating resettlement areas. Out of a total of 9,789 resident families, 3,052 were relocated to new habitational units, some inside the regularization area and others outside the current neighborhood perimeter, but still in the proximities (JNS e Haga Plan, 2007).

The adopted solution for these removals opened space for the conformation of the park Parque Linear, a group of public open spaces with areas for socializing, sports and leisure. The park associates recreational and leisure activities to the preservation of the reservoir banks and to the maintenance and reconstitution of native species of plants, avoiding the silting of the reservoir. This park is also a form of inhibition against future occupations of the APP.

Besides the Parque Linear, other green areas were designed for the recovery of the environmental balance and prevention of future occupations. These areas are composed by the Ecological Park and an area located under the transmission line protected range, where new trees will be planted and a community garden will be created.

Where before were narrow routes with significant declivities, new road connections were designed. Today, the settlement's residents spend, in each direction when travelling to work, from an hour and a half to two hours. The nearest hospital and commercial center are in a time distance of one hour, when using the available public transportation.

To improve the situation, more accesses to the neighborhoods were designed and paving was defined according to the roads' hierarchy and drainage conditions. Asphalt was selected for streets with larger movement, concrete blocks pavement in the smaller ones and permeable pavement in the ones with only pedestrian circulation. With these changes, access was enabled for public transportation and heavy vehicles. In addition, new bus lines and the construction of a new bus terminal were planned.

Regarding the provision of urban infrastructure, the following were implemented: changes in the road meshes; implementation of waste collection; water supply lines; a sanitary sewage system; and a system to redirect the sewer to a treatment station outside the reservoir area.

Regarding the drainage, the urban proposal predicted an expansion of the green area, maintaining the natural conditions of permeability, and the scaling of pluvial water networks in the new and old roadways, where 5,327.90m of new galleries and different superficial drainage systems were designed. The declivity of the roads was set to the center of the roadways, in order to avoid that the pluvial waters would leak into the houses (Soluções para Cidades, 2013).

According to the parameters used to evaluate the project, it was possible to observe that the design did not put a greater emphasis on the urban dimension over the environmental one, or the other way around. However, few complementary measures were implemented. Of this few, more measures were of the environmental dimension and for the adequacy of the occupation and land use, as can be seen in table 4, where the measures that could be ascertained are marked with an 'x'.

Conclusion

Establishing criteria to be used as references during the evaluation of projects is not an easy task, mainly because the list of possibilities is long and the choice of some in detriment to others must be aligned with the expected

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objectives for the target population. In this work, the evaluation related to the reach of the urban and environmental dimensions of the land regularization process through the achievement of measures which promoted quality of life and of the environment.

Using these defined criteria, displayed in Table 2 and 3, it was possible to verify that the interventions designed for the neighborhood Cantinho do Céu have a high degree of concordance to these criteria, especially the basic ones, requested by law, and a proportionality between the environmental and urban dimensions, which may partially explain its success.

However, the complementary measures were mostly not met, which can give hints on the fulfillment of these measures by other projects not as well reputed as this one. Also, analyzing the complementary measures, it was possible to find a light emphasis in what refers to environmental quality, in detriment of what relates to quality of life. This does not necessarily indicate a greater attention to the environmental dimension, because it can also indicate that the required environmental measures are more basic than the urban ones, leading to further implementation of complementary measures in this dimension. To better understand the case, further investigations need to be made in this regard.

Despite the amplitude of the Brazilian land regularization legal basis, the practice that has been growing in the country, after 16 years of the implementation of the City Statute (Law no. 10.257/2001), which established the regularization as an urbanistic instrument, is still far from being consolidated as a path that brings the social, urban, environmental and juridical dimensions together in order to include irregular areas in the formal city effectively. Reducing the impacts brought by informality.

Along these lines, the new legislation, MP 759/2016, can bring setbacks in what concerns the reductionism of the problematic of the regularization process. However, it also seems to establish legality to a recurrent and ongoing practice.

In this sense, it is important to emphasize that the land regularization is a curative measure for the informality. But that there are also preventive measures, which can reduce the dynamics that generate the informality and that should be used to a greater extent. Studies that investigate informality from the perspective of the land market show that the clandestine sales of undeveloped land offers more profits than sales of urbanized land by the formal market. This happens because the landowner of the informal land anticipates in the sale price services that are expected to be introduced in the future, usually by the public authorities (Morales and Smolka, 2005). This, together with the scarcity of urbanized land, ends up generating a cycle of informality.

The prevention of irregularity depends on the advancement of urban policies that affect several areas, in an integrated way. The housing and control policies, together with land regularization programs, should respond in an integrated and connected way to the need for housing.

Notes

1According to the Brazilian Federal Law no. 6,766/79, irregular allotments are the ones which had an enrollment in the official organ for approval, but didn't finalize the process, while the clandestine ones were implemented without following any step of the approval process.

2According to article 47, of the Federal Law no. 11,977/2009, consolidated urban areas are those with density superior to 50 inhabitants by hectare, road mesh implemented and at least 2 from the following infrastructure implemented: pluvial water drainage; sewage treatment; drinking water supply; electrical energy distribution; urban cleaning and solid waste gathering.

3One among the social rights predicted in article 6, "caput", of the Brazilian Federal Constitution.

4The legal instruments that today constitute, together, the policy of urban land regularization in Brazil are: the Estatuto da Cidade - Federal Law no. 10.257/2001, Federal Law no. 10,931/2004, Federal Law no. 11,481/2007, Federal Law no. 11,888/2008, Federal Law

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no. 11,977/2009 and Resolution no. 369/2006 of the National Council of the Environment – CONAMA.

5With the exception of public illumination, there is a consensus on the definition of basic infrastructure, under Federal Law no. 11,977/2009

6In 2008 the construction work was put in charge of the consortium Schahin Engenharia and Carioca

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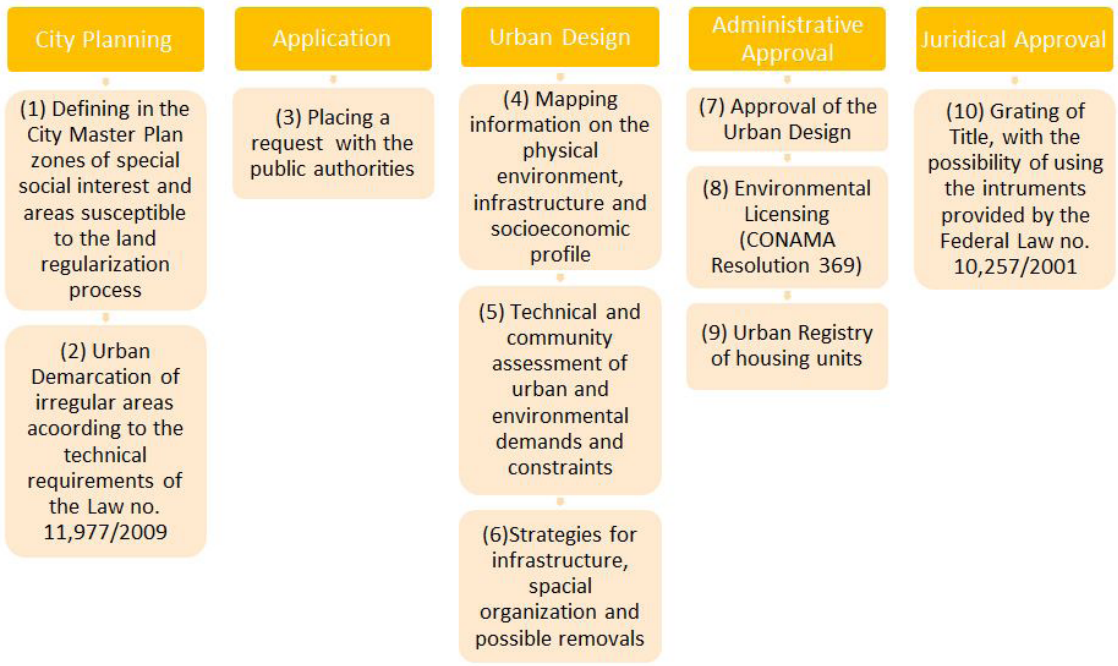

Figure 1. Stages of the regularization process. Source: Author (2017)

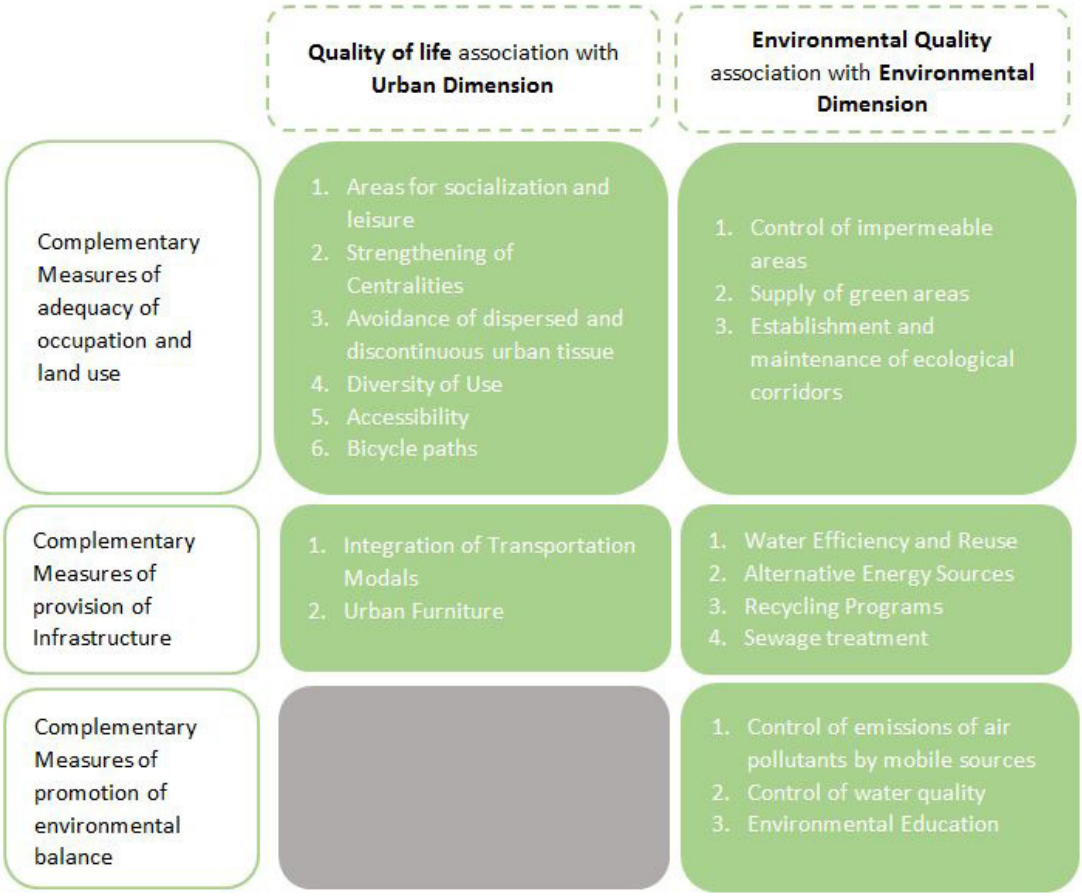

Figure 3. Complementary Measures of Quality of Life and Environmental Quality associated with the urban and environmental dimensions. Source: Author (2017)

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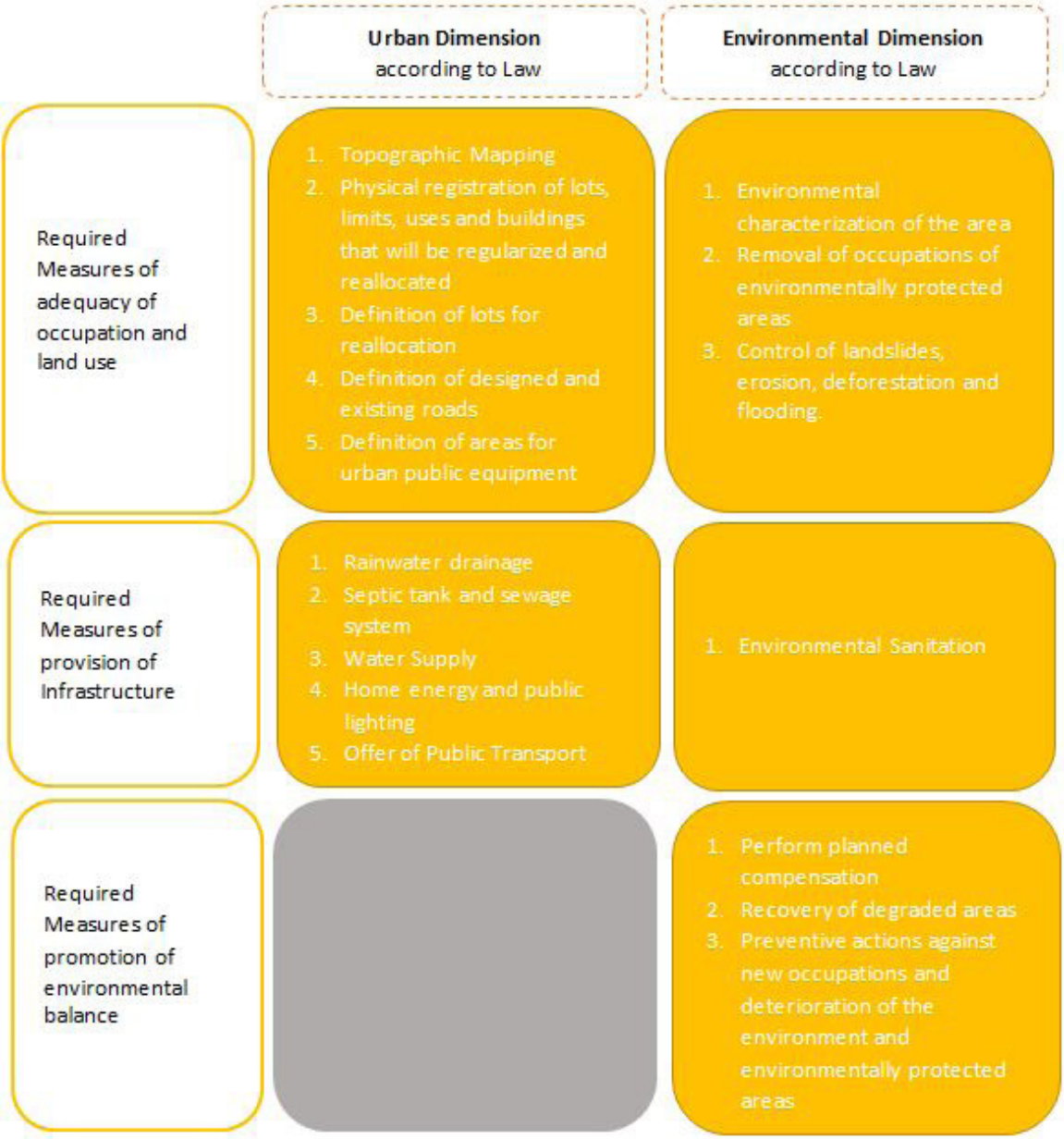

Figure 2. Required Measures associated with the urban and environmental dimensions according to law. Source: Author (2017)

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Quality of life and Urban Dimension

Measures of adequacy of occupation and land use

Required		Complementary	
Topographic Mapping	X	Areas for socialization and leisure	X
Physical registration of lots, limits, uses and buildings that will be regularized and reallocated	X	Strengthening of Centralities	
		Avoidance of dispersed and discontinuous urban tissue	
Definition of lots for reallocation	X	Diversity of Use	
Definition of designed and existing roads	X	Accessibility	
Definition of areas for urban public equipment	X	Bicycle paths	

Measures of provision of Infrastructure

Required		Complementary	
Rainwater drainage	X	Integration of Transportation Modals	
Septic tank or sewage system	X		
Water Supply	X	Urban Furniture	
Home energy and public lighting	X		
Offer of public transport	X		

Environmental Quality and Environmental Dimension

Measures of adequacy of occupation and land use

Required		Complementary	
Environmental characterization of the area	X	Control of impermeable areas	X
Removal of occupations of environmentally protected areas	X	Supply of green areas	X
Control of landslides, erosion, deforestation and flooding	X	Establishment and maintenance of ecological corridors	

Measures of provision of Infrastructure

Required		Complementary	
Environmental Sanitation	X	Water Efficiency and Reuse	
		Alternative Energy Sources	
		Recycling Programs	
		Sewage treatment	X

Measures of promotion of environmental balance

Required		Complementary	
Perform planned compensation	X	Environmental Education	
Recovery of degraded areas	X	Control of water quality	
Preventive actions against new occupations and deterioration of the environment and environmentally protected areas	X	Control of emissions of air pollutants by mobile sources	

Figure 4. Ascertained, required and complementary measures of the project Núcleo Cantinho do Céu. Source: Author (2017)

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Figure 5. Rendered images of the intervention. Source: Boldarini Arquitetos e Associados, 2015, (http://www.arqbacana.com.br/) accessed December 02nd 2015.

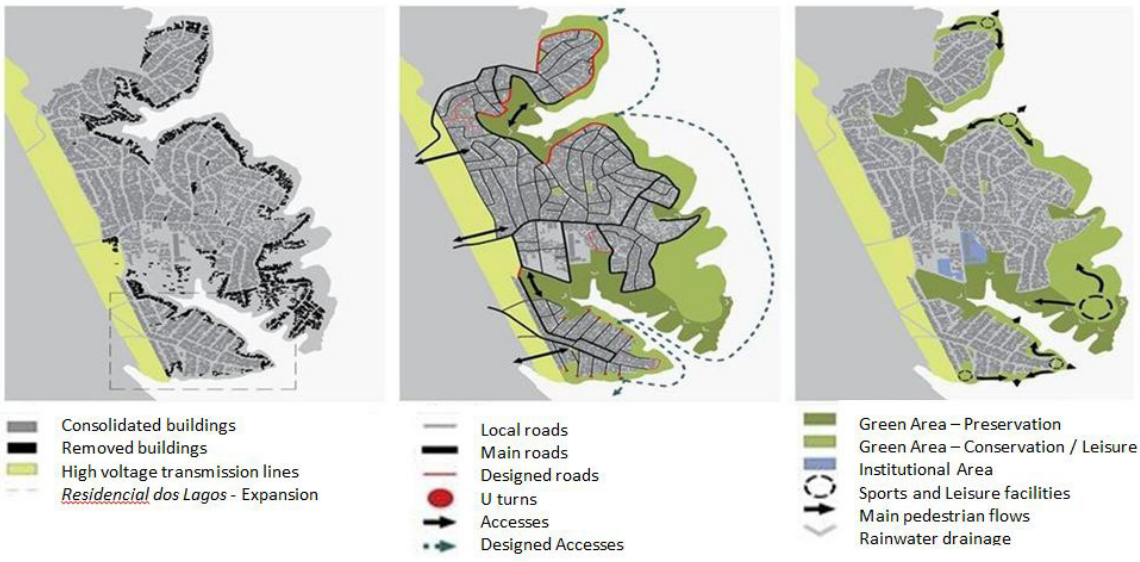

Figure 6. Urbanization of the Núcleo Cantinho do Céu. Source: Boldarini Arquitetos e Associados, 2015, (http://www.archdaily.com.br/) accessed December 02nd 2015

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City and territory
in the Globalization Age

4. Efficient use of resources in sustainable cities

The diagonal city: Crossing the social divisions

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Abstract. *Contemporary cities are affected by transformations that put in discussion the claim of control and stability to which the urban project aspires. All those gradual adjustments are manifested according to the demand, bring toward a less formal and more flexible spatial order, for which the traditional forms of the "static" city become the background of the "kinetic" landscape of informal cities. On the contrary of the formal processes of urban planning, informality process is configured as an organic development model and a flexible dynamic system opened to changes. The informal space is produced according to principles of spontaneity and self-organization. A consideration on the possibility to assume different approaches can be proposed. Those approaches should integrate in the design reasoning all the dynamics usually excluded by the discourse on the urban project, which processes can become catalysts to enrich the methods of planning and design of the urban space. Through the analysis of the case-study Previ Lima and the Living Room at the Border of St. Ysidro, the aim is to delineate in which way the contemporary architecture can absorb and metabolize these processes, triggering a different approach to a different method to intervene in the spaces of relationship among formal and informal. It is believed that the informal urban qualities cannot be eliminated and is impossible to ignore the inhabitants' practices, but rather to work on the intersection between collective and individual actions.*

Keywords: Informal processes, dynamic transformation, new planning approach, flexible space, self-organization

Introduction

Addressing the issue of informality is quite complex. Cities are undergoing fast processes of change which are making the boundary between formal and informal weaker and weaker. The origin of the word informal is related, first and foremost, to the acknowledgement of an economic market beyond the formal rules of the official one. It was only in the '80s that the term started to be used with reference to physical aspects of spatial shape and, therefore, to city planning. The fact that flexibility and change are intrinsic factors of the contemporary society is an issue of paramount importance: it inevitably takes the discussion towards a in-depth analysis of informal processes that become integrated in stabilised realities like planned cities. Indeed cities are containers of different forms of urbanism that coexist or collide in a continuous attempt towards a synthesis, giving them a multi-faceted appearance. According to Rahul Mehrotra, such a continuous tension produces an intertwining of formal city and informal city or, using his words, of "static city" and "kinetic city". The physical manifestation of the static city becomes the background of a dynamic landscape and, therefore, temporal of the kinetic city (Hernandez F., Kellett P., Allen L.K.; 2010).

The intrinsic dynamism of the informal

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city has a typically temporary character which is often related to the use of non-durable materials (plastic, wood waste, scrap of various kinds, etc), that make this dynamism hard to figure out in a bidimensional way. On the contrary, this happens in the static city. On the one hand the concept of the static city is grasped through the representative value of its architectures, on the other hand the concept of the kinetic city is related to a specialization of associative values that it implies, resulting thus connected to a specific occupation modality of the spaces. Informality is thus conceived in a wider acceptation which is related to its development and articulation in time according to a local logic, being tightly connected to occupation of the space it creates, and thus specifically bound to the situation. Conversely, the static city aims at codifying the space in an abstract, generally valid order. The instability and the temporary character of the kinetic city are related to the logic of spatial appropriation by inhabitants. Indeed the frequent demolitions and evictions hat are carried out in such realities by institutional police, force inhabitants to find solutions that have a degree of flexibility and mobility through systems of resources recycling and saving. Yet, this separation between static city and kinetic city doesn't end up being a dichotomy without any points of contact nor interactions. On the contrary the intertwining they generate reveals a rich urban condition which is not connected to a "big urban vision, but to a big regulation".

The interrelation of static city and kinetic city, from different points of view (economic, spatial, organisational, etc.) makes the boundaries between the two terms weak and supports an overall view that is more oriented towards concepts like hybrid and simultaneity aiming at conceiving informality as a "contagious phenomenon that will humanize the city" (Hernandez F., Kellett P., Allen L.K.; 2010).

According to a vision of the two terms that rejects dichotomy in favour for a dialogic concept that integrates the two aspects, we ought to shed light on something that is often neglected or simply not considered in the project: the informal and spontaneous practice which is bound to the use and appropriation of the spaces by inhabitants. The relation that establishes between spatial form and social, economic and cultural processes is complex and, as such, requires an "open" analysis that refuses an approach of dogmatic meaning giving of the terms. Considering the complexity and the size of the phenomenon, greater delimitation and definition of the field are considered necessary in order to identify its manifestations which not always coincide with the mere physical appearance of the city, but which are actually related to the organisation itself, be it social, economic or cultural.

Thus, the relationship between formal and informal is perceived as a socio-spatial continuum and such a continuity is mirrored in the city's organisation and in the process of space appropriation. The large introduction about the expanded boundaries of informality prepared the ground for an analysis of which project characteristics can be catalysts of these fields, emphasizing the necessity to hypothesise a wider operational approach which would be valid in general terms, instead of limiting it to the merely informal reality in the physical sense.

The PREVI-Lima project: encounter between informal city and urban design

Currently, the city of Lima has almost nine million inhabitants, the 70% of which lives in informal accommodations. The matter of informality in Perù has already been tackled in the past by the architect John Turner, who writes speaking of the owner of a house in a barriada[1]: "la ve como el arquitecto mira a su edificio en las etapas delicadas de su nacimiento; no como el desastre que parece en ese momento ni como el caos que ven los no entendidos, sino como una promesa de lo que está por venir" [2] (John F C Turner ; 1963).

Turner used to see exactly in the barriadas the solution to the problem of accommodation for the poor and claimed that self-constructed houses near the city centre were the solution to rural immigrants' problems since the position allowed to save time in the journey to work, which did not happen by decentralizing them in the suburban areas. With his expression

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"housing is a verb", he highlighted a separation line between the "helpful shack" and the "oppressive house", stating, in this way, the importance of the houses' use value (McGuirk J., 2015).

The remarkable increase of the population of Lima between 1940 and 1960, which was due to the migration of big masses seeking a job from Andeans regions towards the city, generated, as a result, a further increase in the creation of fabrics called "young towns". They were real barriadas that arose concerns in the Peruvian government. During the first administration of the architect and urbanist Fernando Belaúnde (1963-1968) housing programmes were undertaken in order to find a solution to this phenomenon. The activities aimed at building social housing and accommodations for the middle class. Lastly, an experimental housing project was launched: the PREVI (Proyecto Experimental de Vivienda).

The experiment (1965- 1973) is the result of the cooperation among different actors: the Peruvian government, the United Nations Development Programme (UNDP), the United Nations (UN), the Banco de Vivienda de Perù and the British architect Peter Land who was entrusted with the project supervision. The government provided economic capitals, local staff and the lands, the UN and the UNDP contributed with technical assistance, international staff and bearing the costs of the international competition.

The PREVI was divided into 3 experimental projects: the PP1, which was focused on the building of a new district; the PP2 that aimed at recover a degraded fabric through a series of operational plans; lastly the PP3 that involved the project of the services and the arrangement of the lots for the rationalization of self-constructed houses.

After the earthquake that destroyed most of the city of Lima on the 30th May 1970, the PP3 was divided into two subprogrammes: a self-construction project of the Ministerio de Viviendas on the one hand, and a post-disaster reconstruction project on the other hand (PP4), which was based on earthquake proof systems and the employment of local materials with methods of self-construction.

For the experimental project PP1 an international competition was organized, where the requirement in the announcement was the design of short houses at high density -vivienda de baja altura y alta densidad (BAAD)[3]-. World-class Architects were called to participate, in total 13 international teams and 13 Peruvian ones under the direction of Peter Land.

The land of about 40 hectares 8 Km north of the centre of Lima would see accommodations for 1500 families on lots of 80-150 square meters rising up with houses of 60-120 square meters with one or two floors, but able to bear the addition of a possible third one.

The PREVI was conceived as a formal district that could develop informally, a platform for its transformation, where the houses were nothing more than the principle itself and not the final objective. It was a real urbanistic collage in which each architect analyzed the behaviors of the future users and transformed them into living spaces. The novelty, indeed, was Peter Land's choice to build the kind of houses with a patio that belonged to the Peruvian tradition instead of building the tower blocks typical of the social construction of the '60s. The limited height would allow the following development: what was recognized and absorbed of informality was the growth capacity, in line with the fundamental principle of the barriadas according to which a house is a process and not an immutable object (García-Huidobro F., Torres Torriti D. and Tugás; 2008).

What makes the success of this experiment so evident is the fact that although the economic conditions of the inhabitants changed, they did not move, they stayed in the district making changes and improvements and transforming a district of social houses in a vital fabric similar to the one of the middle class. The main aim was to develop a generalized method that would be applicable and reproducible, becoming thus part of housing policies of the Peruvian government. The project aspired to build low-cost houses with the related services based on the development of innovative technological solutions by better exploiting resources and by cutting building costs through innovation of the construction methods. It is precisely in the building rationalization and in the prevision

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of the future continuous growth in the initial phase that is the importance of the experiment: the project is considered a transitional stage where to channel the fulfillment of inhabitants' needs and not an end point.

The project design implies associative and growth forms that would stimulate the formation of the neighborhood also through the compactness of the conglomerates, spaced out by small squares accessible on foot from narrow streets. Moreover, the low- cost prefabrication system and the one of dry-stone assembly would implement the local industrial production. Although in some cases choices that belong to the prefabrication on a large scale from Europe have been preferred (Polish and German solutions), in general the PREVI had a series of proposals where there was a union of industrialized techniques which are popular in Europe with the state of development of the Peruvian local reality of that time. It all lead to a choice that aimed at a more than industrial rationalization of the constructive system itself through compatible elements according to a logic that grasped the local construction modalities, allowing thus a further development by the inhabitants themselves. (E.g. Tabibloc – Spain, lighten panels – Switzerland, modular concrete blocks – Colombia).

The PREVI provided a planning key that perceives architecture as an open process which is in continuous transformation in order to adapt to its inhabitants' needs. The houses, indeed, were thought for families with two to six children and they also considered wider families of 10 people. The acknowledgement of the extended familiar composition, related to informal economic activity, allowed to structure living spaces based on the multi-family home. Indeed a different composition of the Latin American family has been acknowledged, which is more extended than the European one, bound to a precise and restricted family unit.
There was possibility of growth and development thanks to expansion devices of the project that allowed a dual direction of the expansion: vertically, through static devices (ladders and technical installations that have been prolonged), horizontally, through dynamic elements (patios, gardens and terraces that have been modified and contaminated in order to insert new spaces or uses) (García-Huidobro F., Torres Torriti D. and Tugás; 2008).

The expansions and modifications that inhabitants added changed the district's overall image both in terms of buildings' height, since, from the three floors of expansion they reached four or five floors in some cases, compromising their static stability, and in terms of uses. Indeed commercial activities were introduced in the residential fabric, eliminating thus the distinction between public and private spaces.

The experience of San Ysidro – Living room at the borders

The border line between The United States and Mexico stretches for more than 3000 Km through four states of the USA (California, Arizona, New Mexico and Texas) and six Mexican states (Lower California, Sonora, Chihuahua, Coahuila, Nuevo León and Tamaulipas). Most of the cities along this border have an intense series of economic, social and cultural relationships with the corresponding cities beyond it, to an extent that they can be considered twin cities, just as it happens with Sand Diego and Tijuana. This reality which is rich in relationships and exchanges leads to the creation of a different kind of city which is related to the concepts of transculturalism and multiculturalism. On the one hand San Diego is the symbol of a kind of town planning based on control and planning from above, according to the logic of separation and exclusion (gated communities), on the other hand, Tijuana is a city that can be considered hybrid, the result of informal layerings and dynamic processes of transformation from below.

Such an emblematic situation of the border territory between The United States and Mexico reveals the difficulties of an area that absorbs different migration and cultural flows and has a double value: on the one hand it unites the city in commercial terms since it allows the productive flow to take place (also guaranteed by the Free Trade Arrangement N.A.F.T.A.), and, on the other hand, it creates a clear separation from the anti-immigration objective.

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The exchanges that take place through the wall that separates the American part from The Mexican one create relationships of interdependence between the two parts which make this division porous and uncertain, by activating cultural exchanges that generate contamination. Speaking about globalization nowadays implies pondering on the idea of boundary and on the spatial meanings that it encloses. According to Pietro Zanini the term boundary refers to a vital space of cultural hybridisation, but also a space of contrasts, a membrane that lets different realities pass through its pores in an interpenetration process that continuously strives to balance (Zanini P.; 1997). The main theorist of the frontier, the architect Teddy Cruz (professor at the University of California, San Diego) can be considered a "cultural activator in critical areas" and he managed to find a common point between the Mexican informal urban dynamics and the gated communities of American suburbs. He conceives the border line that divides the two cities as part of an imaginary line that he defines as "political equator", that is to say a line that stretches along the Equator and that marks the distinction between formal North and informal South and between the developed world and the developing one (Cruz T.; 2008).

San Ysidro is located in the South part of San Diego (the current border line was established in 1848, after the annexation of the area to the United States), a community made up of Latin American immigrant families located on the border with Mexico, to which its develop as a frontier crossing territory is to be attributed.
The San Ysidro experience, developed by the ETC (Estudio Teddy Cruz) in collaboration with the Casa Familiar ONG, starts from an analysis of the ongoing processes in the San Diego territory in the border area with Mexico. In this area, it was noted that informal settlements grew faster than the central areas, according to dynamics that resembled Tijuana's settlements across the border.

According to this logic of informal spatial organization, an intervention was undertaken involving the introduction of heterogeneous elements to the system that could channel planning towards development prospects through a real process of "urban acupuncture".

In addition, Teddy Cruz makes use the concept of the use of multi-dimensional space in informal settlements, according to which a home is a microcosm capable of performing various functions (multifamily home, commercial space, cult place).

The project Living Rooms at the Border is significant for its proposal to combine private life and common activities through a combination of functions (multi-family homes, services and infrastructure) inspired by the spontaneous housing aggregation system of the Tijuana urban center.

The housing units are surrounded by a public garden and are built on a concrete structure in which the ground floor is considered a urban plant capable of performing community and collective functions, privileging an open and indefinite character and avoiding a specific definition.

The living area is a place of family conviviality and is often in common, while the church fulfills the function of a multifaceted social center. The main objective of the project was to convert unused lots into a dense and rich housing program integrated with a range of services.

The project uses the bar code logic, cutting the lot into thin strips allocated to different uses and activities (open spaces, closed, open-covered, public and private) maintaining a flexible system ready to accommodate to the changing community's reality.

The functional program is based on two parcels, the first one offers different types of housing (small flats, larger family houses, studios for artists and flexible units for temporary guests) assisted by a service system, while the second lot includes houses for elderly people with built-in nursery schools, according to the concept of intergenerational system (McGuirk J.; 2015).

An important feature of the project lies in the involvement of several actors that have allowed the development of the design chain, allowing communication and collaboration between the various parties involved. The non-profit company Casa Familiar has been fundamental in mediating between institutions and residents both from a social and economic point of view,

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by carrying out bureaucratic procedures until residents have acquired housing units.

The main characteristic of this experience was the creation of a participatory micro-development model, a real micro-policy strategy (AHOZ - Affordable Housing Overlay Zone) where housing is seen as a system of economic and cultural interaction, which make the residing community an active component of the whole process.

The fundamental novelty behind the idea of the project lies in the diversified use of the land, Cruz claims in this regard that: "Necesitamos un nuevo concepto de densidad. La densidad se sigue midiendo como un número de cosas – de unidades – por hectárea. ¿Por qué no medirla como el número de intercambios sociales y económicos por hectárea?"[4] (McGuirk J.; 2015). In this sense, Teddy Cruz's study has seen in social density, not the housing-density, the key to the success of the initiative.

All stages of the project have been supported by a number of political structures that initiated a development process in which the ONG Casa Familiar could act as a promoter and facilitator between institutions and residents, promoting a subsidy system and administering microcredit to individuals. Redefining the concept of ownership has been the core of the project itself, as residents have become partners of Casa Familiar and therefore co-owners of resources and active part (Cruz T.; 2008).

The innovative character is considering the value of the project as a spatial capital that can generate exchanges and interrelations, enabling socialization and avoiding marginalization of people.

Conclusion

In the cases discussed it is highlighted that the informal city is not conceived as a design tool as such, but as something capable of stimulating the creation of flexible spaces, hybrid environments that allow the dynamic qualities of the kinetic city to manifest themselves.

In PREVI Lima, thanks to the variety of housing solutions since its first conception, it was possible to adapt the spaces to the needs of the inhabitants, avoiding urban monotony. The monofunctional nature that characterized the district at the beginning was contaminated by the spontaneous introduction of commercial activities within the fabric, especially evident in homes that, having double access, are more predisposed to accommodating these activities inside them.

The hybridization to which informal cities tend suggests that projects where there is no separation between public and private space and between different functions and activities can be more able to meet the needs of the inhabitants.

The possibility of foreseeing future expansions with a view of total flexibility has seen a recent improvement in the incremental housing of Alejandro Aravena (eg: Quinta Monroy project). Although in this case enlargement is less free and more constrained than in the PREVI: in Aravena's houses the expansion takes place in spaces between the houses, in PREVI Lima it took place in different directions (from inside out, horizontally, and from bottom up, vertically).

The logic of the fragmentation and assembly of the informal city is transposed into the constructive system, preferring small elements to the large-scale prefabricated systems, this has allowed the inhabitants to fit into this constructive system and integrate it.

Ultimately, PREVI is an urban collage of streets and different types of houses whose outcome is an image of a heterogeneous landscape. Thus, this variety combines the life project of the inhabitants with the project of architecture.

The second case analyzed above, the Living Room at the border of Teddy Cruz, refers to the notion of open-ended projects, which consider the concept of living closely to social and educational programs, thus increasing the capital space of the inhabitants.

The adoption of systems that can combine public spaces for mixed use that join the private aspects of family dynamics with public and commercial activities -it all supported by the collaboration of different actors in finding a meeting point between bottom-up planning and public planning, conceives the theory of mixité, for typology as well as characters involved, as a design strategy-.

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In San Ysidro, inhabitants are active contribution as well as final users and the ONG Casa Familiar is a mediator between institutions and communities. The innovative value of the project lies in the rethinking of the concept of living itself, that, from being a material datum of housing density, gives up the place to cultural exchanges, becoming social density.

Such densification of social exchanges is achieved through a combination of uses able to generate a vital community tension. The hybridization of building types and uses at the base of the design idea gave the possibility to attribute a different value to the houses themselves, and urban complexity is achieved through a series of material and immaterial elements.

The project appears as a mediation between formality and informality according to an interdisciplinary approach, whereby design ideas and urban policies are inseparable.

In line with what Alfredo Brillembourg and Hubert Klumpner claim: "the planned city can neither eliminate nor replace the informal qualities and practices of its inhabitants"[5]. For them, the XIX century had generated the horizontal city, the XX century the vertical city, and thus the XXI century is the century of the diagonal city, which recaptures social divisions (McGuirk J.; 2015).

The project should be a means of knowledge and a useful tool for re-connecting material and social reality, as well as an infrastructure capable of working on various scales (from the territorial dimension to architectural punctual injections).

Notes

[1] A shantytown section on the outskirts of a large city in Latin America (source: www.dictionary.com)

[2] The inhabitant sees the house as the architect looks at his building during the delicate stages of his birth; not as the disaster that seems at the moment nor as the chaos generated by misunderstanding, but as a promise of what is to come

[3] Low-rise and high-density housing

[4] We need a new concept of density. Density is still measured as a number of things - of units - per hectare. Why we don't measure it as the number of social and economic exchanges per hectare?

[5] From an interview with Alfredo Brillembourg y Huberto Klumpner, Urban Think Tank founders "La ciudad planificada no puede ni eliminar ni subsumir las cualidades y prácticas informales de sus habitantes. Lo informal persiste; sus fortalezas inherentes resisten y rechazan los esfuerzos por imponer orden. La ciudad totalmente planificada, por tanto, es un mito"

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Figure 1. PREVI housing collage (source: García-Huidobro F., Torres Torriti D. and Tugás (2008), ¡El tiempo construye! El Proyecto Experimental de Vivienda (PREVI) de Lima: génesis y desenlace, (Gustavo Gili, Barcelona)

Figure 2. Growth and development of PREVI Lima from 1978 to 2003, from left to right: Miro-Quesada-Williams-Nuñez project, Josic-Candillis-Woods project and Charles Correa project (source: García-Huidobro F., Torres Torriti D. and Tugás (2008), ¡El tiempo construye! El Proyecto Experimental de Vivienda (PREVI) de Lima: génesis y desenlace, (Gustavo Gili, Barcelona)

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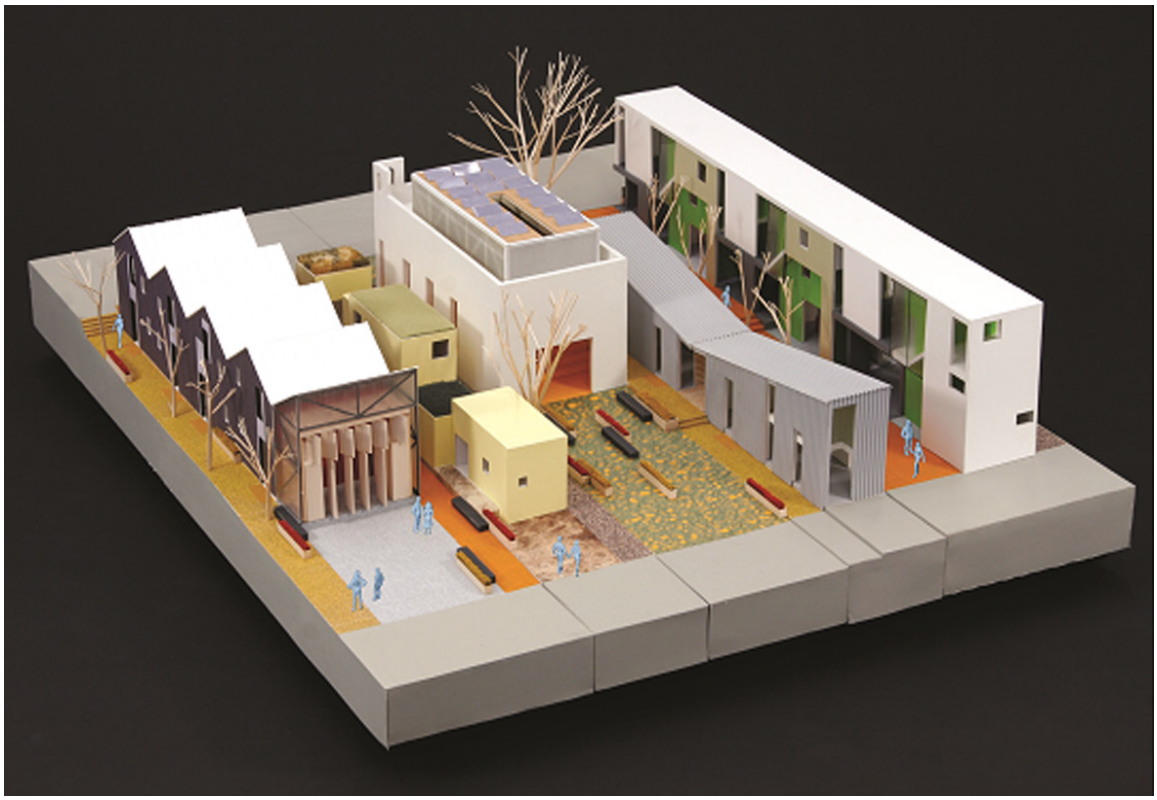

Figure 3.Living room at the border project (source: http://blog.ted.com)

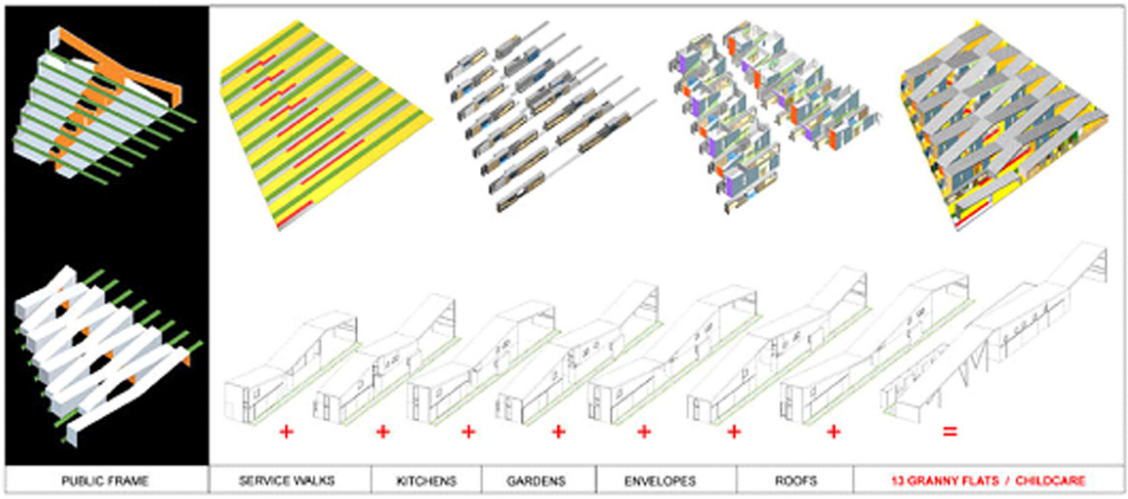

Figure 4. Diagram for Senior Housing with Childcare. (source: www.moma.org from Estudio Teddy Cruz)

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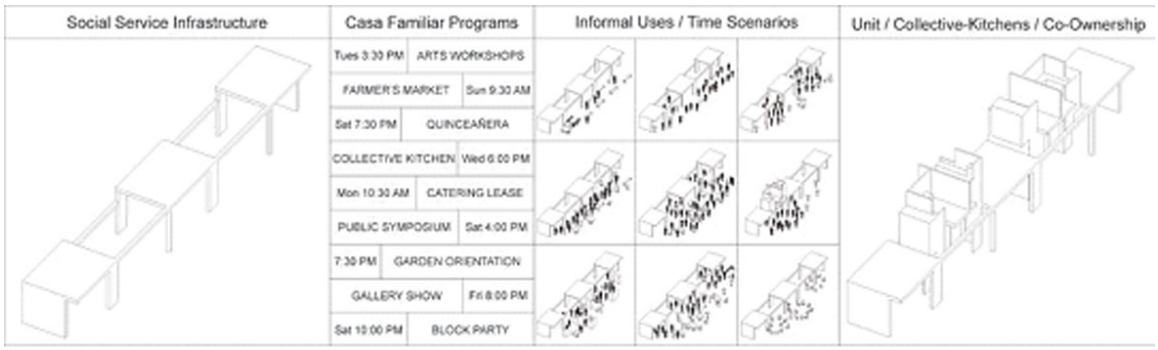

Figure 5. Applications of multiuse frame over time (source: www.moma.org from Estudio Teddy Cruz)

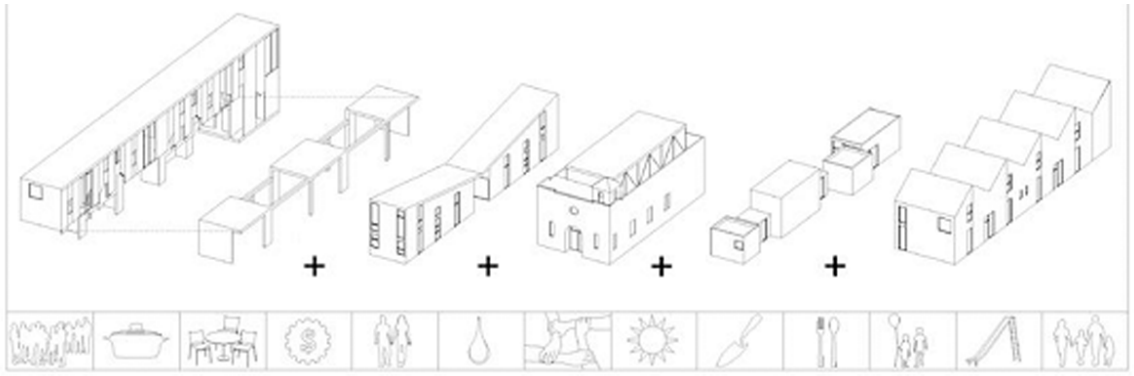

Figure 6. Typologies included in Living Rooms at the Border (source: www.moma.org from Estudio Teddy Cruz)

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City and territory
in the Globalization Age

4. Efficient use of resources in sustainable cities

A quest to quantify urban sustainability. Assessing incongruous growth

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Abstract. *Urban planners, politicians and citizens need comprehensive and clear information in order to conduct or to get involved in successful evidence-based planning and policymaking. The objective to improve the quality of planning outcomes both at the local and regional level needs design mechanisms that can help verify and support urban planning approaches with quantitative analyses and simulation tools. While this issue has been explored through extensive literature on the topic, there is still plenty to research further, especially when dealing with the evaluation of plans, such as local plans of urban development, comprehensive plans, municipal studies or larger planning involving multiple municipal associations. The use of quantitative analyses may be applied to several aspects of the physical form, including connectivity, ecological system continuations, built structure conciseness and its urban boundary, urban tissue morphology, among others. Quantitative analyses completed by qualitative description and enriched with socio-cultural assessment can result in a comprehensive picture of an area's current and planned state. This paper presents our experience with mapping residential structure typologies in Lodz, Poland and its surroundings. This mapping assessed the existing residential densities and planned development capacities considering the area's demographic dynamics in the background. The method revision is completed by examples of open green space quality assessment.*

Keywords: Urban Morphology, Population Density, Quality of Life, GIS.

Introduction

The configuration of urban areas plays a key role in its sustainability. Sustainable planning outcomes at local and regional level need support from urban planners and designers, segments of the civil society, stakeholders and authorities. Efficient and coherent planning needs comprehensive and verifiable outcomes on which to base their approaches and policymaking (Faludi and Waterhout 2006). Verifiable outcomes are able to become inputs for direct evaluations of urban policies. Quantitative and qualitative analyses and simulation tools should pragmatically sustain decisions. Particularly, quantitative methods need to be applied to many aspects of the urban structures.

Density analyses are one of the aspects that need a careful look upon. Density primarily supports the relation between population dynamics and physical development, which constitutes a key factor of sustainable urban development. Residential capacity derives from population density and also plays an important role in analyses supporting planning

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decisions. The adequate configuration of urban areas is essential to provide responsible urban settlements in the age of scarcity and rapid land consumption for all of its inhabitants. The assessment of quality of life in and sustainability of urban areas demands researches and definitions that touch both qualitative and quantitative criteria.

Suitable data analyses are run using suitable databases that aren't always available. Data that provide the basis for urban analyses have been progressively available, especially with the help of GIScience. The INSPIRE Directive in Europe, official land information releases, as well as data from crowdsourcing, free satellite imagery and other open source data creates opportunities to establish a set of available methods and tools that can support decisions on future developments (Hanzl and Bezerra in press). The developing agreement on urban indicator standards also helps in building a verifiable and comparable outcome.

We review applied methods of estimating density and residential capacity. On this backdrop, we present an application of urban morphology analysis illustrated by case studies in Lodz and other neighbouring settlements in Poland. We also address the assessment of quality of life through the existence of publicly accessible green areas and public spaces in urban settings.

Urban Density versus Open Space Provision

Cities that strive to achieve sustainability do so by taking into consideration the rationale for compact city development, by taking care of the natural and social resources and by understanding their population dynamics. The quest to relate the ecological perspective to population growth and therefore land consumption is almost controversial. While urban population grows, city boundaries expand at an unprecedented speed (Angel et al 2011), absorbing their greener outskirts and diminishing its gross urban population density. Although contemporary urban trends emphasise higher population densities, it has been diminishing de facto. There is far too much city space given to transportation infrastructure that adds to underutilised city voids or open areas. Newman and Kenworthy (1999) suggest an urban commons view that makes open public areas, parking and roadway spaces the focus of urban renewal and redesign. They bring together the notion of a very urban city, compact within itself, with environmental quality, urban greening, commitment to the city and its public values.

Urban population density is one of the tools that can propose concise urban development while preserving open space areas that might be dedicated to other activities that collaborate to urban sustainable development. Concentrated urban development can present higher urban density and simultaneously help to preserve agricultural, forests or other types of green areas on cities' outskirts. A planned urban densification can improve quality of life. However, planning needs to make formal provisions that connect number of inhabitants, therefore, a certain density, also to an amount of open and green areas.

The current situation in Poland mimics the uncontrolled market-induced, suburbanized land consumption that has happened in North America and Western Europe half a century ago. The socialist tradition of building isolated mid-rise residential blocks in the cities' outskirts has been incentivized by the lack of strategies for a compact city development or planning, expensive urban land, unknown ownership, and overly long and complicated development approval procedures within cities. City development has been dissociated to population dynamics, including density requirements. The recent 'Amending Act for the Strengthening of Landscape Protection' (PP2015) has started to associate population dynamics and the amount of urban land required for new developments, but it still doesn't have proper legislation.

The provision of open spaces brings both advantages and disadvantages to urban sustainability. While open spaces, and especially parking areas, new streets and areas dedicated to vehicular transport, has to be introduced with due care and limited in scale, the advantages of open spaces can be considered mainly twofold. Open spaces contribute to both social and environmental aspects of the urban area. First, it provides leisure

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opportunities and spaces for encounters, as plazas, parks and community gardens. Second, it can be a space where an area's ecological needs are attended by establishing a protected area, improving its natural habitat or even by alleviating the pressure on urban infrastructure through the application of green technologies. Either advantages are not excluding, but rather complementary.

Density Measurements

Density is the ratio between a given quantity and a unit of area. When applied to urban planning and design it can be used for a number of analyses, as an amount of population, dwellings or built spaces per unit of area. Density is a concept that has a broad application and a simple definition, but there is no established consensus applied to urban planning (Alexander 1993, Churchman 1999), which can hinder the comparison between areas, cities, and countries. Density comparisons can be difficult to realise, therefore its methodology needs to be clearly defined from the beginning. Within the definition of density, net and gross values can vary, as well as scales and area averages, which can change the interpretation of the results - if compared. This is mostly due to one of the most problematic and important definition for density outcome, according to Berghauser-Pont and Haupt (2010): the definition of the boundary area. However the outcome, a density measurement is a neutral indicator, and it does not express a judgment or automatically relate to any given morphological typology. Density measurements applied to urban planning can refer to an amount of dwellings, built spaces or population in a given area.

Residential Density Estimation Methods

Population density measurement relates the amount of a city's area to its population dynamics. It is one of the most basic and widely used types of density measurements applied to urban planning, as it is found in various planning documents and plans stating the preliminary assumptions for an area with residential use. Even though it can be found in many documents, it is not always a mandatory requirement. Poland's planning legislation does not bind population density to its plans, for example. Only recently the use of demographic forecasts as the background for the elaborations of Study of Conditions and Directions of Spatial Development has become mandatory (PP 2015); however, the implementation regulations have yet to be defined. The lack of this basic relation among number of inhabitants and land area can generate waste of resources and infrastructure - especially undesired consumption of green land.

Estimations on urban population distribution have been experimented with since mid-twentieth century. The range of application criteria includes workload and reliability, as well as the requirements of a given task and data available. The traditional method to analyse sample areas usually remains expensive and is time demanding. A gravitational mathematical model was created by Clark (1951) to show how population distribution is affected by its city's formation and population dynamics. Clark's model relates population distribution with distance to the centre, in analogy to the differentiation of urban fabric along this same axis. Other statistical models were developed throughout the following decades along with the use of laser, remote sensing and crowdsourcing towards the turn of the XXI century. The application of GIScience has also contributed to efficient estimation. However, these types of data are not always available for analysis. Therefore other, more traditional methods to approach residential densities are still used.

The use of building footprint for urban planning and design is one of the most common approaches. By surveying building footprints and moreover plot and parcel data, a database is built on which dwelling size, building footprint, Floor Area Ratio (FAR) plays a part in estimating residential population density and moreover its capacity. The method may either consist of summarising numbers of inhabitants per dwelling or use predefined dwelling densities, then assigning a density to

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building footprints or FAR parameters, which results in capacities values. The survey can be done by hand, or facilitated by the use of cadastral data, but can become cumbersome. GIS technologies play its part in optimising the processes and analyses. Smith and Crooks (2010) elaborated a version of such method for London that used address points to obtain data on number of dwellings per building.

Morphological Typology Approach

The survey method may use a morphological classification of the built typologies, stemming from their historical transformation and shaped by cultural and civilizational factors. The morphological method makes into account the basic features of the area: (1) parcellation either from comprehensive plans or cadastral data; (2) building forms and typologies; and (3) land use activities, function or land use. The use of these three features also defines a Conzenian urban region (Baker, Slater 2000).
Planners may use the morphological approach at various scales, starting from the city level and down to much more accurate scales of Local Plans of Urban Development. Usage of GIS significantly enhances the method's flexibility, thanks to the easiness to add or alter features' attributes. Moreover, the systematic approach enables urban form's definition consistency throughout one or more documents.

In 2002, a team headed by Mirosław Wiśniewski applied this morphological method for the evaluation of the city of Lodz's urban structure. The results of this analysis featured in the Study of Conditions and Directions of Urban Development (2002). The assessment, which addressed the whole town area within its administrative borders, was made possible thanks to the application of GIS database (Hanzl 2003). The method used morphogenetically uniform units, which varied in size from one to a dozen of land plots.

To distinguish the smallest morphogenetical units, Wiśniewski's team applied attribute concatenation. Features taken into consideration included the type of land-use, the form of built structures and parcellation properties. A given category featured similar types of urban fabric, for instance, downtown tenements or modernism blocks of flats, if their parcel divisions belonged to the same class and were from the same period. Urban open green spaces, such as parks or cemeteries made another category. The level of completeness, determined individually for each type of land use, added to the characteristics and enabled further estimations of future capacities. Combined values from several fields contributed to a matrix that defined the type of each single record.

The development of this morphological methodology has entered the curriculum of the Urban Structure Division in the Institute of Architecture and Town Planning at the Lodz University of Technology, headed by Prof. Weronika Wiśniewska after Prof. Jacek Wesołowski, and by the research conducted within the division, as Warsza (2012).

The initial framework of the morphological types serves as a basis to calculate population densities. Density values assigned to morphological categories enable the estimation of population capacities. The extent of a basic unit, which typically covers more than one single lot, increases the speed of the calculation process in comparison to other methods, described previously. During the seminar 'Sustainable Development in Urbanism' (Urbanistyka w rozwoju zrównoważonym) in 2016, students mapped residential typologies in the towns surrounding Lodz, Poland. One of the students' works is shown in Figure 1. As a next step they assess existing and potential densities and population capacities, both for the current situation and planned development. The results are further analysed taking into consideration the town's demographic dynamics.

Students of the Architecture for the Society of Knowledge master level program in the Faculty of Architecture at the Warsaw University of Technology used a similar method during the course "GIS – Parametric Description of Urban Space", tutored by M. Hanzl (Fig.2). They calculated the density capacity for Góra Kalwaria, Poland, using GIS aided by WMS data available through INSPIRE. This experience proved that morphological typology introduced as a framework for further

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measurement of population densities enhances computation speed and facilitates the analytical process in comparison to other methods. It is especially useful when there is insufficient cadastral data available from the authorities. Compared to the results of the course mentioned above, the application of GIS software for this task significantly improved its efficiency.

Residential Capacity

A carrying capacity derives from ecology and establishes a cap for the amount of activity that an environment can bear without cause damage to itself, therefore a maximum development density should be the limit for an urban setting (Oh et al 2004). The residential capacity is measured as the maximum amount of residential activity that an area can have without causing environmental, social or economical distress. Its measurement is conceived as a predefined set of parameters and is derived from the existing densities of population and physical structures. The residential capacity has been applied to the calculations of future densities for Lodz's downtown for the Study of Conditions and Directions of Urban Development currently being elaborated for Lodz. The population densities forecasts were obtained based on statistical data and aggregated to transportation units through the estimation of future capacities. These urban structures' future capacities were derived from the regulations of the documents of Local Plan of Urban Development approved for the downtown area, and aggregated to the same units. Figure 3 shows the population densities forecasts for 2015, 2020 and 2025.

The residential capacities were estimated using the Conzenian morphological approach, which enabled the estimation of both of current population densities as well as proved the available potential to further densify central areas. Lodz, which is the capital of the voivodeship and was the second largest city in Poland until 2006, has been rapidly depopulating since the beginning of the 1990s because of a crisis in the textile industry. The decrease of the population in the region's capital has further worsened through the spatial planning policy of its surrounding towns and lack of coherent regional strategy. Migration to smaller towns and villages in the area are the results of better quality of life in small towns with former citizens of Lodz seeking especially the abundance of open green areas in the suburbs. The planning study currently under elaboration contributes to the larger strategy of Lodz municipality to deal with this problem.

Quality of Life Measurement: Open Spaces' Role

Open spaces in the middle of developed urban land present a challenge to urban planning, as it is placed in valuable urban land fully connected to the urban infrastructure. Open spaces directly compete with the potential of creating more living and working spaces for the urban population. The provision of open spaces directly influences urban density as a nominal factor.

The assessment of urban settlements in relation to its sustainable development features many specific themes, such as is defined in the norm ISO 37120:2014, which is currently under review. This norm defines and establishes a comprehensive set of standardised indicators that evaluate city services and quality of life. These precise definitions enable comparisons between cities despite size and location, without defining an ideal level range. Measurement comparisons become a useful tool for city managers, politicians and planners.

A quantitative measurement of urban voids or open spaces along with other measures of the physical urban environment can demonstrate the varying degree of influence of each component in the overall urban life quality assessment. Directly, these voids (or open spaces) have an implication on population gross densities values. Open spaces can be considered green areas, such as parks, landscaped plazas, smaller squares and also streets or pathways. Streets also fulfil significant social functions, beside their transportation role. The increase in area of these open spaces decreases the gross population density, as it adds area without a residential population.

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Among the methods that measure the role of open spaces in urban quality enhancement, many are focused on the current presence of vegetation - namely trees. Vegetation can be identified by field measurements, satellite and laser data analysis. However the method chosen for identification, it is important to quantify them in urban areas. Urban vegetation and more precisely number of trees is widely recognised due to improvements in the urban climate by reducing the impact of heat islands, diminishing noise and improve the quality of air (Roloff 2016).

In the specific case of Lodz's Study of Conditions and Directions of Urban Development, open spaces were quantified by calculating tree trunks through the use of LIDAR 3D cloud point data. The numbers of trees may be aggregated to urban units of various scales. Fig. 4 shows tree densities in parking areas and streets landscape areas per hectare aggregated by Lodz's municipal information system units (SIM). Fig. 5 illustrates public green areas in square meter per capita. This unit of measurement is especially useful because it facilitates date comparison between various places.

The actual distances from these residential areas to urban green areas, such as parks, cemeteries and urban forests were also assessed. Fig.6a showcases the zones within a 300 meters buffer from public green areas in downtown Lodz. It is accompanied by data on share of people living within a distance of maximum 600m from green zones (Fig.6b). Architectural characteristics are also analysed when referring to the quality of open space, as (1) the measured the frequency of heritage structures and other buildings of recognised value; (2) the completeness of urban facades, especially when originally designed as a continuous façade; (3) the presence of defined street corners of streets; (4) the street network density and hierarchy, among others.

Conclusions

The compactness of urban zone has been recognised as one of the most important conditions of sustainable urban development. In order to achieve balanced development, the dimensions of urban zone and its capacities to adequately accommodate current and future populations have to be planned responsibly. To establish the correct relations between the sizes of planned urban zones, robust and knowledgeable methods of measurement of urban densities are called for. Such measurements can be used to support policies to avoid urban sprawl and its negative consequences while satisfying necessary requirements for quality urban living.

Urban planners use indicators such as population density measurements to support and relate a city's physical structures and its demographic dynamics. These indicators have the ability to measure growth and follow shrinking of settlements, looking to establish adequate planning strategies.

This paper showcases methods to measure population densities and capacities based on urban morphology analyses, with the assessment of densities attributed to predefined morphological units. We review already available approaches to density and capacities assessment and follow with the method based on urban morphology. Morphological typologies introduced to residential density measurements facilitate calculations due to the possibility of classification into smaller planning units. Generalisation applied from the beginning of the method enhances the overall performance of a survey. A detailed presentation of its development and applications in several locations, both in study works and in planning praxis illustrates the method's practical application.

The actual usability of quantitative assessment must take into account the presence and role of urban voids, namely open public spaces, which can be on the border of streets and parking areas, and influence the actual quality of urban life. A number of methods to measure their quality have been briefly introduced based on the example of Lodz Study of Conditions and Directions of Planning Development (under elaboration).

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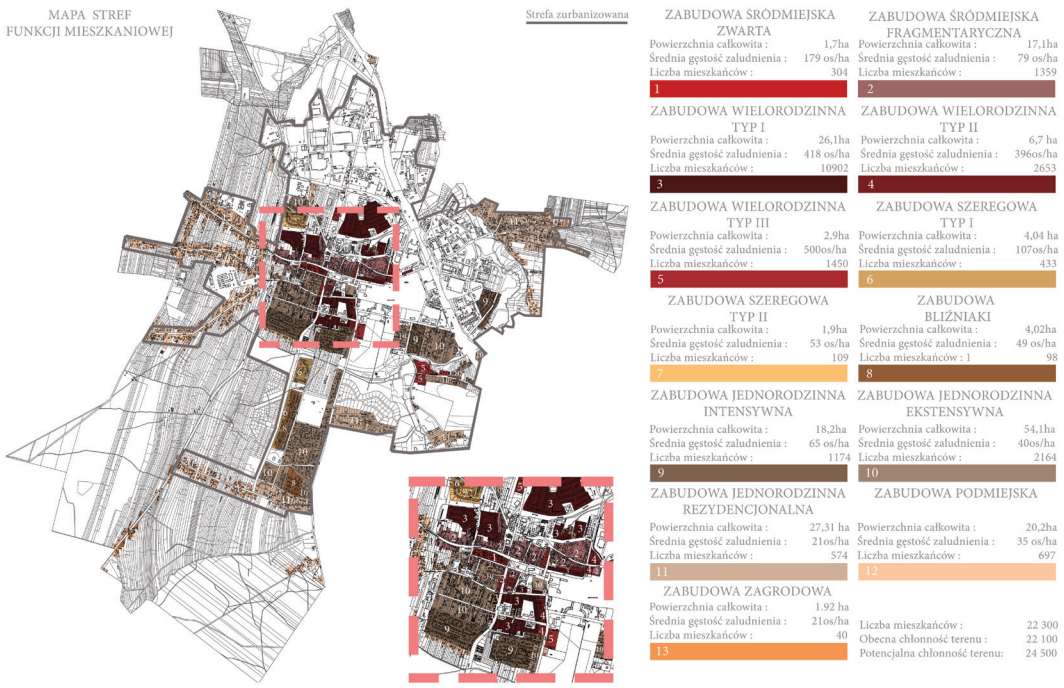

Figure 1. Urbanism and Sustainability Course, MArch 3rd sem. 2015/16, Students: Natalia Bąkowska, Sonia Dymitrowa, tutor: M. Hanzl, Institute of Architecture and Town Planning, Lodz University of Technology. Current residential development in Końskie.

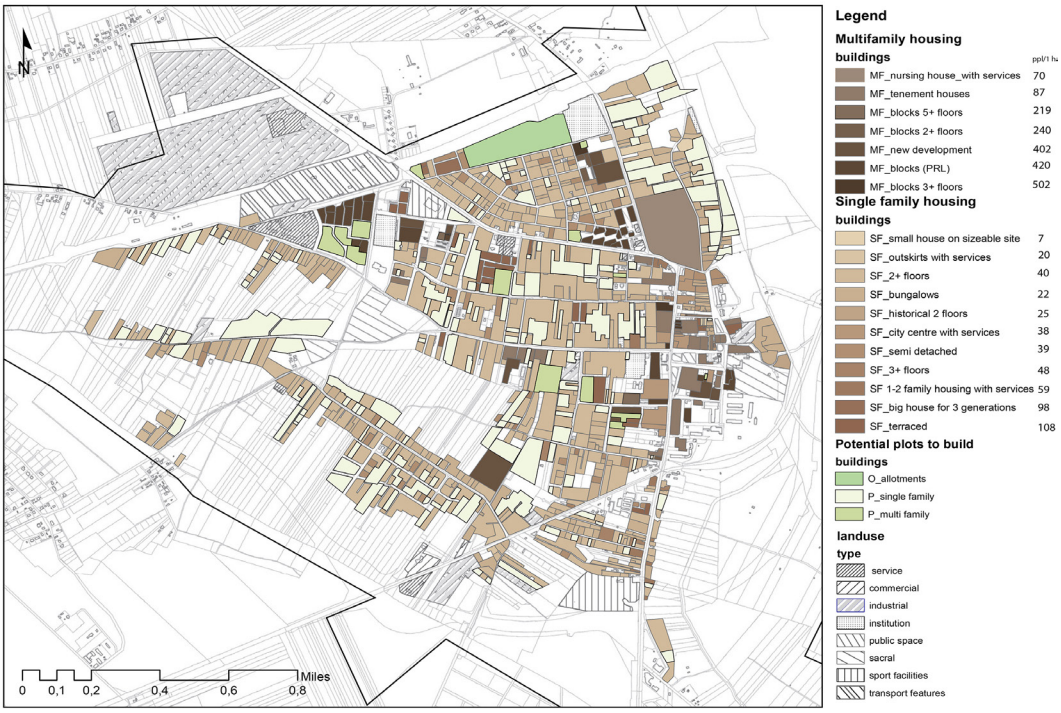

Figure 2. GIS – Parametric Description of Urban Space Course, MArch 1st sem. 2016/17, Students: Aleksandra Grzybek, Magdalena Koczewska, Magdalena Stepniak, and Sonia Molenda, tutor: M. Hanzl, Faculty of Architecture at the Warsaw University of Technology

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Figure 3. The population densities maps - the prognosis for years 2015 (A), 2020 (B) and 2025 (C) in transportation units. Source Study (under elaboration)

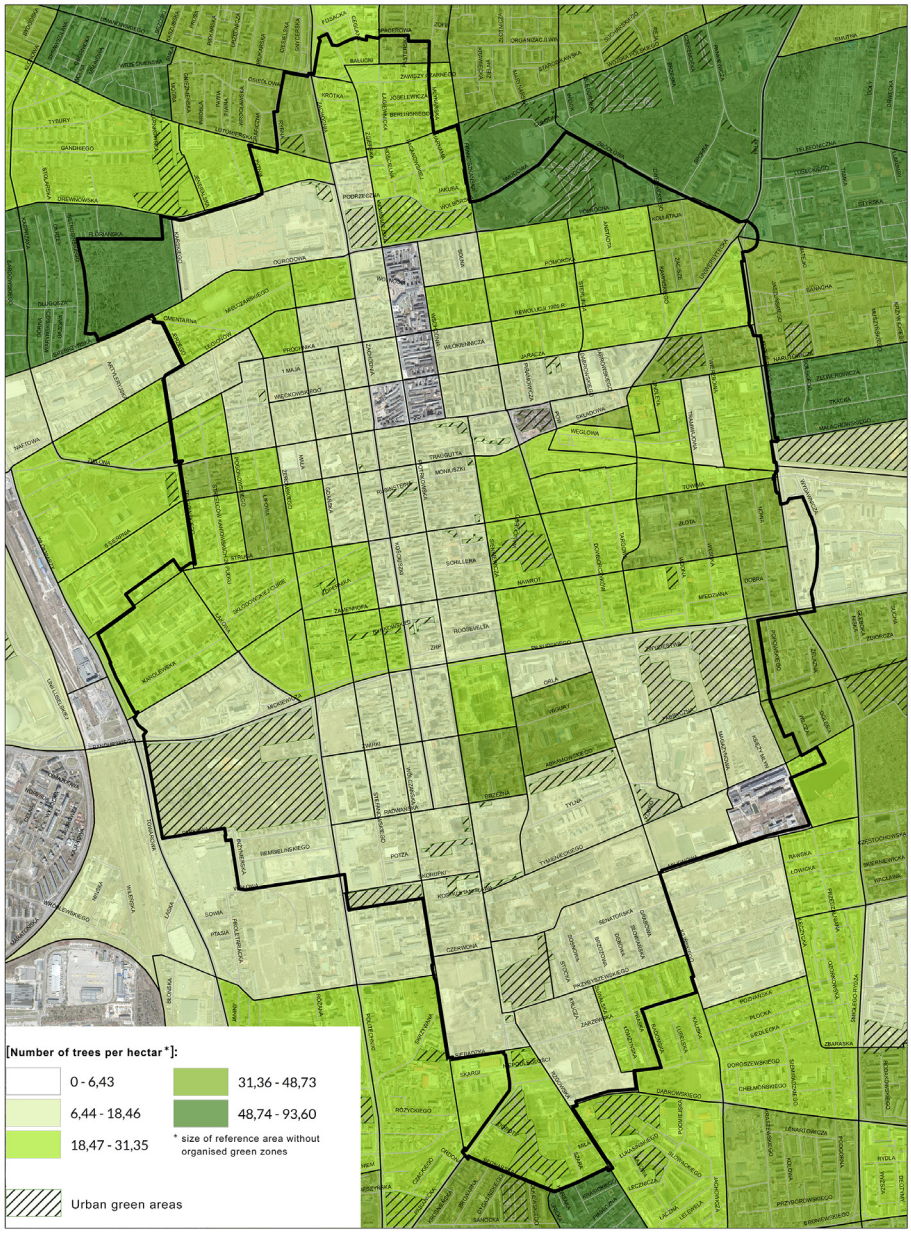

Figure 4. Tree densities in transportation areas per hectare aggregated to the municipal information system units [SIM]. Source Study (under elaboration)

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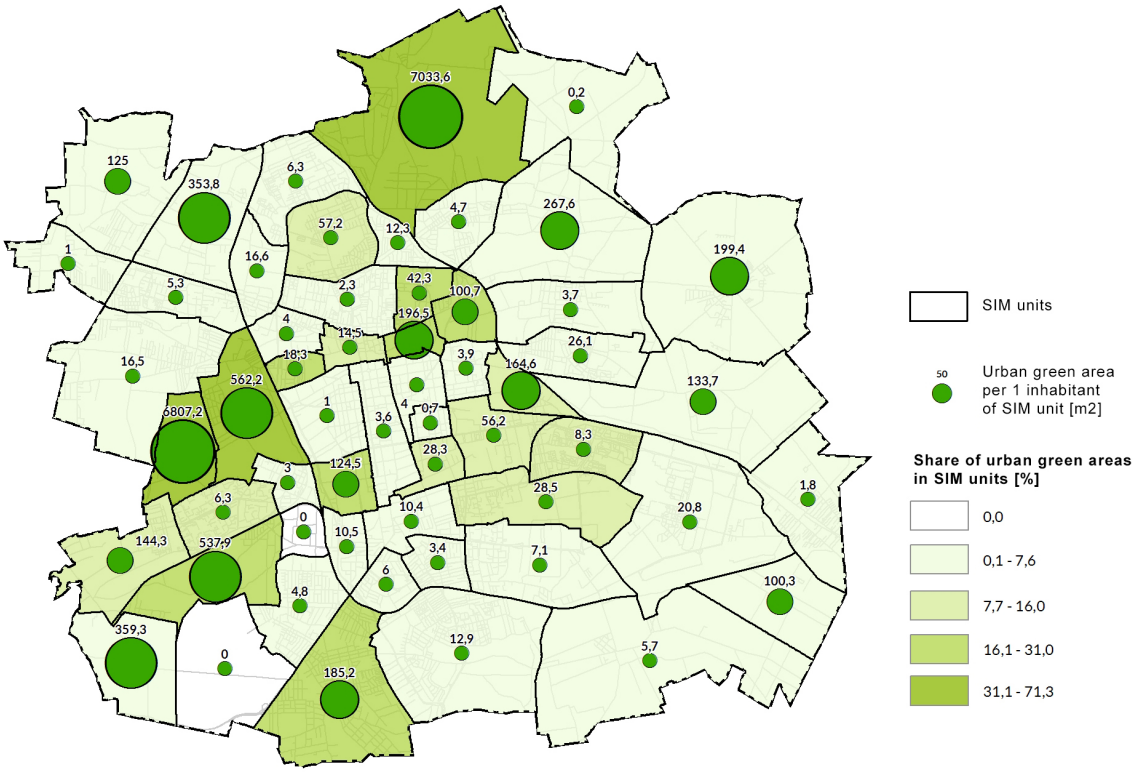

Figure 5. Public green areas (sqm per capita). Source Study (under elaboration)

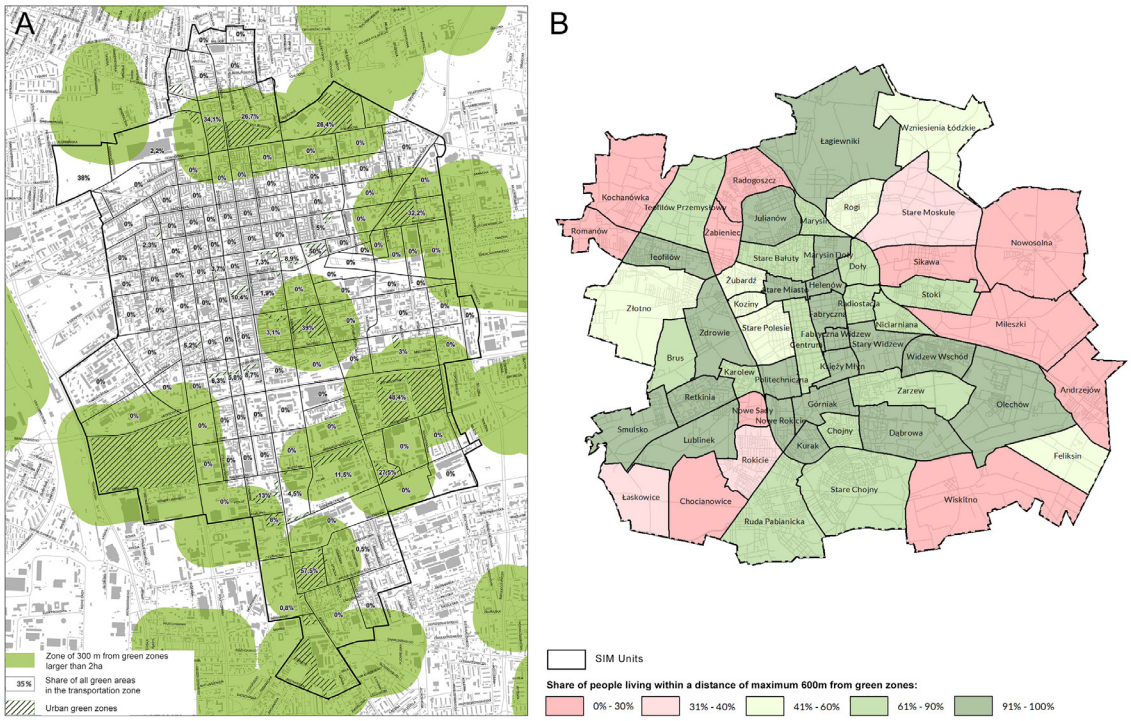

Figure 6. A. Zones within 300 meters buffer from public green areas in the Lodz downtown, B. Share of people living within a distance of maximum 600m from green zones. Source Study (under elaboration)

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Optimal urban density for a carbon free city in different climates

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Abstract. *In a carbon free city, the energy demand, including thermal energy (heating, cooling and hot water), power (ventilation and artificial light) in buildings and transport, need to be covered by the renewables gained on site or in the surrounding area outside of the town. This means a huge compensating area is required for harvesting renewable energy. This paper aims to explore the urban density that could potentially achieve the balance among three requirements: energy saving, land saving, and human scale. By holding constant of building type, number of inhabitants, thermal energy system, power harvesting system, lighting system, traffic energy (electric car), and street width of 25m, different scenarios of urban densities in various climate zones were compared. The results show that, although increasing urban densities by increasing number of storeys does reduce transportation energy consumption, the rate of decreased transportation energy consumption slows down as the number of storeys increases. Also, artificial light will reach saturation (100% of hours of use) with increased number of storeys and, therefore, increase building energy consumption. For cold or moderate climates, the optimal scenario would be 4 to 6 storeys. For the hot and humid climates, the optimal choice would be 6 to 8 storeys. These optimal ranges of number of storeys provide good daylight access and also fall into the range of human scale.*

Keywords: Zero Energy Building, compensating measure, urban densities, energy demand, land-use requirement

Introduction

The Paris Climate Conference in 2015, also known as COP 21, aims to achieve a legally binding and universal agreement on climate with the aim of keeping global warming below 2 degrees. To achieve this goal, cities will be key to a sustainable energy transition. This means our cities need to replace thermal energy (heating, cooling, and hot water) and power (ventilation, artificial light) in buildings and traffic with the renewable energy.

However, a critical challenge is that reaching the renewable targets is not always on the top of the priority list in the land-use planning process. Different aspects of urban development are competing with each other for more space and they are often contradicting with each other. For example, although larger number of storeys creates more area of use and reduces the demand for traffic energy, it also leads to less daylight and solar access to facades and increases the energy demand on lighting and heating. And the increasing demand for renewable energy also faces the challenge of increasing need of addition land outside of the city for harvesting renewable energies with wind turbines, PV modules, sustainable agriculture, and etc. The additional land outside of the city is referred to as the compensating land.

Also, higher buildings often do not fall into

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the range of a human scale neighbourhood. Therefore, finding an optimal urban density, which is defined as floor area ratio (FAR) or plot ratio, and land-use planning that could balance different development targets is a crucial step in the development a carbon free city. However, to date, most papers deal with only one specific aspect of carbon free city and there have not been many studies that include both the considerations of human scale and the land-use requirement of Zero Energy Building (Chen and Dietrich, 2016).

This paper aims to answer the following question in order to contribute to the discussion by considering multiple aspects of urban planning in the process of developing a carbon free city.

Which urban density is the optimal one that meets the requirement of energy saving, land saving, and human scale in developing carbon free cities?

Do results differ in different climates?

Methods, assumptions and measurements

For all calculations we assumed an optimized situation of the cities that should hopefully be fulfilled in the near future between 2030 and 2050. Today's urban planning should include these findings so that no further obstacle is created for meeting the goal of COP 21.
The buildings have a minimized demand for thermal energy:

For cold and moderate climates, such as Hamburg, a passive house is assumed. For 6 months per year, mechanical ventilation with heat recovery is needed. For 6 month per year, the building is naturally ventilated. According to an external shading system, a moderate window size and intelligent ventilation strategy are use. There is no cooling demand.

For hot and humid climates, such as Singapore, cooling demand is minimized by an external shading system, a moderate window size and an intelligent ventilation strategy. Air conditioning is running 12 month a year. There is no heating demand.

Energy demand for hot water is assumed to be constant for both locations.

For optimal daylight access the building depth is assumed with 14 m. The building distance is set to 25 m what corresponds to a good standard street width. Artificial light is assumed with 11 W/m² (energy saving bulbs). For traffic it is assumed that the whole fleet of cars has changed from combustion to electrical engines.

All thermal energy is covered by a geothermal system (on-site on the estate) with a heat pump (HP). If the size of the estate is not sufficient for heat pump to meet the heating demand, compensating land is required and here the wood pellets are taken into account as an example. Similarly, if the size of the estate is not sufficient for heat pump to meet the cooling demand, a power driven split device is used.
All power demand (heat pump, split device, ventilation, electrical equipment, artificial light, traffic) is covered by PV-modules mounted on the building's roof. If this is not sufficient, one of the options is to install wind turbines for power production on compensating land outside of the city.

All building related energy demands were simulated with energy plus based software (PRIMERO-COMFORT, 2009) . The effect of increasing power demand for artificial light as a consequence of shadowing from neighboured buildings is included.

To facilitate the task it is assumed that the thermal energy demand does not change with the building's shape and number of storeys. As a consequence the only changing energy demands are the ones for traffic and artificial light. The energy demand for traffic is estimated on basis of the work of Newman and Kenworthy (1999)(see figure 3). Their famous hyperbola describes the decreasing energy demand for traffic with increasing urban density.

In the following investigations twenty different scenarios of urban densities were created by changing the number of storeys. Table 1 presents these scenarios. The main target is to compare the building energy demand and the land-use requirement for estate as well as for compensating land in various climate zones. Different urban densities are simulated by varying the number of stories from one to twenty. The energy demand and the land-use requirement for estate and compensating land are compared. All results are related to 100 inhabitants.

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Result and analysis

Energy demand

The power demand has its basis on the constant values for heating, cooling, hot water, equipment and mechanical ventilation. The power demand for artificial light and traffic varies with the urban density (and thus the number of storeys), they have to be added to the total power demand.

In general, the power demand for traffic decreases rapidly with increasing urban densities but for larger urban densities the effect becomes smaller. Power demand for artificial light increases linearly with urban density. It reaches its maximum at urban density 4.3 (with the assumed 25 m street width that corresponds to 4 storeys) and does not increase further because the light already needs to be switched on all the time. That leads finally to a minimum in power demand at a certain urban densities. And this number varies in different climates. The detailed investigation is presented in the following.

Percentage of detailed energy demand

Cold or moderate cimate

The results in figure 2 and 3 also indicate that the effect of increasing urban densities on different energy demands is positive on artificial light and negative on traffic. The energy demand for artificial light increases with urban densities, while the energy demand for traffic decreases with urban densities. But this effect gradually becomes weaker and weaker as the urban densities increases. More specifically, when the urban density is larger than 1.43 (with the assumed 25 m street width that corresponds to 4 storeys), the demand for traffic energy slows down as the building becomes higher. Therefore, when the building height is larger than 4 storeys, artificial light becomes the dominant influence on the total energy demand

Furthermore, when the building height is taller than 8 storeys, urban density starts to exert effect on energy demand for heat pump for heating and hot water. This is due to the fact that, when the urban densities are larger than 2.87 (with the assumed 25 m street width that corresponds to 8 storeys), the whole estate is used up for heat exchangers. Additional compensating land is required to harvest more energy produced by wood pellets. When the urban density are larger than 6.10 (with the assumed 25 m street width that corresponds to 17 storeys), more than half of the energy demand for heat pump for heating and hot water is produced on the compensating land.

Hot and humid climate

Comparing with Hamburg, the demand for artificial light in general is lower in Singapore because there is more daylight during the hours of usage. When the urban density is larger than 4.31 (with the assumed 25 m street width that corresponds to 12 storeys), the power for cooling starts to increase with urban densities. Since power for cooling is supplied by HP and supplementary power for split device and HP is a constant value up to 12 storeys, the supplementary power for split device is required when the building is taller than 12 storeys. Because the estate area onsite is already fully used for HP for cooling.

Land-use demand

Total demand of land

Cold or moderate climate

Figure 4 shows that the urban density of 0.72 (with the assumed 25 m street width that corresponds to 2 storeys) requires the least land for estate and compensating measure. The land-use requirement for 2-storey building is even smaller than 1 storey buildings. When the building is higher than 2 storeys, the required land increases. The speed of increase becomes even faster when the building is higher than 8 storeys.

Further detailed results in figure 4 of about the land-use demand in estate, compensating land for power and heating provide the explanation. When the buildings are taller

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than 2 storeys, additional compensating land is required to produce energy for power demand. When the buildings are taller than 8 storeys, the whole estate is used up for heat exchangers. Additional compensating land is required to harvest more energy produced by wood pellets for heating demand. Since the energy density of wood pellets is smaller than the one of heat pump, much larger area of land for wood pellets is required off-site.

Hot and humid climate

Comparing with cold or moderate climates, a building with 3 storeys, instead of 2 storeys, requires the least land for estate and compensating measure in hot and humid climates. The land use requirement for 3-storey building is even smaller than 1- and 2-storey buildings. When the building is higher than 3 storeys, the required land increases and the speed of increase gradually slows down. There is a further slow-down when the building is taller than 12 storeys because there is no further increase in power demand for artificial light.
Further detailed results in figure 4 of about the land-use demand in estate, compensating land for power and heating provide the explanation. When the buildings are taller than 3 storeys, additional compensating land is required to produce energy for power demand. The power demand increases linearly until 12 storeys (corresponding to a ratio building distance to building height of 0.65) and when the building is taller than 12 storeys, the artificial light reaches its maximum because the light is always switched on and there will be no further increase with the urban densities.

Effect of alternative energy harvesting technologies (PV) on the compensating land
In this section, the results of land-use demand for choosing PV as an alternative energy harvesting technology are provided as a reference for comparison with that produced by wind turbines.

Cold or moderate climate

Figure 5 shows that, if the power is produced with PV on the off-site compensating measure, a 7-storey building and a typical street with the width of 25 m is the most land-use saving choice. When the urban density are larger than 2.51 (with the assumed 25 m street width that corresponds to 7 storeys), there start to show a rapid growth of land-use demand because of the low energy density of compensating measures using wood pellets for heating.

Hot and humid climate

Figure 5 also shows that, if the power is produced with PV on the off-site compensating measure, the higher the building the more land-use saving it is in hot and humid climates. However, the advantage becomes small when the number of storey is larger 6 to 8 storeys. Therefore, it is recommended to stay in human scale. There is no need for compensating measures for heating and only the need for compensating measures for power. The energy density of PV on buildings roofs and on land outside of town are identical. Therefore, the decreasing land-use demand can be explained by the increasing urban densities.

Comparing the energy harvesting technologies used in the city center and the one used outside of the city, the later has stronger influence on the final results of the off-site land-use demand. In other words, if the energy density of the renewable systems on site is higher than the one off site, the total need of land grows rapidly with growing urban densities. Because the land where high energy-densiy systems could be used becomes smaller. Thus, renewable energy production will be a mix of all available technologies. For example, the current distribution of the renewable power production in Germany is 20% of PV, 14% of water, 31% of biomass, and 35% of wind.

In the city center, we can choose the system with high energy density, such as geothermal and heat pump for thermal energy and PV modules on the building's roofs. Outside of town, this becomes more difficult. Thermal energy cannot be transported over long distances (district heating/cooling) only as material to burn (wood pellets, renewable gas etc). Such a production has a very low

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energy density. PV has the highest energy density but it is not a good idea to cover the whole land outside of town with PV-modules because that would hinder any other use, such as monocultural agriculture, and creates a competition with food production. The best place for PV modules would be on the building's roofs and in the desert from where power is sold to users. Furthermore, if we place wind turbines onshore, the land could be used furthermore for agriculture. If we place PV modules, the land could not be used for other purposes. In short, the value of compensating land is different when the multiple functions of land-use is taken into consideration.

Conclusion and recommendation

In this paper, different scenarios were created to explore the relationship between urban density, energy demand, and land-use demand. This research also compares this relationship in different climate zones using different energy harvesting technologies. The results show that low-rise buildings with high density may be an optimal option. It is suggested that the land-use planning for renewable energy must measure energy density as well as consider the amount of land required by different building designs. This research highlights the importance of land-use policy and the need for urban policy to create a more holistic view by including a land-use requirement for energy harvesting.
With regard to the development of renewable energies, our future must be based on power. Such systems have the highest energy density. With regard to the guidelines for sustainable urban development: use the minimal urban densities 1.0 (100 inh/ha) so that it stay in the lower part of Newman-Kenworthy hyperbola and create an energy efficient traffic system based on tram, subway, bus etc. avoid too high urban densities, as they do not reduce energy demand remarkably but influence daylight access and human scale negatively building heights should be in the same range to avoid shadowing of roofs for renewable energy systems on site, choose the one with the highest efficiencies, such as geothermal or PV modules on building's roofs select compensating measures carefully so that there is no competition between harvest of renewable energies and food production, need of forests etc.

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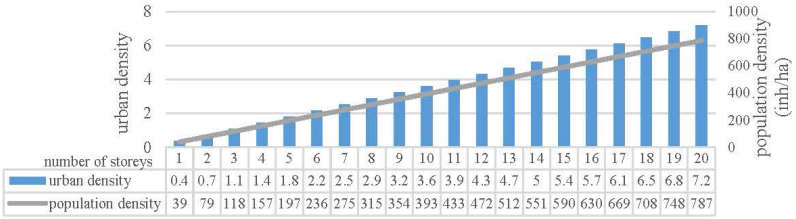

number of storeys	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
urban density	0.4	0.7	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	3.9	4.3	4.7	5	5.4	5.7	6.1	6.5	6.8	7.2
population density	39	79	118	157	197	236	275	315	354	393	433	472	512	551	590	630	669	708	748	787

Figure 1 Twenty scenarios with different urban density and population density by number of storeys.

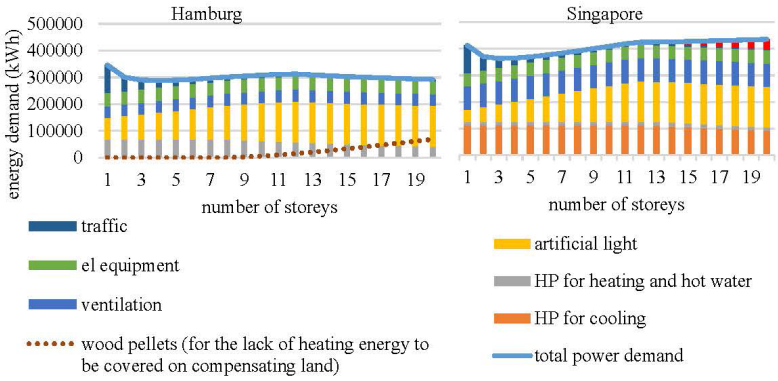

Figure 2. Energy demand of different categories in Hamburg and Singapore.

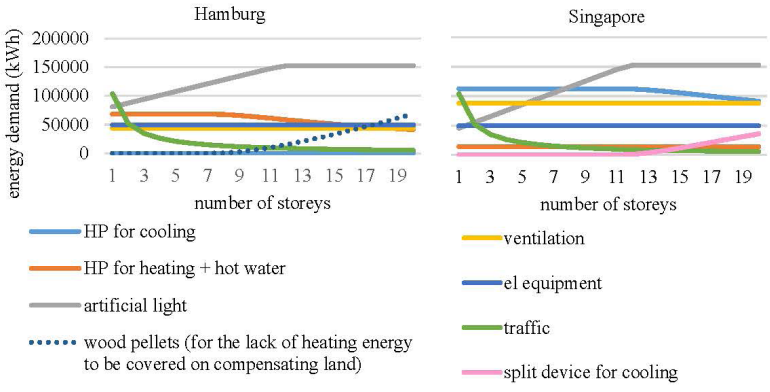

Figure 3. The detailed comparison of energy demand of different categories in Hamburg and Singapore.

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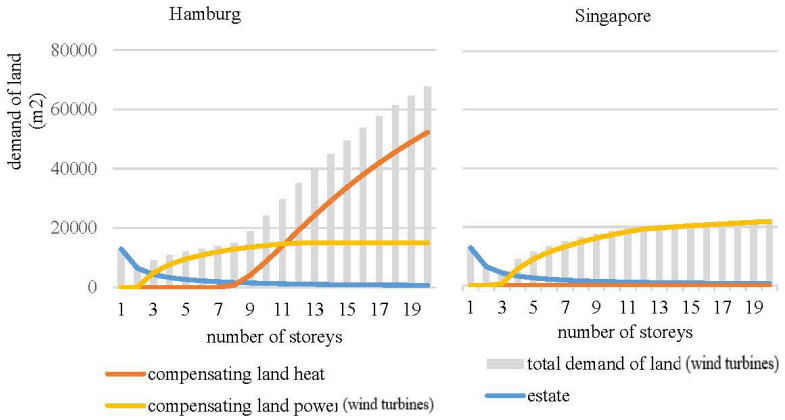

Figure 4. Effect of urban densities on the total demand of land and the detailed comparison of the land-use demand in estate and compensating land for power and heating in Hamburg and Singapore.

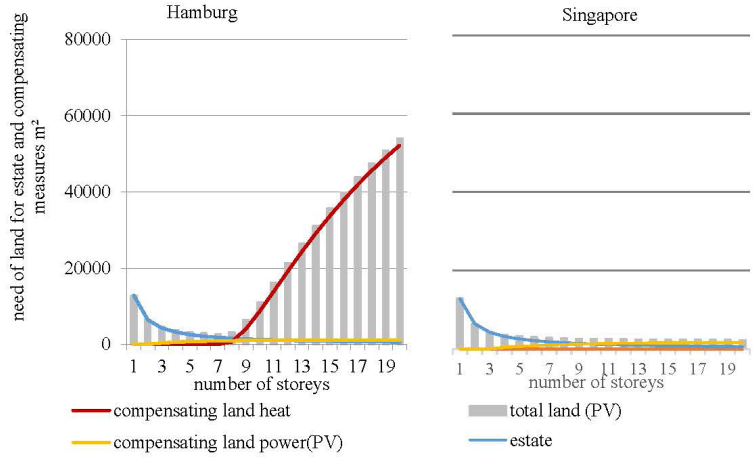

Figure 5. The need of land for estate and compensating measures to produce power with PV.

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Pilot studies on optimizing land use, building density and solar electricity generation in dense urban settings

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Abstract. *Previous studies have identified links between the urban form and the performance of urban energy systems. Land use and density are two important aspects of urban planning and design. This paper studies the relationship between these aspects and the performance of an urban energy system. For this, the study compares different metrics of land use, density, and energy performance. These metrics are floor area ratio, density gradient, land use ratio, renewable energy share, and the peak electricity import from the city grid. The approach is based on the multi-objective optimization of the urban form. The results offer what-if scenarios on how land-use and density can either maximize the performance of an urban energy system.*

Keywords: Military engineering, fortification, urban bastioned system, poliorcetics, city and territory.

Introduction

Cities consume about three-quarters of the global primary energy (UN-Habitat, 2012). Compared to that of the beginning of the Twenty-first Century, urban areas are expected to triple by 2030 (Seto et al., 2012). The future performance of urban energy systems could be substantially influenced by how urban areas are planned, designed, and built (IEA ECBCS Annex51 - Subtask B, 2012). On the other hand, energy systems could enable new possibilities to shape the form and location of buildings. For example, a district cooling system can free up the building rooftops for more architectural design options, like an infinity pool or a sky garden. Besides, it allows more space to install photovoltaic panels (PV). The urban form of a city, described by its land use and density, could influence the energy performance of a district (Hsieh et al., 2017). This paper focuses on the interdependencies between urban form and PV.

Density (floor area ratio) and land use are the two main controlling parameters in the master plan of most cities in the world. In particular, we assume that density is not homogeneously distributed, but rather may correspond to the sun path and the angle of solar radiation. Such heterogeneous urban density distribution exists for other reasons as well. For example, the density of an area immediately next to a transit station is higher for more accessibility and higher real estate values (Cervero and Guerra, 2011). Acknowledging such a transit-oriented urban typology with specific heterogeneous density distribution exists, we intend to explore if any of its design metrics can have a substantial influence on the performance of the electricity generation from PV panels.

As an example, we place this study in the context of Singapore. The annual irradiation

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in Singapore is 1636 kWh /m2 (Luther and Reindl, 2014), with little seasonal variation. However, the share of diffuse radiation is around 55%, and the daily variability is high due to the frequently changing cloud coverage (Luther and Reindl, 2014). Due to the space limitation, the PV modules are mostly installed on building rooftops or facades. Moreover, as for the transit-oriented urban typology, the Authority of Singapore allows additional built area if the project falls into a certain radius from the transit stations (Urban Redevelopment Authority, 2017).

The Methodology section describes the design of the experiment, including the configuration of the parametric computational model, the optimization setup, and the sorting method of the results. The Results and Discussion presents an application of the method to an Area in Singapore. The Conclusion section concludes with the suggestions on urban design concerning land use and density for high-performance PV electricity generation in Singapore. This section also includes a discussion on the shortcomings of this study and the potential future work.

Methodology

In this work, we chose two metrics regarding energy performance. One was the peak electricity power imported from the grid (PDG) of the entire district, which is the highest surplus between electricity consumption and PV electricity generation over the simulated period. This value can be used to design the operation limits of the distribution grid to the district. The other one was the renewable energy share (%RES), namely the fraction of PV electricity (PVE) supply to the total electricity consumption. To study how urban density and land use affect the energy performance, we adopted the method of simulation-based urban form generation and optimization. The model has three parts, namely, a parametric model of urban form generation, energy simulation, and an optimization engine.

Figure 1 illustrates the workflow of our methodology. We built the parametric model on the platform of Grasshopper at Rhinoceros 3D. We used EnergyPlus (EnergyPlus Energy

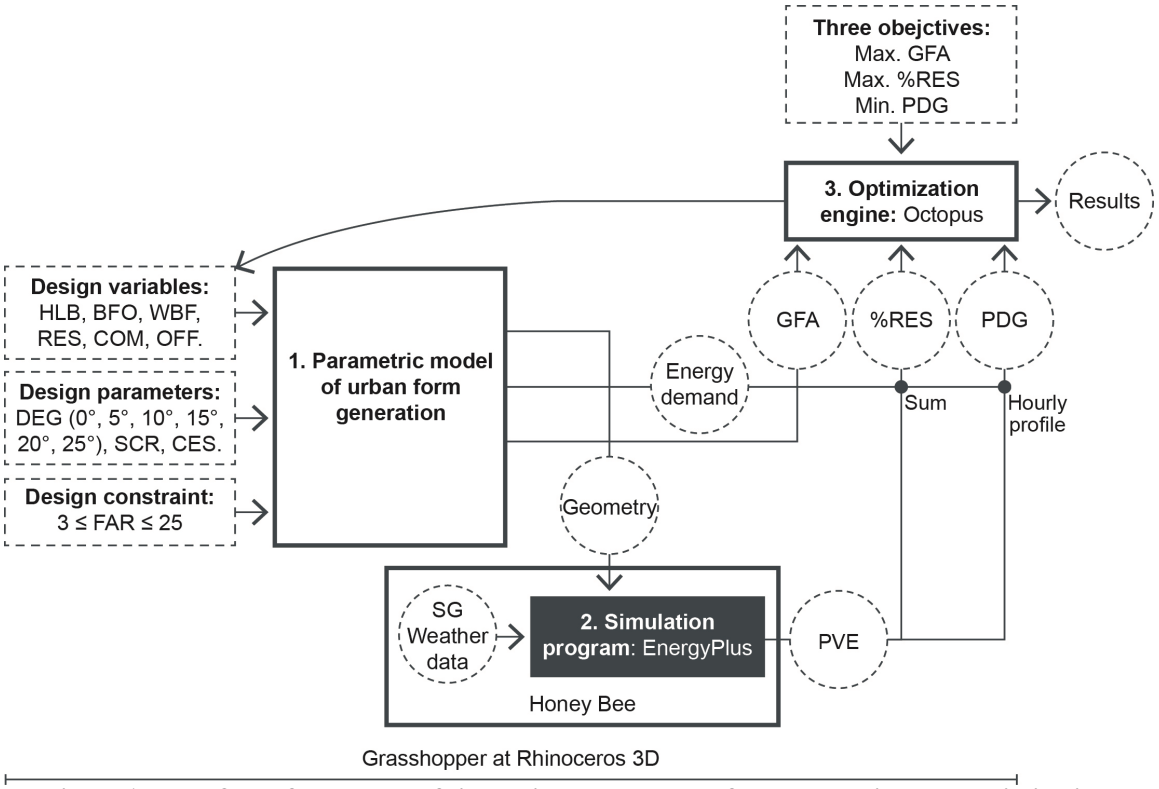

Figure 1. Workflow of the model of simulation-based urban form generation and optimization

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Simulation Software, 2017) to simulate the PV electricity generation. EnergyPlus and Grasshopper were connected through the components of HoneyBee. We used the Grasshopper plugin Octopus for optimization.

The metrics fundamental to develop the parametric model are defined in Table 1 and Figure 2. The metrics related to the density include gross floor area (GFA), floor area ratio (FAR), site coverage ratio (SCR), density gradient (DEG), the height of the lowest building per(HLB) and cell size (CES). Land use ratio (LUR) controls the land use. As per the Singapore Master Plan, the most common land use includes residential, commercial, office and industrial. In this work, we excluded industrial land use as it is less likely to appear in a transit-oriented development in the high-density context of Singapore. In addition, we took the building façade orientation (BFO) and the space in between buildings (DBB) into consideration, as they are important factors for solar analysis (Sanaieian et al., 2014).

Figure 2 presents an example of the parametric model. We adopted the most common regular grid street pattern, found through a morphological survey of cells in the six strategic mixed-use centers of Singapore. For each homogeneous individual cell, we used the most predominant podium building pattern with an SCR of 0.45, as 42% of the total 602 cells surveyed have a podium pattern, and the mean SCR of these cells is around 0.45. The CES was also defined using the equivalents in the case studies, which was a size of 100 meters by 100 meters. With the transit station as the center of the district, all the cells fell into a radius of 400 meters, which was defined by the average walking distance of Singaporeans (Olszewski and Wibowo, 2005). There were six design variables involved defining the parametric model of urban form generation. They were HLB (33-165m, with 3 meters' increment), WBF (50-90m, with

Table 1. Metrics constituting the parametric model

Metrics	Brief description
GFA	the gross floor area of all the built space
FAR	GFA divided by the parcel area
SCR	area of the ground floor building footprints divided by the area of the site
DEG	the rate at which density falls, based on the distance from the location of reference (Section, Figure 2)
HLB	height of the lowest building on the edge of the district (Section, Figure 2)
CES	cell, defined by a block and its adjacent street; the size of a cell is consist of the size of the block contained and a half of the adjacent street width (Plan, Figure 2)
LUR	ratio of the built areas of residential (RES), commerical (COM), and office (OFF) land use
BFO	angle of the building's main façade's orientation, zero degrees from the South (Plan, Figure 2)
DBB	distance between buildings in adjacent cells (Plan, Figure 2)

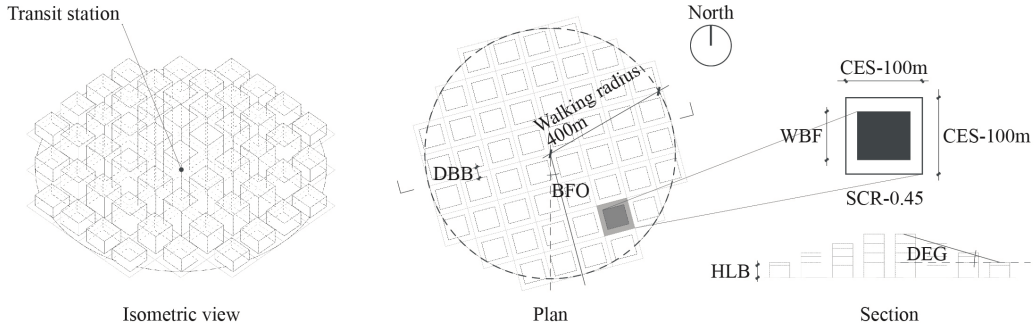

Figure 2. The parametric model of urban form generation

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10 meters' increment), BFO (0-180 degrees, with 10 degrees' increment), and the share of residential (RES), commercial (COM), and office (OFF) land use. As SCR was set as a parameter and the building footprint is a rectangle, DBB became a dependent variable of WBF. We set up six scenarios for different density gradients, namely with a DEG at 0°, 5°, 10°, 15°, 20°, and 25°. The DEG could not exceed 25°, as a higher DEG would result in a FAR that exceeds the norm ($3.0 \leq FAR \leq 25.0$) of high-density cells in the Singapore Master Plan (Urban Redevelopment Authority, 2016). The respective hourly energy demand profiles for weekdays and weekends in Singapore are depicted in Figure 3. In Singapore, it was assumed that the space cooling load and the domestic hot water heating load was identical throughout the year. We assumed that vapor compression chillers running with electricity satisfy all cooling loads. Therefore, all of the demand in the district was supplied with electricity.

To assess the energy generation capacity of the district under different urban scenarios, we set up a simulation model in EnergyPlus for PV electricity generation. The electricity generated from PV was simulated in EnergyPlus over the period of the most typical week near the annual average (30 July to 5 August) at hourly time-step. The typical week was retrieved from the EnergyPlus Weather File (EPW) of Singapore (EnergyPlus, 2017). It was assumed that 100% of the building rooftops and building facades were covered with PV panels. The inputs to the simulation model were building geometry and the incident solar radiation data from the EPW. The incident solar radiation on PV panel surfaces was calculated based on the building surface geometry, accounting for shading with other buildings. With the incident radiation on the PV panel surfaces, the electricity production was predicted with a quasi-steady state equivalent one-diode model (Griffith and Ellis, 2004).

We adopted Octopus present in Grasshopper as the multi-objective optimization engine for this study. Based on the experiences from previous research (Hsieh et al., 2017),

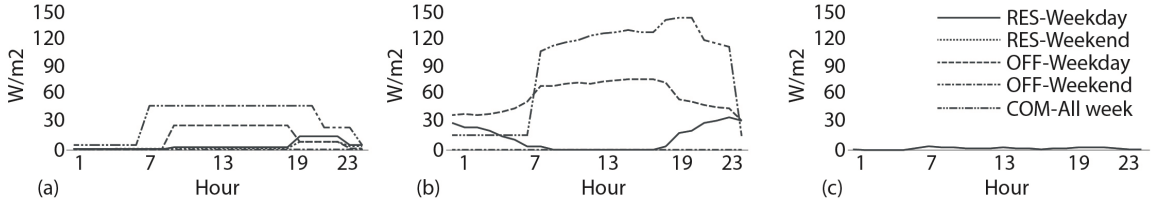

Figure 3. Daily profiles of (a) electricity consumption for appliances and lighting (b) cooling load (c) domestic hot water (DHW) load depending on day types and land use (Hsieh et al., 2017).

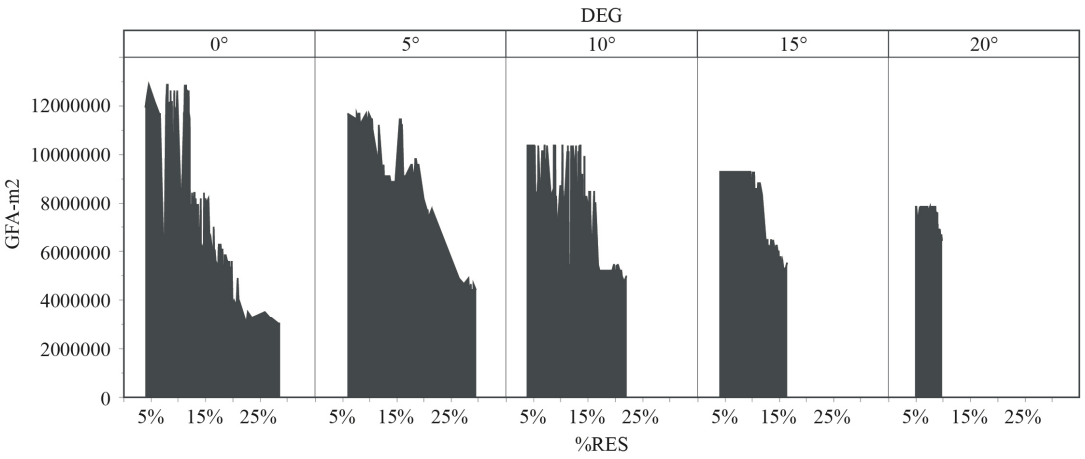

Figure 4. The range of GFA, %RES achieved in dependence on DEG.

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three objectives were chosen. The first was to maximize the share of renewable energy (%RES). The second was to maximize the GFA, as following the first objective only would result in reducing the GFA down to the minimum. The third was to minimize the grid connection capacity, namely the peak electricity imported from the grid (PDG). In each scenario, the decision variables were HLB, BFO, WBF, RES, COM, and OFF. SCR and DEG were constant in this formulation. The FAR of each cell was constrained between 3 and 25. The optimization was run for 20 individuals and 20 generations to limit the computational expense.

The resulting Pareto-front was obtained by performing non-dominated sorting of the entire population obtained from optimization. In a multi-objective optimization problem, an individual solution 'A' was deemed to be non-dominated, when there was no other individual with all objectives better than 'A'. In this work, %RES (maximize), GFA (maximize) and PDG (minimize) were the objectives. The Pareto-front presented did not have a solution which had higher %RES, higher GFA, and lower PDG compared to any other presented solutions.

Results (ZS/SH, 500)

We used JMP 13 (SAS Institue Inc., 2016) to process the data acquired through the six scenarios with a DEG of 0°, 5°, 10°, 15°, 20°, and 25°, and generated the figures in this section. In the sixth scenario with a DEG of 25°, all the valid solutions have the same GFA, due to the FAR constraints of each cell, thus omitting one optimization objective. Therefore, we excluded it from the result comparison and discussion as follows.

Figure 4 shows the trends of the maximum GFA and the range of %RES reachable in the five scenarios with various DEGs. Within each scenario, it can be observed that there is a trend that the maximum GFA decreases as the %RES mounts after a certain point. For example, when DEG is of 0°, as %RES mounts to the peak, GFA drops 76.3% compared to its peak. Such an interrelation justifies our assumption

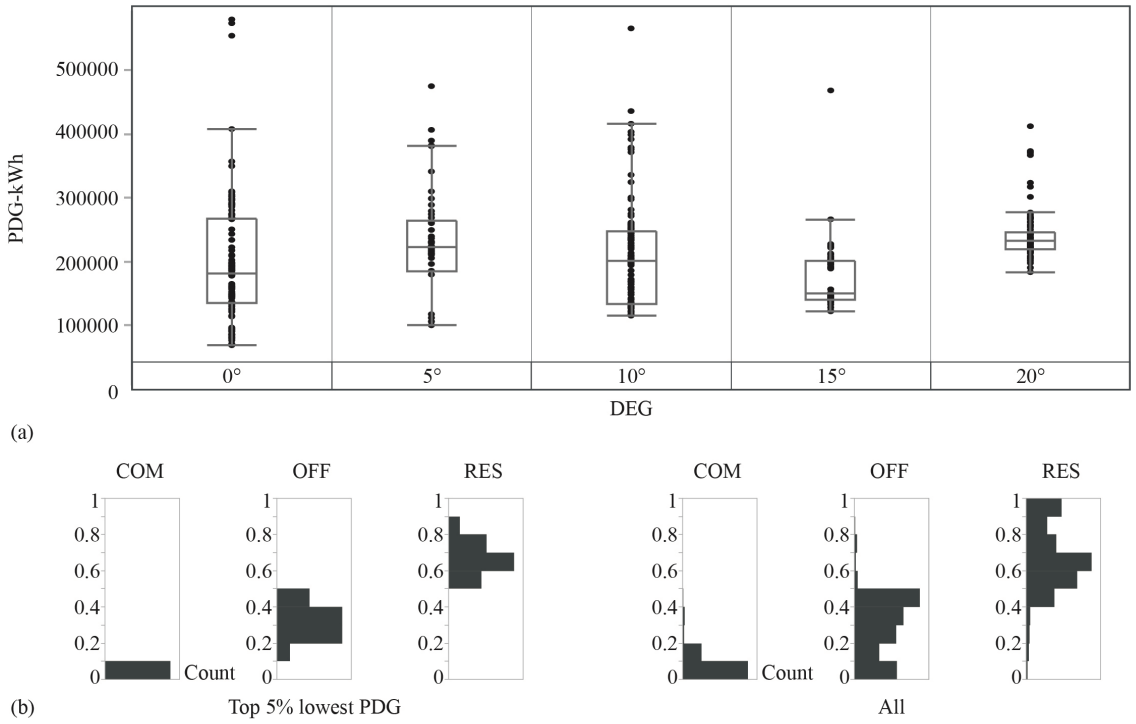

Figure 5. (a) range of PDG achieved in dependence on DEG (b) distributions of the three land use of all individuals and those ranking the lowest 5% by PDG.

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about the interrelation between the first two optimization objectives in the optimization setup. However, before reaching the critical point, as the %RES mounts, the GFA remains constant until a certain point before it starts to decrease. These points are critical for the tradeoff between the GFA and the % RES. At these points, the share of RES is increased to above 95%, while COM and OFF are both reduced to the least.

Across all five scenarios, the %RES achieved spreads in a range from 3.7 – 29.6%. The maximum achievable % RES reaches the highest with a DEG of 5° and drops drastically as the DEG increases. The %RES can reach above 20% only in the scenarios with a DEG at 0°, 5° and 10°. For a DEG of 0°, the range is the largest (4 – 28.6%), for 5°, the range is the second largest (5.9-29.6%). The ranges are rather large as, besides DEG, HLB also has a relatively substantial influence on the %RES, as it can strongly affect the achievable GFA. %RES decreases drastically as GFA increases, in general.

There are 583 individuals in total, across the five Pareto-fronts (DEG = 0°, 5°, 10°, 15°, and 20°). We sorted them based on their PDG. Figure 5a shows the range of PDG achieved with respect to DEG. The lowest PDG is with a DEG of 0°. The lowest PDG achieved in each scenario tends to increase with a higher PDG. Figure 5b shows the combinations of land use, including RES, COM, and OFF, of all individuals and those, whose PDG ranks in the top 5% smallest, respectively. All the individuals that fall into the top 5% have a DEG of 0°. Compared to all, the three land uses tend of the top 5% have narrower spectrum, with a RES of 54-80% and a OFF of 20-45%. COM tends to approach to 0-3%. As COM

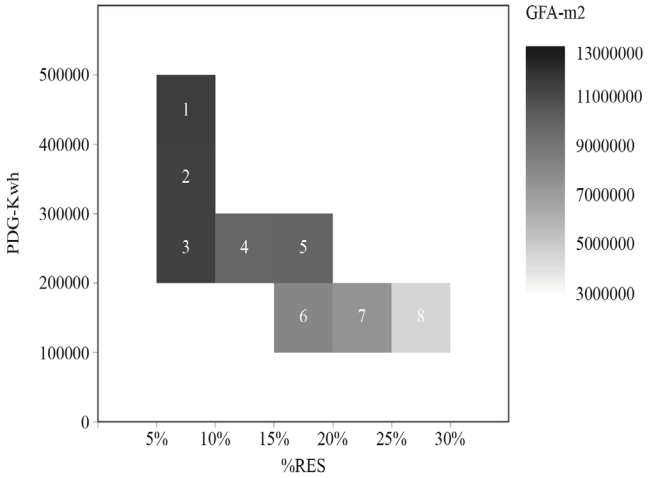

Figure 6. Eight groups of the individuals on the Pareto-front with a DEG of 5°.

Table 2. The representative individuals behind each of the eight groups.

Group	Design variables						Objectives		
	COM	OFF	RES	HLB (m)	BFO (°)	WBF (m)	%RES	GFA (m^2)	PDG (MWh)
1	0%	78%	22%	141	70	70	7.6%	11682000	407
2	0%	74%	26%	141	0	70	7.9%	11682000	390
3	2%	38%	60%	141	0	70	9.8%	11682000	280
4	1%	35%	64%	108	0	80	12.4%	9108000	212
5	0%	1%	99%	117	170	70	18.5%	9810000	237
6	0%	4%	96%	96	0	80	19.9%	8172000	197
7	0%	1%	99%	90	0	80	21.4%	7704000	186
8	0%	4%	96%	48	0	80	29.6%	4428000	106

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has a higher energy intensity, the optimization reduced COM to increase the %RES.

We took the scenario with a DEG of 5°, which has the comparatively largest range of achievable GFA, PDG, and %RES, into further discussion and comparison. Figure 6 divides the individuals on the Pareto-front into eight groups based on the three objectives. Table 2 compares the design variables of the representative individual behind each of the eight groups. Group 2 and 3 have similar %RES and GFA, as well as the same HLB, BFO, and WBF. The different distributions of the land use caused the huge difference on PDG. Group 4 and 5 have similar PDG and GFA, as well as similar HLB, BFO, and WBF. The sharp differences between the share of OFF and RES use lead to the differences in %RES.

Conclusions

Through this pilot study, we adopted the method of simulation-based urban form generation and optimization to study the mechanism of how urban form, regarding density and land use, affects the share of renewable energy (%RES) and peak electricity import from the grid (PDG). We took six design variables into consideration, including HLB, BFO, WBF, RES, COM, and OFF for six scenarios with different DEG. The three-optimization objectives we set are: maximizing %RES, maximizing GFA, and minimizing PDG.

For each of the five scenarios with a DEG equals to 0°, 5°, 10°, 15°, and 20°, respectively, we observed a break point until which GFA remains at the peak as %RES mounts. From that point onwards, a significant increase of %RES may cause a sacrifice up to as much as 76.3% of GFA. Maintaining the same GFA, in order to peak %RES, the results tend to maximize RES to above 95% and minimize the other uses, since the residential land use has the lowest total demand. In transit-oriented districts in Singapore, the highest %RES achievable is 30% with a DEG 5°. %RES can reach above 20% with a DEG under 10°. The distributions of land use have substantial influences on both %RES and PDG. Due to its high energy demand, commercial land use has negative impacts on the achievable %RES. To achieve a higher %RES, the urban planners may consider reducing the commercial uses within a reasonable range. The specific results and their interpretation are location specific and need to be viewed in the context of the site and its climate. The general mechanisms observed, however also apply to other locations.

The study presented in this work has certain limitations. First, it used a transit-oriented district typology (a pyramid shape). Other district typologies exist, for example of stair shape and corona shape (Kämpf and Robinson, 2010). The stair shape represents a typology with a magnificent view on one side. The corona shape represents a typical district typology with a plaza or lower buildings surrounded by taller buildings. According to the research of Kämpf and Robinson, the corona shape yields a high solar potential.

Second, there are limitations with regards to the street patterns. Though the grid pattern is common in new projects, many other street patterns exist as well. Similarly, we adopt the podium building pattern in this research, while other building patterns should also be considered. For example, a court building pattern provides more façade and less rooftop area for PV panel installations. Furthermore, we used density and land use as relevant metrics in the early stage of an urban project, however, other metrics may also have a substantial influence on the performance of PV panels. For example, the window-to-wall ratio will impact the space for PV panel installations on the facades. The building envelope material with different albedos will also influence the solar radiation captured by the PV panels. Finally, there are limitations regarding the calculation of energy demand. As mutual shading will affect the electricity generation by the PV panels, it may also decrease the cooling demand and thus affect the %RES. However, in this work, when calculating the energy demand of the buildings, we did not take the influence of mutual shading into consideration.

The study of the interdependencies between urban form and various energy technologies is crucial for establishing the concept of energy-driven urban design (Shi et al., 2017). It aims to increase urban energy performance through

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maximizing the performance of the energy technologies in conjunction with urban form.

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Making the most of daylight in town planning

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Abstract. *Making the most of daylight in town planning is one of the important ingredients in the attempts for the sustainable city. Exactly 150 years ago Ildefons Cerdà presented his great work "Teoría General de la Urbanización" including methods for taking care of sunlight. However, with modern software, the possibilities to do comprehensive preparations are much better. This paper presents an urban typology considering daylight with basic geometric forms, shapes and patterns. Later this will be elaborated more in detail. The research includes three steps; choosing typical alternatives for settlements and designing some new principle urban solutions, calculations and evaluations of the alternatives considering especially energy saving. The quality and the quantity of daylight are dependent of the geometry of the urban spaces. That means the volumes for the buildings as well as the empty spaces in between. The accessibility for diffuse daylight from the sky and for direct rays from the sun is measurable by computer calculations where the sun angles and the skylight from the hemisphere are simulated. Relevant parameters are height, width and length. In a settlement with a high urban density it is more difficult to distribute daylight than in a settlement with low density. However, the economy for exploitations is also worse with lower density. Therefore, the comparisons between different settlements are with the same density. The orientation of the settlements according to the compass is of crucial importance looking to the direct sunlight and the shadows. How the local environment with parks, water, mountains and specific landmarks in the surroundings also affects the daylight distribution is included.*

Keywords: Daylight, energy saving, typology, urban design, climate

Introduction

Making the most of daylight in town planning is one ingredient in the the sustainable city. Exactly 150 years ago Ildefons Cerdà presented his great work "Teoría General de la Urbanización" including methods for taking care of sunlight. However, with modern software, the possibilities to do comprehensive preparations are much better. This paper presents a first step against an urban typology considering daylight with basic geometric forms, shapes and patterns.

The strict linguistic interpretation of Urban Morphology is the knowledge of the forms in an urban settlement, which are mostly the forms of buildings, blocks and street patterns. However the actual definitions for the topic are much broader as all professionals know. But just in the search for adaptations to the sun the strict geometric approach is relevant. That because the sun angles and the variations of daylight during the day, as well as the year, in addition to the geographical latitudes on earth together with the geometrical forms in the city are the shaper of the fields of shadows and sunshine. An urban morphology for daylight consists of clean geometric forms, shapes and patterns in the city free from history, styles and social processes. In exploring and inventing

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successful new shapes for daylight, such a liberated approach could be seen as necessary.

The geometry of the street grid, together with the height of the buildings, is important for the amount of available daylight in towns. The Case Study in my licentiate thesis (Sundborg, 2016) had a basic method which is used directly, or adapted, in my actual research into different urban settlements. I have done calculations and simulations for three different street alternatives.

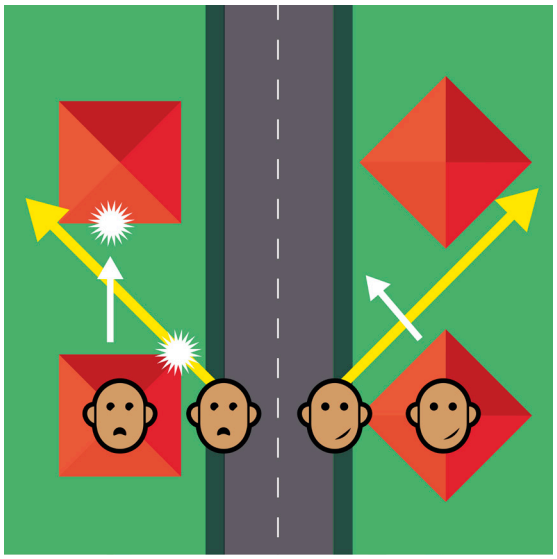

Figure 1. The two obliquely positioned houses to the right have lighter apart-ments then the paralleled positioned houses to the left (Ill. R. Manson, 2017).

Daylight computer simulation models have been performed in order to compare, contrast and calculate the savings of energy for the three types of settlements. With the same spacing and the same exploitation coefficient, it is possible to save energy for electric light through alternative geometrical solutions of the block, the street and the buildings compared to the higher energy use in the conventional layout typology.

The savings depend on good town planning where the daylight is accessible for longer periods of time during the day, both indoors and outdoors. That is when periods of use for electric light will decrease. This research is one of the first studies which evaluate the savings in energy with electric lighting due to the use of daylight in urban planning. The three different patterns for street layouts have been evaluated regarding energy consumption. For example, with straight streets it is possible to save approximately 11 % of the electric energy for the exterior lighting compared to a bending street during twilight. The consumption calculations have approximately the same values in Helsinki, Oslo and Stockholm, which depends on the similarity in latitude.

11% is the value for a straight street with a specific geometry. With more articulated bending, or comparisons between streets with buildings higher than five stories, the savings for a straighter street will be higher. The energy savings are not so great that they alone can justify a specific street type. A number of other factors must also be considered, such as architectural style, uniformity and the building system. The savings from positively affected streets, the straight and the improved bended street, has other advantages so the feasibility is good.

Evaluations of Urban Settlements

Different ways to handle problems related to exploitation was first described in a more detailed structure by the Spanish-Catalan theorist and urban planner Ildefonso Cerda. Later, Raymond Unwin analyzed and compared different solutions throughout the literature. Many others, who came after them, such as the famous architects Le Corbusier and Frank Lloyd Wright, continued and extended this valuable intellectual debate. In Urban Space and Structure, edited by Leslie Martin and Lionel March, they give a good overview over that debate. Especially instructive is the chapter 1:1 (Martin, 1972) with alternative discussions from Manhattan and London. It is also very stimulating in how it develops the viewpoint to new alternatives. Martin emphasised the importance of well described parameters around access, free space, natural lighting, views, etc.

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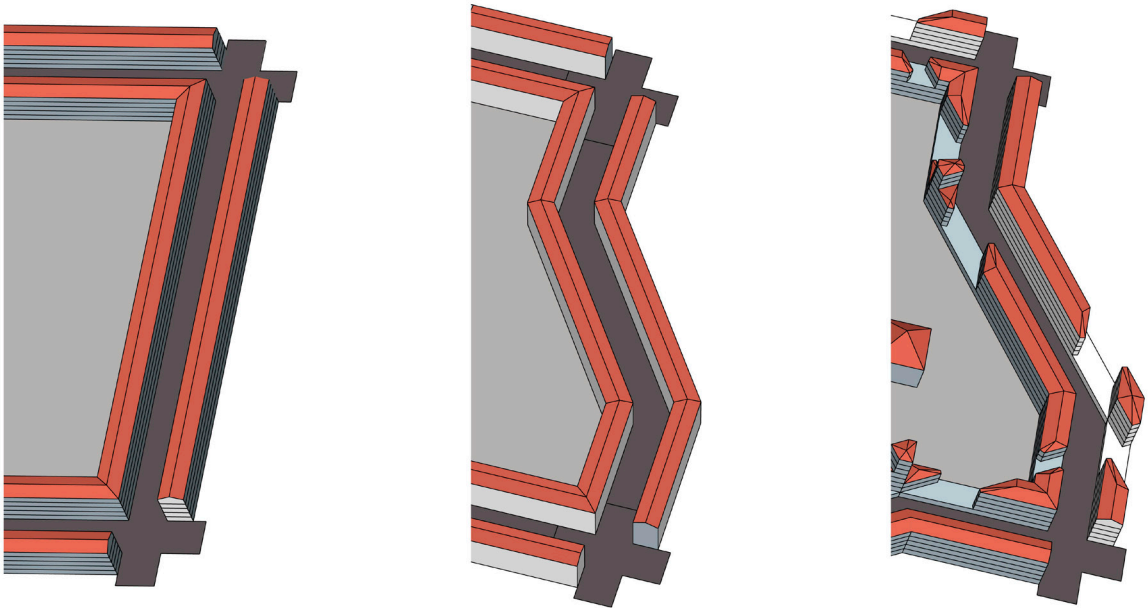

Figure 2. Three different street layouts have been evaluated regarding energy consumption (Ill. R. Manson, 2017).

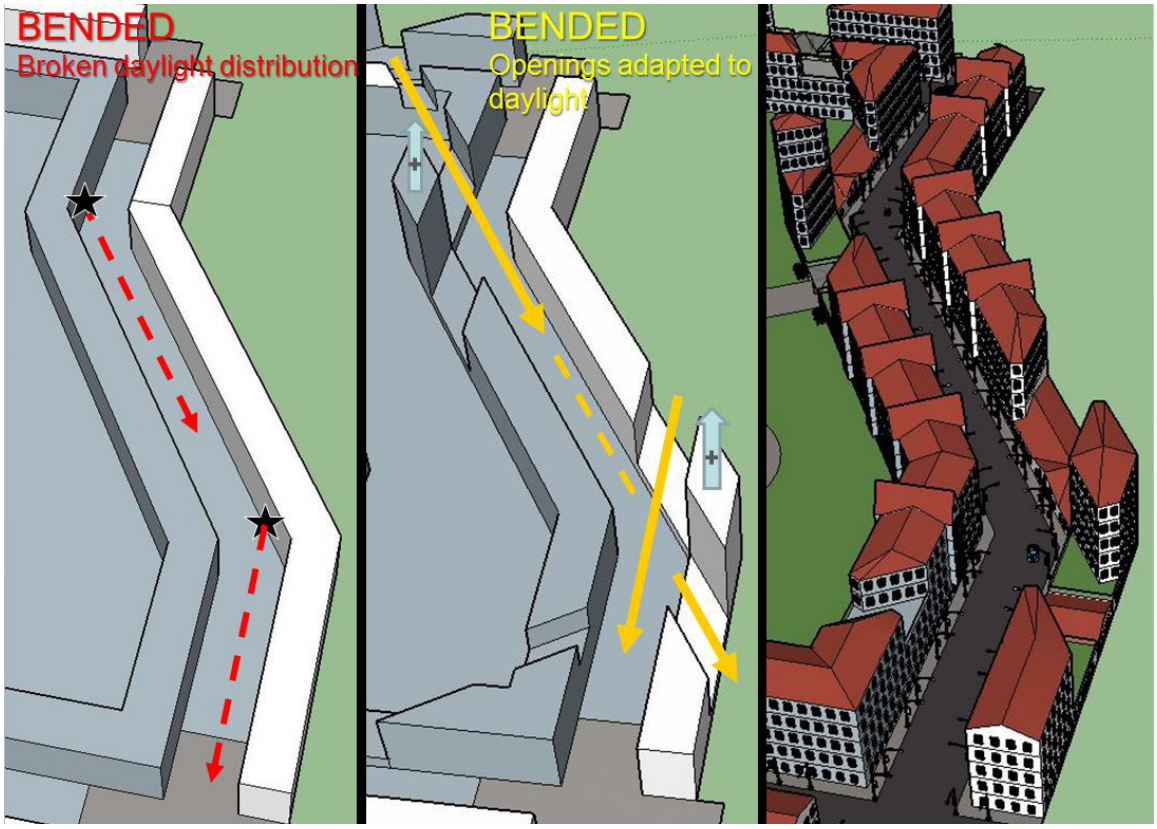

Figure 3. Daylight adaptations in the bends of a street regarding the heights of the buildings (Ill. Sundborg, 2015). Those adaptations resulted in the third street layout alternative see fig 2.

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Strategies, Principles and Regulations for a Good Urban Design Regarding Daylight

One of the earlier studies in this topic which is worthwhile to mention is Paul Little fair's classic guide from 1993 which has been recently revised and updated (Littefair, 2011). A recently published report (Rode et al., 2014) shows how important the energy aspect is today. In the Nordic countries, daylight is especially difficult to handle with respect to its great variation diurnally and over the course of the year. A handbook on "Daylight in urban settlements" based on the experiences from practical town planning has been written in Swedish (Sundborg, 2010).

The development of "good examples" can be strategies, principles and regulations for a good urban design in regards to daylight. Strategies could include orientate of a building according to the compass. Principles can be to avoid acute corners of buildings. Regulations can be to specify the minimum angle from a basement floor of a building which must have direct access to the sky. The examples in my research will mostly be adapted to the Scandinavian latitudes where the most common problem is to develop places with good daylight, not the opposite problem in other climates which is to create shadows.

Many aspects and parameters

To analyze and evaluate existing and proposed settlements, one needs well-defined and descriptive measures and approaches. The initial research includes choosing the most typical alternatives and even designing some new principle urban solutions. Then the calculations and evaluations of the alternatives can start. All morphological facts mentioned below will impact the daylight: The savings in the urban spaces are in different levels in the settlements as:

1- Network. Different street grids have different efficiencies for daylight distribution.
2- Street. Different street types have different efficiencies for daylight distribution.
3- Block. Different types of blocks have different efficiencies for daylight distribution.
4- Building. Different types of buildings and building details as windows have different efficiencies for daylight distribution.
The savings are dependent of the conditions in the urban spaces:
1- The geometry in 3D regarding the spaces for buildings and the empty spaces in between.
2- The accessibility for diffuse daylight from the sky and for direct rays from the sun is measurable by i.e. calculations in computer models where the sun angles and the skylight from the hemisphere are simulated. Relevant parameters are height, width and length.
3- The density. In a settlement with a high urban density it is more difficult to distribute daylight than in a settlement with low density. However, the economy for exploitations is also worse with lower density. Therefore it is important to do a comparison between different settlements with the same density.
The orientation of the settlements, according to the compass.
4- Special features in the local environment. Parks, water, mountains and specific landmarks in the surroundings which can affect the daylight distribution.
1- The savings in the indoor spaces are dependent of:
2- The actual conditions in the urban spaces, see above.
3- The geometry in 3D for the actual room.
4- The size and the localization of the windows.
The orientation of the room and the windows, according to the compass.
Using other strategic techniques, variations in the height of the buildings and calculating the placement of the openings between the buildings, can improve the daylight distributions.

The Structural Approach – A Proposal

A typology for daylight analysis is under development. The different possible alternatives for urban settlements are huge. The alternatives must be selected well, simplified and then structured in a logic and transparent way. One natural approach is to divide the alternatives after the urban scale from Network over Street and Block to Building and details as Windows. The impacts of daylight will be investigated in the exteriors as well as the interiors.

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Network.
The street grid consists of its streets and blocks. Sometimes it can be organic with bending streets often along the height curbs in the terrain. The street grids can also be geometric with radial/diagonal and tangential/circular streets. The very common rectilinear street grids with right angled blocks has straight streets which are good for the distribution of daylight.

Street.
Streets can be straight or bended in the horizontal level. It can also bend in the vertical level shaping a convex or a concave street line.

Block.
The city block can be built in many different ways. In the research, the focus is on variations in two types: groups of tower blocks and perimeter blocks.
- Groups of Tower Blocks: One of many important aspects to notice is if the facades are parallel or obliquely positioned to each other. The groupings can be made in different regular geometric patterns or in more random arrangements. In the study "Urban Form, Density and Solar Potential" (Cheng et. al., 2006) some combinations was tested. The research team concluded advantages for randomly positioned buildings compared to repetitive patterns.

I don`t believe in that due to several reasons. My hypothesis is that it always exist one strategy which is better than all random solutions. The only exception is the random alternative which happens to be identical to the strategy. The further research should hopefully give the answer.

-Perimeter Blocks: The typical right angled block, the zero alternative in figure 4 below, are shaped in squares without variations in height and no openings. The alternative can vary setting the block length, the amount of stores or the depth of the houses as parameters. All this parameters affects the exploitation and the distribution of daylight. Such compare have been done in earlier studies. For practical use it is more interesting to compare variations in shape within a given exploitation.

Alternative A is a transformation of alternative 0 with less building area in the dark corners of the block depending on another distribution of the heights of the single buildings.

Alternative C is like alternative 0 but with chamfered corners both against the street (as Cerdà once proposed) and the courtyard.
Alternative B has both chamfered corners and the variation in heights.

The alternatives D, E, F and G has all the same exploitation which is lower than the first four alternatives depending of that each alternatives has two openings between the streets and the courtyard.

E and G has the openings in the corner two improve the daylight distribution in the darkest place in the courtyard. D and F have the openings in the middle of the facades which are probably the most common solution. The reason for two openings in the alternatives not only one is to evaluate how much the low angled daylight passing through both openings can improve the conditions within the courtyard and further to similar blocks in straight lines in the street grid as a whole. D and E have openings combined with chamfered corners.
-The Orientation and the Extent of the Perimeter Block: It is interesting to expand the study from diffuse daylight to even direct sunlight. Within that expansion it is important to also consider the consequences of perimeter blocks extent to a rectangular form.
-The Orientation and the Groups of Tower Blocks: The orientation has more importance for the direct sunlight in groups of tower blocks than in more dense settlements as in the perimeter blocks. So this will also be investigated.

Building.
The buildings form also affects the distribution of daylight. The facades can be plain, convex and concave or folded in different ways. The roofs usually have forms according to the established building types with some common alternatives.

The corner of the building has a large effect on the daylight distribution. The common

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geometries are round, chamfered or with an angle which is acute, obtuse or perpendicular. Occasionally, even more complicated shapes are used. Arcades and terraces are also interesting ways to shape the building in a practical way, which affect the daylight distribution.

Specific proposals combining different features.

To obtain "really good daylight" results would normally require a set of efforts cooperating together, not only a single measure. Such combined solutions, both proposals and existing buildings are interesting to evaluate in more detailed studies.

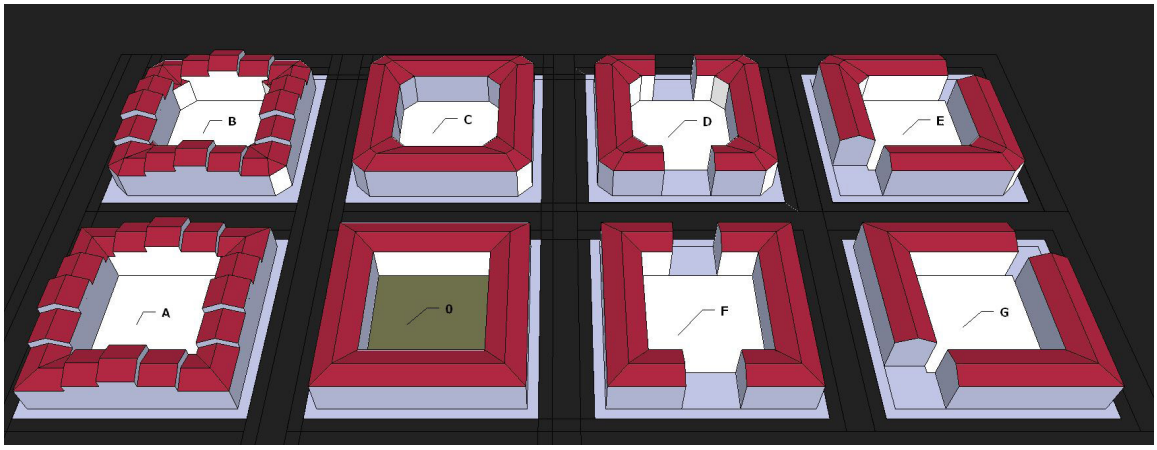

Figure 4. Perimeter Blocks. Variations in height, corner and openings within a given exploitation (Ill. Sundborg, 2017).

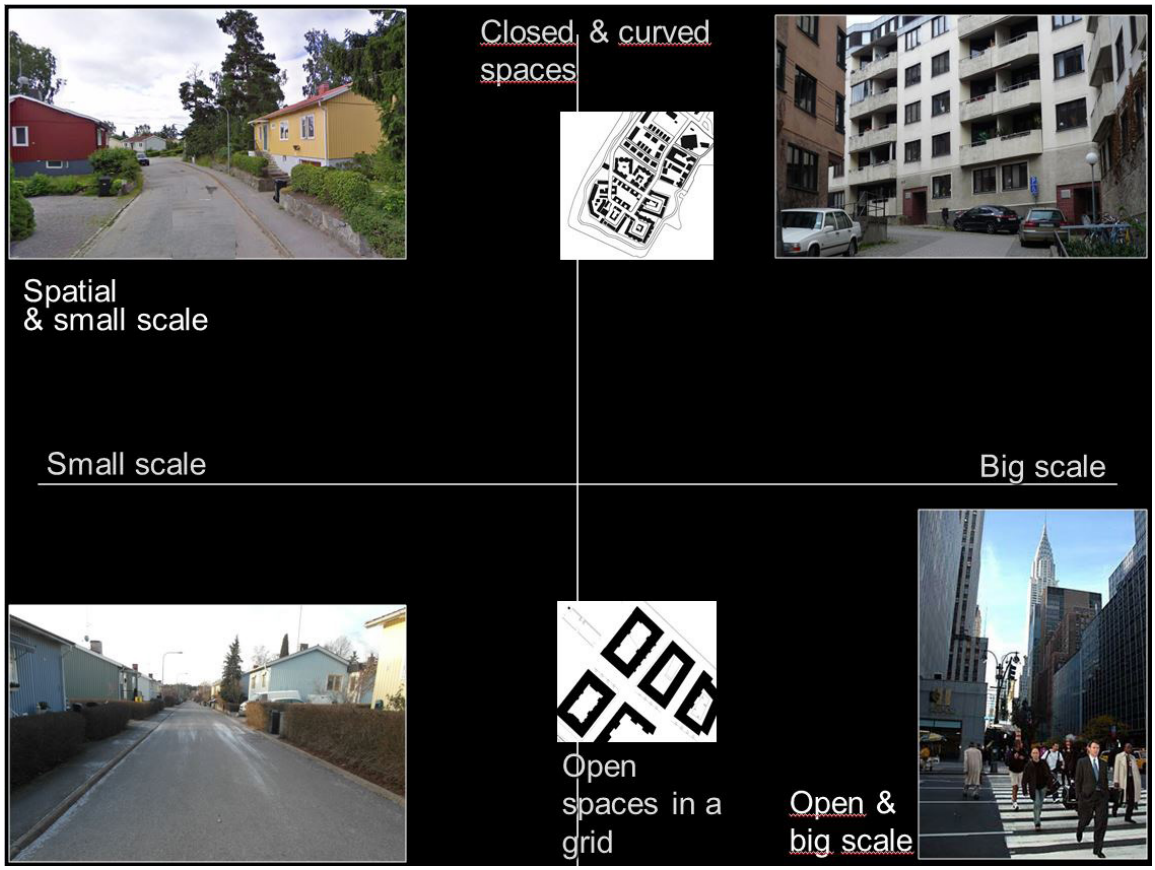

Figure 5. A compact and dense settlement requires more adaptations to daylight as straight facades along straight streets than one with a lower density (Ill. Sundborg, 2012).

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Details as window.
The windows deliver almost all natural light indoors. Placement and direction of the windows are, therefore, of crucial importance. Different features, such as protruding or not protruding frames, is also relevant as well as bay windows and other arrangements of the windows.

Urban Density and Daylight

With increasing urban density the amounts of daylights decrease. A special look to the urban density is therefore of crucial interest for researchers in urban daylight. A paper in "Nordisk Arkitekturforskning" (Berghauser Pont & Marcus, 2014) summarizes common urban density measurements and describes their shortcomings. The authors propose the Space Mate method, which includes a multi-variable definition of density that captures important morphological qualities such as accessible and perceived density that otherwise can result in a focus in abstract numbers. In the method, three geometrical properties of buildings are handled together:

Density expressed as a floor space index (FSI), ground coverage, and number of floors.
An interesting paper brings urban space together with Space Mate and shows how Martin and March's analysis can develop a theoretical explanation for Berghauser Pont and Haupt's empirical findings (Steadman, 2013). Steadman also introduces two additional variables: depth of buildings in plan, and cut-off angles describing the distances by which buildings are separated. For daylight studies, that addition is of great value.

Final Comments

The PhD Report (planned to 2019-06-03) will contain evaluations of many different settlements and, hopefully, also include results for single buildings. A long-term goal for this research in its entirety is practical guidelines for "better" geometry in urban design, taking into consideration the effect of the sun and resulting daylight.

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Environmental and energetic operation in "El Ensanche" of Valencia

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Abstract. *The present paper focuses on the urban parameters we need to study, in order improve the environmental behavior on our cities. It goes deeper on how density and urban compactness can deal with some of the most important urban issues on environmental point of view. On the one hand they permit a better social cohesion due to urban proximity spaces including pocket parks, local trade, public facilities and allows identity social progress. First, it is necessary to make a brief introduction of Valencia urban morphology consolidation through the years, it is needed to begin with an accurate understanding on how does it is urban form on every case study, to could achieve our propose. Secondly, we need to do a climate analysis for Valencia weather conditions. It will detect the best bioclimatic strategies to reduce energy needs, and to create better microclimatic urban conditions. Finally the paper will show studies on the "El Ensanche" urban grid on solar passive gains strategies, internal gains and sun shading. Every strategy will demand form us to taking into account an evaluation on the limits between urban changes and the heritage protection. So this paper will link climate conditions with the urban form of the "El Ensanche" grid to clarify how the city leads with the energetic and environmental parameters. Thus, will allow us to put on the table most effective proposals for improve our cities.*

Keywords: High density, environment, energy, Valencia

Introduction

Urban high density is one of the most important parameters we required to our cities now a day, in order to increasing sustainable levels. Almost everyone believes the benefitsof high density against the low-density models. Benefits concerns both social and environmental function. On the one hand, they permit a better social cohesion due to urban proximity spaces including pocket parks, local trade and public facilities and allows identity social progress. On the other hand, compact urban fabrics, reduces energy need because of the lack of large fuel transportation where an important part of it is lost along the pipelines, moreover transportation of people, medical or cleaning services, increases their costs both economical and energetic in the diffuse city model.

The present case of study focused on "Ensanche" of Valencia, takes for real the above said which is enough contrasted, however it goes one-step further. The main idea of the study is to elucidate if high-density model in "Ensanche" has the same good functioning on some of the most important environmental parameters such as solar energy irradiation, natural ventilation, sun shading or wind protection, and how can those urban models be rehabilitated in order to reduce energy

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dependence. Urban heritage in European cities claim to be renewal, regenerated and rehabilitated putting the eye on the energy consumption without destroying its historical essence.

Methodology

In order to achieve the main goal investigation, and to communicate it successfully, full paper adopt an easy structure. First, it is necessary to make a brief introduction of Valencia urban morphology consolidation through the years. If we need this kind of studies to make better cities, to make them work efficiently and have an ecological behavior, it is fundamental to understand main environmental problems. Those only can be solved by acomprehension urban sense. This urban way of understand the problem, encourages us to analyze urban development to find out better improvement strategies. It is time to prevent from a non-consideration urban knowledge methods, because inside urban heritage and its knowledge is written those better and efficient urban solutions.

Secondly, environmental urban analysis would not be correctly done, if we do not know how does Valencia city climate conditions and territorially conformed. Thus, the second point will focus on the territorial analysis especially related on climatological data bases. Valencia has one of the typical Mediterranean climates, with soft winters and warm summers, that has to be understood. Once we have climate dates analyzed, we can come with comfort diagrams connecting climate with human comfort sense, that will gave us better bioclimatic strategies. Then we will be able to contrast those climatic strategies with the El Ensanche urban conformation. We can study how sunshades works with width and height streets or how does block compactness affects energy consumption or how does affect wind in our geometry. The idea is not to criticize urban masterplan, made hundred years ago and trying to fix quick urban development problemsinstead being energetically efficient. This study has been made to draw near the possible solutions for a sustainable city transformation, taking in consideration those which would be more efficient regarding our urban heritage.

Valencia: El Ensanche urban development

Investigation main goalconsists on clarify some aspects about how does affect urban morphology to energy need and environmental quality, especiallyindoor spaces, where most of the energy will be demanded, consumed and contaminating, at the end. The process to understand how does interact urban form with energy, is generally done in the wrong way. Energetic studies are mostly focused on the energy consumption inside architectural spaces, forgetting matters that will be fundamental, such as climate, orientation, street width or urban compactness, every one concerns on urban morphology.

The present work lies over an important area of Valencia city, The Ensanche. In order to be consequent, It is necessary to make a brief introduction related on Valencia urban development. It is not possible to standby urban form and energy without understanding urban configuration process.

Valencia steels being fluvial instead of seaside, despite its coastline nearness. Originally grew as an island generated by the Turia River near the coastline on an extensive plain.As a roman foundation city, it had not such relevance as other important roman villages on Iberian Peninsula. Although, steel today, it is possible to recognize roman perimeter and the Cardo and Decumanusaxes too, withSan Vicente Mártir and Caballeros streets. The place where both axes crosses wasthe roman Forum being Almoina plaza today, Valencia has been built through roman axes, layer by layer over time, letting its urban lecture till now. Arabic and medieval traces finally draw the existing downtown, that we can see today.

El Ensanche first step:In 1858 Calvo, Monleón and Sancho proposed the First Valencia Ensanche. Although, it was not since 1884 when the second proposal from Calvo, Ferreres and Arnau won urban planning competition launched by Valencia city council, that El Ensanche took its definitelyform. (fig.1)Competition fixed strategically the main

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Figure 1. Calvo, Ferreres and Arnau. Valencia 1884 Master Plan

boulevard position in the city, Gran VíaMarqués del Túria and Gran Vía Fernando el Católico will be the new Valencia bounder line for the First Ensanche, with 50m width. Block size from the 1884 project wascompletely enlarged, thus allowed connection between both urban traces, historical and El Ensanche in radial sense from downtown to city external medieval walls growth. Urban blocks were projected with 100m street axes distance while streets width goes between 11m and 16m, which refers directly to Barcelona CerdáEnsanche. At that point, Valencia south-west development had to deal with out of controlled built neighborhoods, trying to fix urban problems by the boulevard construction. Thus, made important differences between south-west and south-east Valencian urban growth, where the second one would have a better environmental and under control urban quality, because of the orthogonal and homogeneous urban greed.

El Ensanchesecond step: Commonly known by MorasEnsanche, Proposed by Francisco Mora in 1924, he projected Valencia growth till Transitos avenue.(fig.2) It marks the second Ensanche development in a polygonal form and approaches urban strategies over the north side of the Turia River. This polygonal urban form seams easy to read in south east and west orientations, but gets not so easy when it crosses the Turia River, because of the rail ways traces. Analyzing MorasEnsanche, it is possible to see the main road system as a traffic lines distributor, with no more than 25m street width, and how are being drown block structures of 100mx100m. Finally, between Gamazos Plan in 1946 and the Plan General

Figure 2. Francisco Mora. Valencia 1924 Master Plan

Renewal adapting South solution, Valencia will finish its huge urban development, that still giving todays structure appearance.

Climate and territorial configuration

Under climate considerations, it is important to point that climate changes are affecting nowadays in Valencian territory, "several studies on Spanish regions coincide in an essential fact: the warming from the decade of the 70's is visible and significant" (M. Castro, 2005). Hereby, future climate conditions in Valencia would probably extreme the present study dates, encouraging us to be more effective on our conclusions and improvement strategies. In this study the climate data have been used for Valencia weather conditions are IWEC data file, from the United States Department of Energy. This file is the same used by Spanish Technical Building Code.

Rain seasons are far to be homogeneous year by year, Although Autumn uses to be the wet season one, specially November where it could arrive till 350-450mm. It is a meteorological regional phenomenon called cold drop, based on cold winds from north of Spain coming from the Atlantic ocean with two or three days rain forecast, that rises usually in Autumn.

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In the year 1957, took place the Turia River "Big Stream" in Valencia with its dramatic inundation after one cold drop period. This accident will change the strategies of Valencia urban growth, changing old Turia channel bya new one placed outskirts south on the city.At the same time, people encouragement, made possible the transformation of the old river in a large green park for the urban structure of Valencia, instead in a highway as it was firstly proposed by municipality.

Winter average temperatures goes around 10ºC while summer average temperatures rises till 25ºC, annual averages stays over the comfortable 18ºC, specially being outside. Between February and April, uses to come another rain period, softer than the first one, bringing with them a wet summer. High humidity is one of the most important problems to rise comfort sense in Valencia climate, thereby we will take care about how can density blocks orientation, in El Ensanche, get down wet ambient or not. However, Valencia has another climate reason to be benefited, it is the sea breezes. The used to come just in summer time, luckily when they are needed, east winds came from the sea that has lower temperatures than the earth, cooling freely the city.

Those climate conditions described before, are not only data base to make thousands of calculation without control. Those are made by an earth location in the world, then transformed by La Albufera lake, changed by the Mediterranean sea and definitely conformed by its fluvial character. Furthermore, those climatic data base, can explain how people are, what people cultivate or cooks and of course which urban models have they use through the time in order to face climate conditions. Attending to Olgyay ideas of climate, progress and culture, "The spread of population and modern communication have accelerated the age-old interchange of ideas and technological effects. We must realize, however, that the wide dissemination of Western forms evolved from the challenge of cool climates, and pose grave problems when adopted as undigested and inappropriate symbols of culture progress"(Olgyay, V. 1963) .

Next step had consisted on apply those climate parameters and territorial configuration, inside Climate Consultant 6.0 software. With Climate Consultant energetic results, aim has been to translate inside dwellings energetic behavior obtained for Valencia climate into El Ensanche particular urban morphology. Results was has follows.

Bioclimatic strategies in the Ensanche urban morphology

Energetic calculations allow us to visualize how comfortable Valencia climate is, 13,2% of the year, dwellings in Valencia did not need any energetic income to be comfortable spaces, which means that 1.145 hours per year are inside comfort temperatures and humidity. At the first time, results could be unexpected, but we can contrast with the real consumption made by the Instituto de Diversificación y AhorroEspañol IDEA, to evaluate its coincidences.

Passive Solar Gains bioclimatic strategy gave important benefits for elevate human comfort, 29,9% of the time and 2.628 hours a year. But, how does our morphology works on this way? Ensanche morphology is based on big square blocks (100m)x(100m) with a patio inside surrounding entire dwelling block, and its 45 degrees corner cuts as well as Barcelona´s Ensanche. Streets canyons between 11 and 16 meters width and 18-25 height are the main sunshine constrictors on the façades. Although, streets orientation with 45 degrees from the North pure, made a kind of equalization on how does every façade orientation works. Moreover, every dwelling cell has both orientation, one over the street and another over the central patio, because of that Valencia Ensanche morphology equalize every square block façade sun energy heating. (fig 3) In a first step analysis, we got a street canyon that difficult sun radiation because of his straight streets, only solved at corner cross blocks. But if we go further, we can realize the great opportunity given by the square blocks roofs, in order to improve sun heating energy for inner dwelling comfort. Roofs are plane and footable surfaces, without sun shading neighbor buildings and freely open for every neighbor by vertical communication cores in every building that includes one square block.

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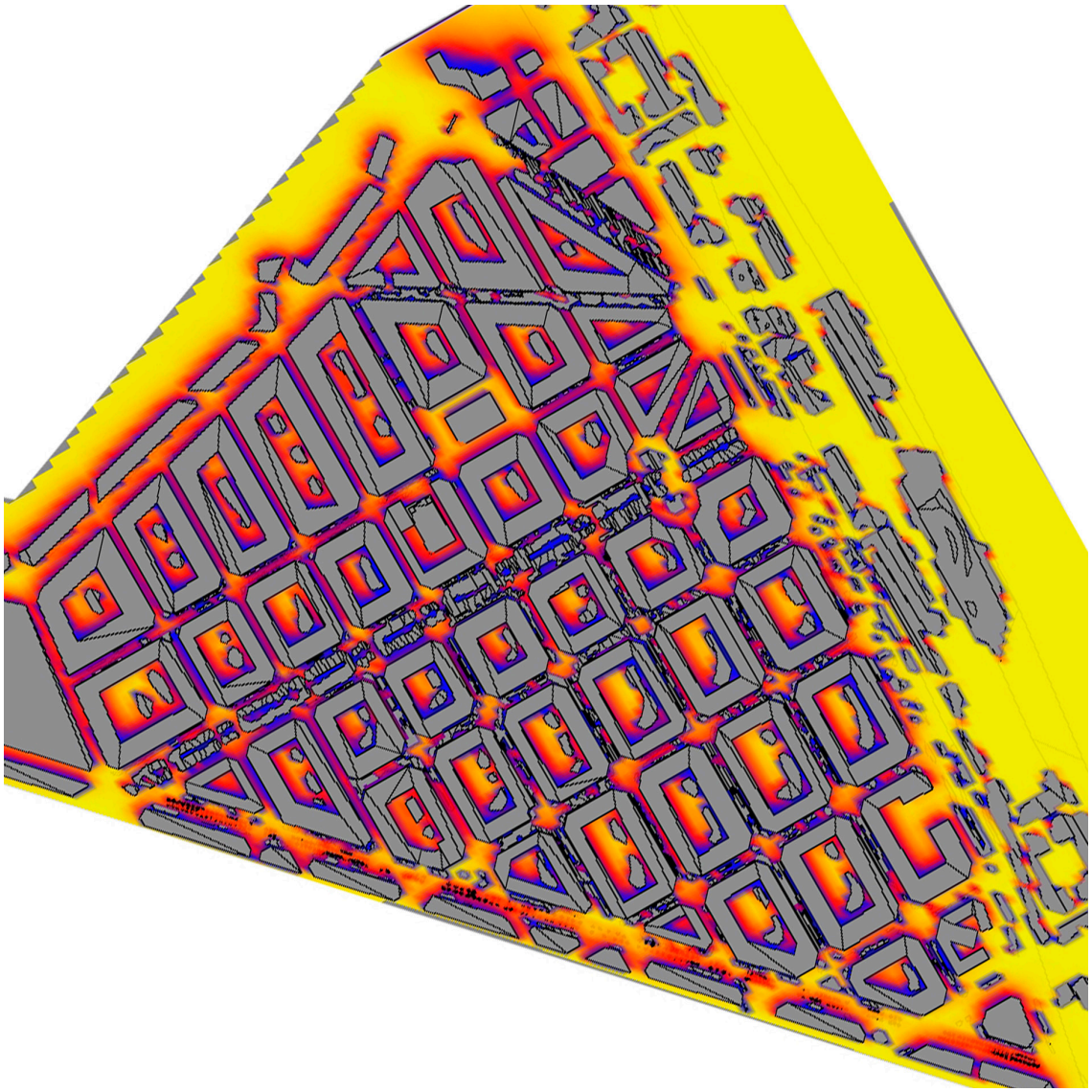

Figure 3. Energy simulation. Watts solar radiation/average hours. on Valencia Ensanche Urban Grid model)

Thus, square blocks roofs are really easy to be improved by solar panels, where energy could be used both, electricity or water heating generation. Last improvements told, are to be included in an active solar gains strategies rather than passive solar once.

Despite 45 degrees streets orientation was not an energetic goal in the original Ensanche Master Plan, it has homogenized in some way the energetic behavior. There is not a south façade so much better than another north one that penalize the grater and the worst orientation. It is important to point up, that every square block is made by many buildings, which conforms its administration function.

Internal Gains. This is the most efficient bioclimatic strategy. If we do not waste the energy made by occupation and activity levels by inhabitants, lightness or home appliances, it is possible to reduce 36,3% of the heating energy needed in winter times. This result, has been unexpected one, and realizes the importance of the passive house system as a real possibility, even on Valencia soft climate.

This strategy seems to be far away to take part on urban planning consideration, in a first stage it could be true, but not if we stare beyond. If we try to stop leaking energy by the thermal envelope, we will be requiredto improve thermal isolation and airtightness as

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a main parameters to upgrade in our buildings. It is true that almost everyone will accept that point of view as real, and thousands of energetic certificates in Valencia are wright at the same point. Although, the way of improve strategies are completely failing at one extremely important issue, the lack of urban scale comprehension of the metter. Spanish energetic certification law, encourages citizens to have their certificates flat by flat, forgetting that dwelling cells are part of a higher entity called building, which belongs into a higher urbanentity such as square blocks with patio inner space, that finally draws Ensanche urban morphology. Changing glasses and frames quality on exterior walls in a flat or even in a building, will affect only partially for the energy need improvement, because there are too many surfaces that are exchanging energy with other flats or buildings. Energetic simulations commonly takes an adiabatic function for those surfaces, in order to be operative, but that is not them real behavior.

When we study energetic needs in the correct scale, the city appears as a hall matter comprehension. The benefits of focuses isolation and airtightness improvement with the whole urban entity, such as square block is, is not only in an energetic direction, it generates an economical benefit too. While hundreds of neighbors participate as a group in the same strategy, economical numbers begins to be realizable and sustainable.

Sun shading. Only by using correctly sun shading strategy, it is possible to reduce 11,5% of energy needed in summer time, which means more than 1.000 hours a year in Valencia. This strategy fails again when we study it in our analyzed Ensasnchemorphology. Narrow urban canyon casts shadows on façades, but it is especially true when the sun goes down, just in winter when the sun heating is welcome. Summer days and middle day hours, are heated without any urban shade projected, so it is need to protect the sun on the window plane after come into inner spaces.

Urban vegetation plays an improvement role at that point. Green structure in El Ensanche, has too different behaviors, a positive one on streets environment quite well solved and another and another on the inner square block patio completely forgotten of green structure. Streets green canopy are solved with enough caduceus tree cop in almost every way, specially giving shadows over the pedestrian urban line. Only fails where streets crosses on chamfel place, here buildings increases their façades separation opening small places of heating sun just on road pavement where trees cop cannot arrive. (fig 4)

On the other hand we have inner square block patios, those urban areas have been always forgotten from any kind of structured vegetation, only sometimes a neighbor individually decides to vegetate a small place on a terrace surface. However, almost every roof surface is built with hard finished material, leaving under its structure commercial inner spaces.

Transform those patio surfaces in green areas, would benefit neighborhood in several directions. In addition to reduce sun heating with sun shading green vegetation, we are able to adapt a useless place in a pocket park requalified urban area. Certainly, urban life on Ensanche is really needed of this kind of urban space. Its lack of green, open and near relationship spaces, would be enormously fixed with the uses of this forgotten surfaces. Moreover, it will not suppose a huge extra money , attending to the many neighbors sharing this small green area.

Conclusion

El Ensanche urban morphology, was not projetced to reduce energy needs and energy consumption as a main goal to achive. Calvo, Ferreres and Arnau Master Plan, was projected to solve many other urban problem, specially how to absorbed Valencia huge population growth, at the end of the XIX century, and it focused the powerfulon every hygienic matter more than energy issues.

Although, we have detected some unexpected goods and at the same time we have contrasted other expected failures, proposing environmental and energetic strategies in order to save some of them. The main energetic benefit, has been the original idea of turn 45º the urban grid. We have illustrate, how that

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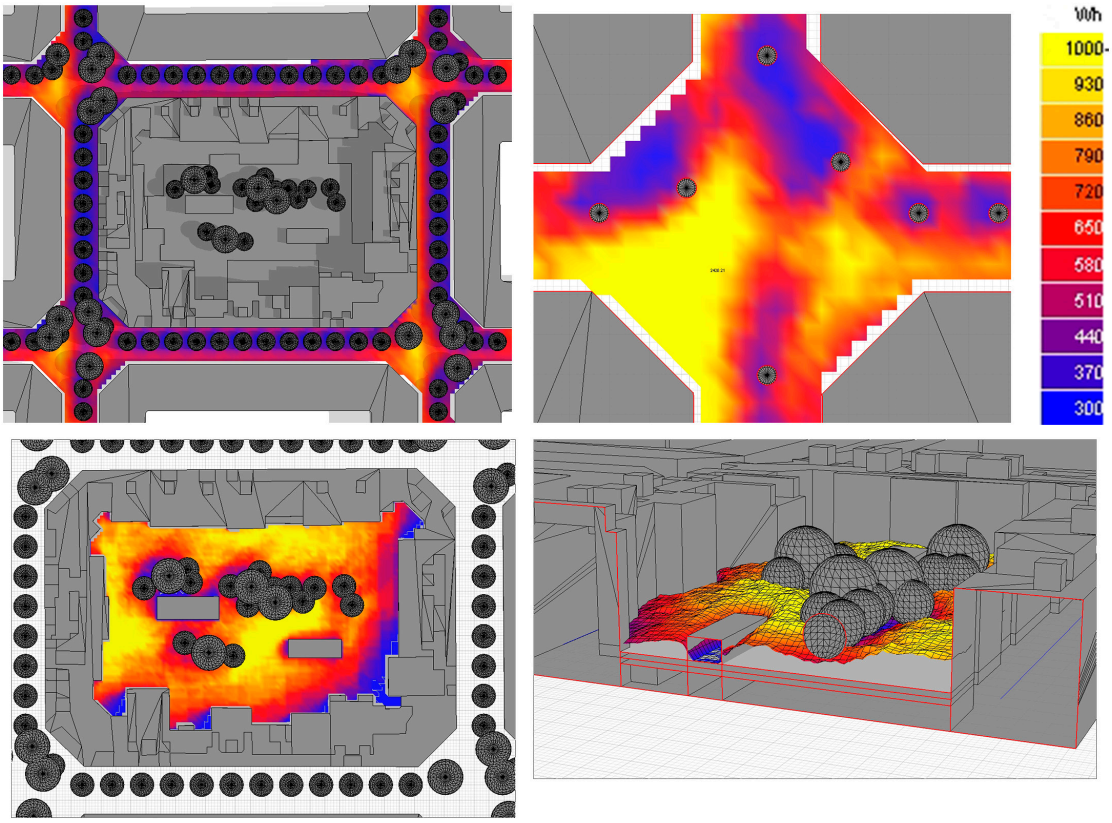

Figure 4. Energy simulation. Watts solar radiation/average hours. on square block Ensanche model

urban grid gyre distribute equal sun radiation, without punish any square block façade too much. However, it is impossible to extract all the sun radiation benefits when we are studding a square block urban grid such as El Ensanche, because of the narrow street canyon prevent it. Finally, it would be both social and environmental solution, transform inner square blocks patios in green urban structures, getting out several urban benefits, with an small economical effort.

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City and territory
in the Globalization Age

5. City transformations

Contribution of planned built environments to city transformation: urban design in Montreal, 1956-2015

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Abstract. *Research on Canadian urbanism and, in particular, Canadian urban design, despite some notable exceptions, are relatively limited. This paper explains from an urban form perspective the practice of urban design in Montreal from the mid-twentieth century onwards. The paper seeks to interpret the development of urban design practice by studying three representative urban projects built over the past 6 decades. These projects are used to illustrate the different design strategies adopted, to understand how urban design ideology/ ideas have evolved over time and how they have influenced the spatial organization, form, and aesthetic of the city. The principal theoretical and methodological contributions aim to develop a typomorphological framework to study and understand the physical-spatial mode of organization of planned built environments and to study their relationship to urban form. Although the political, economical and design frameworks in Montreal and Canada may be different, these are valid cases to define an approach appliable to other contexts. The main objective is to develop tools to help designers and local autorities establish a dialog between new built environments and the historical fabric of the city, to increase the resilience of new urban areas and its spatial and social integration in the contextual urban fabric.*

Keywords: Urban morphology, urban design, planned fabric, schools of thought, Montreal

Introduction

The urban design projects carried out in the last sixty years on the Island of Montreal can be understood as laboratories of Quebec and Canadian urbanism. Since 1956, i.e. when the concept of urban design was first introduced in North America (Krieger and Saunders, 2009), design practices on the city scale have progressively replaced the traditional typological evolution process and its central role in urban form formation and transformation. In this context, we wish to identify how the product of urban design practice, what we refer to as "planned built environments", has structured the urban form of Montreal throughout time. The first objective of the research is to contribute to the advancement of knowledge on the planning experiences that enabled the emergence of the practice of urban design in Quebec and Canada during the 1950s. The second is to develop cognitive tools to understand how planned built environments are structured and how they contribute to the urban form. The intention of this article is to bridge the gap between research in urban morphology and practice in urban design (Whitehand, 2017).

Theoretical framework

Typomorphology consists on the study of the formation and transformation processes of traditionnal urban fabric using diachronic analysis and the notion of the persistance of

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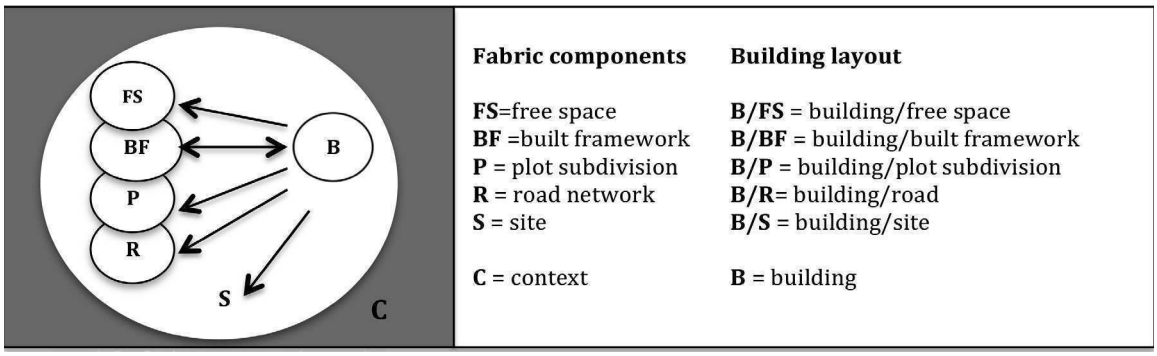

Figure 1. Organization of planned built environments in relation to the context (Racine, 2016)

built types through time (Cannigia and Maffei, 2001). As a researcher specialized in this discipline, our aim is to develop a theoretical framework to study the organization of planned built environments and to examine how these environments relate to traditional urban forms. To study non traditional urban forms, we must define what is meant by "planned built environments" in order to establish a common basis for our analysis. Figure 1 is a schematic representation using a morphological approach revealing how planned built environments are generally designed. On the city scale, the planned fabric components installed in a specific site consists usually of a road network, a plot or land subdivision system, a built framework, and a network of free spaces. The specific interrelations among these various components, understood as morphological units, define and characterize a particular type of urban ensemble (Conzen, 1969). Figure 1 shows also that besides the components, there is, on the scale of the planned fabric, a building layout, i.e. a way of installing the buildings on the site (relationship between buildings and the site); of dealing with the relationship with roads (relationship between buildings and roads); of adapting them to the shape of the plots (relationship between buildings and plots); and of arranging them in order to define the shape of free spaces (relationship between buildings and free spaces) (Lévy in Merlin et al., 1988). Lastly, there is a specific building type (Devillers, 1974) constitutive of the general building framework of a planned built environment. Usually planned built environments fall within a context whereby it is, by its very nature, one of the components of an element on a larger scale, i.e. the form of the urban fabric and of the city as a globality. The hypothesis guiding this research is that the organizational concept of these elements evolves according to the influences of schools of thought and theories that affect specially the relationship of the planned built environments to city form.

Methodology

The qualitative method used to evaluate the contribution of urban design projects to urban form, consists of analyzing in a synchronic manner the general organization of the fabric components, the typical building layout and the characteristics of the building types forming the built framework of the project. Diachronic analysis is used to compare the state of the sector before and after construction of the project. This step helps to determine how the fabric components and building layout and the buildings themselves relate to the morphology of the context of the bordering urban fabric. Plans emphasizing each component, research based on 'figure-ground' to examine interplay between built form and free space (Törmä, Griffin and Vaughan, 2017), field visits and photographic surveys are used to understand the morphology of planned built environments and of the immediate context.

A literature review of the professional report found in the archives of the Planning Department of the City of Montreal (Centre de documentation Marie-Morin) reveals three phases that suggest a periodization of the major theoretical schools of thought in urban design: a modernist phase rejecting the traditional city (Le Corbusier, 1957), from 1956 to 1980; a

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Figure 2. Localization plan: A. Habitations Jeanne-Mance (1957-1959); B. Quartier Angus (1994-1998); C. Faubourg Québec (2001-2015)
(Source: Centre de documentation Marie-Morin, Ville de Montréal)

postmodernist phase based on a recognition and reuse of the traditional forms of the city (Ellin, 1999), from 1980 to 2000; and a contemporary movement of reconstruction of the city based on a more rigorous approach of urban analysis related to the discipline of urban morphology (Panerai et al., 1999), from 2000 to today. Montreal provides significant examples of each approach during the periods specified: Habitations Jeanne-Mance (1957-59) (Figure 2A); Quartier Angus (1994-1998) (Figure 2B); and Faubourg Québec (2001-15) (Figure 2C). The next segment examines each project in detail with an introduction to the background of the urban design command and presents the main actors involved in these projects.

The modernist approach: Habitations Jeanne-Mance (1957-1959)

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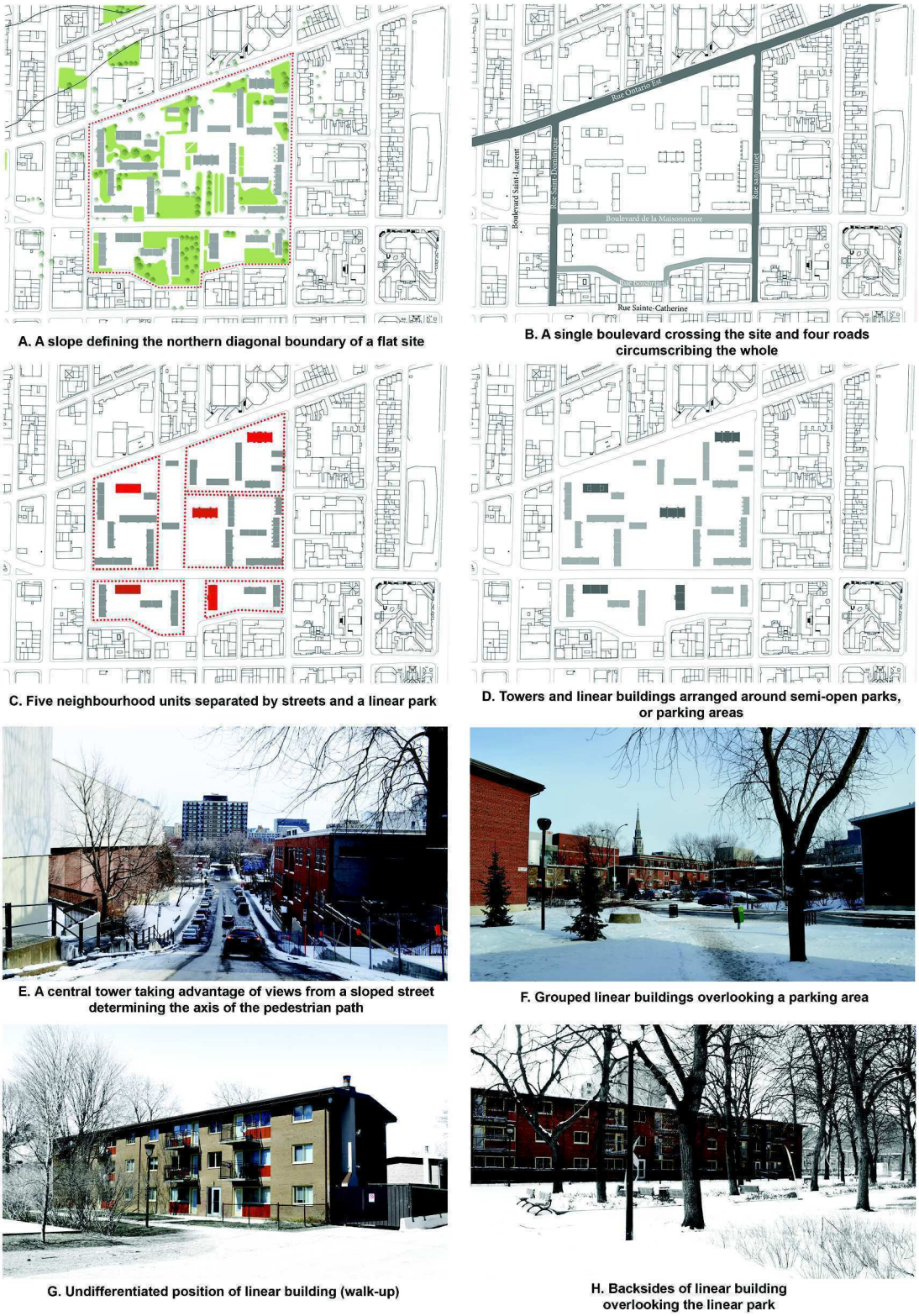

Figure 3. Components of the planned fabric and building implantation mode: Habitations Jeanne-Mance (from the updated cartographic database, Ville de Montréal, 2002; drawings and photographs by Simon Wuilmart).

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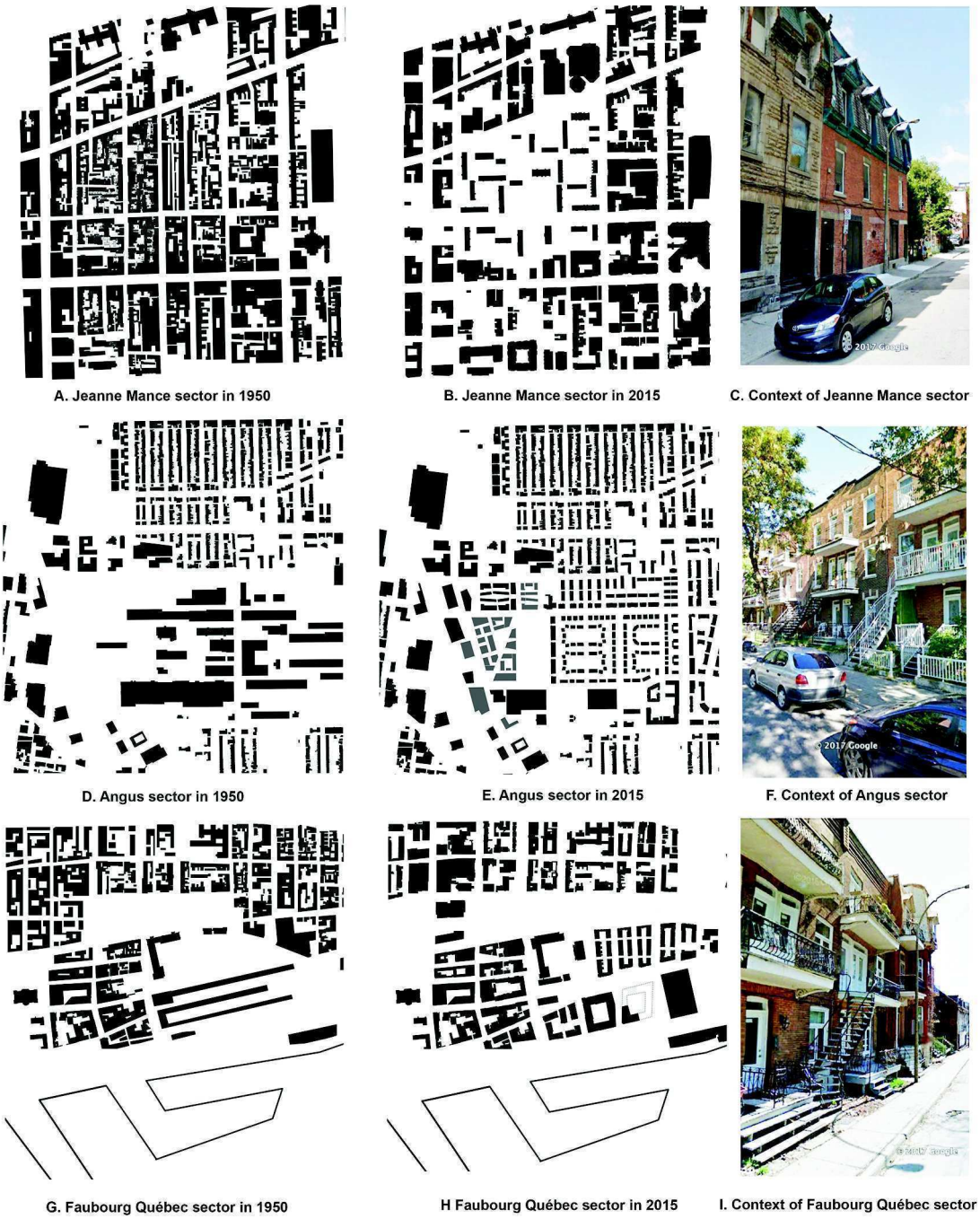

Figure 4. Diachronic analysis of the relationship of the project to the boundary context. Jeanne-Mance sector: A. 1950, B. 2015; Angus sector: C. 1950, D. 2015; Faubourg Québec sector: E, 1950, F. 2015 (Source: historical plans from Bibliothèque et Archives nationales du Québec, drawings Simon Wuilmart and photos Google Earth 2017).

The Habitations Jeanne-Mance is a social housing project intiated by the City of Montreal and financed by the federal government of Canada. As many North American cities (Boston, Toronto, etc.), the functionalist model prevailed as the tool that the public autorities preferred for solving social and living condition problems in central areas of the city. The thinkers of the era, imbued with hygienist theories, established a link between the physical deterioration of the urban fabric and social disintegration, delinquency, and

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Figure 5. Components of the planned fabric and building implantation mode: Quartier Angus (from the updated cartographic database, Ville de Montréal, 2002; drawings and photographs by Simon Wuilmart and Google Earth, 2017).

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prostitution (Choko, 1995). Taking action on the historic city was for them a way to treat the social and the health problems encountered by the inhabitants living in one of the poorest neighbourhoods of Montreal. The operation planned by the City presented the opportunity for proponents of the functionalist approach to show the potential of their urban solutions, i.e. replacing part of the district fabric by a project stemming from the reflections of progressive urban planners (Choay, 1979). Rother, Bland and Trudeau, and an architecture firm, Greenspoon, Freedlander, Dunne and Morin designed the social housing project endorsed by the City in 1959 (Ville de Montréal, 1959). The masterplan is established in a "randomly organized" manner according to Le Corbusier's notion of the free plan (Figure 2A).

To implant the concept a total of eight city blocks located on a plateau, delimited to the north by a diagonal slope, are demolished (Figure 3A). Only one boulevard oriented from east to west still passes through the site and four roads circumscribe the whole (Figure 3B). A green space entirely set aside for pedestrians is created, in which circulation is completely isolated from the surrounding street network. Five isolated neighbourhood units (Figure 3C) are regrouped around vertical towers arranged in order to visually highlight these signal buildings, while ensuring maximal exposure to sunlight (Figure 3D). The major public spaces of the project are arranged in the extension of an existing north-south street defining a pedestrian path, punctuated by a passageway under the highest tower (Figure 3E). Here the notion of the carriage gate (porte cochère), an element taken from residential district typology, replaces that of modernist piles. The opening has been walled recently reinforcing the privacy of the path and its low openness to outside residents. A secondary network of semi-open spaces determines the grouping of linear buildings formed of walk-up units and townhouses to host larger families. The townhouses with their enclosed backyards and walk-up linear buildings are arranged around either semi-open spaces or parking areas permitting very few social interactions. The linear buildings can be entered by way of parking lots or by public spaces and the front or the back face have an undifferentiated position (Figure 3G,H). The undetermined status of the free spaces (private, semi-private or public) explains their low level of appropriation by residents and infrequent use by people living outside (Jacobs, 1961).

Ornamentation has been banned and the facades are homogeneous, with a succession of uniformly sized openings. The crowning termination of the façade is undifferentiated and the gaps between some of the balconies in the high-rise towers are the only elements that enliven the facades and offer more light. The lower buildings are organized in perpendicular built alignments with simple rectangular volumes with low-slope roofs that tie together the whole (Figure 3G). The facades are also devoid of major signs to distinguish the front or rear of the housing units. The difference between housing types is marked by the tint of the facing bricks: the more the house is individualized, the more the brick goes from brown to red.

A comparison of the components of the sector before and after incorporation of the planned fabric (Figures 4A,B) shows that the demolitions have transformed drastically the site. Three north-south streets have completely disappeared and only one road divides the site in two distinct parts. The plot subdivisions have also disappeared and have been replaced by a grouping of buildings around introverted semi-open spaces. The city block system has been replaced by isolated buildings according to a free plan where the limits and the status of the free spaces are blurred when usually they are defined in the adjacent fabric.

The new buildings no longer follow the built environment rule in regard adaptation to the diagonal warping because of the presence of the slope in the north. The road network is no longer the structuring element of the fabric since the implementation mode of the built environment is generally independent from the streets making the movements through the project complex and the buildings difficult to reach. As for the relation of buildings to a subdivision system, the built environment of the context is made of adjoining buildings on 7,5 metre plots (Figure 4C). Usually the facades are overlooking a road in front

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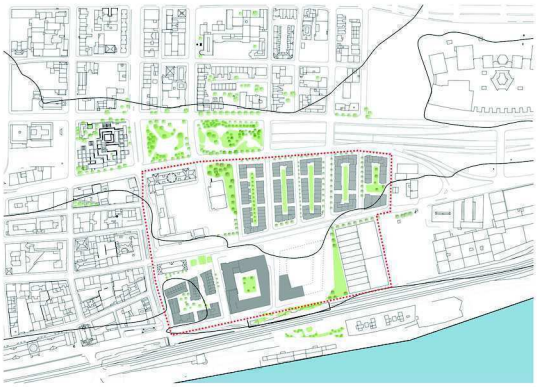
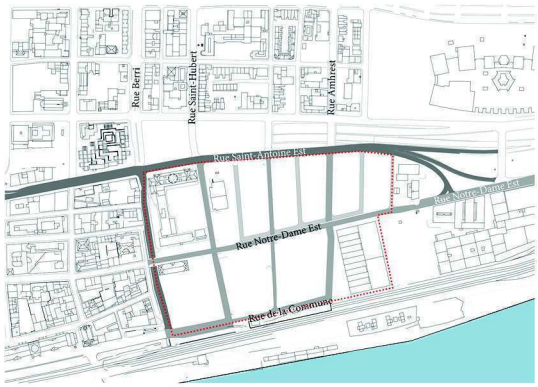
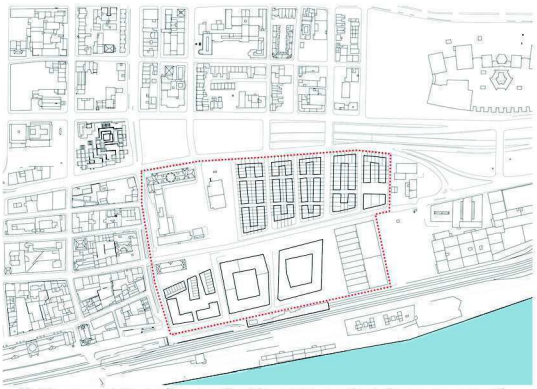


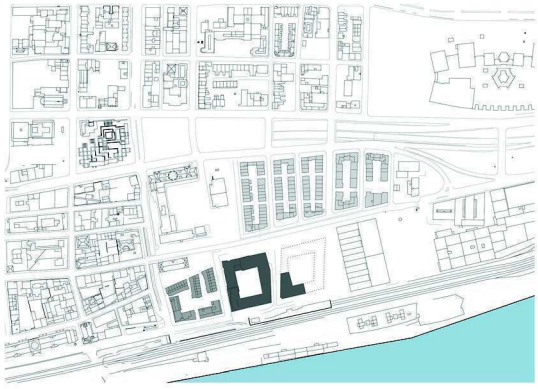
A. Site located east of Old Montreal, above the St. Lawrence River



B. Extension of the structuring north-to-south and east-to-west axes



C. Narrow plots on the north side and broader lots on square city blocks on the south side



D. Row houses in the north and multi-unit residential buildings in the south defining public spaces

E. Buildings giving form to the riverfront

F. Front façades facing the street and back façades opening onto private courtyards

G. Narrow plots for row houses and fragmented blocks enabling the incorporation of higher residential buildings

H. Row houses giving form to Dalhousie square

Figure 6. Components of the planned fabric and building implantation mode: Faubourg Québec (from the updated cartographic database, Ville de Montréal, 2002; drawings and photographs by Simon Wuilmart).

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and a private courtyard in the back but not here, the buildings have undifferentiated alignments disengaged from the boundaries of plot structure and the road hierarchy. Two organizational methods are opposed in space, one with an emphasis on identifiable empty spaces (streets, squares, etc.) and the other on fullness (towers and linear buildings). Open spaces are no longer emerging figures (Arnheim, 1986); rather the buildings are the emerging elements that creates a separation from the old neighbourhood, compromising the possibility of physical and social integration of the social housing ensemble to the city (Kostourou, Karimi, 2017). As for architecture, the hierarchical composition of the context with base, main bodies and crowning termination (Figure 4C) has been replaced by an undifferentiated system. This is representative of the modernist ideology and its will to erase social class division by proposing a uniform and homogeneous architectural language. Only the material, i.e. the clay brick, unites the traditional and planned architectural composition systems, which are discontinuously juxtaposed in urban space.

The postmodern approach: Quartier Angus (1994-1998)

In the Montreal borough of Rosemount, the Quartier Angus is a residential development located on a large industrial site. The site was occupied from 1904 to 1992 by railway equipment manufacturing and repair workshops (locomotives, wagons, etc.) of the Canadian Pacific (CP) company that spearheaded the development of Rosemont. The industrial ensemble has been included in a historic inventory in 1982 (CUM, 1982). Béïque and Associates Architects and the urban planning firm Pluram hired by CP conducted the studies required to draw up the master plan in 1994 (Pluram-Béique, 1994). To justify a zoning modification from industrial to residential, their economic studies demonstrated the non-viability of maintaining the industrial zoning on the entire site. A compromise was reached between Canadian Pacific and the borough to attribute the land close to the railway to a para-public organization named Société de développement Angus for the creation of a business pole. The objective of public authorities was to provide jobs for a local population affected by the disappearance of a major employer. The design concept is marked by the adoption of a historical archetype, the close (Figure 2B), popular with the proponents of postmodernism rediscovering the work of Unwin (Unwin, 1909). In their view, neighbourhood spaces enable the emergence of a community life that is lacking in North American suburbs (Katz, 1994). This organization aims to counter the flight of middle-class families towards low-density housing in the suburbs.

The master plan is put in place on an abandoned industrial site with a railway limiting the site to the west (Figure 5A). Two main axes are traced from east to west and north-south streets are traced in the extension of existing streets and connect to looped alleys circumscribing the closes (Figure 5B). The north-south street extensions are interrupted though, decreasing the continuity of movements through the housing scheme (Hillier and Hanson, 1984). The plot width tends to adapt to the hierarchy of major and more local streets (Figure 5C), wider on major streets and narrower on the looped alleys. The public spaces are organized in a hierarchical network ranging from a major public park, a square and neighborhood spaces (Figure 5D).

The public park is located between the areas with residential and tertiary vocations according to an approach challenging the typical segregation of functionalist urbanism. Because of their heritage value, three buildings are integrated into the masterplan: the Locoshop, the largest industrial building of the entire complex (Figure 5E); the administration building; and a fire station located at the southern entrance of the site. Almost half a kilometre long, the Locoshop building is divided into sections and facades maintained to make it more suitable for commercial or tertiary use and to enable connections to the southern part of the site. To the north, the residential section is modeled according to built alignments along the roads and neighbourhood spaces (Figure

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5F). The plot subdivision system is adapted to host the buildings that occupy the entire width of each plot (Figure 5G). This system is interrupted to give access to lateral or backside garages, thus adapting the built environment to the presence of the car without affecting the role of buildings shaping the figure of the streets. The buildings delimit the form of urban spaces that organize the whole project (Figures 5H) with a standardization of elements based on different models of semi-detached houses. Unified plexes are organized around major roads and walk-up buildings border the large park.

The facades are homogeneous with vertical divisions underlining the span of the living rooms. The buildings generally have a base to enable a liveable basement section and to include lateral or back garages accessible via passageways. Private terraces are located above the back garages and give access to enclosed private courts. The red-brick gable-crowned facades is a reference to Victorian architecture.

The transformations before and after the project (Figures 4D,E) show that traces of the prior industrial occupation remains in the south. Midway, the main axis serving the disused factories is integrated into the road network. In the north, an east-west street is traced to continue avenue de Mont-Royal, although it is interrupted by the railway but this allows the persistence of major urban axes of the grid of Montreal. The northern part of the planned fabric maintains the division-into-blocks method typical of the context (Figure 4E), while the southern section is organized according to a system of closes. The typical width of plots in the setting is 7.5 metres (Figure 4F), while the planned fabric is organized according to a module varying from 4.5 to 8.5 metres to adapt to the different sizes of row houses typologies and multifamily housing. A new type of closed space appears at the scale of the urban fabric of Rosemont giving a distinctive morphological identity to the planned fabric. This has favoured an appropriation by a homogenous upper middle class regrouped around the neighbourhood closes. Because of the compact form of the organisation, these spaces play their role as they stimulate the community interactions between neighbors while assuring a level of privacy by the backyard courts of the townhouses. The larger park of the project attracts people from outside of Quartier Angus because it is incorporated to the network of the public spaces of the borough.

Standardization and repetition characterize the architecture of the planned fabric. With their exterior stairs and balconies, the collective buildings reinterpret the template of the duplex and triplex, typical of the context (Figure 4F), but crownings tend to consist of sloping gable roofs and not flat roofs typical of the context. The tint of the bricks and variations in the form of the crowning termination are the only touches of diversity in a somewhat standardized built environment where quality emanates rather from the landscaped urban spaces.

The contemporary approach: Faubourg Québec (2001–2015)

The Faubourg Québec is promoted by a public organism, Société d'habitation et de développement de Montréal (SHDM) in association with the private sector. The SHDM established a project office that provided an opportunity to initiate a collective debate involving professionals, experts, thinkers, and practitioners and approached different committees to assist it, including community associations and business representatives. The project was subject to public consultations and an open approach in the form of an urban design and public space development. Because of its open process and the financial problems that occured, the morphology of the project has evolved through time. This has permitted the finalization of the planning guidelines in 2001 (Arbour & Associés, 2001). The main idea is to incorporate the site into the urban grid of Montreal. The traditional city blocks are the structuring elements of the whole project (Figure 2C). The public organism has encouraged a mix of typologies to accommodate cooperative housing and more luxurious apartments on different city blocks composing the master plan. The construction is not completed in the moment.

Located along the St. Lawrence River, at

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the eastern end of Old Montreal, the site began as a residential sector in the 19th century and it became an industrial zone a century later, thanks to the establishment of two railway stations, which are now abandoned. The level of the northern part of the site is situated below the level of the old city (Figure 6A). Rue de la Commune was extended to continue the built waterfront of the Old Montreal, and rue Notre-Dame was pursued to the east while north axes continued to the south (Figure 6B). The fabric has narrow plots on rectangular city blocks in the north. In the southern part of the project, the scale of the city blocks, and no longer that of the plot, determined the incorporation of new types of buildings in response to increased downtown land value (Figure 6C). The designers worked on the size of the city blocks to organize the built framework. They regulate the structure of major urban spaces to provide more private inner urban island areas. A triangular public square is built on the site of the enhanced fortified gateway, the former Dalhousie railway station, converted into a circus arts school (Figure 6D).

Through the construction of a viaduct pursuing Notre-Dame Street, the presence of two levels on the site was exploited by a play on the buildings' volumes, some of them connect both on the higher and the lower sides. New buildings pursue to the east the waterfront (Figure 6E). The buildings' front façades face the street (Figure 6F), while their backs open onto private spaces. The narrow plot pattern enabled the construction of adjoined superposed dwellings typology in the north, and the grouping of two city blocks in the south allowed the implementation of larger and higher apartments building (Figure 6G). Even if the viaduct tends to separate the site in two, the project can accommodate different household types, a factor encouraging the social mix planned by the SHDM. The buildings delimit the site's structuring spaces that favour social interactions, such as the Dalhousie Square (Figure 6H), and define the more private character of the backyard spaces. To connect with the context, two different architectural expressions are used. In the northern part, the three-storey scale is typical of the contextual fabric (Figure 4I and 6F). The buildings in the southern part are representative of a modernistic language but the concrete masonry fits with the visually dominating stone in Old Montreal (Figure 6G). Townhouses form the pedestal of higher structures incorporating flat apartments on the upper levels. A diversity of loggia openings, some single, some double or even triple, liven up the facades.

The transformations before and after incorporation of Faubourg Québec (Figures 4G,H) shows that the project took advantage of the site's characteristics, such as its topography and the presence of the river. The orthogonal network was extended with streets of similar scale from north to south and with the primary routes of Old Montreal. In the north, the city blocks are subdivided into small plots, comparable with the context and larger lots subdivide square blocks situated in the south. The buildings are organized in L-shaped volumes to define the more closed city blocks. Open linear or triangular spaces serve as a continuation of existing public spaces in the centre and at the periphery of the site.

The scale of the built environment is generally comparable to that of the bordering fabric (Figure 4I). Buildings directly face the street, are adapted to its layout, and are adjusted to the structure of the street network. They take up the entire breadth of the plot structure, narrow and deep on narrow plots, and more imposing and L-shaped on square city blocks. The block structures the shape of open spaces by extending the waterfront of rue de la Commune and the larger frontage along Notre-Dame Street and along linear public spaces in the northern part. Facade composition utilizes vertical elements (loggias, balconies) and the size of the openings matches the vertical proportions of the facades. The project represents a dialog with the scale of the clay brick architecture of Montreal, while stone masonry use as material for the more imposing buildings is related to the cut stone expression of the ancient fortified city.

Conclusion

We can see the influence of schools of thought that affected the relationship between the three

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planned built environments and the urban morphology of Montreal. Habitations Jeanne-Mance applies the premises of functionalist urbanism and provides a good idea of the disintegration effect of a free plan on the morphology of the city (Figure 2A). Quartier Angus reveals an inspiration drawn freely from the theories of cultural urbanism (Choay, 1979). By retaining the organizing figure of the close of English garden cities (Figure 2B), designers sought an antidote to the typical individualism of low-density housing of North American suburbs. The incorporation of this reference in the urban fabric creates a distinctive environment attractive for families. We also wish to mention the emergence of heritage considerations in terms of architectural forms and layout as structuring elements of planned fabric. The reuse of the Locoshop for commercial and office purposes clearly demonstrates that Rossi's lesson was retained: forms do not follow function; they can be reused and reappropriated throughout history (Rossi, 1980). Finally, the more open planning of Faubourg Québec, involving a multitude of actors and its implementation over a long period enable the integration, in the design process, of a rigorous knowledge of the form of the city itself. The need to densify the city and adapt it to contemporary construction techniques gave way to the emergence of the figure of the city block. As such, the city is structured on basis of a joint effort on the part of architects and builders to define an emerging figure, the built block closed onto itself. This emerging form represents a cross between the form of rectangular district blocks typically formed of 7.5 metre district plots and the closed blocks of Old Montreal whose centre is accessible by way of large carriage gates (portes-cochères). This shows a process of typological evolution and an adaptation related to the typical urban form of Montreal. Here the context and its latent spatial potential for physical integration is use by the designers to assure the sustainability of the new urban ensemble (Kostourou, Karimi, 2017).

Finally, an analysis of the evolution of urban design practices shows the development of expertise over a period of 60 years, where the issue of morphological and spatial continuity between planned built environments and urban fabric has proven to be very important indeed. The analysis reveals that the phenomenon of morphological discontinuity associated to modernistic theories tends to subside with time because the planned built environment is increasingly designed on the premise of a "dialogue" with the morphology of the inherited city. This is explained by an increasingly rigorous interpretation of the morphological and typological characteristics of the host environment when designing urban projects. The task of urban designers during this period has been to reconcile modern architecture and its achievements with the morphology of the city. This knowledge is being used to create today's integrated built environments, and to protect, with the help of morphological research, the gains derived from this long learning process. Thus the role of the architects, urban planners and designers will be to pursue the aim of reconnecting planned urban environments to the evolution of the urban form, by promptly addressing the major issue of contemporary urban design, i.e. sustainable development.

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From the so-called Islamic City to the Contemporary Urban Morphology: The Historic Core of Kermanshah City in Iran as a Case Study

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Abstract. *Pre-1920 cities in Iran were characterized by a number of features shared by other traditional cities of Islamic world. Although often criticized for their Eurocentric nature, the features of "Islamic city" can be useful as starting point to analyze the modernization process of these traditional cities and their crucial impact in their structural transformation. As the traditional cities of the Islamic world have been much more studied than the twentieth century changes that have transformed them, we need more holistic and integrated understanding about the changes derived from the modernization process. To explore the broad and wide-spread of their metamorphosis, it is more enlightening if we study second order cities, rather than studying the transformations of major capitals such as Cairo, Istanbul or Teheran, where interventions are more exceptional and more rhetorical. Therefore, this paper aims to study the historic core of Kermanshah city, to understand the link between urban and social transformations due to modernization process by tracing it historically. We will focus, particularly, on studying the stages of urban transformation and changes of urban morphology as well as conflicts and differences between traditional urban features with the modern ones. In other words, we are interested in understanding how traditional morphology and structure of residential and commercial zone are affected by the opening of new and wide boulevards in course of modernisation process, and how these changes influence everyday people life.*

Keywords: Iranian city, Kermanshah, urban morphology, Islamic city, urban transformation, Modernization schools of thought, Montreal

Introduction: The modernization of a second order city

The Iranian cities like all cities in Muslim world were influenced by western modernization and had major changes. Before 1920 the traditional Iranian cities, including Kermanshah, shared the components and spatial relations of the so-called Islamic cities: city wall and gate, madrasih (religious school), hammam (public bath), bazaar (commercial district), citadel (governmental palace), Friday mosque, Mahallas (residential neighborhoods) that were divided often based on different ethnics or religions criteria and hierarchical networks of winding alleys and the numerous cul-de-sacs that link the houses to the city center (Borumand, 2009; Kheirabadi, 2000).

In 1920 this traditional pattern experienced the beginning of new phase in urban and structure change (Ehlers and Floor, 1993; Marefat, 1988). The first steps for modernizing of Iran, especially Tehran as the capital, were taken during the regimen of Naser-ed-Din Shah in Qajar dynasty by the 1870s after his visit of Paris (Katouzian, 1996). But it was not fundamental until the early 1920s with monarchy of Reza Shah during Pahlavi dynasty (Habibi, 2006). The importance of urban modernization study in Iranian-Islamic

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cities is that the modernization process in Iran was a choice and was not imposed by the Western (colonial) countries like the most of so-call Islamic city (Isenstadt and Rizvi, 2008). Moreover, Iran's case study has become an interesting benchmark, being the only country that has established an Islamic regime since 1979. The period for over 30 years, less studied, in which the religion has acquired a great collective presence.

In the current paper, we analyze what were the features of urban modernization and the tension between them and traditional ones over the time. The paper studies the city morphology and its administrators' and planners' attempts to respond to the real and perceived problems related to process of modernization. The modernization was driven, not only, by power of municipal law such as opening of boulevards, new infrastructures and equipments, but also it was accelerated by historic city transformations dynamics such as new ways of inhabiting, demographic and urban expansion.

Kermanshah city, as our case, is one of important second order cities in Iran and the capital of Kermanshah province. This city has not experienced exceptional and fast modernization process like Tehran. Also it has not been rapid-growing industrial city but has faced with radical urban transformation. As an historical city Kermanshah, in terms of its historical evolution, is not exceptional as Isfahan, Iranian historic city par excellence. But it has a long and constant history, in which the traditional structure of city as a pattern of so-called Islamic city has been maintained long enough before modern transformations (Karimi, 1998).As a result, not only the city has significant features of urban modernization now but also contains considerable character of its traditional features as a traditional Iranian-Islamic city yet (figure.1).

Methodology: A long term and spatial approach

To understand Kermanshah transformation, we need a long-term approach, since the beginning of the twentieth century until today, and also mapping tools for a spatial approach. We used secondary data including documentary research in various libraries archive such as books, literature reviews, newspapers, cartographies, and aerial photos; B) Comparative approach to study this process across the Iranian, Islamic, and non-western urban world.

In order to use cartographies those historical aerial photos of city have been scanned and digitalized by QGIS software; and were drawn based on the main features include streets, rivers and built environments, agricultural

Figure 1. Historical commercial routest (Silk Road) and situation of Kermanshah

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area. Then these maps from different dates have been overlaid to shows more clear change of city over time.

Analysis: The stages of a non-colonial modernisation process

Today Kermanshah is a large market city as well as an important military base for the western part of Iran. This strategically situation of city forces it to face many changes over the time such as modernisation of city. Thus to analyze the process of modernisation in Kermanshah, we consider to chronology and pivotal stages of the city transformation summarized as schematic analysis in figure 5. and figure 6. In the first stage the city is observed in its characterized pattern with features of "Islamic city", before 1920, during Qajar dynasty (Figure.2). Actually, the second stage for study is the beginning point in course of modernisation process when centralized government under Reza Shah Monarchy, from 1925 to 1941, provided context of law to autonomous modernisation for Iranian cities, include Kermanshah (Katouzian, 1996). In this regard, following legislation of Municipalities law as street widening act of 1933, the first new Haussmann's boulevard with new roundabouts divided old fabric of city in 1935(Clarke and Clark, 1969); include bazaar and residential quarters, into two parts through extended from north to the south of city (see figure.3). Although these years were not the period of rapid expansion for the city but some growth occurred to response to construction of Anglo-Iranian oil company refinery and its residential, recreational, and sport complex in the north of city, near to Qarasu River, in 1936 (Clarke and Clark, 1969) (Figure 4.). This new complex brought a modern stream for the city at that time because of its modern design, especially modern layout of houses, modern methods, and materials of construction.

The end of first Pahlavi and the transfer of reign from Reza shah to his son, Mohammad Reza Shah, coincided with Second World War. During Second World War, Kermanshah grew little and there was lack of series experiments and variations in terms of city's modernization even in the network of new streets (Figure.4 and Figure.5). Because the city was located in an area affected by tribal upheavals, after the fall of Reza Shah, it was occupied by Allies, especially by British and Americans, and became a military base, with an airport, as a stopping point in the long route of convoys supplying Russia (Clarke and Clark, 1969).

Mohammad Reza Shah Pahlavi, between 1941 and 1979, like his father not only favoured the construction of new boulevards and highways but also he introduced land regulation and socioeconomic planning as

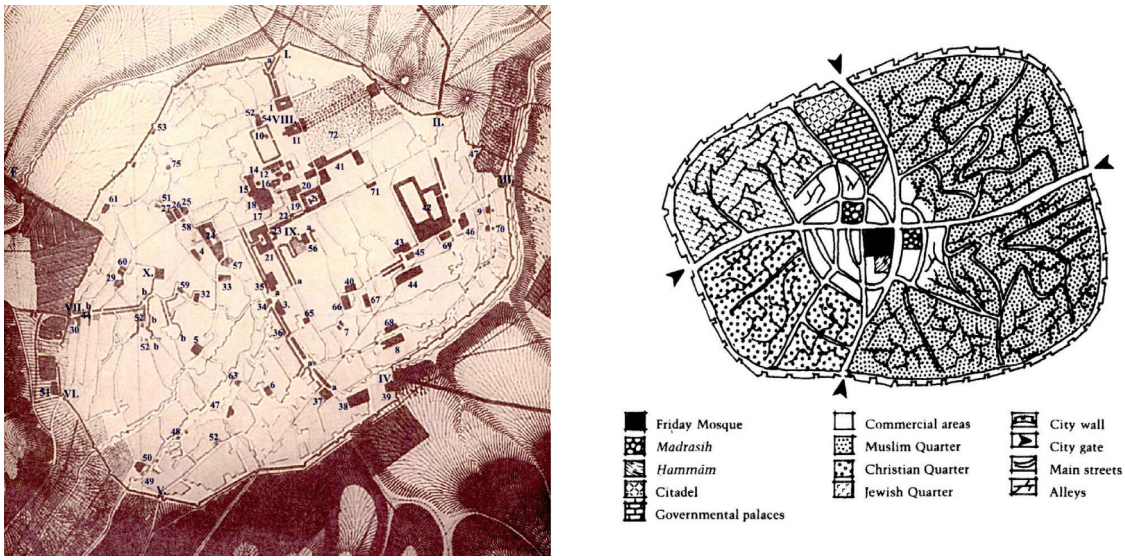

Figure 2. Concordance of Kermanshah city in 1850s with Model of Islamic city (Borumand, 2009; Kheirabadi, 2000)

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urban management devices (Zad, 2013). So during his reign a second and third Haussmann's boulevards in parallel with the first one divided the historic core of city and bazaar and traditional residential districts more (see figure 3. and figure 4). This new modern street segmented active, continues and organic morphology of historic core and attracted retails and construction of new multi-storeys, usually two or three storeys, building in front street. This new situation made them as main competitor with bazaar as a focal point for daily social life of people in the city. During second Pahlavi and monarchy Mohammad Reza Shah, The plan organisation's industrialisation strategy for country, among them was the 'land reform'1 policy, in order to enhancing the industrialisation process, led to the massive rural-urban migration and consequently massive urban growth for city. Hence the population in Kermanshah was increased from 125.439 to 290.600 people between 1956 and 1976 that led to expansion and progressive housing in almost every direction of city's peripheral (Clarke and Clark, 1969) (Figure.5).

This urban sprawl expansion was continued for Kermanshah after Islamic revolution in Iran and also during eight years war between Iran and Iraq, that events accelerated the emigrations and growth of city due to geographical location of city with border with Iraq (see figure.5 and figure.6). The process of modernisation was stopped, replaced with slow reconstructions, during these years and until 1986 there was not any comprehensive master plan to control of city expansion. The city only was witness of uncontrolled, unplanned and enormous expansions but with low density (Borumand, 2010). This outward urban expansion led to inner historic core of the city has been considered as decayed context and goes through demolition and have been replaced with people, most immigrants who don't have any common identical, social and cultural like the past; hence, distinguished traditional neighbourhoods based on ethnic or religious, replace by polarized neighbourhood, based on poor and rich people. Also this uneven development process and widespread city growth led to old villages in the area have been swallowed in the sprawl of modern estates. The most of the remaining people of Kermanshah live in areas, which were previously villages but are now part of the metropolitan area and are regarded as city land (Adibi, 1989).

Conclusion: From the 'Islamic city' to the Islamic Republic

Iranian cities undergo similar processes to many non-Western cities. If we have comparative view to trace modernisation process, between non-colonised cities, among non-western cities, even Islamic and non-Islamic cities, it would be considerable that there are multiple cities that although, they might have experienced diverse particularities and non-uniformity but they have many similarities in regard to plural modernity (Sintusingha and Mirgholami, 2013). Modernisation is above all a reaction to the Western modernization that is imposed globally. The long phase of the Islamic Republic has inevitably followed this process of modernization with strong tendency and the religious question is less decisive than the political situation, the War with Iraq, the emigration of the rural population to the city, or the lack of investment derived from the disconnection of the Western world. So in cities like Kermanshah, as second order cities, even though modernisation process has not been symbolized, equal as major cities like Tehran, but shares many similarities in terms of urban modernisation processes and morphology changes with most of the cities in the world.

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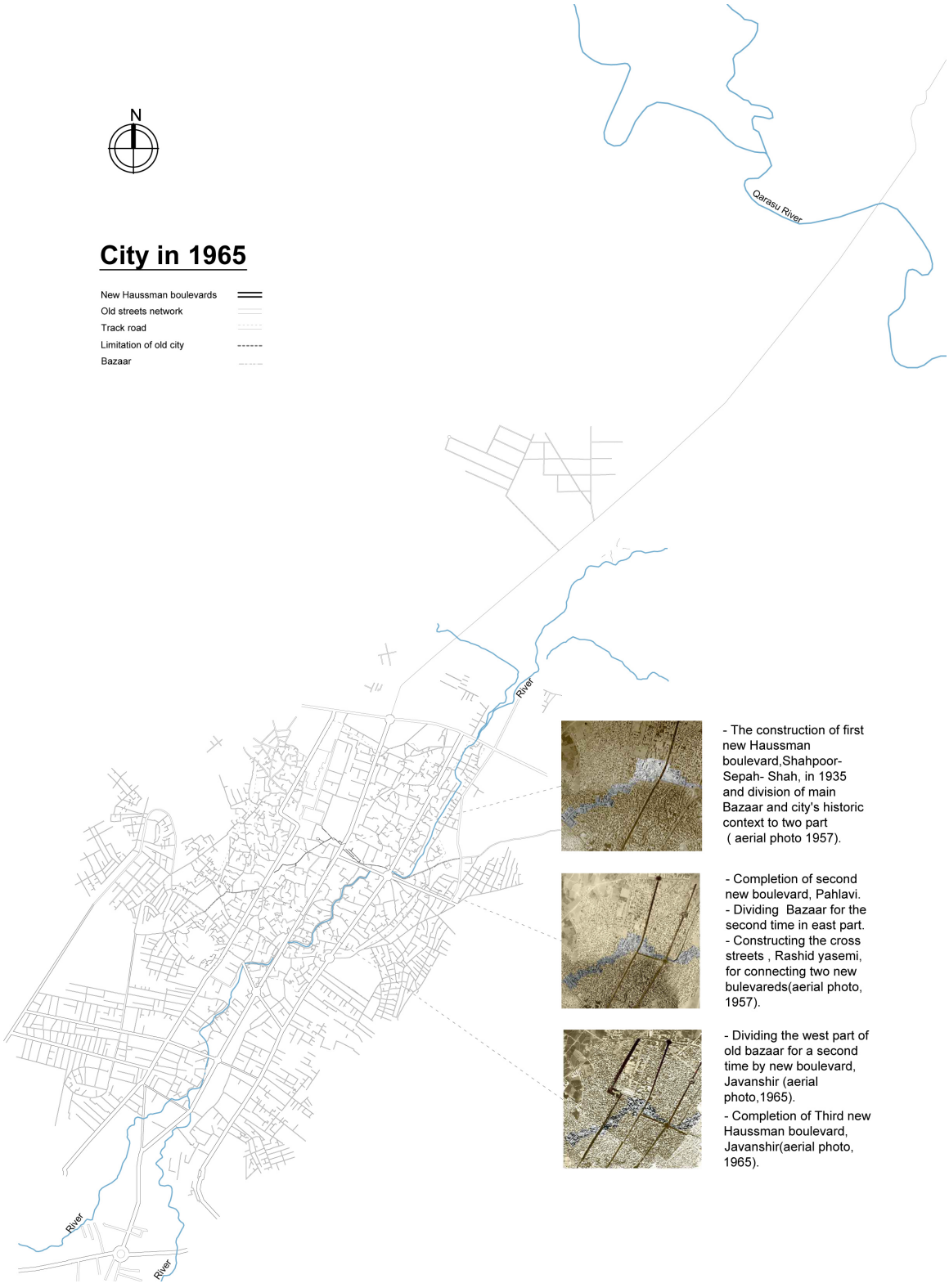

Figure 3. Haussmanian bulevards on traditional context on city

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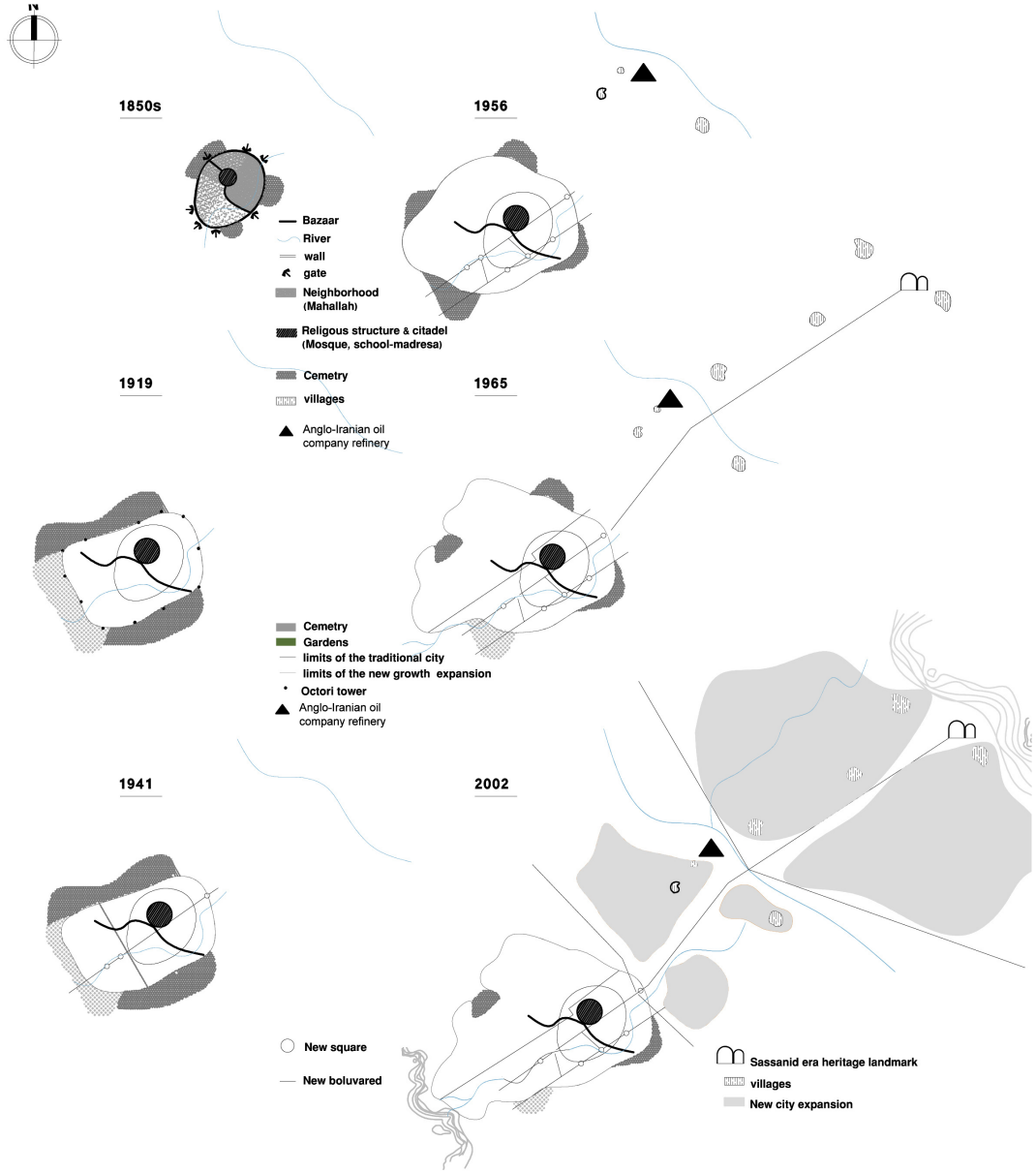

Figure 4. Schematic stages of Kermansah transformation

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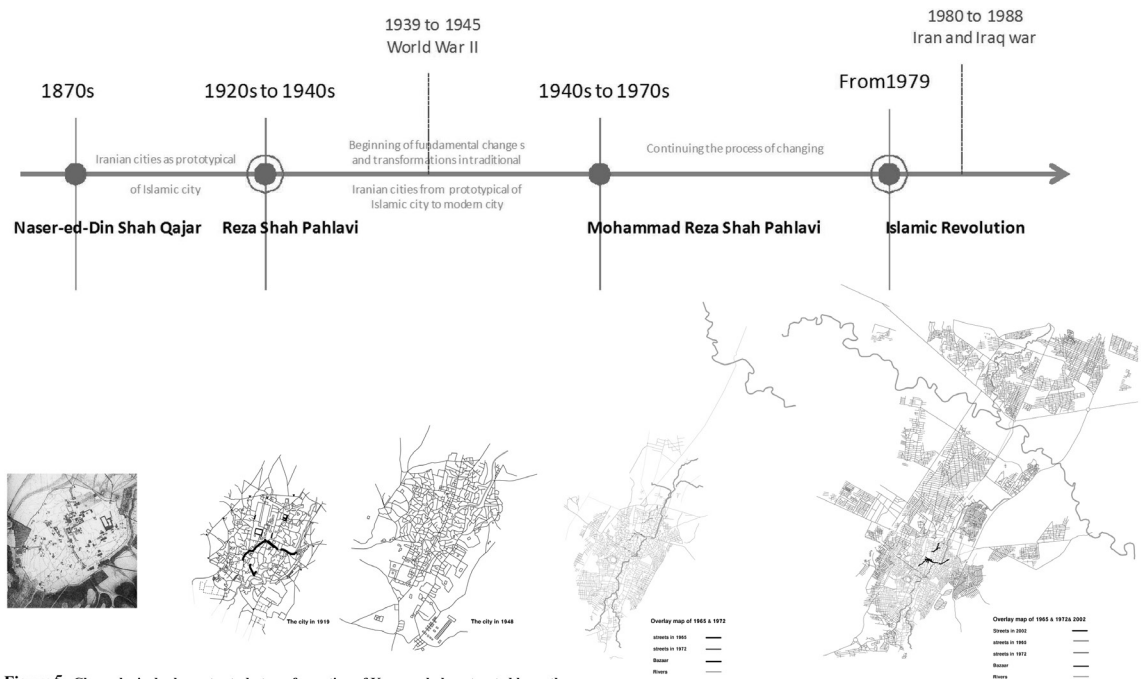

Figure 5. Chronological scheme to study transformation of Kermanshah: extracted by author

Notes

Reverse peasantry into smallholders by redistributing agricultural land from feudal landowners to sharecropping (Zad, 2013).

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The role of plots and building types in the morphological research of Chinese traditional village tissues

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Abstract. *In Chinese traditional village, the morphological transformation of village tissue was embedded in the changing of co-existing morphological elements that recorded the geographical evidence of social structural changing from traditional private ownership economy to rural collective economy. The interactive relationships of individual plots and building types require investigation in detail as theoretical praxis in the morphological research of village. Several questions need to be clarified in relation to plots changing and new plot setting: how the building type transited when the plots size reducing or extending and what is the plot extending rules? What is the principle of plots re-dividing and whether the plot can be re-divide when the building belong to its kept unchanging? Is that plot limits building types or building type decides the size of the plot? Focusing on a village in north of China this paper will investigate how the morphological elements worked and acted during the village transformation, based on the field survey, residential recordings and village maps in several period. Our results will indicate that the role of the plots and building types were different between villages and urban, which were interacted each other differently. The co-relation of plots and building types of the village are developed.*

Keywords: Parent plots, sub-divided plots, building types, village tissues

Introduction

Urban morphology reflected the social development. As the research object, the morphological elements are highly sensitive to socio-cultural forces opening over time and are defined by three fundamental physical elements: buildings, plots and streets (Moudon 1994,1997). A generic structure of urban form, the hierarchy of morphological elements, has been studied in relation to the M. R. G. Conzen, Gianfranco Caniggia and Gian Luigi Maffei (Kropf, 2014). Morphological elements in different levels of resolution are a synthesis of all components, which contribute to the concept of urban tissue (Kropf, 1996). For Conzen, individual plots are the fundamental unit of analysis (Kai Gu, 2014) whereas the existed buildings and its mechanism are the research base of Caniggia. Form different approach, they aim to understand the physical changing of urban form in a complementary way. The analysis in Alnwick from M.R.G.Conzen provided an evolutionary approach to tracing existing forms back to the underlying formative processes and interpreting them accordingly (M.R.G.Conzen, 1961). Originated from Saverio Muratori and based on process-structured reality, Caniggia G developed the methodology in which examining past building is the “historical-type” or “process classification” through the extracting the laws of behavior, formation and mutation of manmade structure on various scales of built environment (Caniggia G, 2001). Conzen focus on town plan analysis that require

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Figure 1.
Satellite image of Shangzhuang Village (left), Gewan village (middle) and location (right).

historical map in the scale of 1/2500 contain the information of streets, plots and block-plan, whereas Caniggia aimed to interpret individual buildings and its mechanism by which the form created in one morphological period are succeeded by those created in the next, that require building information over times. To understand village form suggests the research of interactive relation of morphological elements that reflect the mode of production and land system. Morphological elements in Chinese village also contain building types, plots and streets, each of which present its importance in history. Originated from living experience, clear and stable building type construct the original village form and continue adjusting to accommodate the changing family, accompanying by plots sub-dividing and extending. Conversely, plots regulation played a crucial role in village planning that influenced village form after 1980s. This contrast requires a synthesis method to interpret village morphology by employ the approaches of British School and Italia School. It is the foundation to clarify the terminology in research context since the concept of plots has no clear consensus (Kropf, 1997). In traditional area, plots were originally defined by courtyard building types with the same access and shared yard, namely, plots present both space control and ownership. Through property redistribution, sub-divided plots gain its ownership boundary inside parent plots that continued existing in order to provide the common spatial control, a shared yard and access to sub-divide plot. Transformation of morphological elements records the geographical evidence of social changing: family structure changed from composite family and lineal family in traditional private economic system to nuclear family in collective economic system. Together with economic system and its corresponding family structure, physical elements contribute a relatively stable structure that may fix itself or transform into another structure by some internal adjusting. As theoretical praxis, this paper will go through the internal relationships of individual plots and building types based on morphological process of village through Shangzhuang village complemented by Gewan village in relation to different types of transformation. The different morphological interaction comparing with urban context was developed and further indicates a structural relation between village form, social economy and family structure.

Case and research condition

Village, building types and plot changing

The selected cases suppose to have the character to span the different historical period and contain general building types that continued transforming in process. Originated from Qing Dynasty, Shangzhuang village located in North of China by Qin River where there were several building types. However, Shangzhuang Village had the limitation related to transformation of traditional building types before 1949, hence Gewan Village, pertaining to the same culture circle, complements this morphological changing (Figure 1). The research of Shangzhuang Village was based on

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official documents after 1949 and the analysis of Gewan Village relied on family document contains inscription in physical structure and family documents before 1949.

Around Qin River, reflected the changing of family structure there were several chronological building types, traditional courtyard houses, variant courtyard houses and new building types including semi-detached houses and multi-storey apartments[1], which characterized 3 periods marked by private economic system before 1949, from land reform in 1949 to economic reform till 2000s and urbanization after 2000s (Guo, 2017).

Before 1949, under private economic system, composite family contains several nuclear families cultivating traditional courtyard building type, but family separation only happened by the elder's passing away. Courtyard building types adjust its composition geometrically in the way of typological character contains "Jian", buildings, basic courtyard and composite courtyard so as to adapt family changing (Guo, 2017). The basic living module is "Jian" that measured and composed buildings in one or three Jian. Building with three Jian was a standard unit for a nuclear family and building with one "Jian" played as auxiliary unit to serve 3 Jian buildings. Buildings has the capacity to be basic courtyard to meet the requirements of composite family who's expanding led the composite courtyard. Plots of traditional courtyard house were recognized by courtyard-plan.

In 1949, land reform in Chinese village give rise to the redistribution of property according to family scale, that triggered the re-dividing of courtyard house in name of communism. From 1949 to 70s, new building was not built because of relatively poor economy (Jilin Wang, 2001). From 1949 to 1962, plots can be traded as private property. Since 1962, the ownership of plots belonged to collective production team and the right of use belonged to village residents. However, residents had the ownership for buildings whose trading is free and the right of using of plots followed the changing of building. Around middle of 1970s, economic reform brought the booming of productive force and plenty of building was built (Jilin Wang, 2001). Family structure generally changed form composite/linear family to nuclear family trigged by popularizing family separation (Wang Y, 2000,2007,2008). Another property redistribution appeared for the separation of family by the marriage of next generation. Traditional building types continued serving this social transformation. In 1982, because of a national building and plot policy, new plot was strictly controlled. When new plots required an application with general decreased given area around 1982, 1986, different variant types emerged in new territory through keeping the courtyard pattern and Jian but adjusting building composition. For variant building types served for a nuclear family, the north building continue existed and contained 5 to 8 Jian whereas the west and east building became serve part and the south building commonly disappeared. In between traditional type and variants, both of courtyards was the spatial center but the social center changed form courtyard to north building.

Around 2000, influenced by modern living mode in urbanization and continuing limitation of land resource, new plots was given smaller area adapted by imported building types, semi-detached houses and multi-rise apartments without the character of courtyard houses. Multi-rise apartment lost plot and gained a collective plot and semi-detached houses still had plot.

Historical map provide the foundation for the village transformation. Originally, parent plots both present spatial unit and property unit defined by building-plan, a complete courtyard house accommodating one family. Plots sub-dividing suggest the separation of ownership but continually shared space access in parent plots. In the residential recording of 1992, parent plots was given a term of Zong di with registration number because of the shared courtyard. Shangzhuang Village map in 1992 and 2006 in the scale of 1/1000 are the precondition of historical map. Other historical map in former time including building types map and plot map was reconstructed through residential recording in 1992, residential recording in 1949 and other historic researches on this study case (Figure 2) (Guo, 2017).

The changing of population, family

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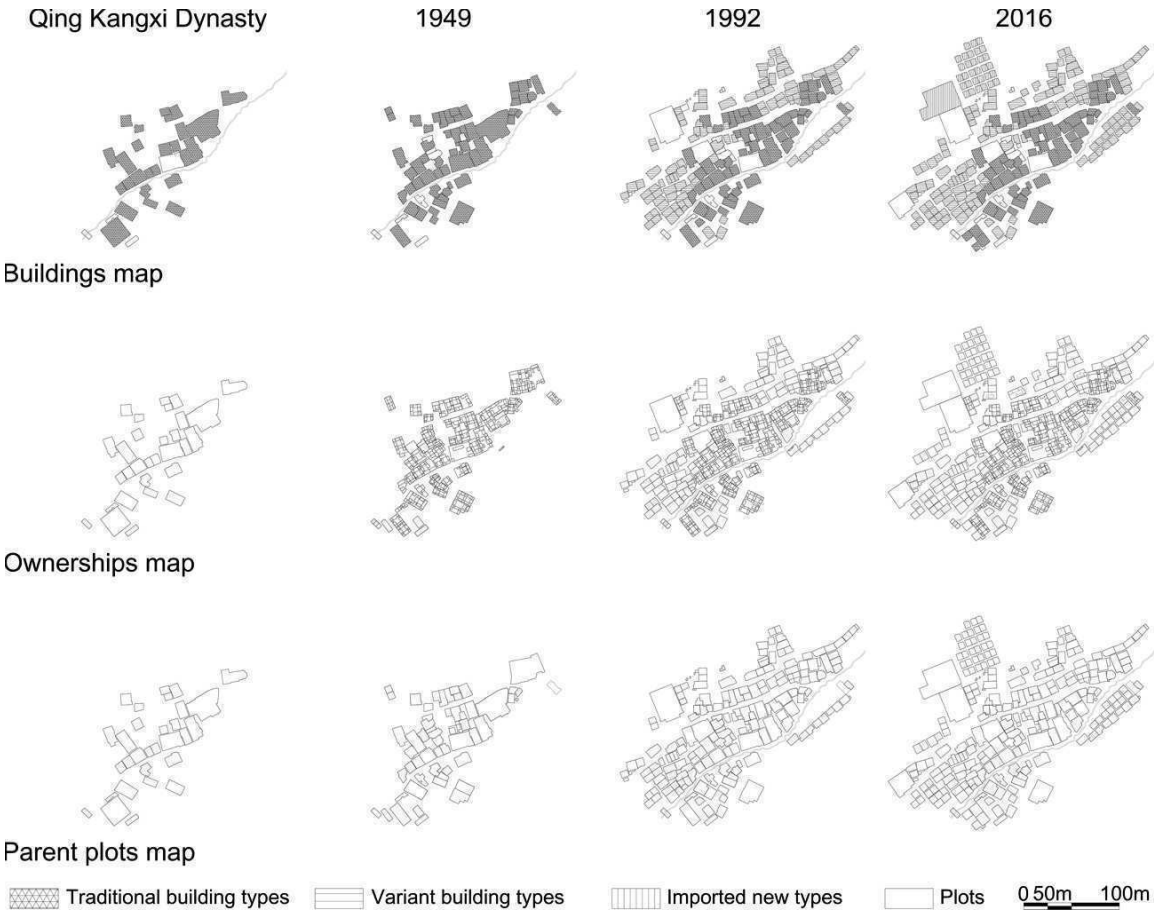

Figure 2.

Previous study of transformation of Shangzhung Village in relation to building type and parent plots.

quantities, parent plots quantities and plots quantities of ownership was showed according to historical map and Historical Records of Shangzhuang village. Quantities of plots ownership, population and family quantities had stable increasing since 1949. However the quantities of parent plots (Zong di) keep unchanging because of there were no new construction before 1980. It suggested the role of family changing that might not changed the quantities of building or building types through new parent plot but changed plot ownership.

Family documents

Individual morphological elements were conditioned by family changing. Before 1949, the time of missing documents, family tree and certificate of family separation indicates the relationship of residents contain family number and separation time, whereas the inscription of beam structure indicated name of householder and built time, the relationships of residents and buildings. So far, the transformation of building, parent plots and plots sub-dividing can be reconstructed. After 1949, official residential information was recorded in 1949 and 1992. Residential recording in

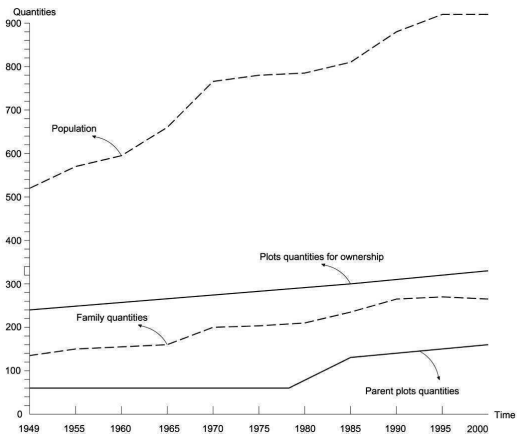

Figure 3.

Statistics of area and quantities of plots and buildings

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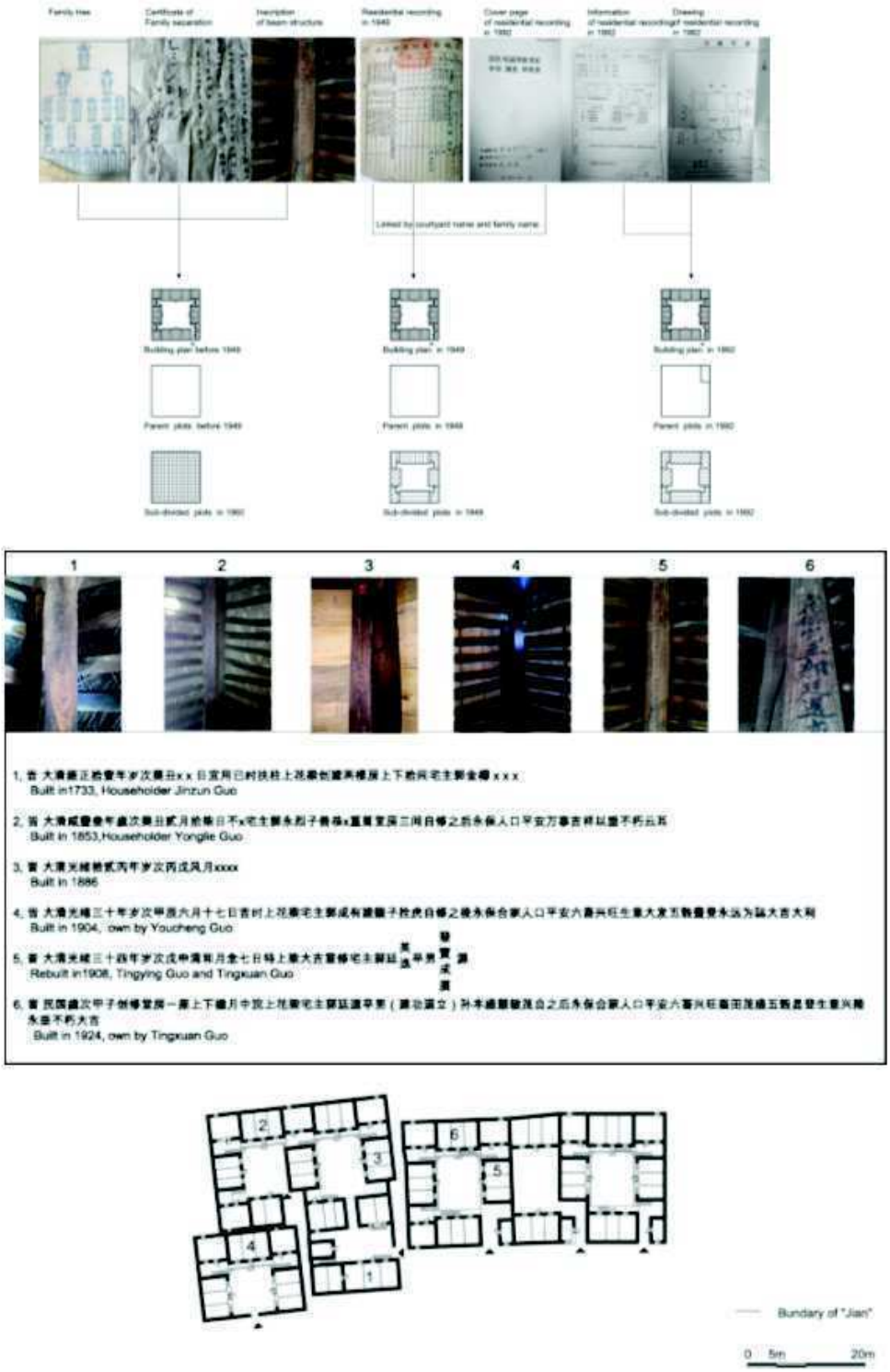

Figure 4.

a. (above) Family documents and residential recordings. From left to right: family tree, certificate of family separation, inscription of beam, residential recording of 1949, cover paper of residential recording in 1992, information page of residential recording in 1992, plot drawing page of residential recording in 1992. Each of pages project to certain part of reconstruction of individual elements

b. (center) Building inscription. Information in beam structure indicate name of original householder and built time.

c. (below) Current building plan with inscriptions in building structure.

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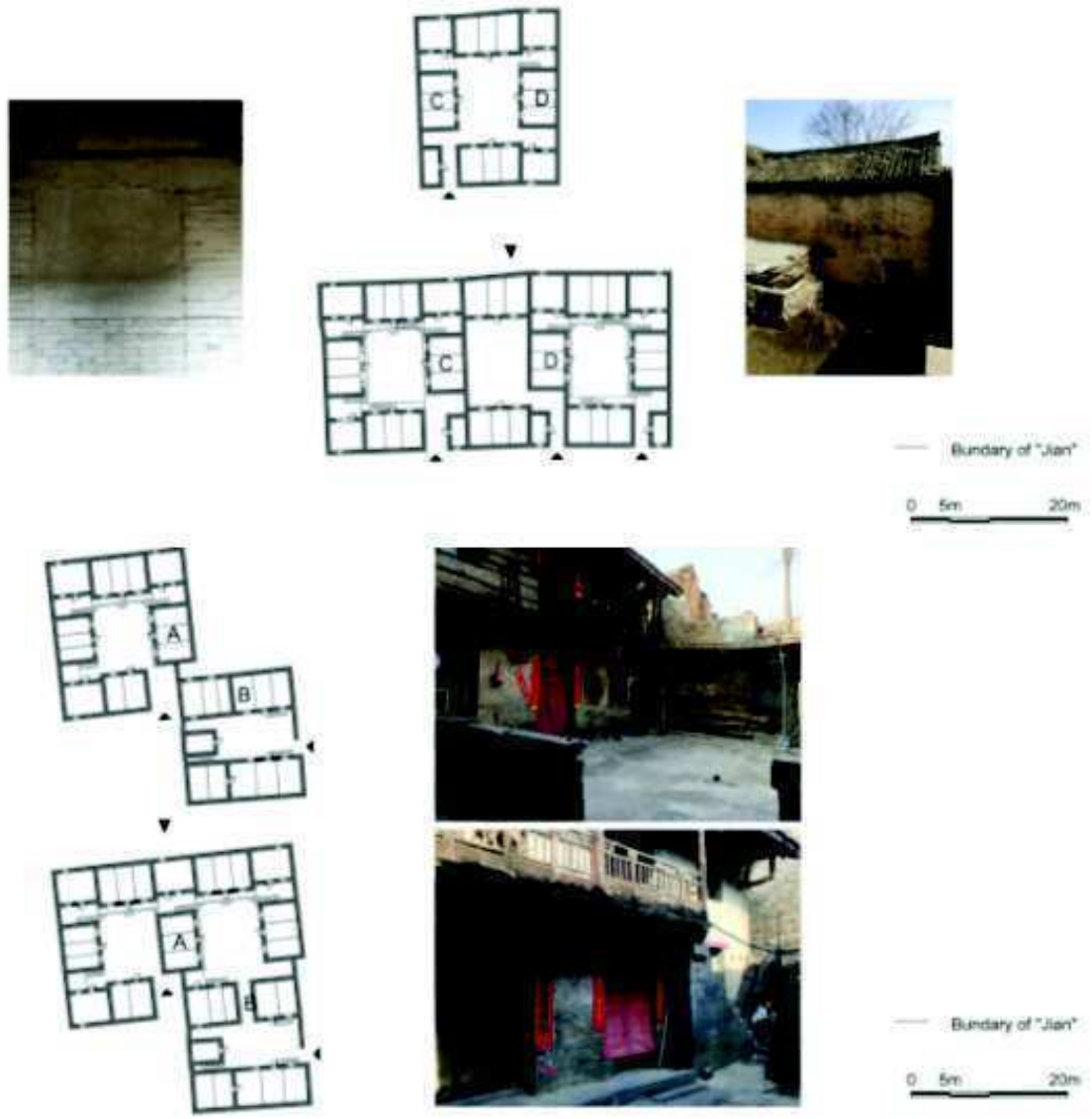

Figure 5.

a. (above) and b. (below) Construction marks indicate the compositional changing related to re-setting of entry.

1992 contains cover paper showing number of parent plot, name of householder and address, information page with ownership, area, family members and family separation certificate and plot drawing page indicating sub-divided plot and parent plot. Family was the unit of recordings and several families might share the same parent number with the same courtyard. Although residential recording in land reform of 1949 only described house name, householder, property list and border in witting without drawings. The shared same courtyard name and concept of "Jian" as basic measuring unit in between recording 1949 and 1992 linked each other that contribute to reconstruction of building and plot in 1949[2]. What is more, the objective properties were buildings, which defined plots, pertain to buildings. Further information in 2006 could be investigated by residential map in 2006 and field survey (Figure 4a).

In the study area of Gewan Village, conserved inscription in beam structure was belong to different buildings (Figure 4b, Figure 4c) that contribute to later reconstruction of individual morphological transformation. Considering each family occupying one courtyard, any one inscription of courtyard house can indicated relative built time and householder though some of inscription was damaged.

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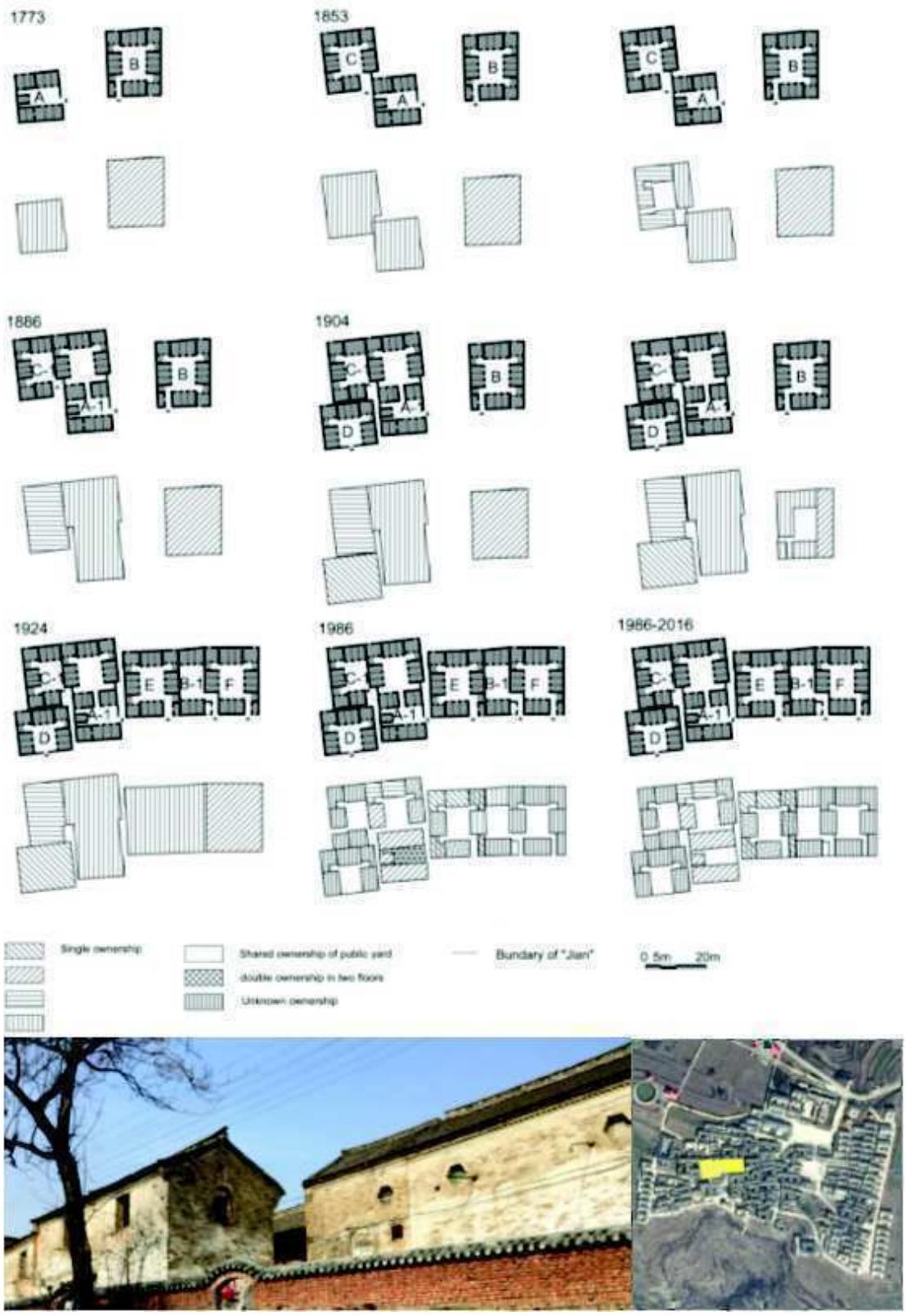

Figure 6.

Samples in Gewan Village. Current plan was constructed by field mapping and historical transformation was reconstructed by inscription in building structure, family tree, certificate of family separation and construction marks.

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Physical evidence

The historical reconstruction marks decodes the compositional transformation of building plan that operated in 2 ways, extending from a whole courtyard house and extending from part of courtyard house that suggest a former plot sub-dividing (Figure 5a, 5b).

In the process of transforming of Gewan Village, entry was cut into building B and building A changed its entry to opposite yard in order to extend to double courtyard house from complete courtyard house. After separation of parent plots, the entry of building C and D was changed to opposite yard so as to form another 2 courtyards house (Figure 4c).

The transformation of village form suggests a hypothesis of interaction of individual plot and building type that reflect family changing.

Morphological Changing of individual elements

According to building types, individual building plan, parent plots and sub-divided plots in transformation of Shangzhuang Village were constructed in order to reduced to several typical changing types (Appendix 1 shows a statistics of different changing types). As complementary, the process of selected block in Gewan Village also presents its individual changing of elements. Typical samples in 2 cases focus on different period.

Traditional building types

Since the lacking of official building recording before 1949, family documents and physical evidences have the capacity to recover the transformation of individual buildings and plots in Gewan Village from1773 to now (Figure 6)[3].

Since the strictly controlling of plot area for each family after 1949, almost plot extending appeared before 1949 when composite family enlarge its scale[4]. Based on the family ownership, it is clear that the some of extending commonly started from a standard courtyard house to composite courtyard house and some of extending approach from part of courtyard house that inversely left the shrinking plot. This extending and shrinking suggest a former plot sub-dividing though there were no evidences to support. Plots changing did not restrict building types but was conditioned by adjusting of building composition defined by variation of composite family. Extending area was based on the multiples of courtyard house and the sub-divided plots were one or several buildings. The traditional construction enables the property redistribution.

Some of sub-divided plot was restricted inside of parent plot may adjust its ownership and some of sub-divided plots without surrounding restriction lost the access to parent plot in order to set up new plot to form a irregular building type by expanding its area till other constructions or road.

Land reform in 1949 redistributes all the building property in average. Buildings measured by 3 or 1 “Jian” conditioned plots sub-dividing and building still did not changed. Around 80s, limited trading and further popularizing family separation by the changing of family structure lead to a continuing property redistribution in-between generations, which give birth to re-distribution of sub-divided plots based on buildings. However parent plots still contained sub-divided plots with shared yard and access. The sub-divide plots reserve the further changing of parent plots and building types (Figure 6).

Variant building types

Variant building types characterized period from 1980s to 2000 when there were 2 times for new plot restriction before and after 1986 triggered the more and more smaller plots that restricted 2 Variant building types. In the property redistribution for popularizing family separation in between generations around 80s, sub-divided plots appeared inside of the parent plot. When parent plot and building keep unchanging, sub-dividing principle here is based on the redistribution of “Jian”. Building construction changed form wood construction to concrete construction. After 1986, the more decreased plot area influenced another smaller variant courtyard building type. However, family separation in generation

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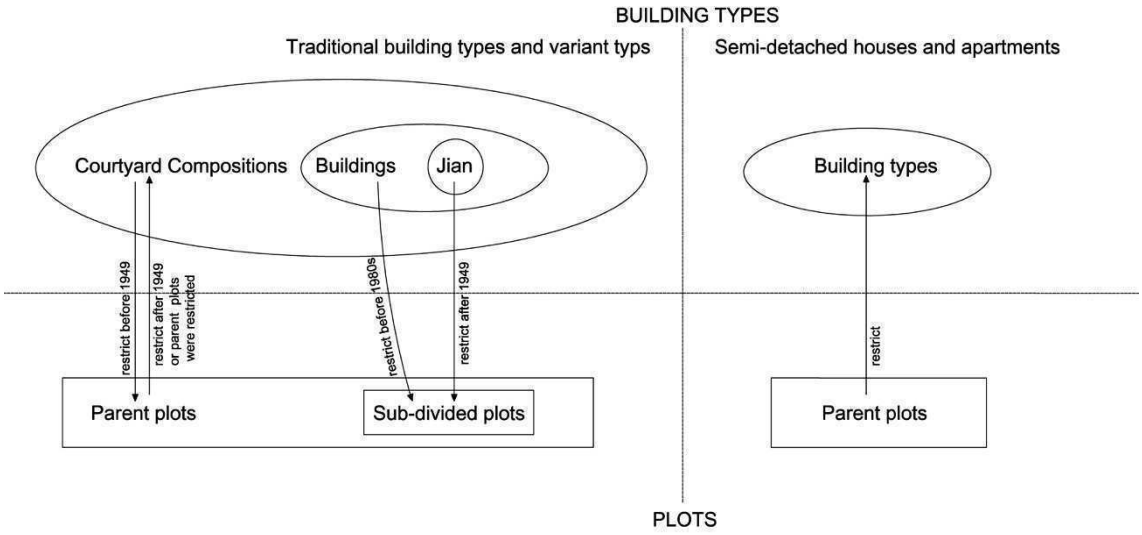

Figure 7.
Diagram of interaction of plots and building types.

did not triggered property redistribution inside this variant courtyard house because of birth control and continually increasing of house quantities. According to residential recording in 1992, the average place quantities of each family were 1.77.

Semi-detached houses and apartments

Since the limitation of land resource, new plot area was reduced around 2000. Semi-detached housed and apartments was imported through the adaptation of new plot area. Semi-detached houses still gain its plot by one nuclear family but lost the typological character of courtyard houses that indicate the difficulty of property redistribution. Apartment lost private plot and shared a common plot by a group of family who face the same difficulty of property redistribution. So far, typology and plot situation evolve into a global modern consensus.

Review

After the investigation in detail, morphological elements in village left geographical evidence that present a changing relationship referred to the transformation of economic system and family structure. Before 1949, a stable political and production mode cultivated the composite family accommodated by a stable building type that perform its flexibility through its composition to redefine plots according to family changing. In 1949, for the political cause, land reforming under the economic system changing forced the property redistribution in the way of plot re-dividing that confront and restrict to another culture force, building type, because of the still stable culture pattern in a relatively poor economic context. After 1970s the changing of production mode led to the changing of family structure from composite family to nuclear family that could not fully adapt traditional building type. Irregular building types derived from traditional plots for the limited space and variant building type emerged from outer space of village in standard given plots. As a smaller courtyard house, variant building type inherited the compositional capacity in courtyard and 3 “Jian” building components of traditional building type so as to full fill the continual property redistribution by family separation in between generations popularized around 70s. Around 2000s, by the limitation of land resource and ideology of urbanization, new building type lost compositional capacity in the way of apartment and modern single house with smaller plots that led to the impossibility of plot re-dividing.

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Conclusion

In Chinese traditional village, plots changing were conditioned by building typology and also restrict building types (Figure 7). The morphological characters of traditional courtyard building type and variants contain building composition, buildings and its "Jian" components. Parent plots may continue existed only as space unit when sub-divided plot appeared inside as property and continue to extend into another courtyard. The relationship between parent plots and sub-divided plots indicated the relationship between building typology and family ownership. Semi-detached house did not have the capacity to generate sub-divide plot and apartment lost plot of individual family.

Before 1949, originated from one of parts of traditional courtyard house, the enlarging of plots were restricted by building composition, accompany the variation of composite family. The extended area was based on the multiples of courtyard house and the sub-divided plots based on buildings. In the land reforming of 1949 and later popularized family separation, plots of traditional building types were re-divided based on buildings when the original building did not change. In variant courtyard house types, sub-divided plots trigged by populated family separation were conditioned the standard of "Jian". However, variant type around 2000 did not have redistribution for the continually increased quantities of houses and controlled birth rate.

Before 1949, plots defined by traditional building composition corresponding with composite family. In traditional parent plots, some of sub-divided plots restricted by surroundings cultivated an irregular type in plot extending in all built times. When family structure changing from composite family to nuclear family, variants types inherited the character of courtyard but was restricted in different compositional sequence by smaller plot. When given plots is too small to support a courtyard type, the imported model, single houses and apartments was introduced in limited plots.

When traditional building type ended around 2000s, new building type did lost the typological capacity to direct plot sub-dividing.

It is clear to see the interaction of building types and plots in this historical transformation. Considering this interrelationship, the process of typology may be understood and typo-morphology may not be reduced to building typology, but a synthesis of interaction between building types and plots. The conclusion developed the concept of interaction of plots and building type contributing to understanding of village tissues.

Acknowledge

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Notes

1 Additionally, some irregular building type commonly appeared within a sub-divided plots and latter extending plot limited by surroundings.

2 For example, document of No 20515101 in recording in 1992 shared the same house name of "Courtyard of the Yans" with that recording in 1949. Recording in 1949 indicated that Yuxiang Cao and his family (6 persons) own 3 "Jian" of southern building, 3 "Jian" of eastern building and 4 "Jian" of southeastern building and his brother Tai'an Cao own 6 "Jian" of western building, 3 "Jian" of eastern building, 5 "Jian" southwest building, 1 "Jian" of northeastern building and 1 "Jian" of northwest building.

3 Courtyard A and B had been constructed in 1773. Before 1949, plots separation supposed to appear in between 1853 and 1886, 1904 and 1924, so as to contribute to new plot extending from A to A-1 and from B to B-1, E and F.

4 Page 62, Jilin Wang(2001). Historical Records of Shangzhuang village, From 1979 to 1990, 64.89% of new residential buildings surpassed the area of given plots illegally, hence the residence received fine.

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Assessment of the process of urban transformation in Baghdad city form and function

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Abstract. *During the 21st century, urban transformation of cities has been intensely affected by flows of socio-economic and technological processes. Through the centuries, such as all historical places in Mesopotamia, Baghdad has given an outstanding example of dramatic evolution. The city, which stands on the river Tigris, faced various transformation processes in the culture and physical environment due to social and political reasons. The transformation of Baghdad city is a very complicated process driven by various factors affecting the homogeneity of the old urban fabric. Reconfiguration and the production of new urban typologies within the heritage fabric were the most fundamental effects. The outcome was different spatial languages competing with each other. This transformation changed the relations and hierarchies among spaces, which allowed more flexibility and accessibility between private and public space. The main purpose of this study is to examine how Baghdad city emerged and to develop a comprehensive understanding of the history of urban transformation in the context of city change. To achieve this aim, this paper will utilize urban morphology to explain how Baghdad transformed from a geometric city (the Round City AD762 by Caliph Al-Mansur) to an organic form and then from a traditional city to the modern metropolis. It will seek to analyze the process of urban transformation in Baghdad and show different types of urban patterns. Moreover, this paper will try to illustrate how the new way of transportation represented by the car has affected the historic center and changed the structural system of Baghdad.*

Keywords: Urban transformation, urban form, urban morphology.

Introduction

Bagdad is the capital and largest city in Iraq, its population approximately eight million, making it the second largest city in the Arab world after Cairo, Egypt. The modern city of Baghdad contains four main historic districts: Karkh, Kadhimiya, Adhamiya and Old Rusafa that represents the traditional centre of Baghdad. The complex growth and transformation in the historical places of Baghdad have produced various and partly conflicting urban systems. The opening of new wide streets was the first change in these traditional areas. The roads have penetrated and changed the traditional urban characteristic and form of Baghdad (Al-Saffar, 2016). This paper will offer a review of the process of urban transformation in the context of city change through utilizing urban morphology to explain how Baghdad transformed from a geometric city to an organic form and then from a traditional city to the modern metropolis.

Historical Background

A set of factors played a substantial role to determine the locational choices of historic cities such as the availability of natural recourses, trade routes, and political considerations, and in some issues on the religious significance

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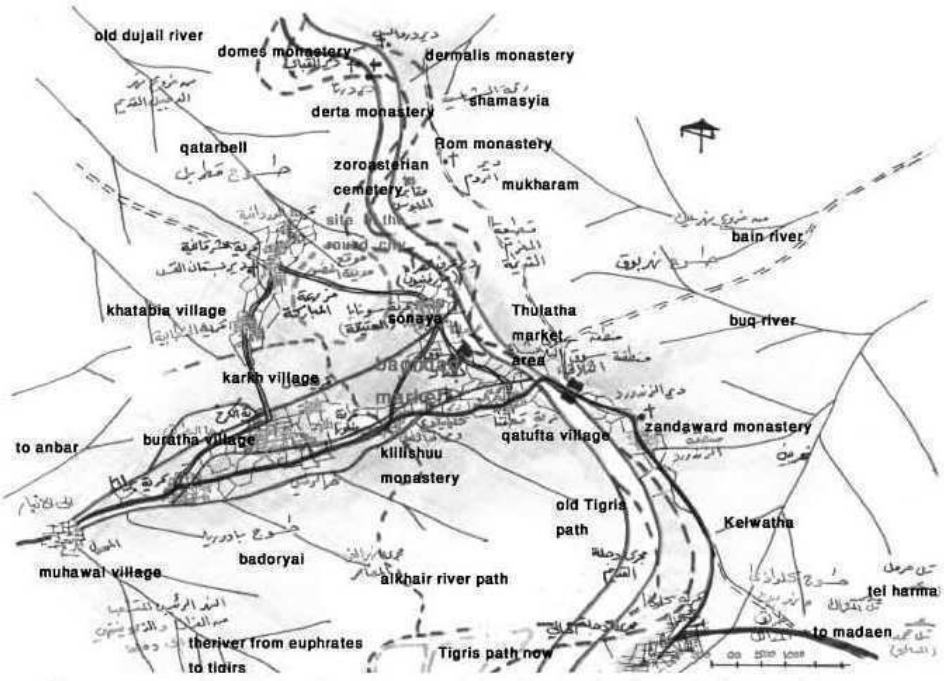

Figure 1.

The area of Baghdad in the first AD centuries before the building of the round city.

(Bianca, 2000:137). In the first century AD, most Mesopotamian cities grew on the bank of great rivers that are the source of prosperity to the country. Many villages and towns were connected by waterways and canals on both sides of the river Tigris. In the early 7th century, there is mention in the historical writings of a market called Baghdad on the western bank of the river Tigris, due to the transportation of goods and the massive agricultural activity. This shows that Baghdad market was a connecting area between east and west and it was regional market before the coming of sea routes, probably as part of the famous Silk Road on the way for convoys between India, Persia, and Iraq (Figure 1) (Al-Silq, 2008).

The emergence of the city (The City of Peace 762-809)

Baghdad faced the biggest challenge in its history when it was chosen by Caliph Al-Mansur to be his capital city. Al-Mansur was the second caliph of the Abbasid Empire and he ruled the Islamic world beginning in 750 AD (Marozzi, 2014:2). Al-Mansur started searching many areas that deserved to be the place for a great empire ruling almost half of the known world stretching from Morocco to Central Asia. After discussion with his assistants and meeting with a number of citizens, he decided that Baghdad was the most appropriate area. In 762 AD, Al Mubaraka (meaning the blessed) was chosen as the site of the round city (The City of Peace), with a palace and mosque in its centre. The City of Peace took four years for construction (762-766 AD). The city had four equidistant gates (Kufa Gate, Basra Gate, Sham Gate and Khorasan Gate) and two main radial streets surrounded by a deep moat and three walls, 17m high the outer one, 30m high the middle and the most significant with balconies and watchtowers, then the inner third wall which separated private houses and the governmental buildings. In the main centre, there were the two impressive buildings, the mosque and the Royal Palace of the golden door. The fundamental feature of the palace was a massive 40m dome roofing the central two floors (Al-Silq, 2008). The mosque had a square shape, a square minaret, a pulpit,

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a mihrab, five courtyards and two rows of columns around the courtyard. This mosque was built similar to Masjad-al-Nabi in Medina (Berehinejad et al., 2014).

In the following decades, the city started to extend beyond its wall because of limited space and increased population. The outer four gates were joined with roads going to the nearer villages; Karkh village was the most important one, which grew to be an urban area that covered the whole area to the south of the city. The surrounding urban district became much more complex each village grew and had its own mosque, market and administrative buildings. The market became an essential part of the city that played a significant role to promote its prosperity. Soon after, a new urban settlement was built by Caliph Al Mehdi the son of Al Mansur on the eastern side of the Tigris. Al Rusafa mosque was the first monument built in this new district the palace was built later. Al Mehdi city was also surrounded by a moat and wall and was joined to the circular city by a bridge (Al-Hasani, 2012). As the city continued to grow, many urban district and palaces were built such as Al Kuld palace, Issa palace, and Al Qarar palace. The population of Baghdad was around one million, and the city became one of the most multicultural places on earth with different nationalities and religions living there, reaching its peak with the golden age of Harun Al Rasheed. (786-809 AD) (Marozzi, 2014:38).

The name of Baghdad dominated the whole capital due to the cultural facilities and policies at that time, while the name of the City of Peace started to disappear progressively. The city consists of two fundamental parts, Karkh on the western bank of the Tigris and Rusafa on the eastern bank. The architectural type of the city at that time can be found from the illustrations in the historical books, which described the architectural type of Al Hira city that had an open central courtyard surrounded by arcades and within them, the most important large space called the iwan. The domes were the other significant features of the Abbasid age covering the large spaces (Al-Silq, 2008).

New Urban Center (809-946)

After Al Rasheed's death in 809 AD, the struggle between Al Amin and Al Mamoon to be crown prince reached the point of warfare. Al Mamoon's army attacked the round city, destroying part of its walls, and many palaces, and killed Al Amin. The new Caliph decided to move to the Rusafa area and construct a new royal palace. Later several building and palaces were constructed around the royal palace, forming a new urban center on the eastern bank of the Tigris called Dar Al Khilafa (house of Caliphate) (Al-Silq, 2008). After the death of Al Mamoon in 833 AD, the new Caliph Al Mutasim moved the capital of the Abbasid Empire to Samara in 836 AD.

Later Abbasids returned from Samara in 892 AD, and a new city center in Al Rusafa was constructed with a half-circular wall (Bianca, 2000:249). A market grew around the new urban center, Thulatha, and developed many urban districts, which became the historical center of Baghdad city. These districts have their own center containing the two main components the mosque and the market, and a variety of buildings, for instance, schools, libraries, public baths, hospitals and the most significant area composed of compact houses in narrow alleys. The new public center grew from three sides and was connected with the other side of the Tigris River by a bridge. This growth was organic in nature, which depended on the old existing paths and nodes. Paths distribution, the relationships between mass and space, compact fabric, a gradation of urban paths from public to private and the narrow alleys were the fundamental characteristics of the urban structure of the city (Al-Silq, 2008). The extension of the new urban center has led to the building of a new wall for more protection from the external power (Figure 2). This city wall and its structure remained until the end of the 19th century.

The Dark Periods

The history of Baghdad witnessed an eventful path of prosperity in times such as the Abbasid Empire when Baghdad had many

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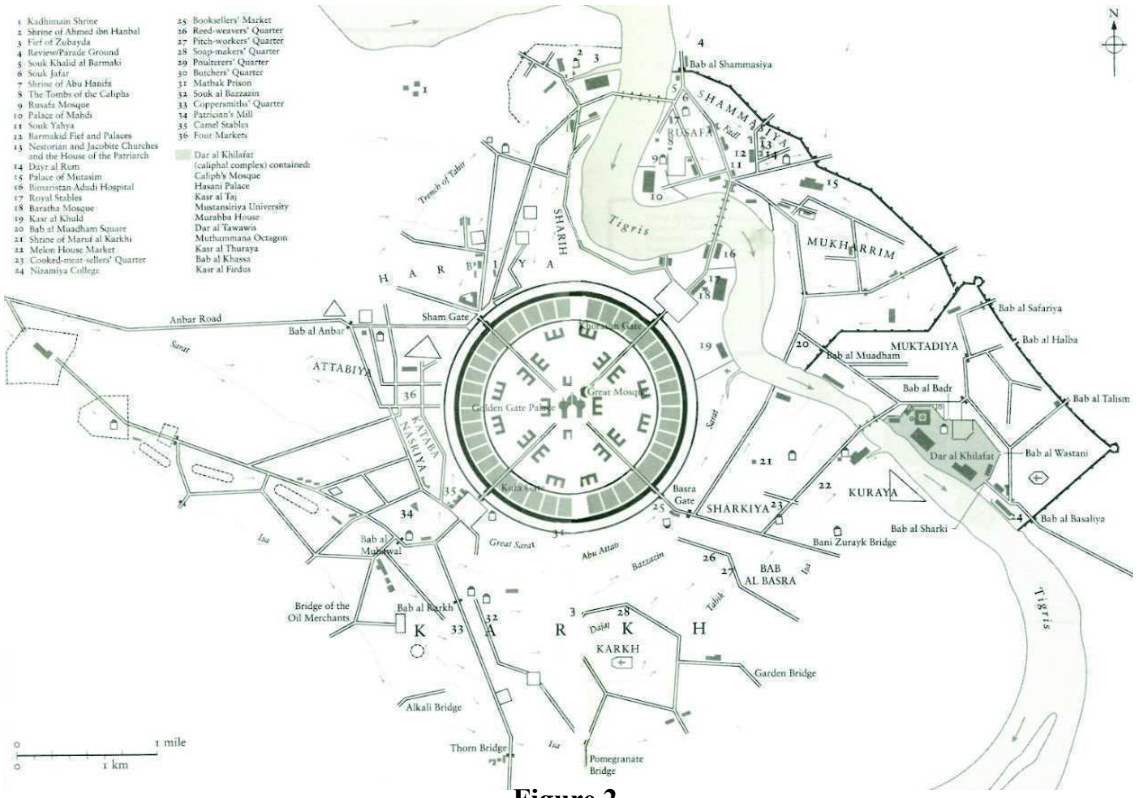

Figure 2.
Baghdad morphology until the end of Abbasid Empire.

unique libraries. The House of Wisdom was an attraction point for the most significant thinkers, scientists, mathematicians and linguists of the world. However, Baghdad had also a difficult time of floods, epidemics, fires and foreign control. In 1258 was the darkest period when Mongols occupied and destroyed the round city. The great Khan of the Mongols, Mongke in 1255 put his brother Hulagu Khan in charge of an army whose goals were to destroy the Abbasid Empire. Hulagu's army, estimated at over 150,000 soldiers, entered and occupied the City of Peace on February 10th, 1258 and destroyed mosques, palaces, libraries, and hospitals within one week (Figure 3). They threw the books from Baghdad's libraries into the Tigris River, which was said to turn black with the ink from the books. More important than everything, the Mongols killed between 200,000 and 1,000,000 people in that week of destruction. They left Baghdad completely depopulated and uninhabitable (Marozzi, 2014:143).

Up to the 20th century the city has been occupied many times by different groups, for instance, the Buwaihids (946-1055), Seljuks (1055-1152), Ilkhanid (1258-1338), Jalairids (1338-1411), Ottomans (1638-1917), the British (1917-1932) and the Americans (2003) have all left their marks in varying degrees and reduced Baghdad's status (JCP, 1984). Caliph Al Nasir and Caliph Al Mustansir tried in the early 13th century to bring some well-being back to Baghdad. They constructed important buildings such as Al Mustansiryia School, Al Nasiryia Palace (The Abbasid palace), the Tomb of Zumurid Khatun (Al Nasir's mother) and Al Khulafa mosque, which are still the oldest existing features of Baghdad. Al Khulafa mosque was built to be Dar Al Khilafa (House of the Caliphate), its minaret still exists but now beside a new mosque built in 1960 (Al-Silq, 2008).

In the 17th century, a map shows Baghdad surrounded by a quadrilateral wall with four gates on the eastern bank of Tigris River while Karkh on the western bank was reduced to a linear area with small neighborhoods. Another map in the 18th century documented the city with its four gates, Kulwatha Gate or Eastern Gate, Muatham Gate, Wistani Gate and Talsam Gate, also it was indicated that there were

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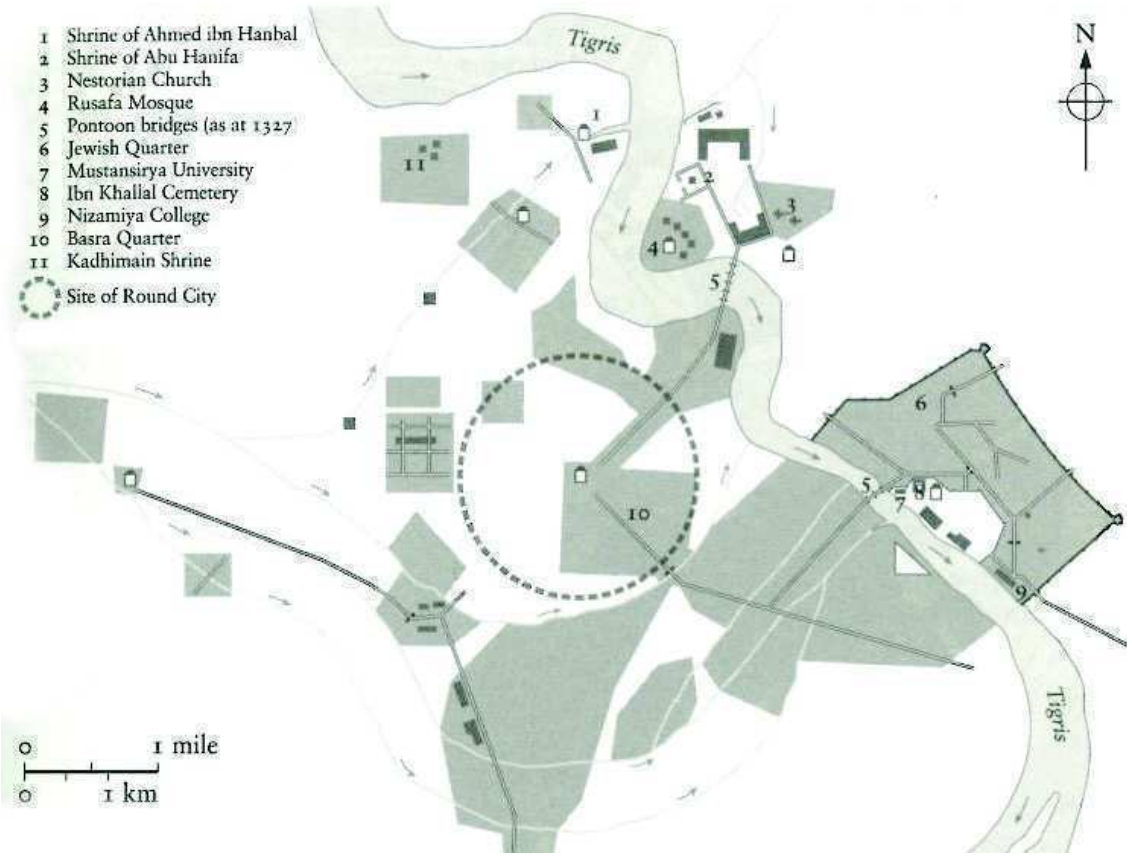

Figure 3.
Baghdad 1258-1534

22 Khans, several public baths, and 20 big mosques. The urban components were well organized and combined in the 19th century due to the geometrical form of the city. The street pattern of Baghdad was narrow and irregular, the houses were more suitable for the social and climatic characteristics of the city and fully integrated with their urban context. In the late 19th century, the Ottoman began to cut the first axis in Baghdad Rasheed Street and attempted to import Westernization into the urban evolution pattern (Al-Hasani, 2012) (Figure 4).

New urban transformation (Baghdad in 20th century)

Another change occurred in 1917 during WWI, after centuries of Ottoman control when the British Army entered Baghdad and once again it becomes a capital city looking to construct a new contemporary country, but under the British mandate. Baghdad witnessed a new change in the urban components and with the cultural structure in the beginning of the 20th century due to the political, economic and social situation. The opening of Rasheed Street in 1908 and then completed by the British was the first change in the traditional urban fabric. The street became the most significant feature and the center of business in Baghdad city for decades. The traditional style of buildings on Rasheed Street had a unique type, which gave the street an outstanding character.

New urban districts emerged outside the historical area in different directions in the 1930s, the new districts (Saadoon to the south, Waziryia to the north and Salihyia and Karadat Maryiam on the western bank of the river) were designed according to the western methods like gridiron planning and the garden city (Al-Silq, 2008), while the old urban fabric developed in two directions towards the Northwest and the Southeast. At the same time, the urban evolution programs neglected the urban heritage concerning renovation and preservation of the old traditional sites. Again

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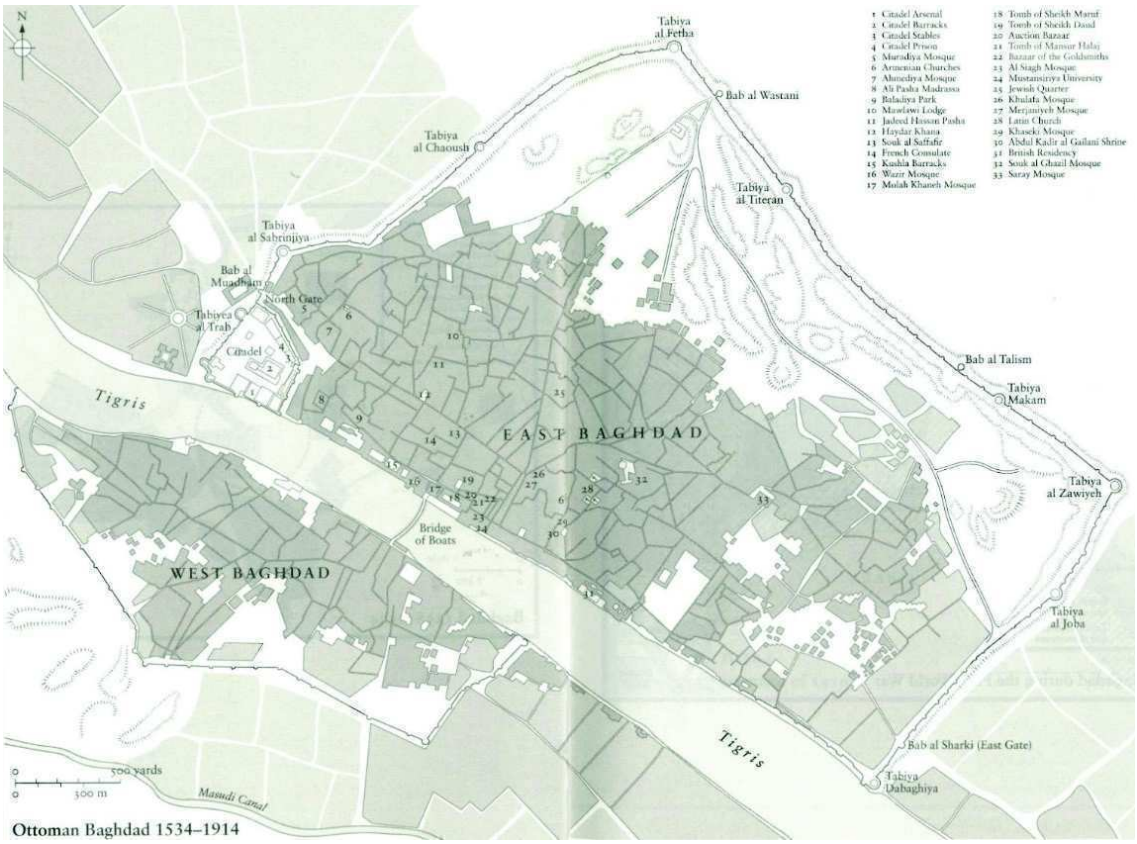

Figure 4.
Baghdad 1534-1914

three major roads (Kifah Street, Sheikh Omar Street and Khulafa Street) were penetrated into the historical fabric of Rusafa parallel to the Tigris River between World War One and Two (Al-Hasani, 2012), with a rate of demolition of about 32 hectares or 6% of the whole site of the old city (JCP, 1984) (Figure 5).

After the massive increase in economic resources in the 1950s, the establishment of the Higher Council for Reconstruction determined the modern planning strategy for the city (Al-Hasani, 2012). Furthermore, and huge projects in Baghdad were implemented such as electric power stations, oil refineries, large factories, and dams, which were essential projects to protect the Mesopotamian valley from the risk of floods. These circumstances led to the invitation of many famous architects in the world to design projects and create unique concepts for Baghdad city. They tried in their designs to combine different ideas: Wright by designing the Opera House of Baghdad and the master plan for greater Baghdad, and Gropius in his design of the University of Baghdad created a sophisticated system of masses and spaces inspired from the courtyards in the old city. In addition, the amazing design of Baghdad Gymnasium building by Le Corbusier, the Ministry of Planning by Ponti and the Art Gallery by Aalto were also planned (Al-Silq, 2008).

The Iraqi Government between 1956 and 1984 appointed various international architects and planners to prepare master plans due to the rapid extension in Baghdad city. P.W. Macfarlane was the first one who proposed in 1956 eight sectors each one with a population of about 18000 and a road system joining the historic urban area in Baghdad with new river bridges and the outlined districts. In 1958, modern urban planning of five sectors of Baghdad was submitted by Doxiadis. He suggested a rectangular district along the north-west and the south-east axis of the river. Doxiadis's master plan aimed to achieve a more comprehensive framework for modernization (Pyla, 2008). The third master plan by Polservice for Baghdad city in 1970

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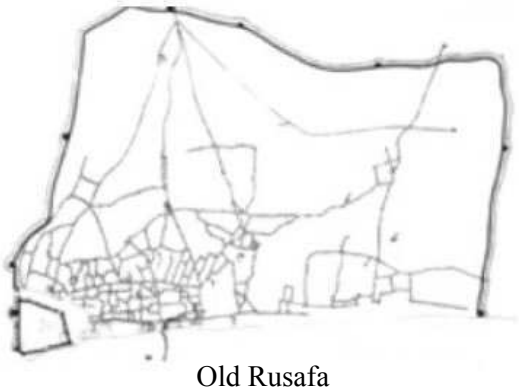
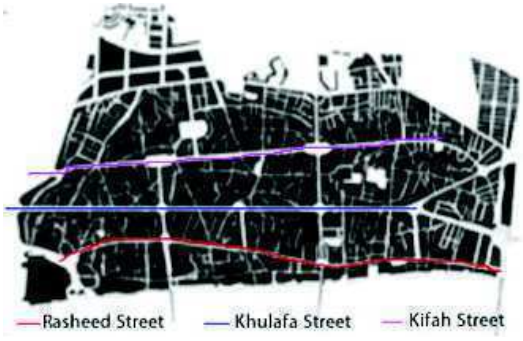


Old Rusafa



Westernization: 1800-1960

Reconstruction Boom: 1970

Urban Change: 1983

Figure 5.
Urban Transformation in Historic Part of Baghdad (Old Rusafa)

determined the administrative boundaries and the development strategies until 2000. Polservice recommended preserving as many as possible of the traditional sites and urban fabric of the historic quarters. The last comprehensive master plan for Baghdad was submitted by JCCF in 1987.

One of the significant comprehensive urban conservation master plan for Old Rusafa was submitted by JCP (Japan planners, architects, and consulting engineering) in 1984. Urban conservation and redevelopment of the traditional core were the main aims of this scheme. The importance of this plan is not envisaged as merely a passive protection of the existing historic centre. In addition to proposing the conservation, restoration or rehabilitation of significant portions of the historic centre, the structure plan and urban design schemes aim for an active development of the historic fabric. This includes the retrieval of many fundamental parts which, if realized, would greatly improve the image of Old Rusafa (JCP, 1984).

Assessment of the process of urban transformation in Baghdad city form and function.

In Figure 6, I have analyzed the process of urban transformation in Baghdad and showed a different type of urban pattern. The city began with a circular geometric form (The Round City) from 767 to 912 AD and then transformed to more organic pattern until the end of the 19th century. This transformation changed the relations and hierarchies among spaces, which allowed more flexibility and accessibility between private and public space. Baghdad has witnessed another transformation in the 20th century due to the urban growth, political issues and economic evolution. The new geometrical areas with new wide streets have increased the pressure on the historic part of the city physically, economically and socially. Since the last transformation the relation between private and public in the new districts has changed, privacy has started to disappear and converted to publicity, and

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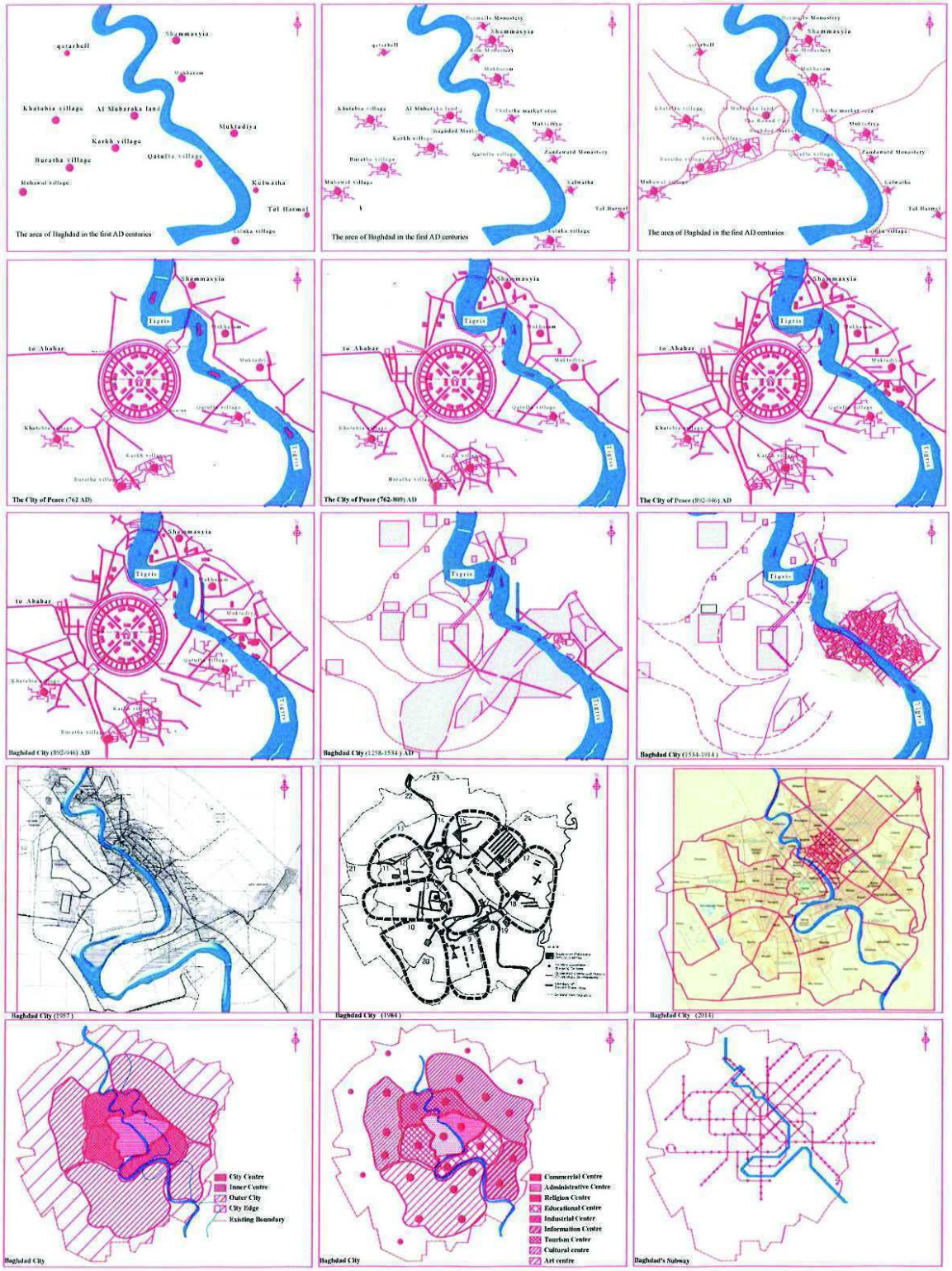

Figure 6.
The Urban growth and Transformation in Baghdad city from the first AD to 2017

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public spaces are still looking for their identity (Al-Hasani, 2012).

The analysis and illustration of the urban growth, morphology and the transformation of Baghdad city in Figure 7 started from the first century AD when the area of Baghdad was still small cells and then developed to be villages that have organic patterns connected to each other through natural paths (waterways, canals, and routes). To use ideas from Batty this analysis shows that Baghdad started with stochastic growth from the bottom up based on developing one of these cells to be the main point for attracting other cells such as Karkh village. For example Batty has stated that although "the city has grown in some direction instead of others is largely due to a combination of physical and accidental historical factors, it does not imply any differences in the way growth has occurred from one time period to the next" (Batty et al., 2006). Later Baghdad witnessed another type of growth, top down, when one of it settlements was chosen to be the place of the Abbasid Empire and a comprehensive master plan (the round city plan) was prepared for it. This type of growth represents a different method for thinking at that time and a new urban form and pattern was produced due to that. This shows according to Batty's analysis that systems are resilient and have the ability to represent different forms of transformations reliant on the processes that generate them.

The limited space and fixed boundaries of the new geometric pattern played a fundamental role to promote the organic form, which had the ability and flexibility to extend and evolve. In addition, we will find that the geometric pattern created new nodes and urban networks that produced new processes for developing urban transformation and led to a growing complex structure in Baghdad city. Each one from these networks had their own unique urban components such as mosque, palace, market and administrative buildings and showed strong levels of connectivity that indicate the fact that Baghdad city had reached a level of self-organization in the golden age of Harun Al Rasheed (786-809 AD).

Baghdad had only an organic pattern after the destruction of the round city in 1258 by the Mongols and that pattern remained until the 20th century when a new essential change in the political, economic and social situation pushed such systems into another regime. The new way of transportation represented by the car also invaded the traditional fabric and changed the structural system of Baghdad. Due to that, new urban systems and forms emerged outside the historical area in different directions and three major roads were penetrated into the historical fabric of Rusafa parallel to the Tigris River. Nowadays Baghdad has a complex system and varied urban forms.

I have tried also through my analysis in Figure 6 to show how such a system has the ability to grow and change in different forms affected by technological innovations. These new forms or networks are defined by their functions and connections to each other through various ways such as invisible smart electronic networks, smart transport systems, and smart central control systems. However, it still needs to be discovered who will be responsible for managing these new systems, what type of processes and morphology they will follow to build themselves. Furthermore, how these systems will develop and protect the traditional fabric in Baghdad and became an example for other historic cities, most importantly "what modern information technologies might do to the future city during the next 100 years" (Batty et al., 2006), will be the subject of more extensive research.

Conclusion

This research has endeavored to realize the spatial features, structure and identity of Baghdad through examining the process of its urban transformation and growth, and by analyzing its physical structures at different stages and periods. Ahmadi et al., (2012) assert, "New cities form rapidly and usually follow many unconnected concepts that cause confusion in urban spaces, while historical cities were formed gradually according to accepted patterns and rules. Many non-local agents influence the form of new cities, while the form of traditional urban spaces depends on the morphology of the site, the historical

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background and the culture of the local people" (Ahmadi et al., 2012). Thus, urban designers, policy-makers, architects and governments should consider devising regeneration solutions and endeavors dealing with historic cities, aiming to integrate traditional principles with contemporary needs and provide a new vision for rethinking the way cities are designed, built, and managed. Moreover, we should seek to find new methods of regeneration that might help to find the positive and negative aspects that can serve as a platform to resolve the conflicting values of traditional urban form and contemporary design models.

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Influence of energy paradigm shifts on city boundaries. The productive peripheries of Madrid

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Abstract. *The promotion or access to certain energy technologies has changed the humanized landscape throughout history; cities have been born around, and because of an energy source, or have been displaced in order for energy-related infrastructures to take their spot. However, and for any city from its very beginning, energy paradigm shifts have deeply altered their morphology. Not only extraction, but especially transformation and transport of resources materializes in artefacts, often controversial and soon-to-be obsolete. This is especially patent in the ever-changing city boundaries; the fringe of 'proximity', where the collision between the countryside and the urban mesh embodies the relations and contradictions between urban growth, energy demand and landscape protection. In a context of growing cities (both in terms of expansion of its artificial land and in terms of energy demand), we are facing two paths which not always converge: an inevitable low carbon transition and a growing sensitivity towards ordinary landscapes. This article, within the framework of the project 'Proximity landscapes of the city of Madrid. From the 19thC to the present', studies the development of the city of Madrid in relation to its energy access and management, in a series of key stages: mid 19thC (before the bourgeois enlargement plan approved in 1860), early 20thC (when the introduction of electricity powered a deep urban transformation and outlaying urban cores were annexed), mid-late 20thC (when a rural exodus took place and the peripheries of Madrid grew rapidly) and today.*

Keywords: energy landscape, periphery, urban history, urban form, Madrid.

Introduction

Historically, urban settlements have changed over time according to the availability of energy. The preindustrial city rarely exceeded half a million inhabitants, lacking the logistics and energy needed to grow significantly (Ivancic, 2010). With the Industrial Revolution came an exponential urban development, boosted by the technology to transport electricity over larger distances in the late nineteenth century. Gas plants proliferated in urban areas, defining the skyline of many cities in the late nineteenth and early twentieth century. With the widespread use of electricity and private cars came a strong urban growth and a fading of the urban-rural barrier.

In a context of low carbon transition and growing sensitivity towards ordinary landscapes (Council of Europe, 2000), the deployment of low-carbon technologies is often finding local social opposition, mainly linked to its visual impact (Van der Hosrt, Lozada-Ellison, 2010). A dynamical view of landscape

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history can be help face the integration of new paradigms (Palang et al., 2011); as done with previous energy artifacts throughout the cities' successive transformations, we must be ready to incorporate the new into our collective imagery.

The peri-urban landscape, so prone to change, embodies the relations and contradictions between urban growth, energy demand and landscape protection, and is particularly relevant when facing future challenges. Madrid, a highly populated, highly consumptive and scarcely productive electric energy region (Fenercom, 2016), provides an example of a complex expansion of a city core. This work searches to study its evolution since the mid-nineteenth century to the present, and detect the driving forces of landscape change, particularly in its southern boundary.

Methodology

The development of the city of Madrid in relation to its energy supply and infrastructures is studied my means of a critical evolutionary analysis at different scales and times. It is presented in a chronological order, divided in four periods that relate to relevant phases of the city's transformation: mid-19th century, early 20th century, mid-late 20th century and recent times.

From a metropolitan scope, the focus is put on the south urban boundary; an area with a productive role during the industrialization process, embedded today in the denser residential urban fabric of the city center, however bearer of great industrial heritage and character. Zooms at a same scale and frame allows for a comprehensive reading of this transformation.

The overlapping of thematic layers (land use, electricity network, areas of urban regeneration and of environmental protection) is done using historical cartography, orthophotography and GIS databases, among other documentary evidence.

Evolutionary analysis

Mid-nineteenth century

Madrid in the 1850s suffered a series of infrastructural shortcomings that prevented it from experiencing an industrial development as other regions were experiencing at that time. Its poor rural surroundings did not provide enough agricultural raw materials, minerals or fuel, making energy expensive and insufficient. Its geographical location, far from any important port or country border, was another challenge the city would gradually have to overcome.

River Manzanares had always lacked the scale and flow to have determined the foundation of the city of Madrid. The fresh water was provided by underground streams (viajes de agua). However, these fell short to meet the growing needs of a city that was suffering scarcity. Canal de Isabel II captured water from River Lozoya, in the northern mountain range, and transported it 77 km to Madrid. Though the underground waters would still be used long after the creation of this channel, the city now had the capacity to undertake a strong urban growth (Rodríguez, 2003). And so, it did. The Enlargement Plan designed by Carlos Mª de Castro in 1857, approved in 1860, doubled the surface of the city in a matter of a few years and spread mainly towards the north and northeast of the urban core; higher lands, which had been difficult to supply with water from the traditional underground streams. The population in 1900 had also doubled since 1850, exceeding the half million inhabitants due to an intense migratory movement from the country to the city (Vicente, 2015).

A succession of walls girded Madrid up to then; since its Islamic origin, first with defensive walls, and later with fences devoted mainly to taxation purposes. The infrastructure associated to the Canal de Isabel II was sited in a highly accessible area, north of the city and outside its fence (demolished in 1869). There had not yet been a design for an urban extension towards the north outskirts of the city, and the failure to foresee this urban growth made the water supply to the northern buildings of the Enlargement Plan far more difficult than expected, since the terrain where blocks were sited was higher than the water deposits and

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channel, and there was not enough pressure by gravity.

Gas had arrived to replace oil as the fuel used in the lighting of the city. In 1847, the first three streets were lit by gas in Madrid (Paseo del Prado, Prado Street and Lobo Street). Its use would later extend to domestic heating and lighting. The Gas Factory became the largest industry in the city by the mid-nineteenth century. Gas storage units, ovens, warehouses, coal storage, laboratories and offices were some of the infrastructures associated to this industry, located in the southern border of the city: a first step in the conformation of a clearly industrial character in this area, later reinforced by the introduction of the railway and electricity systems.

The use of electricity, as in the case of gas, started with public lighting. Though first used in the Royal Palace in 1852, it was not widespread until the last decades of the century. The production of electricity with steam engines, based on coal, was the most extended in urban contexts. Once proved it could be a commercially feasible endeavor, a series of small-scale companies emerged throughout the city, usually generating and distributing electricity for the surrounding neighborhood. The overhead line was the transportation system chosen in European cities. However, in all cases, the distances were quite short. Only from 1889 onwards, with the direct current, could it be possible to consider taking the production of the electricity outside the city centers, taking advantage of the energy produced by water falls (Terán, 2006).

By the end of the nineteenth century, the city was expanding, though the Enlargement Plan would not be considered complete until 1932. Meanwhile, population concentrations were appearing outside the limits of the enlargement project; these would be the origin of districts such as Cuatro Caminos, Tetuán, Carretera de Aragón, Puente de Vallecas and Barrio de Extremadura (Rodríguez, 2003). The spontaneous arise of these clusters of population along the main accesses to Madrid made it necessary to elaborate projects to organize, manage and design the future growth of the periphery of the city. Therefore, by the beginnings of the twentieth century, new urban needs called for interior restructuring and management of the outskirts of the enlargement's boundaries.

Early twentieth century

In contrast to other European capitals, such as London or Paris, the productive and commercial fabric of Madrid in the 1850s was more artisanal than industrial. However, the development of the gas industry, electricity network and railway system changed this situation.

The original stations in Madrid were Atocha (for long-distance trains coming from the south and east) and Príncipe Pío station (for those coming from the north and west). The tracks entered the city through the river, and the stations would lie next to it due to the difficulty to surmount the steep cornice to the west. Soon Atocha and Príncipe Pío would prove insufficient for the growing activity, and other stations would start to appear along the south district (Delicias, Imperial and Peñuelas).

The railway transformed the weakness of Madrid's geographical location into a strength, making it the central operator of a national network that did not have an alternative means of transportation. Figure 1 shows how the siting of the industrial use would be strongly influenced by the presence of the railway stations and tracks, especially by the bypass built in 1860 to connect them (Pinto, 1995-2001).

The tall chimneys of the gas plants had become a part of the urban landscape of the early-twentieth-century cities; the one shown in Figure 1 is still in its place today, however the rest of the plant was demolished in 1967. The site now holds a block of housing and a small park where the obsolete chimney stands as a remnant of what was once there.

The waste waters that flowed into River Manzanares, along with the irregular flow and scarcity during the summer, made the channeling of its urban sector an imperative matter, to improve both sanitary conditions and aesthetics. The project to do so was approved in 1912, and works started in 1914. Over

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7.5 km were channeled (from Puente de los Franceses to Abroñigal stream), and the works were completed by 1925.

Another facet of this new age was the public transportation system. Madrid's first subway line opened in 1919, connecting Cuatro Caminos with Puerta del Sol, strongly influencing the urban development of the northern part of the city. The Metropolitan Development Company (Compañía Urbanizadora Metropolitana), would buy great extensions of cheap land for engine sheds and electrical energy generation needed for its development. The growth of this network fostered the proliferation of electrical substations to feed it, and fostered urban regeneration plans, especially in the northern enlargement urban mesh, mending certain clashes between the different urban textures of the most consolidated enlargement fabric and the less dense areas to the west, such as Ciudad Universitaria (Olivares, 2016).

The electrical panorama left by the end of the past century (a network of small electricity companies scattered around the city and supplying only within the district) would come to an end in the beginning of the twentieth century. The management and transport of high voltage lines made the transition from thermoelectric to hydroelectric energy (far from the urban center) possible, and was particularly important for Madrid, located far from any coal reserve that fueled the thermal steam plants. This change of paradigm also enabled powerful financial conglomerates to gradually absorb the smaller companies. The most important groups were Unión Eléctrica Madrileña, Cooperativa Electra Madrid and, at a smaller scale, Hidráulica Santillana and Canal de Isabel II.

Figure 2 shows how, by 1945, the electric energy reached the city mainly through the south and southwest boundaries, coming from the hydroelectric plants of the main groups mentioned above. Only a small proportion of the energy that arrived in Madrid did it from the north, by the networks of Hidráulica Santillana and Canal de Isabel II. There were still old grids of direct current, though they were progressively disappearing in favor of the more modern alternating current.

Both the subway and the trams system (the two main public transportations in Madrid at the time) worked in direct current. Three transformation plants were associated to the subway network (Pacífico, Castelló and Olid), and another three to the tram system (Mazarredo, Gobernador and San Bernardo), though a fourth one for the tram (Goya) was in progress. The distribution grids inside the city center were almost entirely underground at the time; only in the periphery, where the urbanization and tracing of roads were subject to change, were there overhead tension lines (Spottorno, 1945).

Migration to the capital was a constant flow. The demographic growth was forcing another urban expansion. First in the closer periphery, but soon after, the old towns of the broader periphery of Madrid, devoted to agricultural or farming activities (in the shadow of an industrializing capital), were subject to the gravitational field of the city of Madrid (Vicente, 2015). Soaring housing prices in the city center had driven the less qualified working class away from the southern area of Madrid (which was now becoming part of the central area of the urban metropolis) to the more affordable periphery, along with some production centers that were moved from the urban core to industrial estates in the farther outskirts.

Mid-late twentieth century

After the Spanish Civil War (1936-39), in 1948 started a process of annexation of thirteen outlaying cores to the municipality of Madrid. This gradual process would take until 1954, and resulted in the surface of the city of Madrid being eight times larger than what it used to be. As stated above, the peripheral urban cores had already been influenced by the growing city center and, during the second half of the twentieth century, the urban fabric would continue to fill in the voids in a succession of urban developments that respected two elements which, still today, constitute Madrid's major 'green lungs': Casa de Campo and El Pardo Mount.

Towards 1950, three Spanish cities registered the greatest population increases of their

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history, while fourteen other clearly decimated. Madrid, Barcelona and Bilbao doubled and tripled their size, and seemed to overflow with this 'rural exodus'. The countryside would empty (del Molino, 2016), strongly altering the city-countryside balance.

Spain in the 1970s paired its transition to democracy with the 'Oil Crisis' of 1973; an event that strongly impacted the industrialized economies worldwide, due to their high dependency of petroleum. Consumption restrictions and higher energy prices made production costs suddenly unbearable for a considerable number of industries. Madrid experienced a deceleration in the growing trend of the past years, and a paradigm shift took place in terms of urban growth and landscape values. A more social approach to urban planning (reflected in land-use policy at many scales during the next decade) would be less keen to conquer new lands, and would focus on mending the unresolved fragments of the existing city (voids, interior peripheries and clashes left between the boundaries of successive urban growths and obsolete infrastructures).

An example of this is the Pasillo Verde (green corridor) project, approved in 1989. The railway technology has evolved since it was first settled, and such large associated infrastructures were not needed anymore. Alongside, many industries had been shifted to industrial sites farther from the city center, leaving the area of study ready for a re-zoning into residential use. As shown in Figure 3, the plan reorders the voids left after limiting the use of the railway to the transport of passengers in a double track to Atocha station. The metropolitan role of Príncipe Pío station is reinforced, and the stations in between are reduced to mere halts along the way to Atocha. Rosales and Tierno Galván Parks are extended, and Peñuelas Park is created. It is worth highlighting, within this project, the tree-lined promenade that would be built over the underground rail tracks (zoom in Figure 3), with housing and offices at both sides, and endowed with a series of squares and small parks along its linear morphology.

On a larger scale, in the period between 1982 and 2006, the population in the region of Madrid grew 1.3 million, while artificial land increased by 97% (Gallardo, Martínez-Vega, 2016). Madrid had experienced a rapid economic growth in the last two decades, which led to large territorial transformations and extensive change in land use. Alongside (since the 1980s) came a conceptual change in terms of local identity of the people living in the periphery; the outskirt neighborhoods substituted the rural town as a source of pride and belonging (del Molino, 2016) and a recent, socially charged, awareness of ordinary landscapes shifted the viewpoints towards formerly disregarded areas, such as the east and south of the city (Rodríguez, Sáenz de Tejada, 2016).

Recent times

The area of study, as shown in Figure 4, is now densely populated with housing blocks, though there is still a strong presence of railway infrastructures (mainly around Atocha station). Industrial sites seem to gravitate around them, while the river is now flanked by an urban linear park. Madrid Río Urban Renewal Plan (2008-2010) entailed tunneling a large section of the M-30 ring-road, thus allowing the design of a park along the riversides.

Urban greening trends have been very present in the urban agenda at a municipal level in recent years. A Strategic Municipal Plan of Madrid was commissioned by the City Council in 2009 to reflect on innovative approaches to urban design and studies, facing the challenges of globalization, climate change and social transformation. Another example of this dynamic is the MAD-RE Plan for Urban Regeneration; a long-term project initiated in 2016 by the Area for Sustainable Urban Development of Madrid City Council. It aims to promote accessibility, conservation and energy efficiency upgrades in dwellings by means of subsidies, and defines strategic areas of intervention to address improvements in the public space. Figure 4 shows some preferential areas of urban regeneration within the area of study, as well as areas of opportunity for new developments to be undertaken in a near future. However, most areas of intervention and opportunity in this Urban Regeneration Plan are farther from the urban core, in the southern half

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of the fringe between the first and second ring-road (M-30 and M-40 respectively). This falls out of the boundaries of our closer-scale case of study, but nevertheless is related to the shift of uses this area undertook during the second half of the twentieth century, driving some of the major production centers to industrial estates in more affordable peripheral locations. Today these areas, due to the city's growth and transportation systems, are within the 'proximity landscapes' of Madrid, embedded in a complex urban-rural fabric.

As mentioned above, the recent growth of artificial land in the region of Madrid has not been directly linked to a population growth; new urban developments have been placed around new roads (M-45, M-50, R-2, R-3, R-4 and R-5), as well as commercial and leisure centers (especially in the south of the metropolis). The expansion of Barajas airport nurtured a nearby urban growth of associated uses (Gallardo, Martínez-Vega, 2016).

Returning to the subject of electricity, we find ourselves today with a strongly consumptive (and scarcely productive) 'city of cities' (Fenercom, 2016). The urban growth and transformation has blurred the boundaries between city and countryside, and so the distinction between overhead power lines in the periphery, and the underground power lines reserved for the city center, is not as easily made (Sumper et al., 2010).

Figure 5 shows how the high voltage lines, when entering Madrid, gird the urban fabric in a 20 km-radius circular manner (overhead mainly around the south and west, and underground around the east and northeast side). Substations seem to accumulate in the south and east of the city center, and proliferate especially towards the southwest periphery, in line with the notable growth of artificial land in that direction. This southwest area is also subject to the impact of many overhead 220 kV lines connecting the substations with the high voltage bypass. There is another noticeable accumulation of high voltage lines in the northeast access to the city, east of El Pardo Mount. However, this area seems to benefit from less overhead lines than the south.

A dynamic in recent years at a regional scale, and in close relation to the increase of artificial land and communication network, is the proximity of the urbanized land to sites of high ecological and scenic value, making the Natura 2000 areas especially vulnerable (Gallardo, Martínez-Vega, 2016). The proximity (or overlapping) of the electricity transportation system with the network of ecologically protected areas surrounding the metropolis is worth reflecting upon. Transmission lines are generally perceived as negative landscape elements (Soini, 2011), and while it may be argued that overhead lines produce a visual impact that could be avoided by carrying the cables underground, in terms of environmental impact, these might end up being more damaging (at least during the phase of execution of the works).

Conclusion

The southern boundary of Madrid became the main laboratory where the city's industrial transformation originated, giving way to the metropolis we know today. The building typology and siting of energy, industry and railway infrastructures determined its urban morphology since the mid-nineteenth century. It became a fringe in need of regeneration, especially from the 1970s onwards, after gradually losing its industrial character and transforming into a more consolidated residential mesh. This complex area, with numerous voids and scars, still today holds spaces of opportunity addressed in strategic land-use plans.

The memory of these transformations, detecting the driving forces of urban change, as well as their pace and magnitude, feeds into the idea that a dynamic view of historical landscape can be operational in adapting to paradigm shifts.

The urban growth and transformation has blurred the boundaries between city and countryside, and this effect is noticeable in today's complex system to bring the electricity power lines into the city. Their impact surpasses the mere visual facet, inviting to reflect on their compatibility with environmentally protected areas and new landscape values.

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Figure 1. Industrial fabric in the south of Madrid in 1929)

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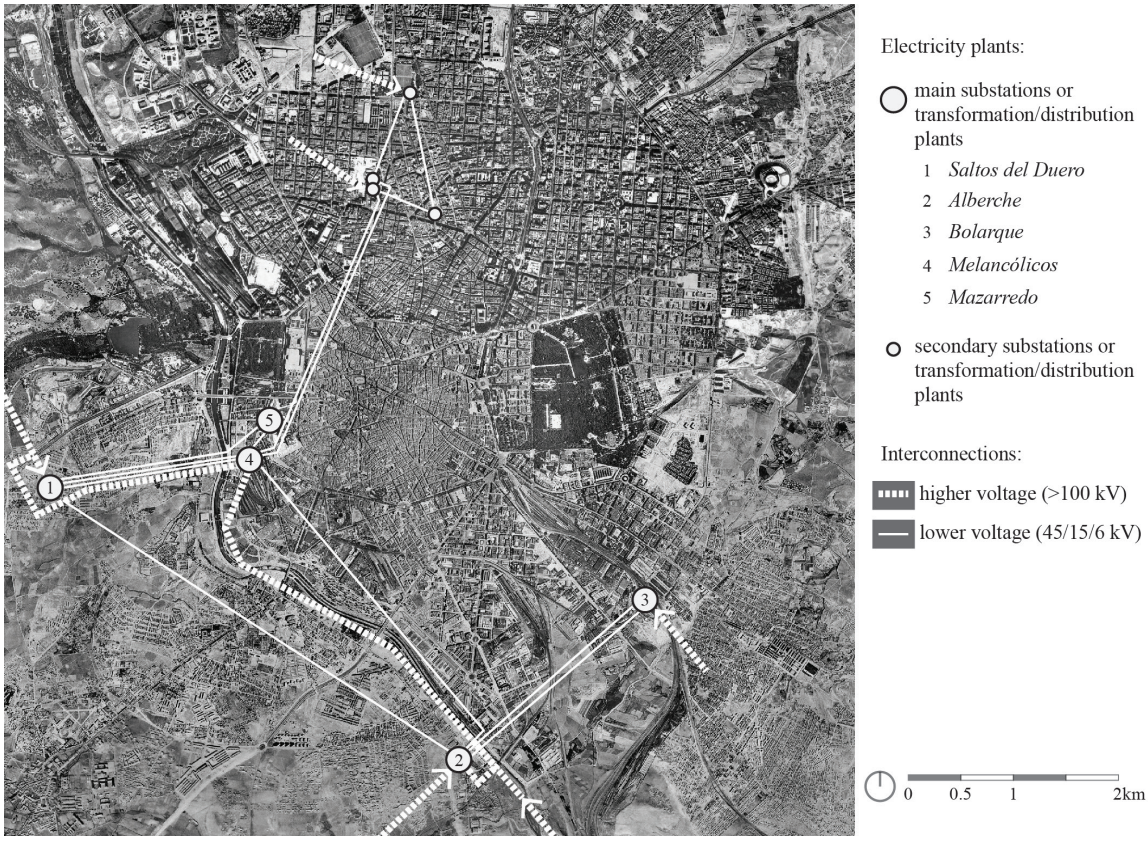

Figure 2. Electrical substations and connections in the city of Madrid in 1945

Figure 3. Urban regeneration plan for the south and west interior border of Madrid in the late twentieth century: Pasillo Verde

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Figure 4. Land use, urban regeneration and spaces of opportunity in the south of Madrid

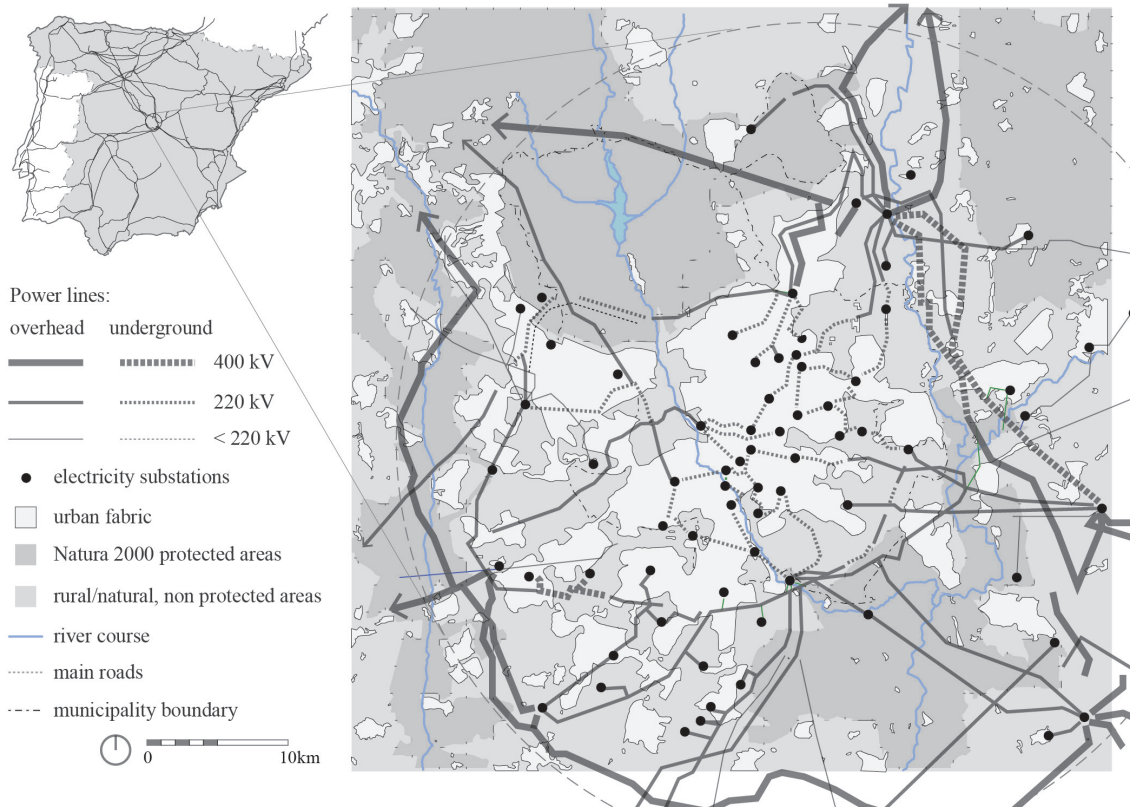

Figure 5. Electrical substations and main lines in the metropolis of Madrid

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Urban contrast of two cities from globalization. Gentrification, socio-cultural and economic aspects in Mexico and Valencia

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Abstract. *Globalization at present influences the transformation of cities in a similar way, they develop changes in their composition, related to socio-cultural and economic aspects that converge in cases of gentrification where the right to the city is altered, modifying the social, economic structure , And politics of the place, in addition to generating cultural changes according to processes related to postmodernity and current neoliberal policies that generate diverse negative changes such as the displacement of the original settlers, that is to say, a rupture of the social structure; Changes in soil values, which increase disproportionately making inaccessible and non-conservable properties for the inhabitants of lower purchasing power. However, this phenomenon also presents positive consequences such as revitalization and improvement of spaces, becoming in some cases in places of fashion, or with great tourist importance and cultural diversity. This work shows a contrast of situations, forms and processes of two cities in different continent and with different characteristics with many similarities, as is the case of Mexico City in areas designated as the historic center, in its four quadrants: Atzacoalco, Cuepopan, Moyotla and Teopan, as well as the Polanco, Juárez, Doctores, Roma and Granada colonies, in contrast to the historic center and the districts of the city of Valencia such as Ensanche, Russafa, and Cabanyal among others. What is relevant is to generate a contrast identifying similarities and differences in the processes of urban transformation in two cities with different temporal space characteristics, but both immersed in current processes of migration and globalization in their territories.*

Keywords: Gentrification, socio-cultural urbanization, globalization, postmodernity, land value, surplus value, urban imaginary

Introduction

In recent decades there has been a dispute over the central floor for urban recycling in which in some cases it is intended the overwhelming construction of works of great magnitude, among which are imposing buildings and modern shopping centers, spaces for trade And represent new socio-cultural practices, that is, a new way of life, where the flag of consumption exerts its main force. Individuals are attracted by symbolisms related to money and fantasy to belong to an important socio-economic status, nonconsciously, their spatial and sociocultural behavior is modified, but this in turn strengthens the economic growth and positioning of various transnational corporations.

This has resulted in changes in the environment, in terms of housing, land value, and use; Changes that end up generating an urban change, which makes homogeneous communities in heterogeneous societies, making progress, which deteriorates existing communities in the place where these spaces are established, and drives economic development

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and trade through change To proceed from the subject in its spatiality through consciousness.

Different situations are generated such as: social leakage and gentrification, that is, the inhabitants with lower economic resources sell their damaged homes and go to the peripheries, arriving new inhabitants with a greater purchasing power and with new ideologies and ways of thinking that displaced originals.

It can be emphasized that this fact, generates development and progress, although it ends with communities, giving way to new societies immersed in globalization.

There are strong socio-cultural and urban changes, as a result of the phenomenon: the land changes ownership and passes into the hands of large real estate, build buildings, demand for new housing is generated, without considering that infrastructure is insufficient because it was not planned and this produces Various problems of an urban but also social and cultural nature where it is necessary to solve different aspects quickly and with an adequate planning that is based on an equitable city right.

The main objective is to evaluate through a complex model the different effects of globalization involved with urban recycling for the construction of commercial spaces, in terms of housing, surplus value[1], gentrification and socio-cultural changes. Studying the urban imaginary by means of spatial readings of the new and original inhabitants of the different places.

Secondary objectives:

1.To explain cases of urban recycling for the construction and use of various commercial spaces analyzing changes of social filtration, gentrification, economic and socio-cultural aspects.

2.Apply Semiotics to identify changes by means of signs.

3.Apply a complex thinking that relates several parameter theories to observe the different zones and the different urban imaginaries.

4.Know and prepare reports of different areas of Mexico City where urban recycling is given for the construction of commercial spaces and contrast it with the case of Valencia in Spain.

The justification of the subject is based on the importance and the boom that has been the search for central spaces destined to commercial activities in the last years being a phenomenon related to the actuality, the globalization and characteristic of the historical stage that we live that is immersed the Capitalism and postmodernity[2].

The hypothetical assumption that globalization generates in cities with different characteristics, population movements that displace the original inhabitants of the central zones that are in dispute, increasing their value and surplus value, besides modifying their use, and Although there is an improvement and revitalization of the space, also generates a social rupture of existing neighborhoods and communities.

Due to the fact that there are already buildings in the central places, there is an urban recycling, which affects, in some cases, even buildings of historical and patrimonial value to give rise to these significant constructions that modify the way of life and the perception of the space, generating economic, social and socio-cultural changes, which in turn modify the urban environment, undermining the existence of communities and neighborhoods, and favoring neoliberal policies, where the economic factor to raise capital of foreign companies prevails and is the one that designs city. The right to it is diminished and privatized.

The search for a balance that generates equity in the city with opportunities for economic development for all and respects the architectural and historical heritage must be a principle in Architecture and Urbanism

Theoretical Bases

The concept of gentrification was first coined in Britain after the end of World War II, with a postwar reconstruction in London predominating; Was Ruth Glass in 1964, a Marxist refugee from Nazi Germany, a pioneer of urban sociology in Europe, who began to use it (Lees, 2007: 4). Observing a displacement of the working class forced by the middle classes that implicitly implied an improvement of the neighborhoods and that

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referred strong conflicts, from threats to violent acts where the inhabitants were forced to leave their house, regardless of whether it was their own or Rent, establishing a social struggle with the displaced. Tom Slater relates that he went through this situation, when he was displaced in 1998 from his rented house in Tooting, south of London (Lees, 2007).

However, the process of gentrification is not analogous to its beginning, since it has gradually transformed, passing through different stages:

1): In the 1960s, it was presented as a sporadic production on a neighborhood scale, under the premise of combating urban decay.

2): From the 1980s to the mid-1990s, it is promoted by public-private partnerships in which there are intense social conflicts emanating from displacement.

3): At present it is observed both in the center and in the peripheries, with more flexible credit instruments in which supply and demand actively participate, presenting a marginalization of anti-gentrification movements. (López Morales, 2009)

Therefore, there is variation in the definition of the concept by various authors, as this process evolves little by little. A representative definition was formulated by Herbert Marcuse citing the following:

"Gentrification occurs when new residents-who disproportionately are young, white, professional, technical, and managerial workers with higher education and income levels-replace older residents-who disproportionately are low-income, working-class and poor, And elderly-from older and previously deteriorated inner-city housing in a spatially concentrated manner, that is, to a degree differing substantially from the general level of change in the community or region as a whole. The definition hinges on economic, social, and population changes that cause physical changes to the neighborhoods. (Marcuse, 1985: 198-199)"[3].

This process is related in some cases to return to the center, as Enrique Pérez Campuzano mentions when talking about residential mobility in central areas where the questioning: ¿between segregation and gentrification? (Coulumb, 2016: 29). The subject can also present debate in different aspects because it can be based on an urban regeneration of the centers as mentioned by Cesar Jiménez Alcañiz where he talks about the incorporation of sustainability criteria in historic cities and the case of Russafa in Valencia (Balandrano, 2016: 19)

The appearances of large commercial spaces according to the dimensions of the city are closely related to the theme of globalization, postmodernity and gentrification as can be seen in the section of Tena Núñez where he alludes to the Shopping Urbanization. The new cultural industries and their complex urban order defining it as follows:

It is a new type of cultural industry: the Shopping. These are the patterns of urbanization imposed by the emergence and development of the last generation of shopping malls: they are new urban-architectural spaces that revalue the public / private dichotomies and commerce / entertainment, displacing their main character from the sphere Economic to cultural, where the massive generation of "ghostly" impressions intensifies, social practices are promoted that respond to hyperreal forms of entertainment and a prototype actor (light people), achieving a new form of organization and urban experience: Shopping Urbanization (Tena, 2007)

The above generates gentrification aspect which is important to mention, however, converge many other elements as you can see below:

Gentrification is a framework of demographic, economic, political, cultural, imaginary and symbolic dimensions; however, attention must be paid to the relationship between the arrival and displacement of individuals, social practices and economic activities (Hernández, 2016: 43). The negative of the gentfication lies as Gaja mentions in the city of the exclusion of social dualization, if we continue in neoliberal austerity, further accentuating social polarization.(Gaja 2016:97)

Methodology

The methodology is based on the elaboration of a complex model from the thought of Edgar

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Morín; with all the approaches that can be crossed on the basis of an open rationality how the same raises it in his book "Introduction to the Complex Thought" where it approaches a perspective that contemplates the phenomenal world, making a weave of inseparable associates, theories that will leave Linking as if it were a tissue (complexus: what is woven together) of heterogeneous constituents inseparably associated: it presents the paradox of the one and the multiple (Morín, 1998: 137), where it will be contrasted, with the semiotic visual, Where it starts from the concept of space-meaning, where reality materializes reality, from the consciousness and is analyzed with signs on several levels of referent: ontic, ontological, pragmatic, aesthetic and semantic.

Complex model that includes:

I Compilation of variables:

Socio-economic: Income, occupations, commercial values, commercial spaces: land use, social filtration, gentrification.

Urban space: morphology, land uses, density, monuments, equipment.

Cultural partners. Semiotics The subject, space-consciousness, symbols that modify his behavior and the symbolic cultural aspect

II Processing of information

Establish a valuation system.

1.-Economic partner

1.1 Economic analysis, soil values, exchange analysis and surplus value.

1.2 Real Estate Developers

2.-Urban space

2.1 Density, social filtration and Gentrification

2.2 Morphology

2.3 Land use and change

3.-Semiotic and phenomenological study

3.1 The interdisciplinary study of city and city, deepening; In physical space and territory, as well as socio-cultural characteristics of society and communities.

4.-Strategic Planning

4.1 Urban diagnosis

4.2 Prospective

Measurement and analysis

To obtain data, interviews and questionnaires were applied to students and professors in the career and postgraduate of Architecture and Urbanism, as well as interviews with inhabitants and key actors in both cities. Different databases were used, such as the National Institute of Statistics, Geography and Informatics, INEGI in Mexico and its equivalent in Spain, the National Institute of Statistics INE in addition to the Valencian Institute of Building, IVE and the Statistical Portal of the Generalitat Valenciana, obtaining the following analysis data:

Mexico City, formerly known as the Federal District, has an area of 1495 square kilometers and is the capital of the country, has a population of 8.9 million inhabitants, but if the metropolitan area is considered as 21 million inhabitants, it is one of the most populous and large populations in the world, is a global city that functions as a business center. The city of Valencia is also a global city and business center, but of smaller scale and in addition is a coastal city; Has a dimension of 134, 6 square kilometers, has 790 201 inhabitants that amounts to 2 544 264 inhabitants (INE, 2016) if we include its conurbation, is the third and most populated area of Spain, after Madrid and Barcelona. Therefore, the dimensions of both cities are totally different as well as the number of inhabitants and their characteristics, this work aims to find similar aspects related to gentrification despite their wide differences.

According to the Compilation of the variables

In Socio-economic: Revenues, occupations, commercial values, commercial spaces: land use, social filtration, and gentrification we can mention the following: the National Minimum Wages Commission in Mexico through resolution published in the Official Gazette of the Federation of December 19, 2016, effective as of January 1, 2017, resolved the minimum wage for $ 80.04 pesos national currency or 1920 pesos per month, however, according to the economic report of Mexico City of 2016, Daily salary of contribution to the IMSS was 412.79 pesos per day, which increases to 9900 pesos per month. (Sedeco 2016) However, in Spain according to the data page macroro (Expansion 2017), the minimum wage for 2017 is 825, 7 euros per month that in pesos

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would mean 16700 pesos. According to the statistical portal (Generalitat Valenciana 2017) are around 10400 to 14600 euros per year per capita. However, in the interviews carried out in Spain the most repetitive response was "we are in mileurismo", that is to say a thousand euros monthly, being the most common salary obtained in response; In the sample in Mexico was repeated the response of 4000 pesos and as you can see the salaries are not equivalent, nor even when making the change to pesos, since a thousand euros would be almost 23000 pesos, but it is important to mention that it is also not possible to buy The same things with the same amount of money in one country as in the other, in Spain things have a higher cost.

In employment-related matters in Mexico City, the total number of employed persons is 4,194,929, according to data from the National Survey of Occupation and Employment (ENOE). The unemployed add up to 222 thousand 41 (Sedeco 2017). And of the 57.2% represents informal trade.

In the city of Valencia according to the regional accounting of Spain base 2010 according to branches of activity in the National Classification of Economic Activities (NACE Rev.2) employment is governed as follows: Agriculture 8.1%, extractive industries 11.9%, manufacturing 12%, construction 10.1%, services 9.5%, trade 10.8%, information 5.5%, financial activities 8.7%, real estate activities 11.9% , Technical and scientific professional activities 8.5%, public administration 8.7%, artistic activities 9.8%. In the survey of active population EPA in 2017 1,944,600 people with work, 11,800 unemployed, and 479,200 unemployed. In the surveys it is very representative to hear in both countries about the economic crisis that occurred in the United States in 2008 where they were about to break several banks due to the excess of contracted mortgages, Spain was dragged in this process when bursting the housing bubble, where the construction stopped for several years and most of the debtors were not able to cover the mortgages, losing possession of their properties, which resulted in an oversupply of real estate by the banks and the fall in prices, besides not being possible the recovery of money. This is very important in terms of soil values in the area of urban space since in the process of gentrification these increase by passing the properties first by a deterioration, to be subsequently offered and renewed in their typology, increased in value, which would question if in Spain really happens the gentrification when giving the break of the

Figure 1.
Calle del Carmen in the Historic Center in Mexico with impaired properties

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Figure 2.
Cabanyal neighborhood in Valencia, traditional houses

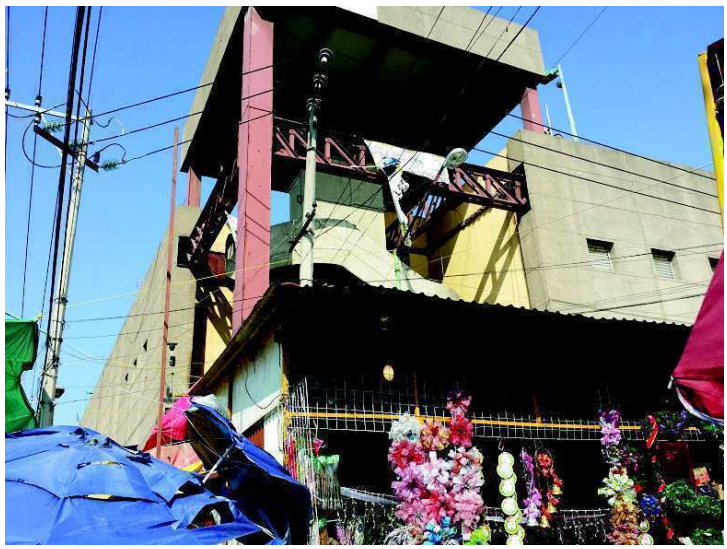

Figure 3.
Plaza 2000 Merced in Mexico raised as demolition in the rescue Project

real estate bubble. In Mexico the buildings in the central areas are in a strong dispute as they are closer to the historical center where historical heritage buildings are invaluable with irregularity characteristics and many are deeply deteriorated, both in the center and in the outskirts of the city. Center and in colonies such as the Doctors, Juarez, Rome, and New Granada themselves that have been a reason for plundering for real estate developers and government actors, where they begin to approve systems of cooperation, which are agreements at their discretion Between private individuals and the authority that allows to relocate and to exchange uses, destinies and potentials of the ground, besides relotificar independent of the existing urban plans. In the surveys carried out in the Historical Center of Mexico, the inhabitants repeatedly refer to the expropriation of several plots that do not have documentation and which are later demolished for the construction of new buildings. (Figure 1).

In the surveys conducted in Valencia is recurrent the case of Cabanyal, where by making various routes can be seen land without construction where previously were thrown houses to give way to the expansion project of Avenida Blasco Ibáñez, pretending to turn it into a hotel zone Which at the moment is representative for its traditional houses of century XIX which are very deteriorated. The councilor of Valencian Culture, Gloria Tello in an interview mentions the importance of putting special attention in this area, which represents a deep cultural symbolism in the Valencian community. Similar situation occurs in the rescue project of the Merced in

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the Historic Center of Mexico City, where to realize a modern comprehensive project, the authorities forgot the traditional markets and its inhabitants and tenants, place of important cultural symbolism. In both cases the projects, although different because in the Cabanyal they are coastal houses (figure 2), and in the Merced of traditional markets, (figure 3) the same essence of a change of density in the zone is seen, where the Buildings of apartments, offices or hotels are the consequence of these majestic projects that can multiply the value of the ground by the number of floors and receive the tourism.

Another interesting case in Valencia is presented in the Ensanche, commonly known as the neighborhood of the bourgeoisie with the existence of the commercial center the "English Court", land where was formerly the Convent of St. Catherine of Siena, part of the historical memory And patrimonial of the place, that was destroyed at the same time that the zone increased of value and became one of the zones more elitized along with the Columbus Market (Figure 4) that changed its market function by a type of small commercial center. Resuming the project of rescue of the Merced in Mexico allows a glimpse of what it represents and means a traditional market in the conscience of the inhabitants.

And then referring to the cultural symbolic aspect from an optics of Semiotics and Phenomenology, all the interviewees were asked how they saw their city in the past, in the present and in the future where it can be referred to: order, disorder and uncertainty

Conclusion

The two cities in spite of their physical differences present similar cases in zones at different stages of the gentrification process, although we can say that this process has other aspects to which they were awarded in its beginnings, the government hand prevails in the proposal of Urban reforms with significant improvements in the quality of the public space, the renewal of the traditional population with the arrival of people from other geographical areas, a significant increase and renewal of commercial activity and the rise in prices in the real estate sector. In Valencia the shopping centers are associated with a bad practice that deteriorates the commerce of neighborhood and is not own of the place, also generates

Figure 4.
Columbus Market (Mercado de Colón) in Valencia

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Figure 5.
Russafa neighborhood in Valencia

Figure 6.
Calle de Allende in the Historic Center of Mexico City

an unsustainable mobility. The historic center of Mexico City presents a strong problem of informal commerce, the government proposal to solve it is the relocation of these merchants in small commercial centers largely rehabilitated in historic and artistic heritage buildings.

In Mexico in addition to what is said of the Historic Center are also identified central colonies with important features in the process of gentrification such as the colony Doctors with the case of Tabacalera where the population was expelled by lies in the same colony, the dairies and the pulquerías, historical businesses, that have disappeared by the appearance of new neighbors and that at that time were very representative.

For the deterioration of an area this may be related even with natural disasters such as the earthquake of 1985 in Mexico that gave rise to the popular housing renovation program in central areas such as the Historic Center, Colony Morelos, Doctors, Lorenzo Boturini, San Antonio Abad, among others, said program promoted a reconstruction of the colonies by expropriation of different buildings, granting facilities to tenants to become owners, however said program did not work as expected and many of the buildings entered In real estate speculation. The case of the overflow of the River Turia in the City of Valencia is also antecedent for the deterioration of zones like the Cabanyal, however, the established public policies have done their thing as they potentiate more the deterioration in these cases as established by Neil Smith in his Theory the rent gap "which contemplates a differential in current capitalized income and future income that can be achieved; That is, the potential profit generated for real estate developers where they are trying to devalue capitalized current income to the maximum and to appreciate the maximum potential rent in the future (López

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Morales, 2009). This effect is also present in the area of the Alameda in the Historic Center of Mexico City, regenerated and with a new presentation to tourism.

In Valencia, the neighborhood of Russafa (Figure 5) is mentioned repeatedly. This neighborhood became a problematic place in a fashionable neighborhood (Del Romero 2015). When you walk along its streets you can see the appearance of a large number of bars. Is nocturnal, similar situation happening in several points of the Historical center in Mexico as they are the street of Allende (Figure 6) and Donceles where the nightlife by means of canteens and bars has taken more force.

In both cases different phases are observed: gentrificated zones and zones in processes of gentrification and although the urban diagnosis draws a prospective of cities with similar problems that are product of global characteristics in the different territories and of population movements that entail an expulsion of the original population and replacement of the same, since the spaces are revitalized, becoming fashionable neighborhoods, tourism referents and with an increase of its value, the obligatory debate is if these processes are natural product of the postmodernity and if it will be possible to find a balance that favors the right of city and equity.

Notes

1 Increase in the value of a real estate, due to circumstances independent of any improvement made in it.

2 Postmodernism is a cultural process identified in the beginning of the 1970s, for Tena it is a very complex period because a wide range of urban processes and forms that dialogue with economy, communication and the environment emerge. (Tena Núñez 2007:207).

3 Marcuse bases this definition on that used by Daphne Spain, in Gentrification Score 3 AM. DEMOGRAPHICS 14 (1981), which considers “the movement of middle-class families in urban areas that cause property values to increase and have the side effect of expulsion from the poorest families.”

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Intensive residential densification: Impact on the urban morphology of Santiago de Chile

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Abstract. *Areas of growing centrality in Santiago de Chile are currently under processes of residential densification, which vary in degrees of intensity and forms of impact in the urban environment. As a result of a weak conduction of residential densification, the structural-radical transformation of the urban fabric has resulted in the degradation of urban space. However, if well designed and planned, residential densification is a form of urban growth that can optimize infrastructure and allow the development of more complex and inclusive cities. This work aims to understand to what extent urban morphology shapes these urban transformation processes in 15 selected areas; the work also proposes typologies of residential densification based on the intensity of the process and the state of transformation of the urban fabric. Density (dwelling units/hectare) is understood as a systemic relation with parameters that determine urban compactness and configure public space such as lot subdivision composition, setbacks, building footprint and height, floor area ratio and mixed use index, among others. The study concludes that the impact of intensive densification on urban space can have three main effects: (1) The standardized high-rise tower radically fragments the urban fabric structure and skyline, to the extent that multiple and dispersed vertical operations transform lot geometry abruptly increase building height and lower land occupation; (2) this triggers a "residentialization" effect, unbalancing existing diversity of activities and contributing to undermine urban vitality; (3) which impairs the quality of public space, by introducing exogenous typological elements (such as setbacks) and reducing contact between private space and street space.*

Keywords: Santiago, Chile, residential densification process, urban morphology transformation, density parameters

Introduction

Intensive residential densification—understood as the process of building substitution that increases the number of dwellings per area unit—constitutes one of the most evident expressions of the "anchoring" of mobile capital on urban land (Weber, 2002). From the decade of the 1990s and onwards, it is possible to observe areas of increasing centrality in the Santiago Metropolitan Area (AMS)[1], which are under processes of residential densification with varying degrees of intensity in the exploitation of land and forms of impact in the urban environment. This process is an expression of a real estate market that is focused exclusively on the production of affordable housing that responds to advantages of accessibility and connectivity, as well as a series of incentives for repopulation and actions taken by municipalities to attract real estate investments (López et. al., 2012).

During the last decade, in the AMS we have observed forms of hyper densification with towers that exceed 30 floors and densities that reach 10,000 inhabitants/ha. Some extreme cases

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have been recently called "vertical ghettos", as they generate severe negative effects on urban and residential habitability, which is due to the lack of effective policy planning and impact mitigation mechanisms. The residential high-rise tower radically modifies the urban fabric through a dispersed verticalization process, based on multiple individual operations (lot by lot) that build in higher height and lower land occupation. When this process lacks gradualness, the effects and impact on urban habitability can have a significant cost. In order for the growth potential of an urban area to allow for the continuity of the transformation process, there must always be a relationship between the substitute morphological type and the substituted morphological type. This is because if the substitute type exceeds the exploitation of the land of the substituted type in an exaggerated way, there is a risk that only a few buildings will exhaust the growth potential (...), altering the fabric that was complete, but without the possibility of replacing it in its entirety (Diez, 1996).

However, residential densification is necessary, as it allows for middle and low-income groups to have access to higher-quality locations, increasing accessibility to urban opportunities such as equipment, services and transport; it also promotes the efficiency and sustainability of urban development. It is necessary to move towards residential densification processes that contribute to enhance the quality of urban space, in favor of pedestrians and social interaction, as density is constituted as a factor of urban compactness. However, the relationship between density and urban form is highly complex.

The scarce relations between density and residential type-morphologies can lead to faults and conceptual confusions, while the form in which density materializes in the urban fabric can lead to different levels of exchanges and interactions intensity. Therefore, both authorities, urban planners and citizens need to count on objective and precise spatial references associated with density and their possibilities of materialization, which will lead to the use of normative instruments of planning and design, residential densification processes that nourish the urban space, especially in the scale of proximity and pedestrians (Campoli 2006, Pont & Haupt 2010, Navarro & Ortuño 2011).

This paper addresses the following question: To what extent do the processes of residential densification and the regulatory frameworks that make them possible, have an impact on the urban morphology of the Santiago Metropolitan Area (AMS)

The main objective is to contribute to objectivize the discussion regarding the impact of residential densification processes in the AMS. The hypothesis posed is that the processes of residential densification are closely related to the morphology of urban space, to the extent that densification restructures the tissue and the properties of the tissue condition the densification. They also respond to the normative and urban planning frameworks that make it possible. Consequently, the residential densification corresponds to a phenomenon that extends differently in the AMS. According to its location and moment of concretion, residential densification presents different degrees of gradualness among so many transformation processes, with different spatial manifestations and impacts on the quality of public space.

This study proposes to sophisticate density as a tool for the analysis and interpretation of the urban phenomenon, placing density in a systemic relation with other variables of the urban form, especially those that determine urban compactness and configure the public space. The systemic reading of these parameters allows the definition of typologies of residential densification, which allow the interpretation of spatial re-structuring processes of contemporary AMS.

If one understands the built environment as an agent that applies pressure on the territory and the public space as a decompressing agent of this pressure, a relationship arises between these, which spatially translates into a greater or smaller compactness of the urban fabric (BCNEcología, 2007). Therefore, the notion that density is positive is transversal, as it combines with other properties of the urban fabric and is constitutes as a factor of urban compactness, which favors pedestrians and enhances the public space as space of encounter and interaction[2].

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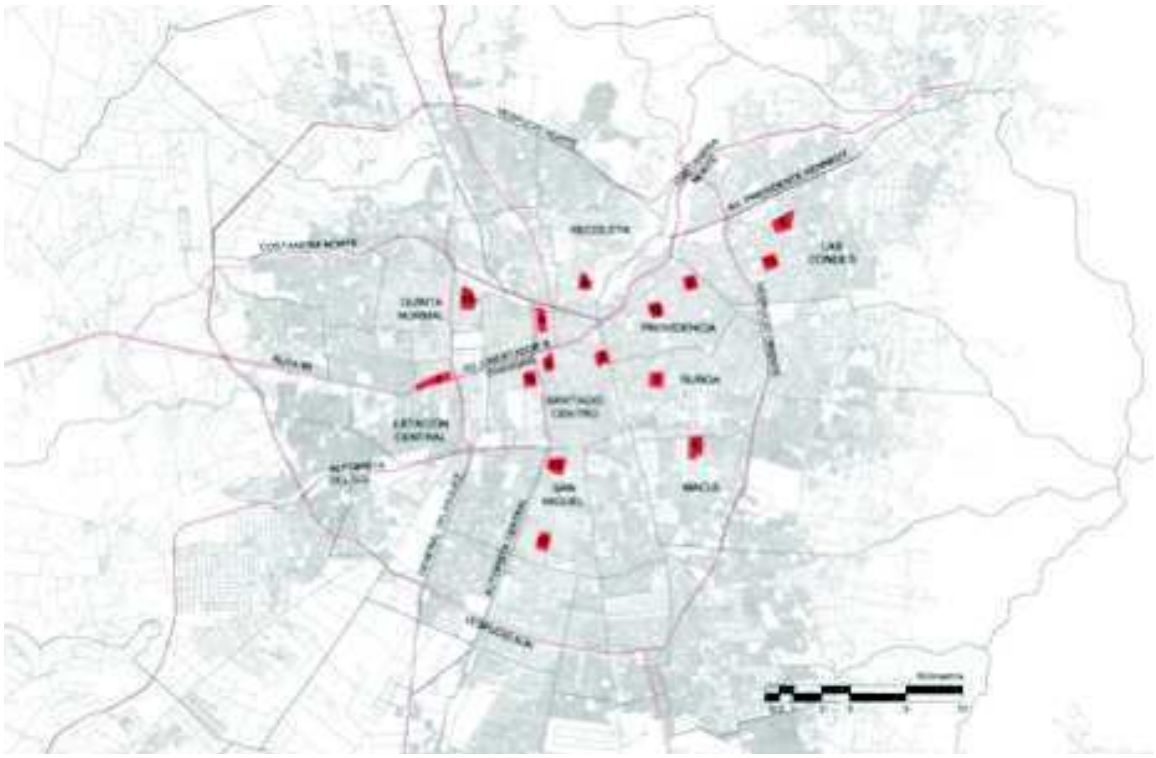

Figure 1.
Case Studies

In the last decade, a series of multi-variable density models have emerged; these integrate various quantitative parameters, their relationships and effects in the urban space. We can highlight the work of Pont & Haupt (2010), who have explored the potential of density as a planning and urban design tool, based on the analysis of the relationship between residential morphologies-types and parameters implicit in density, integrated in the Spacemate model. The work of Hoek (2008), Hausleitner (2010), Ewing et.al., Patel (2011) and Dovey & Pafka (2014), are also noted, to name a few. These studies conclude that the density cannot be reduced to any of the variables of the urban morphology, and is better conceived as a concurrence of interconnected variables. That is, any isolated measure of density is limited and does not reflect the complexity of the urban phenomenon.

Methodology

The specific objectives of this study are the following: (1) To characterize the urban morphology of the residential densification processes in the AMS, (2) to comparatively analyze the performance parameters of the urban form to understand its impact on urban space, and (3) to define and categorize type-morphologies of residential densification, based on the configuration of these parameters in the various stages of development of the city. For this purpose, 15 fragments of approximately 25 hectares were selected, allowing for a 1: 2500 scale representation. The selection criterion consisted in obtaining a relative diversity regarding the state of densification, form and intensity of densification and relative location in the AMS. Each of these fragments constitutes a kind of "biopsy" or sample of the urban form, which allows the reading and understanding of a larger process and a larger scale.

Once selected, the morphological properties of urbanization, subdivision and edification of each fragment were represented in three dimensions (De Solá Morales, 1997). These were built based on the use of municipal property registries and photo-interpretation using Google Earth. Indicators or parameters of the urban form were constructed using the

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Table 1.
Definition of Residential Density Parameters

Parameters	Calculation Formula	Scale	Description
Net Residential Density	Housing units / hectare (area inside official limits)	City block and lot	Indicates the number of housing units per area unit.
Floor area ratio	Total built area / lot area	City block and lot	Expresses the building intensity through the relation between the total built or constructed area and the total lot area. It indicates the number of times the area of the city block is included in the built area. It is also called edification density or edification coefficient.
Building footprint ratio	Area built on first floor / lot area	City block	Indicates how the area of the lot at level "0" or street level is occupied by the built area.
Residential-Use Coefficient	(Area build for residential use – area built for other uses) / (area built for residential use + area built for other uses)	City block	Internalizes the ratio between residential use and other uses in terms of built area. The closer to the value "1", the greater the proportion of residential use compared to other uses. If the value approaches "-1", other uses are in greater proportion than the residential uses.
Number of uses per city-block	-	City block	Expresses the diversity of uses that are observed in a city-block.
Open space ratio	(1- Coefficient of land occupation) / coefficient of constructability	Fragment	Expresses the impact that the different degrees and modes of exploitation of land (constructability) have in the space or space clearance between buildings and between the city-block and the public space. The higher the coefficient of open space, the lower the pressure of the building on the non-built space.
Area of public space by dwelling unit	(Gross area – net area) / number of dwelling units	Fragment	Indicates the distribution of public space area (streets, greens, parks and plazas) per dwelling unit.
Percentage of Densified Buildings	(N° of lots with high rise towers post 1990 / Total N° of lots) *100	Fragment	Indicates the state of progress of the densification process in the fragment.
Percentage of Densified Lots	(Total area of buildings corresponding to residential densification post 1990 / Total built area) * 100	Fragment	Expresses how much of the total constructed area corresponds to densified buildings with dwelling units. Together with the percentage of densified lots and the segmentation factor, it allows interpreting the degree of segmentation of the urban fabric.
Segmentation Factor	Highest constructability coefficient / average constructability coefficient	Fragment	This factor expresses to what extent the constructability achieved by the buildings that most intensely occupy land, move away from the average constructability of the fragment. The greater the factor, the greater the difference and the greater the tissue segmentation.

bases of the census survey (INE, 2012), data from the internal revenue service (SII, 2013), and building permits and information available in real estate portals (Table 1). These were later mapped by lot and city block.

Results Analysis

From the definition and analysis of the residential density parameters (Table 2), along with an interpretation of the role of urban morphology as conditioner of the densification process, five typologies of residential densification are proposed for the AMS, which not only respond to the intensity of the use of land, but also to the state of progress of the residential densification and its effects on urban space. These typologies correspond to:

(1) Hyper-densification that segments the traditional urban fabric, (2) densification of the peri-central heterogeneous and diverse urban fabric, (3) densification of the homogeneous residential peri-central urban fabric, (4) Medium densification with tendency to compactness and (5) perimeter densification of the industrial macro-block.

From the analysis of these five typologies, it has been verified that, especially in the cases of hyper-densification of the traditional urban fabric, the transformation of urban space tends to produce at least three main effects:

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Table 2.
Residential Density Parameters according to densification typology in the AMS

Densification Typology	Case	Max. Density Block	Max. Density Lot	Max. FAR Block	Max. FAR Lot	OSR	Segm. Factor	Public Space Area/ Dwelling Unit	% Densified lots	% Densified area
Hyper-densification that segments the traditional urban fabric	**1. Villa Israel**	436,8	2848,9	2,3	17,4	0.36	15,82	16,2	4%	78%
	2. Santa Isabel	362,9	2933	12	19,1	0.16	7,35	11,9	9%	71%
	3. Barrio Bulnes	1434,6	3124,2	8	16,9	0.11	4,97	7,6	13%	69%
	4. Centro Histórico	1843,8	3019,9	7,0	25,0	0.09	7,14	10,4	16%	34%
Densification of the peri-central heterogeneous and diverse urban fabric	**5. Barrio Punta de Rieles**	265	913,13	0,8	6,8	0.63	11,33	23,3	5%	71%
	6. Barrio Patronato	527	1556,02	2,44	7,8	0.49	7,65	51,6	8%	57%
	7. Barrio Eusebio Lillo	270	1516,9	2,4	14	0.53	12,73	19,0	13%	76%
Densification of the homogeneous residential peri-central urban fabric / advanced densification	**8. Barrio Las Lilas**	217,8	616,7	2	5,6	0.47	4,31	21,0	24%	45%
	9. Barrio Escandinavia	499,1	877,6	3,2	5,3	0.38	2,79	24,1	52%	96%
Densification of the homogeneous residential peri-central urban fabric / incomplete densification	**10. Barrio Llano Subercaseaux**	114	960,7	2,5	11,8	0.61	9,83	24,6	15%	89%
	11. Barrio Los Descubridores	398,2	541,5	4	5	0.36	2,78	15,0	21%	79%
	12. Barrio Los Estanques	238,1	1020,1	2	5,4	0.49	4,15	36,2	37%	79%
Densification of the homogeneous residential peri-central urban fabric / intensive and incipient densification	**13. Barrio Atacama**	153,8	1367	1,2	7,5	0.89	10,71	24,6	6%	69%
Medium densification with tendency to compactness	**14. Barrio República**	269,4	3022,9	1,9	6,6	0.31	5,08	20,2	8%	48%
Perimeter densification of the industrial macro-block	**15. Barrio Estación Yungay**	598,3	848,6	3,2	6,8	0,27	3,58	15,8	42%	65%
Sample Average		508,6	1677,8	3,7	10,7	0 4	7,3	21,4	18%	68%

Firstly, as the substituting model does not adapt to the substituted urban fabric—in the absence of a minimal degree of gradualness of the substitution—the standardized high-rise tower produces effects on the image and skyline, as well as on existing urban and architectural heritage. Habitability is degraded by the high pressure on the open space, not only towards the inside of the block, but also towards the street space, which is manifested not only in terms of greater demands of the public equipment, transport and the public space, but also in terms of environmental conditions such as sun-light exposure, ventilation, noise, privacy and access to views, among others.

Secondly, intensive residential densification

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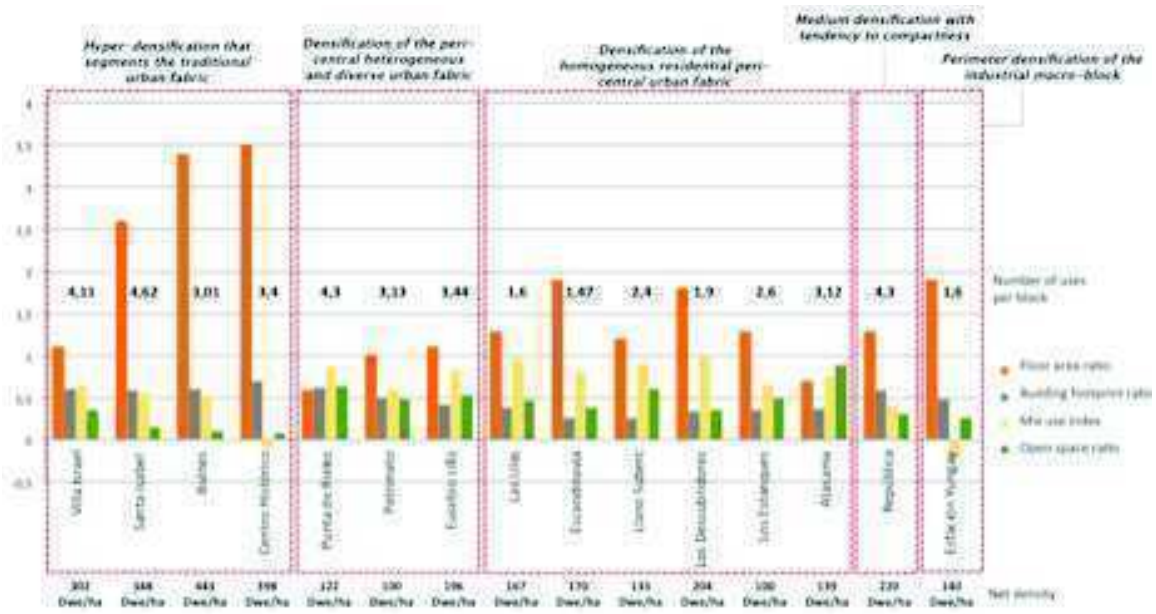

Figure 2.
Typologies of densification in the AMS and parameters of the urban form

triggers a "residentialization" effect, unbalancing the diversity of uses and on occasions reducing urban complexity and vitality in areas of high centrality. As private high-rise condominiums become increasingly self-sufficient, incorporating a series of equipment for exclusive use of land lords, the urban context increasingly has less to offer in terms of complementary uses to residential housing.

Thirdly, intensive densification can damage the quality of public space, as it implies its fragmentation, especially in streets with plans for road widening, when exogenous typological elements are introduced (such as front yards and the isolated tower in neighborhoods of continuous façades) or when the residentialization or lot-fusion reduces space for transition between the private space and the street space. The interface between the public and private domains is especially critical in these processes, as higher densities should be accompanied by larger areas of public space and higher standards of urban design, equipment and services.

Below we will discuss these effects from the analysis of the parameters of the urban form. We will focus on the typology of hyper-densification that segments the traditional urban fabric, since it is the one that generates the greatest impact on the urban space.

Hyper-densification in the AMS produces significant effects on the morphology of the urban fabric: The residential high-rise tower fragments the existing fabric and radically modifies the existing building structure, from a dispersed verticalization process. This is mainly observed in very central areas or areas with increasing degrees of centrality, where the traditional urban fabric predominates, with a continuous façade of one or two stories (or heights of up to 10 stories, where previous densification processes are observed) and where the dwelling use coexists with services, commerce and various equipment. A very liberal normative makes this typology possible; restrictions on height, density or floor area ratio have been largely absent.

The residential densification operation consists of the fusion of two or three lots to raise one or two towers of up to 30 or 40 stories (mainly in a "T" or "L" shaped plan to take advantage of the building geometry); this creates a disruption in the existing urban fabric. The densities exceed 1,800 dwelling units / ha per block and 3,000 dwelling units / ha in some cases. Floor area ratio levels of the building are also extremely high (12 per block and 25 per block).

City blocks have larger dimensions,

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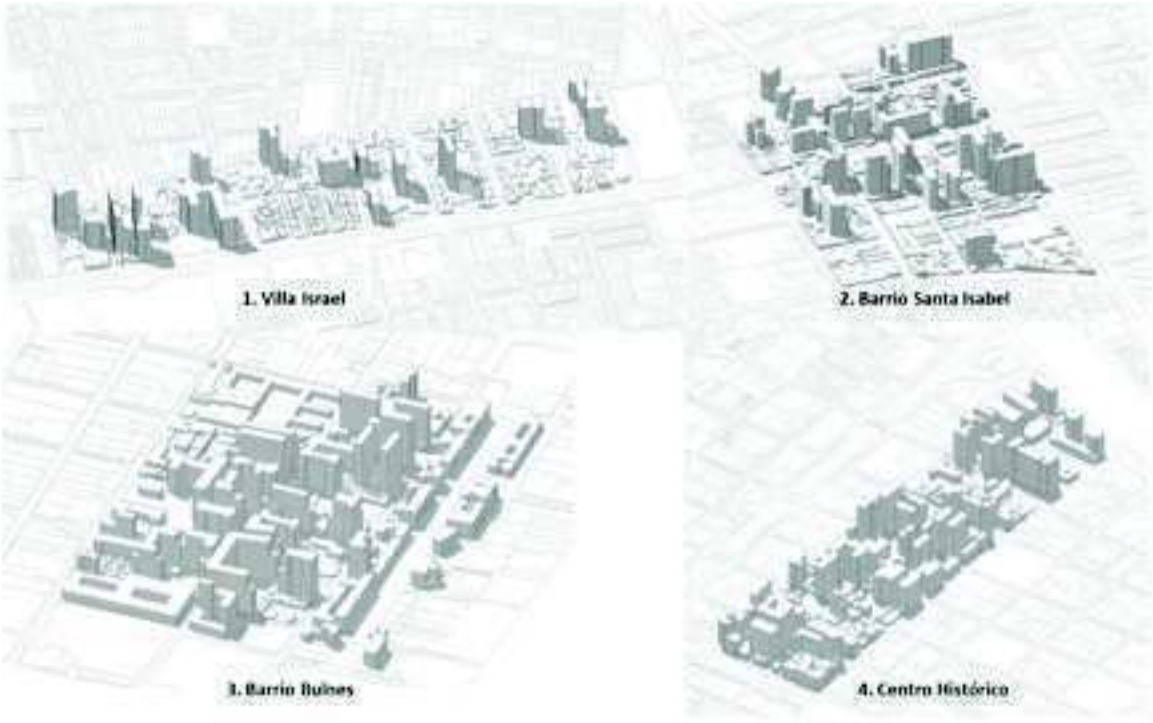

Figure 3.
Hyper-densification that segments the traditional urban fabric

resulting in a smaller surface area of streets and sidewalks. Since the process of hyper-densification does not go along with openings or widening of new streets and implementation of new green areas and public spaces, we can also observe low public space area per dwelling unit.

The high levels of intensity of land occupancy impact on the space or space clearance between buildings and between the city block and the public space. Alike the area of public space per dwelling unit, the coefficients of open space correspond to the lowest of the sample, which has significant implications in terms of sunlight exposure, ventilation and availability of open views from dwellings units. For example, the coefficient of open space in the Historic Center is 10 times lower than in the Barrio Atacama (San Miguel).

In this typology, we can observe two categories that differ by the degree of segmentation of the urban fabric. On the one hand, the case of Villa Israel has the highest segmentation factor of the sample (16). This is due to the incipient degree of progress of the densification process, which, given the significant floor area ratios and maximum heights reached, imply a greater degree of disruption of the substituent tissue over the substituted one. In fact, only 4% of the properties of the fragment contribute to 78% of the total built area. On the other hand, the cases of Santa Isabel, Centro Histórico and Barrio Bulnes present a more consolidated stage of densification, where residential towers coexist with some office towers or equipment in height, which reduces the degree of segmentation of the fabric, but increases the pressure of the space built over the open space.

In terms of Diez, the process of residential densification produces a segmentation of the urban fabric, insofar as the exploitation of the land is low if it is calculated in function of the building with highest level of exploitation. We can observe that a few buildings would be depleting the growth potential of the urban fabric, altering it without the possibility of replacing its entirety and triggering a segmentation that becomes irreversible. In fact, if the floor area ratio is measured in the scale of the lot, the dispersion of this indicator within the block is significant, coexisting constructions with floor area ratios of 0.5 with

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Figure 4.
Densification of the homogeneous residential peri-central urban fabric / Advanced densification.

high-rises that reach a floor area ratio of 20. Something similar occurs with the indicators of land occupation: While older buildings occupy more than 60 or 70% of the land, mainly under the principle of aggregation of continuous facade, the occupancy in the first story of the residential tower fluctuates between 20 and 40% .

On the contrary, regarding the typology of Densification of the homogeneous residential peri-central urban fabric (Figure 4), the coherence of the urban space observed after the process of residential densification, is the product of an urban regulation that has established height limits and floor area ratio that are consistent with minimum building subdivision parameters that promote a relatively homogenous densification typology.

Land occupancy coefficients are low and tend to be similar in the high-rise typology and in those of one and two stories (between 0.3 and 0.4, approximately), which determines that the coefficients of open space are around the average of the sample. Also, the regulations have established landscaping and urban design standards that 'protect' the character of garden city with which these neighborhoods were born. It should also be noted that its relative location in the AMS (high income cone with high degrees of centrality) and the quality of the urban design of its public spaces determine that the high demand for living in these neighborhoods has triggered "sufficient constructive energy" o renew much of the urban fabric.

Consequently, they conform the cases with high coefficients of residential use and the lower diversity of uses per city block of the sample. With parameters of gross and net density of 125 and 170 units / ha, the process of densification of the edificatory fabric approaches a state conformed by only two building types (the residential tower and the single family dwelling) with the same principle of aggregation and exploitation of the soil (isolated building with front yard). There is coherence between the pre-existing parceling and the increase of the property surface in order to increase height and density. Both the pre-existing lot fabric structure as well as the processes of lot fusion is relatively homogeneous, so that a same floor area ratio coefficient translates into relatively similar overall constructed areas. The coherence of the urban space is the product of a coordinated action between the public and private agents.

In the typology of hyper-densification we can find a great variety of uses per block, (some of which can reach up to seven uses). However, despite the diversity of uses, it is also possible to observe a slight predominance of residential use (with the exception of the Historic Center). This process of residentialization can be critical and paradoxical, as the new residents do not have the necessary equipment, and despite their excellent conditions of access to public transport, they must commute to other sectors of the city for daily activities.

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Hyper-intensity of densification is possible to achieve precisely because a standardized model of residential high-rise tower has been implanted and proven to be a product of fast execution and high profitability. This mismatch is more pronounced as we observe the parameters in the lot scale, where we find densities of 3000 units / ha living in a city bock with densities of 10 units / ha. The typological diversity of the substituted city block, especially in terms of the parceling, is determinant of the segmentation of the constructed tissue. The lot structure of the existing fabric constitutes the result of multiple fusions and lot subdivisions taken place for more than 150 years, therefore in the segmented tissue the lot of highest buildability can be 30 times denser in volume than the lot of the lowest buildability.

In effect, where the isolated residential tower "irrupts", there is an "emptying" of the city block at ground level, especially in areas where the predominant building structure tends to be of continuous grouping at low height. The dispersed renovation produces transformations at street level, mainly in two directions: (1) To reach higher heights the towers are located in the center of the lot, keeping distance from the street and bringing a new morphological element to the neighborhood: The front yard, and (2) the process of building fusion implies the reduction of accesses and spaces of contact between the private space and the street space.

Conclusion

The typologies of intensive residential densification proposed in this study permit an objective discussion regarding one of the main contemporary phenomena of spatial re-structuring. Also, they allow a deeper understanding of this process, by differentiating their particular spatial characteristics, their degrees of intensity of use of land at different scales (lot, city block and fragment) and progress of this process of urban transformation.

These parameters of the urban form have contributed to firstly measure the intensity of this process, not only in terms of the final densities (dwelling units / hectare), but also of other urban space variables that are altered through the process of intensive densification (grouping principles, alignment and forms of relationship between the private space and the public space, as well as degrees of edification, occupation of land, use mixture and open space). Second, to measure the extent to which these processes fragment the urban space, with irreversible impacts on urban habitability.

The morphological characteristics of urban space, specially the particularities of urbanization and subdivision, are elements that condition the forms of intensive densification. In the absence of normative constraints in territorial planning instruments, the geometry and use of pre-existing blocks and lots, such as lot dimensions, typological diversity of lots, obsolete industrial uses or availability of large lots, just to name a few, are conditioning factors of spatiality resulting from densification.

Not all forms of densification contribute to build a more vital and compact city. It is precisely the components of urban space that should consist of the basis of the design of regulations that direct or lead a more friendly densification process, with better standards of urban habitability. For example, in those sectors with a high geometric diversity of the urban fabric, the conditioners of edification based on coefficients that are applied to the characteristics of the lot do not assure a morphological coherence in the process of densification.

Residential densification can contribute to an improvement in urban quality, insofar as normative planning considers the relationship between the spatial properties of the substituted tissue and the substituting tissue, balancing parameters that constitute factors of urban compactness. This requires the incorporation of more sophisticated normative mechanisms to those currently used today, which exceed the lot as an operational element of planning, based on morphological parameters that enrich the prefiguration of public space according to the proposed city project. These constitute social agreements that imply a model of city and an idea of urbanity. Therein lies the importance of having planning and urban design instruments that guarantee densification processes that contribute to a greater urban quality.

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Notes

1 The Metropolitan Area of Santiago (AMS) is understood to mean the 34 communes that make up the nucleus of the urban system (communes of Santiago Province plus San Bernardo and Puente Alto) (De Mattos, Fuentes & Link, 2014).

2 Jacobs 1961, Lynch 1962, 1980, Rapoport 1975, Hoek 2008, Ewing & Cervero 2010, Pont & Haupt 2010, Hausleitner 2011, among others.

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Urban morphology in China: origins and progress

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Abstract. *This paper traces the origins and development of indigenous urban morphological research in China. It also considers the adoption of the theories and methods of the Conzenian School. Urban morphological research in China is carried out in different disciplines: mainly archaeology, geography, and architecture. The earliest significant work was within archaeology, but that has been widely ignored by current urban morphological researchers. As an urban archaeologist whose first degree was in architecture, Zhengzhi Zhao worked on the Studies on the reconstruction of the city plan of Ta-Tu in the Yuan Dynasty in 1957. He uncovered the original city plan of Ta-Tu (now Beijing) in the Yuan Dynasty by applying street pattern analysis. Before the Cultural Revolution, Pingfang Xu recorded and collated the research findings of Zhao, who was by then seriously ill, so that the methods he developed could be continued with the help of other scholars especially archaeologists. His methods of study are still used in studies of urban form in China today. Later, the dissemination of the Conzenian School of thought, aided by two ISUF conferences in China, promoted the development of studies of Chinese urban form. With the help of Jeremy Whitehand, researchers, including the Urban Morphology Research Group of Peking University, applied the theories and methods of the Conzenian School through field work and empirical studies. Taking the opportunity of the 110th anniversaries of the birth of both M.R.G. Conzen and Zhengzhi Zhao, this paper summarizes multidisciplinary urban morphological research in China.*

Keywords: Urban morphology, disciplinary history, Conzen, China.

Introduction

Similar to what has been experienced in developed countries in Western Europe, cities have entered a stage of rapid urbanization in China. Although there are significant differences in history, culture and social between China and Europe countries, the urban problems are the same. The rapid changes and disappearance of historical urban landscape, the difficulties in protection work of historic settlements, these issues have arisen in developed countries are now appeared in China. As a result of the specificity of land system and planning policy, revolutionary changes make the situation tougher in landscape protection. Urban morphology, as an important theoretical basis for the protection of historical landscapes, has a wide range of applicability in Chinese cities. However, compared with developed countries, the lag of urban development in China leads to hysteresis of the public policy and theoretical discussion. The research of urban morphology began relatively late, but there are still a number of prospective researchers focused on and explored the knowledge of urban form early, and achieved very important results.

Regrettably, some important researches have been neglected for decades because of the negative academic environment in China in 1970s and tighter bound of disciplines in the second half of the twentieth century. Now we are gradually aware that within the field of urban morphology this has maintained, if not

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exacerbated, a more fragmented knowledge than that contributed by our predecessors of the first half of twentieth century. Therefore, interdisciplinary vision is important and necessary in the study of urban morphology. With the perspective of multidisciplinary, retrospecting the urban form researches in China and analysing its developing process and impetuses not only to evoke the attention to researches done by previous generations and promote their continuation, but also to make new prospects of urban morphology research in China.

Traditional studies on Chinese urban form

The origin of study on Chinese urban form

One of the earliest Chinese scholars who began the study on urban form was Zhao Zhengzhi, a scholar with architectural background. Although he did not use the term "urban morphology" in his study, his case study on the capital plan, consideration on historical factors of Yuan Dynasty Beijing City and its relation with modern Beijing agree with some methods and contents of urban morphology studies in Conzenian school. Unfortunately, after ZHAO Zhengzhi first published his report of Case Study on Yuan Dynasty Beijing City in 1957, he was diagnosed with cancer in 1960. Later Mr. XU Pingfang recorded and reorganized his related study results from his dictation, forming the Restoration study on urban plan of Yuan Dynasty Beijing City. Influenced by the Cultural Revolution after ZHAO's death, it was not until 1979 that his study was published on the Corpus of the Science and Technology History. the most remarkable achievement in ZHAO Zhengzhi's case study was the restoration of the planning methods by inferring the street pattern as well as quantitative analysis of plot scales.

ZHAO believes that most of the streets in Yuan Dynasty Beijing City, except the main streets of south-north directions, are parallel Hutong of east-west direction. The streets and Hutong in the north of Chang'an Avenue of the inner city of Beijing today, was followed by the plan of Yuan Dynasty Beijing City. A number of parallel planned street pattern with the same spacing (50 bu, 50 steps) can still be found in the modern city of Beijing, which are the remains of street pattern of Yuan Dynasty Beijing City. In the analysis of street pattern remains, Zhao also noted that with the passage of time, different plots appeared to undergo regeneration of different intensities, tremendous changes in function, scale and form have occurred in many enclosed plots, which in fact the translation and replacement process were pointed out, and the result of plot segmentation and reuse were noted. But as a palimpsest, the city is not completely erase traces of history, part of the center of buildings and courtyard traces have been retained, according to which ZHAO restored the street distribution and some important building sites such as imperial city, palaces and temples.

In the restoration of the urban plan of Yuan Dynasty Beijing City, ZHAO infer the location and spatial characteristics of the moat by existing street pattern. He noted that intersections of two lanes, Maxian Hutong and Anfu Hutong, face the Wengcheng (small town outside the city gate) of Beijing City and these two Hutong bend southward suddenly at the Wengcheng, as surrounded by moat. According to this, ZHAO believe these two Hutong are remains of the moat. It could be found that from this state of Zhao, he has realized the restriction on the historic town expansion by city wall and moat, as well as its restriction on modern street system of Beijing.

As to quantitative analysis, Zhao conducted detailed survey on the scale of streets and plots. The distance between parallel Hutong is 44 bu (about 73 meters), from which the basic units of Yuan Dynasty Beijing City can be calculated as an area of 8 mu. This sale has been confirmed in the Dongsisantiao Hutong of the modern city of Beijing. The areas of plots of important buildings in the city such as the palace, temple, etc. are modified at a certain ratio of the basic plot, which reflects the strict spatial hierarchical structure of the ancient Chinese cities.

In his study of Yuan Dynasty Beijing City, ZHAO has clearly recognized that street pattern was the most resilient element to change. Much information of development history

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Unfortunately, Zhao's death in young age made it impossible to complete his study of Yuan Dynasty Beijing City, not to mention to build a complete methodology and terminology on the basis of empirical research as the western urban morphology schools. But these methods and research results have seminal significance at his time and is at the forefront of Chinese urban study, which has a great impact on many archaeologists. Since then a lot of research has been carried out on the basis of ZHAO's study, referring his experience and method, and making further explanation and development.

Development of traditional urban form study

Based on ZHAO Zhengzhi's empirical study of restoration of Yuan Dynasty Beijing City plan, XU Pingfang confirmed the accuracy of ZHAO's restoration through archaeological excavations, and on the other hand, made further exploration on theory and methodology. XU puts forward the concept of the overlapping of ancient and modern cities and analyzes its research method. The first time for this concept to use in the published literature was in 1972 and in 1986, Xu Pingfang given it a detailed definition in the China Encyclopedia of archaeology: "the overlapping of ancient and modern cities" refers to the city that most parts of it are built and developed on its former site, which means the modern city today is overlapped on historic city. The only research method for such cities is to examine

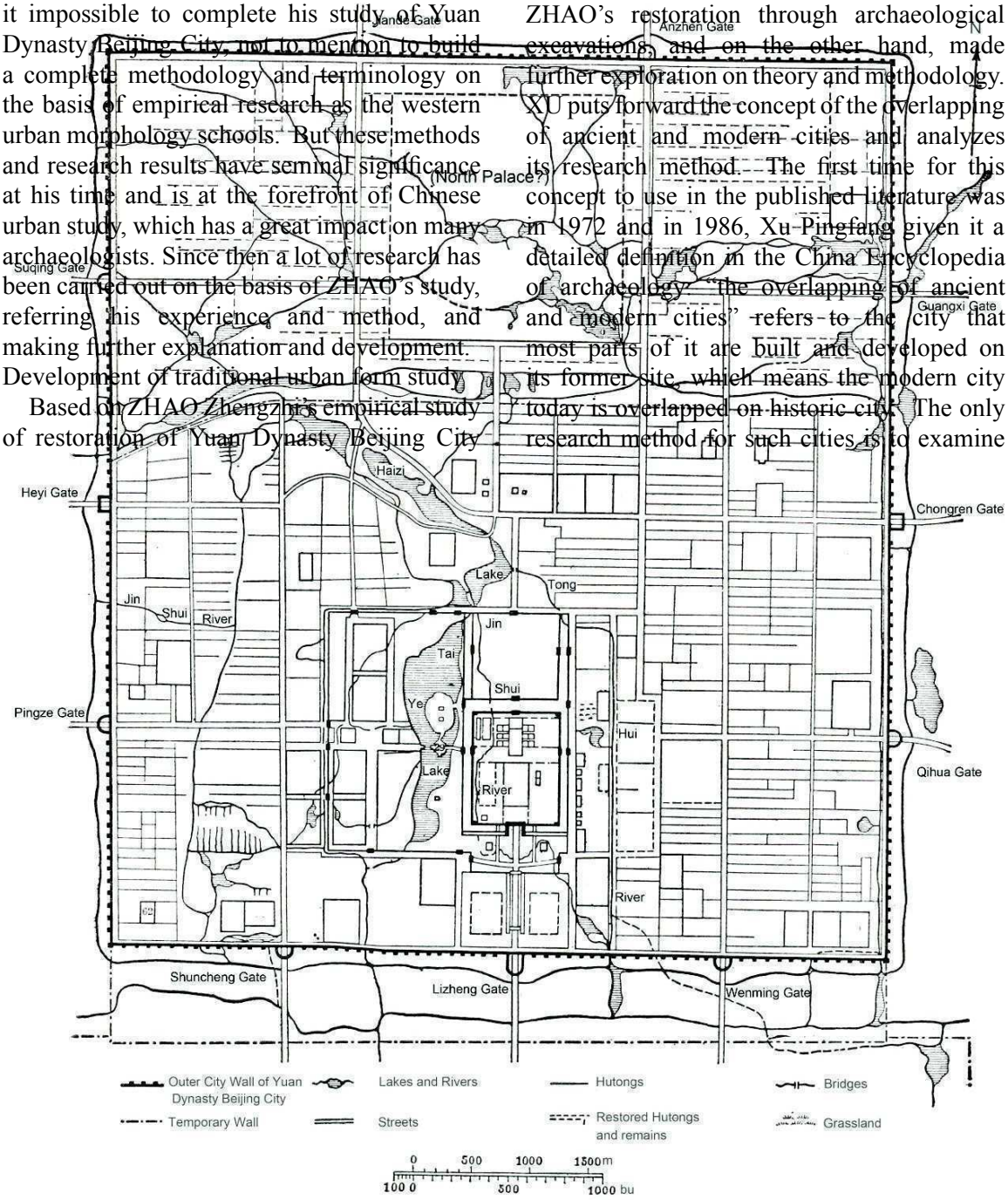

Figure 1.
Restroration Map of Yuan Dynasty Beijing City.

of the city could be reflected, and ZHAO successfully restored the historic urban plan using these clues. In his study, he combined literature information and in-depth plot level field survey investigation which linked streets and plots patterns together in analysis. At the same time, ZHAO paid attention to the limited role of restraint objects to city form, and tried to restore the develop and evolution process of the city. The scale regulation of street and plot in Yuan Dynasty Beijing City that he found by primary quantitative analysis, revealed the natural conditions, political, cultural and social characteristics behind the urban form.

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and analyze the remains of ancient cities left in modern cities. Taking Yuan Dynasty Beijing City as example, its remains could be divided into street remains, building remains and southern walls and moat remains. In these theories and methods, methods of traditional archaeological stratigraphy can be seen, but in fact, XU has already been aware of and made breakthrough of traditional archaeological methods. Much more of his emphasis is on the overall perspective of restoring ancient city form, combining methods of comprehensive literature study, mapping and prospecting. Thus the theoretical framework of urban morphology study was established.

Since then many archaeological research has used in the concept of "the overlapping of ancient and modern cities", as well as city site survey and plan restoration of historic cities carried out based on this theory. For instance, when study the historic remains in modern cities, SU Bai summarized three situations when modern cities develop on its historic site: reduction, expansion and transition, and separately discussed the spatial landscape regularity and characteristics of the overlapping of ancient and modern cities. And SU also pointed out that, it is most difficult for the restoration of original city site in the situation of transition, and he stressed the importance of identifying different times of remains and linkage of street of different times. In the restoration of Zhongzhou City, Chongqing, HANG Kan pointed out the correspondence between historical street and modern city street according to literature and historical maps study. He was also very concerned about the important role that the overlapping city theory could play in today's protection practice of historical city, and especially published articles calling for archaeologists to spread, promote and apply this theory and method to avoid wrong planning and adaptation in city regeneration. In the restoration study of the plan pattern of Zhengding ancient city published in 2017, ZHAO Xianchao still used the concepts and research methods of the overlapping of ancient and modern cities to study the changes of the ancient city plan from the Tang Dynasty to the present. As the scale of historical maps in Chinese ancient records is quite small, there is only the drawings to show relative position rather than precise geographic coordinates. In ZHAO Xianchao's study, satellite maps of 1950s were used, combining with historical maps, literature study, historical city remains, to overcome these problems, turning the historical map into modern maps with precise coordinates.

Although China's traditional urban study has initially formed scientific research methods and system, the impact of cultural revolution against academic activities and barriers between different disciplines made it unable to play an important enough role on China's academic field and urban planning practice. Its influence was mainly limited in spread in the research field of archaeology. This has also led to the consequence that China's traditional urban morphology study was based on archaeological methods and focused on the restoration of the evolution of city plan, while paid insufficient attention to man-land relationship and urban development impetus.

The spread and development of urban morphology theory in China

Establishment of urban morphology study system

In China, the earliest use of the term chengshi xingtai (urban morphology) in urban study was the architectural architect QI Kang. In 1982, QI initially expounded the theory and method of urban morphology in his article the Form of the City (the first draft of study outline). This paper first defined the term urban form and points out its significance of study on urban form. QI takes the city as an organic whole whose form is not static but in a dynamic, evolving process. This dynamic process shows the fusion of natural and human forces and is affected by politics, social and economic factors. Qi Kang also proposed specific methods of analyzing urban morphology and its implications for urban planning practice. The research perspective QI pointed out was very advanced, which is still very basic and of great importance even in today's research.

In the field of geography study, SONG Jiatai

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and his students WU Jin, GU Zhaolin, have made a great deal of instructive results as pioneers in urban morphology studies. SONG Jiatai is the first scholar who study urban form in the view of geography in China. At the beginning of 1980s he discussed the concept of city-region for the first time and expounded elements affecting and restricting the development of cities from a regional perspective. In 1990 WU Jin's doctoral dissertation, the The Morphology of Chinese Cities: Structures, Characteristics and growth is a detailed and systematic study that the concept of morphology, spatial structure, human activities and their relations were studied comprehensively. And WU explored the dynamic mechanism of morphological change from the view of morphogenesis. In the same time, WU Jin with Song Jiatai's another doctor GU Zhaolin together, focused on the studies of urban fringe area of western scholars, and then reviewed and introduced them to China at the end of 1980s. Among them J. W. R. Whitehand's study of urban fringe belt was included, and thus the concept of urban fringe area was introduced into China's geography field. After that, in 90s, they applied the theory of urban fringe to Chinese urban studies. Combined with qualitative analysis and quantitative calculation, a series of empirical studies were carried out in major Chinese cities such as Nanjing, Guangzhou and Shanghai.

Although these academic achievements in 1980s and 1990s now appears to be relatively simple and preliminary, it was groundbreaking at that time. It was these studies that introduced western urban morphology theories to China, and provided new situation for urban morphology study in geography and architecture academic field.

Spread and Localization of Urban Morphology

With the establishment of International Seminar on Urban Form (ISUF) in 1994, the theory of urban morphology has been widely disseminated. At the beginning of the 21st century, there have been lots of articles which introduced the theories of western urban morphology including Conzenian school and Italian typological school, while dissemination and application of Conzenian school in a large range in China began with communication and cooperation between J.W.R.Whithand and Chinese scholars.

In 2007, Whitehand participated in the Beijing Forum 7th sub forum which discussed the inspiration of heritage to the progress of civilization. At the forum, he introduced the Conzenian school theory through Conserving Urban Landscape Heritage: a Geographical Approach and made use of the case study of Zhishanmen area in Beijing to explain the application of urban morphology in the analysis of historical urban landscape. Moreover, Whitehand, Gu Kai, Zhang Jian and other Chinese scholars did a few researches together which concerning about fringe belt and urban landscape unit in Zhishanmen area in Beijing, Pingyao in Shanxi, Hualin Temple and Tongfuxi Road area in Guangzhou. ISUF was held in Guangzhou in 2009. In this process, Whitehand, Micheal Peter Conzen and other western scholars visited China and gave lectures so that more and more Chinese researchers began to study Conzenian school and try applying its methodology to Chinese urban researches. In 2011, the Chinese version of the classic work of Conzenian School, Alnwick, Northumberland: A Study in Town-Plan Analysis (translated by SONG Feng, etc.), was published. Since then, under the leadership of Song Feng, urban morphology research group in Peking University gradually formed and grew, devoted to the application and localization of Conzenian school in China. At the ISUF held in 2012, Dai Ying and Shi Yanhui reviewed the development of Conzenian school in China; Xiong Xinkai and Shi Chunhui gave a presentation on the morphological characteristics of the Land Administration Line as a special fixation line in Shenzhen Special Economic Zone; Liu Hao studied the architectural typology process of Majianglong village in southern China, it is found that under the influence of foreign culture, the village combines western building type with Chinese traditional layout. In 2013, Xiong Xiao explored the relationship between both sides of World Heritage boundary of Macau's historical center from the aspects of landscape and spatial

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hierarchy, providing an integrity perspective for World Heritage protection. Xiong Xinkai uses the method of Conzenian school to interpret the urban form of New Estates for workers in Shanghai after 1949. Wu Menghe took Tiexi District in Shenyang as an Example to explore the evolution and transformation of modern industrial landscape in China. In the same year, in the International Conference of Modern Architecture Heritage Conservation held in Xi'an, Urban Morphology Research Group of Peking University demonstrated the role and impact of Conzenian school on heritage protection through posters. At the ISUF held in 2014, Wu Menghe gave the presentation titled The Reference 8 of Chapter 2, "Alnwick, Northumberland: a Study in Town-Plan Analysis (2nd edition)" and the Research Status of Urban Morphology in China, which pointed out that M.R.G. Conzen highlighted the revolutionary planning, and paid attention to the rapid and thorough transformation with the impact of revolutionary planning in China and similar countries. Applying the theory of Conzenian school to the basic unit of the socialist spatial practice in Chinese modern city, Danwei, Dai Ying proved that the applicability of the theory and focused on the spatial characteristics as a result of influence of economic and cultural. Shi Chunhui taking an example of Nanluoguxiang, a historical district in Beijing, analyzed the important role of agent in the evolution of urban form. In 2015, basing on the plot cycle, Dai Ying and Shi Chunhui analyzed the value and perplexity of conservation and utilization of Baiwanzhuang Neighborhood, the first independently-designed neighborhood of P.R.China. Xiong Xiao studied the value and evolution process of Kuling town in Lushan, which is historical urban landscape and World Heritage, and Liu Min applied morphological methodology to settlements in West Lake, a World Heritage cultural landscape either. All of above works were completed under the guidance of Professor Song Feng, and most of them got Whitehand's support and help.

There are a number of scholars majoring in architecture focus on the researches of architectural typology. For instance, Deng Hao has completed Urban Morphology and Typology in the United Kingdom, Basic Building Interpretation and so on, trying to break the predicament of architectural research through the interdisciplinary approach.

Review of the sinicization of western morphology theory

Looking back on the process of western morphology theory spreading and developing in China, we can recognize a clear timeline, which began with simple introduction of theory and methodology and then empirical research carried out in Chinese cities. However, in the spreading process of western morphology theory there were also errors in early geography and architecture literature. Confusion caused by cross-culture background and language barrier occurred as well. Later with more and more researchers devoted themselves to urban morphology study in China, support by western scholars, field work carried out and related reflection made, study of China's urban morphology was promoted.

In recent years, due to China's special history, differences of economic, institutional and cultural background, Chinese researchers have gradually realized the importance and necessity of the localization of western theory, and a lot of helpful exploration was made. Introducing danwei, the special socialist spatial practice and China's unique historical and cultural landscape evolution into morphological study, provide with a huge amount of detailed supplementary studies of morphological characteristics under what Conzen referred as revolutionary planning operation. Chinese scholars' exploration and efforts have never stopped for the localization development of morphological theory.

The spreading of morphology theory in China also presented obvious interdisciplinary feature, scholars of urban geography, architecture, historical geography, and even some media practitioners of heritage protection showed interest in urban morphology. Although We regret that Zhao Zhengzhi's research failed to spread widely due to the limitation of disciplinary barriers, we are more keenly aware that the general trend is breaking

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through barriers between disciplines and conducting interdisciplinary study.

Impetus of morphological studies in China

The motivation of localization of western urban morphology theory

The western urban morphology theory system has a deep historical accumulation, and with the development of history, the object of study transfer from the medieval historical town gradually to the contemporary urban form. As a result of special historical development, China's urban development process lags behind that of western developed countries, and the urban issues in development show a certain lag too. Accordingly, the study of urban morphology present lack in theoretical depth and the public policy to deal with these problems also vacant in some area.

Nevertheless, the problems in urban development arisen in China and the Western countries still show considerable similarity, which makes it possible and necessary for China to learn and draw lessons from western theories and experiences. Chinese cities have experienced a period of almost 40 years' rapid development after reform, abundant cases for contemporary urban morphology could be found. Although Chinese cities are different from the western cities in term of historical development, there are also develop stages and periodicities, whose effects are clearly reflected in the material form of city (TIAN Yinsheng, 2010). The concept of plan unit, fringe belt in Conzen school and the special concern on special Building in Italian architectural typology provide new solutions to current problems of Chinese cities. Especially in the conservation and management of historical cities and historical streets, the relevant western urban morphology theories show strong applicability.

However, we can not ignore the characteristics of Chinese cities while drawing lessons from western urban morphology theories. Facing diverse historical context and modern institution, although the urban problems show some similarities in spatial level, behind the phenomenon is the difference of economic and cultural background. This reminds us to pay more attention to the adaptability and localization of the western urban morphology theory when we apply that to explore the solution to Chinese urban issues. Therefore, it is particularly important to trace the research context of Chinese indigenous urban morphology studies. Based on the study of indigenous urban morphology theory, applying the western urban morphology theory adaptively as well as localizing it to makes it more suitable for Chinese urban morphology study.

Support from western scholars and ISUF held in China

In 1970s and 1980s, the development of urban morphology in China set off a climax. The study of urban morphology has become more and more eye-catching, and the meaning and understanding of urban morphology has been initially unified (Li Yang, 2006). With the rapid development of Chinese cities in the new century, the study of urban morphology has entered a period of rapid development too. During this period, the introduction of western urban morphology to China played a key role, especially thanks to the enthusiastic help and promotion from a number of western scholars. The Urban Morphology Research Group (UMRG) is the earliest urban form research organization in the UK, initially established by Jeremy Whitehand, Terry Slater and a group of other young scholar of human geography in the University of Birmingham in 1974. UMRG has become one of the most active academic organizations in the field of urban morphology and in decades, its influence has gradually expanded from Europe to the whole world (Zhang Jian, 2012). In the background of rapid development of cross cultural urban form study in recent years, UMRG has supported to establish China's urban morphology research group in South China University of Technology and the Peking University, carrying out morphological study with the theory of Conzenian school.

As the main member of UMRG and professor

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of geography at the University of Birmingham, Jeremy Whitehand has made a great contribution to the spread and development of Conzenian school urban morphology theory in China. Jeremy has been to China to give lectures for several times and under his guidance, Chinese scholars have carried out morphological studies in Beijing Zhishanmen historical area (2007), Pingyao City (2010), Kuling town Mount Lushan (2013), and Shangqiu (2016). A number of Chinese scholars also visited UMRG at the University of Birmingham to further understand the Conzenian urban morphology theory. Micheal Conzen and other scholars made great efforts to the spreading of urban morphology theory in China as well.

In 1994 International Seminar on Urban Form was established by UMRG and Italian architectural typology scholars, and after over twenty years of development, ISUF has become the most important platform for international exchanges of studies in the field of urban form. In the dissemination and development of the West urban morphology theory in China, there are two ISUF held in China: the 16th ISUF was held South China University of Technology in Guangzhou, 2009, and the 23rd ISUF held in Nanjing University in Nanjing, 2016.

The two ISUFs held in China not only showed the spreading of urban morphology in China, but also brought up a number of topics related to China, reflection on China's study of urban form, which aroused extensive discussion. In the 2016 ISUF in Nanjing, there were nearly 60% among the 140 papers were from Chinese scholars, including Peking University, Southeast University and other major scientific research institutions and universities. The urbanization issues, plot and building type of historic city, study method for urban morphology were discussed.

Commemoration and prospection

Contributions can not be ignored

The development of urban morphology in China depends on the foundation of Chinese and Western scholars' researches, research on the town plan of Yuan Dynasty Beijing City did by Zhao Zhengzhi, research on the town plan of Alnwick did by M.R.G.Conzen are all the monumental groundbreaking works, which never too much to be reviewed. Coincidentally, Zhao Zhengzhi and M. R. G. Conzen both born in 1907 and their researches were both completed around 1960, but due to the difference in academic environment and the premature death of Zhao Zhengzhi, two equally important studies received totally different attention.

2017 is the 110th anniversary of Zhao Zhengzhi and Conzen's birth. Reviewing classics of urban morphology is the best way to express the commemoration and memorial.

Review and prospection

This paper summarizes the morphological researches in the field of archeology, geography and architecture, and through the review of predecessors' contributions and the integration of existing researches, clarifies the origin and development of urban morphology in China, so as to arouse the regard and reflection on academic tradition.

The dissemination of morphological theory in China is the process of combining theory with practice and localizing methodology in China. The difference of the urban morphological studies between western countries and China mainly comes from two aspects: the revolutionary transformation caused by different land system and planning means, and the spatial layout with politics core rather than economic core caused by traditional culture. It is the direction for Chinese researchers to establish theory and methodology system which is more suitable for Chinese practice based on the works of predecessors.

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Henri Prost in Istanbul: Urban transformation process of Taksim-Maçka Valley (Le parc n°2)

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Abstract. *With the foundation of the Republic of Turkey in 1923, modernization studies have been started throughout the country. Following this, French architect and urban planner Henri Prost was invited to conduct the planning of Istanbul. He worked with conservative and modernist attitude. He gave importance on open spaces and public parks. His largest public park proposal was Park No2 which was the area extending from today's Taksim Square to Maçka Valley and this park was fully constructed in the 1940s. However, it has been transformed by the planning decisions taken over time depending on the political, cultural and ideological changes. The focus of this study is to understand and define the process of transformation, and investigate the changing of significances and cultural values of the Taksim-Maçka Valley from foundation of the Republic of Turkey to the present day. Accordingly, the first part of the paper presents the formation process of the area through the plans which was prepared by Henri Prost. In the second part, the transformation process of the area on the Prost's legacy is analyzed.*

Keywords: Digital heritage, Prost, Istanbul, public park, cultural landscape

Introduction

Cultural Heritage is a notion conceived and continuously changed in the last two centuries readapting theoretical assumptions practices and practices to new achievements and cultural developments. Nevertheless this notion also developed differently in diffentent cultural and political frameworks, in Europe and in other countries.

The fate of Istanbul, the old capital city of Ottoman Empire, changed with the end of the First World War. Ottoman Empire collapsed and in 1923, Republic of Turkey was founded under the leadership of Mustafa Kemal Atatürk. The Republic of Turkey represented a significant turning point in Turkish history. This new period was the starting point of a modernization process that includes with change of the country's political and social structure such as figures and symbols of the Ottoman Empire and their replacement with secular values for the new nation-state (Çelik, 1993). As a result of this, the Republican authorities had decided to transfer the political capital to Ankara, thus, Istanbul lost its status. In those years, shaping the cities according to modernization approach was also important to creation of new state after long war period. Therefore, Republican authorities perceived urban planning as one of the principal works to form new state as well as to satisfy the needs of industrial age (Bozdoğan, 2002).

Priority of limited funds was given to Ankara, new capital city of the state. After the creation of modern Ankara, according to the Jansen Plan, the Republican Government turned its attention to the planning of Istanbul. The fact that Istanbul was the old empire capital with the traditional Ottoman life, made it a perfect stage to bring the modern city life and to make the secular character of the new regime visible.

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In 1933, to obtain a plan for Istanbul, an urban competition was organized by the municipality. The international specialists -Henri Prost, Donat Alfred Agache, Hermann Ehlgötz- were invited to submit three proposals for the future of Istanbul (Bilsel, 2010). The three architects were then the leading figures who contributed to the creation of the urbanism as a discipline. This condition influenced the choice of their invitation. The German urbanist Herman Elgötz was known for his successful plans for various cities, and in particular, Essen, the German industrial city. Agache and Prost were effective and essential members of French Musée Social, which was an important and leading research center into city planning, social housing and labor organization in Paris (Cohen, 2010). In particular, Prost was playing an important role in Musée Social. He was assistant of Eugène Hénard who was the head of the committee for identifying urban and rural hygiene problems and proposing solutions (Cohen, 2010). Prost's new cities studies within the intellectual atmosphere of the Musée Social affected his works. Besides, he was also known as author of comprehensive planning works for several cities, such as Fez, Marrakesh, Meknes, Rabat and Casablanca (Hautecoeur,1960). Nevertheless, he was also engaged in the direction of the regional planning studies of the metropolitan area of Paris, caused to decline the invitation. Prost suggested his colleague Jacques Henri Lambert to his task. Agache, Lambert and Ehlgötz prepared their proposals. Although Ehlgötz's plan was finally chosen, his plan never was put into implementation. In 1935, in fact, Henri Prost was formally invited by the municipality of Istanbul to conduct the planning of the city. In addition to being one of the leading figures of the period, his planning of Paris, the one of the most important modern urbanism phase, had affected to make the decision of entrusting to him the future developments of Istanbul. For this purpose first he established a City Planning Office in the Istanbul municipality - that was under construction at that time – where he undertaken his task with the role of head of Planning Office of Istanbul between 1936 and 1951. In other words, Prost became not just the urban planner of Istanbul but also the founder and the chief of the new devoted department for planning (Pinon, 2010). In this context he was teaching the employees of the Planning Office by building new expertise

In these fifteen years, he worked for several urban studies such as masterplans and detailed projects. Henri Prost based his studies of Istanbul on three principal issues: transportation (la circulation), hygiene (l'hygiene) and aesthetics (l'esthetique) (Bilsel, 2010). He also took into consideration the diversity of Istanbul as a city above by different, and has planned it with a poly-centered approach (old city on Historical Peninsula/new city on Pera). Regarding his hygiene (l'hygiene) issue on Istanbul, he proposed several public open spaces as defined with his words, espaces libres. Prost's open spaces included a system of parks, promenades, squares, terraces, boulevards, sports areas (Fonds Henri Prost,Paris). Within these open space proposals, the largest public park proposal was for the urban region of 'core of Pera', which extends from the today's Taksim Square to Maçka Valley where modern city settlement has expanded (Figure 1). The fact that Taksim Square was an effective symbol of the Republic hosting the first Republican Monument of Istanbul (located there in 1928), was an important influence of his decision.

The park named Park No2 (parc n'2) conceived by Prost was not only a public park. He also included public building blocks with cultural, sportive and art functions. Such decisions taken by Prost show us the area was not considered the park just as a recreation area, but as a green pattern with public services inside the city center.

As soon as in 1950, the political policy was changed and the multy-party regime was started for Turkey. Prost the following year (1951) was discharged from his position by this new regime that adopted the policies of Turkishness (Akpınar, 2010). Interrupted the plan and broken the perspectives given by Prost, over the time the area has been transformed by the planning decisions taken over time depending on the political, cultural and ideological changes.

This paper aims to study contribute to shape the historical formation process of the area of Park No 2 as a cultural heritage of modern

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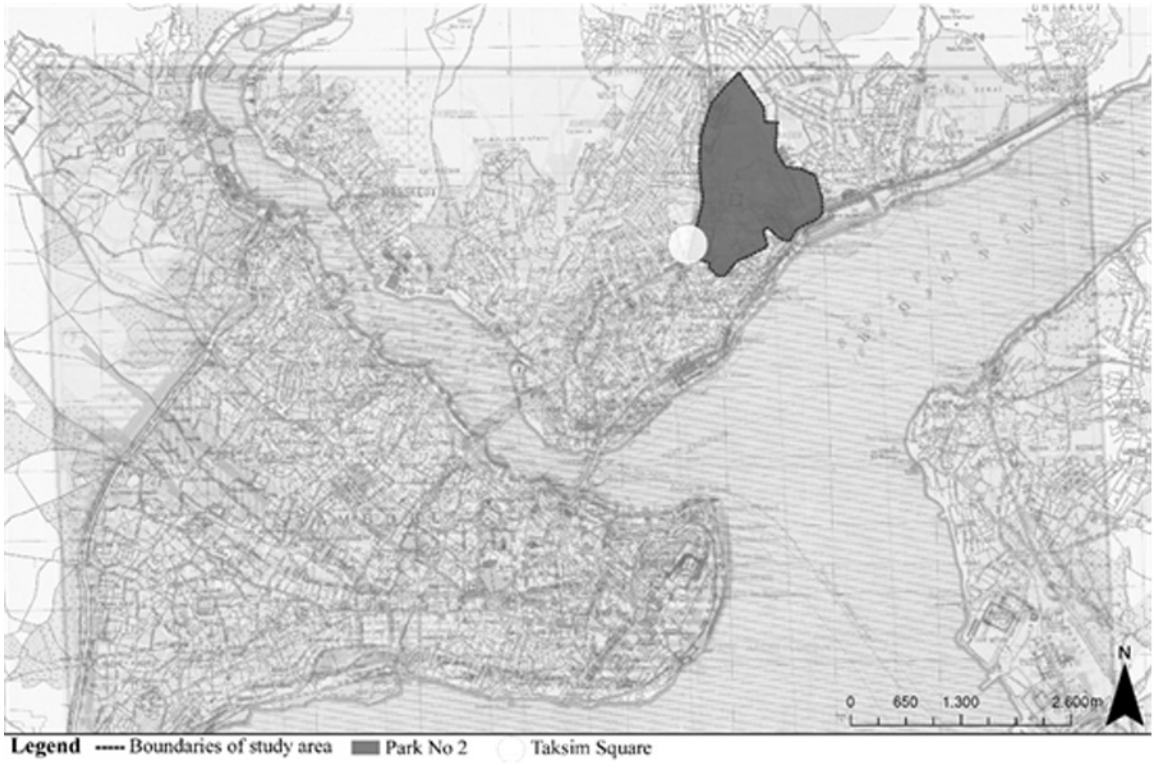

Figure 1. Park No 2; Basemaps 1:17500 Plan d'Ensamble De La Villa De Constantinople-1922 (Harvard Map Collection) and the informations from the program of the masterplan (Le programme du plan directeur) (Prost,1937) are georeferenced by the author (Software: ArcGIS)

Istanbul. The notion of a 'Cultural Heritage of the Republic of Turkey' of Taksim Square and Gezi Park is under discussion nowadays. The main focus of the study is to identify the dynamic of transformations of this urban area by checking its deteriorations of the Prost's legacy.

Methodology

Considering the significant urban heritage and the range of histoircal changes of the Taksim-Maçka Valley, they present a perfect case study focusing on transformation and analyzing Prost's legacy. In order to be able to exemplify the case of Taksim-Maçka Valley within the framework drawn above 'digital urban history method'(telling the history in the age of the ICT revolution) (Tamborrino, 2014) have been used. 'Digital humanities' represent an innovative alternative to use of Information and Communication Technologies (ICT) techniques as use of digital tools. Having use of this technique, digital technologies offer a new approach as a new interpretation key to make it possible to understand the architectural / historical outcomes and Cultural Heritage(Warwick&Terras&Nyhan, 2012). In this study, the method is used for obtaining, processing data/information and for evolution of the outcomes. Visualization and spatialization of data have been concieved as a part of the methodology as a final demonstration but also as a research approach (Bodenhamer&Corrigan& Harris, 2010).

Obtaining of data had done through the light of various direct and indirect sources: literature view, site survey, visiting governmental agencies and archives. These data are processed through mainly using ArcGIS software and 3D modeling techniques. The reason for the selection of the software is its easing the make a comparative study rectifying different maps and data information prepared in different years with the same accuracy.

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Henri Prost in Istanbul: formation process of the Parc No 2

In 1940, Prost prepared 1:2000 scaled masterplan for Park No 2 (plan parc no'2) (Fonds Henri Prost,Paris). Since the area had been defined as a military area by Sultan Mahmut II, a 'barrack construction' movement began on the area until the last period of Ottoman Empire (Tekeli,1996). However, barracks were abandoned at the First World War era and the area was started to use as a public park by the habitants. Therefore, when Prost came to charge, numerous significant Ottoman structures were present on the area. In his planning decisions of Istanbul, Prost put special importance on preservation of heritage. As a reflection of this attitude, he protected a great number of Ottoman structures at the area of Park No 2 by giving them new cultural and educational functions. Topçu Barracks (Halil Pasha Artillery Barracks, the military building that was built in 1806) located at Taksim Square was the only building that Prost proposed to be demolished. During First World War, it had been abandoned and since 1921 the courtyard of the Topçu Barracks had been using as a stadium by the community (Çiftçi,2004). Also, the fact that the Republican authorities want to use the main square as a wide celebration area affected to Prost's Taksim Square plans.

Surroundings of the area were defined as a new settlement area to mark the character of the Republic's new modern life. The park was located at the core of the new settlement zone. The functions of buildings included in the park plan were also important at the large urban scale. Therefore, Prost added the Municipal Club, Dolmabahçe Stadium, Sports and Exhibition Hall and the Amphitheater to his Park No 2 Plan (Leveau,1960). Thus, he considered the area as a whole as a public park by modern cultural notions.

In addition, Prost used the area's topography features on his planning decisions. Thus, the slopes of the Maçka Valley was planned as a fully recreational area by integrating functions of buildings and open spaces. Thus, inside the park, cafes (significantly called by Prost as belvédère) were designed by the launch of the specific competitions for the Bosphorus view. Besides, the settlement of the public buildings was also chosen compatible with the heights of the buildings which date to Ottoman Period and topography.

The first implementation was to demolish Topçu Barracks and construct the so called Gezi Park with the compliance of Taksim Square accomplished in 1943 (Güzelleşen Istanbul,1943). However, although Prost was discharged from his position, until 1950 the implementation of the Park No 2 was almost finished and all proposal building blocks have been built (Figure 2). Immediately, the Park No 2 has also adopted and started to use in everyday life by the community. In addition, the following years, Prost's plan for Istanbul continued to affect the city's urban formation/ transformation process.

Transformation process of the area on Henri Prost's legacy

1950s marked the new regimes abandonment the secular attitudes, stating economic policies and nationalist self-sufficiency of the previous regime. With the new regime, the model of the cultural politics of the nation was shifted from 'European' to 'American' (Bozdoğan&Akcan,2013). As a reflection of these notions, Istanbul's first Hilton Hotel was constructed (Skidmore-Owings-Merrill,SOM was invited to design its project in 1951) and Prost's Park No'2 was selected as its location. Thus, the first deterioration of the area has been realized. Then, in 1959, the Municipal Club located at Gezi Park that was realized as a Prost's proposal was demolished to construct Sheraton Hotel (today's Intercontinental Hotel) (Figure 3) These implementations marked the beginning of radical changing of the conception of the urban area. Shifting its functions from collective monumental significances to touristic and private target.

The Taksim-Maçka Valley's transformation process has gained a different direction with masterplans, development plans and laws that where approved in 1980s. An important legal change that affected the planning approach was Law No. 2634 enacted on March 12, 1982, was entitled as 'Tourism Promotion Law'(Turizm

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Teşvik Kanunu) (Official Gazette, 31.07.1984). Its aim which was allowed the central government to declare certain strategic sites as 'Tourism Centers' caused worries about the implementation of the law in the academic and professional field (Enlil,2011). The first determined tourism centers were located in Taksim-Maçka Valley. This law has led to the construction of very contradictive hotels in the area and the projects of the hotel buildings foreseen to be built in the framework of the law were published with named as Taksim/ Maçka Tourism Center. The valley has been the most discussed and criticized area among the tourism centers determined throughout Istanbul (Ekinci, 1993).

Meanwhile, Habitat II, the Second United Nations Conference on Human Settlements was held in Istanbul from June 3-14, 1996. In order to be able to held various events for the conference, Taksim-Maçka Valley was declared as a 'Congress Valley'. This decision was another significant turning point of the areas transformation. From these events, the area hosted many international congresses and several events to the NATO Summit in 2004. As a consequence, the collection of buildings, functions, private stakeholders was added to the park by compromising its perception as a current project. Despite the general project of a park as a whole, including open spaces, buildings, public functions, a preservation law distinguish between them by separating the monuments. In accordance with Legislation No.10521 of Turkey the Council of Preservation of Cultural and Natural Heritage (Türkiye Kültür ve Tabiat Varlıklarını Koruma Kurulu) which was dated on 06.01.1999, four elements (corresponding in percentage to the 7.5 % of Park No 2) are mentioned that establish Taksim Square, form a whole with each other and indicate that all must be preserved. These are Maksem, AKM (Atatürk Cultural Center), Republican Monument and Gezi Park (UCTEA Istanbul Branch Online Archive). However, until 1990s although the declines had been

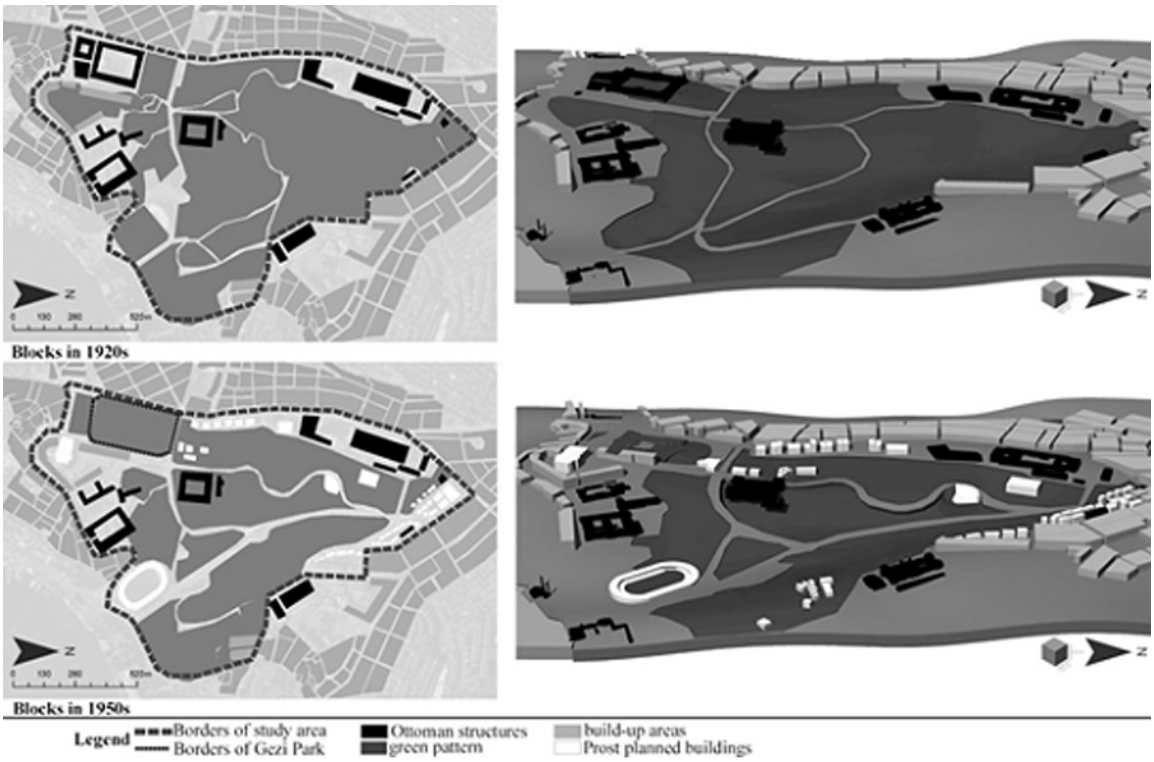

Figure 2. Blocks in 1920s and 1950s;Basemap World Imagery and the information from 1:17500 Plan d'Ensamble De La Villa De Constantinople-1922 (Harvard Map Collection) and the information from 1:2000 Plan de Reference-1940 (Leveau,1960) are spatialized by the author (Software: ArcGIS&Rhinoceros)

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realized, the green pattern of the area had been still present (Figure 4).

Taksim-Maçka Valley - particularly Gezi Park- has been discussed intensively by the academic and professional field at the last decades. 2000's marked an acceleration of urban transformation studies above Istanbul in a questionable way on urban agenda. According to Turkish architects and urbanists (Dinçer, 2010), legal changes and urban renewal/ transformation projects in 2000s that facilitates urban interventions is not a coincidence but an effort to set a base enabling economic policies. In 2011 the government's announcement of the 'Taksim reorganization urban project' included the pedestrianization of the square by the expansion of streets to be re-organized underground and the reconstruction of Topçu Barracks (the one had been demolished at 1940 for the formation of Gezi Park). The reconstruction of the Barracks would mean the latest change of Park No 2, fully destruction of the Gezi Park the final remaining cultural legacy of the Prost's project for Istanbul. The project caused objections and it was brought to court. These contrapositions were a turning point with protests were/are called Gezi Park Protests. Finally, the Istanbul 6th Administrative Court has adopt a motion for stay of execution of 'Reconstraction of Topçu Barracks Project' and 'Taksim Pedestrianization Project'. In the meantime, the pedestrianization project had been realized as well as the construction of hotels, conference halls and a shopping mall continued to transform of the Park No 2 (Figure 5). But demolition of Gezi Park was not realized.

Conclusion

Henri Prost's studies on the planning of Istanbul were put into implementation through a series of urban operations in the aim of collective. The main idea was to modernize the social life through modern public spaces that did not exist in Ottoman traditional life. Achieving this aim has led to shaping of Park No 2 by integrating green spaces with public buildings. But the spatial GIS analysis further indicate that there has been a considerable change of urban land use since then. In the 1950s, the ratio of public buildings to the total built-up area was 73 %. It has continuously decreased: in the 1980s it was 60 %, in 1990s it was 49 % and finally the ratio of the current situation is corresponding to 48 %.

On the other hand, according to the informations gathered from the aerial photos through GIS, the overlay of the green spaces has a decreasing ratio since the 1950s. When Prost finished his service in Turkey in 1951, the ratio of green spaces to total area was 76%. Then, in the 1980s it was 71 %, in 1990s it was 62 %. Today, this green spaces ratio to the overall urban space is around 28 % (the Gezi Park constitutes 17 % of this ratio).

By this computation results, it can be observed that the identity of Taksim-Maçka Valley has been heavily modified. Considering that Prost had been integrated the public buildings to the area, these features can be seen in a small part such as stadium, AKM, amphitheater (they are corresponding to 10 % of the total built-up area).

Despite the removal a large percentage of the green spaces, the Gezi Park still presents an important achievement of the remnants of the legacy Prost. It was the first planned public park of the Republican Period of Turkey and is still being used as a public park.

In this study, digital tools have helped to understand qualitative and quantitative notions of Prost's legacy on the area. By the 3D modeling techniques and processing the data by ArcGIS, the visualization of the relationship between these notions and the topography and plan settlement has helped to investigate the fundamental principles of his planning decision as well as the change the history of Istanbul and understanding the Cultural Heritage.

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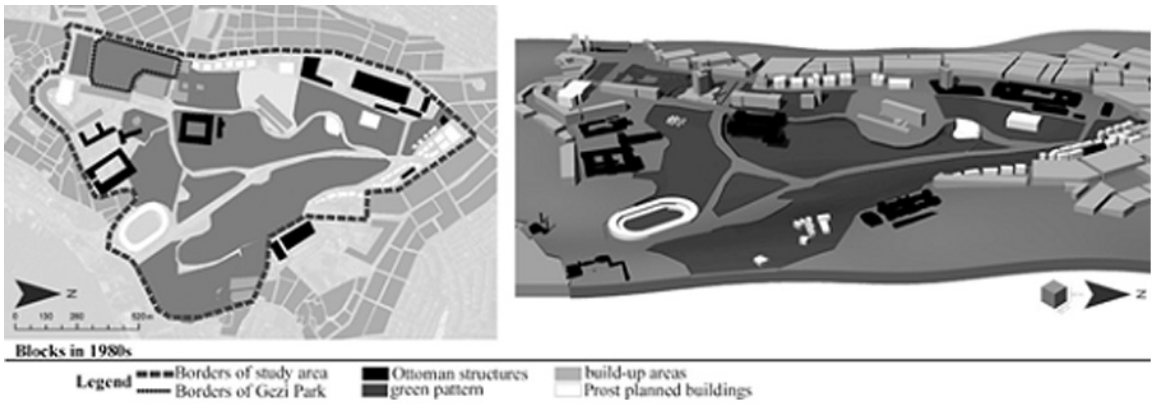

Figure 3. Blocks in 1980s; Basemap World Imagery and the information from 1:2000 Plan de Reference-1940 (Leveau,1960) and the information in aerial photos (IBB Map Collection) are spatialized by the author (Software: ArcGIS&Rhinoceros)

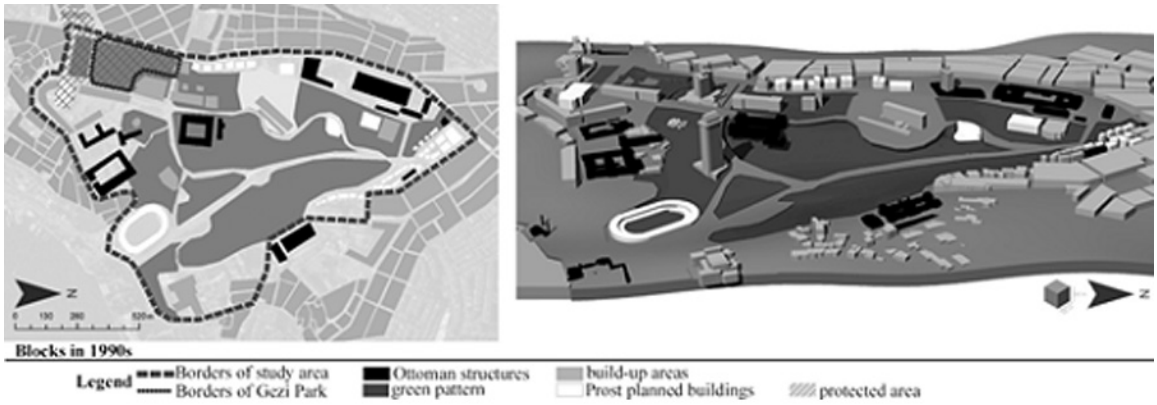

Figure 4. Blocks in 1990s; Basemap World Imagery and the information from 1:2000 Plan de Reference-1940 (Leveau,1960) and the information in aerial photos (IBB Map Collection) are spatialized by the author (Software: ArcGIS&Rhinoceros)

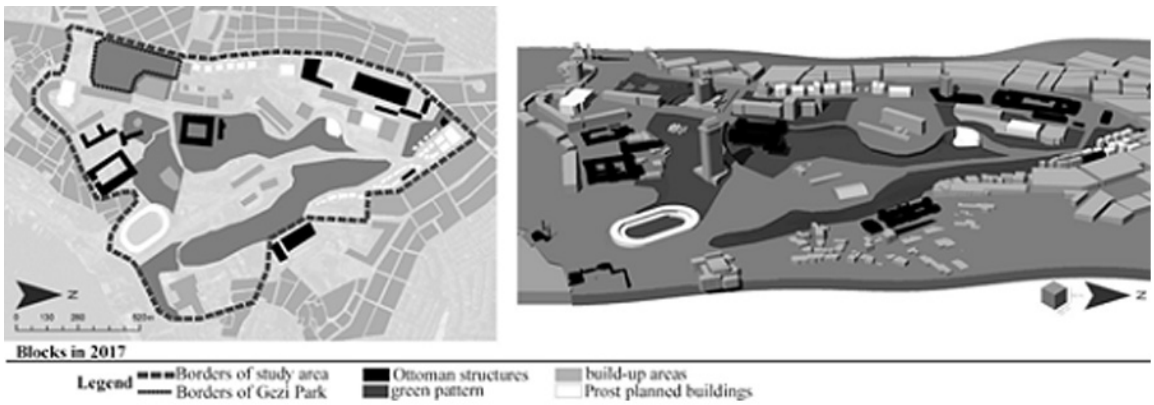

Figure 5. Blocks in 2017; Basemap World Imagery and the information from 1:2000 Plan de Reference-1940 (Leveau,1960) and the information in aerial photos (IBB Map Collection) are spatialized by the author (Software: ArcGIS&Rhinoceros)

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Urban morphology and sustainability. Towards a shared design methodology

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Abstract. *The information revolution is radically transforming the very foundation of the 'fossil city'. A 'virtual' macro-urbanism will intersect with an 'actual' micro-urbanism, physical and concrete, determining the form of the new urban environment. Within the binomial of macro- and micro- urbanism, urban morphology identifies an interesting socio-building scale that can serve as the basic strategy for sustainable city planning in the twenty-first century. Morphology thus becomes the necessary 'plug-in' for registering the different 'networks' that characterize the contemporary city – from IT and 'smart' devices to energy and environmental systems - translating these networks into building practices, into 'fabrics', for the physical city. At this purpose an Urban Design methodology has been developed in order to combine the Urban Morphology tools with those of Sustainability giving particular attention to the topics of the comfort outdoor and the passive environmental control systems. The methodology has then been applied in the Sant Adrià de Besos Waterfront Regeneration Project in Barcelona. Neighbourhood's size, complexity and localization, between the sea and a large area of brown fields at the northern gateway of the Catalan capital, has set up an interesting testing bench. A sequence of consecutive steps characterizes the methodology in which morphology, architecture and sustainability intersect one another within a single design process.*

Keywords: Urban Morphology, Sustainability, Urban Design, Methodology, Barcelona

Introduction

For several years now, morphology has acquired a globally recognized role among disciplines involved in urban analysis, by developing effective tools for reading cities and territories. Their application to urban design and landscape has however remained at the margins of such disciplines and only recently, with the irruption of sustainability issues, has become a proper field of research. Moreover the information revolution is radically transforming the very foundations of the "fossil city". On the one hand it exponentially increases the opportunities for exchange in the new global society, on the other, it progressively reduces the daily movement range creating a sort of "virtual" macro-urbanism intersecting with an "actual" micro-urbanism, physical and concrete, to which the form of the new urban environment is enrolled. Within this binomial of macro and micro urbanism, urban morphology identifies an interesting socio-building scale that can serve as the basic strategy for sustainable city planning in the XXI century. A strategy that involves, on the one hand, a scalar sequence of physical forms related to aggregation and spatial organization (from houses all the way up to districts); on the other, a complementary sequence of forms related to association and civil organization (from families to urban communities). Sequences that find in the concept of "social neighbourhood building" the lowest common denominator of

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sustainability: the sustainable unit, on which urban strategies of environmental control on a larger scale can be based. Morphology thus becomes the necessary plug-in for registering all the different "networks" that characterize the contemporary city - from IT and 'smart' devices to energy and environmental systems - in order to translate them into building practices for the physical city, that is to translate them into "fabrics" on which planning of sustainable cities will be based.

Methodology

Polarities, Routes, Fabrics

All urban organisms can be viewed fundamentally as anthropic settlements on the territory. Yet settlements, starting with the choice of location, require some experience of the environment they become part of envisaging a rudimentary system of land division, a network of land ownership and so on. This structure even in the rural settlements of the most primitive sedentary civilizations, is always an expression of a similar, albeit elementary, social structure, characterized by all those polarities and hierarchies of communal spaces that identify a community. These spaces will gradually multiply, differentiate, be arranged by hierarchy as society expands, becomes richer and develops a complex civic structure, accurately mirrored in its system of polarizations, routes and fabrics. Since the appearance of the first permanent primitive settlements then three key concepts emerge characterizing all human settlements up to the XX century: the concept of polarity, the concept of route, and the concept of fabric.

"A city is a system in which all life, including daily life, reveals a tendency to polarize, to unfold in terms of social aggregates which are either public or private. The more strongly the polarization is exerted and the closer the interchange between the public and private spheres, and the more 'urban' the life of an urban aggregate is from the sociological viewpoint" (Bahrdt, 1966). It is no coincidence that through history a vast urban iconography presents the city as an object well enclosed by walls, enhanced by towers and domes on the inside and distinctly opposed to the "outside". Such view generally tended to discern the essence of the location, fixing its special features in a "characteristic image", where those towers, walls, steeples, domes, minarets, and so on, stand out from urban polarities as recognizable and identifiable elements within the social and architectural city's fabric. Their task is to coordinate the urban fabric, their role is to identify the different urban communities in order to grant all citizens a sense of belonging to one civic individuality. Hence, polarities can have a centralizing or a delimiting role within an urban body. In particular, the most representative buildings, from a social and civic point of view, were generally located in the heart of the city or of specific neighbourhoods (the cathedral church, the parish, the Lord's Palace). Conversely, buildings of a specialized nature (city walls, lazarettos, monasteries, barracks, etc.), due to their greater dimensions and functions were usually placed at the edge of town, occupying the urban fringe belts. But if in small-sized towns the relation between fabric and collective themes is clearly perceivable, since such themes have substantial visibility and presence, in cities of greater size, on the contrary, the perception of the relation is more difficult. The organic value of the city will thus be entrusted to local themes embodied in its fabric (parish churches, "town halls" etc.) whose task will be to reveal their connection to the wider urban system. Moreover in situations of high polycentricity, where various urban communities coexist in the same district, even the simple non-residential - usually commercial - specialization of a square or a street can take on a local polar value. Hence, two key elements emerge when studying the concept of urban polarity. The first is the dynamic relation that is established between polarities. It is thanks to the relation between polarities that urban structures can actually survive and change. The second is the relation that develops between polarities and urban fabric. The relation is reciprocal: the fabric indicates the various potentials for polarization, however only through the physical construction of polarities that the potential can materialize and the fabric can realised. We can therefore see how urban

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phenomena can be read according to a complex dialectic of systems which vary in their degree of collaboration, each with its own hierarchy of relations between center and periphery, polarity and anti-polarity: dialectical systems concerning urban areas that are relatively self-sufficient but that remain complementary to the wider urban organism.

The more a context is anthropized, the more the rationale of route formation is accurate and concise. In general, a distinction can be made between planned systems and spontaneous systems. We will focus on the latter where few 'basic' route typologies generally found in all spontaneous building fabrics, from medieval towns to contemporary informal cities, can be noticed. Hence, given any two nodal points (urban or territorial), the route linking them in the most direct possible way will be termed a matrix route. It is deeply connected and influenced by the morphology of the fabric it fits into - be it natural or urban; it often takes on a distinct curvilinear outline, to achieve the required mediation between the geo-morphological conditions of the context and the rectilinear continuity of a path. But in order to develop urban sociality it is indeed necessary, as already stated, to have collective areas where the civitas can gather and share a common identity "recognition": building will therefore center around such nodal points. Yet when the linear distance from these nodal points becomes considerably greater than the depth of the areas located behind the pertinent strip, then building routes will appear, thus called because conceived from the very beginning as planned routes for building, likely to form a fabric. Once again, however, the construction of a route does not continue indefinitely, beyond a certain distance the tendency will be to form a system of connecting routes (between building routes). Going further a progressive hierarchy of roads will then follow in order to answer to the different levels of sociality characterising the city.

Finally, a city is an organism made of "fabrics": social, economic, cultural and environmental fabrics on which the very functioning of any urban structure depends. The more such fabrics are interrelated and efficient, the more the organism will be dynamic, versatile and capable of meeting the demands of its citizens. The modes of interaction between fabrics in fact express how citizens inhabit their city, express how citizens transform the city through their daily actions. Understanding such logic or, better still, understanding the logical basis of such relations and discerning their role in the definition of urban fabrics can be considerably interesting and useful.

Hierarchies

A concept runs through the issues discussed so far and strongly influences them: the concept of hierarchy. Hierarchy, in actual fact, means assigning priorities. It might be long or short-lived, but it is never static, on the contrary it is essentially dynamic in nature. Day-to-day and long-term priorities, priorities that are planned and spontaneous, private and collective: they all contribute to the definition of an ever-changing system of hierarchies. Hierarchies, therefore, are the "geo-reference points" on the map of our dwelling, they provide us with a scale of values, both individual and collective, on which to base the critical reading of a city. In urban morphology, routes are what condition and determine, more than any other factor, the assignment of hierarchies. Routes are the main vehicles of city life and the fundamental instrument for reading and transforming the territory. This is particularly true in the case of polarities. Not all of them have the same relevance within an urban organism. The role of priorities depends on their location within the fabric but also (and especially) on the quantity and quality of the routes converging in that point. Two "internal" polarities may have a strong hierarchal relation, and from such hierarchization a number of developments might follow: the persistence of one polarity at the expense of another, the transformation of one polarity depending on another, the layout of new road axes, the disruption of entire building fabrics, and so on. The same applies for the various open spaces (public and semi-public) that characterize a city. In this case as well, the quantity and quality of routes converging in a given location determine the degree of "nodality" of a public space, establishing a dynamic hierarchical system that is parallel to

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the formation process of an urban organism. It is exclusively because of their varying degree of nodality that these open spaces are perceived as 'full' civic spaces and not "empty" spaces to be occupied. This is confirmed when we look at fabrics as a whole. The process of spontaneous formation of urban fabrics takes place according to a nodality-anti-nodality dialectic where this state of nodality will be followed by a greater fabric specialization, which will regularly decrease as the distance from the nodality increases finally reaching the opposite condition of "anti-nodality". In other words, the degree of specialization acquired by a building over time depends on the level of hierarchy of the route it belongs to. Routes, therefore, are what determine the various levels of nodality within a fabric and the "weight" of urban polarities. But what determines the hierarchy of routes? We might answer: the hierarchization of the society that built them in a constant and continuous interaction. It is actually true that what gives routes "priority" is the quality and quantity of the polarities they connect, but also the different specialization level of the buildings that define them: a route joining two major polarities (urban or territorial) will typically be occupied by highly specialized buildings, even to the complete exclusion of private residences. Building routes originating from said route are most likely to exhibit a good mix of both specialized and residential functions, while the degree of specialization will decrease gradually arriving at a predominance of residences as the route assumes a more anti-nodal quality. The same applies, at least partially, to the height of buildings, which increases when closer to the nodality; it should not be forgotten, however, that the terms "center" and "periphery", "nodality" and "anti-nodality" are not geometric: it is therefore possible to find nodes and anti-nodes in the very center of a city while, conversely, tall buildings can be found along main routes and, just a few meters away, buildings with only a few stories can rise on connecting roads or in congested pertinent strips. Thus, polarities, routes and fabrics, when viewed within the unstable dynamics of their hierarchal relations, are key concepts. For centuries the transformation of cities has been based on them and morphology relies on them to read urban phenomena. They also are, as a consequence, the thematic framework for a methodology aimed at planning the smart, sustainable, liveable city of the XXI century.

The neighbourhood-building unit

There is a system of built structures whose essential task is to mediate the transition between the citizen's (or family's) individual, sociological dimension and the city's public dimension. The more complex the public dimension is, the more important is the role played by this structures in the functioning of an urban organism. Such structures, at the same time physical and social, can be defined as "social-building neighbourhoods". The neighbourhood, in fact, although it represents the indispensable link between families (small-scale) and communities (large scale), is generally non-institutionalized, and essentially recognizable only in a building context. Perhaps the most considerable historic example is that of Venice, where between the XIV and the XVIII century the Republic or other public institutions built a number of social housing units, generally centered around neighbourhood spaces: the courts. But other significant examples, which appeared thanks to private enterprise, are the London squares and mews with their common areas well enclosed by the walls of houses (often serial and therefore unitary in their "collective" image) and polarized at the center by a collective service: the garden. Actually mews were traditionally linked to squares and terraced houses but when, in the 1970s, they lost their pre-existing specialized role and turned residential they became perfect, if small, neighbourhood units, complete with entrance gates and a central collective space: a sort of "neighbourhood within the neighbourhood", confirming the great popularity this type of structure enjoys in contemporary London. Neighbourhood is in fact responsible for creating a collective dimension of space that acts as a fundamental area of mediation between urban public spaces and private pertinent spaces: a semi-public space of great relevance for urban identity, functionality, and sustainability. Especially

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in polycentric cities, the transition from the individual (a person or a family) to the civitas is far from obvious and often requires an intermediate stage for collective identification, which is exactly what the neighbourhood is. It is, so to speak, an "everyday belonging need" that is not always sufficiently satisfied by the district; activities and functions that cannot be carried out easily at home, and even less so in the street, are therefore entrusted to the collective neighbourhood space. A space to carry out all those co-housing activities that have now become indispensable in a contemporary metropolis: nurseries, workspaces, laundries, sport facilities and more. Social-building neighbourhoods represent, moreover, the sustainable urban unit of contemporary cities. Their nature, both collective and unitary, allows for the implementation of a first strategic level of sustainability, which downscaled to individual buildings would not be very effective. Rainwater and grey water collection, centralized heating systems with clean energy production, "neighbourhood" based and meticulous collection of waste, are just some of the needs the construction of a neighbourhood unit can meet. The value of social-building neighbourhood therefore lies in its intermediate position, both from a social and urban point of view, between citizens and civitas, public and private spheres, communal and individual rights, between the utmost open and permeable urban space and the utmost closed space, focused on its pertinent features. Social-building neighbourhood is, we could say, capable of bringing together the plurality of elements typical of urban fabrics and the demand for unity typical of living spaces: a sort of "unity in plurality" that we believe can play an interesting role in planning the sustainable city of the XXI century.

The Morphological Map and The Nodality Survey

All the issues addressed so far serve for devising an analytical tool we shall call a Morphological Map. A map offering complementary 'levels' of reading, each to be analysed individually or collectively, based on a relation of reciprocity. Each reading is the manifestation of a particular aspect of an urban context's morphological structure and it is open to a great number of sub-levels, in order to better define its qualities according to needs. But, on closer inspection, it should be noted that a structural knowledge of an urban environment allows to "structurally" plan its transformation. In other words, the same elements used to analyse a given urban context can become valuable design tools. It will hence be possible to draw up an analytical and a design Morphological Map to put as the basis for urban design. The advantages of such a system is evident. On the one hand, it makes planning by stages possible allowing at any time the transition from smaller to larger scales (and vice versa), on the other hand, it makes it possible to correct, edit, sharp the project without having to start all over again every time. Moreover, it is always possible, when focusing on a specific layer, to scale down what is being worked on without ever losing sight of the overall picture. In other words, if for instance we are working a single block we will always know what "type" of block it is, what "type" of routes it rests on and what this involves in terms of fabric whether the condition is one of nodality or of anti-nodality and so on: a sort of "compass" for morphologically informed choices, no matter how specific and particular the intervention may be.

An important tool of the Morphological Map is the Nodality Survey. The analysis of the different levels of nodality within an urban fabric is, as previously observed, the main instrument through which to attribute the morphological hierarchies. The whole sequence of factors previously treated (paths, polarities, tissue) depends, we could say, from their own level of morphological nodality. To analyse these levels accurately is not easy. The strong dynamism that characterizes them, their being a direct expression of the way in which men experience the city makes it a theme rather fluid. But this is also the strength and usefulness of the nodality survey in its ability to return, from time to time, an effective and dynamic socio-urban framework, able to understand the main morphological levels of hierarchy and to adapt itself (in real time) to its temporal changes. For this purpose two values of nodality have been identified, a quantitative

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one (scientifically measurable) and a qualitative one (subject to partial interpretation). The first we called Grade of nodality, the second Level of nodality. The Grade of nodality depends on the number of paths that converges in a given point of the fabric. Its minimum value (Grade.2) is obtained by the convergence of only two paths in a point and so on until Grade.4. From the latter, in fact, it is assumed the occurrence of a dilatation of the public space (square, courtyard etc.) to accommodate a higher number of routes. Alternatively, or in the presence of a particularly high number of convergent paths along the same road, we can hypothesized to be in the presence of a "linear nodality". The Level of nodality is otherwise a typical qualitative matter and depends on the type of converging paths in a single location. These levels are calculated starting from a minimum (Level 1) up to a maximum (Level 10) of specialization of the paths where Level 1 is given by the intersection of a local with a fabric route and Level 10 is the result of the convergence of two matrix route. This distinction allows to calculate not only the level of nodality of a given urban context but also its dimensional scaling. So levels up to the third are related to a more local dimension of urban living while those from the fourth to the eighth belong more to the scale of the neighborhood and those from nine to ten are obvious urban nodality. A Node is thus given by the sum of Grades + Levels (G + L) where, however, levels are always hierarchically more important than the formers. On an equal Grade, in fact, two nodes can differ in the type of level: the one having the higher Level will also have a greater value of nodality.

NODE = L + G L > G es: L3 + G2 = 5 = N
L2 + G3 = 5 = N

If then a node has a value greater than or equal to ten we are probably in the presence of one polarity. A polarity that will be at the city scale (urban) or at the neighborhood one (fabric) depending on the value attributed to its level of nodalty (fabric: L4-L8, urban: L9-L10). The subject does not change if we are in the presence of nodes of degree > 2. In all these cases, in fact, the level to be taken into consideration for the calculation is always the upper one.

es: G4 = 2 fabric routes + 2 building paths --> L8 (2 building paths);

G3 = 2 fabric routes + 1 building path --> L6 (1 fabric + 1 building).

Finally, one last important aspect has to be considered. If a node was in a condition for which the grade (G) is greater than the level (L) there are two possible alternatives: we are in the presence of a manifest error of analysis, namely an initial error in the attribution of the type of routes insisting in that given place (eg. building instead of fabric route etc.), or we are facing the possibility of a clear upgrade of the node: a node whose changed urban conditions encourage an increase in size, function and of specialization of paths converging in it. The calculation for this chance is possible thanks to the introduction of a correction coefficient (α) given by the subtraction of G - L whose value is added to that of level (L) in order to equate it to that of Grade (G). What is obtained is a new nodality value incremented of that minimum value of L congruent with the morphology of the context. In other words, the coefficient α indicates the minimum level of modifiability of a place in respect of its morphological congruence.

The α coefficient allows, on the one hand, to correct any errors of analysis made upstream of the nodality survey, on the other, to identify conditions subject to increase. Conditions for which it is possible an intervention of urban regeneration aimed at enhancing the characteristics of a given place through changes and functional increments, spatial increases and so on. Changes morphologically congruent and thus realistically feasible (and desirable) with minimal risk. The morphology is, in fact, expression of all those "tissues" that create a city: social, economic, cultural fabrics finding in the physical "form" of the tissues the place where to play those endless possibilities of relationship which are, in fact, the life of a city. The morphological congruence appears, therefore, a useful factor to "scientifically" establish any urban regeneration project and for this purpose, the calculation of nodality values through the nodality survey becomes a very important instrument.

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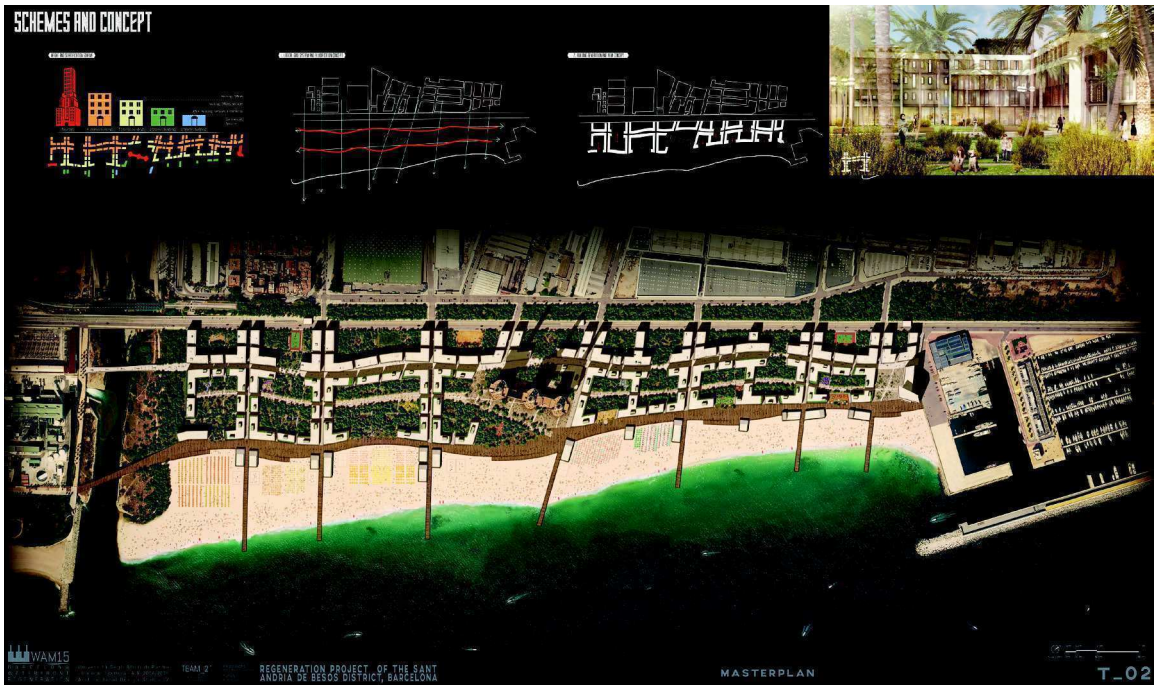

Figure 1.
Project one.
Aim of the project is to create an urban edge to the district of Sant Andria de Besos. This margin is thought to accommodate the main context lines as they approach the sea until they become new pedestrian routes crossing the project and, finally, wooden piers over the sea. Functional hinge of the new system is the coastal road with the new fast tramway. It is intentionally left empty of building in order to don't conflict with the transverse direction of context streets. So the large green courtyards are open upwards to enhance the functional nature of the coastal axis and semi-open to the waterfront as collective courts with facilities for citizens. The system is then crossed by three major axes. The first, the most relevant at the urban level, creates a sort of long "road-square", entirely pedestrian, designed to connect the Forum 2004 area with the northern Marina. It is the heart of the new district, where the main commercial and tertiary activities are located. Continuous building walls highlight its mainly polar character. The second path is the long waterfront. It is the place intended for major recreational activities, sports, and small commercial. A third level of route is the promenade. It slightly sets back from the coastline crossing the large green collective courtyards. It is the ideal place for relaxing activities, for children and families, away from the summer heat and definitely more dynamic waterfront activities. These three paths converge to the center in the garden square dominated by the imposing presence of the three chimneys of Sant Andria de Besos Power Plant, now disused, whose structures have been maintained and transformed into cultural activities. A careful study of the main environmental components (sunshine, prevailing winds, albedo values etc.) within the urban courtyards led the architectural design, guided the casing choices and allowed the selection of materials in order to ensure a truly sustainable urban project.

The Topic: Barcelona. Sant Adrià De Besos Waterfront Regeneration Project

The area of Sant Adria de Besos is at the edge of the northern outskirts of Barcelona. Its location is of considerable territorial importance being to act as a hinge between the compact tissue of the Catalan capital and the continuous system of coastal settlements that characterize this part of Catalonia. On the one hand, it is standing just beyond the Besòs River, natural border of the Barcelona urban sedime and a few hundred meters from the Forum 2004, on the other hand being at the arrival point of the Avenida Diagonal and the Gran Via de Les Corts Catalanes, it stands out immediately as a spontaneous "northern gateway" to the Catalan capital. Moreover, the coastline, traditionally neglected by all the settlements of the west of Spain, lying along the ancient Roman road

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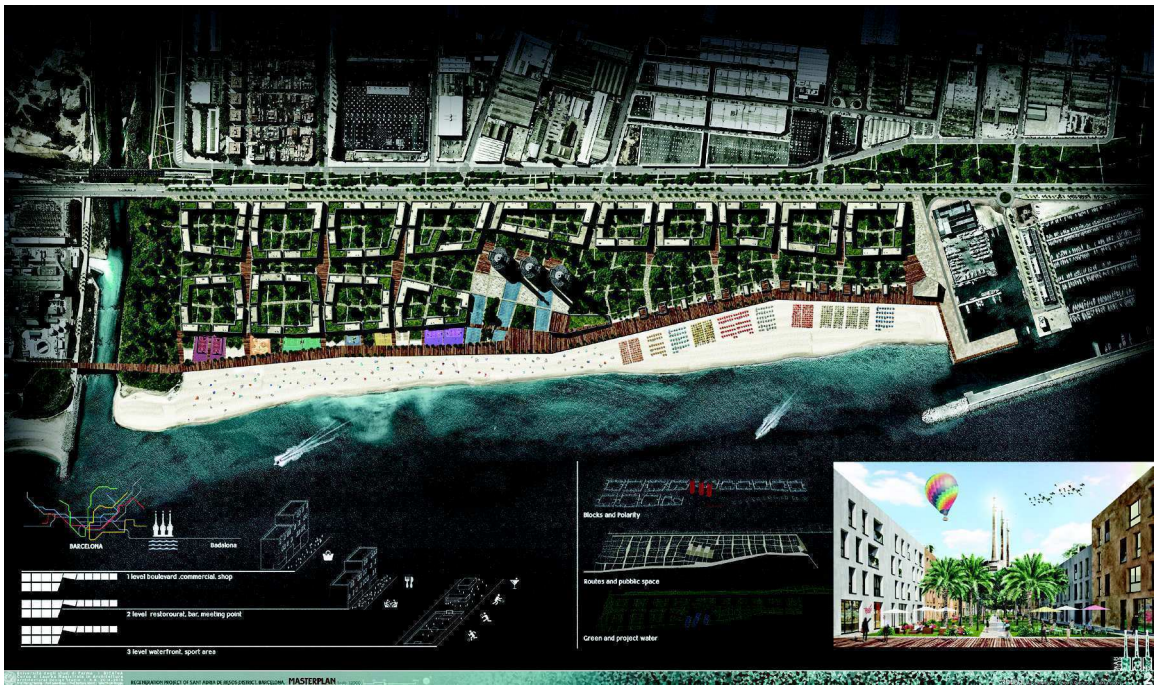

Figure 2.
Project two.
The project moves from the decision to create a real urban boulevard balancing the new district with the rest of Sant Adria de Besos. All major paths are vertical penetration toward the waterfront which is strongly hierarchical thanks to the exclusive use of the wood for the flooring and the location of all major sports and recreational activities. The major commercial activities are planned along the boulevard where all the infrastructural facilities are located. A second settling situation, at a more local character, focuses on the grafting of the pedestrian vertical penetration systems through the dilation of routes in small squares. A third and last hierarchical level is given, finally, from green courtyards system, the neighbourhood unit, which determine the building fabric and that innervate, through a hierarchical grid, the entire project area. At this level, in addition to make entirely pedestrian the new district, the main environmental control choices are given. The latters, as mentioned above, are aimed at a conscious design of outdoor spaces and at the congruent choice of the opening levels of the buildings facades. A final element relates to the identification of the disused Great Plant as a new urban polarity to be devoted to culture whose square recovers the general urban design by the introduction of materials and textures able to specialize the urban fabric without interrupting its continuity.

and set back from the current sea front, now plays a key role in defining their identity. Since the major initiatives of Barcelona '92, the waterfront is, in fact, the starting point of any urban renewal strategy for this part of Catalonia and it is therefore the main subject of this project experience. Finally a major element for which the physical and functional recovery is required, is the large power station, now abandoned, which with its three imposing chimney dominates the entire coastal area for several kilometres: a real territorial landmark that play a fundamental role in the process of urban regeneration of Sant Adria de Besos.

The Urban Projects

Projects presented in this paper are based on a common methodology for urban analysis and basic urban design. All projects are characterized then by taking some common elements derived from the urban analysis, certain common concepts at the basis of the methodology itself (such as urban sustainability, liveability, mixité etc.), but offering a wide variety of design solutions to the issue. So all projects provide a localisation of new urban polarities with the aim of creating a system, within the existing one, on which to base the new morphological structure. Their function and sometimes their

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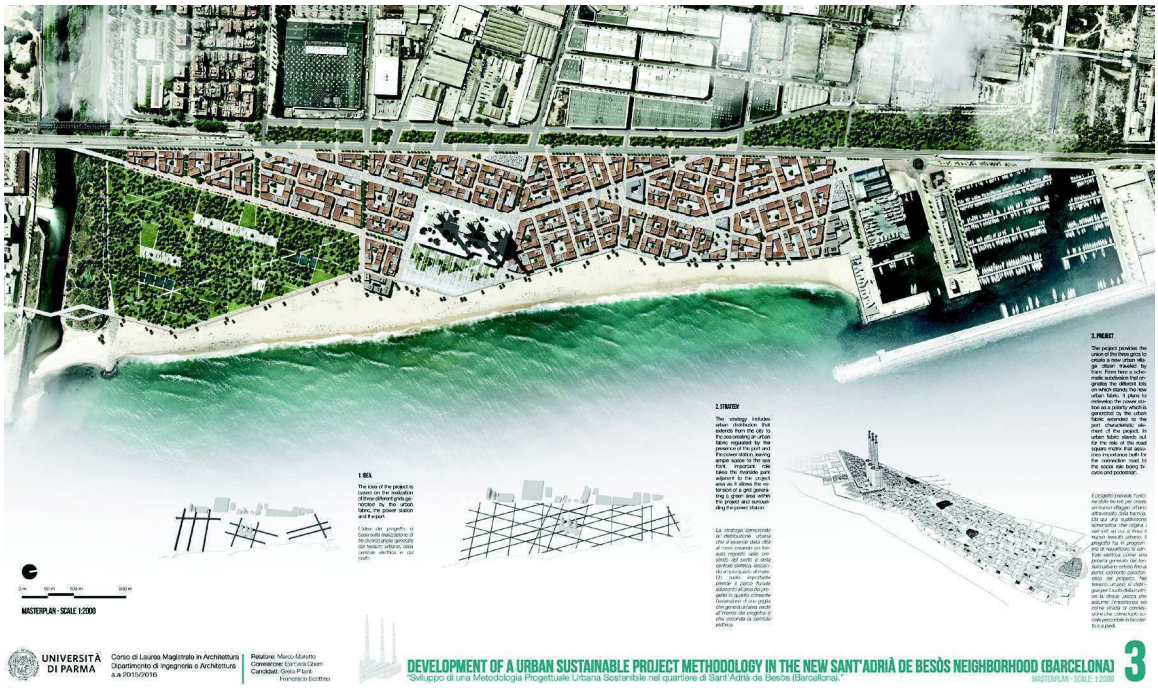

Figure 3.
Project three.

The project is very different from the previous for two substantial reasons. To the one hand it restores the urban boulevard through a compact front opened to the new building tissue and to the routes penetrating the existing fabric. Accesses to these paths, when fitted with a certain value of nodality, are always identified by the presence of a small special building, a square and the stop of the new fast tramway. On the other hand the new district takes on the characteristics of a independent "barrio" with its own hierarchies, its own relational ratios and a settlement strategies dialoguing more with the Mediterranean world in general than with that part of Barcelona in particular. A central axis cuts the settlement putting in connection its major nodalities with the big disused heating Plant in the middle. To the latter we entrust the task of identifying the new neighbourhood within the waterfront of Barcelona. A further set of small "local" squares contributes to hierarchize the urban fabric, while an interesting collective courtyards system generates a network of protected paths from winter winds and excessive summer sunshine. All this to deliver a variety of hierarchical public spaces greatly contributing, in our opinion, to the dynamic unfolding of the different "levels" of life and sociability that characterize an urban organism. To complete the project, to the south, a large urban park is connected with the Besos River Park up to get into the heart of the project while, to the east, a new fish market connects the neighbourhood to the Marina. Even in this project a careful environmental analysis has guided the design choices at the building scale helping to draw the collective courtyards and to design the open spaces system.

own morphological role can change depending on the interpretation that designers have given to the Morphological Map. Yet location of these new polarities, although very similar, does not necessarily coincide from one case to another: it is the design of the new tissue that defines the real urban coordinates, even the relationship with the sea changes according to the different idea of waterfront developed by projects. Sometimes it is fringed, jagged, open, backing up the sea line in the new district; in other cases it is well marked by the presence of a path which is an ideal location for all major sports and recreational activities, and so on. The same goes for public spaces. In some cases, few important squares sum up in themselves all the civic values of the new settlement, in others, few large spaces, usually themed by an urban polarity, are a counterpoint to a system of small squares, courtyards and gardens for everyday life.

The first step has been then to analyse the context from a morphological point of view focusing on the system of routes, polarities

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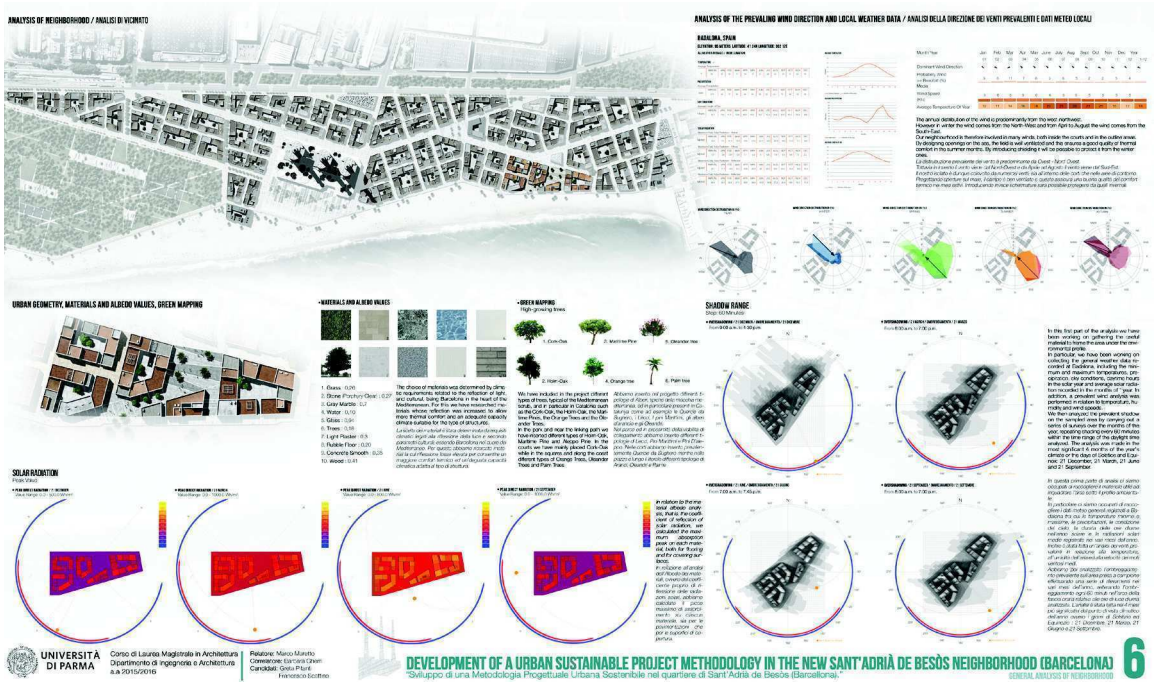

Figure 4.
Project three. Environmental analysis: General data.

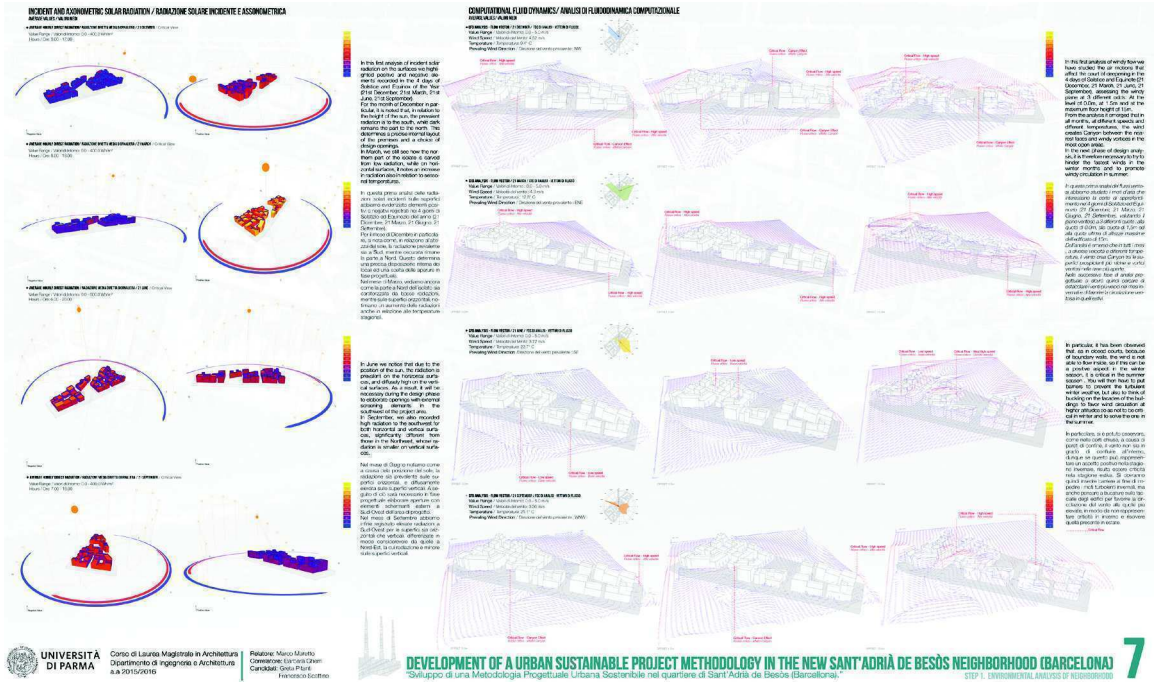

Figure 5.
Project three. Environmental analysis: Highlighting criticality of a block-type.

and types of urban tissue in the area. As for the first, it was decided to intervene, first of all, on three topics: the extension of the Gran Via as a fast axis of urban connection; the design of the new waterfront (as an extension of the Passeig Maritim); the transformation of Carrer d'Eduard Maristany, now split in two by the railway, in a real urban axis capable of gathering together, visually and functionally, all coastal settlements until Girona. For this

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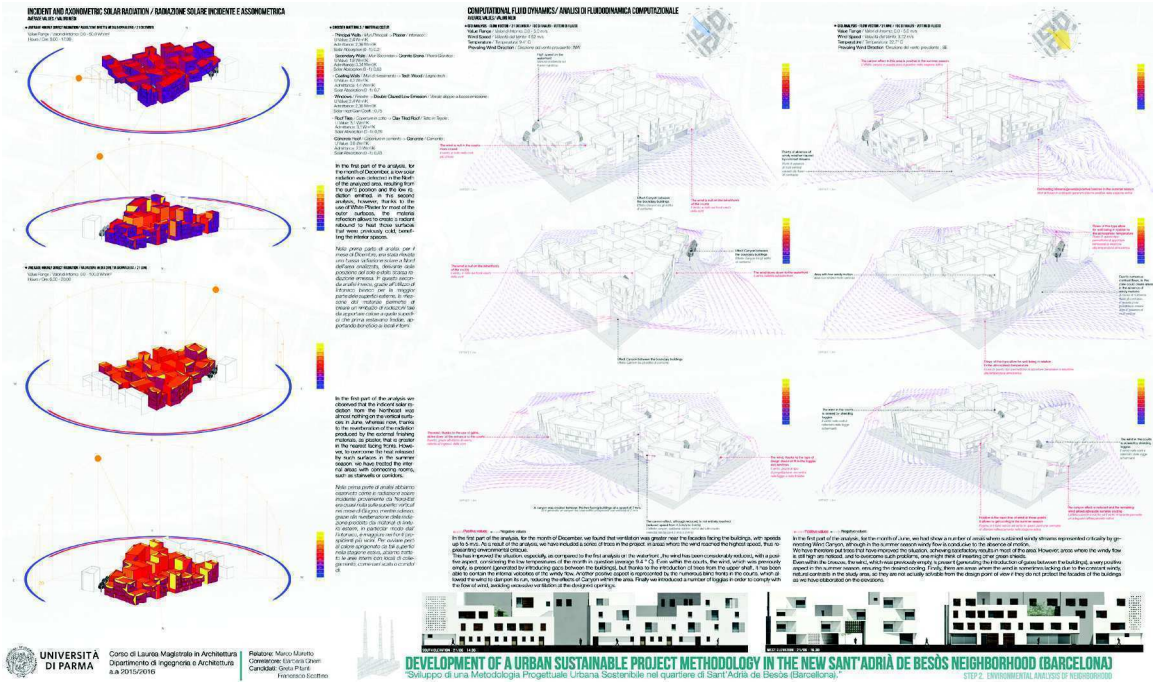

Figure 6.
Project three. Environmental analysis: Design solution of the criticality identified in the block-type.

purpose, the obvious choice has been to provide for the burying of the coastal railway line as strongly required by all the municipalities of the territory envisaging the realization of a fast tramway able to effectively serve the coastal area. On this routes system grafted then all the others, creating the basic conditions for the urban regeneration. As for the second, it was then to identify the presence of urban polarities in the area. Analysis highlighted a substantial lack of "inner" polarities in favour of some important "outer" ones, however, it was noted that the now dismissed Power Plant, with its three large chimneys, could well be that "inner" polarity to identify and organize the new neighbourhood's tissues: a large urban landmark able to make system with the other two towers dotting the waterfront of Barcelona. As for the urban fabrics, the vast majority of settlements in the area are made up of multi-family houses built along the route (the block is hierarchical from the road) and a few line houses (the road is hierarchical than the block). These two typologies were then chosen as the starting point for the design of the new building fabrics. One specific issue was then the design of open spaces and green as a fundamental connective-morphological element of the urban project. The design of public spaces follows then, in all projects, the same social and urban hierarchies provided for the new fabric, from large to small scale, adopting the so called neighbourhood building unit as minimum intervention area. Finally sustainability. That of the environmental design has been, since the beginning and for the whole duration of the design experience, the main urban design tool. It is the instrument that guides the formal definition of urban design, it is the tool that defines the design of public spaces, it is the palimpsest for the architectural design. Morphology and Sustainability are then the two main design tools of our methodology and the basis of this experience.

Conclusion

Urban morphology can be at the basis of the sustainable design of contemporary cities precisely because it addresses the very substance of urban fabrics, the rationale that determined their transformation over time, and uses such rationale as a flexible, dynamic, concrete planning tool. An informed plan, where all the different scales of dwelling are held together, where the social, economic and cultural aspects of a city are linked to its

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physical, environmental and technological features. Without ever losing sight of its ultimate objective: planning the smart, sustainable, liveable city of the XXI century.

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Plot structure and housing form: Pierre Le Muet vs Athanasio Genaro

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Abstract. *The present paper deals with the relationship between the historically built-up housing constructions and the models proposed in the "technical" books on residential architecture that circulate in Europe and Spain from the late XVII century on, inscribed in a longer term research aimed at re-constructing the bloodline linking pre-industrial residential buildings with those that ended up by being its subsequent tributaries towards the end of XIX century. The private residential building constitutes the fundamental supporting element of the city's urban different fabrics. In the case of the city of Valencia, a great part of these fabric is composed by neighbourhoods made out of multi-family buildings or 'casas de pisos', frequently added serially and usually forming enclosed perimeter-blocks, who are the result of the progressive codification of building prototypes that appear within the historic city throughout the nineteenth century, through the transformation of existing buildings of pre-industrial origin, usually single-family artisan houses. The artisan house is, thus, the hypothetical starting basis of that transformation based on exploiting the undifferentiated spatial structure of the pre-industrial dwelling, expanding its built-up mass and subdividing its interior, so that it could be rented to different families. This process of typological evolution promote the new identity of the residence as a formal and functional response to the new times, which may also make it possible to outline the local affiliation of the "house", a result of the particular development of each cultural environment. This article focuses on the historical time of typological transition using as a source the re-composition of the pre-industrial plot and the systematic study of the residential types contained in the contemporary architecture "handbooks".*

Keywords: Building type, urban morphology, Valencia, house floor-plan design, plot form.

Plot structure as framework for studying the residential building form in historic cities

The study of the pre-industrial residence through the plot

We have focused our interest in the forms of housing during the process of their transformation, but the historical documentation available on this subject is almost non-existent in Valencia, as occurs in many other cities. There are no plans or documents that refer to the plan, the facade elevation or the domestic brief. We do not know how large or small was a civil servant dwelling, or what kind of housing did comply with a lawyer requirements. At this level of research, the relationship between building form and social function is difficult to establish. And besides, function changing faster than form, what had served as a workshop for a tinsmith may easily become that of a bakery; what had served as the residence of a nobleman may become the seat of an institution without requiring fundamental architectural changes.

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Therefore, no function or project brief seems to be able to inform the built-up plot. Conversely, it is more the permanence of the container - plot and building - in relation to the content of the inhabitants - what makes it possible to address plot typology on formal criteria, referred to three characteristic plot parameters: its surface, its geometry (the shape of the contour delimited by its boundaries), and its relation with the surrounding spaces, street-space in particular. To determine plot typology, it is essentially to analyse the variation of these three elements and the relative influence of each of them on the architectural form, i.e., the organisation of the built masses supported by the plot.

Given equal plot-surface, architectural forms vary accordingly to the variation in the plot shape and, conversely, identical architectural forms may be found on plots of the same shape but with very different surfaces. We can therefore conclude that the shape of the plot is more decisive than its surface, since the class of plot-forms and that of the architectural forms can be divided simultaneously into subclasses, whereas it is not possible to organize in the same way architectural forms and surfaces. Definitely, plot form is the essential element of the typology of the urban fabric units. (BOUDON, 1975).

Surface is, however, also relevant as regards typology, acting as a form discriminator. Within an urban fabric of the same historical nature, a surface threshold may be established, below and above which the relations between plot form and architectural form differ. In the lower side, that of the small plot, the parcel shape determines imperatively the architectural form. In the upper limit, the relations between the parcel form and the architectural form become much more undetermined.

On very small plots, the organization of the built-up masses of the house is uniform, because, as the ground surface is limited, the formal constraint is very strong. Conversely, on very large plots, the surface is such that, whatever the project-brief, architectural forms are free from plot constraint; The plan design is organized according to the preferred architectural style or the wishes of the architect. In plot typology, as soon as the constraints of the plot form on the architectural form weakens, one enters another surface field, into another plot category.

Plot structure in Valencia, late XVIII- early XIX centuries

Pre-industrial residence through the plot structure: Valencia

The plot structure is, then, the most suitable field of study to make verifiable hypotheses about the pre-industrial residential fabric. But the intensive urban transformation processes of the last two centuries have virtually eliminated all residential buildings of medieval and pre-industrial origin. The few examples of surviving buildings are so transformed that they are unrecognizable, or they are grander houses, insufficiently representative for the purpose of evaluating the fabric as a whole. On the other hand, the greater stability of the parcel structure allows us to trace with certain precision the processes of change operated in urban fabric.

Following this line of research, we have reconstructed the plot structure of the city in 1865, in the period immediately before the demolition of the enclosure wall, key date in which the enclosed city has reached its densification limit. This reconstruction uses as a source the valuable work of restoration of the entire historical centre, elaborated under the guidance of Professor J.L. Piñón (PIÑÓN 1988) with re-adjusting and translating the information to the contemporary cadastral cartography (Figure 1).

In the 1865 city cadastral map we can read and interpret Valencia city as an organism articulated around a primary structure dominated by four spaces: Plaza del Mercado (Market Square), Plaza de la Virgen, Plaza de Santo Domingo and Plaza de San Francisco. All the buildings representing the authorities of tiered estates are located around those squares: the Bayle (old municipal authority), the regular clergy, the secular clergy, the local nobility, the civilian power and the military power. On the other hand, none of these squares is a formally planned space. They are the result of

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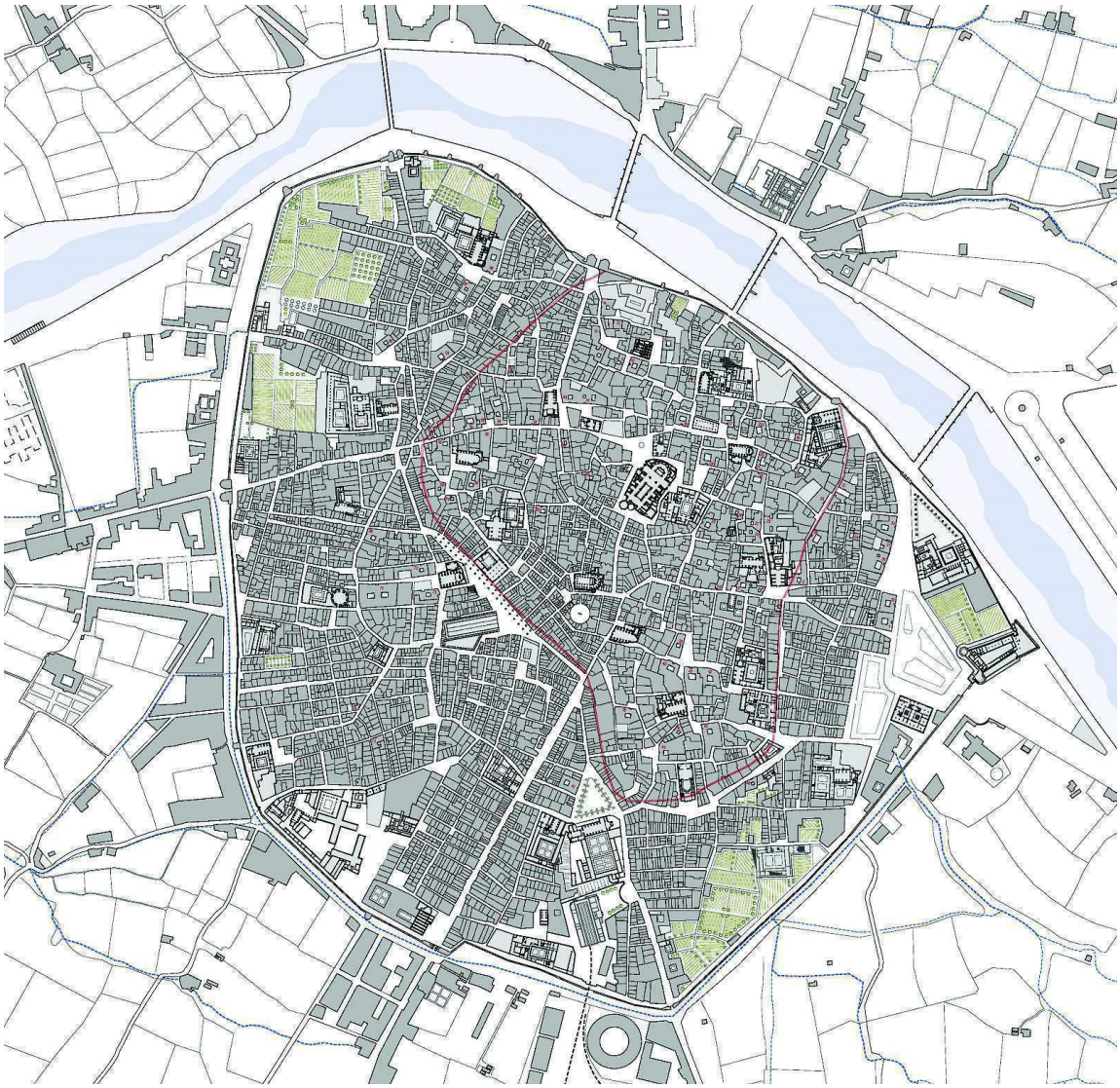

Figure 1.
Valencia city map in 1865, previous to the demolishing of the enclosure wall. From Ph.D. thesis "Residential fabric and urban structure" by Gonzalo Vte.-Almazán. Unpublished.

different interventions, multiple agents and at different times. The primary urban structure is completed with the street network connecting these squares with the city enclosure gates. This structure has been shared and successively developed by the Roman, Arab and Christian city layout.

At a second level, another structure can be read, dependent but complementary to the first, formed by the residential fabric. This fabric comes, on the one hand, from different adaptations of inherited residential structures and, on the other hand, from extending and occupying the vacant spaces within the perimeter of the outer Christian wall. In this second residential structure we can find, within the ancient Arab enclosure, ten residential groups that have the parishes as central 'local' kernels, and a hierarchised street layout as structuring axes. Within the vacant grounds that were progressively occupied, the fabric was formed around a hierarchical street layout system conditioned by the existing structures (roads, properties, irrigation ditches and topography) (Figure 2). On these streets, a series of building bands were gradually being arranged, made out of the dominant building types in each historical phase. The resulting morphology is a number of urban block groupings, each of them endowed with

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Figure 2.
Extracting the structural elements and the residential fabric. Ibid.

a specific regularity. We distinguish six regular autonomous groupings, whose genea and formation process can be explained.

The 1865 plot structure plan allows us to elaborate a reasoned classification of types according to their geometric parameter and their location.

Examining the city map shows a substantial difference between the fabrics bounded by the old Arab enclosure wall and the area between that wall and the Christian wall. The first presents a more contorted street network, typical of the evolution of a developed Islamic settlement. In the urban fabric between both enclosure walls, plots seem to be arranged in a more regular structure, although still there are different nuances in terms of form. However, both fabrics share the same structural elements, forming a homogeneous whole. We will focus on this second group, in which we detected the existence of a module derived from the use of similar buildings according to their historicity. This base module is the plot. Apart from some exceptions, the module-plot tends to have a rectangular shape, perpendicular to the street line and with its shorter side as a street-facade or frontage. Each frontage corresponds to a built mass with a variable depth depending on the building type occupying the plot, mass that evolves in time synchronously. The block is the ultimate result of this aggregation system as an arrangement of built-up bands.

Plot structure and socio-spatial hierarchy of the city

In order to properly relate residential types and urban morphology, it is necessary to extend the study of housing to all social classes, which will allow us to recompose the integrity of the urban fabric. Architect and military engineer José Hermosilla Sandoval (1715-1776), Director of Architecture in the Royal Academy of San Fernando, described in his "Tratado de Arquitectura Civil " (HERMOSILLA 1750) that the form of residence in the 18th century could be divided into three classes: the residence of the higher nobility, based on the central courtyard (or cloister) type; the residence of the labour class, based on the artisan's house; and finally, he described an intermediate class, which we may refer as the emerging, well-to-do bourgeois class, whose residential type is based on town-houses that "will imitate the nobility house, only adjusting it to its economic possibilities".

To elaborate a hypothesis of how each of these social classes was quantitatively distributed in Valencia city in the late eighteenth century, we resort to the interpretation made by historian Manuel Ardit (ARDIT 2009) based on the 1787 census under Floridablanca. Using its parameter we have elaborated data table nº1.

Data shown represent a society still dominated by a minority elite, with a majority presence of artisans and craftsmen not yet

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SOCIAL-ECONOMIC PROFILE in Valencia city according to Chief Minister Conde de Floridablanca census (1787)	total inhabitants	
artisans and labourers	45.360	63%
tradesmen, professionals and functionaries	7.200	10%
servants	14.400	20%
nobility, clergy, military and asimilated	5.040	7%
	72.000	100%

DataTable 1.
Social-economic profile in Valencia city at late XVIII century

CORRESPONDENCE BETWEEN RESIDENTIAL TYPES AND SOCIAL STRATA as deduced from Valencia plot structure		plot total surface	total number of plots	mean average plot surface	%
social class profile	dwelling type	m2	nº	m2	
artesans and labourers	artisan house	362.946	3.328	109	65%
well-off middle classes	middle-class house	303.158	1.757	173	34%
nobility	urban grander house	67.194	73	920	1%
		733.298	5.158	142	100%

DataTable 2.
Correspondence between residential types and social strata

"proletarianised", and in which emerges an incipient bourgeoisie. The high percentage of servants is surprising, and we can only guess to what extent their residence was linked to that of the masters they served.

Plot structure can provide us with data of interest in quantifying the three types of housing present in the city. The building substitution process is very intense in the decades prior to 1865. Nevertheless we can form a hypothesis based on one of the three fundamental plot characteristics mentioned above: the size of the plot.

We make a data table with the mean average plot area by dividing the sum of their surfaces by their number and classifying it by zones, crossing the two eighteenth-nineteenth century administrative demarcations, the Barrio (Neighbourhood) and the Parroquia (Parish). With this operation, we subdivide the city into 31 groupings with a high degree of plot homogeneity in which the data allow us to draw different conclusions.

The mean average surface of the urban residential plots is 131 m2. Studying all the different sizes we have made three discriminating thresholds: The first, comprising the smallest - below 115 m2 - belongs to the commercial and artisan districts that surround the Market and the Lonja. It corresponds to the natural space of the house-cum-workshop or commercial shop. The second one, up to 135 m2, takes up the whole area of Christian extension to the west side of the Arab older city. They are the later artisan-commercial settlements. Up to 160 m2, a third group containing the parish of St Bartolomew intramuros and Christian extension outside the Arab wall of the east. From here the nobler, wealthier city neighbourhoods, reaching 200 m2, in the Parishes of St. Nicholas and St. Thomas intramuros. Finally, over 200 square metres, we count the most traditional bourgeois and nobility settlements, the Parishes of El Salvador, San Esteban and San Lorenzo. If we draw in the city map a hypothetical line separating the first three from the latter two, we will obtain an invisible physical frontier that divides socio-economically the city. (Figure 3).

On the other hand, if we relate the size of

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the plots with the socioeconomic profile, we can elaborate data table nº2. The data table shows, broadly, the correspondence between residential types and social class-profile or, to be more exact, the correspondence between the plot structure and the social stratification in the city at the beginning of the nineteenth century.

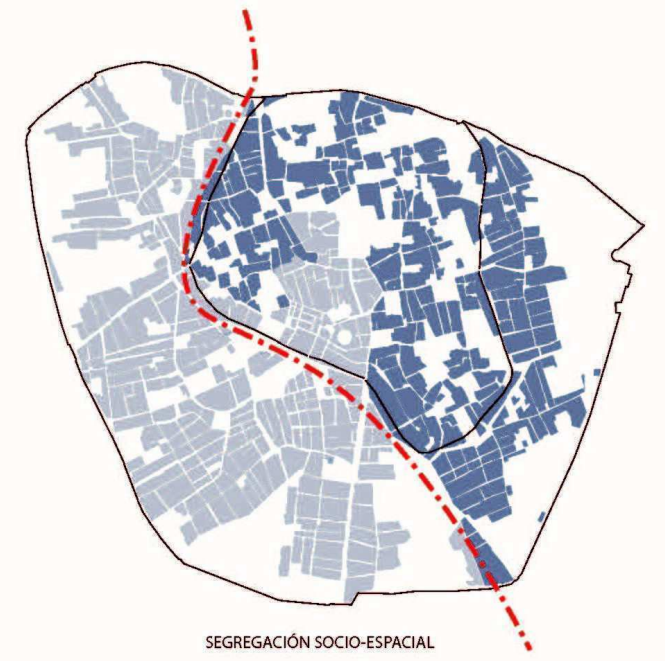

Figure 3.
Social-spatial segregation in Valencia city at late XVIII century

An attempt at delimiting a statistical profile of the plot shape

We worked out the previous topographical hierarchy using one of the three parameter characteristic of the plot: its surface. However, as we have explained, we believe that the plot shape is the essential factor in ordering and understanding the architectural forms built-up on them. It is necessary, therefore, to tackle the task of outlining the parcel geometry. We proceed as follows:

a) First we analyze small plots, those with less irregularity in form, since their small size does not admit significant variations in the disposition of the built masses, forced by the need to adapt to their use and, therefore, to be economically viable.

b) We then select as a field of study one of the homogeneous groups in which we have subdivided the city by taking on account surface size, using as a differentiating threshold the average area of 109 m², corresponding to the largest -and lowest- social class-profile.

c) We draw a "typical plot" that derives from statistical analysis, assimilating its dominant form and calculating its frontage and depth dimensions as mean average value of the constituent plots of a typical urban block.

We chose a group of urban blocks from the Cuartel del Mar and the San Esteban Parish, organized around the axis of Bonaire Street, as natural route that, parallel to the Arab wall, united the Temple portillo (gateway) with the rambla de Predicadores. It is a group of 15 blocks with varying dimensions but corresponding to the same pattern: they are rectangular and are formed by the arrangement of two parallel plot bands, sited back to back. The longitudinal axis of the block is, thus, posted perpendicularly to the most important hierarchical street axis while, in turn, plots are arranged perpendicularly to that axis. This maximizes the number of plots having a street facade. The width of the block, therefore, will be double the depth of the plot type. This aggregation logic is only altered on the short sides of blocks that, as we saw, are in direct contact with the main the hierarchical street axis. In this case plots face the main street by turning 90º, and are arranged with its longitudinal axis parallel to that of the block. This positioning allows us to read the hierarchy of the chosen block group. (Figure 4)

If we calculate and draw the mean average block, we obtain an block unit of 60x32 metres and 1,920 m2 of surface. If we operate the same as for the constituent plots, we obtain a plot unit of 6 metres of street frontage and 17 metres in depth, with 102 m2 of surface. If we take into account the social classification we have made, we can consider that this plot type is the support of the typical building of the artisan's (or menestral) dwelling. On the one hand, its parameter put it above the samples found in the Market neighbourhood, much more fragmented and dense, with plots falling

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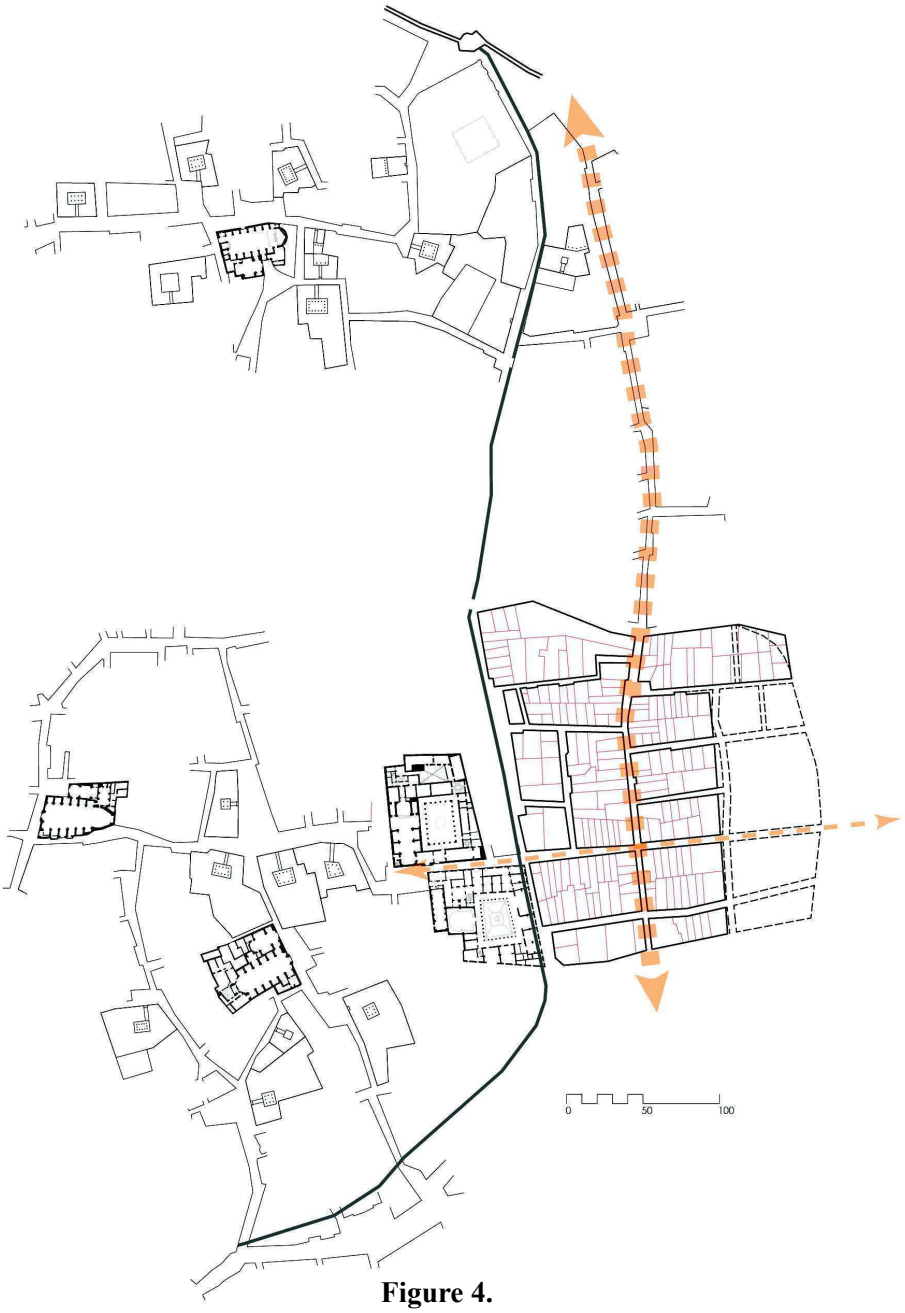

Figure 4.
Map of the homogeneous grouping around the axis of Bonaire Street

below 50 m2 in surface. On the other hand, it comes below the 160 m2 threshold, which we have attributed to the appearance of the first samples of well-to-do houses.

To accomplish the same operation with plots larger than 150 m² has not been deemed viable. Their geometrical disparity prevents us from finding a pattern that allows us to draw a typical shape. Their greater size also allows for a greater freedom as regards the design of the architectural form of the supported building.

Architecture "technical handbooks" in XVII and XVIII centuries in Europe

The urban dwelling form in the technical architecture "handbooks"

It has been observed that the role of architecture as a 'cultured' discipline and a professional trade did address a limited amount of the urban architecture and building construction along the period in which the typological transition

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we are interested in was being outlined. In this context, the professional building design competence was mainly borne by the masters-masons, the epigones of the medieval magister operis, the participation of architects remaining irregular and minor, mostly referred to relevant buildings (RODRIGUEZ CEBALLOS 1987), (BERCHEZ, J. 1987)

A distinctive feature in the professional culture of private architecture in France and Spain from XVII up to the second half of the XIX century is the existence and diffusion of architecture "Manuales", i.e., books in which general rules on the art of building are combined with the systematization of examples of residential buildings, containing plans and, frequently, elevations and sections, as well as technical advice and recommendations on other elements forming part of the building construction process.

European architectural treatises since the Renaissance written by Serlio, Alberti, Vignola and others were based on translations and reinterpretations of the Vitruvius's "De Architectura", and wilfully intended to collect, interpret and spread the great classical architecture themes. On the other hand, the architecture "handbooks" of the type described, i.e., those that exclusively, or complementarily to the classical themes, do collect and systematize the actual experience of private urban building construction, from grand to modest houses, are relatively unusual. For the purposes of this paper we are primarily interested in two: "Maniere de bastir pour toutes sortes de personnes", by Pierre le Muet (1623) and "Escuela de Arquitectura Civil en que se contienen los órdenes de arquitectura, la distribucion de los planos de templos y casas, y el conocimiento de materiales" by Agustin Bruno Zaragoza and Ebri (1728), published under the pseudonymous anagram "Athanasio Genaro Brizguz y Bru". For reasons of proximity in time and other aspects of interest, we have also consulted "L'Architecture moderne ou l'art de bien bâtir pour toutes sortes de personnes" by Charles Étienne Briseux (1728)

"Maniere de bastir..." by Pierre le Muet is a straightforward technical handbook addressing the construction of residential buildings. From the beginning the aim is to make accessible to the private minor dwelling the virtues of decorum and convenience attributed to public buildings In his introductory text, addressed to the reader, Le Muet states that he simply aims at (...)faire voir au public un moyen de bastir sur toutes grandeurs proposées, afin q'aux maisons des particuliers on puisse observer la bienseance & commodité, proportionnément à celle qu'on garde aux batiments publics. J'ay donc commencé depuis la plus petite estendue sur laquelle on puisse bastir iusques à une grandeur telle qu'il se trouve plusieurs personnes posseder des places de semblable messure (...)

The handbook contains 53 beautifully drawn plates with graphic scale in toise (six feet), 46 of them containing designs for a number of houses of which about half correspond to the lower stages of urban plot, with a rather complete design including ground floor plan, typical floor plan and facade elevation. The building 'models' proposed are varied and systemised according to step by step approach as regards plot measurements.

For his part, Athanasio Genaro was a "tracing friar" i.e., an educated clergyman with studies in architecture and mathematics. His book is more of an hybrid between a treatise and the practical handbook. It begins with a survey of the important elements of classical architecture, focusing particularly on constructing the classic architectural orders, drawn from Vitruvius, Palladio, Scamozzi, etc. as well as more local talent -- Juan de Herrera, Caramuel Lobkowitz, Thomas Vicente Tosca, a near-contemporary--, and dedicates one third of its extension to the practical treatment of contemporary designs for private urban dwellings. Thirteen of the work's fifty four plates are dedicated to plans and elevations of multi-storey city townhouses (casas medianeras), ranging from quite humble six-room apartments to grand dwellings complete with fine courtyards and stables. These illustrations are accompanied by precise measurements, which suggest that Agustin B. Zaragoza had given thought to how new construction could be adapted to differing tiers of clients.

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Le Muet vs. Athanasio Genaro: a comparision of specific cases in Valencia

Plot-type and dwelling-type: an approach through the architectural manuals

The natural continuation of this research line is to relate the conclusions drawn from the study of the land structure to the building types that support it. Since verifiable samples of such types have not survived, it is of interest to refer to the architectural manuals of the last few centuries that address the subject of residence and to cross-refer the data of the theoretical elaborations with those of our field research. In this sense it is pertinent to use the mentioned manuals of Athanasio Genaro and Le Muet in order to compare them with each other and with our data to draw conclusions.

The comparison will be made by re-drawing the plans contained in both manuals and unifying them into the metric scale. Le Muet uses the toise (T) as linear measure, unit while Genaro employs the Castilian foot. Both intend to elaborate a group of prototypes with the character of operational handbook, capable to be used to address the building up most usual urban plots in any real location. They must cover both the needs of the whole of the social spectrum and the geometric variables derived from plot location and form. For this reason the different types are considered as a repertoire of valid solutions for different dimensional series, in which the determining value is the frontage, the length of the façade segment. Incidentally, the dimensions used in the plates of both manuals are taken without considering the widths of party walls, nor front and back façades, which complicates the data homogenization. We have decided to take as representative for each type the one drawn by the authors, understanding their own choice as optimal.

The result of the comparison is reflected in data table nº3. Will shall distinguish three plot groups regarding the building type:

The first group is the artisan's house, corresponding to the first four types listed in Le Muet and the first two of Athanasio Genaro, with similar dimensions to the those found in the socio-economic zones of the Valencian fabric. In fact the particularization that we have made in the Bonaire street axis, keeps within the dimensional abacus of both "handbooks". This fabric grouping around Bonaire axis is formed by rectangular plots, with a frontage measuring less than 7 metres and depths up to 17 metres. Frontage/depth ratio varies between 1/2 and 1/3, and its surface between 40 and 120 m².

A second group, which we assimilate to the well-to-do house, includes plots measuring

CORRESPONDENCE BETWEEN ARCHITECTURE "HANDBOOKS"

PIERRE LE MUET				ATHANASIO GENARO				
	plot frontage (metres)	plot depth (metres)	plot surface (m2)		plot frontage (metres)	plot depth (metres)	plot surface (m2)	
PLOT 1	4,9	7,9	38,7					
PLOT 2	5,0	9,3	46,5					artisan house
PLOT3	6	12,8	76,8	PLATE 42	5,7	12,2	69,5	
PLOT 4	7,0	17,2	120,4	PLATE 43	7,2	17,2	123,8	
PLOT 5	7,4	21,2	156,9	PLATE 44	7,4	21,2	156,9	middle-class house
PLOT 6	10,9	20,0	218,0	PLATE 45	10,9	20,4	222,4	
PLOT 7	13,7	33,6	460,3	PLATE 46	13,8	25,6	353,3	
PLOT 8	17,8	20,4	363,1	PLATE 47	17,7	20,4	361,1	
PLOT 9	20,0	40,3	806,0	PLATE 49	20,2	32,9	664,6	hôtel- urban gander house
PLOT 10	25,0	25,6	640,0	PLATE 51	24,5	25,5	624,8	
PLOT 11	24,5	41,4	1014,3	PLATE 52	62	46,5	2883,0	

DataTable 3.
Correspondence between architecture "handbooks" of Le Muet y A. Genaro

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between 120 and 230 m² in surface. A direct correspondence between the types in both handbooks, with rectangular plots with frontages between 7 and 14 metres and plot depth between 20 to 30 metres. Again frontage/ depth ratio varies between 1/2 and 1/3.

Interpreting local dwelling identity in Athanasio Genaro designs vs. Pierre le Muet

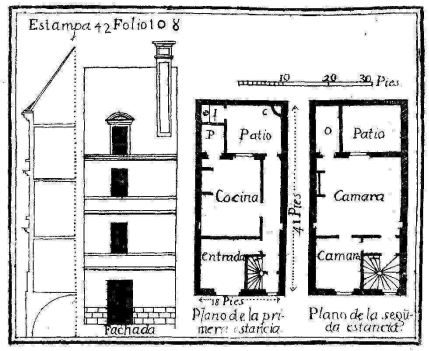
Le Muet completes his list with plates containing seven more designs, comparable to the five examples included in Genaro "handbook", all offering a varied repertoire of forms for the urban palace or grander house project, in which architecture finds its autonomous expression means.

Comparing both handbooks, a first glance makes evident the formal similarity between both: The French handbook is taken, one hundred years later, as a direct reference-model by Athanasio Genaro. In fact Genaro's plates can be considered direct copies both in plan and facade elevation, incidentally representing formal and constructional solutions rather alien to Spanish -and Valencian- own cultural traditions.

However, the obvious similarities or equivalences between both should not prevent us from focusing at what, in our opinion, is most interesting: the differences. In Genaro's handbook we find only two plates in which the distribution design is distinctly different from that of the French model. These are Plates 42 and 49, which correspond to Plots 1, 2 and 3 and 9, respectively, of the manual of Le Muet.

Plots 1, 2 and 3 (Figure 5) represent the minimal plot- unit and, organised in a single built-up volume with one or two constructional bays parallel to the facade, and a backyard at the bottom. In the five designs the staircase is always placed at the bottom of the plot except in the third distribution of the third plot.

In Genaro's case, the design for plots of this size is contained in plate 42, but, while the built-up volume is identical to Le Muet, the staircase is sited at the facade. Athanasio Genaro is reproducing in this plate the Valencian tradition of "l'escaleta", described literarily by local chroniclers like Orellana



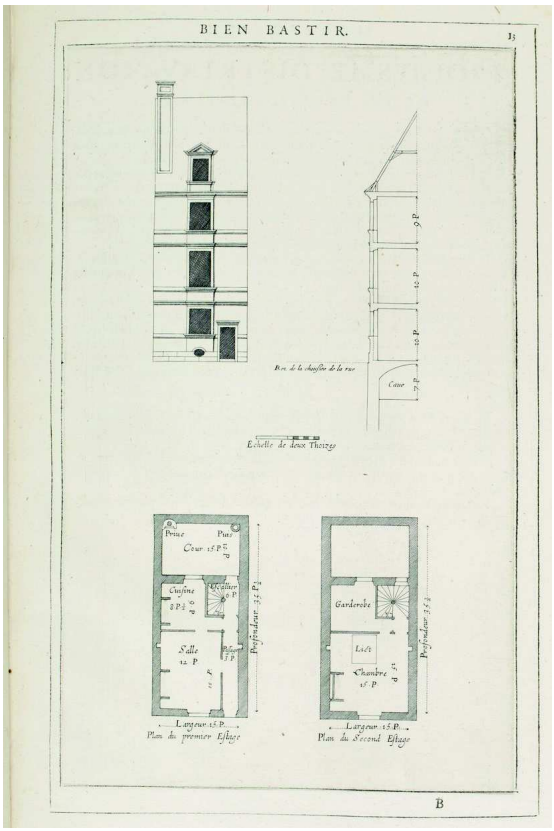


Figure 5.
Lámina 42 – Parcela 3

(ORELLANA 1923), and profusely present in the pre-industrial architecture of the city.

Plate 49 (Figure 6) represents a model of urban grander residence in which the plan is organized around a central courtyard, surrounded by four building bodies of different magnitude. In Le Muet plates, the design of a grander house in a rather extensive plot is always organised around a courtyard, this being not central but sited laterally, so that the building masses are organised either as an "L" shaped plan, or as "U" shaped plan, with two parallel building bands with a staircase

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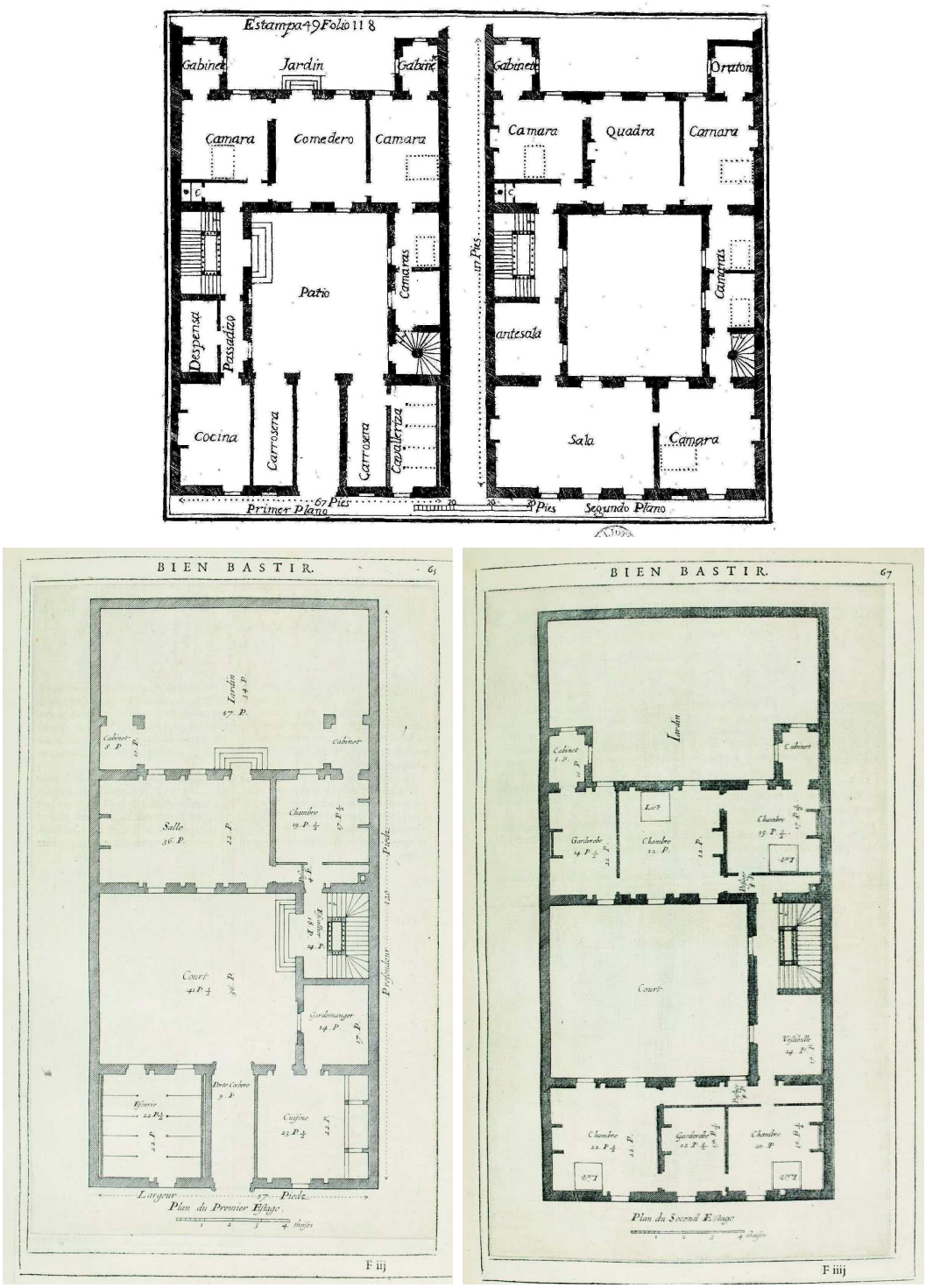

Figure 6.
Lámina 49 – Parcela 9

between them. Both French plan layouts correspond to more rational distributions, which do not appear to come from direct historical references. In contrast, we believe that Genaro central-courtyard layout is an interpretation of the Valencian Gothic palace, a model repeatedly used in Valencia city well into the nineteenth century.

We can conclude that Athanasio Genaro uses and copies the models in Le Muet handbook as an abacus for distribution layout solutions, but that he chooses the models that he knows

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firsthand as different and alternative to those provided by French rationalizing logic.

According to our hypothesis, plates 42 and 49 thus become a valid abstraction capable of illustrating the architectural forms physically building the Valencian preindustrial plot-system.

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Geometric and poliorcetic inertia in the fortified system vs urban morphological inflections in 18th-Century. Barcelona

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Abstract. *Research Between the War of Nine Years and the Napoleonic invasion of 1808 Barcelona underwent a morphological transformation according to a progressive evolution that came along from a typical wall-constrained stronghold towards an urban structure where the primacy of the internal and external strategic control gave way to the socioeconomic, industrial and commercial detachment of the city. The warlike needs of the first quarter of the 18th century involved a series of explicit poliorcetic interventions that gradually made available other criteria related to the development of several infrastructures for peacetime and certain urban licenses. These improving processes that let transform the urban features later changed the sense of the vectors which settled the nexus between the intramural space and the territory beyond the bastioned perimeter. Starting from a predominantly centripetal structure where the city walls played a segregating role, they afterward tended to reinforce the creation of newborn civic spaces that appreciably reduced the strength of the suffocating perimeter and also established alternative centers of power. These procedures foreshadowed a further decline of the traditional values about the former city walls and allowed the take-off of the territory outside them as an expansion of the orthodox urban system essences and its outward projection. The confluence of both municipal government purposes and the Crown's impositions eased the work of the military engineers who undertook the interventions directly dependent on their sphere of responsibility.*

Keywords: Military engineering, fortification, urban bastioned system, poliorcetics, city and territory.

Introduction

The urban global structure of Barcelona at the turn of the 17th to the 18th century, as so many other contemporary cities, was shaped mainly by its defensive needs. The continuous succession of warlike conflicts between several European monarchies forced the municipal authorities to restore the old urban walled system and prevent this way any siege attempt by an external army. This process constituted a permanent essay of adaptation and improvement to the poliorcetic characteristics of the city. But there was not enough money or time –nor even, maybe, the suitable technical skillfulness in terms of poliorcetics and fortification– to achieve the aim.

Walls, towers and bastions before the Bourbons

The city walls were the main defensive structure of Barcelona until the beginning of the 18th century. A small fort near the bastion of Levante and the fortress of Montjuïc at the top of the hill complemented the whole system. However some sectors were not balanced, since several bulwarks had a poor poliorcetic capability and couldn't protect each other.

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When General Engineer Jorge Próspero Verboom was captured by the Austracists in the battle of Almenara in 1710 and transferred to Barcelona as a prisoner he had a precious opportunity to study all the city fortifications. He was able to analyze in detail the entire urban walled perimeter not only from the inside but also from the moat. All the data gathered by the Flemish engineer were decisive for the final victory of the Bourbon armies in the Siege of 1713-1714. He described accurately every part of the fortified system. From this exhaustive report he could assess all its poliorcetic strengths and weaknesses (Figure. 1).

Fortification implementations planned by French military engineers

On the occasion of the siege and seizure of the city on August 8, 1697 by the Duke of Vendôme in the context of the Nine Years' War between France and Spain, the French authorities confirmed the need to improve the status of the Barcelona defenses by establishing a powerful control towards the interior of the city, since they felt the possibility of any riot against the occupation forces. The geographer Nicolas de Fer showed in a map of Barcelona the urban poliorcetic system reformation plan by means of the transformation of the old arsenal *(Atarazanas)* into a kind of fortified redoubt facing both the western suburbs and the interior of the old city, taking advantage of the medieval wall of the *Rambla* as a former retrenchment. Similarly, the walled perimeter at the eastern

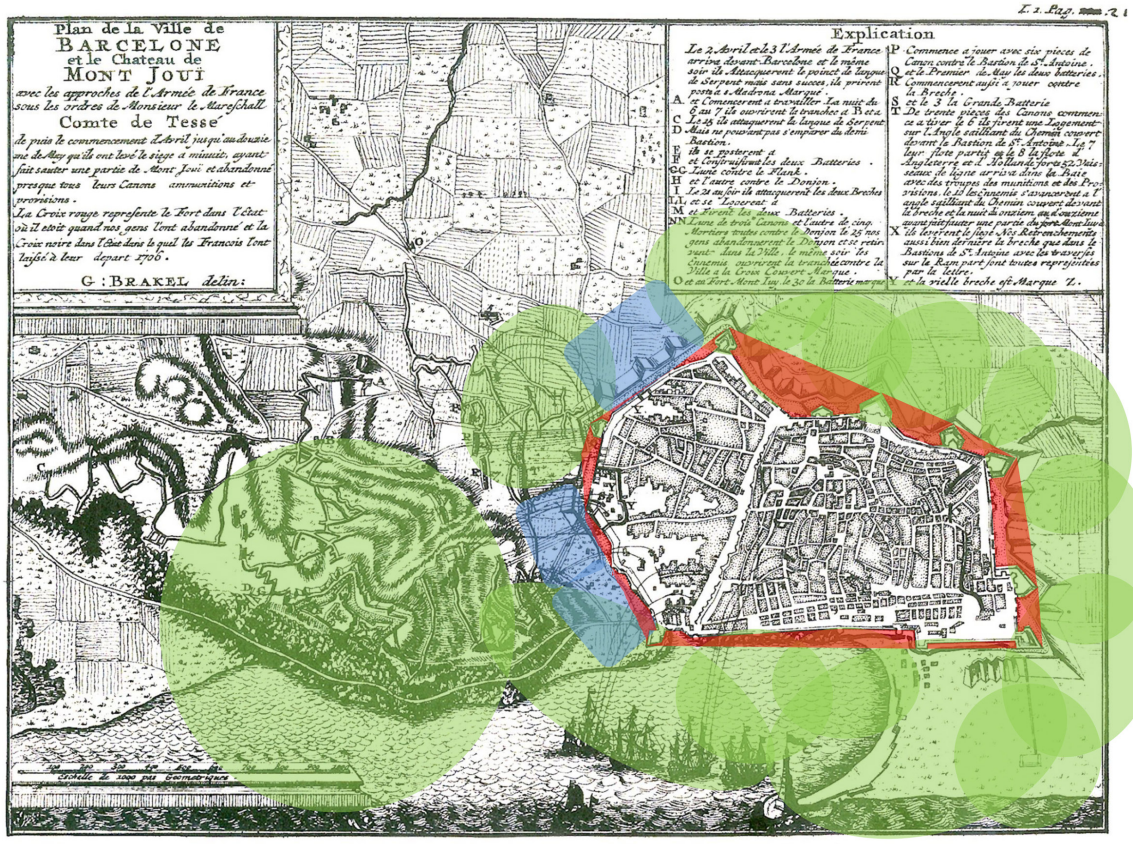

Figure 1. Brakel, G. (del.) 'Plan de la Ville de Barcelone et le Chateau de Mont Jouï avec les approches de l'Armée de France sous les ordres de Monsieur le Mareschall Comte de Tessé de puis le commencement d'Avril jusqu'au deuzieme de May (…) 1706'. Lamigue, Isaac (1715) Histoire du prince d'Orange et de Nassau (…) divisée en deux parties (…) Enrichie des Plans des villes, & de leurs fortifications (Chez François Halma, imprimeur des Etats de la province de Frise, Lewarde). 2 vol. Grosso modo: in red, areas covered by each bastion flanking fire; in green, areas covered by each bastion global fire; in blue, fire from towers in the western side of the city. (Patterns and color by Muñoz Corbalán).

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part, between the bastion of Santa Clara and the *Puerta de Mar*, was supposed to be closed by a horn work with a crown structure, clearly offensive towards *La Ribera,* formerly the wealthiest and most dynamic urban district till the 16th century. The increasing new constricted character of the city was still reinforced by the proposal of a four-bastion redoubt located on the slope of Montjuïc, between the castle itself at the top of the hill and its communication with the city. This comprehensive transformation of the Barcelona defenses, with the addition of several external fortification works and the erection of new bulwarks in the weakest points of the wall, implied a western extension of the harbor and the creation of a new arsenal or shipyard, covered by the fire of the abutting brand-new redoubt on the slope of Montjuïc (fig. 2).

This poliorcetic concept was resumed by Paul-François de Lozières d'Astier in his project to fortify Barcelona after the surrender of the city on September 12, 1714, in competition with another one elaborated by the General Engineer of the Spanish Crown Jorge Próspero Verboom. The French engineer openly criticized the proposal made by the Flemish because of its supposed strategic inefficiency and he planned a system similar to the one conceived eighteen years earlier, when France and Spain were still enemies. Lozières took advantage of his active experience during the Barcelona sieges of 1697 and 1706. His thoughts were based around the supremacy of the castle of Montjuïc, with the extension

Figure 2. Fer, Nicolas de (del.), Inselin, Charles (fec.) (1697) 'Le Nouveau Plan de Barcelonne Comme il est aujourd'huy. Assiegée par les Armées du Roy sous les Ordres de Mr. Le Duc de Vendôme, par Terre, et de Mr. le Comte d'Etrée, par Mer au mois de Iuin 1697. Tout ce qui es audela de la ligne de Points n'est que projeté, aux ouvrages desquelles on travaille actuellement. Mis au jour par N. de Fer'. (Dans l'Isle du Palais sur le quay de l'Orloge a la Sphere Royale, Paris).

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of its offensive power over the city through a double horn work facing the city. In his *Plan General de Barcelone* he projected several complementary improving works for the urban wall, with the reinforcement of the bastion of the Ángel by means of a small doubled bastioned gorge threating the city, and a design not very far from what De Fer showed in 1697 with the projection of a sort of citadel-like triangular fortress, absolutely integrated in the area between the bastions of Santa Clara, Levante and Mediodía (Muñoz 1997).

Walls, towers and bulwarks in a first peacetime under Phillipe V

The project designed by Verboom consisted of a pentagonal bastioned citadel centered between the urban bulwarks of Santa Clara and Levante, which should disappear. The new fortress was complemented by the Fuerte Pío, a not far outer redoubt that faced the northern countryside, and the Fuerte Don Carlos, another one located on the beach line. In addition to restoring the wall ramparts and curtains, which were deteriorated by the bombing during the recent siege, the Flemish engineer organized an inner control belt with the transformation of a large part of the old *Atarazanas* into a pseudo-citadel, and also proposed to reconvert the bastion of Tallers in a kind of redoubt-like structure integrated in the city wall by means of a double exterior-interior function, both defensive and repressive, according to a poliorcetic morphology not very far from the one used several years ago, in 1701, when he himself designed the Fort Verboom, next to the Kieldrecht dike, a long strategical dam integrated in the Eastern Flanders *Bedmarlinie*, when the War of Succession to the Spanish Crown had not still left the Netherlands (Muñoz 2015a).

Barcelona was thus structured within a poliorcetic system where the walled perimeter strengthened its centripetal characteristics and consolidated a discrete defensive organization referred to the surrounding territory as well.

Some years later, in the mid-20s, a broad campaign ordered by the War Office tried to organize an effective network of quarters throughout the Kingdom in order to establish a permanent garrison in the major strategic strongholds and main border cities for the control of the territory. In the case of Barcelona, under the supervision of the Director Engineer of Catalonia Alejandro De Rez –Verboom's total confidence qualified professional since the campaigns in Flanders–, several buildings with different functions were reformed so as to be transformed into barracks for troops and officers (Muñoz 1994). Many of these soldiers had already been lodged in some interior places of the citadel, but the specific problematic of the city, because of the authorities' founded fear to any inner citizen rebellion, led to increase the number of troops in Barcelona. So it was necessary to turn some former buildings into military barracks to accommodate these contingents. The leading strategic concept kept being based, for several decades, on an idea of centripetal control over the urban space. Buildings such as the *Atarazanas*, the convents of San Agustín and Junqueras, the University *(Estudi General)* and the *Lonja*, all of them peripheral, very close to the urban walls and well located in places of strategic and significant balance for the city, were converted into military quarters with a striking regulatory character around their areas of influence. However it was not only important to achieve an inner control, but also to improve the external urban defensive system which was still incomplete.

When the duke of Montemar assumed the position of Secretary of War, he undertook intense enterprises related to the political structuring of the Kingdom in military terms. The *Real Junta de Fortificaciones* of Madrid became a new body of technical control of the Corps of Engineers. The wish to exercise a more rigorous and pragmatic supervision about the works planned and directed by the members of this group led to manage all the work that was intended to be materialized within the national territory. Montemar had got a special link with Barcelona, both institutional and emotional. There, he had been Captain General between 1722 and 1726 and had married two ladies of the local Catalan nobility. So he put a special attention in intervening on his beloved city. Some attempts were made to improve

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the urban fortifications. Several engineers designed a series of projects to consolidate one of the weakest parts of the walled perimeter, the front between the bastions of Tallers and Junqueras. In September 1737, Francisco Ricaud, Antonio Rivière, Baltasar Verboom, José Crane, Francisco de La Pierre and Antonio Fovet were asked to present some particular proposals to improve the defensive features of this city wall section by means of some exterior works and the addition of some integrated bulwark along the urban wall (Figure. 3). Formal solutions were, in some cases, the product of an excessive imagination, through which designers performed real exercises of typological variations from the conventional repertoire fixed by fortification treatises at the end of the 17th century in different geopolitical contexts, mainly among French and Dutch theoreticians, but also throughout Sebastián Fernández de Medrano's lectures in the Royal Academy of Mathematics in Brussels and several of his books on poliorcetics and fortification. It's really interesting to realize how within the French post-vaubanian environment there was a similar process to the Barcelona bizarre example, in the sense that several engineers serving the French crown felt free to show out their creativity, elaborating complex systems which were supposed to improve the internationally recognized achievements made by Sébastien de Vauban both in projects and field works and also through many manuscripts and printed stuff summarized by other theoreticians and colleagues from the *Corps du Génie*. In fact, most of those poliorcetic dreams or academic graphic exercises were useless. They just constituted sophisticated ways of morphological stylization, and the more complicated they were, the more lack of functionality they had. At this point, it seems that technical mentality turned into an artistic delirium in a sort of anti-pragmatic mannerism, which created a true connection between art

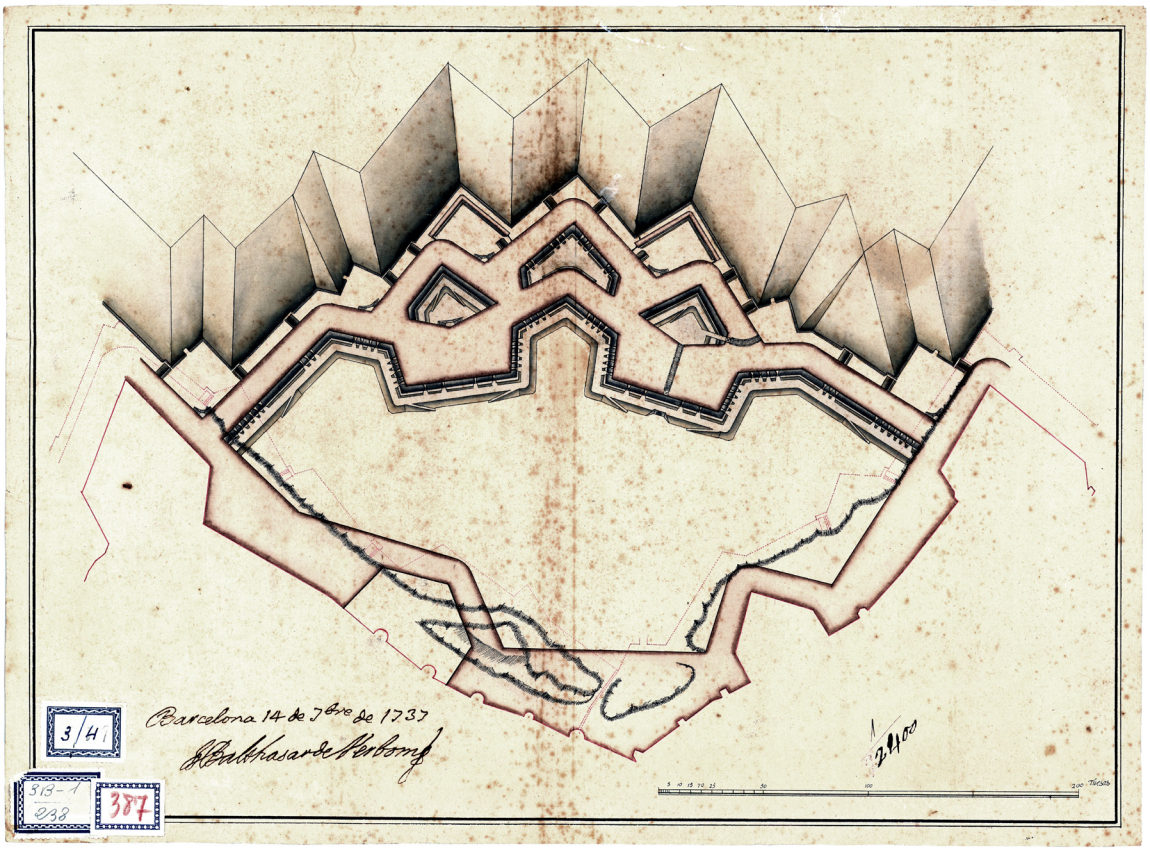

Figure 3. Verboom, Baltasar (1737) Project of fortification between the bastions of Tallers and Junqueras in Barcelona. Barcelona, September 14, 1737. Archivo General Militar, Madrid. Cartoteca Histórica, B-13/7.

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and technique (Muñoz 2015b). Some of the projects conceived by these French engineers were far both from the rational and logical postulates which were supposed to inspire all of them and their consequent strategic efficiency. However, their essential underlying theoretical arguments were meant to keep the balance between all inherent factors in any poliorcetic design so as to achieve the proposed objectives.

The intervention on the wall of Barcelona was intended to respect the poliorcetic orthodoxy, following the reasonable and commonly accepted fortification typologies and morphologies. The basic premise was to cover efficiently all the bastioned elements existing along the wall to prevent the presence of dead or passive zones. But the process was not imminent and it was necessary to wait for a new political context to decisively carry out such enterprises.

A time for the city transformation under Ferdinand VI and Charles III

The new policy developed by king Ferdinand VI and his War and Finances ministers allowed a change about the territorial strategic notion and the primacy of the monarchy defensive character. In strictly political terms, the engineers' commanders also echoed the deep reforms that the power wanted to carry out referring the Corps of Engineers and their functions and responsibilities. This new atmosphere revealed the institutional wish to encourage Spanish professionals –instead of the actual dependence on Flemish and French engineers– and modernizing their academic and technical training, as well as a greater rationalization and standardization of their skillfulness and procedures, despite the inevitable and usual lack of economic resources to undertake major initiatives (Cámara 2016).

As Juan Martín Zermeño and his son Pedro Martín Zermeño attained major responsibilities within the military engineers' organizational structure, their role in projecting large-scale enterprises became increasingly manifest. The father's career culminated when he got the General Command of the Corps and led some remarkable works in Catalonia such as the reformation project for the Barcelona fortified system in 1751, the design of the new outer Barceloneta neighborhood and the extraordinary fortress of San Fernando in Figueres, both in 1753 (Alfaro 2015).

In the case of Barcelona, the need to put into order its defensive system because of the latent threat of an enemy invasion opened the way not only to increase the suitability of the existing resources with the inclusion and modernization of specific elements but also the marginalization and even the elimination of some others which were considered obsolete and useless. Few years after the already planned reform of the walled front between the bastions of Tallers and Junqueras had been definitely undertaken –an intervention supervised by Pedro Martín Zermeño– this engineer elaborated a simple inquiry on the adjustments that should be made over the citadel's area of influence and the bastioned fortress itself. Throughout the short written explanation he expressed the idea of suppressing the Fuerte Pío, a strategic complement for the impressive pentagonal fortress and also a defensive advance of the city in the case of any attack coming from that northern zone of the countryside. However, this redoubt could become a hostile stronghold towards Barcelona itself and its citadel if taken by invading forces (Figure 4).

Along with the planning of the Barceloneta, this series of actions insinuated an incipient change in the defensive criterion applied to the city of Barcelona, which began gradually to be considered as an organic morphology whose projection outside the urban walls seemed to be absolutely inevitable. These novel ideas started to be reflected and applied during the third quarter of the century as regards the 'peaceful' and 'centrifuge' nature of the new planned interventions in the medium term. However, the authorities' concern about a possible public uprising encouraged the improvement of the internal control system, which was materialized with the reform and expansion of the urban military barracks network, the always intimidating presence of the citadel and the continuity of the repressive character of the bulwarks integrated in the walled perimeter.

Sixty years after the siege of Barcelona by the Bourbon armies, the former argument in

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order to establish a solid control of the city remained surprisingly valid. In fact, events like the Esquilache Riots in Madrid in 1766 –and its propagation by different cities of the Kingdom, among them Barcelona– contributed to keep this feeling alive. From the point of view of the impact on the urban form, the thoughts expressed in an anonymous document from 1774 emphasized not only the repressive character of the whole poliorcetic and military urban system, but its effect on some essentially civil elements as well1. The belt formed by the city walls, its towers and bastions was thus constituted by a poliorcetic-like circumvallation ring where the troops should *«asegurar el recinto de la Plaza con tal arte (...) impidiendo el acceso del Paisanage al terraplén»*. Three were the main objectives: *«guardar las Puertas con la maior firmeza»*, protecting them with paling or barrels *«competentes à la defensa»*; *«impedir que los paisanos se apoderen de algún Baluarte, ò Cortina»*, trying to *«cortar las avenidas al Muro por medio de Barreras»* and controlling the guard-houses; and *«que los Quarteles sean Yslados, retrincherados en lo interior de la Puerta, y coronados de Ladroneras»* (*Precauciones* 1774, fol. 1r). These concepts, both generic in theory and strategic practice concerning any stronghold's internal security, were specifically detailed in each part of the technical analysis. The writer determined the need to reinforce the defensive belt safety by means of a greater isolation of the city wall since the smooth slope of the ramparts was an adverse factor to the restrictive power of the wall. His solution consisted in the erection of a parapet *«de mampostería hasta formar antepecho por todo el Recinto, capaz de contener las tierras, construiendo de distancia en distancia Garitas rectangulares interpoladas con las de la campaña»*, and eliminating *«todas las casas y edificios unidos al terraplén»*, because they *«son perniciosos padastros, que le importa al Muro desprenderse de ellos, sin que haya prerrogativa alguna, ò privilegio que pueda exceptuar à nadie, porque tienen la excelencia de encubrir à los paisanos que quieran atravesarle por debajo tierra para lograr su salida à la campaña por varias partes sin oposición alguna»* (*Precauciones* 1774, fol. 7r-7v).

This dichotomy and greater segregation between the defenses and the urban structure itself was not in line with the evolution the city had been developing from some years ago. The repressive sense prevailed over other urban and civic considerations, since the argument about security was practically reduced to *«impedir que los Paisanos, no solo salgan del cuerpo de la Plaza, pero ni aun se atrevan à arrimarse al terraplén»* (*Precauciones* 1774, fol. 8v). In fact, one of the flourishing zones in terms of sociopolitical, economic and commercial leadership of Barcelona, Plaza de Palacio, was just contemplated under these strictly military criteria because it was *«ordinariamente el parage donde se unen los principales seductores, y cabezas de motin para imponer leyes al General».* The solution was to install a small armed redoubt on the *«registro que se halla entre las dos Puertas [de Mar] (...) y con este preparativo queda limpia la Plaza al menor aviso»* (*Precauciones* 1774, fol 6r-6v).

It is significant that, simultaneously with the need to maintain the effectiveness of the city's fortified defenses, the determined take-off of Barcelona's economy and society since the mid-eighteenth century helped to generate a urban dynamic that allowed deep changes in the external road network (Figure. 5) and the transformation of certain centers of political and socioeconomic power, forming new spaces of urban hierarchy. Although the military points of reference continued to exercise a specific control over the social structure of Barcelona –throughout the dissuasive and factual presence of several military quarters strategically distributed all around the city, as well as the permanently visible and operative role of the fortified perimeter system–, the emergence of the civic world activated the raise of these non-military initiatives which undoubtedly accelerated the development of some infrastructures and other undertaken actions encouraged by the monarchy but also by the liberalization of various sectors of urban life (*Història* 1995).

In 1774 the Corps of Engineers was divided in three Branches (Strongholds and Fortifications, Academies of Mathematics, and Civil Architecture, Roads, Canals and Bridges). Together with the already consolidated

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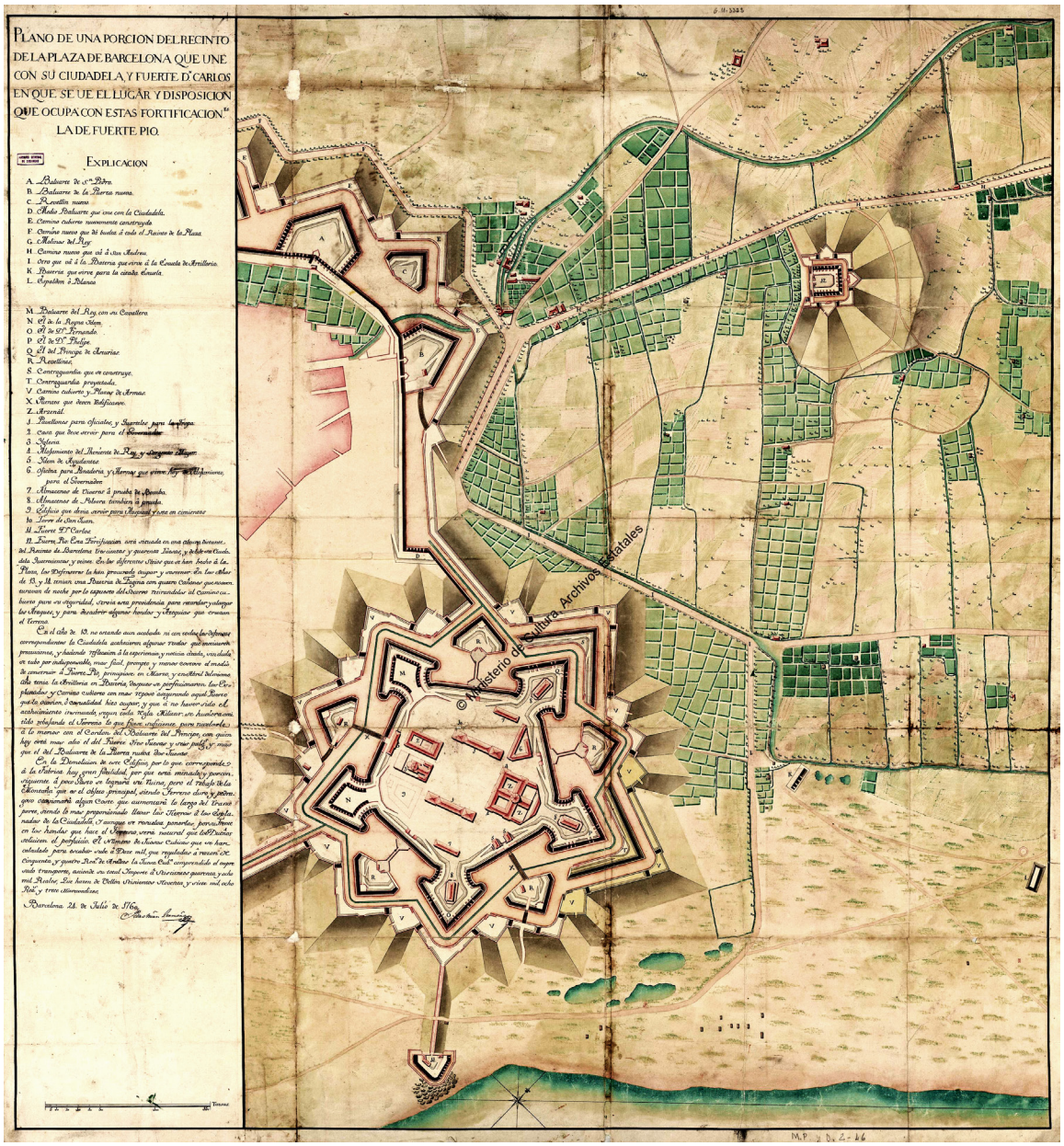

Figure 4. Zermeño, Pedro Martín (1760) 'Plano de una porción del recinto de la plaza de Barcelona que une con su ciudadela, y Fuerte D[o]n Carlos en que se ve el lugar y disposición que ocupa en estas fortificaciones la del Fuerte Pio'. Barcelona, July 24, 1760. Archivo General de Simancas. Mapas, Planos y Dibujos, 02, 046.

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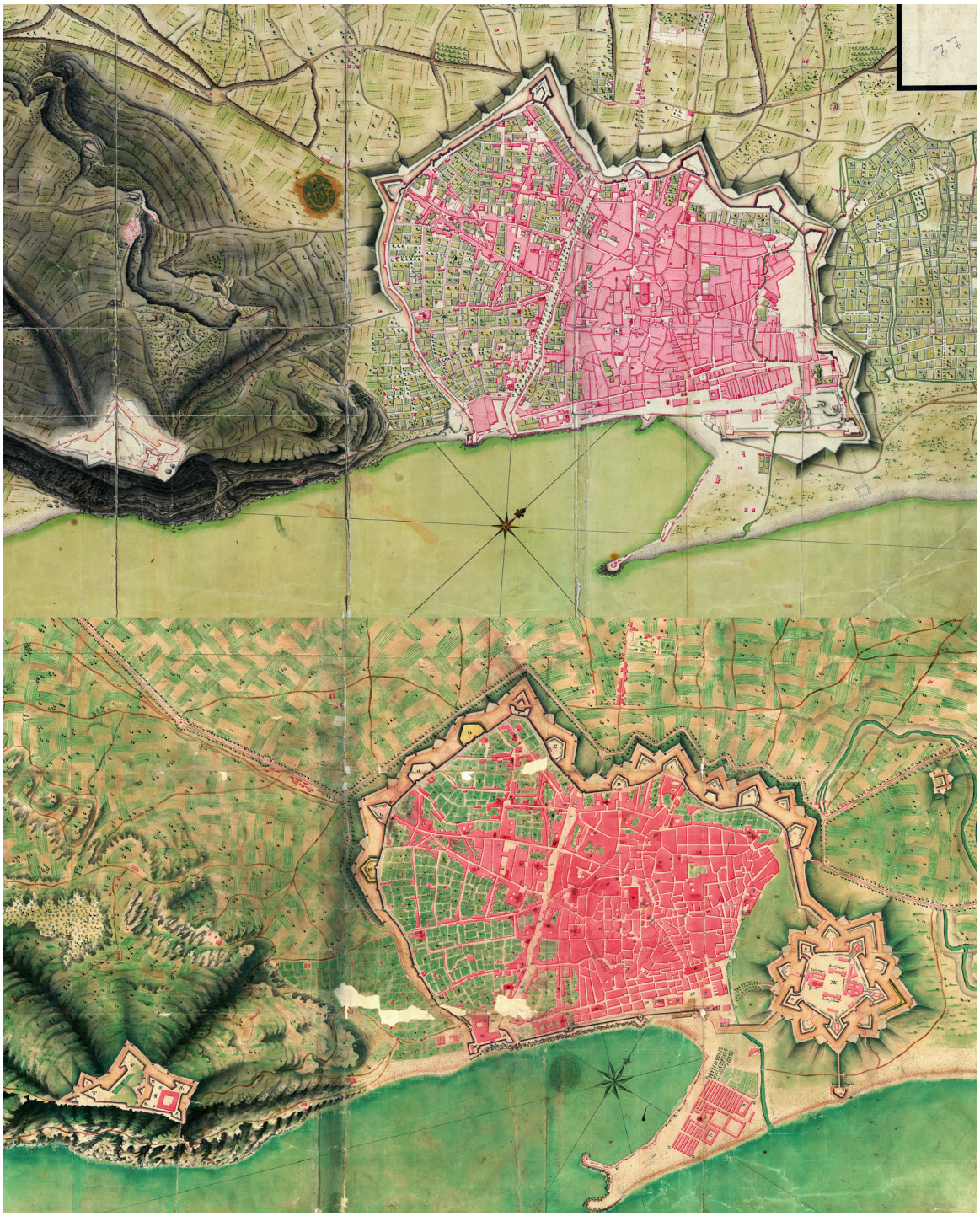

Up: Anonymous (ca 1695, copy) 'Plano de la Plaza de Barcelona' (detail). Archivo General Militar, Madrid. Cartoteca Histórica, B-36/18. Down: Anonymous (after 1773) 'Plano de la Plaza de Barcelona, Su Ciudad[el]a. Castillo de Mō[nt]jui[c] y Cercani[a]s' (detail). Archivo General Militar, Madrid. Cartoteca Histórica, B-36/17.

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power of the dictates coming from the Real Academia de las Tres Nobles Artes de San Fernando, officially founded in 1752, this new circumstances stimulated some building professionals who didn't belong to the military Corps to participate in non-strictly civil works traditionally undertaken by the monarchy under the responsibility of those military engineers.

A further consideration for the new times under the reign of Charles IV

In 1803 the military engineer Antonio López Sopeña, who was involved in a series of deep changes that affected the planimetric design of some of the most representative areas of the city, elaborated a comprehensive *Descripcion de la Plaza de Barcelona*. There, López Sopeña unveiled unambiguously the sociopolitical and economic transformations of the city and, therefore, how Barcelona should be adapted to this new reality2. The spirit that inspired this report proposed an urban and territorial analysis that went beyond the strictly military criteria usually being handled until a couple of decades ago. As a product of rigorous objectivity, López Sopeña summarily dissected the defensive structure of the city, understanding it as a system that integrated its own strategic essence into a higher-ranking body involving a living urban form and its territorial enclave.

Starting from the premise that the location of Barcelona on a plain –*«elevándose este sobre las fortificaciones insensiblemente à poca distancia de las mismas, y siendo lleno de caminos hondos, acequias, y una inmensidad de Caserío, presentan à la vista un sin numero de obstáculos contra aquellas por proporcionar un comodo establecimiento al Enemigo que intente atacarlas»* (*Relacion* 1803, fol. 2r)– was a great inconvenience for its effective protection, López Sopeña observed the urban defensive system formed basically by: seven bulwarks *«por la parte de tierra»* (two more under construction and some complementary exterior works); three bastions facing the harbor; the citadel; the *Atarazanas*, *«cuyo puesto se puede considerar como una Ciudadela»*; Fuerte Don Carlos, whose original purpose *«fue el impedir la comunicación de la Barceloneta, y Marina con la campaña»*, Fuerte Pío, *«expuesto à un golpe de mano, facilitando al sitiador un asilo fuerte desde el qual puede ofender à la Plaza, y cubrir el flanco de sus ataques»*; the city gates with their corresponding guard-houses; seven intramural military quarters and two more in the Barceloneta; as well as thec of Montjuïc, *«la principal defensa que tiene la Plaza»* (*Relacion* 1803, fol. 2v-8r).

It is interesting to observe how this brilliant engineer verified the coexistence of two technically anachronistic urban defensive typologies which, in fact, proved to be perfectly compatible and complementary, taking into account the double directionality of the external-interior poliorcetic character. When analyzing the outer perimeter of the city, he emphasized the complementarity between the medieval structure –*«con torreones de bastante robustez»*– and the modern works. About them, he pointed out that the bulwarks, since they were added *«al muro antiguo, siendo más bajos que él, quedan cerrados por sus Golas con el referido muro proporcionándoles de este modo mayores defensas, por quedar construida una cortadura, que domina toda la extensión del Baluarte»* (*Relacion* 1803, fol. 3r).

Another interesting aspect in López Sopeña's report is how he showed a change in the criteria when considering the strategic characteristics of a stronghold. The engineer highlighted the value of Barcelona's artificial harbor, one *«de los de mayor concurso del Mediterráneo»*, which allowed him to derive his military dissertation towards the values of the city –*«de las más importantes del Reyno»*– as a center of territorial articulation in its both *«marítima y de tierra»* condition and gifted with some relevant features in order to consolidate itself as the capital of commerce by means of issues such as *«la industria de sus naturales, y el sin número de Fabricas de todas manufacturas que encierra»*, along with *«la comodidad del Mar, y la fertilidad de su inmediata campaña»* (*Relacion* 1803, fol. 8v).

This striking change of mentality, propitiated by the enlightened reformist policies developed during the last years of the reign of Carlos III –after the initiatives of the Count of

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Floridablanca– and their continuity during the first period of the reign of Charles IV, allowed opening new possibilities regarding the essential nature of the city. In Barcelona, such socio-economic rush was reflected in several interventions that affected the urban morphological and spatial reality (Figure. 6): the opening, enlargement, extension and urbanization of public streets and avenues such as *La Rambla* (A), Conde del Asalto (B), Calle Ancha (C) and Paseo de la Explanada (D) between the citadel and the district of *La Ribera*; the reform of the *Lonja* (E) and the consequent hierarchical ordering of the Plaza de Palacio (F), with the erection of the new Customs (G); the expansion of the Barceloneta neighborhood (H), the harbor (I), roads around the city and territorial communications (J)... Antonio López Sopeña himself was responsible for designing and supervising several of the new military and public works in Barcelona, which were part of a general plan to modernize and 'civilize' a city whose morphology had been basically arranged for several centuries by strict strategic and poliorcetic factors.

Methodology

Most of the studies on Spanish military engineering during the 18th Century are based on documentary manuscripts, graphic and cartographic material from several archives both civil like *Archivo General de Simancas, Archivo General de Indias, Archivo de la Corona de Aragón*, and military like *Archivo General Militar, Centro Geográfico del Ejército*. Other local archives offer some interesting data about municipalities and their relationship with the Crown enterprises. A special mention must be

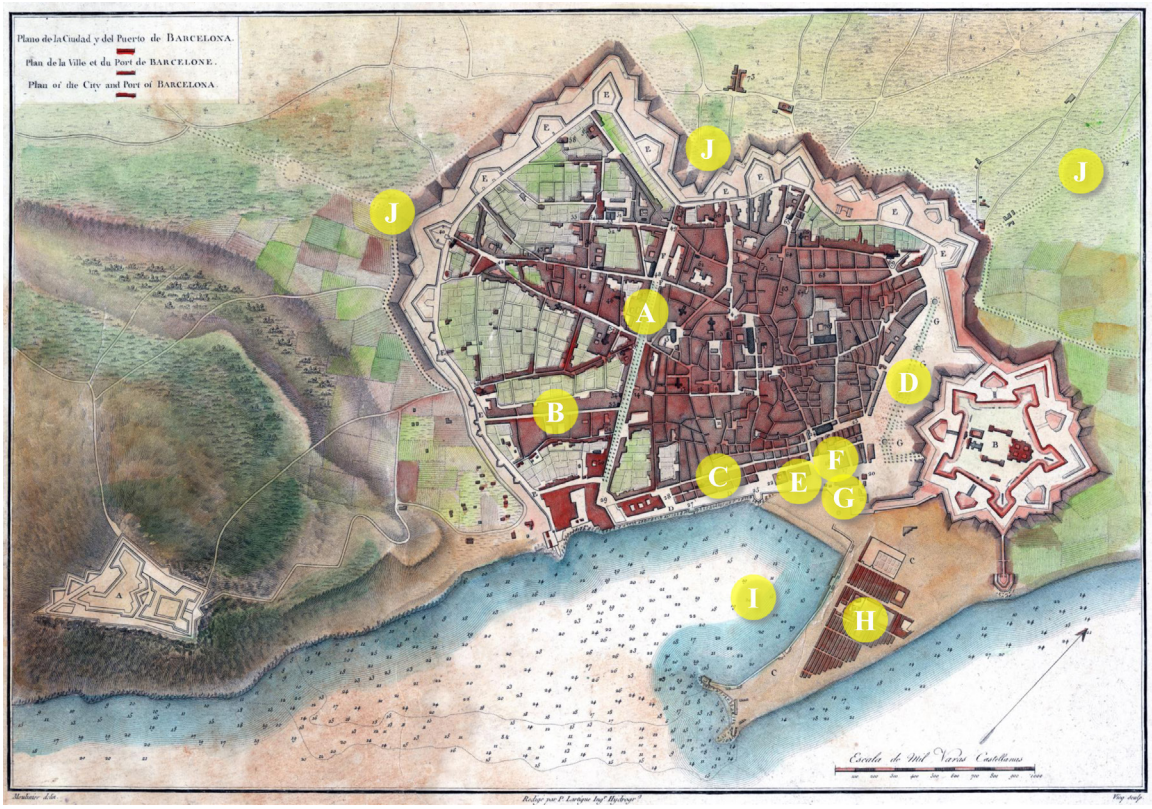

Figure 6. Manzano, Juan Serafín (1814) 'Plano y Vista de la Ciudad de Barcelona, y su puerto. Fue ocupada con engaño por las tropas del Tirano Napoleón Bounaparte, estando en Paz y unión con España, el día 12 de febrero del año de 1808 y permanecio bajo el Yugo de estos hasta el día 30 de Mayo del precente año de 1814 que fue entregada á las tropas Españolas' (detail). Archivo General Militar, Madrid. Cartoteca Histórica, B-36/20. (Highlighted reference numbers by Muñoz Corbalán).

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done on the information found in the French *Archives de l'Inspection du Génie* because of the continuous link between both monarchies. Contemporary treatises on military engineering and fortification are also a solid basis for the research.

Conclusion

Like most contemporary European cities, Barcelona's urban evolution during the 18th century depended on its character as a constrained stronghold inside a walled perimeter. The city underwent several interventions which tried to increase both its defensive capacity towards the outside and its restrictive character concerning the urban interior.

Approaches used by military engineers in order to carry out the suggested projects respected many of the consolidated postulates used in treatises on poliorcetics and permanent fortification, both from the theoretical and practical point of view. However, the socio-economic development run by Barcelona from the mid-eighteenth century helped to transform the closed and repressive vision of the city and gave way to a series of actions that changed the hierarchy of some centers of power and, consequently, the own urban form. It also allowed the contemplation of an incipient urban opening towards the surrounding space, both territorially and in its maritime projection3.

Notes

1 This text has been developed within the framework of the R & D project "El dibujante ingeniero al servicio de la monarquía hispánica. Siglos XVI-XVIII. Ciudad e ingeniería en el Mediterráneo" (The draftsman engineer at the service of the Hispanic monarchy. 16th-18th centuries. City and engineering in the Mediterranean), ref. HAR2016-78098-P (AEI/ERDF, EU), funded by the Agencia Estatal de Investigación (Ministerio de Economía, Industria y Competitividad of the Spanish Government) and the European Regional Development Fund (ERDF), of which I am a researcher.

2 Precauciones que convendria tomarse en el recinto de una Plaza [Barcelona] quando hay recelo evidente de infidelidad en los naturales, y que pueden ser corregidos con escarmiento si llegar à perder la obediencia al Rey. Anonymous, 1774. Archivo General Militar, Madrid. Catálogo General de Documentos, 3-2-10-4.

3 Relacion de la Plaza de Barcelona en que se manifiesta el actual estado de las obras de defensa, sus avenidas, y pahís que cubre, con otras circunstancias que se expresan. López Sopeña, Antonio. Barcelona, March 30, 1803. Archivo General Militar, Madrid. Catálogo General de Documentos, 3-2-10-11.

4 This text becomes a first stage of several more specific investigations that, also integrated in the project HAR2016-78098-P, will deal with 'Los proyectos de mejora poliorcética de Barcelona durante el siglo XVIII entre la teoría y la fantasía' (Poliorcetic improvement projects for Barcelona during the 18th century between theory and fantasy) and 'La Aduana de Barcelona y la transformación del entorno urbanístico de la Plaza de Palacio a finales del siglo XVIII' (Barcelona Customs and the transformation of Plaza de Palacio's urban environment at the end of the 18th century).

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A first approach to the possible urban form of the city of Alcoy for the 21st century

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Abstract. *The will of Modernity to define and decide the urban form has been truncated by an endless succession of conditions related to land ownership and the many ways of justifying compliance with all kinds of rules that elude the question about form. The consequence is that they provoke a distortion of reality by blurring the entity of the city and its position in front of history.In this sense, the drift and banalization of urbanism has been directed by the bureaucratic criteria of an administration that, with or without technical knowledge, makes decisions that impact on the urban form but without acquiring commitment or responsibility towards it. The urban form is at the mercy of the local building legislation, of the road or the shape of the plots susceptible or not to be built. Irremediably, the resulting urban form, achieved both in an active and passive way, evidences the error of the procedure because it reveals an operational ignorance of the context, of history, or simply of the faith in progress. From the shelter of thought that represents the discipline of urbanism we introduce a series of urban solutions for the city of Alcoy that correspond to a possible urban proposal bounded in the time of the XXI century. This study aims to have a view of the urban form and urbanist order for the city of Alcoy and its territory under the premises of understanding both the inherited city and the needs of the new generations committed to a possible future.*

Keywords: industrial city, urban project, sense of citizenship, urban things, territorial laws.

The city in the territory

The city of Alcoy stands on the valley of l'Alcoia, the valley is governed by the law that emanates from its rivers and adjacent lands. The Molinar river, with a steep hydraulic elevation (3%) and the Riquer or Barxell river, with a more gentle slope (1.5%), join to form the old Alcoy river, now called the Serpis river.

The valley of l'Alcoià results from the intersection of the rambles and banks of the three rivers. With an average section of 50x400 m the east-west breeze is responsible for keeping the valley clean of pollution.

Topography

Dealing with this inherited topography, the city is stabilized through the definition of a service plan that includes the old village and urban sprawl between levels 525 and 540.

This plane is so dominant that the morphological unity of City would not be comprehensible without it. Establishing the city's reference plane is as much as affirming its scale, its routes and its urban perception as a continuum.

The service plane obviates the planimetric discontinuities between the channels and the layout of the streets as the bridges provide the necessary connection to sew the banks and distract us from that discontinuity. The coherence of the bridges joining the streets produces in its inhabitants the perception or the feeling that the city is a continuous whole.

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Figure 1.
View of the new Y shaped Viaduct bridge that connects Viaduct and Northern zone. ©VVV

Axis and service planes

In 1847 Joan Subercase, with an enlightened vision, traced the straight axis of the Alameda from San Roque church to the Merita pool as a decidedly modern proposal, becoming 30 years later in the regulatory axis for the expansion project of Alcoy that gave rise to the idea of the service plan of the city.

Consequently, when making the road from Játiva to Alicante in 1861, the bridges of San Roque and la Pechina were built in order to maintain that service plan of the city. As these works were funded by the State and the decision of straight alignment involved expensive bridges that were avoidable by going around the ravines, the City Council assumed the cost difference in anticipation of a safe repayment for the future of the city. This decision was physically translated into the main axis of the city with a length of almost two kilometers and was the basis on which the geometry of the 1878 extension of the city was drawn. In a city with so great topographical differences the only way to catch sight of the new century was through the collective consciousness of that regulatory plane interpreted under the sign of the air.

Poposal for the XXIst century

Bridges

For a city heiress of this know-how, the union of the Viaduct neighborhood with the North neighborhood is proposed through a bridge that links the lower end of the Viaduct walk and the middle height of the Northern zone through a double connection: the extension of Andalusia avenue and l'Escorxador street.

Andalusia avenue is an axis that vertebrates the north zone along with the Hispanitat avenue. The node where both avenues converge is of enormous importance for the future of the city because it offers a straight opening in direction and height to the highway. L'Escorxador street connects directly with Gil Albert avenue and is configured as the natural extension of the local walk along the bridges.

Tours

The walk along the bridges offers a daily perception of the city, less distracted than the mere anecdote and as structured as a habit. The bridges belong visually and organically to the street system and so any new bridge

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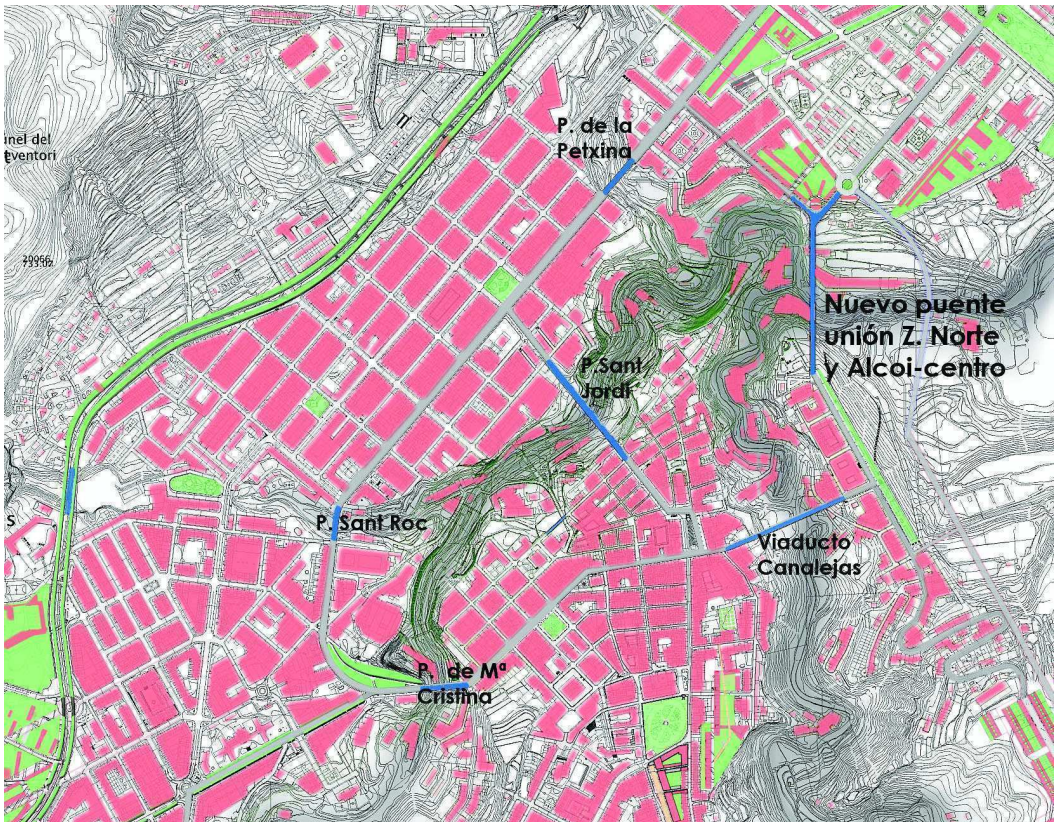

Figure 2.
Plan of the city showing the relation between the bridges and the two possible tours along them that pivot on St. George's bridge. ©VVV

must accept the street character of the bridges in Alcoy. Understanding the development of the city as a continuous fact the traditional walk along the bridges is extended with a second circuit that would be formed by the St. George's bridge, Canalejas' Viaduct, the new Y shaped Viaduct bridge and Pechina bridge. This second ring offers a new territorial image that unifies city and valley. Finding the meaning of the city is a task to be taken up again. We must maintain the relation of this complex modern creation, the industrial city, with the physiocratic heritage that still shows itself in the surrounding territory as a whole. The current city still clearly shows through its industrial character the importance it had when in the nineteenth century it was maintained and adressed by a solid industrial culture.

Industry.

The industrial activity of the city was started when the general systems for production focused on the generation and channeling of energy, access and the availability of useful land near the places of residence. In this way the industries of the Molinar ensemble could take advantage of the hands given by the force of the water. The order of the hydraulic wheels and the factories were subordinated to the territorial order under the sign of the water and they found a peaceful form of rest between the works of the man and the nature. In Alcoy the primary order of the distribution of water was established as a foundational principle of its identity.

Due to the dispersion of the industry in the city there must be an indexation of the industries that develop activity not only in the industrial sectors but also in the historic center so that the transfer of those that lose competitiveness because of its location and accessibility can be grouped through a more evolved territorial organizational model than the mere delimitation of a sector.

This higher order organizational stage consists of a ring that interweaves all industrial areas currently scattered and disconnected

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Figure 3.
Articulation of the industrial lines in Riquer Alt, Sant Benet alt, Molinar and Pagos. ©VVV

amongst them. This articulation of the different industrial sectors consists of an industrial line with an extension of half a million square meters of industrial land that connects the West an South entrances of the city. The line begins in Batoi, in front of the existing Serpis factory, goes through Riquer Alt offering a new way out to Sant Benet sector, then slopes into the mountain until it reaches the dismanteled railroad of the now called Green path and follows it until the Sports zone. With a new detour it gets to the southern entrance of the city and from there it can either slope down with a 5% ramp into the Molinar area or connect with the generous Pagos area and, exiting to the highway, with the Northern side of the city.

Territorial laws

"Man produces rules, nature is governed by laws. Without the knowledge of the law, without the feeling of the law, nothing can be done. Nature produces both. The mind desires things and defies nature to produce that which expresses the inexpressible, the indefinable, the inconmensurate, that which has no substance, love, hate or nobility. The mind wants to express everything but it can't do that without an instrument. The law is the builder of the instruments. We should all consider rules modifiable and laws immutable." Kahn, 1961:4 Territorial laws are permanent and show the relationships between topography, roads, rivers, waterfalls, sources and channels as elements that make up a place beyond its immediate usefulness. Other less obvious laws are within a complex order that, concealed in history or latent in the atmosphere of the place, can give rise to a formulation of the principles governing the disposition of industry and urban units. In the project of the city it is necessary to establish rules that allow to incorporate the sense of the laws to the urban order. Everything is broad and distant in the law, but through the rules, when enforcing them in the field of the construction of the city, everything gets accurate.

Accepting the laws that give rise to the shape of settlements in the territory, the rules that decide the territorial morphology are subordinated to the principles emanated from history, geology and topography.

City and territory are inseparable. Therefore, when the new route of the north highway is incorporated into the territory, it should be used in favor of the altogether image, maintaining and extending the service plane, visually gaining the valley and approaching the distant traffic of the highway. It is also necessary that the city takes advantage of the road access to gain an additional territorial level. In the urban scale the city-highway connection must provide a clarity that revitalizes the urban structure, improving the streets, avenues and gardens that belong to the everyday use.

The display of a territorial network as the variant of the highway to Alicante has to be able to be assumed by the industrial city as a positive value articulating a new axis of access to the Northern zone and revitalizing both the access to the Cotes Baixes industry and

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Figure 4
View of unbuilt Northern bridge defining a horizontal service plane of the city. ©VVV

the arrival at the hospital. The creation of the new bridge as the northern access respects the valley and affirms the level of the service plan of the city giving continuity to that particular atmosphere that the bridges generate.

In that step of territorial adaptation we find an old user of the valley in the railroad. And it would reinforce the regional vocation if the health infrastructure of the hospital could be served by such an efficient transport. The modernization of the railway in the city should evaluate the transference of the tracks to the level of the middle plane of the city for its modal interconnection with the bus station and its real approach to the citizen.

Institutions.

The general hospital is configured as a health institution that marks the role of a city of regional relevance because no other institution has the power to bring in together such services and specialized jobs. Its optimization and updating necessarily influences the quality of life of the inhabitants and their expectations as social beings within a welfare project. The existence of a hospital is not understood without the collaboration of research institutes attached to the center and in connection with other institutes throughout the country. To have the possibility of increasing the services of this institution implies the solution of a clear accessibility and a foresight of space in continuity with the existing infrastructure.

Given the specific weight and the relation of immediacy between the transport center and the sanitary complex, the institutional vocation of Al-Azraq square needs a unitary project that integrates gardens, edification and free spaces. The set of courts, treasury, general archives and municipal library can find their precise setup in this location, coexisting with a hybrid program of homes, offices, shops and kindergarten.

The University as a social operator of knowledge also needs historical memory. For this reason the rescue and reuse of abandoned structures gives notice of a continuous progress of the society. The models of restoration of the Molinar ensemble, beyond the direct reference to the museum, have the capacity to generate shared spaces that serve for the study and the transfer of knowledge as well as to facilitate a type of multidisciplinary contact that is the basis of the creative knowledge.

The modern research and development units not only need large laboratory units but also a transversal theoretical support that is the engine of the advances and the progression in the search of the knowledge. Support spaces are needed in the daily working environment of researchers, which facilitate alternative and autonomous discussion routes that do not involve a much more complex and expensive research process. For this purpose it is extremely useful that the landscaped environment of the buildings that host the lines of research and development can be an invitation to the walk and the conversation between experts.

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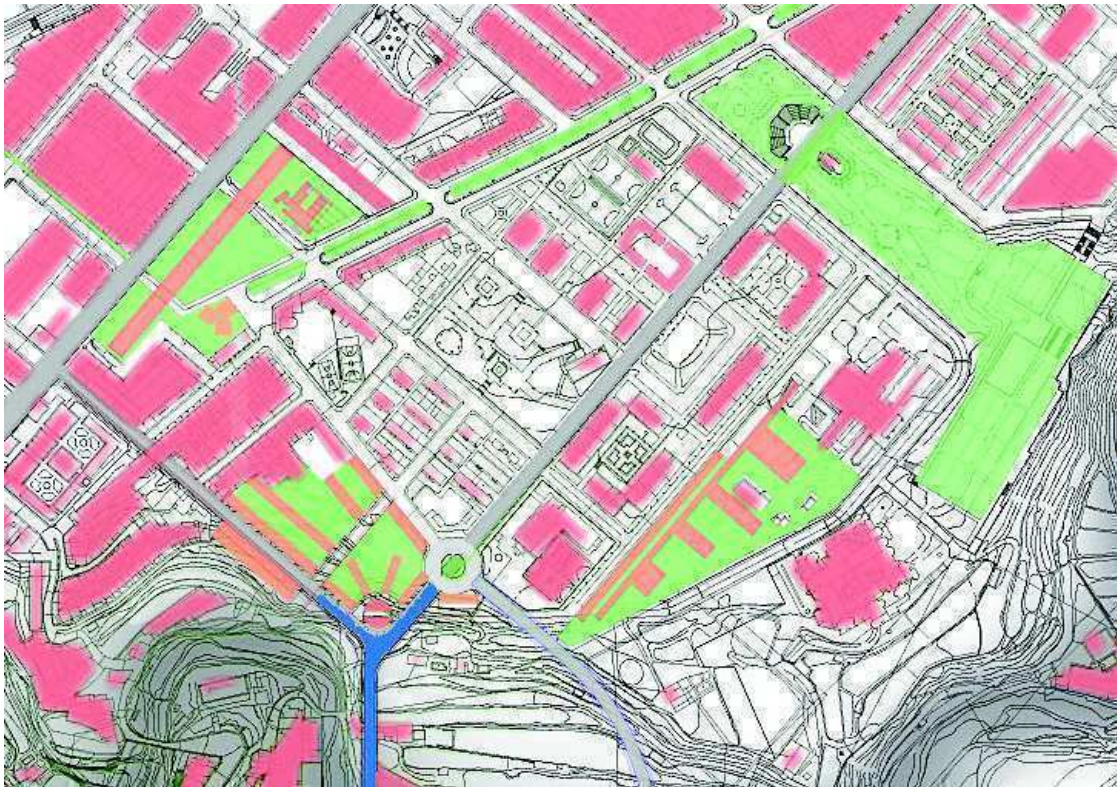

Figure 5.
Plan of the Northern zone with Al-Azraq square, the Hospital an the new Y shaped Viaduct bridge. ©VVV

Housing

"The irresistible need for order is the highest mission of the civilized man... But in the aggregations of houses the sense of order is still seriously compromised by many barriers that oppose to a complete and perfect geometric realization". Pagano, 1938

The city of Alcoy, as an industrial city, has grown by accepting the menestral house and transforming it into working-class housing to accommodate the growing labor demanded by the industry. The urban form depends on the geometry to grow adding layers of coherence to the city, so this is the modern condition necessary to tame the overwhelming force of expansion of the city.

The city of this century must accept its territorial heritage, preserve paths and give a renovated coherence to the road structure, propose a rational plan of architectural rehabilitation of the historic center, improve its welfare values by updating existing dwelling buildings and accept the commercial vitality of the streets as an urban event of strong dynamism.

New growing sectors must develop alternative types of housing that are sensitive to the concept of essentiality inherent to the human being in full opposition to the stale program of real estate markets that reduce to the absurd the sense of a house with surface numbers, number of rooms, compliance with regulations and other common places that exclude excellent project openings for fear of what is not codified. The incorporation of the concept of life into the open and a social demand for more space at a price not increased by speculation should be extended to social housing of new construction.

Conclusion

A current analysis of the latest interventions in the city reveals how far they are from that rational certainty of a century and a half ago in the progress of civilization. Instead, the dictates that decide the shape of the city do not come from an intellectual base or an attentive look to

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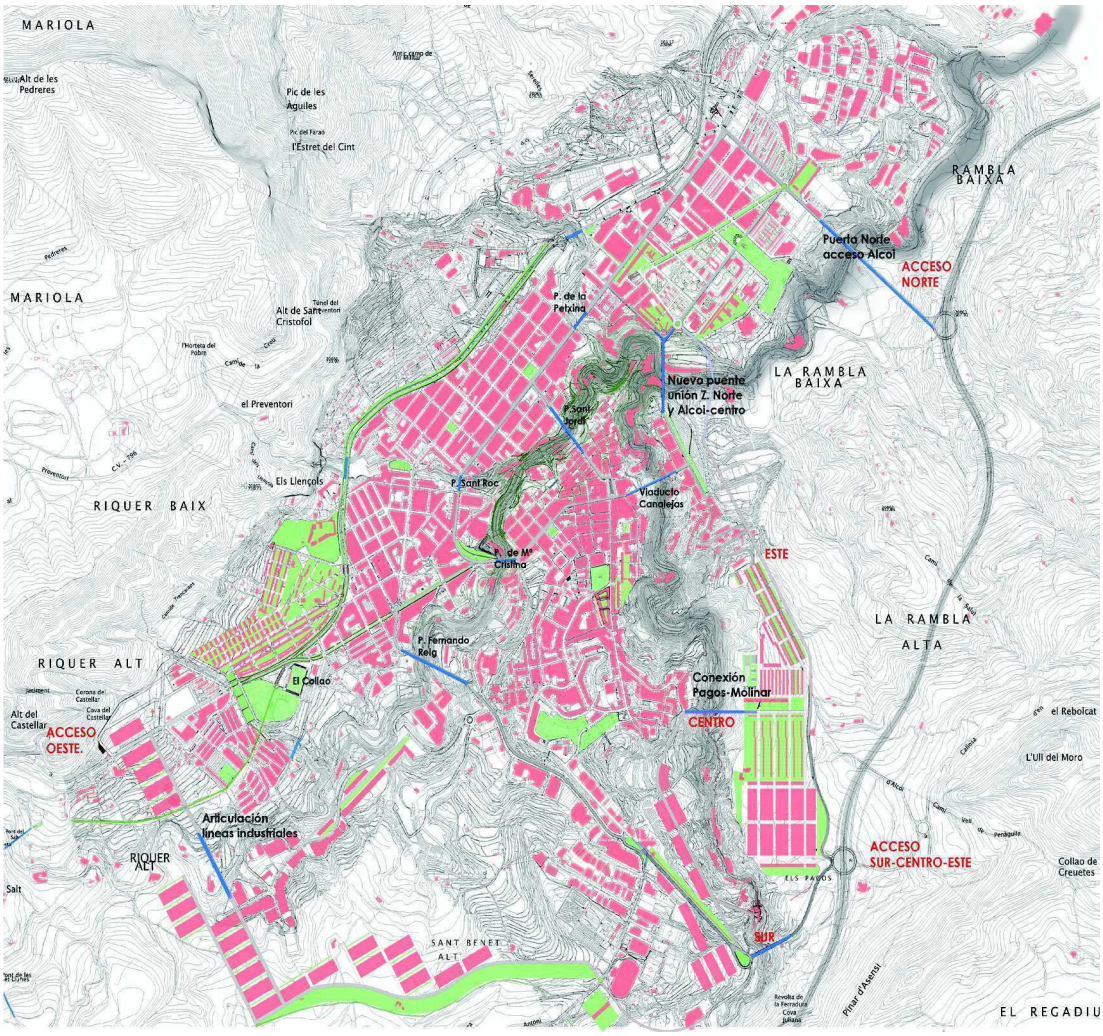

Figure 6.
Plan of Alcoy with the proposed extensions of the city. ©VVV

the future. There is only an urbanistic prejudice linked to the registration of property and a fanatical conviction in the opportunity offered by the short term with a disturbing disregard for the dire consequences of decisions that are merely banal.

It is necessary to make a reading of the city trying to collect that theory felt by the conscience of the citizens and that made possible the growth and transformation of the industrial city. For Rousseau the individual could only acquire the sense of citizenship if he first rebelled against himself, acting as his own antagonist in order to adopt the general interest of the community. Lighted by this moral principle we can interpret the formal principle of the city. The primal forces that shaped it are the key to evaluate the guidelines that will make the city a coherent organism not depleted by isolated interventions that mortgage its future.

Knowledge about a discipline as complex as the city's urbanism is nourished by observation and attentive conversations around the multiple layers of reality. This must be interpreted from very calibrated points of view in order to be able to see what, obviously, goes unnoticed. The concepts that Solà-Morales bequeathed to us are linked to the way of understanding that the materiality of the city is necessary to verify the meaning of things and also to be able to follow the meaning of history. The urban form perceived by the citizen starts from the reality of the urban object. Thus corners, sidewalks, streets, squares, institutions, etc. are inserted in the idea of urban things where architecture seeks to accommodate idea and reality.

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The search for a coherent line in the city planning is a multi-scale problem. It assumes a principle of subordination where the traces belong to a logic of different scales that are present in the insertion of the gardens, the industries, the presence of its Archeology, or a corner, or the macroform as a territorial overlap. To a great city, a great form, in this way we can interpret New York or Cerdà's hypodamic urbanism. The urbanism of Alcoy is not only an act of interpreting its bridges, streets and alleys. There are traces in their territory to think of a favorable future, traces that are already induced and that need a careful observation to distinguish and propose them as rules that help us to show the interrelations between the paths, roads, bridges and neighborhoods. Everything is written in the territory and it is the task of urbanism to decipher its signs... Therefore, beyond a detailed description of its components, it is preferable to show through the iconic language of images the scope of an inductive system of propositions channeled through drawing, propositions that serve as a guide to think of that favorable future for the anonymous settlers of the territory of l'Alcoià.

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Research of the morphological types of urban blocks in the old city of Nanjing

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Abstract. Research The block is one of the basic elements of urban space and its morphology is always changing due to the accumulation and substitution of constructions in different times. This article has taken the old city of Nanjing as an example to study the characteristics of blocks in old urban areas in China, where top-down plans and practical constructions remained conflicted in the long history of development. Extensive studies of relevant literature, quantitative researches and graphic analyses have been adopted to meet the research aims. This research has produced a number of key findings: at the scale of the whole city, the grid of streets tend to deviate from the boundaries of morphological homogeneous districts or, urban landscape units; blocks in the old city of Nanjing usually contain all or part of several different urban landscape units, which can be divided according to construction times and land-use types; the morphological difference of blocks can be presented by the different urban landscape units contained and the configuration pattern, so in this way the classification system of blocks has been discussed; some regularity has also been concluded regarding the transformation of block morphology.

Keywords: Nanjing, old city, plan unit, urban block, morphology

Introduction

This paper aims to investigate the features of blocks in the old city of Nanjing, which is on the base of urban morphology theories. Within urban morphology, a common feature in the definition of built form is the hierarchical structure of elements and the fundamental elements of built form include streets, plots and buildings. (Karl, 2013) Conzen, Caniggia and Maffei, Castex and Panerai are the representative scholars who have developed the concept of the compositional hierarchy within the typological approaches to urban morphology. They have identified elements of different levels in the hierarchy from different perspectives, but the position of urban block remains ambiguous.

As an urban morphologist in the field of geography, M. R. G. Conzen established some historico-geographical methods to describe and interpret built form, which are very important to the morphological research on urban blocks in this paper. Conzen proposed the idea of “form complexes” which includes ground plan, land utilization and building form as three components of the morphological character of an urban area. (Conzen, 1960) He established a hierarchy of morphological divisions to show unitary areas of the three basic form components, among which the ground plan generally determines the major units of the hierarchy, or to say plan units. And the identification of the building, plot and street was proposed by Conzen as the principal elements of the “plan unit”. Meta Berghauser Pont and Per Haupt have discussed the relationship between plan units and blocks in a city, however, there is some incompatible

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when adopting that theory to analyze Chinese cities.

The form of a city could be observed, analyzed and described at different scale levels. Generally speaking, researches on urban morphology in China started very late in the 1980s and since then most of them have focused on the scale of a region or a city as a whole. There are some researches on mediate or micro scope discussing problems in ancient towns, but only few about current situation in urban area. Liang Jiang and Sun Hui discussed the transformation process of city form, especially of street and plot patterns, in central urban area, which is very helpful for us to understand the form of city blocks in China. However, the phenomenon of juxtaposition of different patterns was not discussed in depth.

This paper studies on the old city of Nanjing, namely, the area within the city wall constructed in Ming Dynasty, because the area with its rich historical accumulation is a perfect example of old urban areas in China. A variety of literary and cartographical sources, such as "Nanjing chenghsi guihua shi" (Urban Planning History of Nanjing) and "Jianguo yilai Nanjing chengshi kuozhan yanjiu" (Urban Growth in Nanjing since 1949), provide important information on the city development.

Methodology

To study the morphological types of blocks, this paper takes urban landscape units as a reference. An urban landscape could be interpreted as a mosaic of urban landscape units, which is the product of the combination of plan units, land use units and building form units according to Conzen's idea of "form complexes". Those units divide the city into many areas with homogeneous forms which could be explicitly recognized. Therefore, the principle and method to delimit the urban landscape units has firstly been established. Then the landscape units in the old city of Nanjing has been identified and mapped on the base of the geological information collected, including the construction periods and land use types of different areas. After that, the morphology of blocks has been studied on the scale of "superblock" divided by main streets, according to the urban landscape units contained. This research has focused on the situation of China, morphological characters of blocks, such as the relationship between the grid of blocks and the delimitation of urban landscape units has also been compared with existing theories in the western world.

City development and morphological periods

The capital city of many feudal dynasties in Chinese history was in the area of Nanjing and the built-up area scope kept changing due to the regime changes. The history of Nanjing City could date back to 472 B.C., when the king of Yue State built a City called "Yue" in the area of today's Nanjing. In 229 A.C., the king of Eastern Wu moved the kingdom's capital to the area of Nanjing and named it "Jianye". The city of Jianye was divided into two parts and the northern part was named "Jiankang" in Western Jin. Then in 317 A.C., "Jiankang" became the capital of Eastern Jin. After that, the Southern Dynasties (420-589), namely, Song Dynasty, Qi Dynasty, Liang Dynasty and Chen Dynasty, all established their capital in Jiankang one after another. After Chen Dynasty was defeated by Sui Dynasty, there had not been a capital in the area of Nanjing until the king of Southern Tang moved the capital to "Jiangning Fu" in 961 A.C. In different periods before Ming Dynasty, the city of Nanjing had kept mutative in terms of the boundary and the city structure.

It was in Ming Dynasty that the fundamental framework of the old city of Nanjing was established. Nanjing for the first time became the capital of the whole country in 1368 A.C. It was the only quadruply-walled capital in history, with four layers: a palace city, an imperial city, a capital city and an outer city. (Lei, 2016) The capital city was encircled by a city wall built in Ming Dynasty, which has been preserved in a great measure. The city continued the layout of Ming Dynasty and the constructions kept the traditional technique and pattern before 1864, when Taiping rebellion was suppressed by Qing government. After 1864, the introduction

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of modern civilization began to bring about changes to the city form and constructions. In the year of 1927, the Nationalist Party installed the Nationalist government in Nanjing and then the city experienced comparatively stable development mainly led by the Capital Plan in the following decade, until the Second Sino-Japanese War broke out in 1937.

After successive warfare from 1937 to 1949, the People's Republic of China was founded. Nanjing experienced a period of rehabilitation in which the old city was getting more replete with massive constructions on industrial buildings, institutions and government buildings. In this early socialist period, a kind of enclosed self-reliant compound called "Danwei" largely leaded the new constructions of the country. The Third Plenary Session of the 11th Central Committee held in 1978 proposed policies of reform and opening up. As a result, the economy system of China began to transit from planned economy to market economy. Moreover, a constitutional amendment in 1988 made the usufruct right of land a kind of property right and can be transferred, leased or mortgaged. (Food and Agriculture Organization of the United Nations, 2004) This policy actually came into force in Nanjing after 1992 when the "Notice on the relevant matters concerning the compensated use of state-owned land" was issued by the city government. (Yi, 2016) That means the replacement and new construction in the old city could be realized in larger piece of land with more regular shapes by a payment. Therefore, real estate development and renovation of the old city began to flourish in the 1990s.

Morphological periods, as Conzen proposed, refer to the periods during which large numbers of similar forms are reproduced. All the three components of "form complexes", ground plan, building form, and land utilization, derive their character from the historical and cultural context at the time of their creation and adaptation. (Whitehand, 2009) Ground plan is the form complex most resistant to change over time and thus becomes the most complete record of the urban form of different morphological periods. Therefore, the distinctiveness of morphological periods provides a basis for the plan units to be divided. Liang Jiang and Sun Hui divided the city centers in China into four patterns: traditional pattern in feudal period, colonial pattern in early modern period, planned-economy pattern and new pattern in modern period. (Jiang and Hui, 2007) Such a division could roughly summarize the types of morphological patterns in Chinese cities, but a more detailed periodization is needed for urban landscape units to be delimited in the particular city of Nanjing. Important turning points in history which greatly influenced the city landscape are picked as the border of the six morphological periods:

Traditional period: before 1864
Early modern period: 1864-1927
Nationalist Government period: 1927-1949
Planned-economy period: 1949-1978
Early reform period: 1978-1992
Market-economy period: 1992-the present

Urban landscape units in the old city of Nanjing

As mentioned above, there is a hierarchy of urban landscape units according to Conzen's researches. The ground plan generally determines the major units while land utilization and building form are respectively the second- and third-order standard for subdivisions within form units. To reveal the morphological characters of blocks, this paper mainly investigates the relationship between blocks and the urban landscape units defined by the combination of plan units and land utilization units, because these two components determine the fundamental differences between form units at a mediate scale. The smallest-scale units generally determined by the form of buildings are not discussed in this paper.

The ground plan of an urban area is characterized not only by the time when the area was formed but also by the time when important reconstruction projects were conducted. As for the core areas of a city, the pattern of the ground plan usually reflects some characters of ancient times when the area was formed, even though the buildings may have been replaced. That is because urban development usually

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tends to take use of existing streets with some modifications in certain parts and building constructions are at many times limited by the existing streets and plots. However, the adaptations of a certain area could sometimes make it completely different from the original one, especially in Chinese cities where the land-use system was subverted in the 1980s and the street and plot patterns of many areas were greatly changed. The periods in which different urban areas were formed and adapted have been taken into consideration. On the one hand, the urban expansion of Nanjing City has been examined and then the built-up areas in each morphological period have been mapped. On the other hand, the time information of major constructions for current blocks has been gathered and separated into five morphological periods. The mapping of areas constructed and adapted in each morphological period has been compared with built-up areas in different periods. (Figure 1) It has been shown that, before 1864, the urban development was mainly constrained in the south of the city. After the port in Xiaguan was opened at the end of the 1890s, new commercial area and port area began to be built in the northwest of Nanjing. During the "Nanjing decade" from 1927 to 1937, the backbone of a new street system was built, starting from Xiaguan port, passing Xinjiekou area and leading to the east. New constructions took place along these roads. Starting from 1949, constructions extended further to the east and north of the city, taking use of the vacant land inside the city wall. The old city was largely replete before 1978, except some areas on the fringe. Then in 1992, new constructions were almost finished. After that the city experienced massive reconstruction mainly due to the real estate developments, while previous reconstructions to the built-up area just happened in a piecemeal way.

Figure 1. City expansion compared with construction and adaptation in each morphological period

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In this paper, plan units are delimited by the morphological periods in which the main streets and buildings of an urban area were constructed or adapted. Therefore, the current city could be firstly divided into five parts, numbered I, II, III, IV and V, and the corresponding construction periods are respectively 1864-1927, 1927-1949, 1949-1978, 1978-1992 and 1992-the present. Thus the plan units has been delimited theoretically, although the morphological differences between these units need to be further analyzed.

Apart from the morphological period, the morphological characters of an urban area are also influenced by the land utilization. Conzen pointed out the indirect contribution of land use pattern to the intermediate ranks of regionalization of Ludlow, through its individual elements adhering to the plot pattern and its broad land use zones. (Conzen, 1988) It was also demonstrated that the land utilization is subject to so many changes in history that it essentially represents the urban form of the recent period. This paper adopts the present land use classification in the city planning of Nanjing to do the second-order delimitation of landscape units. The Urban Land Use Classification and Standard for Development Land Planning (GB50137-2011) divides urban development land into eight patterns: residential area (R); administration and public services area (A); commercial and business facilities area (B); industrial area (M); logistics and warehouse area (W); road, street and transportation area (S); municipal utilities area (U); green space and square (G). Since the aim of this paper is to study the morphological characters of blocks, only the intensive construction areas of the old city has been observed. Those areas mainly include four categories, namely, residential areas (R), administration and public services areas (A), commercial and business facilities areas (B) and industrial areas (M).

Then the plan units could be subdivided by these four land utilization categories with the help of GIS spatial analysis tools. The summary of the urban landscape units are listed as following:

I-R: residential areas (before 1864)
II-A: administration and public services areas (1864-1927)
III-R: residential areas (1927-1949)
III-M: industrial areas (1927-1949)
III-A: administration and public services areas (1927-1949)
IV-R: residential areas (1949-1978)
IV-M: industrial areas (1949-1978)
IV-B: commercial and business facilities areas (1949-1978)
IV-A: administration and public services areas (1949-1978)
V-R: residential areas (1978-1992)
V-M: industrial areas (1978-1992)
V-B: commercial and business facilities areas (1978-1992)
V-A: administration and public services areas (1978-1992)
VI-R: residential areas (1992-the present)
VI-M: industrial areas (1992-the present)
VI-B: commercial and business facilities areas (1992-the present)
VI-A: administration and public services areas (1992-the present)

Morphological characters and types of urban blocks

Block has been defined by American Planning Association as an area of land bounded by a street, or by a combination of streets and public parks, cemeteries, railroad rights-of-way, exterior boundaries of a subdivision, shorelines of waterways, or corporate boundaries. At many times a block is surrounded by streets, but it is unclear what kinds of street should be regarded as the boundary of city blocks. In China, there is a hierarchy of streets constituting the whole urban street system: expressways, primary streets, secondary streets and local streets. Main streets including expressways, primary streets and secondary streets are effectively controlled by city planning while many local streets may form spontaneously and lack later regulation. The idea of "superblocks", proposed by John Peponis, refers to the areas defined by a higher order network of major streets or thoroughfares. (John, 2015) Those main streets define an explicit grid of superblocks, which are subdivided into smaller blocks by the minor

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streets inserted. This idea provides a new view for the research of this paper that dual scales of blocks should be considered in response to the hierarchy street system. Rivers and green lands with notable barrier function are also taken as boundaries of adjacent blocks. Thus the intensive construction areas are divided into 76 superblocks, while large green areas or other open space are excluded.

It is obvious that the boundaries of urban landscape units intersect the boundaries of blocks mainly consisting of the street network. (Figure 2) That is different from the situation described by Meta Berghauser Pont and Per Haupt that the urban fabric consists of a collection of islands with homogeneous form, as well as the network that surrounds these islands and is required as access to the islands. (Berghauser Pont and Haupt, 2009) As a result, the area within one block may actually include parts of different form units and one urban fabric is usually separated by the street network. To better understand the distribution and aggregation regulation of urban fabric, the following part is focused on the relationship between superblocks and landscape units.

Considering the plan units contained, which are distinguished by construction periods, most superblocks could be divided into the following categories according to the primary morphological periods: early modern period, Nationalist government period, planned-economy period, early reform period and market-economy period. But some superblocks cannot be simply classified because they contain different plan units of the equivalent area. In the present plan of the old city, most superblocks have been reconstructed in part or whole from the year of 1992 to the present, except several blocks on the fringe. The reconstruction areas tend to be irregularly distributed within one superblock. (Figure 3)

In accordance with the dominant land use unit contained, the superblocks could be categorized into residential blocks, administration and public services blocks, commercial and business facilities blocks and industrial blocks. The only industrial block (No. 51) is under transformation so there is actually no large-scale industrial area inside the old city. Superblock No. 47 is the only one block completely occupied by commercial and business facilities. At many times commercial areas locate on the edge of superblocks, along the main streets. Therefore, the two main categories are mixed residential blocks and mixed administration and public service blocks. (Figure 4)

After mapping the urban landscape units, which is the combination of plan units and land use units, morphological configuration patterns of superblocks could be concluded. There are mainly two prototypes of superblocks, although in fact many superblocks are complex and may have the features of both prototypes. One type of superblock is evenly occupied by several large landscape units, such as the No. 30 superblock. This superblock is composed of residential areas in the west and northeast, constructed mainly in the 1990s, and gated work units in the middle and southeast, formed in the early 1950s and reconstructed in the 1980s and 1990s. Another type of superblock is dominated by one kind of fabric with some little heterogeneous units mixed in it. Those little heterogeneous units mainly including commercial and business facilities areas and administration and public service areas are usually distributed along the main streets and thus form a ring-shaped area surrounding the interior area. The No. 38 superblock is one example of this type, with several gated residential communities in the middle and groups of centralized commercial and business buildings on the edge. However, in the "Laochengnan" area, which is in the very south of the old city, many public facilities tend to be located along Qinhuai River. Those landscape units form a ribbon-shaped area crossing the superblocks. For instance, the superblock No. 75 is one superblock with Qinhuai River going through. It contains a large swath of traditional residential areas on both sides of the river and two narrow strips of land with small-scaled commercial buildings along the river. (Figure 5) In ancient times, this part of Qinhuai River had a lot of traffic so many commercial or cultural buildings were built beside it. Now the river has lost its transport functions, being a landscape element inside the superblocks, but the land use layout has remained.

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Figure 2. Urban landscape units and urban blocks

Conclusion

In this paper, the relationship between urban landscape units and city blocks of two different scales has been studied, in order to present and analyze the form of blocks in an intuitive way. City block is one of the basic elements of city planning and management, connected with the city structure at the macro level and also with buildings at the micro level. It is very important to understand the morphological characters of blocks in the present urban environment. The research has been conducted in the old city of Nanjing, where the city transformation in history has made the landscape with great complexity.

Based on the townscape research method mainly established by Conzen, the intensive construction area within the old city of Nanjing has been divided into 16 kinds of major landscape units. The division of landscape units is a comprehensive classification of homogeneous urban area in terms of ground plan and land utilization. The comparative study on the landscape units and the grid of city blocks has revealed that the boundaries of landscape unit usually deviate from the network of streets. The idea of "superblock" has been introduced to study the regulations of distribution and aggregation of urban fabrics. Considering the land utilization, most superblocks are mixed residential blocks or mixed administration and public service blocks. Finally, two configuration prototypes of superblocks have been found and the simplified diagrams could help us understand the complex form of city blocks.

This paper is a basic research on the block forms in the old city of Nanjing, as an addition to the existing intermediate-level morphological researches in China. Although studies on the specific morphology of landscape units and quantitative analyses on different types of blocks are likely to continue to be meaningful contents of the follow-up research, this research has not only offered a reference for the interpretation and description of urban blocks, but also established a foundation for the method exploration of urban development in China.

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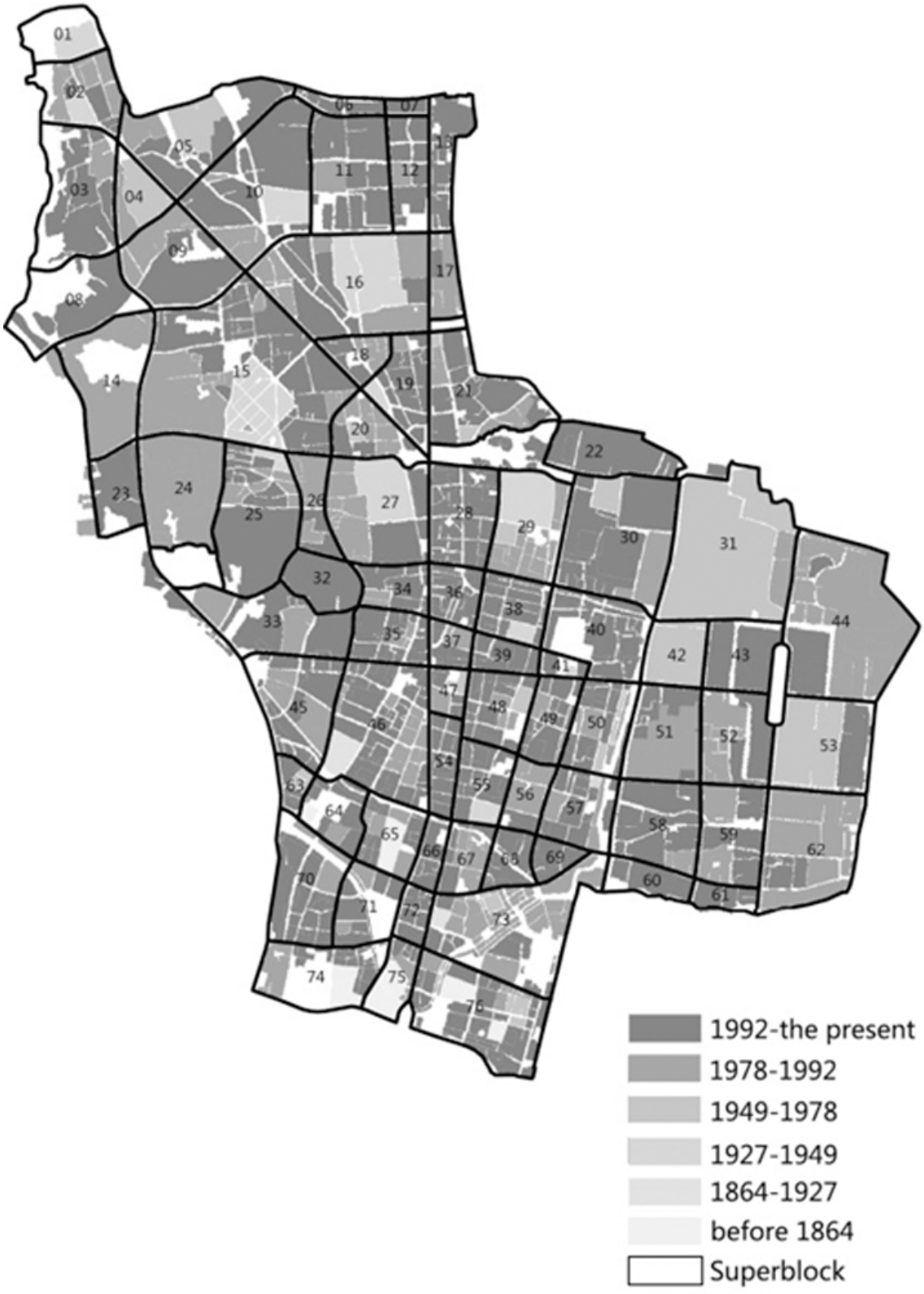

Figure 3. Plan units of different construction periods and superblocks

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Figure 4. Land use units and superblocks

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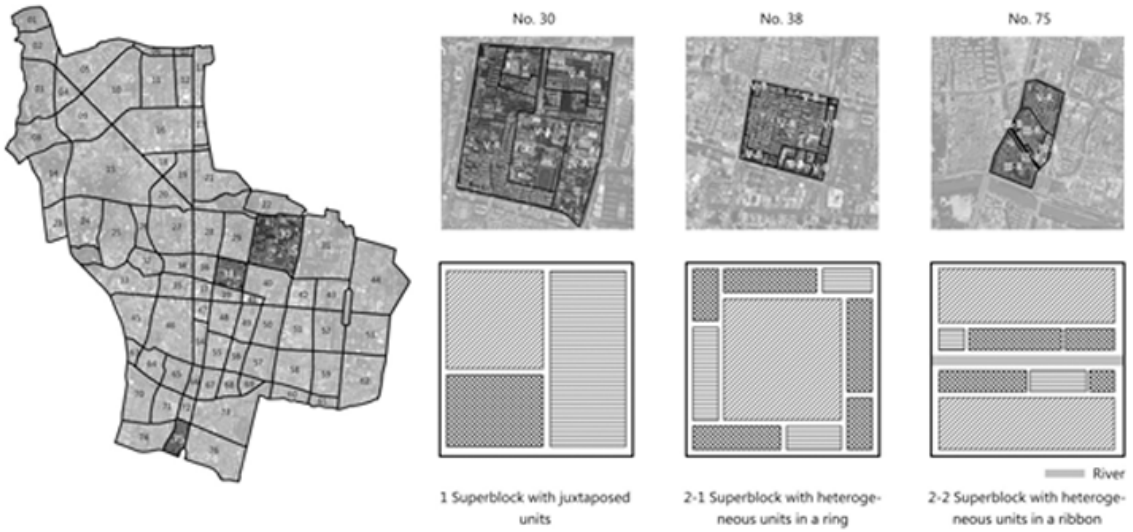

Figure 5. Prototypes of superblocks

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Second life of great American parking garages: Exploring the potential of adaptive reuse of urban parking structures in the American cities

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Abstract. *Research The structure of American cities has been greatly influenced and transformed with the onset of the car culture and its ever evolving impacts to the everyday life of American people. The early 1900's experienced a noticeable growth in the demand and need for automobiles resulting in the increasing need for parking spaces in the city. However, better public transit options in downtown cores; growing public awareness of reducing automobile dependence in order to address issues of sustainability; advancement in autonomous vehicles and demand-based traffic management, all are making existing parking garages obsolete and useless. The era of designing cities as if car access alone was sufficient appears to have ended. An opportunity lies where the existing underused parking garages can be repurposed into residential, entertainment, or work spaces. This paper examines three past projects that have converted existing urban parking garages to other uses around the world. It then analyzes their design and construction approaches and discusses the implications of this* type of conversion to the urban form of the areas surrounding these projects.

Keywords: Parking garage, adaptive reuse, automobile, building repurposing, retrospection.

Introduction

The structure of American cities has been greatly influenced and transformed with the onset of the car culture and its ever-evolving impacts to the everyday life of American people. The early 1900's experienced a noticeable growth in the demand and need for automobiles resulting in the increasing need for parking spaces in the city. Eventually, multi-level parking garages were built to suffice this requirement of the ever-growing city (Mohl, 1997). However, increase of parking spaces around urban fringes; raise in gas prices; better public transit options in downtown cores; growing public awareness of reducing automobile dependence to address issues of sustainability; advancement in autonomous vehicles and demand-based traffic management, all are making existing parking garages obsolete and useless (Andreotti, 1995). The era of designing cities as if car access alone was sufficient appears to have ended. An opportunity lies where the existing underused parking garages can be repurposed into residential, entertainment, or work spaces rather than paying up for demolition and construction costs of an altogether new structure. It can be projected that this technical and architectural retrospection of existing parking garages can prove as a catalyst in resolving existing issues of the city.

This paper traces past projects around the world that have attempted to convert existing urban parking garages to other uses. It then analyzes their design and construction approaches and discusses the implications of this type of conversion to the urban form of the areas surrounding these projects. Our initial investigation concludes with an analytical framework that includes the following criteria:

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type of garage structure; vertical circulation and ramp configuration; material and construction method; floor plan arrangement; size in relation to block and street orientation; surrounding area condition in terms of land use and street network. Furthermore, implications of garage conversion to urban form of surroundings can be examined by these measures: remediation of building façade; alternation in setback between public right of way and building footprint; change in active usage along building frontage.

A brief history of urban parking garages

Transportation has always been determined as the backbone in the evolution of cities. The convenient facility of private means of transportation such as cars and motorcycles has predominantly occupied the long connecting tendons of cities. Since Progressive Era in the early twentieth century, parking structures and garages have been added to the urban fabric in American cities. Eventually, parking garage has turned to be one of the universal structures, which knit together and address some of the irreplaceable essentials of a city such as transportation, sustainability, and architecture (Guiney, 2001).

Unlike other man-made elements in a city, parking garage has been adding up to the problematic dilemmas of architecture and urban fabric of a space. While serving as an absolute accommodation to one of the user-friendly, dependable, and undisputed mobility factor, it also creates a huge vacuum in a city thus pressing down the marks of modern car culture. It is the need of ever-growing car culture that has given rise to the dreadful unwelcome spaces, which push this technological dependency into human societies' daily routines (McDonald, 2012).
Dedicated to the technology, user needs and specifications, the parking garages have always been circumscribed by the parameters related to design, engineering, and construction. As the technology took its pace in the twentieth century, many new urban forms and spaces started evolving by setting the parking garages as the foundational elements. However, it would not be wrong to mention public parking as social spaces as they provide an alternative identity and functionality of it. The invention of car ultimately gave birth to the exceptional blend of architecture and exclusive motorized shelter space, which added a new term to the configuration of modern architecture. Adhering to the traces of history and rendering its compatibility with different influential factors of function, style, aesthetics, engineering and urban design, the parking spaces have gained a significant voice in the regulatory city plan (McDonald, 2007; Smith, 1988).

These emergent parking structures in the modern American cities have been under the knife for incorporation of innovations and experiments before the turn of the twentieth century. Employment was one of the factors that influenced the arrival of nearby inhabitants thus lashing in the problem of overcrowding. Soon when the mechanical replacement was invented, it brilliantly cancelled out the environmental factors linked to the animals-powered transportation. At the same time, it offered a reasonable access to the peripheries of the city, which still occupied a major part of the country. In the end of nineteenth and the beginning of twentieth century, the downtowns started emerging as powerful social, commercial and business districts thus turning into an indispensable part of the evolving city. The uptown part of cities however remained as the residential and domestic part, which stayed interdependent with the core downtown area (Jackle and Keith, 2004).

The invention of steam engine and electricity proved to be a turning point in shaping the fabric of the city as it connected two extreme extents of a city within lesser or equal amount of time. An organized change in the module of the city was observed when home and work got diverged in uptown and downtown areas respectively. The concept that residential places could be placed away from the workplaces in downtown rendering a high real estate value set forth the path for horizontal development of the city. Even though the automobiles strengthened this separation, it was observed that the horizontal growth induced social isolation, traffic congestion, environmental, financial as well as land use burdens in the city vibe. The birth of parking garages was

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essentially triggered by personal automobiles, which required a place for shelter. Not only has the parking space formulated as a crucial public-use building type, but it also points to issues related to social and environmental factors (Wormster, 1997).

In the making of sustainable environments, which acknowledges the scale of an individual as well as the city, vital and repurposed urban forms need to be planned as options to drive in city transformations. Those aging urban parking garages ought to take their fair shares and find ways to morph themselves into a more sustainable form of urban amenities.

A shifted paradigm – repurposing parking garages

After the World War I, parking structures essentially began to take a major role in the American landscape. They became a necessity to the city. Surface and garage parking both occupied a substantial area of the downtown of almost every city. The multi-story cage garage came with the rewards of open deck system which had no maintenance and construction costs thus making it an attractive system for parking developers (McDonald, 2007).

In the early 1950's three primary ramp systems came into use, including spiral, continuous opposed, and modified split level. There was an increasing need of spaces near the downtown commercial areas with walking access to shopping districts. It was generally believed that this downtown parking crisis was practically unsolvable without simultaneously tackling the issue of mass transit. However, parking garages continued to be built with new construction systems thus making them more efficient to fit into tight urban sites (Klose, 1965).

A trending fashion in the parking industry for the last decade in downtown, urban or educational setting included some type of mixed use in new projects where retail is located on the ground floor where an interaction area could be created. It was estimated that the inclusion of this retail on the ground floor could greatly influence the design from the typical standalone garage typology. Several types of parking garage came into existence, including single level parking garage where just one floor serves the purpose. The multi-storied parking garage has multiple floors to park with connecting ramps and/or lifts to move from one level to another. The underground parking garage, mostly located in the city centers where there is not much of space to build a parking facility, has levels below the ground surface (Martin, 2003; Mayer, 2005).

All parking structures are not the same. They differ in physical characteristics, land value, coverage, boundaries, associations and size, as well as aspects of use, programs and peak periods. They differ also in both the constitutional order and representational order in relation to their potentials to enrich public space. On any given site, the combination of typologically specific strategies for each attribute will invariably result in a unique and comprehensive design strategy. Just as parking structures vary by type, so must strategies to improve and convert them into different uses or physical forms (Macht, 2014; Marshall, 2016). This study intends to identify effective ways in which urban parking garages can be converted or repurposed to other uses. To do so, this study employs case studies to examine three projects both in and outside of the United States. Each case has attempted to convert existing urban parking garages to other uses. The goal is to analyze their design and construction approaches and discuss the implications of the resulting conversion to the urban form of the areas surrounding these projects. The case studies are focused on understanding their design logics and various construction and engineering considerations, such as existing structure; ramp configuration; vertical circulation; material and construction technique; floor plan arrangement; size and volume with regard to block and street orientation; site configuration in relation to surrounding existing land uses.

Case studies

From Garage to Kindergarten, Berlin:

In 1974, a four-story parking garage was

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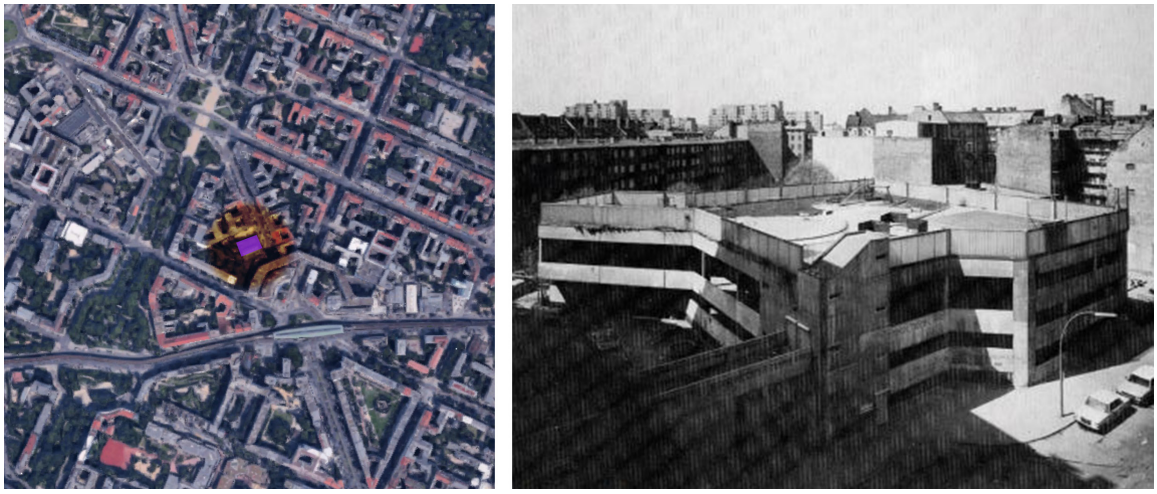

Figure 1. The INA kindergarten is at the east part of the Kreuzberg in Berlin (left). The exterior of parking garage prior to the conversion (right).

constructed in a predominately residential neighborhood in the southeastern quadrant of Berlin. The garage was built to provide parking for a large commercial development that never materialized. After six years of sitting vacant, it was determined that the structure could not be removed. The building continued to take up space in the neighborhood as the residential fabric filled in around it. The empty concrete clad building in the middle of the residential neighborhood quickly became a blight (Figure 1).

A design competition was held, and Berlin architects Dieter Frown and Gerhard Spangenberg were selected to convert the existing parking garage into a kindergarten. The neighborhood needed a school for young children, and the architects saw reusing the garage for this purpose to bring an element of nature and fantasy to the building that would help to counteract the ecological waste embodied in the existing garage, and the waste of space that it had been in the neighborhood for the past six years (Strasse, 1989).

The existing garage was approximately 40 feet tall, and contained 7 staggered half floors. The staggered floors were likely to reduce the vertical distance that needed to be spanned by ramps between each level. There was expected a ramp at each end of the building connecting the floors. The garage had a steel frame structure that was infilled, both floors and exterior cladding with precast concrete panels. The footprint of the building was approximately 125 FT by 115 FT, giving it around 50,000 square feet of enclosed space. The architects' primary design decisions for the building's reuse revolved around sustainability principles. The most important intervention was the insertion of a greenhouse-like atrium space. A portion of the roof and the upper three floors were removed to create a large open light-filled space, covered by a greenhouse-like structure. This atrium space dealt with several of the problems in converting parking structures. Not only did the atrium create double height space within the building, but it also helped deliver natural light into the central portion of the deep floor plates of the lower levels. The glass-roofed structure also acted as a solar heat collector in the cold months of the year, and could be opened to pull stack ventilation effect throughout the building. The building's steel frame structure and infilled precast concrete system made this intervention manageable without the need of new structural interventions and is an excellent example of a desirable system when considering the reuse of an existing garage (Strasse, 1984).

To add to the sense of nature, a green roof with grassy play area for the children and garden and compost area for their education was installed. To provide the necessary depth for larger plants, the architects added a steel lattice screen system to the original exterior of the building, which acted as an armature for plants to grow to the full height of the building while bringing their root systems and the soil they required

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down to the ground where the building didn't have to support the added weight. The original ramps were converted to vertical circulation that took the form of both stairs and a stepped ramp that lent the space a sense of playfulness and engaged the children while they moved up and down through the building (Figure 2). The compact nature of the ramps was again ideal for reuse as they kept most of each floor area level and reusable. Its conversion to an energy efficient, vibrant, educational space for children provided a needed amenity to the community. This example, now 30 years old, highlights the vast potential for making sustainable, humane and desirable space by converting an existing parking garage.

From Garage to Newspaper Office, Paris:
The Liberation Newspaper office is located in Paris on an inner street running parallel to the main street, which takes its path from the place de la Republique, a public square, which lies in a quarter mile radius from the office. The neighborhood context of this newspaper office is quite dense with a set of residential, commercial and retail buildings. Also, the site is reasonably close to the means of public transportation. This internal road, which leads to the office space, is narrow with moderate parking facility thus making it quiet and less busy (Figure 3).

In the early 1980's, a Parisian developer became interested in converting the top five floors of this post-war era parking garage into office space (Ellis, 1988). Patrick and

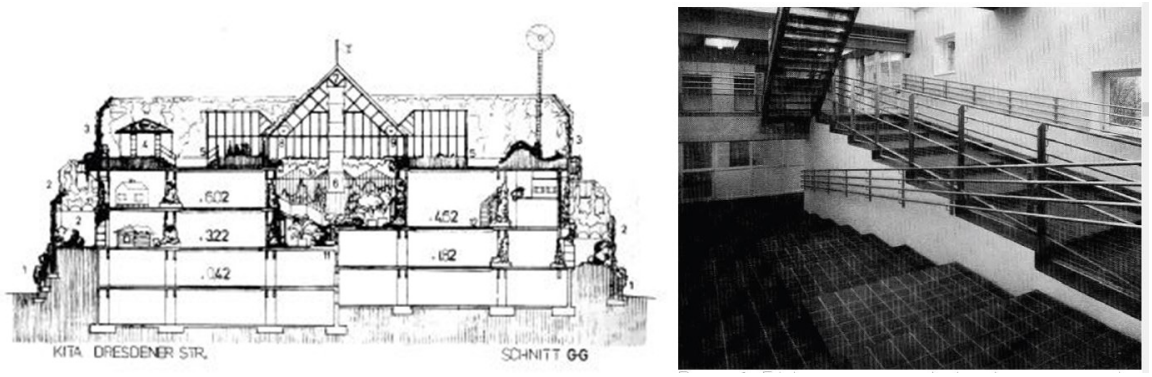

Figure 2. Conceptual sketch of repurposed garage space (left). Existing ramps converted to broad steps for children to play (right).

Figure 3. The Liberation newspaper office is located in Paris on an inner street running parallel to the main street which takes its path from the place de la Republique (left). Conceptual sketch of repurposed garage plan (right).

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Daniel Rubin, of the architecture firm Canal, had a vision for reuse the structure. Their ideas included keeping the curving ramps connecting each level of the garage intact. This was not only important to the developer, as the removal of the ramps would create an insurmountable financial hurdle, but also Canal argued that the ramps could benefit the building's future tenants as well. The French newspaper, Liberation, became the new tenant. Presented with minimal daylight, low floor-to-ceiling heights and pre-existing ramps, Canal attempted to make the office space as open as possible.

The ramps connecting each half floor were kept intact as a physical and psychological link between department offices or workspaces. Wherever feasible, glass was used to partition space. This continued the sense of connection between departments and maximized the limited daylight available. Ultimately, an underused garage with prime real estate at the center of Paris was put to a good use with 58,000 SF of office space (Figure 4).

From Garage to Luxurious Condominiums, New York City:

The luxurious condos are located in New York City near the Union Square Park. The setting of this property is within many mid-rise and high-rise buildings basically of retail, commercial and residential nature. Parsons School of Design also falls on the same axis. This internal road adjoining the site cuts down the high traffic and noise from the main street thus making it accessible to the dwellers around. The street also consists of on-street parking and is one block away from the metro station (Brown, 2011).

With the increase in demand for the parking spaces for cars, Hertz Garage was built near the Union Square in New York City. However, this 1931-built eight storied Hertz garage building started going obsolete as the trend of public transit roared. Instead of demolishing this garage building, developers came up with the idea of repurposing this old structure and planned on to retain it completely with the addition of a new façade referring to the early area (Figure 5). The idea of adding four storied duplex penthouses was incorporated on the top of the building with the retention of few bottom floor garage spaces. This new form of reused space originally has a steel structure thus making it feasible for alteration and creating a townhouse-like appearance. High ceilings, large windows and unobstructed views make this re-adapted space a distinguished one (Figure 6). The topmost unit of this building is listed for a whopping price of $31.5 million. Prices of other apartments start from seven million dollars (Gross, 2013).

The building is featured with 67-foot-wide units with only four columns in the entire space for each of the eight full floor apartments below the penthouses. The neighborhood area would profit from this adaptive use of building as it lies within a busy context of surrounding activities. It influences the demand and character of the surrounding area thus making the building as a

Figure 4. New work space with glass wall to facilitate connections throughout the office and maximize natural light (left). Office space and lobby (right).

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Figure 5. The former Hertz rental site at 12 E. 13th Street in New York City (left). It has been converted to a 12-story, 8-unit development (right).

Figure 6. The duplex penthouse on top of the original garage structure (left). The spectacular view from inside the three-story penthouse (right).

symbolic character (Hughes, 2014).

Discussions

The common feature that could be observed while comparing the three fruitful case studies is the workability of these adapted structures and their response to the user and the surrounding area. As early as the mid 1970's this idea of repurposing an existing outdated parking structure started booming up in Berlin's busiest areas. Similar is the cases in Paris and New York City as well. However, the intended use of these spaces varies greatly as per the needs of the nearby surrounding

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civic/commercial establishments or individual dwellers in the area.

The prevailing site conditions greatly influenced the demand of newer structure in place of the existing parking garage. For example, in the case of Berlin the parking structure was converted to a kindergarten by cumulative voice of the neighborhood area. This new user space in the old rundown structure did not only acquire popularity within the context of the entire city but it also set a path for the many such old and unused types of buildings. Similarly, the office building in Paris was proposed regarding the necessity of the kind of user space anticipated in the neighborhood.

Although there were certain constraints, which proved to be a challenge while manipulating the existing structure for a different kind of use, it was over-powered by the desire of settling with an obsolete chunk of mass to a more substantial set up of a new type of space. In the case of Paris, the existing structure now enfolds the ramps as the connecting space between floors and minds of the people working over there. The case of the third case study in New York City totally differs from the other two where a parking garage is developed into luxurious condominiums. A high end residential place with addition of duplex penthouses on the top suffices the context of New York City. The wide spaced columns however proved as a boon to this project as it allowed more column-free space to roam around. Also, the existing structure is believed to uphold the additional penthouses at the top thus making this project quite unique and camouflaging with the busy and posh streets of the city.

Conclusion

The repurposing of existing parking garages brings about an unanticipated transition in the building industry, which aims towards the new trend of going car-less. The giant mass of parking garages whose sole function is just the storage of cars is a potential form of structure that challenges the outdatedness of it by reusing the same. Eventually it reaches out to the transition in the urban fabric and the society by encouraging better mass transit, involvement of mixed use typology of structures and increasing the density in the urban center. While conversion of parking garages makes use of the embodied energy in the existing structure it also at the same time saves time and money associated with the demolition and erection of a new structure. Perhaps more importantly, these converted structures, instead of housing motionless machines, now are filled with livid souls ready to claim and enrich their territories.

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City-like settlement to industrial city: A case of urban transformation in Huwei township

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Abstract. *City-like Settlement (German: Teilweise Stadtähnliche Siedlungen) (Schwarz, 1989; Sorre, 1952) plays an important role in the course of civilization, especially the development of industrial cities. Accordingly, this study utilizes ground plan (Conzen, 1960) to deconstruct the relationships between industrialization and settlement formation in order to illustrate the common origin of cities in Taiwan as a result of the emerging economy at the turn of the 20th century. The industrial city of Huwei, known as the "sugar city" with largest yields of cane sugar in Taiwan, had the largest-scale sugar refinery in pre-war East Asia (Williams, 1980). The city has grown and transformed with the factory during the four phases of morphological periods, which began at the establishment of the sugar refinery and worker housing in the middle of the fertile flooding plain in western Taiwan. The spatial arrangement was directed to operational and management efficiency, characterized by the simple grids and hierarchy of layout along the riverside. As the industry enlarged, the new urban core was planned to support the original settlement with shophouses accumulated in the small grids. Followed by postwar modernism (Schinz, 1989), the urban planning again extended the city boundary with larger and polygonal blocks. In the fourth phase, however, the sugar refinery downsized, leading to the conversion of the worker housing and the merging of the factory and the city that slowly brought to its present shape. The morphological process results in the concentric structure from the sugar refinery, providing valuable references for the preservation of the sugar industry townscape, and unveils the influence of industrialization as well as the special urban development pattern in Taiwan.*

Keywords: Industrial City, City-like Settlement, Morphological Process, Town-Plan Analysis, Sugar Refinery

Introduction

On the convergent boundary of Eurasian Plate and Philippine Plate along the East and Southeast Asia island arcs is where Taiwan lies. The small and mountainous island is the outcome of the plate movement between the East China Sea and the South China Sea, which has one of the highest population densities in the world in some 36,000 square kilometer land. The majority of the people live in the western flooding plain, where hundreds of cities and towns were established along coastal areas or agglomerated in the middle of the fields. The extensive Jianan Plain is where the crops are grown to sustain the whole island. With its sub-tropical climate, the plain was used to grow sugar cane since the early 17th century as one of the major export goods besides rice. After the Second Opium War in 1860, Taiwan was forced to open trade with western merchants according to the Convention of Peking, which resulted in the bloom of the sugar industry. The sugar production increased significantly in the late 19th century with trading partners from around the world, especially Japan and Hong Kong. The early development of sugar production played the major role in the economic activities in the 19th century Taiwan. The traditional sugar factories were small,

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primitive mills with traditional machinery and facilities that temporarily constructed at the sides of the sugarcane fields and mainly relied on ox carts for the transport (Chang, 2015). However, it was not until the industrialization of sugar factories at the turn of the 20th century that brought to complete breakthrough of the industry as well as new urban forms in Taiwan. The sugar, as the "sweetener" in Taiwan's development (Williams, 1980), has since been indispensable to the island's economy and the important element in the landscape.

In 1895, Taiwan was annexed to the Japanese Empire as a result of the First Sino-Japanese War. The colonial government deemed the sugar as the important economic sources and thus began the modernization and industrialization of the sugar industry. The measures included the replacement of the traditional sugar factory with modern sugar manufacturing plants, the use of steam power or oil power, the construction of sugar railways, and the setting of the system of cane supply region. After the upgrading of the sugar refinery at the turn of the 20th century, the scale of sugar production had expanded as ever before and allowed Taiwan to become the major sugar supplier of the Japanese Empire. In 1939, more than 1.4 million tons of sugar were produced in more than one fifth of the agricultural land. In the meanwhile, the construction of the modern sugar refineries had also brought to the emergence of City-like Settlements (German: Teilweise Stadtähnliche Siedlungen) (Schwarz, 1989; Sorre, 1952) in many parts of Taiwan, leading to dramatic changes of the urban landscape in the Jianan plain.

These City-like Settlements are industrial cities that grow with the modern sugar refineries. They are the settlement forms between rural settlements and cities, which does not largely depend on agriculture as the former nor are they able to provide various functions as the later. The City-like Settlements stemmed from the sugarcane field in a short time and operated as self-sufficient entities. Due to the distinctive background, the City-like Settlements does not share the same development processes with the surrounding small towns, but are the pure results of modern urban planning. The locations are conditioned by the transportation or material needs, which are the planned development on large pieces of available land serving for the particular function. Because of the high demand of workers in the factory, there are usually equipped with dormitories as well as sufficient amenities and recreation services for the workers and their families. They represent the classical industrial settlement in the 20th century in their intimate relationship between the spatial arrangement and the functions, the emphasis on efficiency in the simple grid layout, the limitation of construction techniques of the time, and the clear hierarchy in the forms of dormitories.

One of the most prominent case is Huwei, also known as the "sugar city" with the largest yields of cane sugar in Taiwan and had the largest-scale sugar refinery in pre-war East Asia. The industrial city came into existence shortly after the construction of Huwei Sugar Refinery and the worker housing, which transformed into a commercial city with the development of the new urban core in the 1920s. In the postwar era, the urban plan extended the city boundaries and brought to the restructuring of the industrial city. In the 1980s, the reduction of the sugar production in the refinery again led to the merging of the factory and the city that contributed to its present shape. Today, the traces of the City-like Settlement still embodied in the town plan that show its origin as the sugar factory, which is the interrelationship between the industrial development and the urban landscape. Accordingly, the purpose of this study sets in the revelation of the transformation of the sugar industry in Huwei and its influence on the formation of the industrial city in order to understand the common origins of cities in Taiwan since the 20th century.

Study methods

A study on the ground plans of Huwei was conducted following the systematic analysis of the town plan proposed by Conzen (1960) to identify the characteristics of the City-like Settlement and its transformations throughout the subsequent phases. The empirical study utilized the 1:5000 Digital topographic map produced by Yunlin County Government

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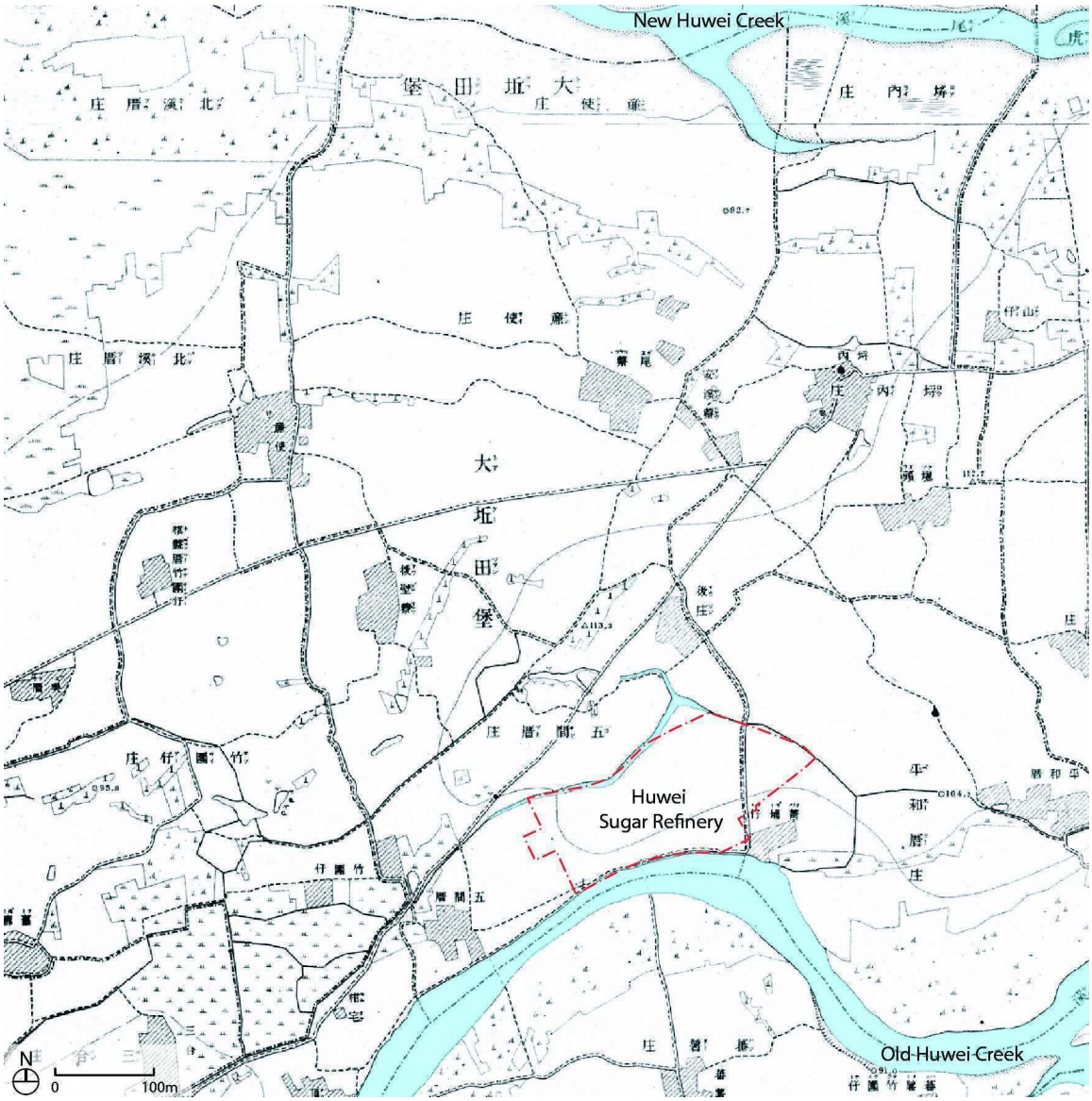

Figure 1.
Huwei and surrounding small towns before the establishment of Huwei Sugar Refinery in 1898 (Center for GIS, RCHSS, Academia Sinica, 1898)

in 2015 as the main source alongside the historic maps and the urban plans from each development phase. A comparison between the ground plans throughout the formative processes of Huwei industrial city provided the important basis for understanding the shaping of the City-like Settlement as well as the planning intervention that gave it its specific industrial characteristic. The emphasis was put the street systems and their spatial configuration, the important infrastructure and land uses to build up the comprehensive image of the townscape of the industrial city. In closer scrutiny, the study took the streets, building types and their arrangements in the blocks, as well as the plot agglomerations to reveal the interactions between the sugar refinery and the city as a result of the transformation of the sugar industry since the last century.

Case study in Huwei industrial city

The northwestern part of Jianan Plain where the downstream of Zhuoshui River, the longest river in Taiwan, runs through is the extensive flooding plain that nurtured the sugar cane fields in Huwei. There used to be several

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small villages in the middle of the fields that connected to each other and relied heavily on the surrounding small towns and the land (Figure 1). Many small towns were formed along the winding streets where the traffic ran through and services were provided (Tomita, 1943). Because of the fertile land and the sub-tropical climate for the sugar cane, many modern sugar refineries were constructed in the nearby regions since 1906, including Huwei, Douliu, Beigang, and Longyan Sugar Refineries successively. The abrupt development of City-like Settlements that came with them had brought to the reshaping of the original landscape that was in no way similar to the existing forms. Huwei, as one of the biggest node in the northwestern part of the plain, had since emerged from the broad and flat sugar cane fields and slowly grown into an industrial city.

Phase 1: establishment of Huwei Sugar Refinery in 1906

Huwei Sugar Refinery (Figure 2) was constructed at the careful chosen site in the middle of the fertile sugar cane fields in Yunlin County, where sugar cane can be transported to the factory within twenty-four hours. Because of the large amount of water required during the sugar refining process, for example, generating steam power, boiling, cooling, and cleaning the sugar, the sugar refinery was thus located between the new and old Huwei creek in the north and south respectively to ensure the supply of water resources (Lin and Su, 2009). In the meantime, a new transport system was set up to allow the easy access of ingredients from the sugar cane fields and transporting finished products to the seaports. Huwei Sugar Railways were constructed accordingly, which was a radial network with its center in Huwei Township as part of the whole Taiwan Sugar Railways system. Between the sugar factory and the sugar railway, as well as in the vicinity of the railway station, the main street, and the post office, the administration offices were erected in order to manage the factory operation.

On the other side of the sugar railway was the dormitory area, which was surrounded by parks, recreation facilities, the school, and the hospital. In order to sustain the daily needs of the factory workers, there were also the shrine, tennis courts, the canteen, the club, the library, and the barber shop in the dormitory area. In its simple (see Figure 3c) and repeating grids, however, a clear difference can be found in the building types of the dormitories that exhibited the ranks of the staffs. Bungalows with large gardens were built for the factory director in the southern end of the area (see also Figure 3b). The building density thus became higher northwards, which were duplexes and four-

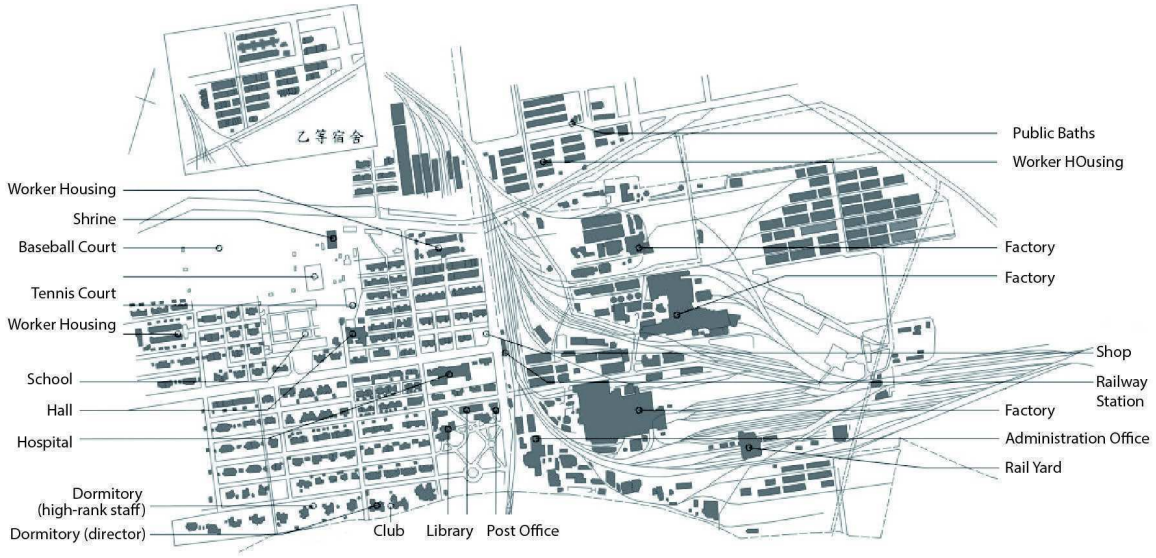

Figure 2.
1906 Plan of Huwei Sugar Refinery in the 1st phase (Xu, 2011:40, fig. 3-7-1)

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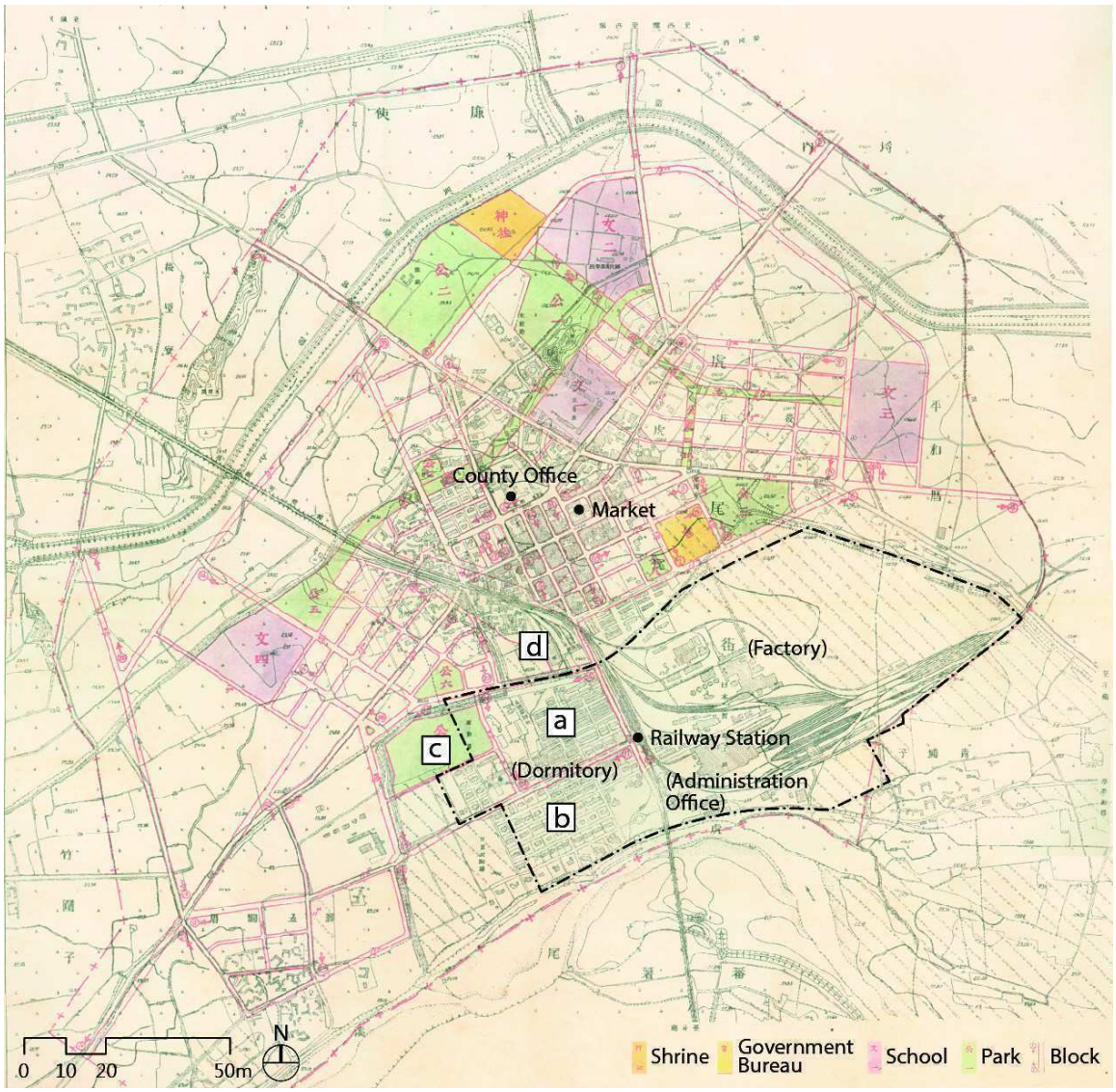

Figure 3.
1941 Plan of Huwei in the 2nd phase (Taiwan Sōtokufu, 1938)

flat houses for lower-rank Japanese staffs (see Figure 3a). In its simple yet hierarchical layout, the establishment of Huwei Sugar Refinery marked the emergence of the City-like Settlement at the riverside in the middle of the sugar cane fields.

Phase 2: early development of the urban core in 1920

After the establishment of the Huwei Sugar Refinery, the area flourished with its rising importance as the regional administrative center and the transport node. In 1920, a new urban center (Figure 3) in the north of the refinery was planned to provide commercial services for the staffs working in the factory. Apart from the usual Strassendorf, or the linear development along the main streets in most of the small towns in western Taiwan, the new town in Huwei did not rely on the surrounding countryside but was designed as a self-dependent urban center that focus primarily on the sugar refinery. Accordingly, the streets were not planned to conform the connecting streets to the surrounding towns, instead, they were laid in the simple grid layout with comparatively small sizes and shallow depths right next to the northern boundary of the sugar refinery. The new city area contained three parts. In the southern part, there were twelve rectangular blocks in sizes ranging

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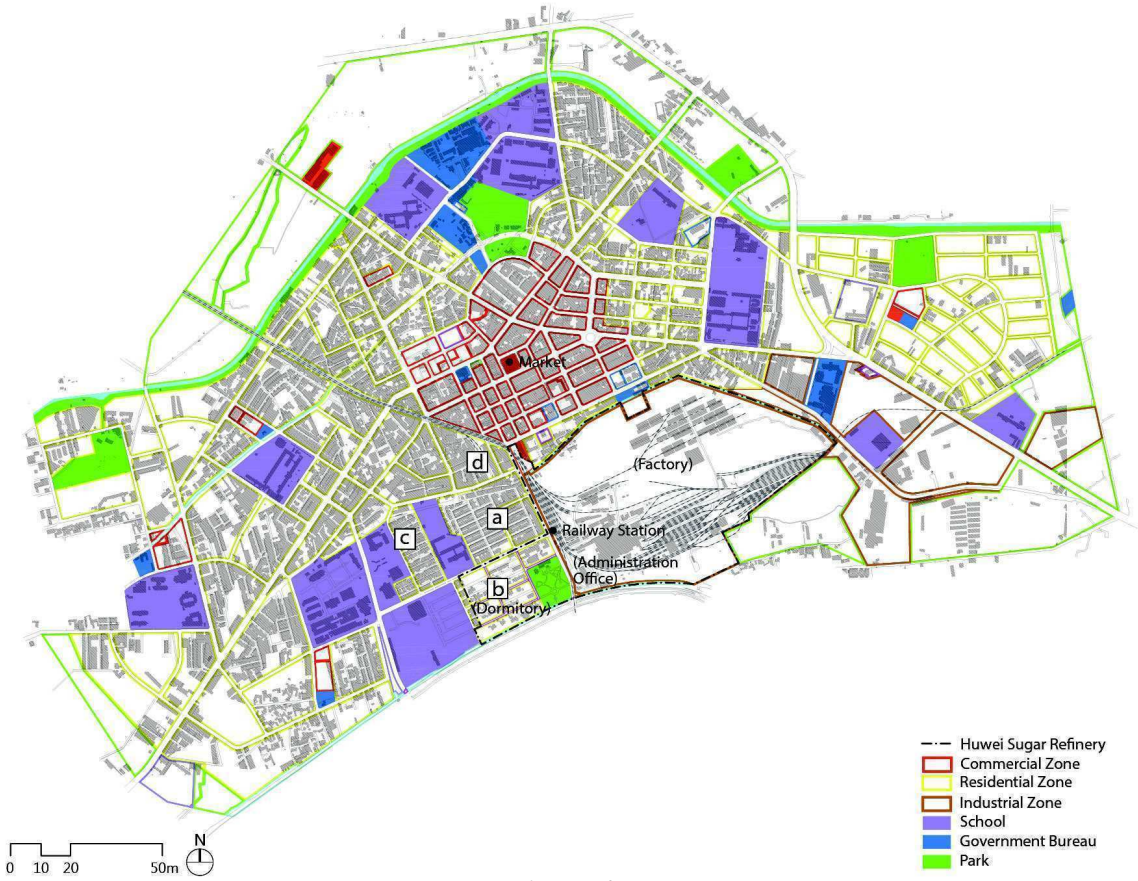

Figure 4.
Plan of Huwei Sugar Refinery in the 3rd phase (Yunlin County Government, 2015b)

from 50 meters by 40 meters to 80 meters by 50 meters that contained mainly shophouses for commercial activities. In the northern part, there were the county office, the market, and government bureaus (i.e. the police office and the fire station), standing at the opposite end of the axis and faced the entrance of the sugar refinery. In the southwestern part of the new urban center (see Figure 3d), the area was confined to the railways and a waterway and was used as the worker housing and the rail yard in the north of the dormitory area of the sugar refinery. As a result of the thriving sugar industry, Huwei quickly took its shape to become a small commercial city. The urban center acted as the service provider outside the refinery to supplement the daily necessities available in the refinery. In 1941, a revised plan was drawn to expand the city area however only a small portion was realized before it was replaced by the new urban plan in the 1970s.

Phase 3: postwar urban planning in 1940s

In the postwar era, the regime was shifted back to China, and Huwei Sugar Refinery was since managed by Taiwan Sugar Corporation (TSC). The sugar production in the factory had remained the systems and processes from the Japanese period on the whole, however the production had reduced annually due to the changing economic environment. On the other side, the city had extended its boundary to the east and southwest side during the 1940s from the original urban core (Figure 4). The new development areas featured larger and polygonal blocks that engulfed the sugar refinery and the worker housing. In contrast to the Japanese urban plan, the new city blocks were not the simple, small grids leading directly to the sugar refinery, instead they were influenced by the post-war modernism (Schinz, 1989) and designed in the more organic patterns. In other words, the new urban

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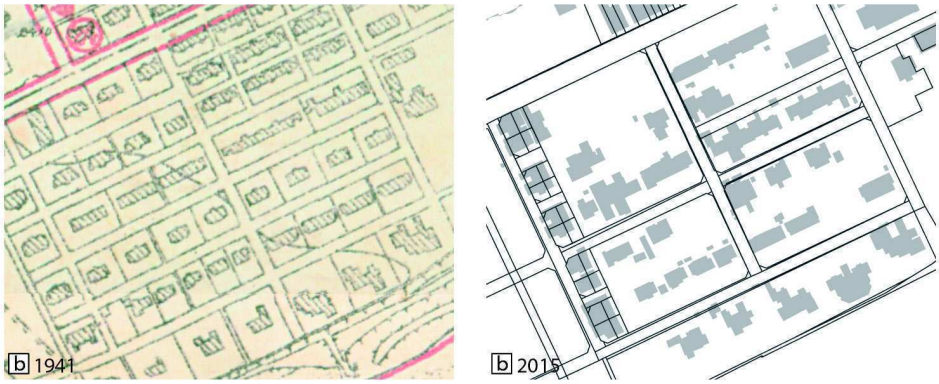
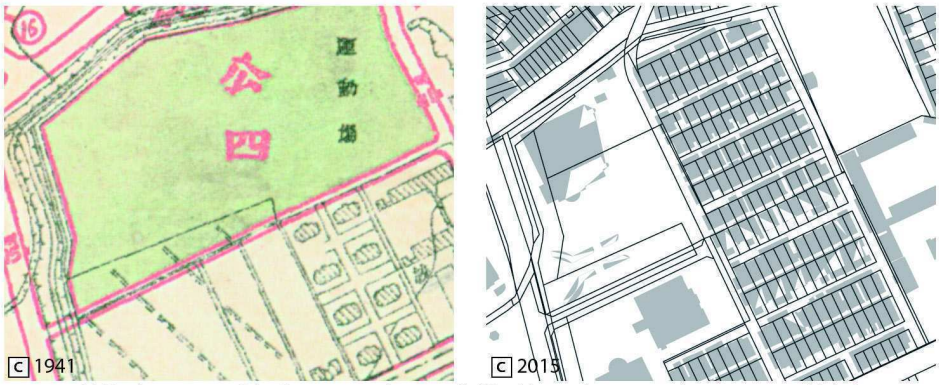
(a) Replacement of the former worker housing (left) with row houses (right) in northern dormitory area.



(b) Replacement of the former bungalows (left) with villas (right) in southwestern dormitory area.



(c) Replacement of the former tennis court (left) with row houses and campus area (right).

(d) Replacement of the former rail yard and worker housing (left) with row houses (right).

Figure 5.
Changes of Huwei city from the 3rd phase to the 4th phase
(Taiwan Sōtokufu, 1938; Yunlin County Government, 2015a)

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plan discarded the compact and centralized grid system of the 1941 plan (Figure 3) and established a more decentralized and diversified system with block sizes ranging 75 meters by 100 meters to some 100 meters by 150 meters, or even larger. Moreover, the new street system turned its center to the roundabout in the east side of the original urban core where several main streets converged, and thus brought to restructuring of the spatial linkages and the eastward expansion of the city area. In this phase, Huwei had completely transformed from a City-like Settlement to a planned city with sizable residential, commercial areas and the public infrastructure that provided various functions and services.

Phase 4: downsizing of Huwei Sugar Refinery and merging with the city in 1980s

Until 1980s, the sugar no longer held the economic importance in Taiwan, and Huwei Sugar Refinery had since downsized dramatically, including the demolition of the northern half of the Japanese dormitory, recreation facilities, and a rail yard. Consequently, these areas became parts of the city and blurred the boundary between the sugar refinery and the city. In closer scrutiny, the conversion of the former factory dormitory had resulted in the replacement of the worker housing with the row houses that were accumulated in the original street blocks and remained the similar urban landscape (Figure 5a). In the western boundary of the remaining dormitory area, the first layer of the Japanese bungalows was replaced with villas, however the traces of the former forms were still visible in their arrangement in the grid blocks (Figure 5b). The former tennis courts of the refinery were also turned into residential zones (Figure 5c) and part of the campus area for National Formosa University which mainly occupies the land of the former Sugar Cane Research Institute in the west of the dormitory area. In the southwestern part of the old urban core, the area had transformed dramatically due to the abandonment of the rail yard and the worker housing, resulting in the fractional and chaotic urban forms as a transition zone between the railways, the waterway, and different street systems, as well as between the city and the sugar refinery (Figure 5d).

In 2015, with the establishment of the high speed railway station in Huwei that brought to the change of location and regional connection and the modification of the former industrial and residential zone of the sugar refinery as the new „sugar industry specialized zone“, the once City-like Settlement has become the key cultural landscape site and thus the main focus of urban planning. The modified urban plan centers on the redevelopment of the sugar refinery as housing and recreation areas while preserving the sugar industry landscape, which is expected to reshape the relationship between the city and the factory once again.

Conclusion

The industrial city of Huwei develops with Huwei Sugar Refinery and shows the intimate relationship in the spatial arrangement between the city and the factory. Today, even though the sugar industry had long ceased in Taiwan, Huwei Sugar Refinery still maintains a small portion of sugar production in its cultural heritage site. Unlike most of the heritage sites, the focus of the modified urban plan is the industrial and residential zones of the refinery, while the original urban core in the north continues to grow at its own pace. The city, however, continues to develope under the influence of the sugar refinery from the earliest urban planning as an industrial city which embodies the uniform grids in the old urban core and the dormitory areas.

In summary, the emergent City-like Settlement and the large areas of worker housing contributed to the initial urban landscape in the middle of the sugar cane fields. Because of its development background, there are comparatively more public utilities and infrastructures in Huwei than the surrounding settlements. In purpose of supporting the factory, a small city area was planned to provide services to the factory staffs which was characterized by the simple grids, spatial hierarchy, and the function-oriented arrangement of facilities. As the sugar industry slowly declined, the city expanded and engulfed the factory, which was the less compact and more organic layout that extended the city to the

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east and southwest. In the last phase, the sugar refinery dramatically downsized and resulted in the conversion and merging of the city and the factory. Nevertheless, the traces of the sugar refinery and the original layout continue to dominate the urban forms in these areas. The townscape of Huwei resonant with the sugar industry, which serves as a classic case of the outcome of industrialization and modernization in the 20th Taiwan. As "sweetener" in Taiwan's development, the sugar industry not only acted as the important economic sources, but also the key influence to the shaping of industrial cities and their subsequent formative processes.

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Urban traces: revitalization strategies for abandoned villages

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Abstract. *Research In Italy today, one can count more than 6000 villages that have been abandoned(deserted) for a variety of causes. This negletc state produces a serious problem related to a wider phenomenon of abandonment of entire portions of italian territories. Realities that differ form the city because of their morphology: Does urban shape represent an urban limit? or is it an alternative testimony to the city?Research purpose is to understand how relationship, between these cases and the territory, works; in particular during the absence of the main component: the human one. The case study Santo Stefano di Sessanio, an ancient village in the center of Italy, inhabited until 90's, shows how the examination of urban shape represents the potentiality of his own revitalization. By relating his historical identity to the scattered hotel projectual approach, it contributes to combine conservation, valorization and sustainability of the existing building fabric, in order to claim the authenticity of these villages declaring their own autonomy and dimension to major urban centers polarization. In this example transformation is meant as conscious project that grow up from the built reality not from the project itself, transformation as knowledge of urban facts, tool to approach to the structure of this reality.*

Keywords: Abandoned villages, urban morphology, scattered hotel, existing fabric, revitalization strategies.

Introduction

The origin of this reflection comes from the realization that man's intervention on the land, his presence, always leaves traces, triggering a process of interaction between anthropic action and the regional system. To talk about this process does not solely entail the issue of time, but also, it opens up to a much complex understanding in which process turns into analysis, reality's reading and design. The core of this theoretical-strategic research lays here. Territory subjected to human transformations, outcome, in turn, of previous modifications; a dynamic reality that draws from experiences in order to create future prospective. Design project then, has to be able to read this intricate weave and carry the new traces that will combine with those of the already existing reality. The action of designing has to follow morphological analysis, whose role is that to study the unrevealed logics of our constructed reality, taking into account cultural, social and political factors.

The case study taken into consideration, that of Italian villages, deals with a reality whose process of construction seems to be crystalized, so much so that it has undone its potential and has been caught in a standoff, with the consequence of total abandonment.

These villages are immersing in the rural Italian countryside, they are sometimes hard to reach, and nonetheless, they have been able to confront a harsh environment. In the course of centuries, they have been able to tame nature thanks to the work of human beings; however, they are now frozen in the time of the "unreal", in the state of total abandonment. To

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consider these realities as a synthesis between territory and human labor allows transforming a contemplative conception of nature into an architectonical one. The etymology of the term ?Architecture', derives from archè e teknè, which intervene in the landscape giving origins to what German architects call Kulturlandshaft, "cultural landscape"1. Within this frame there are the concepts of time, history, and operating history, in which knowledge and architecture identify with reality, as exemplified in the study of the architect Saverio Muratori in the 50s: "This is how it has been possible to include the new into the ancient in a unitary subject: through a process of subsequent integrations where the individual's personality and the spirit of an age embrace the heritage of the predecessors and their past and complete it with originality, thanks to a continuous operation, an endless action towards creation. Such a process is typical of architecture which, is at the same time, a work of the individual and the collective, of art, which is creation and tradition of the culture it comes from, and of life itself, which is always originality and preservation." He goes on as follows: "the anatomy of an urban organism is to be understood and studied in its layout, in its "building fabric", in the way it integrates itself in the environment, in order for it to be developed and interpreted, not distorted." "The transformation of an old urban unit is a venture neither for improvisers, nor for speculators, nor for ambitious ones […] the strictest and most vigilant control needs to be opposed to such strengths, yet, at the same time, a technical, legal and administrative organization needs to be developed for the protection of old urban units[…] and, even before this, a cultural movement among public, scholars and architects that deal with the issue with the aim of spreading interest for the city's history by elevating it to moral value. Without this, legal and administrative measures, even if approved, are not going to be applicable." 2. This setting-out allows restarting from these "unreal" realities, given their estrangement to the contemporary life, in such a way that it is possible to rethink about their revitalization, about human intervention in a way that allows for their continuation in the human and architectonic process, the very survival of this immense heritage.

Urban morphology seems to furnish the necessary tools not only for the analysis of these realities, but also for a conscious and wise intervention on them, thanks to the very fact that it operates through those same essential aspects of cultural landscape: nature and human action. In this manner, the analysis of the urban fabric becomes essentially meta-designing. This dimension is fundamental if we want to operate in a context as complex as that of small rural mountain villages, which have to recover, or better propose again, their identity in the contemporary society. Regarding the role of architecture in this context, Pigafetta, referring to Muratori's work, wrote: "It was not that Muratori wanted to simply propose study instruments for the formation and development of the urban fabric, it was not a matter of detecting spaces of confrontation, more or less dialectic, between "the old and the new", it was not about finding fortunate itineraries for restoration and reuse. It was rather about establishing an "operative" relationship with historical architecture, in such a way that, instead of simply creating the condition to intervene on it, disciplinary norms for architectonic design tout court would emerge, independent from the historicity of the context."3

The historical dimension has to be at the center of architectonical reasoning, not in an exclusive way but rather it is a necessary step to further include the future and essential actions of the architect. This type of acknowledgement will be then the guide for actions of tutelage and safeguard of these realities4.

The study of the urban morphology of these minor realities, blocked in the time of unreality, is particularly interesting if one also wants to investigate on the collective dimension of architecture and its role in contemporary intervention as process in act. Therefore, the case study taken into consideration is useful because the reading of the area has allowed for a further passage, the revitalization of these minor centers through programs that are fully respondent to the needs of contemporary collectivities. It is therefore the expression of values added to the already existing traces deposited on this constructed reality. These

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designs let us read the past, treasure it, and also continue the process in act in these cultural landscapes. Specifically, the idea of sustainable tourism that materializes through the planning of "diffused hotels" allows operating according to what has been said.

"To do it is not more than the means for which we participate to the natural world"5. We can add to these words the term "sustainable", to do "sustainably".

The definition of sustainability implies a vision of globalism, in the sense that it is not possible to understand it as the outcome of technical thinking, attached to the technical performance of a building or, more generally, design. Sustainability has to be understood interdisciplinary, meaning the sustainable doing of man on earth. This is the fundamental premise for a new global society. This conceptual mark intends to use the land, already the protagonist of anthropic action, in a way that accounts for the needs of a society that is more and more driven to consumption.

The principle of consumption per se, more than consumption and reuse, has given origin to a series of episodes that constellate our reality. The scenery of abandoned Italian villages seems to be one of them.

Taken into consideration the past life of these urban sceneries, one realizes that a sort of balance between nature and human labor governed them. To restart from these settlements, whose abandoning shows the paradigmatic change in post-industrial societies, means attempting to re-establish this lost but necessary balance.

This new conception of global sustainable society needs the return of those forms of territorial living.

Obviously, the recovery of the villages has to be reasoned and measured according to the needs of a new society, since rural lifestyle does not apply to places that have been abandoned precisely because of the negation of this rurality. However, architectonic design can intervene thanks to the subtle formative logics of these settlements, in order to carry new values, or better, re-discover those forgotten values that have been left together with physical places. These realities are in fact witnesses of building, social and cultural traditions that run the risk of being forgotten by contemporary society, because they are attached to specific weather, habits and local materials. Once one recuperates these aspects, revitalization comes through sustainability, because it answers those same dispositions of the local scenery that once sought sustainability as the solution to everyday problems, the only possible form of survival.

The theme of revitalization in these minor historical centers of immense heritage becomes a strong necessity once the identity of the place is strengthen by the rethinking of the villages in terms of economic, social and architectonic development. Identity and cultural values should be at the center of the strategies for recovery. Moreover, to interpret this recovery in terms of economy and tourism is also extremely contemporary. The National Observatory of Tourism accounts for the growing importance of integration between tourism and local realities: "According to the WTO (World Tourism Organization), cultural tourism represents the moving of people for cultural scopes, such as study holiday, live shows, festivals, cultural events, visits to archeological sites and monuments, and pilgrimages. Cultural tourism also involves the pleasure of plunging into local lifestyle and everything that constitutes its identity and character."6

In 2010, the plan "Europe 2014-2020" has been approved. It states: "In line with the new priorities of the European Union, as established in "Europe 2020", and for the purpose of maintaining the European primacy of main global tourist destination, the Commission proposes a new plan of coordinated actions for tourism on the EU level for the purpose of strengthening competition and sustainable growth for European tourism."7

In the "European Pact Villages 2020" will be taken into consideration, especially the strategic importance of giving value to abandoned villages through tourism as engine of growth and territorial development in European countries.8

According to Istat results, small districts9 (less than 5000 inhabitants) are 5693. This is a generic classification, since many of

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these municipalities are included in this case study records, which deals with those villages that with the advent of modernity have been gradually abandoned. Villages have a specific morphological structure: there is a square, households around, a fortification and a market. This structure was fundamental for survival in the medieval period, and it furnished those conditions of historical and cultural integrity that have collapsed with industrialization. This happened because of the exclusion of small-scale rural economy from the necessity of a society that was going through a process of rapid development. During the IIWW aftermath, these lands have seen the gradual fading away of vitality. The 50s have in fact seen significant modifications in the relationship between people and land, caused by the industrial revolution and the development of transportation. The importance of a given residential area begins to depend on the infrastructural networks it has to offer to its hinterland. The rail system represents the measure of this capacity. During the 60s, the economic boom in Italy also raises the demand for households in big cities, with the consequence of abandonment of the rural world. Cars become the best way to move, together with the development of roads. This, in turn, exasperates the attitude towards small historic centers that are difficult to reach and lack those characteristics that the modern world needs.

These ghost towns start constellating the national territory. Abandoned villages maintain their untouched characteristics as if the clock has stopped. This implies also the progressive erasing of their cultural and social connotations. Better, their desertion does not imply that the heritage disappears, as they surely deteriorate but remain intact and untouched, but the custodians of their memory are human beings, visitors, inhabitants that with their fruition allow the reactivation of the historical memory of places.

The study of this situation is not exhaustive in terms of both general knowledge and architecture. Researches were made by public organizations such as Legambiente e privare, gruppo Norman Brian. 10

It is a study conducted by Confcommercio-Legambiente, "Italy and dwell's disadvantage" 11 , that reveals the actual conditions: "If in 1996 "dwell's disadvantage" hit 2.830 municipalities, in 2006 there were 3.556 of them, with the prospect of 4.395 in 2016 (one very two) and 1650 ghost towns, risking extinction". To continue with the analysis of studies already conducted, the group Norman Brian has some saying on "Ghost Towns": "the project was born out of the observation of a common phenomenon in Italy; the death of villages and villages primarily involves the more isolated communities, far from big cities, or those realities close to dangerous areas in terms of natural or water disasters. Their position, far away from transport junctions, has prevented their growth, and migration towards Italian and foreign big cities, especially in the 50s, has established their slow decay." 12

This being the general picture, in which way can architecture intervene in the name of tutelage of this collective cultural heritage?
The impact of the phenomenon of dwell's dismissal, and the consequent loss of the social, cultural and economic role of these realities requires the fine tuning of a strategy in which architecture, understood as reality's reading and a type of design that takes into consideration the continual role of history, can and must have a leading role.

It is not enough to talk in terms of tutelage and physical conservation of buildings, better, the architect has to be part of the economic, social and cultural process that has in mind the second life of these Villages. Were this not the case, we would face an even worst situation: the musealization of historical centers, a declaration of defeat in respect to all of those processes that led to the decay of these realities. Regarding the strategy of intervention, there are some interesting records of various local contexts. A review of concrete experiences of reactivation of small centers, thanks to several initiatives, seems to prefigure an effective modality of answer to the problem.

The discourse of the physical requalification of these minor centers, in fact, cannot be detached from the dwell's option. It still remains the parameter of confrontation for operations of recovery: for who one recovers,

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and how the design finds innovative solutions for both the values of the past and the present needs of potential inhabitants.

We can talk about inhabitants in many ways. Inhabitants are those who visit, who decide to live the experience of tourism and come back year after year; inhabitants are the elders, who might decide to live in a village for their retirement; inhabitants are those migrants that move and bring new habits and lifestyles, reactivating the economy; but also workers who pick a small-scale type of industry to install new and alternative modes of business.

The key to success of all these experiences of requalification consists on the capacity to be replicable, the ability to integrate with other options of governance according to private-public administrative synergies in a systematic vision that involves the entire country as the ultimate deposit of processes of requalification.

The term "management of the landscape" means all those actions that, having in mind a prospective of sustainable development, assure a regular and balanced evolution of the landscape to guide those passages of social, economic and environmental transformation. The term "management" implies the presence of the human component, without which the above-said process would not be possible. In fact, article 1 of the European Convention for the Landscape cites: "Landscape designates a specific part of the territory, as perceived by its people, whose character derives from the action of nature and/or man and their interaction"; landscape can be imagined as a continuum of natural and human-technological systems, in which the latter acquires more and more power in terms of influence on the land. Moreover, the term "perception" refers to two components, the visual and the social. Both indicate the way in which man lives and produces the notion of landscape.

It is therefore necessary to understand that "built city" is not "lived city", as the container in not the content, as the former contains and molds the latter, and so it plays a fundamental role of social identity.

This definition reveals the importance of the human factor in this type of realities (village, hamlet, etc.). When this misses how is it possible to intervene? Does intervention legitimize the existence of village that would otherwise cease to exist? What kind of perception would one have of a given landscape?

The study case of Santo Stefano di Sessanio

The case of Santo Stefano di Sessanio in Abruzzo is a good example of this, because it exemplifies the reasoning of this research. It is a fortified medieval village on top of the hill of Gran Sasso, 1250 mt, surrounded by mountains. It is also part of the National Park of Gran Sasso and the mountains of Laga. It has Roman foundations. In the VIII century Santo Stefano di Sessanio and the surrounding lands become Langobardic possession, determining the repopulation of the countryside and the construction of new types of dwellings, such as the agglomeration of households and walls around the castle. From the 1600 on, Medici's family intervention is a constant presence. They contributed to the restauration of the tower, the intervention on the church of Santo Stefano Protomartire, and the building of many of the courts, patios and loggias with double-arched and decorated windows. Starting from the 1900, the phase of decay follows the crisis of mountain agriculture and the growing de-industrialization13, reaching the level of 142 inhabitants in 1991 (ISTAT).

At the end of the 90s, Daniele Kihlgren, a foreign entrepreneur, buys part of the village with the intention of recuperating its historic, cultural and artistic heritage. His approach is multidisciplinary. It blends humanistic and philosophical culture with anthropology, architecture and economy, as his choice of "diffused hotel" represents a relevant economic value for demographic and economic growth. The starting point of intervention is tutelage of real estate: conservation of the original cubing, of the typological implants, destination of use and holes. Recyclable materials were taken from the surrounding areas, to assure the involvement of local economies. Different uses are assigned to different buildings: hotels, private residences, restaurants, shops, taverns, workshops, areas for free time, etc., all within the village.

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Some data on the intervention:

4000 m2 area of intervention
42 rooms
8 common areas
Restaurant
Polyvalent room
6 workshops

In 2001 the spare households were around 75,5%, in 2012 the percentage is almost 0%, with around 7300 presences per year and more than 30% of employment, exponential growth was registered thanks to hotels, when in 2001 there were only three14 of them, finally, 90% increase of real estate worth between 2006 and 200815.

Many private businesses became sponsors, public organizations such as the Municipality of Florence, the Ministry for Cultural Activities, the Ministry of Tourism help supporting the cause. Moreover, there have been the revitalization of forgotten jobs and professional figures, a positive impact on local agriculture and a significant wave of tourism. All these aspects help us framing the case as a paradigmatic example for similar realities.
This is a global resource, because it combines different aspects and also draws from the characteristic urban traces of a given area and transforms them into strategies of revitalization.

Notes

1.To deepen the topic about cultural geography, see Von Humboldt, A., Kosmos, 1845-1847
2.Quote from Muratori, S., Vita e Storia delle Città, in "Rassegna critica di architettura", n. 11-12, 1950, pp. 3–52
3. In Pigafetta, G., Saverio Muratori architetto. Teoria e progetti, Marsilio Editori, Venezia, 1990
4. In Pigafetta, G., review to B.P. Torsello, La materia del restauro, Venezia 1988, in Eidos, 4, 1989 pp. 106-108
"The very first meaning of tutelage derives from the Latin "tueor" which means to look, to contemplate, take care, a form of tutelage that recalls the act of looking at, before possessing or having something at disposal. Teuor goes together with another Latin verb, "respicio" (respect) which has a similar connotation, that of looking behind, from a far distance. To look, to contemplate is necessarily connected to knowledge. Not only in terms of intuition (in-teur, look inside) but also in the translated form of "ratio", or "intelect" (intelego, look, understand, represent, imagine). Like Heidegger, and Husserl before, the semantic root of id-idein reminds of the act of looking. It is a fundamental trait of our culture" (my translation)
5. In Muratori, S., Storia e critica dell'architettura contemporanea, 1944, opera postuma a cura di Marinucci, G., Centro studi di Storia Urbanistica, Roma 1980, p. 87
6. National Tourism Observatory – Italy - Drafting NTO, 19-02-2013, http://www.ontit.it/opencms/opencms/ont/it/focus/focus/Seminario_Il_valore_del_patrimonio_culturale_idee_a_confronto
7.Federturismo Confindustria, http://www.federturismo.it/it/federazione/federturismo-bruxelles/lattivita-dellue-per-il-turismo-menu-orizzontale-574
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9.http://www.comuniverso.it/index.cfm?menu=590
10.M. Bassanelli, Geografie dell'abbandono, progetto del gruppo di ricerca, DPA, Politecnico di Milano, luglio 2010
11.1996/2016, Eccellenze e ghost town nell'Italia dei piccoli comuni, in collaboration with Serico-Gruppo Cresme.
12. Quote from Paesi Fantasma. Tesori nascosti dell'Italia minore, 23th June 2005. In Bassanelli, M., Geografie dell'abbandono, p. 42.
13. L. Klarmann, Rivitalizzazione dei nuclei storici minori. L' esempio dell'albergo diffuso, Tesi di laurea in Architettura Ambientale, Politecnico di Milano, 2014, p.17
14.Source SEXTANTIO S.p.a.
15.Source Agenzia delle Entrate

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The morphological approach in the reading of the territorial city

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Abstract. *The crisis of the traditional city, with its morphological characteristics, has been largely debated. The new urban phenomenon has almost always been described as antithetical; on the contrary this article explores the possibility of reading continuity between the traditional and the contemporary city. The paper brings forth the concept that the territory can be described as an urban phenomenon resulting from a change of scale of the city, and offers the definition of the contemporary city as Territorial City (Città-Territorio). The article recovers this term introduced in the 70's by the Italian morphological school, to emphasize the continuity with the European traditional morphological schools, taking advantage of its learning, to compare the traditional city with the contemporary city. The relevance of a morphological approach in the study of the contemporary Territorial City is discussed through a summary of the main European schools' contributions, with a particular schematization due to geographical areas. From the synthesis of these references emerges a basis for the definition of a taxonomy organized around three main elements that constitute the urban grid. Moreover, the article proposes a methodology for the analysis of the Territorial City that uses the taxonomy as a reading tool describing its aggregation logics and decomposing the historical-procedural continuum. This method is illustrated through experimentation on the Metropolitan Region of Barcelona, which is of particular relevance for the interpretation of the processes that have characterized the morphology of the current urban phenomenon.*

Keywords: Territorial City, territorial grid, auto-similarity, relief of elements of innovation.

Introduction

In this paper I present the theoretical framework of the research1 I developed collaborating with both the University º my study is the morphological relationship between the current urban scale phenomenon and the traditional city, with its aim being the deepening of the aspects of continuity and characteristic invariance of anthropological settlements. Moreover, the study underlines the relevance of a morphological approach for the understanding of the territorial scale, opening up to the possibility for a description of the contemporary phenomena of territorialization in an 'urban frame'.

With this aim, I chose to recapture the term Territorial City (personal translation of 'Città-Territorio', term that was introduced by the Italian morphological school in the 1970's) to describe the present territorial scale's urban phenomenon. This term reconnects the concept of 'city' with the spatial domain of anthropological settlement which today coincides with the territorial scale. The use of the term also serves to establish a clear link with the traditional morphological readings and to justify research in the study of the territorial grid ('trama territoriale') as the physical outcome of anthropic appropriation of the territory.

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Concerning the morphological relationship that exists between the traditional urban phenomenon and the present one, according with the synthesis of Monclus (Monclús, 1998) there are some interpretations that explain contemporary transformations as the break which starts the beginning of a new urban cycle, while other interpretations consider those transformations the result of a reorganization of the city to a new scale.

On the one hand, the 'break interpretation' which relates the emergence of new territories to the end of the fordist period, highlights the break in the production process and organization of territories. On the other hand, the 'continuity interpretation' explains the new decentralization processes and the reorganization of the city to a new scale as a continuity of the classic expansion mechanisms of the cities since the industrial era.

The first interpretation uses to focus on a minute scale analysis corresponding to a morpho-typological approach which highlights the breaking of the traditional forms of territorial occupation and the new ones which have arisen in the '70s. The second 'geographical scale' interpretation corresponds to a morpho-structural approach which explains the transformation process as a historical continuum, allowing us to define the Territorial City as the natural evolution of the traditional city and representing its scale leap on the territorial scale.

Considering this inter-scalar and auto-similar relationship between the traditional city and the Territorial City, it is possible to hypothesize that even in the new territorial configuration, aggregation logic (which has conditioned the formation of the urban organism from its' origins) can be found.

Caniggia and Maffei (1979) have extensively argued for the auto-similarity phenomenon in urban structure. More recently, fractal vision (Batty & Longley, 1994) has introduced a new development in the analysis of this phenomenon: the city, like a fractal system, observed through several scales, shows shapes that re-appear as if the parts were the result of the aggregation of self-contained parts.

In my research I argue that considering this auto-similarity we can use the knowledge we possess in relation to the aggregation logics and generalizable characteristics of the traditional urban form as an interpretative key for the comprehension of the new territorial configuration.

This analysis will highlight the elements of continuity in the historical-process dynamics of the formation of the territorial grid.

With all this in mind, we can see there is a clear interest in the revival of the traditional morphological school and the rise of a renewed morphological approach, continuing with the traditional approach but adapting to the new object of study, the Territorial City.

In the research, after an introduction of characteristics of Territorial City, I focused on a review of the main contributions of the European morphology schools with the aim of redefining a theoretical framework for the morpho-structural description of the territorial grid.

Through a synthesis of these contributions I propose a taxonomy of the invariant elements of the urban grid. The taxonomy is both an inter-scalar analysis tool for the urban phenomenon at the traditional and territorial scale and also a diachronic analysis tool, capable of describing invariant processes.

As well the taxonomy has been proved by its experimental application on a sector of the Metropolitan Region of Barcelona in the time line from the 1950's until today.

The material of the MUC2 by Generalitat de Catalunya was essential for the drawing of the cartographic bases and to extrapolate the classifications of the built fabric, of the land use and the hierarchy of the roads.

Other essential resources for the collection of data on land use were the AMB work (Area Metropolitana de Barcelona) collected in the publication 50 anys de transformacions territorials (Carreras Quilis, Ruiz i Almar, & Otero, 2012) and the extensive urban studies of the ETSAV Escola de Arquitectura de el Vallès, which recently join in the publication directed by Llop, in particular Vol II: Ciudades, territorios y regiones urbanas eficientes (Font Arellano, Maristany Jackson, & Mas Artigas, 2016).

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A new urban phenomenon: the Territorial City

Some characteristically aspects of the contemporary territory justify its interpretation as an urban phenomenon. In particular, those aspects concern: The perpetuation of a large-scale stratification process.

As the research Territori post-metropolitani come forme urbane emergenti directed by Balducci (2011) points out, the regionalization process follows a slow evolutionary path, strongly marked by 'path-dependency' (Paba & Perrone, 2016) both from the spatial and socio-economic point of view.

The study remarked that the structural grid of the territory is not located indifferently on the ground but arises around locational inertia: historical settlements, ancient traffic lines and agricultural paths. The new grid would thus overlap with the previous one, as a result of a large scale stratification, that in the last century has invested all levels of the Christallerian hierarchy (Christaller, 1933) by inducing a progressive filling of the grid's mesh.

As shown in the book Il Territorio che cambia : ambiente, paesaggi e immagini della regione milanese (Boeri, Lanzani, & Marini, 1993) this stratification process is the result of the superposition of two time lines of evolution: the long time of the invariants and the faster overlaps related to the elements of the contemporary urban phenomenon.

The presence of a matrix organizational structure: a large scale grid (territorial grid), which represents the support structure of the spatial urban phenomenon.

According to Dematteis (1996), this large-scale grid emerged as result of the growth of the middle and lower levels of the urban hierarchy. From this general growth a pattern has arisen which is characterized by a generalized indifference of the localization's interests. This pattern of reticles is the result of a long-term structural trend which is linked to irreversible transformations that took place from the 1970's both in the forms of productive organization and in the infrastructural organization of the territory.

From recent studies (Font Arellano, Maristany Jackson, & Vecslir Peri, 2012; Garavaglia & Pennati, 2016;) we can see how this territorial grid tends to assume a 'corridor' configuration. The configuration of these 'corridors' is of large bands along territorial connected axes. They share some common characteristics and tendencies: a densification phenomenon which mainly affects middle size cities, dense exchange areas of commuter flow and a diffused economic growth because of new location competitive advantages
A hierarchical allometric organization.

In the territorial grid, the typical location indifference which characterize the matrix organizational structure affect just the reticle level while the centrality of the traditional urban cores is preserved thanks to the retaining of a higher yield due to their administrative and directional nature of super-centrality.

The traditional divide between the city and the countryside in our day has become a growing detachment between the metropolitan level, which focuses administrative city functions, and the rest of the urbanized territory of which urban reticles constitute the functional infrastructure (Dematteis, 1999).

In addition, Dematteis has found that after the earlier urban explosion phase that characterized the city growth from the 1990's, there is a new phase of 're-centralization' toward the main centers of territorial systems.

Continuity in contributions from schools of urban morphology

The morphological approach has been particularly relevant in the 70's and 80's. In those years, urban-based studies focused on finding explanations for the formation of urban areas based on the idea that the study of form could generate specific knowledge about their physicality and spatiality.
Moudon in her article Urban morphology as an emerging interdisciplinary field (1997) provides a comprehensive summary of the main contributions of traditional urban morphology studies and identifies three schools of morphology which have defined the foundational basis for the field. In her article, Moudon summarizes the contribution

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of the French school of Panerai and Castex, the English school of MRG Conzen and Whitehand and the Italian school of Muratori, Caniggia and Rossi.

In my research I kept forth the schematization by geographic areas to highlight the link between the traditional studies of the city and the new urban studies about contemporary territories; this helps us to understand how a certain analytical approaches have been applied to the two scales.

The first analytical approach from the Italian school is heavily focused on build type, identifying the artifacts that represent the historical trend in production of urban fabric. In the last thirty years, we can observe a new 'Elementarism' (Viganò, 1999) in the study of urban phenomenon at the territorial scale, which recover the heritage of the traditional school through the analysis of 'urban materials', of 'primary elements' and of new architectural types (Boeri et al., 1993; Isola, 2003; Munarin & Tosi, 2001). Those parts of the elementary analysis and their localization within the grid are not neutral, but they affect the polarization process as well as the reiteration of architectonic types.

In the second analytical approach from the French school, the common link between traditional and contemporary thought concern the study of the city through the social dynamics that are used to influence city transformations as the result of the dialectic relationship between 'urban theories' and the real city construction. In this perspective both the contemporary and the traditional cities have to be interpreted as a social phenomenon (Mangin, 2004; Panerai, 2008).

The Anglo-Saxon analytical approach uses the concepts of configuration analysis.
Conzen's (1960) geographic approach had already given a particular interpretation about the configuration of the edge elements along the fringe belt in relation to the evolution of the city due to the dynamics of transformation in land uses. With similar scientific beliefs, some Anglo-Saxon authors (Batty, 2013; Hillier & Hanson, 1984) further developed the analysis of the reconfiguration processes determined by how demographic movements impact the definition of centrality and transformation in land use.

As well as the research from these three schools, in my own research I have also included the contributions of the Spanish school which main topic concerns the study of urban and territorial transformations as a process strongly related to changes in land use (de Solà-Morales, 1972; Font Arellano, Llop, & Vilanova Claret, 1999; Font Arellano et al, 2005). In my research this contribution has been very useful for the definition of 'morphological territories', polarization processes and localization of central and productive elements.

A new taxonomy

From the review of the contributions of the schools of morphology, after studying the common elements of the urban form we can identify the primary elements that make up the urban grid.

I used the following three elements to focus my analysis into three macro groups that make up the main structure of taxonomy:

routes
build fabric
special emergences

The first is the routes layer which reflects the growth and the gradual integration of the grid and the transportation technology which use to determine the morphology of the connections. The second macro group is the build fabric, which is characterized by the reiteration of common architecture showing the original city concept of the different periods. The last group shows especial elements which have emerged from specific human activities.

The three macro categories are further schematized by sub-categories (Figure.1) representing the invariant processes of development of the primary elements and describing the stages of formation and progressive integration of the urban grid.

These sub-categories can be read in chronological order as successive phases, it should also be noted that they respect a

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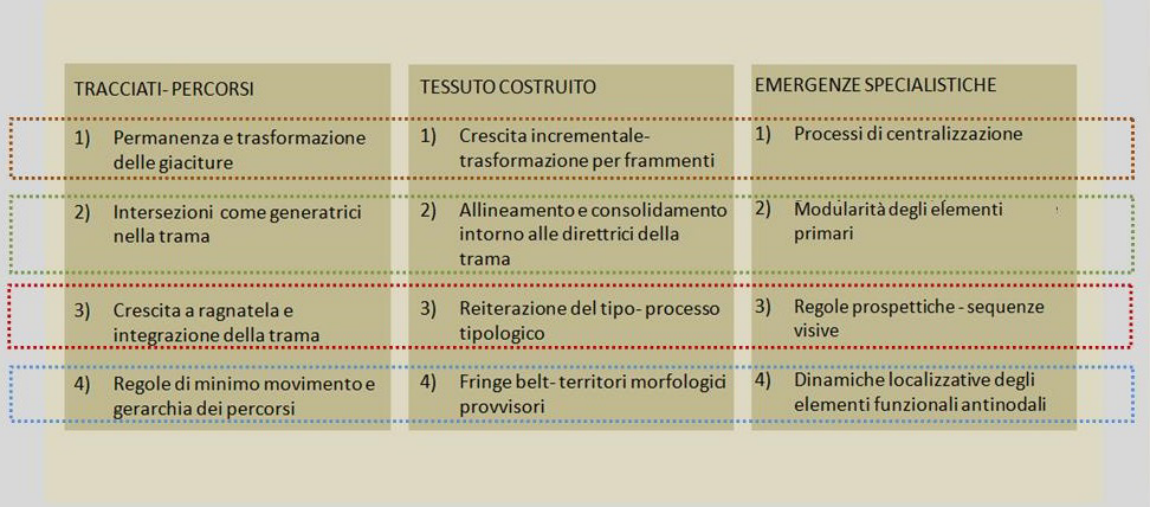

Figure 1. Taxonomy of invariant processes of formation of urban grid (Gagliardi, 2016, p.81)

'circularity', meaning that each cycle will repeat itself at a higher level of scale and complexity.

The first phase of formation of the routes layer coincides with the first interaction with a territory and represents the physical result of the anthropization processes within the topographical and the morphological elements of the environment. This result which is usually a territorial road is a first element of permanence or invariance that will undergoes future transformations.

In the basic configuration of the first territorial route there are nodes which represent the main points of tension where the highest localization interests cause a strong demand for the space occupation. The second phase of the process of grid formation is represented by the morphogenetic changes that the nodes imprint on the formation of the grid.

At a later stage around the main nodes and axes, grid integration dynamics create a more homogeneous mesh network that makes the grid more permeable. The third stage illustrates the formation and consolidation of the grid itself through the progressive integration and filling processes that takes place until the spatial structure of the grid is complete.

The fourth stage, with the completion and saturation of the settlement, usually begins with the advent of new technologies in transportation or new social dynamics. This phase is characterized by the emerging of 'restructuring elements' which overlap the previous ones creating new hierarchies, new territorial connections, and new nodes and mesh in a bigger scale.

From this we can see that the creation of new 'restructuring elements' also redesign the elements of strong permanence (phase one) at this new scale. These 'reconstructing elements' represent a new linear connection ('corridor configuration') where new polarities appear at the main nodes, expressing its morphogenetic value at a new territorial scale.

The second primary element of taxonomy uses the concept of build fabric which refers to the physical volumetric dimensions of urban tissue. Build fabric can be classified with respect to its' different forms of density and saturation. It is made of homogeneous parts that we can call 'morphological territories'(Font Arellano et al., 1999); among these, there are a number of uncertain spaces that we will define as 'provisional morphological territories' where new processes of transformation appears.
We can also describe the forming of the build fabric through the circular sequence of the sub-categories of the taxonomy.

In the first phase we can see a fragmented building occupation in the adjacent areas of the aggregated buildings or in more isolated positions depending on the localization needs.

In the second phase, the previously fragmentation assumes a linear form consolidating the adjacent areas or 'lateral bands' of the main connective road.

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Once the build fabric is consolidated as an urban settlement, we move to the third phase where its expansion can be described through the recurrence and repetition of architectonic types which define homogeneous morphological territories.

In the fourth phase, which corresponds to the system's saturation, the urban settlement begins a new phase of fragmented colonization at a larger scale occupying new 'provisional morphological territories' on the fringe belt.

Lastly, the third element of taxonomy is related to special emergences. These emergences refer to the hierarchy of the urban structures where we can recognize nodalities as well as anti-nodalities.

While the study of nodality has great significance for the cultural dynamics of a particular society, the analysis of the processes of the dismantling and relocating of the anti-nodal elements gives us information on productive trends and clarifies the dialectical relationship that exists between residential settlement and productive areas.

Once again, the taxonomy sub-categories emphasize the circularity of the centralization processes with the progressive auto-similarity of the nodality's location at the urban and territorial scale.

The first subcategory describes the emergence of central elements within the build fabric that starts the process of centralization as a result of their morphogenetic power.

The second sub-category describes the emergence of a modularity in the system of central localization both at a urban scale then at the territorial scale. This modularity expresses the 'domain fields' of the central elements which depend on the catchment area of users.

The third category explains the consolidation of the system with the appearance of sequences of central elements within the urban settlement.

The last phase refers once again to the dialectical process that appears when the urban settlement reaches its saturation point and exceeds its geographical limits. In this case we will see how the anti-nodalities are pushed toward new territories and replaced by new nodal elements.

In my research nodalities are considered elements that have a particular role in centrality related to social activities. For example, in the traditional city, the main centrality is represented by the system church-city hall. On the other hand in the contemporary city the centrality is related to the quaternary and tertiary functions within the central city and leisure-tourism dynamics in the metropolitan territory. Therefore it is difficult to define what has a nodal or anti-nodal value in the Territorial City because we can often find a mix of functions that are both production and leisure. That for I want to underline that the aim of my taxonomy is not to give a definition of central and anti-nodal elements but to understand their localization and how they moved within the urban grid influencing the configuration of the grid itself.

Particularly, anti-nodal elements are traditionally those elements that lie on the edge of the urban settlement in a dialectical position with respects to the main aggregation. In the contemporary city, this edge is not unique or easy to recognize which is why describing the shift of localization of anti-nodalities proves to be an important contribution to the understanding of the urban boundary reconfiguration in the new territorial grid.

Finally, looking at the taxonomy and its cycles of urban transformations, it is also possible to relate the three macro-categories of the elements of the territorial grid in a horizontal manner.

Meaning, it is possible to recognize a first phase of fragmentary configuration, represented by an elementary structure, organized on a simple mesh of infrastructure and a fragmented build fabric grown around a singular centrality.

The second phase could be described as axial consolidation. In this phase some sections of the territorial main connection which unites the main nodes, pass through a further consolidation with the axial aggregation of build fabric and the modular distribution of central elements that defines the modular dimension of the emerging pattern.

In the third phase, the urban settlement assumes its final configuration through the recurrence of road connections, build types conforming morphological territories and central elements with complex organizational articulating sequences.

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Lastly, the fourth phase describes the saturation process and a leap in scale, which is represented through restructuring paths, the emergence of new provisional urban territories and the expulsion and relocation of anti-nodal elements.

Experimentation on a sector of the Metropolitan Region of Barcelona

In testing the taxonomy as a tool for analyzing the formation of the territorial grid, first I drew three series of cartographic maps (Figure. 2-3-4) representing each of the three macro-categories of taxonomy. Each series of cartographic maps consisted of five frames corresponding to the years 1952, 1970, 1990, 2000 and 2013.

Using these I drew another series of five maps (Figure. 5), which correspond to the five years mentioned earlier. In these five maps, I described the process of formation/transformation of the territorial grid representing the sub-categories of the taxonomy. In particular 'the innovation elements' are represented by only showing the changes from the previous year. This experiment highlights the morphogenetic process of formation of the territorial grid and also underlines the localization logics and hierarchies within elements of territorial grid.

In this paper I report some final observations arisen from the reading of the five maps that I found were capable to describe the emergence of the generalized configuration I described in the first part of this paper.

In the first two maps we see the changes which occurred between the 50's and the 70's and detect the expansion that has been concentrated around the traditional driving axes. In this phase, the changes consolidate the traditional territorial 'implantation' (impianto territoriale) (Caniggia, 1976) between the two urban poles (Barcelona and Matarò) by filling the spaces between the mountains and the coastal area. In this phase of strong increase in land occupation, the highway has not yet resulted in significant changes in the territorial system which preserves its structure as a strong element of permanence.

Therefore we can say that the permanence laws affecting the grid at the traditional urban scale occur in the same way as on the big scale with the permanence of the traditional territorial 'implantation' reflecting the maintenance of path-dependence phenomena. In the map showing the 90's transformations, the highway, as a restructuring axis, caused the location of new settlements with a modular character occupying new mountain spaces. This type of graft pattern intersecting the new axis can be compared to the graft implantation pattern in the urban scale. Therefore a 'corridor' appears in the territorial scale with a modular structure articulated along the edges and characterized by the recurrence of connective axes and new urban tissues. Similarly the urban scale settlements are consolidated around the structuring axis through the modular recurrence of connective roads and the reiteration of architectural types. The maps of 2000 and 2013 show a further phase of consolidation of the 'corridor'. While in the previous phase the main affected area was around the edge of the axis, in the later phases where it is probably closer to the saturation point of the system, we see how the transformations are mainly affecting the main poles of the territorial system in a progressive process of re-centralization. These dynamics suggest an impending leap in scale which could be linked to the new super-centrality reached from the main cities, and to the locational interests related to their international competitiveness.

Conclusion

By establishing a new taxonomy the research has defined a new tool which can be applied to different territories, demonstrating the relevance of a renewed morphological approach in the study of the urban phenomenon at a territorial scale.

The graphical experimentation of my taxonomy demonstrated the hypothesis of auto-similarity and highlights aspects of the circular recurrence found in the process of the formation/transformation of the territorial grid. In addition it was useful to recognize and describe the generalized phenomena that

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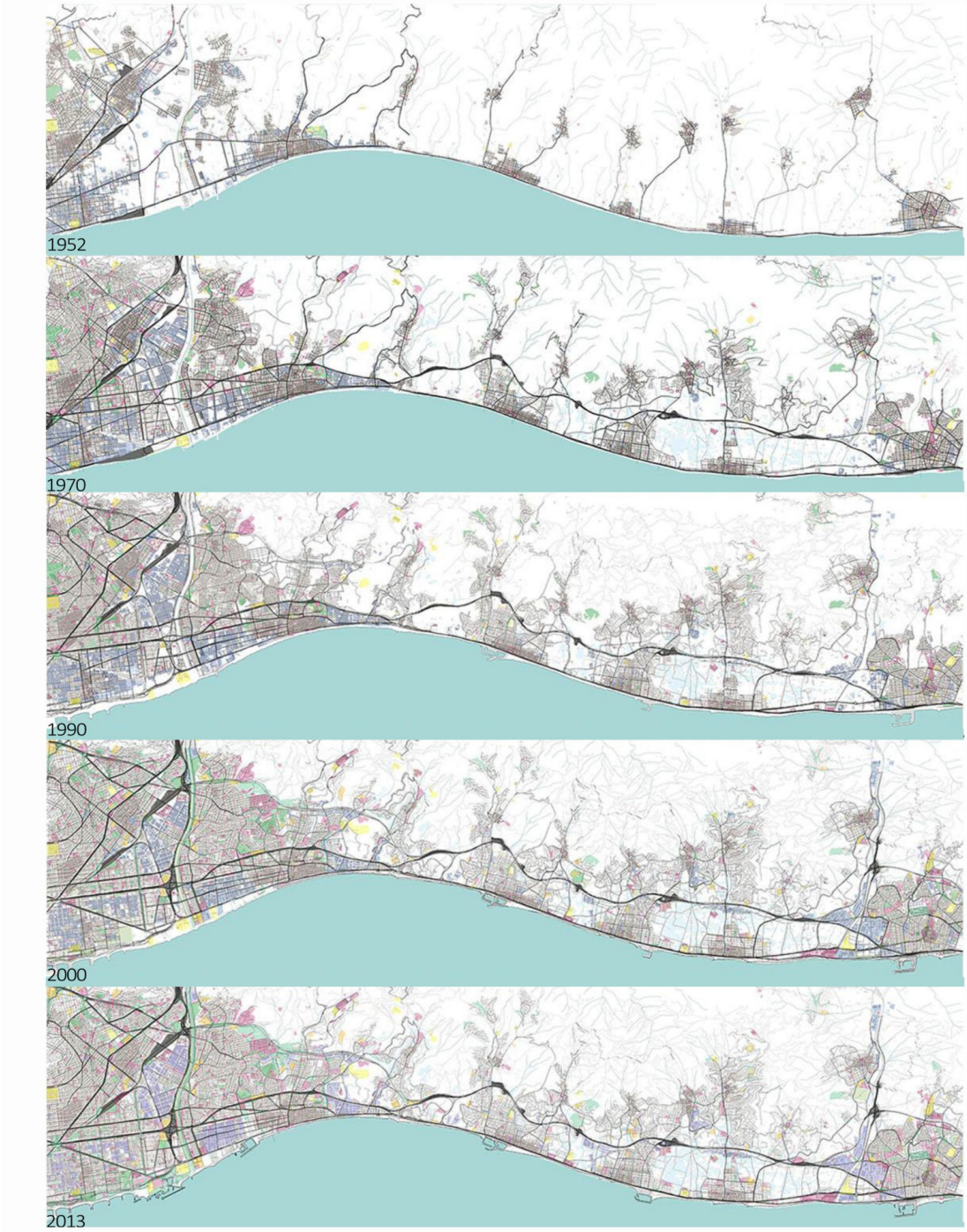

Figure 2. Routes: 1950-1970-1990-2000-2013 (Gagliardi, 2016, p.195)

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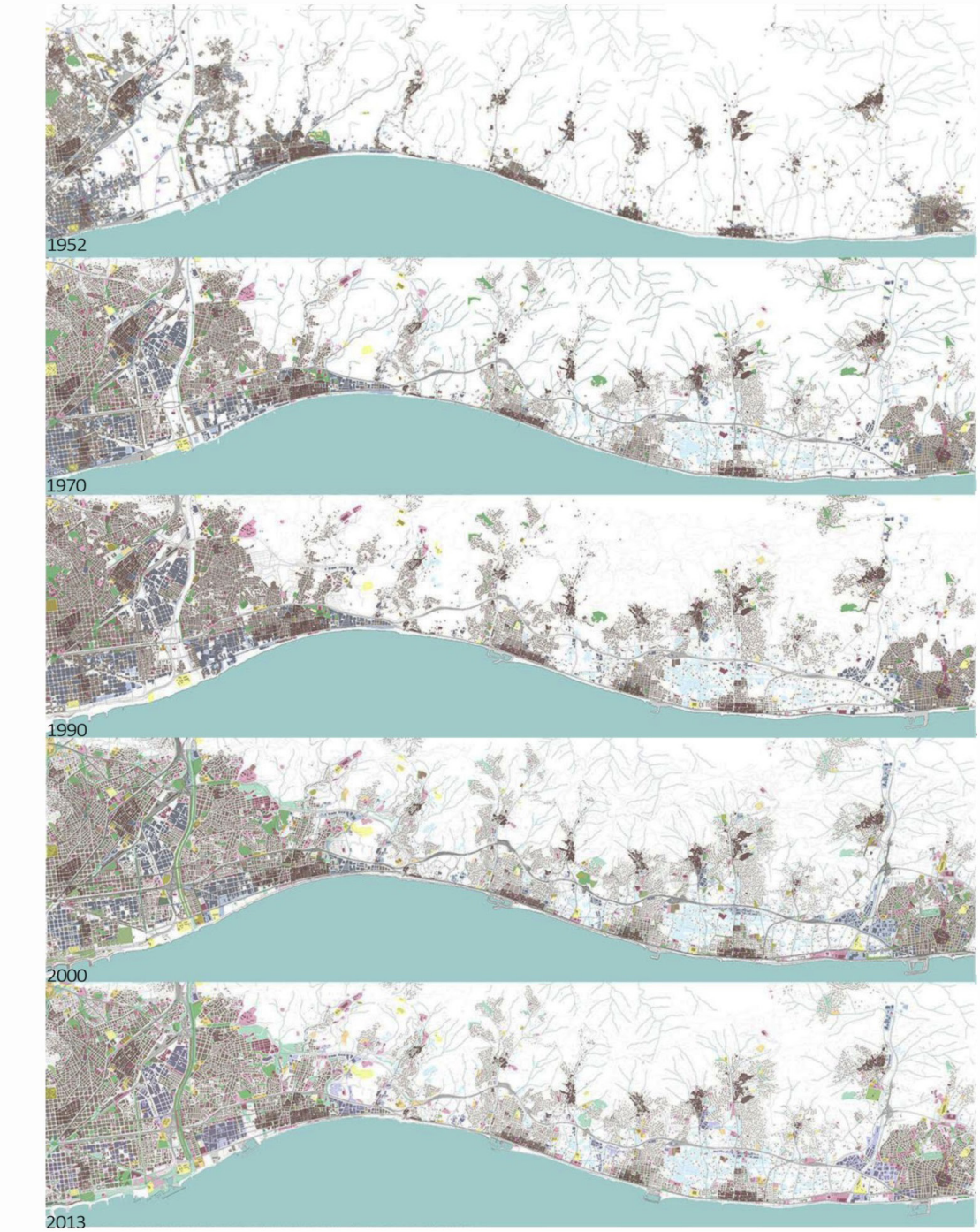

Figure 3. Build fabric: 1950-1970-1990-2000-2013 (Gagliardi,2016, p.196)

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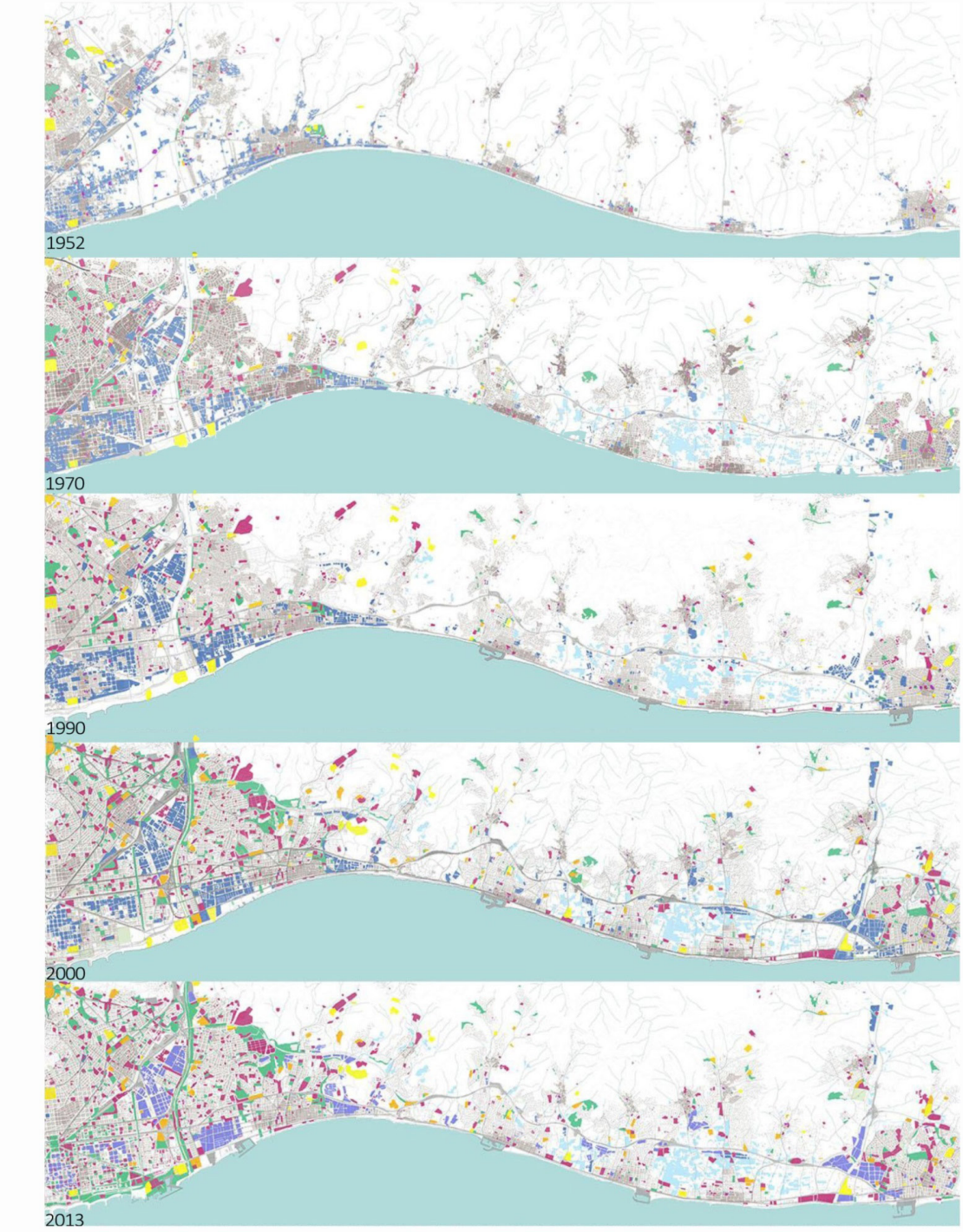

Figure 4. Special emergences: 1950-1970-1990-2000-2013 (Gagliardi,2016, p.197)

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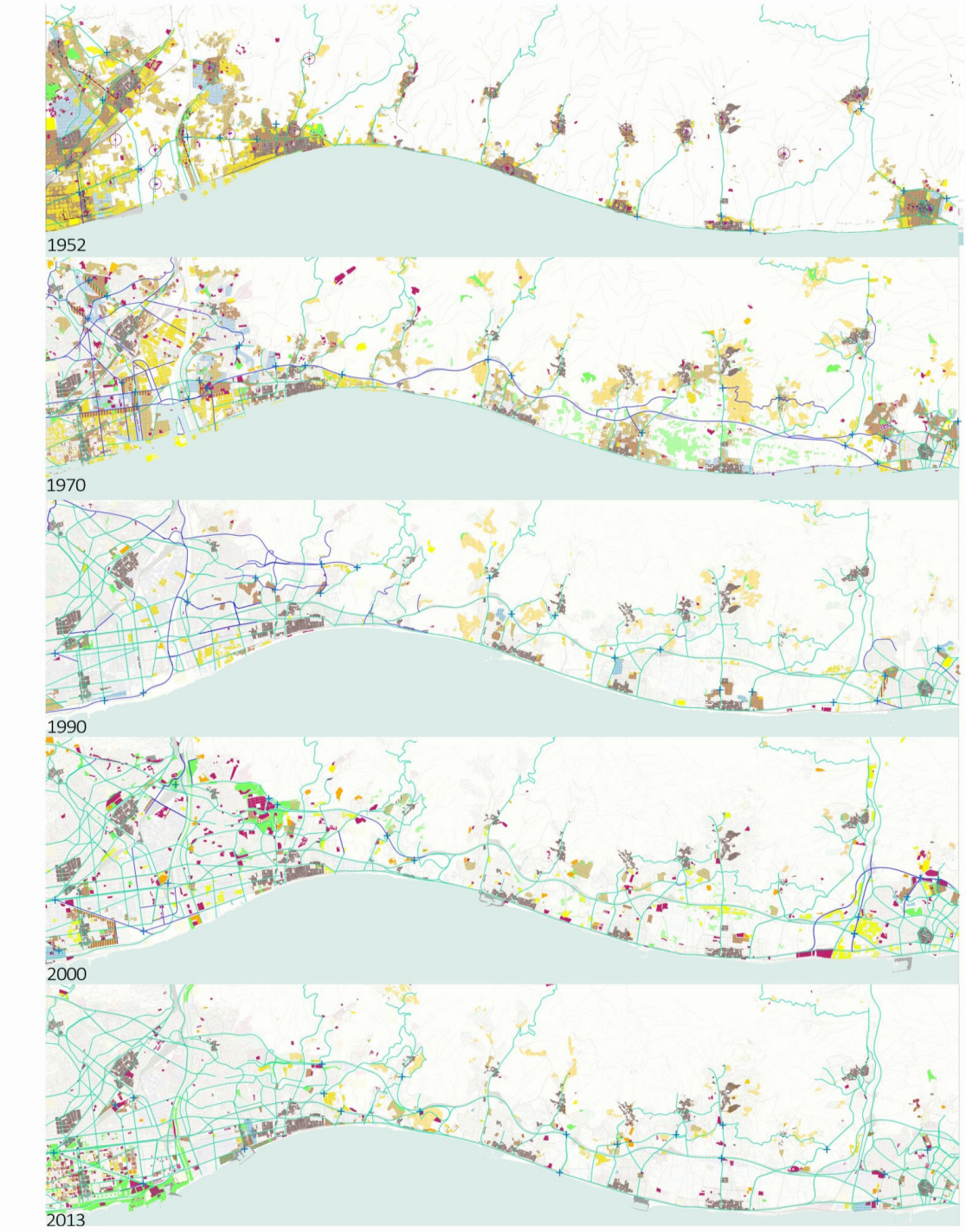

Figure 5. Permanences and 'elements of innovation': 1950-1970-1990-2000-2013 (Gagliardi,2016, p.200-209)

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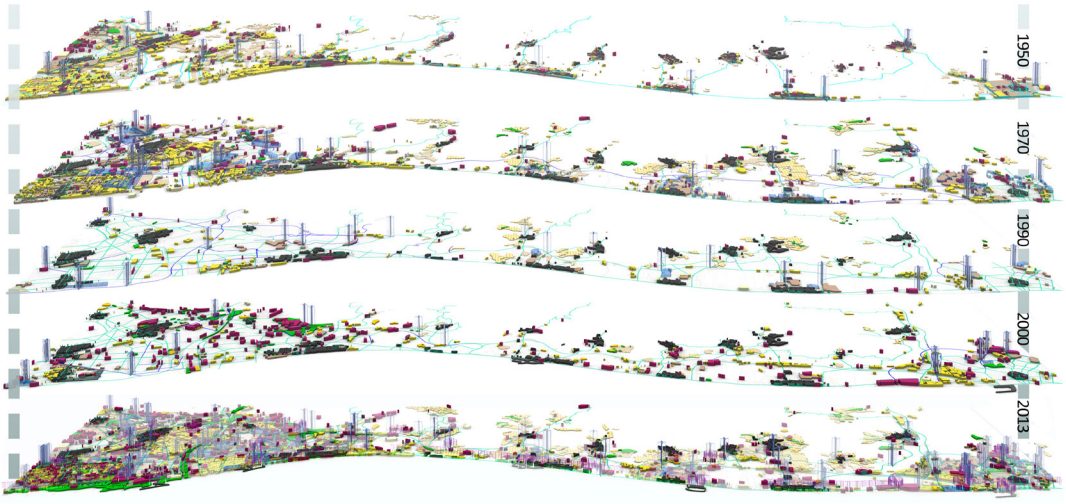

Figure 6. Allometric trasformations. (Gagliardi,2016, p.227-228)

characterize the development of contemporary the urban territory (Dematteis, 1999; Garavaglia & Pennati, 2016; Paba & Perrone, 2016), verifying the theoretical framework and the academic value of the concept of Territorial City and territorial grid in the current urban phenomenon.

The method of representation by 'elements of innovation' was useful in relation to a possible deepening of morphogenetic power of new elements of transformation, new hierarchies and centralization dynamics. Therefore further research with the test of the taxonomy trough GIS technology would be an interesting step for the field of morphology.

The following figure (Figure. 6) represents the first attempt of an allometric dimensional representation of the centralization processes that take place within the territorial grid. To make this graph I assigned different heights to each element of taxonomy according to its function, morpho-genetic power and its central role within the urban grid. In the diagram, nodes have a greater height than the other elements, followed by central elements, and so on, until the anti-nodal elements which are the lowest.

Notes

The research ended with the publication of my PHD Thesis. (Gagliardi, 2016)
http://dtes.gencat.cat/muc-visor/AppJava/home.do

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Redefining the Smart City concept: the importance of humanizing 'Intelligent' cities

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Abstract. *Within the context of the changes provoked by globalization and over-urbanization in recent decades, cities face the challenge of conceiving new and more competitive and sustainable development models. To this effect, the Smart City is proposed as a new model of urban development. However, the concept of Smart City has developed in such a way (in most cases completely alien to the area of Urbanism) that, in a way, cities have begun to face the risk of losing their soul. Clear examples of this are the new 'intelligent' cities created from scratch as mere efficient functional structures, without history and even without inhabitants, and lacking understanding of the very complexity and nature of cities, which are first and foremost dynamic places to be experienced. This is why, one of the main challenges with which Urbanism of the 21st century is confronted, is to work on redefining the concept of Smart City, redirecting its development to humanize and give soul back to these near future 'intelligent' cities. In this direction, the main objective of this research is to contribute as urban planners in this redefinition of the concept of Smart City as a new model of urban development. From the work carried out, the proposal of a model, sensitive to the environment (natural, cultural and urban) but above all a model focused on people, their preferences, opinions and needs is concluded.*

Keywords: Smart City, Inclusive City, Sustainable City, Urban Development Model, Humanizing Cities.

Introduction

With the multitude of people living in cities today, over 50% of the world population, and considering that this proportion will continue increasing until reaching at least 70% in the next thirty years (Vojnovic, 2014), the quality of life and well-being of citizens are compromised and adversely impacted. Demographic changes and their consequences, such as urban gentrification, social exclusion, sustainability of resources, health services, and urban security, among others, are urban problems increasingly faced by cities. That is why the global cities of the 21st century are constantly seeking a solution that guarantees the satisfaction of these needs as a priority (Glasmeier and Christopherson, 2015).

The extraordinary development of Information and Communication Technology —ICT— has fostered a society that is increasingly connected and able to participate and demand its needs within the field of urban development (Dodgson and Gann, 2011) (Townsend, 2013). Consequently, the new urban methodologies lead to a new model based on the integration of technologies in urban infrastructures to facilitate the functioning and efficiency of an expanding city and also to take care of the valuable aspects of the city (Hollands, 2008) (Stimmel, 2016).

The true protagonists of a future urban 'intelligence' are not innovative technologies but citizens who are able to take advantage

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of those technologies (Oliveira, 2015). The true potential lies in participatory systems in which citizens and communities are able to interact with superior authorities and entities in a collaborative way, exploiting the power of innovative services designed focusing on users (Concilio and Rizzo, 2016).

Background: Around the concept of Smart City

It is difficult to understand the concept of Smart City precisely after the important diffusion and uncontrolled use of the term since its first appearance, which has led to the current situation characterized by the lack of clarity and thoroughness of the different initiatives. Nowadays, in many circumstances, the concept of Smart City is nothing more than an ambiguous label that ends up being applied within a very wide field of cases (Angelidou, 2014).

Therefore, in many areas of knowledge, the concept of Smart City has lost relevance and has diverted from its own context and purpose. Such is the case of the specific field of urbanism, in which it has generally become an empty term and without content. As a result, it is commonly accepted by researchers in the field of urbanism that there is no precise definition of Smart City, while other thinkers take a step further and have developed theories about how the intelligent city is nothing more than a destructive movement (Ojo, Dzhusupova and Curry, 2016).

There are many conflicting ideas about the origins of the "Smart City" concept, so it is complicated to specify and date a first case or emergence of the movement, but it has been concluded that Americans can be credited in the 1970s by looking for models that would coordinate urban growth and act against extensive growth that manifested itself in an uncontrolled way, leading to the emergence of various urban problems That would lead to an analysis and investigation of the North American cases and the consequent evaluation and implementation of solutions.

It is really from the 90's that the concept is introduced to highlight the importance of ICT in new urban growth (Al-Nasrawi, Adams and El-Zaart, 2016), especially thanks to the advance of the Internet that had previously been simply an instrument in the scientific community and became a service of easy access that revolutionised the models of social interaction (Neirotti et al., 2014).

It is proposed more often today as a potential solution to urban problems and conflicts that often arise in a contemporary city, especially in the face of the global population movements and the tendency to live more and more the world population in a city, producing in turn a lack of resources, a new challenge and the need to create a more sustainable urban environment. It includes within this solution the care of the areas of health services, transport, infrastructure of communications, systems and energy resources and environmental sustainability, above all. The definition of the Smart City sometimes includes the set of these services and infrastructures that manage to be based on the computer and communicative technologies and a more efficient and fluid urban functioning. However, very often the label of 'Smart City' is put in use to identify the technological transformations of an aspect or core system within a city such as economy, government, transportation, environment, etc.

In general, the services included in smart initiatives are governed by a Interconnected network of domains or essential ideals 'Smart'. These concepts are: Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Living, Smart Environment.

Objectives and Methodology

The objective of this work is to study a series of cases of intelligent cities and the factors involved in their development, to determine which are the most efficient methods used so far and to establish bases and guidelines to optimise the potential of our future cities, always with the maximum benefit for the people who are going to experience and live in that community. Simultaneously, a research on the historical values and heritage of a city is proposed, in which the importance of preserving the historic footprint of a city in

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its development, with the implementation of new technologies, systems and services, is discovered. In any case, the study is based on existing cases.

Study of existing cases

As a background, the first Smart City can be dated in 1854 (Copeland, 2016). It may have been London in the year that there was an outbreak of cholera in the Soho district causing some 616 deaths in just one month. This case explains a first example of a solution to a civic dilemma, through the collection and use of data. A map of the area was drawn up marking the geographical points where there were deaths (Figure 1), from which it was deduced that all the victims were near the same water well. In this sense, Copeland argues that the 'Smart City' concept has less to do with innovative technologies and futuristic visions of automatic cities, and the concept of 'internet of things', stating that a Smart City is the one that implements the collection of data and research to solve urban problems and improve their functionality, although this may foster a social conflict.

In the current context of the wide diversity of urban 'smart' applications, on the one hand the incentives of a development based on the integration and application of broad technological innovations seeking the modernization in the historical cities are highlighted. Some experts maintain a functional city vision, establishing their bases in the abundant use of information and communication technologies with the objective of creating an efficient environment for the development of human life, while others establish their principles around the accessibility and inclusion of the citizens themselves, whose quality of life and satisfaction takes a priority position in technological innovation processes, with results more controlled and thought than in the previous case, thus promoting a new urban sustainability.

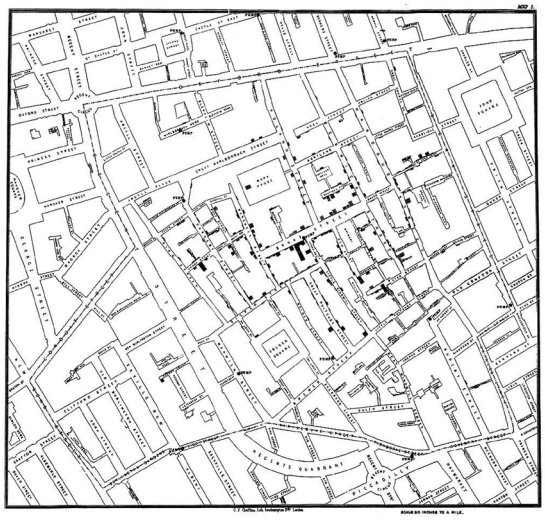

Figure 1. John Snow's Map. Collection of data of the city of London in 1854. Source: (Snow, 1855).

On the other hand, at the other extreme, there is a relatively recent and growing tendency of urbanizations based on the occupation of non-urbanized land, as descendants of a host city under optimum economic conditions seeking to build an ideal city from a fabric intact. In recent years there has been a great push and advance in the development of Smart Cities in this most literal sense. Particularly in the Middle East and Korea where it could be said that the term has been pushed to the limits of technological advances with the purpose of reconceiving the operation of the cities in an experimental way, driven by a futuristic vision and creating models from scratch for the future urban development that is beginning to spread in other parts of the world.

These prototype cities are driven by contemporary attempts to develop a new 'experimentation' of the Smart City from scratch, revealing themselves as areas of new construction, without residents or previous infrastructure that make up the urban layout. To this end, the political routines that are put in place and the specific regulations are flexible in order to facilitate the execution of this 'experimentation'. Existing cases show that the objectives of these cities include the implementation of interventions on a blank canvas in which urban systems and infrastructures can be integrated with the greatest ease and flexibility through ICT technology from the outset.

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Figure 2. Location of prototype cities in the areas of East, South Africa, and Europe. Source: Company web sites; The Economist.

The main cities of this type to be highlighted can be located in the areas of East, South Africa, and Europe, which started to project from the year 2000 (Figure 2).

The design and construction of a city from scratch has the advantage of avoiding costly technological adaptations, encouraging more capacity to encourage the internet of things and the introduction of more innovative techniques. This initiative is attractive because of the idea of avoiding the complexities that entail the transformations in the existing cities, and the alteration in the daily processes to which the citizenship is already accustomed. It seems that the essence of these new cities ends up winning against the traditional cities with the isolated solutions that can provide the internet of things, introducing key tools for the reduction of complexity, costs, processes, and the time required, for the development of intelligent solutions in a city.

Developing countries are in an optimal position to take advantage of these prototype cities. The lack of adequate infrastructure has prevented good development so far, but starting from scratch opens up new opportunities. The city is designed to create a new experience specifically for its citizens with systems and services that achieve optimum efficiency and sustainability throughout the city. Starting from zero allows these amenities to be fully integrated into one network, creating the city's supporting skeleton. Every component, each sensor or monitor of water circulation, traffic, lighting or security, would grow as a result of this network.

A characteristic of prototype cities is to depend on a neighboring city or region, the 'host' city, in its political, legal, and above all financial aspects. The new base on which it operates is perceived as a perfect opportunity to integrate new systems more easily, as a test, thus allowing experimentation with the most advanced innovations, as well as integrating new infrastructures without the inconvenience of modifying anything existing. Likewise, there is a certain freedom in the creation of elementary infrastructures of the city, both physical and socio-political, without being governed by precepts or previous regulations or social contexts. They are faced with the possibility of playing with new political systems to analyse impacts and reactions in the public domain, intensifying the emergence of political conflicts not only in the local context but also as a side effect in the host city.

However, this is done without the possibility of a previous analysis of the social impact and the implications that would result from such extreme interventions, so that the systems

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can manifest themselves prematurely and ambitiously, without having been properly prepared for their integration into the society, utopian infrastructures that risk straying too far from reality due to the lack of antecedents that are found in traditional cities. In addition, these interventions are conditioned by a high knowledge of the advanced technologies, implying the lack of the possibility of public inclusion. The management of new systems and technologies so advanced, in order to guarantee the correct functioning of services, induces an idealistic 'functional city' aspect, unlike a city to be lived, with a contradictory aspect that is public exclusion; an aspect that the "smart" movement seeks to avoid from the beginning. Therefore, the advantages of a 'from scratch' development are at the same time its greatest limitations. Three examples are given below.

Songdo, South Korea (Figure 3).- We are located on an island in the South Korea area, about 50km from the city of Seoul, in front of the nearest city, Incheon. It is planned to occupy a territory of some 5,300 hectares once completed the execution, which is still in process although it 'opened' in 2009. The expected completion date was 2015. The main innovations projected for the city include the integration of an international business district, residential areas, international university campuses, science parks and technological amenities. Its main visionary ideal is the ubiquitous city, or U-city, which refers to the idea of total interconnection of information systems, including technological integration in the homes themselves. The main host entities of Songdo are the city of Incheon, the national government, IFEZ (Incheon Free Economic Zone), Gale, POSCO and Cisco. Technological innovations include the Cisco 'TelePresence' system and the radio frequency technology, RFID technology (Integrated Operations Centre). In early 2000, the city of Incheon was declared a free economic zone, and the Songo project became one of the main pillars of its investment strategy, with a visionary goal of attracting international companies, universities and expatriate workers. Songdo's first technological visions date back to 2004 when it was selected as part of the Korean initiative of ubiquitous city, or 'U-city' and as a testing ground for these new technologies and the integration of them into everyday life. By using radio frequency identification apparatus systems, smart monitors, data exchange, audio-visual networks and sensors, strategies are proposed that include real-time traffic solutions, health services, crime prevention and environmental information services.

Problems related to data collection, conflicts in the area of privacy and ownership arise, which tend to dominate the debate, thus diverting attention from more delicate issues within the community, including the development of the relationship between companies and the users, as well as the link between the city itself and its socio-political environment.

The neighbouring communities themselves have shown varied opinions on the costs and benefits of the city, which together with the changes in political systems and population uncertainty contribute to the deterioration of social and political support for Songdo,

Figure 3. Songdo, South Korea. Sources: Google and ZDNet Korea (http://www.zdnet.co.kr/news/news_view.asp?artice_id=20111108094612)

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resulting in problems in obtaining financial resources, among other things, implying the lack of guarantee of the durability of 'smart innovations' and the risk of temporality of new technologies.

Masdar City, Abu Dhabi (Figure 4).- The city of Masdar is planned in Abu Dhabi with the help of the British study Foster + Partners as a manifestation of the new technological advances in the innovation of sustainable energy sources that the government wanted to promote. With accommodation for about 40 thousand people, in addition to the 50 thousand workers who would be added daily. Among other incentives, it promises an infrastructure that responds to environmental conditions, which would include regulation of solar energy and moisture to control the desert space that characterizes the area, thus achieving better levels of comfort under unfavorable conditions. It includes the integration of an electric public transport system that traverses the city in such a way as to eliminate any need for its own vehicle for citizens.

PlanIT Valley, Paredes, Porto, Portugal (Figure 5).- To 30 km of the city of Porto, we located this city in the neighbouring area of the one of Paredes, with a planning of occupation of 1,670 hectares. Urban planning ended in 2009 but the start of its operation was delayed. It is projected with the initiative of research and development city, in addition to implementing prototype services, along with the residential dimension and basic amenities. Its development is based on the notion of 'brain city' with an urban structure that resembles the nervous system of the human body. It promotes a technological innovation that includes a city of sensors and 'urban apps'.

Despite the first push, PlanIT is having a hard time getting started, Songdo's u-strategies have lost ground, and overall major technology proposals are starting to be implemented on a smaller scale, less ambitiously, in Smart City initiatives all over the world. They present difficulties in taking care of innovative ecosystems, mastery of corporate technological knowledge, limited user relationships with producing entities, and the tensions that appear with the socio-political areas of the surroundings and with the distances with the system of governance and rulemaking.

Conclusion

If precisely the concept of Smart City arises in search of a solution to the increasing urban challenges, it is necessary to ask for what purpose these new model cities are being created. Innovations are being integrated for a society that does not yet exist. And as a result, externally developed ideas, visions and technological innovations do not process the necessary adjustment for proper integration and run the risk of being totally dominant, creating a considerable division between the producing entity and the users (citizens), contradicting thus one of the main objectives of the 'Smart' initiative that is the public inclusion and obtaining totally paradoxical results.

Over time and above all due to the great technological advances that are available to us, an endless number of models have emerged

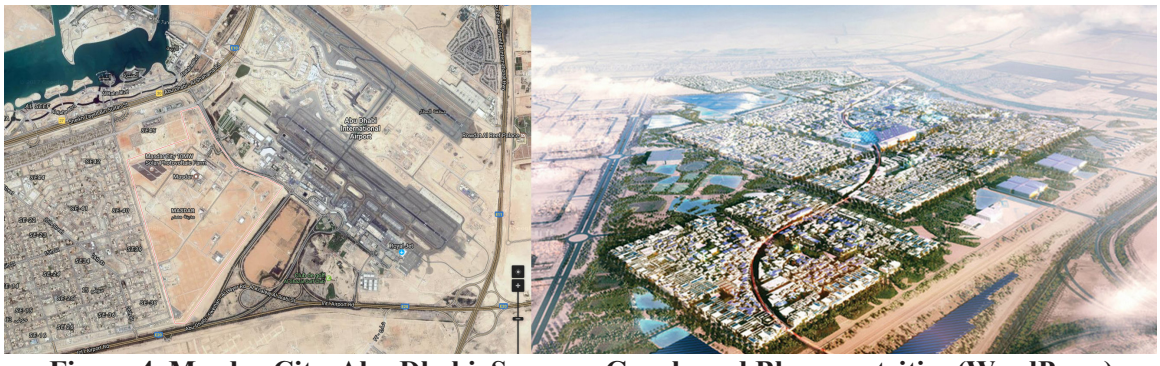

Figure 4. Masdar City, Abu Dhabi. Sources: Google and Blogsmartcities (WordPress) (https://blogsmartcities.wordpress.com/2014/04/30/masdar-city-die-okostadt-in-der-wuste/)

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that aim to pick up the large defining blocks to succeed in the development and evolution of 'Smart' incentives for the city and its citizenship. These development bases regulate the methodologies of the actions by means of specific criteria that have the purpose of achieving optimal conditions of efficiency and sustainability for the city.

Faced with the challenges that arise, such as interventions in historic cities that seek to renew in many cases the foundations on which a city is based, involving major changes in infrastructure and disturbances in the city's own functioning, urban planners face the need to preserve and treat scrupulously the essence of a city from its roots during the great processes of innovation that the 'Smart' movement entails. In search of a way to evade these obstacles, in recent years a new model of intelligent development has been cultivated based on the treatment and the establishment of intelligent incentives 'from scratch' in unaltered and non-urbanized territory.

The new prototype cities are capable of illustrating a potential for political and business development that fosters sustainability through technological processes and methods, the integration of new innovative infrastructures and systems to improve and enrich efficiency and reduce excessive expenditure of resources. However, these entail a new apparent problem in several aspects of urban development, new technologies often lead to similar and even higher levels of consumption in certain aspects, rather than adopting methods of development towards changes in patterns of production and consumption, and towards the reduction of ecological impacts. Existing cases have shown more conflict than benefits in the social aspects to be dealt with in the development of the urban structure, also losing the prestige and appreciation of the entities and communities on which it will depend, manifesting themselves as a burden of which they do not want to be responsible.

On the other hand, other models of innovation in the world of Smart Cities and Eco-Cities tend to emphasize above all the economic and ecological dimensions of sustainability, leaving aside social issues and community equity.
Urban development is proposed in order to deviate from the current path that positions the concept of an intelligent city solely as an application of new technologies in urban environments, in order to emphasize the idea that the development of solidarity and harmony of our contemporary cities should be based on the care and maintenance in the design of the relationship between the traditional structures of a city and the new information infrastructure, always taking care of the implications of the changes that have on the daily life of the citizens, and with the capacity to face the notions of sustainability and transition projects that include changes in the governing behaviours, the power, economic accessibility, participation and inclusion Social; a new model for social justice and human prosperity against elite interests and the suppression of values.

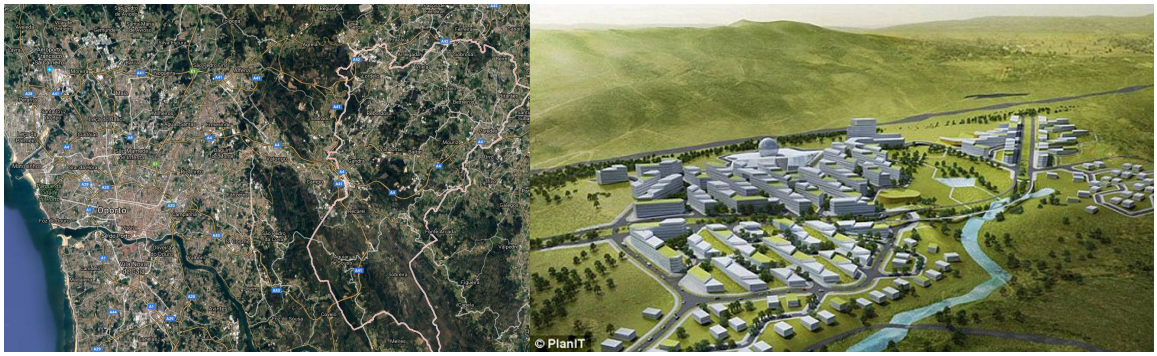

Figure 5. PlanIT Valley, Paredes, Porto, Portugal. Sources: Google and MailOnline (Science & Tech) (http://www.dailymail.co.uk/sciencetech/article-2045577/Urban-Operating-System-revealed-run-PlanIT-Valley-super-city-Portugal.html)

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Altea Urban Project: An academic approach to the transformation of a coastal Spanish touristic city based on the improvement of the public space

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Abstract. *The town of Altea (Alicante, Spain) has an important urban center that has historically been characterized by two contrasting situations: on one hand, the settlements located on the seaside elevations (Bellaguarda and the Renaissance Bastion) linked to the agricultural uses of the fertile valleys of the rivers Algar and els Arcs, and on the other hand the coastal developments, originally fishery, but nowadays with touristic uses on the maritime front. All these elements configure an urban nucleus that, due to its urban, architectural and landscape qualities, gives rise to one of the main tourist attractions of the region. However, the area described nowadays presents an important problem related to the use and habitability of public space, which is invaded by the presence of the private vehicle, even along the seaside, due to its touristic relevance. This article presents the results of an academic experience developed to study different possibilities of urban transformations for the municipality of Altea, taking as a project site the urban vacuum still conserved between the two situations previously described: the historical areas on the coastal elevations (Dalt) and new urban developments parallel to the seaside (Baix). This academic activity, performed by nearly 50 students from the University of Alicante, was developed in the context of the design course Urbanism 5 during the academic year 2015-16, thanks to the agreement signed between the Municipality of Altea and the University of Alicante.*

Keywords: Public space, historical urban evolution, tourism phenomena, urbanistic project, educational experience

Introduction

Defining a new design course is something quite similar to an everyday action. In both cases we apply to a specific case a set of motivations and previously acquired criteria to take the precise decisions that will lead us to some expected results. Thus our experience is a powerful tool, not only to perceive reality, but also to alter it by projecting on it. Urbanism 5 is one of the last courses of the educational itinerary of urbanism in the degree of Architecture at the University of Alicante.

After diverse courses that approach the formation of the student around certain subjects (such as the rudiments of the discipline, the ecological urbanism, knowledge on residential developments or tools for landscape analysis), students reach a level in which they are expected to be able to develop a projective activity on the existing reality with a certain autonomy. It is therefore a question of applying the experience gained previously to a specific site in order to establish a series of objectives to be achieved. The work performed by the lecturers responsible of this design studio is to show them a panorama of contemporary urbanism capable of helping them to define successful planning strategies to achieve those targets proposed by themselves. This panorama is neither complete nor closed, but tries to

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show the culture of the urbanistic project that they intend to develop (understood as a set of appropriate contemporary references). Joan Busquets and Felipe Correa identified X lines (2006) of the contemporary urban project, ten fields of work and ten ways to understand the projective activity of the discipline. The panorama to which we referred above is framed within these X lines, completing the theoretical context of the course.

The study case where to apply it during the academic course 2015-16 at the University of Alicante was the Filharmònica square, an urban vacuum present in the center of Altea -a coastal village in the Southeast of Spain- which configures a key public space to improve the urban quality of the historical quarter, but nowadays used as a huge parking lot. The city of Altea, like many other similar villages of the Spanish Levant, shows what can be called as a double location: on one hand the historical nucleus formed around the existing seaside elevations (Bellaguarda and the Renaissance Bastion). On the other the urban settlements linked to the marine activity: the original fishers quarter (Raval de Sant Pere) and the later linear developments along the national road N-332, related to the touristic activity. This brief description shows us two different parts of Altea -the city on the hills (Altea de Dalt) and the city linked to the seaside (Altea de Baix)- which are present in the collective imaginary of its inhabitants. And between one and the other a historical urban void (Figure 1) that nowadays is still present in the urban network due to the presence of the Filharmònica square (a plot obtained after the demolition of the municipal cinema) located in a strategically central area. The last condition, but the one which gives the location almost a territorial dimension, is the presence of the narrow-gauge railway line between Alicante and Denia crossing the village of Altea precisely through this urban vacuum, and through the Filharmònica Square. Due to the improvement actions carried out in the area by the public entity responsible of this railway line, a public debate started about what could happen in this key urban area in the near future, and this was the context in which a teaching agreement was signed in between the Municipality of Altea and the University of Alicante.

Figure 1. Map of Altea, F. Coello y P. Madoz, 1859 modified by the authors

As we have already mentioned, the Filharmònica Square (project site) despite of being an adequate working environment in itself, allowed the students to establish a whole series of urban and territorial relations that implied the whole urban nucleus of Altea. Thus the students, organized in working groups, had to extended and delimitate a bigger area where to develop their projective action, adjacent to the Square (strategic site). It was a question of answering the above mentioned relations, but also of showing how a project like that could have repercussion on the whole city. This two concepts –project site and strategic site- will be later described in detail in the Methodology section. As a result of the extended delimited areas (strategic sites) proposed by the students three different attitudes were identified that allowed to organize and classify the projects.

Firstly can be found those projects that operate on what was called the relations between the upper and the lower part of the city (de Dalt a Baix), that is to say on the improvement of the urban relations in between those different urban settlements thinking that the Filharmònica Square could be a key element in the route that lead from the church (previously the main tower of the Renaissance Bastion) located in the upper part of the city, to the maritime edge.

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Secondly, those projects that recognize the value of the urban vacuum that remains between the upper and the lower part of the city. The starting point of these projects was that this empty space, present in the public image (Lynch, 1960) of the city of Altea for centuries, must remain as a meeting place for citizens. A place like this could endow the town with a lack that many of our Mediterranean cities suffer: a large public space, capable of organizing the relationships between facilities and green spaces on the basis of cycling or pedestrian routes. These student works, which operate following linear developments parallel to the coast, were grouped under the denomination Baix.

Lastly ni Dalt ni Baix, that is to say, those projects which although they operate mainly in the existing environment between the Filharmònica Square and the Renaissance Bastion, focus their interest in those urban voids -of diverse entity- that have remained vacant into the urban network over time, either because of its complicated orography or because of issues related to soil management. Activating this network of vacancies based on a specific programs was the target of these exercises.

Once established the fields of interest and the scope of work that extended the strict project site (Filharmònica Square) began a working process that lasted over four months. The result were 15 proposals in which can be identified actions on urban space, minimalist projects based on strategic actions, large-scale landscape proposals that cover the entire urban center or its seafront, urban projects that propose to complete the plot of the city in the surroundings of the Filharmònica Square, actions of revitalization of the historical center or great artifacts (Busquets and Correa, 2006) that endow the locality with the necessary facilities, not only for the occasional tourists, but for the citizens; In short, a panorama of contemporary urbanism for the city of Altea.

Methodology

The academic course was developed by working in groups of 3 to 4 students in a theoretical-practical format developing two parallel activities: on one hand the study of contemporary theories and urban developments, and on the other the development of a design project in a workshop format. Thus the final result of the course in 2015-16 was a teaching material capable of showing a vision of the contemporary practice of urbanism and at the same time a projective interpretation of this vision coming from the degree of Architecture at the University of Alicante for the specific case of Altea. In this paper, although it is fully addressed to show the results obtained in the workshop section, in order to fully describe the teaching method used, the theoretical section will be briefly described below.

As already mentioned, the objective of this theoretical activity was to build a proper frame of reference for the course. As a result of this, it was intended to create a teaching material that could show a selection of urban developments showing alternative ways of proceeding in the contemporary project in relation to the built (or not) environment in which they are located. This section comprised two parallel activities: firstly the reading, elaboration of an essay and later critical session in the classroom about a series of lectures selected by the faculty and secondly the construction of a panorama of contemporary urbanism, based on the critical study of a whole series of urban projects on the premises described by J. Busquets and F. Correa (2006) which are related to the projective actions to be developed in Altea.

As for the workshop, the projective action started from the first moment after a field trip to the locality, with the Exercise 0, in which each student had to propose his own map of Altea. It is usually accepted that maps are objective and univocal representations of reality, but it is precisely in the system of graphic conventions and in the selection of those aspects of reality that pretend to be represented where we find the subjectivity of the author. This is precisely the objective sought by this first “warm up” exercise carried out quickly (1 week): to show publicly those self-interests present in the students, from the conviction that it is precisely from the intersection between the physical, social and cultural reality of a community

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and the cloud of interests of the author from where the future projective actions could be developed.

During the length of the workshop, different sub-deliveries were planned in which the students had to answer a series of questions in parallel to the development of their project:

·Define a strategic site. Therefore, each working group had to answer two main questions: Where? Showing an accurate delimitation of the proposed strategic site and Why? Explaining the reasons for establishing this delimitation. It is here where previous individual reflections developed in Exercise 0 find their raison d'etre. This dual-purpose urban reflection finds a clear reference in the methodology developed by the organization of the Europan competition during the last decades which can be consulted, for example, in the catalog of the last edition (Rebois, 2014). Each of the cities interested in participating in the calls for this international architecture contest, must submit to the scientific committee of Europan two related urban areas, with different scales (one including a larger one) on which that locality requests the elaboration of different urban reflections by the architects participating in the competitions. This dual approach allows the different proposals presented not to be a mere architectural or urbanistic resolution of a small scale, which could be approached in context different to an international competition, including a more far-reaching urban reflection. Therefore, the lecturers in charge of this design course proposed to the students to assume a role similar to that of the municipal authorities proposing the double delimitation already commented.

Make a diagnosis in which problems and opportunities could be identified both in the project and strategic sites and its environment: What is happening currently?

Define the objectives to be achieved by the proposal and therefore a proposal program for the selected sites: What could happen in the future?

Finally, the students had to develop the necessary urban and architectural strategies to achieve the previously defined objetives: How? It is precisely here where the panorama of contemporary urbanism developed in parallel theoretical work took on a crucial importance.

Measurement and analysis

Now some of the urban strategies developed by the students will be briefly described grouping them on the basis of the three categories of strategic sites above commented.

Starting with those student works addressing the topic titled de Dalt a Baix now will be described two different approaches which build a kind of spatial continuity. On one side can be found the work performed by J. Martín, J.A. Ortega and R. Palencia (Figure 2) which develops an improvement on the existing urban conditions, specially focusing on the universal accessibility, in the way from the square located in the top of the Renaissance Bastion and the project site, selecting and transforming a series of existing streets that follow the level curves and nowadays presenting traffic transit on them. These new shared space route ends at the Filharmònica Square proposing a new urban project learning from the urban morphology present in the historical quarter. On the other side can be found the project performed by L. Birker, S. Ortega and C. Ortiz (Figure 3) which developes a connection between the project site and the sea front proposing to eliminate the traffic transit from the seaside and transforming an existing surface parking lot located in front of the seaside promenade which breaks the continuity of coastal uses in the Altea Bay. As a part of this transformation landscape project the students propose the creation of a new universal accessible beach after detecting the opportunity that this kind of touristic facility could be for the whole region.

To conclude among the works developed in the category entitled ni Dalt ni Baix two proposals should be commented here: the projects performed by H. Ibáñez, C. Sala and J. M. Santo on the one side (Figure 5), and by A. M. Conejero, C. Ruíz and N. Sanjuan on the other (Figure 6), as both of them address the historical relation existing in between several artists during the XX century and the city of Altea, a relation that finally was consolidated with the foundation of the Fine Arts Faculty.

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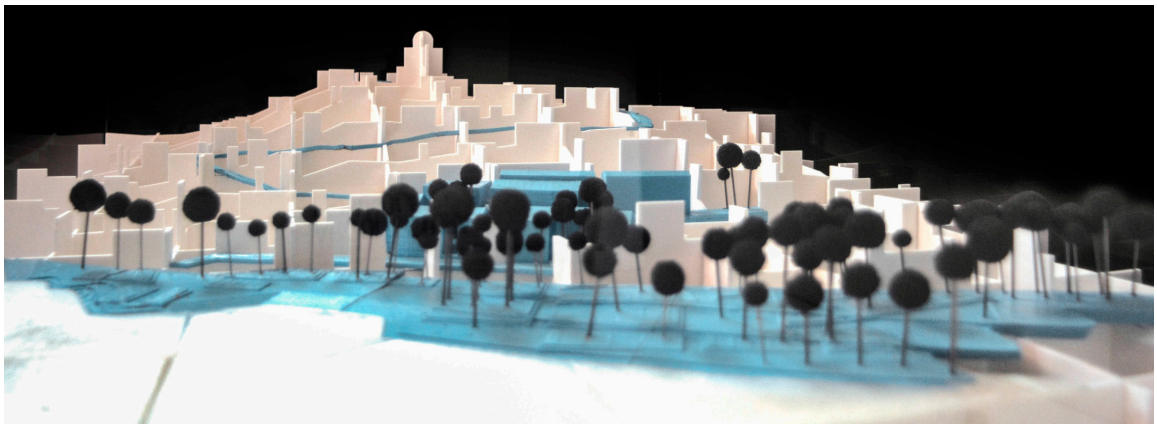

Figure 2. Model of the connection between the Renaissance Bastion and the project site. J. Martín, J.A. Ortega and R. Palencia

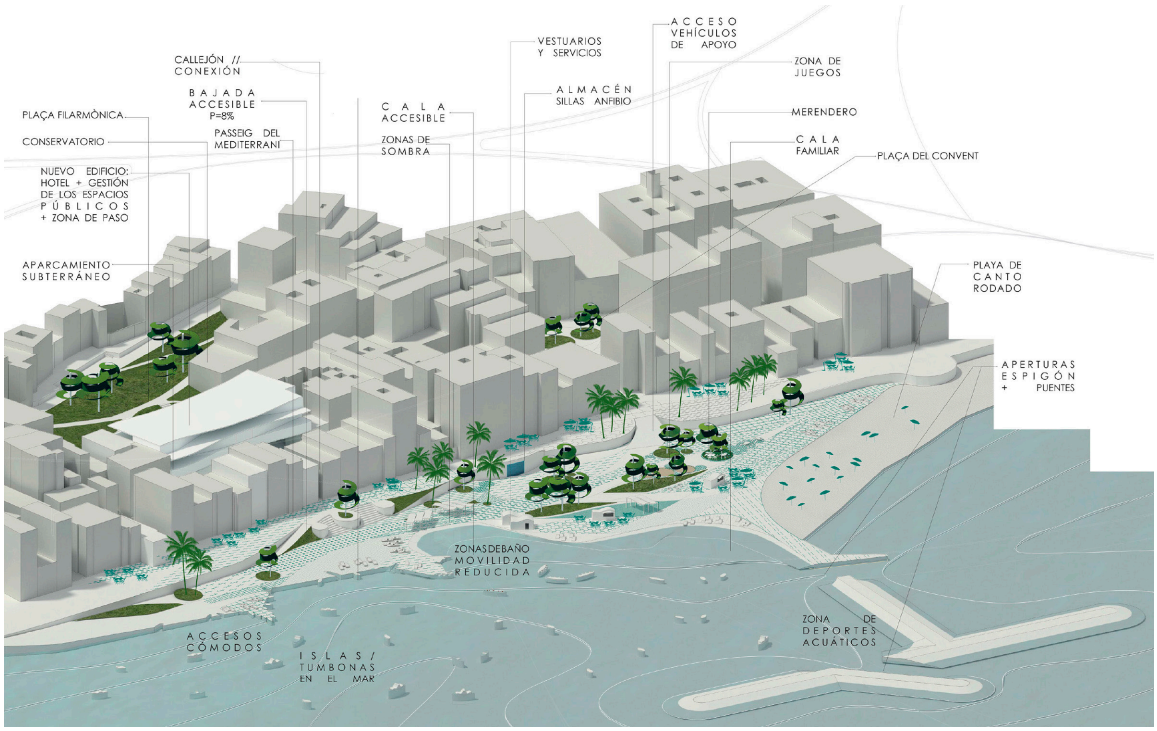

Figure 3. Illustration of the new seafront promenade and beach by L. Birker, S. Ortega and C. Ortiz

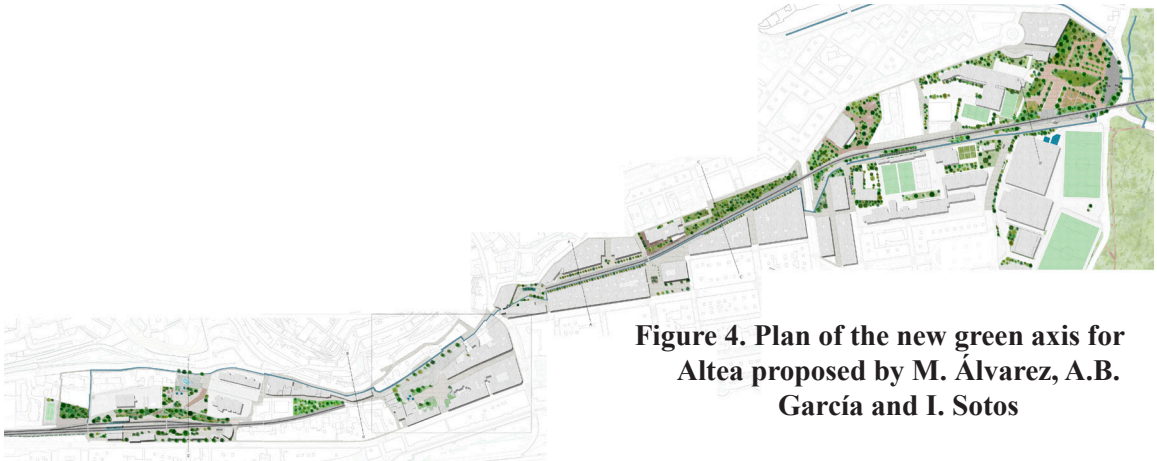

Figure 4. Plan of the new green axis for Altea proposed by M. Álvarez, A.B. García and I. Sotos

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Figure 5. Plan of the new housing and working facilities proposed in relation with the public space of Altea by H. Ibáñez, C. Sala and J. M. Santo

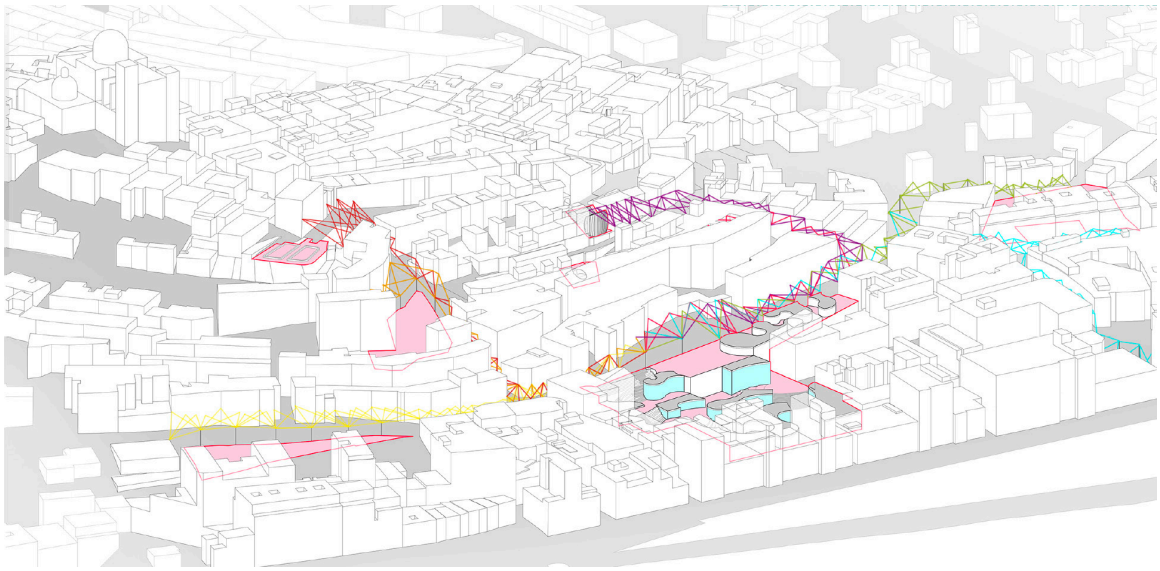

Figure 6. Axonometric view of the city center of Altea activated by the residence proposed by A. M. Conejero, C. Ruíz and N. Sanjuan

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These two projects propose the improvement of this relations after detecting both some debilities and opportunities. The first one proposes to create a network of small student apartments spotted among the different urban voids detected inside the urban network of the historical city, including the Filharmònica Square, in which actions on the public space are combined with housing, co-housing, working and co-working spaces, trying to visualize the plastic work performed by the Fine Arts students. The second one proposes the creation of an artist residence system taking these vacant spaces as the new locations for the artistic creation and for the public participation.

Conclusion

During the development of the above mentioned design course at the University of Alicante two different levels of conclusions had been observed: the first one related to the physical urban reality observed in the study case selected, and the second one about the implemented educative tools developed during the course.

Firstly must be said that the initial intuitions about the key urban role that the Filharmònica Square should play in the near future of Altea have been confirmed after the working period. It could become the bigger public space – despite of the beach- of the whole village, and what is even more important, with a central location inside the historical quarter, areas that typically present a clear lack of these kind of spaces in the Mediterranean compact cities. In addition to this the improvement of the urban qualities were expanded to different parts of the city acquiring a possible repercussion for the whole city that should be further studied by the Municipality on the implementation of new urban initiatives in a multiple sense: improving the qualities of the public space, creating a new network of facilities, linking different parts of the urban center, developing a proper framework where to implement new social and cultural actions, or even when creating a regenerated seaside promenade.

Secondly the educative methodology proposed and implemented was successful in obtaining two different targets: on the one hand creating a proper educative cultural framework where to develop the objectives fixed by the students after the theoretical approach, and on the other hand as an effective communication tool in between academicians, politicians and citizens. About the first target must be said that the ten lines defined by J. Busquets and F. Correa (2006) defined clearly the game field where the course should be developed and a range of possible references to help the students in the materialization of their work. Also, as has been mentioned above, the double approach to the location represented by the project site and the strategic site topics developed by Europan during the last decades has allowed the lecturers responsible of the design course to explain the students how an urbanistic project, that in a first sight could be seen as a local punctual action, could (and sometimes must) have a wider repercussion in the urban environment where it is implemented. About the second mentioned target the implementation of the strategic site concept that allowed to classify the projects (de Dalt a Baix, Baix and ni Dalt ni Baix) resulted in an effective communication tool to organize the developed work when presenting it to third agents not related with the academic world, like politicians and citizens from Altea, as it could be easily read by the people living in the village. Finally these three different areas of interest defined were the base for the organization of the communication actions developed for the public presentation of the student work results: a web page, an exhibition and a publication.

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The intervention of Víctor Eusa in the 2nd Ensanche of Pamplona: The artistic transformation of a technical model

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Abstract. *It is inevitable to be disappointed when we consciously compare today's city with yesterday's. Territorial occupancy was an arduous task which confronted man and nature. It was a collective act, the cultural manifestation of a society that aspired to artistically represent itself in the cities it built, both in buildings and public spaces. The city of the past, so conceived, successfully raised through time, and even today we can appreciate, in the human affection it brings about, the plastic value of its buildings and the ambient quality of its public spaces. Currently the contemporary city is just incapable of meeting a profound spiritual demand if it does not pursues a practical goal. In the Ensanche, one of its most renowned examples, the idea of the city imposes a restriction to the artistic or monumental value of the historic city in favour of a technical efficiency that facilitates the economic and administrative management of the new city. The unidentified reticular mesh so characteristic of the urban morphology of the Ensanche evinces the distortion of the hippodamian model which in past ages and also throughout time probed its validity to provide magnificent examples of cities thought and built also from artistic principles. In the late example of the 2nd Ensanche of Pamplona, we attend to the solitary labour of an architect such as Victor Eusa Razquin, who knew how to transform with his buildings the "technical" uniformity of the Ensanche by transforming, qualifying and enriching it with the incrustation of architectural episodes of elevated artistic value.*

Keywords: Eusa, Pamplona, Ensanche, Orden, Variedad.

Introduction

The construction of Pamplona's 2nd Ensanche represented the application of a city model that, based on efficiency, aspired to occupy the territory without restrictions. This fast-growing and technically efficient city, with no exact limits, had limited its only possibilities of formal inspiration to the block residential unit. Of the hippodamiam model offered by the classical Greek city, only the residential mesh offered it the guarantee of a rational support to develop this new modern city, considered now as just a technical problem.

The intervention of Víctor Eusa Razquin in the construction of this Ensanche, represented a correction of that technical model, incorporating the artistic principle of his architectonic work. The rigidity of the Ensanche is transformed, in Eusa's work, into plastic flexibility, showing an artistic intent that is able to produce surprise, admiration and an architectonic reality in a setting where architecture had been limited to satisfying the practical needs of the constituent and of the regulating ordinance.

This positivism, assumed as a sign of efficiency, has ferociously limited the artistic capacity in the construction of the city. In contrast, the historical experience, both of our recent past and that of the other more distant

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past, offers us the example of cities where the delicate balance reached between science and art still causes admiration, converting those exemplary cities into something to be imitated. The spirit of pragmatism, the willingness to search for a practical purpose, is an in-depth concern of human nature, and as it is something we cannot relinquish, the cultures of the past knew how to share the utilitarian desire with a representational value, consolidating it as a superior asset to the value of utility. This representational will was firstly expressed in the foundational act of the city which trusted in the invocation of the myth – bearer of the symbol – and continued with a sophisticated ritual which, in its liturgical development, made evident the important meaning of that inaugural act.

The old city: symbol and representation

In the historical experience that has preceded us, architecture and city, as a singular expression of the same, satisfied utilitarian needs, but reflected in it we were also able to find those other aspirations of a spiritual nature that affected the social group and that needed to be expressed artistically. On these occasions, art is offered to us as a natural medium where we can find the tool that will enable us to involve the spiritual and transcendent desire of a community in its everyday.

In the past, constructing the city meant the renewal of a new beginning, a premeditated and rigorous act that, directed by elite, engaged the entire group. In its origins, the foundation of the historical city as a collective act had a high symbolic value, which was entrusted to the execution of an elaborate ritual. The exclusive predictive secret of the augur, the mysterious secrecy of his knowledge, was totally rational and coherent at a time of thought when myth shared with science the ability to give a rational explanation to the eventful world of nature. If science investigated into the cause, the myth, with its highly symbolic nature, clarified the purpose of the phenomena.

The ritual act provided the myth with an organised and coherent structure, which, in its symbolic undertaking, aspired to rationally explain the world: "if we imaginatively accept the premises of the ancients, we would be surprised to discover the extent to which their consideration of the myth and of the ritual is complete and rational, even in such a complex issue, from the ceremonial viewpoint, as the foundation of a city" (Rykwert, 2002).

As a collective architectonic ensemble, the symbolic aspect contained in predictive and ritual practices gradually gave way, with the passing of time, to a representational value that ended up being consolidated as a mark of character of the traditional city. The city constructed the necessary physical framework for the relationships among its inhabitants, and also, in the high plane of the symbolic, it provided them with a stage for daily living that had to be designed based on artistic principles that took into account the requirements of the artistic will – kunstwollen – to which the culture of every historical time aspired.

This characteristic of the traditional city as an artistic work, can be verified from historical experience, and despite the fact that during each era the city has been constructed in a different manner, with its own and specific character, in all cases it can be acknowledged "as a perfectly undertakable, homogeneous and closed event, as a delimited and autonomous place that contains the public and private elements that guarantee its equilibrium" (Martí, 1991).

The hippodamian mesh: a timeless model

On the grid, the Ensanche supported the idea of a city based on technical efficiency that would facilitate the economic and administrative management of the new town. This practical approach of the urban reality, closely linked to an idea of positivist disposition, represented a restriction of the artistic and monumental value that was so present in the old city.

The limitless reticular mesh, typical of the morphology of the ensanche, shows the denaturalisation of the hippodamian model, which, in past eras and throughout time, had proved its validity to offer superb examples of cities designed and constructed from artistic principles: Mileto; Priene; Timgad; Zamosch; Manheim or La Carolina, de Pablo de Olavide

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in the province of Jaén, are some of the many examples where the grid, as support for urban planning, was complemented with the artistic principle that each culture aspired to. In all these examples, the technical uniformity of the hippodamian grid that supports them, is offset, qualified and enriched with the incrustation of episodes of an architectonic nature, whether they are buildings or public spaces, with a high artistic value. The spiritual desire of art as a genuine expression of human behaviour, in its creative desire to overcome the historical contingency, permits cultural vicissitudes, making the city, as an architectonic reality, feel at the same time like an aesthetic reality.

The demand for utility and the need for representation were, in the past, aspirations that ran parallel and where the stimulus was reciprocal. Scientific thinking and artistic aspiration walked hand in hand at a time when the technique fell within the limits of the artisan. The alterations and modifications that the hippodamian grid suffered in the evolutionary process of the historical city were always carried out under the intuitive control of spatial meaning, of a harmonious and sensitive relationship, adapted to the specificity and destination of each space; as well as to its degree of representativeness.

Order and Contrast as an artistic principle

When one observes the work constructed by Eusa in the Ensanche, we can see more fully how the characteristic image of that Pamplona of the start of the 20th century, eager to enter modernity, has been constructed with the fragments that Eusa deposited in it throughout the years. The unhurried decantation of his singular work has been enriched with variety and contrast, with order and uniformity inherent to the hippodamian model on which inspires the Ensanche is supported.

Order and Variety as an implicit artistic principle, appealed to the judgement of reason, and Marc-Antoine Langueri made it explicit in the 18th century as a way of introducing order, and perhaps calm, faced with the overwhelming presence of a rococo decoration that, behind the pomp and glitz, concealed the truth of an art that been left hidden and suffocated by an invasive and ecstatic ornament. Thus, the oppressive order of a regular city, submitted to the uniformity of the building ordinance, makes the sensual stimulus aroused by the enjoyment of the artistic work, in this case, of the urban environment where we live, disappear. J. Starobinski correctly expresses the limitation of an art given over exclusively to order, when he says that "perfect harmony permits the coexistence of order, aimed at satisfying the spirit, and a variety of details and nuances, able to stimulate the happy surprise of the senses. Order and variety, these two principles of the classic aesthetics, are interpreted as qualities that will simultaneously claim the activity of understanding and the activity of sensitivity" (Starobinski, 1964).

The varied work of Victor Eusa in the Ensanche of Pamplona, offers, in its static and uniform landscape, an intense corridor of buildings and styles that appear before the observer as witnesses of the architect's sensitivity; but also as evidence of the artistic spirit from an era that still kept the memory of history alive.

The eclectic spirit in which Eusa had trained, enabled the architect to exploit his natural disposition to use any contemporary artistic manifestation as an expression of architectonic form; from the eclecticism of the first works, to motifs inspired by Secession and Art Déco, his unmistakeable figurative expressionism of red brick or exposed concrete, or the compulsory regionalism and the least inspired "national style" that was enforced after the war.

The emotional vicissitudes with which Eusa has expressed the art of his profession can be found peppered throughout a city which, in the longer term, has assumed the architect's characteristic work as its own identity. The variety and wealth of all of this work is offered as a guarantee of visual pleasure, in the face of the edifying spectacle of finding buildings, in the heart of the technical and efficient city of the ensanche, which understand their location in that modern city from a personal and artistic viewpoint.

Eusa's buildings overcome the programmatic demands of the project and engage in the

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construction of a city that is about to take on full significance within the urban context in which they have been designed, and only there. The actual city would be visually flatter and both its structure and its visual identity reduced, if we were to deprive it of the visual image constructed by Eusa' buildings. Understanding the Ensanche as a sensorial experience would also be limited.

The disconcerting uniformity of the Ensanche is limited with Eusa's personal work, which manages, in the urban settings where he operates, to define "a characteristic and legible environment [that] does not only offer safety but also enhances the potential depth and intensity of human experience,.(…) potentially, the city is, per se, the symbol of a complex society. If it is visually well planned, it can also have an intense expressive significance" (Lynch, 1998). The quality of Victor Eusa as an architect emancipates his work over and above the rest, making it possible to showcase the perspectives that his buildings offer in a featureless city. His building form vanishing points, visual focal points for the passer-by that stand out over the rest of the setting that is more neutral. Immersed in this inexpressive coral accompaniment, V. Eusa reveals, full of formal power, some extremely personal architecture with great determination, to influence the immediate urban setting, until transformed into visual references of the city they occupy.

The repairing work of V. Eusa

The city of the ensanche was supported on a geometric outline that lacked limits, and therefore, there was no need to define either its profile, or its singular points where that urbanised interior comes into contact with the diaphanous and ruralised exterior. The formal idea that dwells in that grid of the ensanche is deprived of that physical and precise limit, typical and obvious of the historical city.

This situation will be corrected by Eusa,

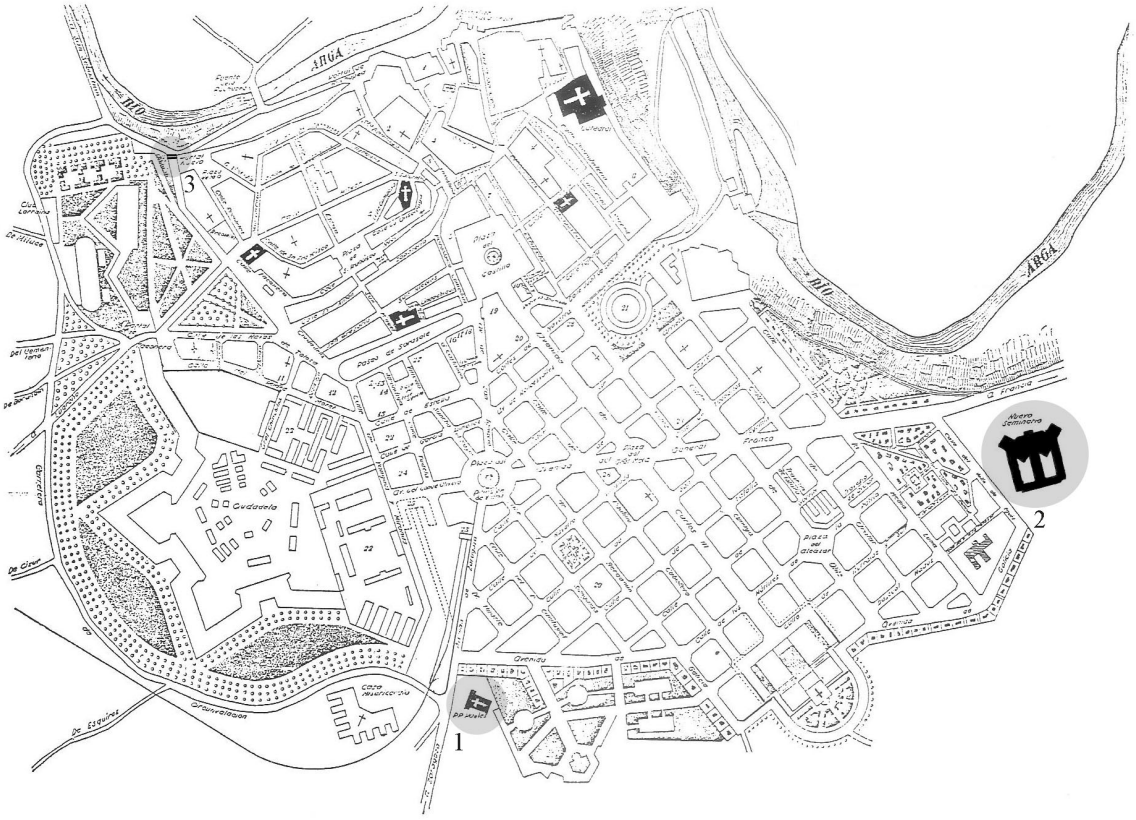

Figure 1. The 2nd Ensanche of Pamplona: 1. "La Milagrosa" School; 2. "San Miguel" Seminar; 3. Portal Nuevo.

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who, through his projects, will carry out a series of buildings in the new perimeter of the city, thus managing to characterise the entry points into Pamplona and for the urban perimeter of the new Ensanche to be architectonically signified and physically delimited (Figure 1). The strategic position of these buildings, which are located at the natural accesses to Pamplona from Zaragoza (south), France (east) and Guipuzcoa (north), allowed the architect to correct the absence of that recognisable element, that allegory of the gateway that announces the passage from an organically laid out setting to a rationally structured urban setting. Gateways that symbolically show the city as a visible expression of a mark of identity, and that the city of the Ensanche was not even able to suggest. The connection points between the inside and outside of the city were, thanks to Eusa's intervention, going to be qualified, and the ends of the ring road – now as a new boundary in the south of the urban area – architectonically resolved.

In 1928, when the design of the Ensanche began and the image of the new city was barely visible, Eusa constructed the School and Residence for the P.P. Paules in the southern access. This was a compact building, whose unit volume was supposed to show the religious community around the church as a symbol of the joint communion between teachers and students, congregation and parishioners. In 1931, on the eastern side of the city, at the opposite end of the ring road, Eusa constructed the "San Miguel" Seminary, a monumental work of modern Spanish architecture, both due to its size, and its formal and symbolic pretensions.

With these interventions on the edge of the city, Eusa managed to transfer an evident and legible image to a model with a uniform nature that was being formally being developed but lacked in identity, thus making Pamplona once again an imaginable city. These buildings have the ability to elicit the vigorous image "that facilitates the elaboration of mental images, which are vividly identified, powerfully structured and of great utility" (Lynch, 1998).
The last of three interventions on the perimeter of the city, was the Portal Nuevo, and of the three, it is the one that can assume the name of gateway with more propriety, as it reconstructs the demolished canvas of the Baroque wall. The project was carried out by Victor Eusa in 1939, but it was not constructed until 1950, modifying a previous intervention from the year 1906 by Julian Arteaga. Eusa, as municipal architect, drafted a gateway project that would dignify the city's image at that point, offsetting the deficiencies of the previous intervention, with a castle-like building that had a vigorous image, in the style of E.-L. Boullée's Portes de ville, where the architect's artistic intent placed his work on a par with the walled monument (Figure 2).

The evocative and always powerful image of Boullée's work, finds a place in this monumental work by Eusa where he relinquishes the elaborated language of the old figurative form, in favour of the play of bare masses where abstract volumes transform this Gateway into the worthiest access that the city of Pamplona has today. However, the evocation of the remote past is subtly controlled in the severe treatment of the crown of battlements that finish off the walls, and in the corbels that separate the lower body from the upper towers. All of this is treated with great austerity as corresponds to a building whose aim is, from the expression of architectonic form, to fit in with the defensive system of the walls. The actual bare surfaces of the walls act as a support to show, as if it were an ornamental collage, the archaeological remains of the Portal de la Rochapea situated nearby and more to the east of the wall, and which had been dismantled in 1914. This fortress-like work provides it with a defensive aspect that is characteristic of the walled ensemble, and the sobriety of its forms grant it a severe aspect that is suitable for a defensive element. Eusa's project completed the ensemble with some Baroque-style stairs, with no recharging and that fit in well with the austere style of the ensemble, connecting the upper level of the ring road to the lower level of the Guipuzcoa road.

Of all the fragments of the Ensanche where an ambience constituted by the work of Victor Eusa can be recognised, the one configured by Garcia Castañon Street is the area that contains the largest amount of architecture constructed by the architect. This small street

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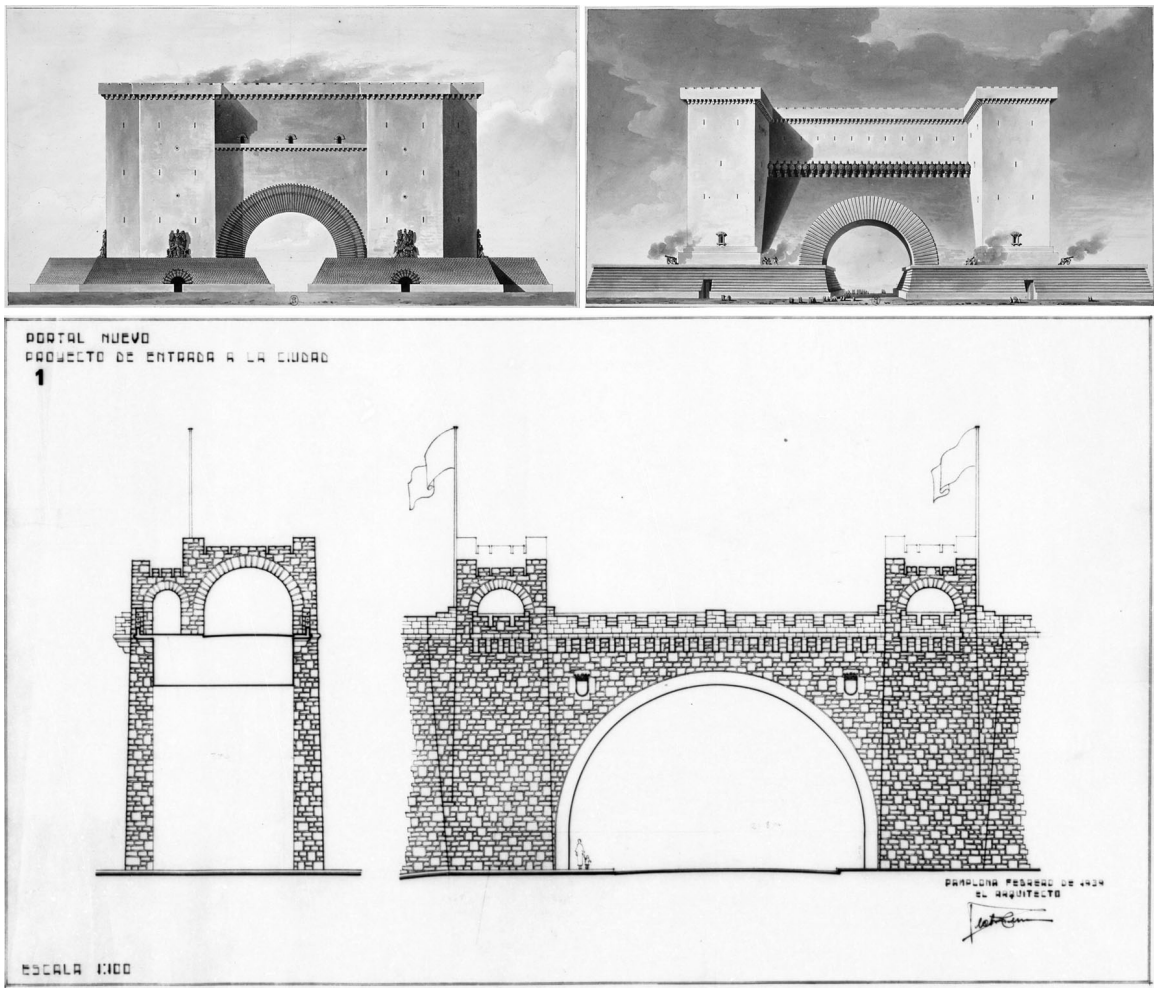

Figure 2. E.-L. Boullèe. Portes des villes; V. Eusa. Section and Elevation of the Portal Nuevo.

of the Ensanche is thus transformed into the metaphor of a living museum where some of the author's most important works can be found. Although it is not a definite collection, it comprises an important and very significant sample of the architect's personal and artistic journey over three decades.

His earlier work was carried out in the twenties, and outstanding examples of this era are the Uranga House (1922) and the Goicoechea house (1924), both of which represent an eclectic spirit that was expressed in the local terms of regionalism. In 1924, Eusa planned a residential and office building for the insurance company, La Vasco-Navarra (Figure 3). This building, in addition to the eclectic experience of the previous work, afforded a new language which, in the eastern forms, encountered a natural continuity with the regionalist northern language, as well as a note of character with which to signify the building in that urban area where García Castañón, Bergamín, Avda. Roncesvalles and Avda. San Ignacio streets converge.

Victor Eusa showed non-dissimulated devotion towards O. Wagner, and in this La Vasco – Navarra building, we find the reflection of some of the typical elements of Wagner's work. Architecture was, at that time, still a mainly artistic product, bringing together all the other noble arts: sculpture and painting. In a building like the Postsparkasse (1906) that O. Wagner offered to the international architectonic context as a mark of identity for a modern architecture that had managed to incorporate the technique of the architectonic form into the figurative world, kept alive that artistic spirit which naturally understood the

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advisability of crowning that Viennese postal bank with Othmar Schimkowitz's sculptures. Víctor Eusa, with the same enthusiasm, imitated his master and crowned his with an Athenea.

Six years later, in 1930, Eusa constructed a small block of flats on the corner of Garcia Castañon and Fdez. Arenas streets, which would end up becoming the emblem of an

Figure 3. V. Eusa. Vasco-Navarra building.

Figure 4. V. Eusa. Residential building in García Castañón street.

extremely inspiring period of the architect. The plastic capacity of the artistic genius of Victor Eusa is concentrated in this project, completing a stage of personal maturity when the architect had detached himself from the diffuse but encoded language of an eclecticism that although late, was still governed by the historical form (Figure 4).

The transformation that the architect experiences with this change in language does not entail a rejection of the previous stage, but rather, in an evolving process of continuity, this new phase allows us to recognise, in the multiplicity of lines that comprise the ornament, an endless articulation, typical of Moorish ornamental calligraphy that Eusa does not apply to the surfaces of the building; but rather he involves the actual architectonic form in the construction of that arabesque. The architect's spiritual affiliation with some artistic forms that had literally and expressly been used in his previous work is thus denounced.

In 1938, Eusa planned one of his most complete and admirable buildings in Olite Street near the Bullring. This was the San Miguel and Escuelas Pias School. The academic composition floor had a highly hierarchised axial layout where the formal emphasis applied to the corners stands out. In the beginning, these appeared to be outside the field of action of the static central symmetrical axis; but the tension introduced in the diagonals gives forewarning of the prominence that the architect will grant to them in the volumetric configuration of the ensemble. The equilibrium and accumulated tension on the floor will end up disappearing into the exterior volumetric accumulation that will afford the building its characteristic image (Figure 5). The stimulus of buildings such as H.P. Berlage's Amsterdam Stock Exchange, becomes obvious in this project. And, as in the Dutch case, the formal resources used by the architect seek to recreate, with the expression of a new spirit, the artistic keys with which the old mediaeval city was constructed.

The use of the tower as a visual lure in the uniform and aseptic context of the Ensanche, is particularly vital and emotionally suggestive. The slimness of the form and its figurative treatment, both of which are related to the building they belong to, recall the monumental square-tower-palace ensemble, as an architectonic grouping whose compositive complexity and plasticity make it a first rate urban type and aesthetic reference.

This exemplary work contains a silent statement about the idea of a city that Eusa imagined for Pamplona. The typical picturesque qualities of San Miguel and Escuelas Pias School, with the multiple forms that coexist in this architectonic object, demand an organising composition that will lead the rich formal

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Figure 5. V. Eusa. San Miguel and Escuelas Pías School.

Figure 6. View of the tower of San Miguel and Escuelas Pías school from the bull ring.

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variety inspired by that mediaeval-based urban model, and whose idea of form was not subject to any previous outline, to a harmonious and unitary whole.

The symbolic content of this project can be interpreted as a recomposition of the myth-rite duality in the anthropological plane, representing the symbolic meeting of the bullring and its Sanctuary, the latter embodied in the figure of the tower as a religious emblem (Figure 6). Recalling that atavistic moment is consciously expressed by Eusa through the appearance of the tower over the bullring, managing, both from the urban contingency plane and from the meaningfulness of the archaic, to express his will to construct "mankind's environment as a social and artistically sensitive being" (Collins and Collins, 1980).

Conclusion

Víctor Eusa incorporates an artistic value into the Ensanche through the different building he constructs on it. His buildings, clearly identifiable due to their singularity, afford the formal quality of his artistic expression that transforms them, compared with the other buildings that surround them, into urban elements with a high added value in terms of their ability to qualify and signify the urban setting where they are located.

Eusa attempted to recuperate the artistic profile that existed in the historical city from the aesthetic standards of architectonic expressionism, seeking the sources for his inspiration in those artistic movements that value the artist's non-abstract expression within models that could be understood as a renewed continuity of architectonic tradition. Therefore, his work lacks references to the examples that extol the machine as a model, making the denial of History the purpose of a new art. An art that expressed the spirit of modern man and of his future, thanks to technical progress, represented the consummation of a positivist materialism that threatened to destroy that other mankind that was still represented in the humanistic spirit that found, in history, the real model of art.

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A configurational perspective on the transformation of small- and medium-sized historical towns in Zhejiang, China

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Abstract. *Historical cities in China have experienced tremendous changes in the past century and in particular over the past 30 years. While an increasing number of researches on the transformation of major cities have been witnessed in recent years, endeavours to studying the more ordinary and small- and medium-sized towns are very rare. This research attempts to bridge this knowledge gap by studying six historical towns in Zhejiang, China from a configurational perspective. Changes of street configuration and its relation to spatial distribution of urban activities from Qing dynasty to the present are investigated. Methodologically, both axial and segment models of Space Syntax method are employed and different syntactic measures are examined, in order for an insightful analysis of the change of street configuration. Point-of-interest (PoI) mapping is harnessed to describe urban activity distribution, and its relationship with street configuration is examined using bivariate correlation analysis. The result shows that all six case studies exhibit similar process of change – street configuration become increasingly integrated and structured from Qing dynasty to the 1980s before getting separated and less structured and diverging in street layout until the present. The distribution of urban activities, however, is shown positively correlated to spatial integration throughout the period of history under investigation.*

Keywords: Urban transformation, spatial configuration, Space Syntax, small and medium-sized historical Chinese cities

Introduction

Recent years have witnessed an increasing number of researches on the formation and transformation of major historical Chinese cities such as Beijing, Nanjing and Xi'an (see Gaubatz, 2009; Gu et al, 2003; Chen et al, 2016; Schneider et al, 2016, among many others), but endeavours to studying the historical process of the more ordinary and small- and medium-sized historical towns in China are relatively rare. While the challenges of urban heritage conservation and historical area regeneration to those major cities are still pressing and require continuous efforts in both research and practice, the small- and medium-sized traditional towns, especially those in the East of the country, arguably will soon be confronted with the same threats due to a new wave of rapid urban development in the near future (see China's 13th five-year plan (2016-2020), where urbanisation of small- and medium-sized cities and towns is high in the agenda).

The difficulty that rapid urban development brings about is often a dilemma between the demand of rapid growth, which usually requires, and mostly results in, radical changes to old street layout and building blocks, and the need for conservation, which in general

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aims to retain as much as possible, or at most permit incremental changes to, the traditional urban fabric. Specifically, for those towns of which the historical area successfully retains its economic attractiveness and social vitality, the challenge lies in coping with excessive investment and over-development; and on the opposite, for those towns of which the economic centre shifts away from the historical area, maintaining the past urban environment and preventing it from declining is the key task. In either case, understanding the correlation between the functioning of the city and the transformation of its physical structure, and in particular the underlying spatial-social logic, would undoubtedly be useful for making informed decisions on urban planning and development.

However, studies on the transformation of historical cities in China mostly focus on social, economic and political institutions, and only a few investigate the spatial dimension. This disproportionate emphasis in research has led to a lack of knowledge about the interrelations between the formal change of a city and its economic and social processes. In practice, the absence of this insight may easily rule out opportunities for achieving concerted efforts in both conservation and sustained development. This study is therefore conducted as an initial attempt to bridge this knowledge gap.

The primary aim of this research is to firstly explore what new light configurational analysis of street network can shed on our understanding of the transformation of the small and medium-sized historical towns. In light of this, two fundamental questions are raised to serve as the guideline for this study:

1) What configurational characteristics do the street networks of small and medium-sized historical towns exhibit in their transformation?

2) In this process, whether the transformation of streets configuration is correlated with the change of urban activity distribution and, if so, in which ways and to what extent?

And six historical towns in Zhejiang, China are selected as the case studies. On the one hand, as one of the most time-honored provinces, Zhejiang is the home to a great variety of small- to medium-sized historical towns, which are mostly reasonably well preserved and hence can provide a fertile ground for the proposed investigation; on the other, Zhejiang province and in particular these historical towns are now standing at the forefront of new economic development in China, which means that an insightful understanding of the correlation between their physical structure and urban activities is in dire need to cope with the aforementioned challenges.

In this paper, we start by briefly reviewing Space Syntax method, the most widely applied approach to street configuration analysis, and how it has been used hitherto to study the transformation of cities. The methodological framework, which is largely drawn on Space Syntax method, will then be introduced before discussing in detail the results of configuration analysis and their relations to urban activity distribution.

Space Syntax and urban transformation

Space Syntax, developed in the 1970s by Hillier and colleagues in UCL, is a well-known method for describing and analyzing street system. Basically, it argues that cities are movement economies, where the structuring of movement generated by the configuration of urban grid leads to dense patterns of land uses, which, through multiplier effects, further attracts movement and other urban activities and then characterizes the spatially successful city (see Hillier, 1996). So far, Space Syntax method has been used in a broad range of research fields, ranging from economics, archaeology and sociology to architecture and urban design and planning. In urban studies, it is widely used to study the spatial configuration of street network and its relation to social and economic processes, such as pedestrian movement, land use layout, community security and etc.

Technically, axial and segment analyses are two methods often used in Space Syntax. For axial analysis, street network is represented using the longest and fewest straight lines, which is generally regarded as axial map, and distance between different spatial locations

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(axial lines) is measured by topological depth. Two key metrics, integration and choice are calculated to describe respectively the 'to-movement' and 'through- movement' potential of a spatial location as well as the entire network (Hillier et al, 1987). For segment analysis, as suggested by the name, street network is represented following natural street segments and the distance between different spatial locations (street segments) is measured as total angular changes along the shortest path. The same metrics of integration and choice remain as key indicators but are calculated in a slightly different way. It is necessary to point out here that the segment analysis with metric radius is found to be instrumental in detecting major to- and through-movement routes in a street network (Al-Sayed et al, 2014). Moreover, it has been proved that the normalized angular choice (NACH) and normalized angular integration (NAIN) can effectively eliminate the interference from system scale and enable the comparison between street systems of different sizes (see Hillier, 2012).

In studying morphological transformation of cities, space syntax method is often used for comparing configurational properties of street network and its relation to urban functions between different historical periods. For instance, Karimi (1998) investigated and compared the spatial transformation of old English and Iranian cities, using global and local integration, connectivity, synergy and intelligibility based on axial models, and found that the transformation of English and Iranian cities is dictated by two different rules. And Pinho and Oliveira (2009) studied the evolution of urban form of Oporto during the 19th and 20th century, using the same measures, and identified three typical morphological periods. There has also been some research on Chinese cities using Space Syntax. Dai (2004) investigated the spatial structure of Suzhou and its relation to urban functions before and after 1949. Using segment analysis and the measures of NACH and NAIN, Shen et al (2013) studied the morphological transformation of historical centres in Tianjin over the past 150 years and examined the spatial reasons for the change of their role in the entire city.

Case studies and methodology

As shown in Figure 1, six historical towns in Zhejiang province, namely Yuyao, Ninghai, Tiantai, Longquan, Qingtian and Lanxi, are selected as case studies. First, the administrative system of the old Chinese cities generally contains, from low to high hierarchy, Xiancheng (county), Fucheng (prefectural city), Shengcheng (provincial city) and Ducheng (capital city) (see He, 1996). For the ease of comparison, all six towns selected in this study are exclusively Xiancheng. Second, these cases are selected to provide a relatively full spectrum of development scales. Specifically, the built-up area of the cases ranges from 550 ha of Qingtian to 4924 ha of Yuyao. The third consideration is to cover different geographical conditions. The selected towns are distributed across plains, riverine areas, and mountain valleys.

Moreover, to provide a picture of continuous urban transformation, four historical periods from 19th century onward are identified. They are decided based on the general historical development process of the small- and medium-sized historical towns in Zhengjiang as well as the availability of historical maps. As shown in Figure 1, the first period is 1870s-1900s of the Qing Dynasty; the second is 1930s in the period of Republic of China; the third is 1980s, the beginning of economic reform in China; and the last one is the present. Space Syntax is employed to analyze street configuration and both axial and segment analyses are performed for all six towns in three stages:

The first stage aims to provide an overview of the spatial transformation of all six towns together using both axial and segment models. Analysis at this stage mainly focuses on comparing and contrasting the key syntactic measures of street configuration across the four historical periods. The second stage pays a special attention to the transformation of configuration 'cores' . Based on axial model, both 'integration core' and 'choice core' of each case study are compared across different historical periods. The first research question stated previously is to be answered with the results of the first two stages. The final stage

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examines the relationship between distribution of urban activities and street configuration. This will be examined both qualitatively based on land use maps and axial model and quantitatively using bi-variate correlation analysis. Result of this stage is to answer the second research question.

An overview of spatial transformation

The investigation into spatial transformation begins with axial analysis, where several syntactic measures are calculated and compared, including global integration (radius n) and local integration (radius 3), global choice (radius n) and local choice (radius 3), connectivity, and synergy. The definitions of these measures are explained in Table 1. While each measure of six towns is calculated respectively, this section aims to focus on the combined results to gain an overview of the spatial transformation. Because of this, the mean value, standard deviation (Sta.Dev) and coefficient of variation (CV) of each measure are shown in Table 1.

First, while global integration increases from Qing to 1980s and then decreases in 2017, both local integration and connectivity exhibit constant increase. This means that at the local level the street networks of all six case studies in general become increasingly integrated throughout the history, but at the global level they turn to be separated from 1980s to 2017. This result may be attributed to two characteristic patterns of urban transformation that have been observed in many Chinese cities since the 1980s. The first one is that, due to rapid urbanization, many cities did not expand incrementally from the edge of existing urban areas, but instead attained growth by developing multiple large-scale new districts from scratch in the outskirt of the city. Not surprisingly, the poor connections between different new and

Historical Period	Statistics	Int. Rn	Int. R3	Con.	Choice Rn	Choice R3	Synergy	Intel.
Qing	mean	0.861559	1.24106	2.652507	0.190659	0.168133	0.761362	0.442208
	Sta.Dev	0.197149	0.26263	0.510503	0.112114	0.062576	0.100019	0.08581
	CV	0.228829	0.211617	0.192461	0.588034	0.372181	0.131369	0.19405
1930s	mean	0.997385	1.53017	3.119673	0.072771	0.113648	0.713019	0.334471
	Sta.Dev	0.061541	0.084709	0.242305	0.035543	0.017355	0.062264	0.110263
	CV	0.061703	0.055359	0.07767	0.48842	0.152711	0.087324	0.329664
1980s	mean	1.074205	1.557807	3.159782	0.063561	0.106386	0.772586	0.383326
	Sta.Dev	0.184841	0.157187	0.239312	0.030541	0.039702	0.09101	0.072256
	CV	0.172072	0.100903	0.075737	0.480497	0.37319	0.117799	0.188497
2017	mean	0.966395	1.673565	3.556453	0.04716	0.10157	0.640058	0.308457
	Sta.Dev	0.231804	0.168155	0.357048	0.027975	0.036035	0.136959	0.068584
	CV	0.239865	0.100477	0.100394	0.593191	0.354777	0.213979	0.222345

Int.= integration; **Con.**=connectivity; **Intel.**=intelligibility
Global Integration: mean depth of each axial line from all other lines within the system;
Local Integration: mean depth of each axial line from all other lines up to three steps away;
Global Choice: frequency of each axial line traversed by the shortest path between each pair of axial lines within the system;
Local Choice: frequency of each axial line traversed by the shortest path between each pair of axial lines up to three steps away;
Connectivity: the number of axial lines intersecting with each axial line;
Synergy: correlation coefficient between local and global integration. It is usually used as a measure of the part-whole relationship of the system;
Intelligibility: correlation coefficient between connectivity and global integration. It is usually used as a measure of the degree to which we can understand the whole system from a part of it.

Table 1: Results of axial analysis for all six case studies from Qing to 2017 (Source: authors).

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to existing urban areas lead to the decrease of global integration of the entire city. The other one is that, for both old and newly developed urban areas, gridiron layout is often used, and in many cases superimposed, as the standard street plan, which in fact substantively contributes to the increase of local accessibility and hence local integration.

Second, from 1930s to 2017, while the coefficient of variation of local integration exhibits moderate increase, much more significant increase can be observed for that of global integration. This reveals an interesting pattern of transformation that when the six towns grow larger in scale, their street configuration tends to share more similarities at the local level but vary more evidently at the global level. Putting together this result with the cartographic maps of six towns, this difference, particular for the present, can be explained by the fact that all the case studies have a number of urban areas in gridiron layout, but the ways they are organized into the entire street system and connected to surrounding areas differ dramatically from one another.

Third, both synergy and intelligibility increase from 1930s to 1980s, and then decrease from 1980sto 2017. It indicates that the part-whole relationship of the six towns is getting poorer and poorer with the expansion of urban areas. This result mirrors a problem of urbanization suffered by many Chinese cities that an increasing number of urban areas, both old and new, become less connected with the rest of the city as a result of large-scale urban development with and accompanied creation of super blocks.

To sum up, an overview of the axial analysis results shows that the six historical towns share a similar street configuration in the Qing period and the 1930s. However, in their development process, especially from 1980s to 2017, the difference of street configuration becomes larger and larger.

Following axial analysis, segment analysis is conducted to further investigate the spatial transformation. The aforementioned measures of normalized angular choice (NACH) and normalized angular integration (NAIN) are compared. 'Mean and max NAIN show the ease of accessibility in the foreground (max) and background (mean) networks in the usual syntactic sense, while mean and max NACH index the degree of structure in the system', and structure here means 'the degree to which the background network forms a continuous grid with direct connections, rather than being broken up into discontinuous sub-areas (mean NACH), and the degree to which the foreground grid structures the system by deformations and interruptions of the grid (max NACH) (see Hillier et al. 2012). The mean value of NAIN and NACH, standard deviation (Sta.Dev) and coefficient of variation (CV) are shown in Table 2. And the result of four indices are visualized in Figure 2.

Historical Period	Statistics	mean NACH	mean NAIN	max NACH	mx NAIN
Qing	mean	0.883396	0.970938	1.481435	1.436195
	Sta.Dev	0.135146	0.074013	0.069851	0.094876
	CV	0.152985	0.076229	0.047151	0.066061
1930s	mean	0.879242	0.931843	1.452103	1.380713
	Sta.Dev	0.052185	0.157786	0.034431	0.144193
	CV	0.059352	0.169327	0.023711	0.104434
1980s	mean	0.936116	0.960042	1.483612	1.417337
	Sta.Dev	0.048224	0.151599	0.050434	0.260763
	CV	0.051515	0.157909	0.033994	0.183981
2017	mean	0.95603	0.960266	1.448925	1.358004
	Sta.Dev	0.031147	0.232705	0.026243	0.33721
	CV	0.03258	0.242334	0.018112	0.248313

Table 2: Angular segment analysis results of six case studies from Qing to 2017 (Source: authors).

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Considering the relatively low quality of cartographical maps and to achieve an as accurate as possible analysis, Qing period is excluded in the following discussion.

Regarding the background network, both the mean NACH and NAIN increase from the 1930s to 2017. This indicates that in general the background networks of all six towns become more and more structured (continuously connected) and integrated since 1930s. Besides, the increase from the 1930s to the 1980s is shown much more significant than that from the 1980s to 2017. This can be explained by different development patterns of street network in these two periods. From the 1930s to the 1980s, the strengthening of the accessibility and structure is mostly due to the refinement of street network, and specifically, connecting the dead-end in the old city. And from the 1980s to 2017, the increase is instead attributed to the newly introduced gridiron layout as discussed before, which by default tends to have relatively high value of mean NACH and NAIN.

As for the foreground network, the results are different. Max NACH and NAIN increase from the 1930s to the 1980s but decline from the 1980s to 2017, when the values of both indices are even lower than those of the 1930s. This means that generally the foreground network of all six towns is clearly identifiable and serves as the main blood vessels of movement before the rapid urbanization in China, but this function became weaker and weaker since 1980s. This change is also reflected in the visualized result of both NAIN and NACH as shown in Figure 2. Putting together with the results of mean NACH and NAIN, we can find that the 'foreground' and 'background' of the six towns in general are clearly observable in the first period, but their differences becomes less strike and ambiguous in the second period.

Spatial transformation of 'configuration cores'

The above overview uncovers some interesting configurational characteristics that the six case studies have in common in their development. To provide a more insightful answer to the first research question, the six towns are investigated separately focusing on the change of 'configuration cores'. Both the 'integration core' and 'choice core' of six case studies are shown in Figure 3.

In the axial model, Hillier empirically defined the 'integration core' as a cluster of axial lines obtaining the top 10% integration value. In a street system, 'integration core' usually enjoys the highest accessibility and is usually where social and economic activities likely to concentrate. Considering the differences of Chinese cities, instead of directly following Hillier's definition, we experiment with a slightly different way to define and identify both 'integration core' and 'choice core', using 'mean value + one standard deviation' as the cut-off point. Tested in comparison with Hillier's approach for all six case studies, this new method is proved more effective and appropriate for this study.

First, integration cores of all six towns share a similar process of change – they exhibit incremental and continuous growth in the first three periods but dramatic variation in the last one. Specifically, for the period of Qing, the 1930s and the 1980s, the integration cores consistently exhibit the same pattern of a 'deformed wheel', which basically consists of one or two long and highly integrated lines, mostly are the main thoroughfares of a city, and several slightly less integrated lines connected to them. However, this commonality cannot be observed in 2017. While the integration cores of Yuyao and Ninghai somewhat retain the pattern of 'deformed wheel', those of Tiantai, Longquan and Lanxi become much more dispersed. More interestingly, unlike other towns, the core of Qingtian remains static in the old city and does not even reach to the new developments opposite the river. This result corroborates with the previous findings discussed in section 4 that street configuration of the case studies has more similarities at the first three periods but shows more variations when they expand and become large in scale.

The second interesting observation is the spatial relationship between integration core and choice core. For all case studies, their integration cores and the choice cores are largely overlapping in the first three periods. In general, the choice core includes within it the long and straight lines of the integration core. We can infer from this result that the six towns are likely to be structured following very

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similar spatial rules and logic in the first three periods. For instance, bounded and constrained by the city walls, they are generally developed along one or several connected main streets, which serve as the centre of movement and many other urban activities.

However, spatial layout of the integration cores and choice cores become divergent in 2017. While the choice cores still mainly comprise of the arterial roads for all case studies, the integration cores varies among the case studies. This can be attributed to their different ways of urban development over the past 30 years. For instance, Yuyao and Ninghai has expanded incrementally from the edge of existing urban area with a continuous urban grid, and as a result their integration cores take the form of a centralized grid 'patch'. On the contrary, the new development areas of Tiantai and Lanxi are separated from and only weakly connected to existing urban area, and this makes the connecting roads between different urban areas highly integrated and a main part of their integration cores.

Street transformation and urban activities

In this section, we relate the results of configuration analysis to spatial distribution of urban activities, addressing the second question raised at the beginning of this paper. Distribution of urban activities in this research is described in two different ways due to data availability. For the present, it is measured relatively accurately using Point of Interests (PoI) mapping, and for the three periods in the history, it is approximated by the layout of principle urban 'elements', i.e., the major buildings or urban spaces that accommodate important activities in the city, such as government buildings, shopping malls, churches, markets and etc. (see Karimi, 1998). In general, these 'elements' are mostly the main generators or attractors of movement and urban life. In the following texts, we firstly look at the relation between street configuration and the layout of principal urban 'elements' for the first three historical periods and then conduct a bivariate correlation analysis to analyse that between street integration and kernel density of PoIs for 2017.

The 'integration core' and urban elements

In general, the principal urban 'elements' of the case studies are divided into two categories. One is public element, including governments, hospitals, schools and temples; and the other is commercial element, including markets, hotels, cinemas and department stores. In order to analyse the relationship between street configuration and spatial distribution of principal urban elements in a more intuitive manner, all the urban elements are directly registered onto the axial maps showing the integration core. Results are illustrated in Figure 4.

For the first three periods, it is not difficult to find out that across all six case studies the principal urban elements share a similar spatial layout with the integration cores. For instance, most public elements are located along streets that are parts of the integration core, and in particular the most integrated lines always pass through the government building for all six towns. This result seems to suggest that street configuration plays a crucial role in shaping the functional city, because historically these urban elements always act as symbolic carriers of social and economic life (Kostof, 1991).

For the present, the relationship between urban activity distribution, which is described using PoI maps, and spatial integration varies among the case studies. For instance, the urban activity centre and integration core almost overlap with each other in both Ninghai and Qingtian. In contrast, the range of integration core is much larger than that of activity centre for Yuyao, Tiantai, Longquan and Lanxi, yet looking more closely, they are all different. Despite different ways of describing urban activity distribution, the hazy relationship between urban activity centre and integration core is sufficient to warrant a more detailed examination.

Correlation between street configuration and distribution of PoIs

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Bivariate correlation analysis is performed to investigate more accurately the relationship between spatial configuration and urban activity distribution for the period of 2017. Specifically, integration measures of both axial and segment models and at both local and global levels are correlated to kernel density of PoI for all six case studies. For local integration, radius of 1000m and 2000m are selected in view of the scale of the historical towns. In GIS platform, a 100m*100m grid is deployed to calculate the kernel density of PoI. And the same grid is superimposed onto both axial and segment maps to translate integration values of street to adjacent cells, which are used as the unit of analysis. The result of correlation analysis is shown in Table 3.

The result shows that almost all different measures of spatial integration are significantly and positively correlated with kernel density of PoI. This means that urban activities in general are gravitated towards the more accessible streets. In the meantime, differences in the degree of correlations can be clearly observed among different cities and different measures.

In all the cases except for Tiantai, the correlations examined based on the axial model are exclusively higher than those based on the segment model. This suggests that axial analysis is relatively more sensitive and accurate in capturing the configuration of street network that is likely to affect the spatial location choice of people in pursuing their economic and social life.

It is also noteworthy that the correlations of local integration measures are much stronger than those of global measures for segment model and the opposite for the axial model. In other words, segment model, where metric distance is used as the radius to measures the threshold, tends to be more capable of capturing local residents' spatial location choice for their everyday urban life. And axial model that uncovers the topological structure of a system instead is more powerful in describing the overall distribution of urban activities across the entire city.

Another interesting observation is that all the correlations of local integration measured at the 2000m radius are exclusively above 0.5, and which are also the strongest one among all five correlations for every case study (except for Lanxi). This result suggests that, at least for the five historical towns, distribution of urban activities is most effectively described and perhaps can even be predicted by local integration measured within the range of a 2000m radius, i.e., 20-30 minutes' walk or 5-10 minutes' drive.

Models	Measures	Pearson correlation with kernel density of POI					
		Yuyao	Ninghai	Tiantai	Longquan	Qingtian	Lanxi
Axial Model	Global Integration	0.296**	0.546**	0.290**	0.342**	0.496**	0.187**
	Local Integration (R3)	0.206**	0.474**	0.293**	0.242**	0.346**	0.135**
Segment Model	Global Integration	0.105**	0.39**	0.317**	0.126**	0.405**	0.013~
	Local Integration (R1000m)	0.478**	0.784**	0.477**	0.165**	0.544**	0.618**
	Local Integration (R2000m)	0.647**	0.803**	0.643**	0.553**	0.673**	0.529**
N		4314	1657	1666	914	418	2136

Significance level: **p<.01, *p<.05, ~ p>.05

Table 3: Bivariate correlation between integration and kernel density of PoI (Source: authors).

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Finally, let us look at the correlations more closely across all case studies. Ninghai obtains the highest r value for four out of the five integration measures, and the correlation coefficient at 2000m radius is even above 0.8. In contrast, Lanxi is shown to have the lowest r value for three out of the five integration measures. The reasons for these differences can be many and the spatial ones that can be inferred based on their cartographic maps are perhaps different street layout and topography. For instance, while Ninghai has a continuous and well-connected street network, which means the system is generally highly accessible and therefore is likely to give rise to strong correlations for different integration measures, Lanxi is divided by rivers into three barely connected urban areas, and in such a case the forming of urban centre is usually not related to the configuration of street network but instead many non-spatial factors.

Discussion and conclusion

Through the layered analysis in this article, we have tried to establish, from a configurational perspective, an account of the spatial transformation of small- and medium-sized historical towns in Zhejiang, China. As shown in the results of configuration analysis, the six case studies repeatedly exhibit a strong pattern of change. That is, they become increasingly integrated and structured and share many similarities in street configuration from Qing to the 1980s, but turn out to be separated and less structured and diverge in street layout at present when they grow much larger in scale. This pattern is also evidenced by the relationship between spatial integration and urban activity distribution, whereby the principal urban 'elements' are found mostly and consistently located in the proximity of highly integrated streets before the 1990s, whereas in 2017 the spatial location and range of urban activity centers and integration cores considerably varies from one another.

In view of the rapid urbanization in China after the 1980s, we argue that underpinning the abovementioned reversal of street configuration in urban transformation and its relation to the distribution of urban activities is presumably the drastic expansion of cities. It may take the form of developing new urban areas from a tabula rasa at the outskirt or superimposing context-free urban layout onto the existing or both. Without more concrete evidences from more insightful studies, however, perhaps for now we can only leave this argument as a hypothesis. In particular, the complexity of urban process needs to be carefully considered when examining the relationship between street configuration and urban activity distribution.

Nevertheless, the significant and positive correlations between different spatial integration measures and kernel density of PoI, though vary dramatically, are noteworthy. Despite that people's spatial location choice for social and economic activities in a city cannot be reductively simplified as a function of street configuration, from the point of view of Hillier's theory of cities as movement economies (Hillier, 1996), it is not unreasonable to argue that the links between street configuration and PoI distribution uncovered by the correlation analysis potentially can offer some insights about, for instance, the possible spatial change of urban activity centre in the near future, and then contribute to more informed decision-making on future urban development.

Moreover, the results also seem to suggest a categorical framework of the spatial transformation of small- and medium-sized towns in Zhejiang, China. For instance, if we take a close look at the specific form of integration cores and their position in the whole street system, it is clear that the six case studies can be easily categorised into three groups. Perhaps we can call the first one 'grid patch', including Yuyao and Ninghai, of which the integration cores are very compact and in a gridiron form; the second one can be named as 'connector', including Tiantai, Longquan and Lanxi, of which the integration cores are somehow dispersed and comprise of connecting routes between several separated urban areas; finally, the third one is represented by Qingtian, of which the integration core is linear in shape and only comprises of a few loosely connected lines, and for this reason may be regarded as 'linear core'. Similar grouping can also be identified based on the relationship between integration core and choice core, and/

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or the correlation between spatial integration and urban activities. Admittedly, categorical framework proposed solely based on a small sample can be very arbitrary. However, as hypotheses, they are sufficient to suggest a relatively clear direction for future studies.

Last, due to time constraint and data availability, this study is limited to only six case studies and the findings can be drastically different when one case study is removed or a new one introduced. For instance, in the analysis of mean NAIN, we found that it decreases substantively from 1980s to 2017, but if we eliminate the lowest value of Qingtian, the mean NAIN instead shows a slight increase. More case studies need to be incorporated in future research to either verify or falsify the findings of this study and also to explore the abovementioned new opportunities.

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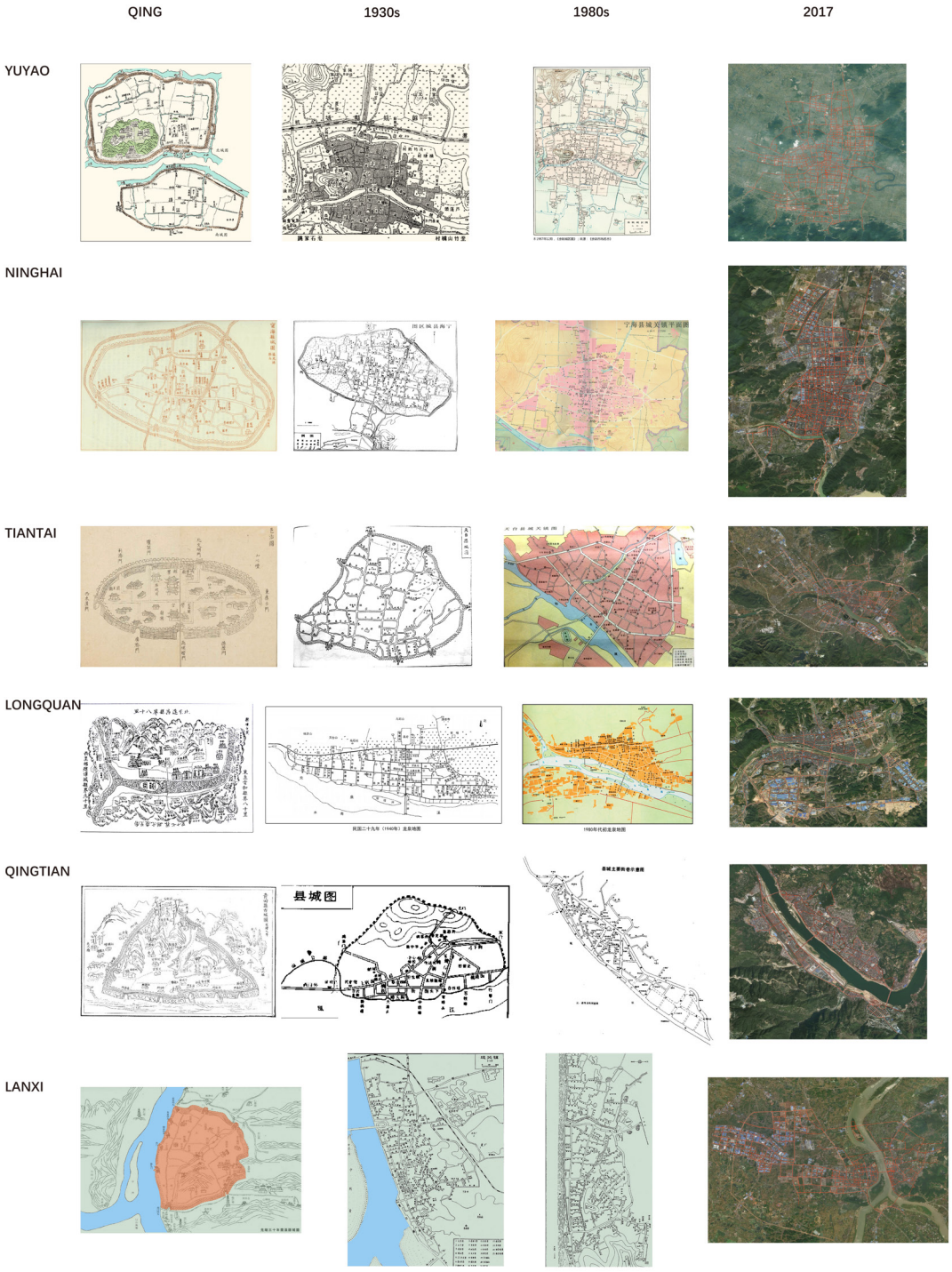

Figure 1. Cartographic maps of six case studies in four different historical periods (Source: archives of selected towns and Google Map

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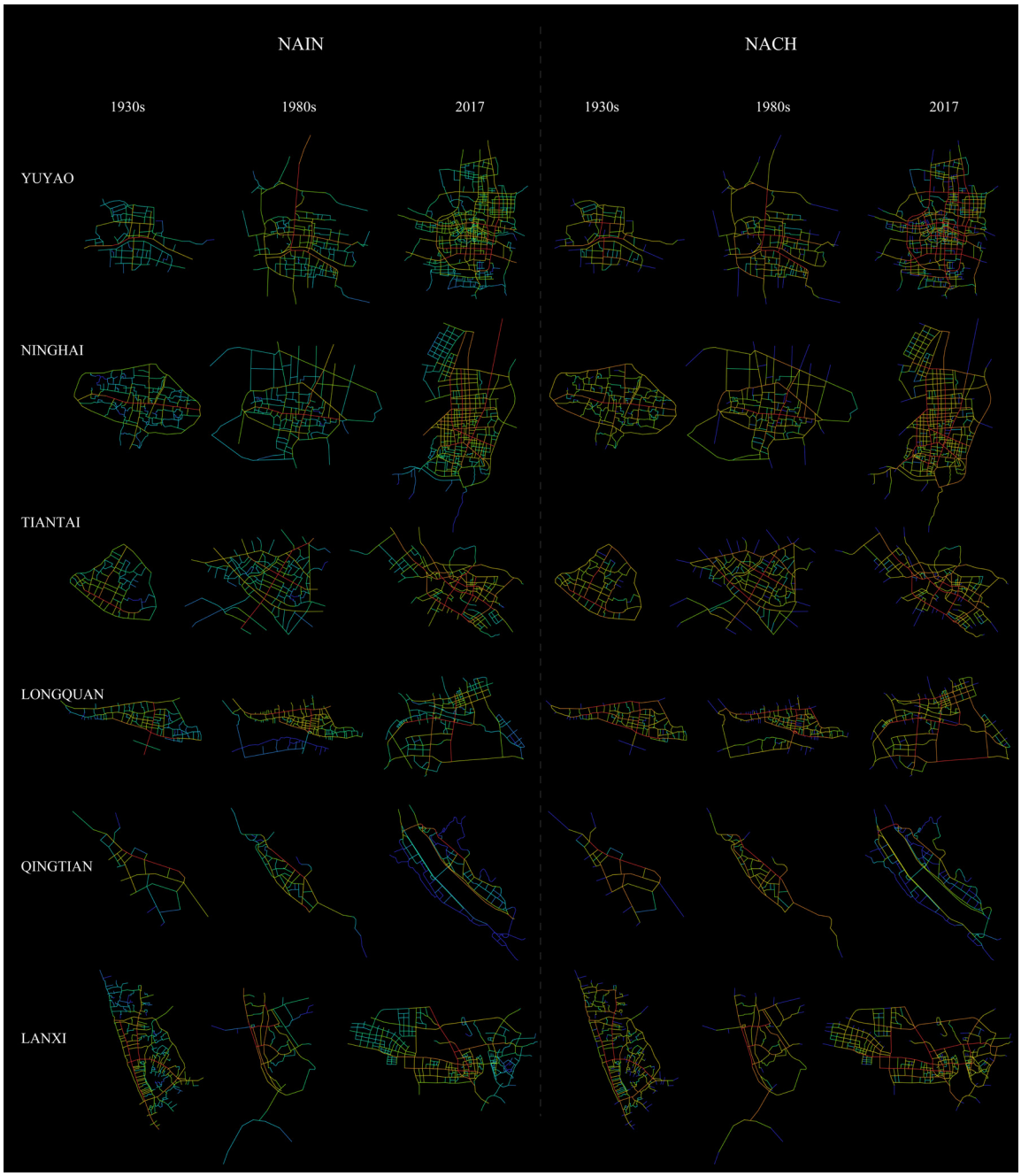

Figure 2. Results of angular segment analysis of six case studies (Source: authors)

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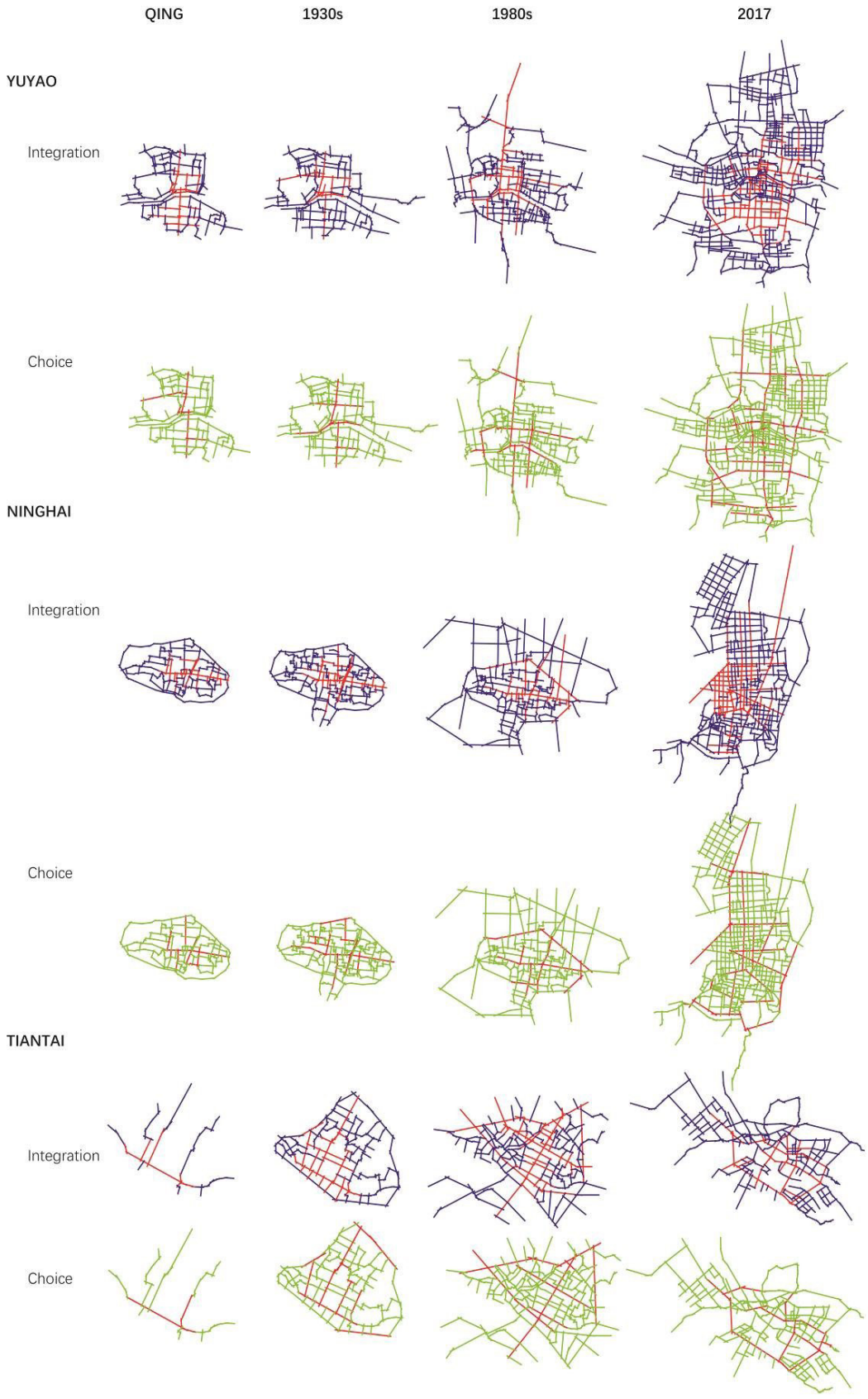

Figure 3. The 'integration core' and 'choice core' of six case studies (Source: authors)

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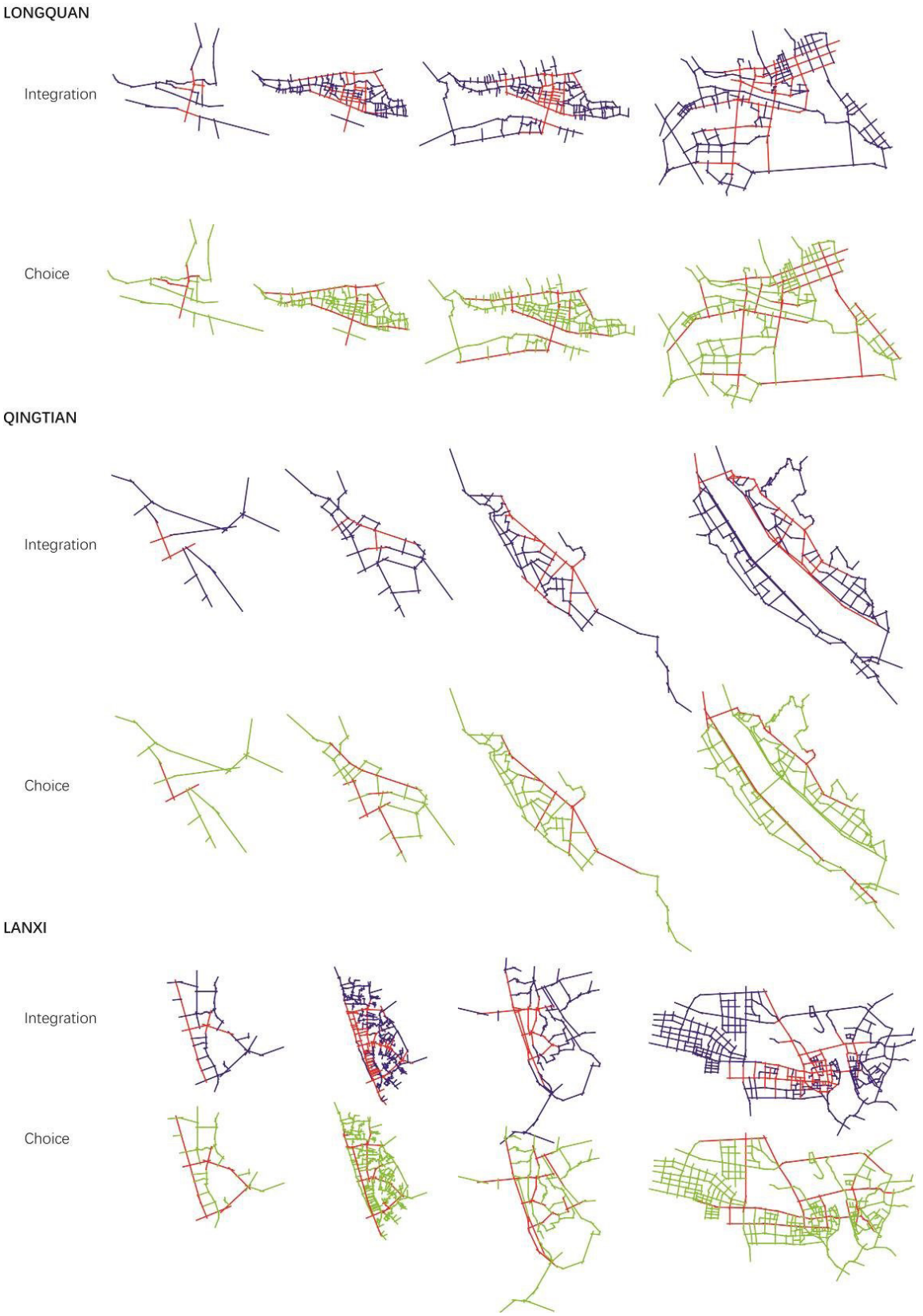

Figure 4. The 'integration core' and distribution of urban activities of six case studies (Source: authors)

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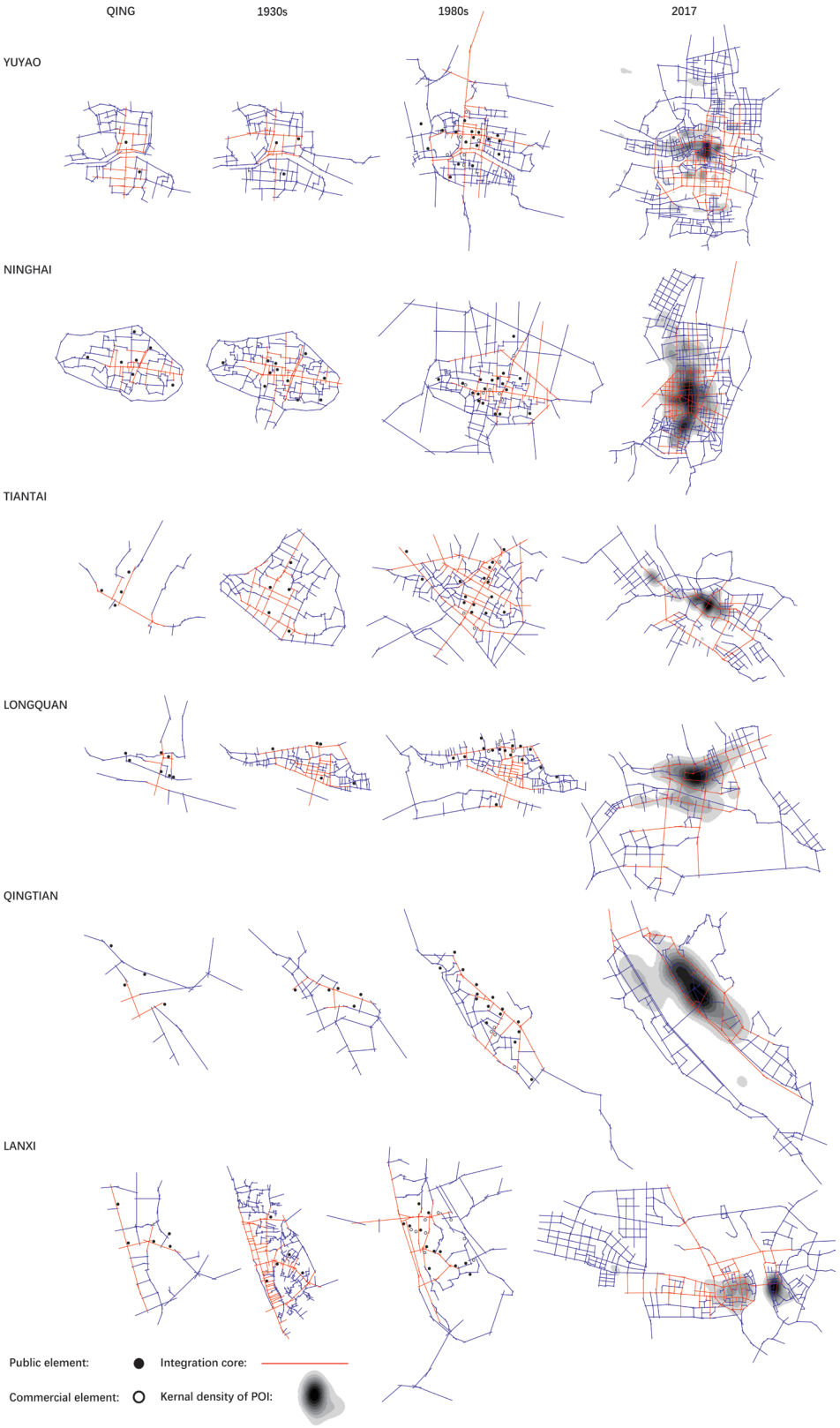

Figure 5.

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Re-reading morphological concepts to face globalization: using typo-morphology to excavating modern and contemporary forms

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Abstract. *Traditionally typo-morphology deals with reading cities, chiefly historical cities, to retrieve legible urbanism after Modernism changes. During Modernism period and after that new types of forms and new kinds of functions inserted to urban fabrics all over the world which this process can be seen as a mutation of urban form everywhere. Disadvantages resulted from Some of these forms are the main reasons which morphological studies turned his head to historic cities to find traditional approaches which can answer better the functions responded by these new forms. But some of them includes functions never exist before. This mutation happened once again during the globalization process. Globalization gave birth to new types of forms and new kinds of function. Typo-morphology based on a deep background of concepts and methods found many ways to study historic urban forms. This article argues using typo-morphological methods for understanding and taxonomy of new forms can lead us to knowledge for how to bolter these new forms for further exploitation. In this regard the notion of type in classical studies of typo-morphology, philosophical interpretations of 20th century and methodologies developed by different schools of typo-morphology is reread. Based on such scrutiny judging all these forms can be possible and give some legitimacy to stay in or abandoned from the repertoire of urban types. The article ends with a proposal for a methodical exploration of classical notions of morphology to study the mutation process happened after modernistic changes and the new round of changes known as globalization.*

Keywords: Typo-morphology, Globalization, Modernism

Introduction

It seems unacceptable that "urban form" as a general term had a meaning in ancient cities. In another world people in old civilizations, ancient territories and our old cities hardly had any idea about the notion of "urban form". But by contemporary interpretations ancient and traditional urban forms were functionally acceptable, not only for old everyday life, but also some of them can respond, more or less, the contemporary way of life in some scales. Today urban morphology of middle ages, Renaissance, and baroque cities in Europe, and Islamic, Indian and Chinese and East Asian cities before Modern era can be considered as a rich repertoire for architecture and urban design, today. But it is obvious that there are many enormous changes in way of life that the method for using best appropriate forms in urban context is a matter of thought. These changes happened by Modernism and Globalization, here called as two round of urban form mutation, and the main question which is tried to be answer is in which way urban morphology can dominate these all changes.

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Methodology

The article fundamentally uses interpretative, Hermeneutic research methods. The temporal process of changes in urban form is reviewed and synthesized with based on roots, development and changes of Modernism and Globalization. Urban morphology, also, reviewed as an approach facing problems of urban form. In hermeneutical terms this procedure led to understand the morphological concepts from new point of view, to excavate its ability to faces changes and non-historic forms.

Reviewing the past: Modernism, Globalization, and the role of urban morphology

Historicity of urban morphology and the problem of modern discontinuity

Applying historical urban forms can be seen in contrast with rapid urban changes in modern period. Catastrophic ending of 19th century comporting sudden increase of population, hygiene problems of cities, congested roots and streets, and unorganized spread of suburbs, made many reformists and architects, as Lammpugnani (1985) shows, to develop reforming of ideal concepts of cities (Wagner 1895, Statham 1897, Howard 1898, Garnier, Berlage (1902-1915), Le Corbusier (1922). Modernist concepts based on Protestant ethics and soul of capitalism (Weber 2002), pure Descartesian rationalism, growth of technology (steel, concrete and armed concrete) and in context of post-war period took traditional urban fabric under a heavy surgery. Reformists and idealist tried to create a fabric responsible to many changes happened in this new world which can tolerate the pressure of mass population, new transportation facilities, and hygiene requirements of cities. These led to creation of many new forms and types totally different from routine traditional urban forms, as well as new types of activities. Tall buildings, hypermarkets, highways and subways, and new formal expression of monumental buildings injected to soft and smooth fabric of traditional cities. The most influent change has been reversed relation of mass-space which modified spaces from closed polygons surrounded by buildings to a fluid liquid which tall buildings were floated in it (Ostrowski 1970).

The "city" changed from an organic environment, being in peace with context and having humanistic scale, to a mechanic mass, superimposed to environment and gigantic dimensions. Rhetorically and poetically, we can use the word "mutation" as a metaphor for this changing process. Naturally a city might transfer from one formal condition to another, but trough this mutation the word transform can be used to explain this conversion. This condition spread out of Europe and influenced many other cities like Islamic cities and East Asian ones. The mutant urban form could be seen everywhere across the world in mid 20th century. This condition led to many approaches which can be classified to two main categories, in the same direction and the other in opposite. Typo-morphology (also urban morphology) is one of these antithetical approaches.

Typo-morphology in 60's was a clear effort to retrieving all formal values of pre-industrial urban form. Many elegant works, theoretically and practically, formed by pioneers of urban morphology, like Conzen (1960), Vidler, (1977) Colquhoun (1969), Argan (1963), Moneo (1978), and members of Muratorian School. Many projects have been done, mainly in Italy based on morphological concepts. But during these efforts, another process of mutation happened once again.

Another round of mutation, global forms

Based on Late capitalism, post Fordism and informative evolution, all manners of businesses, transportation, giving birth to new telecommunications, flow of labor and professional forces between countries (Stiglitz 2007), changed many formal aspects of cities once again. Naturally new types of activities are derived out of this new condition, and some of new formal changes are exactly in continuity of modern concept. Giving birth to airport cities, in scale of a whole region, CBDs and world trade centers, in scale of districts, megamalls, and international exhibition complexes, in

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scale of big buildings and complexes, and many small stores with universal exposé, like Mc Donald's, Subways', Starbucks' and so on, are samples of "modernistic universal continuity" (Guggenheim and Soderstrom 2010) .

Here the Ingredients of global development are not similar to its modern alternate. The concept of mobility penetrates in all aspects of development of Global Era. So, here the problem is not domination of modern technology. The concept of mobility penetrates in any physical entity, so the matter of development is not using concrete, or steel structures, but using any facility to make data, money, materials and people floating all over the world. This will happen to serve global flow of finance work better to serve international financial companies, brands and trademarks. Buildings are built to be a place for universal brands and markets.

There is another formal aspect of globalization in cities. Buildings themselves become as new brands which can travel from their context to new country, like activities. Any form from any context can be decontextualized and has been used in another atmosphere. A great sample of this is the type of "villa". In real state's advertisement all over the world we can see images of "villas" fundamentally belong to places far from the market's regional/ territorial boundary. Kint (2010) presented a "Scottish villa advertisement in Indian market. Many other types of buildings/activities can be found similar to this one. Bungalows, resort cottages, fancy royal houses and other types of buildings are trying to have market from East Asia to Middle East, and from Africa to South America, as well as Europe and North America.

According to this any individual person can experience, "somehow", "same" activity, in the "same" special configuration, no matter what's the context. He can inter a global-branded coffee-shop, and see people, nearly from many countries beside the host countries people, Experience a global-like atmosphere, and again return to local social context. According to this, "branded" building has a possibility for user to be disconnected from context and connect to it whenever he wants. This can be considered as another round of mutation which made a time-space black-holes in city fabrics, which no-one can refer them to any specific place or social context.

Urban morphology and challenge of discontinuity

The basic considerations of urban morphology jargon were to conquer the problem of discontinuity resulted by modernist changes. In this regard urban morphologists tried to reread rich repertoire of European typology and morphology of old medieval European cities. They categorized block types, street patterns, plot lots and buildings to formulate a mechanism for piecemeal change in urban fabric or to inject new formal configurations in building projects.

Urban morphologist criticized the modern concept of mass and space. First of all the idea of pure functionalism (as a design rationale) and plastic abstraction (as aesthetic preference) of modern design are disqualified (Vidler 1977). Mainly, the modern relation between mass and space of urban configurations became a subject of criticism. Modern designers saw urban space as an endless and unbounded phenomenon like a liquid which can reach any place when it is flowed on land, and can go around free-standing buildings. This pattern of mass-space relation named Tower in Garden by Le Corbusier. The main claim of urban morphologist, in this regard, was to reverse the relation of mass and space (Krier 1979). Returning to medieval pattern, morphologically, urban space is preferred to be bounded by buildings and being a closed space, like a liquid bounded by bowls and jars linked together by narrow pipes (the last one can be considered as streets).

In relation to this urban configuration and mass-space mixture, building types can find places in morphology, which are not no more considered as a result of functional rationale, but formally have an independent value which can contain deferent activities without heavy manipulations and historically are elements of identical and historical continuity (Rossi 1982).

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The concept of historical continuity and criticism of permanent destruction/renewal of modern thought led to an historical obligation of urban morphology. Here, the word history can be seen as a place of scrutiny. The question is where is the ending point of history? Today, in the beginning decades of 21th century can we still credit the beginning of modern mutation as the ending point of "history" and read "historical urban fabrics" which formed before that? Or we can, should or must consider "history" as a process which it's ending point day by day? Does urban morphology, substantially deals with form, or time? And is there any attention timeless forms can be found in theoretical debates of urban morphology, or not? Recently the approach of ISUF to practical aspects of morphology can be a undeniable tendency to considering the subject of contemporary time and considering history as a process which can find its end, only in "today". Writings by Sheer (2013) and McCormack (2013) shows such tendency, but more accurate Nasser (2013) targeting the subject of contemporary city and morphology.

It seems that the concept of non-alignment of urban morphology and history can be found in fundamental texts such as Vidler (1977), Calqohoun (1969), and Moneo (1978). But initially the question will arise that what can be the alternative of urban morphology's historicity and to what extend this alternative(s) can work(s)? and moreover, what can be the rule of the historicity itself.

Disscusion

Trilogy of a century: Modernism, Globalization and urban morphology

Relying to any concept for changing urban environment deals with a deep-rooted need for that concept, whether it works or not. According to this, we can see the raison d'etre of modernistic urban form in need for furious after war construction, raison d'etre of global forms in an extensive need for inter-territorial connectivity, rooted in vast scale of mobility, and raison d'etre of morphogenetic approach in exact need for historical and identical continuity.

The first sparks of modern thought after renaissance deals was results a dichotomy between subject and object (based on descartesian thought which led to new duality between self and outside world which ended to victory of outside world. Understanding objects (without subjective interpretation) led to objective studying methods of environment base on measurement and scaling. Quantitative approaches came out this point of view in sciences which dominates many fields including architecture and urban considerations. Any line of enquiry, any test of existed knowledge needs a clear answer about its credit, a positive or negative answer. According to this modern building process is based on quantitative calculation about population mass, transportation needs and construction requirements. Such elements do not deal with sensual, perceptual, social and identical needs of human being, because objective approach of modern though tried to superimpose objective results worldwide on life of every human being. Tall buildings, huge transportation lines, vast unbounded spaces and ultimate zoning are result of such line of thought. Moreover, rush in construction is fundamentally a modern development process. According to modern formal aesthetic an ideal form does not belong to it context and can be found everywhere, and uses everywhere.

Globalization era is begotten of an idea about time and space, beginning with primitive telecommunication tools. This idea does not change the presence of time and space but tries to deny it. The ideal of globalization is ultimate mobility and connectivity. The world of globalization, metaphorically, is similar to its required infrastructure, digital technology and mobility. The matter of globalization is to transfer data, capital, goods, people, as much as, as fast as, and as far as it can. In this world, anyone, any object and any kind of data, can, should and must be able to, move from one place to another, and be disconnected from its context and be connected in new one. So, forms in global era are neither belong to their context nor to any other contexts, and simultaneously can be found everywhere. One can see a complex, a kind of spatial configuration, a type of ornament or decoration in different place of

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the world. One can enter a mall in Dubai and experience snowfall of northern land, one can be in India and see American Dream houses, and one can be in Tbilisi or Shang Hi, or Prague and enter a Starbucks coffee shop, or one can be in Tehran, Athens, or Istanbul and by Benetton cloths. It is obvious that digital technology let people to experience many events far from its place, like watching a world cup game happening, for example, in Moscow, standing in front of a giant monitor in Berlin. It is not a matter of reflection that "where we are" because we can experience the whole world in any places in every time. No matter the time and place, we are in no time and nowhere.

But the matter of urban morphology is exactly related to time and place. Continuity deals with a form related to its context and to its past. Urban morphology retrieves pre-modern urban forms and elements because they have a continuous background of existence. Urban morphology focusing on form of settlements in diverse scales sees forms in relation to each other. This relationship can be seen based on time or space. A single definite form can be interpreted in relation to its past forms, to evolutionary variations of itself in future, and to adjacent forms, forms before its existence or precedence, or form after these. Typology of these forms belongs to a place or a time, simply to somewhere.

Table 1 comparatively shows these concepts in a short glance. It is obvious that modernism and globalization defined new needs which their selves generate forms for these needs. Despite the efficiency of these forms, they have been used and spread all over the world and many everyday requirements are being answered by these forms. The existence of these new forms and simplicity of their use are undeniable. Urban morphology which refers to history can dominate these forms and dissolve all of them in its legitimate everlasting approach, by considering "history" ended in present time. The main question here is to find concept in urban morphology debates to conquer typology of everywhere and typology of nowhere and melt them to typology of somewhere.

The jargon urban morphology and contemporary forms

Regardless of genealogy of the word, type, which is not so crucial for practical actions, reviewing this concept must be started from mid 20th century conceptualization of Argan (1963), Colquhoun (1969), Vidler (1977), and Moneo (1978), Although all these are based upon thoughts of Quatremere de Quincy, Abbe Laugier and first of all Goethe, which built up the concept of type, in architecture, which is applicable in urban design and planning now. Argan used the word "type" versus "prototype" which means a configurative form exist a priori to all designed examples derived from it. But "type" is result of a reduction process

Point of view	Raison d'tre	Rationale	Duality/dichotomy	Approach	typology
Modernism	Furious construction	Functionalism	Positive- negative	Quantitative	Typology of everywhere
Globalization	Inter-territorial connectivity	Mobility	Connect-disconnect	Digital	Typology of nowhere
Urban morphology	Identical continuity	continuity	Before-after	Relational	Typology of somewhere

Table 1. Trilogy of 21th century's typology

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of all existing forms of a defined function, use, or configuration. So type is a root form, which stemmed from a knowingly study and observation process, reducing all existing forms with a commons subject (Argan 1963). So recognizing 'types' is result of refining, reduction and summarizing definite forms to a root. The root form is not like a structural grid, but internal configuration of a form or a principle which provide possibility of endless formal diversity. According to Argan types must be defined in a hierarchy which these types should have longitudinal and latitudinal relation with each other.

Vidler (1977) seeks the meaning of typology in the context of city as a repertoire for architectural and urban forms. Here, urban fabric can be seen as a whole which it's past and present is embedded in his body. The typological approach which he described as 'third typology' (versus Nature- oriented typology of Laugier and Mechanical typology of Le Corbusier) deals with themes remained on pre-existed types, themes which are common between types and themes resulted by combining these types (Vidler 1977). This approach is neither utopian and nor nostalgic, neither ancient and nor avant-garde. The urban fabric is stack of city's experience, and in this stack we can find fundamental rules of designing spaces and buildings. By choosing forms (basically their types) from the past, although the forms are disconnected from their temporal period, but still bring their social and political meanings form past to present. So we can see the continuity of urban form during temporal changes.

Calquhoun (1969) extracted the innovative capacity of 'type' in design process. He argues that every act of design deals with a pre-assumptions and there is no way to see our pure intuition at the beginning of design process. So using types will not bind our hands to design, but just makes us to start faster. Because the respond to each design problem can be found in a definite type and any other methods, tools and applications (like all quantitative analytic tools, interpretive and intuitional ecstasy, and problem solving diagrams) can only lead us to a framework which shows us the way how to pass the process, and no final forms can be gained from this methods, tools and applications. Here, using a typological hierarchical repertoire can bring us at the first step of designing absolute final form.

Moneo (1978) excavated the notion of type and defined type as 'a concept which describes a group of objects characterized by the same formal structure'. As he argues type is not a spatial diagram of an average of a serial list, but based on the possibility of grouping objects by certain inherent structural similarities. The idea of type which 'ostensibly rules out individuality at the end has to return to its origins in a single work'. Moneo expressed that types are not only tools for describing architecture, but architecture is always produced though types. The architecture can be produces through types because types are open to the process of change. The type can be thought as the frame within which change can be operated. So type is not a frozen mechanism but in can deny the past and looking to future.

All these can be seen as viewpoint extremely rooted in the words of Quatremere as defined "type" versus "model"

"the model understood as a part of the practical execution of art is an object which should be imitated for what it is the "Type" on the other hand is something in relation to which different people may conceive works of art having no obvious resemblance to each other. All is exact and defined in the model; in the "type" everything is more or less vague. The imitation of "types" therefore has nothing about it which defies the operation of sentiment and intelligence." (Chr 1788 in Argan 1963)

Quatremere see type as a vague and neutral entity that brings only an idea of a form and do not dictate a form. So type always transfers a content of past projects but this content do not affect on design process of new building. So all these buildings are refined of their formal qualities in a type and designer can create a new building free from historical indicators.
According to this review, the notion of type is fundamentally value, and time free, but the reduction process of existing building to root types let values and temporal character to be embedded in type. Table 2 will give a clue about this character of the concept, 'type'.
As an outcome for this conceptual review, key

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Main definition	Quatremere :The idea to conceive design without dictating any definite form, as a vague and neutral entity which can be repeated in many forms but let diverse forms exist		
Author	**Notion of type**	**Procedural aspect**	**Conceptual explanation**
Argan	Result of reducing many existing form to a root type	Refining. Reducing and summarizing forms with degined function, use of configuration	internal configuration of a form or a principle which provide possibility of endless formal diversity
Vidler	A body which embed past and present of urban fabric	find fundamental rules of designing spaces and buildings, in the stack of urban experience, By choosing forms (basically their types) from the past, which is disconnected from their temporal period, but still bring their social and political meanings form past to present	Timeless and value free (neither utopian and nor nostalgic, neither ancient and nor avant-garde)
Calqohoun	A pre-assumption for intuition in any act of design	Responding to diverse design problems, by its diversity	A cell for typological hierarchical repertoire which can bring us at the first step of designing absolute final form.
Moneo	A concept of form which describes group of forms with similar inherent structure	A tool which opens up the process of change in architecture	The type can be thought as the frame within which change can be operated.

Table 2. Summary of mid 20th definitions, explanations and concepts for type

points that introduce the notion of type can be summarized which any` practical action deriving from morphological thoughts should be founded upon them

Consideration of 'type' as a vague and neutral entity that brings only an idea of a form but not dictating it

The process of reducing existing form to a root configuration of a type

Embedded historical content within the type and the ability of type to be free from historical contents.

The commitment of developing hierarchy of types which have longitudinal and latitudinal relations with each other

The ability of types to be used independently of in relation or combination with each other

Using a contextual repertoire of types as a beginning stage of design process

Morphological concepts let us be free from any substantive value, so any urban form can be subject of reducing process of sample forms. So any kind of forms, belonging to any temporal period, and any context, can be reduced to a definite type.

Conclusion

Referring to the notion of type as the essence of formal elements of urban fabric the solution of the problem of being is seeing urban morphology free from values apathy to historical substances. According to this, form can be seen regardless of functional, conceptual and historical substance. This can

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be done by reductive process and abstraction of all contemporary forms (contemporary forms, here, means all forms existing in urban fabric, whether historical forms, their modifications or new forms). Any individual type, no matter what is the historic period it belongs to, and no matter what is the function it serves, can be used again and again in many new derivations. So, such repertoire of types can be a fundament for using, mixing, making hybrids, modifying, and updating forms for new needs. In this way we have a line of continuity which starts from the beginning of our history, save its continuity through modernism and globalization and do not escape from any period.

Such a process will lead us a knowlege for a a framework which include a method for selecting forms exist in all urban fabrics to develop prescriptive norms for all situations. So this method should choose forms with many possible configurative patterns and diversity of morphological hierarchy; patterns remain from past, or modifications of old patterns. Also all other forms with any kind of contrast with formal preferences embedded urban design and architectural theories, have capacities for further development of cities. But using this capacities need to modify the forms for real needs. It seems this is similar to the absolute meaning of reading the city expressed by morphologists (Nessbit 1996). Nevertheless, the main question here is how to mix and combine different types. Is there any theoretical indication for such a thing or just simple practical rationale will give us a chance to do this? Combining different qualities with different fundamental bases and concepts will make a designer to use normative approach as a meta theory. But using this approach for urban changes relying on urban morphology needs more researchs and deep scrutiny.

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Nova Imago Urbis: the transformation of city walls in early Renaissance as a model to recover the image of contemporary city

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Abstract. *The transformation of fortifications in early Renaissance supposed a revolution not only from a strictly military view: at the same time the medieval fortifications were replaced by others designed to deal with the artillery, the urban walls which was part of the essence of the European cities from Antiquity had to be transformed. Aware of this problem, several generations of architects coinciding with those that promoted the Renaissance in Italy during the quattrocento and cinquecento, tried to look for a functional, formal and symbolic resolution to this incipient fortifications against the artillery. The challenge was to give a new form to the new defence works, a "form" that at the same time allowed the maximum of technological correspondence and the maximum of symbolic and visual significance for the city. This article discusses the consequences this process had for the definition of the city's image from Renaissance to 19th century and exposes some recent project examples that, following the lessons learned during this process of redefinition of fortifications, tries to give back to the current historic cities its lost image.*

Keywords: Fortifications, Image of the City, Imago Urbis, Renaissance

Introduction

The development of our European cities has drastically transformed its structure and positioning in relation to its territory. From an organization in which both –the City and its territory– responded to essentially distinct entities, the city has extend its influence to its surrounding, even occupying its environment completely. This kind of development has made disappear in a short period of time, those typical tools which cities used to exhibit themselves as single entities stood out from their natural surroundings – remembering these words of Goethe on his journey through Italy – as belle natura fata per il huomo, differentiated from nature itself.

This city concept as a microcosm – as a self-space singularized by and for the human – gave rise from the spring of the first urban organizations to the establishment of some city-constituent concepts, largely invariant and traceable throughout all urban acts to date; concepts which are closely related to our need to position ourselves in the world and organise, both physically and symbolically, our surrounding landscape.

These mental connections derived from this primitive act of inhabiting – essence of the City after all – have lay down from the origin of our western civilizations the norms for an inhabiting style that in essence remained invariant, producing some types of cities that – although diverse in immediate signs – responded to the same way of asserting themselves against

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nature. Such is the continuity and the trace left by this attitude that it even reborns in an author distant with this idea of the western city as Le Corbusier:

Primitive man has brought his chariot to a stop, he decides that here shall be his native soil. He chooses a glade, he cuts down the trees which are too close, he levels the earth around; he opens up the road which will carry him to the river or to those of his tribe whom he has just left; he drives in the stakes which are to steady his tent. He surrounds this tent with a palisade in which he arranges a doorway. The road is as straight as he can manage it with his implements, his arms and his time. The pegs of his tent describe a square, a hexagon or an octagon. The palisade forms a rectangle whose four angles are equal. The door of his hut is on the axis of the enclosure – and the door of the enclosure faces exactly the door of the hut.

This primitive man called up in this fragment of the famous Vers une Architecture becomes aware of his position and makes it his own through two simple but transcendental acts: the delimitation of an enclosure – he surrounds this tent with a palisade in which he arranges a doorway – and the creation of an inner geometric order – the pegs of his tent describe a square, a hexagon or an octagon; the palisade forms a rectangle whose four angles are equal – which differs from the outer natural order. Therefore, reappear in this text those two invariants which – as Paolo Sica also states – are coincident with those who have long dominated not only the form, but also the City idea: the concept of limit and the concept of center.

Idea of limit and idea of center, outer boundary and inner trace which, as a speedy response of humans against the virgin nature, are already represented from the earliest civilizations. As example, this notion appears in the Egyptian hieroglyphic sign of City – an inner cross enclosed by a circle – or in the primitive idea of labyrinth, proving not only the material transposition of these two concepts to the form of the city, but also its strong symbolic change that survived even to our days. In this sense, the debt of the pictogram Le Poème de l'Angle Droit made by the hand of Le Corbusier to these two previous symbols is evident. [figure 1].

Of this pairing, I am interested in arguing the importance of this idea of limit for the establishment of the City itself. I will do it paying attention to one of the most critical moments in the evolution of this urban boundary: the transformation of the medieval walled enclosures of the European cities in fortifications prepared to face the new artillery, and the consequent change caused in the city image, symbolized until then through the

Figure 1. Hieroglyph of city, Minoan coin representing a labyrinth and drawing for Le Poème de L'Angle Droit of Le Corbusier

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defined image of medieval crenelated walls and elevated towers. Considering that albertian parallel of thinking the city as a large house, the city perimeter itself –its precinct– shapes not only its simple urban enclosure, but also sets up the true façade of the city, an essential part of it structure which is crucial to its representation outward

Consequences of the transformation of medieval fortifications for the European cities image

The significance of this urban façade for the city's own image is clear if we consider not only its functional use, but also the symbolic and formal meaning of the enclosure par excellence of this urban limit idea: the city walls.

Besides fulfilling a clearly functional role, that of defense, these walls inevitably assumed for themselves those values that their own nature as an essential part of this urban pairing – the limit and the center – demand them. A glance to the symbology related to the fortifications is enough to understand the close link between the walls and those symbolic-representative connotations of the urban boundary: from the mythological meaning of walls in the Greek archaic culture to the founding rituals of the Roman pomerium, from Biblical significance of the fall of Jericho's walls to the vital importance that them took in the medieval representations of the City, the formal definition of this urban boundary was essential to define the way in which the city itself was shown outwards. It is such the connection between both them in some periods – between the city and its walls – that to give an example, Isidore of Seville could even claim that the city itself was its own walls, as we can still suspect in the Renaissance fresco made by Benozzo Gozzoli at Montefalco, which represents the city of Arezzo. [figure 2]

In spite of the changes produced over the centuries and transformations caused by the different conditions of epochs, it can be affirmed however, that both antique fortifications – Greek and Roman ones – and even other as distanced in time from them as medieval ones,

Figure 2. San Francisco expels demons from Arezzo, Benozzo Gozzoli

were in accordance with one same structure. Therefore, this functional correspondence preserved a certain formal continuity that connects not only these medieval fortifications to its predecessors, but also links the medieval urban image with those cities of Antiquity.

However, this affinity of the spirits in relation to forms – reusing this quote of Henri Focillon – was truncated during the 15th century due to the appearance of the cannon as a siege weapon. The changes forced by the new siege techniques transformed radically the functional base that underpinned the unique ensemble of symbols and formal repertoires of medieval fortifications. Beyond the functional challenges that this supposed – there is a large bibliography about it – the replacement of the ancient medieval walls imply the research of a new formal repertoire for this city boundary – is walls – that could replace this formal complex system not only functionally, but also from its representative and symbolic sphere.

Fully aware of this necessity, several generations of architects – those who coincide with the generations who promoted the Renaissance in Italy during the quattrocento and finally settled it in early cinquecento – tried to find a functional, formal and symbolic resolution to the budding fortifications against artillery. From Francesco di Giorgio Martini to Baldassarre Peruzzi, from Leonardo to Michelangelo and, with more intense if it fits,

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all the generations of the Sangallo family from Giuliano to Antonio the young, worked to promote this transformations, completely aware of its implications beyond their functionality. Definitely, as Giorgio Muratore also warned, the challenge was to give a new form to the new defense woks, "form" that at the same time contains the maximum of technological response and the maximum of symbolic and visual significance.

This process, which finalized as we can know from our current perspective with the adoption of the bastioned systems as the defensive form par excellence, far from being a continuous and linear walkthrough, was characterized by numerous particular contributions that over the years defined certain tendencies that ended up defining this bastioned system itself. In my opinion, the main success of these attempts was to use geometry itself for formalize the fortifications and bring together in these new defensive systems their double character of functional limit and symbolic boundaries, inherent as we have seen to this idea of urban limit and of which – according also to Giorgio Muratore – the city itself could not be dispensed with.

The first effort against the power of artillery was to oppose passive resistance. The top of the elevated medieval towers and walls were cut, walls were thicken and new defensive elements were developed: rounded cubes, curved planes and curved surfaces for example. As Francesco Paolo Fiore stated, the resistance by the solidity of the materials budget up to the resistance through the form. The first notable attempts to give formal and visual coherence to this defensive system must be attributed to Francesco di Giorgio Martini in his fortifications for the Duchy of Urbino. In a structure still clearly dependent on medieval schemes, these martinian defensive buildings are characterized by a sequence of broken and sloped planes alternated with rounded and polygonal towers with a great plastic and formal coherence.

Grosso modo, after these first passive efforts, followed a progressive assimilation of artilleries power as a useful weapon also for the defense. The straight line drawn up by the shot of the cannon, instead of being faced by the curves and slopes on first fortifications, started to take importance as modelling elements for the defenses. Fortifications began to use flanking systems to protect the walls laterally, the cubes were transformed into polygonal bastions with large terraces to settle artillery and the general geometry of the walls began to adapt to these shooting angles. In this sense, the work of the leading Renaissance architects was significant to prevent the definition of these new defensive elements from being based solely on technical and military judgements. The hand-drawn sketches of Leonardo da Vinci in its codices or Michelangelo's own drawings for the Florentine walls speaks for themselves regarding to the searching for a formal expressivity in their fortification projects. [figures 3 and 4]

The crucial step towards defining the new image of the urban façade occurred when the communion between these two answers – the passive and the active one – make easier the establishment of a coherent formal system where all the parts were linked with each other through clear geometrical connections. In Henri Focillon's words, nothing is more seductive than to show the form submitted to an internal logic that organizes it, where the variation of the form itself does not depend on the use of strange contributions, on the use of a

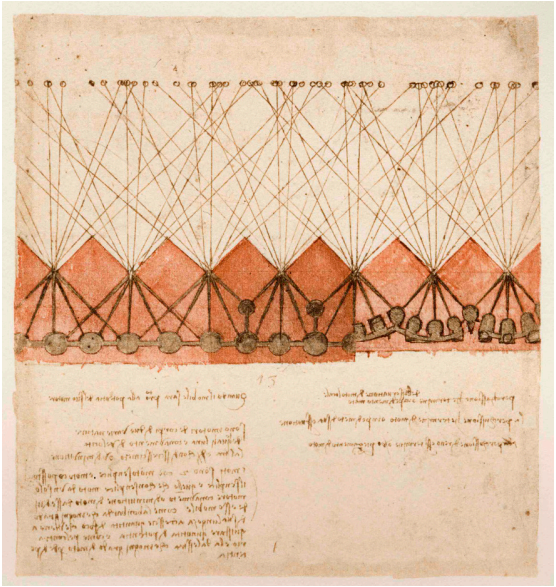

Figure 3. Leonardo da Vinci's drawing, Codex Atlanticus 0767r

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Figure 4.One of Michelangelo's sketches for the fortifications of Florence, Casa Buonarroti 27Av

random choice – as it happened until then – but on the game managed by its own rules. And it were precisely these simple geometrical rules, summarized and concretized in their definitive form by Antonio da Sangallo the younger for the third decade of 16th century, which allowed, as Francesco Paolo Fiore also affirms, to synthesize architectural stability – that is, formal and symbolic coherence – with few and simple offensive-defensive rules.

This rules contributed to reach a new defensive system that could be easily adapted to any location; a system that gave a unitary support in which project the symbolic and representative aspects of the city, and that also improves the formal unity of the whole, reinforcing in this way, the image of these new urban boundaries. Proof of this success are not only the several defenses made in many cities according to this geometrical system, but also its use since then – practically without any exception –in al Renaissance Ideal Cities treatises, where the deep geometrical order of these bastioned walls clarity reinforced the geometrical idea of Renaissance city. As an application of these Ideal Cities, it is not only the well-known city of Palmanova, but also all those citadels built in representation of the governing power – Florence, Pamplona, Antwerp, Turin, etc... – not by chance, built in form of miniature cities which follows the simpler geometric scheme originated in this defensive system: the fortified pentagon.

In conclusion, the efforts made by these Renaissance architect generations succeeded in preserving the nature that characterized the walls from ancient times as vera facciata of the city. The new fortification system developed during so many decades, undoubtedly was able to replace the medieval ones, and also contributes to the emergence of a new idea of city which, without essential variations, become the image of our European cities – and all those new cities that were founded on colonial lands throughout the world – well into the 19th century.

Lessons for the contemporary city: two examples of recovering of this historic city boundary

The demolition of fortifications that surrounded the historic city, its massive growth and the transformation of the skyline of our cities – among many other reasons – has unbalanced this center-limit relationship that has been until today an essential part of its urban structure. From this Italian experience can be valued the relevance that for the city had not only the definition of its interior structure, but also its representation outwards. That is, from this experience can be learned the relevance of configuring a boundary that delimits an inner enclosure – the city itself – and an outer space – its territory – delimited by an effective façade that gives to the city its own unity and image.
Althoug this inside-outside relationship has changed in the las century, opposed to what happened between the 15th and 16th centuries, there are few cases in which the redefinition of this historic cities boundaries has been consciously reconsidered. Exceptis excipiendis, the case of the famous Viennesse Ringstrasse for example, cities have favored a continuous expansion where, at best, in this transition between the old walled city and its successive extensions is placed only an empty space or an uncertain street, in short, a blurred memory of this forgotten limit.

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Despite the fact that the development of the contemporary city seems to continue on other paths – unrelated to its definition as a unitary structure – regarding to the historical city it still seems possible – even essential from my perspective – to recover and reinforce the memory of this missing urban façade. Only this way, through the reaffirmation of the singularity of the historic cities, can be recovered the relation between these essentially different two cities which are destined to coexist: the historic city and its respective extensions.

Among the projects that have recently tried to resolve this question, I have decided to outline two interventions where the influence of the lessons learned from this Renaissance experience – the use of a formal system based on the geometrical clarity as a substitute of medieval fortifications – is manifest. These are two projects made in two cities, diverse for one another, Milan and Hondarribia, but with a common feature: the use of formal recoveries of their fortifications – the first one through formal evocation, the second one by restoration – as a way to give back to these cities the memory of their historic urban image and to redefine their relation with their suburbs. In the project proposed by Giorgio Grassi for Milan [figure 5] the restoration of this urban image is based on the construction of new buildings on the footprint of the disappeared Porta Volta bastion, positioned in the angle where the old fortifications built by Spaniards gave a sharp angle to connect with the Castello Sforzesco's walls. As Grassi confirms, the demolition of the walls made this boundary unrecognizable and transfigured drastically the image of the historic city. This image, is recovered in this grassian project erecting a new public buildings: a library following the bastioned volume of the razed fortifications and some car park buildings recovering the respective curtains of walls. The geometrical and volumetric clarity of the intervention, as well as respecting the order of the old walls, continues the same spirit that – as we have seen in this text – marks the essence and raison d'être of the fortifications developed in the Renaissance from times of Francesco di Giorgio Martini, evoking in a masterful way the character of this urban limit that Grassi wished to reconstruct in his project. This recovering process of the urban façade is rounded here with the placement by anastylosis of the two old city-portals of Porta Volta – currently dismantled and preserved by pieces – on the façades of the new buildings.

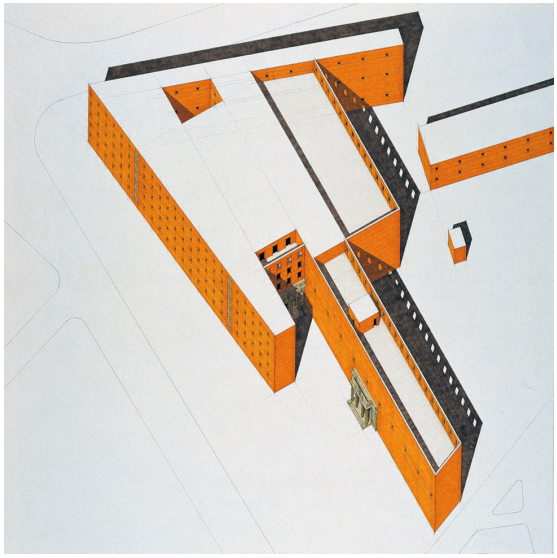

Figure 5. Axonometric view of Giorgio Grassi's proposal for Porta Volta at Milan.

In the project for Hondarribia, began by Manuel Manzano Monis in the sixties and continued by Alberto Ustarroz and Manuel Iñiguez, the recovering process of the walled image of the city is realized through its reconstruction and restoration. Partially demolished by French army and forgotten for over a century by citizens, these fortifications remained in state of ruin. The city was extended beyond its walls, and it was not until the second half of 20th century when Manuel Manzano began the rehabilitation of some parts of the historic city and promotes an intervention that was vital to recover the image of this urban façade: the reconstruction of Queen's Bastion in the southwest corner of the walled city, in a very similar context to the proposal of Giorgio Grassi for Milan. The reconstruction of this walled corner succeeded becoming the main reference of the urban fortified boundary and meant a turning point with respect to the attitude of the city about its historical center. It also opened the way for the restorations were

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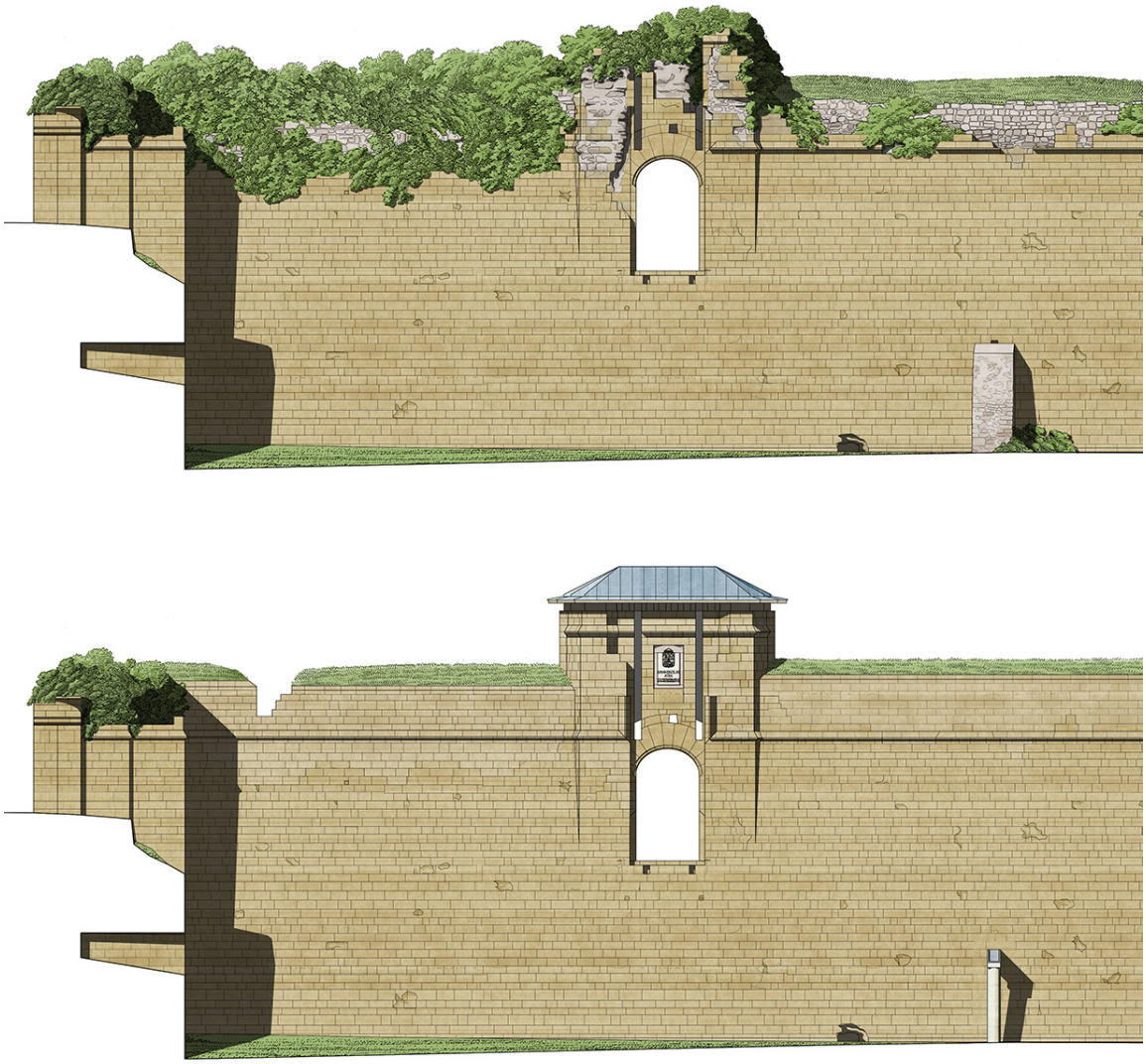

Figure 5. Elevation of the project made by Iñiguez&Ustarroz for the reconstruction of Hondarribia's walls

recently made in the rest of the fortifications by Alberto Ustarroz and Manuel Iñiguez. These architects completed the restoration of the Queen's Bastion and recovered the image of the walled curtains, as can be seen in the image that accompanies the article. [figure 6] This intervention gives back to the city the memory of its lost walled front, recovering the geometric presence of its fortifications and emphasizing the two main access doors to the historic center.

Two different examples, both in context and in their materialization, but which coincides on the same objective: the restoration of the city's walled enclosure as a way to reclaim the significance of the historic city and to restore its relationship with the contemporary one.

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Building a timeline, developing a narrative: visualising fringe belt formation alongside street network development

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Abstract. *This project was developed as an attempt to assess the relationship between different morphogenetic processes, in particular, those of fringe belt formation as described by M.R.G. Conzen (1960) and Whitehand (2001), and of centrality and compactness as described by Hillier (1999; 2002). Different approaches focus on different elements of the city has made it difficult to establish exactly how these processes interact or whether they are simply different facets of development reflecting wider socio-economic factors. To address this issue, a visual, chronological timeline of Limassol's development was constructed along with a narrative of the socio-economic context of its development. The complexity of cities, however, makes static visualisations across time difficult to read and assess alongside textual narratives. We therefore took the step of developing an animation of land use and configurational analyses of Limassol, in order bring to life the diachronic analysis of the city and shed light on its generative mechanisms. The video presented here shows that the relationship between the processes mentioned above is much stronger and more complex than previously thought. This related paper explores in more detail the links between fringe belt formation as a cyclical process of peripheral development and centrality as a recurring process of minimisation of gains in distance. The project's outcomes clearly show that composite methods of visualisations are an analytical opportunity still little exploited within urban morphology.*

Keywords: Fringe belts, street network, urban history, visualisation, Limassol

Introduction: background to the project

The development of cities is influenced by many factors, the time of their foundation, their early development as centres of religious institutions, government administration, locations for trade and cultural exchange. Their geographical location often has an impact on their role within a specific region and their topography also plays a part in the way they develop. Historical events impact on their expansion or contraction and on their development or redevelopment, while formal planning by government authorities following industrialisation naturally plays a leading role, along with market demands and pressure from the real estate industry.

Cities have a history, which is written into their urban form and built fabric; different periods manifest themselves in street patterns, architectural styles and the functional distribution of uses throughout the city. As a period follows another so the cityscape changes and the contemporary city ultimately is an accumulated historical record of all the factors that have shaped and influenced its development, however "it is an incomplete and confused record since the features created in one period are subjected to change in another in varying degree" (Conzen 1960, p.6). In most cases the existing fabric of cities tends to be adapted rather than replaced during successive

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courses of redevelopment. It is only in extreme cases following natural or man-made disasters or through specific urban interventions such as slum clearances that substantial replacement of the existing fabric is likely to occur, and this is likely to occur only in large cities. For this reason, as M.R.G Conzen (1960) points out, the most changeable element of cities is land use, which tends to respond quickly even to small or specific changes such as the introduction of a new street or the implementation of a transport link. On the other hand, the street is the most resistant element of cities as new roads in existing areas or significant changes affecting the street network are limited.

Diachronic analysis of cities aims to study the human form of settlements and the process of their formation and transformation. However, it remains a challenging area for scholars in different fields, as the complexity of cities makes them particularly hard to analyse, especially across time.

Furthermore, assessing how cities have developed requires both accurate cartographic records as well as historical and current sources of information on their demographics, their history and their land uses. Many historical records and data, even within a short time span, are not easily comparable to current ones and tend to require either processing or summarisation for comparison. At the same time differences in the quality of cartographic records and the points of interest and land uses they report means that analytical tools able to capture specific properties of cities regardless of the detail of information available, are needed in order to assess changes in the built form, identify what processes enable such changes and relate these to the ways in which cities function.

Despite these barriers, the scholarship in the field of urban morphology is vast and has led to the identification of certain processes according to which cities evolve. This has in turn led to new and refined theories of the city and potential 'rules' of development applicable to all cities, as well as universal and individual characteristics which define the nature of cities.

Different methodologies have been developed to approach the analysis of the evolution of cities, but have often been applied in isolation and have led to the emergence of separate schools of thought. The main approaches and their related schools of thought are: 1) the historical-geographical approach of the British school of town plan analysis initiated by M. R. G. Conzen in the 1960s; 2) the process typological approach of the Italian school based on the work of S. Muratori in the 1940s; 3) the configurational approach developed by the space syntax community following the work of Hillier & Hanson (1984); and 4) the spatial analytical approach which is applied through a variety of methods by different scholars, but is mostly associated with the work of the Centre for Advanced Spatial Analysis (CASA).

This paper focuses on certain developmental processes identified through the application of the historical-geographical approach and the configurational approach, namely the processes of fringe belt development and those of centrality and compactness.

The process of fringe-belt development

The process of fringe-belt formation involves the establishment of certain land uses at the urban fringe during periods when the built-up area is stable or only growing at a slow pace. Initially, fringe belts include large open areas, public utilities and open land attached to institutions (Whitehand 2007). Following this occurs a filling-in of gaps during periods of high-density development, followed by further expansion. The process of fringe-belt development is characterised by a series of subsequent phases: a fixation phase of initial establishment, followed by an expansion phase, and then a consolidation phase (Conzen 1960). Fringe belts are also subject to a number of transformations, known as reduction, absorption and translation (Conzen 2004).

Whitehand (1977) analysed the relationship between building construction cycles and fringe belts; his findings showed a link between the urban economy and the various phases of fringe belt formation and residential growth. According to these findings and later research it is during economic slumps that institutional and private development which require large spaces accumulate at the urban fringe,

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while during economic booms residential building extends into the new urban periphery (Whitehand 2001). How the process of fringe belt formation and densification by residential development occurs either as concentric belts or as radial routes is exemplified in figure 1 – the two models are not exclusive of each other and in real-life cases they can overlap.

The processes of centrality and compactness

The configurational approach identified certain invariants and differences across cities: they share similar global structures in the shape of a deformed wheel, but highly different localised spaces, in particular residential areas, which reveal different forms from city to city, country to country and even more so, from culture to culture. Hillier (2002) theorised that these similarities and differences are driven by two kinds of social forces, the micro-economic and the socio-cultural forces respectively.

These invariants and differences are related to the processes of centrality and compactness. Hillier (2002) demonstrated that centrality has a powerful impact on the generative process of cities, to the extent that he defined it as a generative law, which states that "an object placed centrally in a space will increase universal distance[1] more than one placed peripherally" (Hillier 2002, p.17). This has implications for the way cities change when built elements are added to an urban system as an object placed close to one object and far from another will minimise the increase in universal distance. The opposite is also true: an object placed at equal distance from two other objects will maximise the increase in universal distance. Doing the former will tend to create long and short lines, while doing the latter will tend to create lines of similar length. If creating longer lines, even if this causes the creation of a short line, is beneficial to minimising distance, then it follows that conserving longer lines at the expense of shorter lines when a system changes will also minimise the gain in distance and hence will preserve interaccessibility as a settlement grows. The counterpart to the law of centrality is the law of compactness, which states that "the more compact an object or group of objects... then the less the increase in universal distance in the surrounding space" (Hillier 2002, p.18); this means that a compact object will also minimise gain in universal distance compared to an elongated object of equal area.

Hillier then argues that local interaccessibility operates through the compactness law which is driven by the residential process and socio-cultural factors, while global interaccessibility operates through the centrality law which is driven by settlement growth, the public space process and micro-economic factors. At certain transformative stages of a city a large gain in accessibility values of a locality is followed by

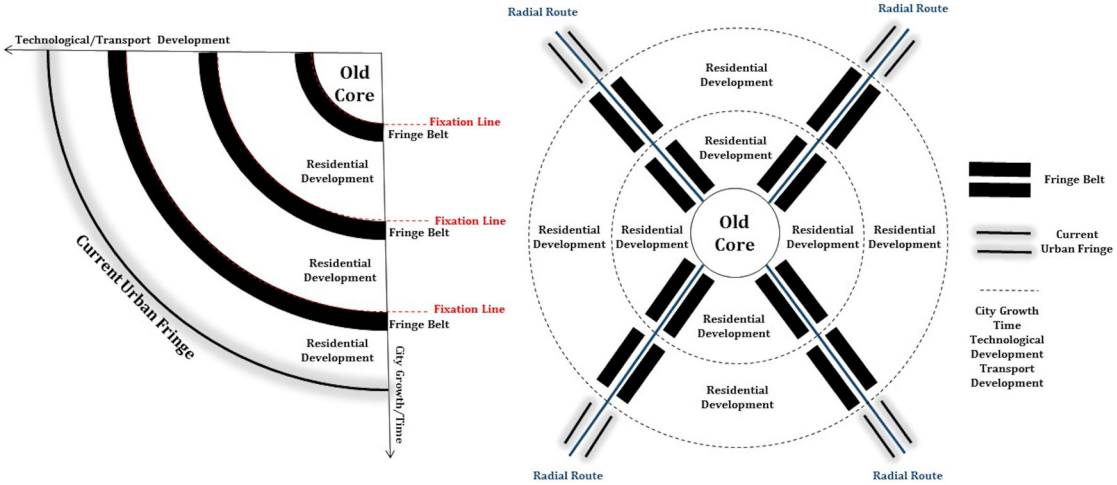

Figure 1

Conzen's fringe belt model as concentric belts (left, adapted from Whitehand, 1994) and as radial belts (right)

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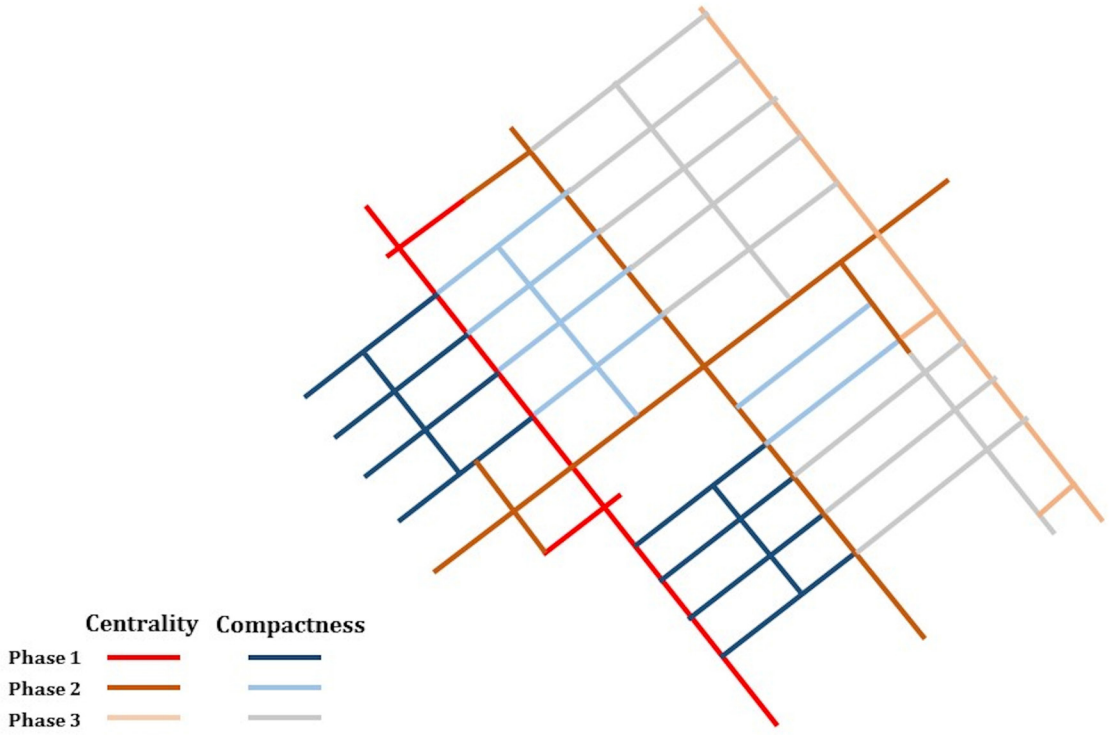

Figure 2
Generalised model of the processes of centrality and compactness.

subdivisions in the same areas. This indicates that centrality drives the generative process and precedes the emergence of densification through compactness, articulated in the development of grids in areas surrounding long routes, as well further subdivision of existing grids (Al-Sayed et al. 2012). A generalised model of how the two processes operate over time is shown in figure 2.

The relationship between processes

The fringe belt concept and the configurational laws have one fundamental difference (their focus on different elements of the city) and one clear commonality (the identification of economic factors as a leading determinant of the development process). The former focuses on buildings and its associated elements (the building, the block and the plot). The latter focuses on the streets and their properties (the street, the routes, the street segments, their connections and so on); something often referred to as the 'space' between the buildings where the social life of the city occurs. Scholars of both fields would certainly agree that the two the forms are inextricably linked; the one would not exist without the other. Research from both fields also provide us with some indication of the relationship between the two, most notably, on the one hand, that fringe belts tend to form along long radial routes or in circular strips; they are also normally defined by a fixation line which may be a road, most often a wide vehicular road. On the other hand, the spatial properties of streets tend to correlate with high levels of specific land uses, in particular the distribution of commercial and service uses. Furthermore, the processes of centrality and compactness are determined by the effect that the form and size of buildings has on the property of universal distance.

What the two approaches have not yet explicitly attempted to do is to clarify the relationship between the two built forms in terms of their morphogenetic role, in particular their respective role in the formation of urban areas through their distinctive phases of growth. Nor attempts have been made at

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understanding the relationship between the processes identified, despite the commonalities mentioned above. The aim of this paper is to initiate a debate on possible methods for assessing what the linkages between these processes are and how they interact.

Scope of the project

In recent years a number of studies, initiatives and events, (Kropf 2009; Zhang 2015; Oliveira et al. 2014; Oliveira et al. 2015; Scheer 2016) have explored bridges between the different morphological approaches in order to assess the viability of a common framework and of a multidisciplinary analytical approach. While the needed comparative work on the different schools of thought has been initiated, there are still limited analyses and elaborations of how the approaches are interlinked and how they can be brought together within a comprehensive framework.

Furthermore, the advancement of such comparative and multidisciplinary work is fraught with the difficulty of analysing and understanding urban growth and the human intervention in such growth that has occurred throughout centuries of urbanisations. Attempts to embed the temporal process in theorisations and methodologies for the study of cities' transformations requires an understanding of the structuration of space in time. Such attempts are discussed in theoretical and methodological debates (Baker 2003; Griffiths 2011; Netto 2016) and do exists in empirical studies (Griffiths 2009; Al-Sayed et al. 2012; Charalambous & Geddes 2015), but remain limited and are still not fully developed and exploited.

The idea underlying the project is to move beyond a view of history as a simple contextual factor or a view of ideology as being the lead determinant of form. In doing so, the temporal factor shaping the structuring of form must be deployed dynamically: the attempt is to develop an approach to describe the relationship between spatial, physical and socio-economic factors diachronically. In order to do this, the project first focused on assessing the existence and nature of the processes of fringe belt formation, centrality and compactness in Limassol through separate historical-geographical and configurational analyses of the city; at the same time a historical review of the city's development was carried out. At a later stage the analyses were layered as individual maps for each point in time for which analysis was carried out and then they were brought together into a single 'timeline' aimed at visualising the relationship between the different processes across time and linking these to social and economic information derived from the historical review of the city. While the timeline provided various benefits for the understanding of the city's development, the linkages between the processes and the socio-economic factors remained static and difficult to read. For this reason, a decision was made to animate the timeline into a video. This paper briefly describes the methods used to develop each analysis and the timeline; it does not discuss the analyses individually or make an argument as to the existence and the nature of each process in the specific case of Limassol: these processes do exist and are discussed elsewhere (Geddes 2017). The paper does, however, present the timeline and discusses how this was used as the basis to construct the animation of Limassol's development. The procedures used for animating the timeline are presented, a portion of the video resulting from this work was shown at the ISUF 2017 conference. The benefits of the output as an analytical tool, a dynamic visualisation as well as a communication medium for urban morphology are discussed in the last section of the paper. The full version of the video will be presented within the context of the Cyprus Network of Urban Morphology (CyNUM)'s seminar series towards the end of 2017 and later made available through its web site (www.cynum.org) and through social media.

Methodology

The methodology used to develop the timeline comprises the creation of two parallel accounts of Limassol's development. On the one hand is a narrative which describes, through historical and archival research of primary and

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secondary sources, how the city has grown and changed since the 19th century, when textual records and historical data become relatively substantial, until contemporary times. At the same time, accounts of the actors involved in decision-making for particular sites, the reasoning and forces behind certain planning developments are reported and discussed through conversations with a variety of stakeholders. The full narrative is available elsewhere (Geddes 2017) and a summary of it, including an in-depth discussion is being prepared for publication. On the other hand, is a spatial history of the city, which focuses on systematically analysing the development of the city's street network and its built form at six specific points in time for which cartography is available (1883, 1933, 1960, 1974, 1987 and 2003). The specific methods used for analysis were a configurational analysis through space syntax methods, a land use analysis and a block size analysis – all are described in further details below. This spatial history attempts to build a timeline of the city's development to identify how the sequence of physical events in the growth of the city affects its spatial and physical properties.

A narrative of Limassol

In the context of this study's framework, the meaning of 'narrative' as a research method is taken from Actor-Network Theory (ANT) (Latour 2005), which requires to provide a description where all the actors involved in the process of emergence are accounted for and their actions are outlined. The aim of the narrative is to fully depict a state of affairs by being specific and accurate while capturing the broad-ranging connections between different components. The narrative is developed and written by the researchers themselves. However, here, we are not strictly using ANT methodology to construct a narrative, which would involve the tracing of a network. Instead, we are using a combined approach, typical of more 'classic' social research using narrative as a qualitative method, where the narrative serves the purpose of providing an analytical layer. The narrative itself is still developed by the researcher, but through the collation, description, interpretation and communication of existing knowledge of the city, through researching primary and secondary sources, including photographic and cartographic material, and press archives, as well as through holding conversations with expert stakeholders.

The historical context within which Limassol developed was investigated through a literature review of secondary sources. Substantial research on Limassol's urban history was compiled by Serghides (2012) in a book which focuses both on the growth of the city and the development of specific areas and architectural landmarks, but in particular the industrial development of the city. The book takes a historical approach to the description of the city's development rather than an analytical one. Primary sources which describe the city included a small number of historical tourist guides produced between the beginning of the 20th century and 1974, and a number of historical travellers' diaries from which the information regarding Limassol was collated by Severis (2006). Some other records regarding the city, such as police reports and newspaper articles were also found in other secondary sources.

Another primary source was newspaper articles from the archives of the Cyprus Press and Information Office (PIO). At present this archive provides a searchable database of about 20% of the material from 38 Greek and English language newspapers dating from 1880 to 2006. The PIO's resource was used to gain further details about Limassol's development timeline, in particular major infrastructure works and large developments. Following a review of the historical cartography and of the land use analysis, the search focused on the major developments in the city; this yielded 15 articles of relevance dated between 1953 and 2000.

Conversations with expert stakeholders had the dual purpose of retrieving information which is lacking in the available documentation, and of collating a variety of different viewpoints on the reasoning behind development and on the actors involved in the planning processes. The conversations, firstly, aimed at clarifying some of the mechanisms of the city's development

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and to retrieve the dates of planning and construction of major routes and building projects requiring large land areas. Secondly, they attempted to gauge expert opinions on the value of various projects as well as the reasoning behind them. A total of 6 in-depth conversations, in the form of semi-structured interviews, were held with the experts. Extracts and information from the conversations were not included in the timeline, but were embedded within the general historical narrative.

Whenever possible, information on the dates of planning and construction of specific developments is matched to data on GDP growth, which is available in detail from 1974 to the present day (figure 3). Prior to this date, the relationship between planning decisions and economic circumstances is assessed analytically based on the historical context. This is done in order to gain an overview of how processes of development discussed above relate to their common economic element.

A spatial history of Limassol

The aim of the spatial history is to reconstruct the key features of the city's growth at specific times in the past, while assessing the relationship between spatial and locational factors and how this evolves.

The spatial history is composed of three layers of information relating to the material components of the city: an analysis of the spatial properties of the street network, an analysis of a physical property of the built form (block size) and an analysis of a socio-economic property of the built form (land use).

Six spatial models of Limassol were constructed using space syntax methodology[2] . The specific analysis used in this study is angular segment analysis; the measure used is normalised angular choice (NACh), which measures the number of shortest routes going through each segment and allows for comparison between systems of different size. In each individual map in the timeline, the routes which very high NACh levels are highlighted.

Block size maps were automatically constructed from the spatial models; these give us an indication of the city's permeability levels. By performing this analysis diachronically, block size measures also give us an indication of the extent to which and at what rate newer peripheral areas of the city densify. Block size analysis can be combined with land use analysis to inform the identification of different

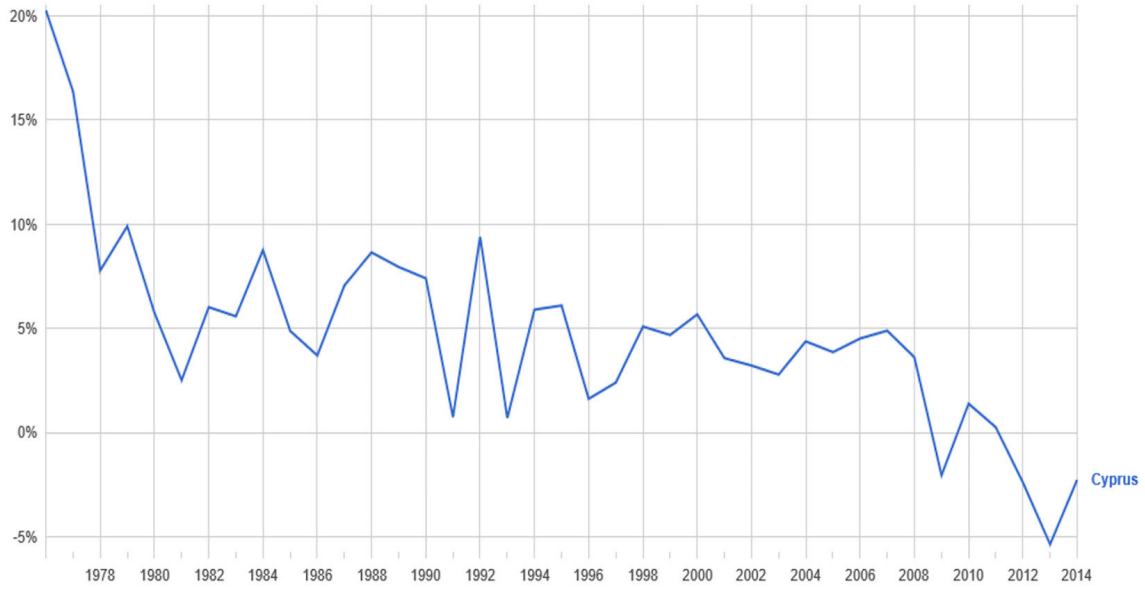

Figure 3
Cyprus's GDP growth 1976-2014.

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fringe belts in the city in cases where maps of plots are not available, and to assess how these relate to the evolution of the street network and to the density of their surrounding areas. Block size per se cannot be used as a tool to identify fringe belts as these are essentially defined by plot sizes, their boundaries and their aggregation as well as by their land uses. However, it can give an indication of the formation of peripheral zones with large blocks in the city – details of the limitations with regards to using a combination of block size and land use analysis to identify fringe belts are given in Geddes (2017).

Layering the analyses aimed at assessing the relationship between the location of large blocks of specific uses and the evolution of the street network. In order to visualise the establishment of specific land uses in peripheral areas, schematic maps of the city were created for each time period. The maps embedded in figure 4 report in simplified form the extent of the built fabric of the city and highlight the individual large blocks whose use is identified in the maps. The large land uses are coloured thematically according to their time period. Such analysis provides us with the information to identify any potential fringe belts and whether these relate to the routes with high NACh.

Visualising the outputs: timeline and a narrative animation

The material developed through the analyses discussed above was layered in order to develop a visual timeline, which combines the maps resulting from the quantitative analyses with textual information from historical sources. In the timeline, the major routes identified through the space syntax analysis were layered over the land use maps, thus providing the opportunity to assess how potential fringe belts relate to highly accessible routes. At the same time, a linear chronological rule following the sequence of maps reports relevant dates and events, as well as extracts from primary sources. This timeline aids the assessment of the inter-relationship between fringe-belt and configurational processes, thus shedding light on whether they are at play in the emergence of Limassol's urban form, how they interact and how the relate to historical events and other socio-economic factors.

The timeline shown in figure 4 reports a schematic version of all available maps from 1849 to 2003. The key physical features of the city are reported in these maps along with the extent of the high-density built-up area and the peripheral fringe belt uses identifiable in each map. The roads which have very high choice

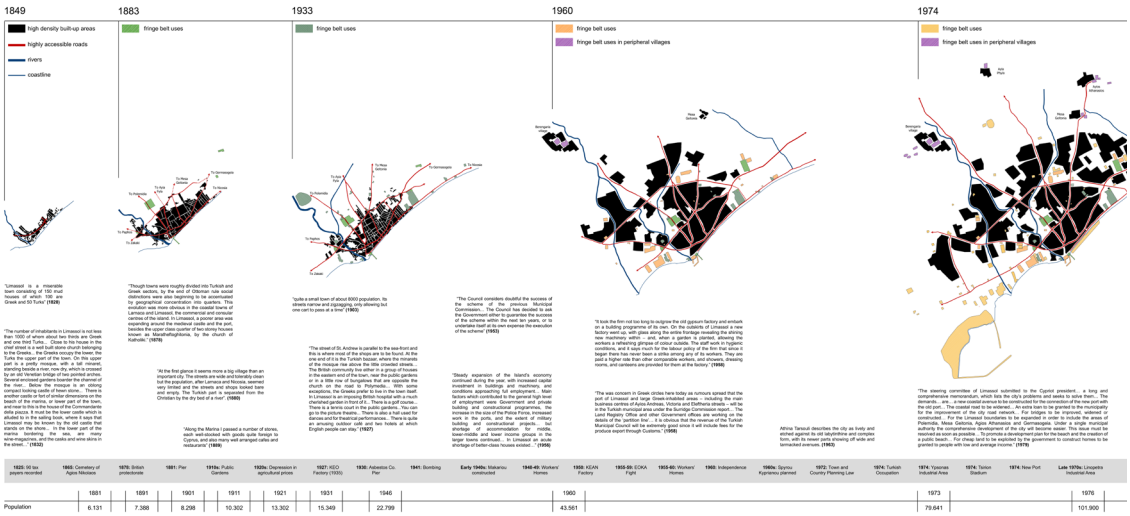

Figure 4
Timeline of Limassol's development (I)

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values, as measured by the configurational analysis, are highlighted in red for every point in time (a high-quality version of the timeline is available from www.cynum.org/limassol). The maps are presented in chronological order alongside primary sources which describe the city at different times in history. Key historical events, the establishment of very large land uses and significant road infrastructure are also reported chronologically, as is the population growth. The timeline summarises elements of the narrative and of the spatial history of the city by layering all the pieces of information onto one medium. In doing so it is particularly useful not only to relate the formation of fringe belts to specific elements of the road infrastructure, but also to highlight how the accessibility of the street network of the city shifts in relation to the formation of fringe belts and to the processes of densification. The timeline also permits us to easily relate key historical events to the urban form as the temporal aspect unfolds, while being able to perceive the scale, population growth and increased complexity of the city as time goes by.

As a combined visualisation of separate analyses used for this project, the timeline shows to have relational potential for effectively linking how different processes are taking place in the city; as such, though static, it is a very effective output and thus provides the basis for the development of further, more complex visualisation tools.

In order to develop such tools, an animation of the timeline was created. For this, four actions were undertaken to prepare the material for animation. Firstly, the narrative was split into two separate sections: one including only the primary sources reported in the timeline, the other comprising a summary of the researcher's narrative, including information from various secondary sources and from the conversations with expert stakeholders. Secondly, this latter narrative was rewritten and refocused on the interaction between the processes, historical events and socio-economic factors by highlighting the findings from the various analyses. The description of the city's development was therefore a summary of that originally developed for the analysis in order to meet the requirements of a medium different from that of a research paper. The two sections were then recorded separately. Thirdly, a storyline was developed by the researchers describing in detail how the timeline should unfold in relation to the two separate narrating voices and to the visual appearance of the different elements from each map in the timeline. Finally, the layers of each map presented in the timeline were split according to the storyline and the sequence of elements appearing in the animation.

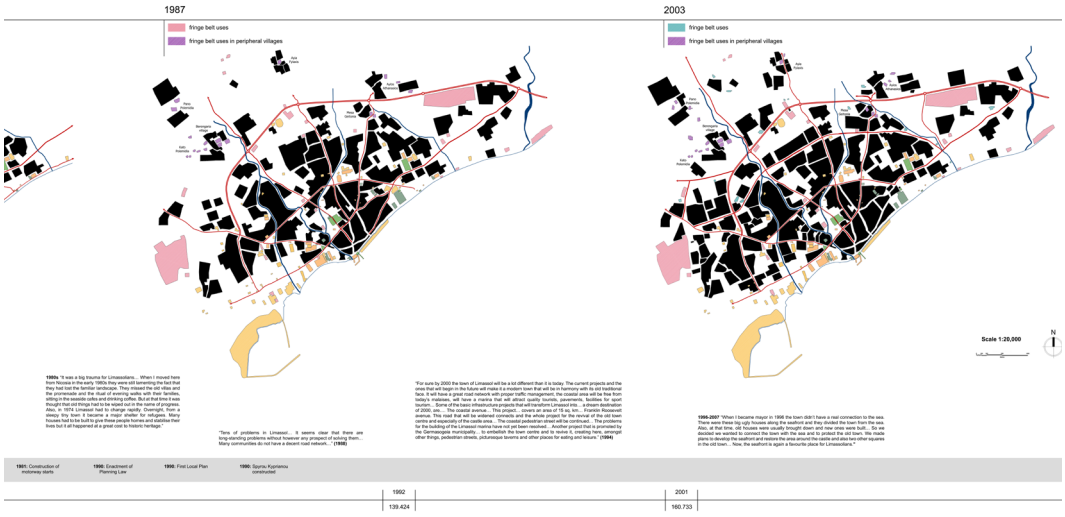

Figure 4
Timeline of Limassol's development (II)

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Ultimately, the researchers worked along a professional animator to produce a video in the format of a mini-documentary narrating and displaying how the built form and the street network of Limassol developed and changed since the middle of the 19th century to the early 21st century.

Discussion and Conclusion

This paper initiated a reflection on and explored the linkages between the processes of fringe-belt formation and those of centrality and compactness. The project explored avenues to assess the relationship between such processes by firstly carrying out separate analyses to identify the existence and nature of each process in the case study of Limassol and then layering the analyses and linking them to socio-economic factors. Two outputs resulted from the project: a static timeline in the format of a digital and paper drawing, and an animation of the timeline with the addition of a narration explaining the timeline itself in the format of a video.

Looking at the outputs, it is clear that cyclical change and growth are occurring in Limassol through the combination of development of long routes and establishment of fringe belt uses, and densification, with the change occurring repeatedly to spatial properties and to the character of fringe belts.

The main structural changes affecting the urban form of Limassol are the passage from the Ottoman to the British rule, the influx of rural populations during the 1920s, the influx of refugees and the economic slump after 1974, the economic boom of the 1950s, and the economic recovery of the 1980s and 1990s.

The main physical characteristics displayed in Limassol's growth and change are the formation of fringe belts, including two separate and different functional zones (an industrial one in the west and a tourist one in the east), the development of an extremely strong road 'superstructure' with the imposition of a 'fan-shaped' network onto a deformed wheel, and low density of the urban fabric composed of a patchwork of residential areas.

The processes of fringe belt formation and that of centrality seem to be the two key mechanisms shaping the form and character of the city. However, while these are clearly linked to certain historical events and social circumstances, the relationship with economic cycles is not as clear.

The results of the project offer two significant contributions to the field of urban morphology. The first is the identification of the fact that the relationship between the process of fringe-belt formation and that of centrality seems to be very strong and deserves further investigation through other, more empirical methods. The other is an accessible and communicative tool to visualize the results of different urban morphological approaches and to communicate these not just within academia, but also more widely to the planning and design sectors, as well as the general public.

Notes

1 Universal distance is defined as the average distance of each segment from any other segment in a system, see Hillier (1996, chapter 3) for further details.

2 Further details on all aspects of space syntax can be found through www.spacesyntax.org and in key space syntax publication including Hillier and Hanson (1984) and Hillier (1996), Hillier and Iida (2005) for details of angular analysis, Hillier, Young, and Turner (Hillier et al. 2012) for details of the normalised choice measure.

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The impact of bridges on spatial transformation of urban pattern: The case of Golden Horn, Istanbul

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Abstract. *Transportation projects especially subways, bridges and new transportation modes gained importance in İstanbul in the last decades. The Golden Horn Metro Bridge, which connects two parts of the European side of İstanbul and has a station on the bridge, has caused criticisms not just because of having these unique characteristics but also because of the effects of the bridge on the silhouette of Historical Peninsula. The main aim of this paper is to analyze the impact of bridges on urban pattern and to explore the different influences of metro and vehicular bridges. Within this scope, three bridges located over the Golden Horn, which created connections between historical site of İstanbul and the newly developed CBD, are chosen as case study. Areas within 1km zones around the bridges are analysed separately, and the urban pattern (street pattern, block size, building data) is investigated comparatively through GIS. The layers of the past geographies (Historical GIS) and the Space Syntax (angular segment based integration and choice) analyses are conducted for demonstrating spatial changes. The findings indicate that the study area has transformed into more divided streets and urban blocks and the number of buildings increased through time. Moreover, it is observed that the metro-rail bridge system has less impact on urban pattern. This study contributes to urban planning/design not only by analysing comparatively the transformation of the urban pattern during the pre- and post-construction processes of the bridges but also by evaluating the impact of the bridges through a quantitative and innovative method.*

Keywords: Urban pattern, transportation projects, the Golden Horn Metro Bridge, Istanbul

Introduction

The Golden Horn region of Istanbul constitutes a significant historical part of the city and this area has changed dramatically during its history. The bridges which have been constructed along the Golden Horn are essential examples of these changes (Figure 1). Due to the effect of these bridges, the form of the neighbourhoods on the Golden Horn has changed, and by examining this change, this paper analyses the major influences of bridges on the urban pattern of cities.

The main purpose of this study is to analyse the influence of bridges on urban pattern and to explore the different effects of metro and vehicular bridges. The goals of this paper are:

I. To explore the pattern of settlements of the Golden Horn and determine its level of transformation

II. To analyse the spatial structure of the area by using Historical GIS method

III. To discover the different effects of vehicular-pedestrian bridges and metro-pedestrian bridge

IV. To make a mathematical comparison also by using Space Syntax methodology.

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Urban morphology is an approach which is used to conceive the physical form. This concept explores how towns have grown and developed through small scale analyses of buildings, plots and streets, and also macro scale studies (Larkham 2005). Buildings, gardens, parks, streets are the main elements of any morphological analysis; thus, they have dynamic relationships: each one shapes the others and is also influenced by them (Moudon 1997).

It is believed that cities can be read according to their physical form. In addition to this, there is an acknowledgement that morphological analysis is based on three principles:

1. Urban form can be defined by three elements: the buildings and their open spaces, the plots/ lots and the streets,
2. Urban form can be understood from the building or lot, the street, the city, and the region,
3. Urban form can be understood historically through the transformation and replacement it has undergone (Moudon 1997).

As a part of this study, street patterns, buildings and urban blocks have been analyzed not only to explore the urban form, but also to discover the transformations it has undergone. Moreover, space syntax methodology is also adapted to this paper. This methodology is developed by a team led by Bill Hillier (1996). Space Syntax is essential for urban planning and design studies as it gives consistent results based on the mathematical data created according to the open spaces within cities. This methodology provides evidence-based learning by creating a framework that allows comparisons between settlements to be made(Peponis 1990).

Methodology

Within the scope of this paper, three bridges located over the Golden Horn, which created links between historical site of İstanbul and the newly developed CBD, are chosen as study area. Three bridges which span the Golden Horn; the Atatürk, Galata and Golden Horn Metro bridges were selected to facilitate an analysis of the influence of bridges on settlements. Areas within 1km zones around the bridges are analysed separately, and the urban pattern (street pattern, block size, building data) is investigated comparatively through GIS. The layers of the past geographies (Historical GIS) and the Space Syntax (angular segment based integration and choice) analyses are conducted for demonstrating spatial changes.

Empirical evidence is used to determine 1km as a distance that people can walk (Lee and Moudon 2006). To determine the specific study area, 1km zones around the bridges were created and the mathematical data inside these buffers is analysed separately for three bridges (Figure 2).

The neighbourhoods around the bridges were selected as a study area due to the historical processes they have undergone, and also due to the bridges themselves as they were built during different time periods. There are many important examples of Ottoman urban layouts in the study area. While one side of the area is historic, the other side is connected to more developed areas. As a part of this study, not only the pre-, post- construction process of bridges but also two-time periods, which urban pattern changed dramatically, were also examined. During the first – 1922 – the Islamic city image changed to that of a more cosmopolitan city; the organic pattern started to shift toward a grid pattern and the Republic was about to be proclaimed. During the second – 1996 – several planning decisions were implemented in the study area, thus the patterns of the settlements around the bridges were changed.

On the other hand, to discover the transformations of street patterns, buildings and urban blocks, Historical GIS methodology is adapted to the study. A Geographic Information System (GIS) links locations and their attributes so that they can be analyzed, whether by their geographical characteristics or factors such as distance, location, or physical characteristics. The main organization principle of GIS is based on location, which is encoded as geographical coordinates. With the location data established, it then becomes

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a. b. c.

Figure 1. The bridges located over the Golden Horn (a. Ataturk Bridge, b. Galata Bridge, c. the Golden Horn Metro Bridge)

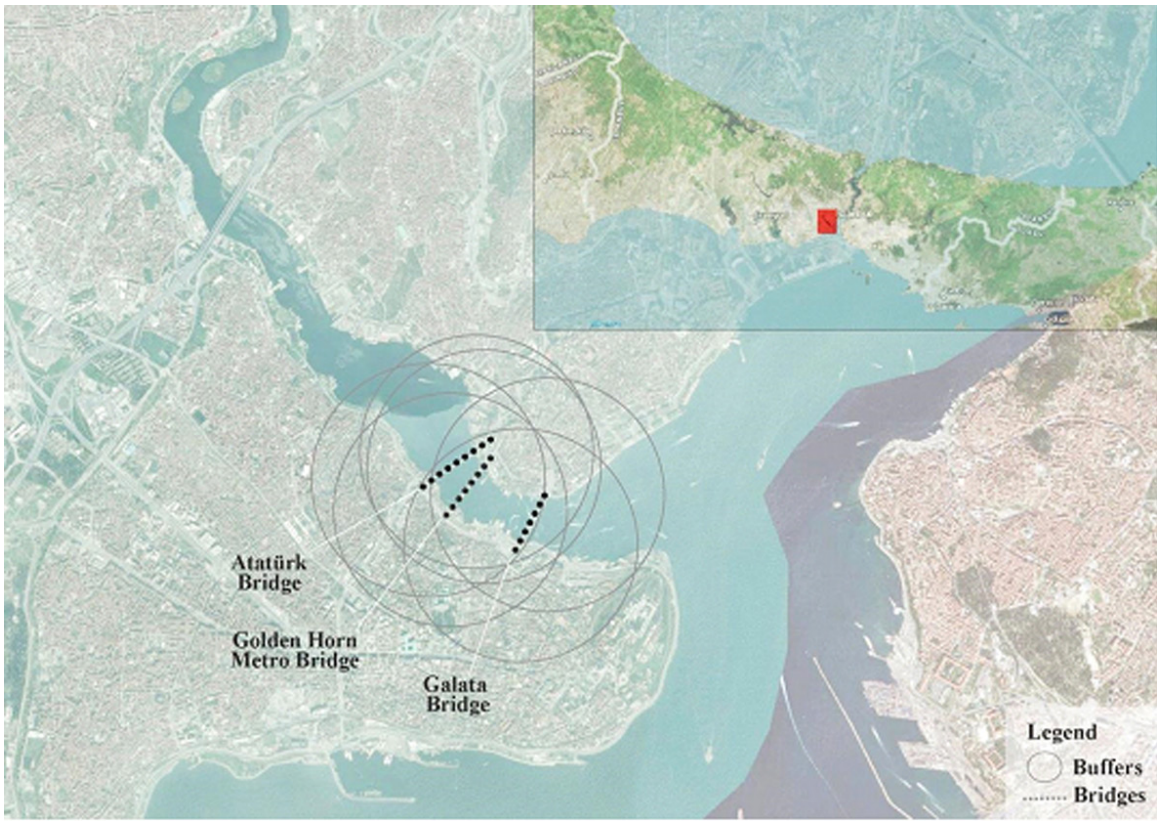

Figure 2. Location of the bridges and the case area

a powerful tool for the analysis and integration of other variables (Knowles, 2002).

There are several advantages of Historical GIS; first, the spatial data reveals where the data is located and thus, it can be used for integrating any data which seems incompatible. Secondly, Historical GIS allows data to be visualized by using maps and other techniques such as virtual landscapes and animation. Thirdly, GIS allows different forms of spatial analysis to be made where the coordinate locations of the features under examination are a specific part of the analysis (Gregory & Healey, 2007; Gregory et al., 2001). Moreover, once a historical map is added to GIS, the information it contains can be extracted, analyzed and compared with other data (Knowles & Hillier, 2008). Therefore, the data about street pattern, urban blocks and buildings isgenerated for different time periods by using this methodology (Figure 3).

Moreover, angular segment based integration and choice values are also calculated through the use of Depthmap10 software. Choice can be defined as the possibility for each segment to be selected by pedestrians as the shortest route. A choice analysis means the "through movement" potential of each segment in a system (Al Sayed et al., 2014).Integration is

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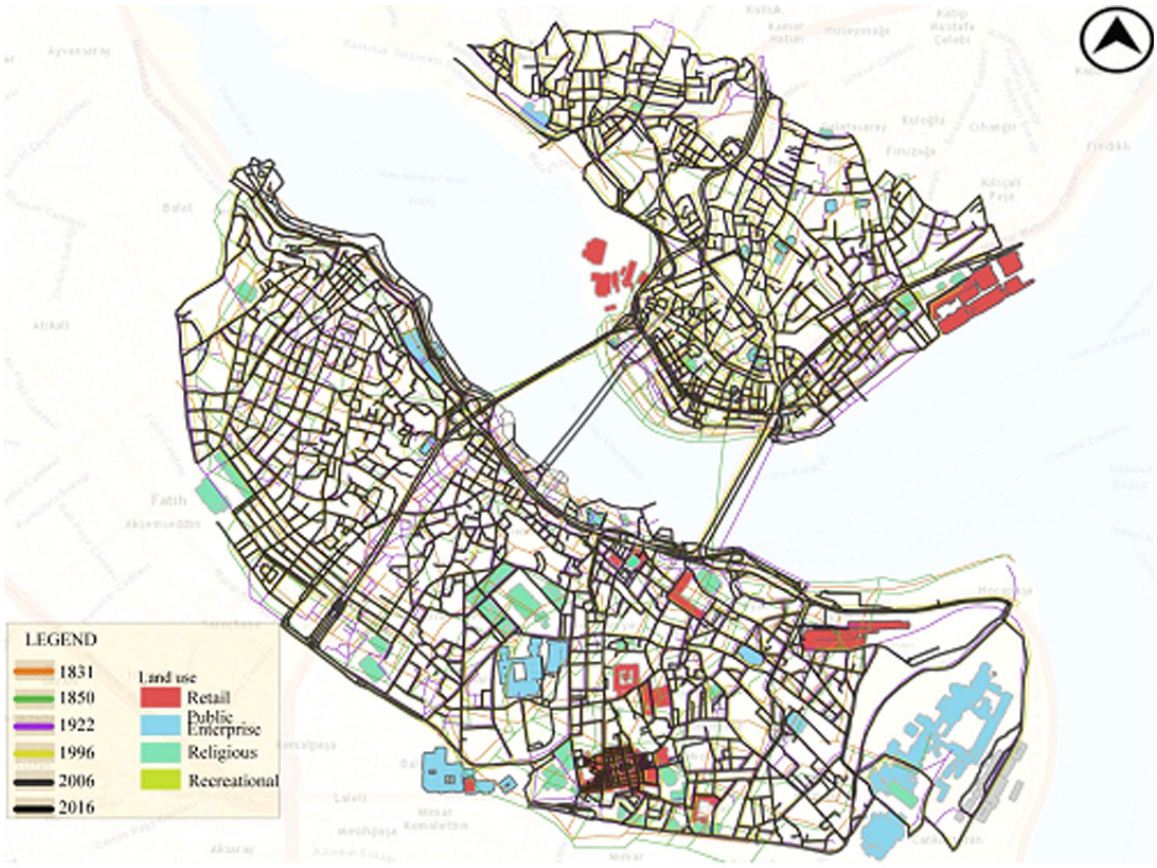

Figure 3. Historical layers of the Golden Horn

defined as the distance of each segment to all other segments in a system (Hillier et al., 2012). Therefore, it can be said that while a choice analysis examines the through movement potential, an integration analysis examines its "to movement" potential of a given system. Integration shows the degree to which a line is more integrated, or segregated, from a system as a whole (Jacoby, 2006).

Analysis

Historical Process

Historical background of the bridges over the Golden Horn dates to 1930s. In 1836, the first historically-verifiable bridge, Unkapanı (new Atatürk Bridge) bridge was built across the Golden Horn. After this period, because of the growing population and new palace for the Sultan, a second bridge was needed. Therefore, the "Cisr-iCedid" bridge, now known as the Galata Bridge, was built in 1845 (Cekmis Gorgulu and Hacihasanoglu 2012).

On the other hand, the construction process of the last bridge, the Golden Horn Metro Bridge, first started with an announcement by the mayor of metropolitan Istanbul, Kadir Topbaş, in 2004 and the project was approved in 2009 by the Conservation Board. Although the Historical Peninsula, where an abutment of the bridge is located, has been on the World Heritage Site list since 1985, the bridge project was not reported to UNESCO (Vardar 2014). When the construction of the project began in 2009, UNESCO stated that this project would damage the silhouette of the Historical Peninsula and warned that the area could be added to the World Heritage in Danger category (Bilgehan 2015). After this warning, the project was revised and the height was decreased from 82 meters to 65 meters and construction work was halted until 2011 (Vardar 2014). In 2012, the revised design of the project was approved and the bridge eventually entered service in

February 2014.

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Spatial and Syntactic Changes

Spatial changes before and after the construction of the Unkapanı (Atatürk) Bridge

At the beginning of 1830's, the Historical Peninsula was the centre of the settlement and the Galata region was limited by its old borders. The street pattern was usually organic, except at the north side of the Golden Horn. Additionally, Topkapı Palace, the Suleymaniye and Yeni Valide mosques, the Grand Bazaar and the other commercial buildings and large mosques were the most prominent structures of the period. During this period, the number of street segments totalled 272 and average number of buildings totalled 148. Moreover, the average area of urban blocks was 29853 square meters (Table 1).

After the construction of the first bridge, the data shows that the number of street segments increased to 303 and the average area of urban blocks decreased to 25301 square meters. Furthermore, the average length of streets declined from 151 meters to 140 meters and the average area of buildings decreased from 412 square meters to 385 square meters. To conclude, the area around the first bridge transformed into more divided streets and urban blocks after the construction of the Unkapanı Bridge.

On the other hand, after the construction of the first bridge, the street network configuration of the study area underwent some changes too (Table 2). As shown in the table, the choice (n) value increased from 3.73 to 4.15 and the choice within 400 meters increased from 2.14 to 2.39. In addition, integration (n) value increased from 2.05 to 2.28 in this time period.

Spatial changes before and after the construction of the Cisr-iCedid (Galata)Bridge After the construction of the second bridge in 1845, the number of street segments rose from 277 to 287 and the number of buildings increased from 314 to 365 around the bridge. Moreover, average area of buildings decreased from 545 square meters to 482 square meters (Table 3).

On the other hand, it is observed that ln (n) increased from 2.28 to 2.34 and ln (r3) increased from 1.79 to 1.94. And finally, connectivity increased from 0.48 to 0.52 after the construction of the second bridge (Table 4). Therefore, it is possible to state that after the construction of the second bridge, the area become more accessible and connected.

Spatial changes during the 20th Century

During the 20th century, there were many different processes underway in the study area. Therefore, it is constructive to conduct an analysis across two different time periods. First, in 1922, the Republic was about to be proclaimed and a tram lane was added to the Galata Bridge. The most important buildings were the Sirkeci railway terminal (on the Historical Peninsula), two hospitals (Beyoğlu and Sankt Georgs) and the town hall (located in Galata) in this time period. Additionally, after the establishment of the Republic of Turkey, Topkapı Palace was transformed into a museum at the date April 1924 and it was also the first museum of the Republic of Turkey. Ministry of war was transformed into a university building in 1923.

In 1933, after the proclamation of the Republic, three different urban planners were invited to the city and a new planning approach was developed. One of the most important events of the period was the invitation extended to Prost. His plans affected Istanbul in a number of different ways – in particular, a scheme to create different functional zones for different activities. One consequence of this was the relocation of all industrial facilities to the Golden Horn, which affected the area in a negative way as the shore became heavily polluted and the area soon fell into ruin. However, Prost was also responsible for limiting the height of buildings, which successfully preserved the silhouette of the Golden Horn (Kuban, 1996).

Under the government of Prime Minister Adnan Menderes between 1950 and 1960, the whole city underwent some changes. These included the introduction of wide boulevards, which Menderes took from the examples of European countries. The road between Unkapanı and Yenikapı (which is located on the south side of the Atatürk Bridge) was widened. From Galata to Dolmabahçe, from Karaköy to

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Azapkapı and between the two bridges over the Golden Horn, more new boulevards were built (Kuban, 1996).

During the 1980s, the city underwent many economic, social and political transformations. A new master plan was created, and there was also a plan to remove the industrial areas from the shores of the Golden Horn. The planned demolitions, which are now remembered as "Dalan Operations" (after Bedrettin Dalan, the mayor at the time), were given the go-ahead, and more than 4000 buildings up to 50-100 meters inland of the Golden Horn shoreline were expropriated. 696 factories and 2020 offices were demolished and relocated. Furthermore, the shoreline of the

Golden Horn (representing about a million square kilometres) was transformed into parks and gardens (Erbey, 2009).

By the beginning of the 21st century, communication within the core of Istanbul was improved. The main aim of this period was to provide an uninterrupted communication network across the Historical Peninsula by creating new arteries so that these could make connections between the heart of the city (the commercial center) and the Byzantine gates (Kubat, 1999).

Spatial changes before and after the construction of the Golden Horn Metro Bridge In 2016, after the construction of the last bridge, the number of street segments increased from 17168 to 17507 and the average length of street segments increased from 6, 48 to 6, 53. The number of buildings increased from 269 to 298 and the average area of buildings raise from 431 square meters to 558 square meters (Table 5). The study area now contained Istanbul Ticaret University and Kadir Has University; thus, these buildings can be thought as the most significant reason for the changes in the number of buildings and the average area of the buildings.

After the construction of the last bridge, the Golden Horn Metro Bridge, a very slight change in syntactic values around the bridge was observed. It is determined that the values of choice (n) decreased and choice within 400 meters and integration (r3) increased slightly while choice within 800 meters and ln(n) remained stable (Table 6).

Table 1: Spatial changes around the Unkapanı Bridge

Years	Average building area (m2)	Number of buildings	Average street length	Number of streets	Average area of urban blocks (m2)
1831	412,207	148	151,139	272	29853,188
1838	385,346	145	140,980	303	25301,827

Table 2: Syntactic changes around the Unkapanı Bridge

Years	Connectivity	Choice (n)	Choice400 metric	Choice800m etric	Ln (n)	Ln (r3)
1831	0.526	3.739	2.142	2.905	2.059	1.813
1838	0.491	4.159	2.399	3.145	2.286	1.779

Table 3: Spatial changes around the Galata Bridge

Years	Average building area (m2)	Number of buildings	Average street length	Number of streets	Average area of urban blocks (m2)
1838	545,773	314	146,801	277	24897,113
1850	482,986	365	146,411	287	24702,920

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Conclusion

Intelligibility is a value which is derived from the correlation between connectivity and global integration. A high correlation between two factors means that the spatial structure is intelligible, and low correlation means that the spatial structure is not intelligible. Kubat(1997), discovered that the intelligibility value of the Anatolian towns she analyzed was 0.350, while that of the Islington area of London has been reported at 0.61-0.26 (Hillier 1989), and that of Athens has been reported at 0.790 (Peponis et al. 1989).

The intelligibility values of the areas around the three bridges are higher compared with both Kubat's analyses and the overall values reported in 2016 (Table 7). Thus, when considering whole case area, the spatial pattern around the bridges is more intelligible.

As result of these analyses, it is possible to state that the study area has transformed into more divided streets and urban blocks, and the number of buildings increased over these periods. Although it is not possible to claim that the bridges are the only factors behind these changes, it can be stated that the bridges have created more integrated and accessible spaces. Therefore, as planned, Galata and Karaköy regions have become more accessible and more preferred areas; thus, new functions and buildings have been constructed.

Table 4: Syntactic changes around the Galata Bridge

Years	Connectivity	Choice (n)	Choice400metric	Choice800metric	Ln (n)	Ln (r3)
1838	0.488	4.199	2.388	3.133	2.286	1.792
1850	0.522	4.192	2.304	3.045	2.346	1.940

Table 5: Spatial changes around the Golden Horn Metro Bridge

Years	Average building area (m2)	Number of buildings	Average street length	Number of streets	Average area of urban blocks (m2)
2006	431,959	269	6,487	17168	4357,475
2016	558,941	298	6,532	17507	4493,386

Table 6: Syntactic changes around the Golden Horn Metro Bridge

Years	Connectivity	Choice (n)	Choice400metric	Choice800metric	Ln (n)	Ln (r3)
2006	0.370	7.466	7.051	7.070	3.644	3.806
2016	0.369	7.465	7.052	7.070	3.644	3.807

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Table 7:Correlation of bivariate connectivity and integration(n) data for three bridges in 2016

Bridge	Atatürk Bridge	Galata Bridge	Golden Horn Metro Bridge
R^2	0.408	0.459	0.413
Significance	0.01	0.01	0.01
N	16936	16132	16684

** Correlation is significant at the 0.01 level (2-tailed)

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This study is an attempt to contribute to the literature by explaining the influences of bridges on urban morphological characteristics and street network configurations. Furthermore, the metro bridge-rail system of the Golden Horn Metro Bridge has had less impact on the pattern of the settlements when it is compared with the impact of the vehicular bridges. The primary reason for these lower values is that there is no distinct, continuous pedestrian route in the north-west direction. However, just as with the Galata and Atatürk bridges, it is expected that with some new planning decisions (new routes connected to the main sidewalks and new functions around the Golden Horn Metro Bridge), the settlements around the bridge will become more accessible and integrated spaces.

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Urban compactness and growth patterns in Spanish intermediate cities

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Abstract. *Contemporary processes of urbanization have outpaced the traditional notion of city. Connectivity has become a distinctive characteristic of urban spaces, so that networked cities don't rely anymore on continuous urbanized areas, but on connections that rarely leave a direct spatial footprint. The new spatial structure of urban areas include greater inter-penetration of built-up and open spaces, and the emergence of urban enclaves, which can be spatially isolated despite being functionally connected to a city. In order to study these enclaves and their impact on urban form, a sample of 47 Spanish functional urban areas was examined, ranging from 36,000 to 6.0 million inhabitants. Land use polygons provided by SIOSE were grouped into three main categories (residential, non-residential and urban infrastructure) and cross-matched with functional urban areas defined by AUDES (an iterative method than combines morphological and functional criteria) in order to calculate compactness proximity index, gross and net density. Factors that influence urban compactness were identified: most northern and some coastal urban areas display a low compactness which can be attributed to orographic conditions; bigger cities tend to display high compactness, but smaller ones display a great diversity of values, from the highest to the lowest. A further analysis of small and intermediate cities helped to identify two complementary mechanisms of urban growth, spatial expansion of core areas and functional integration of peripheral nuclei, whose ocurrence in different proportions can explain the variation of compactness in the studied sample.*

Keywords: Urban compactness, urban growth patterns, intermediate cities

Introduction

Since Industrial Revolution, urban forms have suffered profound transformations. The urban growth associated to the new technical and economic reality of industrial cities created new spatial entities, named 'conurbations' by Geddes (1915), from the coalesce of formerly separated cities and towns. In 20th century, this impressive urban growth defined new low-density and discontiguous forms of urbanization, satellite cities and suburbs, that began to challenge the traditional notion of urban form. The expansion of urban footprint, including facilities and infrastructures, has produced a topological inversion of the landscape of most urbanized regions: there is no more an unlimited rural space surrounding a discrete urban entity, but an assemblage of strongly interlinked urban spaces that cross and

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break increasingly fragmented and encircled rural spaces (Margalef, 2005). At the same time, rural spaces tend to host a growing set of urban facilities and be home to a growing population of urban commuters, a proccess named 'rururbanization' by Bauer & Roux (1976). This interpenetration of rural-urban realities supposes a challenge to the definition of urban form, as the city is no longer defined by a clearly differentiated space, but by a set of physical and virtual networks linking spatially-separated urban spaces (Dematteis, 1991; Dupuy, 1992; Corboz, 1994; Ascher, 1995). This new urban reality lacks definable boundaries, and the definition of urban space shifts to functional criteria: "families create their own 'cities' out of the destinations they can reach (usually travelling by car) in a 'reasonable' length of time" (Fishman, 1990).

In any case, this functional vision of the urban space is already implied in the traditional notion of metropolitan area. The US Bureau of the Census firstly introduced functional criteria in 1964 to define Standard Metropolitan Statistical Areas (SMSA), based on the commuting flows, although without totally abandoning previous demographic, morphological and socio-economic criteria. Later, Fox & Kumar (1965) proposed Functional Economic Areas, defined from the labor market extension of the central cities; Berry et al. (1968) conducted an analysis of commuting movements of the 1960 census, noting that while 66% of the US population resided in metropolitan areas, this figure rose to 87% if their commuting areas were included. All these approaches were conceptualizing the urban area from the labor market and daily commuting (Berry, 1973), or spatial self-containment of employment supply and demand (Smart, 1974; Hall & Hay, 1980), and in such terms the metropolitanization and suburbanization of Western Europe began to be analyzed (Chesire & Hay, 1986; Chesire, 1995). Currently, the US Bureau of the Census proposes differentiated methods for distinguishing rural and urban areas, on the one hand, and for defining metropolitan areas. Demographic and morphological criteria are usedf to differentiate urban and rural areas, while the definition of metropolitan area has a fundamentally functional base, although it is always derived from an urban core. Thus a metropolitan area may include both urban and rural areas, while an urban area may not belong to any metropolitan area. In the European Union, the ESPON project manages several types of territorial units, distinguishing between morphological units and functional units that are defined from the former. Morphological Urban Areas are defined by demographic criteria (population and population density) from existing administrative units, with various corrections, while Functional Urban Areas are derived from the former, incorporating those municipalities that have more than 10% of workers employed in the central core. Finally, Eurostat, the Urban Audit program and the OECD are concertedly working on a harmonized definition for all developed countries: the enlarged urban areas (Larger Urban Zones, LUZ), which corresponds to the traditional concept of Metropolitan Areas. Its delimitation follows a procedure similar to that of functional urban areas, although its central core is not defined from the density and population values of administrative units, but from the cells of an 1-kilometer orthogonal grid.

Despite all these efforts, the concept of labour market-related metropolitan area has not challenged the traditional notion of urban space, still asociated to a continuous built-up area, specially when comparing urban areas at international or global scale, where there is no consistent definition of metropolitan areas. The use of GIS and remote sensing technology has improved the access to global harmonized data and boosted the morphological study of greater urban areas (Angel et al., 2016; Demographia, 2017), but these studies fail to incorporate the new challenging definitions of urban nature and space, while displaying a bias towards greater urban areas that obscure any possible influence of city size in urban form.

Methodology

The main objective of this study is to unveil the relationship between city size and urban form, trying to answer the question of how urban growth modifies urban form, in a context or

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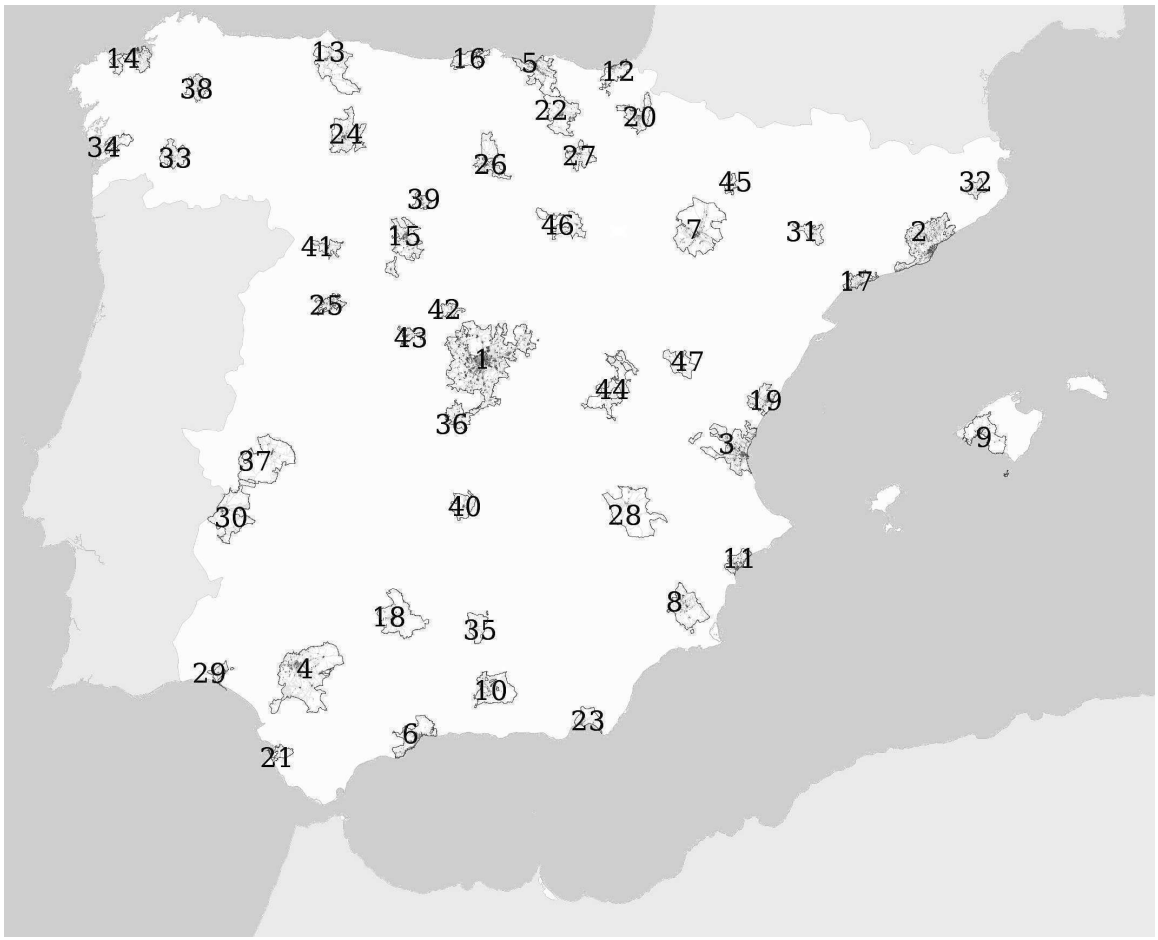

Figure 1.
The analized sample of functional urban areas

growing integration of rural and urban spaces, functions and population. In order to fulfil this objective, a wide sample of Spanish cities and towns was selected, showing different sizes and geographical contexts, but sharing a common legal frame and urban culture. It also was necessary to search for scale-independent spatial metrics that could be adapted to urban areas of such different size and population.

The sample includes all the Spanish provincial capitals (Figure 1), which have since been operating as administrative centers since 1833, and have developed a central role in the process of urbanization of the country, becoming the main population center and urban referent of their respective territories. On the other hand, the size of these urban areas is correlated to a large extent with the demography of their surroundings: the largest cities are situated in the most populated areas, while smaller cities are usually in less populated regions.

Delimitation of urban areas

There is a great variety of methodological investigations on the delimitation of urban areas in Spain that adapt methods from international organisms or assume original approaches. Some works by the public administration make explicit a series of criteria of delimitation, but in fact they show no precise methodology, as they are based to a great extent on expert opinion, without ruling out criteria of political expediency. However, most of the works are academic studies based on detailed methods, and among them, more than half develop different variants of functional delimitation based on the labor market data from the 2001 Census, which detail the municipality of origin and destination of these daily work travels (Jiménez, 2015: 71-79).

On this common basis, each approach uses a different definition of the central core, employs

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different interaction thresholds to incorporate new municipalities and applies the process in one or several iterations. The starting point is usually a large municipality (Roca et al., 2005), or a set of municipalities, defined by the continuity of the urban fabric (Ruiz, 2011) or by self-containment of the local labour market (Roca et al., 2012). The incorporation procedure is the most important parameter to define the extension of the metropolitan area: the more flexible, iteratively applied criteria offers the greatest extensions, while more stringent criteria, together with a more restricted iteration, reduce the extent to a minimum.

The methodology that offers more extensive urban areas (Roca et al., 2005) is based on the pursuit of the maximum self-containment of the labour market area. This approach ends up offering the most disturbing results, by presenting large rural extensions as integrated into huge metropolitan areas. Paradoxically the low population of these territories makes them more dependent on the jobs available in the cities, so that an theoretically undisputable rural territory houses a population that has much of an urban lifestyle. At the opposite extreme, the AUDES project (Ruiz, 2011), without renouncing a functional conceptualization of the metropolitan area, applies much stricter morphological restrictions, displaying a much more conservative picture.

The AUDES method consists of an iterative process in which an urban nucleus is identified (based on data from Corine Land Cover 2006) with a population of at least 10,000 inhabitants. The degree of functional integration of contiguous municipalities is then evaluated according to an attraction ratio, calculated from the commuting travels collected by the 2001 Census. This ratio counts both the movements from the periphery to the center as those from the center to the periphery. The minimum ratio for joining the urban area is 25% (provided there is an absolute minimum of 200 transfers), and also includes the condition that there is spatial continuity. The next step in the process is to re-calculate the attraction ratio, but this time with adjacent urban areas, not isolated municipalities. These peripheral urban areas are incorporated into the greater urban area as urban subareas incase they have an attraction ratio of more than 25%. The fourth and final step is to evaluate the interaction rate between adjacent urban areas, constituting what is named 'conurbation' in case the percentage of daily transfers between both areas exceeds 25% of the total daily transfers.

This iterative method is similar to those used in other studies, but it is also more demanding in terms of morphological criteria. Apart from the minimum population thresholds, each urban nucleus is strictly defined by its morphological attributes, and from that it is accepted the addition of a first crown of municipalities by exclusively functional criteria. The following iterative steps are no longer carried out with isolated municipalities, but with urban areas that have previously met both morphological and functional requirements.

Urban form metrics

There is a plethora of metrics designed to quantitatively describe urban form. Schwarz (2010) identifies two main groups, landscape metrics and socio-economic indicators, summing up more than 40 indicators used in different studies. However, most of these usually present strong correlations, so Schwartz finally uses seven main indicators to characterize European cities: "area of the discontinuous urban fabric, edge density, mean patch size, number of patches, compactness index of the largest patch, population number, population density" (Schwartz, 2010:41). Huang et al. (2007) use seven spatial metrics related to compactness, centrality, complexity, porosity and density, but correlation analysis shows strong relations among most of them, specially complexity, compactness and porosity, while density correlates only partially with some of them. Angel et al. (2016) calculate density, fragmentation and compactness metrics for a global sample of 200 cities, however fragmentation metrics strongly depend on scale-dependent factors, unsuitable fot a sample of such different size urban areas. For this estudy two metrics were chosen, as defined by Angel et al. (2016): gross density, or built area density, as "the ratio of the total population of the urban area and its built-

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up area, measured in persons per hectare"; compactness proximity index, defined as "the average beeline distance of all points in the equal area circle to city hall and the average beeline distance of all points in the urban extent" to the geometric centre of the built-up area (Angel et al., 2016:31)

Built-up area is calculated from SIOSE project, which covers the whole Spanish territory with a continuous mesh of polygons, characterized by the type of land use and cover. SIOSE database does not follow the traditional hierarchical classification of landcovers, but describes any polygon as a combination of one or more covers with their correspondent attributes and percentage of occupancy, with two associated superclasses: land cover and use (IGN, 2007). The SIOSE model includes a large number of cover types, but in this study we will resort primarily to a set of predefined associations within the category of artificial composites, covering the different types of urban fabrics, which have been grouped in three broad categories: mixed urban fabric, including residential areas (UCS, UEN, UDS), specialized urban fabric (industry: IPO, IPS, IAS; tertiary sector: TCO, TCH, TPR, TCG; urban facilities: EAI, ESN, ECM, EDU, EPN, ERG, ECL, EDP, ECG, EPU); and infrastructure (transportation: NRV, NRF, NPO, NAP; telecommunications: NTC; water supply: NDP, NDS, NCC; waste management: NVE, NPT).

Measurement and analysis

Gross density values vary from Teruel's 17.34 inhabitants/hectare to Cadiz's 94,21 inhab/Ha. Apart from these extreme two cases (and Lleida, with a density similar to that of Teruel), the rest of the urban areas are in the range of 25-70 inhab/Ha. It is possible to distinguish, in any case, three large groups: the smaller urban areas (<100,000 inhabitants) are in a range of densities of 25-40 inhab/Ha; larger urban areas (>500,000 inhabitants) display higher densities: between 40 and 70 inhab/Ha; finally, intermediate cities (between 100,000 and 500,000 inhabitants) are those that present the greatest diversity, with examples of maximum and minimum density, and occupying the entire range from 25 to 70 inhab/Ha.

Although largest urban areas display higher values of density than smallest, the intermediate range displays the greatest variability, and one of them, Cadiz, has the highest density of the sample. Apart from this case, which could respond to extraordinary conditions, the highest values of density correspond to Barcelona, Bilbao, Donosti and Pontevedra, between 71 and 65 inhab/Ha, with populations between 4.5 million and 126,000 inhabitants. Thus, the sample shows the absence of small urban areas with high gross density and large urban areas with low gross density, while intermediate urban areas cover the full range of densities, reaching extreme values, both above and below.

On the other hand, compactness values obtained for the sample vary within the range from 20% to 55%. Smaller urban areas display both the minimum and maximum values of compactness, while as the size of urban areas increases, the range of variation narrows, increasing the minimum values. The areas of Madrid and Barcelona have a compactness very close to the maximum values, but smaller urban areas (Alicante, Salamanca, Ávila and Huesca) are the ones that present the highest compactness. These values are relatively low compared to other studies (Angel et al., 2010), but this is due to the methodology used: urban infrastructures are not being computed, so that even in an area of continuous urbanization the spaces dedicated to these infrastructures appear as empty spaces. This methodology allows us to distinguish between those infrastructures integrated within the urban space versus those located on the periphery or in the vicinity of the urbanized area.

Gross density and compactness have a high degree of independence (Figure 2), with examples of low density and low compactness (Teruel), low density and high compactness (Avila), high density and low compactness (Oviedo, Santander, Pontevedra), and high density and high compactness (Barcelona, Bilbao). The obtained values of density and compactness allow to re-evaluate the traditional typology of Spanish cities, which is articulated around the geographical location:

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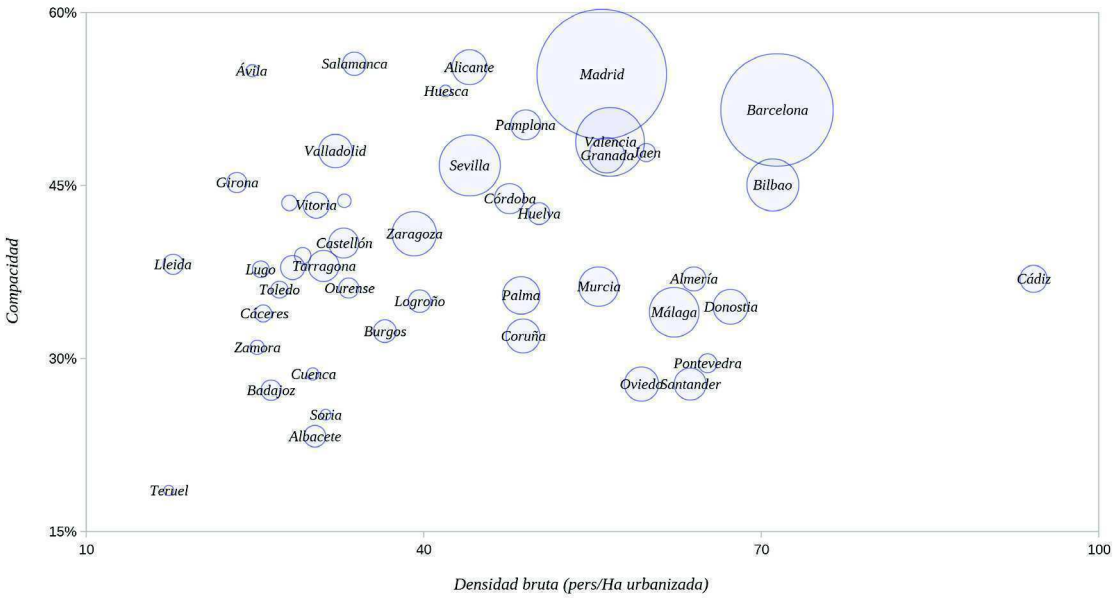

Figure 2.
Urban areas classified in terms of density and compactness

Mediterranean, Cantabrian and Inland cities. As a summary we can confirm the traditional groupings in terms of typology of cities, but density and compactness values offer a quite novel description.

Inland urban areas are characterized by a low gross density (17-39 inhab/Ha), a pattern that only Andalusian areas, northern Ebro Valley cities (Pamplona and Huesca) and Madrid, the largest area of the whole sample (55 inhab/Ha), break. On the contrary, compactness values are the most diverse, from the minimum of Teruel (19%) to the maximum of Salamanca (55%).

Urban areas of the northern coast of Spain (including the Atlantic capitals of Galicia), on the other hand, are characterized by high values of gross density (48-71 inhab/Ha) and low compacities (28-34%). Only Bilbao, the largest urban area of this group, has a significantly high compactness (45%).

Mediterranean cities display a fairly wide variation in gross density values (31-71 inhab/Ha), with larger urban areas showing the highest values, while compactness values are in the mid-high range (35-51%). In the case of Andalusian urban areas, all of them have relatively high gross density values (44-94 inhab/Ha), while compactness values are also in the mid-high range (34-48%).

From the former, some factors influencing urban compactness can be identified: most northern urban areas display a low compactness which can be attributed to orographic conditions, while southern and Mediterranean urban areas tend to be more compact. On the other hand, bigger cities tend to display high compactness, but smaller ones display a great diversity of values, from the highest to the lowest, that still have to be explained.

Different patterns of growth in intermediate cities

In contrast to the relative homogeneity of the large urban areas, the smaller ones present an important variability of both density and compactness (Figure 3). On the one hand, Avila and Jaen are typical examples of a Mediterranean-type compact city, with the bulk of the urbanized area grouped in the urban center and much smaller areas in the vicinity, maintaining a very similar total area and extent (around 2,000 Ha and between 2 and 3 km of average distance to the center), although Jaen has more than twice as many inhabitants as Avila. In front of these, Pontevedra and Teruel have urbanized areas of similar size (also around 2,000 Ha), but with average distances to the center of almost 5 and 6 kilometers respectively. The lower compactness of these

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Table 1.
Gross density and compactnes of 47 Spanish urban areas

Urban area	Population	Built-up area (Ha)	Gross density (inhab/Ha)	Compacidad
Madrid	6.003.662	107530,17	55,83	54,64%
Barcelona	4.516.079	63245,49	71,41	51,55%
Valencia	1.689.835	29871,78	56,57	48,78%
Sevilla	1.335.740	30285,48	44,10	46,73%
Bilbao	969.327	13644,64	71,04	45,05%
Málaga	881.008	14147,22	62,27	34,01%
Zaragoza	705.267	18012,05	39,16	40,82%
Murcia	560.442	10089,60	55,55	36,23%
Palma	501.898	10313,11	48,67	35,46%
Granada	452.238	8036,96	56,27	47,62%
Alicante	437.148	9916,11	44,08	55,25%
Donostia	431.744	6417,46	67,28	34,48%
Oviedo	417.841	7038,96	59,36	27,78%
Coruña	410.972	8416,80	48,83	31,95%
Valladolid	402.076	13508,36	29,76	38,61%
Santander	364.883	5729,49	63,69	27,78%
Tarragona	343.147	11034,56	31,10	38,02%
Córdoba	324.658	6815,66	47,63	43,86%
Castellón	322.222	9796,59	32,89	40,00%
Pamplona	320.149	6524,86	49,07	50,25%
Cádiz	262.459	2785,96	94,21	36,90%
Vitoria	240.929	7912,42	30,45	43,29%
Almería	209.635	3275,02	64,01	36,90%
León	207.991	7336,06	28,35	37,88%
Salamanca	196.553	5808,57	33,84	55,56%
Burgos	184.257	5040,82	36,55	32,36%
Logroño	182.487	4603,37	39,64	34,97%
Albacete	169.649	5592,83	30,33	23,26%
Huelva	168.584	3354,51	50,26	42,55%
Badajoz	147.553	5581,93	26,43	27,25%
Lleida	145.407	8200,45	17,73	38,17%
Girona	144.404	6174,08	23,39	45,25%
Ourense	144.013	4319,58	33,34	36,10%
Pontevedra	126.095	1932,71	65,24	29,59%
Jaen	120.070	2008,16	59,79	47,85%
Toledo	103.731	3816,06	27,18	35,97%
Cáceres	103.028	4002,65	25,74	33,90%
Lugo	99.813	3910,64	25,52	37,74%
Palencia	96.526	3299,93	29,25	38,91%
Ciudad Real	86.346	3076,56	28,07	43,48%
Zamora	73.915	2933,12	25,20	30,96%
Segovia	64.543	1958,71	32,95	43,67%
Ávila	53.272	2151,63	24,76	54,95%
Cuenca	53.211	1765,68	30,14	28,65%
Huesca	49.312	1175,85	41,94	53,19%
Soria	40.494	1294,20	31,29	25,13%
Teruel	36.608	2110,74	17,34	18,55%

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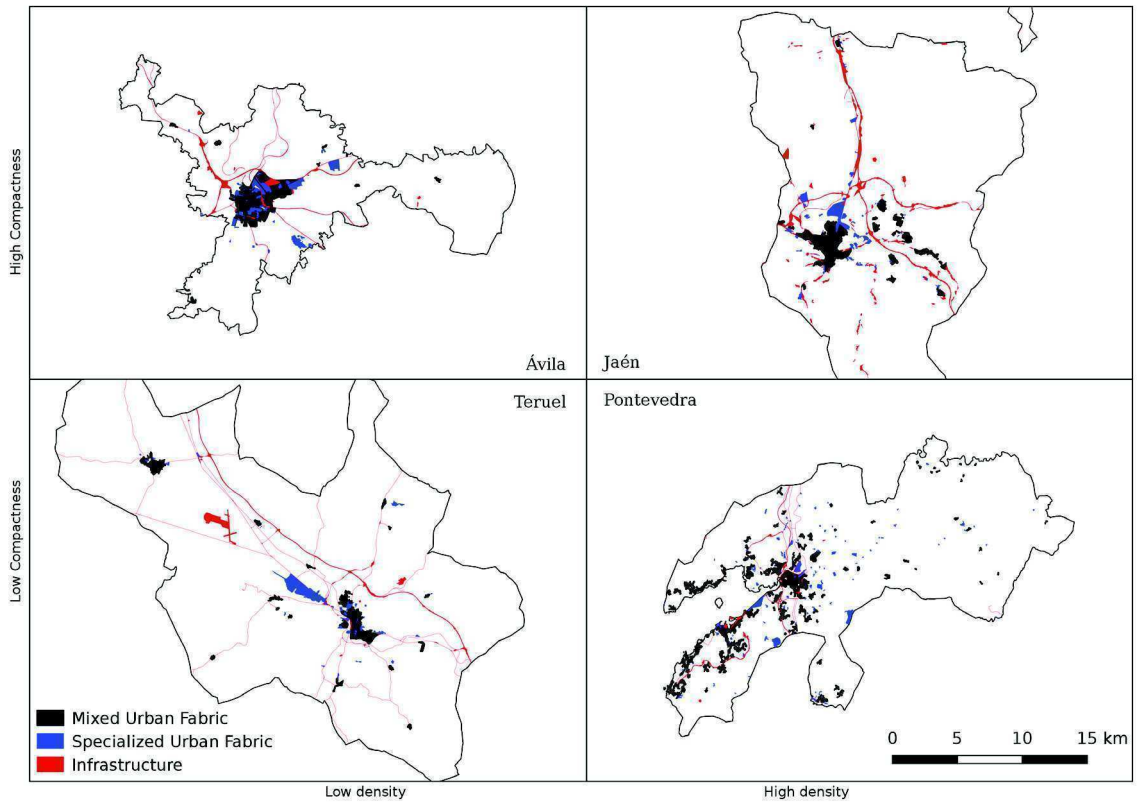

Figure 3.
Different patterns of density and compactness in intermediate cities

two urban areas is due to the existence of large non-urbanized areas interspersed between urbanized areas. In the case of Pontevedra this distribution corresponds to a specific type of dispersed settlement, typical of the Atlantic Europe and specifically the Galician region. The case of Teruel corresponds to another situation, since it is derived from the functional integration of two compact nuclei (Teruel itself and the neighboring municipality of Cella) and an extensive industrial estate located in the road that connects both. The 20 kilometers that separate both municipalities, combined with the small relative size of both nuclei explain the low compactness value (18.55%).

Conurbation vs. functional integration

The process of urban growth and residential spread in Spain has more frequently implied the expansion of preexisting nuclei than the emergence of new suburban settlements. The urban areas of Castilla-Leon constitute a good sample of cities of intermediate and small size distributed over a fairly homogeneous geographic space, in terms of both topography and distribution of pre-industrial settlements. These urban areas also share similar values of gross density, but very different values of compactness (Figure 4).

The highest values of compactness correspond to Avila urban area, which only includes one municipality, and Salamanca, which has integrated a whole crown of nearby municipalities bordering the conurbation. On the other hand, the lowest compactness correspond to the less populated urban area of the sample, Soria, which has anyway managed to functionally integrate a number of relatively distant municipalities, and Zamora, which displays a structure very similar to that of Salamanca but with a much smaller size, so that the conurbation of the nuclei are very far from being achieved. Finally, the most populated area of the sample, Valladolid, also displays a high compactness, although lower than Salamanca, because after the intense conurbation with the first crown of municipalities, it has also integrated other municipalities further away from the central

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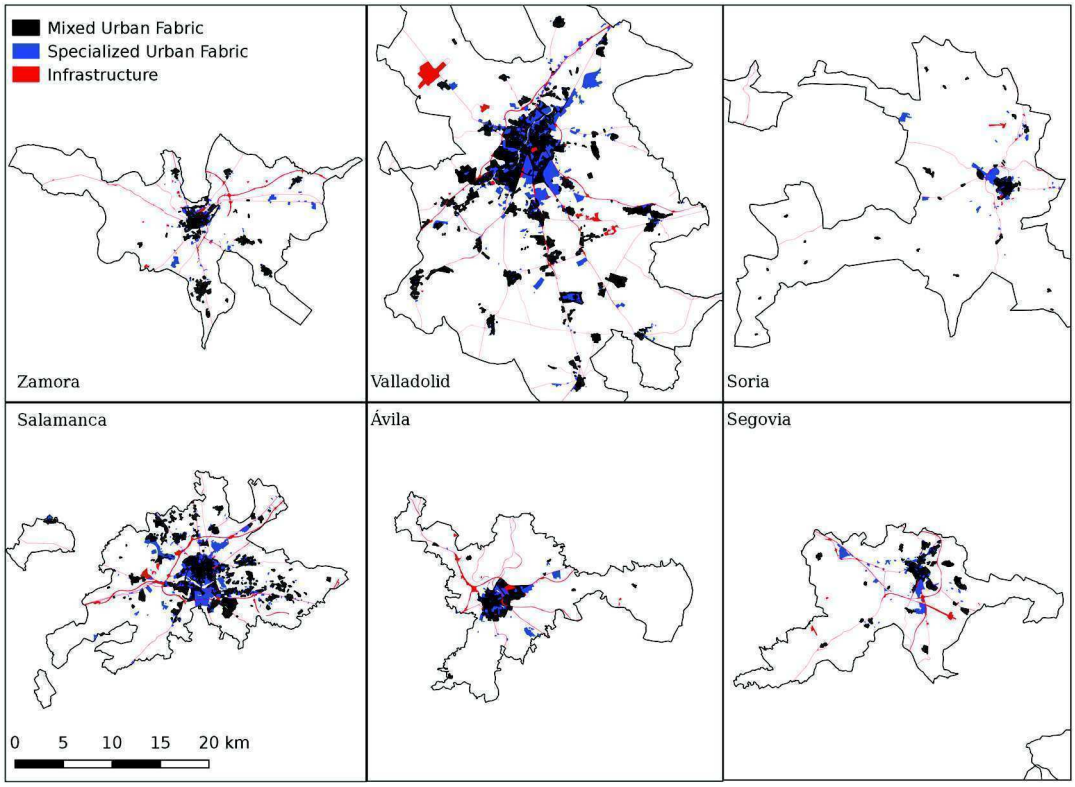

Figure 4.
Compactness and pattern growth in Castilla-León urban areas

core. In these urban areas we can observe the combination of two mechanisms of urban growth and how their different combination can explain the divergence in terms of compactness values: functional integration of distant nuclei drastically reduces compactness, while the subsequent growth of those nuclei tend to increase it.

Conclusion

This study has carried out a morphological characterization of urban areas mainly defined by functional criteria. The distinction between definition criteria and analysis variables is essential to avoid circularity: if we define an urban area as a dense and continuous space, no further analysis will show any space that is not dense and continuous. The urban functional space, however, is capable of showing itself as more or less dense, more or less compact.

The analyzed sample includes urban areas that share a social, cultural, economic, administrative and political context, but differ in size and geographical context. Geographic location seems to be the basic variable to explain the density-compactness pattern, while size seems to impose its own pattern when dealing with larger urban areas, where high density and compactness values are prevalent. Compared to the relative homogeneity of the large urban areas, the smaller ones present a much more varied range of density a compactness values.

The great variation of compactness values found in smaller urban areas can be explained because two different growth mechanisms take place in the peri-urban fringe that have opposite effects with respect to compactness: the functional integration of remote urban nuclei generates longer commuting distances with minor spread of the urban footprint, while the organic expansion of the central nucleus and previously integrated nuclei, tends to increase the urbanized area without increasing commuting distances. In greater urban areas these two mechanisms would not disappear, but the smaller relative size of the peri-urban fringe would substantially mitigate these fluctuations.

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Compared to other global studies that analyze broader and more diverse samples of large cities, this study is useful for evaluating the influence of size factor on the processes of urban growth and transformation of urban form. Similarly, comparing urban areas of such similar characteristics (within a peculiar urban culture as the Spanish one) allows to identify details of the urbanization process that are often overlooked when comparing cities of very different social, cultural, economic and political realities.

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Dialectic contradictions of global and local within the city transformations. (Case study of Russian cities)

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Abstract. *The results of morphological analyses of the urban structures more and more attract attention with the aim of understanding the processes and laws of transformation of the city fabric. Comparison of the case studies representing different regional cultures gives reasons to presume the presence of global trends as well as local features. Their dialectical contradictions lead to a unique urban form very often. Thus, recent global conversion caused very similar urban problems as well as methods for their solution characteristic to the whole world. Popularization rate of the past is comparable to the speed of propagation of a certain fashion lifestyle. As the result - reversal of thinking to find local uniqueness of each settlement and this tendency again step by step became global. From other side universal morphological conceptual apparatus built on factual analysis allows to trace the objective process of urban transformation and to give some forecasts concerning changes in their structure. Assumptions must be considered with the adjustment for the modern scale. Never the less contemporary cities - Krasnoyarsk, Irkutsk demonstrate building and fabric adaptation, redevelopment, additive processes, contrast with transformative processes, agricultural residual (areas of town dachas in Russian urban tradition), augmentative redevelopment, different scales of changes of use, loft-cycle (second, re- use) development, street markets concretion, other, characteristic not only for the historic heritage areas but for the modern city as well. Russian cities in our days demonstrate urban-rural fringe development - somewhat even similar to "cocktail-belts" but with the local eclectic Siberian architecture.*

Keywords: urban structures, global and local reasons for the city transformation, morphological gaps

Introduction

Since the middle of the XX century in the world professional consciousness a firm position on the value of each historical stage in the development of cities and settlements, preservation of special peculiarity of each of them has been formed. Methodologies, methods of research and conservation of cultural monuments have been formed. However, urban areas of different scale as objects of cultural history, actively functioning with all the complexity of the problems, are mainly subjects of scientific discussions. In historical science, as a rule, architectural objects, established urban ensembles and historical cities of a certain stage of development are studied, but applied research and practical urban planning deals with functional zones, structure and infrastructure of populated areas. The gap within the research approaches could be filled out with the urban morphological methodology.

Methodology

Since the middle of the XIX century to the

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present time humanity has four times changed the concept of its environment under the pressure of global crises of technological epochs. The city has passed through medieval, industrial, post-industrial stages of development and by definition of a number of researchers "is being immersed into "post-carbon " stage. In each of the eras a specific image, structure of towns and cities, rules of design are being developed. These arguments contain at least three ideas about the development of populated settlements and an urban idea, confirmed by a number of studies. They are also confirmed by new large-scale urban projects implemented at the end of the XX - beginning of the XXI century. We mean conflict-free coexistence in a single urban space of phenomena and systems that are considered incompatible - sort of "parallel":

- overcoming spatial segregation and restructuring of the modern city in connection with the formation of marginal gaps in the process of replacing industrial, energy, information technologies, as well as territories with the incomprehensible morphology for the urban designers and planners;
- the inevitable tendency of combining global and regional beginnings of the modern city, while preserving its cultural identity;
- restoration of aboriginal eco-systems through the functioning of the city and unexhaustion of natural resources (combination of territorial spaces of cultures and biotypes). The latter process requires the development of a fundamentally new view of the regulations of eco-oriented urban renewal, not based on the principle of cost-effective approach to engineering and building complex, but on the contrary, some "spare" abundance, ensuring the vital activity of biological species, especially in the case of anthropogenic crises.

Cultural identity as a social-planning problem has sounded particularly urgent in relation to global phenomena and processes in economics, information technology, an increase in the population mobility, introduction of "the international architectural style" of high-rise construction, universalization of the so-called "central business districts" instead of the classical understanding of the city centre. Leaching of regional traditions, way of life, architectural styles, etc. is taking place.

At the same time residential environment of the old town is commonly viewed as a community of integrated "natural areas". A "natural area" - is a concept associated with perception of the residence, visual certainty and perceptibility, a special architectural image, connectivity of the territory with any phenomena, traditions, history of the place. They are also looked at as established resident communities, or the communities that are being established, that is, with the feelings based on a specific quality, its borders, which are regulated by neither the city administration nor the documents of the layout.

Understanding the above-mentioned processes of city development leads to an understanding of the morphological diversity of urban form. As it has been proved in the studies of urban morphology, each of the unique fragments of the city could be identified as a specific landscape unit with a unique history of formation, but close and in interrelation with other morphological units of the city (Conzen, 1969). What, in general, can lead to a more accurate formulation of urban development strategies and conflict-free preservation and development of the uniqueness of each of the landscape unit. The following is no doubt a productive urban morphological concept that can serve to overcome the segregation of the city - if the concept of fringe belts (Conzen, 1960; Whitehand 1967, 1974, 1988; Barke,1976, 1990; Ünlü T., 2013, other)

Measurement and analysis

Urban ideas in the late XIX – early 30-ies of the XX century in many countries were aimed at finding optimal design solutions for cities, to overcome the crisis of chaotic development and degradation of territories in connection with the emergence and development of industrial production. One of the greatest challenges in this regard was the problem of industrial and residential slum areas, mostly located on the outskirts of the city. Three tendencies of scientific-theoretical urban planning sprang into being. The first was the search for concepts of a "new city", unburdened

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by the marginal slums. It was assumed that margins should carry a new feature – a smooth transition to rural or natural areas. The second tendency consisted in the urban morphological studies based on historical analysis of urban development depending on their physiographic features. The third direction included natural and Earth sciences, exploring the city. Our aim is to consider the results of the influence of global concepts of development of cities and urban processes that has swept into the world and local factors on the formation of unique characteristics of Russian cities, based on the above research areas and morphological classification of the territories.

Siberian cities at the time of design of the first master plans of the Soviet period in the late 30-ies of the XX century included residential areas attached to industrial enterprises, working-class suburbs, suburban areas for recreational and economic purposes, etc., like any other city in the world. Russian historical research highlighted four periods in the history of the origin and development of Siberian cities. The first stage is considered to be the foundation and construction of "ostrog" settlements, carrying out defensive functions in the East of the Russian Empire, with the progress of Russian explorers in the depths of Siberia in the XVII – the first quarter of the XVIII centuries. The second stage covers 1725-1892 from the time of transformation of cities into centers of trade, gold mining, the fur trade and the establishment of their close relationships with the Moscow (Siberian) tract. The third period covers the construction process of the industries and railroad and its impact on urban growth in the 90-ies of the XIX century until 1917. And finally, there is the fourth stage - the Soviet period.

Krasnoyarsk was founded as a military settlement of the first phase of the development of Siberia in 1628. The second focus of settlement was the Bazaikha village – a modern part of the south - western district, and the third area after the city had lost its military importance was named the village of Pokrovskaya on the Karaulnaya Hill. The importance of the Karaulnaya Hill as the focus of landscape relations was recognized from the very beginning of the city's foundation as a viewing point, a reference point, observation post and the architectonic construction of the "body" of the mountain crowned by its chapel. The Krasnoyarsk ostrog settlement was located on the spit of the 3rd flat above valley bottom terrace at the confluence of the main river – the Yenisei and its tributary, the "home» river Kacha. The orientation of the West-East cape arrow and almost parallel direction of the Yenisei and Kacha beds defined the natural shape of Krasnoyarsk streets in the type of a lattice, close to "the grid". The city was restricted by an ostrog wall and the channels of two rivers (had artificial/physical and natural borders), and in the West it was protected only by the ostrog wall (artificial/physical border). At the end of XVII century two dramatic moments in the development of the city were fixed, both events being associated with the inclusion of western outlying areas in the plan of the city and review of the status of its borders. The first was associated with the movement of sales outlet rows from Starobazarnaya on to Novobazarnaya Square (later Sobornaya). Novobazarnaya Square (located on the site of modern Revolution Square) was formed on the western side of the city and, in the opinion of the citizens of that time, was not attractive since it was situated on the far "edge" of the city. New outlet rows were larger, taller and took more space, so the townspeople found them cold, uncomfortable and unattractive. It took special measures for the resettlement of merchants to the new trading areas and attraction of new developers to this part of the city. The second episode was associated with the establishment of the municipal garden to the South of Sobornaya Square. Later, Sobornaya Square and the city garden formed a broad strip of vacant space that separated the previously established city from the new development and protected the area against the spread of potential fires, the main danger of Siberian cities in the XIX century. On the other side, the territory became a transitional buffer element from high density buildings of the "old" city to the new architectural scale of Sobornaya Square, where in 1845 – 1861 the main Orthodox Church of Krasnoyarsk and the Yenisei province the Nativity Cathedral by K. Ton was erected. The Bishop's house

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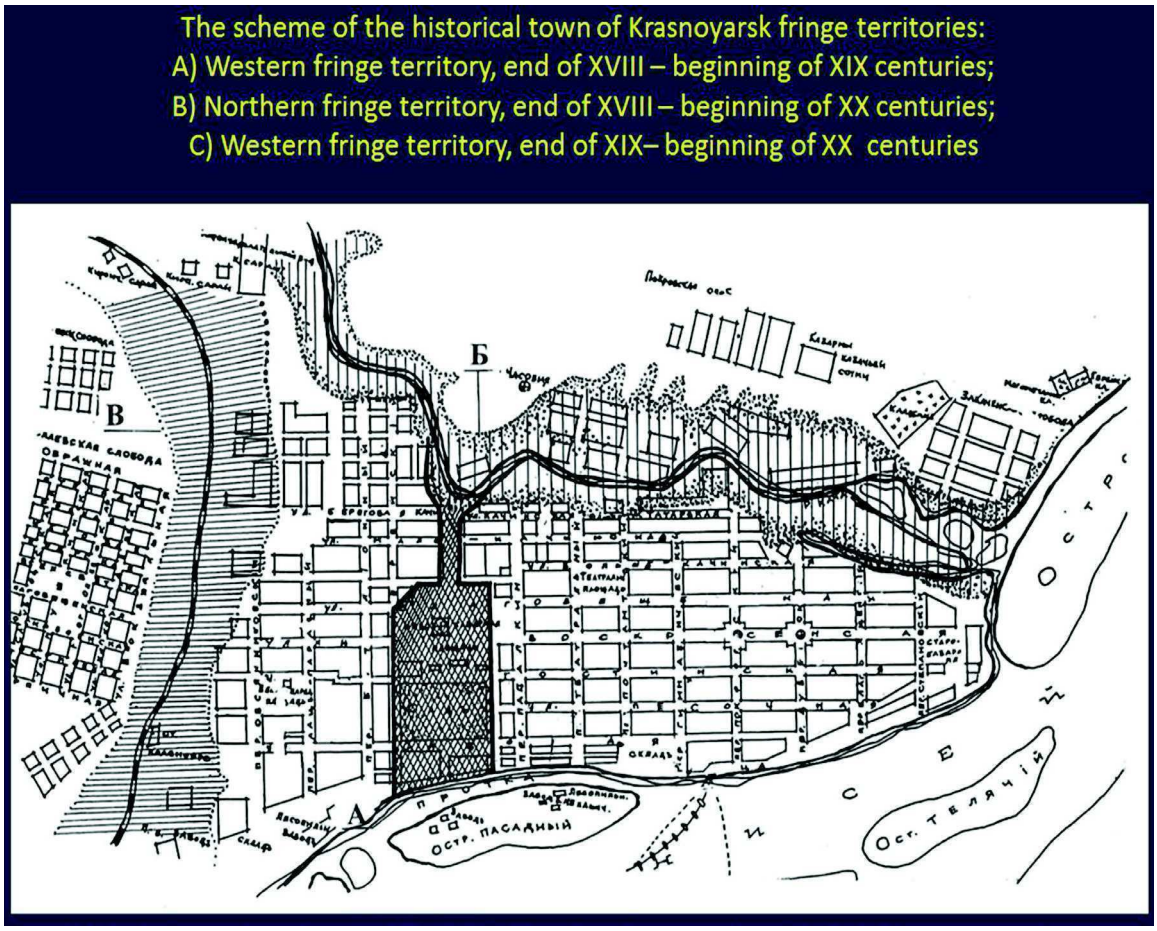

Figure 1.
Scheme of the fringes of Krasnoyarsk

and Seminary building overlooked the square. The western edge of the end of the XVIII century has retained its composition-separating function to the present time. First, because the eastern part of the historic center has smaller size of neighborhoods in the city plan; it is in this part of the city where coronary intersections have been preserved; secondly, the eastern and western parts are very different in scale, density and style of facades. During the construction of the railway, and as a result of the active construction of the city, the old wooden fund started to be quickly replaced in the "old" city territory, stone buildings up to four floors were being erected of representatives of all architectural styles of the late XIX and the early XX centuries. Development was conducted mainly in the eastern direction from the city garden and Sobornaya Square, while to the west stone buildings appeared only in separate quarters. Replacement of wooden low-rise buildings occurred mainly in the period after 1917. New larger buildings were very different from the architecture of the eastern side of the old city. The western marginal area of the beginning of the XIX century to the present time keeps a separating function between the city quarters of the historic centre of different architecture and scale of neighborhoods. Not by chance there existed ideas in some projects of the late twentieth century to unite the garden, the square, Surikov's Square, located further to the north and the garden of the merchant Yudin in Kacha in Krasnorayska, a single element of water and green diameter (architect V. I. Krushlinskyi). Governor A. P. Stepanov protested against the anticipated new construction on the slopes and in the floodplains of the Kacha and Yenisei rivers, formally proposed in the master plan of 1827, believing that one should not provoke flooding of buildings, and landslides of the

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banks. Perhaps, this is why until the early twentieth century, the valley of the Kacha on the northern fringe of the city with suburban villas, remained a beautiful area and favorite rest place of citizens.

The railroad passed at the foot of Nikolaevskaya Hill on the western outskirts of the territory of the late XIX century, by softly rounding Afontovo Hill, cutting a steep slope from the city. Railway repair workshops, warehouses and goods yard were implemented in residential development. As a result, on the western margin a multifunctional area with a high density was developed. In the city the railway line became a formidable anthropogenic transport-industrial boundary. Karaulnaya hill and the Kacha river became natural barriers for the city development in the North. At the time of designing a new master plan of 1936 the valley of Kacha had been built by inexpressive buildings of a mixed use: individual residential development, warehouses, workshops, small industries, municipal areas, industrial bases, etc., Pokrovskaya village to the north of the chapel became one of the areas of the city. The former recreational borderland area loses its importance. To date, the mountain has been exposed to the onslaught of various utility companies, garages, clinging to its base on the west side. In master plans of 1936, 1948, 1973 and 1996 proposals were made for the reconstruction and rehabilitation mode recreational areas. The valley of the "home" river is gradually changing, multifunctional public buildings of citywide importance are appearing, small parks connect the old town and the former district of Pokrovskaya village. It can be argued that the Northern borderland of the historical territory of Krasnoyarsk is gradually changing its structure, returning back to its original importance, but with a new architectural quality - to become a linear public recreational center of the city in the valley of Kacha, at the foot of the Karaulnaya Hill between the historic city and the new northern regions.

Krasnoyarsk was founded and developed in sharply contrasting geographical conditions and the form of the city plan followed them. Marginal areas, their contours, also

Figure 2.
Old blocks of Krasnoyarsk.

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Figure 3.
Scheme of the old Irkutsk

followed the pattern of the landscape, being preserved in the modern structure of the city, but now as internal morphological units, separating the historic center and other areas of the city. Former marginal areas of the old town have changed or are in the process of planning structure change, but retained their importance of buffer areas (with a dual nature: a transitional importance and a separating character) between the development and natural components, between the residential and industrial development and between the development of different architectural quality.

The nearest city to Krasnoyarsk - Irkutsk can be considered as a contrast example of the formation of the city, under the influence of a single global forces and technologies.

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Irkutsk ostrog (founded in 1661) in 1682 became the center of an independent province (voevodstvo), which in 1686 received the city status. It is of interest to note that even in the 50-70ies of the XX century during a period of intense industrial construction Irkutsk was the only city in Siberia, in the borders of which there were no large industrial enterprises and at the beginning of the XVIII century consisted of "small" and "large" cities. A "small" town was a wooden jail on the territory of which were concentrated an administrative building and the home of the Voevoda, then the Governor and officials. It was not only the administrative center of the city, but also of the extensive province. The ostrog was rebuilt and expanded twice in 1669 and 1693, was conveniently located on the crossroads of trade and colonization routes. So very quickly there appeared a"big" city – posad – a marginal territory of Irkutsk of the period, which was gradually inhabited by alien people, mainly by the people from the Russian North. The posad gradually embraced a "small" city, expanding in three directions to the South and South-East of the Angara. The economic life of the province concentrated here. During this period of construction, the low floodplain area crossed by logs and dead channels of the Angara tributaries was being developed without administrative and planning regulation. Decisions as to where, what and how to build were made only by homeowners, for reasons of personal expediency. The areas not liable to flooding were chosen, there were no streets, and the south window location was the only rule of construction orientation. Perhaps, construction was affected by the method, adopted in the Russian North – the picturesque chaos of the houses actually prevented the building from through blowing in cold winter. Later, formed by driveways, streets actually repeated the outlines of the coastlines of the Angara and Ushakovka. For example, there was an unsuccessful attempt to straighten Basmanskaya Street (now Sverdlova) in the process of development regulation, but it presumably ran around the edge of the log formed by a creek of one of the tributaries of the Angara - Gryaznushki. Disproportionate picturesque web of streets of the marginal area of Irkutsk of the XVIII century in a generalized form has survived to the present time till the Street of Karl Marx, has become the compositional planning "frame" in the oldest part of the historical centre of the city. Defensive fortifications – "polisads" (artificial/physical border) erected in 1726 (in modern Karl Marx Street), became a border of the fringe area (of a "big" city). Behind these borders the barracks of the local garrison, named "soldier's grid" were located and once again unplanned development appeared. An active

Figure 4
Block 21. Irkutsk. Plan

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growth of the city occurred after the formation of the Irkutsk province in 1764. There was an increase in areas of the city due to the growth of the next ring of marginal territories and the main direction of development of the city to the south-east towards the Krestovozdvizhenskaya Mountain was being determined. In the first master plan, adopted in 1792, attempts were made to straighten the pattern of streets, to order their width; a regular design of new neighborhoods was considered. But it turned out to be impossible to resolve the discrepancy between the axes to the "palisade" city and the new one. Moreover, when fortifications were dismantled, a complete mismatch of the alignments of streets in the old city and outlying blocks was revealed. Attempts to reschedule the "big" city in the regular one failed even after the fire of 1879, when almost the whole of its development with few exceptions had perished in the fire. The city was very quickly rebuilt within the boundaries of the previously established blocks. It became possible only to unscramble the size of the streets to some extent. In 1899 a new approved master plan of Irkutsk legalized this situation. According to the master plan of 1792 all industrial enterprises, factories, plants, slaughterhouses were supposed to be positioned downstream of the Angara river in the Znamenskii suburb, residential area – on flat area till the Jerusalem Mountain. So for the first time in the history of Irkutsk a sort of functional zoning with the allocation of industrial economic fringe was held. This vast territory of "brick sheds" has been preserved to the present day on the banks of the Angara river at the foot of the Jerusalem Mountains. In the aftermath of the fire, because of the shortage of housing, the construction of two and more residential houses on a plot of one estate became conventional; housing density increased significantly. In the early XX century, this density did not allow new mass construction in the old town. According to N. Bubis the most important factor that allowed Irkutsk to maintain uniform integrity of the historic central part was the split of plots on the outskirts, cutting off significant

Figure 5.
Block 21. Irkutsk.
Images http://www.i-irk.com/gallery/foto_irkutska_130_kvartal/ Photo A. B. Belik

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undeveloped areas and mixing of old and new buildings. On the other hand, it is on the outskirts of the late XIX century where most old buildings, the most valuable architectural fund not killed in the fire of 1899 have been concentrated now. By the end of the first third of the XIX century the city "greeted" on its way of development an insurmountable barrier for development of construction technologies - Krestovozdvizhenskaya Mountain; that is why the last row of blocks, located along the line of streets Podgornaya – Gornaya – Kanavnyi Pereulok received an incomplete triangular shape. This planning grid, in somewhat modified manner, has been preserved to the present time. According to the testimony of Irkutsk chronicle in the 1840-ies the city "leapfrogged" the steep slope and built the mountainous Ushakovo part as far as Arhireysky Villa (Dacha). It should be noted that only by the end of the XIX century, there had been some alignment of this part of the city: having mastered the territory between the Angara and the Jerusalem cemetery, Irkutsk, stopped by a difficult terrain, for nearly half a century slowed his development to the south. Fringe areas have played a preservative role in urban Irkutsk history: established in the XVII-XVIII centuries and reaching "palisade" they have formed a vivid planning drawing of the old town of the preplanned period; an increased development density after the fire has become the cause of preserving the integrity of this part of the city; the "soldier's grid" along with the buffer zone, reaching the slopes of the Jerusalem mountains have become the outskirts of the territory established in the XVIII-XIX centuries. It is the most valuable construction, not affected in the fire of 1879, and at the same time it is the most contrasting development due to the introduction of new construction on cut off areas. A physical boundary – "polisad" – military fortifications – has formed the modern K. Marx street, because due to a discrepancy between the alignments of freely developed outlying areas, transport links between the "big" city and behind the polisad part is made possible only by a transverse line of the former line of fortifications.

When comparing the history of the formation of fringe belts of Krasnoyarsk and Irkutsk, large cities of Siberia in the period up to the beginning of the XX century, their role has become apparent in the formation of the city spatial composition; dependence of the planning pattern both of the city and its outlying territories on geographical conditions, changing administrative status, industrial development in each new period of development. Towns and cities consistently use or adapt to natural boundaries and barriers or new artificial/physical boundaries are built. After the cities lose their defensive importance, industrial, engineering, transport structures and their combinations serve as barriers comparable to the scale of the city and the level of construction technologies. Fringe areas appear at the boundaries/ barriers and gradually "surround" the city, being transitional to the natural environment. Step by step unique landscape units form within the town fabric. The newly adopted master plans contain drawings and building rules for new neighborhoods (suburbs, regions), realized, as a rule, close to design decisions; master plans contain as well drawings and actions on streamlining the current established outlying territories, which are implemented, as a rule, only partially.

The samples of the renovation of the valley of the river Kacha at Krasnoyarsk and re-creation of the Block 21 at Irkusk could be considered as the flexible incorporation into the historic complicated and highly contradictory dialectic territories between old and modern understanding of the town environment. "New" river valley keeps traditional functioning of the inner fringe belt of Krasnoyarsk and modern architectural form. Re-created Block 21 at Irkutsk in historical form got a new using. Both identify old towns in modern city life.

Conclusion

Taking into account historical knowledge of the urban from development city must be built or restored as an ongoing system – from central areas to the most remote communities. There exists a method of establishing highly conventional boundaries of natural areas – "a sense of place" of local residents, confirmed

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by the territory use zoning plan. In domestic practice of urban designing, plans at different levels contain a number of documents substantiating certain boundaries of functional areas, structural parts of the settlement, land allocation for roads, plans of surveying, red lines of development, etc. Conventional boundaries require the functional integrity of the process, planned on the "circled" area, but do not assume any connectivity of neighboring territories or unplanned variability of the areas highlighted in the project , and these factors do not assist to the formation of the whole urban environment. In this way functional, composition, natural-anthropogenic and other conflicts of neighboring areas are laid. Research in the field of urban morphology allows to explain the formation of spatial gaps, borders of heterogeneous territories, and established unique regional features of both historical towns and certain districts of the city. On the other hand, the growing factual study of cities research in different countries confirms the universality of the laws of urban development and this could be used in modern projects of renovation of cities.

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Development of urban areas of the Russian Federation on the Trans-Siberian Railway: town-planning a railroad role in the city of Krasnoyarsk

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Abstract. *A not populated or low-populated territories development due to the railroads construction exerted considerable impact on regional planning of the country. Construction of the Great Siberian way – the Trans-Siberian Railway was one of the significant events of the end of the 19th century. Numerous new settlements and the cities, such as Novosobirsk, Irkutsk, Krasnoyarsk appeared on the map of the country. Krasnoyarsk began to develop violently and grew by 270% after railroad construction in 1897 - 1911 years. New created structure of resettlement entailed industry development. A lot of the new productions were transported from the central part of the country during the Second World War. Factories were accommodated along the railroad generally.. The majority of objects of cultural railway heritage remained on the railroads territories in present time. The pioneer settlement of railroad workers in the city of Krasnoyarsk – is the Nikolaevskaya sloboda escaped. Typically Siberian residential buildings and style life still characteristic for that unique area. The strategies of the renovation of Nikolaevskaya sloboda area oriented toward the tourist quarter of the Siberian city is required. Development of the city continues. Krasnoyarsk, thanks to the railroad, became the million plus city. Light rail transport, rewatching municipal warehouse territories under cultural clusters, business and residential districts is supposed in the future. Development process is oriented to transformation of the transport oriented district (TOD).*

Keywords: Trans-Siberian Railway, railroad , Krasnoyarsk, transport oriented district (TOD), Nikolaevskaya sloboda.

Introduction

The railroad is one of the main transport arteries in Russia. More than 40% of a passenger turnover and 80% of all goods turnover of the state are the share of it. Value of railway transport in Russia is fundamental because the country differs in long distances. The level of development of the economy of the state depends on effective work on this system.

Development of a network of the railroads has begun since 1837. The ceremonial opening of the Russia's first railroad from St. Petersburg to Pavlovsk was held on November 11, 1837. The road St. Petersburg — Moscow became the first most significant railroad construction. Its operation began in 1851.

Railway infrastructure gave a strong impetus for the development of the cities and regions of the country owing to historical tendencies and geographical features. Relevance of studying of a railway system is defined by need of further development of problems of its social and economic development. The railroads continue to play a key role in transport service of the Russian economy, strengthening of integration processes, and also development of urban areas throughout all intervals of the existence.

This type of transport has demanded big capital investments since the first construction

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of the railroad in Russia. But, despite it, the railroad has a number of advantages:

1. Functions round the clock under any weather conditions;
2. Has the low cost of transportations (especially when transporting on long distances);
3. Connects all areas and the regions of Russia;
4. Has the lowest coefficient of impact on the environment.

The objective of this research is the proof that the railroad can function on success and the comfortable environment of the city. The following tasks, proceeding for the purpose were made:

2. To analyze the structure of the railroad in a system of agglomeration of Krasnoyarsk. To reveal that usefulness to the city is at short distances. What communications are necessary.
3. To analyze a historical component of the railroad. To reveal the most significant objects of railway heritage. To track the growth of the city since construction of the railroad.
4. To reveal how the environment of the city and the railroad interact? To offer the development strategy and the technique.
5. To analyze the prerequisites of formation of the transport focused areas along the railroad, to offer the classification and strategy.

Not populated or low-populated territory development due to the railroad construction exerted a considerable impact on regional planning of the country.

History of the Krasnoyarsk railroad is inseparably linked with the history of the city and Krasnoyarsk Krai. The rapid development of the city began with the emergence of the Trans-Siberian Railway more than a century ago. Krasnoyarsk quickly turned into the industrial, scientific and administrative center.

The railway line was transformed to a structural and planning axis around which new urban development was intensively formed. The new urban area is the Nikolaevskaya Sloboda in connection with the inflow of the population occupied on construction of the railroad, service of the railway transport working in railway workshops was formed.

Today scales of the Krasnoyarsk railroad and its importance for Krasnoyarsk Krai give to the highway the status of one of the most important participants of social and economic life of the territory. The operational length of a way of the Krasnoyarsk railroad made 3157,9 km. In 2012. The Krasnoyarsk railroad, transports by trains of the distant and suburban message about 9 million passengers on average in a year.

The Trans-Siberian Railway occupies one of the leading places in the economic infrastructure of Krasnoyarsk area. About 80% of freights and passengers of the Krasnoyarsk railroad by rail are on average transported. Krasnoyarsk, thanks to the railroad, became the million plus cities.

The railroad penetrates practically all cities. More than 50% (About 156,6 hectares.) the spaces of the territory of the city are occupied by the railroad tracks and repair and warehouse territories of the railroad. The railway line has very branched structure, and seriously influences coherence and the division of districts of the city. Also, it creates a set of problems in urban areas through which it passes. It is noise pollution, irrational use of valuable lands, formation of marginal territories, a rupture in city fabric.

Modernization of intercity railway transport is supposed in the future. Rewashing railroad municipal and warehouse territories is also necessary under cultural clusters, business and residential districts. Development is directed to the transformation of the transport focused areas in nodal crossings. The areas (TOD) focused on railway transit will unite housing, commercial development, culture and a social assistance. These areas will become available to the pedestrian with qualitative public transport.

Methodology

Methods of scientific research:

1. Research of international theoretical and practical experience;
2. Studying of scientific literature;
3. Acquaintance with archival documents;
4. Analysis of town-planning documentation and design materials;
5. Natural inspections;

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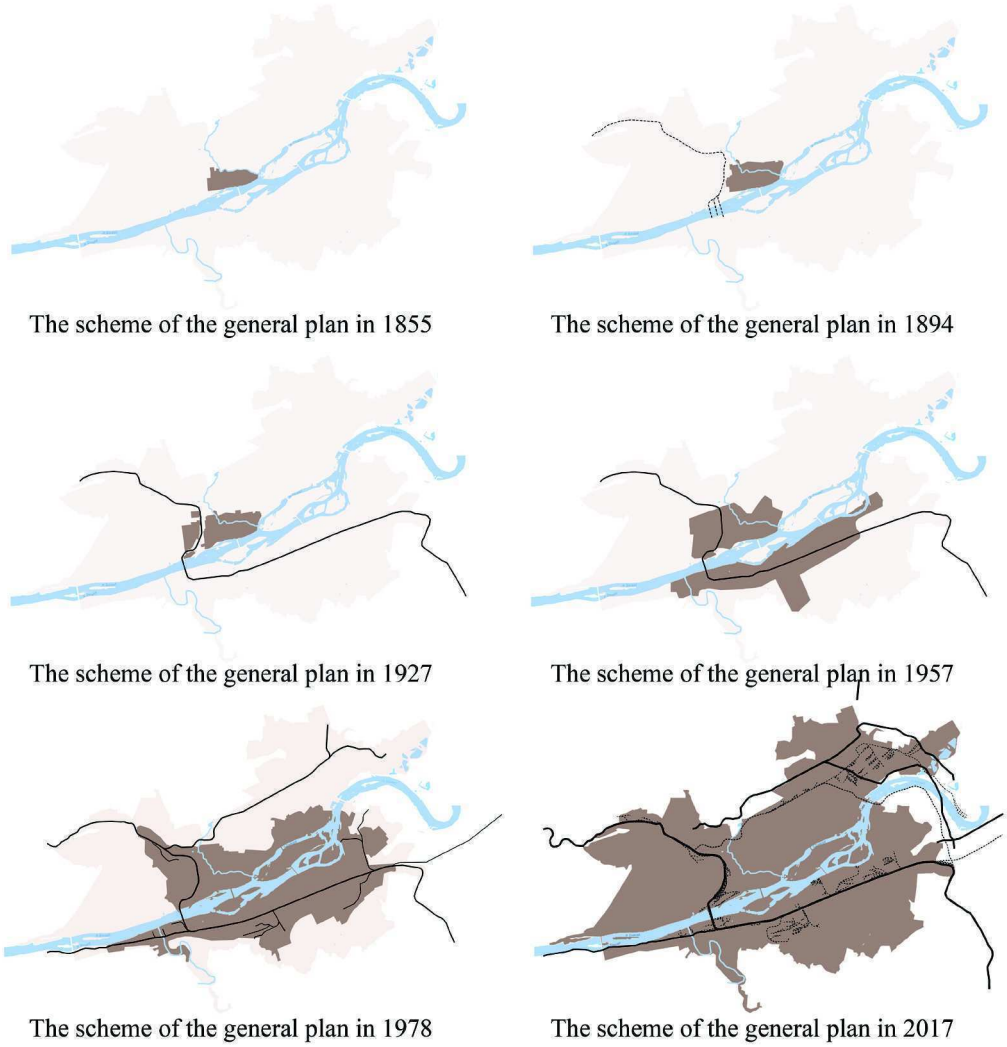

Figure 1.
The growth of the city of Krasnoyarsk after the construction of the railway

6. Social poll;
7. SWOT – the analysis.

Three techniques were formulated as a result of the carried-out analysis. They are aimed at the development of historical and cultural potential, formation of the environment and development of the transport focused areas along the railroad.

1. Classification of the railway transport hubs forming the transport focused areas.

Classification of transport and additive knots is offered on the basis of the analysis of territories of the railroad:

1) Transport hubs of city value
2) The formed transport hubs of city value
3) Transport hubs of regional value
4) Transport hubs of trans federal importance

The focused areas which are formed transport have various potential and ways of development depending on category of transport hubs. Objects of different degree of value are formed in these areas.

2. Three approaches to transformation of historically significant territories at railway transport hubs.

Three basic approaches to transformation of territories, according to this technique are offered. It is possible to apply them in certain functional and planning zones:

1) Zone of preservation of valuable historical building.
2) Zone of preservation of morphology of building and structure of land use.
3) Zone of formation of new planning structure of land use.

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The described method of identification of zones with various town-planning, landscape and cultural and historical characteristics and applications to them approaches to renovation, various on extent of intervention, allows to reach a considerable architectural variety, to keep a cultural landscape, important for city history, to receive higher quality of the environment in general.

3. The principles of transformation of historically developed environment Nikolaevskaya sloboda in the transport focused area.

The principles of transformation of the environment were formulated, leaning on the revealed three campaigns of transformation of the territory:

1. Identification and preservation of the objects having historical and cultural value.
2. Preservation of structure of land use.
3. Maximum preservation of low building (introduction of various types of the housing estate).
4. Integration of the designed territory into transport and pedestrian structure of the city.
5. Integration of the designed territory into system of gardening and a recreation of the city.
6. Increase in cultural and historical and tourist capacity of the Nikolaevskaya sloboda.

Measurement and analysis.

Analysis of railway transport hubs of the city of Krasnoyarsk.

Construction of the Great Siberian Way – the Trans-Siberian Railway was one of the significant events of the end of the 19th century. Numerous new settlements and the cities, such as Novosibirsk, Irkutsk, Krasnoyarsk appeared on the map of the country. Krasnoyarsk began to develop violently and grew by 270% after railroad construction in 1897 - 1911 years (Figure 1).

Carrying out through Krasnoyarsk of the Trans-Siberian railroad influenced city economy. In February, 1891 the final decision on construction of the Great Siberian way was made. The total cost of the road was determined approximately at 350 million rubles. The first train came to the city in 1895, and in 1899 the railway bridge through the river Yenisei was open. Railway depots and the main railway workshops with carriage, assembly, forge; electromechanical turning shops at that time begin to work in the city. Placement of such enterprises turned the city into the most important industrial center of Siberia. Krasnoyarsk became the central point of the Average-Siberian railroad.

Projects of a bath, cinema, foundry workshop, the pump station of a city water supply system and a large number of houses for a building of the Nikolaevskaya Sloboda in the 1900th – the 1910th years, according to archival data were made. Today the majority of objects of cultural railway heritage, individual Siberian building and the life of Siberians remains.

It was supposed to carry out reconstruction in design developments of the 1920th – the 1930th years. Wooden building of the settlement was outlined to demolition. The tendency to preservation of individual building in the Nikolaevskaya Sloboda which kept before the beginning of the 21st century, in town-planning projects in Krasnoyarsk of the 1950th years was traced.

The Nikolaevskaya Sloboda is the area with the developed individual and expressive architectural and historical environment. It is not presented properly in the modern city. Architectural and cultural and historical value of the area is underestimated in the formation of Krasnoyarsk of the 21st century.

Ten knots were revealed in structure of the city of Krasnoyarsk according to classification of transport and additive knots. It is three knots of city value (the station the overpass, the station railway hospital, the station student's), two formed knot of city value (the station the northern highway, the Krasnoyarsk-northern station), four transport hubs of regional value (the Yenisei station, Zlobino's station, the station Bugach, Bazaikh's station) and one knot of transfederal importance (Krasnoyarsk-passenger station) (Figure 2).

We will consider two railway transport hubs and potential of development in more detail. Also, we will consider the formation of the

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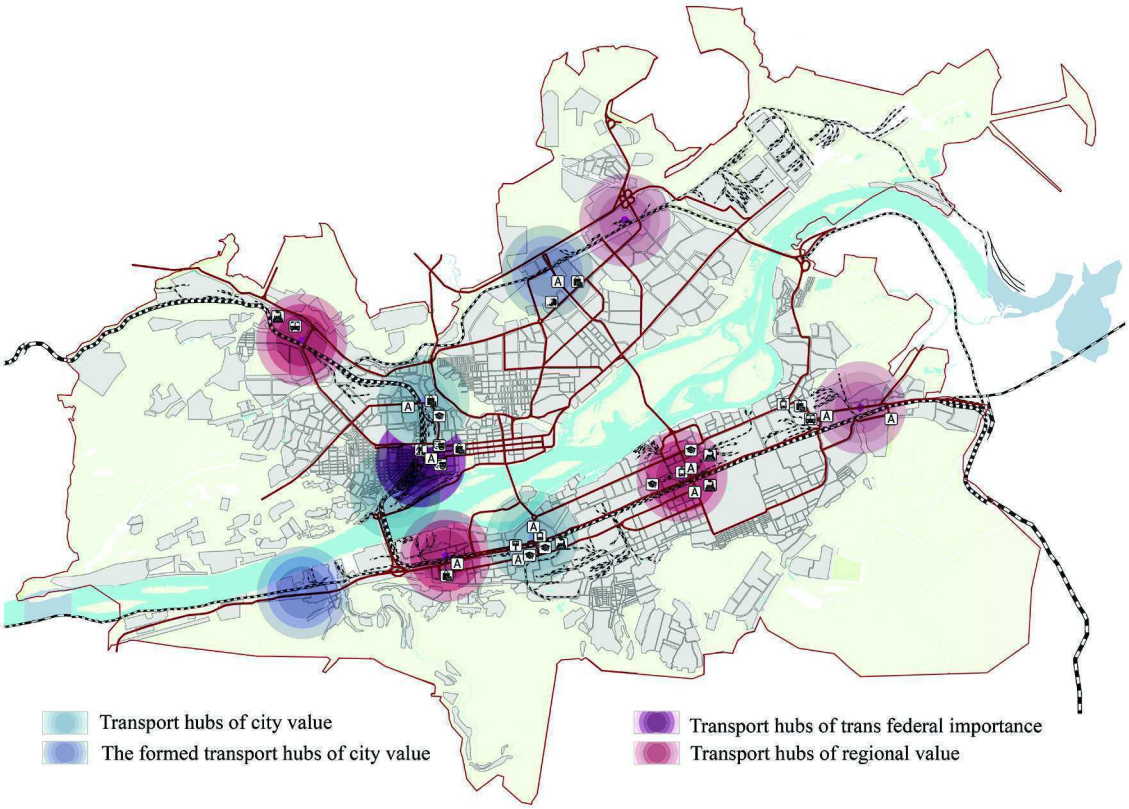

Figure 2.
Classification of the railway transport hubs forming the transport focused areas.

transport focused areas in nearby territories. The first transport hubs of trains federal importance are the Krasnoyarsk-passenger station. The second knot of city value is the station Puteprovod.

I. Krasnoyarsk-passenger station.

Historically developed environment settles down near the station. It is the Nikolaevskaya sloboda. The Nikolaevskaya sloboda is the area with the developed individual and expressive architectural and historical environment.

In a result of a conducted natural observation, an analysis of archived documents, trending project materials combined with exploring global theoretical and practical working skills related to a unique homestead building development in an urban area were determined and found “adaptive” progression directions of historical and cultural potentials of Nikolaevskaya Sloboda. The offered “adaptive directions” have become the foundation for the renovation concept of one of the remaining historical areas of Krasnoyarsk. (Figure 3).

1. A zone of preservation of valuable historical building (in figure 3 it is designated in red color). This approach is applied to territories with high concentration of objects which have cultural and historical and architectural value. Transformations in this zone demand careful preservation of historical features of building. Development of the project of zones of protection is necessary. It is with the accurate description of regulations and requirements to reconstruction and new construction. The zone of valuable building forms a historical kernel of the Nikolaevskaya sloboda. It defines its cultural importance for all cities.

2. A zone of preservation of morphology of building and structure of land use (in figure 3 it is designated in orange color). The general nature of individual farmstead building is offered to be kept in this zone without cardinal change of functional purpose of the territory and borders of sites of property. Subjects to building are not subject to protection and obligatory preservation and can be reconstructed or

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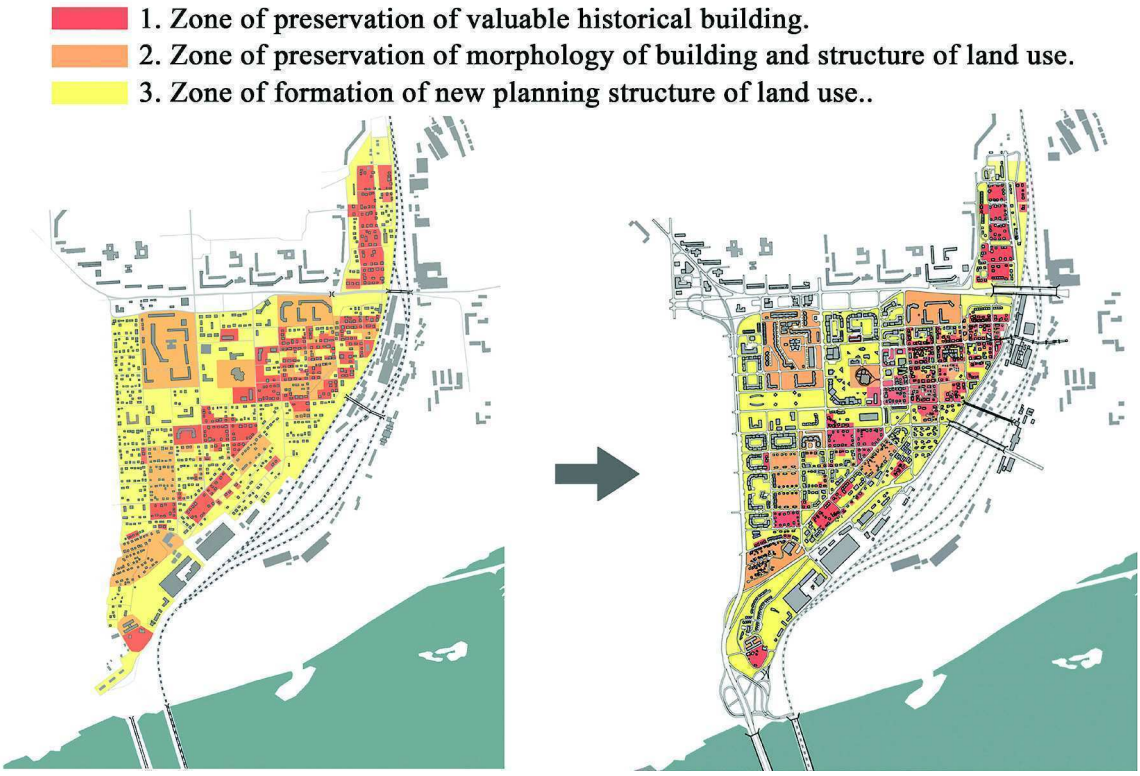

Figure 3.
Three approaches to transformation of historically significant territories at railway transport hubs.

reconstructed within the general parameters of the allowed use (the maximum number of stores, building coefficient). It is focused in this approach on stimulation of locals to independent improvement of the housing conditions. Participation of third-party developers in development of the territory is not excluded on condition of observance of the general requirements to the nature of building.

3. A zone of formation of new planning structure of land use (in figure 3 it is designated in yellow color). Change of typology and (or) functional purpose is supposed on the sites carried to this zone. For example, emergence of the new thoroughfare which connects the new bridge with this area cannot but affect the nature of building of adjacent territories.

The principles of transformation of historically developed environment Nikolaevskaya sloboda in the transport focused area.

Leaning on the revealed three campaigns of transformation of the territory six principles of transformation of the environment were formulated (Figure. 4):

- Identification and preservation of objects which have historical and cultural value. unique architectural and planning features were revealed as a result of careful on-site investigation of houses and public buildings in the Nikolaevskaya sloboda. They allowed disclosing the historical and cultural importance of the area for preservation of an originality of our city. The majority of structures are not entered in the register of monuments of cultural heritage. Objects the architectural details, design features and materials reflect the value of a certain time and the place. They are single copies in historical building of Krasnoyarsk;

- Preservation of structure of land use. The maximum preservation of the developed structure of land use with increase in quantity of the planted trees and shrubs spaces at the expense of territories of the demolished shabby housing is supposed;

- Maximum preservation of low building (introduction of various types of the housing estate). All decisions are directed to the maximum preservation of low building of the Nikolaevskaya sloboda as unique planning area.

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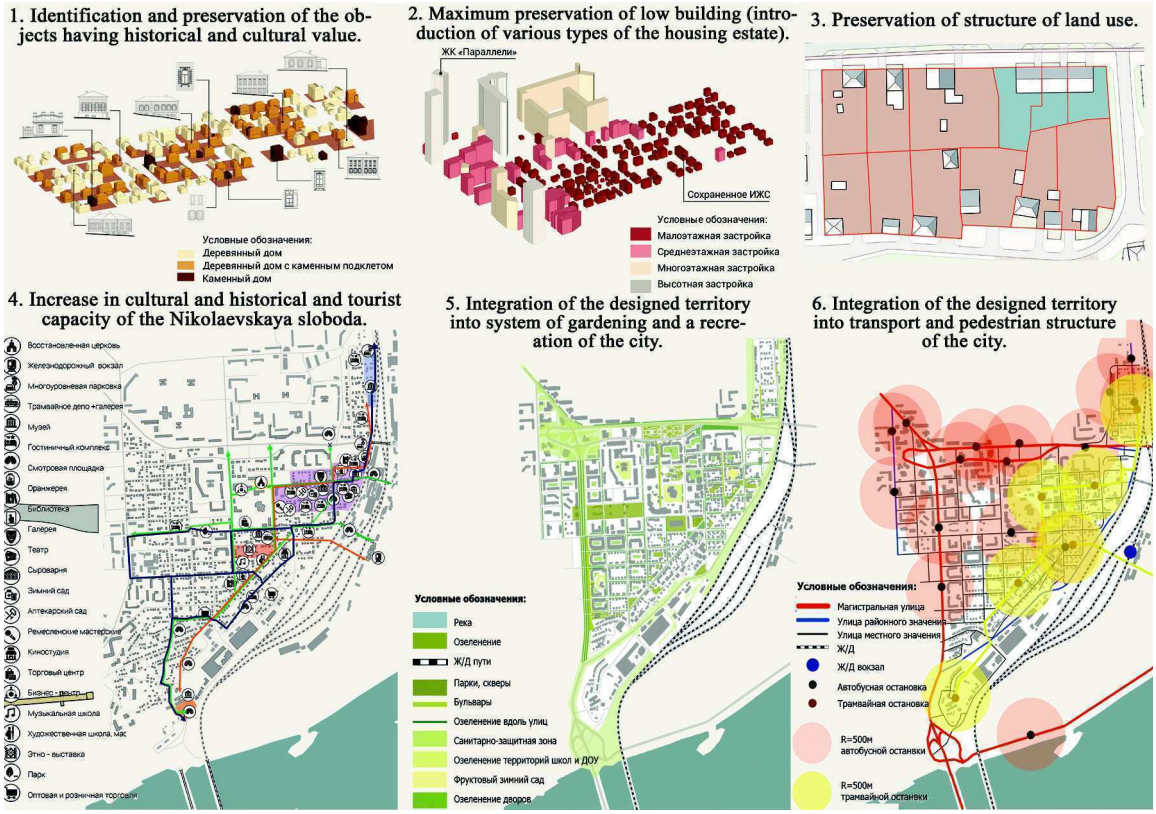

Figure 4

The principles of transformation of historically developed environment Nikolaevskaya sloboda in the transport focused area.

It emphasizes with the undersized structures a natural landscape of slopes of the Afontovy Mountain. Construction of average number of stores by buildings is planned fragmentary. It is transitional type to the existing multistoried area;

- Integration of the designed territory into transport and pedestrian structure of the city. The concept is executed taking into account the automobile outcomes of the fourth bridge, and also two new outcomes which are already constructed and planned to construction. This principle has to promote integration of the Nikolaevskaya sloboda with other districts of the city. The organization of the convenient pedestrian movement is provided. The majority of streets are transferred to category of pedestrian and transport. The boulevards having an exit to the neighboring residential districts are designed. Strips for cyclists are allocated and streetcar service on streets of the settlement and through the automobile bridge to the downtown is designed;

- Integration of the designed territory into system of gardening and a recreation of the city. The decision assumes systems of the planted trees and shrubs and recreational spaces of the Nikolaevskaya sloboda. It is creation of protective many-tier gardening along thoroughfares, the safe pedestrian movement, and the organization of rest and on integration into the general system of the city is directed to their rather uniform placement on the inhabited territories;

- Increase in cultural and historical and tourist capacity of the Nikolaevskaya sloboda. In the concept solutions on creation of the tourist routes uniting historically significant, key places of the area with building, characteristic of it, are proposed. Installation of small architectural forms, the information installations telling about Place history, the organization of museum platforms is provided. Development of agro tourism is not excluded on the basis of individual farmstead building. All this will make more available studying

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of identity of the Nikolaevskaya sloboda and traditional tenor of life of its inhabitants.

II. The station Puteprovod.

The station Puteprovod station is in the central part of the city. Here 3 look city transports – railway (the overpass and the station – the top level), the bus and trolleybus movement, and also individual city transport – the car are crossed. The station is developed. It is with the plentiful pedestrian streams. This place is transit. Around the railroad more than 70% occupy garages.

This station has a high potential to become multifunctional transfer knot with the transport focused area. The territories around the station are empty, or are occupied with garage cooperative, or absolutely abandoned. In this territory there is not enough accompanying service and existence of a cultural and entertaining and public and business zone.

The urban environment around the station is friable, there is no clear boundary. The pedestrian space along the railroad is unorganized. Transport entrances are inconvenient to the next residential buildings. Shortage of social institutions of the next areas, domestic spaces is felt. Children play in the middle of the railroad; there is no all making safety along the railroad.

During the research, borders of the transport focused area and extent of influence of transport hubs on the area were defined. In the center of the transit focused area the railway station is located. The center is surrounded with rather dense building. In the course of removal from density of the center construction decreases. The transit focused building settles down at distance ranging from 400 to 800 meters from transit stations and stops. It settles down in a zone of pedestrian availability (Figure 5).

After the analysis and delimitation the concept of renovation and strategic development of the territory of the transport focused area was offered.

Such strategic planning is necessary for formation of conditions of sustainable social and economic development of urban railroad areas, increase of mobility of the population

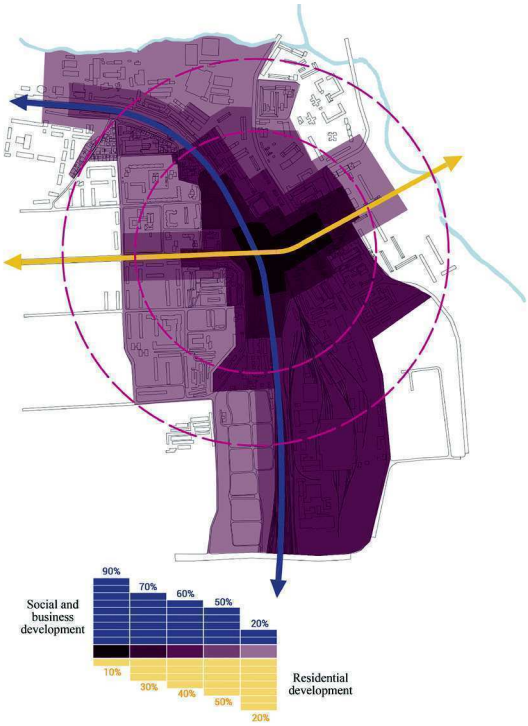

Figure 5.
Borders of the transport focused area and extent of influence of transport hubs on the area

and optimization of pedestrian and traffic flows, and also innovative development of the railway transport which is harmoniously coordinated to development of other means of transport.

Strategy is directed to the solution of the following tasks:

- Formation of available and steady transport system as infrastructure basis for ensuring transport integrity, independence, safety of the area,
- Social and economic growth and providing conditions for realization of needs of the population for transportations;
- Realization of city transit potential on the basis of integration of railway transport into transport system of the city;
- Creation of conditions for deepening of economic integration and increase in mobility of a manpower;
- Decrease in cumulative transport expenses, including due to increase in efficiency of functioning of railway transport;
- Increase in investment appeal of railroad territories;
- Creation of comfortable and favorable,

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Figure 6.
Schema concept of renovation and strategic development of the territory of the transport focused area

ecologically safe environment of the transport focused area;

The territory can become the region of a multipurpose orientation. It is: the railway station serving trains of city, regional, and also regional value. Placement of business center, office, commercial and hotel, sports and recreational zones is supposed. The educational function extends. The territory of the existing technical school increases, construction of new cases is planned. The high comprehensive school will be orientated, and also the new school of 2000 thousand children is added. Construction is planned different typology of the housing estate: multistoried quarter type, high-rise, social housing for young families and students, apartments, housing of hotel type, and also individual housing, townhouses, city country houses.

The area in strategy is integrated into system of a city transport-pedestrian framework. It has six stopping points of public land transport, and also four stations of easily rail transport. All stopping points are in pedestrian availability, have canopies, are equipped with a warm contour, the device for handicapped national

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groups and connected among themselves by the aboveground, underground and elevated covered crosswalks.

Creation of the system of gardening, including the park zones, squares connected among themselves by a system of boulevards and pedestrian streets is supposed. Reconstruction, the organization and improvement of the river embankment of Kacha is provided. The domestic planted trees and shrubs space at the different levels is designed in quarters. It is the operated "green" roofs.

The main parking zones are designed along the railway tracks intended for use by residents and for public and business appointment. They are land multilevel. They serve as protection for residential quarters against noise. Parking spaces are intended for continuous, temporary and guest storage of cars.

The underground, or entered in a relief parking's are located for the continuous storage of cars of residents in the area. Land guest parking's are provided along commercial institutions.

Conclusion

Result of a research is the developed technique of planning of the territories located along the railroads and historically significant territories at railway transport hubs, and also the transit focused areas.

The presented three approaches of renovation can be used for transformation and preservation of historical significant environments in the cities of Russia. Such approach is universal. The listed principles of transformation of historically developed environment in the transport focused area can be used in similar areas which basis is sustainable development.

The transport focused development (TOD) allows providing compact and multipurpose development of zones within walking distance of intercity railway transport. We provide the basic principle of TOD. This principle is granting qualitative public transport. Good transport service always attracts people. It reduces dependence on the car and expense both people, and local self-government. TOD can bring benefit to local economy by means of the mixed land use. It increases economic activity due to diversification and availability of goods and services.

We tried to optimize as much as possible all pedestrian and traffic flows, at comfortable and favorable building and urban environment in our strategy of development for the transport focused areas at transfer knots of various category.

We proved that the railroad can function on success and the comfortable environment of the city while fast growth causes a number of problems for the cities. Our urbanized approach gives an opportunity to change city planning. It promotes its harmonious development and the organization of districts of the city with the increased density of population.

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The heritage of the Modern Movement in the conformation of the city. The Casa Guzmán of Alejandro de la Sota

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Abstract. *The "Casa Guzmán" of Alejandro de la Sota, Master in the spanish Modern Architecture, has been recently demolished. From where are we coming and where are we heading in the building of our cities? This cultural catastrophe is a symptom of the way in which the new metropoli evolves, reckless, adrift… "Let the single family household be the test tube, the microscopic preparation of the great experiences". The Casa Guzmán means the resolution of the constant worries about the habitat. There, Sota materialized topics such as the relation of human being with nature, the order and the freedom of movement, the space flexibility and many other topics which are translated and reflected in the architecture of greater scale, in the city itself. Where are we then the architects? We are the responsible ones of the becoming of our heritage, of keeping safe the great architecture and constant evolution of our city. The heritage of the modern movement becomes fragile in this speech. Let's bet for it, for our culture. We should anticipate, as Le Corbusier in the safeguard of the Ville Savoie, with that productive attitude. The maintenance of our Heritage and therefore the increase in the value of urbes, begins with the formation. By now, a long distance of the path has been traveled by organism such as Docomomo o the Alejandro de la Sota Foundation, who spread and make accessible the architecture of the XX century. But there is still plenty of the way ahead. Let's follow Sota's advice: "Protect the heritage not with ordinances, but with sensitivities. That is the only way"..*

Keywords: Heritage, House Guzmán, city, conservation.

Introduction

That brief but intense work of Benevolo, "The projection of the modern city" started with strong affirmations; That Modern Architecture, almost from its origin, shows "the distinctive features of scientific research", that "modern architecture must suggest a new type of city that can be opposed to the traditional" (Benevolo, 1978). It then describes the new city as the aggregation of a number of models proposed by the M.M. in answer to those of the neoconservative city. It analyzes them under the concept of "type of building" born in CIAM 2 and 3, especially residential, which classifies as follows:

1. House Laminar.
2. Blocks built to redents.
3. Isolated housing. Not only villas, but prefabricated houses, transformable and transitory cells.
4. Housing blocks in a row.
5. Half-height blocks (as criticized as adopted).
6. Skyscrapers.
7. Public buildings also based on repeatable elements, such as teachers.
8. Public buildings that are not repeatable or "singular".

Alejandro de la Sota, proves once again his modern conviction in the recently demolished house Guzman. "That the single-family household as theme is the test tube, the microscopic preparation of the great

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experiences" (Alejandro de la Sota, 1967). House Guzman is the resolution of constant concerns about living. There, Sota materialized topics such as man's relationship with nature, order and freedom of movement, spatial flexibility, the possibilities of new materials, and many other issues that are translated and reflected in the larger architecture, the own city.

The Casa Guzman is a great lesson about the respectful implantation of the new architecture in a new fragile atmosphere, in this case the Guadarrama landscape, but its message could be extrapolated to interventions in cities, contextualization and respect for preexistence, as a goal that has been present since the beginning of the project.

The House Guzmán. The Architecture and its value.

An in-depth analysis of the Guzman House is carried out now, in order to keep alive its memory, but above all to underline the contributions that comprise this house made on a human scale, linked to man, at the service of whom we should always build the city.
The house is analyzed in its original state and in the state before being demolished in the past year. The study is carried out under the parameters of the validity, in terms of spatiality, materiality and climate. The results of the research, contrast with the outcome of this work and motivate a series of questions about the future of architecture.

Enrique Guzman, an aeronautical engineer of great character, commissioned Alejandro de la Sota, friend and architect of already great prestige, his family home. This was to be built on a plot located in the Urbanization of Santo Domingo, Algete. The plot of Mr. Guzman was in a privileged place, on the edge of the urbanization with excellent views of the Guadarrama.

"The plot of this house is a rectangle with the largest dimension perpendicular to the road, where it has access, a rectangle that falls on its opposite side over the only great landscape of the Jarama river basin. The highest point is on that ledge above the landscape; There will be the house"(Alejandro de la Sota, 1989).

The setting is located in Callejón del Jarama nº6, about 30km north of Madrid. Bordered on the east by the river Jarama and west by the river Guadalix, the area is known as the Atalayuela de Algete. The gentle topography falls from the Sierra de Guadarrama towards the south and abruptly to meet the river. Traditionally this area is considered one of the most genuine Spanish landscapes, frequented by artists like Sorolla and mentioned by writers like Machado "Isn`t you, Guadarrama, old friend, the Sierra gray and white, the mountain of my Madrid afternoons that I saw in The blue painted? "(Antonio Machado, 1912).

The plot is located on the eastern edge of the urbanization, right on the bank above the Jarama basin. The Master places the house on the plot; Behind it leaves the rest of the urbanization (then virgin of construction) and the sierra, to its front, that has south-east orientation, looks at the exquisite landscape of the river.

Sota drew different versions of an idea that debugged in the project finally built. The implementation in the field is key in the project. "We speak from time to time of the specific weight of a construction for a given. Let the house float, rise, fall and remain in its quota; The house is a solid floating in a magma and she alone will fix that quota. It is necessary to be an observer of the up and down to the final building. Thank you home!"(Alejandro de la Sota, 1989).

The house Guzman was thought rumbling, looking out over the imposing landscape of the Jarama. The access to the plot, is produced by the back of the house. From there the terrain invites you to walk around it and surround it in a conch and upwards. Always on a carpet of vegetation you reach the top; the roof of the house, from where it dominates a great panoramic of the Jarama. This idea of implantation that finds the reason in the functional organization of the house, existed from the first version, as we see in the memory of the project written in 1971: "It is thought that the rest is united to the enclosure, to the hiding in the land and the active life, on the contrary, to its dominion. The house is projected clearly differentiating the two zones: half-buried the part of dormitories, to which is added, for convenience of use, the

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Figure 1.
The site of Casa Guzmán in 2015

one corresponding to the service with its union to the dining room and protection to the play of children. It is avoided the half - buried in the parts of the living houses of height - play of children and dining room - services - with openings to its level, patios, that neutralize and vivify them. Only the large room is dominant on the ground and is also glazed to increase this feeling of activity and communication with its surroundings - plot. Other areas of garage, facilities and warehouses still lower (...). Living this house is a consequence of itself. It is lived in the part integrated to the plot, with domain and peace of the field - surroundings and empty or patios, swimming pool and housing covers equally incorporated -, all "acaracolada" house that opens and closes on itself. Landscaping the deck is part of this desire that the field should be highly respected. With its capacity, with its good living, this house has little presence and this likes as formula of life. To be fully - today is said to be realized or to be able to be realized - and not to disturb, being nobody, as much happens"(Alejandro de la Sota, 1970)

The Guzman house is an example of architecture that is apprehended in movement, according to the space-time principle, that Giedion emphasized in the villa Savoye. As is the case in the city, at every step an event is discovered or one has a sensation, which only the architect has the power to give. Sota wanted to introduce the exterior in the interior, wanted the landscape, the environment was in the day to day participating in the house. From the top, from the top of the house you can access the "watchtower"; A warm library in which we find the landscape, framed in a corner window. When descending from the summit inside the house, Sota surprises us with a living room totally connected with the garden that we traveled before. "Due to the good climate in spring, summer and autumn, the living area is very open to the outside. Terraces linked in different heights. Study of the whole in very relation to the landscape"(Alejandro de la Sota, 1989). The central key of this house is the intimate relationship between exterior and interior that the Master achieves. "The good thing about today is that we can make an open house, open, that it closes, closes. It seems to be silly but that's right, that's the big news. To be inside your house and that the garden penetrates in it, that you do not stumble when passing on that inside-outside. Then come all those other things of situation of quota for views, dominion, self recollection, etc .; those other things of orientation and so many others of everything: security. It is very important to feel good in all of it, in every corner "(Alejandro de la Sota, 1972). The thresholds

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or intermediate spaces that extend the interiors to the exterior are very important. A series of vertical and horizontal sliding planes generate changing and flexible spaces that appear and disappear with ease. On the one hand, the use of the same plateau pavement Burela inside and outside. On the other side, the separation of the carpentry plane and the marquee plane, confuses the limits of the house. To materialize "the great novelty", Sota has a carpentry of champagne colour and Thermopan glasses made by the aeronautical company CASA. The room can be so open that it fuses with the outside. It is the materialization of one of the Master's concerns about living; how to bring nature closer to man in everyday life. It is a teaching, always transladable to the large scale. Why gardens exist? How should it be? What relationship should they have with buildings? Another of the peculiarities of the architecture of Sota is the constructive coherence. Thus, all these spaces described, which correspond to the day zone, and are facing the landscape, are built with light structure. In contrast, the night area, located behind the house, are made with concrete structure. They confront, the daytime spaces, more ample and luminous with the nocturnal zones, smaller and with dim but light. This constructive coherence appears in Sota's work from the grand scale to the detail, and seems to be the result of an always logical reasoning that questions the why and the how before drawing a line and of course long before placing a brick.

Figure 2.
South perspective of Casa Guzman in 1974.

As a summary of the house, Sota chooses an image showing two comfortable armchairs, in the shade of an awning and on the warmth of a carpet, making feel the breeze come from the background landscape. The longed desire for "being well" that the architect always wanted for architecture was finally materialized.

Figure 3.
Southeast perspective of Casa Guzman

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A visit to the house in 2014. The Heritage and its value.

During the investigation, a visit to the house and an interview with the owner were made; Enrique Guzmán, the son. With more than 40 years old, the Casa Guzmán needed some maintenance work to make it livable. Some of the pathologies that had to be solved before restarting the life of the house were pointed out: the awnings did not run well, the finish of the corner window was degraded by the entrance of humidity, some Burela platelets that cover the external enclosures of the housing had been lost and air conditioning facilities were obsolete. On the other hand, the architectural walk described above was repeated in situ and we discovered and confirmed the values of this small-scale architecture. Enrique related some anecdote that reflects the will of the architect that the landscape and its enjoyment are part of the daily life; The north wall of the library was named "the wall of lamentations". The horizontal window of this parameter was thought to a height such that when being seated in the step of the library could be observed the Mountain range. Due to the difference in height between Guzman and Sota, this wall was made and retracted until the window height was reached and the Sierra was introduced at home. In addition, something that was impossible to decipher on the planes was discovered; It is an architecture truly tied to its territory. As has been mentioned, the house is located in an urbanization on the outskirts of Madrid and it could be said that Casa Guzmán is an example of how to build a city. It is thought under the conditions of its surroundings, respects the preexisting landscape that surrounds it and adapts to it with coherence, without mimetisms or false imitations. From the point of view of the site, it managed to cope with the passage of time without being affected by the surrounding transformations. The surroundings of the house Guzman was filled with the passage of time. In 1974, when the house was built, there were few urbanized plots, and in a matter of 20 years the land was swollen. However, the situation of the plot right on the edge of the building land and the good work of Sota, allowed the time did not start the calm, views and isolated atmosphere

Figure 4.
Exterior-interior of Casa Guzman.

of the world that was breathed in the house Guzman. It draws attention from the street the nonexistent presence of the house. Currently, the urbanization is populated by sloping roof cottages and other more recent and minimalist. When arriving at the alley of the Jarama nº6 there was no house, but a barrier of vegetation; yellow poplars, green spruce and a concrete block wall of 1 meter high buried under yellow leaves that delimited the plot without showing what was behind.

The study of the house in the state in which it was in 2014 was intended to decipher its validity. In spite of needing logical interventions of updating the house was effective from the spatial point of view. Proof of this is the Casa Trigo, a replica of Casa Guzman in La Florida, which its owners say "is very comfortable to live in".

A house that is inhabited tends to be preserved in better conditions than one that is less inhabited. "We are at a time when the remodeling, rejuvenation of so many buildings is being carried out in so many cities, and in cases with truly satisfactory results; It is necessary that next is thought since next year must be enabled a budget for the new maintenance of what has not been maintained tube to be restored. Do not go back to a new story repeated, to a new beginning"(Alejandro

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Figure 5.
Terrace of Casa Guzman in 2014.

de la Sota, 1987). It is necessary and urgent to protect our heritage and to save the culture of the atrocities that are happening and that have no turning back.

In search for solutions

"The house was cold, sad and it cost me a fortune to keep it". These words of Enrique Guzmán son were the headline of the news of the demolition of the architecture of Sota. Where were the architects, who did not know how to anticipate and solve the normal requirements of the owner in a sustainable way?

Reuse is the only way to keep 20th century architecture alive. Maristella Casciato, who was director of Docomomo International, said: "The challenge is to project the transformation without betraying the heritage that the architects of the Novecento have left us" (M. Casciato, 2009). One of the keys to preserving our heritage, and even more so, the Modern Movement, is to keep it permanently alive and for this it is imperative to accept the need to evolve and transform within the limits of the logic of the work itself.

The disappearance of the Guzman House, after the Aversú and many others of the Spanish Modern Movement, indicate that there is no awareness in Spanish society towards this type of heritage. The disparity of owners disposes architecture to the fate of the destiny. Therefore, it is necessary a proactive attitude on the part of the group of architects, that anticipates to the events, case by case. Sota would say: "Our evils, our needs are not so easy to know for ourselves ... That people are interested in things is good only to a certain extent; Hobbies of masses only football and bulls; The others are always, or should be, of minorities, and these have to put their knowledge at the service of others" (Alejandro de la Sota, 1980). It is the responsibility of the architects, to create an interest in society for this type of architecture, to form about its value and to promote viable solutions. We create an interest, just as there is an interest in classic cars, there is a clientele and a sector that is responsible for recovering original engine parts for those cars to work. Let's do it. How different it was in Villa Savoie! The icon house of the Modern Movement, which is now a museum of its own, was also threatened with demolition in the 1960s. However, at that time the world of architecture and art mobilized to defend it and secured their safeguard mobilized and led by Le Corbusier himself. On the verge of being demolished by social ignorance perhaps for

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Figure 6
South perspective of Casa Guzman in 2014.

temporary closeness, but today no one would hesitate to mourn his absence.

Conclusion

A few days ago, it was emphasized in the IV Congress of Pioneers of Modern Architecture that it is necessary to know our past to know where we are going. The Modern Movement, its successful research and progress, are our latest architecture, as to how to shape the city. It is therefore part of our memory and identity. Protecting and preserving the good architecture of the twentieth century is urgent, so as not to lose the thread of our past and present, to know where to go in the future. Once again, we find in the words of the Master the clues on how to proceed "to protect the heritage not by ordinances, but with sensibilities is the only way" (Alejandro de la Sota, 1990).

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Linear parks understood as vertebration instruments of the city

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Abstract. *This research raises as thesis the idea that Linear Park is an urban instrument capable of vertebrate the city and, consequently, of regenerate it. To this end, ten parks strategically located in big cities such as Rio de Janeiro, London, Paris, Madrid, Barcelona, or in medium or small cities such as Valencia, Castellón or Figueres, have been analyzed. Of this analysis we have deduced some characteristics that are considered key in the linear and transversal vertebration of the city, such as: green axis-corridor approach; sequence of events with integration of public buildings; continuity derived from the union of different areas; promotion of active leisure activities, individual or collective: sports, cultural, ...; capability of relation and regeneration of ecosystems: forest, meadow, orchard, nurseries, water, city, ...; capability to restore environment, with reduction in CO2, in noise pollution, ...; establish relations between the city and the territory with definition of natural parks; contribute to prevent thermal inversion in the city; establish a beginning and an end as recognizable elements in city; confrontation of opposites: static or dynamic; soft (green) or hard (pavement); unitary or fragmentary, cartesian or organic, ... The parks thus understood can be organized in diverse typologies, such us: classic order; in net; upholstery-continuous map; linear order with grooves, tapes or bands; landscaper and naturalist; ... The work delves into these themes by recognizing tools of interest such as: harmonic relationship; human scale; non-guided tours; sensory experimentation: spaces, sights, aromas, sounds, colorful, ...; unexpected and random; pragmatic and passionate; order within disorder; activation of spaces without hierarchies or apriorisms; flee from monotony; evocations; ...*

Keywords: Linear park, green corridor, city vertebrator, urban regeneration, sensorial experimentation, harmonious relationship.

Introduction: to recover the scale of the city

The thesis proposed by this text is that linear parks within cities can be a highly effective instrument for integral, sustainable and participatory urban development, capable of transforming the city and consequently regenerating it.

In order to study the keys for linear parks, it is convenient, as always, to go back to the origin and to recognize in history how they have arisen and how they have evolved from what can be described as elemental linear park, to the current parks of Great complexity.

First actions: row plantings on roads and roads outside the walls

In 1552, Henry II King of France ordered "all lords, the justices , and all the rulers and inhabitants of cities, towns and parishes, to

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plant and planting along roads and as good public roads and A large number of the so-called elm trees that over time our kingdom has been sufficiently populated “

Nearly two centuries later, in 1825, the Ponts et Chaussées service systematically planted tree lineages on the roads for its own exploitation, with a triple purpose: to mitigate the lack of wood after medieval deforestation, to beautify the roads, and to affirm the State power.

Recommendations are made for the said plantation, depending on the width of the road and the perception to be obtained, defining variable distances between the trees (4 to 20m), and between these and the road itself (2.5 to 6m) .

With this and according to the type of tree to be planted, of vertical growth like the elm trees or horizontal with wide glass like the bananas, it was possible to define diverse landscape perceptions like for example: row of trees very dense perceived like a directional green line, that acted Of reference from the great distance, and as a shadow for the traveler, from the short distance; Or the channeling of the road with double row of trees, with a sequential arrangement perceived as a protection for the traveler.

This second form of double-row plantation is the one that masterfully used André Le Notre, in the seventeenth century, in the definition of the Allées (tree-lined walks) of Versailles and many other French-style gardens. Le Notre, uses the Allée, not only as a walk that picks you up, protects you and takes you forward, but also and above all as a directional mechanism that remarks the perspective towards a great stage finale, such as the Palace of Versailles , Or as an instrument to establish certain optical illusions, supported by the play of light and shadow, transparencies, sound of water, chromatic changes, ...

One of the most important contributions

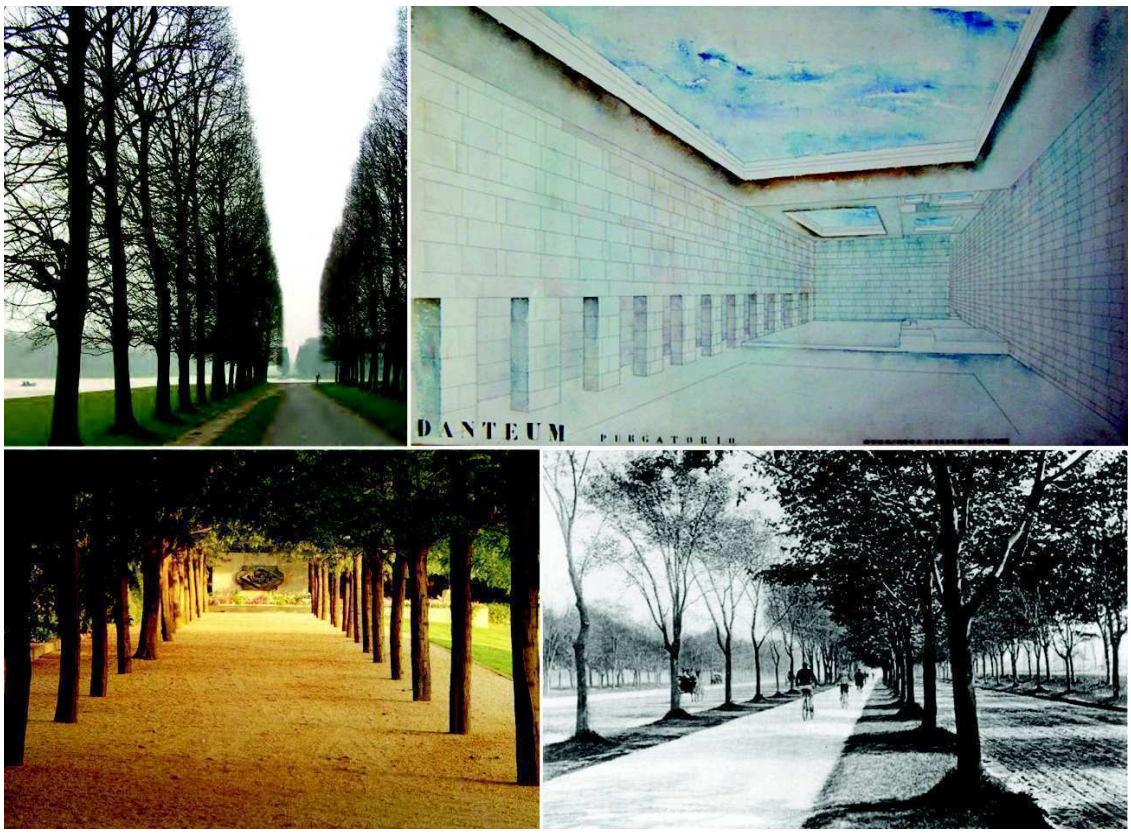

Figure 1.
Allée du Canal. Versalles. Andre Le Notre, s. XVII; Salt Danteum Purgatory, Giuseppe Terragni, 1938; Allée of Chestnut Miler Hause Garden, Dan Killey, 1953-1957; Ocean Parkway, Brooklyn, Frederick Law Olmsted, 1860-1880

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of Le Notre in Versailles is the different configuration of the architectural space through the arrangement of the trees, obtaining not only a directional space, but also that it becomes a large window towards the celestial vault, able to frame A fraction of it, attracting it to the observer, who became the ceiling of space, as centuries later Giuseppe Terragni recreated in the room of the purgatory of the Danteum, projected in 1938. (F01)

In the same way, Le Notre, is able to define the closed vertical space, by having double rows of bananas in the Allée Real, which grows even above 40m in height, their cups come together, establishing a space where the component Vertical, that which Christian Norberg-Schulz defined as the sacred tension of architecture.

This approach to the definition of architectural space through the use of tree plantations is a theme that has remained in time in a way that modernity has assumed as its own. A good example of this is the Miller Hause Chestnut Allée, made between 1953 and 1957 by Dan Kiley, in perfect harmony with the traces of the house designed by Eero Saarinen and Kevin Roche, forming a beautiful garden, where the formal essentialization of the Zero ground plane, in earth or green tones, acts as support for the rational sequence of the double row of chestnut trees, whose trunks arise from the ground with perfect circular section, we are shown as a classic double colonnade, where the entablature, Covered are replaced by the tree tops that join us in an architectural space full of nuances and suggestions. (F02)

In Europe, this system of plantation of trees in the territory creating Allées, approach the walled cities establishing external perimetral walks, so that at the end of the XVIII with the demolition of the walls, they become part of the structuring of the city , Becoming what we know as boulevard.

In the United States, this process of introduction into the city of the incipient linear park, is produced in the nineteenth, through the great landscape architect Frederick Law Olmsted, who in addition to designing many of the present great parks of American cities, such as Central Park New York, developed a system of tree plantation, similar to the Allée, called Parkways or avenues. The great difference and contribution of Olmsted is to understand this issue as a system of urban planning, so that the growth of the American city, an extensive city of low density, occurs from that moment with a repetitive sequence in parallel, zone Of houses giving a green corridor with four or six rows of trees (parkways), establishing the transverse relationship, in addition to the directional. (F03)

One theme that appears systematically in these examples, both European and American, is the sought unity of formal criterion in the definition of the walk, so that chosen the type of tree, this is repeated throughout the entire route of the Allée, the Boulevard or parkway.

However, at the beginning of the XVIII century, in Valencia (Spain), the plantation of the Alameda Allée is produced, whose distinctive feature is the diversity of the woodland that forms it, introducing tropical species, which give it a marked pluralistic, very close to the eclecticism that will prevail a century later.

Contribution: enjoy sensory - experimentation

In any case, these tree plantations in row, whether in the territory or structuring the city, when they travel, introduce us to a first sensorial enjoyment, where the slight or accelerated movement of the leaves produced by the roar of the wind, next to the Effects of transparency and reflections of light and shadow, establish an atmosphere of multiple sensations.

At present, and for some decades, one of the key issues in the design of linear parks, is precisely the search for the user, sensory experimentation, so that the choice of materials (pavements, street furniture, Illumination, ...) of plant species, and their relative disposition, are posed so as to activate the five senses of the observer, inciting him to contemplate, to caress, to smell, to hear, to perceive, to feel.

For this, it is essential to know the plant species well, its evolution along the four seasons, type, color, size, shape of flowering, ... seeking learning through the senses, through the diversity of textures , Flavors,

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Figure 2.
Thames Barrier Park in London. Group Signes, 2000; Campus Riu Sec. University Jaume I. Castellón (Spain). M. Del Rey, I. Madro, A. Gallud, Mª T. Santamarina. 2004

aromas, sound elements, colorful, shapes, sizes, blooms, ...

Many are the examples that base their design on the long-awaited sensory experimentation, but it may be useful here to highlight two of them. The first is the performance of the Signes Group at the Thames Barrier Park in London, where, from the concept of the park within the park, they establish a diagonal green pier, like a vegetable river, organized on the basis of parallel bands, Which arise from the earth as linear wave-waves of different heights, imparting a strong dynamism, introduces us to sensory enjoyment through the sequence of aromatic plants such as rosemary, thyme, lavender, basil, sage, herbal, etc. The sensory experience occurs from the apparent formal, vegetal and chromatic unity, which can scratch monotony for the observer.

The second example, "the Riu Sec Campus of the Jaume I University of Castellón (Spain), designed by the architects Miguel del Rey, Iñigo Magro, Antonio Gallud and María Teresa Santamarina, bases its design on the diversity of the performance, variety of Species, shapes, colors, aromas, images, sizes, blooms, ... If in the above example sight and smell were the two key senses in experimentation, in Riu Sec, it is the combination of the five senses, which gives strength and quality to the whole. (F04)

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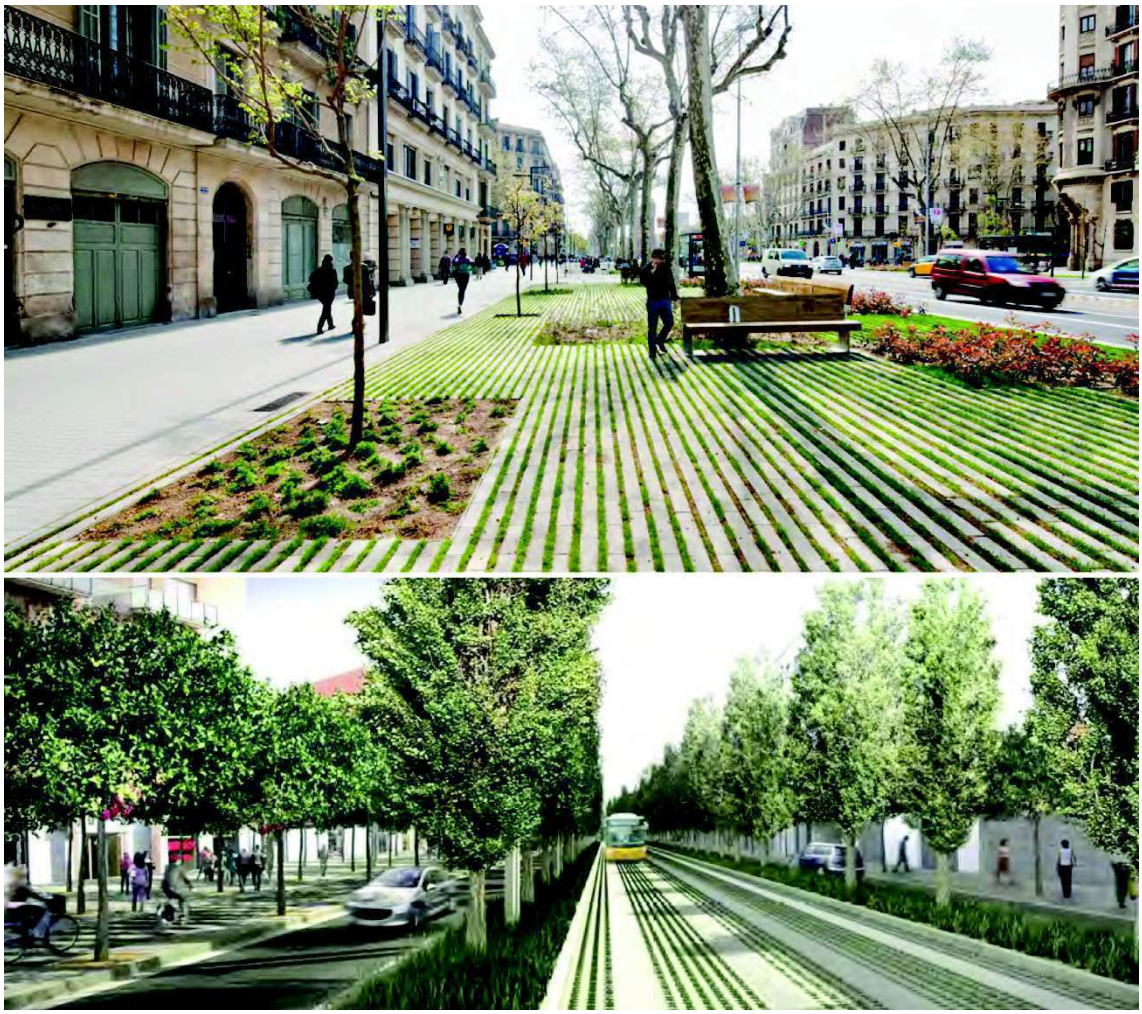

Figure 3.
Passeig de Sant Joan de Barcelona. Lola Domenech 2010 and 2011;
Bus lane Cornella Castelldefels, Bajo Llobregat, Barcelona. Batle and Roig, 2008.

Contribution: natural-artificial integration

One of the most difficult issues to achieve in translating the concept of linear park into the city, through any of the aforementioned figures, such as boulevards, is precisely that necessary relationship between its natural-vegetable origin and the artifice of The construction of urban space.

Some example will help us understand if this integration is possible. We refer to the performance of Lola Domenech in Passeig de Sant Joan in Barcelona, conducted between 2010 and 2011, in which it achieves the sought-after nature-artifact fusion, defining a single horizontal plane in which in a simple and clean, interlock The vegetation, the trees and trees, the pavement, the flower beds, the urban furniture, ... Establishing an exquisite harmonic discourse.

In this direction, the group of architects Batle and Roig, in 2008, in the design of the bus lane from Castelldefels to Cornellá, of the Bajo Llobregat of Barcelona, take a further step in this desired direction, and they intend to achieve a total integration between the Stay, the walk, the public transport, the bike path, ... Defining it as a real green corridor. (F05)

Contribution: new city vision from above

If we have been talking about "elementary linear parks" so far, we can refer here to "complex linear parks", starting with the High Line of New York (2004 competition

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Figure 4.
High Line, New York. James Corner Field Operations, 2004-2015; Cheong Gye Cheon F07- Arroyo. Kee Yeon Hwang, 2003 and 2005.

and Execution from 2010 to 2015), which has marked a new way of designing a linear park, in which concepts such as recycling, or natural spontaneity, arise from the very bowels of it. (F06)

The idea of the High Line arises when it loses its use a railway infrastructure that from 1930 to 1980, supplied raw materials, besides milk, meat, ... to certain factories located in a route of 2,33Km, to 9m of height on the map of the city.

This idea is not the first time that it arises, since in 1988-93 the landscaper Jacque Vergely and the architect Philippe Mathieux realized it in the Coulée verte René-Dumont of Paris (le Promenade Plantèe), reusing an abandoned railway line Since 1980, so that the first stretch from the Opera de la Bastide to the garden of Reuilly, the linear walk is located above the viaduct of Arts, 10m above the level of the city. However, the difference lies mainly in the concept of the design, since the Paris is based on a classic approach to the garden, far from the contributions of the High Line.

This, based on the concept of recycling, which tries to print a new cycle of life to the preexisting that has lost its validity, proposing the reconversion of an urban vital industrial infrastructure, in a post-industrial tool of leisure, life and increase. And this is intended to be achieved by making spontaneous growth of nature in abandoned land, so-called “weeds”, take quality charter, and emerge as a new and simple way of using the natural. This way of acting, produces a change in the hitherto rules of the man-nature relationship, which makes it more suggestive and unpredictable.

It is considered as the opportunity to have and participate in a new, changing experience, linked to the discovery of the city itself from a different view, or the observation of a spontaneous, diverse, and continuously changing nature. The High Line, is not a finished and closed work, is the opposite, a work in process, open to new incursions. It is therefore flexible and offers a great capacity to respond to the changing needs and opportunities and desires of society.

Its route, west of Manhattan, from Ganservoort Street to 34th Street between Avenues 10 and 11, has a clear tourist attraction, since from there you can see the Statue of Liberty, the Empire State Bulding, the Hudson River And the financial district. It has 10 access points, so some are produced ascending through the center of the Line, to get the visitor to enter the park from the inside, impregnating with its attractive attractions.

A green axis is designed, where wooden paths, rest areas, eating places, cultural spaces for temporary shows, exhibition and small shops arise. The work is based on recreating the old links and rail lines, with large flower gardens and small more pauses.

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Materiality is established as one of the key themes in the definition of an "almost natural" green axis, where the usual artificiality of the urban space is brought back to a spontaneity in which the instruments of design tend to go unnoticed. In this way the lighting is done with leds arranged in the ground plane, under the furniture, in a sequential way illuminating the paths. The pavements are prefabricated concrete, with a friendly finish in Ipe wood, recycling the original metal structure, such as railroad tracks, Art Déco railings of the original stairs, ... The vegetation is diverse in its shape, image, colorful, textures, ... grass, shrubs, bulbs, evergreens, tropical plants, ... Here too the observer is introduced into sensory enjoyment.

Contribution: linear and transversal vertebration of the city

If the case of the High Line commented on the recycling of an outdated infrastructure turning it into an autonomous pedestrian walkway as a green corridor, producing a linear structure of the city, the typology of linear park that is discussed in this section, raises as contribution The double structure of the city: linear and transverse, sewing neighborhoods-areas that were previously clearly separated by a natural barrier such as a river, or artificial as a traffic infrastructure of heavy traffic.

The purpose of vertebration is established from the idea of continuity obtained from the union of diverse areas, giving rise to a sequence of events, sometimes unforeseen that arise spontaneously, and others clearly announced, through the integration of equipment.

This type of linear parks seek in their design to accommodate multiple active leisure activities, both individual (cycling, running, walking, doing gymnastics, ...), as a collective (sports, racing, games, ...) and family as It is the leisure, the walk, the games of children, ...

An interesting case in this direction is the work done by the team of urban planner Kee Yeon Hwang between 2003 and 2005 in the recovery of the historic Cheong Gye Cheon stream that runs from west to east in the center of Seoul, eliminating the highway built in 1968 On it, turning it into a linear river park as an attractive place, for the use and enjoyment of the citizen, in which the "soft" areas with vegetation accompany the water course, and the "hard" zones where there is a Integration between the pavement, the stands and the water sheet, which thanks to mechanisms such as water, is achieved that is at rest, which allows their use by people. (F07)

The sought and well achieved transverse vertebration of the city, in this case is established through several mechanisms: the continuity of the cross streets through 22 bridges; The cross-sectional design of the park in a friendly manner, where tree-lined sidewalks, vehicle lanes, park-river and pedestrians are easily related; The connection between the level of the city and that of the park, in most cross-connections; And finally the direct connection of certain equipment located in the margins.

This action has become a real operation of urban renewal, in which, in addition to achieving the city's structure, new objectives of sustainability and ecology have been covered, substantially improving air quality (by eliminating pollution from the previous motorway), Reducing the "heat island" effect with a temperature drop of 3.5º in relation to neighboring neighborhoods, and creating a new natural habitat where many plant and aquatic species have found the right ecosystem for their existence, becoming In the lungs of the city.

Thus, with an intense citizen participation, the Cheong Gye Cheon recovery has meant much more than removing an obsolete infrastructure, or the nostalgic recovery of a forgotten river. In fact it has become a generator of new activities, new ways of living, new relationships, resulting in a radical change in downtown Seoul, enhancing civic life, which had almost disappeared.

Contribution: recovery of history

This type of operations of linear and transverse vertebration of the city, is a recurrent theme, that already was put into practice in the city of Valencia (Spain), back in the seventies, when recovering as a public park, the old River

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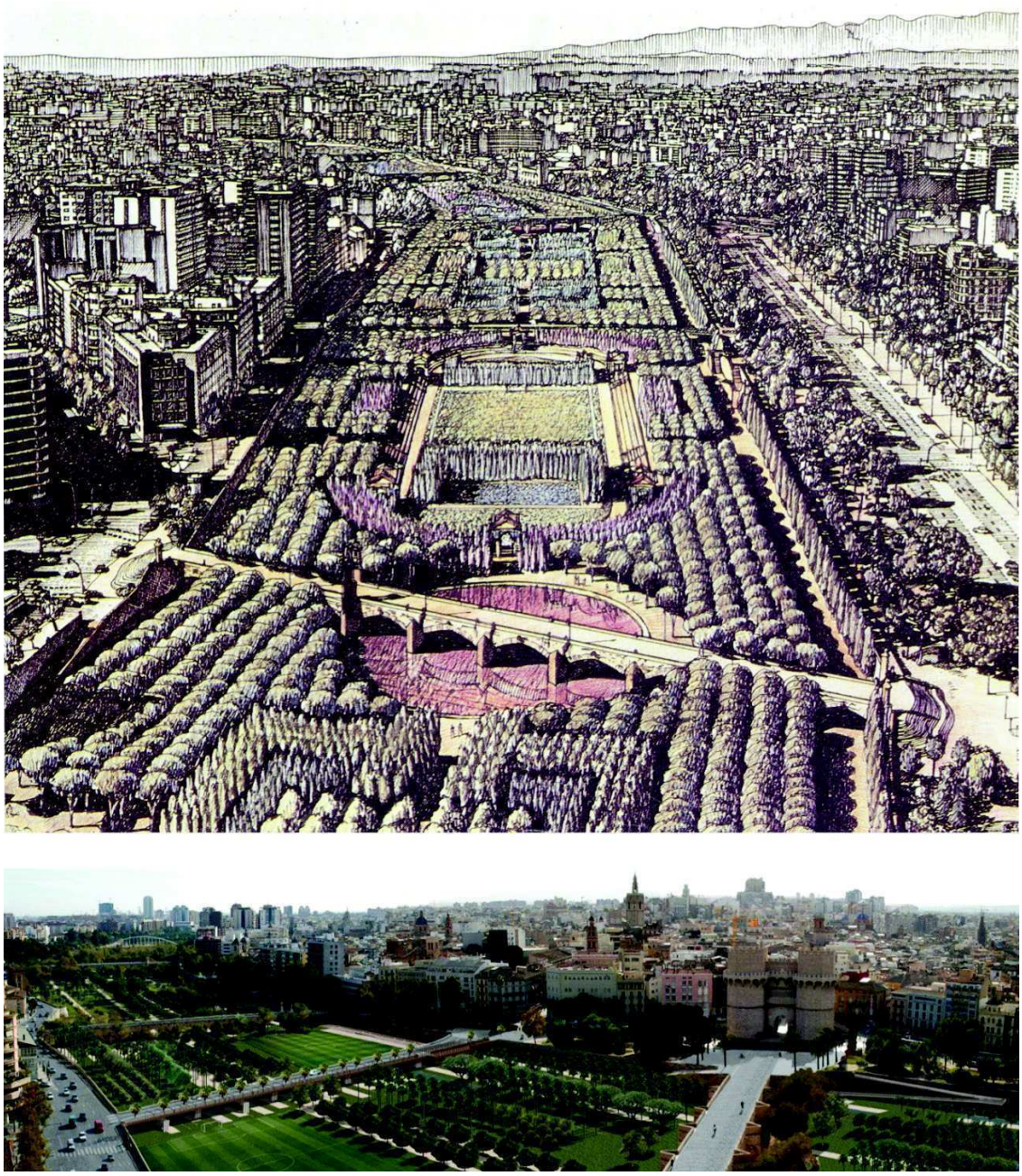

Figure 5.
Parque del Turia, Valencia (Spain). Ricardo Bofill, 1975; Restoration bridges Trinidad and Serranos Parque del Turia, Ignacio Bosch, 2005.

Turia, whose use as a river had ceased to exist since 1968 with the construction between 1961 and 1968 of a new and peripheral channel that solved a continued danger of floods suffered by the city (89 between 1300 and 2000), especially the devastating 1957.

The initial approach of the new Turia linear park, based on the Ricardo Bofill project of 1975, proposes to obtain the concept of unity through the tree mass that acts in full, over which, through systematic subtraction operations, Empty as elementary spaces, which are organized geometrically in a classical order, establish a harmonious relationship between them, in which different events take place, with sports, leisure, recreation, cultural activities ....

This sequence of activity spaces, located in the center of the tree mass, is defined by simple

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Figure 6.
Parque Manzanares, Madrid (Spain). Burgos and Garrido; Porras and Caste; Rubio and A. Hall; and West 8; Water Park, Figueres, Girona (Spain). Michèle Orliac and Miguel Batlle.

and direct geometries such as the circle, the square or the rectangle, which are perimetrally supported by individual linear paths for pedestrians and cyclists. In them, the water at rest as a reflective sheet, or in continuous movement, introduce us again into the sensory enjoyment, perceiving an endless number of variations of light, shadow, reflections and sounds.

The river Turia, having no water for most of the year, was historically used as a place of recreation, where cattle fairs were set up, public laundry, ... , So that several of the stony bridges of the XV and XVI centuries, had stairs or ramps of descent of carriages for their connection with the level of the city. Or spaces of wardens, on the Tajamares, that acted of viewpoints and zones of rest. All these elements were partially dismantled in 1810, with the war of the independence, in an attempt to prevent the taking of the city by the French.

With the restoration project of the historical bridges of Trinidad and Serranos, carried out in 2005 by the team of the Universidad Politécnica de Valencia, led by the architect I. Bosch, one of the key themes of the linear park Of the Turia, which has been precisely the recovery of both the public uses that historically developed in it and the urban elements that had disappeared at the beginning of the nineteenth, so that both the bridge of the Trinity and Serranos , Stairs and descents have been recovered at the level of the river bed, as well as the stewardesses from which a calm view of the landscape of the city is allowed. (F08)

In this way, the Linear Park of Turia, which crosses the center of the city of Valencia over 17 km, has become the green lung of the city, and at the same time the mechanism of transverse vertebration, establishing important connections Cultural center between the West, the historical center, with its monuments, palaces and museums such as the IVAM, and the East area, where is located the museum of St. Pio V, Palau de la Música, Gardens of Nurseries, ...

Contribution: regeneration of ecosystems - sustainability

But it has been in the last two decades, when we have become aware of the need to propose a sustainable design, which allows the regeneration of ecosystems, from a naturalistic-landscape concept of the linear park.

And this approach has been developed from large operations with a high economic cost but at the same time with results of great benefit to society, or through operations of small investment but of great interest for their conceptual relationship with the natural space.

Among the first is Operation Madrid Rio, with the Manzanares Park, the result of a competition won by the team formed by the architects: Burgos and Garrido; Porras and La Casta; Rubio and A. Sala; And West 8. (F09)

The new line park of the Manzanares

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emerged as a result of the burial of the motorway that bordered the river bank, had become an impassable barrier, which had segregated the neighborhoods of southern Madrid, disconnecting them from citizen life.

The operation goes beyond the scope of the city, establishing a 60 km route, which begins in the town of Manzanares del Real, and passing through Madrid, ends in the city of Aranjuez, regenerating the ecosystems of the territory through which it moves The river Manzanares.

In the interior of the city of Madrid, and crossing from north to south, the River Manzanares has become a large linear park, partly fluvial, made based on sustainability criteria such as: universal accessibility with slopes of 4 to 6% ; The reuse of land coming from the excavation to bury the highway, which in turn assumed the reduction of 35,000Tn of CO2 from the air pollution, as well as the elimination of noise pollution.

With the planting of 34,000 trees, the park has an important vegetable quality, which is organized by looking for unity within diversity, so that the linear pine walk that is arranged throughout the park, is combined with masses Trees of different species but homogeneous in themselves.

The elimination of the road barrier and its replacement by the park has meant the connection and transverse structure of the city, linking the south with the central zone, and producing an intense urban regeneration based on the concept of landscape-city integration.

In the park again appears the sequence of diverse events, with integration of equipment, services, sports activities, peripheral urban parks, ... But also the quality of the indetermination that allows to realize new experiences not programmed, ...

Contribution: city-territory relationship. natural park

Among the activities that achieve a sustainable naturist-landscape design, with a very limited investment, we should highlight the Parque de las Aguas, made by landscape architects Michèle Orliac and Miguel Batlle, in Figueres, Girona (Spain)

The park is configured from the recovery of the natural territory, with minimal intervention, reusing the existing elements such as the pool, using a single artificial material, such as sheet metal, which serves equally to contain the land, to become Water channel, to define the path-walk, the bank run, ...

This type of actions can recover a natural territory, reconvert it into an urban park, integrating nature with the artifice, showing a high capacity for regeneration of the ecosystems: forest, meadow, orchard, nurseries, water, city, ..., Environment, with CO2 reduction, noise pollution, ...

Conclusion

Undoubtedly the urban linear park as well as being a driving force for the regeneration of the city, with a green corridor-axis approach, which is configured based on the sequence of events with integration of facilities, which promote individual active leisure activities, familiar, collective, sports, cultural,..., producing its directional and transversal vertebra, has evolved towards sustainable design, whose most relevant characteristics can be summarized in the following:

•ECOL support system or logical or n r egeneraci of natural spaces, such as the restoration of wetlands, native plants, forests, grasslands, Orchard, nurseries, ... of the landscape of the place.

•Use of natural landscape elements rooted in the area, as flowing water, water lilies, ...

•Recycling of materials and structures, with realization of new bioclimatic energy efficient architecture.

•Efficient stormwater mamagement, with efficient illumination.

•Universal accessibility.

•And as always, a good design is based on the tools of architecture as the binomial light-shadow, the control of scale, the confrontation of opposites: static or dynamic; Soft (green) or hard (pavement); Unitary or fragmentary, Cartesian or organic, ...

This allows to recognize positive results for the city and the citizen, as they are:

•The restoration of wetlands, orchards,

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grasslands, and forests undoubtedly drastically improves the quality of air, water and biodiversity

•In the parks of sustainable design, the fauna and flora regenerate, there is fishing, the birds nest, ...

•The ecological system is reinforced with this type of actions that produce the recovery of the native ecosystems.

•The collection and efficient management of rainwater reduces the demand for drinking water by an important percentage.

•There is a strong decrease in CO2 from environmental pollution, as well as a reduction of noise pollution, so that the arboreal mass of the park acts as an absorbent mattress, and helps to avoid thermal inversion in the city

•It establishes new and intense relations between the city and the territory with definition of natural areas.

In short, an ecological linear park obtained through a sustainable design, becomes the lung of the city and acts as its symbol of vitality.

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Resilient urban morphology to the flood risk in the final stretch of the Girona River (Alicante province)

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Abstract. *The Litoral-Cota 100 zone represents approximately 25% of the total area of the Region of Valencia and concentrates more than 70% of the urban area. One of the consequences of this situation has been the high urban developments produced in the last 50 years. The Valencian Community has a river flood hazard mapping, according to which, in the Litoral area, more than 80% of the flood hazard is concentrated. As a result of the experienced urban development and the extent of flooding, there is a significant number of people and property exposed to flood hazards. In order to analyze in detail the urban morphology on the coast and its interaction with floods, research has focused on the specific area of the final section of the Girona River, in the province of Alicante. Specifically, in the municipalities of Els Poblets, El Verger, Denia and Beniarbeig, located in the surroundings of the Girona River, very different urban morphologies have been generated that are not adapted to the existing flood hazard. The analysis carried out allows us to conclude that, despite the significant expansion of urban land, existing urban morphology offers ample possibilities to reduce the risk of flooding. It is proposed the integration of overflows in the built city, avoiding the consolidation of non-built land and designing particular measures on affected buildings. These measures of adaptation to the problem will generate a resilient urban morphology.*

Keywords: Flood risk, Flood hazards, Land use, Resilient Urban, Girona River.

Introduction

The Valencian Community is a territory that, due to its climatic conditions and its physiographic characteristics, is susceptible to experiment frequent and important floods. If we add to this situation the alterations to which the territory has been subjected as result of the anthropic actions, such as urban developments and infrastructures, it is observed that the material, environmental and human damages have increased significantly from the 80s to the present.

The Valencian Community has the so-called Territorial Action Plan on Flood Risk Prevention in the Valencian Community (PATRICOVA), in force since January 28, 2003, which was revised and approved on October 29, 2015, by Decree 201 / 2015 of the Consell. The purpose of PATRICOVA is to provide the Valencian Community with an instrument for improving knowledge and risk assessment, preventive management of land uses, cooperation and administrative collaboration, and management of flooding in the green infrastructure.

Taking into account the previous objectives and territorial characteristics defined in the Territorial Strategy of the Valencian Community (ETCV), approved by Decree 1/2011, of 13 January, of the Consell, which divides the territory of the Valencian Community into three major Geographical areas according to

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urban and environmental configuration criteria, which have been denominated Coastal Area Level 100, Middle Belt and Rural System, we find very different flood conditions in each of the referred areas.

In this sense, more than 80% of the surface subject to risk of flooding in the Valencian Community is located in the Coastal Zone Level 100, which represents 25% of the Valencian territory, mainly due to the presence of river and dry riverbeds mouths, and wetlands. It also concentrates a population that exceeds 80% of the entire Comunitat, as a result of this occupation, a large area is used for urban uses, equipment, economic activities and infrastructures, of which 13% of these uses are affected by risk of flood according to PATRICOVA, a significant figure if we compare it with the areas corresponding to the Middle Belt and the Rural System, with conditions around 2%. This situation requires a singular attention on the part of all the administrations related to the land uses and the risks of flood, in view of the high impact to which the Coastal Zone - Level 100 is exposed by flood risk.

The goal of PATRICOVA is to reduce this impact from a dual perspective, on the one hand, through the implementation of structural measures that mitigate the risks detected in the floodplain areas, and on the other hand by orienting urban development towards areas with lower risk of flooding.

However, in view of the current situation and the scope of the actions envisaged, we consider it necessary to act on the constructed city, analyzing in each case its urban morphology and the incidence of flooding, trying to integrate both aspects in order to make the city built more resilient to the risk of flood avoiding the increase of the same due to the non adaptation of the city and the occupation of inadequate spaces.

Methodology

For the development of the research, the Girona river basin and the Portelles ravine have been selected as a pilot basin, located to the north of the province of Alicante, which integrates the three territorial areas defined in the ETCV. The consideration of the ravine of Portelles is due to the fact that both courses are very linked because the overflows of the Girona river significantly affect the ravine of Portelles, being able to consider both as a unique system.

Data have been generated relating to land uses, the evolution of urban morphology through building constructions and the extent of flooding according to different scenarios. From here, we have determined the extent of flood risk and propose solutions that make it more resilient the municipalities of Beniarbeig, El Verger, Denia and Els Poblets, in the vicinity of the Girona river and the ravine Portelles object of the investigation.

Regarding land uses, it was considered necessary to evaluate the effect of changes in soil cover on the generation of surface runoff, which have a significant effect on the extent of flood events, in order to determine if the transformations Produced in the basin have aggravated the risk of flooding.

For this purpose, the land use mapping of the year 2011, according to the Land Use Information System of Spain (SIOSE), has been arranged, in the area of the Girona river basin and the ravine of Portelles . On the other, a map of the land uses corresponding to the year 1956 was made, making use of the following sources of information: Aerial photograph corresponding to the American flight of year 1956 of the National Geographic Institute and the characteristic leaves of the General Direction of the Cadastre, between the years 1955 and 1964.

With the information mentioned, the methodology developed has been based on photointerpretation from the aerial photographs, and its contrast with the leaves characteristic of the Cadastre, for the identification and delimitation of the different units that were wanted to be mapped, assigning them one of the ten categories of soil that were defined.

As for the evolution of urban morphology and its incidence on floods, the development of the building, its typology and the occupation of flood areas between 1956 and 2013 were analyzed in order to evaluate the increase of damages due to exposure to floods.

With the aim of delving into the effects of floods on territorial transformations and their

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morphology, it has been analyzed for each of the municipalities that integrate the field of research which has been the growth in their constructions from 1956 to 2013, according to data published by the General Direction of Cadastre, focusing this article on the municipalities of Beniarbeig, El Verger, Dènia and Els Poblets. The municipalities partially affected by the river basins of the Girona river and Portelles ravine have been analyzed exclusively in the areas affected by these basins.

Measurement and analysis

Land uses.

As explained in the methodology, the effect of changes in land use between 1956 and 2011 has been analyzed. In order to compare the two cartographies and their effects, they were homogenized by establishing ten categories or coverages of the land uses, which have been grouped as follows:

Forest trees; Crops; Hydrography (dry riverbeds); Scrubland; Pastureland; Beaches, dunes and sandy beaches; Hard rock; Artificial soil; Road network and Burned areas.

Once the land use maps for the years 1956 (Figure 1) and 2011 (Figure 2) have been defined, the areas of each coverage have been determined, considering that the basins of the Girona river and Portelles ravine have been modified as a consequence of the anthropic alterations in the territory. However, it should be borne in mind that the two maps generated are products derived from images obtained by different sensors, so that the starting data have diverse spatial, temporal and spectral characteristics.

As mentioned above, it can be seen that the total area of the watersheds studied does not have the same surface area, being higher in 1956, which has been reduced by the various territorial transformations, in particular by the developed urbanization processes.

Another point that should be made, is that in the 1956 land uses mapping, the burned areas were not reflected, in the absence of such information. However, the forest cover identified is much lower in 1956, as shown in Table 1, which indicates either abundant deforestation due to the exploitation of the resource wood and charcoal, or the existence of large forest fires.

Table 1.
Area and percentage of land uses in the years 1956 and 2011.Source: Own elaboration.

LAND USES	YEAR 1956		YEAR 2011	
	Land surface (m^2)	Land in the basin (%)	Land surface (m^2)	Land in the basin (%)
Forest trees (*Arbolado forestal*)	1.559.649,30	1,31	9.547.013,91	8,05
Crops (*Cultivos*)	52.420.766,14	43,90	32.664.580,78	27,55
Scrubland (*Matorral)*	6.148.416,92	5,15	13.631.728,91	11,50
Pastureland (*Pastizal*)	51.585.534,95	43,20	47.279.272,51	39,88
Beaches, dunes and sandy beaches (*Playas, dunas y arenales*)	9.724,59	0,01	4.811,21	0,00
Dry riverbeds (*Ramblas*)	1.410.360,93	1,18	676.283,40	0,57
Hard rock (*Roquedo*)	4.699.145,77	3,93	5.614.041,92	4,74
Artificial soil (*Suelo artificial*)	1.062.880,81	0,89	6.971.551,60	5,88
Road network (*Red Viaria*)	522.755,07	0,44	643.515,65	0,54
Burned areas (*Zonas quemadas*)			1.524.082,36	1,29
TOTAL	**119.419.234,48**	**100,00**	**118.556.882,26**	**100,00**

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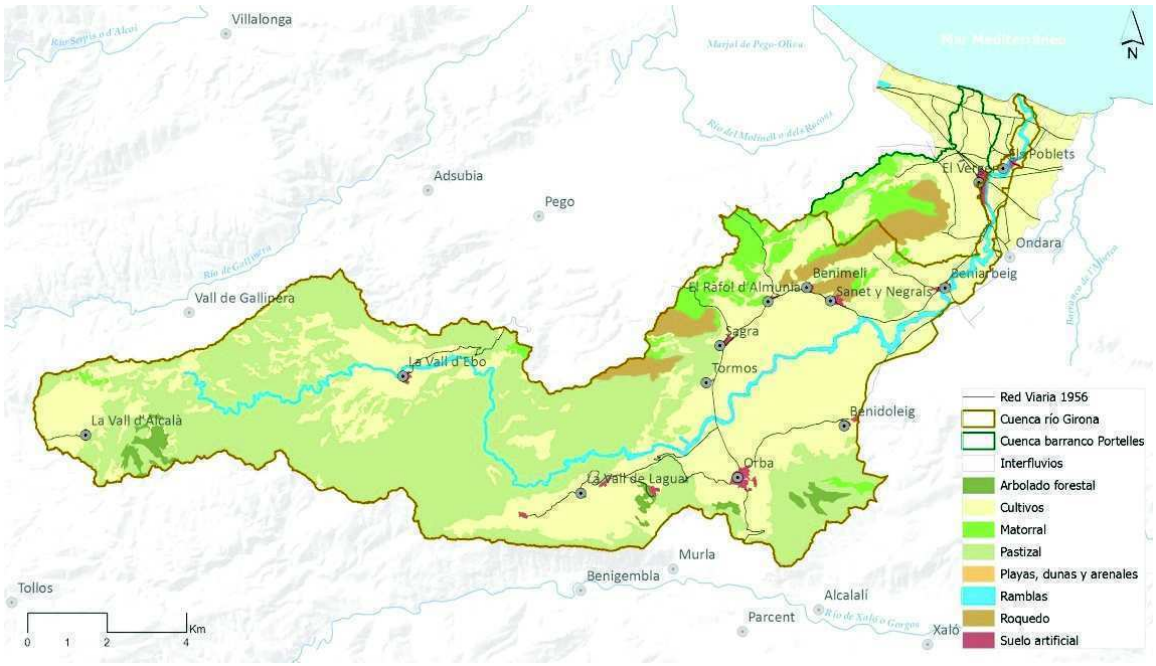

Figure 1.
Land uses in the basins of the Girona river and Portelles ravine in the year 1956.
Source: Own elaboration from aerial photographs of the IGN and Cadastre.

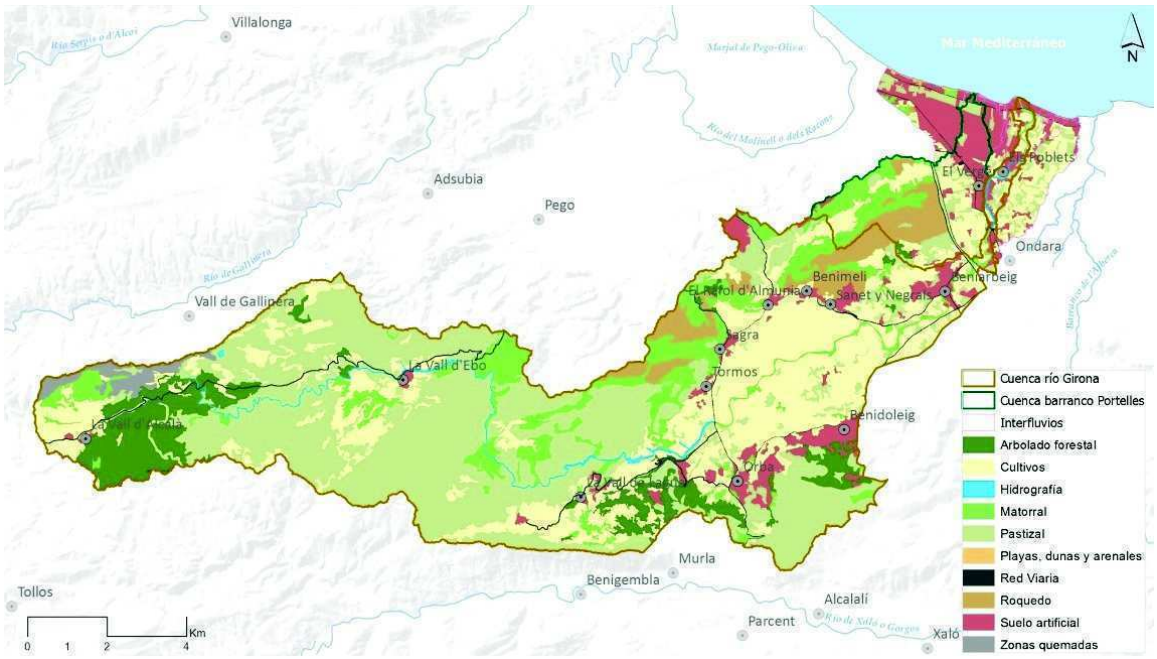

Figure 2.
Land uses in the basins of the Girona river and Portelles ravine in 2011.
Source: Own elaboration based on cartography of the ICV.

The basins of the Girona river and the Portelles ravine have undergone important changes in the land uses in practically the 50 years considered in this investigation. Table 2 shows that the greatest change in absolute value has been the crop, with a reduction of around 20 km2, which has been 37,69% less cultivated area than in 1956. In The middle and upper stretches of the Girona river have produced a large part of the abandonment of

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terraces for primary rainfed crops, giving rise to the development of natural vegetation, both arboreal forest masses and scrubland.

Forest surface area has increased slightly above the surface of scrubland. However, compared to the surface of these same uses in 1956, there is a much higher development of forest trees, increasing by more than 500%, in front to scrubland that increases by 121% with respect to the one existing in 1956.

The positive effects that occur in the basin due to the increase of the forest masses are offset by the negative effects of the considerable increase that the artificial soils have experienced, especially the building in areas susceptible to be dangerous in the face of floods. Artificial soil, including the road network, in 1956 barely represented 1,33% of the uses that were located in the basin, in 2011 it was at 6,42%. The growth in the total area of the basin is of 5,09%, but with respect to the surface that own use had in 1956, the increase is of more than 380%, having transformed more than 6 million square meters of land, in front to one million almost six hundred thousand (1.585.636 m2), existing in the initial year of reference.

The changes in land use experienced in the basin between 1956 and 2011 have changed the runoff generated. In order to estimate the runoff threshold (P0), it is necessary to identify the type of soil (due to its drainage capacity), soil cover, slope and moisture conditions predicted. Table 3 shows the average runoff threshold in the basins of the Girona river and the Portelles ravine, grouping the land uses, being higher in 2011.

Changes in land use, in particular the reduction of agricultural areas and the increase of forest areas have meant that the average runoff threshold at the research site has increased by nearly two points compared to 1956. Urban areas have increased significantly in the period analyzed, with an impact on the reduction of the average runoff threshold. This has been offset by the considerable increase in forest areas, by almost 20% with respect to those in the year 1956, with agricultural land being reduced by 38%, compared to 1956, in favor of forest and urban soils, as has been shown.

Urban morphology

In the analyzed area the density of houses in the municipalities of the mouth of the river Girona (Dènia and Els Poblets) is low, being dominant the model of occupation of the extensive territory. In the upstream municipalities, El Verger and Beniarbeig, the density of houses is average, with a greater number of multi-family

Table 2.
Variation in land use between 1956 and 2011. Source: Own elaboration.

LAND USES	VARIATION IN SOIL SURFACE BETWEEN 1956 AND 2011	
	m^2	%
Arbolado forestal	7.987.364,60	512,13
Forest trees (*Arbolado forestal*)	-19.756.185,36	-37,69
Crops (*Cultivos*)	7.483.312,00	121,71
Scrubland (*Matorral)*	-4.306.262,44	-8,35
Pastureland (*Pastizal*)	-4.913,38	-50,53
Beaches, dunes and sandy beaches (*Playas, dunas y arenales*)	-734.077,53	-52,05
Dry riverbeds (*Ramblas*)	914.896,15	19,47
Hard rock (*Roquedo*)	5.908.670,79	555,91
Artificial soil (*Suelo artificial*)	120.760,58	23,10
Road network (*Red Viaria*)	1.524.082,36	-
Burned areas (*Zonas quemadas*)		

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Table 3.
Area and average runoff threshold in 1956 and 2011. Source: Own elaboration.

LAND USES	YEAR 1956		YEAR 2011	
	Land surface (ha)	P_0 (mm)	Land surface (ha)	P_0 (mm)
Urban areas	158,56	0,05	761,51	0,23
Agricultural areas	5.242,08	8,43	3.266,46	5,34
Forest and semi-natural areas	6.541,28	21,96	7.827,72	26,62
TOTAL	**11.941,92**	**30,43**	**11.855,69**	**32,19**

buildings.

In addition to the density of houses, which explains the occupation model, the evolution of urban constructions has been analyzed, taking into account their location, as well as their exposure to flood risk.

Also, different flood scenarios have been considered in the analysis, which allowed to determine the degree of exposure of the studied constructions. In this way the following flood scenarios have been considered:

• T100 / CAL> 70: Equivalent to buildings affected by the flood corresponding to the return period of 100 years and depth greater than 70 centimeters.

• T100 / CAL = 30-70: Equivalent to buildings affected by the flood corresponding to the return period of 100 years and depth between 30 and 70 centimeters.

• T25: Corresponds to buildings affected by the flood envelope for the 25-year return period.

• T100: Corresponds to buildings affected by the flood envelope for the return period of 100 years (includes the two initial scenarios).

• T500: Corresponds to buildings affected by the flood envelope for the 500-year return period.

• PREF FLOW: corresponds to the buildings affected by the flood envelope of the preferential flow defined in accordance with Article 9 of the Regulation of the Public Hydraulic Domain, approved by Royal Decree 849/1986, of April 11, and modified by the Royal Decree 9/2008, of 11 January.

In order to be able to compare the buildings affected by flood risk from those not affected, a scenario of all constructions carried out in the municipality, both affected and not affected, has been identified as TOTAL CONST.

For the development of the work, data sources have been used of the General Direction of Cadastre and the National System of Mapping of Flood Zones (SNCZI).

With the information available and through geographic information systems, new layers were generated with information on the built surface affected by flood and the year of construction for each of the previous scenarios.

Results and graphs were obtained for all municipalities in the basin, however, by way of example, the municipality of Els Poblets (Figure 3 and Figure 1) are shown.

The municipality of Els Poblets, one of the most affected by flood hazard, experienced its greatest increase in construction since 1977 (Figure 3). In this year the total constructed area was almost 12% of the existing one in the year 2013. In the year 1990 had been reached almost 72% of the total constructions. The built area continued to grow at a slightly slower pace, and it is from 2009 when the activity of the new construction is virtually paralyzed.

If we consider in the analysis the different scenarios considered in terms of flooding, it is observed that the constructed area affected by the scenarios T100/CAL>70, T100/CAL=30-70 and PREF. FLOW, reaches maximum values in 2013, almost 14% for this latter, being around 8% for the T100/CAL>70 scenario and 0,3% for the T100/CAL=30-70 scenario, as can be seen in Figure 4.

These results indicate that the constructed areas affected by a return period of 100 years and depth of more than 30 cm are very small in the scope of the municipal term of Els Poblets, being able to study solutions that are integrated in the urban network, making use

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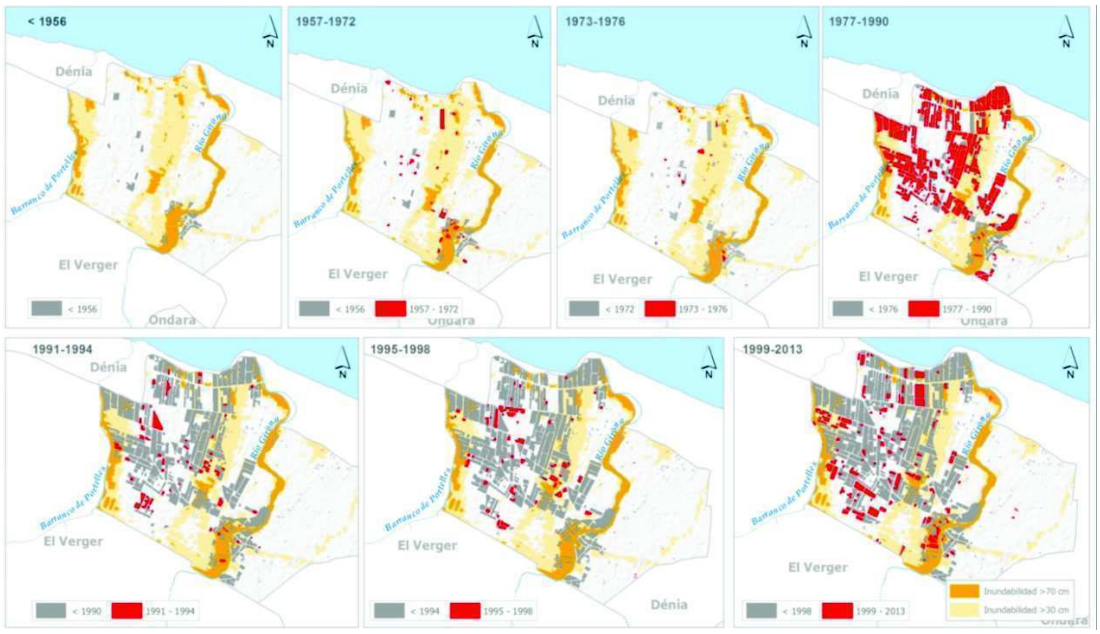

Figure 3.
Urban evolution of the municipality of Els Poblets between 1956 and 2013 and its flooding condition for the 100-year return period (T100). Source: Own elaboration based on the General Direction of the Cadastre and the Hydrographic Confederation of the Júcar.

of the developable or urban soils that have not yet been built. It is noteworthy that of the 83% of the constructed area affected by floods of T100, almost 75% presents depths smaller than 30 cm. This circumstance allows to propose measures of protection of individual character on the constructions, improving the resilience of the same ones.

In the area affected by this research in the municipality of Denia, a behavior similar to that of Els Poblets has been observed, both in terms of the evolution of buildings and the different scenarios considered. The period of greatest growth in buildings was between 1977 and 1990. In this case the percentage of area affected within the basins studied for each of the scenarios is somewhat lower than that of Els Poblets, reaching 8,5% the priority flow, 8,10% the T100/CAL>70 and 0,25% the T100/CAL=30-70. Again, 64% of the surface area affected by the T100 reaches depths of less than 30 cm, being able to apply individual protection measures that increase the resilience of the constructions.

The municipality of El Verger presents a similar behavior to the two previous ones, but with a growth in the constructed surface that begins before, in the year 1972, being a smoother growth than the previous ones, so that in the year 1972, El Verger had built 26% of the surface area of the year 2013, it had reached 56% in 1999, that is to say, for 27 years, 30% of the current constructed area. From 1999 on, there was an accelerated growth until 2009, in which almost 99% of the current constructed area was built, that is to say in ten years the municipality of El Verger has consolidated 43% of the area corresponding to urban constructions. However, the percentage of surface area built on the priority flow flood is less than 5%, practically the same as for the T100>70 scenario, being insignificant for the scenario T100/CAL=30-70.

For the three cases analyzed, the scenario of T500 shows a condition on very high constructed surfaces, being between 81% and 87% of the total constructed area. However, a more detailed analysis would be required for the T100, in order to discretize the depths and, where appropriate, the most appropriate measures.

As for the growth model, Beniarbeig has followed a pattern similar to El Verger, and since 2000 it has increased its growth, concentrating 45% of it between 2000 and 2010. In Beniarbeig, for the T500 scenario, the

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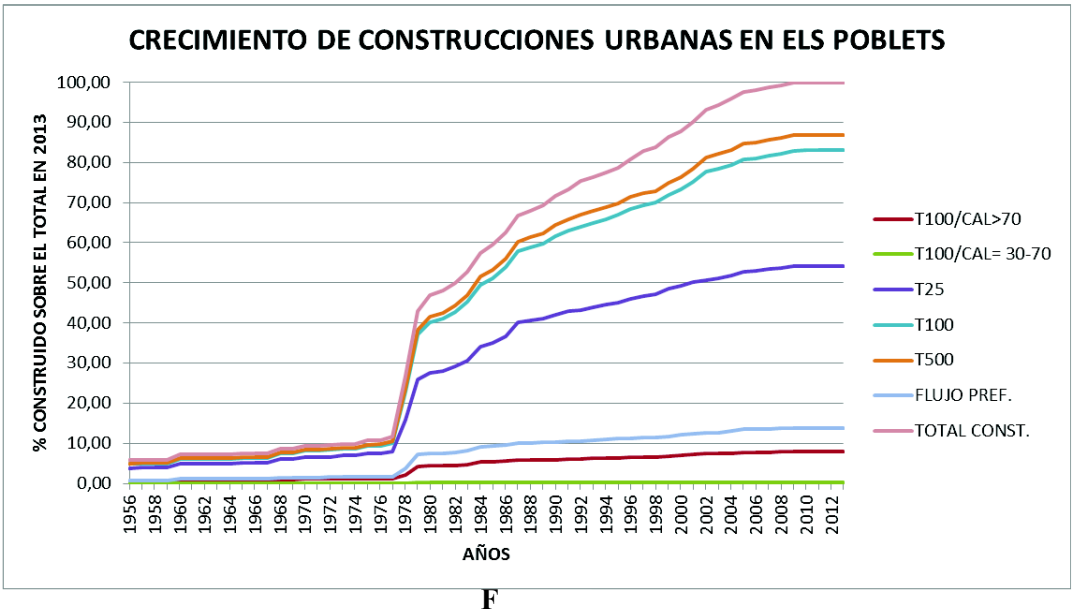

Figure 4.

Evolution of the urban construction area of the municipality of Els Poblets between 1956 and 2013 and its flooding condition for different scenarios Source: Own elaboration based on the General Direction of the Cadastre and the Hydrographic Confederation of the Júcar.

condition on the built surfaces is smaller than in the previous cases, with 17,61% of the total constructed area. However, the constructed areas affected by priority flow are high, of the same order as in the previous municipalities, 7,82%. The rest of buildings are punctually affected, relocation being the best measure, allowing the integration of the riverbeds with the urban environment.

Conclusion

The conditions regarding the production of runoff have improved in the basin analyzed, as the average runoff threshold has been increased as it has been seen, however, the damages currently produced are higher as a consequence of the increase in the risk exposure of people and their property. This situation can be worsened if the forest masses were reduced to the levels of the year 1956.

Analyzed the dynamics in the growth of the urban constructions in the municipalities of the scope of this research affected by some of the flood scenarios defined above, it has been observed that in general, those who have been more dynamic have shown similar patterns increasing the surface of buildings affected by flood. However, the percentage of the constructed area affected by a return period of 100 years and depths of more than 30 cm is sufficiently low in proportion to the total constructed area, which should oblige the competent authorities in the matter of spatial planning and urbanism to study possible solutions related to the urban morphology that integrate the model of occupation that they have developed with the management of the floods.

Likewise, it has been shown that most of the undue occupations on flood areas could have been avoided for return periods of 100 years and depths greater than 30 cm, due to the small area they occupy. Flooded areas with very low depth and medium-low frequency (100-500 years of return period) are more difficult to avoid due to their large extent, particularly in the municipalities located in the alluvial plain such as Els Poblets, Denia and El Verger. However, the adoption of particular measures on buildings and avoid taking flooded soils as those considered in the T100/CAL>70, T100/CAL=30-70 and scenarios FLOW PREF., would have considerably reduced the risks of these municipalities.

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Topological analysis of contemporary morphologies under conflict: The urban transformation of Dobrinja in Sarajevo

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Abstract. *A topological analysis of urban systems under conflict have been carried out for developing new methodology in order to record and intervene in urban areas affected by uncertainty. In the present article the tested method is presented through the analysis of changes in a specific neighborhood in Sarajevo. This method analyses the transformation of urban areas in five consecutive phases: urban form [1], increase of uncertainty [2], application of the apparatus [3], change in urban form [4], information flows [5]. These five phases were applied to different empirical studies, analyzed through specific morphological and topological models. In the light of this method, a selected urban morphology (Dobrinja, a suburb in Sarajevo) has been examined. The urban morphology of the area was dramatically transformed as a consequence of the interethnic conflict. Dobrinja suffered severe modifications, first provoked by the violence of the siege during the Bosnian War (1992-1995), and then by the Inter-Entity Boundary Line as a result of the Dayton Peace Agreement (December 1995), which divided the neighborhood and caused serious alterations in its ethno-demographic and spatial structure. The morphological and topological analyses enabled us to determine the initial causes of these alterations and their spatial consequences in this urban area, during conflict and post-conflict stages.*

Keywords: Sarajevo, Bosnian War, post-conflict planning, uncertainty, topological models, spatial network, divided urban areas, homogenization.

Introduction

As Karl Schlögel exposes in his work Im Raume lesen wir die Zeit (In Space We Read Time), the spatial condition could be crucial for the interpretation of history (Schlögel, 2003). Alterations in space are an expression of time and spatial changes could be indeed accelerated by historical events, especially in form of traumatic episodes. The city is constantly evolving, but in some occasions changes occur abruptly. Reading space is a complex and meaningful work. Urban form and topology should express not only the functionality, but also the social reproduction of space, by tackling the relationship between society and space (Hillier and Hanson, 1984). Regarding this indissoluble relation, a new approach to urban changes has been developed thanks to a conceptual method based on changes in urban areas affected by conflicts. To analytically construct this conceptual method, we have developed a topological analysis in order to record urban evolution by adding its historical, political and social interpretation. The method is presented and applied to an urban area highly affected by uncertainty, violence and fear.

Methodology

In regard to the topological interpretation of space, this research aims to identify urban

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morphologies whose topology becomes increasingly decisive under high uncertainty. This topological approach has been applied to an evolutionary analysis of urban spaces under siege, fear and conflict, which conducted to the construction of a specific method.

The topological analysis is embodied in a conceptual framework, which analytically interprets the evolution of urban systems. This conceptual method analyses the transformation of urban areas in five consecutive phases: urban form [1], increase of uncertainty [2], application of the apparatus [3], change in urban form [4], information flows [5]. These five phases were applied to different empirical studies, analyzed through specific morphological and topological models. In the present article, one urban system is presented comparing phases [1] and [4], in which the change of the urban form and urban topology has been identified. Phases [2] and [3] are included as triggering phases but not developed methodologically. Phase [5] is incorporated as an outcome of the analysis.

To examine the city as a spatial network, we apply graph theory, which enables us to develop a spatial section of a city as a graph. A graph G is a pair of ordered sets (V, A), where the elements of A are two-element subsets of V. The elements of V are called vertices and those of A edges. As we shall see, graphs are diagrams with nodes and lines, where nodes are vertices and lines are edges, connecting the corresponding vertices.

In Figure 1, graph G represents the spatial relationship between road sections, delimited by two blocks. Graph I is an acyclic graph, which represents a building (Figure 1). Graph G' compiles the first network represented in G with the addition of multiple graphs derived from I, which represent possible buildings adjacent to the different road sections. The example of Figure 1 have been reproduced subsequently in a larger scale to analyze complete urban systems, used as a topological representation of urban form.

The particular methodology developed in this research aims to examine evolutionary changes in cities. This method enables us to examine not only variations in urban form, but also alterations in its relational network, in its connectivity and in its adjacency, being key parameters to identify disturbances within the binomial space-society.

The above-mentioned conceptual method and the morphological and topological representations are applied to the system of Dobrinja, a neighborhood in Sarajevo. In Dobrinja, the Bosnian War and its post-conflict condition triggered an unexpected evolution. Thanks to the morphological and topological analysis of this urban system, it has been possible to identify which spatial changes took place since the beginning of uncertainty, and what kind of communication channels have recently been established between both sides of the border.

Uncertainty and change in Dobrinja, Sarajevo 1984 – 2016

In 1984, the Olympic neighbourhood of Dobrinja, consisting of juxtaposed residential

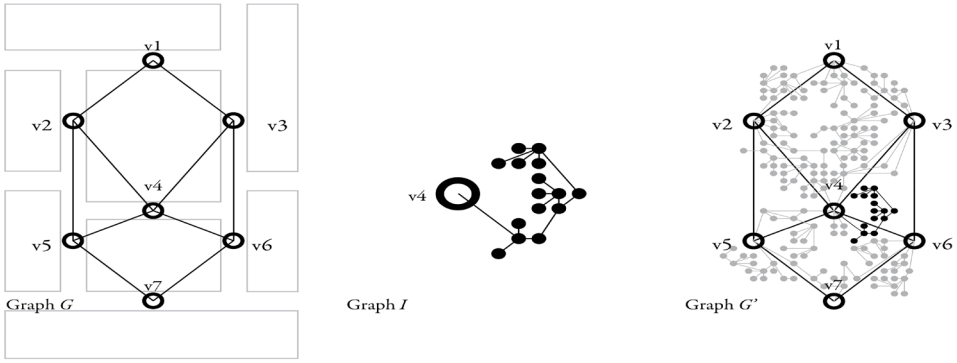

Figure 1. Graph G represents 8 blocks and their relational street network. Graph I is a topological representation of a building. Graph G' is a topological representation of 8 blocks, their adjacent streets and their adjacent buildings. Source: Inés Aquilué, 2012.

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blocks was built in Sarajevo and occupied by young Bosniak, Serbian and Croatian families. In 1992, the war broke out in Bosnia and Herzegovina and Sarajevo was besieged by the army of Republika Srpska. Dobrinja, located in an enclave near the airport (Figure 2), was besieged within the siege. It barely had any connections to the surroundings and its whole perimeter was on the front line. Following the war, Dobrinja was the only urban area in Sarajevo divided by the Inter-Entity Border Line and soon, the construction of a new residential area, known as East Sarajevo –result of the willingness to construct Serbian Sarajevo– began in its south-eastern limit. Since 1992, the neighborhood has undergone serious spatial alterations, initially triggered by the uncertainty provoked by the war. However, new changes took place after the conflict, this time due to spatial segregation caused by building a new area on the basis of ethnic homogenization.

Urban form [Phase 1]: The disconnected construction of the socialist suburb

The residential area of Dobrinja is a suburb placed in the southwest of Sarajevo, in a rural plain in front of the airport. The area (around 110 ha) was developed in low-rise and medium-rise buildings (G+3–8) and divided into five executive phases: Dobrinja I, II, III, IV and V. Two smaller areas of duplex apartment buildings (G+2–3) were also constructed, occupying the area in front of the airport, quadrants C4 and C5. In phases I to V, 9,000 dwellings were built, even though it was foreseen to construct 15,000 dwellings. According to Medić, the architect who designed the plan, the density of Dobrinja was calculated to be 320 people per hectare –or 80 dwellings per hectare– a low-medium density (Medić, 1984).

The type of building in the area was the variation of a similar pattern –except for quadrants C4 and C5– (Figure 3). The linear blocks were formed through the adhesions of the same type of building with a central staircase and four dwellings (80 sqm) per floor. The front façade was separated from the road, leaving a space for the sidewalk, the green belt and the main pedestrian access. Thus, even though the buildings were aligned with the road, a distance in-between was preserved, which partially determined the almost exclusively residential character of Dobrinja. Moreover, ground floors varied depending on their location in the area. Dwellings occupied peripheral sections of the ground floors, whilst in the central areas were reserved for shops, business and studios. In all phases –Dobrinja I to V–, a large part of blocks was designed using this basic type of building. A commercial boulevard with linear basement and direct contact with pedestrian sidewalk was projected in the central area.

The residential area was delimited by three parallel road axes in northwest-southeast direction, slightly rotated in regard to the linear implementation of the city, approximately 45º clockwise (Figure 2). The southern axis defined the limit with the airport, whilst the northern axis bordered the hill of Mojmilo (Figure 3). The rest of the roads within the neighborhood, as well as the tributary of Dobrinja, which was canalized and rectified with a concrete basin and natural banks on each side, were planned regarding those perimeter axes. Both perimeter axes connected Dobrinja with the rest of the city. The location of Dobrinja not only defined the end of the planned city, but its dislocated and outlying position also meant limited connection to Sarajevo. This particular situation would determine its physical role during the Bosnian War, as well as its placement between the military barracks of Lukavica and the airport (Figure 3).

Increase of uncertainty [Phase 2]: The siege of Dobrinja within the Bosnian War

The Siege of Sarajevo initiated as soon as Alija Izetbegović declared the independence of Bosnia and Herzegovina in April 1992, after holding a referendum (Donia, 2006: 277-279). As a reprisal, some paramilitary Bosnian Serb groups took the hills around Sarajevo and besieged the city, cutting communications and services. A double process of survival began: the life under siege of snipers and the lack of every single type of supplies and provisions. The armored aggression immersed the whole

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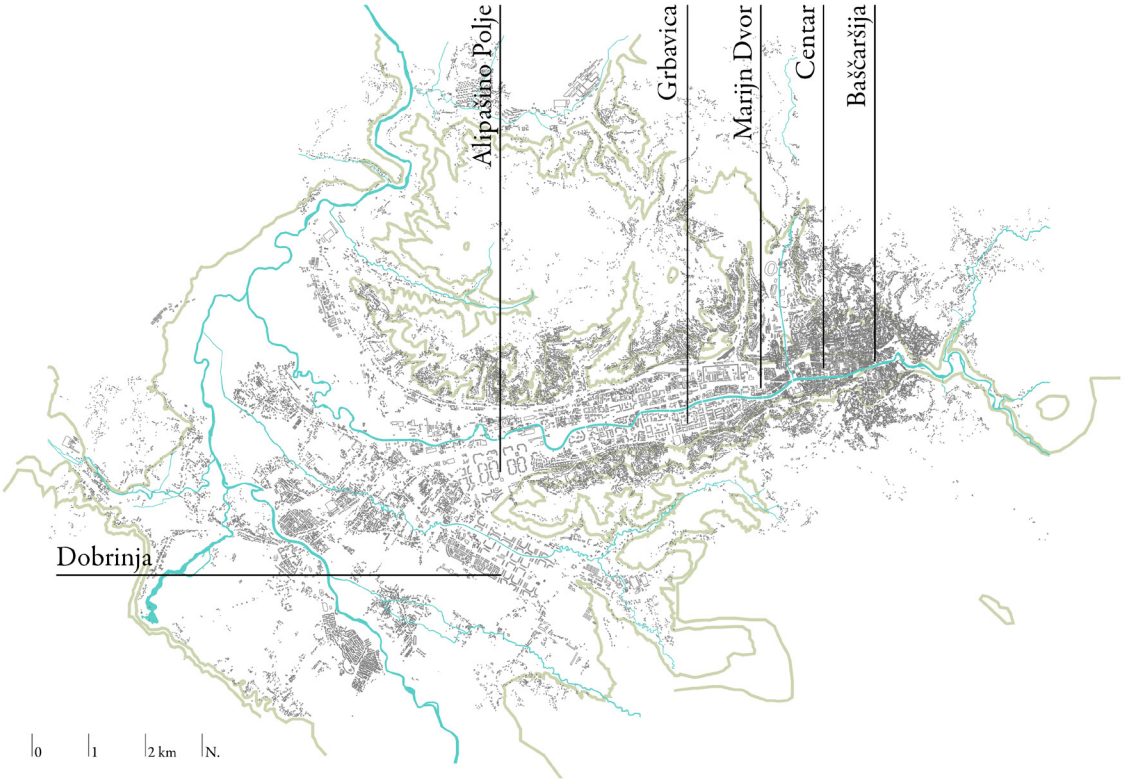

Figure 2. Location of Dobrinja as a suburb of Sarajevo. Source: Inés Aquilué, 2016.

Figure 3. Morphological model of the neighborhood of Dobrinja in 1992, before the war. To the southeast the barracks of Lukavica. Source: Inés Aquilué, 2016.

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city into almost four years of scarcity and violence, where civilians were the regular target of besiegers –mainly composed by the Army of Republika Srpska (Vojska Republike Srpske, hereinafter VRS) and some old members of the Yugoslav People's Army (Jugoslovenska Narodna Armija, hereinafter JNA). The besiegers were under the political imaginary of Radovan Karadžić, an ideal that attempted to eradicate a part of the population in its own territory and to destroy historical ties between the humans and the place.

The emergence of Bosnian Serb troops around the hills created the first interethnic border in the city, which despite some variations along the siege, would maintain the division between the area controlled by the VRS and the area under control of the Army of the Republic of Bosnia and Herzegovina (Armija Republike Bosne i Hercegovine, hereinafter ARBiH), named free zone.

Geographical features of Sarajevo determined the siege. Its condition as a longitudinal city, annexing different neighborhoods within a narrow valley surrounded by hills, facilitated the position of the troops and their view onto civilian targets (Aquilué and Roca, 2014; Aquilué et al., 2014-2015; Ristić, 2011). Besides, the physical location of Dobrinja captured aggressors' attention. The VRS had military interest in Dobrinja (closeness to bases and armament storages, such as Lukavica), territorial interest (closeness to the main airport) and social interest (betweenennes to residential areas occupied by VRS). Therefore, even though the neighborhood was never fully occupied, it was besieged and nearly cut off from the rest of the city, and its boundaries were utterly destroyed –especially quadrant C4, Dobrinja I and IV (Bublin, 2006).

Genocide and urbicide were the double purpose of the siege (Shaw, 2004), both conducted until the built environment, which enabled the heterogeneity required for the reproduction of the social system, was destroyed. It was a strategy not only for eradicating urban citizens but also for redefining Sarajevo's urban structure that once made heterogeneity possible. The strength of the discourse of homogenization, applied as "ethnic cleansing" based on hatred of otherness, grew in the fear of uncertainty. In the discourse on homogenization, there was an intrinsic claim to prioritize ethnicity over territory. Its destruction was a means to an end, in which homogeneity of urban population was equated with physical and symbolic space.

These discourses started at the end of the 1980s, in a process of ethnic securitization, first guided by homogenization discourses and followed by violence based on fear. Bosnian leaders promulgated homogeneity as the condition that would allow individual security. It represented security for a theoretically homogeneous group at the expense of eradicating other heterogeneous groups through fear, uncertainty and anxiety of security threats. The desire for division and physical homogenization remained and altered the space of Dobrinja, once the violent uncertainty decreased and the siege of the city was over.

Application of the apparatus [Phase 3]: Ethnic homogenization and the division of Dobrinja

In November 1995, more than three years after the outbreak of violence, the aggression against Sarajevo began to calm down due to ceasefire negotiations. The peace agreement was signed in Dayton (Ohio, US) by the presidents of the Republic of Bosnia and Herzegovina, Republic of Croatia and of the Federal Republic of Yugoslavia (Serbia and Montenegro) –Alija Izetbegović, Franjo Tuđman and Slobodan Milošević. Besides, in order to put an end to the conflict, the state of Bosnia and Herzegovina was internally divided into two new entities, the Federation of Bosnia and Herzegovina and the Republika Srpska. The political and territorial bases of both entities were included in the General Framework Agreement for Peace in Bosnia and Herzegovina –better known as Dayton Peace Agreement (hereinafter DPA)–, where the boundary between the Republic and the Federation was designated: the Inter-Entity Boundary Line (hereinafter IEBL) (UN 1995, Bose 2002).

In the city of Sarajevo, the IEBL sectioned part of its outskirts, reducing its influence on the suburbs and some of its less populated

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municipalities. On the Federation side, the Canton of Sarajevo replaced the old city of Sarajevo, resulting in the loss of 39% of its territory, whilst in the Republika Srpska the new city of East Sarajevo was created. Analogously to what happened at state level, the area of the old city of Sarajevo –previously made up by 10 municipalities– was divided into two halves, and this division led to an alteration in its regional ethnicity composition. A region formerly composed of three major ethnic groups, was transformed into two administrative regions –the Canton of Sarajevo with Bosniak majority, and East Sarajevo with Serbian majority. This reorganization into ethnically self-enclosed sectors resulted from a process of regrouping of ethnic redoubts who felt insecure. This fear-propelled process had already begun at the outset of the war with the discourses of homogenization.

Dobrinja was the only neighborhood in urban Sarajevo divided by the IEBL. The IEBL was drawn on a 1:600,000 scale map, designed in Dayton and afterwards redrawn to a 1:50,000 scale map, elaborated by the UNPROFOR. In Dobrinja, the drawing of the IEBL did not show enough detail to determine its accurate and valid position. Indeed, an imprecise spatial resolution did not solve the conflict established in 1996 (whether the boundary should coincide with the war front line). Consequently, the Office of the High Representative (hereinafter OHR) –the highest international body in Bosnia-Herzegovina– had to intervene to define the location of the IEBL in Dobrinja. In April 2001, the final line was defined by the Arbitration Award for Dobrinja I and IV, and four buildings (around 370 dwellings) from Dobrinja were ceded to the Republika Srpska (Sheridan, 2001).

Once the Arbitration Award was decreed and the border was drawn, the Republika Srpska determined different territorial schemes to delimit East Sarajevo. New buildings emerged on the area adjacent to Dobrinja and the old military barracks of Lukavica. Its legal construction was possible after a change in planning statements that led to the abrogation of old plans. The application of the apparatus was initiated –in Foucauldian terms (Foucault, 1977)– and new regional planning led to a new urban form, highly determined by the IEBL.

Change in urban form [Phase 4]: The construction of East Sarajevo

The final drawing of the IEBL brought about the set of regional and regulation plans for the new urban center on the east side of the IEBL, bordering Dobrinja. Whilst the modifications of the urban form in the Federation area were practically null, a new building process started on the east side. On the Republika Srpska side, in East Sarajevo, specific urban regulation plans, which could be overwritten if necessary, enabled rapid development of the area. Figure 4 shows the development of the IEBL eastward, on the site of the former military barracks of Lukavica, where blocks of continuous façades and open inner courtyards were built.

Since the adoption of the first urban regulation plan in 2001, it has been estimated that between 2,300 and 2,700 dwellings were built in East Sarajevo. Dwellings previously belonging to Dobrinja (370 dwellings), dwellings in the barracks of Lukavica (around 300 dwellings) and single-family houses built before the war on rural plots (around 40-50 dwellings) should be added to determine the total number of dwellings in the new urban area. According to the morphological model, it is estimated that there were between 3,000 and 3,400 dwellings, with approximately 8,500-9,500 residents in the whole area (200 ha included in the first regulation plan). The ground floors of the new residential streets were partially occupied by services (shops, cafes, restaurants, pharmacies, banks, etc.), and five shopping areas (supermarket type), as well as a cultural center, a library, three primary schools and various sports areas were built or rehabilitated. In the northeast area of East Sarajevo some industrial warehouses denote the transitional state of Lukavica from military-industrial area to urban or residential center. Similarly, the undeveloped rural plots show a transitional appearance from rural to urban environment, since the whole area is still under process of stabilization (Figure 5).

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Figure 4. Morphological model of Dobrinja and Lukavica in 2016. Source: Inés Aquilué, 2016.

The topological model of Dobrinja from 2016 reflects serious changes that affect its eastern border due to the drawing of the IEBL (Figure 6). In Figure 6, the new connections –new public roads and accesses to new buildings– are represented in magenta. In the area of the Federation there is no change in the urban fabric, except for the trolleybus station installed before reaching the border line. The buildings of Dobrinja I and Dobrinja IV ceded to the Republika Srpska have been reconnected with new roads and with buildings constructed on the eastern side (pre-existing vertices n24, x6, n23, v3, n13 and n12). The newly built networks have greater robustness and higher density of public space, as shown by the number of edges incident on new vertices (in magenta). However, the new network is strongly connected in the eastern area, whilst it remains hardly linked to the Federation area. The strongest path between both sides of the IEBL is defined by vertices v2, v3, x8, v5 and x13. As shown in Figure 6, the connectivity network has been altered since the new built areas are all linked within the limits of East Sarajevo in the Republika Srpska.

Information flows [Phase 5]: The future of Dobrinja and East Sarajevo

The ethnic structure in the urban area bordering Dobrinja and Lukavica has been severely affected by the IEBL. The 2013 census –results published in 2016– showed a clear trend towards ethnic homogenization not only of East Sarajevo, but also of the entire Republika Srpska (Agencija za statistiku Bosne i Hercegovine, 2016: 54). This tendency

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Figure 5. Images show the blocks of East Sarajevo built during the first decade of the 2000s. Source: Inés Aquilué, 2014.

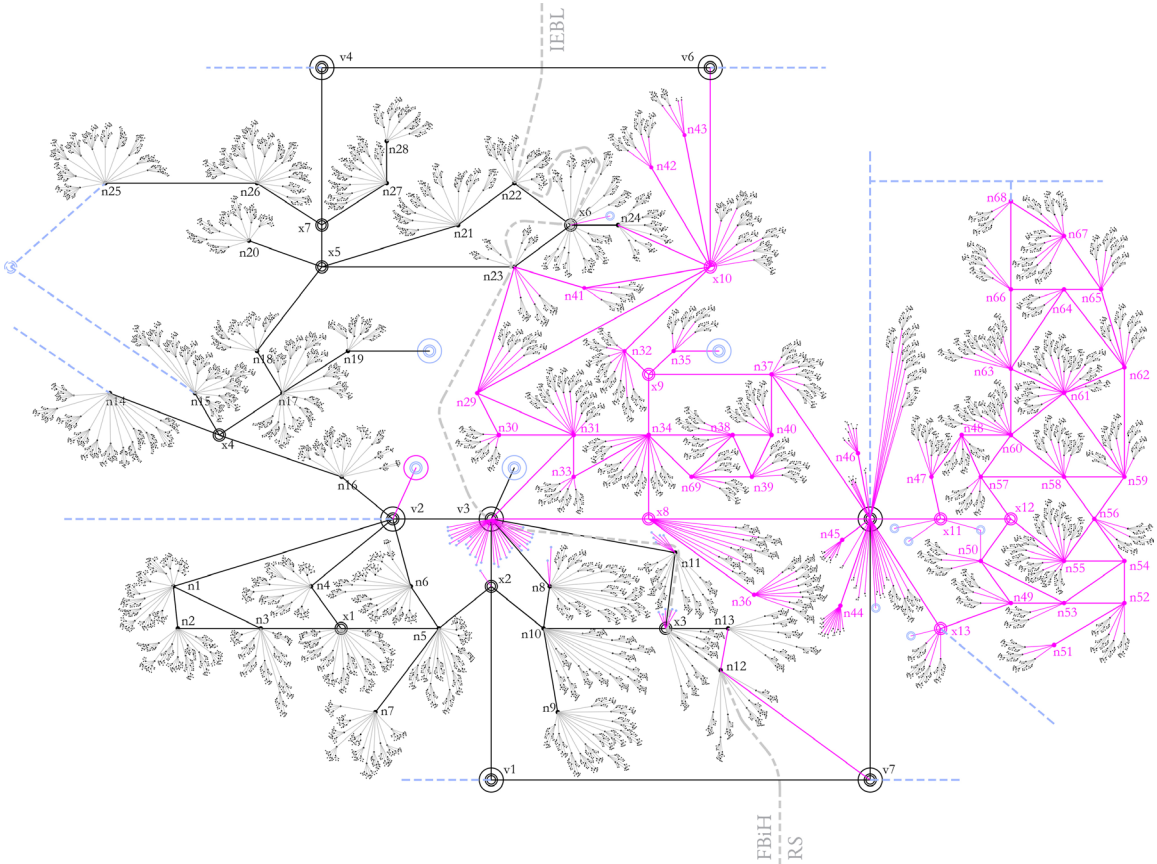

Figure 6. Topological model of eastern blocks of Dobrinja and Lukavica. In black and grey the spatial network before the war, in magenta the new spatial network constructed in East Sarajevo. Source: Inés Aquilué, 2016.

follows the political ideology that guides the government of Republika Srpska and which is moving towards the division of the State of Bosnia-Herzegovina. However, there are still some links between both sides (Figure 6), which are becoming necessary paths of functional exchange.

The future of Dobrinja and Lukavica has been severely altered in recent decades. Security discourses of ethnic homogenization have had consequences in demographic distribution and spatial construction. However, more than twenty years after the end of the Bosnian War, the possible futures of the neighborhood are still uncertain. Despite the political tendency to ratify the division through social simplification and the homogenization of the areas adjacent to Dobrinja, the economic and geographical reality on both sides seems to be more complex. Hence, the absolute disconnection does not seem to be an imminent reality, despite the induced weakness of the common network.

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Conclusion

Changes in Dobrinja have been recorded thanks to morphological and topological models. Besides, variations in urban form and in its spatial network have been historically and politically interpreted using a conceptual method. This analysis has enabled us to elaborate a spatial reading of historical context, on a specific urban area dramatically affected by violence and fear. Broader research showed that this conceptual method and its inherent morphological and topological models are valuable tools for evaluating change in space triggered by uncertainty. Analysis of abrupt changes in cities should be considered as a key for developing a theory on urban resilience, led by a holistic understanding of urban systems (Rogers, 2012). Topological interpretation of space added a layer of relational information that overlaps with spatial and social features. The resilience of cities relies on urban evolution in contexts of distress and space should be included in its dimension.

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Building transformation in Bandung city centre: Expansion of land lot at Pasar Baru area

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Abstract. *City as a man creation is always experiencing transformation from time to time. The city center area, originating from a residence area has turned into a commercial area for trading. This transformation is recognized by the physical building change. This paper will describe building transformation in the Pasar Baru area, which is a conservation area in the city center of Bandung city, Indonesia. Colonialism left dualism of the land status in this area, formal and informal. Formal land is located on the road side shaped as row shop houses whilst the informal land lies behind the shop houses in form of urban kampong. The improvement of business and trading, demands a larger working area so space expansion is needed. The difference of land status and location makes it possible for shop house owners to expand their lot toward the kampong behind. Nowadays old shop houses as conservation buildings are hard to recognize because they have been transformed into new shop house forms. By observing the shape it's expected that the lot expansion was the motivating factor. How did the transformation occur? Can transformation on one land lot give contribution to transformation on the city? It's expected that the occurring transformation should not eliminate the conservation, building and area in the city center and the residential function could still be maintained*

Keywords: Territorial expansion, building transformation, conservation area

Introduction

Almost all major cities in Indonesia were estabilished during the Dutch-colonial era. The Colonial government constructed city centers not far from the existing village or kampong. The increasing of the urban economics cause the villages develop into trading areas with the village market as center. In Bandung city the area mentioned above is Pasar Baru trading area with the market as a center point. At the beginning this area was known by the row shop houses built with various architectural styles i.e. Traditional Sundanese, Chinesee and Indishe (mixed between European and Indonesian style).

At present, the Pasar Baru area become a trade center serving not only Bandung city but also cities surrounding Bandung. The high demand for trade activity space cause there is little habitable space left, thus the shop houses are used only for trading activity during day time and left empty during night time. Function alteration also could be seen on some shop houses that transforms into offices, restaurants and mini markets, which are also unoccupied during night time.

Besides function alteration also occur on building physic. The shop house tends to transform into irregular shapes such as

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flat slim building extend backward, broken shapes or become a larger building then the other building surrounding it. This kind of transformation is identified as an impact of the land lot dimension transformation that enlarge or shrink corresponding to owners that buy or sell their land followed by construction of new building according to new land lot shape.

This paper is going to review the building transformation types caused by land lot dimension and shape change, causative factor and the impact to buildings and the surrounding environment. Will the transformation occurring to these buildings create a new form of the Pasar Baru trade area? Interference from the Local Government is expected to resolve the transformation process considering this area have been set as a cultural heritage in Bandung city. The high number of transformation case is feared to eliminate the remaining cultural heritage building in this area. One way to handle the problem is to directing the transformation by revitalization of the building as one way to preserve the cultural heritage.

Methodology

To review the land lot alteration, accurate field data is required, so grounded research is estimated fit for this paper. A few case studies are chosen and grouped based on land lot dimension change; divided and fused. Besides of that, search of old data from literature such as history books, pictures and earlier research. Some interviews are held to competent sources IE building owners, Local Government and local community to complete needed data. This research is considered qualitative research because there is no mathematics calculation in each case study.

Measurement and Analysis

I.Literature Review

I.1 Territorial Expansion;

In this paper the term of territorial expansion is the expansion of area caused by the expansion of land lots. The expansion of land lots tend to be followed by changes in elements located on it, which is building. This could lead the transformation, as Habraken (1983) state: site can be transformed by the addition, removal or change the position of elements.

I.2 Building Transformation

According to Antoniandes (1990) transformation is a slowly changing process until it reaches its peak. Changes are responses to external and internal influences that direct the changing from known shapes before, through repeatedly reduplicating or doubling the object. Alexander (1987) describes transformation as a slow and unpredictable process with the beginning and end shifting, depending on the influencing factors. The nature is comprehensive and sustainable and has connections with social values in the society. In the presence of various forces, architecture of physical forms, mainly buildings, transform through changes to their shapes. Those changes carry with them significant influences to shaped spaces, through either inner space formations, outer formation or space formations in between.

I.3 Conservation Area

In Bandung city there are 7 area that have been established as conservation area. These area considered worthy of preservation because of its special architectural and historic interest, one of them is China town. China town locate in the city centre of Bandung close to Pasar Baru market; so that many of shop houses at Pasar Baru area have Chinese architectural style.

In the city center there is China town which also conservation area. The location of China town close to Pasar Baru market According to the term conservation area nearly always applies to an area (usually urban or the core of a village) considered worthy of preservation or enhancement because of its special architectural or historic interest.

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II. Pasar Baru area as a case study

II.1 Location

The Pasar Baru area is the oldest commercial area which located at Otto Iskandardinata Street in the city center of Bandung. Otto Iskandardinata Street is a second class street in Bandung. This street cut perpendicular the first street, Asia Afrika and connect the Resident's house (the head of Bandung and the surroundings) in the North with the Tegallega horse racetrack in the South part of Bandung (Figure 1).

II.2 Historical back ground

The Pasar Baru area originated from a kampong. The colonial government implemented grid pattern for this area that was planned to be the city center. So that plantation farms become divided into blocks with various extents and every block was surrounded by 4 streets. Every block consists of outer block, along the streets and inner block inside.

Rapid development of the city encourage change. Slowly but surely the outer part of the block becomes more and more dense by buildings well ordered facing the main street. These buildings follows regulation issued by the Colonial government, as for the ownership of the land lot. Different case happens in the inner block, land is controlled and managed by the indegenous people as customary land and buildings were built without permit and with no rules to follow (Figure 2).

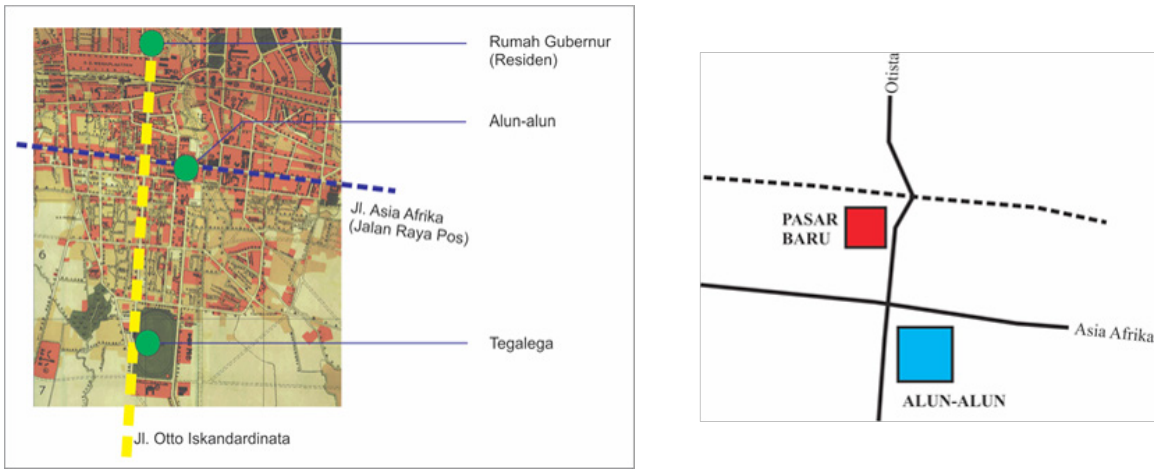

Figure 1. (The location of Pasar Baru area (Processed from Source Voskuil, 1996)

Figure 2. (Grid Pattern at the City Centre and some houses at Otto Iskandardinata Street in year 1882 (Source KITLV-Leiden)

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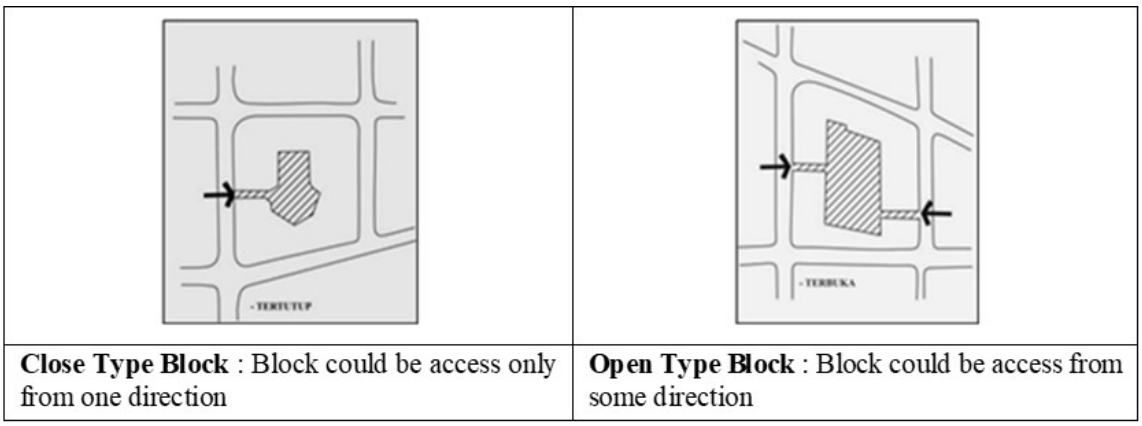
This condition is the cause of the difference of type, material and building style between outer block and inner block buildings as well for the inhabitants. The inner block, settled by indegenous Sundanese scociety whilst the outer block setteled by the mixture of indegenous and newcommer. This difference a lso b rings f orth different architectural shape. There are two block types that differes by the access achievment (Siregar, 1990) which are; close type and open type (Figure 3). The entryway into the block is in the form of alley between rows of buildings of the outer block.

The succses of tea and quinine plantation arround Bandung increases the economic matters to the city and brings impact to the city development. In the year 1906 Bandung was assinged as a municipality (gementee), so the city government have the right to built its own city, then some Building Regulations were issued, one of them were that buildings along the main streets (outer block) should be permanent buildings (Kunto, 1984). This encourages transformation to main street buildings included Otto Iskandardinata street (before; Pasar Baroe weg).

Transformation foremostly is seen in the Pasar Baru trade area, buildings transforms into shop houses, beginning by adding impermanent shop function in the front part. This form is the pioneer of the shop houses along the trade area of Otto Iskandardinata street or Pasar Baru area (Figure 4).

Transformation is also followed by change of land ownership. The skill and precistence of the Chinese people in the trading field, slowly but surely replace the indigenous traders. This is seen by the domination of Chinese shop house in the Pasar Baru area, followed by other buildings along the Otto Iskandardinata street (Figure 4).



Close Type Block : Block could be access only from one direction	**Open Type Block** : Block could be access from some direction

Figure 3. (Type of Block (Processed from Source Siregar, 1990))

Figure 4. (Simple shop-house and some Chinese shop houses at Otto Iskandardinata Street in year 1990's (Source Voskuil, 1996))

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Sundanese Traditional Shop House		• Use non-permanent material, such as wood or woven bamboo for wall • Use Julang ngapak roof style as Sundanese traditional roof style
Modern Shop house	 	• Permanent material • The height of ceiling follow on Dutch house • The style follow on the popular style at that time
Chinese Shop House	 	• Permanent material • There are some Chinese ornament on the building and on the roof • Use Chinese traditional roof style

Figure 5. (Typology of shop houses at Otto Iskandardinata Area (Source Personal Document)

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II.3 Typology of shop house

Observation on site nowadays could still find the remains of old buildings. Some are not intact anymore, some others have changed. From some of the remaining left, the original shape could be recognised. Various factors have changed, one of them is road widening that causes the building's facade changed, the beauty of architectural style disappeared. The other factor is the implementation of arcade system on the pedestrian sidewalk, its causes the front part of the house used as pedestrian, reducing the building area.

From the various architectural styles found, some shop house types along Otto Iskandardinata street (Figure 5).

II.4 Present Condition

II.5 The Transformation

As presented before, buildings in this area have experienced changes several times. Beginning with building material change, function change and building physical change with several causative factors. Those changes occurs only to buildings located alongside the street or outer block.

The inner block in general dont experience significant change. From observation on site nowadays, transformation in the inner block have also accured. Buildings in the inner block transforms following buildings in the outer block so there is no difference between buildings in the inner and the outer block.

Observation to a few cases found two types of transformation, see in table of analysis 2 and 3.

Segment 1 .Stasiun Timur – Asia Afrika Street	Segment 2 Asia Afrika – Kepatihan Street	Segment 3 Kepatihan street – Tegallega

Table 1. Present condition of buildings in Pasar Baru area

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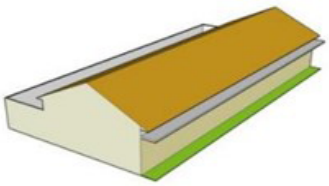
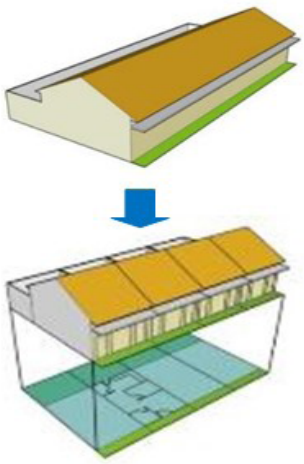
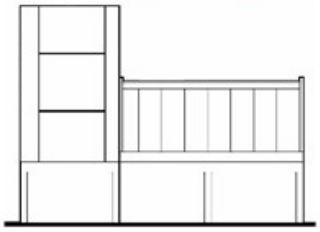
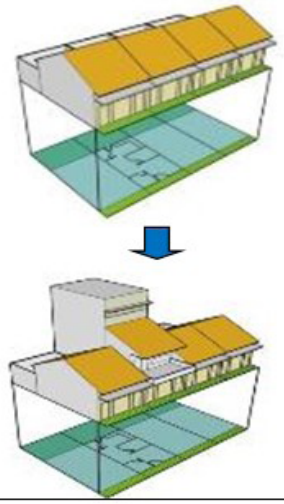
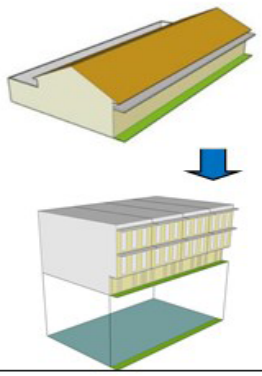
a) Type 1: Fragmentation. There are 3 cases in this type, see in table of analysis 2.

Analysis of type 1:
- Land lot and shop house building divided

Present Condition	Previous Sketch	Analysis
Case 1: land lot divided		
		
Case 2: land lot divided and gradually vertical development		
		
Case 3: re development of shop house		
		

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into several unit, depends on the length of the building.
- Division is occuring crosswise so each unit still have access to the main road.
- In case 1, shop house building do not experience changes. The differences of ownership could be indentified from the differences colour, façade, door and window frame design.
- In case 2, the building is not intact any more, already divided. The differences of ownership could be identified by the development. Some units become vertical shop houses and some leave old face. The initial shape of the building could still be recognized from the remaining roof ornament that at the beginning was located in the middle of the roof and also from the building remains.
- In case 3, the old shop house was destroyed first then built vertically into several units depending on length of the building. This case create new form and style of shop house

These three cases have similarities, building and land lot had divided without expansion land lot. In case 2 and 3 the addition of space occurs vertically by adding floor.

b)Type 2: Amalgamation. There are 2 cases in this type, see in table of analysis 3.

Analysis of type 2:
The building transformation that occurs parallel with the expansion and merger of land lot.
- In case 1, division done, the ownership bought new land lot and merged it. The construction occurs gradually along with the land lot purchase prosess.
- In case 2, merge some land lot and simultaneously development by individual.
- Case 1 and 2 produce irregular buildings, identical to the land lot shape.
- In case 3: Division is done simultaneously or at once after the land purchase prosess is finished. This type of transformation produce new shop house building type which consist several unit to sell or to rent. This type of commercial building most common in the commercial area in some big cities in Indonesia.

These 3 cases have similarities, the expansion of land lot occurs toward the rear (left and or right), to inner block. Inner block is kampong area or urban kampong which land lots belong to the community as customary land. The land have no certificate and called informal land.
At present urban kampong considered potential, so many parties desire to have that location. This can be seen from many cases of land expansion that occured towards to urban kampong, both by individuals (case 2) or developers (case 3) despite the status of informal land.

Analysis:
- The building transformation occurs gradually starting from fragmentation. In many cases fragmentation will follow by vertical development.
- High demand for trading activities encourages amalgamation. Cases of amalgamation generally occur toward the back, to inner block.
- Individual cases of amalgamation will occur gradually over long periods of time and will create irregular form of shop house, identical to the land lot shape.
- Cases of amalgamation by developer will occur simultaneously in the fast period and create regular form of shop house with gigantic size.
- Advance of trading demands more space and since space is limited, generally the residential function is pushed out, the shop house is only used for trading.
- Understanding shop house as one residential and trading building that have experienced changes.
- The possibility of shop house still inhabited is on case 2 type 2 where residential located at the back part, at inner block.
- Both transformation types, fragmentation and amalgamation results one conclusion that the ownership of shop houses have encounter changes.

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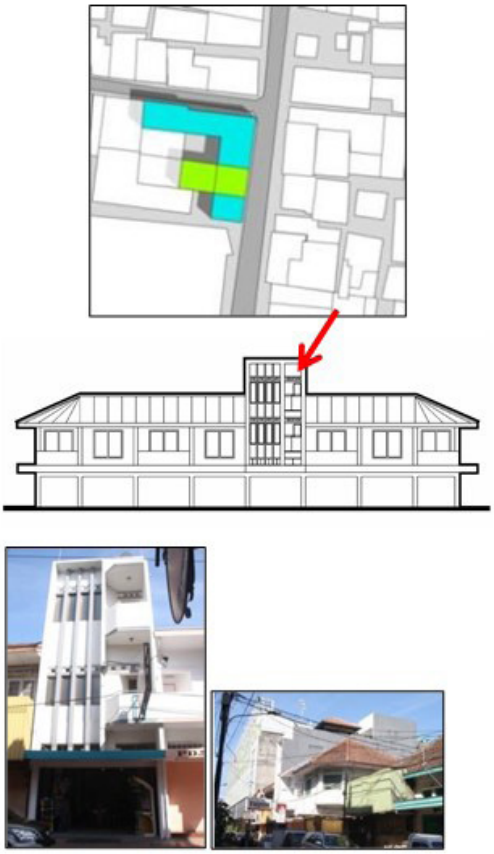
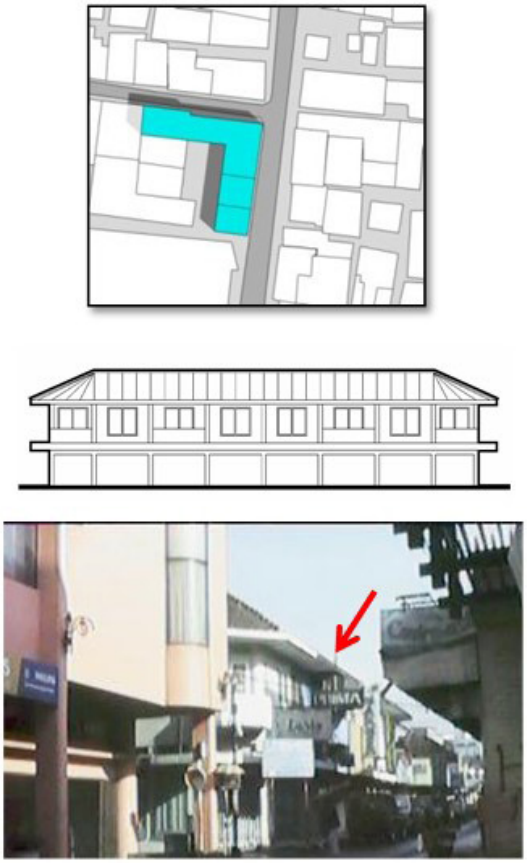
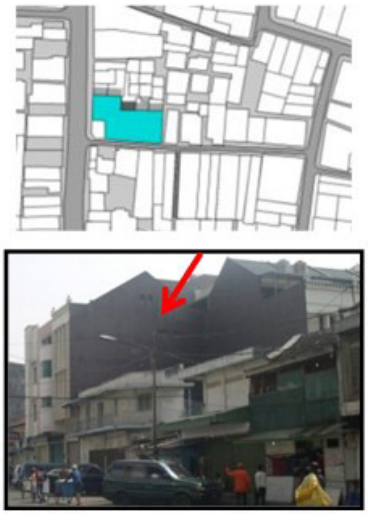
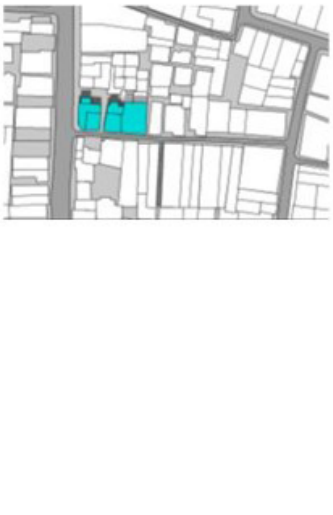
Present Condition	Previous Condition
Case 1: land lot expansion and gradually development	
	
Case 2: land lot expansion, merger and re development by individual	
	

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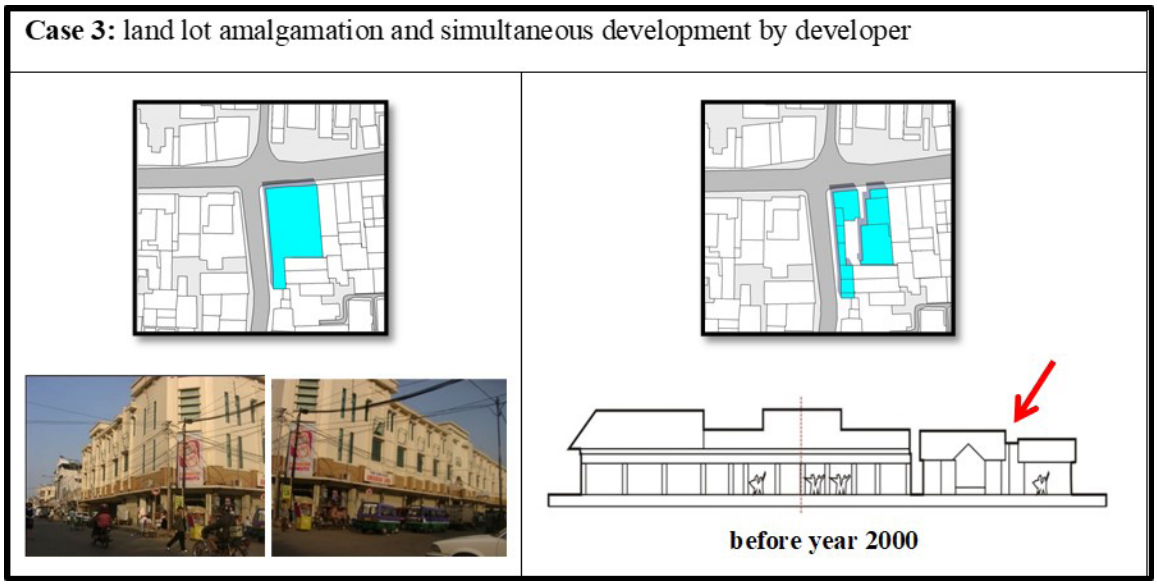

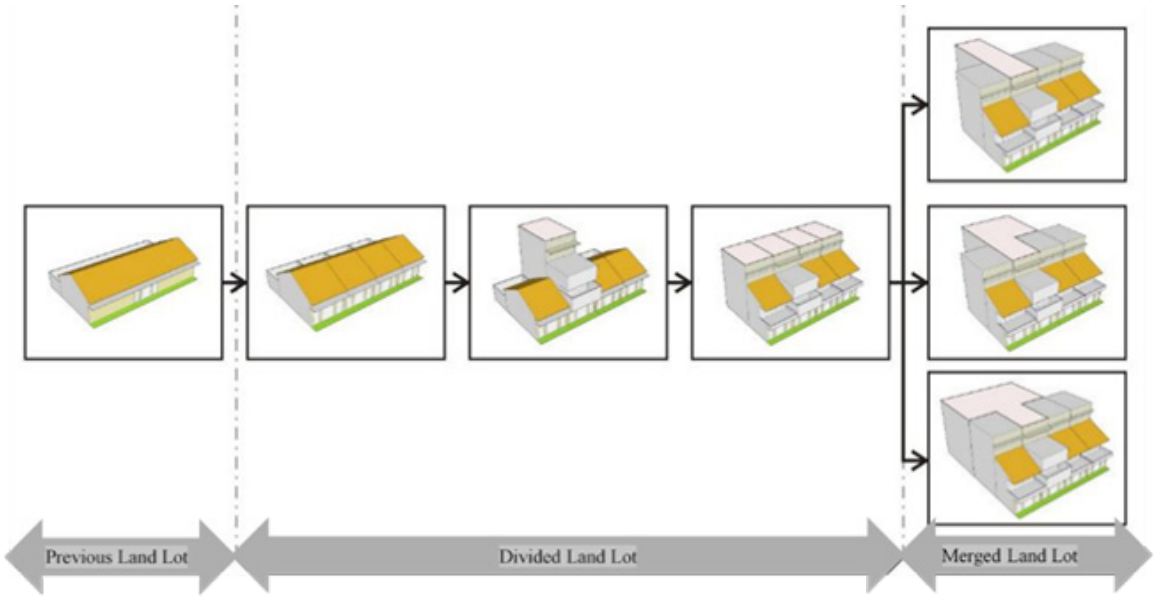

The process of transformation building and site

Conclusion

The change of land lot ownership is believed to be the driving factor of the site transformation, both fragmentation and amalgamation. Expansion of land mainly occurs toward the inner block which will gradually eliminate residential areas in the city center. Similarly, the dominance of trading activities in shop house building also eliminates the residence space.

Both transformation type, fragmentation and amalgamation create new form of shop house, vertical modern replace the traditional one. Many transformation cases in Pasar Baru area changed the character of Pasar Baru, from the row of low-storey into the row of medium-storey shop house. This change is supported by the increasing of technology and the economy of the city.

Change is inevitable but it is expected the transformation that has occurred does not eliminate some old shop houses which

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categories as conservation buildings. Similarly, the existence of the building and residential environment should be maintained so that the city center area still livable.

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Urban form in special geographical conditions: A case study in Kenting National Park

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Abstract. *Since the land surface is heterogeneous, the natural landscape as an essential element in contemporary morphological studies becomes the initial factor in the formation of a settlement. Moreover, the interaction with natural landscape, built form and the boundary matrix can illuminate ecological perspective on the form of the city (Scheer, 2016). To understand the urban form under special geographical conditions, a case study is conducted in Kenting National Park, which is a tropical area with rich landscape such as mountains, lakes and rivers, plains, basins, and surrounded by seas. An analytical approach based on Historico-Geographical approach (Kropf, 2009; Oliveira, 2016) is applied in this paper. Three kinds of plan units (Conzen, 1960) by comparing the combination between streets, buildings and plots: i) Detached, duplex houses on small plots along the access road; ii) Attached buildings on small plots along the main road; iii) Public buildings, Villas, and hotels on large plots along the main road. Finally, the relationship between the morphotopes (Conzen, 1988) and the geographical conditions shows that the homogeneous configuration of plan units corresponds to the certain landscape. On the other hand, this article finds out that the site may directly affect the size and accessibility of settlements. In other words, the special geographical conditions not only determine the formation of urban form but a certain degree of socio-economic context.*

Keywords: Kenting National Park, special geographical conditions, Historico-Geographical approach, morphotope.

Introduction

In many geography theories considers landscape is homogeneous, such as central place theory, the real world's surface is heterogeneous. In response to the neglect of natural landscapes, Michael Hough criticizes urban design without regard to the natural environment. The neglect leads the city to replace mixed forest communities, fields and rivers, destroying the original self-sustaining ecosystem. Therefore, Michael Hough said that urban design must bases on an environmental perspective (Hough, 2004). Also, with the trend of sustainable development, natural landscape has become one of the important factors in contemporary morphological studies. The interaction with natural landscape, built form and the boundary matrix can illuminate ecological perspective on the form of the city (Scheer, 2016). In order to explore the interaction between urban and natural environment, this paper chooses three settlements in Taiwan's Kenting National Park as a case study.

Taiwan Island is shaped by plate movement and has the highest peak in East Asia and complex landscape. Among them, Hengchun Peninsula, the southern part of Taiwan Island, is a collection of diverse landscape. It is at

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the end of the Central Range and adjacent to the Taiwan Strait, the Bashi Channel, and the Pacific Ocean. Hengchun Peninsula has a unique coral reef geology, rich tropical and marine ecological landscape (figure1). The rich geographical condition, however, became natural barriers that limited the settlement development and resulted in the unique development processes to respond to the natural environment. In 1982, Kenting designated as the first national park in Taiwan. Under the protection of the National Park Law, Lots of settlements in was saved. It is the relatively isolated feature makes Kenting a suitable case to find out the impacts and changes caused by special geographical conditions.

Method

According to Kropf (2009), urban form consists of site, social and economic context, function, land utilization, townscape, and development. Among them, the site mainly based on geological, topography, hydrology and other natural physical characteristics of the spatial relationship and distribution. It is of particularly importance under the special geographical conditions of Kenting National Park.

The historico-geographical approach (Town plan analysis) is applied to describe and analyze the physical form and the evolution of settlements in Kenting National Park (Kropf, 2009). Due to the natural landscape constraints, the scale of the settlements in Kenting National Park is small. That's the reason why this paper use morphotope as the basic unit for observing the morphological region. The analysis is first focus on the utilization of buildings, then figure out the plan units of residential or commercial buildings and public use buildings.

With the absence of historical town plans, morphological analysis at a micro scale can be an alternative means of investigation (Chakma et al., 2013). Therefore, the case study is conducted in Syunguangzui, Kenting, and Yongjing. The primary data source is

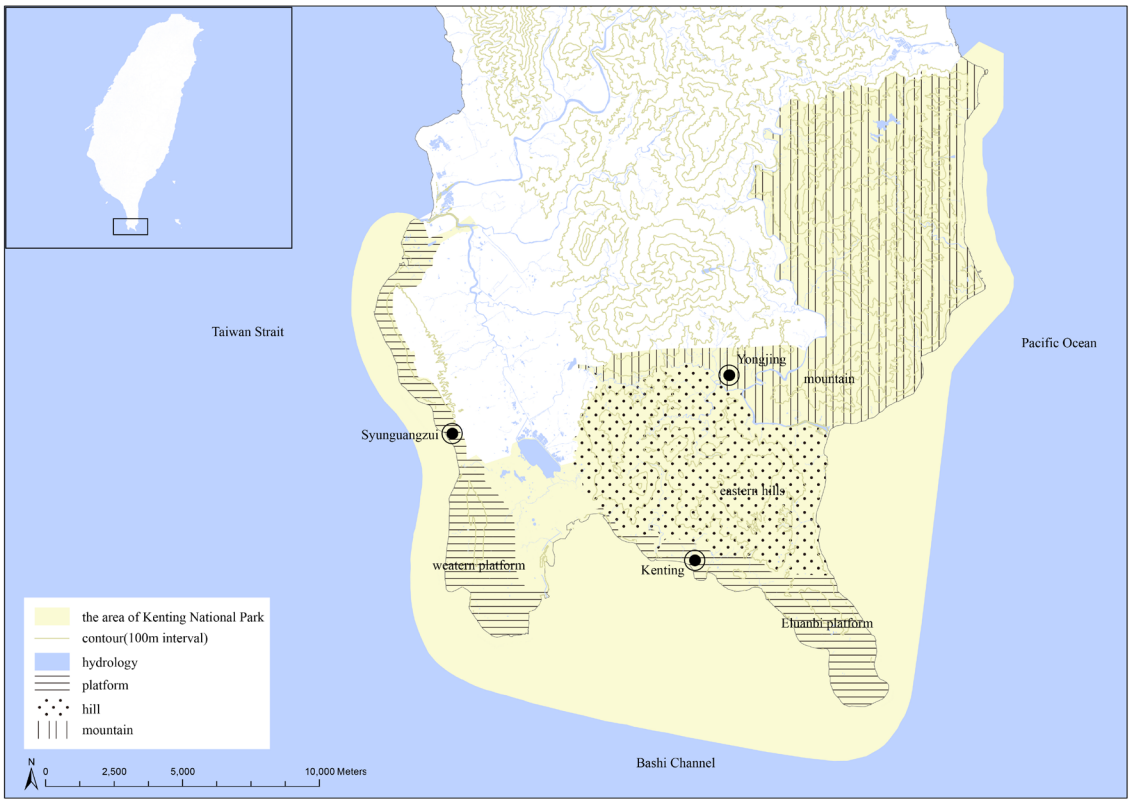

Figure 1. Geographical situation of Kenting National Park (source: National Land Surveying and Mapping Center, Ministry of the Interior, 2012)

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Taiwan Electronic Map. For the 1: 5000-scale digital topographic maps, the map information contains roads, water, administrative, building and so on.

Kenting: a mixture of natural wonders

Kenting National Park is located in the southern part of Taiwan Island; the terrain is high in the East and low in the West. Uplifted coral outcroppings, limestone caves, and isolated peaks are dominant geologic features of Kenting. The terrain in the area can be divided into three part, including the western platform, the Eluanbi platform and the eastern hills and mountains (Figure 1).

The area of Kenting National Park is lack of water resources due to the coral reef geology cannot keep water. Moreover, the river is steep and the rainfall flows directly into the sea. As a result, the distribution of settlements is often related to water resources.

As Kenting National Park is located in the monsoon region, the area in the northeastern monsoon windward surface is the subtropical regional characteristics; leeward side is a tropical area. The northeastern monsoon prevailing from October to March of each year will produce “foehn” over the mountains. Interestingly, the impact of foehn is also reflected in the physical form. In the past, most of the buildings are thatched cottages. To avoid the roof blew off by the foehn, residents put stones on the roof of thatch cottages. Even if the brick building structure is stronger, it still needs to strengthen the roof reinforcement measures. As reinforced concrete structures with better resistance to the wind, reinforced concrete buildings are becoming more and more popular. Thus accelerate the speed of replacement of traditional buildings.

The historical context of Kenting

Before the middle of the seventeenth century, the principal activities of Aborigines were

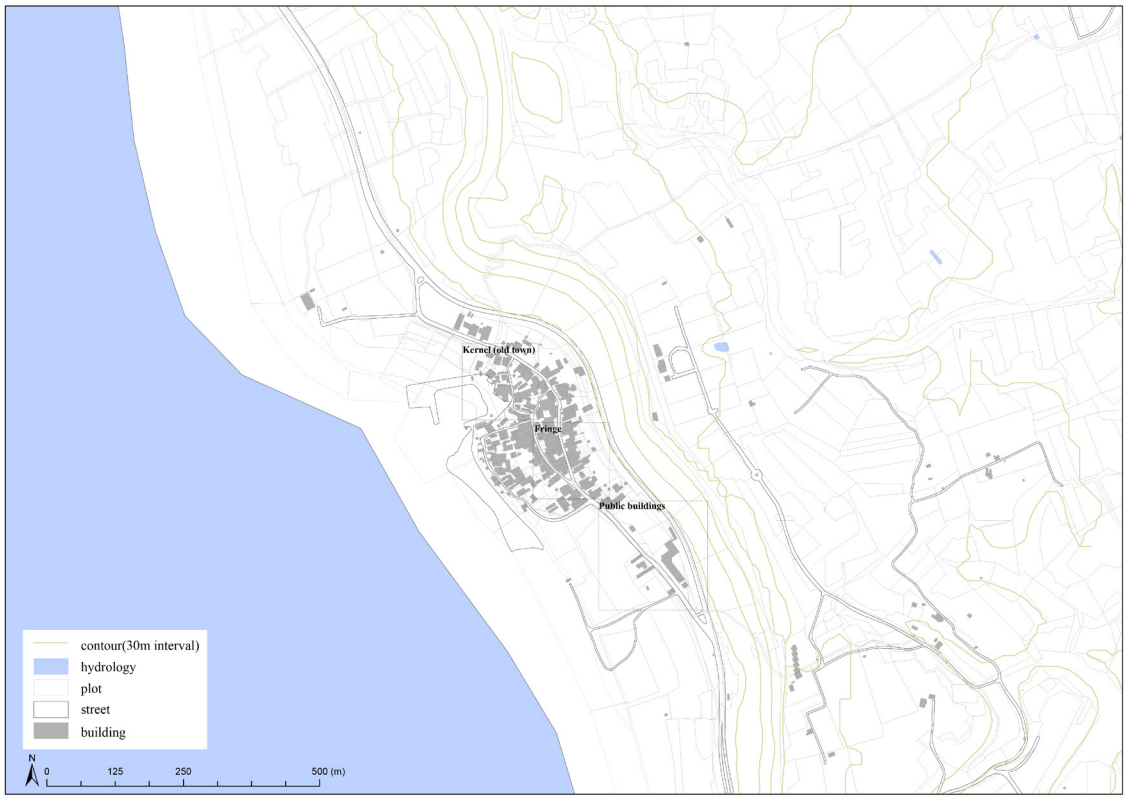

Figure 2. Plan of Syunguangzui in western platform area(source: National Land Surveying and Mapping Center, Ministry of the Interior, 2012)

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in the eastern hills and mountains area. The settlement of the Han people can be traced back to 1661, reclamation from the western platform, plain area, and gradually eastward development.

However, under the constraints of terrain, the impact of traffic on the development of settlements is the most significant, whether it is indigenous tribe or Han Chinese settlement.

Synchronic comparison between Syunguangzui, Kenting, and Yongjing

Syunguangzui, Kenting, and Yongjing are the larger settlements in the three special terrain areas of the Kenting National Park. Although they are located in different natural landscapes, they have similar morphotopes. The following will be a brief description of the site, social and economic context, and the spatial structure of the three settlements.

Syunguangzui

Syunguangzui is located in a natural harbor beneath the western platform. The east side of the settlement is close to a cliff, the west side is close to the Taiwan Strait. The buildings are concentrated on both sides of the access road connecting the main road (Figure 2).

Shanhai Fishery Harbor is the oldest fishing port in Hengchun Peninsula. Since the sea is the most important local traffic before the land transport opened, there was a way build in 1984 to link Hengchun City and the harbor (Chen and Tu, 1983). The junction of the road and the port was the core of the settlement, and now can still see the layout of detached houses scattered. In the past, the fishery was the primary industry. In recent years, since the flourish of sightseeing activities, residents were engaged in Snorkeling, bed and breakfast and other related activities.

There are three main types of plan units in Syunguangzui (Figure 5). First of all, the core area, which is also the center of religion, close

Figure 3. Plan of Kenting in Eluanbi platform area(source: National Land Surveying and Mapping Center, Ministry of the Interior, 2012)

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to the Shanhai Fishery Harbor. The plan unit is mostly detached, duplex houses on small plots along the access road. Second, the fringe of the settlement, which is on the southeast side of the core, develops along the main road. The plan unit is attached buildings for residential use on small plots along the main road. Besides, there is an elementary school outside the settlement. As the need for a larger plot, the public building distributed on the edge of the settlement. Because of the terrain barrier, the settlements are far apart, therefore schools are small but densely distributed.

Kenting

Kenting is located in the area of Eluanbi platform. The coastline segment of Kenting National Park offers the finest water-based recreation in Taiwan. The coral reefs, protected beaches and blue waters between Maopitou and Oluanpi allow for swimming, sailing, sport finishing, sunbathing, snorkeling and scuba diving. As the terrain of Kenting has relatively flat, larger hinterland, and close to the main road, it is the largest settlement among the three settlements chosen as the case (Figure 3).

Reclamation in the region dates back to 1877. In 1895, after Taiwan ceded to Japan, Japan brought new local economic sources. In 1905, because the foehn help clear the bacteria, the Japanese government set up "Kenting Ranch" in Kenting. Establishing the dependence between Kenting Ranch and Kenting people for more than 100 years. In 1986, Kenting was reported as the best place to watch Halley comet in Taiwan. Since then, the Kenting beach area has started to change from Primary industrial sectors to Tertiary industrial sectors. This attracts the emergence of bed and breakfast and the the hotel.

There are four kinds of plan units in Kenting (Figure 5). First, the old town on the west side of the ranch is the earliest development of the location of Kenting. The combination between streets, buildings and plots is detached, duplex houses on small plots along the access

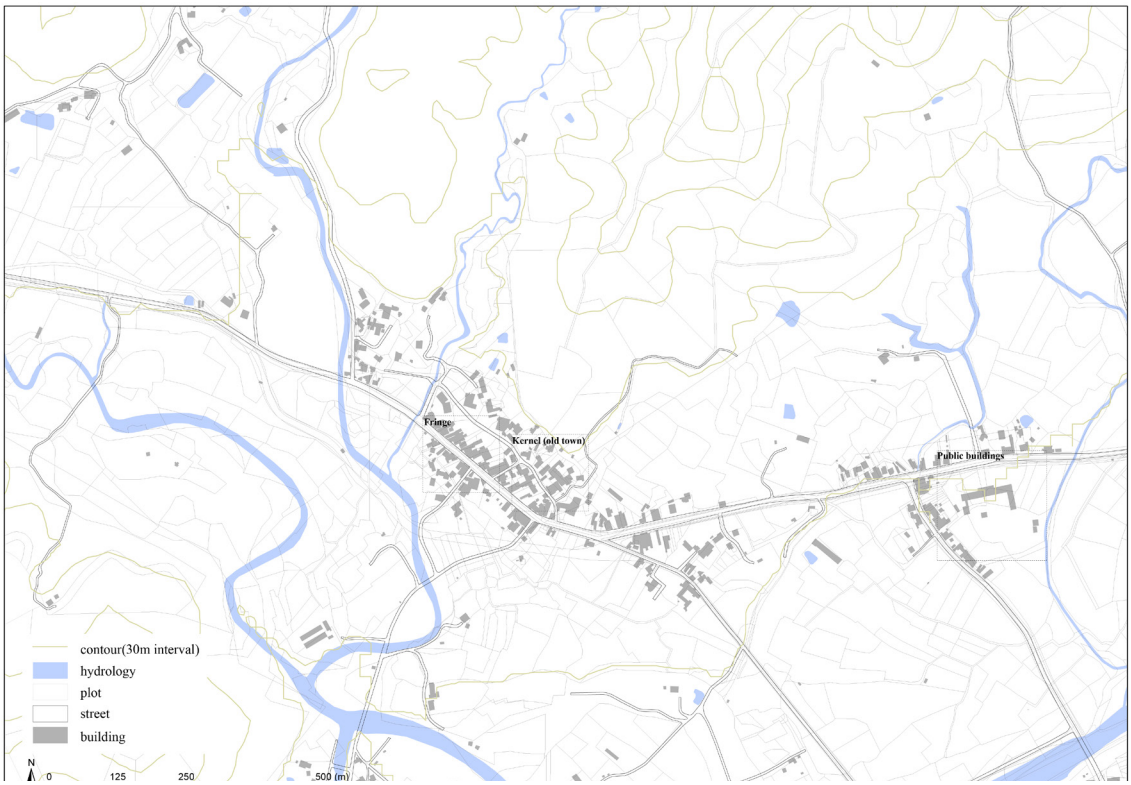

Figure 4. Plan of Yongjing in eastern hills and mountain area(source: National Land Surveying and Mapping Center, Ministry of the Interior, 2012).

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road. However, due to the rise of the tourism industry, the area near the main road appears replacement for attached buildings to replace detached, duplex houses. The second plan unit is the attached buildings for commercial use on small plots along the main road. The place is also the current development focus area. Third, there is an elementary school on the edge of the settlement, because the site of the settlement can provide enough land. Finally, due to the development of the tourism industry, the outermost side of the Kenting settlement is made up of large hotels that have developed along the main road.

Yongjing

Yongjing is located in the eastern hills and mountains area of Kenting National Park. Yongjing east facing the Pacific Ocean, north side close to the mountains, south of the river flow (Figure 4). Residents are dominated by aborigines, and agriculture is the main industry.

Yongjing's plan units can be divided into three kinds (Figure 5). First, the eastern side of the settlement is the development of the core area. The combination between streets, buildings and plots is detached, duplex houses for residential use on small plots along the access road. Second, along the main road to the development of the fringe. The plan unit

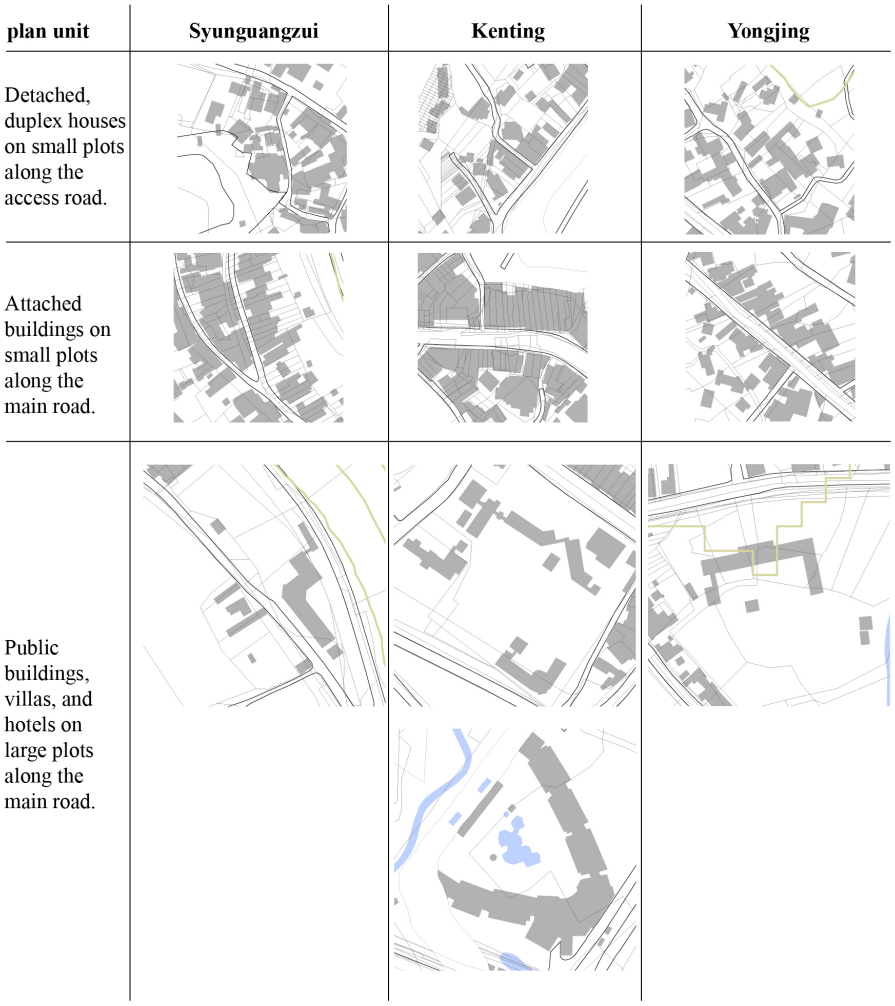

Figure 5. The plan units of Syunguangzui, Kenting and Yongjing

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is mostly attached buildings on small plots along the main road. Finally, the distribution of public building is on the eastern side of the other settlement with an elementary school.

Conclusion

In summary, the three settlements in common are all limited by terrain. According to the hinterland size is followed by Kenting, Yongjing and Syunguangzui. Thus we can see the site may affect the size of the settlement. Compare with the accessibility, only Kenting links to the main road where you can contact other counties. As a result, the site affects the size and accessibility of these settlements, and these differences would make a difference in the development process. In other words, the closer to the main road of the settlement, the higher possibility of change. For example, Kenting in the past to agriculture for a living, now Kenting Street has become the main purpose for tourists who come to Kenting National Park.

Also, the settlement is limited by the size of the settlement and the development of hinterland, to obtain enough building base to build large facilities, public facilities are mostly located on the edge of the settlement, the distribution of large hotels show the similar way in site choice.

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Plastic City/Elastic City. A critical interpretation of urban transformations

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Abstract. *Globalization phenomenon caused effects that profoundly reduced the variety of reality, involving cultural, social and economic diversities, once recognizable and also identifiable through the study of architecture as a collective product of a civil community. In this context, architecture, as built and anthropic reality, suffered the shots of a revolution that has produced osmosis, hybridization, contamination, both diatopic that diachronic, now became synchronic and syntopic phenomena. Actually, you can find/ read common characters in the substrate, first typological then material, which, if critically interpreted, could indicate a possible and alternative way out of this apparent chaotic condition. In my opinion, following the consolidated basis of a theoretical and cultural heritage that has provided tools for critical reading of urban transformations, it is possible to distinguish two types of processes, usually traceable in cities. In order to rich this goal, I used the tools of the mechanical building discipline that identify: 'elastic' and 'plastic' transformations. The 'elastic' transformation produces 'elastic cities' because, at the end of the sustained stresses, the final configuration not change, instead the 'plastic' one produces 'plastic cities' when, at the end of the sustained stresses, the final configuration is not coincided with the initial one. These considerations / critical notes are the beginning of a research that, in my opinion, could offer inedited developments, both in the recognition of an unusual history of architecture, closer to his material essence, either as design and project tools, coherent with new consolidated environments.*

Keywords: Globalization, cultural area, plastic/elastic transformations, urban fabrics.

Introduction

Talking about globalization without being able to contain the problem within certain limits is almost impossible. Synthetically, it is an overcoming process of ideals limits and boundaries and a homologation process of influences and consequences that affects various aspects of society at the cultural, economic, political, and technological level. It began to talk about globalization in the 90s of the twentieth century, when market liberalization overthrew the active weight of state systems for private-financial systems in the global society: this process began after the Second War Worldwide and asymptotically increased with the development of global communications technologies.

Before globalization, as we know it, would endanger this phenomenon, it was possible to import, transport, relocate forms and architectures from other distant countries. Recent news on finding Roman coins, discovered in archaeological excavations in far China, brought there by Chinese merchants, suggests the idea of a relatively globalized world already in ancient times even though there are no evidence that directly involved in architecture.

Then travels, especially linked to war

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experiences, were the first tools to transport and relocate distant, interpreted and rewritten forms and architectures. The experience of Emperor Hadrian, who in his great Villa made the reproduction, interpreted, partial and resized, of all the architectures he had to visit during his travels. And even before, when the ancient Greeks had reached the coasts of Sicily, Apulia and Calabria, they had brought with them the same forms that they built the temples of the Motherland, in larger proportions.

Of course, the influence that such import actions had on the known world is relatively small compared to today's globalized world where architectural forms and big cities have almost completely missed the connotations that distinguish them from each other. The world was not yet globalized as we mean it today, but in these attempts of 'transplantation' one could find the same phenomenon: Adriano wanted in his Villa images of his travels took in Roman provinces, condensed and built in architectures reproducing their shapes; The Greeks built temples in the Magna Grecia territories greater and mightier to affirm their relationship with the symbol of their faith in an extraneous and unknown context.

After the discovery of the Americas and, in general, with numerous explorative geographic journeys the colonization process began to contribute to the exportation of architecture, styles and ways of founding new cities.
More recently, the eclectic spirit, which contributed to consolidating the concept of copy and transplantation, shared the phenomenon globally: we could refer, for example, at the integral reproduction of the Parthenon in the city of Nashville in 1897.

During the early twentieth century, the International Style was promoting and enforcing an attempt to enforce rules for the diffusion of the new architecture, called 'modern': this attempt works, enforces and circulates globally thanks to rapid technological developments related to mass media, communication tools, faster dissemination press and a new important tool, that is photography: it always contributes more and more to the diffusion of architectural images. This is a fundamental topic for understanding the current globalizing phenomenon: it is the domain of the 'icon', of the 'logo', symbol in architecture that is now a commercial vehicle and an economic mechanism.

Global trade malls, theme parks, and finally, those unique buildings designed by so-called 'archistars', become commercial-economic operations, which, on one hand, produce a positive result, for example, in the transformation of degraded urban areas; on the other, trigger a slow and inexorable diabolical process of detachment from the deep meaning that stays inside architecture: the close bond with human being who produces and uses it.
This bond has remote origins and concerns the way to transform the reality in which man lives. Reality that is made of matter, of which the ability to transform into building material must be recognized. The construction material will be increasingly elaborated and become a completed element and component that, by aggregating it, will form the architectural organism. This process of transformation of matter has allowed the codification of two worlds with common general characteristics 'readable' in architectures (and urban fabrics as we try to demonstrate in this fragmentary notes): a 'masonry-plastic' world whose characters are linked to the transformation of the stone material; a 'wooden-elastic' world, whose characters are related to the transformation of woody material.

It is relatively easy to recognize and distinguish, even in this current complex global context in which we live in, masonry architectures and wooden architectures and the cultural area in which they have been developed and built too. This has been proven by numerous scientific studies and constitutes a process that links the formation and transformation of architecture and city to the specific site, and thus to the matter, in which they were built. The stratification and consolidation of constructive habits have been inherited and transcribed in architecture. The city, which is material and social aggregation, on a larger scale, resembles their common features of architecture.

In the field of architecture, globalization phenomenon caused effects that profoundly reduced the variety of reality, involving cultural, social and economic diversities, once

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recognizable and also identifiable through the study of architecture as a collective product of a civil community.

Architecture, as built and anthropic reality, suffered the shots of a revolution that has produced osmosis, hybridisation, contamination, both diatopic that diachronic, now became synchronic and syntopic phenomena.

Actually, you can find/read common characters in the substrate, first typological and then material which, if critically interpreted, could indicate a possible and alternative way out of this apparent and chaotic condition.

In my opinion, following the consolidated base of a theoretical and cultural heritage that has provided tools for a critical reading of urban transformations, it is possible to distinguish two types of processes, usually traceable in cities.

In order to rich this goal, I used the tools of the mechanical building discipline that identify: 'elastic' and 'plastic' transformations. The 'elastic' transformation produces 'elastic cities' because, at the end of the sustained stresses, the final configuration not change, instead the 'plastic' one produces 'plastic cities' when, at the end of the sustained stresses, the final configuration is not coincided with the initial one.

These considerations/critical notes are the beginning of a research that, in my opinion, could offer inedited developments, both in the recognition of an unusual history of architecture, closer to his material essence, either as design and project tools, coherent with new consolidated environments.

Plastic City

The latest systematization of the typo-morphological discipline plastically reorganizes the existing theoretical heritage and prepares itself to the possibility of a coherent and continuous update, favored by many open questions as small crevices of a ductile and resistant structure, as components that are reinforced/completed with new, complementary and coherent theoretical structures, obtaining other new units in preparation. Considerations which have been stratified until now ideally found an adherent graft just in these crevices and claim fit into the ongoing process of theoretical elaboration that, for each 'fusion', proposes a new coherent, albeit partial, result. It would, that is, examine in depth the sense of the future/possible 'Plastic City', advocated at the conclusion of reflections on the evolving masonry-plastic world.

The characters of the 'masonry-plastic' world derive from the transformation of the matter available in large quantities in areas such as the Mediterranean basin. Man recognizes in stone those properties that make it usable and exploitable in the construction: he encounters pieces of such dimensions and organizes them in a way they could stack themselves on, one on another, and form, for example, typical dry stones walls defining private property land. As the piece of stone is excavated and worked, it joins in increasingly complex constructions in which each piece assumes a particular role and a particular form, making it unique and identifiable in the architectural organism. Constructions that derive from this 'plastic' process take on a massive, organic, heavy character.

'Plastic' city consists of a smaller scale elements that work together spatially and constructively to the organic unity of urban composition. Collaboration between parts is necessary because the system of elements shares the same goal: the life of the city itself. Those transformations, that urban organisms undergo in a continuous way, are finally called 'plastic' because, when stabilize the temporary balance achieved, they present new unitary configurations that include and merge the existing reality with the new proportioned one. Plastic city is, for those reasons, organic and resilient: routes, paths, buildings, fabrics not only blend them together, including and obtaining new forms, coherent and anthropically measured, but are ready to adjust their spatial structure in response to violent external attacks represented by exceptional events to which they oppose resistance, even constructive.

A 'plastic' city presents organic, spatial, constructive, and finally aesthetic characters

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related to linguistic expression of logical relationships between constructive elements, making it visible and then exteriorly readable. Architectural expression is the last degree, concise and intelligible, of a process, the typological process that accumulates costumes and actions that always repeat, encoding them in language and shares them spontaneously in the community of a social and cultural neighborhood.

A 'plastic' process, which physically involves matter in its arranging and organizing phenomenon, even more complex, through man critical actions: the measure of a brick has remained the same since its first definition as the only one to adhere to the hand size that would have had to take, lift and place, composing the wall.

Architectural language is coded from repeated constructive costumes that become common rules, unwritten but present in the spirit of human kind of each era: the construction of a wall included, when it reached a certain height, the 'beating' of the setting-up plan for the opening of windows; in Roman area it was common to setting-up a subfloor done with a different material, usually composed of two rows of regular bricks that established a material discontinuity in the vertical plan of the wall over the other resistant material, for instance the Roman tuff.

In Rome, for example, a long building tradition, one would say, that is interesting for its 'plastic' ability to turn itself into rules/language, to adhere to the materic/constructive significance and express, ultimately, the aesthetic attitude of each individual builder: these rows, internal to the own construction and belonging, one could say, to the technical/construction discipline, turned into recognizable elements, such as the 'marcadavanzale' (possibly translated with 'windowsill stringcourse') that is a horizontal element realized with travertine bands that together express and plasticize the process of assimilation and codification of primitive constructive actions that were its 'spiritual' and unconscious legacy.

The contemporary 'plastic' city coincides with its central core that continues to change with 'plastic' transformation processes involving pre-existing tissues, obtaining a new configuration in continuity with the originating formative process; they are, for example, all those compact peripheries, made up of compact fabrics that resist to the sprawl phenomenon. In this case, the aggregation of several in-line residential units does not occur by physically sharing perimeter walls, as it was a few decades ago, but we could individuate some solidarity between buildings that continue to place side by side and form closed enclosures. On a larger scale, the compact city is still structured on the ancient territorial connection routes that, despite the strong pressure of an 'elastic' way of planning that destroyed the solidarity of built urban fabrics, continue to be important arteries, often converging in the urban pole of the oldest and most vital core of the city.

Elastic City

The 'elastic' city is formed in places where the matter, available in large quantities, is wood. In Europe we could trace those cultural areas where this process took place that are in the Center and Nordic countries where there is a massive amount of woods. In such areas man has had to recognize in the woody matter the aptitude to be transformed into building material: first, recognizing its intrinsic 'elasticity' potential, that is, the property for which wood can be, for example, bent and not broken up to a certain amount of load.

For this reason, the first huts had to resemble those represented and suggested by Violett-le-Duc: trunks of trees, bent and knotted in the higher part. This represented the supporting structure of the hut, but not its closing space system. This was followed by the placement of a dense foliage supported by the underlying elastic structure. This way of defining space will persist for a long time and will come, critically interpreted and innovated, to this day. Due to needs of space inside the hut, which is objectively difficult to handle for the formation of unused corners, it is built a wall, that can regularize and orthogonalize the space, load-bearing the foliage cover: this process assumes a special exploitation of the wood material that comes most elaborated,

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standardizing and unifying, in a way, the shape of the single element. The element, no longer 'met' fortuitously but 'searched' and selected for its size and structural capabilities, is now compounded in an increasingly complex structure, where it is necessary to close the space at a later time.

Typical half-timbered houses -you could see, for example, the typical German 'Fachwerkhäuser'-, spread in high-availability woody areas, are a clear example of this approach: the wood structure remains visible and it is therefore possible to distinguish it from the filling material of the closures which is, in turn, left exposed or plastered and painted. This approach consolidates itself and becomes typical: first you build the structure and then you close the spaces inside it. A common feature that 'unites' these buildings is the seriality of those elements: beams and pillars, long-limbed elements with a predominant dimension to the other two, when aggregated, form structures where the knot is often determined by overlapping them and junctions, more or less complex.

This gives the typical 'serial' character related to the opportunity, ideal rather than directly practical, to eliminate one of these linear elements without causing distortions in the overall configuration of the building. In my opinion, we can find this character, on a larger scale, in 'elastic' cities: buildings approach each other without sharing load-bearing structures, as instead in the case of the masonry-plastic area where load-bearing walls are physically shared with two or more buildings. This is evidenced by the persistent presence of the pitched roof with the top line orthogonal to the path, obtaining the 'individuation' of the building in its autonomy, within the urban fabric of which it is a recognizable component. The formative process of the medieval urban tissues of the Center and Northern Europe, when not derived from a previous Roman layout, generally follows the same phases identified in other contexts of the same period: basic building construction is set on the main route that generally converge in a pole, in the most important point of the urban settlement that is almost always represented by the religious building of the church and the civil building; in a second phase, secondary routes appear with the basic building that is set on these; finally, appearing connecting routes and, in some cases, break-through routes.

But the 'serial' character of buildings, thanks to an impressive technological development, will lead to the definition of the modern city which, in my opinion, represents the peak of the process and condenses all the intentional characters of the 'elastic' city. The new modern city, in fact, losing the minimum cohesion of traditional compact urban tissues, eliminates any possibility of structural sharing of buildings, that become isolated elements placed at certain distances from each other.

Thus, we have peripheries in which sprawl leads to a proportional expansion of urban areas: the obsessive repetition of the same equal elements forms urban tissues where it is potentially possible to replace an element or more elements without involving others, causing only relative transformations involving the immediate neighbourhood. In conjunction with the process of serialization and discretization of urban tissues, another parallel process begins and predicts their vertical growth.

The skyscraper thus forms the sprawl space set on multiple levels. The skyscraper may have a residential or special/public function, but its global conformation condenses characters that, in my opinion, could be identified: it is a linear element, with a prevalent dimension in the space over the other two and is characterized by its relative isolation. The skyscraper does not combine with other skyscrapers, it not constitutes a traditional horizontal urban fabric, it is a vertical urban fabric (Ciotoli, 2017) in its own right.

From the point of view of architectural language, it maintains the 'serial' and 'elastic' characters of the elements that make up it: beams and pillars form framed structures that are often visible on the facade along with a transparent closure. They are regularly replaced without involving the context, or involving the context relatively. The elastic city is therefore a city that is transformed by maintaining its configuration relatively unchanged: as when an elastic structure regains its initial configuration after the stress has been exhausted.

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Conclusion

The way in which cities could be 'read' and the kind of transformations connected to them is, in my opinion, useful to interpret, through the 'technical/constructive' filter, these general mechanisms that have always governed their development. Mechanisms that could be connected at the provisional end of a continuous and still ongoing formative process, and whose general common features can be read despite the strong phenomenon of continuous and accelerated hybridization (Ieva, 2011) that has affected that process.

Not only technological hybridization, which presupposes a unitary mixing and progressive advancements, a cultural hybridization that blends in some way and potentially creates a new society, but an imposing and closed 'colonization' tends to erase some characters and set others.

It may be possible, in my opinion, to control this hybridization, that is the critical mixing phenomenon of different starting conditions for the purpose of obtaining a new enriched unit in which all parts are collaborating through the 'plastic' mechanism: measuring the degree of interference, collaboration, inclusiveness of those various parts, including physical, for the construction of basic and specialized urban tissues, allows us to obtain continuity in transformation and, in case starting conditions are of an 'elastic' type, obtain a new unit result, that is serial, discrete, closed, isolable.

The control of the 'colonizing' phenomenon could be interpreted through the 'elastic' filter, understood as a violent substituting act, in which the starting conditions are not fused into a new unit: in such contexts where, for example, densification represent the urgent need for urban transformation -trying to interrupt the process of territorial dispersion- could be triggered by a 'plastic' approach that tends to the aggregation, even structural, of isolated elements by applying critically and simultaneously the general formative laws extracted from the reading of inherited urban contexts.

In conclusion, this initial and partial study proposed in this article might indicate, in my opinion, a new line of research on the definition of a new critical approach, not only for the preservation of the existing built realities, but also for their necessary transformations: to understand the deep mechanism, more or less 'elastic' or more or less 'plastic', of urban tissues could, in my opinion, indicate the most coherent way to be able to intervene critically in these ongoing transformation processes.

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Figure 1. Historical Elastic Cities. Gdańsk, Poland (above), Antwerp, Belgium (below)

Figure 2. Contemporary Elastic City. New York, U.S.A.

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Figure 3. Historical Plastic City. Matera, Italy.

Figure 4. Historical Plastic City. Gravina in Puglia, Italy.

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Ruins and city. Procedure suggestion for the Imperial Forums of Rome

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Abstract. *The actual area of the Imperial Forums is presented as a big urban void in which the scale of the city has been lost. A "no man's land", inhospitable, to which you could assign the qualifying of "non-place". A huge and fragmented "archaeological park" in which the observer is not able of relate the rests and recognise the trace of the ancient forums. This problems have been adressed within the framework of the "Workshop of Conservation and Intervention" of the MCPA Master of the UPV, in which have been suggested differente strategies, both of search of the sewn of the city, and of the recognition of the different historical stratums existing on the place. To the same extent, this topic has been an international contest object, on which the proposal we have presented comes from a "modern" attitude, that helps us going beyond the evocative power of the ruin, or from its value as a referent from the past. An attitude which seeks to inhabit the ruin, occupy and settle it with architectures that renew its value, they are commited with the past and the present, and they guarantee their future presence. In this sense, the wanted and searched condition of "presence", is not as supported by the recovery of what have existed as it is by the ability of the intervention by accepting the transformations which have happened throughout history, introducing in turn a new stratum that besides answering the current needs, strengthen its statement as architecture. And all of that, urban regeneration is searched through the recuperation of the city's scale loss.*

Keywords: Ruins, urban void, urban regeneration, scale of the city, presence.

Introduction: to recover the scale of the city

We find ourselves in a place full of history, as a result of the addition of the layers of the Roman, Paleochristian, medieval, Renaissance and modern cities that, after the sventramenti from the 30s, has lost large urban sectors, turning into an immense archaeological site, in the centre of Rome.

To intervene on it, is a certainly complex territory, wherein the feelings can emerge above the rationality, and it makes it more attractive and suggestive, as it connects with the depths of our being, in a permanent internal struggle between what we wish and what we consider appropriate.

But, our western culture, decidedly influenced by Piranesi's drawings and engravings, and by the writings and paintings from the nineteenth century romantic travelers, induces us to assess its evocative power above other considerations, running the risk of replacing the reason by the admiration, setting up a look back at the past, as a basis for its permanence.

However, the desired and sought condition of "permanence", does not depend as much on the recovery of what existed before, as in the capacity of the intervention to assume the

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Figure 1.
Urban void in the centre of Rome

transformation that culture itself has introduced in the course of history. And therefore, it will be its statement as architecture what will guide it to new interventions that will extend its existence indefinitely.

Methodology

In this process, it should be underlined as relevant, to understand the intervention as an unfinished work, in progress, and consequently, opened to new actions.

This is a "modern" attitude, that helps us to go beyond its evocative power, or its value as a reference from the past, as Alos Riegl once said, to attribute to the ruin the "artistic will", to be source of inspiration to the observer, and therefore to stimulate the imagination and creativity. In this way, following Harbison, it will be able to construct new meanings, and thus to raise the promise of the uncertainty and the unexpected.

This capacity of spontaneity and unpredictability is reinforced, if we take into account, in accordance with Walter Benjamin, that the technical capacity of reproduction-imitation, leads us to question its value of authenticity.

Ultimately, it should be understood that the action on the ruin must be such that by living, occupying and colonising it with new architectures, renews its value, commits with the past and the present, and projects it to the future, with more confidence in its permanence.

And we raise that from a critical look, developing a historic analysis and a profound recognition of the site, that will allow us to carry out a precise architecture, simple and abstract, where applying the right design tools, we will be able to conjugate time and history, to manage the scale, to determine the whole from the fragments, and therewith to construct the city. (Figure 1)

Analysis

From the analysis done, it is worth to mention that the current area of the Via dei Fori Imperiali, is presented as a big urban void where the scale of the city has been lost. A "no man's land", inhospitable, to which you could assign the qualifying of "non-place". But we can neither describe it as an "archaeological park", since the observer is not able to link the remains and recognise the trace of the Fori Imperiali.

From here, there have been recognised three strands of values to recover and enhance, such as:

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Figure 2.
General view of the intervention; Floor plan of the whole intervention; general section of the proposal

-The first one, to preserve, as a key urban view of Rome, the unparalleled perspective obtained in the 30's, with the aperture of the Via dei Fori Imperiali, between Piazza Venezia and Colosseo.

-The second one, to introduce an order system between the current fragments of the ruins, that will allow the recognition and definition of the original spaces of the Forums.

-The third one, and most specially, to search for the recovery of the scale of the city, with the objective of obtaining an urban space, that combines both the activity of the city and the enjoyment of the pedestrian and the tourist.

Proposals

New urban linear axis

For that purpose, it is proposed a new axis west-east, from Piazza Venezia to Colosseo, as a safe and comfortable path, that levitates over the Forums, and allows the viewing of the archaeological space beneath the way, as well as its dimensional and compositional comprehension.

To achieve it, we propose six transverse walkways, with a double purpose: to stablish north-south connection city paths, and to

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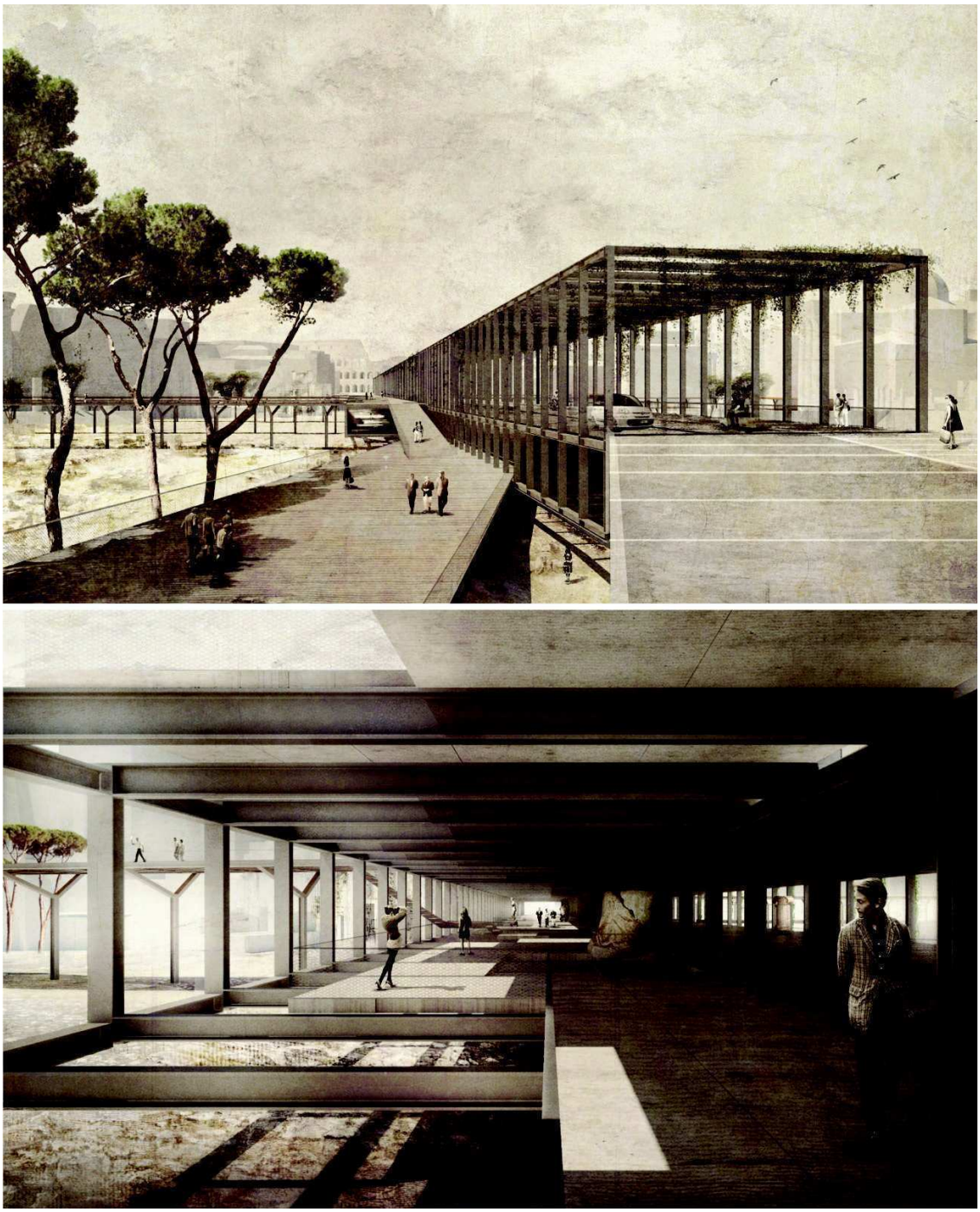

Figure 3.
3D view of the intermediate level and the connection to the axis

delimit the dimension of the Forums, enabling its legibility, through the definition of its original limits.

The west-east path (Piazza Venezia – Colosseo), is defined by the new axis, as a built urban space that as 8 meters high shading structure, partially covered with vegetation, aims to introduce a reference element on the site, and to stablish the environmental conditions that allow the visitor to feel protected by the scale of the city.

This shading structure, starts in front of the Foro di Traiano, and crosses the Forums of Augusto, Nerva and della Pace, and ends at the East edge, leaving visible the rests of the Tempio della Pace, that are not dug yet.

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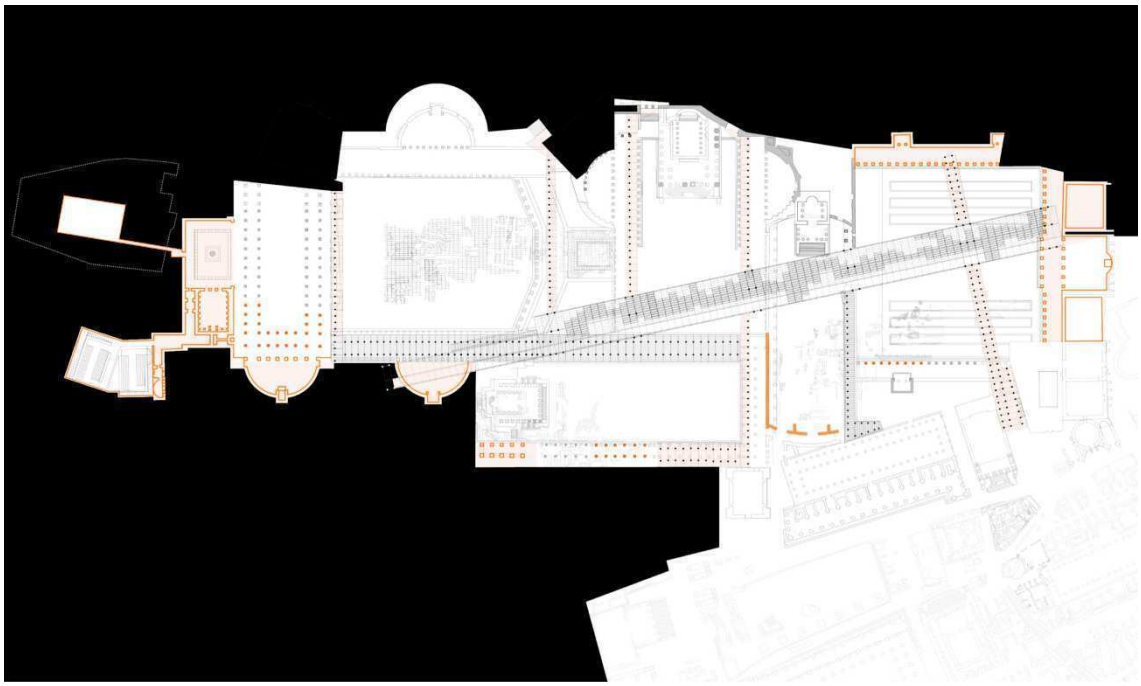

Figure 4.
General floor plan at the intermediate level

This place will conserve the existing wooded areas until the completion of the archaeological excavation, and it will have new wooded areas, taking advantage of the interstices between the Forums and in the areas originally landscaped at the Tempio della Pace, where it is planned to evoke the ancient species.

This new urban axis, begins at Piazza Venezia as a paving, that defines a pedestrian space, in front of the remains of the Adriano's Auditorium, stablishing a walkway-path that allows to contemplate them form the above, and a ramp that gives access to the lower level.

At the city level, the void of the Auditorium's ruins is protected by a bench parapet on its perimeter. (Figure 2)

At the Roman level, it is showed the will of stablishing a connection between the remains of the Temple of the Forum of Adriano and the Auditorium of Adriano, which in turn is raised as an access or exit from the archaeological level to the city level.

The section reinforces the idea of the connection at the lower level, and at the same time transmits a minimal intervention approach at the Auditorium of Adriano. (Figure 3)

The definition of the limits of the Roman Forums:

The provision north-south of the 5 meters wide transverse walkways, is the adequate to define the void space of the different Forums, in such a way that allows to be recognized by the observer who contemplates the archaeological remains. In addition to this important objective, the aforesaid walkways collect the pedestrian flows from the north part of the city, defined by via Alessandrina, Piazza del Grillo, Arco di Pantani and via della Madonna del Monti, and crossing the new urban axis, channel them to the south, givin access to the Chiesa dei Santi Luca e Martina, Curia Iulia and Basilica Emilia.

The substantial number of pedestrians at via Cavour, is solved by a wider walkway (8m), and with a perpendicular layout to the new axis, so that crossing it establishes a connection with the Tempio de Antonino e Faustina and the building beside the Basilica of Magencio.

On the other hand, the definition of the south limit of the Foro di Nerva and Tempio della Pace, is relied on the essential reconstruction of the south wall, and the new wooded area (cypresses and olive trees).

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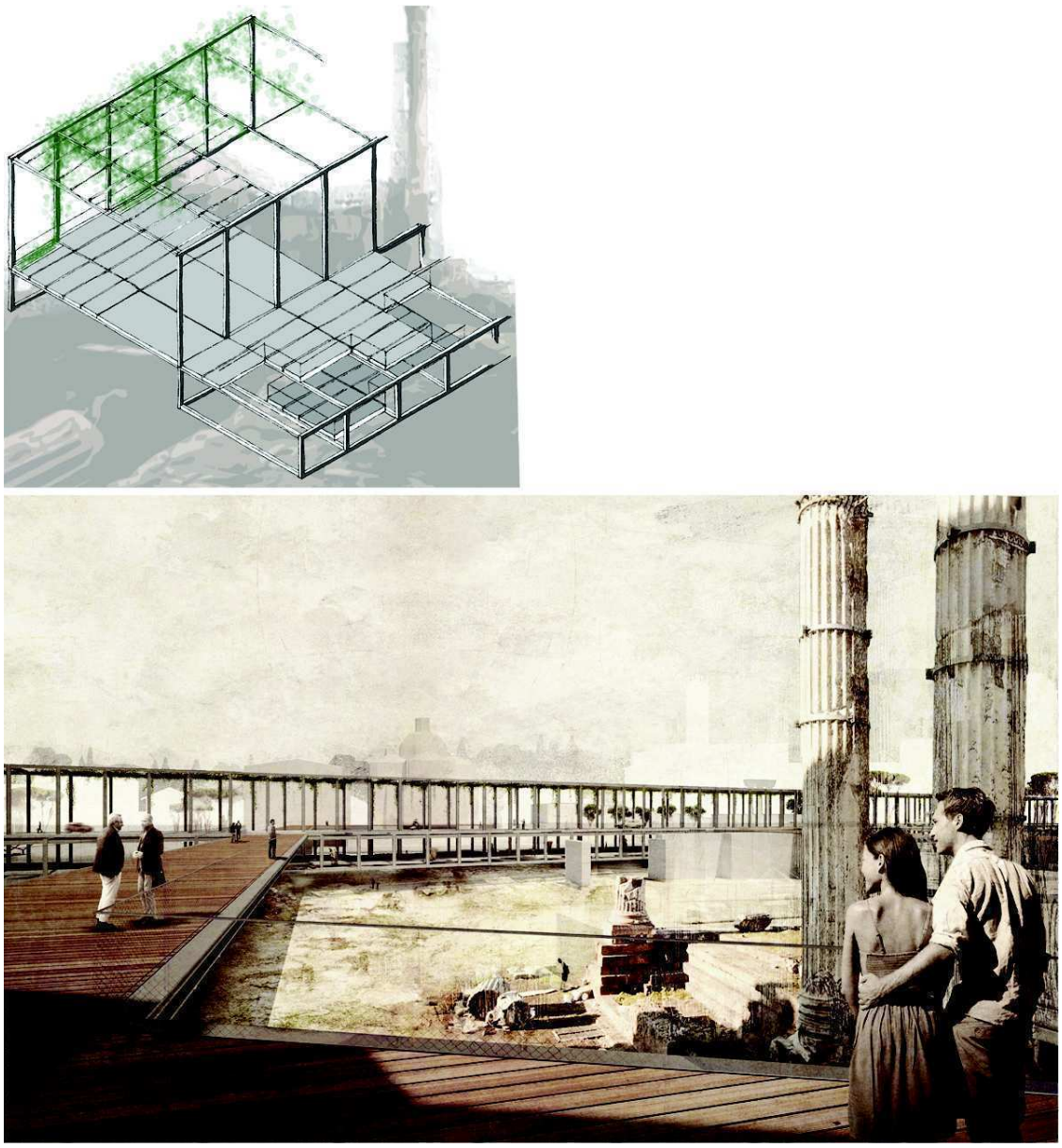

Figure 5.
Structural detail of the axis; 3D view of the new axis flying through the Forum

The south limit of the Forum of Traiano and Nerva, and the north limit of the Forum of Cesar, are defined by a lineal walkway, west-east, located at the intermediate level.

This is one of the topics that were explored from the beginning, evaluating the connection possibilities of the transverse walkways with the new longitudinal axis, so that intermediate levels could appear between the city and the archaeological ones.

This topic has been defined by an intermediate plane, that establishes the south and north limits of some Forums and introduces new uses and paths, by connecting with the lower part of the axis and thus allowing to observe the remains from a 3-4m height. (Figure 4)

This space, can be used to build, through prefabricated elements, platforms for various uses, under the shade of the axis, such as a linear development of an antiquary that could compile and organize the various archaeological remains that are scattered at the roman imperial level.

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This intermediate level, is extremely versatile, so that it could being built in accordance with the archaeological digging, or the evolution of the society, what is linked with the concept of opened architecture and in progress, aforementioned.

If we focus attention on the archaeological remains level, it should be highlighted at least two relevant topics: firstly, the rhythmic sequence of the new walkways pillars, that define the limits of the Forums, by evoking the intercolumniation of the original arcade.

The construction of the new linear axis:

And secondly, the strategic arrangement of the only six points of support of the bearing structure of the new west-east urban linear axis, conceived to bridge big spans, and thus pass through the forums, crossing its whole dimension (60m), avoiding intermediate pillars that could confuse to the observer. (Figure 5)

This structure is formed by three vierendeel girders, placed in a longitudinal direction, and connected through laminated profile girders.

Both viernendeel girders placed in the south side, emerge from the city level, creating a shading structure, while the one placed in the north side, only descends towards the archaeological level, providing support for the intermediate plane. (Figure 5)

The new axis, at the city level, has at the south side the shading structure with a 14m fixed width, where can live together pedestrians and public and emergency transport. And, at the north side, has a variable dimension space, with 10m maximum width, acting as walking and stay platforms, where there will be arranged the explanatory boards of the spaces to be contemplated.

These platforms pass through the north sector medieval archaeological remains, what will allow to adequate over time the aforementioned excavation, and they will be built with variable depths, according to the necessities, following once again the concept of an open and in progress architecture.

This is one of the topics that where explored from the beginning, searching to coordinate the necessary and slow archaeological excavation with the delimitation of the new elements that will shape the urban space created by the intervention.

The archaeological excavation:

To carry out the project, the archaeological intervention of the Imperial Forums is organised in the following sequential phases:

1st Phase: removal and disassembly of the successive layers to a depth of around 1.5 m, of the Via dei Fori Imperiali area involved.

2nd Phase: Archaeological excavation in a longitudinal trench to a depth of 1.5 more meters, from the beginning of the Foro di Traiano to the Basilica Massenzio, for the installation of the three Vierendeel girders that form the main structure of the project.

3rd Phase: Archaeological excavation for the realization of pile foundation, down from the seven support points where the main structure of the new axis rests.

The excavation of these two phases will follow an inverted pyramid system, which will allow integrating the remains of the different historical stages.

4th Phase: Once the assembly of all structural elements is completed, an extensive excavation will begin over all those spaces still to be excavated, coordinated with the construction of the elements proposed directly linked with the excavation, such as the intermediate plane, the linear axis north side platforms, or the construction of certain parts of the walkways.

The new museum:

Returning to the proposal, the urban linear axis is extended in front of the ancient Velia Hill, where the new museum is placed, across a new lower square, located at the level of the lobby of the new Metropolitan station, and continues as a pavement up to the Colosseo square.

This square, is constituted as an access space to the Imperial Forums, ascending by the via Venere Felice, sidestepping the temple of Venere e Roma up to the wall of the Basilica Massenzio, where the access control to the Forums and Museum is located. A simple one-level construction, with the necessary services, located at the level of the Basilica Massenzio, connects through escalators and lifts with

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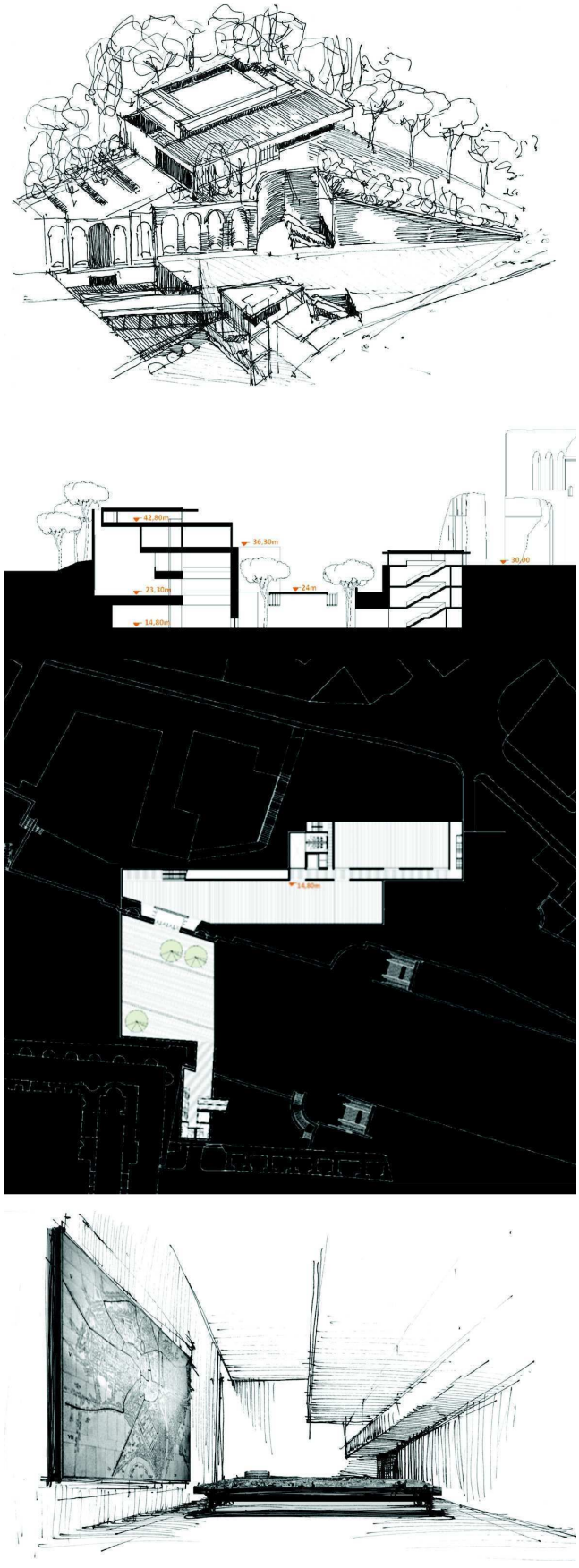

Figure 6.
External perspective of the museum, with two access; Floor plan; section and perspective of the museum inner space

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the new lower square that connects with the museum 15m further down.

Thus, the Museum architecture extends at both sides of the new axis at Via del Fori Imperiali, connected through the aforementioned lower square.

The main building of the museum is locates on the north side, as volumes that emerge beside the Muñoz wall, up to reached the upper level of the aforementioned ancient Velia hill. (Figure 6)

The inner space of the museum is articulated according to three systems: the overlapping of horizontal spaces, acting as exhibition strata; the insertion of large vertical spaces that creates cross views; and the provision of an upward linear path, with escalators, that acting as a backbone, connects the different spaces.

The loading and unloading access for the exhibition works, is located in the rear side of the museum, from the Via del Colosseo, at the first floor below the street.

On the floor above the Velia hill, it is located the second museum access, reached through a wooded walk upward from the Colosseo square.

And on the next floor, it is located the cafeteria, in a magnificent belvedere that allows contemplating the Colosseo, the Basilica Massenzio and the extension of the forums.

The museum's architecture intends to be morphologically simple, giving priority to the landscape, to the sense of the ancient hill and the existing trees. (Figure 6)

Inside, profound visual relations are pursued, an upward exhibition path, that starting in the depth earth (Roman stratum), emerges up to the top of the Velia.

There is placed the main space of the museum, where the model of the Imperial Rome and the Forma Urbis are exhibited, that enlightened by a skylight, will infuse to the space a dramatic sense.

The key elements of the museum project are: understanding the exposed item as the focus; highlight the versatility, simplicity and concealment of the display system; and use of natural and artificial light, either directed, raking or frontal, highlighting the exposed item.

Consequently, the exhibition of new didactic material such as plans, projections, videos, models… is considered through large sizes that produced immersive spaces.

Conclusion

With the intervention, the landscape that defines the area of the forums transmutes, introducing a new spatial reference system that impregnates the place with a gentle order, allowing structuring the current non-place, and turning it into a series of interlocking spaces, and humanised, and thus recovering the scale of the city.

Finally, the authors of this report, want to reflect the importance of the teamwork developed on this labour, that has allowed a profound debate, without which the proposal made would not have been possible.

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The role of residential fabric in the configuration of the city in Spain in the 1940s and 1950s. The case of Jaca

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Abstract. *The housing problem was one of the fundamental concerns of the new State that emerged after the Civil War in Spain. Different official bodies were created to this end, facing the need for reconstruction of different cities and villages and the dwelling shortage. A series of residential projects of different nature were developed in towns and cities, modifying their urban configuration. The aim of this work is to study different public housing group projects carried out during the 1940s and 1950s in the city of Jaca (Aragon) by Lorenzo Monclús, Municipal Architect of the city, Regional Delegate of the National Housing Institute and Urban Planner. On the one hand, the study focuses on the theoretical models on which they are based, the building types, the architectural language, and the design of the urban space. On the other hand, on the adaptability of these models to the existing city structure and its planning: a 1917 Extension Project according to nineteenth century models, carried out after the demolition of the city walls, and revised on successive occasions during the studied period. This analysis of a local experience is part of a wider debate: that of the urban culture in Spain during the postwar period. Despite all the limitations, modern functionalist urbanism was assimilated through public housing projects and urban extensions with open edification in smaller settlements, with techniques akin to those used in larger cities throughout the country.*

Keywords: Residential fabric, public housing, city extensions, Jaca (Aragon)

Public housing in Spain in the autarky years

The housing problem was one of the fundamental concerns of the new State that emerged after the Civil War in Spain. The need to rebuild or renovate the housing stock of damaged towns and cities was added to the dwelling shortage that already existed during the dictatorship of Primo de Rivera and the Second Republic. Therefore, during the autarky years (1939-1959) the New State radicalized its interventionist policy in housing that had been previously initiated (Solà-Morales, 1976, 20-22). It also incorporated a strategic intention, since giving access to the working class to decent housing would involve neutralizing one of their demands, contributing to the consolidation of peace and social stability (Lasso de la Vega, 2008, 44). Different official bodies were created to this end, formed mainly by a group of young architects who studied in the 1930s: The Directorate General for Devastated Regions (Dirección General de Regiones Devastadas, DGRD) was responsible for the reconstruction of housing, urban equipment, infrastructures and settlements, where the reestablishment of the residential fabric was an important work. The National Colonization Institute (Instituto Nacional de Colonización, INC) was at the forefront of the modernization of rural areas. The Unions Housing Project (Obra Sindical del Hogar, OSH) was responsible for implementing public social policy programs on housing (Sambricio and Sánchez Lampreave, 2008).

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As for the National Housing Institute (Instituto Nacional de la Vivienda, INV), it was the body in charge of coordinating the entire State housing strategy. Among its many functions was to define the legal framework from which the actions of the aforementioned bodies would take place (Lasso de la Vega, 2008). The INV regulations determined the conditions to be met by each dwelling: total area, number and minimum area of the different rooms, or lighting, orientation and ventilation conditions. But it also laid down several regulations for groups of residential units. Thus, the types of blocks and the minimum distances between them were defined. Also, densities, areas of free spaces per inhabitant, or streets conditions: their width, paving, vegetation, etc. (Instituto Nacional de la Vivienda, 1939). Both the regulations relating to the housing unit and its grouping allowed some freedom in composition, but were very strict in functional issues. The language used in the housing groups built these years has sometimes led to qualify this architecture as afar from the principles of modernity, but hidden behind its classicist or regionalist facades we can find processes intrinsic to modern functionalism, which prove the knowledge of the research developed in the architectural and urban culture of Central Europe in the 1920s and 1930s (Solà-Morales, 1976, 26-29).

From these regulations drafted by the INV, different public bodies —the described ones, but also local administrations— carried out numerous operations of public housing and urban extensions. The housing typologies used would determine a series of different residential fabrics, an essential component of the city, understanding both buildings and their linked public spaces as part of the fabric (López de Lucio, 2013). This issue is more clearly identified in the projects carried out in smaller settlements, where techniques akin to those used in larger cities were used. The work developed by the Higher Urban Planning Commission of the province of Zaragoza (1957), which established building standards for eight different areas, can serve as an example. Five of these areas corresponded to residential use: old town, closed block, open block, isolated building and agricultural building —the other three being disseminated agricultural construction, industrial area and green area—. The same range of types is used in other parts of the country, like the plans of the contemporary Urban Planning Commission of the province of Barcelona, both in line with the ordinances of Berlin of 1925 (Gigosos, 1983, 127). The city is thus conceived as a mosaic built step by step from different residential units, each one generating a different type of urban fabric with its own characteristics.

Among the members of this Commission was Lorenzo Monclús Ramírez, Regional Delegate of the INV, Urban Planner and Municipal Architect of the city of Jaca (Aragon), where he designed several public housing groups in the 40s and 50s. The aim of this work is to study these groups: on the one hand, the theoretical models on which they are based, the building types, the architectural language, and the design of the urban space, On the other hand, on the adaptability of these models to the existing city structure and its planning. Before studying these groups, we will briefly go over the urban history of the city between 1900 and 1950.

Jaca in the first half of the 20th century

The city of Jaca is located in the first foothills of the Aragonese Pyrenees. Its location, 25km from the French border and in the valley of the Aragon river —the only great valley parallel to the axis of the Pyrenean chain— makes the settlement a strategic enclave, which had a major impact on its urban history. The city was constrained by its walls until the beginning of the 20th century, which led to health and hygiene problems. This situation changed when in 1902 permission was granted to demolish the walls surrounding the city, justified by its inefficiency as a defensive element and the population growth (Yeste, 1991, 20). It would be authorized in 1914, taking place a year later. It would result in the drafting of the City Extension Project in December 1917 by Francisco Lamolla Morante, following the concession to Jaca of the benefits of the Madrid and Barcelona City Extension Act of

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1892 (Buesa, 2002, 266). The City Extension Project comprised two main areas, west and north, as well as an Interior Reform Plan for the old town, not contemplating the possible growth of the city to the south or southeast beyond the plateau where the settlement sits. The Project took as a starting point the link of old roads, railway lines and main accesses to the city. It also established the general regulations that new constructions should follow (Yeste, 1991, 23). The western area was relatively regular, but the northern area opted for a more complex layout, generated from the superposition of an orthogonal grid with diagonal lines communicating new squares, inspired by approaches close to the City Beautiful movement. Therefore, most of the resulting blocks were triangular or trapezoidal, an issue Lamolla (1917) justified by stating that symmetry and right angle were "procedures that practice has sanctioned as defective" (Figure 1).

Lorenzo Monclús drafted successive revisions of this City Extension Project (Bambó, 2016, 287-295). The first one, in 1944, consisted in the modification of the layout of the west area, to accommodate the constructions that had been built not following the alignments of Lamolla. The second, carried out between 1945 and 1952, reconsidered the northern area, seeking maximum regularity in the blocks, without relinquishing the singularity of squares located at strategic points. In addition, Monclús proposed a zoning plan of the whole of the city. The issue of zoning had been addressed by Gabriel Alomar (1947), who synthesized the knowledge and theories about the matter in Spain at that time (Terán, 1978, 232-236). Monclús established a division in high and low-density housing areas, industry and green zones, drawing the different roads according to their hierarchy (Figure 2). Therefore, following almost literally the orthodox functionalist precepts established by the Athens Charter, and the zoning of the city in areas for living, working, recreation and circulation.

This city extension in transformation was be the domain on which Monclús designed the housing groups, stablishing a different relation in each one of them. Some proposals were autonomous, like small peripheries totally independent of the existing or projected urban structure, while others were understood in continuity with the layout, defining the encounter of the City Extension with the historical centre and with the city limits.

Group of 34 protected housing units

This group promoted by the municipality of Jaca consists of 34 single-family detached houses, being the most important residential operation built outside the historic centre so far. It is located far away from city centre, towards the north. It occupies a sloping terrain falling towards the east, exceeding the plateau boundary on which the city lies, outside the limits of the Lamolla City Extension Project.
The group is organized around a central road connecting the two streets that limit the site. The geometry of this road is conditioned by the topography —straight when the terrain is horizontal, curved in the greater slope— and by the few existing trees. The housing plots are arranged on both sides, being of variable geometry to adapt to the terrain (Figure 3). This new street is the only public space of the group, with different conditions along its length: the first horizontal section has wider sidewalks and two lines of trees. The sidewalks narrow and the trees disappear in the sloping section, except in its central part, where there is a widening also with trees. Thus, there is a degree of privacy in the free space of the group: from a public walk in the encounter with the city extension to an almost private road, which presents a small common space in its central section. Despite this, the whole group seems to be inserted in a large park: the division of the plots is made with low height fences or hedges, so there is a visual fusion of the public vegetation with the one of the private yards.

Monclús designs two types of housing, of three and four bedrooms. Both locate day areas on the ground floor, and bedrooms on the first. He uses a hybrid language between vernacular architectures, heterodox rationalisms, and Central European Alpine architectures present in the magazines of its library, like Moderne

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Figure 1. Francisco Lamolla, Plan for the Extension of Jaca (Aragón), 1917.

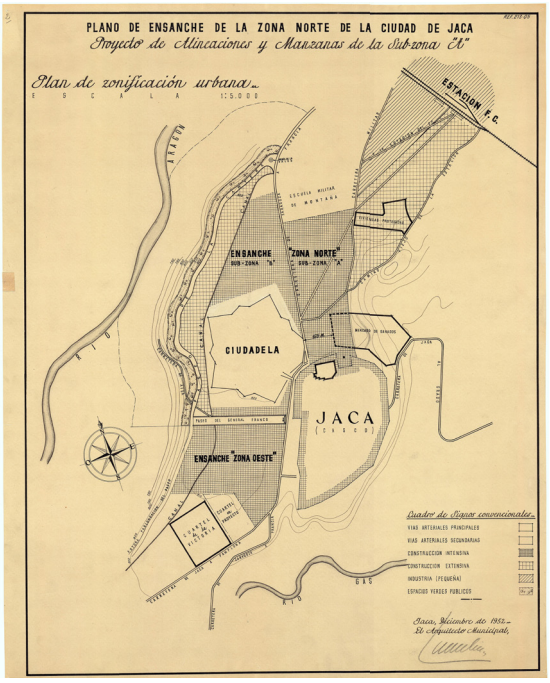

Figure 2. Lorenzo Monclús, Zoning plan of Jaca (Aragón), 1952.

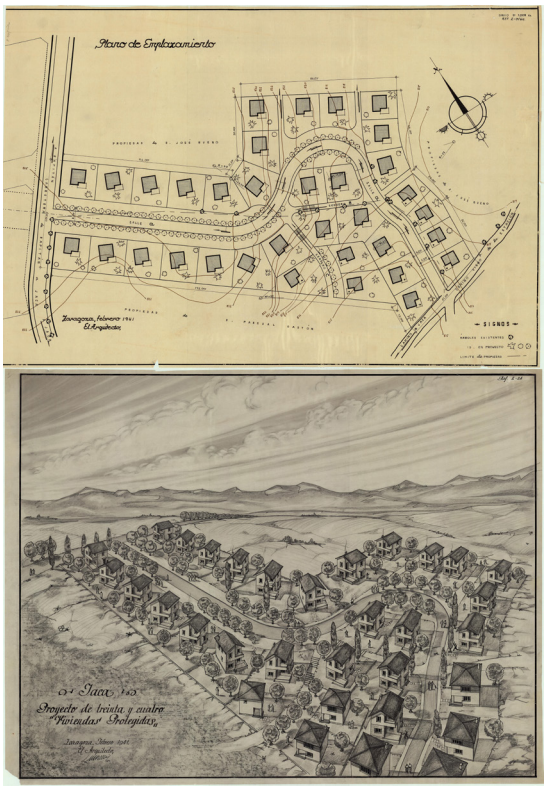

Figure 3. Lorenzo Monclús, Group of 34 protected housing units, Jaca (Aragón), 1941.

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Bauformen, Monatshefte für Baukunst und Städtebau, L'Architecture d'Aujourd'hui or Architettura (Bambó, 2016, 131-133). The street does not condition the organization of the houses: they are arranged in strict function of the orientation, with the main rooms facing south, and with slight turns to adapt the buildings to the topography, always within the margins allowed by the regulations. Thus, any of the house façades can indistinctly face the street, giving the group a certain picturesque character. This makes it impossible to speak of front yard and backyard, contributing to the isotropy of the whole.

The housing type, the relative distance of the city centre, and the homogeneity and autonomy of the plot, gives to the group some characteristics of a garden city, or rather, a garden suburb, a more appropriate term to this kind of groups that aroused in Spain early in the century as an alternative to the popular subdivisions and middle-class extensions (Monclús and Bergera, 2012, 34), carried out based on the Cheap Housing (Casas Baratas) legislation (Arias, 2008).

Group of 50 protected housing units

In 1953, Monclús designs a second housing group for the city council. It is located partly on the land occupied by the livestock market. The location is optimal for several reasons: it is outside the city extension, but next to its east border, and close to the historical centre of the city. From the logistic point of view, its construction does not depend on the total dismantling of the market, since it does not affect its buildings, but it subtracts much of its area, limiting its functionality. In this way, it accelerates the process of its transfer to areas further away from the urban core, one of the demands of the city at the time. The main drawback, however, is the topography, with a difference of six meters between the limits of the terrain.

Monclús faces this situation with a strategy of fragmentation: the 50 housing units are distributed in 21 blocks of different length. He uses two types of housing: paired, and three-story blocks, with two dwellings per floor, which can be arranged on the available land with relative freedom. In the west, towards the city extension, the blocks are placed perpendicular to the street, equidistant, offering an ordered front. However, to the east he rotates the blocks, enabling their adaptation to the terrain, and looking towards the landscape. A new street crosses the group. Horizontal in its first section, it reaches the lower street level by a large staircase, of excessive dimensions for the scale of the group, not so much if it is considered as urban element of connection. In order to reinforce the idea of this street as part of the road network of the city, rather than as internal road of the group, it is flanked by two blocks of greater length and height. The rest of the free space is treated like a garden shared by the dwellings, unlike the previous group, where each housing unit had its own garden (Figure 4).

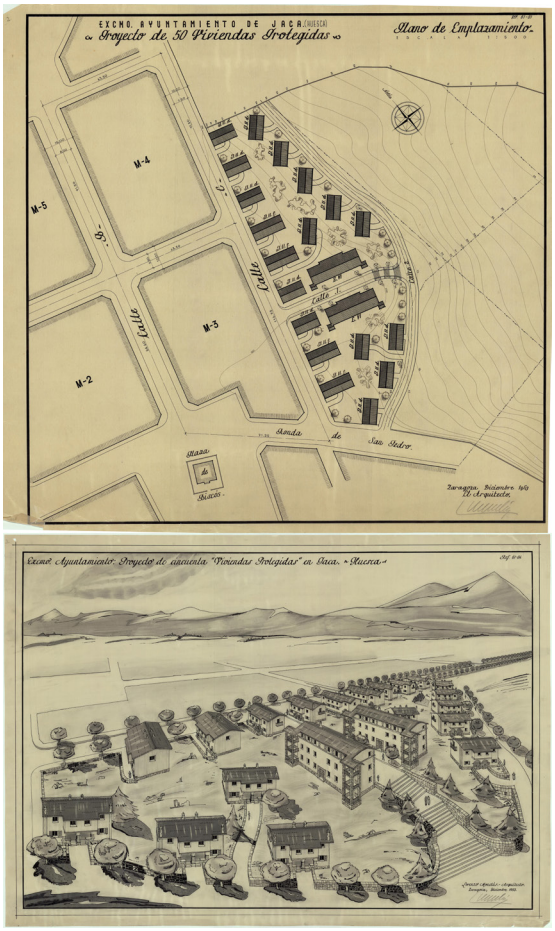

Figure 4. Lorenzo Monclús, Group of 50 protected housing units, Jaca (Aragón), 1953.

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In this group, geometry is used not only as a way to adapt to the topography and orientation, but as a response to an urban situation: following the direction of the city extension, and turning towards the landscape, presenting a more imprecise front in what will be for some years the new limit of the city.

José Soto López de Uribe Group of 30 low-income housing units

A year later, another group of public housing was developed, in collaboration with Mariano Lacarte: the José Soto López de Uribe group of 30 low-income housing units, in this case promoted by the OSH on a municipal plot next to the train station. They form part of the Union Trade Housing Plan (Plan Sindical de la Vivienda) for the years 1954-1955 (Sambricio, 2003).

The group consists of five equal three-story blocks that are arranged following the direction of the station's road, displaced between them, accommodating to the geometry of the site, also improving the sun exposure and allowing all the blocks to have views towards the landscape at the south (Figure 5). In the technical report of the project Monclús justifies this layout "according to the Jaca weather conditions and the location of the plot within the city extension. Both conditions advise an open urbanization and isolated blocks, which allows good sun exposure of each dwelling, with a traffic road on one side of the plot, and pedestrian paths from this road to each block." In this description, we can see the autonomous nature of the group, independent of the structure of the city. The free space is designed as a green area in its entirety, without any road between the blocks as in the previous cases, reinforcing this situation of isolation with respect to the surroundings. This also allows the group to adapt to a low-density housing environment, as planned in the 1952 Monclús Zoning Plan. The green area thus serve as a transition between single-family or semi-detached houses and blocks, avoiding sudden changes in the layout. Each block houses six triple orientation dwellings, with two dwellings per floor served by a staircase. All the dwellings follow the same model, one of those collected in the Plan Sindical (Sambricio, 2003). The dwellings are very simple and austere, assuring the optimal conditions of sun exposure and ventilation in all the rooms, optimizing the areas to the maximum, reducing for that purpose the circulations to the minimum possible. The same austerity can be seen in its formal appearance: five sober white prisms with gabled roofs.

Group of 125 subsidized housing units and bus station

The group of 125 subsidized housing units and bus station was the last one designed by Monclús in Jaca, in 1959. It is located next to the group realized in 1953, being the only group located in the north zone of the City Extension. It is facing the historic centre, occupying two blocks in front of the Biscós square. The group, promoted by the municipality of the city, benefited from the extension in 1958 to the whole country of the subsidized housing type, developed in the Social Emergency Plan of Madrid a year earlier.

If in previous projects the general layout was determined by the topography, orientation, views or even a certain will of picturesqueness, in this case it is the configuration of the city extension that shapes the layout. The group is formed by eight longitudinal buildings arranged in two blocks of the extension. Five of them are equal, perpendicular to the streets limiting the plot. The group finishes at its northern end with a C-shaped building. The front towards Biscós square has two buildings perpendicular to the rest, placing between them the new bus station [figure 6].

Biscós square, an important open space of Jaca since the sixteenth century, played a key role in the new structure of the city in the different expansion plans. Lamolla placed in front of it the new Town Hall, from which parted a trident of streets. Monclús discards this approach in his plan, but maintains the role of the square: is the beginning of a structuring street of the city extension; a new block of the extension, L-shaped, helps to enclose the urban space. The housing group reproduces this L shape with two blocks. The importance of this

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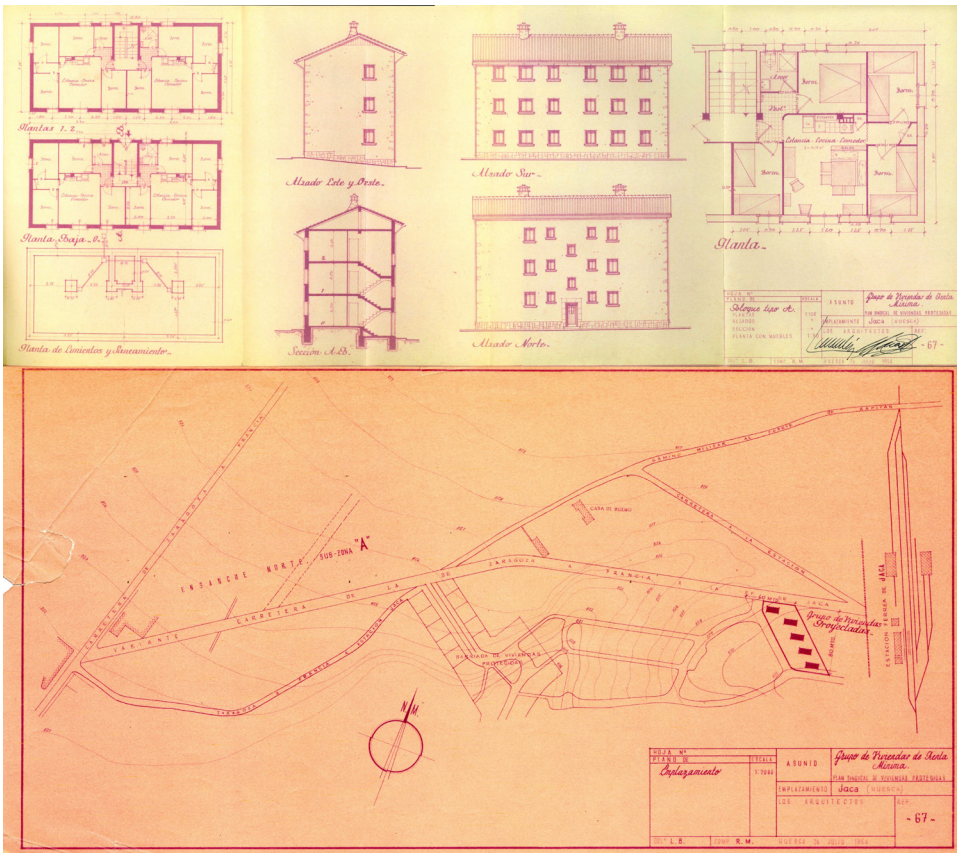

Figure 5. Lorenzo Monclús and Mariano Lacarte, José Soto López de Uribe Group of 30 low-income housing units, Jaca (Aragón), 1954.

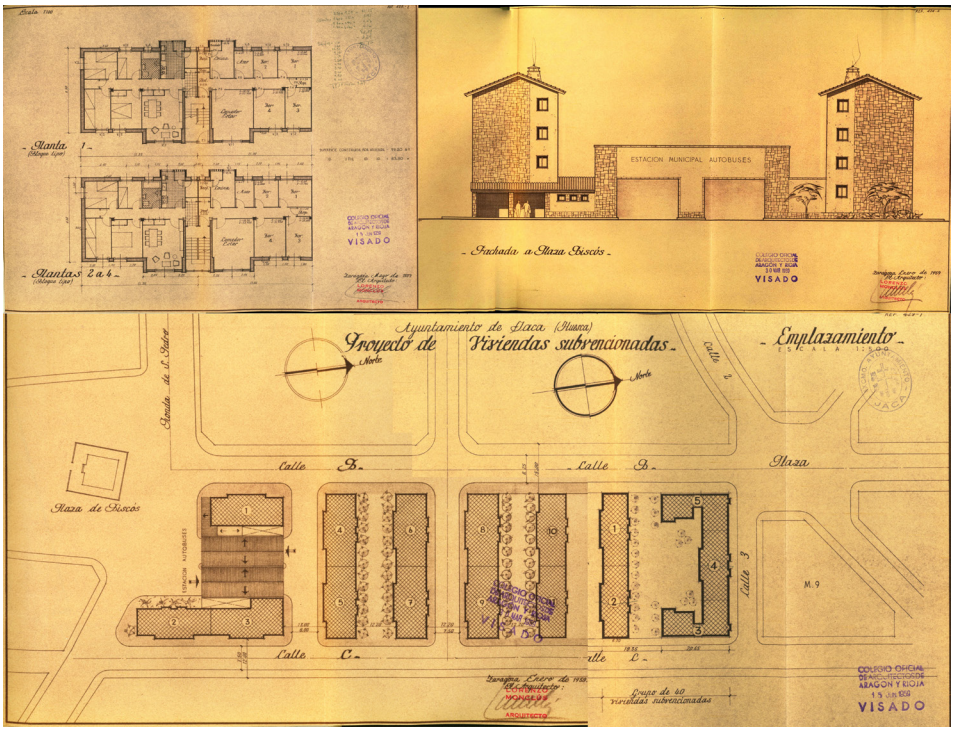

Figure 6. Lorenzo Monclús, Group of 125 subsidized housing units and bus station, Jaca (Aragón), 1959.

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point is highlighted by placing in front of the square the new urban equipment.

Monclús therefore uses an open block system, according to the definition of the INV regulations (1939, 65-66), with a 12m separation between blocks, equal to the height of the buildings. In a similar way to the Soto López de Uribe Group justification, the technical report says: "For reasons of constructive economy, the layout in parallel four-story blocks has been preferred, allowing optimum orientation of one of the facades of all the dwellings, and wide-open spaces, with optimum sun exposure, fundamental in this mountain climate". The distance between buildings in the streets crossing the group is the same as in the garden areas that are located in the space between the rest of the buildings, so there is no spatial hierarchy of the free zones. The gardens, despite being opened to existing streets, have a private character, almost of an inner courtyard, since most of the pedestrian transits uses the streets to that cross the group. All buildings are four-story, and are shaped by adding modules composed of a central staircase serving two dwellings per floor. The layout of the dwelling is similar to those of the linear blocks of the previous examples: double orientation, cross ventilation, maximum functionality grouping wet rooms (kitchen and bathrooms) and separating day from night areas. The image is not very different from the previous examples, with walls partly cladded in stone.

The continuity of the modern project

The four groups constitute a set of eclectic character in formal and language issues, but that systematically uses a series of typologies that allows to solve multiple urban situations in an effective way. Except for the first case, made in 1942, all groups are shaped using linear blocks, with similar characteristics. It is a very efficient typology: its width, between 7 and 9 meters, guarantees optimal conditions for the dwellings, optimizing the structure and allowing schemes of maximum rationality. We have seen the urban versatility of the typology: different arrangements of these blocks with free green spaces between them can be used to configure blocks of a city extension, to solve the edges of the consolidated city, or to generate autonomous groups. The end of the 1950s would be the era for the emergence of large public housing estates with open blocks in Spain (López de Lucio, 2013, 119-143); Monclús would continue to explore this system in larger scale interventions than those carried out in Jaca (Díez Medina and Pérez Moreno, 2012).

It is therefore not surprising to find in Monclús' personal library Rationelle Bebauungsweisen (1931), the proceedings of the third CIAM held in Brussels in 1930, focused on rational land development. Its spirit is present in the INV regulations, like the one of the previous congress, devoted to the minimum dwelling. This tradition of modernist urbanism would be added to the influence of authors such as Patrick Abercrombie, Karl Brunner, Thomas Sharp, Frederick Gibberd, Gaston Bardet or Werner Hegemann, first hand known in the case of the first two for the publication of their work in Spanish (1936 and 1939), or by the influence on the theoretical production of César Cort, Gabriel Alomar, or in the courses of urbanism of the Institute of Local Administration Studies (Instituto de Estudios de la Administración Local, IEAL) (Gigosos, 1983, 125-126 and Terán, 1978, 232-246). We can therefore speak of a historical continuity with design methods of the 1920s and 1930s, including those of orthodox rationalism.

This analysis of a local experience is part of a wider debate: that of the urban culture in Spain during the postwar period. Despite all the limitations, modern functionalist urbanism was assimilated through public housing projects and urban extensions with open edification in smaller settlements, with techniques akin to those used in larger cities throughout the country.

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Learning from Slussen: Place, idea and process in the transformation of central urban interstices

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Abstract. *Research Over the last two decades the Slussen in Stockholm designed by Tage William-Olsson in 1935 has been the subject of an intense debate about how to update it to the contemporary needs. Tabula rasa reconstruction or renovation? This lively discussion, however, has resulted in a final proposal granted by the expertise of an international firm but controversial for its political management, opposed to several social groups and, above all, highly problematic in terms of urban form and sustainability. The strategic location of this place, the indelible presence of its modern shape in the collective imaginary or the overwhelming force of the new paradigms of public space, have ended up provoking a range of more than twenty-five proposals in a short period of time. But while today this process seems to be settled and the demolition works of the original structure has already started, it would be still useful to draw some conclusions relevant to other similar interstitial sites in European compact cities where architecture, infrastructure, public space and landscape meet in such an intense way. Thus, this paper summarizes some of the last arguments of the on-going doctoral thesis about the recent evolution of Slussen according to four different outstanding topics: the form of place and history as an undeniable premise; the strength of tactics versus the power of the image in the process; the importance of time in the sequence of urban decision-making and, finally, the weight of urban culture as a key argument in contemporary urban transformation processes.*

Keywords: Slussen, Urban project, Public space, Infrastructure, Urban culture

Introduction[1]

Over the last two decades the Slussen in Stockholm designed by Tage William-Olsson in 1935 has been the subject of an intense discussion about how to update it to the contemporary needs. Tabula rasa, reconstruction or renovation? The strategic location of this place, the indelible presence of its modern shape in the collective imaginary or the overwhelming force of the new claim for public space has led to the development of more than twenty-five proposals in a short period of time.

However, since 2008 this lively discussion has resulted in a final proposal granted by the expertise of Foster+Partners international firm (Figure 1). Despite some important amendments to the original project carried out by the Stadsbyggnadskontoret of Stockholm, the resolution has been very controversial not only because of the lack of transparency in the political management or the disregard towards the alternatives presented by a number of social and cultural entities, but also because of the highly problematic issues in terms of urban form and environmental impact. The low care towards the conditions of the place, the difficult situation of the bus-terminal under Katarinaberget, the long north-facing staircase

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Figure 1. View of the Slussen in 2015 and model of the 'new Slussen' designed on the basis of the proposal by Foster+Partners and Berg Arkitektkontor adopted in the international competition in 2008. Photo by Patrick Sörquist (left) and photo by the author (right), 2016.

with a "transparent" building or the strong segregation between the eight-lane road traffic and the 'water-square' around the lock has been some of the most criticized points by the public opinion[2].

However, although this proposal has been pushed forward and the structure of the Slussen in 1935 has already been under demolition since 2015, this example might be relevant to draw general lessons on the space, the ideas and the processes that might shape other similar examples. This paper aims to give some arguments to those European central urban interstices of intermediate size -less than 5 ha- where architecture, infrastructure, public space and landscape meet in an intense way, places that are in friction with the central part of the city and, therefore, spaces that coexist and are present in the everyday life and in the common imaginary of citizens.

The importance of addressing those interstitial places in the European context has been widely confirmed by a number of recent researches and practices. Firstly, it is worth mentioning the line of research on Barcelona Links conducted by the Laboratori d'Urbanisme de Barcelona since 2010 and which has already published in two exhibitions (COAC, 2013; CCCB, 2015) and a monograph (Parcerisa and Crosas, 2013). The aim of this approach has been the discussion of new design strategies for several "internal barriers" within the metropolis of Barcelona. Mobility infrastructures, open space opportunities, social disintegration or regulatory gaps has been some of the elements addressed in these places. Other similar researches have been recently carried out by Institut pour la Ville en Mouvement (IVM) / PSA Peugeot Citroën and focused on the conceptualization of Passages as links, places and transitions between different social groups. This approach has produced interesting international competitions and a complete exhibition on this topic (Paris, 2016). Finally, it is worth mentioning other European research experiences in cities like Copenhaguen –with the edition of Transitions. Space in the dispersed city (Juel-Christiansen, 2000); Paris –in the wide spectrum of ideas around the Boulevard Phériphérique by TVK and Tomato Architects; or Antwerp –specially in relation to the Structure Plan by B. Secchi and P. Viganò (2003-2007).

In this framework, which arguments about urban form and decision-making process should we then learn from the Slussen's life and could be applied in the transformation of other similar central urban interstices?

First lesson: interstitial space, activities and dynamics as indelible attributes

The Slussen (lock) is a strategic place located between Gamla Stan and Södermalm, and connecting Lake Mälaren and Saltsjö (Baltic Sea). From the early times of Stockholm, this complex and steep place has been used as a key strategic gate, as a bastion, customs and lock (Sörenson, 2004: 22-57), as an esplanade for business and wholesale, as a node for public and private transport and as an active urban

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space. All in all, as we have been arguing in our recent doctoral dissertation, the complexity of those spaces similar to the Slussen might be understood as the consequence of the so-called 'interstitial condition', i.e., a set of precise spatial, programmatic and temporal attributes that configure their unique urban form in four different grades: 1. the place itself; 2. the projects of 'urban articulation' which seeks to design urban continuity at that point; 3. the relationship between other similar spaces in the city; 4. the way those spaces evolve over time. If we focus on the first of those assumptions, it could be said that this 'interstitial condition' might be the combination of three different lenses: the space, the temporal dynamics and the kind of activities that are produced there:

a. Three spatial dimensions of urban interstices

The spatial configuration of central urban interstices could be defined according to three different intertwined elements: force-vectors, centres of gravity and scene. The force-vectors are the minimum number of lines that shape the basic structure of the place and they could be summarized in, at least, two major ones: the vector that links the opposing pieces and the vector that follows the transverse direction. While the former refers to the urban continuity between different parts of the city, the second is more linked to the systemic urban configuration, i.e., the connection to other interstices, infrastructures or open spaces.

In the Slussen area, the value and presence of the 'earth-vector' and the 'water-vector' has been changing in time (Figure 2). The first

Figure 2. Force-vectors, centres of gravity and urban scene in five different stages of the history of the Slussen, Stockholm: 1550, 1700, 1770, 1850 and 1935-65. Created by the author, 2017.

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centuries of this place were mainly focused around the first one because of its condition as a city gate and customs for the city "mellan broarna" or 'between bridges' (Söderlund and Hjulhammar, 2007). However, with the inauguration of the Kristinaslussen lock in 1642 (Abrahamsson, 2004: 22), the Slussen included a new perpendicular force in the balance of this place. As many engravings shows, for many years the area became a strategic and often conflictive intersection of people, goods and maritime traffic: an urban centre without a clear urban form.

With the turn of the 20th Century and the definitive diversion of the main maritime routes to Hammarby (south of Södermalm) as approved on 25th May 1914, the 'earth-vector' became the key argument in all the upcoming proposals. More than thirty different designs were developed since 1894 in order to display a clear solution for the overall architectonic composition and to provide good integration for an increasing number of horse-drawn carriages, cars, railways, boats, tramways, pedestrians, cyclists and, lastly, the metro system. But both in the drawings presented by Ferdinand Boberg, Carl Bergsten, Ture Ryberg, Per Olof Hallman, Lars Israel Wahlman, or in the final proposal by Tage William-Olsson and Gösta Lundborg, the 'water vector' remained the main argument. This imbalance was clearly modified eighty-five years later, with the undertaking of the renewal and transformation process that started in 1991.

The second element that shapes the spatial configuration of interstitial spaces are the so-called centres of gravity, i.e., those massive or light presences located at the confluence area of the abovementioned vectors to signify and organize these places. They could be seen as an interpretation at a more local scale of the nodes used by the well-known work of K. Lynch and D. Appleyard (1960), or also the concept of ties as stated in the recent PhD thesis by A. Abraham (2009). The centres of gravity work as fixed points within those dynamic spaces and their position, size and character change as a conscious or unconscious consequence of the balance of the force-vectors. It might be argued that when those centres do not exist, the place is able to generate them but, if it does not succeed, they become informal and mere transient spaces. It could be then stated that the lack of identity of these places is also intimately linked to the absence of precise and meaningful centres of gravity.

These logics may be observed also in the Slussen area, where the centres of gravity were also modified over time: Södretorn until the middle of the XVIII Century; the Södra Stadshuset by N. Tessin (built in 1663 and more active in the spatial configuration after 1935); the sequences of locks (Kristinaslussen in 1642, Polhem Sluss in 1755 and Nils Ericson Slussen in 1852); the sculpture and square around Karl Johan XIV (since 1854); the Katarina lift (1881 and rebuild in 1932) or, finally, the line defined by Kolingsborg(1954), Strömmen Restaurant (since 1936) and the exit of the T-Banan. In the project by Foster+Partners developed since 2008 it remains uncertain which will happen to be the new centre of gravity of this area.

If we focus briefly on other central urban interstices in E uropean cities, we could draw a similar pattern. Most of them began as spaces occupied by city walls and gates[3]: Schottenpassage on Schottentor and Opernpassage under Kärntnertor in Wien, Stachuspassage by Karlstor in Münich, Avinguda de la Llum-Plaça Catalunya next to Portal de l'Àngel, Moll de la Fusta-Pla de Palau on the Muralla and Portal de Mar in Barcelona, Hofplein with the Delftsche Poort in Rotterdam before 1940, Stadelhofen on the traces of Stadelhoferbastion in Zürich, Alexanderplatz by Königstor and Potsdamer Platz by Potsdamer Tor in Berlin, Stationsplein in Lovaina or Place des Nations Unies by the Medina of Casablanca. In a second phase, the majority of those sites were converted into market and interchange square, thus moving the centre and the force-vectors out of the gate premises. Together with the demolition of the walls, those spaces tried to achieve a greater urban scale by means of sculptures like the Berolina in Alexanderplatz or the Geni Català in Pla de Palau. Finally, after the arrival of the railway and underground systems, those spaces were refocused mainly towards the stations: the new gates of contemporary cities.

The third element that shapes the spatial configuration of interstitial spaces is the so-

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called urban scene. It could be understood as the set of facades that draws and consolidates the geometry of the space. The scene is defined by a void as its main spatial attribute, by a clear visual and sensible connection to the system of open spaces and, thirdly, by the confluence of a number of different architectures and styles. These places are, therefore, precise records of the evolution of the construction of cities.

b. "What time is this place?"[4]

As a corollary of what has been argued in the last chapter, it might be confirmed that the temporal dynamics in interstitial places are far more accelerated than their surrounding urban context. The urban scenes are rebuilt and reshaped in short time cycles, the force-vectors change their direction or weight and, subsequently, the centres of gravity move, multiply or disappear. These spaces, unlike other hyper-static urban places, are in perpetum mobile and, consequently, should be designed as adaptive and open systems, using the concept largely explained by Richard Sennett.

This vibrato in the configuration of the urban form and activities could be explained as the interaction of four different rhythms (Figure 3): 1. the historical time made of the palimpsest of constructions, street lines and presences defining the space and the future projects (Cfr., Corboz, 2001); 2. the time of ideas manifested in the process of design; 3. the time of urban resonances or the moment when any particular place establishes relationships with other sites of similar interstitial conditions and shapes the forma urbis (Parcerisa, 2012); 4. the time of use as a stage where the urban articulation project is built, used (Cfr., Lefebvre, 2004) and decay (Lynch, 1990).

If we focus specifically on the second

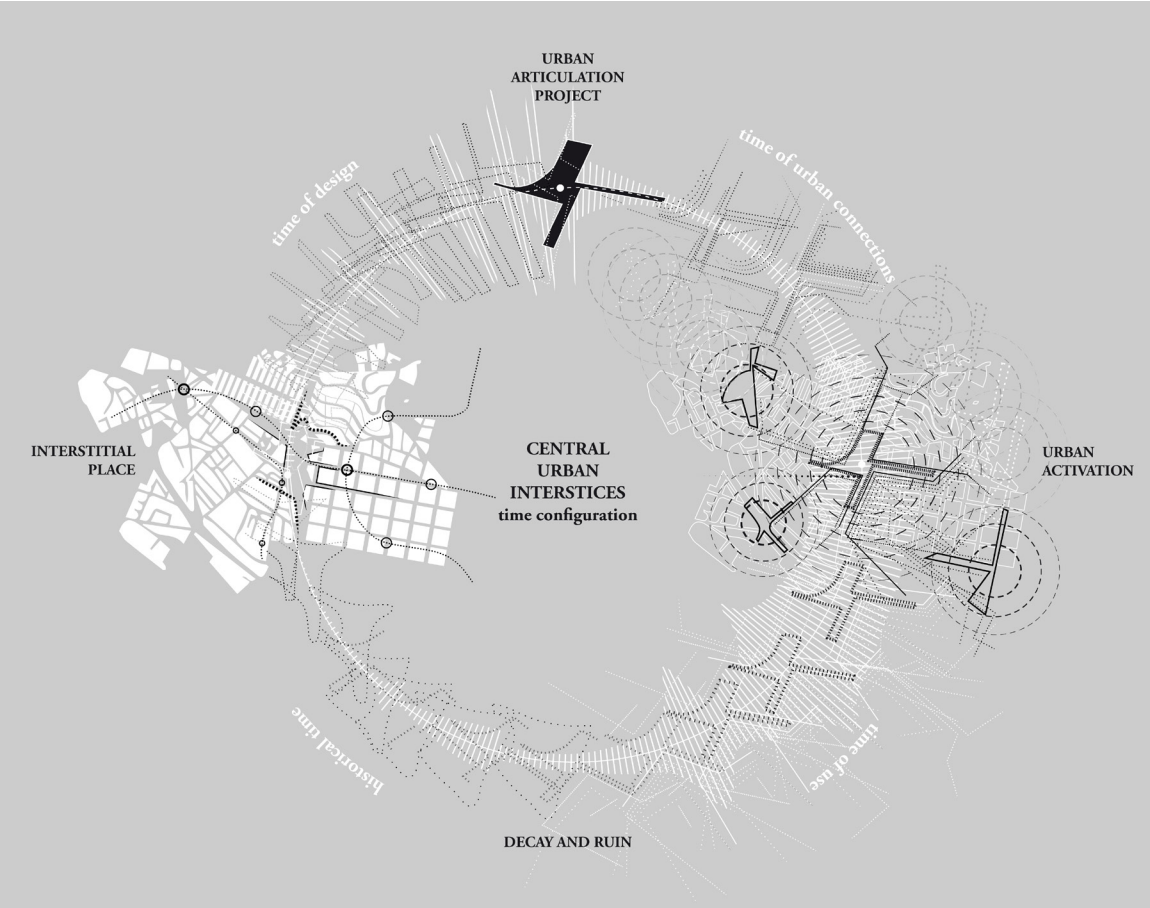

Figure 3. The configuration of central urban interstices as an interaction of four different times: 1. the historical time; 2. the time of design; 3. The time of urban resonances; 4. the time of use and decay. Created by the author, 2017.

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and third of those times, two different ways of transformation may be pointed out: the aggregative, opportunistic and gradual evolution and, on the other hand, the use of unitary projects like large infrastructures, big competitions or overall masterplan. These are two design logics that come hand by hand in central interstices and express a simultaneous global and local thinking. This double identity has been well described by Carsten Juel-Christiansen (1985: 68) with the idea of "doublelocality" as a category of the "new architecture" of the late 20th Century. When applied to the urban scale, this concept alludes to a duality of scale, uses and rhythms. It could be therefore argued that the denial of any of those dimensions in the design of those spaces generates banalization and simplification in their urbanity.

c. In-between activities

As a consequence of the last argument, it might be well observed that in most of the analysed case-studies, the activities and uses are simultaneously peripheral and central. Peripheral because of their clear peri-urban position in the city and because they often host some urban facilities that have been expelled from the central areas. But at the same time, the activities might be also considered central since their unique position is very strategical for the system of urban routes and because these peripheral facilities are, indeed, essential in the metabolism of the city. The activities held in Slussen and other similar places are indeed "infrastructural" or, in other terms, 'below of' or 'in the service of' the structure. That may explain why most of those transition spaces do not have housing and, conversely, why those are profitable areas to develop varied and mixed commercial activities due to its high accessibility.

Second lesson: modern infrastructure heritage as an operative design tool

In the same way as the Slussen in Stockholm, most of the central urban interstices are not only defined by their unique spatial configuration, activity and temporality, but also by the active presence of urban heritage in the process of transformation. By the term 'heritage' we would like to refer both to the built constructions as well as those unbuilt projects or ideas that have been drawing the site year after year and constitutes a solid background (Figure 4). This

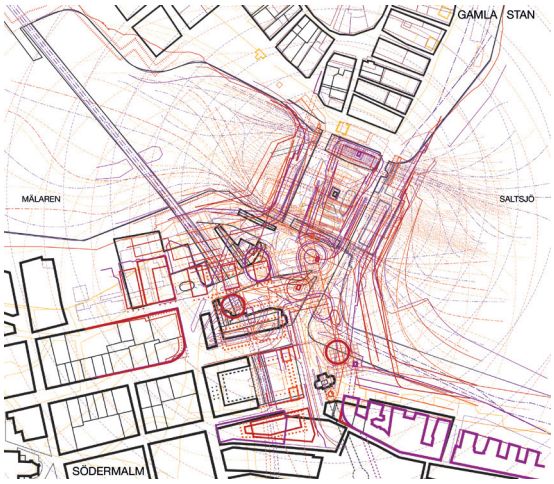

Figure 4. Slussen as a palimpsest. Overlapping of the different spatial configurations of the Slussen (1550, 1700, 1770, 1850) and the sequence of projects by Tage William-Olsson designed between 1929 and 1931 Created by the author, 2017.

complex palimpsest might be observed even after the functionalist project started by Tage William-Olsson and Gösta Lundborg in 1931. This project included as well some historical features of that place: the position and value of the sculpture of Karl Johan XIV and Katarinahissen, the idea of the original isthmus by using a complex "terrain artificiel"[5], the presence of the old Södretorn interpreted by the building Kolingsborg some years later (1954), and, above all, the incorporation of Södra Stadshuset (today Stadsmuseum) in the new masterplan for the area.

However, if we focus on the most recent proposals for the transformation of Slussen in the late two decades and the discussion around the maintenance or destruction of the worn structure of 1935, it might be relevant to summarize, at least, two different ways of interpreting modern heritage. The first of these readings has been exemplified in "Plan B" (Figure 5), the most coherent and argued alternative to

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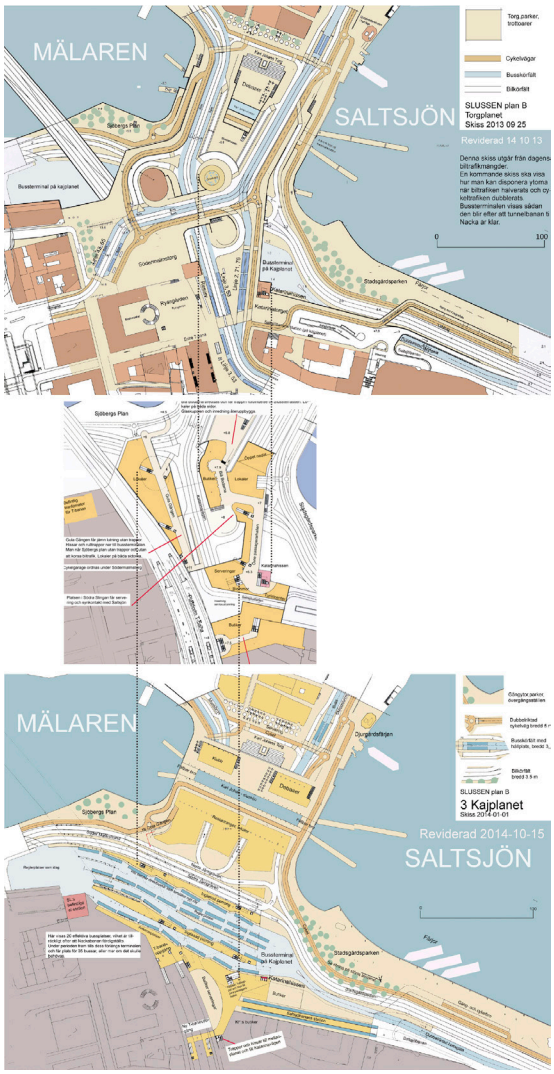

Figure 5. Underground, middle-ground and street surface of the "Plan B" for the Slussen (since 2008). Composition of documents published in http://slussenplanb.nu

the proposal of Norman Foster+Partners. This proposal, led by an architect, a traffic engineer, an environmentalist and a historian, has been suggesting the demolition and rebuilding of the Slussen of 1935[6]. Beyond the discussion around the viability of this proposal (Tingsten, 2011), it is worth highlighting that this project raised the idea of heritage as a preservation of an "image" and prompted the necessary adjustments to fulfil the contemporary functional and environmental requirements, its flexibility and flow easiness. In any case, the unsuccessful impact of "Plan B" shows clearly how difficult is for modern infrastructures to fit in the recycling agenda (Cfr., Alonzo, 2016: 459): they are often too slow to become part of the heritage catalogues but also they should be considered too heavy to be forgotten.

A second approach to the use of modern heritage has been well illustrated by the set of projects developed by Bjarke Ingels Group + NOD since 2006 (Figure 6). Their proposals were very much appreciated by the jury[7] and,

Figure 6. General view of the Slussen proposed by Bjarke Ingels Group+NOD for the international competition in 2008. This is one of the different variations elaborated from 2006 to 2009. https://www.big.dk/#projects-slu

besides, a number of external reports such as the one written by Spacescape (2008) saw it as one of the best projects among the selected ones[8].

The first merit of their vision has been precisely the express recognition of the 'new Slussen' as an interaction of two perpendicular and equally important force-vectors. As stated in their project report: "Is it possible to keep Slussen as a traffic centre point and, at the same time, turn the site into an (at all levels) urban leisure-zone?"[9]. With this proposition they assume, then, that new urban interstices like the Slussen should be designed as an integrated mixture of flows and spaces, a confluence of different 'urban things' (De Solà-Morales, 2008), as a place where conflicts might be turned into positive opportunities to produce ambiguity and, therefore, urbanity.

But, above all, their project should be also considered a skilful and contemporary interpretation of Tage William-Olsson's strategies developed for the Slussen in 1935 or,

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to put in other words, a clever understanding of the modern Slussen as a prototype that could be still applied today: "Rather than revolution we are interested in evolution" (BIG, 2010). Their proposal includes, for instance, the use of the inclined surface as an expression of the natural isthmus that configures this place. They have been also developing a complex and wise display of the "function oblique" (Parent, 2009) as an effective mechanism to interweave different levels and overcome the difference in height between the water features and the higher streets of Södermalm. Furthermore, the project has envisaged a contemporary review of the idea of underground passageways tested in the historical Blå Bodarna, Gula Gangen and Gröna Gangen (Clua, 2017), now providing them with more legibility, better materiality, mixed commercial uses and improved accessibility. The architecture for the 'new Slussen' has been also a major discussion and, after more than a hundred of alternatives, their final masterplan answered well to the interstitial condition by minimizing the distance between Gamla Stan and Södermalm, by generating a protected square around the Stadsmuseum and, finally, by inducing the production of different 'microspaces'.

Third lesson: the weight of urban culture in the urban decision-making process

The third consideration that could be briefly drawn from the Slussen evolution during the last two decades is the observation of the particular way in which the 'urban culture' is able to influence the processes of transformation of central urban interstices. By 'urban culture' we should understand here a certain shared collective thought that, using the well-known triad of Henri Lefebvre (1974), is able to influence the "production of space" in their three intertwined meanings: l'espace conçu (mental representation and projection of the space as an abstract entity), l'espace perçu (referring to the physical-sensible space and the conditions of its daily use) and l'espace vécu (space as a lived environment and representation of a particular society). If we focus specifically in the influence on the first one, on the design considerations, how will this 'culture' be manifested in the Slussen latest process of transformation?

In Stockholm, this shared thought has been expressed in the sharp confrontation between the official decision of developing Foster+Partners proposal and, on the other hand, the outbreak of a large number of collective alternative initiatives. As stated by Michele Micheletti (2016)[10], a number of administrative changes in Stockholm led to this social manifestation specially focused on the Slussen area: the sequence of up to three different political parties between 1994 and 2014, the increase on political jurisdiction in urban planning (Malmsten and Norberg in Micheletti, 2016: 17), the approval of the Plan- och byggladen act regarding the participatory process and, above all, the political vision of this project as a key step towards a "world-class Stockholm".

The different citizen design alternatives raised after the international competition in 2008, as a response to the lack of transparency in the management of the process, to the low confidence in the technical solution of the approved project or, as we have state in the previous chapter, as a defense for the Slussen modern heritage. Most of those alternative proposals were supported by architects, engineers, politicians, artists, historians and people involved in urban management processes. Beyond the 1200 letters of protest against the approved 'new Slussen'[11], the more exploratory visions of Måns Tham, Fredrik Falk or Per Gantelius, there have been other proposals of superior technical accuracy: "Ny Syn på Slussen", "Rädda Slussen", "Knutpunkt", "Utblick Slussen" or the aforementioned "Plan B". Some of them were eventually considered in some official reports like the one following the international competition in 2008 but, all in all, their impact in the final resolutions has been very low.

As a consequence of the upheaval of discussions concerning the eventual demolition of the Slussen 1935, the City Hall of Stockholm itself and other private organizations have been promoting a number of monographs and researches on the issue. It is worth mentioning, for instance, the

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exhaustive reading of the evolution by L. Blomquist in Slussens planeringshistoria, (Stadsbyggnadskontoret, 1999); the two volumes about the more general modernization of Stockholm by A. Gullberg in City-drömmen om ett nytt hjärta. Moderniseringen av det centrala Stockholm (Stockholmia, 2001), or the complete approach to the figure and work of Tage William-Olsson. Stridbar planerare och visionär arkitekt (Stockholmia, 2004) by E. Rudberg, B. Bergman, C. Caldenby, A. Gullberg and A. William-Olsson. In Stockholm. En utopisk historia (Prisma, 2004), Åke Abrahamsson has produced a complete review of the unbuilt utopias for Stockholm, with a special mention to some of the ideas for Slussen and Tegelbacken of Tage William-Olsson. The Samfundet S:t Erik has been responsible for the publication of the Årsbok 2004 edited by Ulf Sörenson, a gathering of historical, critical and poetical articles on the Slussen (Slussen vid Söderström, Lind & Co/Samfundet S:t Erik, 2004). Another art-focused and historical vision has been recently exhibited and edited by Eriksson and Sydhoff in 2012 with the title Slussen. När Stockholm var modernt (Konstakademien, Stockholm). And last but not least, an exhaustive description has been commissioned by the Stockholms Stadsmuseum to Maria Lorentzi y Per Olgarsson to register the status quo of the structure of the Slussen in 1935 (Slussen. 1935 års anläggning, Stockholms Stadsmuseum, 2005).

But it is worth mentioning that, among this wide range of publications and interventions, there have been some active groups like YIMBY (Yes In My Back Yard, with H. Tingsten already mentioned), bloggers like Göran Johanson[12], architects like Jan Söderlund (Cfr. Söderlund, 2004: 167) or companies like the aforementioned Spacescape (directed by L. Marcus and A. Ståhle) that have been engaged into the quick and effective transformation of the Slussen and, sometimes, developing criticism against the most 'nostalgic', 'romantic' or 'proper of a cultural elite' alternative proposals.

In any case, this intense atmosphere of proposals has resulted into the final demolition of the Slussen of Tage William-Olsson as approved in January 2015. The reason for the disregard of the alternatives might be found, as Michele Micheletti pointed out, in the fact that those designs were seen as partial, unconnected to each other and, therefore, not enough powerful to face the official solution.

As a consequence of those reasons, we could note two more remarks. The first one is the consideration of time as a political decision strategy, in other words, the disregard towards citizen involvement in the Slussen renewal process has been eventually minimized by the political 'urgent' need to achieve a definitive solution in a short period of time. Time –even more than technical discussions- is often the definite argument in urban decision-making.

Secondly, the fact is that the final political resolution should be understood as a clear consequence of a sequence of decisions coming from long time ago. A thorough analysis of the proposals surprisingly shows how the current version for the 'new Slussen' is nothing else but a clear evolution of the idea by Leif Blomquist in 1995, a member of the advisory team in the competition held in 2003 and person in charge of the Slussen transformation for many years in the Stadsbyggnadskontoret. That illustrates well the persistence of strong ideas over time and its power to influence any future decision.

Conclusions: towards a smart design of central urban interstices

After this trip around the spatial configuration, uses, temporalities, ideas and processes that has been operating in the Slussen renewal and, more generally, in central urban interstices, it could be concluded that the so-called 'interstitial condition' prompts a precise and strong character to those urban sites. It has been revealed as a condition that influences inexorably the history of the place, its design, the city and relationships between interstices and their temporal dynamics. Central urban interstices thus become real living records of the city's changes and, because of their double peripheral and central condition, might be regarded as potential new centralities for cities and a key resource to drive a renewed urban structural thinking.

In terms of design strategies, it seems clear

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that the articulation projects on interstitial places shouldn't be addressed as a simplistic extension of the logics of their surroundings but as a place itself, with a unique global and local interescalarity. Because of their spatial and use configuration, those projects should intertwine the infrastructural and metropolitan approach with the counterbalance of the neighbourhood's particularities. Or, to put it in another way, those spaces should be considered both as key mobility hub but also as places with identity: from the "non-lieux" of Marc Augé (1992) to the aforementioned doublelocality of Carsten Juel-Christiansen (1984).

Furthermore, if we focus specifically on the discussion about the value of the heritage of Slussen of 1935, we could end assuring that, as shown by BIG+NOD's proposals between 2006 and 2009, the 'prototype' of Slussen of Tage William-Olsson could be still interpreted in a contemporary way. The use of an inclined topographical surface, the intertwining of shopping stores and facilities underneath, the interaction with the underground or the use of architectures to frame the void are some of the lessons offered by the prototype-Slussen in 1935. Those are indeed some of the key arguments that the final proposal by Foster+Partners have forgotten.

Conversely, the "Plan B" illustrates well the difficulties and paradoxes that a demolition and imitation of the original structure could have in terms of the real value of the heritage and its capacity to deal with new functional requirements. As stated by F. Choay (1992), the "maintenance costs" of heritage, its "unsuitability to current uses" or the capacity to "block the development of larger urban projects" could be seen as the reasons why the Slussen of 1935 has been definitely neglected. In this sense, Plan B might be considered not only a discussion on the idea of copy and authenticity but, above all, on the flexibility or adaptability as an inherent attribute of urbanity in interstitial places (Cfr., Olsson et al., 2015). Are the slight improvements suggested by "Plan B" for the former geometry enough to tackle with the new uses and requirements in a long-term perspective?

Regarding the bustling atmosphere of proposals and alternatives generated in the last two decades on the Slussen, it seems clear that time and inertia have become two decisive points in the process of political decisions. The first one might be observed in the conscious ruin of the concrete structure during the last decades[13] and in the disregard for the alternatives projects. The inertia, in turn, has been present in the transformation of some old design ideas into strong prejudices in the project of the 'new Slussen'. The ideas are often more definitive than the built constructions.

On the other hand, it should be pointed out how the presence of a growing urban culture has turned out to be definitive in the claim for "more public space" in the Slussen. As shown both in the diagrams by BIG or in the bright renders by Foster+Partners, the contemporary Slussen is called to change its modern celebration of the vehicular traffic into a more human-focused public space priority. Nonetheless, a deep understanding of the Slussen 1935 might also suggests the design of a non specialized public-space platform such as the one proposed in the 'new Slussen'. Public space in central urban interstices should be displayed as an intense relationship with other uses and flows: an 'integrated segregation'. The inherent contradiction between movement and friction should lead to new forms of public spaces, on the basis of the questioning of the efficiency as such and the understanding of the mobility as a contemporary reason to foster encounters and interaction.

Finally, this brief analysis of the Slussen and, hence, other central interstitial places might be useful to point out how those spaces are indeed exceptional registers of the evolution of the city itself. From defence to trade, from commerce to transport, from mobility to public space. They must be recognized as opportune spaces where to build new urban centralities, where to test new forms of intense and adaptive urbanity. Indeed, those spaces might be considered as strategic areas to strengthen the open structure in our cities, a privileged and dynamic field of action for the contemporary urban project and, therefore, an effective way to achieve a more coherent and inclusive city.

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Notes

[1] This paper summarizes some of the arguments developed in the PhD thesis written by the author in 2017: La condición intersticial en los proyectos de articulación urbana. Del Slussen al Estocolmo de Tage William-Olsson en cuatro tiempos (Departament d'Urbanisme i Ordenació del Territori, Universitat Politècnica de Catalunya, Barcelona).

[2] See, for example, the article in Svenska Dagbladet, 20th June 2011 or the post "Stoppa Nya Slussen del 2 – Avslöjandet" published on 20th August 2014 in Stockholm Skyline blog.

[3] The image of the "bastion" mentioned by Carsten Juel-Christiansen (1985: 70) is very suitable to express the strong duality between 'rupture' and 'transition' that shape central urban interstices.

[4] Title of the book published in 1972 by Kevin Lynch where he draws a complete analysis of the perception and evolution over time of the urban processes, with particular attention to the idea of "adaptability". See Lynch, K. (1972) What time is this place? (Boston: MIT Press).

[5] As stated by Le Corbusier in a note written on the plan of the project given by Tage William-Olsson to him in 1932. Foundation Le Corbusier, 13317.

[6] This idea have many similarities with the one by White Architects in 2007.

[7] The fact that the project of BIG+NOD was further developed after the 2008 competition, might support the hypothesis that the jury was initially supporting their proposal. This has been confirmed in an interview held with the members of the company in 8th June 2016. Nonetheless, the political decision of May 2009 will settle the issue in favour of Foster + Partners and Berg Arkitektkontor.

[8] This report gives a detailed comparison of the five projects submitted for the international competition in 2008. The analysis will use space syntax, place syntax and sociotop methodologies to test the different scenarios for the 'new Slussen'.

[9] Project report on 1st December of 2006, p. 6.

[10] It is highly recommended the reading of the paper by Michele Micheletti where she gives an exhaustive reading on the citizen engagement and political process of the transformation of the 'new Slussen'.

[11] Article of Lars Epstein at Dagens Nyheter, 9th September 2010: "Senaste Slussenförslaget förskräckte kulturborgarrådet". Available at http://blogg.dn.se/epstein/2010/09/09/senaste-slussenforslaget-forskrackte-kulturborgarradet-8013/

[12] See the blog Fredman på Kvarnberget by architect and urban planner Göran Johanson at: http://fredmanpakvarnberget.blogspot.com.es/search/label/Slussen

[13] As stated by Tor Edsjö in an interview held in 11th May 2016. This is a common point claimed by the opponents to the approved "new Slussen".

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The University-Residence Hall paradigm. Urban transformation of Alcalá de Henares in the Renaissance

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Abstract. *Once deployed the Bolognese University model, springs an emerging educational building typology. Due to the lack of board and lodge in the brand new Alcalá University, the Cardinal Cisneros' University-Residence Hall model is born. A changing step is unveiled, proceeding side-by-side with the climax of previous building experiences in the cities of Salamanca and Valladolid. Such new category forges the concept of "Colegio Mayor" with a greater ambition than those existing in the mainland, and able to address the new requirements of an early Modern-Age borough. The growth regime is hierarchized through new cloisters. These patios organize all the fixtures of the whole. A rising town takes up, showing off the avant-garde investigation spotlight which it (later on) proved it had become. In its town planning, the constitution of a sort of "Ensanche" -Urban Expansion Plan- of an early medieval old town is focused, overarching equally either the educational, residential or public facility buildings. This was a red-hot experience, and could be credited as the first -planned to a certain extent- University Town in the history. It had a great trend projection and international influence, having the widest reaching in South American cities. And by the recent 1998, this University Campus was admitted together with the Old Town of Alcalá de Henares in the Unesco World Heritage List.*

Keywords: Alcalá de Henares, urban morphology, Universitay Residence Halls, ortogonal and hierarchical cloistral system, cisneriana block.

Introduction

The urban layout of Alcalá de Henares has changed successively throughout its history. The alcalainan region is located in the geographical center of the Iberian Peninsula. It occupies a strategic place as it is a natural crossing of the roads that cross the length and breadth of the Spanish Central Plateau. The rich vega of the Henares runs in a southwest direction from Guadalajara to its encounter with the river Jarama, which, with abundance of water and grass, has favored human settlement since prehistory. Settling these the zones plain in times of tranquility, and in the high hills in times of war.

Throughout history, there have been changes in the urban morphology of this city, each occurring in different stages, of which, by way of summary, it is worth mentioning: Settlements in prehistory (previously mentioned), Settlements in the Roman period, Visigothic occupation, medieval Islamic Alcala, medieval Christian Alcala (repopulation) and Alcalá of Cisneros. The latter is the one developed in this article.

Since Roman times, the city has evolved following a reticular layout, from where the urban nucleus increases in size. At the same time, concentrations of population appear around the urban center, like "islands", but always respecting the Roman orthogonal design. These towns concentrate population mainly linked to agriculture.

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The period of commercial and economic splendor that seems common denominator in the XII, XIII, XIV and XV centuries will disappear when in 1492 the Edict of Expulsion of the Jews becomes public. When this fact occurs, an important part of mercantile activity disappears, but what is still maintained is an organized urban nucleus that retains its physical structure, which will be used by Archbishop Cisneros to avoid its decadence, seeing in it the framework Ideal to create a cultural institution in Alcalá, where the new activity will be the university.

The university beginning

The university chronology of Alcalá begins on May 20, 1293, when King Sancho IV of Castile granted to Archbishop Toledano García Gudiel to create a Studium Generale[1] In Alcalá de Henares. These studies linked with the "Cisnerian refoundation" on July 17, 1459, where they originated through the granting of Pope Pius II of a bull, requested by Bishop Alonso Carrillo de Acuña for the erection of three Art and Grammar Chairs in this study of Alcalá[2], Which entails the creation of the University in 1499[3].

Well before the papal bull was obtained, Cisneros had begun a work to buy land and construction, to create what he called Civitas Dei, City of God, under a totally innovative system, to create a university city within it Layout of the existing city.

Urban planning is based on the so-called "Cisneriana block", characterized by occupying an area of more than 15,000m², an urban project that Cisneros entrusts to Pedro de Gumiel, his Master of Works in the Archdiocese of Toledano. The university city, the Civitas Dei, was designed to achieve one of the objectives of its founder: to reach God through knowledge.

The nucleus of this one takes place in the eastern part of the town, in the space that was left between the first walled enclosure and its extension, made from 1454 by Archbishop Carrillo, where the village had been extended along the Century XV, that is to say between the market square, current of Cervantes and the doors of Guadalajara and Tenerías. The projected "new city" divides the space into eighteen islands, following an orthogonal, con Two parallel main streets, the one of Libreros and the one of Rome (current Residence Halls), that is the extension of the streets Mayor and Santa Úrsula respectively. To obtain all the necessary space for its university city and because in the zone previous constructions existed, like the monastery of Santa Maria de Jesus or of San Diego, demolished in 1859 to construct a new building that today is known like barracks of the Prince Of Asturias, The cardinal had to carry out a number of real estate transactions to facilitate the installation in existing houses or in the majority of cases, the construction of new schools for the study and residence of students (religious and lay people of all social, Including the poor), and teachers, and all those services necessary for activities related to academic life (book trade, typographic industry, library, prison, recreational property ...). He did it quickly and with usual materials in the area, such as brick, tapial and wood, where his joined the useful and the beautiful. The basic model followed was a building of quadrangular proportions with a central courtyard around which were arranged the stays of diverse uses, including the church, except for those whose parcel was very irregular. In them the Gothic and Mudejar constructive traditions were fused with the plateresque artistic current Prevailing until the middle of the century XVI That ended up displaced, from the eighties by the classicist current of severe and simple forms imposing the most classic baroque that dominated throughout the seventeenth century. The medieval hull maintains a strangely simple trajectory between the traditional medieval traces being very marked by urban axes of direction east-west as a reflection of its own geographical position of crossing of roads. In the Baroque period, it suffers both the inclusion of collegiate-university-like institutions and the opening of new plazas with a typically Renaissance meaning.

The university city centre is located approximately in the center of the Alcalá of this time, in the present Place of the Victory.

At the beginning of the fifteenth century,

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the walled enclosure was enlarged, incorporating land adjacent to the urban nucleus, and making the existing roads (Mayor and Offices) an extension of the old roads that defined two new gates of the city, those of Guadalajara and those of Tenerías (ROMAN, 1994, 404).

Cisneros participated, next to Juan López de Medina from 1476 to 1489 in the creation of the School of San Antonio de Portacoeli in Sigüenza , which finally acquired the status of University through a papal bull of Innocent III, with the Chairs of Arts, Theology and Canon Law.

From the laying of the first stone of the University, there is an urban renewal that originates an authentic "University City" and Alcalá is populated by major and minor residence halls, convents and churches. The Residence Hall-Convent model is about to be born and will act as Residence Hall-University.

The location of these first Residence Halls-University where higher studies were carried out demands the provision and abundance of food and, in turn, the healthiness of the students. Possibly, their ideal location would have been closer to The Court and Governing Bodies, these being in Toledo, but the Cardinal preferred that the studies were far from outside influences.

Residence Hall of San Ildefonso and the configuration of the city.

The first building of the performance that is constructed is the Major School of San Ildefonso, its construction will last until the year 1508, And was replaced in 1543, being Rector J. Zurbarán, by the present school, whose facade is atributted (ALVAR, 1996,20), by innumerable sources, to Rodrigo Gil de Hontañón[4]. It can be considered the summit building of the Spanish Renaissance, as much for its realization as for its originality, whose facade and first crust were declared Historic Artistic Monument March 19, 1910. The church was held in parallel with the Residence Hall, being concluded at 1510.

Cardinal Cisneros entrusts the architect

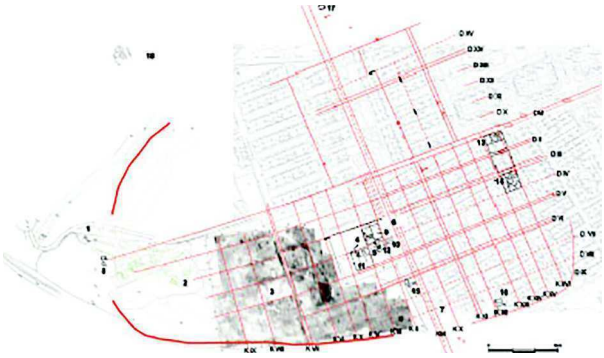

Figure 1.
Orthogonal **urban planning of Complutum city.**

Pedro Gumiel with the construction of the Residence Hall of San Ildefonso in the lands recently annexed to the city after the extension of the wall on the opposite side of the Market Square. The rest of the land was cut for the construction of houses and annexes linked to the operation. Thus, the first example of University-Residence Hall is produced in a context of urban planning and with the possibility of growth.

The point of union between the University and the rest of the city was made through a large arch that was built on the side of the Market Square. It was 7.3m long and 5.30m high, being made of stone base with an upper balcony to be able to witness acts. The real estate operation based on the purchase of real estate and land serves to provide continuity and increase the economic assets of the Residence Hall.

As just pointed out, the development and growth of the University City is done by the construction of new Major and Minor Colleges. They are distributed in the urban fabric as "islands", thus producing the first configuration of the University.

The Cisnerian University complex is composed of three institutions:

-The Residence Hall of San Ildefonso, as the core of the rest of the urban planning.

-The "minor" Residence Halls, Which serve as a preparation for schoolchildren in order to be able to enter the san Ildefonso Residence Hall.

-Buildings annexed to the Residence Halls.

On October 17, 1517, the existence of 18 Junior Colleges was approved, of which 7

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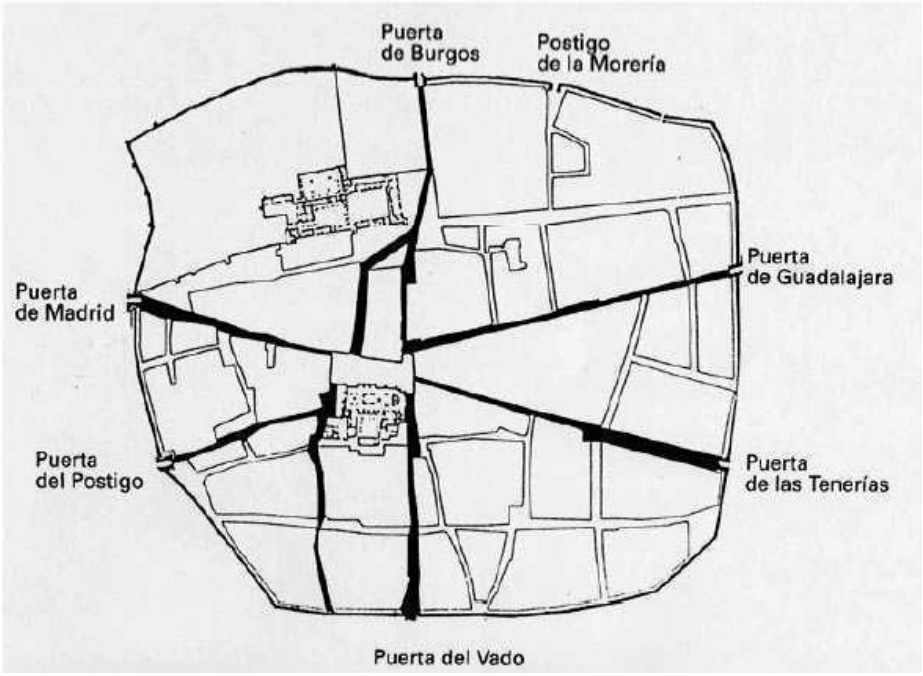

Figure 2.
City gates. XII-XIV centuries

were started in the life of the Cardinal Cisneros (ALVAR, 1996,21) And the rest will be built later with its funding provided with money left by the Cardinal Cisneros.

In the rest of the city, in addition to multiple arrangements and improvements such as the sanitation of the main street, change of the right feet of porches or the cobblestones of the streets adjacent to Calle Mayor, Cardinal Cisneros and his collaborators dedicated themselves to Increase with more purchases of land and existing buildings to provide new services to the University, and also, to obtain income for the maintenance of the same.

Joined to these constructions, several streets were also built around the San Ildefonso Residence Hall in which residences are housed for students who did not live in the Older Residence Halls, workshops and printing presses that helped the development of the University, creating a city through and promoting new activities in the town, such as the construction of the San Lucas Hospital, which will meet the needs of members of the university community.

Undoubtedly, the character of this city is strongly marked by the presence of the University, as occurs in a similar way in Oxford and Cambridge, where the identity of the city is the image of the University. In this case, religious symbolism is closely related to the University Foundation, assimilating the figure of Jesus Christ to the San Ildefonso Residence Hall, And the first Christian community to Minor Residence Halls, A total of 12 in honor of the twelve apostles, and the other 6 minor colleges, in honor of the 72 disciples, a total of 6 per apostle.

The university success of Cardinal Cisneros is due, in large part, to the solid financial structure that allows to give stability, in front of other spanish universities that ended up disappearing due to the extinction of its resources.

There are three pillars on which supports the Alcalainan University,

-Legislative regulation of the Foundation

-Economic resources

-Purchase of physical space and the possibility of acting in it with a regulated urban plan.

The University founded by Cisneros causes a new city to emerge, becoming a research focus of the first magnitude. This city is planned in a way that constitutes a kind of “expansion” in early times, of the medieval center, comprising

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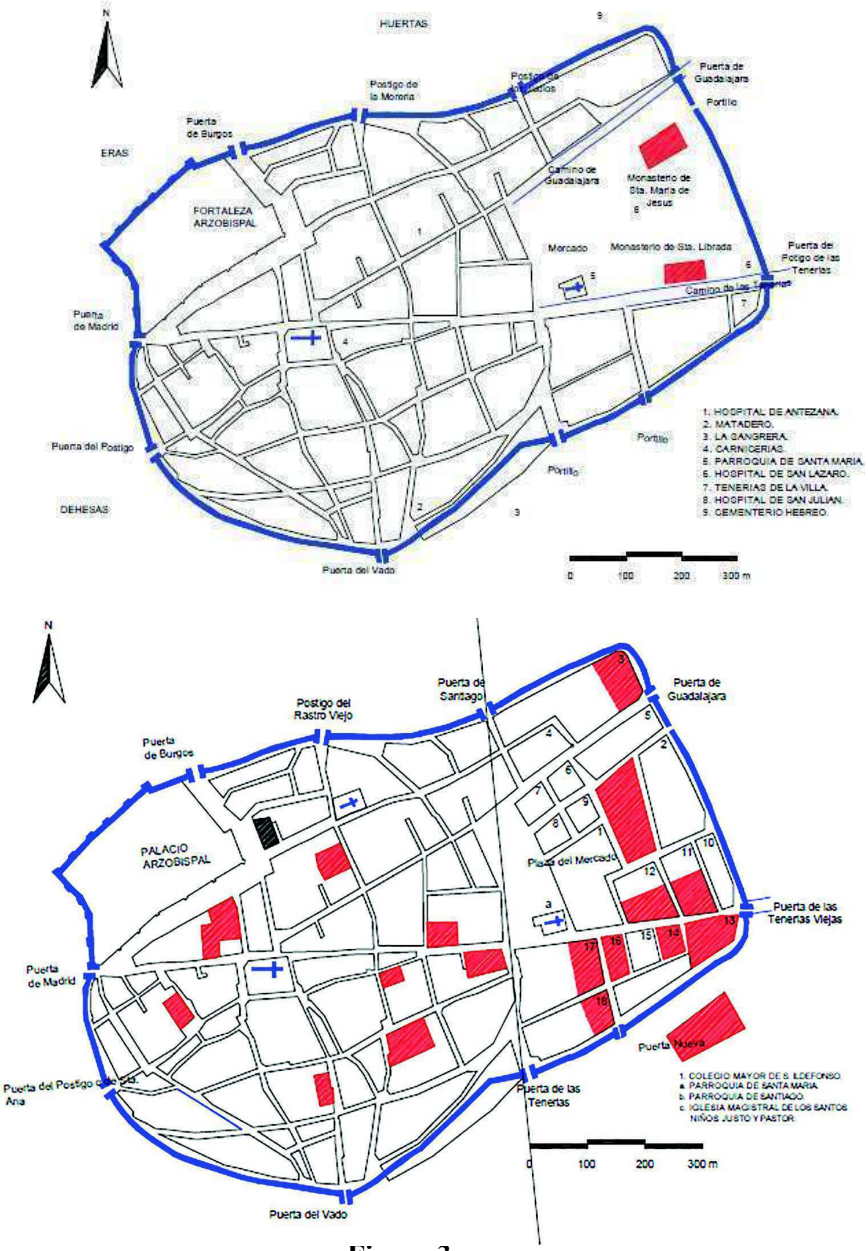

Figure 3.
University cration and extensión of the walled area. XV century

both the educational and residential buildings as well as of the equipment, which is a totally new experience, the first university city planned in the history.

Cisneros turns the town into a modern city, paving entire streets, drawing the first sewer network and designing the place of residence to be occupied by students, professors and complementary services, making Alcalá a reference model where the intellectual level and urban practise are effectively combined.

Repercussions of the cisnerian model.

There are repercussions of this model in other national as well as international.

As we have seen throughout the text, the University City of Alcalá can be defined as a unique example in the history of Spain of the sixteenth century, and which will serve as a fundamental model for other later university foundations. Alcala gave splendor to a new university organizational system: the Residence Hall-University. Following this

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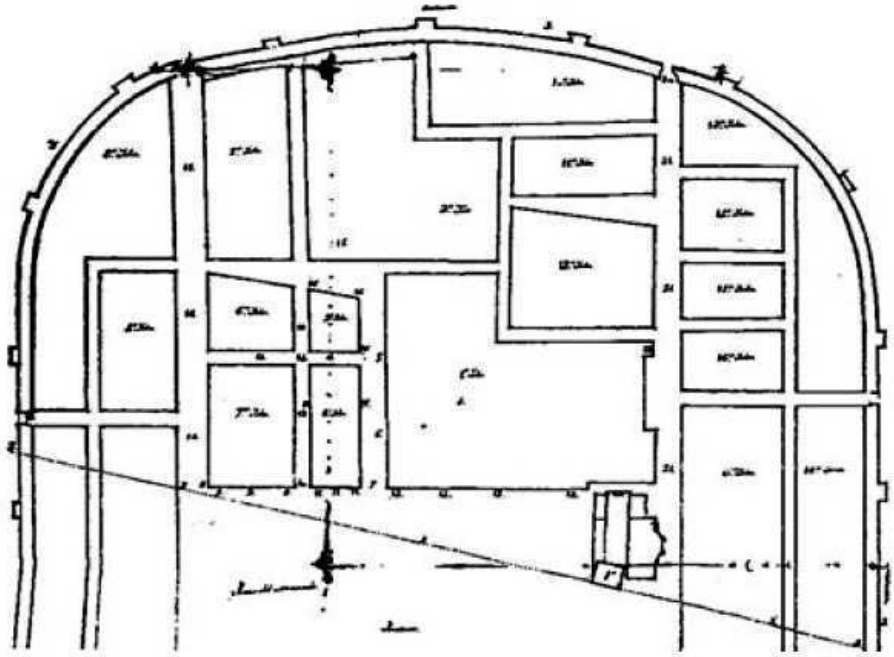

Figure 4.
Iintial university configuration. Urban planning of the colleges.

pattern, many other university centers, such as Toledo in 1520, Baeza in 1538, Oñate in 1542, Burgo de Osma and Almagro in 1550, emerged in Spain throughout the sixteenth century. And, stressing the tremendous operational value it represented for Culture and society of America the formula college-University or convent University, can present a long list of American universities that acquire this practice of organizational novelty.

The University of Santo Domingo (1538), the first and dean of America, wanted to stand in the image and likeness of Alcalá de Henares. Following its wake others were founded; Universidad Pontificia de Ntra. Sra. Del Rosario - after Santo Tomás- de Santa Fe (1580), San Francisco Javier University (1621) and San Nicolás University (1694) in Bogotá; Pontifical University of San Fulgencio de Quito (1586), Royal Pontifical University of Santo Tomas (1681) and University of San Gregorio (1621) in Quito; Santiago de la Paz University (1558), in the Dominican Republic; Universidad Ntra. Sra. Del Rosario (1619) and Universidad San Miguel (1621), in Santiago, Chile; San Antonio University (1629) and San Ignacio University (1621) in Cuzco; University San Ignacio (1621) in Cordova and the Real University of Merida of the Yucatán in Mexico, of which it is said that it granted degrees in the XVII.

In the eighteenth and nineteenth centuries continued using the Model that Alcalá had created and consolidated in the s. XVI. In this way, adapting in a way that formula and contributing its peculiarities, the University of Havana (1721), University of Caracas (1721), University of Popayan (1744), San Francisco Javier of Panama (1749) Chile (1749), University of the Assumption in Paraguay (1779), University of Guadalajara in Mexico (1791), University of Merida in Venezuela (1806), and University of León in Nicaragua (1812).

Alcalá exported its prestige and organizational way of making the University profitable: a microcosm where services, population, the academic world, education and Knowledge coexisted. It exported its system of studies, academic degrees, its legislation and its operation.

Therefore we are in Alcalá with a new model of city, prolongation and continuation of the existing one. We are facing a Church University, before a City of God that has to function as a light of cultural redemption. The specific

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cultural values of humanistic philosophy (knowledge of the bible, vernacular languages to know the truth, integral theological study, natural philosophy) transformed the city. With the Cisneriana University City a structural urbanization was fixed, and its technical and juridical functionality was projected identified with its Convents and Colleges. One of the great contributions of the Alcalá University to the creation of the scientific culture of the language, with universal characteristics, was the creation of the Trilingüe Residence Hall, a unique institution and assumed by other Universities of recognized fame. For example, the Salamanca University sent Professors delegates of its Cloister to observe the operation and performance of this New educational institution, and later to implant it in its own Salamanca University.

Conclusion

The University founded by Cisneros causes a new city to emerge, becoming a research focus of the first magnitude. This city is planned in a way that constitutes a kind of "expansion" in early times, of the medieval center, comprising both the educational and residential buildings as well as of the equipment, which is a totally new experience, the first university city planned in the history.

Cisneros turns the town into a modern court city, paving the streets, tracing the first sewer network and designing the place of residence for students, teachers and complementary services, making Alcalá a reference model where Intellectual level with urbanismo.

The University created by Cisneros became the focus of Spanish Humanism and later in the center of the Golden Age. It attracted great intellectuals, linguists, literati, doctors, historians, and religious for centuries.

The very organic and functional configuration of the University of Alcalá, constituted by a Major School around which emerged a constellation of Lesser Colleges, favored in a decisive way the participation of all the social estates in the great university work of Complutense. Ecclesiastical University By becoming a prominent focus of religious reform, first, and then counterreform, numerous orders.

The significance of the University is reflected in the UNESCO Declaration on the recognition of the University of Alcalá as a World Heritage Site, which shows that unlike other universities in Europe, such as those in Bologna, Oxford, Paris and Salamanca , Alcalá de Henares did not develop slowly, adapting to its urban environment. On the contrary, Cisneros conceives it from the beginning as an entity that invades the partially abandoned medieval city and converts it into another whose end is the university. All this involved the construction of accommodation for teachers and students, the provision of different services such as sewer systems and street paving.

The profound social change that occurs in the cities in which the University is embedded has a positive revitalizing part of the same, and a negative part, in terms of supply problems, or the conflict that was caused by the fact that only men came And there was considerable disproportion between the sexes, proliferating fights, and degrade areas.

Notes

1 Studium Generale (Estudio General) como se llamaba a la universidades en la época. Real Carta de sancho de Sancho IV el Bravo al arzobispo Gonzalo García de Gudiel. Archivo Histórico Nacioanl, sección de universidades, legajo 1 y libro 1151-F.

2 Bula Cum aliarum verum distributio. Archivo Histórico Nacional, sección universidades, libro 1095-F, pp.9v-11r.

3 La Obra de la Políglota. La Universidad Complutense a través de los libros: 500 años de la bula Cisneriana. 1999.

4 Rodrigo Gil de Hontañón (Rascafría, Madrid; 1500 - Segovia; 1577) fue un arquitecto renacentista, considerado como uno de los mejores arquitectos españoles del siglo XVI. Su estilo personal ha influido en la obra de arquitectos modernos como Antonio Palacios. Su obra simboliza la coexistencia entre el gótico tardío y el clasicismo renacentista, y al mismo tiempo, la superación en España del medievalismo.

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Arrival City: Refugees in three German cities

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Dedicated to Tahir from Pakistan

Abstract. *Since late 2015, the authors have studied the refugee crisis in Europe and the Middle East (PUARL Refugee Research Website, 2017). In this paper, we present three case studies in three different cities in Germany. Refugees are everywhere in Germany, even in smaller towns and villages. The case study cities are at different scales and include Borken (15,000 people), Kassel, a mid-size city (200,000), and Essen, a larger city (600,000) which is part of the still larger Ruhr Area Megacity. In these cities we try to understand the life of refugees from their original escape city and country to their arrival in these new communities. Our work focuses on the social-spatial aspects of refugee experiences, and the impacts on urban morphology and building typology. We also try to understand how refugees manage their new life in partial safety of place, shelter, food and financial support, but also in uncertainty and insecurity until officially accepted as refugees. Beyond crisis, we are looking at how refugees can and will try to integrate into their host countries, cities, and neighborhoods and start a new life. Urban architecture projects for housing and work opportunities that help the process of integration are part of this study. Particularly, in this paper, we investigate the reality on the ground of the positive Wilkommen Kultur (welcome culture) and the high expectations and implied promises that were set in 2015 by Chancellor Angela Merkel and German society.*

Keywords: Arrival City, Refugees, Urban Morphology, Design and Building Projects.

The Wilkommen Kultur (welcome culture) and its implied promises

The United Nations estimates that there are about 250 million migrants in the world, of which more than 65 million people are refugees (United Nations, 2015). This means that one in every 113 people alive today are now displaced by war, violence, and persecution (UNHCR, 2017). Refugee arrivals in Europe continue at crisis levels, particularly in Germany, where more than 435,000 asylum seekers arrived in the first half of 2016 alone (UNHCR, 2016). These forced migrants joined the nearly one million earlier arrivals to Germany in 2015, most still in limbo awaiting asylum approval or appeals. In Europe and in the United States, migration issues are divisive and at the fore of public debate and protest. How the world responds to this global crisis will arguably impact the trajectory of peace and well-being on this planet for generations to come.

In 2015, in response to the ongoing conflict and humanitarian crisis in Syria, German Chancellor Angela Merkel welcomed refugees into Germany with a wide open door to help them in a direct and humanistic way. At the time she calmed down the concerns of the German people with the now famous expression ‘Wir schaffen das schon” (“We will manage that”) (Sommerpressekonferenz von Bundeskanzlerin Merkel, 2015).

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Merkel's "Wilkommen" (welcome) policy has generated a large number of positive reactions and activities in Germany at all administrative levels of federal, state, county, and municipality, as well as an overall positive response by civil society with its social, religious, and private associations and organizations, and individual citizens. Initially, a Wilkommen Kultur (welcome culture) emerged in communities throughout Germany. German communities took on the role of "arrival city" (Saunders, 2012), and collectively generated an atmosphere of "making Heimat" ("Heimat" is a German term that means to create a place for one's own life, feeling, wellbeing, and belonging, embedded in the history and community to which one belongs) (Schmal, Elser, Scheuermann, 2016). Help and support continues today in a pragmatic fashion after two years of up and down experiences.

The Portland Urban Architecture Research Lab (PUARL) has begun initial, preliminary research by developing a set of focal areas situated within the broader context of this international crisis. These focal topics are also referred to as building blocks within this larger study of refugee escape, assimilation, integration, and return to original home country. Current building blocks that are being studied include: urban morphology studies, building and typological studies, refugee legal frameworks, patterns and pattern languages for assimilation and integration of refugees, project languages for particular design and building projects, and lastly, case studies of cities towns and neighborhoods, the first of which are presented here. Initial versions of this research were presented at the International PUARL Conference in San Francisco in October 2016. (PUARL International Conference, 2016)

In this paper we investigate the reality of this positive Wilkommen Kultur and the high expectations and implied promises that were set in 2015 by Angela Merkel and German society. Our discussion and findings are drawn from research conducted by the authors in Germany in August 2016, as well as preliminary visits undertaken by Dr. Hajo Neis in December 2015 and March 2016, and a follow-up visit in December 2016. Our research focuses on the ways in which the invitation for refugees to come to Germany is playing out in these three communities in regard to primary immediate needs for refugees, and in regard to the initial impacts on the German citizens and social-spatial aspects of German communities. In this paper, we analyze how the Wilkommen Kultur is actually working on the ground in states, cities, towns, and villages. To this end, we selected three German cities that serve as case studies with which to address our main question: the small town of Borken in the state of Hessen, the larger city and county of Kassel, and the much larger city of Essen, a part of the Ruhr Area Megacity of five million people.

Our initial research included informal interviews with German officials at various levels. Given Dr. Neis's German citizenship and wide network of contacts in Germany, we were also able to interview a number of German citizens working in the private and volunteer sectors, as well as university faculty. Professor Alexander Schmidt and doctoral candidates at the University of Duisburg Essen provided numerous interviews and tours of refugee facilities in Essen, and they also shared the final report from a masters' degree planning seminar (Wehling, Schmidt, Pozo, Casanova, Pahlen, and Kürzdörfer, 2015). We also spoke informally with numerous refugees at various camps and group housing facilities, and we met with a few Syrian refugees for detailed interviews. However, we note that this first round of case study research was an initial investigation, and our evaluations are suggestive, rather than exhaustive.

In the following sections, we provide a series of short vignettes and brief discussions that illustrate how these three communities are working to address the more immediate, basic needs of refugees. Specifically, we examine the following: a. overall support structure, b. housing, c. communication and acclimatization, d. work, and e. the formal, legal asylum application process. We end the paper with a series of initial findings and evaluations of the current situation, and a brief discussion on the outlook for the near term future of refugee integration in Germany.

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Figure 1.
Map with different kinds of shelters and camps for refugees in use in the city of Essen in 2015-2016 (Source: Der Westen, 2015).

Detailed topics of investigation in the Arrival City

Help and support structure in cities, towns and villages, counties, states, and the country

The most amazing reality for people who come from outside the country and visit Germany to observe the refugee situation is the fact that refugees are present everywhere, including in very small villages and towns, such as the interim housing in a former hotel near Dr. Hajo Neis' house in the small town of Borken. Germany has adopted a policy of distributing refugees to communities throughout the country according to the so-called "Königstein Key," which sets quotas for each state according to economic capacity (BAMF Glossary, 2017). Distribution is roughly organized in three to four levels of helping and administering refugees. At the federal level refugees are first registered, and then they are distributed to the different states. The state government then continues to distribute refugees to counties, cities, towns, and villages. After their initial placements by the government, refugees' daily life becomes a purely local event in which refugees and citizens of the towns, villages, and neighborhoods have to exist together.

It is worthwhile to emphasize that the administrative structure could not handle all these refugees through the government alone. In Germany, a well-functioning social structure has been very helpful. In addition to the city administration, religious organizations, and a number of volunteers and partially paid helpers, there is a very strong structure of 'Vereine,' which are associations for all kinds of purposes from sports clubs to historical associations, garden associations, and even rabbit clubs. In Germany one can find anything under the sun for which people might create associations. These associations tend to be extremely helpful in supporting refugees in various ways. For example, sports clubs fulfill a key role in helping young male refugees to engage their energy.

Refugee housing in Essen, Kassel, and Borken

As in much of Germany, the number of refugee arrivals in Essen in 2015 and 2016 surpassed the amount of available built spaces in which to house refugees even temporarily. During the height of refugee arrivals from 2015 to end of 2016, the City of Essen operated thirty-two temporary facilities throughout the city (Figure 1). Due to the large number of arrivals in 2015, Essen, like other places in Germany, moved to a system of modern tent camps in

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Figure 2.
a. Temporary tent camp structure in Altenbergshof, Essen, in use in 2015, and b. after removal one year later in 2016. With researcher Aurelio David from University Duisburg-Essen.

order to provide basic shelter for new arrivals. Other permanent structures, such as hostels, hotels, and empty buildings, were retrofitted for temporary refugee housing. In contrast to Landkreis Kassel, where the Landkreis (county) oversees and manages all aspects of refugee support, in Essen, management of the tent camps has been contracted out to a private firm, European Home Care (EHC). EHC managed all aspects of the temporary housing, including distribution, operations, meals, and security.

By the end of 2016, most of these temporary camps had been closed and refugees had moved to other temporary accommodations, but this time in permanent structures. During a visit in December 2016, Dr. Neis was indeed surprised that some of the camps we had visited in August 2016 were non-existent after a year of use. In December 2016, Dr. Neis visited two of these camps – Altenbergshof and Bamlerstrasse - and only found the paved floor plan remnants formerly occupied by tents and paths, with gravel still in place (Figure 2). The question of course is where the refugees were moved to, in what kind of housing, and what kind of building structures, old and run down or remodeled and new. We were told by university researchers that refugees from one camp were partially moved to the city's edge with poor transport connections.

Essen is now working with a challenging situation of accommodating these thousands of new arrivals in their own housing stock in a city with very low vacancy rates for apartments (only 3% according to the City) (Essen City Website, 2017a). The City places refugees whose asylum has been approved in their own apartments, but asylum approval can take months or even longer than a year. In addition, the City advertises for volunteer landlords to rent to refugees. Refugees are also eligible to find their own apartments after achieving refugee status, but in the meantime, they most often live in dormitory style housing with others from around the world.

During the past three years, the City of Essen, like any other city in Germany, has had to work with constantly changing forecasts for the number of refugees who will arrive. Recently, arrival rates have slowed substantially and plans to build additional dormitory style facilities or to retrofit existing buildings have been canceled. In the meantime, the City is still working to find apartment placements and to manage the facilities and needs of thousands still housed in dormitory style facilities.

In the town of Borken with about 13,500

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Figure 3.
a. The restaurant and hotel 'Bayernkeller' used for refugee housing in the town of Borken, and b. conversation with refugees inside the hotel in 2016. Dr. Neis with Tahir from Pakistan.

inhabitants and about 200 refugees (number changes all the time because of new arrivals), refugees are located in the core town but also in neighboring villages that are part of the municipality. Most of the young male population lives in the core town in a former restaurant with hotel, called Bayernkeller (Illustration 3). In the village of Kleinenenglis, a number of families are housed in a four story apartment building, and in the village of Gombeth, a former community building now serves as a shelter for unaccompanied minors. Distributed in some former prefabricated 'Plattenbauten,' a few refugee families live in individual apartments rented by the City.

Acclimatization, assimilation, communication, and living in a new local culture

After going through the federal arrival camps in a new country, then passing through the state arrival camps, refugees finally reach the local city, town or village arrival places, where they will live for quite a while and get used to local life and culture to reach their main objective of getting safe asylum status.

In practical terms, all refugees are taken care of by the government according to European Union regulations and the German Constitution. Upon arrival in Germany, all refugees are provided shelter in some form. They each receive Euro 359 for their personal use and expenses, and they are taken care of by a number of institutions, as well as private helpers and volunteers (Reddit, 2017). They have arrived in a place where some fundamental life necessities are provided for them, at least for a while.

Refugees also face a number of challenges that will take time and real effort to live up to. They are first faced with communication issues, the problem of learning a new language, the problem of learning new customs, getting used to living in a European culture, getting around in a new place and neighborhood, needing help with all kinds of paper work, and dealing with trauma from experiences in conflict zones and serious problems on their escape route from their original home to a new arrival city in a different country, language, and culture.

There are also events of coming together and just enjoying a moment of relief and understanding each other. On Christmas in December of 2015, the Protestant Church in Borken organized a live music event with modern music within the church as part of its ecumenical ongoing efforts, and all refugees were invited. Dr. Neis attended and experienced local residents and Islamic women, children, and some young men coming together to participate, clap, and sing to modern mixed music in a Protestant church. In particular, small children running around with happy red faces made one think quite positively about the future of living together.

Language skills are critically important to

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Figure 4.
Map of county of Kassel with various individual municipalities and locations, including the city of Wolfhagen with the Pommernanlage, the old airport buildings in the municipality of Calden as a federal refugee camp, and the main Social Department Headquarters location in Kassel.

support even the most basic interactions between refugees and locals in host communities, and these skills are also key to opening possibilities for employment in the host country. In 2015 and 2016, during the height of refugee arrivals, government emphasis understandably focused first on meeting basic needs of safety, housing, food, clothing, etc. Work placement efforts and language training then developed in various forms according to the capacities and motivations of various government institutions, but with language training in particular, much of the municipalities efforts are well supported by the private sector through charities and informal volunteer programs.

For instance, in the town of Wolfhagen, part of the county of Kassel, retired people, particularly former school teachers, were eager to put their skills to work and so started up a variety of German language classes for the refugees at the Pommernanlage facility near the town, formerly used as a military camp. As a way of further encouraging everyday interactions, municipal buses service the Pommernanlage with regular stops between the camp and the town. Language classes are typically offered in town to encourage people to mix outside of the camp and to become part of the community. Ms. Elena Beck, a social worker at the camp, explained to Briana Meier the importance of these informal programs in helping refugees and Germans interact and connect:

"It is important not to make a parallel world here in the camp. It is important for people to have structure and purpose, and to feel that they have some involvement. That is why there are no groceries here (at the camp), and why the German course is offered in town." (Figures 4 and 5)

In Essen, language classes are also provided by various charities and volunteer groups, such as the Diakonisches Hilfswerk. Classes offered in various parts of the city provide refugees a chance to get out of the camps or refugee-only facilities. During a conversation with Briana Meier and Tomo Furukawazono in the private flat he had recently rented, Assaad, a refugee from Syria, explained that although the German lessons were critical for him in learning the basics of the language, the way he really learned to converse was through actual informal conversations with Germans, such as those he had while volunteering at a clothing donation center:

"The most important thing is to help people get better integrated. For example, to learn a language, people need to speak it, not just have lessons then go back to the camp. We got so much contact with German people through working together at the Kleider Kammer. We succeed in language without going to any school by practicing the language with our friends."

Work and work-learning related activities

If there are any two major issues for refugees of importance it is housing and work, Mr.

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Figure 5.
Pommernanlage - Social workers Mr. Zeuch and Ms. Beck at a former military barracks for a tank battalion in the town of Wolfhagen, now used as a peaceful camp for refugee.

Rossberg, head of the County of Kassel refugee organization and department of social affairs, easily assured us. While housing is part of the refugee package according to German laws, work is less easily available and sanctioned (more in Finding 5 about the legal structure of work). Still, there are kinds of work that refugees can and will do if offered. These include short term help, practical, internships, apprenticeships, and other kinds of support and learning operations that also help refugees to assimilate, learn technical terms, and get to know the work culture in a particular society or particular trade or craft.

Our experience in the town of Borken shows that the young men there appreciate work of any kind, even if the additional amount of money is minor. Being needed, doing something useful, and learning a trade are in themselves of value; work experience is also considered to help in attaining asylum status. In the Bayernkeller Restaurant and Hotel in Borken where twenty or so young men are living, having work or a job is considered very important, and if one of them can attend the university in a close by city, that already counts as great success. For regular work, the City of Borken takes a number of young refugees to work in their 'builder's yard and repair facility,' with outside park, garden, and streets work and repair operations. Some refugees also work in the private sector. One young man works in a painting shop, he proudly explained to us, and another works in a car repair shop, a job he had occupied in his home country. Another works as a kitchen helper in the Italian restaurant 'Dal Circulo.' More work needs to be done to create legally sanctioned work opportunities for refugees who do not have official asylum status.

Asylum application, approval, or denial by authorities

At the same time that refugees and Germans are addressing housing, work, and overall acclimatization issues, refugees must also apply for legal asylum if they wish to stay in Germany. Germany is not an immigration country; there are only two mechanisms through which

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migrants may apply for legal residency in the country. First, Article 16a of Germany's 1949 Constitution includes provisions for asylum seekers (Basic Law for the Federal Republic of Germany, 2017). Second, federal law includes an "exception" policy, which states that the country does not allow immigration, except as appealed on a case by case basis (for example, for people who have married German citizens, for those with special work in Germany, etc.) (Federal Ministry of the Interior, 2017 and Scherer, 2016). Refugees apply for legal status through the asylum law. Asylum application processing can take from a few months to over a year. During the interim period between their arrival and the asylum decisions, refugees' are very limited in their abilities to find self-rented permanent housing and paid employment.

Asylum denials may be appealed, but the appeals process again can go on for many months to a few years. Asylum has recently primarily been approved for people from Syria, Iran, Iraq, and Eritrea, while the many others from places like Afghanistan, Pakistan, and Ethiopia and other African countries are denied. Asylum denials are increasing now that a few years have passed since the first large waves of refugees arrived, and growing numbers of people are now in precarious positions as migrants without legal status in Germany and Europe, but who are also not able to return to their home countries. This poses a serious dilemma for many of the refugees after so many days, weeks and even years of hardship.

Findings and evaluation: The Wilkommen Kultur and its reality on the ground

Our initial research into these three towns and five major topics for refugees focused on mapping the general situation facing these communities as a precursor to more targeted and extensive research. These first visits allowed us to collect material for our initial field study cases that helped us to find research supported answers to our questions and enough data to actually accomplish some evaluations with regard to our main question of how the implied promise of the is working on the ground.

Finding 1: Help and support structure are seemingly working well, but are also becoming overwhelmed by ever increasing refugee numbers in 2015-2016.

The support structure in the three German communities we investigated seemed to be quite well organized at the administrative, public, religious, and institutional levels, at the private business level, and also at the level of private initiatives. Overall, at all levels and in each community, we encountered a generous attitude and desire to help. The overall helping attitude can be seen as a positive sign of the refugee Wilkommen Kultur. For example, when refugees began to arrive in Borken, the Free Protestant Church there soon established a place and time for refugees and locals to meet every Monday for coffee and cake to just see each other, talk about issues and problems, but also just enjoy. They call this event and space Cafe Hope. Tomo Furukawazono participated in the Cafe Hope events on various occasions. In the City of Essen, Pastor Achim Gerhard-Kemper represents one of numerous neighborhood 'Round Tables' (Essen City Website, 2017b), public stakeholder meetings where refugee issues and how to live together with refugees could be discussed in an open and constructive manner.

However, in 2016, as more and more refugees reached even the smallest villages in Germany, city officials and residents started to wonder how they could actually handle and help more and more incoming refugees. Mr. Rolf Waldeck, the head of the City of Borken ad-hoc committee on refugees, was quite confident that with a number of about 100 refugees in the town he and volunteers could handle this crisis. But when the number became more than 200 refugees for a town of 13,500 inhabitants, Mr. Waldeck reported that he started to wonder how they could continue to successfully support the refugees.

Mr. Waldeck's worried sentiment also reflected the national opinion at the time, that the ever increasing magnitude of the refugee situation started to be seen as more and more difficult. As time goes on and the numbers

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of refugees grow, the Wilkommen Kultur is facing its first major tests locally, as well as nationally.

Finding 2: Refugee housing is a test of Wilkommen Kultur.

A.Housing is obviously a key element in the care for refugees. And while Germany was remarkably well prepared for taking care of refugee housing, the large number of refugees more often than not created serious accommodation challenges at the local level. While refugees are first housed in large federal arrival camps, it is really the local level where refugees are housed more long term and in a more open and connected way to the local community.

B.While the general tendency in Germany is to provide housing for refugees in existing building stock structures, there are also a limited number of new building structures provided for refugee housing. The unwritten policy is to provide the same kind of low cost housing for refugees and local citizens alike so that there is no indication of special, preferential treatment of refugees. In order to test more options, one of our architectural design studios took up a live-work design exercise at the edge of the central city in Essen and the University of Duisburg-Essen to explore socio-economic integration. Professor Howard Davis carried out a successful live-work design studio for Syrian refugees in the winter quarter of 2017 at the University of Oregon, Department of Architecture in Eugene (CIU, 2017) (Illustration 6). This project raises the progressive question of next steps through which housing and work can help together with socio-economic integration.

Finding 3: Acclimatization requires communication; the mobile phone is key.

Daily life for refugees and how they become accustomed to their new surroundings includes a large area of practical matters, from learning a language, health issues, to connecting with the local community and keeping connections to family and friends in their home countries and cities.

Figure 6.
'Refugee Live-Work Design Studio in the cities of Essen (Germany) and Portland (USA)' by Prof. Howard Davis, University of Oregon, Architecture Department, Winter 2017.

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A.Starting with the last first, almost every refugee has a cell phone, first for the purpose for staying in touch at home, and also for staying in touch with fellow refugees locally and in other cities in Germany or other EU countries. Smart phones and internet connection are critical tools for refugees to navigate new communities, to learn the language, and to keep up to date on their paperwork and asylum application process.

B.One of the key challenges concerning communication among refugees and citizens is that it can be difficult to commit to the level of investment required for teaching and learning a new language while it is still uncertain if refugees will be able or wish to stay in the country. Another challenge is that refugees are often coping with high amounts of stress, so it may be difficult to encourage social interaction with the pressure of learning a new language.

Finding 4: Work experience is critical for assimilation and integration, but it is difficult to get during asylum processing.

Next to housing, work is the biggest issue for refugees in terms of a regular daily life and in terms of security and outlook for a good economic future. One could say that refugees are taken care of quite well in terms of housing, health care, monetary support and other needs for daily life. In terms of work there are also a number of measures that are taken in cities and towns, such as internships, practica, and job learning, in the public as well as in the private sector. However, these activities or small jobs are not regular jobs with standard pay, insurance, and other benefits, the most important being retirement. Even for refugees with recognized asylum status there is no definite right on work with benefits. Here the promise that Chancellor Merkel made is incomplete in its results.

The welcoming invitation for refugees needs to include provision of regular jobs and support for private start-up enterprises by refugees. Socio-economic assimilation and especially integration depend largely on working opportunities in all kinds of forms, including self-help, start-ups (i.e., food related jobs), and regular paid jobs. In this area, a lot of work needs to be done to successfully help refugees become part of German society.

Finding 5: The asylum law and the German residence law are not sufficient to deal with the refugee crisis in an effective way.

One of the main reasons for a number of the difficulties and complications with refugees being fully welcome in Germany is the current legal structure regarding foreigners from outside the European Union. The two laws dealing with foreigners are the asylum law and the residence law. The asylum law gives one the right to apply for asylum and be provided for until a decision has been determined about refugee status. The residence law essentially states that non-citizens cannot live in Germany unless there are strong reasons for doing so. In a way, the United States is better able to receive refugees quickly due to the existence of immigration laws there that allow for quicker processing of applications.

Special laws need to be introduced in Germany to solve some of the problems for refugees including the right for more work opportunities or, even better, a solid comprehensive immigration law should be established by the parliament in order to provide more options for refugees to participate and become part of the host society in a faster, less troublesome, and productive way.

Final comments: Outlook - One cycle complete

With regard to our main question of direct or implied promises of the arrival city, best expressed by chancellor Merkel's invitation to all refugees to come to Germany, we can say that German society was surprisingly well prepared for taking on the challenge, especially on the local level of towns, cities, and villages. In the city of Borken, county of Kassel, and city of Essen, the administrations, as well as public and private organizations, and private citizens alike were managing various challenges quite well, such as housing, connections to refugees, providing work related opportunities, as well as

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helping with asylum matters, helping refugees to learn the language and so on. Refugees we were in contact with were well taken care of and reacted quite positively, on the one hand. On the other hand, when the numbers of refugees started to become larger and larger up to one million arrivals in 2015 alone, the general mood in the German population did swing with negative tendencies.

The choice of the three German cities was determined by specific criteria including size and scale differences, as well as availability and our own connections to universities and municipalities. However, in a discussion with Mr. Claus Muller from the renowned newspaper Frankfurter Allgemeine, Mr. Muller correctly pointed out that all our case study cities are located in western Germany, and none is in eastern Germany, where conditions are dramatically different. Consequently, and on the suggestion of Professor Ralf Weber from the Technical University of Dresden, we have decided to look at the city of Bautzen, close to the Polish border and the city of Dresden, to get a more complete picture in a more difficult context. We intend to tackle this task in the summer and fall of 2017.

The fact that our case study cities can be evaluated quite positively with regard to our main question of fulfilling the promises of the arrival city and Wilkommen Kultur on the ground is of course in itself remarkable as a positive result, and one can applaud the participating actors and organizations. However, people from other countries and around the world may also ask questions about all the negative news of hate crimes, attacks on refugee shelters with fire bombs and other nasty events that have taken place. For instance, one disturbing event occurred inside the county of Kassel at a former airport, where a large number of refugees from different ethnic backgrounds had a huge fight among themselves in the dining hall, which was reported all over the world (Deutsche Welle, 2015). We must note that this large camp is a national federal camp, not part of the responsibility of the county.

Finally, since early 2017, we hear and read more and more about young refugees who were not accepted with refugee status, but were rejected and in fact deported by police cordoned airplanes to their home countries such as Pakistan, Afghanistan, and African countries (Al Jazeera English, 2017). For example, during Dr. Neis' December 2016 visit to Borken he found out that Tahir, one of the Pakistan refugees with whom he had met the previous summer, had received notice that his asylum application had been rejected and had fled to another part of Europe to avoid deportation. This latest development in the refugee saga reminds us of the incomplete attempt for a better world. One refugee cycle has been completed with forced return to where these young men had started their difficult journey, but now they have nothing to show at home that was worth the effort (Süddeutsche Zeitung, 2017). For others who were accepted as asylants, a major step forward was achieved that continues to promise more success and start of a new life in the arrival city.

In this paper we discussed the results of initial research in three German communities, conducted primarily during August 2016. While much remains to be investigated, our visits and interviews provided insights into the five major topics summarized above and for preliminary findings. In our next step we would like to continue to explore and also confirm our findings and extend the scope of our field study work to other cities and challenging topics.

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Historic urban fabric as basis for further urban renewal: later 20th century public urban interventions in Ciutat Vella, Valencia

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Abstract. *Valencian old town -locally called Ciutat Vella- suffered a huge transformation along 20th century. It was almost the whole city in 1900, and became less than 5% of the urban area in 2000. There was not only a process of architectural replacement, but a complete series of plans trying to update the historic spaces. There were three specific stages for those town planning proposals, made by public administrations but not always from public execution. The first group was developed at the beginning of the century following hygienic principles, with both public planning and execution. A second group, in the middle of the century, collected a series of punctual urban corrections and only one huge new urban axis -Avenida del Oeste-; all them specially built by private investors. The third, final group of interventions occurred after Bologna protection principles, and its specific treatment of degraded areas into city centre. In this later, most recent interventions can be studied the hard influence of previous urban fabric in the process of creating new urban spaces. Both historic slots' and blocks' geometry provide the definition for further street sections; but, in the other hand, those new street edges –alignments- must be geometrically balanced with the possibility of construction of the new buildings behind them, where structural geometries and functional measures must be attended. So, in this paper a series of clarifying samples are shown about the processes of public urban renewal implementation built in Valencia along the last third of 20th century.*

Keywords: Old town, Urban renewal, Valencia, Urban fabric, Urban geometry.

Ciutat Vella in Valencia: Old Town permanence and transformations

As the many part of Western cities, Valencian old town preserves recognizable its general framework, the series of historical additions through centuries becoming the main part of the current city. Ciutat Vella, Valencian old town, maintains a clear permanence of the city parts even if compared with the city nowadays. In 1738 Priest Tosca draw up the first liable plan for Valencia, by detailing all the buildings and inner spaces into the blocks, as well. It contains at all a huge quantity of valuable information about 18th century Valencia. A comparison between that image a current aerial one of the city we can easily establish an immediate relationship between several parts in the city as well. In a first eye-shot we recognize the general characteristic lines of the city, especially possible due to the river presence –even when in 18th century the cities on a river were drawn "on it", and not in its cardinal placement-. And, consequently, we can read the trace of the disappeared walls turned into a modern ring avenue. In addition to this, into this almond-shape urban space some main buildings stay through centuries, such as Catedral or Lonja -the silk merchants' loggia-. And some other main pieces suddenly appear at the very beginning of 20th century, such as Mercat Central, Estació del Nord -the Northern

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Railway Company Station-, Ajuntament -Town Hall- or Correus -Main Post office-.

In parallel to all these buildings, the next point head us to identify into the aerial view new urban lines and spaces opened throughout the ancient urban fabric and did not exist on the ancient map. We meet new clear spaces such as the great one around the Catedral and its religious hinterland or the huge Ajuntament square and surroundings. And new, huge streets can be found as well in two unique cases: a narrow 19th century Paz Street, and a wide, middle-20th-century Avinguda de l'Oest - both cases following the genuine French formula for boulevards in Paris. Just with this simple number of cases we confirm the changing life of the city, specifically carried out in ancient cities as the scenario of huge number of stories and periods.

But the great urban interventions carried out into Ciutat Vella in Valencia were executed along the 20th century with difference, as it happens in the rest of European or western cities too. In a smaller scale than previous grands-travaux, a huge number of alignment modifications, parcel additions, building replacement or modern constructions were implemented. And all they, as a whole, transformed the old town into a partially updated city for modern requirements.

We cannot forget that from Roman times -form the point of view of Western culture- the city is a continuously changeable entity, such as s biological one, being in a permament transformation to be updated to new times. This continuous updating of the city shows the appearance of new style buildings, but specially verify the permanence of streets tracing as shown before with Valencian images almost three centuries far. However, even the street delineations modifies partially, in parallel to the cultures or civilizations operating on them. Furthermore, many times mediaeval streets are the vague reflection of a former roman grid pattern, and often is deleted by the street aggrandizement of hygienist boulevards. At this point, nowadays civilization must preserve the historic city as a legacy form former times and cultures, as well as way or learning living lessons for the future.

Three periods on 20th century transformations in Ciutat Vella

Along those decisive changes produced along the 20th century into Ciutat Vella, three different periods of changes can be established separated. They're marked through the presence of both main political moment in Spanish 20th century: 30's Civil War and the very first Democracy after 1975. In an urbanistic context, two main year-dates can be established to refer to: 1931 and 1984. 1931 is referred to as the publications year of the last town planning following 19th century principles. 1984 refers to the publication year of the first protection town planning rules for listing heritage buildings as well.

The first period, 1900-1931, is the time when urban renewal plans were developed following 19th century hygienist principles in Paris. There were two plans, in 1911 and 1929 and they were leaded by the municipality and signed by respective town hall master architects at each moment. Both plans cover the whole old town with punctual interventions throughout the historic urban pattern to adapt it to new times performed by the new Ensanches -19th century city extensions-. 1911 Plan de Reforma -Renewal Plan- was signed by Federico Aymamí and is the first 20th century renewal plan after the successful intervention done in Valencian Paz street. This plan was based in some proposals from later 19th century to sanitize city Centre widely funded on hygienist principles, defining two main interventions and a huge number of small ones. The next one, 1929 Plan de Reforma Interior -Inner Renewal Plan- was proposed bay Javier Goerlich, one of the greatest 20th century Valencian architects and, even more, the real author of the current city Centre townscape. Into this plan, huge interventions were reduced just to a single one -Avinguda de l'Oest- and a global treatment of corrections for old town.

These two plans were global proposals containing, for the last time in history, huge scale interventions in a haussmanian way. On the other hand, they started a different way of updating the historical urban pattern through a wide series of lesser urban corrections. They were not developed because of economic

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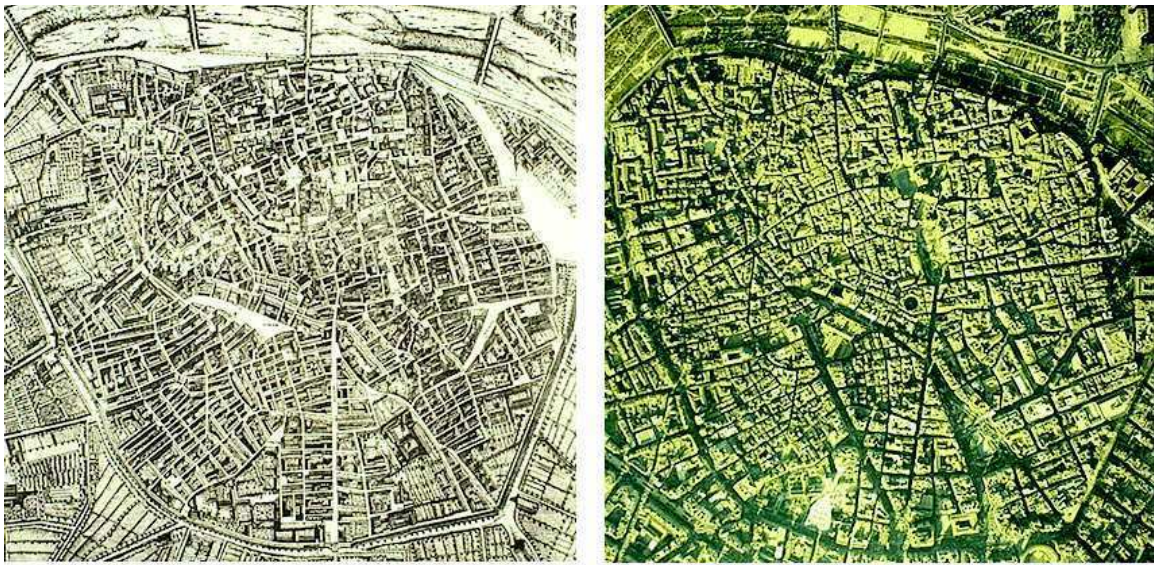

Figure 1.
Ciutat Vella over the course of centuries.

matters, and only a dozen buildings were risen up into the new urban alignments.

The second period, 1931-1984, covers half a century with no urbanistic activity. The economic depression after the Spanish Civil War on the one hand, and the national closure to outer influences till the democracy on the second hand, produced a time with no planning relievable production for the city. There were only some revisions on the existing town planning, as general strategic plans (1949 and 1966) or even such partial developments without an urban planning aim (1956).

If the first period symbolizes a sort of time for planning, this second one becomes the moment of practices and execution of works. However, there was only one huge case in an urban scale execution - the construction of Avinguda de l'Oest. At the same time, a big number of building substitutions were promoted as well. All these new buildings replaced former ones respecting the existing parcels or making very few changes of alignment.

Finally, the third period, 1984-2000, is the time to rethink the city after the Italian lecture on heritage protection specially held in Bologna. This new way for updating the city went deep into the new municipal democratic in Spain. And as a result, in 1984 a series of protection plans were draft for Ciutat Vella. But as a reaction to 70s' disorder, these plans became a straitjacket for refurbishment because of excess of protection points. So, a huge number of historic buildings fell down with no intervention because of its extremely exhaustive and expensive procedures. And these 1984 protection plans became the opposite effect to that intended.

With this dramatic scene, in 1992 a second protection plans were held in a more hands-off approach. This point was a turn to build reality and the possibility to refurbish old buildings into new uses and incorporation of new technics and materials. In an urban side, this less restrictive wave led to the possibility of old alignment changes ever thought in the former time. In this second group of town planning initiatives a huge care on historic urban pattern was developed, which will be carried out here bellow.

A comparison of the spirit of both groups of plans -form 1984 and 1992- can be seen in the schemes bellow, where the red points show in both cases the number of public space modifications. As can be seen easily, the number of modification proposals in 1992 is too high that that in 1982. [Fig.2, A and B]

Finally, 20th century finishes with a last third group of town planning proposals because a regional heritage law was published in 1994. This law led again the prominence to strict rules for intervention on historic buildings and urban heritage.

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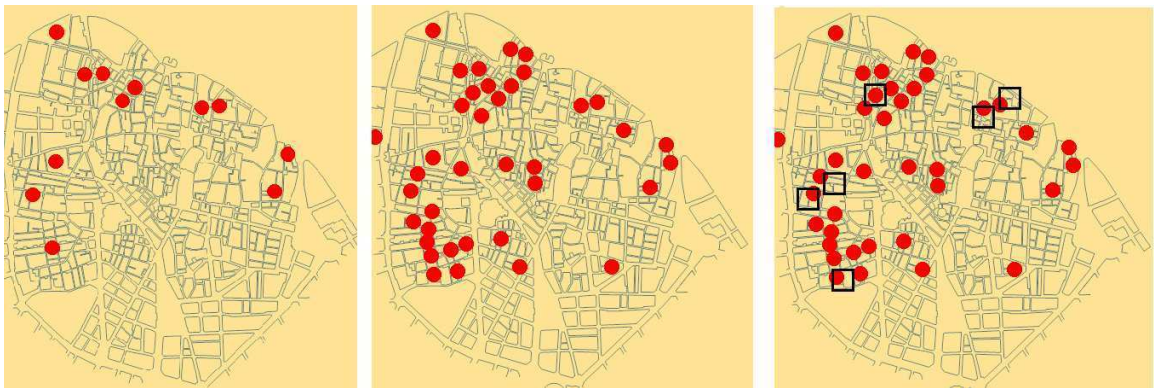

Figure 2.
Alignment modifications in Ciutat Vella in 1984 plans (A) and 1991 ones (B). Case studies situation (C).

Historical geometry into later alignments

After this general overview on 20th century town planning in Ciutat Vella, there is a period where a specific attention must be payed: that of the 1990s proposals. Into that 20th century third period, town planning carried out by public administrations developed a special care on the existing urban fabric. The plans for the five quarters -in which Ciutat Vella was divided- have a common technical approach for further design, taking profit from old town to update old town.

Even though that division of Ciutat Vella into five quarters has quite artificial matters, it remains the basic differences between the different corners of the common historic enclosure, as explained before, with its own urban genesis, parceling evolution and built heritage. Therefore, it evidences the character of the four corners and the central area itself. In addition, the graduation of those characters can be seen from the modest and popular NW area -Barri del Carme-, to the bourgeois and dynamic SE one -Barri de Sant Francesc-; or between historical and highly heritage graded NE area -Barri de la Seu i la Xerea-, to the latest, silk-workers' SW quarter -Barri dels Velluters-. In the middle, the area around the central market -Barri del Mercat- stays almost invariant undoubtedly because this part remains loyal to the city origin character itself as an important trading center.

Between 1991 and 1993, public administration pushed up those special planning figures to update the ancient city definitively. Moreover, because of the presence of buildings heritage and their own story, all the efforts were focused on the west side of the old town. In fact, this part had a lower evolution far away from the new Centre at SE of Ciutat Vella in connection to new ensanches. That was why the autonomous government, in collaboration with the municipal one, signed a convention for the regeneration of the whole city centre, specially developed for NW and SW quarters - Carme and Velluters respectively. In both quarters, the point was to respect the existing city through town planning, where town planners would have to use the existing geometry of the historic parcels as an essential issue for the materialization of that regeneration.

Different teams of architects and planners drew up Ciutat Vella urban plans, and they indiscriminately used a common tool. That one was the junction of the existing geometry of the parcels and urban spaces together with the forthcoming geometry of the new buildings to be inhabited. New alignments were drawn both to become further buildings and to create the curtain façade of the new urban spaces as well.

As a selection of some specific practices, hereby six cases of final materialization of town planning proposals will be shown. These case studies are the legacy of a technical practice in a precise period of time that will never happen again. Both urban and heritage regulations preserve the historic city to future generations. Moreover, the interesting point produced along these years -between 1992 and 1998- is to mark the technicians' skills to keep a balance between updating the ancient scene and create profitable buildings. We can find bellow three samples in each western

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Figure 3.
Barri del Carme case studies: Moret, 5; Garcilaso, 22; Morella, 6.

quarters in Ciutat Vella: Carme and Velluters. These were the concentration area of all the regeneration efforts in that period.

These cases show the transformation of ancient urban pattern for solving "died" situations in it, such as narrow constrictions or dead ends –cull-de-sacs-. Thus, in all these cases the ancient pattern is broken for expanding or connecting streets to achieve a sort of modern updating of the antiquity. The more frequent situation is to make wider a former narrow street. The second one is to trespass the block extending a cull-de-sac – or to create a tangential urban square in the crossing point of the existing street and the cull-de-sac. A third situation is to open an emptying into one block, in a similar way to Italian sventramento.

Therefore, these cases can be reviewed in detail to appreciate the power of geometry to create new, coherent urban space through new buildings. On one side, we will consider three cases in Barri del Carme, the more North-Western quarter in Valencia old town covering almost a real forth part of the initial surrounding circle walls. On the other hand, we 'will attend other three cases at Barri dels Velluters, which is the more South-Western quarter in Valencia old town and covers a third part of the former circle walls length.

Barri del Carme cases

This area has its origin out of the muslim town -the second city walls circle-, and emerged as an outter side of the city as a slum area or a kind of suburb of it. However, it allways had a modest, humble background. Because of that origin out of the formal city, its urban patern is a result of a spontaneous extencion of streets inperpendicular to the roads arriving to the city. So, there is a narrow width in the streets, no parallelism or seriation, and it is the presence of several cul-de-sac as well, as a heritage of the muslim origine of this area, as we can see in the three cases shown [Fig.3].

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Figure 4.
Barri dels Velluters case studies: Maldonado, 33; Arolas, 4; Villena, 5.

Case 1: Moret 1. An existing short street or pass between two long, winding streets is the base to extend it to vreating a kind of urban square at its south façade by shortening southern block. On the basis of the existing parcels, just five of them were demolished in order to creta a new,large one with 22,60 m. wide and 10 and 16 m. depth in both sides. So a huge, new plot is created on 300 sqm, devoted to social housing.

Case 2: Plaça de l'Autor 1. The presence of an old, abandoned cul-de-sac is the basis to create a new urban square tangential to the main sreet. So, south and bottom façades of the cul-de-sac remain, a the northern one is eliminated to be removed to parcels free. In this case, the existsting parcel as a new façade is re-built with a new, small building facing the new space – emerging a 190 sqm plot.

Case 3: Morella 6. This third case in Barri del Carme has a similar situation than the first one, but without an existing cul-de-sac. Two long existing blocks, with a very bad situation o central builindgs is profitted to open a new urban square conecting both streets, by demolishing three parcels. South side –a kind of ancient inn- will open windows to the new space, such as one of the northern parcels. The other one in the north is rebuilt, on a plot of 218 sqm and four stoery high devote to social houisng as well.

Barri dels Velluters cases

This area requires special apreciations because is the last one to be created into the chistian walls, and it has different urban pattern as genesis. All the area was out of the walls til 14th century. With the construction of the third, Christian city walls, a new urban area was developed by more or less parallel

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streets towras outside of the city with E to W orientation, and a few number of streets form N to S. So, a kind of urban, spontaneous grill was formed, with the basis of existing roads and, specially, waterways or irrigation ditches. These are the origin of several craft workshops devoted to silk.

With that conditions, the general case in this quarter interventions is the existing street widening, creating new, narrow and long parcels to be re-built. As it has been said before, there were few, narrow streets in N-S orientation, and the new public intervention dicide to create a new, wider N-S axis torough the quarter as an own vertabration one for it, on the basis of former Carrasquer, Arolas and Recaredo streets. Three selected cases are commented, and can be seen in the image [Fig.4].

Case 4: Maldonado 33. In the most southern part of that new Carrasquer-Arolas-Recaredo axis, a new very narrow and too long parcel is created by widening Recaredo strret. As an outcome, there is a plot 35 m. long by 4 and 7 m. deep, and finally a near 190 sqm area for a 5 story high building. In other terms, the architectural solution had the merit of avoiding a boring, long new façade, emulating the broken rythm of the ancient buildings cornices.

Case 5: Arolas 4. In the middle of the aforementioned axis, an interesting intervention was developed covering a huge part of a former "L" shaped block. Arolas street was widened, and several ancient buildings were in ruins, to be substituted by a huge one in an intrincated, irregular shape. The eliminations af a very smal NW block into the "L" area helps to create an interesting new urban space.

In this case, the complicated geometry created façades 41, 20 and 32 m. long, and depths 10, 16 or 4 m., in an unquestionalbe, high quality result.

Case 6: Villena 5. The final case is located in the only huge square planned in the middle of Carrasquer-Arolas-Recaredo axis: Viriato square. This square was planned by the elimination of the central part of a former long block - but the subsequent archaeological excavations confirmed the intial existence of a pass in this point, for serenity of openings reluctants. In this case, a set of 4 parcels were combined to form a new one, 23 m. long and 5 and 10 m. deep, with a few more than 180 sqm. area and 5 storey high new building faceing the new square.

Conclusion

The six cases studied tackle the importance of the ancient parcels geometry for the transformations of old town, Ciutat Vella. Current Spanish and Valencian urban regulations protect the historic shadow of ancient buildings and alignments, and it is not possible to modify the historic tracks, but in the third part of 20th century there was a group of urban interventions that had to have a deep knowledge of the existing city in order to update it by modifying it.

Old town is a set of ancient parcels that emerged with no organization through history, and whose geometry is the base for new buildings and uses in further urban interventions. Thus, existing geometry finally provides physic plots for new urban spaces and buildings - pieces with specific requirements due to their functionalism and mass materialization. This becomes a very useful technique to handle when acting -if regulations allow it- in old town for urban renewal interventions.

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Nowa Huta, Krakow, Poland: Old urbanism, New urbanism?

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Abstract. *This paper considers the first stage of Nowa Huta New Town built near Krakow in the 1950s. In contrast to UK and US new settlements of the post war period it is a high density apartment block development which was ignored in the literature for more than half a century because its design, apparently based on a system of streets, is in contrast with contemporary forms of development, either low density garden city or higher density free standing apartment blocks. A discussion of its neglect and the recent rediscovery of its qualities, both in Poland and by exponents of the US New Urbanism (part of the Urban Morphology spectrum somewhat neglected by ISUF) leads to a systematic investigation of the development, its influences and how this project conceived in a radically different political and economic context, matches or departs from the tenets of the Charter for the New Urbanism. The extent to which the context has determined the differences leads to a conclusion discussing the enduring qualities and contemporary relevance of inherited urban forms.*

Keywords: Poland; Nowa Huta, Krakow, New Urbanism, Socrealism, housing, streets

Introduction

In a conference held in Krakow Elizabeth Plater Zyberk, doyenne of the New Urbanism movement in the US, concluded her address by declaring that "… you have excellent examples of modern town building here in Poland. I was happy to hear that Nowa Huta is being rehabilitated in the literature. It is a remarkable achievement with a highly characteristic sense of place, connected to the city of Krakow by transit, and exhibiting so many of the principles of good urbanism. So you have beautiful models, in your more distant history but also in a more recent history of planning." (Plater Zyberk 2015).

Until recently this new town was ignored in English literature. For example a book published in English to celebrate the achievement of modern Polish architecture ignores the earlier neighbourhood of the new town, those admired by Plater Zyberk, and only includes later tower blocks characteristic of so many Post World War Two housing developments throughout the world (Lisowski 1968).

While there has been a renewed interest in the architecture of the Stalinist hegemony in Eastern Europe (Hatherley, 2015) this has been primarily focussed on the social and political aspects (Lebow, 2013, Stenning, 2000) or the broader planning issues of the post socialist states in general (Hirst and Stanilow 2009).

Following a brief description of the earlier stages of the project and an exploration of the cultural reasons for its neglect (including the changing fashions of architects) Nowa Huta is examined with respect to the extent to which it fulfils the tenets set out in the Charter of the New Urbanism (1999).

Nowa Huta, a Polish New Town, was designed and built in the 1950s. For those

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coming from an anglophone context it is of particular interest because, in contrast to UK and US new settlements of the post war period it is a high density apartment block development. From an urban form point of view its design around a system of streets is in contrast with the prevailing forms of development either low density garden city (e.g. The UK New Towns) or higher density free standing apartment blocks (e.g. Muratori 's Rome housing at Tuscolano 1949 -50, Maretto 2012).

Although New Urbanism clearly fits into the canon of urban morphology (Gautier and Gilliland 2006) it has been relatively neglected in the literature of urban morphology in spite of its impact on the practice of urban design e.g. in the US, Seaside and in the UK, Poundbury. It is therefore considered appropriate to discuss the morphology of Nowa Huta to the extent to which it converges with the principles of this movement.

Given its neglect in the literature so that many urban designers outside Poland would not be acquainted with Nowa Huta this paper starts by describing briefly the first stages of its development which are the focus of this study. It then sets out the main tenets of New Urbanism and then compares these with the realisation of Nowa Huta. Since the topic is too extensive for a single paper we will focus on one canon of NU, that of walkability. This will facilitate a discussion of aspects of the street layout, its connectivity and the relation between the private space of the dwellings and the public space system, which are arguably the most distinguishing characteristics of the composition and structure of Nowa Huta.

Urban history of Nowa Huta

The new town is located east of the old city and now forms part of metropolitan Krakow. It was built by the communists on fertile agricultural land for the house workers of an enormous steel mill (Nowa Huta means New Steel Mill). Building started in 1949 and the sector this paper focuses on, Old Nowa Huta, was completed in 1955 (Komorowski, 2005). Construction continued after that date but with a more modernist typology with separate blocks set in landscaped communal areas.
The authors of the plan, with Tadeusz Ptaszycki as a leader (Juchnowicz, 2005), (Ptaszycki, 1953), (Bittner, 1971), did not have much design practice experience and based the concept on the knowledge acquired during their studies, although it is considered that Magnitogorsk could be a model.

The undeveloped area allowed the perfect realization of the selected composition. A geometric layout of streets radially spreading from the central square was the basis of the scheme. This square is placed on the edge of the Vistula slope where it reaches over 14 m in height. The square opened to the south with a wide panoramic view and a panorama of the

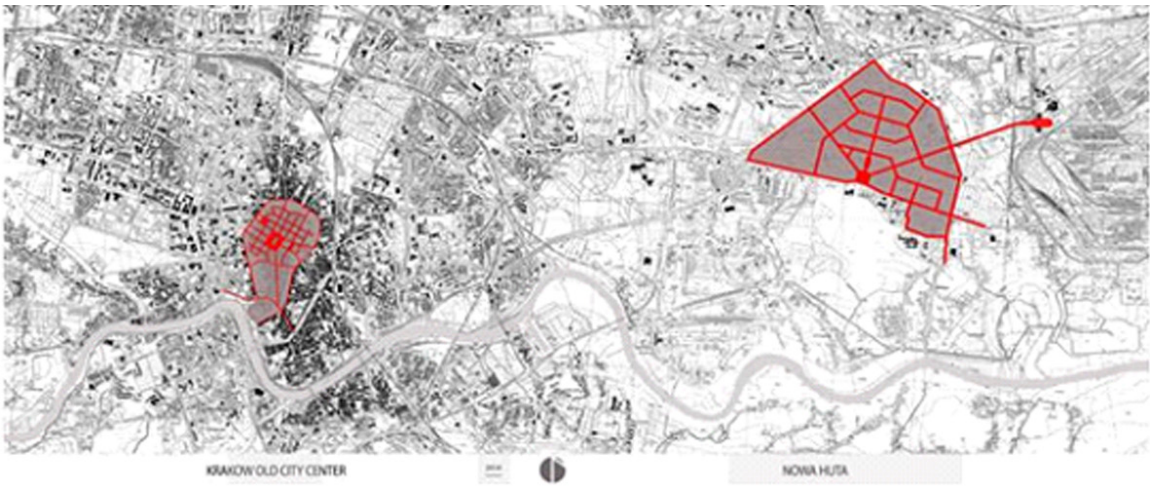

Figure 1. Nowa Huta location in Krakow (A. A. Kantarek on (IX International Biennale of Architecture, 2002)

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Tatra Mountains on clear days. It is the main point and dominant feature of the composition with streets connecting the district (once a separate town) from the center of Krakow (on the west) and the Steel Mill (from the north east) (Juchnowicz, 1986), (Miezian at al, 2006), (Lorek, 1999), (Smaga, 2017).

a - General view of the urban model designed by T. Ptaszycki with the team, 1950-1051 (publ. Architektura Polska 1950-1951, Institute of Urban Design and ArchitecturePWT Warszawa, 1953;

b - Nowa Huta, the design of the green areas with the concept of the South Park - by S. Juchnowicz and the team, 1954;

c - A model of the Nowa Huta Centre , a southern view, designed by T. Ptaszycki with the team, 1950-1051 (publ. Architektura Polska 1950-1951, Institute of Urban Design and Architecture PWT Warszawa, 1953

Large blocks of buildings surrounding the square were designed according to the rules

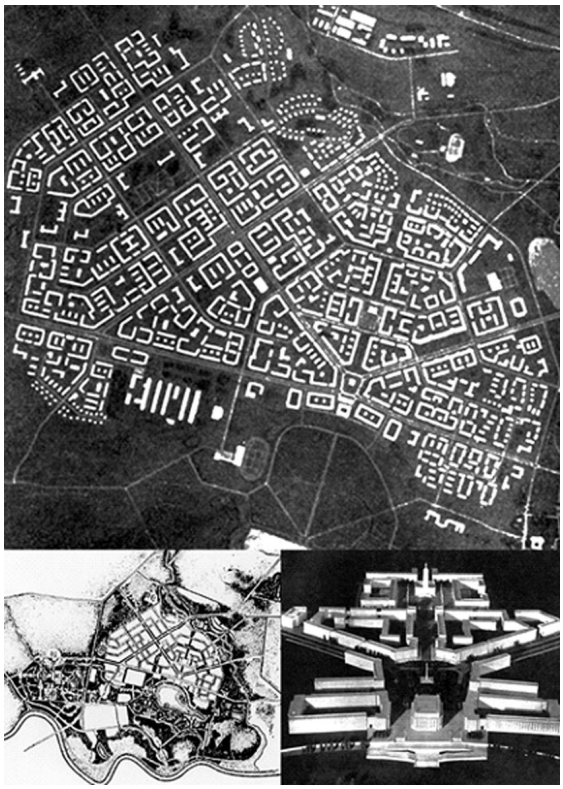

Figure 2. Nowa Huta urban structure as designed (IX International Biennale of Architecture, 2002)

Figure 3. Nowa Huta - up to date urban structure (A. A. Kantarek on (IX International Biennale of Architecture, 2002)

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of neighbourhood units with 5,000 to 6,000 residents and the basic facilities needed: crèches, kindergartens, schools together with the necessary commercial, crafts, gastronomic and cultural services .

Shops are located within the deep of residential blocks and these are now proving a problem for larger shop units although some blocks of specially designed retail units of a greater depth have been built. All the homes are in apartment buildings with four to seven storeys with staircase access and elevators.

To quote a recent observation by S. Juchnowicz, a member of the original project team (Urbaniec, 2014): "From today's perspective, Nowa Huta is a global phenomenon (…) It represents the value, also cultural, of this urban composition. The project of Nowa Huta is done with authenticity, it is a compact concept, based on regular streets and squares, referring to the historical heritage."

Nowa Huta was built on expropriated private land - another important factor that gives us an idea of those times. Plunder rather than expropriation meant taking ownership of the property and symbolic payment was made only in order to document ownership.

It is worth mentioning that Nowa Huta´s structure was inscribed in 2004 by the Malopolska Voivodship Monuments Conservator into the Register of Historic Monuments (Decyzja, 2004). The Act decided to: "Enter in the Register of Historic Monuments of the City of Cracow under registration number A-1132 the following cultural asset: The Urban layout of Nowa Huta district in Cracow, as a representative example of the urbanism of socialist realism in Poland. The subject of the protection is the urban layout, i.e. the layout of streets, squares, green areas, location of blocks and dimensions of the buildings, architectural and landscape enclosures, composition of greenery (…)".

While some attention has been given in the Anglophone literature to Stalinist architecture, much less attention has been paid in general to its Polish versions and in particular to Nowa Huta. Nevertheless its development broadly fits into the time scale of the embrace of modernism and its subsequent rejection in urban development. However this process worked out in a syncopated way on either side of the Iron Curtain. A common way of denigrating Modern Movement architecture is to associate it with the architecture of Soviet Communism. Thus the blocks of such notorious developments as Ronan Point and Pruitt Igoe have been labelled as Soviet because 'they are repetitious and use reinforced concrete' (Hatherley, 2015. p5). But it is necessary to point out that many of these developments were openly following the models of contemporary western architects such as Le Corbusier, especially in their rejection of the corridor street and its replacement by free standing blocks in landscaped parkland.

In fact, after some years of modernism after the Russian Revolution, from the 1930s to the mid 1950s (a date which coincides with the building of Nowa Huta) it was rejected as coming from the West. The intention was to show in architecture and urbanism a dependence on a style derived from the USSR while at the same time arguing that it was a national style of building. Modernism was to be rejected decades later in the West by the post modernists of the 1970s and the 1980s as being repetitious and inhuman (Hatherley, 2015) in favour of urban forms which referred to local traditions and in particular to the importance of the street and the urban block (Panerai et al, 2004).

Thus local critics writing in the 1960s at the zenith of modernism would praise the second stage of Nowa Huta with its tower blocks standing in parkland and ignore the first stage. (Lisowski (1968). Only recently following the rediscovery of the street by the New Urbanists, among others, has its virtues begun to be recognised (Plater Zyberk, 2015).

New Urbanism principles realized in Nowa Huta?

In order to consider to what extent this new town follows the tenets of New Urbanism reference is made to those that are relevant to a new town or a district of a metropolitan area and to housing in detail as set out in three sections of the Charter. It is not considered that the regional scale which is the topic of the first section of the Charter is appropriate to Nowa Huta.

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Walkability - street and urban block

Table 1. Brief Summary of Nowa Huta assessed against Principles of New Urbanism

New Urbanism http://www.newurbanism.org/newurbanism/principles.html	**Nowa Huta as designed and built**	**Nowa Huta today**
1. Walkability	Yes, wide sidewalks along large scale monumental streets ; but unfriendly interface between dwellings and streets; entrances at back of blocks ; initially car ownership limited.	Yes and no. Increased car use with high speeds on wide straight roads; car parking problems; some main routes blocked by central barriers to speed trams
2. Connectivity	Yes. based on hierarchy of movement networks; interconnected street grid easy for walking and inner superblock space well connected and accessible; low quality of services and design of pedestrian spaces.	Yes, with no major changes compared to the initial design
3. Mixed-Use & Diversity	No. Main workplace separate from town; limited services; socially homogeneous.	Improved with increase in the number of services inserted existing fabric; more social diversity;
4. Mixed Housing	No, only multi-family housing	Gradual improving standard of flats and buildings; combination of small multifamily units into larger homes
5. Quality Architecture & Urban Design	Yes, with emphasis on political role of architecture as it was the prestigious new town built after WW ll	The neglected socialist realist architecture has been slowly refurbished and appreciated as witness of an epoch and part of national heritage.
6. Traditional Neighbourhood Structure	Yes, functional programme was based on Neighbourhood Unit and form built on positive urban space. Some elements unrealised because of financial problems (sport, greenery).	Yes, with additional elements of functional program.
7. Increased Density	Yes, it was a town with relatively high density although less than in the City Centre of Krakow. It was planned for 100 000 inhabitants.	During 50 years there were some elements of the programme incorporated (schools and its expansion); some modernization of roof space in multifamily housing Nowa Huta District is 65,41 km² with 54 588 inhabitants and with density 835 persons/km²
8. Green Transportation	Mass transport based on - bus, tram and cycles; cycle network implemented	Mass transport still effective because of car congestion and parking problems; cycle routes converted to car parking; cycles use pedestrian routes or car streets.
9. Sustainability	Doubtful sustainability since town located on good agricultural land; traditional building technologies respected environment; development carefully located in relation to River Vistula scarp with open views to south	A large number of buildings have been modernized (insulation, new windows); planted areas neglected but vegetation has matured
10. Quality of Life	Yes, as politically declared.	For years considered as a subordinate, working-class district, now gradually recognized as attractive, full of greenery and life-friendly environment.

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It has been noted that almost all the entrances to the staircases and lifts are located towards the internal common space i.e. on the back of the buildings with respect to the street facades. With a few exceptions, there are no entrances on the street side, the front. This reinforces the inhabitants' identity with the urban block rather than the street. This is strengthened by postal addresses being given by urban block number rather than street address. Thus although the streets are such an important element of the plan it is doubtful whether they can be considered as comparable with those of a traditional layout where the entrances to the dwellings act as the interface between the public and private realms. This must certainly reduce considerably the extent to which Nowa Huta can be considered as responding to the tenets of New Urbanism.

The configuration of the main streets, wide and straight with no traffic calming measures, encourages high vehicle speeds while some of the main streets have long central barriers which enable the trams to travel at high speed but hinder connectivity for pedestrians between the urban blocks.

One of the four urban blocks of Nowa Huta (Osiedle Centrum C) situated in its center

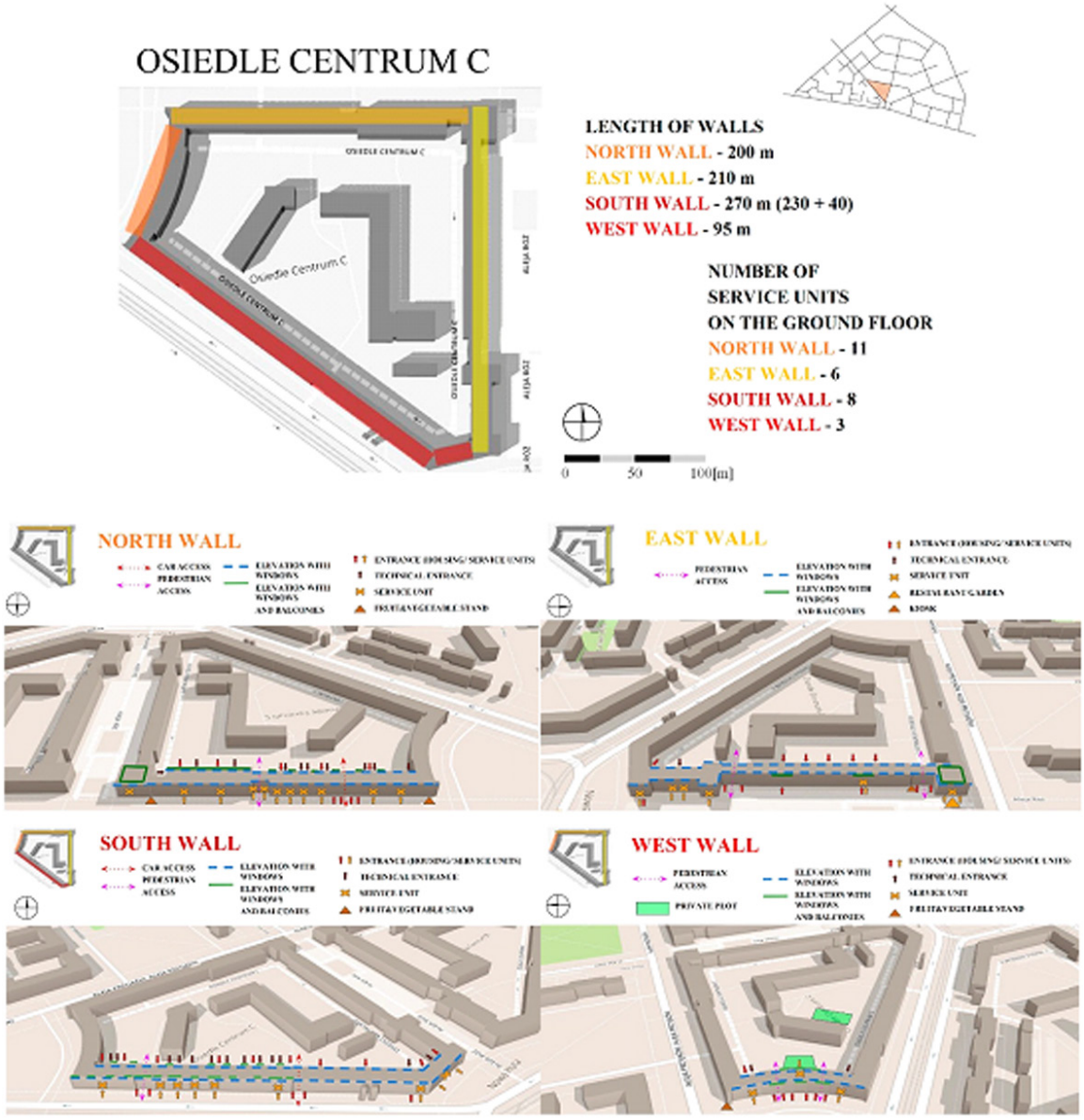

Figure 4. Osiedle Centrum C - walkability (A. Lis, A. Maliga, A. A. Kantarek)

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is presented below. Its south facade forms the part of the main square of the district (R. Reagan Square). The following public spaces are defined by it (some of the names have been continuously changed since 1991):
-Plac R. Reagana (R. Reagan Square),
-Aleja Generała Władysława Andersa (Gen. W. Anders Avenue) - with tram line,
-Service street (no name),
-Aleja Przyjaźni (Avenue of Friendship),
-Aleja Róż (Avenue of Roses) pedestrian zone
At the same time car movement takes place not only along the external roads but also through service roads within the urban block. With a very small number of parking spaces it is noteworthy that the urban block has car movement supported on both sides of the buildings defining its shape, overwhelmingly (82% of the outer perimeter and 90% internal). The pedestrian pavements along the outer streets and on the façades of the buildings are spacious. This allows the incorporation of a variety of functions. However, despite these advantages the services in the ground floor and with windows in the facades, overlooking the pavement, are poorly managed. Only a few services offer activities outside, there are no benches or any provision of green spaces (playgrounds, resting places, etc.)

Table 2. shows some parameters of Osiedle Centrum C pedestrian zone. Quite a large part of ground floor is used for different commercial functions and there is a wide pedestrian pavement.

Table 3. and 4. present Osiedle Centrum C characteristics related to the quality of the urban frontages with the number of entrances and windows which give perspective of the role of the building in activating the public space. This study was carried out to ascertain the extent to which it meets the rules of good frontages according to the Gehl scale (Gehl, 1994).

Commentary

Table 2. Osiedle Centrum C pedestrian zone

Osiedle Centrum C pedestrian zone	Width (m)	Pedestrian zone to the frontage of Osiedle Centrum C (m)	Lawn on the side of Osiedle Centrum C (m)
R. Reagan Square	96 (to the center of the square)	12	15 max
Gen. W. Anders Avenue	49 - 58	6,4	5,4
Service street	22 (to the greenery on an another side of the street)	16	only 9 m lawn on 18% of the frontage length
Avenue of Friendship	47 - 50	5	8
Avenue of Roses	52	52	0 (only row of trees in pedestrian zone)

Table 3. Osiedle Centrum C – characteristics of facades

Osiedle Centrum C urban block	North wall	East wall	South wall	West wall
Length (m)	200	210	270	95
Service units	11	6	8	3
Premises/100m	6	3	3	3
Entrances Housing/service units/inner block space	4/10/2	7/7/2	5/9/2	6/2/2
Σ entrances	16	16	16	10
Entrances/100m	8	8	6	11
Windows	40	33	51	19
Entrances+windows/100m	28	18	25	31
Entrances on inner wall - housing/service units/technical/to the street	5/0/8/2	6/0/1/2	10/0/13/2	1/1/2/2

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Table 4. Osiedle Centrum C urban block - a quality of frontages (Gehl, 1994:33, 34)

Osiedle Centrum C urban block	**North wall**	**East wall**	**South wall**	**West wall**
Service units every 100m	C (6)	D (3)	D (3)	D (3)
Windows and doors every 100m	A (28)	A (18)	A (25)	A (31)
Range of functions	B	C	C	C
Blind or passive facade	A	A	A	A
Depth and relief in the building surface	B	B	B	B
Quality of materials and details	C	C	C	C

Table 5. Osiedle Centrum C characteristics

Osiedle Centrum C urban block	
Urban block area	34 940 m2
Total overground floors area	64 576 m2
Built up area	11 140 m2
Density (net)	1,85
Average floor ratio	5,8

It is suggested that, given the low car ownership at the time of its inception, an important function of the Neo Baroque configuration of wide streets was to provide ample space for the carefully orchestrated demonstrations and processions organised by the communist regime. It also may be that the wide streets could also facilitate the suppression of any demonstrations against the regime – like the Parisian 19th Century boulevards.

Further research is needed to ascertain the origins of the ideas which informed the design of Nowa Huta but some preliminary reflections suggest that there were contemporary models which demonstrate the same street layout if not with the same motivation . Post World War II Le Havre as rebuilt by Perret (Hatherley, 2016) and even parts of pre war Welwyn Garden City are characterised by wide straight streets and long vistas.

Apartment buildings with no entrances on the street elevation can be found on other socialist developments (Lorek, 1992) like Magnitogorsk, Novi Beograd even though the street networks follow a very different configuration to that of Nowa Huta. An earlier model which bears a striking similarity to Nowa Huta are the interwar Viennese Hofe such as the George Washington- Hof or the Karl Volkert-Hof (Tafuri, 1980).

The paper concludes with a comment on the extent to which very different political economies can produce similar forms. Pancewicz (2015) has discussed in general terms the relevance of New Urbanism to the contemporary Polish context but does a geometry which tries to meet human needs have a more general application beyond the imperatives of politics and economics? If this can be demonstrated then it is a powerful argument for the autonomy of urban form.

This conflict between the street and the urban block in the facilitation of pedestrian movement gives rise to this hypothesis. There are in fact some New Urbanism schemes where street activity is reduced by the possibility of increased connections within the urban blocks, like Poundbury (Dorchester, Dorset, UK) or Vista Field (Kennewick, Washington, USA).

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The forming process of Fiumicino

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Abstract. *This work, carried out within the Lettura e Progetto (Lpa) Laboratory of "Sapienza", University of Rome, and based on the "processual" method, proposes the regeneration, through the reading and interpretation of the forming process, of the urban settlement of Fiumicino, on the east coast of Rome. The area was formed by a set of fragmented interventions developed in different phases, with heterogeneous destinations and, apparently, no relation of necessity between them. The site appears mainly linked to the development of illegal buildings that date back to the second postwar period. However, a deeper analysis based on the reading and interpretation of the character of the building fabric, shows the existence of a clear relation of historical continuity between the today town and the territorial structures developed starting from the ancient city of Portus. Through this reading emerges the plan of a town connected to the activities of Porto Canale (Channel Port) in function since XVI Century. From the analysis of the historical cartography appears as a matrix route based on the continuation of the ancient via Portuense was formed in time and developed on the building routes that have resulted. We propose a hypothesis of regeneration in the existing fabric through the densification of routes at higher urban vocation. We believe that this is a remarkable case study that exemplifies the potential formation of local identity at the edge of the metropolis as over time the area has developed a complex structure, connected to port activities, that is now forming its own urban character and individuality, so that recently it was constituted in autonomous municipality.*

Keywords: Fiumicino, Portuense, forming process.

Topic

The inhabited area of Fiumicino, settled on the eastern coast of Rome in relatively recent times, and for long considered a remote, peripherical area of the city of Rome, recently become an autonomous municipality independent of the Capital, constitutes a major case study showing how the outer fringe of the great Italian cities can be considered historical territory.

The Municipality of Rome had already begun in 1976/77 an operation for the recognition and perimeter survey of areas that the current PRG classified as "agricultural, of expansion or industrial" and which were, as a matter of fact, characterized by the presence of many spontaneous buildings, often illegal, with predominantly residential purpose. These areas were delimited and subjected to variation in urban destination and 74 abusive settlements were identified, including Fiumicino. This operation has highlighted the specificity of these areas, so as to identify definite urban planning tools ('O' zone variants) for their urban regeneration.

In particular, the area of Fiumicino showed problems so peculiar and dissimilar from those of the Capital to assume the necessity of a separate administration. On 4 April 1992, with a referendum, the Fiumicino Municipality officially formed. On that date Fiumicino acquired administrative autonomy, but lacking

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its own urban planning instrument. The PRG, the General Urban Planning of Rome (approved in 1965 and subject to numerous variations, where the Fiumicino area is defined as the 14th district of Rome) remains still effective at present for the Fiumicino area. On 31st December 2016, 79.806 people reside in the territory of the Municipality, which has an extension of 22,000 hectares (about 8,000 are in Fiumicino centre). Aside from the area known as Isola Sacra with 32,000 inhabitants, the settlement of Fiumicino centre is the most populated among the entire communal territory ones.

Method

This area is currently being studied by the Lpa (Reading and Design of Architecture) laboratory, in continuity with researches on the eastern outskirts of Rome, already being published (Strappa, 2012).

The steps of this study are briefly illustrated below:

1. Reconstruction of the formation process based on historical cartography, IGM mapping (Military Geographic Institute), photogrammetric maps, cadastral plans.

2. Identification of pathways structure and land subdivisions that prove to be, as always, the most conservative elements of the fabric.

3. Analysis of the aggregative organism based on the recognition of fabric elements and their characters: routes and poles; edilizia di base and edilizia speciale. It should be noted that the edilizia (an abstract term) extensively employed in Italian architectural literature and often translated simply as building (a concrete term), refers in general to the activities related to the evolution of the city and its built result (Ieva, 2014). As such does not have a corresponding English term. An old translation problem never really solved that caused many misunderstandings. In the field of Urban Morphology, it should indicate, in our opinion, the set of components, organized by routes, that contribute to the formation of the fabric: the building and the ground on which it is built. In particular, refererring to the building plot, the term edilizia corresponds to the building proper and the pertinent area to which it is typologically inseparably linked.

4. Identification of the potentials transformation of the aggregative organism based on the characters recognized in the fabric.

Here we therefore propose a reconstruction of the building fabric, by the means of recognizing a still operating process of innovation/renewal.

The analysis, based on the "processual" method, clarifies the nature of the formation of Fiumicino and the persistence over the years of its local identity despite the fact that the central nucleus played the role of an extended residual area for the provision of "low added value" services for the capital, since the unity of Italy (1861).

Analysis

Today Fiumicino appears at a first as a hybrid place: a modest residential fabric with a tiny XIX Century historical centre, influenced by the presence of a Tiber channel and by the proximity of the Leonardo Da Vinci International Airport. The most prevalent activities are small scale naval shipbuilding, fishing sorting and limited local tourism. The building fabric looks like a fragmentary set of heterogeneous constructions, built mainly in the post-war period and without apparent connection between the single parts. The current system of settlements does not derive its origin either from the restructuring works that affected the area of Isola Sacra around the 1920s, nor from the planning actions of the Rome Municipality which has always considered Fiumicino a border site with bulky functions (countryside and industrial settlements). The only Fiumicino area that has been considered by zoning plans, by the way never fully realized, was Fiumicino Nord, intended by a Detailed Plan (Piano Particolareggiato) of 1931, to host residential buildings both for the locals and for the roman summer vacationers.

However, a more in-depth analysis focused on reading and interpreting the forming characters of the building fabric shows the existence of a clear historical relationship

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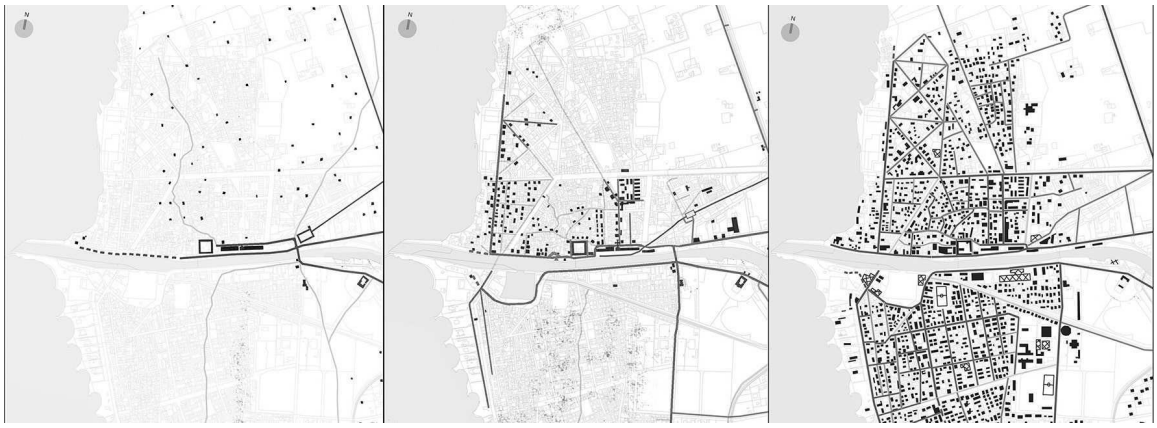

Figure 1.
Reconstruction, on territorial scale, of the forming process of Fiumicino Centro on IGM cartographic base, respectively in the years 1880, 1931, 1989.

between the present city and its territorial structure. The nature of a port city clearly emerges, related to the ancient Roman harbour built by Emperor Claudius and to the canal dock, operating since the Sixteenth century. From the analysis of historical cartography, it is evident that the historical small nucleus of Fiumicino has been formed along a matrix route, the current Torre Clementina route, extension of the ancient Via Portuense, and the neoclassical intervention of Giuseppe Valadier (1823-1827) at the same along the matrix route of Via Torre Clementina aimed at the construction of housing and services for the locals, is the first planning attempt and founding act for the ancient seaside village.

The analysis carried out at this stage also shows the presence of a railway line (inaugurated in 1878) connecting Rome, located near the Portuense route and ending in the area in front of the Borgo Valadier.

Through this study, carried out on urban scale and subsequently on a fabric scale, it was possible to reconstruct the formation process of Fiumicino and to interpret the role of the single physical elements structuring the contemporary settlement: streets, squares, buildings, pertinent areas and their mutual relationship.

On an urban scale, the comparison between the cadastral maps and the IGM maps explains the close link between the form of the territory and the settlements intentions, highlighted by the hierarchization of routes and land partition in the area between via Giovanni Battista Grassi and via della Foce Micina (Strappa, 2012). Fiumicino's contemporary central nucleus, strongly characterized by the apparently non-hierarchized presence of spontaneous constructions, is settled behind the Borgo Valadier along two spontaneous matrix pathways (Via Giovanni Battista Grassi and Via delle Scuole), on which residential buildings were assigned. A fourth planned matrix route was also formed along Via Del Serbatoio, as a result of new constructions works carried out between 1954 and 1989. The real role of these urban axe is not evident to a superficial reading of the fabric, also because of the presence of Via Clementina along the channel to which is usually attributed a centralizing character.

Interpretation

In the belief that the same principle found in historical centres is to be found in the suburbs and that, more generally, the built landscape is the provisional outcome of a modification in progress (Strappa, 2016), it has been made an attempt to read in the urban reality of Fiumicino the transformations of a processes still in progress.

The reading of the urban fabric carried through the cadastral mosaic of the individual buildings and the reconstruction of the building ground floor plans, carried out along the matrix routes and for individual plots, allowed to recompose the structure of the edilizia part of the fabric and to make the hierarchy of the

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Figure 2.
Cadastral layout, 1965.

paths explicit within the forming process the settlement. The urban sprawl, largely based on small single-family residential buildings, prevented the constitution of poles, public spaces and continuity of housing facades that would have contributed to a legible urban unity. Although it is legible the presence of a basic dimension of residential spaces that is approximately related to that of the elementary cell, the types of buildings employed seem far from being homogeneous and perhaps derive from the specific cultural area of origin of the builders-dwellers or, in the case of multi-family buildings, from the extemporaneous choices of small building firms.

On the routes of spontaneous origin, Via Giovanni Battista Grassi and Via delle Scuole, we find the recurrent type of the single and multi-family isolated house, located orthogonally to the road and characterized by a private garden. On the matrix route of territorial origin of via Torre Clementina, especially in the area of the buildings designed by Giuseppe Valadier, we find the in linea type, multi-storey buildings characterized by the aggregation of single flats served by a common staircase.

These observations suggest some criteria for restructuring the fabric. In fact we can assume as possible a process of partial recasting of building units along the main routes, leaving current building types in the most "unloaded" paths.

The goal is to provide guidance not only for the development of simple and rational solutions for the new Fiumicino, but also to identify a suitable urban form fitting with the forming process and meeting the expectations of the inhabitants

Considering the feasibility of the hypothesis, we should underline the courageous choice of the municipal administration at the beginning of administrative autonomy (1992), to have preferred not to program a new urban planning scheme in the traditional sense. The connection between the design of Fiumicino's physical form and the need of a principle of citizenship has been captured in the unique historical moment of rethinking of the city.

Since it was not a problem of new expantion but the construction of a political and urban identity, the administration has decided to devote more attention to those spontaneous residential settlements that prevalently dominate the municipal territory and to intervene in a punctual and operational way on these areas by promoting the idea that the project and its implementation were a result indicated time after time by the requirements of the contingencies and not by a long term plan.

Applying a moratorium on the current plan, the Rome PRG, the administration suspended the perenniality of its directions and devoted itself to the design "from below"of the new

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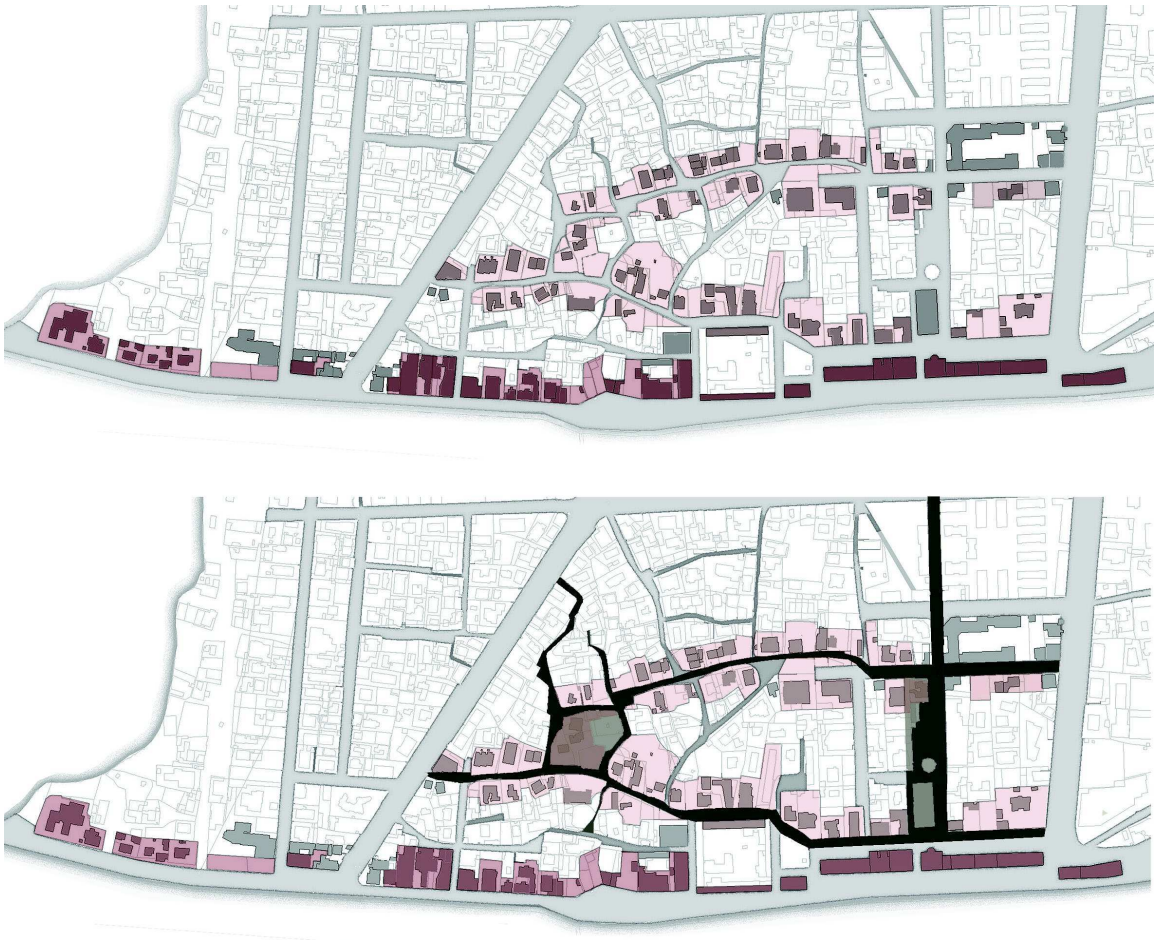

Figure 3.

Analysis of Fiumicino urban fabric on a cadastral basis (Map Extract, 2015). Above: Study of urban morphology and building warpage. Identification of the pertinent strips on the matrix routes of spontaneous origin of Via delle Scuole and Via Giovanni Battista Grassi and the matrix route of territorial origin of via della Torre Clementina. On the routes of Via delle Scuole and via Giovanni Battista Grassi can be found the type of the single and multi-family isolated house, located orthogonally to the street and characterized by a private garden; On the matrix route of territorial origin of via Torre Clementina can be found the type of the multi-storey building with apartments having common staircases. Below: Analysis the Fiumicino Centro building fabric. Formation of urban poles.

community indicating territories and areas where to intervene. Important contributions to this politic were those of Alessandro Anselmi for the construction of the current Isolato Stazione and the new Municipality headquarters, of Carlo Aymonino for the project Porta dei Porti (the new railway exchange junction) and Luca de Merich for the preparation of the Detailed Regeneration Plan Of Fiumicino North.

This happy intuition, as well as the single project attempts, did not end in a unitary project for Fiumicino. In spite the attention immediately addressed, with a practical approach, to the spontaneous settlements and the zoning directions across the entire territory was suspended, since a strategic planning of "vast area", lacking a morphological in-depth, has oriented the interventions towards the construction of special buildings isolated on public property lots, without any relation of necessity to the fabric and lacking the unitary character deriving from a real specialization process.

Densification hypothesis

The problem of drawing operating consequences from the previous considerations is not simple.

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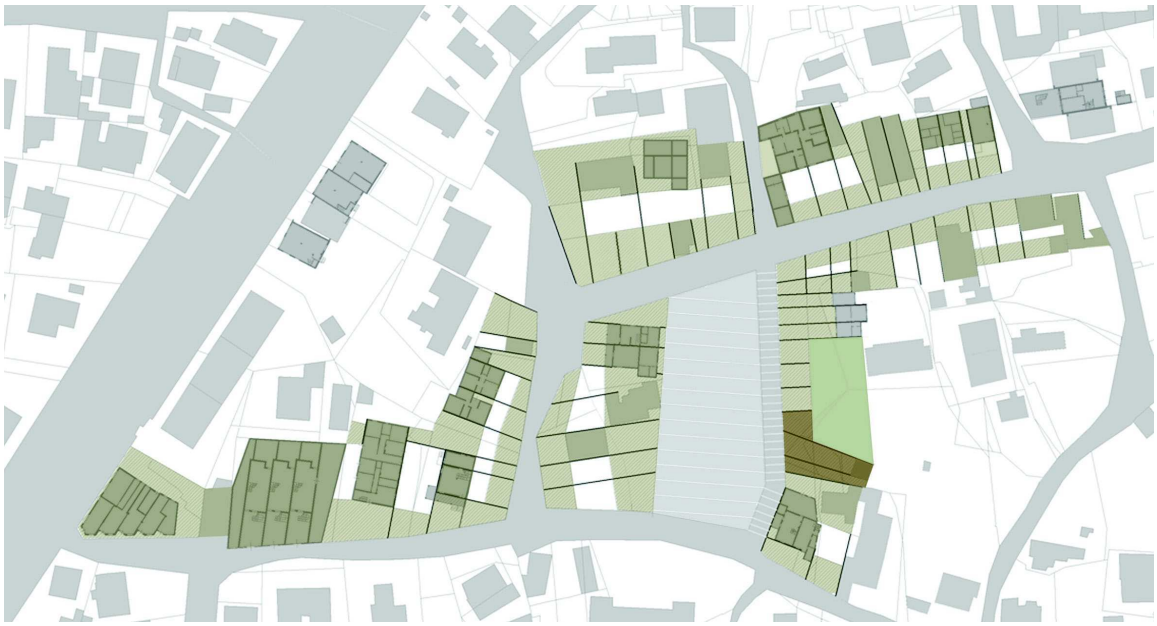

Figure 4.

Densification proposal of the spontaneous urban fabric on via delle Scuole. Reconstruction of the structure of the blocks on the matrix routes of spontaneous origin by recasting the fabric by building the pertinent areas of the housing units and by the construction of passages and common yards within the buildings linearly arranged on the route. No demolition of any existing building is expected. It is foreseen the formation of a new square and special housing in the polar area identified by the analysis of the building fabric.

It is clear that, to transform the actual serial structure of single plots and isolated buildings in a true urban fabric, it is necessary to densify constructions on matrix routes and specialize building at the poles, to increase the supply of services, currently insufficient.

We must deal, however, with the general directions of the old city plan, at present still in force, which include in this area:

• Conservation of existing lots and related areas;

• Completion of partially built lots by repeating the types of buildings used.

• New construction, on free lots, of commercial buildings and services without any analysis of their role.

• As a 'B-completion' area of PRG it is not necessary to satisfy all the standards required by the current regulations (the parameter can be lowered by 50%).

• In line with the requirements of the previous 1965 PRG of Rome, which classified some parts of the area we are considering as agricultural, the requirements of some standards can be accomplished in other areas of municipal territory.

• The Detailed Plan of Fiumicino centre merely confirms the existing urban layout on the territory

As a result of these conditions, the proposals that derive from the reading and critical interpretation of the fabric are these that follow:

• If the areas of appurtenance of the buildings that are on the spontaneous matrix pathways were built in order to fix the existing building fabric, and if clogged buildings were to be demolished, there would be no incongruity with the standard criteria of volume conservation, bearing in mind that any porch connection would not increase the cubic capacity. It seems reasonable, however, to propose the granting, with new interventions of recasting of the urban fabric, of an increase in cubic capacity as an incentive for the realization.

• Special buildings and public spaces should be constructed in pole areas. In addition to their specific function, these interventions would increase the standard ratio of standard/mq - standard/population

• The choice of densification will lead to the

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Figure 5.

Densification proposal of urban fabric and formation of a new square on via del Serbatoio (market area). The design includes the preservation of the existing communal market, the replacement of some residential blocks located on the new central square and the recasting of the residential ones located on via del Serbatoio. Existing and newly constructed buildings are connected by the construction of a perimeter gallery within the new block. The last image highlights the paths and routes system and their hierarchy.

construction of arcades, passages, common courts within the buildings, etc. Arranged linearly on the matrix paths. These elements can also be inserted into standard 'definition'.

• Enlargement of the roadway.

With the design in progress we should prove, from a regulatory point of view:

• That densification operations do not increase the volume (in a normative sense) of buildings (especially residential)

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• That the surface reserved to the standards (services and public spaces) could increase. Currently they were calculated at 50% and part of this 50% was found outside the Fiumicino centre area.

Normative aspect

The Fiumicino Centre's Detailed Executive Plan (Piano Particolareggiato Esecutivo or PPE) was adopted in 2002 and, as it has not been approved within 5 years of its adoption as established by law, it has since been considered decayed. As long as the instructions of the detailed plan are not in force, the General Plan PRGs apply. It was, however, a very conservative PPE, who took note of the situation and tried simply to adapt it to the official rules. As it has been attempted to demonstrate, the area we are considering would need, on the contrary, a substantial work of regeneration.

However, although the analysis of the reasons that led to the Fiumicino settlement to be in a marginal condition and the study of the fabric characters may lead to clear operational indications, the problem arises from a planning point of view considering the instruments that can guarantee the real feasibility of the new planned transformation process.

Considering the central role of edilizia di base as a unifying factor for the future transformation, it should be considered that the notion of density includes, in this case, not only the ratio between the number of inhabitants expected (and hence the housing volumes built) and the surface, but the idea of urban concentration expressed by the continuity of built volumes and surfaces including the organization of common pathways and spaces. The reference model is the multi-familiar and continuous fabric of the Italian city, model from which the proposed corrections result. (Marzot, 2012).

The application of this concept is topical, to the point it can become a central element within the process of transformation of Fiumicino.

Instruments are therefore the recasting of the built matter and the densification of the fabric along the matrix paths both spontaneous and planned, as well as the specialisation of poles.

The aim is to direct the process of demographic increase in order to avoid the spreading of it outside the inhabited centre (an important aim of densification is to give a direction to urban growth by avoiding new territory consumption and concentrating the offer of new housing).

If the interventions of recasting and densification of the urban fabric –intended both to improve housing conditions and to develop the identity of the site - would be considered as "public interest" and therefore as necessary for the inhabitants, as the provision of services and works for primary urbanization, the particular relationship between public administrations and private individuals could be used for the implementation of the plan, using the instrument of "sub-funds", urban sectors to be submitted to Convention between the administration and private owners. The administration would so acquire the areas needed for the implementation of the interventions envisaged and would at the same time recognize to the owners (reunited in consortium) effective rights on the soils and buildings, a new real right proportional to the areas originally owned.

The urban planning tool to be used, according to current legislation, should be the Integrated Intervention Program (or PII) provided by Regional Law no. 22/1997, but only on the territory of municipalities with an approved general urban planning instrument and may affect both public and/or private buildings.

Its realization can also be achieved through the partnership of public and/or private subjects, with the respective contribution of financial resources.

The PII can also be used '.... in order to allow the municipal administration to modify the PRG's directions.'

The PII consist of (Article 2) a project of major public interest characterized by the presence of a multiplicity of functions, from the integration of different types, 'including the urbanization works and the infrastructures necessary to ensure the completeness and full functionality of the 'Intervention itself, and of such dimensions as to affect the reorganization of the urban fabric.'

The rules contained in the law (Article 7) also apply to urban recovery programs as

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defined by Article 11 of Legislative Decree 398/1993.

The areas of intervention must be delimitated as 'sub-funds' (which may be either public or of private initiative), landowners must gather in consortiums (with the consent of at least 75% of the participants) and proceed together with the realization of the works.

If the initiative is declared of public utility, even with the obvious political problems the operation could raise, it would be imperative for the citizens to participate.

However, the inhabitants would be encouraged to participate because the proposed project would guarantee not only the same share of property previously owned but also a bonus in the increase of the living area, an increase in public spaces and facilities (services, shops, parking lots, etc.), and, in general, a progress in the quality of life.

Conclusions

The analysis is still under development and the proposal of a densification process, here presented as a conclusion, is in fact still a hypothesis whose limit lies in the private property partitioning. The maintenance of land divisions can be the main difficulty to the implementation of the project. As mentioned above, however, some technical and legal instruments are available which, if properly studied and applied, can allow the formation of an organic tissue to replace the existing urban sprawl. Avoiding to propose the cancellation of any real rights on soils and buildings, we can still assume the concrete feasibility of the proposals.

The research work has not yet been completed but we believe that the kind of intervention hypothesized, if accepted by the Municipality, could contribute to the "processual" construction of a New Fiumicino, obtained from a real regeneration of its centre.

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City and territory
in the Globalization Age

6. Cartography and big data

Exploring patterns of socio-spatial interaction in the public spaces of city through Big Data

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Abstract. *Research on the socio-spatial aspect of cities has never been so vibrant and exciting. The form of urban life is changing and evolving with new advancements in communication and technology. Digital communication and social media have reshaped the way people as the actors of society interact with each other and with the network of the city. New social networks and widespread of mobile devices can be used to create and reinforce existing social ties. Mobile devices also change the role of citizens from consumers into producers of data; they are the new reporters, photographers, videographers of everyday life. This production creates large quantities of data known as the "Big Data." Big data has created many new opportunities for researchers to investigate new aspects of cities. This paper aims to explore how people access urban public spaces through social media by taking the parameter of distance and physical proximity into account. We tried to investigate if different levels of accessibility effects the way people interact with space through social media. Through this process, the study explored different socio-spatial patterns in the city that are being affected by social media. The data was collected in two layers in the city of Lefkoşa located in Northern Cyprus: first, the geo-tagged social media data was collected from the target group, and it was located on the map. Twitter as a microblogging medium was selected for data collection due to its public nature, geo-tagged abilities, and manageable short content. Second, degrees of accessibility in local and global scale was calculated using Space Syntax. The result shows the importance of local accessibility even when social media is the effective variable.*

Keywords: Lefkoşa, Socio-spatial Interaction, Big data, mobile devices, Twitter, Urban Network, Accessibility

Introduction

Cities and their socio-spatial structure have become more complex due to new developments in digital communication and social media. Exploring these structure through the window of scientific and analytical techniques has become the norm. New data and high computational power enable the researchers to approach more complex phenomenon (Batty, 2012). Cities can be defined as the container of interactions, the spatial structure of communication and exchange, but the tangibility of these words has been changing dramatically over the past few decades. Therefore the very definition of the city has become a new. The majority of interactions, communications, and exchanges that are taking place in urban space are invisible and not bound with proximal space (Willis, 2007). Human activities in public space or the production of urban space is a complex network of interaction. Anytime somebody mentions a space or engage in an activity inside an urban space a tie forms which is a socio-spatial interaction. The beauty of social media is that it enables us to explore

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and read these interactions in the space as they happen. Furthermore, the formation of new interactions on social media might work as a new attraction that leads to more interactions. Therefore, we need new ways of understanding and reading urban space that includes this new phenomenon.

Accordingly, this research tries to contribute to the existing literature by exploring the possibilities of using social media as a research tool on top of spatial analysis to read the effects of distance free mobile communication on the socio-spatial form of urban life. The study uses geo-tagged Twitter data to read a layer of interaction with space and Space syntax to explore the accessibility to urban space in different distances.

The mobile-networked society

Social media has affected human interactions in three main ways, offering more diversity and opportunities, increasing access to information, and immediate access to network through mobile devices that transforms peoples' way of interaction. This revolution has shifted the social structure from groups to network individuals(Rainie & Wellman, 2012). The rate of access to communication through various mediums is growing. Looking at this growing lifestyle together with the rising population of cities indicates the necessity of conducting research on the effects and consequences of this relatively new phenomenon in city life. The access to social media and free communication is not a luxury that a particular group of people could access; it becomes more available and accessible to more people around the world even in underdeveloped and developing countries(ITU, 2013).

The constant changes in means and way of communication in the city reidentify the social and socio-spatial ties. Consequently, people's relationships have become more individual and more connected at the same time. Digital communication has affected the interpretation of network in the contemporary society (Chambers, 2006). Accordingly, there is a critical need for more research on people's interaction with space and with each other within the spatial content of the city. Castells (1989) argue that the changing dynamic of information technology reshapes the meaning of time and space. He describes this new hybrid space as the 'space of flow' which is a space between physical and digital space. This space makes the physical proximity a less critical player in the everyday life of the city. However, this analysis was done before the spread of mobile devices. Therefore, the dynamic of the socio-spatial form of urban life needs reevaluation.

Reading urban space through big data

Studies on big data cover a wide variety of methods, techniques, approaches(Klauser & Albrechtslund, 2014), in this research, we primarily focus on peoples' interaction with space through social media. Mobile devices carry many embodied data collection tools such as cameras, global positioning system, and instant access to data sharing facilities. As Ang and Seng (2016) argue the recording capacity of these devices provide potential data collection which was impractical through traditional methods. The geo-tagged data, in particular, shows strong promises in providing additional layers to our approach in exploring urban space (Dunkel, 2015). The geo-tagged data creates a link between an interaction and physical space in real time. Arribas-Bel (2014) argues that the availability of these new data sources can be used as a complementary alternative to the census or survey data; this does not mean ignoring the existing data, but rather using the full potential of new sources for caring out new research and strategies regarding urban space.

According to Boyd & Crawford (2012), Big Data effects the scholarly activities in its' technological, analytical, and methodological aspects. Rabari and Storper (2014) describe an emerging 'digital skin' which is being created by human interaction recorded through digital communication. The becoming of this skin opens up new questions and theoretical issues in urban policy making. Anderson (2004) argues that this new data can be more natural, accurate, and objective. As the quantity of data increases

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rapidly, the results are becoming more accurate, or using his words: "With enough data, the numbers speak for themselves". Availability and accessibility of digital communication transforms the role of citizens as producers and reproducers of content through mobile devices (Bontcheva & Rout, 2014). Therefore, this production is an inherited interactive layer of the contemporary city and not merely a tool for research. Thus, new methodological and theoretical frameworks must be explored to understand this data. Big data is beneficial for citizens as well as policymakers as it provides alternative visions and decision-making patterns in everyday life of the city(Kitchin, 2014). The big data can be used to increase people's indirect participation in urban planning, but it requires numerous further studies as the field of study is still very young and emerging (Crampton et al., 2013; Hao, Zhu, & Zhong, 2015). The interactions through social media should not be merely considered as a way of reading the network but an inherited part of its reality. To understand the reality of urban space and how people interact with it the nature of big data which is produced by people should be carefully explored. Mobile devised with their internal global positioning system can tie any interaction to a specific location on earth which provides endless opportunities for researchers. Furthermore, the big data together with advanced computational power and statistical analysis could provide insight into urban studies.

Distance and accessibility in mobile networked society

In the early frameworks of social network analysis distance is treated as a fundamental principle. However, digital communication has decreased the physical proximity as a necessity of forming interactions. The nature of digital communication is less bounded with distance and more with the structure of the information network (Castells, 1996). Being present in space is not essential for participating in socio-spatial dynamics of the contemporary city (Zachary, 2012), but not being necessary does not imply the obsoletion of distance (see Batty, 2012). Cairncross (2001) argue that the wireless technology kills the location and puts it into our pockets. People are becoming more connected to each other and at the same time more individual centered. Yuan, Raubal, and Liu (2012) show a positive correlation between the usage of digital mobile networking and the distances people travel inside the city.

On the contrary, it could be argued that social media and mobile devices be tools that enhance people's interaction with space. Digital communication has the potential to add an extra layer of interaction to the urban space, causing the rise of diversity (Kotzias, Lappas, & Gunopulos, 2014). It seems that there is a misconception that people's online interactions are detached from their everyday life(Rainie & Wellman, 2012).

Case study, exploring the socio-spatial interactions in the city of Lefkoşa

This study examines the concept of accessibility through social media in the North Nicosia (Lefkoşa) located in the Island of Cyprus. The city is physically divided into two parts as the result of 1974 conflict by the United Nations buffer zone (Figure 1). In this article, we focused on the northern part of the border. The data was collected in two parts: first, the social media data was gathered through Twitter public records, and second, the space syntax analysis was conducted in different levels of physical accessibility.

Twitter data

Twitter was used as the data collection method for this research due to its short and manageable content; its geotag capability and its' public availability for researchers. One of the challenges in using Twitter data is the process of filtering irrelevant entries (see Bollier & Firestone, 2010). For instance advertisements and people sending continues tweets from a single residential location. This research addressed this issue by selecting a particular target group. Throughout a process

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Figure 1. The city of Nicosia and UN buffer zone (by author).

of screening the interactions in public space, 1189 users have been chosen. The selection was based on the regularity of their activity and being engaged with urban space. Accordingly, the Twitter record of the target group in a one year span was collected through NodeXL platform. More than 1.2 million were collected, out of this entries, 53430 were geo-tagged and within the borders of the case study. Figure 2 (left) shows the heat-map of the Twitter data. The university campus on the north, walled city on the south and the vibrant urban spaces on the west side are visible just by looking at the raw data. The data was further categorized into a hexagonal grid (see Shelton, Poorthuis, & Zook, 2015) with a diameter of 500m to facilitate an easier way of making sense of the data and overlaping it with space syntax outcome (Figure 2 right). There are 270 cells with significant data. The same grid is used to measure accessibility through space syntax.

The space syntax

Space syntax uses mathematical properties of the spatial network to estimate the movement is a network of spaces. It can be used for understanding pedestrian and vehicular movements in the city (Hillier, 1996; Hillier & Hanson, 1984). Space syntax measures a variety of variables for the urban network. To address the primary objective of this research, we used To-movement (integration) and Through-movement (choice) in ten radii from local to global. 3000 meters was considered a global accessibility radios and 600 meters as local (Bill Hillier & Ing, 2012).

To-movement measures destination. It evaluates the accessibility of each part of the network from all other parts in a given physical distance. This measurement helps the research to understand which parts of the spatial network have more potential of being a destination for

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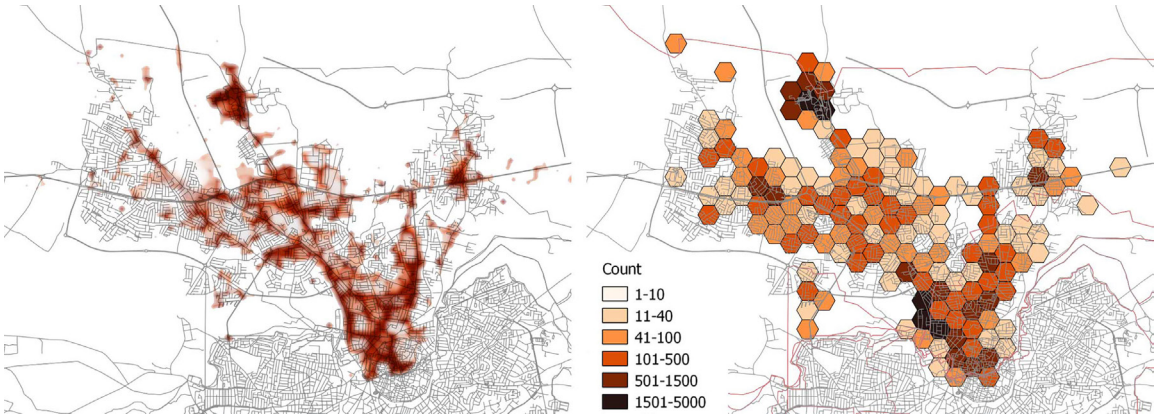

Figure 2. Left: The heat map of collected Twitter data, right, counting the twitter data in the hexagonal grid

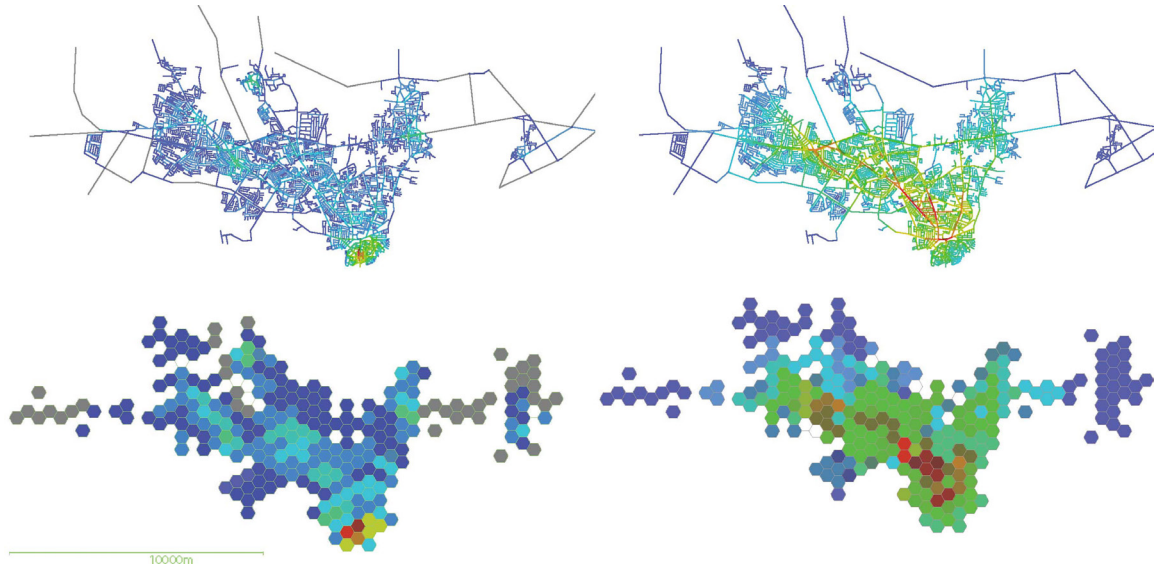

Figure 3. Left: To-movement in local level (600m), Right: To-movement in global level (3000m)

public activities. Through-movement (choice or betweenness) explores the space as a passage, a move through space, or in-between spaces; It can be used to analyze the possibility of people choosing a particular path to reach all possible destinations in a given distance. The space syntax technique provides flexibility in measuring various levels of distance for each variable

The Space syntax analysis was conducted using UCL DepthmapX. Accordingly, the Axial map was prepared N=7266; then it was broken down into segment map. Both measurements were performed with 200 meters of interval, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, and 3000 as the suggested global reach. The data was put into the hexagonal grid, the average value of all lines inside a cell was calculated. Figure 3 shows the To-movement value and its average in the hexagonal grid in 600 meters (Local) and 3000 meters (Global). The raw data shows the strong local accessibility in the historic core of the city close to the border and high global accessibility in contemporary developments of the city.

Data Analysis

The final table consists of 270 cells with three main variables, twitter count, average to-movement, and average through-movement. Pearson correlation was performed to explore the correlation between variables.

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The first stage of analysis looks into the relationships between Twitter data and integration. The result shows statistical significance at all levels of integration, but it demonstrations stronger correlations with local measures (Table 1). The correlation between Twitter data and integration reaches its pick at 600m. The result demonstrates the importance of local access to destination spaces in the urban spatial network. It could be argued that the local accessibility plays a more significant role in the formation of socio-spatial interactions within the urban public space.

The second stage of analysis looks into the correlations between Twitter data and Choice (Table 2). The data starts to show statistical significance in 1400m and substantial significant ($p<0.01$) at 1000 meters. It seems that the local measurements are more dominant in Through-movement analysis as it does not show any correlations with global measures. It appears that even in in-between spaces which are facilitating peoples' movement to their destination higher local measurements is correlated with higher probability of socio-spatial interaction.

The study used the regression analysis to detect the outliers in the data sets. Unlike the usual approach of identifying and removing the outliers, we considered them a valuable source of information. These are spaces that are not fitting within the expected statistical patterns socio-spatial interactions. The cumulative distribution function of chi-square for Mahalanobis distance with 10 degrees of freedom on the integration variable was conducted to find the outliers. Figure 4 shows the detected outlier cells on the map.

Table1. Correlations between Twitter data and different levels of To-movement (integration)

		TWITTER DA	T1024 Integration R3000 metric	T1024 Integration R2000 metric	T1024 Integration R1800 metric	T1024 Integration R1600 metric	T1024 Integration R1400 metric	T1024 Integration R1200 metric	T1024 Integration R1000 metric	T1024 Integration R800 metric	T1024 Integration R600 metric	T1024 Integration R400 metric
TWITTER DA	Pearson Correlation	1	.146*	.170**	.176**	.185**	.194**	.207**	.224**	.236**	.226**	.191**
	Sig. (2-tailed)		.021	.007	.005	.004	.002	.001	.000	.000	.000	.002
	N	270	248	248	248	248	248	248	248	248	248	248
*. Correlation is significant at the 0.05 level (2-tailed).												
**. Correlation is significant at the 0.01 level (2-tailed).												

Table 2. Correlations between Twitter data and different levels of Through-movement (choice)

		TWITTER DA	T1024 Choice R3000 metric	T1024 Choice R2000 metric	T1024 Choice R1800 metric	T1024 Choice R1600 metric	T1024 Choice R1400 metric	T1024 Choice R1200 metric	T1024 Choice R1000 metric	T1024 Choice R800 metric	T1024 Choice R600 metric	T1024 Choice R400 metric
TWITTER DA	Pearson Correlation	1	.084	.101	.108	.118	.133*	.152*	.168**	.180**	.182**	.183**
	Sig. (2-tailed)		.187	.114	.089	.063	.037	.017	.008	.004	.004	.004
	N	270	248	248	248	248	248	248	248	248	248	248
*. Correlation is significant at the 0.05 level (2-tailed).												
**. Correlation is significant at the 0.01 level (2-tailed).												

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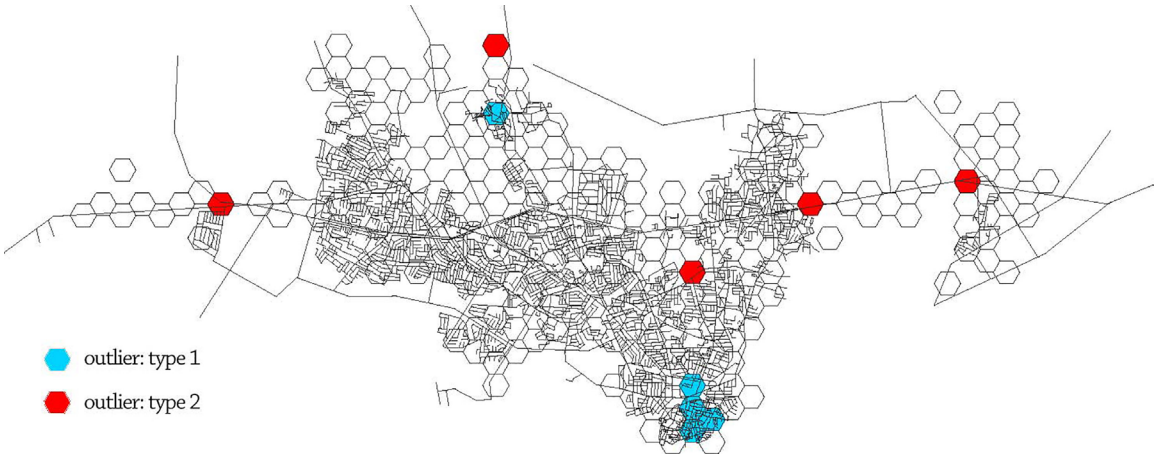

Figure 5. The detected outliers

Two main types of outliers could be described in this case: type 1 represents parts of the spatial network that show high local integration levels, shallow global integration, and extremely high density through social media. In this case, the historic core of the city and the university campus are fitting this behavioral pattern. These two spaces are different in nature, but both have their internal life within the wider network of the city, and they offer high-quality public spaces for interaction. Type 2 represents spaces with low local and global integration and somewhat high visibility through social media. These parts of the network are the activity driven spaces. Interesting functionalities that attract people regardless of travel distance in . Therefore, in addition to our previous findings, it could be argued that accessibility and distance can be both critically important and obsolete in some cases.

Conclusion

Digital communication and social media have changed the way people interact with the city and with each other. Widespread and availability of mobile devices have brought the new type of interaction into the spatial network of the city in real time. The side product of this transformation is 'big data,' which is being recorded by the people. 'Big data' opens up new horizons for researchers, and it provides unprecedented data collection and evaluation thecniques in comparison to traditional methods. The field of 'big data' is still in its infancy. Theoretical, technological, and methodological frameworks are being created and tested every day. The 'big data' in its raw form cannot be self explanatory; it must be supported and evaluated together with other types of data. In this research, we tried to develop a methodological framework to read urban space through Twitter data (big data) and space syntax. The research objective was to explore the relationship between accessibility and the formation of socio-spatial ties through social media. The Twitter data has been monitored and processed into a fine-grained collection of socio-spatial interactions and free of spams and unwanted tweets. On the other hand, accessibility was measured using space syntax. To-movement (integration) and through-movement (choice) were measured to explore the urban space as both destinations and move through parts of the network.

The findings show the critical importance of both global and local accessibility in the formation of socio-spatial interactions. To-movement seems to be more correlating with Twitter data at the local level. Therefore, it could be argued that spaces that are more locally accessible as urban destinations have the potential to contain more interactions within. Through-movement shows significant only at local level. It could be assumed that when people are moving from one point to another if pedestrian (local), they are more likely to interact with space. On the other hand,

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global movements in the network are probably vehicular movement. Thus there are fewer chances for socio-spatial interactions. This paper argues that when the data is properly collected and sorted, exploring the outliers play a critical role in undersetting socio-spatial interactions. In this case, we found two types of spaces that are not fitting into the statistical analysis. First, spaces with high local and low global accessibility that are heavily reported through social media, and second, spaces with attractive functions which are low in both local and global accessibility of spatial network.

There are a variety of opportunities for research in the urban socio-spatial network through the window of social media. Perhaps in further studies, including more variables like land use, economic drivers, or domestic destinations might shine more light on the subject.

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Cartographying the real metropolis: A proposal for a data-based planning beyond the administrative boundaries

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Abstract. *Nowadays, there is a great gap between the functional reality of urban agglomerations and their planning, largely because of the traditional linkage of urban management to the administrative limits inherited from the past. It is also true that the regulation of urban activities, including census and statistical information, requires a closer view of its citizens that can only be addressed from the municipal level. In any case, it is clear that the metropolitan delimitation has met useful but often ethereal or exclusionary criteria (economic or labor patterns, functional areas...), which become disfigured by an administrative reality that does not always correspond to the real metropolis. This paper, aware of the new cartographic possibilities linked to the big data - CORINE Land Cover, SIOSE, multi-sector digital atlases (in many cases referred to the urban extent, etc.) and other open system platforms - explores the evidence that might base a new objective methodology for the delimitation and planning of large urban areas. Indeed, what if basic data for cities would arise not from administrative entities but from independent outside approaches such as satellite imagery? What if every single sensing unit (every citizen, company, building or vehicle) directly issued relevant and dynamic information without going through the municipal collection? Finally, the research analyzes the eventual implications of this data-based planning with administrative structures and urban planning competencies in force through some current case studies, with the purpose of achieving a more efficient and clear metropolitan governance for our planet.*

Keywords: Data planning, metropolitan areas, big data, urban extent, good governance

Introduction

The increasing share of the global urban population has recently generated a growing interest in the study of metropolitan areas (United Nations, 2015). The quantification of areas and densities, as well as the extent of the urban footprint have been a subject of study in recent literature (Angel, 2016), in which the extent of urban agglomerations and even the definition of the 'urban' itself has been questioned (Brenner and Schmid, 2014).

In Spain, valuable information about large cities is available, through documents such as the publication Áreas Urbanas +50 (Ministerio de Fomento, 2013), or the numerous research papers on urban systems and the delimitation of metropolitan areas (Roca Cladera et al., 2012). All of them have in common their statistical nature - for example, making use of the 2011 census data of residence and work mobility - and the identification of a minimum indivisible and unquestionable unit: the municipality. However, there is usually a mismatch between the geographical delimitation of these metropolises and the scope of the planned planning instruments, which are often non-existent (Hildenbrand, 2017). This generates a dysfunction that has its root in the fact that social sciences tend to use the administrative

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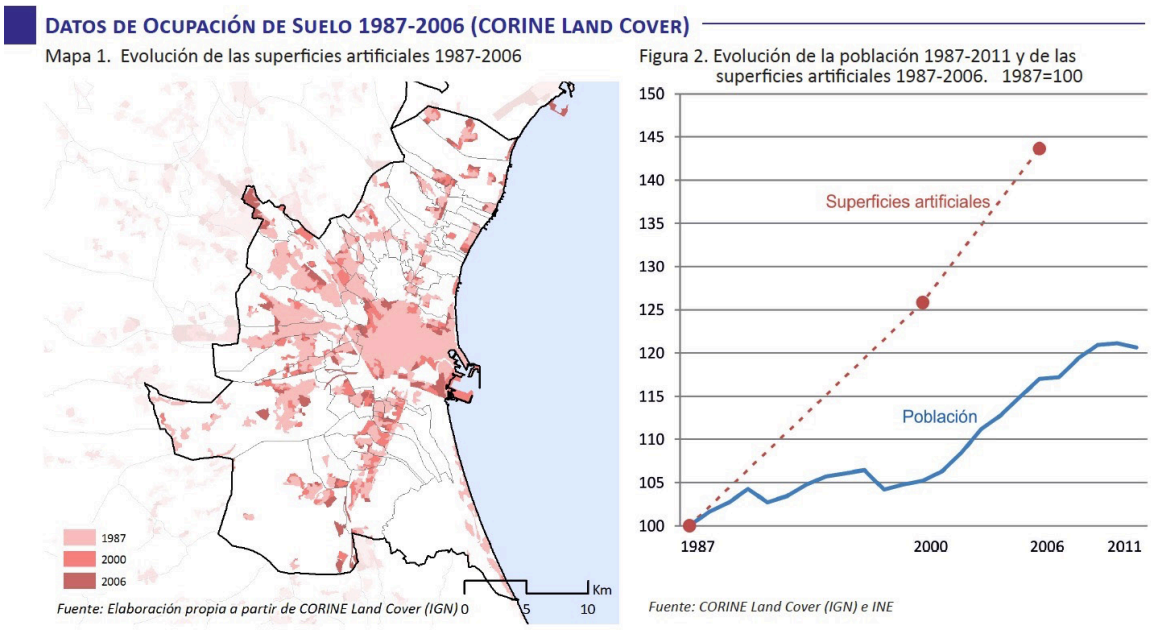

Figure 1. Valencia Urban Area delimitation obtained from diverse statistical data, finally covering 45 municipalities (Ministerio de Fomento, 2013).

municipal limits as a given object, often ignoring the reality and functionality of these metropolitan areas as a whole.

In this sense, the Valencian case is very relevant. Currently, the process of drawing up a thorough and comprehensive Metropolitan Territorial Action Plan for Valencia (PATEVAL) is underway. According to the Territorial Strategy of the Region of Valencia (ETCV), the draft of the plan takes into account diverse scenarios of delimitation of the metropolitan area, which reveals a worrying lack of definition in the starting point. Thus, the ETCV indicates an Integrated Urban Area of 58 municipalities according to basic criteria of interaction by proximity of uses in contiguous municipalities. In the other hand, if the commuting relations and physical continuity are taken into account, the result is a total of 76 municipal terms. Furthermore, recent studies based on surveys of intermunicipal mobility extend the metropolitan area to a total of 80 local constituencies (Feria Toribio and Martínez Bernabeu, 2016).

This mismatch not only affects the metropolitan delimitation, but also generates a frequent lack of coordination between the local and supramunicipal planning policies. In this regard, the inconsistencies of municipal boundaries are worth noting for cities such as San Sebastián in which urban functional area transcend even the national Spanish border, generating a metropolitan area between two countries.

It is necessary understand that the term metropolis (which means mother city) was originally conceived as a relational concept where political, cultural and even military relationships were established. Nowadays, new variables derived from the productive model and economic relationships (mobility and work policies, territorial delocalization, digital connectivity) deserve to be included in this mix. Metropolitan reality transcends historically established administrative boundaries, often functionally obsolete, and its delimitation should respond to truly relevant information instead of to the sum of some administrative boundaries.

Metropolitan delimitation criteria in Europe
The Spanish metropolises are integrated in the European Cities project (Urban Audit), Eurostat's urban data collection. In it, the city is defined as "a local administrative unit (LAU) where the majority of the population lives in an urban center of at least 50 000 inhabitants". Two other units are also defined, the Functional Urban Area - formerly known as larger urban zone (LUZ) - consisting of "a city and its commuting zone", and the Greater City as "an

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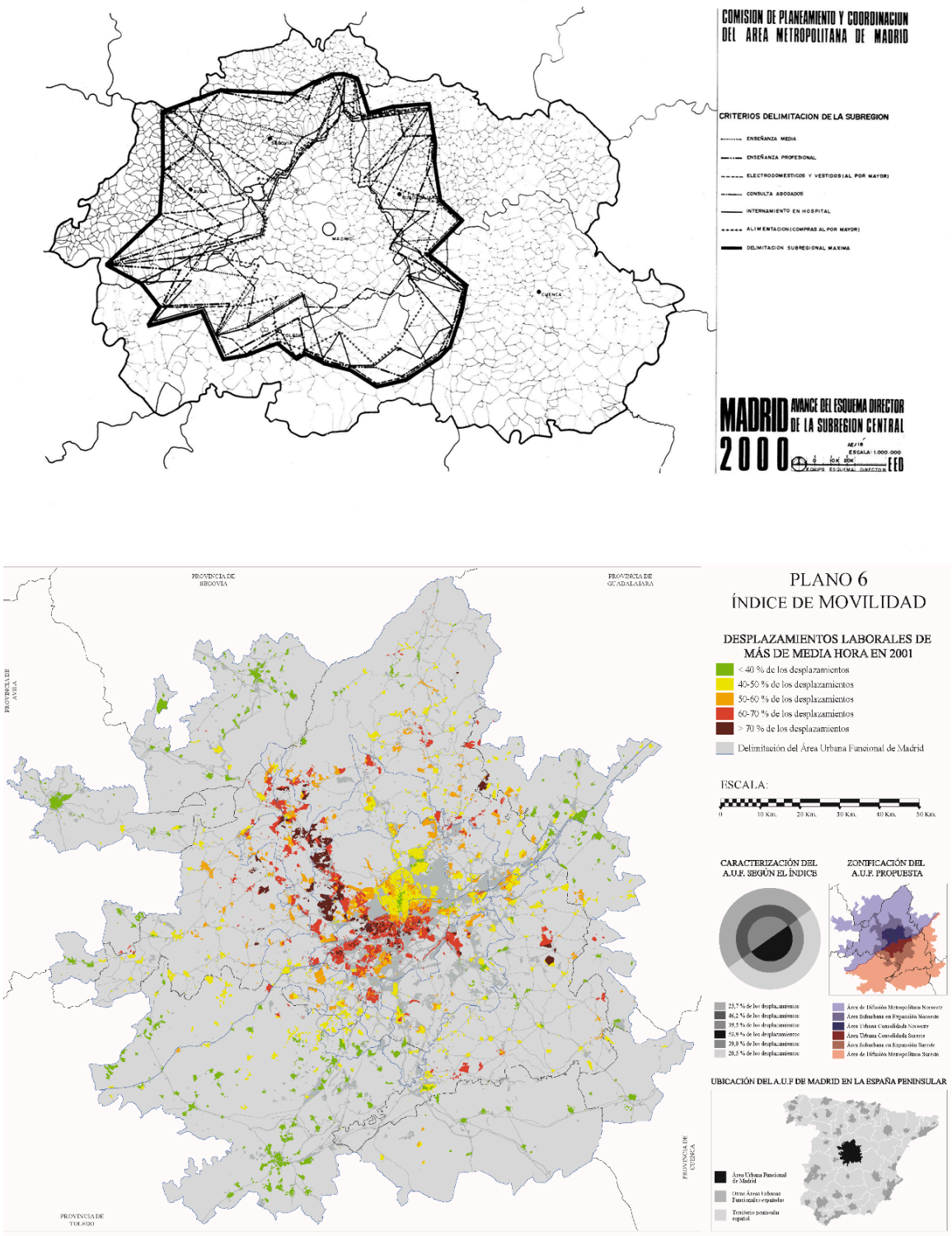

Figure 2. Throughout the last century, regional planning in the capital of Spain has not been completely alien to the attempts of multicriteria delimitation: above, graphic pertaining to the structural analysis of the "Madrid 2000" Scheme Director, 1971; below, commuting plan with statistical information of 2001 on the Functional Urban Area proposed by Madrid Council in 2014 (Terán, 1999, p.97; Gómez Giménez, 2017, p.17).

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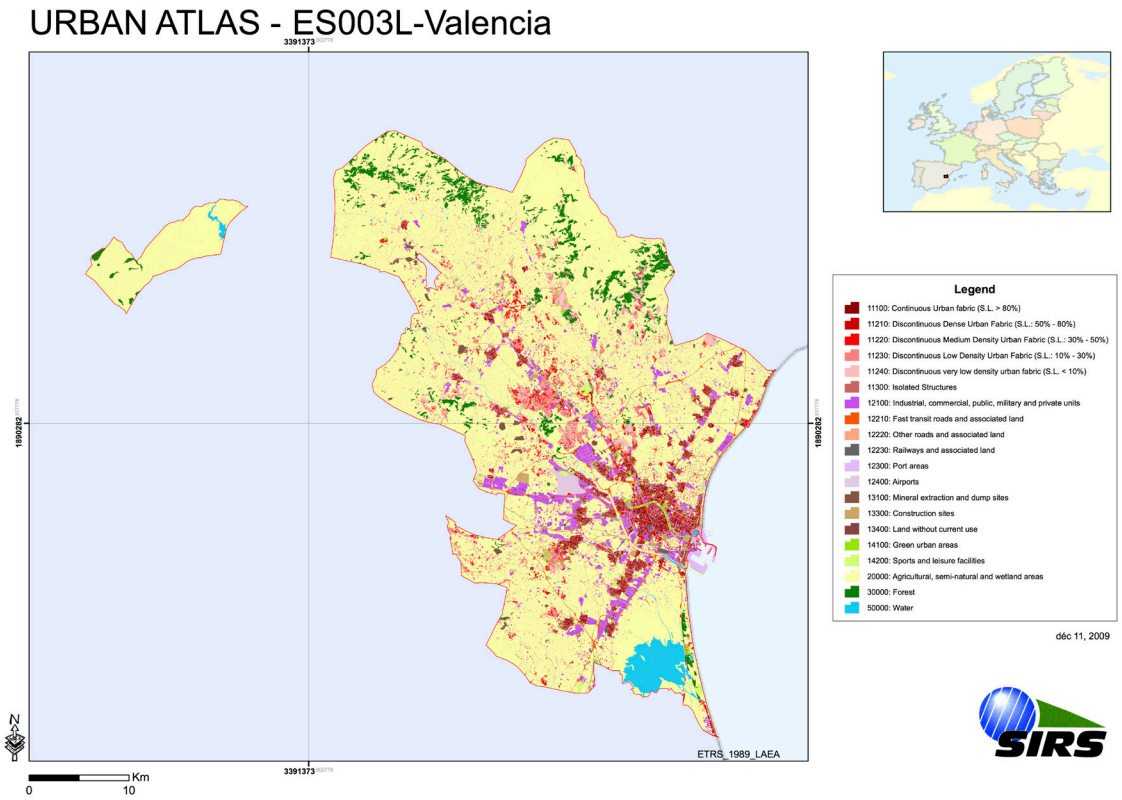

Figure 3. Valencia Functional Urban Area (ES003L2) according to the 2009 European Commission Urban Atlas, including an extraneous leapfrog area.

approximation of the urban center when this stretches far beyond the administrative city boundaries" (Dijkstra and Poelman, 2012).

As it can be observed, this attempt to standardize the way in which urban boundaries are established responds fundamentally to administrative criteria and to commuting patterns. Both concepts have served as the basis for important datasets such as the Urban Atlas (hereinafter, UA), a large set of high-Resolution digital land use and land cover maps covering more than 300 European Functional Urban Areas as defined by the Urban Audit. In fact, together with other mappings supported by the European Environment Agency, such as CORINE Land Cover (CLC) and the European Soil Layer (SSL), the UA is now an indispensable tool for urban studies in Europe (European Comission, 2011).

Other interesting initiatives have also been developed using these databases, such as the recent European Settlement Map (ESM) project, which uses very high-resolution satellite imagery combined with the general GHSL - Global Human Settlement Layer – methodology to support urban policy makers (Florczyk et al., 2016), or the attempt to integrate the MOLAND and Urban Atlas geodatabases (Ribeiro Barranco et al., 2014). All of them are important projects of the Joint Research Center of the European Commission, whose aim is to track urban growth changes systematic and consistently.

However, these valuable cartographies - as we have seen in the particular case of Spain - suffer from at least two important deficiencies. First, they omit the connection with the territorial scope of the respective instrument of planning, the key tool of metropolitan management. And secondly, but no less relevant, the fact that regardless of the dataset used, all maps are always adjusted to some indivisible minimum unit of a purely administrative character: an urban cluster, as defined by Urban Audit; The OECD-EC Functional Urban Areas, for the Urban Atlas mapping extent; or administrative units linked to ESM validation experiments.

In this sense, it is frequently mentioned

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that the coordination of these cartographies with other datasets, such as cadastral ones or those linked to building footprints (ex. Open Street Maps) would be desirable in order to obtain a detailed and adjusted Metropolitan characterization. It is worth noting that many municipalities concentrate their urban activity in a specific area of their land, however, they are fully integrated in the definition of the larger metropolitan area. Without a doubt, unless the administrative circumscriptions are transcended, we will not be able to effectively limit the Greater City. Only then will it be possible to fully understand and plan the real metropolis, in order to develop efficient planning instruments for its best possible functioning.

Big data and new cartographies

While defining the metropolis, the need of attending to spatial patterns - built-up areas, open spaces, geographical constraints, etc.- seems undeniable, according to methodologies based on high-resolution satellite image (Inostroza et al., 2013). In addition, new cartographic possibilities linked to big data, such as the already described European ones and other statistical datasets (as included in the Spanish Digital Atlas of the Urban Areas of 2016: population, housing and real estate data, coverage, SIOSE, etc.), would enrich the spatial component.

Last but not least, the metropolitan delimitation should respond to the dynamic and changing character of cities: a dynamic quantification, related to the urban expansion trends and commuting patterns, that can not be measured with the use of static census data gathered for limited municipal boundaries.

All these projects include the creation of datasets with the use of satellite images as their basis - Statistics National Institute (hereinafter, INE), Cadastre, etc. -, whose potential is still to be exploited to a great extent because they are not "sufficient in terms of the resolution, thematic granularity, coverage or temporal span. None of the available products offers a wall-to-wall fine-scale and consistent representation of the built-up areas in Europe" (Florczyk et al., 2016).

In the case of Spain, the Municipal System of Indicators of Sustainability presents a series of references, essentially static, that can implement a solid base on which to combine the dynamic elements. In the first place, the occupation of the land or the definition of land uses, obtained from the data of the SIOSE and the cadastre, allows us to obtain a clear information of the quantity and degree of artificial soil created by the man, along the

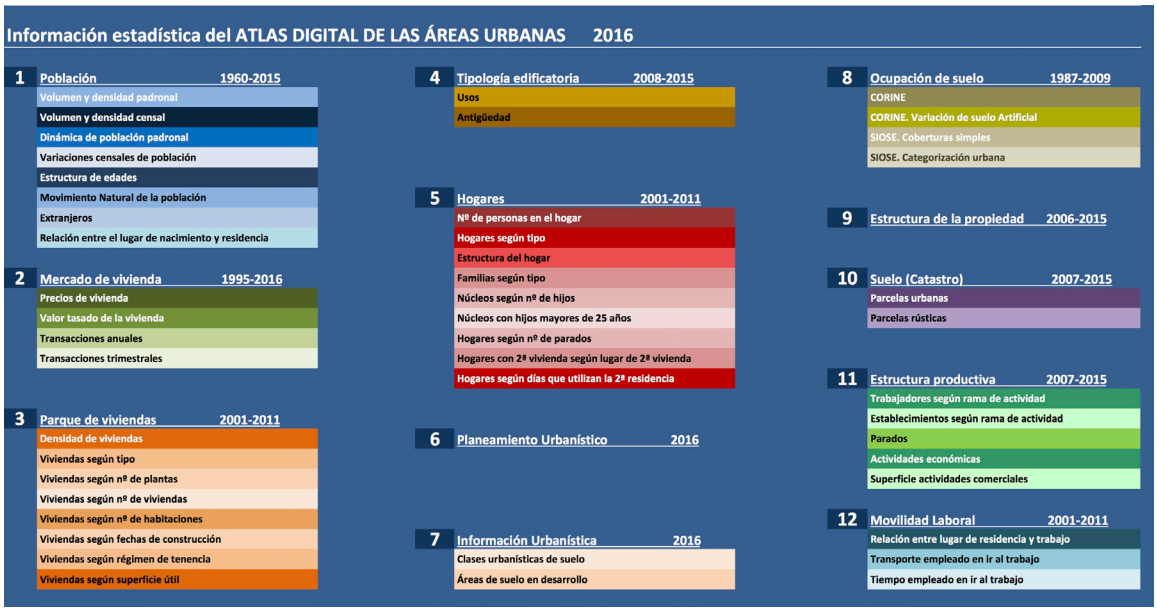

Figure 4. Statistical information considered in the 2016 Spanish Urban Areas Digital Atlas.

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lines of the European Urban Atlas or the ESM. In combination with this value, the density or intensity of use (present in the cadastre or in the INE censuses) allows not only to locate the built-up areas but also to quantify their intensity and thus their importance in the configuration of the region.

Apart from the intensity, using satellite images to determine the use of the built-up areas (available at the cadastral databases), can help identify polarized constructed areas with very specific uses. This allows establishing dependency relationships between exclusively residential areas (dormitory cities), commercial, industrial and office areas (workplaces) and mixed-use areas that are capable of offering the appropriate services for daily life. In this regard, the definition of public transportation networks and proximity indexes to bus stops, subways, bicycle lanes, etc., would allow a deeper understanding of the relationships between the different built areas. Studying the traffic maps of private vehicles that are contemplated in some way in the noise maps and INE databases could complement this mobility study.

The new satellite techniques and their potential when associated with census and statistical data have been very useful to map the city and its activity so far. However, the truth is that no current implemented tool is able to accurately measure the mobility of people and vehicles in a dynamic way, or in other words, with a sufficiently significant frequency of time to be able to understand the real activity of a metropolitan area as a whole.

In Spain, initiatives have been carried out at the municipal level to try to quantify mobility in urban areas of special interest in order to increase the efficiency of municipal planning (improved traffic in San Sebastian and telephone data in Barcelona). They respond, respectively, to two complementary methodologies:

Use of people and vehicle counters. Composed mainly by sensors or pneumatic road tube counters, they are useful to establish

Figure 5. Human detection approaches through color bounding boxes in different scenarios (Idrees et al., 2015, p.1996).

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the Annual Average Daily Traffic, where the sum of the traffic activity of a whole year is divided among 365 to obtain the mean. It serves to determine the approximate number of vehicles, people or bicycles that make use of a track on a daily basis.

Crowd analysis. Usually employed in urban contexts with large influxes of people, in which the number of people and their speed are observed, making use of camera images. These are able to measure the number of people with the use of algorithms for image analysis. They have led to the development of mass behavior prediction techniques such as swarm intelligence, which serve to establish more efficient urban planning criteria.

These strategies have been proven useful while quantifying flows or densities in a particular road or area of the city, but lack a broad enough scope of study to encompass the urban or metropolitan scale. In addition, in many cases, these studies occur at specific times or with frequencies that do not extend over time (such as concerts or festivals in the case of crowd analysis, or a series of months in the case of vehicle counters). The combination of these two shortcomings makes these techniques insufficient to determine the real extent of urban activity.

However, the rise of cellphones and smartphones has generated a new series of techniques that are capable of approaching the measurement and representation of urban activity in a dynamic way. Due to the fact that these devices act as real time locators with a very high degree of disaggregation, it is possible to determine urban activity with unprecedented accuracy, scale and frequency.
Attempts to develop a digital platform in which all the urban activity can be shown (also named real-time city) are of special interest, particularly the ones developed by the MIT Senseable City Lab. The way in which these platforms gather urban data is usually based on the use of smartphones to obtain information on the movement of people and vehicles in urban areas.

One of the first initiatives in this direction, developed precisely by this laboratory in 2014 is HubCab. It shows the trips made by New York City taxi drivers over a year for each daily time slot. In addition, it shows where the passengers were picked up and where they were dropped off. Although real-time smartphone location was not used for this study (only pick-up and drop-off points), it is capable of showing which areas receive more influx of people throughout the day with a very large accuracy and with a general vision of the metropolitan area.

Another interesting example is the Waze application, which acts as a social traffic network. In it, users share traffic incidents through their smartphones to notify other drivers who also use the app. In this way, Waze is capable of suggesting the driver the fastest route to reach the destination according to the point where he is at on a real-time basis. It is worth noting that the technology giant Google paid approximately € 1 billion for this company, in its quest to offer the best map service possible to represent the activity of cities in its platform.

On the other hand, Uber has recently joined these services with the launch of Uber Movement, the platform in which the information of its drivers over a year is shown. In it, you can observe the approximate travel times of the trips that the company makes in a series of cities. Along with these platforms, closer examples such as the collaboration between Euskaltel and the San Sebastian City Council under the European project Replicate (H2020), allow to understand the flow of people in the city in different timespans (throughout the day, week and months) thanks to the company's telephone data.

All of these tools, which currently demonstrate their potential in the measurement of city traffic, could be used to determine the physical reach of a city and its actual economic impact. In this sense, it is necessary to reflect the dynamic and changing nature of the metropolitan delimitation, beyond the administrative limits: the same citizens can reside, work and practice leisure in municipalities, regions or even different countries during the same day, and at the same time, vary their behavior patterns according to the day of the week or season of the year.

The growing number of partnerships between technology companies and local

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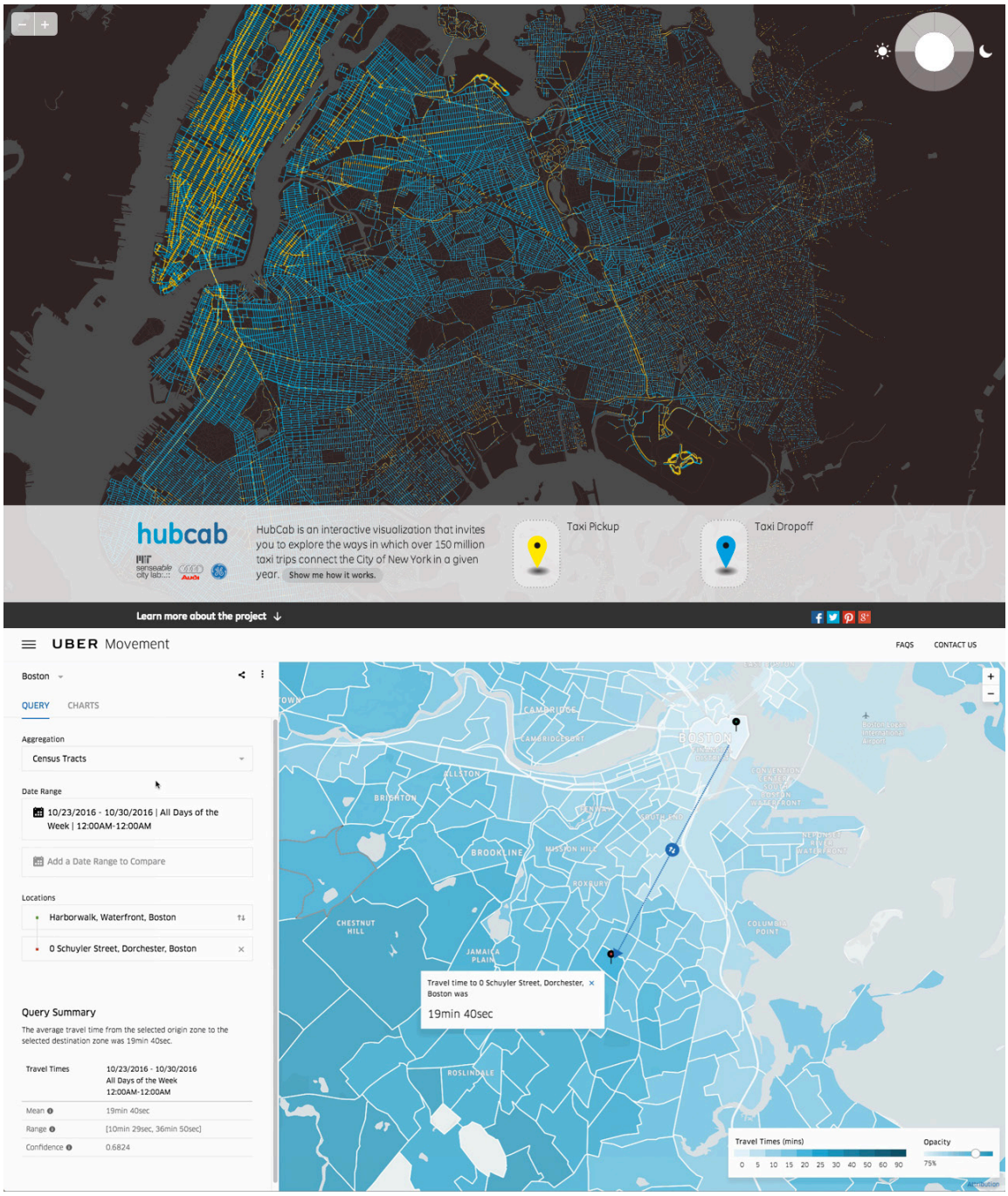

Figure 6. HubCab interactive visualization and Uber Movement display sample (MIT Senseable City Lab, 2014; Uber, 2017).

entities is emerging as the inevitable modus operandi of public administrations when it comes to understanding the way in which their cities work and what the actual reach of those cities is. Most probably, the debate on administrative boundaries is part of a political, rather than a technological sphere, but we should not lose sight of the fact that real-time information about our cities is the best current existing tool to show urban weaknesses and opportunities, and that these are precisely the challenges to which the administration should give an adequate response to.

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Towards a data-based planning

After reviewing the different approaches to characterize the metropolis, it is worth noting, first of all, the convenience of using a multilevel methodology while delimitating the Greater City. Combining the spatial component and layers of statistical information with highly disaggregated dynamic sensing databases seems the only efficient way to face the challenges of metropolitan management.

In the final analysis, the different layers of information - both spatial and statistical, both static and dynamic - would be merged to form a general map that could serve as a basis for territorial planning (Schmid, 2013, pp.408–413). This result would generate a single maximum boundary for the metropolitan area, under which different types of delimitation could be established, depending on the planning purpose (ex. transportation, land use, waste treatment, etc.).

Although the legislative nature of land use planning implies a fixed consideration of all the layers - that is to say, the maximum boundary - as a field of action, in the face of a sectorial application, it would not be unreasonable to propose different combined planning boundaries for different planning purposes. To this end, the use of an urban planning authority that is superior to the local or even regional level that drives and leads the process is highly desirable: it is at this point were the maximum envelope can play a binding role in determining the number and proportional weight of the agents involved in the governance of the metropolitan area.

Finally, the dynamic nature of this data-based methodology would require the creation of an open-access platform in which the collected information and the design of the algorithms that relates that data is as transparent and unbiased as possible. Areas that are currently affected by some of the levels of planning (metropolitan mobility, structural land classification guidelines, etc.) could one day not depend on this kind of management. On the other hand, municipalities that would contribute to the creation of that metropolitan authority in proportion to their demographic or labor weight could review their respective contributions to metropolitan planning - economic or governance - according to their variable extent of the areas.

In summary, the incorporation of the new cartographic possibilities offered by big data and the digital collections (multi-sectorial mapping, satellite imagery, dynamic datasets) is presented as an incomparable opportunity for the planning of the territory, which until now has been historically linked to the administrative districts. This could reduce the existing and undesirable gap between the administrative and real metropolis and facilitate an efficient and sustainable management of our urban environments.

A clear thought in this regard is the fact that decisions at a municipal level many times lack the empirical data that justifies those decisions, and implementing these dynamic data-based approaches to understand the urban reality could strengthen the efficiency of urban policies. Technology, as this paper shows, is within our reach, but its application depends on the ambition of our authorities and policy makers. Today, more than ever, our cities require innovative techniques to face the tremendous challenges that they are experimenting throughout the world, from climate change, to socioeconomic inclusion. We encourage local administrations, and more specifically, the planning community, to rethink the way in which our cities are planned, according to the possibilities, challenges and opportunities of our time. The delimitation of real metropolis is just the first step.

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Morphological and functional attributes of preferred urban public spaces in Alicante province

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Abstract. *Understanding the role of urban public spaces in today's historic Spanish Mediterranean cities is a key issue for researchers and urban professionals. Increasingly, social media showcases users' preferences, a trend that can provide an indication as to why some urban public spaces are preferred over others. This research focuses on the study of morphological and functional attributes of preferred urban public spaces in historic cities of the Province of Alicante (Spain). Two main objectives are pursued: to describe urban morphological features of preferred plazas within the city; and, to identify functional patterns taking into account building uses and activities found in these public spaces. Eight plazas, selected from a previous study using Foursquare social media data, were used as a case study. The research methodology involved the spatial definition of the plaza followed by an analysis of each plaza's morphological and functional attributes. The results demonstrate that the preferred urban spaces have in common more functional than morphological characteristics: good accessibility; ground floor activities; and presence of landmark buildings.*

Keywords: Public space; plaza; livable spaces; social spaces; social networks

Introduction

The analysis of urban public spaces has traditionally been an important concern in the various disciplines related to Urban Studies. The recent application of new technologies as tools to monitor cities' activities offers a wide range of innovative approaches to urban analysis.

This research takes as a case study the most socially relevant plazas of historic cities in the Province of Alicante. The eight plazas analysed in this paper were selected under the assumption that data from location based social networks showcase urban preferences about public spaces in cities (Martí, Serrano-Estrada, & Nolasco-Cirugeda, 2017). Even though the methodology used for the selection of the eight plazas is broadly explained in the paper "Using locative social media and urban cartographies to identify and locate successful urban plazas" (Martí et al., 2017), some of the highlights related to the selection of cities and plazas will be noted hereafter.

First, a population growth criterion was used to determine which of the 141 municipalities in the Province of Alicante could be considered both presently significant in size and historically relevant. In total, eight cities in the Province of Alicante, namely: Alicante, Torrevieja, Elda, Orihuela, Benidorm, San Vicente del Raspeig and Elche were selected.

Second, data from each of the above listed cities were retrieved from the location-based social network Foursquare. The data collected were basically a list of preferred urban spaces, registered as venues in the Foursquare's web service. Also, data included the total of individuals that have visited each venue and registered their presence —or checked-in—. Then, a ranking list of the cities' best ranked urban plazas was obtained and the venue

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occupying the first position was taken for each city —. Once the most relevant urban public plazas were identified, their spatial relationship to the city structure was studied —Table 1—.

From the study of the plazas' location in relation to the city structure, two circumstances should be mentioned. First, all plazas are strongly connected to main structural urban axes and, second, almost all plazas are urban open spaces located either within or in close proximity to the historic centre.

On the basis of the aforementioned observations, the present study may be regarded as an attempt to continue and extend the previously cited work. More specifically, this paper aims to recognize common morphological and functional characteristics among socially successful urban spaces in the Province of Alicante. The hypothesis is that the liveliness and social character of an urban plaza largely depend on its physical and functional configuration.

Methodology

The research methodology consisted of two stages: determining the extent of what is considered plaza space; and analyzing the morphological and functional attributes of the plazas. The morphological attributes were defined as: the overall shape, dimensions and proportions of each plaza; and the area of the façade in relation to the dimensions of the plaza. The functional attributes of the plazas were analyzed and compared in terms of surrounding building uses as well as other elements of the plaza.

a. The spatial definition of the plaza

A precise definition of the space itself was required. A digital reconstruction and dimensioning of the plazas was necessary. For this purpose, four main sources of information were used: the Valencian Community's cadaster electronic office —Portal de la Dirección General del Catastro (Dirección General del Catastro & Ministerio de Hacienda y Administraciones Públicas, 2015)—; Terrasit (Terrasit, 2017); and PNOA's orthophotos (Instituto Geográfico Nacional & Ministerio de Fomento, 2015). Onsite observation and other images were used to compare the various information sources referred to above and obtain the most accurate definition of the space. In terms of the actual limits of the plaza space, a physical, rather than a perceptual, approach was taken. For the purpose of this research, façade walls or any continuous vertical barrier at eye level —normally located at the lot frontage— were considered as the spatial limit of the plazas. This approach responds to the fact that not all plazas are surrounded by buildings tall enough or in close proximity to each other to be viewed and perceived as a continuous enclosure wall for the space.

In order to study the morphological attributes of the plazas, their shape was simplified into a polygon form based façade edges in Figure 1. The polygons were drawn by tracing over the façade edges in Figure 1 and extending them until they intersected an adjacent or perpendicular façade edge. This resulted in the simplified polygon forms represented in Figure 2, which excluded only the plaza access points as they were not considered to be strictly plaza space. The plazas polygons include open areas and covered walkways within the defined limits.

Once the plaza space of all case studies has been delimited, two analyses were performed:

b1. Morphological attributes of the plaza

The enclosed character is the main requirement of a plaza space (Sitte, LeGates, & Stout, 2000). This was a key factor in the analysis of the morphological attributes of the plazas in this case study. The three morphological aspects studied and compared between the eight selected plazas were: the space's horizontal and vertical plane dimensions and proportion. Thus, a quantitative analysis was performed in order to study the dimension and proportion of the selected plazas. For that purpose, the surface area and building heights of each space were calculated to find the relation between the morphological attributes of the eight socially relevant public spaces.

It is important to take into account that the human eye is able to collect an extensive range of information within a radius of approximately 100 meters (Hall, 1973). This reference point is

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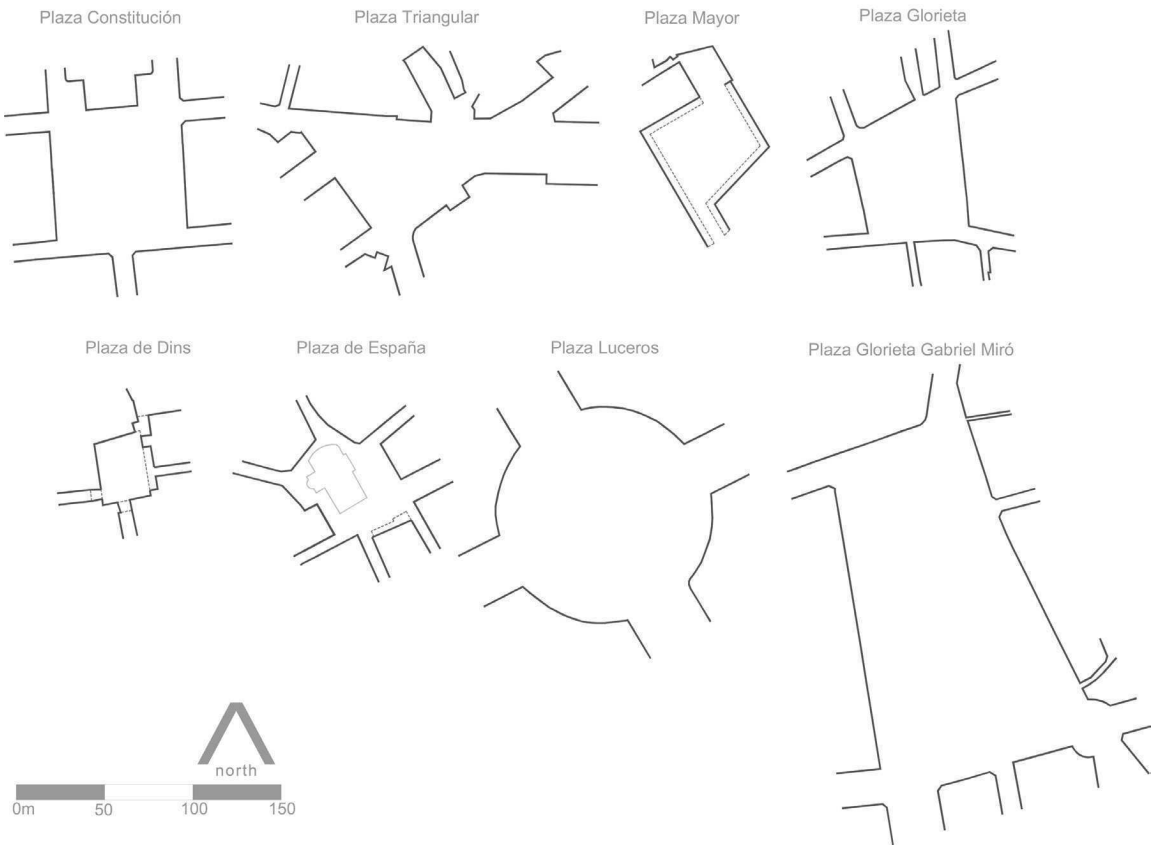

Figure 1.
Façade Edges —continuous vertical barrier at eye level—. Source: authors.

supported by Gehl (2010:71) who, after having studied different public spaces around Europe, recommends that the length of a plaza should not exceed 100 meters.

As for the plazas analysed in this case study, the horizontal plane dimensions were calculated as follows. Two perpendicular axes were drawn, crossing the centre of the polygon from the shortest and longest points at opposite edges of the plaza area representing the horizontal plane of the space. Both lines are taken to represent the width and the length of the polygon.

The plazas' surrounding building heights —vertical plane— and their relation to the plaza space —horizontal plane— were then calculated. With respect to the building heights, it was necessary to obtain the height of each separate building —Figure 3—, and then calculate the average building height of each plaza —Table 2—.

In order to calculate the proportion of each plaza space, the height from the highest and the shortest buildings surrounding the space was considered for the operation of maximum and minimum ratio respectively. This value was then divided by the distance of the perpendicular horizontal line that starts from these buildings —shortest and tallest— to the opposite edge of the polygon. As for the average ratio, it is obtained calculating the average between the two lines that define the horizontal plane —long and short intersecting lines in polygons— divided by the average height of the plazas.

b2. Functional attributes of the plazas

For the purpose of this study, the functional attributes of the plazas are represented by building uses as well as other elements of the plaza space. More specifically, the diversity of building uses affecting the plaza space will be assessed. This responds to the claim that the more active the plaza facade edges, the greater the likelihood of social activities in the space (Gehl, 2010). Thus, since this study is concerned with the most socially relevant

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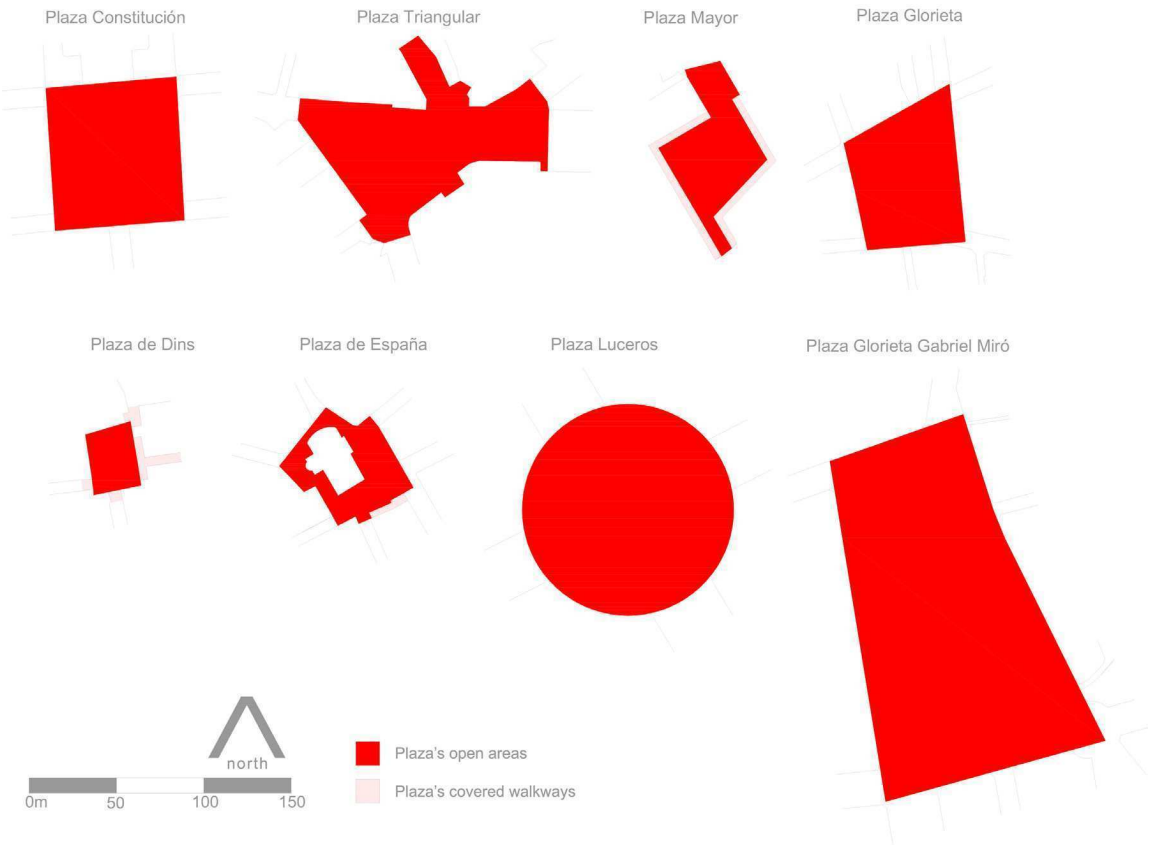

Figure 2.
Plazas' simplified polygon forms. Source: authors.

plazas of Alicante Province, the functional attributes of the space are a key component of their design and livability.

Landmark building uses and other economic activities, capable of reaching a community beyond that of the neighbourhood —religious, governmental buildings, etc.— are worth differentiating from other local economic activities as they might be potential contributors to the social and economic life of the urban area in which they are located. For that purpose, building uses and other elements affecting directly the plaza space are registered and compared. Special attention was given to the impact these may have on the liveliness and social life of the urban environment. Therefore, not only the kinds of economic activities but their availability —opening times— will be considered in the overall discussion relating to the functional attributes of the selected plazas.

Results

a. Spatial definition

The spatial definition of the plazas involved the recognition of the space's façade edges followed by the determination of the polygon area limits. These tasks were complex because the shape and proportion as well as the size of and the angle at which the streets open onto the plazas varied significantly.

b1. Morphological attributes:

Different shapes among the plaza polygons have been recognized. Five of them could be regarded as quadrilateral, one circular and two irregular. With respect to the shape of the polygons, two singular cases are worth noting. First, the polygon of Plaza Triangular in

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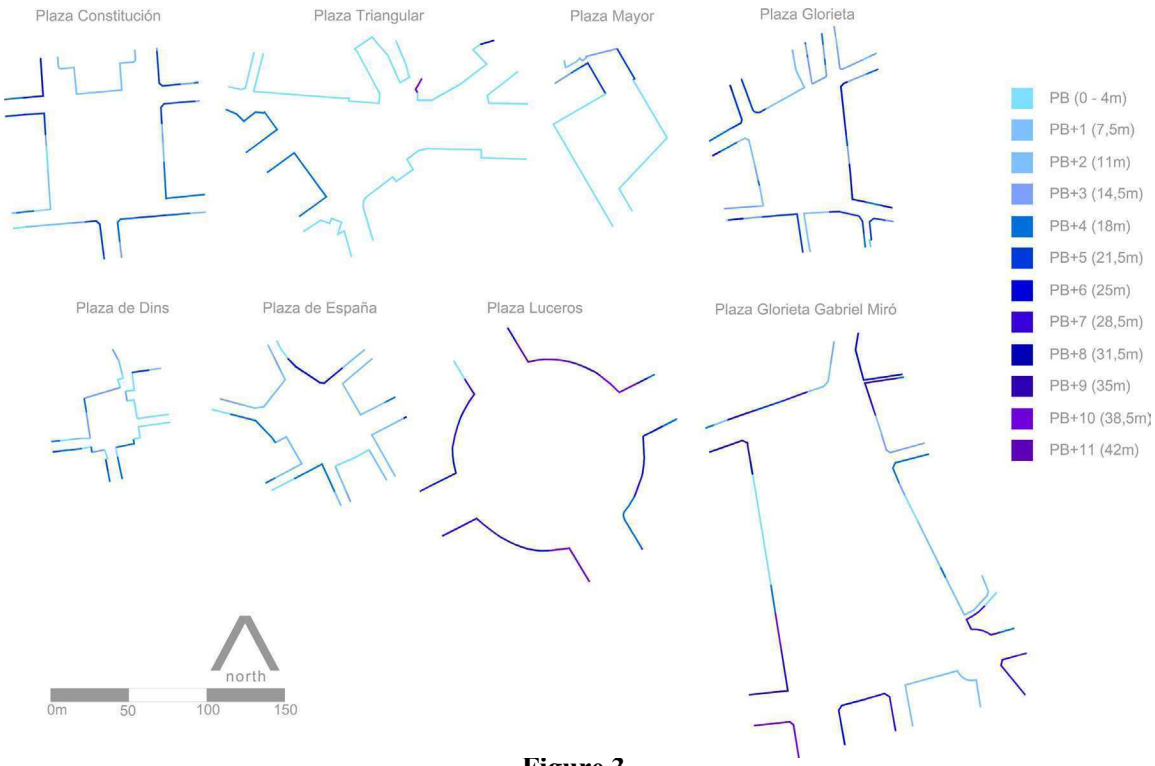

Figure 3.
Plaza's surrounding building heights. Source: Authors.

Benidorm is the most complex of the eight cases studied due to the surrounding buildings' irregular alignment, façade setbacks and varied lot occupation. Second, in the case of Plaza España, in San Vicente del Raspeig, it was decided to include the religious building —San Vicente Ferrer church—in the polygon. The building occupies a great amount of plaza space thereby impeding the visual continuity of the surrounding open space. Thus, the portion of Plaza España next to the rear façade of the church is perceived as disconnected from the rest of the space. However, the final polygon shape of the plaza includes the public spaces surrounding the church in order to consider the morphology and the social character of the plaza space. Firstly, regarding the morphology, unlike Plaza Triangular, most buildings facing Plaza España have a regular morphology and a continuous façade alignment which conveys a sense of enclosure. Secondly, regarding the social character of the space, namely building openings—windows, store fronts and entrances to residential and commercial uses on main floors— are an important part of the Plaza's social life and offer resident self-surveillance opportunities. Furthermore, the plaza space, contiguous to the church's front and side access, is mostly pedestrian and provides opportunities for sitting, leaning and staying —urban elements such as benches, building ledges, bicycle racks, etc.—; all of which promotes people presence and socialization in the space.

Dimension and proportion of the space

With respect to the size of the plazas —Table 3—, the Glorieta Gabirel Miró in Orihuela is the largest plaza studied. It exceeds Plaza Luceros— the second largest plaza— by 10,000 square meters. In contrast, the smallest plazas are plaza de Dins in Alcoy and plaza de España in San Vicente del Raspeig measuring 1300 square meters and 2200 square meters respectively. The rest of the plazas analysed measure around 3500 and 7500 square meters. These figures support Gehl's theoretical claim in relation to the dimensions of European plazas for two reasons. Firstly, six out of the eight plazas analysed do not exceed 10000 square meters; and, secondly, the typical size of European plazas ranges from 6000 to 8000 square meters (Gehl, 2010: 38).

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As for the calculation of the horizontal dimensions of the space, plaza Luceros, plaza Glorieta Gabriel Miró y plaza Triangular exceed Gehl's 100-meter reference point on their longer side. In contrast, the smallest plaza —plaza de Dins in Alcoy—, is 35 meters long at the plaza's longest side. The rest of plazas —Glorieta, Constitución, España and Mayor— have dimensions ranging from 60 to 80 meters at their longest side.

Hence, the width ratio of the polygons considering the lengths of the perpendicular lines —horizontal dimension— for the plazas in Alicante, Elche, Torrevieja, Alcoy, San Vicente and Elda are approximately 1:1; and, Orihuela and Benidorm are exceptions with a ratio of 1:2 and 1:3, respectively —Table 3—.

With regards to the building heights, Table 2 shows that Plaza Mayor in Elda, Plaza Triangular in Benidorm, Plaza España in San Vicente del Raspeig and Plaza de Dins in Alcoy have an average height ranging 6 to 12 m.; Plaza Glorieta in Elche and Plaza Constitución in Torrevieja have a height ranging 15 to 20 m. and Plaza Glorieta Gabriel Miró in Orihuela and Plaza Luceros in Alicante possess the highest average building height with 20.6 m and 28.8 m respectively.

With respect to the spatial proportion of the plazas —Table 2—, three cases should be highlighted considering the minimum ratio. Plaza Triangular in Benidorm, Plaza Constitución in Torrevieja and Plaza Glorieta Gabriel Miró in Orihuela, with a minimum height ratio value of 1:17, 1:19 and 1:24 respectively, characerized by the presence of some quite low buildings in relation to the horizontal plane of the plaza. Whereas, the maximum height ratio of most of the plazas does not surpass the 1:3 value. The average height ratio of Plaza Triangular in Benidorm is worth highlighting. The 1:12 value responds to the fact that the vertical plane of the plaza is small in relation to the horizontal plane.

b2. Functional attributes

In terms of the quantity and diversity of building uses and economic activities, there are two casuistries: Four plazas —Plaza Glorieta in Elche, Plaza Triangular in Benidorm, Plaza Luceros in Alicante and Plaza Mayor in Elda— have a good quantity and diversity of main floor building uses. By comparison, plaza Constitución in Torrevieja, Plaza Glorieta Gabirel Miró in Orihuela, Plaza de Dins in Alcoy and Plaza España in San Vicente del Raspeig, are the four plazas with fewer economic activities on the building's ground floor, predominantly occupied by restaurants and bars.

In all cases, the uses of the buildings surrounding the plazas have an impact at city scale mainly due to one or both of the following scenarios —as shown in Table 4—: a) the plazas possess commercial and restaurant services attractive at a city scale level—, like Mc Donald's restaurant in Plaza Triangular in Benidorm; b) they are landmarks —religious, administrative, cultural, or heritage, etc. Moreover, franchise-style retail stores were found in the plazas Glorieta in Elche, Luceros in Alicante and franchise-style restaurants were found in the plazas Triangular in Benidorm, and Luceros in Alicante.

Five of the eight plazas studied possess landmark buildings; also, Plaza Glorieta in Elche, Plaza Constitución in Torrevieja, Plaza Triangular in Benidorm, Plaza Luceros and Plaza Glorieta Gabriel Miró have both monuments and ornamental structures and greenery. Plaza de España in San Vicente del Raspeig has trees and planters and Plaza de Dins in Alcoy and Plaza Mayor in Elda have a scarce amount of greenery.

Discussion and conclusion

The results derived from the analysis of the most socially relevant plazas in the Province of Alicante open a twofold discussion around not only the complexity of delimiting the urban space but also the insights derived from the morphological and functional study.

As for the spatial definition of each plaza, the adopted criterion has evidenced the difficulties involved in delimiting such urban space due to the morphological diversity of the surrounding buildings: the form in plan view; the area of the portico and covered walkways; the characteristics of the facade edges; the height of surrounding buildings; and the existence of isolated buildings.

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The perception of an urban space is not the same when the spatial boundaries are clearly defined by continuous building façades alignment or isolated buildings. Examples of these two different perceptual situations are the cases of Alcoi and Benidorm. While in plaza de Dins —Alcoy– a row of façades defines the vertical plane of the square, in plaza Triangular –Benidorm– open spaces, greenery and isolated building blocks give the impression of an unenclosed space.

In terms of morphological insights, it is also worthwhile noting that the plazas analysed in this case study do not follow the model —100x70m— of typical European historic cities observed by Gehl (2010, p. 38). The study of the urban dimensions of the selected plazas allowed an identification of the relationship between the horizontal plane and the vertical plane. In some cases, although the ratios were similar, for example, in the case of the Plaza Glorieta Gabriel Miró —Orihuela— and the Plaza Mayor —Elda—, the perception of both urban spaces is very different. Glorieta Gabriel Miró, the largest plaza, surrounded by a continuous row of façades, is perceived as an unenclosed space because the delimiting vertical plane is not high enough and is hidden behind the greenery. Plaza Mayor is perceived as an enclosed space, with an unobstructed view of the vertical plane that delimits the plaza. Altogether, the most socially relevant plazas of the province of Alicante possess a variety of morphological attributes, not necessarily complying to theoretical standards.

The findings related to functional issues indicate that the quantity and diversity of economic and leisure activities are two of the most important factors that influence social activity in urban public spaces. Moreover, if economic and leisure activities are diverse and available continuously, social interaction at different times of the day is encouraged. The cases of plaza Triangular—Benidorm— and plaza Glorieta Gabriel Miró —Orihuela— are two examples worth noting. They both have offices —with early opening hours—, shops —with morning and evening opening hours—; restaurants and bars —with activity until dawn—; and a casino —with extensive opening hours from 10am to 5am—.

Ultimately, the functional analysis showed that the plaza's edge, as an independent entity, plays a fundamental role in the social activities that take place in the plaza and, therefore, may alter the perception of a space. The plaza's permeability, transparency and visual content are decisive elements for the social life of a public space. Specifically, restaurant and bar terraces in the plazas of the province of Alicante are an activity booster.

Finally, this research has demonstrated that the eight most socially relevant plazas of the province of Alicante share more functional than morphological aspects. The connection between the plaza's social relevance and its location, accessibility (Martí et al., 2017) and sense of enclosure (Sitte et al., 2000) have been well documented in the scientific literature. However, this research has established that the social relevance of a plaza is also determined— at least in so far as the cases studied— by the presence of landmark buildings and/or city-scale impact establishments.

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Appendix

Table 1. Selection of relevant historic cities in the province of Alicante and identification of preferred public spaces (Martí et al., 2017).

Historic Cities of the Province of Alicante	**Most socially relevant plaza according to Foursquare's cumulative number of visitors (up to 2 Feb 2016)**	**Location in relation to the historic city centre as defined by the bibliographic references**
Alicante	Plaza Luceros	-
Elche	Plaza Glorieta	within
San Vicente del Raspeig	Plaza de España	within
Benidorm	Plaza Triangular	In close proximity
Alcoy	Plaza de Dins	within
Torrevieja	Plaza de la Constitución	within
Elda	Plaza Mayor	In close proximity
Orihuela	Plaza Glorieta Gabriel Miró	In close proximity

Table 2. Average building heights and space's height ratios considering the vertical and horizontal planes.

	Average height of the plazas (m) —vertical plane—	**Maximum ratio**	**Minimum ratio**	**Average ratio**
Plaza Glorieta, Elche	17.4	1:3	1:7	1:4
Plaza de Dins, Alcoy	11.8	1:2	1:7	1:3
Plaza España, San Vicente del Raspeig	10.3	1:2	1:5	1:5
Plaza Constitución, Torrevieja	15.3	1:3	1:24	1:7
Plaza Triangular, Benidorm	6.9	1:2	1:17	1:12
Plaza Mayor, Elda	8.3	1:1	1:4	1:7
Plaza Luceros, Alicante	28.8	1:3	1:7	1:4
Plaza Glorieta Gabriel Miró, Orihuela	20.6	1:3	1:24	1:7

Table 3. Total area of plazas and width ratio of the polygons.

	Total area of the plazas (m2)	**Width ratio of the polygons —horizontal plane—**
Plaza Glorieta, Elche	4.644	1:1
Plaza de Dins, Alcoy	1.359	1:1
Plaza España, San Vicente del Raspeig	2.250	1:1
Plaza Constitución, Torrevieja	6.139	1:1
Plaza Triangular, Benidorm	7.591	1:3
Plaza Mayor, Elda	3.853	1:1
Plaza Luceros, Alicante	11.543	1:1
Plaza Glorieta Gabriel Miró, Orihuela	20.382	1:2

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Table 4. Functional characteristics of the plazas.

	SURROUNDING BUILDINGS		ELEMENTS OF THE PLAZA	
	Landmark buildings (religious, administrative heritage buildings)	**Commercial uses and restaurant services (L= local or C=city scale)**	**Greenery**	**Monuments and ornamental structures**
Plaza Glorieta, Elche	Heritage	L, C	Trees, flowerbeds	Ornamental fountain, Sculptural element
Plaza de Dins, Alcoy	Heritage, administrative	L	Planters	Local art and craft display
Plaza España, San Vicente del Raspeig	Administrative, religious	L	Trees, planters	Ornamental fountain
Plaza Constitución, Torrevieja	Administrative, religious	L	Trees, flowerbeds	Ornamental fountain
Plaza Triangular, Benidorm	-	L, C	Trees, flowerbeds	Sculptural elements
Plaza Mayor, Elda	-	L	Planters	Ornamental fountain
Plaza Luceros, Alicante	-	L, C	Trees, flowerbeds	Ornamental fountain
Plaza Glorieta Gabriel Miró, Orihuela	Religious	L	Trees, flowerbeds	Ornamental fountains and Ornamental gazebo

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Urban form in the tourist cities of the coast of the Canary Islands. The morphologies of the leisure activities

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Abstract. *The tourist city has been a space with few reflections from the urbanistic discipline. Not in vain, the developed planning, at best, has been uncritically exported from the residential city. However, these cities generate almost 12% of Spanish GDP. The vast majority of Spanish coasts, especially on the Mediterranean coast and in the archipelagos, are occupied by large extensions of leisure towns, many of them born of the first boom of Spanish tourism in the 60s. The predominant mass tourism model on our coast also generates a mass city whose morphology does not follow the common and more consolidated patterns of the residential city. In this work, we propose the analysis of two micro destinations in the Canary Islands (Puerto de la Cruz Tourist and Adeje Tourist / Las Américas-Los Cristianos), characterized by its great contrasts, and will focus our identification on the morphological evolution of a minimal piece of tourism: the hotel.*

Keywords: Tourism, hotel, standards, Canary Islands

Introduction

It is paradoxical to admit that, being Spain for several decades, one of the world leaders in the tourist industry, with all that it entails: services, transport, locations, resources ..., its architecture and urbanism, that has given the urban form to these leisure spaces, have not been a special object of study or specialization in our schools (Pié, 2015). Far from it, it is often recognized, that leadership in this type of activities is not accompanied by studies or research lines that allow learning from the mistakes and propose new solutions to this complex activity. With the exception of some cases, the shadow of the "shameful architecture" (Pié, 2002) and by extension of "foreing urbanism" have predominated in the disciplinary landscape leaving a bulky linear void on the seafront.

Fortunately, in recent years there seems to be a renewed reflection on these areas in which, either because of the exaggerated occupation of the coastal strip, by the deterioration of the landscape or directly by the interest in the renovation of "tourist cities", there is a greater interest from the urbanistic discipline to understand and to know how they have been constructed the emporiums of the leisure.

This lecture is part of a wider research framed within the R + D + i Project entitled "Geographic Information Technologies applied to the analysis and design of innovative proposals for the renovation of tourist accommodation", funded by the CajaCanarias Foundation. It is also part of the project entitled "Crisis and Restructuring of tourist areas on the Spanish Coast" (CSO2015-64468-P) of the Ministry of Economy and Competitiveness (MINECO). Within these projects, a line of research developed deals with the analysis and description of the urban form of tourism

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especially in the Canary Islands. One of the results of the research tries to obtain the "Atlas of the Canary Islands Tourist Renewal", a graphic tool that allows us to know spatially the distribution of forms of tourism in the coast of the islands and at the same time their potential for renewal. Having an inventory and assessment of the physical construction of tourism has been a goal several times claimed (Mesalles, F., & Tous, J. 2003; Pié, 2015; Temes & Tuset, 2015). Specifically, in the case of tourism, the statistical and cartographic study has the same difficulties as any territorial project, but it is aggravated by the inherent disadvantages of this type of activity -imprecision in the definition of the tourist, difficulty and reliability of records and surveys or the impossibility of comparing information- (Pié, 2015).

To do this, it is essential to know the urban form of the destinations, to understand their typologies and morphologies and how they respond in a singular way to the tourist activity. Hence the work with "minimal pieces of tourism" as "management units and construction of the tourist territory and the structures that allow to adjuste them in a proper spatial planning to this form of land occupation, analyzing social, technical, cultural and economic factors that have conditioned it." (Barba, 1996). In this paper we will offer some partial results of this analysis by establishing a comparison between two micro destinations of special relevance in the Canary Islands: The micro destination of southern part of Tenerife formed by "Adeje Turístico"[1] [2] and "Las Américas-Los Cristianos" and the micro destination of the north of Tenerife "Puerto de la Cruz Turístico" .

Methodology

Considerations about the urban form and the particular perspective offered by the morphological-based studies, have had in Spain an interesting tradition with influences mainly from the Italian, Anglo-Saxon and French culture (Whitehand, 2001; Pinho & Oliveira, 2009). This initial influence gave way in the 70s to its own methodology of analysis "morpho-typological" mainly driven from the Department of Urbanism of the Universitat Politècnica de Catalunya (UPC) and then extended to many other research centers. In "Forms of urban growth" (Solá Morales,1993), the name used by this methodology, urban fabrics are classified according to the construction process, the relations that are established between the design of the ground, the urbanization of the land and the construction of the buildings. Depending on the order and the characteristics of each one of them, the result is different. This methodology is very useful not only to recognize the characteristics of the urban conglomerate and delimit its parts, but also to project the urban space, because you can use the same parameters for the analysis and the architectural project of the place. However, they are not useful for the analysis of the areas with tourist developments (Pié, 2015). In this case, the tourist space can be qualified according to the taxonomy of the "minimum pieces of tourism" already mentioned in the introduction of this work. If in "forms of urban growth" what matters is the morphological rule with which an urban fabric develops, in the "minimal pieces of tourism", it is their level of autonomy, a basic question in "tourist artifacts", especially in its first implantations.

Although the original method of analysis defines at least four types of "minimal pieces": accommodation, equipment, infrastructure or services and the large equipment, in this analysis we only go to focus on accommodation parts and, specifically, on the hotels, leaving the rest for a further development of the work. In addition, as an analysis tool that has proven to be very useful in the morphologist's line, we use a Geographic Information System (GIS) that allows us to understand and to explain the construction of the tourist areas through its various growth strategies.

The Areas of study: Puerto de la Cruz Turístico and Adeje Turístico/Las Americas-Los Cristianos

In the analysis of the morphology of the tourism, we have wanted it to focus in this lecture, in the case of the island of Tenerife. The reason has been to contrast two very different microdestinos and very distant from each

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other. The case of Puerto de la Cruz, a tourist settlement in the north of the island, pioneer in the Canary Islands and characterized for being a model that has coexisted with a traditional urban settlement, and the case of Adeje Turístico /Las Americas-Los Cristianos, settlement in the south of Tenerife, representative of the mass tourism model in which it is possible to distinguish virtually all stages of the tourist boom and the growth of the settlements in the Canary Islands (Simancas, 2015).

The micro destination "Puerto de la Cruz Turístico" has as a great attribute to unite in one place a landscape of great urban density next to a natural landscape of an amazing energy. In a space of less than ten square kilometers the visitor finds many urban experiences. In the same center of the city we find the area of Martianez, with buildings of more than 15 floors, which give the city a vocation of great metropolis, and allow the visitant to enjoy the proximity of services guaranteed by the concentration of activities. At the same time, from a large number of streets, you can glimpse, looking toward the interior of the island, the image of the peak of Teide. Its imposing image is framed by the Valley of La Orotava. A few minutes walk from anywhere, you get to see the sea, the Atlantic Ocean which bathes the volcanic coasts of the city with a wave beat always attractive for the walker, which has its maximum expression in the encounter between "Paseo de San Telmo", "Penitente" and "Punta del viento" the tip. But Puerto de la Cruz is also a charming place, full of small but lush tropical gardens, such as the famous Botanical Garden or the gardens of the Sitio Litre. Puerto de la Cruz is the dean of the tourism on the Canary Islands and currently has a 5.78% of the establishments and apartments open with 83 facilities and a 5.33 % of the number of places available with a total of 21,428 places. (Table 1)

The nucleus formed by Adeje Turístico and Las Américas-Los Cristianos, is the most important tourist city of the southwest of the Island of Tenerife and one of the main tourist destinations of the Canary archipelago. The territorial scope presents, by its size and development, a diverse and complex internal structure, configuring itself as the sum of areas with differentiated urban characteristics from a morphological and functional point of view, better or worse articulated among themselves. Unlike Puerto del Cruz, it is not part of a consolidated urban nucleus, but rather a "virgin" territory in which partial plannings were developed, resulting in one of the densest and largest tourist settlement in the Archipelago. In this case we speak of a concentration of more than 200 tourist facilities that represent 22% of the tourist accommodation in the Canary Islands.

The definition of standards for the construction of the tourist ground

Article 5.2(c) of the Law 7/1995, of 6 April, of the Canary Islands Tourism Planning, establishes the competence of the Public Administration of the Autonomous Community of the Canary Islands, the planning and management of tourism at the regional level, including the management of the offer, as well as the planning and programming on tourism infrastructure of regional interest. In the case of the Canary Islands, there are legislative references in the Decrees 149/1986, of 9 October, the management of hotel establishments, and 23/1989, of 15 February, on the management of tourist apartments, related to the establishment of tourist standards. However, it is not until the promulgation of the Law 7/1995, of 6 April, of the Canary Islands Tourism Planning, which begins to articulate a model of tourism development, which is concretized with the approval of the Management Guidelines of the Tourism (Law 19/2003, of 14 April), and, specially, of the Decree 10/2001, of 22 January, when the regulation of tourist standards occurs: whereas in Article 35 of the first rule stablishes minimum standards relating to the tourist development, the second sets a series of minimal physical parameters of the different structural elements of the tourist accommodation (size of the rooms, percentage of green areas and sports activities, etc.). In this way, Decree 10/2001 solves a question widely demanded by all sectors involved in the tourist activity, which considered it necessary to establish general weighting criteria to determine the minimum density standard, its application to subdivisions

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Table 1. List of places and establishments in micro-destinations

	Open establishments	*% in relation to Canary*	*Places available*	*% in relation to Canary*
LANZAROTE	262	18,25%	72.026	17,91%
FUERTEVENTURA	162	11,28%	62.432	15,52%
GRAN CANARIA	589	41,02%	130.834	32,53%
TENERIFE	423	29,46%	136.900	34,04%
ADEJE	92	6,41%	43.548	10,83%
▪ Callao Salvaje	8		2.536	
▪ Playa Paraiso	6		3.854	
▪ Playa de El Duque	22		11.778	
▪ Costa Adeje	40		20.209	
▪ Torviscas – Fañabé Alto	16		5.171	
LAS AMERICAS – LOS CRISTIANOS	110	7,66%	44.876	11,16%
▪ Las Américas – Adeje	12		5.338	
▪ Las Américas - Arona	56		27.652	
▪ Los Cristianos	42		11.886	
ABONA	41		7.673	
ISORA	25		8.387	
PUERTO DE LA CRUZ TURÍSTICO	83	5,78%	21.428	5,33%
▪ Playa jardín – Maritim	15		4.635	
▪ Conjunto Histórico	30		3.364	
▪ Taoro – La Paz	29		9.648	
▪ Martiánez	9		3.781	
OTHER MUNICIPALITIES OF TENERIFE	72		10.988	
	1.436		**402.192**	

of plots, as well as the establishment of the minimum parameters of infrastructure and necessary services applicable to the totality of the tourist ground. To be more specific, art. 2 of that Decree establishes:

1. The standard density of tourist use, determines the minimum net plot area required for the construction of each tourist accommodation.

2. The standarscomplementary equipment determine the minimum reserves of equipment with which the tourist establishments of accommodation have to count.

3. The standards of infrastructure and services determine the minimum infrastructure that the new tourist developments have to offer.

In this study, we will focus on offering some results on one of the most important minimum parts of tourism: the hotels. We will discuss how over the past 60 years have evolved the morphologies and how the implementation of the standards has a decisive influence on the change of model from one period to another.

Minimum pieces of accommodation of tourism in the Canary Islands.

Using as representative areas of these morphology, the north and the south of Tenerife, which account almost 30% of the canarian tourism we can distinguish between hotel and extra-hotel supply. Inside of this classification, we can find according to the Bylaw of procedure of the tourist accommodation activity (Table 2) different minimum pieces of tourism in terms

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of their characteristics, the form of grouping, service and representativeness. From this relation, the predominant tourist settlement models in the Canary Islands are the hotels and the apartments. In the case of Tenerife hotel offering is greater than that offered in modality of apartments. Over the past 40 years, these models have been changing and we can find differentiated patterns in the north and south of the island. Let's move on to identify them.

Table 2. Category and typology of hotel and extra hotel settlements

Categorys	Typologies
Hotels	Hotel
	Urban Hotel
	Milestone Hotel
	Rural Hotel
Extra-hotels	Apartment
	Villa
	Milestone House
	Rural House

Panoramico or vertical hotel and the terraced hotel (between party walls)(1950-1980)

This model of hotel, whose chronology can be placed between the 50s and 70s, is the first model to respond in the Canary Islands to the mass tourism. From the point of view of their organization, in a general way, we talk about hotels formed usually by 2 clearly differentiated pieces. On the one hand, the ground floor or base where common services and collective facilities predominate. On the other hand, the body of rooms distributed in height, in one or two prisms representing the architecture of the modern movement. In the case of Puerto de la Cruz, within this general pattern we can describe two cases. On the one hand, the terraced hotels, inserted in the urban center of the original downtown area of El Puerto and on the other hand the vertical hotels. The hotels between party walls usually lack of green areas and promenade, and has its swimming pools on the upper floors. The average area of their plots, that is around 600 m2, does not allow many more facilities, using the city as a whole as compplementary equipment.

On the other hand, the first hotels in height, have a more generous plots, around 1.5 hectares and have free spaces, green areas, solarium and swimming pools. Regarding the proportion of this type of use, around 15% of the surface, increases up to 40% in the case of luxury hotels (Botánico, 1973 or Tigaiga, 1959). The layout of the buildings on the plot, usually adopt in the case of El Puerto an eccentric position and the buildings often have a prismatic geometry, very characteristic of the period. In addition, because of the topography in slope of El Puerto, the Panoramic hotel is not defined as a hotel in front of the sea, a very common condition at this time in the Mediterranean tourist, but it is a hotel with panoramic views of the sea and other resources that offer scenic views of the area. The orientation of the Puerto de la Cruz places the recreation areas and solarium at the rear of the plots with south orientation, placing the accommodation fronts normally parallel to the coastline. If this, it is linked to the important vertical component characteristic of El Puerto, with hotels up to 15 floors being for several decades the highest buildings on the island, we can see how these topographic conditions will be reflected in the morphological organization of the architecture.

In the case of the south of Tenerife, within this same modality, we can observe different behaviors. On the one hand, there will be no models between party walls, since the tourist areas are areas of new colonization. With regard to vertical or panoramic hotels, the practically flat topography of the area and the reduction of resources, focused especially on the sea and its beaches, give rise to a model of hotels with a wide perimeter development, either with parallel layout to the coastline as the Tenerife-Sol (1975) or Gran Tinerfe (1973) or with the balconies and terraces of the rooms oriented towards this direction, adapting to the conditions of their plots. A good example of these latter cases would be the Aparta-Hotel Club Bonanza (1971) or the Hotel-Apartment Ponderosa (1973). Unlike in Puerto de la Cruz, the existence of larger average plots (around 2 hectares) and the proportion of soils destined for services, swimming pools and green areas,

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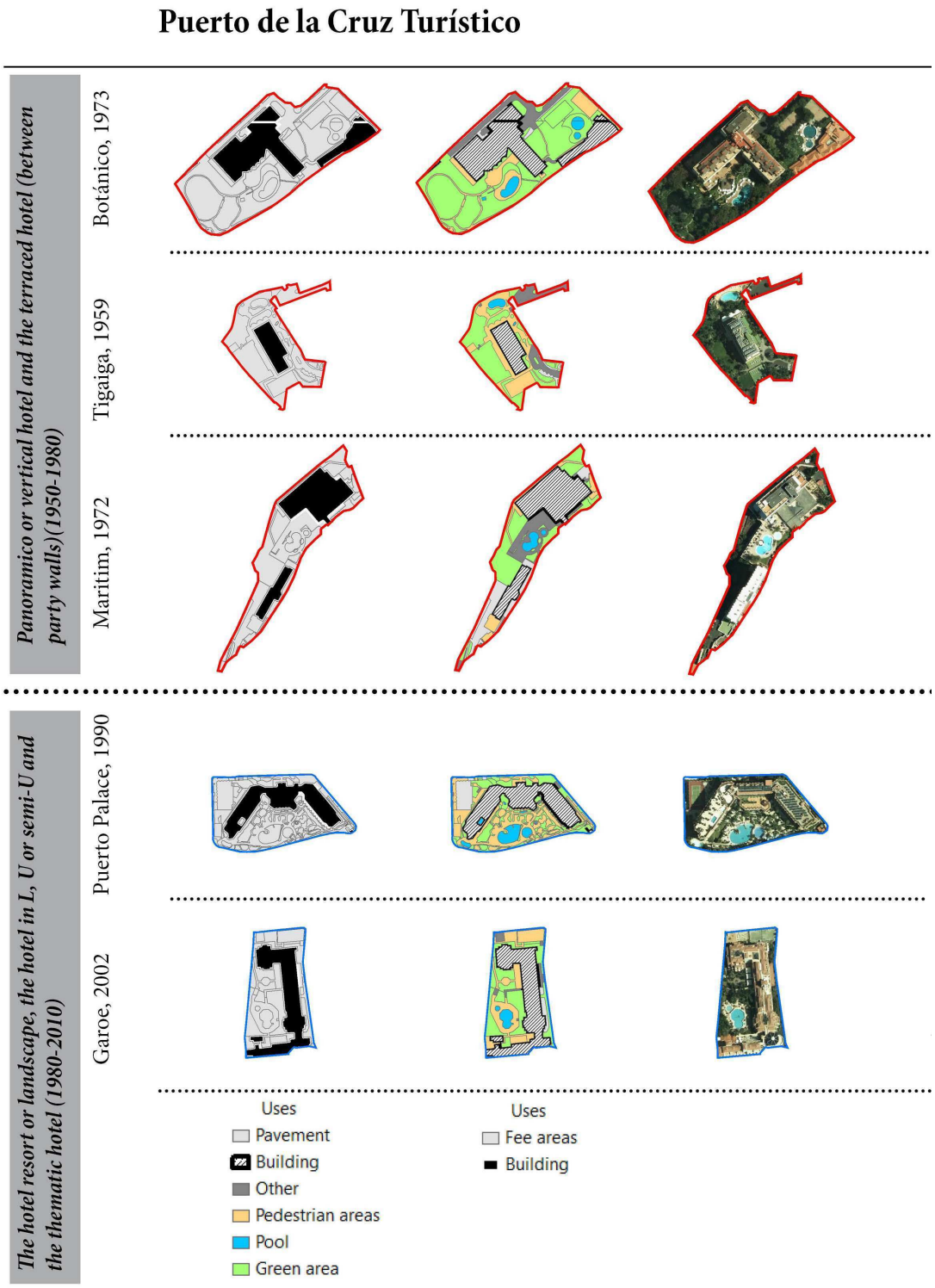

Figure 1.
Puerto de la Cruz turístico. Morphological evolution of the hotels of mass tourism

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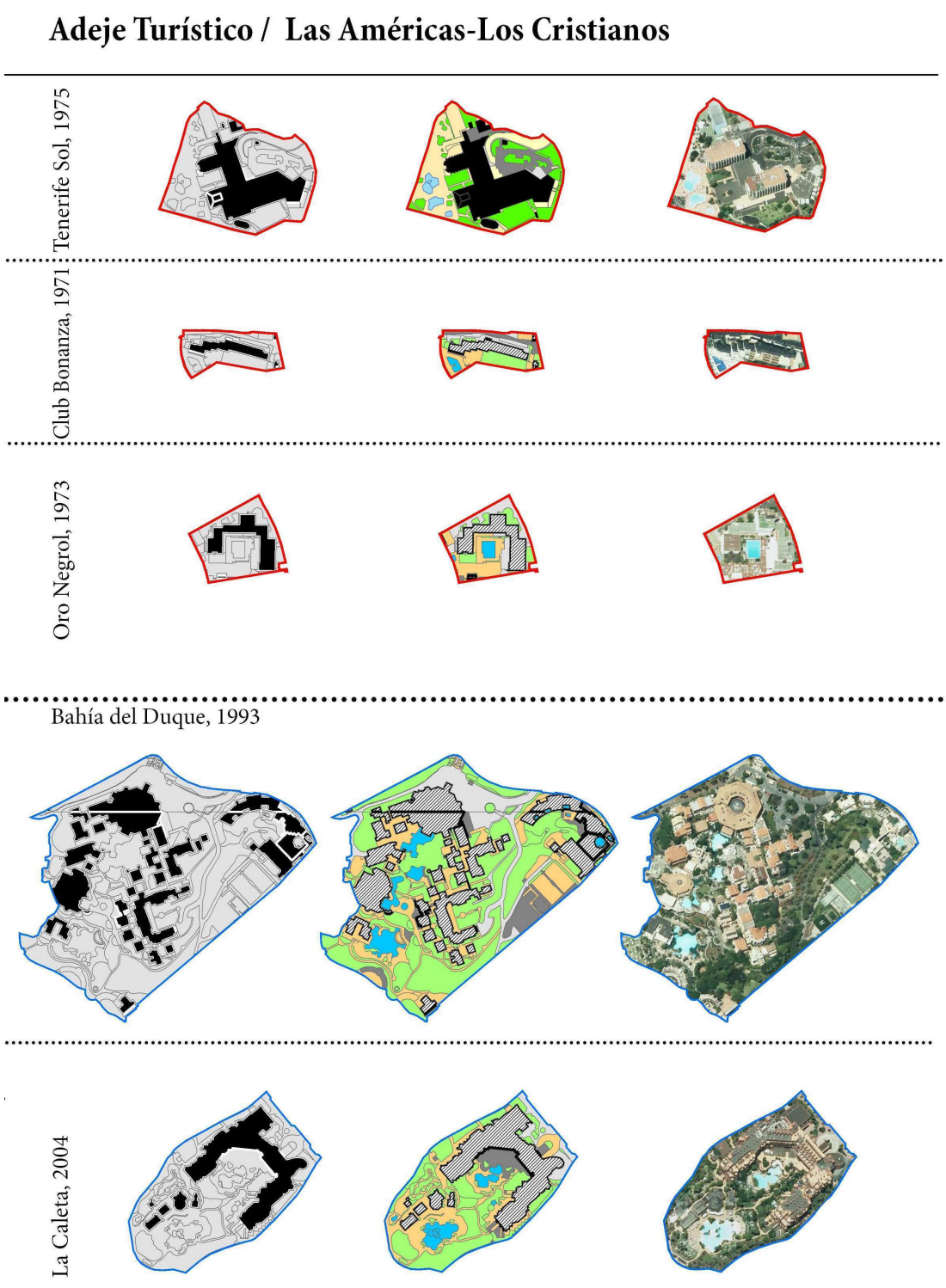

Figure 2.
Adeje turístico/Las Américas-Los Cristianos. Morphological evolution of the hotels of mass tourism

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which are also more generous too, have made these models coexist with U-shaped or semi-U arrangements, which envelop the new spaces of private equipment always with south or south-west orientations. This situation is given in both hotels, in first line of sea as the Hotel Las Palmeras (1973), that combine the position of their equipment to extend them with the landscape itself, or in other hotels located in positions away from the beaches, such as the case of the Hotel Oro Negro (1973), in which a landscape is recreated from the spaces of leisure and service of its own.

The hotel resort or landscape, the hotel in L, U or semi-U and the thematic hotel (1980-2010)

In this second group, the construction of hotels is going to be characterized by the size of its implementation, the volume built, by its relative position and, in the case of the south of Tenerife, since the 90s, by their thematization.

In the case of Puerto de la Cruz, the implementation in this second stage, will be conditioned by the existence of a quite consolidated nucleus with a coast line practically closed in the previous period. The hotels between party walls are practically testimonial during this period (Chimisay, 1980) or they are the first reforms of existing hotels previously (Astoria, 1993). The most frequent implantations will occur, as can be seen in the graph, inside the tourist destination, in plots slightly larger than those seen in the previous period, reaching a mean of 1.2 ha. In relation to the height of the volumes we must say that we are now with buildings with an average of 5 floors, well below the previous hotel provision and occupations in the floor not greater than 40% of the plots (Puerto Palace, 1990 or Garoé, 2002). This change will be much more appreciable in the South of Tenerife, where many more units will be built.

In the south of Tenerife we can distinguish 3 modalities of hotels within this range. In the first decade of analysis, between 1980-1990, we find the hotel in L-U and semi U. In the mid 90s, a new themed hotel model was introduced with the Gran Hotel Bahía del Duque (1993). From the late 90's until today, we find the horizontal hotel-resort itself, which is a direct consequence of the implementation of the standards of the Decree 2001.

Hotels with closed or semi-closed layout, already initiated in the previous period, now have their consolidation acquiring provisions in L, U or semi U. Unlike its predecessors, the plots are now somewhat higher (above the 1.3 hectares) and slightly lower heights, started to set up the horizontal or resort model to be introduced at the end of the period. Hotels representative of this morphology could be the Best Tenerife (1985), La Siesta (1986) or the Mediterraneum Palace (1987).

In the decade of the 90, the previous model coexists with a new product. The inauguration in 1993 of the Gran Hotel Baháa del Duque starts a new formula then followed by other hotels like Resort Mare Nostrum (1997) or the Costa Adeje Palace (1999) aimed to open up a new market based on specialization and in the provision of extensive facilities. Normally the architecture of these "themed" hotels are a revival or a recreation, with licenses, of models or traditional or exotic motifs using architecture as thematic claim. This stage will have an important influence on the morphological configuration of the hotels in the Canary Islands. The Decree 4/2001, will take as reference these initial plans and will dissect their forms and proportions to establish them as a rule of mandatory compliance. As Simancas (2010) points out, the application of the tourism regulations established in Decree 10/2001 will have a virtually exclusive effect on hotel accommodation, coinciding with the so-called "tourist moratorium", that began with the Decree 4/2001, which agreed to the formulation of the guidelines of General Management and Tourism. The territorial implementation of the Decree 10/2001 generates a positive relationship between category, accommodations and physical dimensions of the establishment, giving rise to the construction of large hotels, similar to the "Caribbean resort". These are what we have termed as "horizontal hotels", have an irregular volume, occupy an block of buidings, a small height (no more than five floors), as well as a greater physical surface built - to increase the size of the accomodations units and the common spaces - and a high proportion (around 33%)

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of the part of the unbuilt plot that is destined to green areas, swimming pools, solarium and sports and leisure facilities of common use of the clients. This implies a change in the morphology of the tourist accommodation plant, as well as in the distribution of the uses in which each plot is destined. Good examples of these models that are compatible with the horizontal layout are the hotels "Sheraton La Caleta Resort SPA" (2004) or the hotel "La Plantación del Sur (2005).

Conclusion

In this partial result of the research, we have shown the morphological evolution of the hotels of mass tourism in the Canary Islands in the past 50 years. The changes in the facilities have been different types being able to concretize them as a conclusion in four (Fig.1 and 2):

•Disposition. By the way of organizing the building on the plot, we have been able to distinguish, in the first decades, terraced, with few services and small plots; hotels in prismatic disposition, representatives of modern architecture in which the base was extended to give rise to collective services; L, U or semi U-shaped hotels in which the building tries to define its own landscape taking advantage of the largest extension of the plot and the provision of central free space for green areas, solariums and swimming pools; landscape hotel in which the height of the volumes is reduced to be distributed in several bodies staggered on larger plots

•Height. The first implementations in the decade of the 60 and 70 will be characterized by the use of modern architecture in which the height and slenderness of the volumes are displays of modernity and quality of its facilities. For several decades the tallest buildings in Tenerife were concentrated in the north of the island. This height in recent patterns has been considerably reduced generating staggered models, in which the impact of the architecture is more integrated in the coastal landscape of the Canary Islands.

•Occupation on the ground. The occupation of the ground floor for uses of complementary services to the hotels has had a pattern of remarkable growth. In the north of the island, the first models utilized the services of the city itself as a necessary complement, gradually to have larger plots with private services specific to each recent. In spite of this progressive rotation toward more closed system or "gate hotels", the urban life of Puerto de la Cruz is maintained with a certain dynamism taking advantage of the walks and pedestrian streets of the destination. However, in the south, the absence from the beginning of this "custom", was the design of a much more closed model. In the last years it has been intended to make compatible with an offering of quality public space and commerce not tied to the hotels.

•Style. Will be in Puerto de la Cruz, pioneer of the tourism on the Canary Islands, where we will find in the decade of the 60 and 70 the first hotels that are consistent with the architecture moment. The international style characterized by laminar blocks in height, free low floors or the use of sockets that contrasted the verticality, were the identity of this time. Later the hotel has been ignoring the more contemporary language of architecture and taking more or less exotic revival and pseudo romantic tributes or interpretations of the vernacular architecture of dubious taste. While in the first decades we could consider hotel architecture situated in the vanguard of the architecture in capital letters, today we cannot say the same.

Notes

1 The concept of micro-destination is defined as a small geographical unit that is highly dependent on tourism. It is composed of a wide range of tourist facilities and has an image and a typology of tourist (tourist products) differentiated. In addition, a micro-destination is a single unit very useful for decision-making in tourism management and planning. For a more operational definition, a micro-destination is a spatial unit of statistical analysis characterized by a high density of establishments of industries characteristic of tourism, homogeneous tourist statistical information, and spatial continuity.

2 Adeje Tourist is formed by: Callao Salvaje, Playa Paraiso, Playa El Duque, Costa Adeje, Torviscas - Fañabe Alto; and Las Americas

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– Los Cristianos: Las Americas - Adeje, Las Americas - Arona, Los Cristianos

Puerto de la Cruz is formed by: Playa Jardin - Maritim; Old Center; Taoro – La Paz; Martianez

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Case study on emerging trends in geospatial technologies for study of urban form

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Abstract. *GIS has been an effective tool to study urban form. However, as its own field, GIS has evolved in a rapid pace over the past decades. Recent developments in geospatial analytics and visualization technologies offer new tools and applications for the researchers in the field. This paper traces recent major trends in GIS and discusses their implications to the field of urban form research. These trends include the following: 1) increase in dimensions with 3D GIS; 2) integration with LiDAR remote sensing; 3) cloud-based GIS; 4) integration with virtual reality. This paper identifies best practices from two recent projects in the United States. It then discusses a class project and demonstrates the potentials of these new emerging GIS technologies for the study of urban form.*

Keywords: geographic information system (GIS), urban form, 3D GIS, remote sensing, virtual reality.

Introduction

Geographic information system (GIS) has been used to study urban form over the past decades. It is particularly useful to measure quantitative variables of urban form, such as density, clustering, proximity, accessibility, etc (Song and Knaap, 2004; Tsai, 2005). Overall, GIS has been an effective tool for researchers in the field. However, GIS as its own field has continued to evolve in a rapid pace (Goodchild, 2011). Recent developments in the area of geospatial technologies offer new possibilities with new toolsets for spatial analysis, data visualization, and three-dimensional (3D) modeling (Kumar, 2015).

This paper traces recent major trends in GIS and discusses their implications to the field of urban form research. These trends include the following:

1) Integration with remote sensing: remote sensing not only enables 3D visualization with imagery processing but also provides other spatial information to create meaningful analysis results. For instance, LiDAR point cloud data allows extraction of built forms and identification of physical features and land coverages.

2) Increase in dimensions with 3D GIS: conventional 2D maps are being replaced by interactive 3D models generated by procedural rules stored in GIS. Along with locations and associated attributes, vertical elevation and architectural details are also represented.

3) Cloud-based GIS: web-based GIS services allow centralized access to location-based information. Yet through distributed mobile platforms, real-time data collection, sharing, and collaboration are done seamlessly in the cloud.

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4) Integration with virtual reality: virtual reality creates immersive experiences with a perception of being physically present in a virtual world. GIS not only can greatly enhance the accuracy and realism of virtual scenes with digital elevation models and street networks, but also can assist in 3D features generation.

This paper identifies best practices from two recent projects done by two municipalities in the United States. It then discusses a class project conducted by the author and his students, and demonstrates the potentials of these new emerging GIS tools for the study of urban form.

LiDAR

LiDAR (light detection and ranging) is an optical remote sensing technology that uses laser light to densely sample the surface of the earth. It is active remote sensing. This means that LiDAR itself sends a pulse of near infrared light and it waits for the pulse to return. This is different from passive sensors, which collects reflected light from the sun. LiDAR, mainly used in airborne laser mapping applications, can produce highly accurate x-y-z measurements and mass point cloud datasets that can be managed, visualized, analyzed, and shared using GIS software programs, such as Esri's ArcGIS (Esri, 2016).

Post-processed spatially organized LiDAR data is known as point cloud data. The initial point clouds are large collections of 3D elevation points, which include x, y, and z, along with additional attributes such as GPS time stamps. The specific surface features that the laser encounters are classified after the initial LiDAR point cloud is post-processed. Elevations for the ground, buildings, tree canopy, roadway structures, bridges, and anything else that the laser pulse encounters during the survey constitutes point cloud data (GISGeography, 2017).

Recent achievements in LiDAR technologies are changing the pace of our transition to true 3D GIS. Earlier LiDAR systems emit a pulse of laser energy and measure the time it takes for that energy to travel to a target, bounce off the target, and return to the sensor. These systems are called linear-mode because they generally only have a single aperture, and so can only measure distance along a single vector at any point in time. More recent Geiger-Mode and Photon-Counting LiDAR systems are based on focal plane-based LiDAR design. These systems are able to collect data with sampling rate of more than 200 MHz, versus the maximum 800 KHz of the current linear-mode LiDAR, and point cloud density of up to 100 points per square meter. Such LiDAR systems collect data from an altitude up to 30,000 ft above ground resulting in a wider ground coverage. Another important aspect that these newer LiDAR technologies offer, beside the density, is their focal plane design aspect, which results in a raster-style data acquisition and in turn produces an accurate elevation for the intended survey area. Overall, LiDAR has become the inevitable technology to provide accurate 3D data fast and reliably (Abdullah, 2015; Ullrich and Pfennigbauer, 2016).

3D procedural modeling

Spatial information in 3D enables users to view and analyze data in detail and precision that cannot be achieved in 2D. 3D allows real-world views that improve the users' orientation and increase their ability to perform wide variety of tasks related to their spatial workspace. One of the recent software developments in 3D modeling is procedural modeling (Andrews, 2017).

Procedural modeling is an umbrella term for a number of techniques in computer graphics to create 3D models and textures from sets of rules. Procedural modeling focuses primarily on creating a model from a rule set, or enhancing models automatically. Procedural modeling is often applied when it would be too cumbersome to create a 3D model using conventional 3D modeling programs, or when more specialized tools are required. This is often the case for plants, architecture or landscapes (Muller, et al., 2006; Nishida, et al., 2016).

Esri CityEngine is a stand-alone desktop commercial application for the design, planning, and modelling of large-scale urban

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environments in 3D. With the procedural modeling approach, CityEngine facilitates professional users in urban planning and management to quickly generate 3D city models from existing 2D GIS data. Urban designers can conduct conceptual design in 3D based on GIS data and procedural rules. Professionals in the filming and gaming industries can model virtual 3D urban environments for simulation, game development, and entertainment (Ribeiro, et al., 2014).

A single procedural rule can be used to generate many 3D models in CityEngine. With the integration between CityEngine and ArcGIS, a rule set can make use of feature attributes stored in GIS data, such as numbers of floors, floor heights, roof types, or wall textures, to generate different 3D models that represent properties of different features. A 3D model generated in this fashion is basically a 3D object resulting from a 2D shape extrusion according to the rules defined in a rule set, in this case a .cga file. The origin of these 2D shapes can either be imported from ArcGIS or built manually in CityEngine.

CityEngine connects to ArcGIS mainly through data exchange. It now can import and export multiple file formats that are compatible with many other desktop 3D modeling applications, such as AutoCAD or SketchUp. Terrain models can be created from simple image files with georeferencing information (GeoTiff files) or from digital elevation (terrain) models (DEM or DTM). Currently, CityEngine only supports image-based terrains (gray scale height maps). It does not support 3D meshes. CityEngine provides tools to align 3D shapes or features to the terrain (Jin, et al., 2015; Ribeiro, et al., 2014).

Cloud-based GIS: ArcGIS Online

The rise of cloud computing has been one of the most significant advancements in the field of information and communication technology. Everything these days seems to be heading to the cloud. You can store your documents, images, contacts, calendars, presentations, articles, accounts, everything in the cloud. So it just seems logical that GIS is also heading that way. Most of the leading GIS vendors have developed cloud-based GIS solutions, including Esri's ArcGIS Online (Chappell, 2010).

Some of the broad advantages of cloud-based GIS include: 1) data access can be through any Internet connection, anytime, anywhere; 2) For an organization with a range of remote users, cloud-based GIS makes the distribution of GIS data, analysis and systems simple to implement and manage; 3) having a cloud GIS allows data capture in real or near real time to be displayed directly onto a centralized system.

Esri's ArcGIS Online is an online cloud-based, collaborative web GIS that allows users to use, create, and share maps, 3D scenes, applications, layers, analytics, and GIS data. Users have access to many data sources that have already been made available to the subscribers, such as Esri's Living Atlas of the World. Users can also use many templates to create their own maps or apps. They can take advantage of Esri's secure cloud, where users can add items and publish web layers or 3D scenes. ArcGIS Online is an integral part of Esri's ArcGIS system. It extends the capabilities of ArcGIS Desktop and other GIS platforms and tools (Esri, 2017).

ArcGIS Online includes a suite of basemaps that provide reference maps for the entire planet and context for local jurisdictions. These maps are built from the best available data from a community of authoritative data providers and presented in multiple cartographic styles. ArcGIS Online also includes detailed imagery of the world, which reveals both the present state of the planet and change over time. It also includes a comprehensive set of demographic and lifestyle maps of the United States through its online-based systems: Business Analyst and Community Analyst. With these ready-to-use basemaps and data, users can then add their own GIS data and create mashups that serve their own purposes (Esri, 2017).

Virtual reality

Virtual reality (VR) is an environment where the human perception of a simulated environment is as close to the perception of the real world

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as possible. VR creates immersive experiences with a perception of being physically present in a non-physical world. To experience VR, users hold a screen mounted to a headset, which is typically powered by a gaming console, a mobile phone, or a computer to their eyes. Then through specialized software and sensors, users are immersed in an artificial world where they interact and reach out to the various objects (Manly, 2015; Parisi, 2015; Rubin, 2014).

The immersive nature of VR, which allows viewers to encounter a simulated 3D landscape from multiple points of view, can be a very useful tool for urban planners, designers, or researchers in the field of urban morphology. They can use it to redraw streets and neighborhoods, offer real and imagined views of existing and proposed developments, or study historical events related to urban transformations.

With its promising potential to be a powerful tool for landscape architects, architects, planners and developers, most of them happen to be frequent GIS users, VR has already drawn attentions from the GIS industry, considered to be the next frontier to broaden the capabilities of GIS. For example, Esri has created a mobile VR solution for urban planners, architects, and GIS professionals. With their latest release of CityEngine (2016.1), users of CityEngine have the option to quickly convert their 3D models into VR experiences on mobile devices. Esri's ArcGIS 360 VR allows users to quickly immerse themselves (through a mobile phone with VR headset) into 3D city models by teleporting to static viewpoints and comparing different urban design scenarios. These VR experiences can be easily created in CityEngine and are hosted on ArcGIS Online (CityEngine, 2017).

In addition to this streamlined approach offered by Esri. Users can also use commercial third-party 3D game engines (game development software programs, such as Unity or Unreal) to create VR experiences. Esri CityEngine allows users to export their creations in various formats, including .fbx files, which can then be imported into 3D game engines. Users then can add VR support to their models in these game engines (Singh, et al., 2014; Smelik, et al., 2014).

Case study

Several cities in the United States have taken advantage of these new GIS tools to create maps, 3D models and scenes, and other presentations to support their urban planning and development efforts. Some of these tools and the methods incorporated by these cities can be possibly applied to study urban design, urban form, or urban morphological processes in general.

City of Beaverton in Oregon used ArcGIS Online to create a series of 3D web scenes to study various urban planning issues, including land use, zoning, and flood risk. This was done by using the basemaps already available in ArcGIS Online to provide the context of the city, then adding City's own authoritative data to create the contents (City of Beaverton, 2016). City of Beaverton also used the LiDAR feature extraction technique to generate fairly detailed 3D building models and tree canopies. They also created a series of CityEngine models to represent a number of future development scenarios for a neighborhood in Portland as a pilot test (Figure 1).

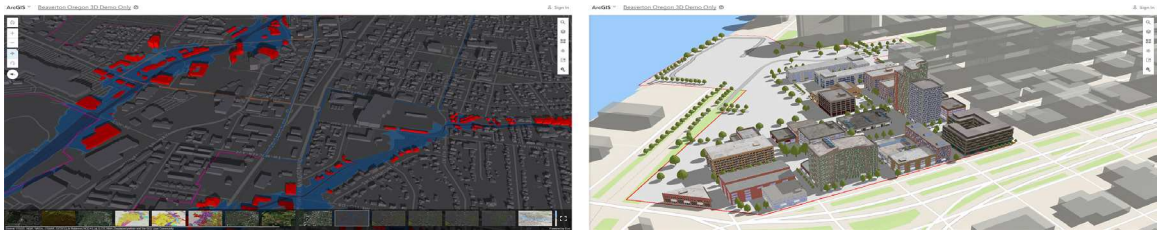

Figure 1. City of Beaverton used ArcGIS Online to create 3D web scenes to study flood risk in relation to urban form (left), and created CityEngine models to examine future development scenarios (right).

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Central Boulder in Colorado also used ArcGIS Online to create a web scene to conduct their growth factors analysis, which included existing natural physical factors about open spaces and water features, as well as man-made systems, such as bike lanes, trails, parks, etc. (Central Boulder, 2015). They also included some demographic and economic measures in the web scene, such as population, total dwelling units, land use, and housing mix. 3D buildings and trees were generated from LiDAR and placed on top of a built-in basemap in the web scene. To present their web scene, Central Boulder then created a story map, a web-based presentation platform designed by Esri, which allowed Central Boulder to include other forms of media in the presentation, such as photos, statistic graphs, and text narratives (Figure 2).

Project introduction

To explore the potentials of these geospatial tools and visualization media, a project was conducted by the author and his students in an urban design studio class. The Graduate Program in Urban Design in School of Architecture at the University of North Carolina at Charlotte took on the challenge to re-envision the future of an old urban renewal site in City of Atlanta, a neighborhood used to be called Buttermilk Bottom. The main idea for this academic project was to learn from City of Savannah about how the class might use those lessons to redo what was badly done three decades ago in the site in Buttermilk Bottom. The assignment was to re-design the Buttermilk Bottom site according to the design principles observed in the plan for Savannah's historic district and their quantifiable traits.

Many GIS applications were incorporated in this urban design project, including 2D mapping (ArcGIS Desktop, ArcGIS Pro), remote sensing (Esri Local Government 3D Basemaps), 3D procedural modeling (Esri CityEngine), and cloud-based tools (ArcGIS Online).

GIS data acquisitions

To assist in both the site analysis and urban design processes, GIS was used by the class to explore physical structures in both two cities, including street networks, street block/lot configurations, open spaces, distributions of land uses, demographic data and their related socio-economic characteristics.

The GIS analysis started with collecting data. The class relied on online open-source GIS databases to acquire the needed datasets for their analyses. For the study area in Savannah, SAGIS (Savannah Area Geographic Information System) Open Data site was the primary source, which provides free access to geospatial data in a standardized format to the public. For the site in Atlanta, two sources were used by the class: DPCD (Department of Planning and Community Development) Open Data and ARC (Atlanta Regional Commission) Open Data.

A series of basemaps were constructed by combining GIS datasets in both ArcMap and ArcGIS Pro to create a digital representation of the existing urban structure for both two cities. The datasets used in these basemaps included

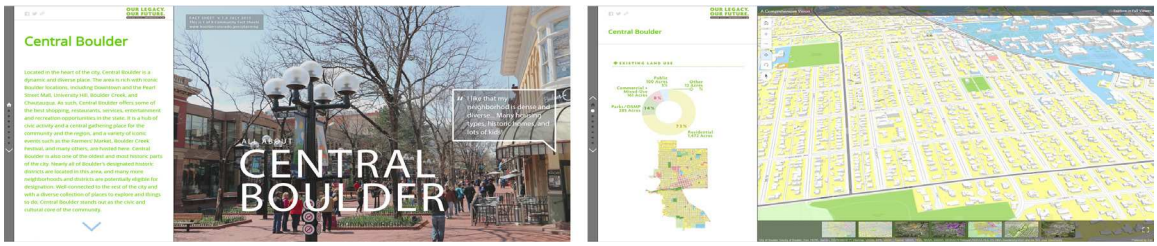

Figure 2. Central Boulder in Colorado created a story map to publicize city's images (left) and conduct growth factors analysis, such as land use in relation to building massing (right).

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the following: streets, parcels with land use information, building footprints, parks, landmarks, points of interests (such as schools, churches), water features, contours, census tracts. Demographic data was collected from Census Bureau website (American FactFinder) and linked to the census tracts dataset.

LiDAR processing

After the basemaps being created, the next step then was to construct 3D models for both two cities. These models were intended to display the existing buildings, trees, and accurate terrains to represent the landforms. This was done by extracting 3D features from LiDAR point cloud data.

For the site in Savannah, the LiDAR data was acquired from Department of Architecture in Savannah College of Arts and Design (SCAD). Eight (8) LiDAR tiles were obtained in the .las file format (version 1.1). They were commissioned in 2009, each covering an area of 5,000 ft by 5,000 ft with a point spacing of 1.5 ft. These tiles had been classified into 5 classes: unassigned; ground; building; noise; water.

For the site in Atlanta, the LiDAR tiles were downloaded from the website USGS Earth Explorer. Two (2) tiles were obtained in the .las file format (version 1.0). The tiles were created in 2006, each covering an area of 5,300 ft by 5.300 ft with a point spacing of 4.6 ft. Since these two LiDAR tiles were not classified, the first step was therefore to reclassify them. ArcGIS Pro was used to process this step. The reclassification was performed by applying the following two methods: classify building; classify by height.

After this step, the class used Esri's Local Government 3D Basemaps tools to process all LiDAR tiles for both two cities to extract buildings and trees in 3D (Figure 3). This step also produced digital terrain models (DTM) in the .tiff file format to represent the bare ground-level terrain for both two sites.

3D modeling

The 3D models created by extracting features from LiDAR data were considered simple representations of the existing urban structures for both two sites. To enhance their visual qualities and model appearances, Esri's CityEngine was used by the class to add details to the 3D models. These details included architectural structures and textures, landscape features, roadway signs and pavements, transportation features, vehicles and human figures. Lighting effects were also added to enhance the level of realism in the models.

Before using CityEngine, a GIS data package in the .gdb file format (Esri's File GeoDatabase) had to be prepared in ArcGIS Pro. This package included the following items: 3D buildings extracted from LiDAR by Local Government 3D Basemaps; DTM as .tiff images; tree points (also from LiDAR), streets, building footprints, aerial photos of the sites as .tiff images.

The street-creation tool in CityEngine was used to generate streets. This step was done based on street types that were identified by the class. All the details associated with the streets, such as vegetation, signs, pavements, vehicles and human figures, were added by using Esri's Complete Street rule package, which is available online. The class then used Esri's Urban Design rule package to generate 3D buildings with architectural details and textures.

Overall, the class was able to use the 3D models generated by CityEngine to examine the physical qualities of the areas, such as: overall land use distributions by color-coding building footprints; potential ways of urban transformations by urban design; streetscape configurations with fully rendered details (Figure 4).

Cloud-based GIS

In addition to relying on online open data sources to acquire GIS data, the class also took advantage of Esri's cloud-based platform, ArcGIS Online, for the following activities and purposes:

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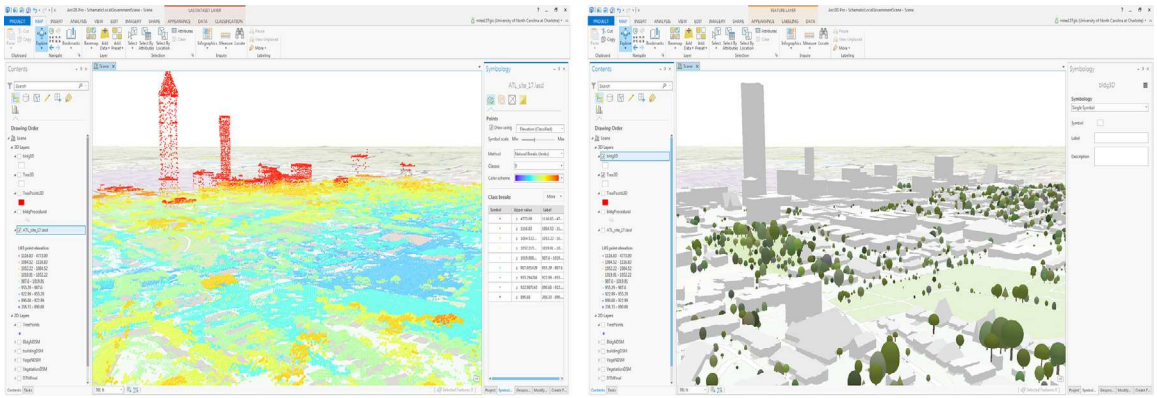

Figure 3. The class used ArcGIS Pro and followed Esri's Local Government 3D Basemaps workflow to reclassify LiDAR point cloud data (left) and extract 3D features from the LiDAR (right) for City of Atlanta.

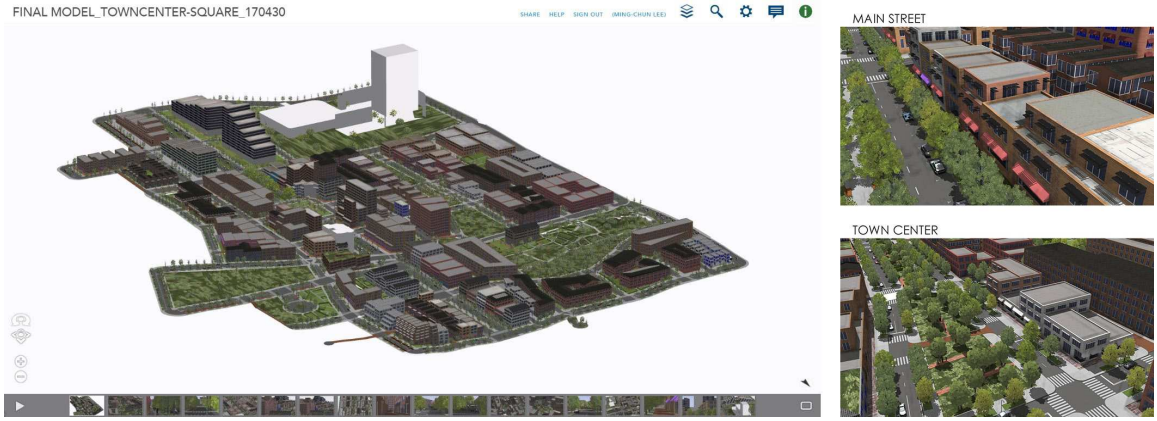

Figure 4. CityEngine allowed the class to create a large-scale model with details to render future urban design solutions.

1) Data and content sharing: An online user group was created to include all the students as well as the instructor of the class to enable sharing of GIS data, processed map layer and scene layer packages, and maps and 3D scenes that were generated by the class.

2) Data processing and analysis: the class also used some of the analysis capabilities offered by the platform to perform some basic analysis, such as walkability analysis and hot-spot analysis.

3) Map and web scene generation: the class used this online platform to generate maps and 3D web scenes, which included detailed streetscapes, buildings, and spatial analysis results, to visualize and explore urban structures and design solutions.

4) Project presentations: the class used the template provided by the online platform to create story maps to present the project outcomes. Each story map contains multiple forms of media, including static images, text narratives, interactive maps and 3D scenes that reveal urban structures of the two sites (Broyles, et al., 2017). These story maps were made available to the general public online through the Internet (Figure 5).

VR development

The class also tested the potential of using virtual reality as a way to study urban form and explore urban design solutions. Their 3D CityEngine models were exported as .fbx files (Autodesk), which were then imported into Unity, a game development engine, to be later converted into virtual reality scenes.

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Figure 5. The class created a story map to organize a series of web scenes for documenting their analyses and design solutions, including land use mix analysis (left) and walkability analysis (right).

Unity allows additional lighting effects and environment rendering options to enhance the appearance of the models. It also enables virtual reality settings that allow a user to use a typical game controller, such as Xbox controller, to walk around 3D scenes generated by the CityEngine models. During the class final review meeting, a computer was set up to allow guest critics to experience the virtual reality scenes in person and offer comments for students' design projects (Figure 6).

Discussions and conclusion

This class exercise offered an opportunity to explore the possibilities to use new geospatial tools and visualization media to study urban form and its related topics. These tools and media, including 3D procedural modeling with GIS, LiDAR remote sensing, cloud-based GIS platform, and virtual reality, represent four of the many major development trends in the geospatial technology industry and its related fields.

This final section presents some of the author's initial thoughts about the potential advantages of these tools for the study of urban form, as well as some noticeable disadvantages or issues that may face prospect users.

Advantages:

1) Quick 3D form extraction from LiDAR: With the recent advancements in the LiDAR technologies and the lower costs of deployment and data acquisitions nowadays, as well as with some significant efforts from several federal agencies in the United States to establish geospatial databases accessible to the public, it has become quite possible to obtain high quality LiDAR data at no cost within the States. Furthermore, modern GIS software packages have also become more powerful in their abilities to leverage LiDAR data for point clouds reclassification, ground terrain identification, and 3D feature extraction. For this project, LiDAR data processing offered a convenient way to study the existing physical fabric of the two study sites by revealing their landforms and quickly extracting built structures from the LiDAR data.

2) Urban structure exploration with 3D procedural modeling: Procedural modeling with its rule-based approach to 3D form generation has made it possible to quickly create detailed 3D city models for a large geographic area. This has become possible in particular with the integration between GIS and the procedural modeling program itself. Now users can import GIS data into the modeling program and use the attributes that are already embedded in the data, such as land use classifications or building heights, then link certain attributes with an appropriate set of form-generating rules to build 3D models. Users can then explore different urban form configurations, such as street width, distance between building facades and street edges, or even tree canopy or vegetation coverage, by simply changing certain rules associated with the intended physical features. The students in the class used CityEngine's Complete Street rule package to create a series of street typologies by simply changing parameters associated with street configurations, such as the number of lanes, availability of public transit, or vegetation on sidewalks. They also

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Figure 6. Virtual reality scenes, converted from CityEngine models, allowed reviewers to experience students' urban design solutions in an immersive way.

imported building footprints GIS data into CityEngine and created 3D massing models based on the land use information that came with the GIS data.

3) Easy access to accurate terrain elevation data and global satellite imagery: The cloud-based ArcGIS Online platform provides ready-to-use basemaps with accurate terrain data and satellite imagery. The class created many web maps and 3D scenes by combining their own data and 3D models with the basemaps already available in ArcGIS Online. With the elevation information and the imagery showing the ground features in the sites, the students were able to verify the accuracy of their data and models and further examine the spatial structures in the sites.

4) Easy data sharing and presentation over the Internet through cloud-based platform: The cloud-based platform also enables easy data sharing and project presentation over the Internet. The class shared their map layer packages with one another as a group in ArcGIS Online. By doing so, they were able to include some of the contents that were made by other teammates in their own maps or 3D scenes for presentation purposes. The class also created story maps using Esri's templates to document their projects. All these story maps are accessible online to the public.

5) New way to experience urban spaces through virtual reality: VR creates immersive experiences with a perception of being physically present in a non-physical world. GIS can greatly enhance the accuracy and realism of virtual scenes with up-to-date terrain models and geographically referenced 3D features. The class combined multiple software programs to take 2D GIS data, turn them into 3D models, and eventually walk around these models in a VR environment. This has been made possible through the interoperability across many different programs, including desktop GIS, procedural modeling tool, and game development engine.

Disadvantages and issues

1) Proprietary software license: All the computer programs used in the class are proprietary software. They are not free of charge. The class was able to access all these programs at no cost with institutional or educator licenses. However, the students will lose this privilege of free access once they graduate from the school.

2) Data availability and quality: Although public GIS open data is becoming more and more accessible nowadays, still not all the data are being made available to the public. Even if some data are available, they may be incomplete or out of date. The LiDAR data used for the study area in Atlanta was created in 2006 with relatively lower resolution.

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3) Inconsistent data schema: The attributes that are included in GIS data are not standardized across different jurisdictions. Different cities may have their own protocols of coding GIS data and setting up attributes. For example, land use information may be classified very differently from one city to another.

4) Multiple software programs and platforms with steep learning curve: There is just no one-button solution that would magically make things happen. This has already been true for most of the conventional GIS software programs, such as market-dominating ArcGIS. One can just imagine the complication when you need to include other programs, each of which requires intensive training and learning before it can be deployed.

5) High cost of VR devices: Most of the VR technologies are still in development. Newer devices and programs are yet to come to the market. Those options already available to the consumers are in general very pricy. Although inexpensive devices are coming, such as Google Cardboard or Samsung Gear VR, they tend to suffer from lower graphic quality and limited support in terms of visual effects.

Final thought

Though an in-depth evaluation on the exact effectiveness of these software tools or media for the study of urban form is out of scope for this paper, which can certainly be an important next-step for advancing this particular practice, this project allowed for a quick glimpse of the on-going development trends in the GIS world. As these digital tools are becoming more and more advanced, we researchers, scholars, or designers interested in understanding the dynamics of city building processes should explore new methods and establish new workflows to utilize these tools in order to advance our work.

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Because people act, cities can be smart: Promoting social innovation in smart-city design-tools in the Mediterranean

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Abstract. *Smart city is an innovative paradigm tackling a range of emerging problems associated with urbanization, massively understood from a technology-driven approach. Much of the focus of the smart city movement to date – city authorities and other organizations deploying sensors, networks, decision support tools and data analytics to improve the efficiency and effectiveness of urban systems (like transport, utilities, etc.) – is only half the story. In occasions, citizens struggle with a top-down managing city system that should help public administrators, service providers and citizens, but reports instead on personal frustration. To avoid this, an attempt to promote social innovation processes to the smart city paradigm is now taking place. In this paper, we analyze reactions to a smart city design-tool for energy strategy plans' definition and implementation, in the three EU most populated Mediterranean countries (Spain, France, Italy). The research is based on the ACCENT study case. Interviews show common challenges with regard to ACCENT smartness, as the needs and dangers of sharing real energy consumption data of buildings, the low willingness of some energy suppliers to offer information, the user-unfriendly interfaces for citizens, the lack of linkage among public bodies, the dispersion of data, the requirement of disseminating mechanisms to make citizens aware of the benefits of the energy renovation, or the inaccessibility to existing information on the state of buildings. These challenges resulting from ACCENT study give rise to three recommendations to foster social innovation in further Mediterranean smart city design-tools: co-responsibility, hand-in-hand co-creation and citizens' organizational empowerment.*

Keywords: Social innovation, smart city, co-creation and co-responsibility, city management, ACCENT.

Introduction

The smart city concept is nowadays very extended in urban studies (Hollands, 2008; Vanolo, 2014). There are many definitions of smart cities. However, the most predominant one is focused on ICT as a technology driver and enabler, while less used but broader definitions include socio-economic, governance and multi-stakeholder aspects such as the use of social participation to enhance sustainability, quality of life and urban welfare. Consequently, many studies showcase the smart city as a tech and sustainability frontrunner (Townsend, 2013), lacking figures on how can a smart city promote the social innovation that European Commission is looking for in Europe 2020 Strategy (EC, 2013).

Furthermore, it is well known the crucial importance of data collection when planning public policies (Genre, Flourentzos, & Stockli, 2000). In order to achieve long term urban renovation processes, monitoring and managing smart decision-support tools are needed (Ascione, De Masi, de' Rossi, Fistola, & Vanoli, 2012; Stylianidis, Karanikolas, & Kaimaris, 2012; Hailu, 2012). The two most important

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aspects of these decision-support tools are (1) the manageability (Bhanot & Jha, 2012) and (2) the integration of real data from different city stakeholders as service providers, citizens, policy makers and local authorities (Müller & Siebenhüner, 2005).

Therefore, city management tools based on big data and technology driven processes are the most dominant in policy and scientific literature, based on the idea that policies with updated data are smarter since they are more effective, fiscally balanced and capable of attracting competitiveness, jobs, and human capital (Caragliu et al., 2011; Hancke et al,. 2013). Still, measuring success at city level is complicated as a consequence of the relative immaturity of smart city users and tools, and due to the difficulty of linking technology based solutions to particular socio-economic issues or social innovation processes.

This predominant vision places the smart cities in a neoliberal-trend public management of the city. However, some authors go further and do not assimilate the intelligent city as a neoliberal city (Harvey, 1989; Castells, 2000) or the uses of public spaces with neoliberal urban activities (Peck and Tickell, 2002). Initially, smart cities will be smart because their citizens have found new ways to craft, interlink and make sense of their own and each other's assets, data and other resources.

Smart cities are concerned with using data and coordinating local assets of all types to improve the lives of local inhabitants in terms of improved physical environments, mobility as well as community cohesion to tackle many of their own problems. But, which are the social patterns and trends behind a smart city? Does the technocratic smart city approach promote social polarization between low income areas and high-income areas? Or more specifically: Is social innovation a key aspect when designing smart cities design-tools? Indeed, the conclusions of the 2014 European Parliament study "Mapping Smart Cities in EU" underline that inclusion and participation are important targets for successful smart city design and management tools to avoid polarization between the urban elite and low-income areas.

In order to avoid passed mistakes when promoting smart cities, in this paper we analyze social barriers of citizens, civil servants and service providers in a study case smart city design-tool called ACCENT: Accompany Cities in Energy Strategy. ACCENT focused mainly in building performance as buildings are responsible for approximately 40% of the primary energy consumption in Europe and often they are the largest energy consumer and CO2 emitting source in cities.

In this framework, municipalities have a vital need to reduce energy consumption in this sector through efficient policies and innovative solutions (Bloem, 2015). Hence, there is an urgent need to provide local authorities with tools to build up and update a realistic monitoring of the current situation (Ascione et al, 2012; Stylianidis et al, 2012). In order to achieve this goal, ACCENT is a new decision-support tool for local administrations developed under a pan-European project upheld by Climate KIC. ACCENT is a GIS web-based platform that supports local administrations to monitor public and private building energy performance and plan actions on the building stocks of the city. Therefore, ACCENT as a smart city design-tool, seeks to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership.

In this research, we have focused on the main city-actor's reactions to ACCENT in Spain, France and Italy, the most populated EU countries in the Mediterranean area. The research questions launched are 1) if is there the danger of a one-size fits all, top-down view of urban city management with ACCENT and 2) which are the main barriers to achieve social innovation with ACCENT. The diverse needs of the inhabitants as individuals, households, neighborhoods, communities, organizations and businesses – that bring the city to life – are of such importance for this research. We end the paper formulating recommendations to promote social innovation in future smart city design-tools in EU Mediterranean countries. The hypothesis behind is that any adequate model for the smart city must also focus on the smartness of its citizens and encourage the social innovation processes. We believe that cities are, by definition, engines of diversity, so focusing solely on streamlining utilities, transport, construction and unseen government processes can be massively counter-productive.

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Methodology

In this study, we test ACCENT with local authorities and service providers in France, Italy and Spain. With this aim, five structured workshops were held involving local authorities and service providers from the different countries (Valero et al, 2016). The goal of these workshops was firstly, to identify the main challenges for the tool, and secondly, to assess how far ACCENT was promoting social innovation among the actors as visualized in Figure 1.

The starting point of the workshops were the results of the interviews made in a previous stage to make participants react to these results and to validate or invalidate them. In the second part of the workshops, a mock-up of the ACCENT tool was presented to participants in order to obtain their feedback about it. Once the mock-up of the ACCENT tool was refined and adapted, we went through an end-user oriented demonstration phase involving four different pilot cases: Paris, Valencia, Reggio Emilia and Ferrara. This pilot phase aimed at achieving, on the one hand, a user-oriented tool for pilot cities, and on the other hand, a user-oriented tool for cities ecosystem: service providers and citizens. On a city-scale level, the work with cities consisted of five semi-structured meetings with cities' representatives. These meetings were focused on managing and guiding them to test the proof-of concept of the tool and analyse their suggestions of improvements regarding functionalities and ergonomics to iterate toward the final tool. In parallel, the needs of the cities ecosystem (service providers and citizens) were studied. Firstly, as shown in Figure 2, we developed a workshop with service providers in each pilot city to go further in their needs/expectations/barriers. With respect to citizens, the process consisted of interviews with citizen representatives (consumers, homemakers and other citizens' associations) in order to obtain information about which are the needs or expectations of citizens regarding energy saving and efficiency in their cities and buildings (For further information, see Mateo et al., 2017).

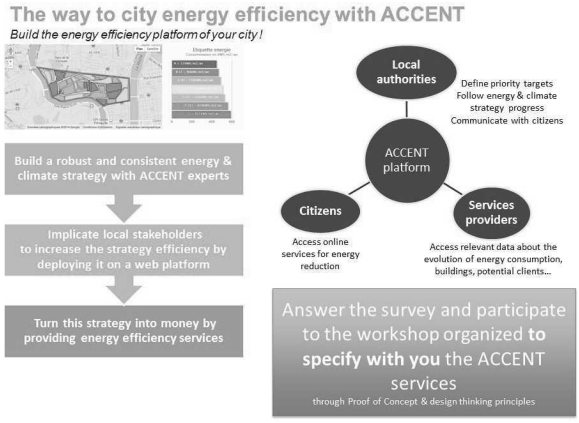

Figure 1.
Promoting social innovation through stakeholder participative workshops.

Figure 2.
Participative workshop with service providers.

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This participatory process allowed us firstly to determine societal challenges according to the different actors approached, and secondly to identify recommendations to foster social innovation while improving ACCENT smart city tool.

Measurement and analysis

Societal challenges identified during the development of ACCENT smart city design-support tool

Hereafter societal challenges identified could be summed up in three: A/ Getting and using real energy data; B/ Using decision-support tool for energy planning and C/ Establishing links with other actors and learning from other similar experiences.

Getting and using real energy data

Energy consumption and CO2 emission reductions are both of key and growing importance on the political agenda. Local authorities need to have a realistic monitoring of the current situation; they have a strong need to understand the building stock energy consumption to be able to draw a strategy of energy efficiency, set targets and evaluate the impact of actions on energy consumption and CO2 emission reduction. Interviews undertaken with local administrators showed that normally municipalities get yearly real energy consumptions of the building stock at city scale. Furthermore, data are few years behind the current year of exploitation, depending on the type of data and the source. They also count on information regarding buildings and households provided by Statistics organisations (NSIs). Such organisations get data through population census and provide them to actors that evaluate the energy consumptions and CO2 emissions.

But most of the local administrations interviewed pointed out that to go further they need more detailed data at all levels. The scale of data needed depends on the actions to be carried out. Generally, lower scale is needed by technical actors, and upper scale information is targeting policy and strategic actors. On the one hand, the interviews have revealed that district and block scale is generally sufficient for municipalities because they are unable to target one precise building and they organize strategies at district level. But some municipalities would prefer information at building level, because they would have a more precise and reliable evaluation of the consumption. On the other hand, going down to the level of the dwelling could enable the public authorities to address issues of occupants, but for most actors this is considered as an intrusion into the privacy of citizens.

Furthermore, service suppliers have diverse needs concerning the scale of information needed. Interviews have revealed that they would like data at all types of scales, depending on their core business and their specific projects. Utilities' big investments would require data at regional level. For energy network companies, needs are at building and district levels. To develop district heating network, operators need to have at least the information at district level and preferably at building level too. For construction companies doing refurbishment works, data at building level is sufficient but they could need data at dwelling level. Some appliances companies would like the information at dwelling level or even more detailed inside the dwelling to have a precise analysis of the consumer behavior and offer them a dedicated service.

The third key actor worried with getting and using energy data were citizens. The results of the interviews conducted with representatives of citizens in the three countries (France, Spain and Italy) led us to common and similar conclusions. Interviewees agreed that the appropriate scale of data for citizens is dwelling/housing scale. This is the usual scale they manage energy data, and seem to be the more understandable for them. Furthermore, citizens are interested to monitor their energy consumption and get precise advices on energy saving measures and potential renovation works to improve the energy efficiency of their homes. In addition, it was also considered very interesting to provide them with information on energy consumption at city scale, as a necessary exercise of local government transparency, but also to include them in a collective effort, to allow citizens to understand how their actions influence city energy consumptions.

Apart from the needs identified, some

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barriers to respond to these needs came out regarding getting and using energy data for local administrators, service providers and citizens were:

•Reluctance of energy companies and citizens to share data. It seems that when companies are more integrated to the local level they are more willing to share data, but in countries like France, Italy, Spain, which have an energy system dominated by few major utilities, cooperation between national utilities, local governments and citizens is not easy and many issues have to be tackled.

•The confidentiality of the data is also a very important issue, especially information from the energy consumers for privacy reasons, but also from service providers for competitive reasons. Interviews reflected that generally stakeholders are willing to share the data and information they have if they get benefits in return. They are not willing to share them for free.

Using the decision-support tool for energy planning

In this case, we just identified barriers with local public administrators. Workshops and interviews with local administrators showed that defining energy strategies regarding the building stock starts with the knowledge and understanding of the current situation in terms of energy consumption and energy saving potential. It is difficult to have an intuitive knowledge of the building stock, even more for bigger cities. From this starting point, cities need a tool that allows them to design and evaluate different scenarios and alternatives based on a defined set of attributes, which can be used by city administrators, citizens and companies.

Barriers identified by local administrators were:

•Lack of financial capacity: most of the time energy systems or efficiency investments are driven by lower cost, which is a major source of problems for the future, due to a lack of consistency in long term results.

•Lack of city administrators with strong competences and tools. Some cities need to be supported by external consultants for these tasks. Additionally, citizens do not understand the information provided by these kind of tools.

Establishing links with other actors and learning from other similar experiences

Today, there is no meeting point between public authorities, service providers and the general public. Both local authorities and service providers are trying to bring services directly to citizens, but this has limited success across cities. This meeting point is strongly needed.

In addition, interviews and meetings hold with municipalities showed that they are really interested to learn from other cities' experiences. Sharing information with other cities implementing similar actions to the ones set out in their action plans can anticipate success or failures what provides margin to straighten up or given up actions, minimizing usefulness investment costs. Local administrations have the duty to orchestrate the development of the energy system on their territory. They do so by directing, more or less closely, the services and products supplied by providers, and by motivating the citizens to have virtuous behaviors regarding their energy consumption, which are not always effective.

Moreover, service providers wanted to communicate their activities and reach the market with their services or products. They firstly needed to know the energy strategy of their operation territory. This would help them elaborate clear and relevant services to address the action plan. But in this regard, we have found that sometimes there seem to be some discrepancies and contradictions, as e.g. Spanish service providers highlighted a gap between the local plan objectives and its implementation, what does not favour the planning of their core business strategies.

Finally, citizens need to have clear information about the challenges of their territory and their building regarding the energy consumption. Awareness raising and co-responsibility consciousness of environmental and economic issues are essential to success. They need to know what the proposed services are to make an educated choice among them. Consumers do not know where to go when they are looking for regulations, products and services for energy efficiency. They also demand information on service providers, about their reliability, quality, and performance.

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Barriers identified for local administrators, service providers and citizens were:

•Significant proportion of citizens without access to the internet or with difficulties to find the right information through this source. Other ways to address citizens are needed: face-to-face, school campaigns, neighbourhood associations, etc.

•There's a lack of communication between public administrations, at the same or different levels. SEAPs from municipalities at the same territory should be aligned to regional policies and vice-versa.

Recommendations to foster social innovation

According to the social barriers identified during the definition of ACCENT tool, we bring forward three specific recommendations to foster social innovation when designing a smart city decision-support tool. These are co-responsibility, hand-in-hand co-creation and citizens' organizational empowerment. The logical framework of the analysis is displayed in Table 1.

Co-responsibility: People interviewed demanded data-sharing while keeping data confidential. This apparent oxymoron could be solved promoting co-responsibility in designing and using the smart platform. This could end with a win-win situation: having a space to co-design the city sharing responsibility of the decisions taken. All the open-source movements already act under these logics of governance. A smart city shouldn't result from a top-down design and management, in which some actors provide information and take responsibility while others suffer or benefit the consequences, and in which citizenship are considered passive. A smart city support-design tool should come up from an active society willing to improve the city management via transparent and open source governance tools, in which all actors assume responsibility.

Hand in hand co-creation: Most of the niches

Table 1.
Recommendations summary to foster social innovation according to the ACCENT societal challenges identified via the different actors approached.

Societal challenges identified according to the different actors approached (local public administrators, service providers, citizens)	Barriers	Recommendations for ACCENT smart city decision making tool to foster social innovation
Getting and using real energy data.	Reluctance of energy companies to share data and data confidentiality	Co-responsibility
Using decision-support tool for energy planning	Lack of city administrators/service providers/citizens with strong competences in using these kind of decision support tools	Hand-in-hand co-design
Establishing links with other actors and learning from other similar experiences	Significant proportion of citizens without access to the internet. Other ways to address citizens are needed: face-to-face, school campaigns, neighbourhood associations	Citizens organizational empowerment

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analyzed in this process complain about the unidirectionality of the municipalities when it comes to operating. The strategic objective of a smart city should be to develop better (energy/ other topics) decision support tools hand-in-hand with community cohesion, in order to avoid the creation of tools not understandable by city administrators and/or citizens. Citizens interviewed demanded more capability to design the city that they live in. However, some city administrators see as a problem using participation methods to design the city as they have not the right training to manage these processes. That's why training is needed for both civil servants and citizens on participation and co-creation methods, in order to empower both sides of the urban development process and to promote new alliances and associations among citizens, civil servants or citizens-civil servants.

Citizens organizational empowerment: However, promoting hand in hand co-creation is not enough if these processes don't promote citizens' empowerment. For instance, without being asked, some citizens provided alternative ideation platforms to develop a better city, or competitions to take advantage of open public data to develop apps, useful data mash-ups or new services. Citizens empowerment could include ICT-enabled citizen participation open data strategies, crowdsourcing and co-creation platforms, but also alternative channels to the digitals one. One underlying theme should also be the resilient channels to promote city decision-making and enabling better feedback from citizens to civil servants. Additionally, awards and competitions could foster social innovation.

Conclusion

Today the identification of a smart city design-tool with an intelligent city-council and with top-down management processes is overcome. In addition to the changes on governmental level speeches like UN Habitat III in this direction, we can affirm from the analyzed case that smart city users demand property and rights to the information that is generated in their cities, or voice in the decisions that affect the way in which their environment is transformed. The ACCENT study case highlights that citizens and city administrators need to be empowered through active participation to create a sense of ownership and commitment, so it is important to foster participative environments that facilitate and stimulate citizens, businesses and the public sector to contribute.

The engagement of all the city stakeholders in the city management is essential to promote smart cities. This collaborative approach allows service providers and citizens to play an effective role in planning and decision-making processes. However, this approach has also its limitations: the speediness of the ITC market and the rising needs of municipalities to reach their low carbon goals, has opened a very fast changing business niche, and it is not easy to actively promote social innovation when the business-driven processes are faster than local administrations.

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City and territory
in the Globalization Age

7. Tools of analysis in urban morphology

Medieval Porticoes of Rome: Revealing Rome's Architectural and Urban Heritage Digitally

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Abstract. *As a case study in digital documentation this paper examines the medieval façade porticoes of Rome through the identification and mapping of these structures and analyzes them together with drawings and historic views allowing one to examine them in relation to historic and present day city maps. This paper makes use of a methodological approach to the multimedia representation of architectural and urban heritage, in order to offer architects, planners and scholars research tools that extend the capabilities of traditional forms of primary and secondary source material. Digital documentation examined in this study reveals a distinct layer of the city's building tradition, highlighting the phenomena of a shift in architectural and urban patterns and as a result the fabric of the city. The field of investigation of this paper is the city of Rome. More specifically it deals with the 54 buildings and complexes that house the remnants of medieval residential façade porticoes that exist inside the walls of the historic center of Rome. Through the identification of a distinct type and character of a medieval building such as the residential façade portico and their distribution, this study begins to contribute to what can later be added to and expanded upon in terms of gaining a better understanding of the density of settlement patterns of Medieval Rome.*

Keywords: Medieval, Rome, portico, digital documentation, urban networks, processional routes, urban armature,

Introduction

The 54 medieval residences identified in this study, when examined together reveal four distinct categories or sub-types of residential porticoes [Figure 1]. Type 1 will be referred to here as the trabeated portico and most likely the earliest form of residential façade portico constructed in Rome [Figure 2]. The particular reuse of ancient Roman building materials in the form of a simple architrave, single shaft columns, ancient column bases and Ionic capitals made by medieval craftsman from ancient blocks of stone are comparable in size, character, and detail to trabeated porticoes found in the narthexes of medieval churches such as the one visible along the façade of the church of San Lorenzo in Lucina. Type 2 is referred to here as the arcuated portico and is comprised of a series of brick arches that run along the façade of a residence, supported by single shaft columns, that either have an Ionic capital or carved abacus, and marble bases from antiquity or medieval production [Figure 3]. Similar to the first type, the arcuated portico has its counterpart in medieval church construction and are still visible today along the façade of Santo Stefano Rotondo. Type 3, the Tower house is found at the base of medieval towers creating an arcuated permeable base to an otherwise defensive and closed structure. Type 4, referred to as the Townhouse portico that is comprised of two arched openings supported by a single shaft column with an Ionic capital or carved abacus with or without a base mark one of the latest types of portico construction. According to Tomei, it is this residential type from which the Renaissance *casa a schiera* or

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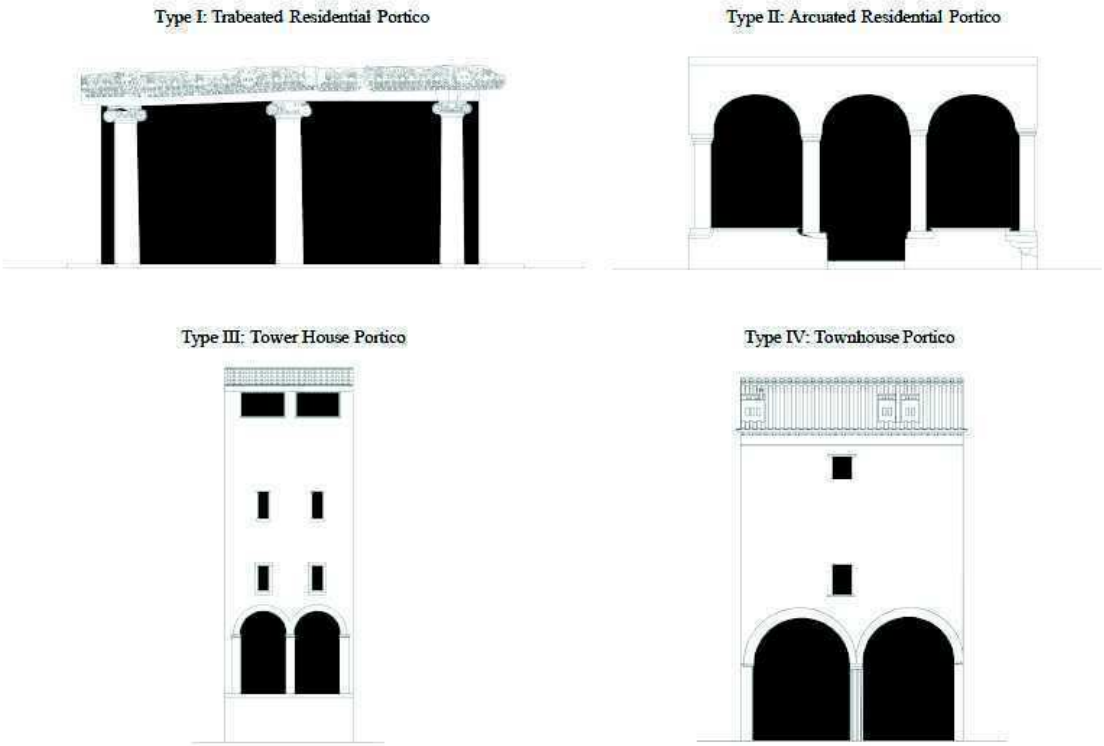

Figure 1. Four types of residential façade porticoes of Rome

Townhouse emerges. In addition to these four types there was one additional portico attached to a medieval tower that more aptly resembled a market loggia rather than a residential façade portico [Figure 4]. Of the 54 structures discussed, 17 could not be classified under any of the above mentioned sub-types due to the fragmentary elements of the porticoes visible, the existing remains still residing beneath layers of plaster.

In order to gain a better understanding of the architectural character of medieval Rome, a brief survey of residential architecture of the Middle Ages will be explored. It is difficult to pin point the exact moment of evolution of residential architecture in Rome that in antiquity was comprised of the single-family *domus* or the multi-family *insula*. While there were countless variations of these two types, they served as cornerstones for understanding of ancient residential architecture. Scholars look to ancient examples to better understand the origins of medieval residential architecture that served as a single family dwelling including a ground floor *bottega* with living areas of one or two storeys above. One of the few places where it is possible to examine this evolution in residential architecture during late antiquity near Rome, is in the city of Ostia as mentioned by Torgil Magnuson and Axel Boëthius. Magnuson goes on to outline significant moments in Rome's medieval residential architecture, finding that "before the eleventh century families of the Roman aristocracy lived modestly in low buildings, usually referred to as *domus maior* and were usually free standing. The structures had multiple levels and the reuse of ancient building material was almost always present. Of the houses of this type and time that survive is the above mentioned Casa dei Crescenzi and the ninth century houses in the Forum of Nerva. Based on Meneghini's reconstruction of the houses in the Forum of Nerva, the construction type and design appear to more closely resemble Early Christian architecture,

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Figure 2. Type 1 Trabeated façade porticoes of medieval residences in Rome

specifically the design and construction of the narthex in relation to the church. The location an design of these types of residential buildings continued to evolve throughout the center of Rome as we will see later.

During the twelfth century in Rome an increasing number of the city's inhabitants were situated in and around the area of the Campus Martius. On the other side of the river there was the growing neighborhood of Trastevere and the Borgo Leonino near St. Peter's Basilica. By this time an increasing number of Rome' residential architecture included fortified towers, built by the aristocratic families of the city. Documentary evidence suggests that the city of Rome around this period had somewhere around 318 towers. Today, very few of these towers survive; they have either been reduced, masked and enveloped by the growing heights of neighboring buildings or incorporated into later structures. The more common housing type for the average shop owner or craftsman during this time consisted of a mixed-use work live situation that included a workshop or *bottega* on the ground floor and a living area above. Houses with two storeys were reffered to as *domus solorata*, and became common at the beginning of the thirteenth century. From the middle of the eleventh century this housing type became common for merchant classes and not just the aristocracy. Yet the three-storey houses or *domus solorata cum tribus solariis*, do not seem to have been built in Rome until the thirteenth century. At the back of the house there was almost always a garden. The workshop, *bottega* feature was common and when a number of houses of this kind were joined, in some cases a portico was formed as we will examine later in this study. Twentieth century renovations have revealed a number of walled in medieval residential porticoes throughout the center of Rome providing greater understanding of the porosity that existed along the streets during the Middle Ages, where workshops were abundant. We can imagine, if the number of tower houses

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Figure 3. Type 2 arcuated façade porticoes of medieval residences in Rome

in Medieval Rome reached 318 representing the aristocracy of the city and others of later wealth, the number of houses for the average person, including residences with a portico along the façade would be double. While this type of house must have been more profuse in Rome than what we see today, there appears to be orderliness to their construction that differs from the same building type found in central and norther Italy. While there is quite a variety in these buildings that we see today, the use of materials and even architectural details are much more harmonious to the Roman street scape providing unity with individual variety.

In order to visualize the street scape of medieval Rome, historic *vedute* or views of the city coupled with deeds of sale and leases begin to provide a more complete picture. In this study, archival documentation and historic views are immensely helpful in re-populating the topography of the medieval city. Beginning with Fra Paolino's 1323 map of Rome, that shows a number of non-attached houses and row-houses, lining the sterets, which were more common of that time we can begin to better understand the medieval cityscape. The map describes the topography of the city of Rome through a series of pictorial elevations rather than the measured iconographic maps that we use today. While it is not an accurate measured plan of the city, it is telling in its depiction of important ancient, religious, civic, and residential architecture. Porticoes seem to be present throughout Rome on the surfaces of buildings as well as a free standing street portico that appears to run through the center of the city.

The Codex Escurialensis from the end of the fifteenth century also provides detailed views of Rome and its urban fabric that is not easily understood from the later bird's eye view plans of the city produced by Leonardo Bufalini in 1551 and Antonio Tempesta in 1593. In particular views of the Forum of Nerva through the arch of the ancient building framing a residential portico that passed along

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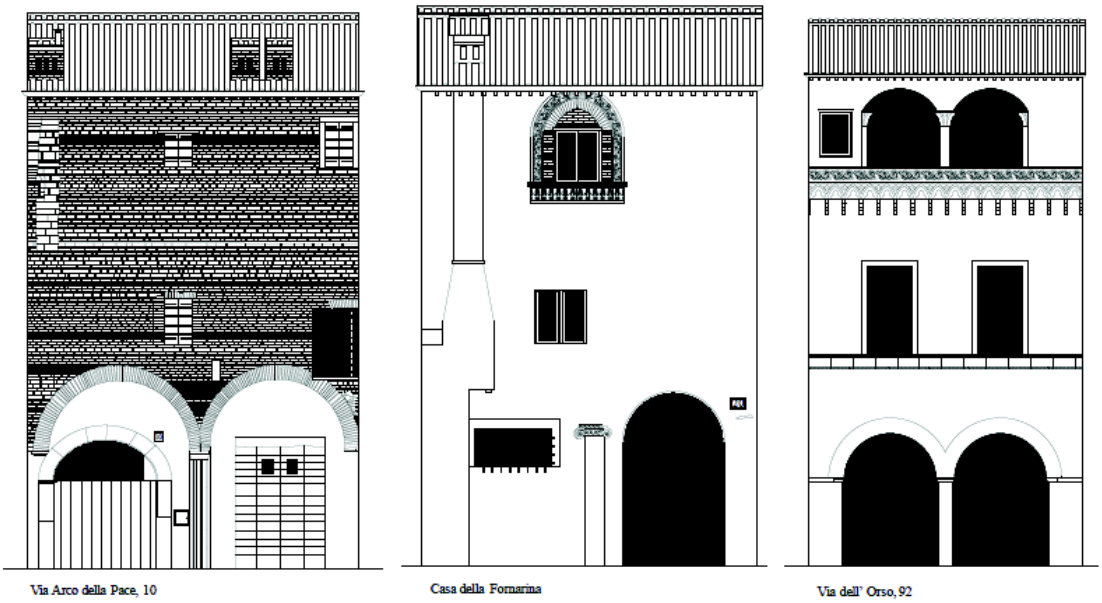

Figure 4. Type 4 townhouse façade porticoes of medieval residences in Rome

the present day Via della Madonna dei Monti is no longer visible but captured in over three hundred years of artist's renderings of the same view. The present day street still retains a residential portico examined in this study, indicating the greater number of porticoes that existed historically throughout the city. From the Dutch painter Marten van Heemskerck (1498-1574) who produced copious drawings of the city of Rome from 1532-36 it is possible to make out residential and religious porticoes throughout the center of the city that are no longer visible to us today [Figure 5]. These views also include snapshots of the portico near the Forum of Nerva. Heemskerck's abundant drawings include cityscapes of Rome's porticoes present in the area surrounding the Basilica of St. Giovanni in Laterano and the Capitoline Hill.

Methodology

Through examination of the medieval façade porticoes of Rome what has emerged as a result is a greater understanding of the major urban sequences and or processional routes along which these porticoes were situated [Figure 6]. The mapping and geo-locating of these structures reveals the commercial heart of medieval Rome. At the architectural scale what emerged is a clear and comprehensive culture of construction that it not only limited to residential architecture but carries over to the building of churches and other religious and civic structures. Also discovered in this study is the identification of four distinct sub-types of residential porticoes that emerge when examining the extant remains of these medieval structures coupled with historic archival materials. The reuse of ancient *spolia* reworked by medieval masons was quite systematized and cohesive and when examined as a group, clear patterns emerge allowing one to better understand not only the medieval culture of building but the quantity of certain ancient Roman materials such as architraves, capitals and pieces of stoner were available locally and re-worked by medieval masons. The use of the Ionic order appears to be executed by a number of skilled masons in a variety of ways that attempt to communicate the ancient precedent from which they were taking inspiration. The Ionic order in medieval Rome was not only prevalent in residential architecture but the capital of choice by masons for religious architecture of the period as well. While this study is limited in the fact that it is not able to examine every building thoroughly in the *abitato*, peeling back the layers of

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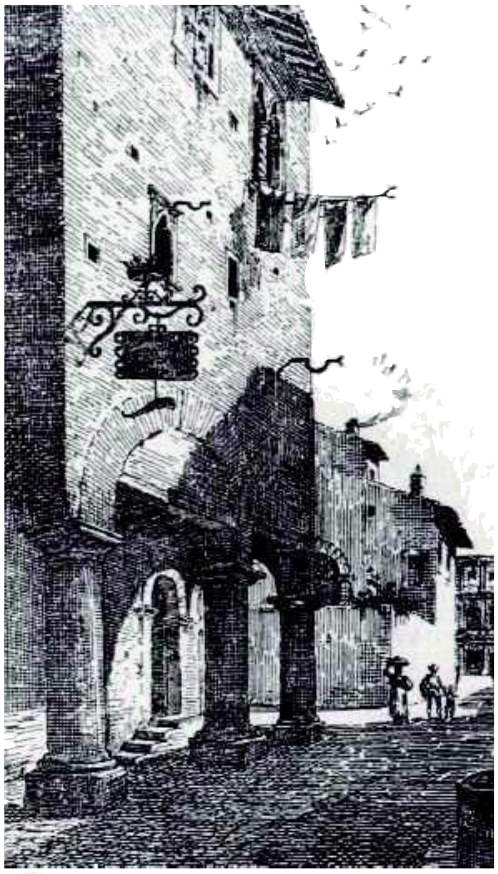

Figure 16. Residential façade portico. Source: Giovan Battista Giovenale

Figure 45. Forum of Nerva. Maarten van Heemskerck, 1532-36. Source: Kupferstichkabinett, Staatliche Museen zu Berlin

Figure 43. View of the Forum of Nerva towards the present day Via della Mad... dei Monti. Codex Escurialensis, Domenico Ghirlandaio, 1490. S... University of California San Diego

Figure 5. Historic views of medieval porticoes in Rome

each and every structure to reveal the pre-existing masonry, ruins, or use of *spolia*, what is partially visible in the form of enveloped columns, tower houses, and church structures serves as the base of future research that can be continuously added to.

Type 1 Trabeated Residential Portico

Rione II. Trevi
1. Piazza Fontana di Trevi, 92
2. Piazza Fontana di Trevi, 95

Rione III. Campo Marzio
3. Piazza Campo Marzio 5-6

Rione V. Ponte
4. Casa Bonadies/Via di Banco Santo Spirito, 61

Rione VI. Parione
5. Via dei Giubbonari, 64

Rione VII. Regola
6. Via Capo di Ferro, 31

Rione VIII. Sant' Eustachio
7. Palazzo Ginnasi, Via dell'Arco de Ginnasi, Largo di Santa Filippini, 5

Rione XIII. Trastevere
8. Casa Mattei in Piazza Piscinula

Type 2 Arcuated Residential Portico

Rione I. Monti
1. Via della Madonna dei Monti, 67, 68, 69

Rione V. Ponte
2. Antico Albergo dell'Orso

Rione VI. Parione
3. Vicolo Savelli, 32

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Rione VIII. Sant'Eustachio
4. Palazzo della Valle, Corso Vittorio Emanuele II, 101

Rione X. Campitelli
5. Vicolo Margana, 12
6. Vicolo Margana, 14

Rione XI. Sant' Angelo
7. Via del Teatro di Marcello, 2
8. Via dei Delfini, 8/9
9. Via Tribuna dei Campitelli, 23
10. Via Tribuna dei Campitelli, 23 B
11. Casa dei Vallati, Via del Portico d'Ottavia, 29
12. Albergo della Catena (Via del Foro Piscario)

Rione XIII. Trastevere
13. Casa Mattei in Piazza Piscinula
14. Via della Lungaretta, 160-161
15. Vicolo della Luce, 57
16. Piazza S. Cecilia, 19
17. Via della Renella, 42
18. Via della Scala, 5

Type 3 Tower House Portico

Rione VII. Regola
1-7. Case di S. Paolo
8. Piazza Margana, 40

Type 4 Townhouse Portico

Rione V. Ponte
1. Via dell Orso, 11
2. Via Arco della Pace, 10

Rione XIII. Trastevere
3. Casa della Fornarina, Via di Santa Dorotea, 20

Urban growth in the inhabited parts of Rome, or the *abitato* was gradual. With the construction of new buildings, primarily inside or above ancient Roman ruins or the reuse of *spolia* from these ancient structures, the urban armature of ancient Rome slowly began to change. Some significant streets from antiquity have remained in use until present day and new ones were created through the manner in which medieval residential block structures had a tendency to grow on top of larger ruins from antiquity as can be seen near Campo de Fiori and the houses that were built above the Theater of Pompey. In this example, the curvature of the street as formed by the sequence of buildings that line it, reflect the form of the theater below. Others however, were built up in the open areas of the Imperial Forums, making use of the surrounding building materials and foundations. Roberto Meneghini's studies of the archeological remains of early medieval housing in the area fo the Imperial Forums reveal some of the most compelling information about the development and character of early medieval residential architecture. Meneghini's findings of other later medieval residences along the Via Alessandrina provide for a greater understanding of the profusion of this housing type in the present *rione* of Monti, that today only one example can be found. Meneghini's work depicts a profound continuity in architectural design and the use of the façade portico from the early Middle Ages to the beginning of the Renaissance.

Through the mapping of these residences, it appears that their distribution is far from random and through an examination of historic cartography coupled with documentary evidence, it becomes clear that this housing type appears much more frequently along important street networks that persisted from antiquity to present day. These streets in particular marked not only ancient thoroughfares, but later sacred processional routes of the papacy, pilgrimage routes, and streets important for trade in the center of Rome. Examining these buildings together allows one to repopulate the center of Rome in the Middle Ages with its trade activity, pilgrimage and procession. This thesis focuses primarily on one specific building type, yet coupled with research findings pertaining to significant church architecture, tower houses, residential compounds, and civic buildings, the center of Medieval Rome can begin to be repopulated, changing our present day understanding and visualization of the historic urban landscape of Rome.

Measurement and analysis

The static nature of traditional methods of visual representation has limited the ways

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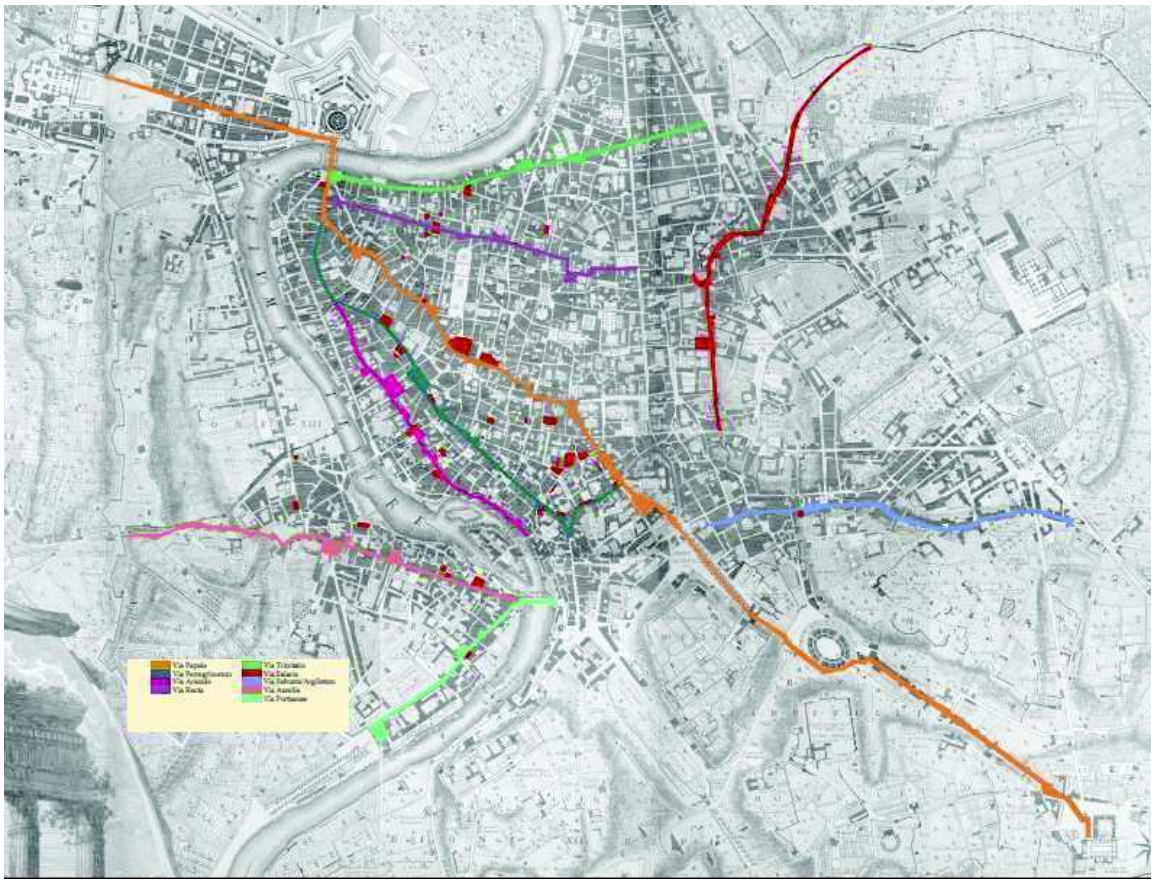

Figure 6. Map of Rome indicating medieval residences with porticoes in red, highlighting major streets and processional routes of the middle ages

shcolars are able to communicate large bodies of visual data spanning both space and time. In contrast, digital innovations have provided new and dynamic platforms for computer visualization and simulation of real, reconstructed and imagined environments. The increasingly dynamic nature of representational tools has opened up new veins of research and possibilities for both professionals and scholars studying the built environment, allowing for greater synergy between traditional and digital means of analyzing the development of architecture and urban form. Advancements in integrative and digital approaches to the study of the historic urban environment is becoming of increasing necessity for scholars. This paper prepared a case study and methodology ready for virtual deployment in order to provide new views and insights into one specific layer of the urban and architectural fabric of Rome through an examination of medieval residential façade porticoes. Making elements of the city that are invisible to us today visible once again.

At the moment comprehensive texts and instruments that allow architects, designers, historians, planners or even students the ability to understand the complex layers of a city's urban environment are limited. The case study examined in this thesis is ready to be uploaded to a digital tool that allows for such exploration of the built world. Through the development of one such research tool with the Historic Urban Environments Lab at the University of Notre Dame (HUE/ND), the findings of this paper will be added to a website and digital application for public use and study of one specific layer of Medieval Rome. This digital research tool allows for visualizing and analyzing the built environment and its evolution virtually, through the integration of traditional methods of creating images including drawings, maps, plans and other archival source materials with the latest optical technologies that utilize modern day instruments to assist in answering

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the questions left by the existing remnants of the past.

In order to prepare traditional research material for digital application, the collection of primary archival materials is necessary including: images, maps, plans coupled with secondary source materials. In the current study, the visible remnants of medieval residential porticoes throughout the city of Rome were identified, geo-located, documented on site in the form of measured drawings and photography. This onsite data was then coupled with archival data in the form of historic plans of residences dating from the fifteenth-seventeenth centuries. In addition, historic views, photographs and restoration drawings were then examined and combined with maps of the city to provide a comprehensive geo-database. This data then can be added to an interactive website that can house all of the content of this study for virtual exploration that combines textual sources, advanced computing, GIS and geo-location, data mining, and scholarly input. This data could then be added to a website that includes features such as a digitized full text searchable publication, a searchable image gallery that contains all of the images from the study, layered historical maps, a large plan of Rome with each neighborhood and case studies highlighted and described, with room for additional scholarly content. Images and text can be recreated virtually, presented through a book reader software program, and searchable through optical character recognition. The website will allow the user to build and create specific content that can then be transferred to a mobile application. Allowing for a customizable experience that can be brought into the field focusing on a particular neighborhood or route. For example, this project examines historic urban street patterns in relation to the location of medieval porticoes, relying on contemporary cartographic data. In this study, historic maps and cadasters are redrawn to create illustrated map layers that can be searchable digitally.

Conclusion

Traditional research methods carried out in the field for this paper in the identification and documentation of the medieval residential porticoes of Rome, in the form of measured drawings, photography, geo-location and examination of archival resources has provided an ample case study ready to be explored digitally. The information gathered in this thesis is the beginning of a greater attempt to find ways of breathing new life into print scholarship, allowing it to be housed not only in the confines of the pages of one book but also to simultaneously reside alongside other sources of information and explored in new and vibrant ways. This paper allowed for the development of a methodological approach to data acquisition and examination of architecture and the built environment that could easily be studied in both traditional print media and on the web. In this particular study, it will be possible to begin to explore medieval Rome in new and exciting ways.

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The life-cycle of the city: a morphological perspective

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Abstract. *Over the last decade, we have been witnessing the progressive weakening of the so-called "Network City", indented as the sheer embodiment of the globalization driving forces. This phenomenon mostly occurred because of the worldwide crisis of finance, which was the propellant of the mentioned urban model. It progressively delivered an increasing amount of waiting lands and building vacancies over the territory. Emptiness suddenly appeared as the most preeminent evidence of the market deficiency, replacing the well known "culture of congestion". Recycling seems to be the immediate reaction to the building standstill and it is nowadays widely accepted as the most promising strategy to face the crisis of the city, especially within Europe. This statement brings us to deeply reflect on the city in the perspective of its life-cycle. In that respect it becomes fundamental to reconsider the forerunning contribution of Urban Morphology and Building Typology. In fact this discipline, since the second half of the '50 of the XX century, because of the necessity to reconstruct Europe after the Second World War, was pioneering the necessity to read the Form of the city beyond any ideological prejudice, superseding the Modern approach. As a consequence of this attitude, the city was even more intended as a "manufact" constantly transformed through the different historical epochs. This paper intends to offer a complete reflection on these premises to define appropriate operative devices in the contemporary condition to build a promising future for our cities.*

Keywords: Globalization, Network City, Crisis, vacancies, recycle

The "Network city" and its crisis

Over the last decade we have been witnessing the effect over the territory of the worldwide crisis of finance, intended as the main propellant of the globalization processes. As an immediate consequence, one can remind the progressive weakening of the "Network city" (Marzot, 2006 i). This urban model was intended, since its inception, development and forerunning application, to take over the role of Planning in the management of the territorial transformation and to supersede it with urban and territorial marketing strategies. To achieve this purpose, finance was promoting massive investments in the field of multimodal infrastructure to group existing cities into clusters, considered coherent to specific economic goals, according to a top-down strategy. This overarching process was developed at the expenses of national and local interests, almost completely disregarding the effects produced onto the already established communities.

Therefore, if the "Network City" was apparently unfolding an unlimited capacity to multiply opportunities, by increasing movements of people, goods, information and resources, it was pursuing its goals by being very selective and exclusive with respect to the existing framework. As a side effect of this overarching strategy, the dominant urban model

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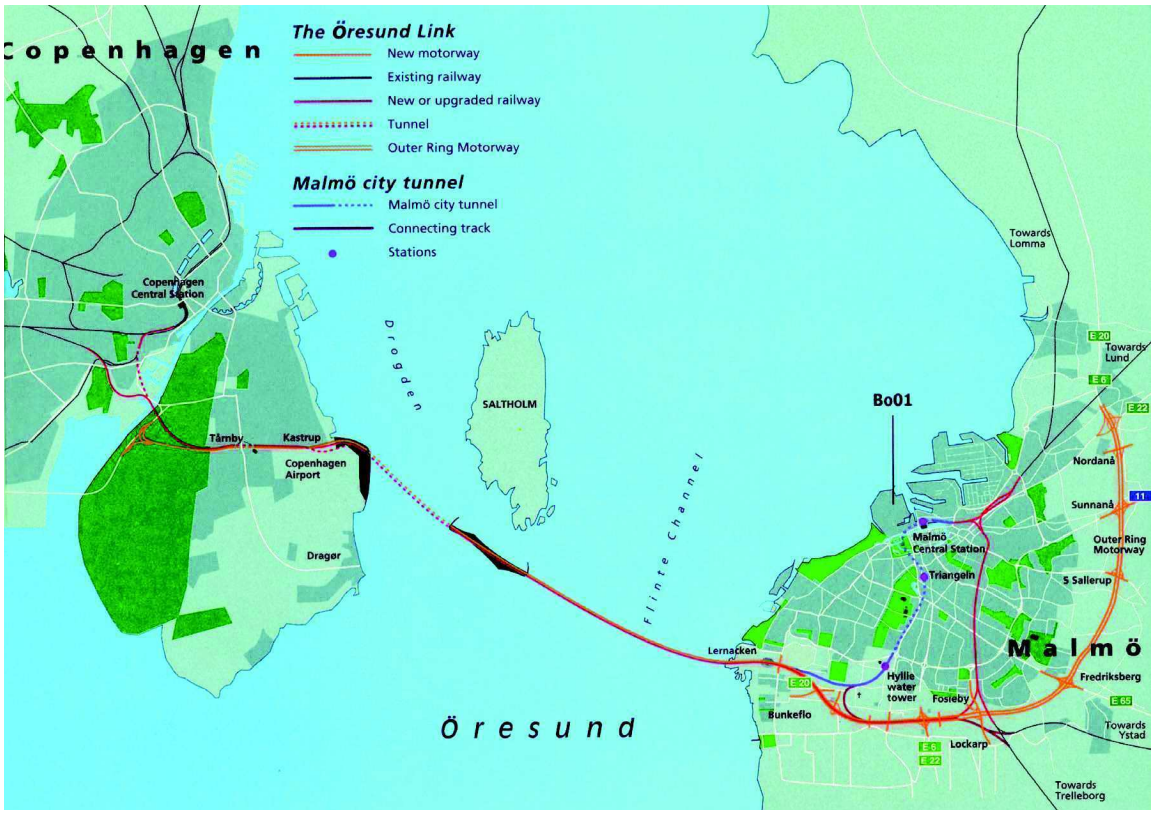

Figure 1.

(The Øresund Bridge autonomously generates the most important multimodal logistic hub of the entire North Sea, completely subverting the local dynamics from an out-of-control perspective, generating a transnational model to be experimented and tested. The Swedish compound of BO 01 in Malmö, on the opposite side of Copenhagen, is then delivered as an exclusive residential district conceived for a cosmopolitan custom. It appears neither part of the existing regions nor belonging to a new expected one, remaining suspended into a sort of "nihilistic" international nuance).

was producing as well an increasing amount of social, economic, political and cultural "residuals". If transformations had been occurring systematically over the history, the specificity and the uniqueness of the mentioned phenomenon was that it was explicitly hetero-directed, or driven by forces external to local interests, inhibiting the possibility of the latter to reclaim a stance in guiding the process itself and its consequences. Globalization therefore, tacking a sort of technocratic command over the territories, explicitly acted performing an out-of-control process of systematic de-legitimization of the local identities.

Not by chance, limiting our discussion to the European Institutions, they were considered unable to face the situation and, to some extent, even more blamed to accomplish the explicit interests of the international credit system. The "Network City" model was therefore instrumental to promote a systematic process of territorial colonization, exploiting local resources, destabilizing existing power relations and promoting a condition of permanent state of thread (Figure 1). Theses premises justify an increasing demand of sustainability of the economic decisions, widespread all over the world in the last decade, and a progressive shift in cultural paradigms. If the "culture of congestion" (Koolhaas, 1978) was therefore considered the main intention pursued by globalization processes, nowadays the accent is on "reclaiming the residuals", putting on the fore the territories and their unavoidable necessities.

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From the "culture of congestion" to the culture of recycle

The "Network City", by promoting infrastructural multimodality to organize existing cities according to economic clusters, was systematically excluding those parts of the territory, and the related subjects, which were not considered instrumental to its main purposes, dooming theme to exist in a permanent peripheral state. The side effect of the "culture of congestion" was therefore the widespread abandonment of areas and buildings whose position was far away from the most prominent hubs of the newly established logistic routes. However we cannot underestimate the reclamation process which almost immediately happened in those areas. Being mostly secluded by the new centers, they were in fact witnessing the emergence of new enterprises and subjects related to very specific local conditions.

Simultaneously, post-industrial Brownfield close to strategic location of the "Network City" were progressively witnessing the effect of the territorial deconstruction and disconnection by suddenly exceeding contextual limitations, being targeted by considerable investments. By beneficing of the new urban phenomenon they were undergone to huge transformation project, becoming hybrid multi-functional complexes. However, the distinct character of the Hybrid is not the coexistence of a wide range of activity. This is just the side effect of a sudden "leap in scale" (Koolhaas, 1978), which explicitly acts as its main cause, occurring because of agents of change systematically acting from the outside, disregarding the already mentioned operating constrains (Marzot, 2006 ii, iii and iv).

The crisis of the "Network City" model therefore came to insist on an already existing intricate and compromised situation, additionally promoting an increasing delivery of waiting lands and vacant buildings, derived by frustrated expectations of investment and/or bankruptcy of newly established enterprises, especially affecting the "Great Distribution System": business parks, leisure centers, industrial areas and logistic hubs. A new condition of "emptiness" started promoting the idea of the city as a threatening "landscape of ruins". This phenomenon was mostly provoking a twofold reaction. On one side it was leading to a self-satisfied romantic acceptance of the situation, intended as the "glorifying evidence" of the financial capitalism's ultimate defeat, and then to be preserved as a permanent Monument of its aporias. On the other, it was promoting an increasing interest for the culture of "recycle". Not by chance, this was leading to revaluate recent precedents of this attitude, as the Japanese "Metabolism" (Koolhaas and Obrist, 2011) and the so-called "Dutch Structuralism" (Risselada and van den Heuvel, 2006), both operating in the field of Architecture. The former was considered a symbolic inheritance of the traditional urban landscape after its dissolution, because of the second world war, sublimated by the support of the building industry. The latter was explicitly assumed, not by chance during the same period, as the possibility to reconsider the legacy of Modernity (in particular its mission to provide a framework for future development) in the perspective of social accountability and collaboration, to partially counter the overwhelming power of technocratic bureaucracy in compliance with building industrialization processes. A third approach was progressively flourishing in Italy, thanks to an internationally successful exhibition, hold at the MAXXI in Rome in 2011-12 (Ciorra and Marini, 2011). By collecting a considerable number of well known case study, ranging from territorial reclamation to architectural reuse, the emphasis was put on the possibility to regenerate the existing, forecasting the idea of grounding the inception of a new world on the critical inheritance of the previous one. The consensus manifested in favor of the proposal, and its later translation into an important research network, Re_cycle Italy, still nowadays unfolding its fascination over the design practice and the theoretical reflection, confirms the increasing expectation from an even wider audience regarding the "culture of recycle" consequences on a political, economic, social and cultural level.

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The life-cycle of the city: aporias of the Modernity and the contribution of Urban Analysis

Not by chance the premises of the resurgence of interest on the phenomenon of the recycle have to be found into the so-called "parasite architecture" (Marini, 2012). It elicits the conviction that architecture could nurture itself from architectural precedents, intended both as material evidences of existing buildings and/or still living images and ideas regarding it. This is clearly a post-modern assessment, whose relevance, not by chance, was fiercely and systematically supported and widespread by Urban Morphology and Building Typology, starting from the '50 of the last century onward, to counter the Modern prejudice to derive architecture from scientifically accepted functional requirements, not being conditioned by the past (Marzot, 2002 and 2014).

Saverio Muratori has the indubitable merit to have been a pioneer in the field. By focusing on the urban history of Venice, viewed from an architectural perspective, he was witnessing, through a systematic survey campaign of its centre, developed in close collaboration with his students, the endless process of derivation of the city from a previously established form, by selecting its basic components through a critical transformation of its framework (Muratori, 1959/60). Later on, he got confirmation of this "derivative approach" by similarly working on Rome, finding additional archeological evidences and promoting the birth of a promising school which is still nowadays very fertile, at his fourth generation, on an international level (Muratori, 1963).

Carlo Aymonino, however paying respect to the leading role of Muratori in Urban Analysis, stresses the impossibility of reestablishing a derivative process of contemporary architecture from the past, if not into "ideal" terms. In fact, deeply investigating the transformation occurred in the field of urban design, emerging since the Bourgeois society onward, he recognizes the advent of the Plan and the dialectical relation between Architecture and Planning, as unavoidable changes that resist to Muratori's claim (Aymonino and Brusatin and Fabbri and Lena and Lovero and Lucianetti and Rossi, 1970). In addition he strongly supported the thesis according to which Modernity, since its inception, brought to the fore unexpected functional requirements asking for specific prototypes, not accepting anymore to adapt existing buildings to new purposes, as it happened before.

Aldo Rossi, a former pupil of Aymonino at the IUAV in Venice, was progressively developing an original stance, in order to find a possible common ground between the aforementioned positions. By analyzing the process of progressive "consumption" of existing "urban facts", at the end of their own life-cycle, he was finding historical evidence of the existence of Architectural Form as what transcends any previously manifested functional requirement and/or conventional value. Once deprived of any possible conditioning factor, according to the author, Architecture is doomed to become a "primary element", ultimately reduced to its basic internal logic arrangement (Figure 2). Rossi implicitly refers to it as "the Being of Architecture", while its explicit metaphysical order, manifested through meaningful drawings, identifies with a rediscovered "Hyperuranion", endlessly floating between a "not anymore" status and a "not yet" one. This assessment justifies the incredible international audience reached by Rossi's position (Rossi, 1966). To some extent, it seemed possible to his followers to recap a critical stance with respect to Functionalism, simultaneously reevaluating the role of Rationalism both in the design theory and practice.

Among the many who supported and widespread Rossi's intuition we can at least enumerate Peter Eisenman and Manfredo Tafuri. The former was strongly fascinated by the possibility to reduce architecture to its internal syntactical order, finding evidence of a "Transformational-Generative" grammar, derived from Noam Chomsky's linguistic and intended as the deep structure upon which is grounded any existing language as well as the promise of any possible future (Eisenmann, 2006). The latter was attracted by Rossi's self-satisfaction for the "poetry of the fragment", instrumental to a polemic position towards capitalism, supported by his strong belief in the role of Planning (Biraghi, 2013). However,

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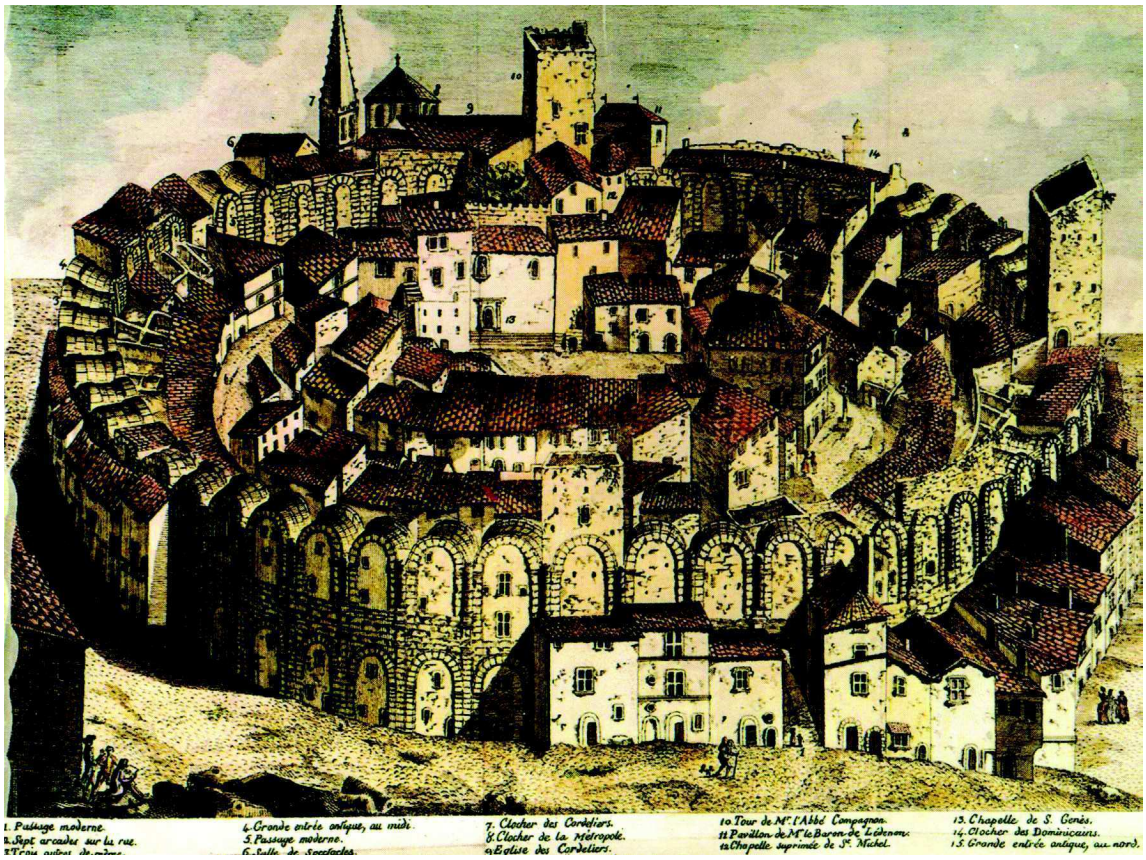

Figure 2.

(Engraving of Arles' roman amphitheatre after the Empire fall, XVIII century. Aldo Rossi finds archeolo gical evidences of the survival of Form, calling it "primary element", through the process of "consumption", and successive abandonment, of already existing public monuments of the past. Assuming this metaphysical permanence, beyond historical epochs, as the grounding principle of the architectural practice, and naming it Composition, the latter becomes the "natural environment" into which architecture establishes its valuable horizon. As a consequence, neither the conventional value of architecture nor its functional necessity are questioned. The dualism between the idea and its materialization duplicates, in the disciplinary field of architecture, the Enlightenment's dichotomy between rationality and its sheer application).

the Italian historian was also suspicious about the possibility, somehow evoked by Rossi's drawings and design proposals, to ground into the newly established metaphysical order a new form of disciplinary status, intended as a reinterpretation of J.N.L. Durand's Compositional Partì (Aureli, 2008)

Gianfranco Caniggia, a former pupil of Saverio Muratori, succeeded to accept the critical challenge launched by Aymonino's sincere belief on the dialectical relation between Architecture and Planning, additionally superseding Rossi's implicit accomplishment for an "Absolute Architecture", by inheriting Saverio Muratori's legacy regarding the idea of the derivative process of architecture from architecture. This result was achieved through a tight sequence of interrelated concepts. To explain the condition into which architecture finds itself at the end of its life-cycle, he introduced the definition of "substratum". The term describes architecture once loosed the functional requirements and the conventional value it originally embodied. As such, it presents itself as an indeterminate "matter", available to transformation. To explain the process through which architecture is progressively transformed and made instrumental to new purposes he introduces the definition of the "building type". It expresses the concept of "inhabiting" into specific conditions of space and time. It has a circular quality. In fact, with respect to an existing "substratum", weather it is natural and/or artificial, it is "analytic a

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posteriori", since it results from a tentative process, made via trials and errors, of selection and combination of existing evidences, collected and arranged according to behavioral parameter. However, with respect to an already established framework, achieved through experimentation, it is also "synthetic a priori", representing the way the inductive process is then translated into a deductive project, to be applied to transform a natural environment into an anthropic one (Caniggia and Maffei, 1979).

The effects unfolded by the type cross though multiple horizons, all responsible to set a specific historical epoch, which correspond to different levels of complexity: the architecture, the building, the city and the landscape. These horizons are literary co-centered and coherent to the human being's achieved framework. This also implies they are doomed to change according to his position within the experimented world, shifting perspective accordingly.

The epistemic foundation of the aforementioned concepts is based on the relation between the body and the environment. While the former is meant to be a coherent unity and self-sufficiency between the "psychical" and the "physical", the latter is intended to identify with the state of indeterminacy which preexists to the human being's behavior. However the relation is not pre-determined by automatic reactions to external stimuli, as it happens to animals, which are guided by instincts. From this assessment one derives that the relation is "tentative", or made via trials and errors, and then it orientates the specific modality of appearance of the anthropic process. The human being then emerges by comparing the different data deriving from repeated experiences, grouping them into "classes" and combining them according to mutual "correspondences". In fact, through multiple exercises he progressively "inscribes" his brains, changing and empowering its networking capacity, achieving a consciousness of the relation between the behaviors and the obtained results, finally becoming a man.

Once he gets a very specific kind of awareness, he finally can use it to properly act with full responsibility, to conform the "indeterminate real" to a "determinate reality". The framework allowing this specific way of acting is called "type". It then implicitly encompasses the ensemble of all the singular experiences, made through praxis and theory, translated into their conceptualization, which identifies a representation of the former. This is extracted from the real and then abstracted from it, constituting the base of the language, necessary to obtain a consensus among the different subjects belonging to the same community. This procedure defines the "common" upon which is grounded politics, from whom derives a shared logic, economics, ethics and esthetics (Marzot, 2014).

From culture to nature. The great projects

Interestingly, the previously mentioned relation between the body and the environment is the foundation of Modern Anthropology as well. Not by change the "processual typology" shares with this discipline its "structural" principles. In fact, what remains mostly implicit within the experimental practice becomes explicit within the corresponding body of knowledge. In between the two, what literary comes into existence is the capacity to conceptualize the singular experience, to define a language to share the experience, to exert politics to take common decisions on different subjects (Searle, 2009). The man appears therefore as the history of the process of adaptation of the body to the environment into which he operates.

However, from Rousseau onward (Rousseau, 2004), the ambition of Modernity is to explicitly deprive the human being of any historical and conventional constrain. To demonstrate that the latter are nothing more than "incrustations", unduly limiting the possibility of the former, the shared intention is to bring him to a newly rediscovered "state of nature", where he can perform according to his unlimited capacities. Not surprisingly, the originating argument reformulates that used by the former Fathers of the Christianity to counter the domination of the Roman Empire, as the indictment of Paul elicited in the "Letter to the Romans" still reminds us (Paolo di Tarso, 2000).

In such a way, Modernity apparently

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recognizes the grounding role of the relation between the body and the environment. However, the relation is brought to a paradoxical position. In fact, once the environment is reduced to the natural one, removing the cultural, the human being is unprecedentedly assumed as "centered" with respect to the nature, defined as his newly institutionalized unlimited horizon. The combination of these two arguments causes an anthropological "short circuit". The human being is not anymore a goal, as previously warned by Kant in his Ethics (Kant, 1991), and later confirmed by Hegel in his Phenomenology of the Spirit (Hegel, 2000). On the contrary he is intended as a "given" prerequisite, whose Destiny is to reveal what was already "placed" at the beginning of the process- Rationality- as the principle upon which every phenomenon is implicitly grounded (Figure 3). Paradoxically, it seems that Modernity cannot afford to let the man looses himself anymore. Not having anymore the chance to experience the unlimited, relying on senses, being condemned to just think it, the above mentioned presumption is verified by men following the scientific method as main instrument of investigation, formulating hypotheses, inventing new models of interpretation, producing new techniques to apply them into the real, evaluating the results and temporarily assuming them as law, if confirmed by the newly constructed reality (Calvino, 1972).

Faith and Mathematics seem to develop the same prejudice. In fact, what the Christianity considers a Dogma instrumental to refund a society previously instituted on inequality, Modernity aims at transforming into its legitimating principle, making explicit its ambitions with an unprecedented Manifesto: "The Crisis as a Project" (Biraghi, 2013). Schopenhauer is the first to recognize it, defining the human being "official of the species" (Schopenhauer 2009), followed by Nietzsche (Nietzsche, 1972) who revaluates the Dionysiac background of any conscious life.

The bourgeois society coherently institutionalizes the Plan as the dogmatic representation of the above mentioned implicit rationality, which provide a framework to

Figure 3.

("Essai sur l'architecture", Laugier's book frontispiece, second edition, 1755. The allegory of Architecture. The picture has a twofold level of ambiguity to discuss. The former consists in what the definition of allegory implies. In fact its etymology (the Greek terms ἄλλος and ἀγορεύω) refers to a discussion into public about that condition of "otherness" which precedes the definition of "publicness" itself. The latter refers to the iconographic and iconological perspective through which we look at the content of the representation, which implicitly questions the legitimacy of its rational meaning. The image describes a woman, Architecture, holding with her left hand a compass and a square ruler. She is sitting on a landscape of ruins, evidences of the architectural order, metaphor of its past conventional identity. She is pointing with the right hand the primitive hut, assumed as the natural goal towards which should be focusing the Genius, or the dynamic energy of any kind of regeneration process, metaphor of the Enlightenment's search for creativity. The manifestation of the "daimon" is allegorically invited to reveal what was already "placed" at the beginning of the process, i.e. Rationality, as the principle upon which every phenomenon is implicitly grounded. Because of Modernity, the Project is replaced by the Destiny, and the human being is doomed to please it)

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develop the human actions and conditions his way of behaving. The man's duty is then to operate within the newly established horizon, revealing its unlimited Bigness (Koolhaas, 1995) and absoluteness (Aureli, 2011). Therefore the architectural practice asymptotically aims at confirming the growth's prejudicial prevision of the Plan, inaugurating the unceasing season of Le Grand Travaux.

From nature to culture. The small practices

The impossibility to fulfill the prevision of the Plan is established by the Plan's configuration and provision of soil. Its horizon cannot be achieved. Its identity is necessarily "out of scale": if not it would imply the human being's capacity to claim and control it, which is not acceptable at all, because this would lead to contradict the grounding principle institutionalized by Modernity itself, identifying the Rational with the Sacred to manage what is literary "out of reach" of the human being. The objective is systematically frustrated and inevitably leads all the mentioned hypotheses to be accumulated within a real and metaphorical "graveyard of the broken dreams". In fact being Modern, since the very beginning, implies not to be conditioned by precedents, to physically and psychologically remove the past (Marzot, 2013), especially the self-produced one.

Nevertheless any crisis generates debris. Modernity simply hides them or dedicates to them a new species of monuments, in the form of landfill. The life-cycle of the city is substituted by its linear progress. The recent crisis of Globalization is an explicit standstill to the idea of a never-ending expansion of control capacity, claimed by an all-encompassing Infrastructural Technique, over an ever increasing extension of earth, systematically transformed into soil, which is assumed as the product of the former rational transformation. A growing amount of "residuals", ranging from waiting soil provisions to vacant building, is therefore potentially offered as a second-hand land to re-colonize for the sake of the community, experiencing the new dramatic condition (Oswalt and Overmeyer and Misselwitz, 2013). This seems to be an opportunity to carefully collect. However this implies to previously free it from that constrain system which is still embedded into the ground, marking the earth with invisible but still resisting and powerful limitations, institutionalized by the Plan (Schmitt, 1991). This seems to be the unique "war of civilization" worthy to be fight nowadays.

Conclusion

The culture of the re-cycle is apparently meant to be the correct answer to the current crisis of the city and its architecture. However we should not simply consider that culture neither a new ideology, extending its legacy beyond the specific necessity resulting from the current situation, nor the sheer expression of an actualized Zeitgeis, limiting its role to face the main issues prompted by the crisis itself. On a broader perspective, the recycle fully challenges the modern way of living, dwelling and thinking, literary projecting ourselves towards a post-modern society.

Not by chance, over the last decade we have been discussing about the so-called "circular society" (Bonomi and Della Puppa and Masiero, 2016) as the necessity to get rid of the linear one, supported and promoted for at least a century by the modern economy of production. Notwithstanding it seems evident the necessity to ground the "coming into existence" of the emerging society on the critical transformation of the existing one, the ontological implication of the mentioned metabolic process are still vague and unclear.

Some outstanding precedents can highlight our gait. At least we have to mention Georg Simmel (Simmel, 2006) and Marting Heidegger (Heidegger, 2002). The sociologist argued about the necessity to get rid of the dichotomy between the nature and the landscape, considering the former as a state of indeterminacy and displacement from which the human being has to emancipate himself to survive within an evident unhomely condition, being aware of the fact that every definition and delimitation is doomed to come back to that originating "estrangement", because of the

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Figure 4.

("Campo Marzio dell'Antica Roma", 1762. Giovan Battista Piranesi pushes to its extreme an imagined process of dissolution of the Roman heritage, transforming the field into a congested "landscape of ruins", into which coexist fragments resembling well known buildings with fictional ones, blurring into an "uncanny" atmosphere. Architecture, reduced to particles suspended into a limitless time, awaits for a possible claim In such a way, what was initially perceivable as a self-sufficient social reality, suddenly leaves room to a virtual condition potentially supporting new experimental approaches, progressively appearing in between the residue's interstices.)

endless flow of birth and destruction of things. The philosopher heavily criticizes the modern interpretation of nature as a simple resource to exploit and the implicit reduction of its "being" to the instrumentality of its "entity".

In both cases it is manifested the intention to put into discussion the idea of a metaphysical truth which exists independently from the fluctuating relation between the human being and the environment into which he operates, and the necessity to define the Truth as the never-ending emergence from a condition of

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latency, made possible by constantly evoking it through the mentioned relation. The recycle is literary what makes possible that emergence. As such, it is a circular process witnessing the "continuous discontinuity" between matter and material, subject and object, grounded on the necessity of the mutual implication. But the relation is doomed to change in accordance with the specific phase of the recycling process.

Regarding this aspect, the typological process is the expression of the recycle process in a morphological perspective. Not by chance, the typological process describes the never-ending transformation of an operative concept of "inhabiting" at the different scales, or levels of complexity. The crisis of this concept, which is distinguishing an historical epoch from the one that precedes and the one that may follow, expresses the crisis of an entire system of knowledge and the necessity of reestablishing it. The re-institution of the system is not the restoration of an existing one, but the creation of the new one. This is the deep significance of the so-called Restauratio Urbis.

Its coming into existence therefore requires an experimental phase using what already exists, and proceeding according to a tentative way, via trials and errors. The experimental phase is therefore assumed as the "uncanny" of architecture, since what emerges from the relation between the human being and its environment is to some extend familiar and estranger to him, belonging to the unconscious dimension of what has been removed by the crisis but progressively reemerged because of the desire to emancipate from the crisis itself. What has been removed by the crisis is nothing but the limits, in terms of values and functional requirements, deconstructed because of the decadence of the type concept.

To reestablish new limits then asks for a systematic reflection about what results from the experimental phase. This justifies why it is not possible to distinguish the praxis (what we do) from the theory (what we know about what we do): in fact by doing we stimulate our capacity to observe what we are doing, increasing the possibility of translating the practice into a new system of knowledge. The emerging data are then classified to be comparable, in order to discuss the different yield of the results. The discussion is nothing more that the emergence of the political phase, reflecting the necessity to take decisions about the available solutions. Through the discussion it is literary enhanced the sense of the "common" as the possibility to emancipate from a singular experience of the relation between the body and the environment, entering into the collective one. But this phase requires a shift in perspective. A leap is needed from the expression of a relation to its representation.

The representation is therefore nothing but a project, establishing what is considered valuable among the members of the emerging community. This project is the type. What was previously experienced by singular subjects, and then conceptualized to be discussed among them, is ultimately translated into a Form. The power of the Form derives from the fact that, from that moment onward, any action within the community will be conformed to that Form and that form is then responsible of the activation of a social reality, embodying a new historical epoch. In such a way we witness the smooth transition from common responsibility to the individual one. While the former derives by representing the taken decision, the latter comes from its application. This is the deep sense of the so called Storia Operante (Muratori, 1959/60). By consciously applying the type concept, anyone becomes part of an instituted social reality of which he was a former instituting member by taking part to its discussion, based on the uniqueness of the singular experimentation.

The common requires the singular, but also imply a process of progressive delimitation of what is possible, for the sake of a societal living. Without this limitation we endlessly experiment possibilities not exceeding the singularity of the phenomenon. This is why phenomenology cannot explain the coming into existence of the type and consequently of the society. This requires an abstraction exercised on the uniqueness of the experience, however extracted from it, and both these aspects ask for rational decisions. Not by chance the logos, upon which the rational is based, is literary the "discourse about what manifests itself". It requires a mediation. The mediator is the capacity to conceptualize, to keep a distance,

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which means to translate an experience made through the real body into a metaphorical body of knowledge.

Since Plato onward, our system of knowledge was based on the refusal of the body, unduly considered a resistance to the possibility to achieve an objective knowledge about the world. He than was developing a system where concepts were substituted by ideas. While the former were subject to experience, being extracted and then abstracted from it, as we have demonstrated through the combination of phenomenological and rational arguments, the latter were grounded on metaphysical premises, deprived of any reference to existing limitation, considered prejudicial. To make it possible Plato was obliged to deconstruct the previously assessed way of thinking, doming it to is ultimate crisis (Platone, 2011).

Once again Urban Morphology already describes this process by explaining what happens to architecture at the conclusion of its life-cycle. It is progressively translated into a ruin, a brutal fact deprived of the Form it was carrying on to consciously represent a social-historical investiture, witnessed by the type. It substantially remains a logic deprived of its raison d'étre, ultimately resulting into a mute ensemble. The collection of all the residues, deriving from the type's fall into crisis, whatever is its motivation, is endlessly enriched by all the experimented solutions literary "removed" at the end of the political discussion necessary to give birth to the type itself. The aforementioned collection assumes the configuration of a "collage" (Figure 4), suspended between a world which is not anymore and a not yet one, while its interstices allow for the "substance of hopeful things" (Persico, 1945). The recycle process implies that we accept the challenge of the whole procedure. Forgetting it would imply to betray its principles. In fact, the recycle claims for and endless change of phase of the architecture, grounding on it the possibility of the architecture existence and significance.

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The effect of buildings on atmospheric turbulence in open spaces in Western São Paulo State, Brazil

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Abstract. *This paper seeks to identify a pattern of air turbulence that reflects the effect of buildings on air turbulence characteristics measured in open spaces in Western São Paulo State, Brazil. Atmospheric turbulence was estimated using high-frequency observations of the three orthogonal wind components (u, v, w). A CSAT3 sonic anemometer from Campbell Scientific Inc. (CSI) was deployed on the roof of a building, and the turbulent components (u', v', w') were systematically measured and recorded at 0.1 s and 5 min intervals, respectively, over 100 days between the end of summer (March 2015) and beginning of winter (July 2015) with a CR3000 automatic data acquisition system (CSI). The data analysis took into account the diurnal and nocturnal variability of the turbulence, and the experimental results revealed the existence of a daily vertical circulation pattern. The w component varied between 15 and 45 cm.s-1 on average, and the turbulent fluctuations observed indicated that an ascending component with a speed of up to 1 m.s-1 predominated during the middle of the day and early afternoon. Throughout the night until the early hours of the morning, a less robust, subsiding component with a speed of up to 0.5 m.s-1 was observed. The mean horizontal flow (u, v) was low-speed (around 1 m.s-1) and predominantly from the southeast. There was a consistent change in the direction of this wind, which changed to easterly during the morning as the ascending branch developed. We propose a model for air circulation close to the surface in which this change in direction of the wind is the main effect of the building on the observed turbulence.*

Keywords: Built environment, sonic anemometer, atmospheric turbulence, open spaces

Introduction

Turbulence is not completely random; it is almost random (STULL, 1988). When fast-response sensors are deployed in an open space on top of a building, the signals corresponding to eddies blown by the wind appear to be random. However, when these signals are examined carefully over a long period, a statistically robust signal can be observed. This study seeks to determine the robust component of turbulence and separate it from random fluctuations under the hypothesis that the nature of turbulent fluctuations in open spaces can only be analyzed if we know beforehand the non-random component of the turbulence, which is influenced by the building the sensors are mounted on.

Convective turbulent fluxes of sensible heat and latent heat were quantified for the first time in studies of energy balance on a natural surface using the vapor pressure and temperature gradients observed by Bowen in 1926. In subsequent decades urban surfaces have evolved considerably, and natural surfaces have been replaced by cities that store increasing amounts of anthropogenic and natural energy

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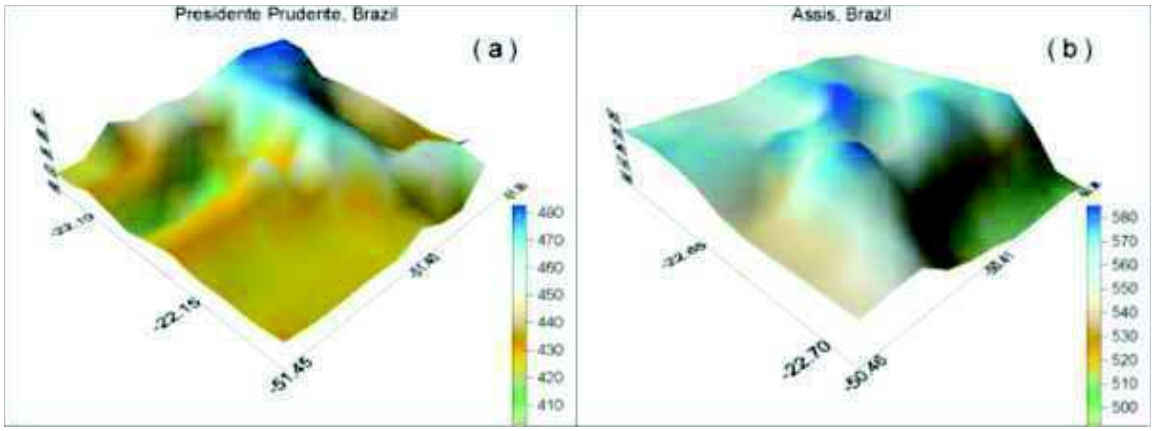

Figure 1.

Geographic location and sampled topography in meters above sea level for urban Presidente Prudente (a) and urban Assis (b) in Western São Paulo State.

and modify the surface ventilation and energy balance (Ribeiro and Azevedo, 2003).

Major efforts have been made since 2006 to analyze in detail the spatial and temporal distribution of radiative and turbulent fluxes inside the urban canopy layer in the state of São Paulo, initially in densely urbanized areas in the east of the state (Machado and Azevedo, 2007; 2013) and from 2012 in the west of the state (Barboza and Machado, 2015), where urbanization is in its early stages.

In light of this, it was decided to carry out a controlled field study to investigate atmospheric turbulence patterns close to the surface. It is reasonable to suppose that, in addition to being influenced by the vehicle fleet and large numbers of pedestrians (Azevedo, 2004), turbulence is influenced by the position of buildings in relation to the sun and wind and their exposure to these. This would support the validity of observations and estimates of turbulent flows acquired on built structures close to the ground and in the middle of open spaces.

Eddy correlation method

Because of the turbulent nature of air, all atmospheric entities show short-term fluctuations around a longer-term mean fluctuation. Eddies move continuously around surfaces, from which they derive their properties. Hence, an entity (s) can be said to consist of its mean value ( ) and a fluctuating component (s') (Oke 1987, p.376) so that:

$$S = \overline{S} + S' \quad (1)$$

where the bar indicates a mean time-averaged property and the dash the instantaneous deviation from the mean. Figure 3a shows very clearly how fluctuations in the vertical component of the wind (w) and temperature (T), for example, combine to produce the instantaneous sensible heat flux (QH). The intensity of the instantaneous flux is calculated from the mean of the product of the intensities of the fluctuations, a technique known as eddy correlation.

The diurnal and nocturnal evolution of the three wind components (u, v, w) and their turbulent fluctuations (u', v', w') can be analyzed in detail with the aid of a Campbell Scientific Inc. (CSI) CSAT3 sonic anemometer using the relationship described in Equation 1.

Observation of the vertical component of turbulent fluctuations (w') is particularly useful for estimating turbulent convective fluxes of both sensible heat (QH) and latent heat (QE), the main fluxes responsible for dissipation of energy stored in a built volume (ΔQS). The variability of ΔQS is proportional to the difference between the energy sources and sinks and can be defined in terms of a balance:

$$\Delta Q_S = (Q^* + Q_F) - (Q_H + Q_E + \Delta Q_A) \quad (2)$$

where Q* is the density of the net radiation at all wavelengths observed directly with a Kipp & Zonen (KZ) NR-LITE-2 net radiometer, ΔQA represents the heat advected by the horizontal components of the winds (u, v) and QF

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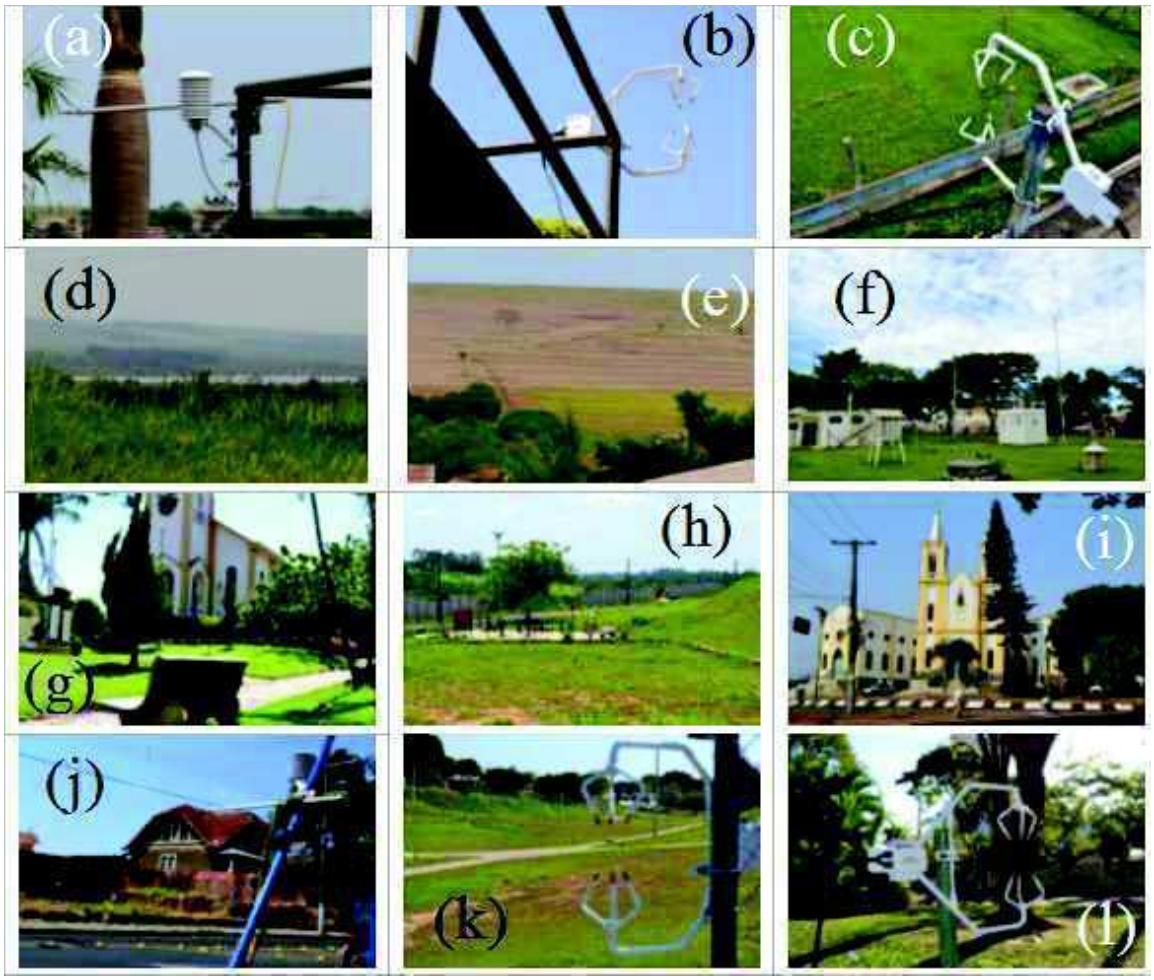

Figure 2.

Net radiometer, pyrgeometer, thermo-hygrometer (a) and sonic anemometer (b, c) deployed on Padre Francisco Penskoffer Square in Iepê (g), near a dam (d), near a plowed field (e) and at the FCT/UNESP meteorological station (f). Open spaces in Presidente Prudente (h, i, k, l) and historical heritage in Assis (j) (modified after Machado, 2016)

represents the heat produced by human activity. An inventory of QF for specific activities has been compiled for Western São Paulo State (Finati and Machado, 2015); the values of QF in this inventory are one order of magnitude smaller than the values for Q*. It should be stressed that all the terms in the surface energy balance are heavily influenced by the different types of atmospheric weather that predominate in the area (Pradella, 2014). For this reason, to highlight the effect of the surface on the temporal variability of turbulence, a sample of 100 days of observations was taken starting at the beginning of the dry season, when clear skies tend to predominate.

A brief characterization of the locations where turbulent fluctuations were monitored

Western São Paulo State is the westernmost region of the state of São Paulo and is located at the meeting point of the Paranapanema River and Paraná River valleys. The largest city in the study area is Presidente Prudente (22°07'47"S, 51°24'31"W), which is approximately 600 km from the Atlantic Ocean and 400 m above sea level. The municipality extends over some 562 km2, most of which is rural, and the majority of the 200,000 inhabitants (IBGE 2012) live in a densely populated urban area of around 30 km2.

Campaigns were carried out in Presidente Prudente and then in the towns of Iepê and

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Assis, to the southeast of Presidente Prudente. Figures 1a and 1b show the main features of the landform in the region of urban Presidente Prudente and Assis, respectively, in the extreme northwest and southeast of the study area. Topographic sampling and georeferencing during the 2012 campaign showed that the mean altitude in Presidente Prudente is approximately 100 m less than in Assis. The landform in the Iepê urban area is significantly simpler than in Presidente Prudente and Assis and is therefore not shown. It consists essentially of a steep west-facing slope close to the bottom of the Paranapanema River valley and some 500 m above sea level. The Assis urban area is located on the edge of an intermediate terrace, while Presidente Prudente is located on a broad ridge.

The landscape in towns and cities in Western São Paulo State is characterized by a great variety of urban forms, a typical feature of contemporary Brazilian landscape (Macedo, 2012). In recent years the contrast between open spaces, such as squares, pedestrian precincts and central areas, and, on the other hand, private spaces, such as housing developments, gated communities and private gardens, has increased markedly. The urban form contrasts strikingly with the surrounding rural area.

Field experiments in open spaces in Western São Paulo State

Two campaigns were carried out to collect data, the first in 2012 and the second in 2015. In the former, fixed campaigns were carried out in various locations in Presidente Prudente, Assis and Iepê, while in 2015 a fixed experiment was carried out in one location in Presidente Prudente. The present study deals primarily with the analysis of the data collected in the 2015 campaign. The same strategy was used in both the 2012 and 2015 campaigns: deployment of a CSAT3 sensor (CS), net radiometer (KZ), pyrgeometer (KZ) and thermo hygrometer (Vaisälla) on existing urban structures at heights of between 1 and 3 m above the ground (Figs. 2a, 2b).

Time series data for the wind components, net radiation, longwave radiative flux, air temperature and air humidity were recorded at these locations over intervals ranging from a few hours to a complete diurnal cycle from sunrise to sunset. The wind data, which were the subject of analysis in this study, were acquired automatically with a CR3000 (CSI) data acquisition system at a frequency of 10 Hz and stored at 1 s intervals. All the observation sites were georeferenced, and their elevations above sea level were sampled with an automatic GPS (Garmin).

In March 2015 the CSAT3 was deployed on the Presidente Prudente Meteorological Station building (Figs. 2c, 2f) in a controlled experiment and has remained in operation there since then. Wind components are recorded continually during the day and night. The sampling frequency of 10 Hz used in the 2012 campaign was maintained, but the recording interval was increased to 5 min.

During the 2012 campaign, measurements were made on urban fixtures in public squares and roads (Figs. 2i, 2j) and occasionally near rural areas (Figs. 2d, 2e). Unlike in other cities, the green areas in open spaces in Presidente Prudente (Figs. 2h, 2k) are used much more as places to walk through rather than as places to linger in. As a general rule, there are few trees (Fig. 2l). The design of these green spaces tends to be based on a recurring geometric formalism (Figs. 2g, 2i), and even the shapes and coverings of the church façades vary little. A very limited number of buildings retain their cultural and historical value (Fig. 2j), illustrating the poorly or inadequately restored architectural heritage passed down from the Europeans who colonized the area in the first half of the 20th century.

Measurement and analysis

Explosive convective events observed using eddy correlation

A large eddy was observed in Iepê amid small eddies (Fig. 3). Apparently it was a large eddy that had started on the surface of the dam or in the very large ploughed field close to the city. The surface energy balance, which depends on the removal of heat by the convective flux QH (Fig. 3a), suggests an intra-urban breeze

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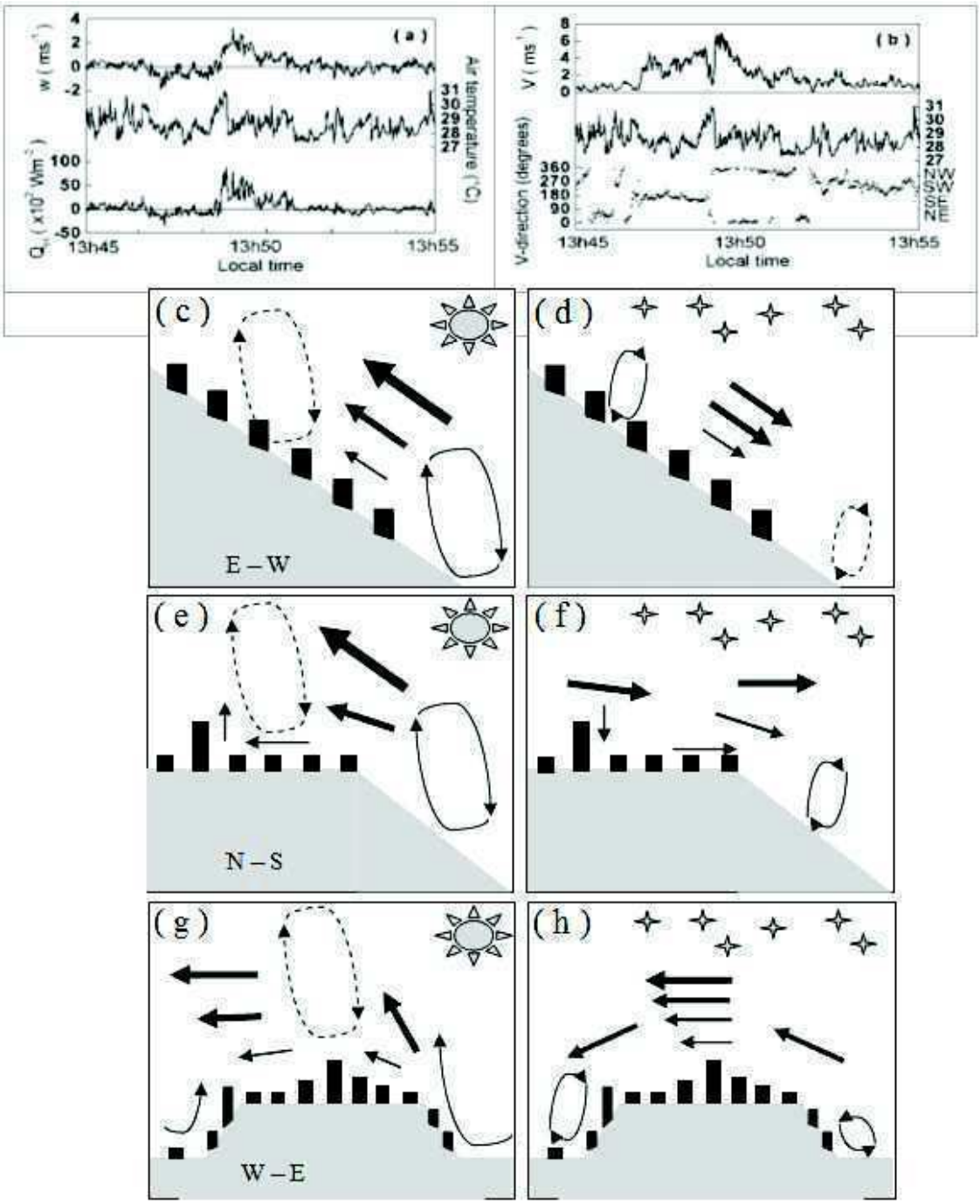

Figure 3.

Comparison of a large eddy amid small eddies represented by the flux QH (a) and observed breeze (b). The other diagrams are schematic representations at times t (solid line) and t+1 (dotted line) of large eddies in the boundary layer circulation during the day (c, e, g) and night (d, f, h) in Iepê (c, d), Assis (e, f) and Presidente Prudente (g, h). The light gray areas represent the topographic profiles for each of the urban areas studied, and the black rectangles represent the buildings. The direction of the circulation is shown for a meridional direction (N-S) and a zonal direction (E-W or W-E) (modified after Machado, 2016).

possibly caused by a convective explosive event (Fig. 3b). The breeze is characterized by a sudden change in direction between 13:45 and 13:50, when it is consistently southerly, while before and after that it is predominantly northerly.

The sensible heat flux transported by this large eddy reaches the impressive figure of

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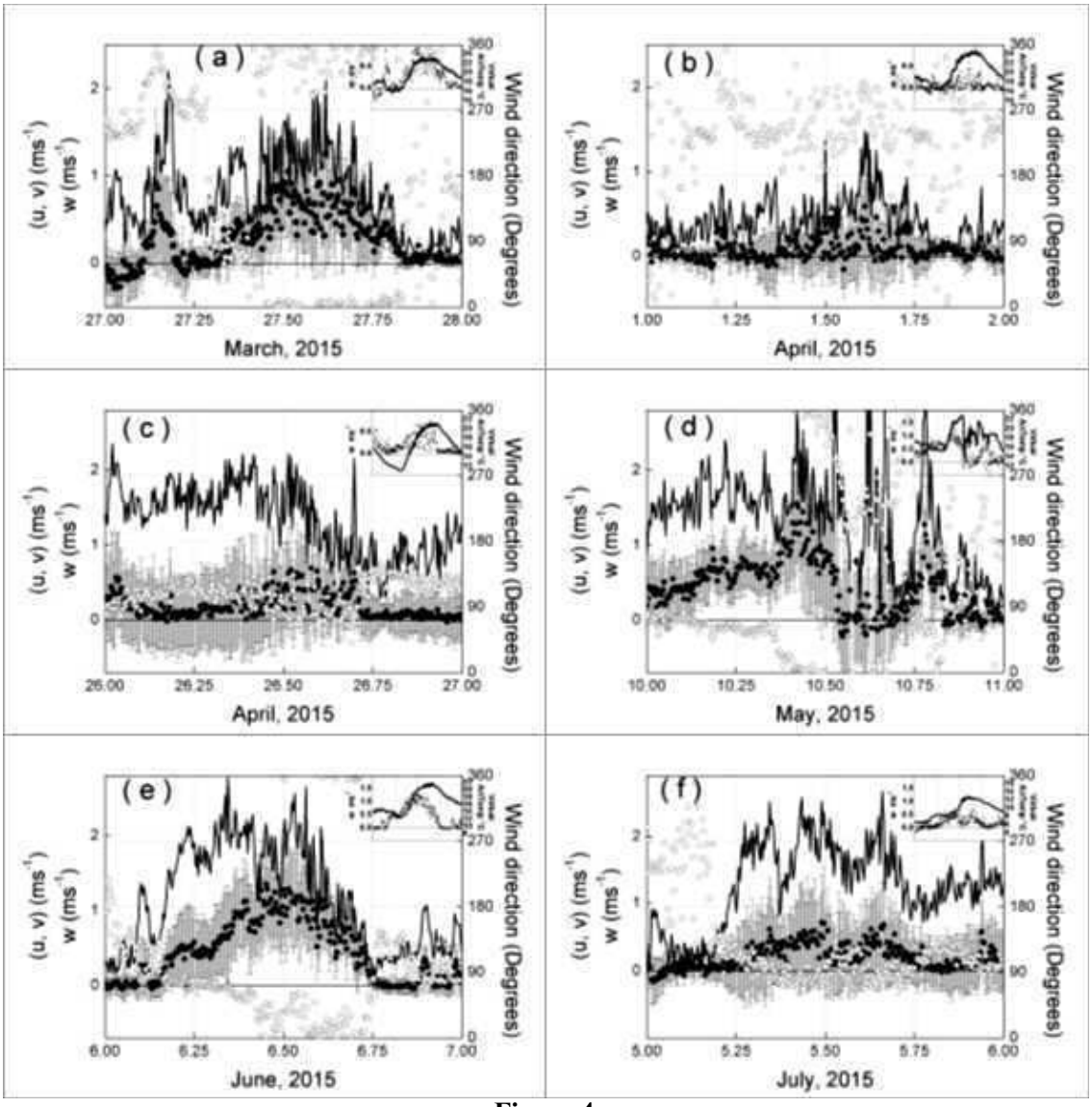

Figure 4.

Vertical wind component (black circles), horizontal wind component (continuous line) and wind direction (white circles) on March 27th (a), April 1st (b), April 26th (c), May 10th (d), June 6th (e) and July 5th (f) 2015. The error bars represent the standard deviation of the vertical component. The graph in the top-right corner shows the vertical component (circles) and virtual temperature (continuous line)

8000 Wm-2 during this 5 min period, 400 times the mean flux QF generated by human activities in a metropolis extending over 2,500 km2 (Azevedo, 2001).

In an attempt to illustrate the dynamics of these large eddies, various schematic representations of the circulation at the boundary layer associated with the basic characteristics of the topography and land cover are proposed (Figs. 3c-h). This relationship between, on the one hand, circulation and, on the other, landform and urban morphology may be the reason for the diurnal and nocturnal turbulence patterns observed.

The measurements taken in Western São Paulo State indicate that the wind blows mainly from the east. Depending on the orientation and location of the urban settlement, this flow leads to different turbulence configurations during the day and night. Each of the urban areas studied here had very different locations and orientations: the town of Iepê is located close to

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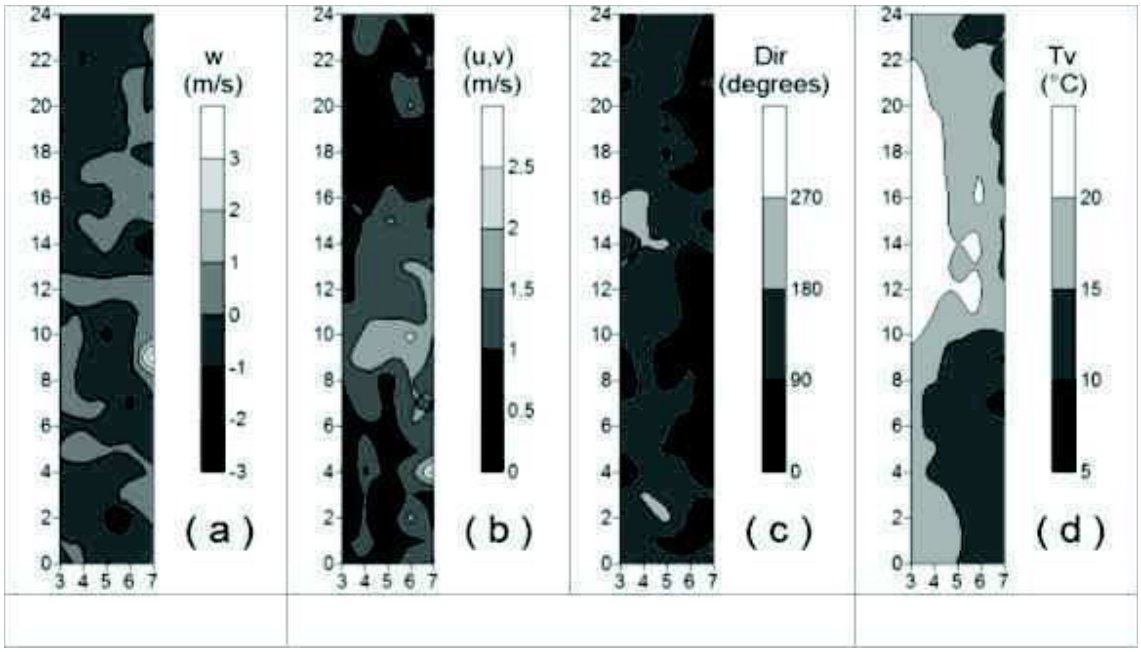

Figure 5.

Vertical wind component (a), horizontal wind component (b), wind direction (c) and virtual temperature (d) as a function of time (vertical axis) and month of the year (horizontal axis, starting in March). Sonic anemometer deployed at the UNESP meteorological station / Presidente Prudente (2015)

the bottom of the Paranapanema valley, Assis is higher up on a large terrace and Presidente Prudente extends along a broad ridge on the lowlands leading to the Paraná valley. The Iepê urban area is situated on west-facing slope, and the town of Assis lies in an east-west direction bordered on the south by the edge of the terrace leading to the Parapanema River, while Presidente Prudente lies mainly in a north-south direction on the top of the hills that make up the broad ridge lying in the same direction.

In the schematic representations based on observations at the surface, the large eddies circulate at right angles to the prevailing wind in Assis, while in Iepê and Presidente Prudente the large eddies formed on the steep slopes oppose or follow the prevailing circulation and are accordingly favored or inhibited by it.

In the case of Assis, the town's location on a plateau at the top of a slope helps to divert the eddies above the urban canopy. A more intense version of the same effect can be observed in Presidente Prudente, where the range of elevations is 50 m greater than in Assis (Figs. 1a and 1b) and there are more tall buildings, both factors that lead to a deeper turbulent boundary layer.

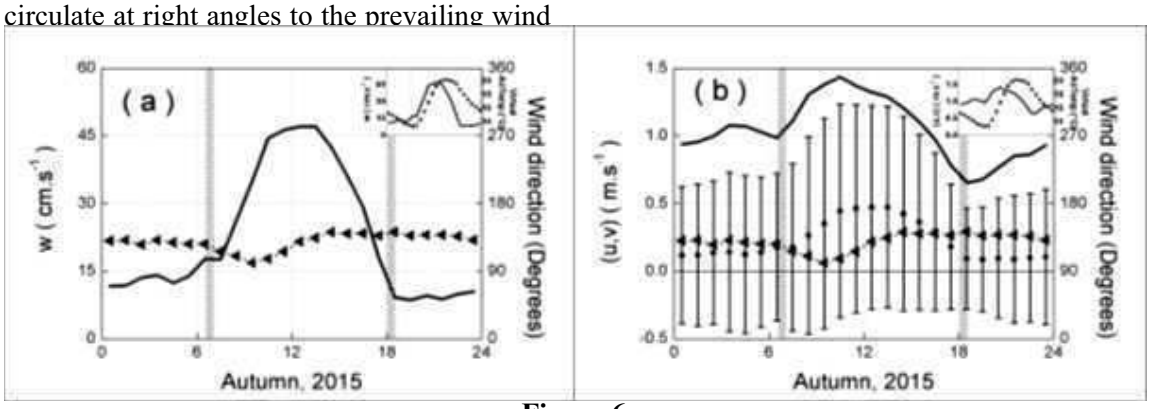

Figure 6.

Vertical wind component (a), horizontal wind component (b), wind direction (c) and virtual temperature (d) as a function of time (vertical axis) and month of the year (horizontal axis, starting in March). Sonic anemometer deployed at the UNESP meteorological station / Presidente Prudente (2015)

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Diurnal and nocturnal evolution of turbulence inside the urban canopy layer

Atmospheric turbulence in the urban canopy layer is highly complex. Continuous observation of the variability of the vertical wind component (w) and its fluctuations (w') as well as the variability of the horizontal wind component (u, v) shows that there are diurnal and nocturnal patterns (Fig. 4). Fluctuations of the horizontal component (u', v'), which were also measured but are not shown here, were negligible compared with w' and will be discussed in a future study. Initially w is analyzed in relation to the horizontal component, wind direction and virtual temperature (Fig. 4a). Then the observed variability of the vertical component itself is included in the analysis (Fig. 4b-f). The intensity of the turbulence is directly proportional to this variability, and it can be seen that the turbulence increases as the wind speed increases. This mechanical effect is also accompanied by a thermal effect. As diurnal heating increases during the morning, an increase in the intensity of the turbulence can also be observed even though relatively weak winds with speeds below 2 m.s-1 predominate.

Figure 5 shows the evolution of the vertical component, horizontal component, wind direction and virtual temperature during the day and night for different months of the year. Initially the horizontal component tends to be weaker from the beginning of the night until just after dawn (Fig. 5b). This pattern only changes with the onset of winter, when wind speeds in excess of 2 m.s-1 are observed at around 4:00 AM. Moderate winds during the early hours of the morning may be related to a nocturnal low-level jet, a meteorological phenomenon associated with nocturnal stratification of the lower atmosphere that is more pronounced during the cold months.

The vertical component is also stronger at the end of the fall and beginning of winter (Fig. 5a), with a well-defined ascending branch in the early morning and a descending branch in the early afternoon. The direction of the horizontal component is shown in Figure 5c. Easterly winds predominate, with winds tending to be southeasterly at the beginning of the fall and turning to northeasterly at the end of the fall. Southwesterly winds may be associated with the passage of intense frontal systems.

To clarify whether circulation was subject to thermal effects, the virtual temperature (TV) estimated by the CSAT3 is shown in Figure 5d. The pattern identified is similar to that typically associated with a clear sky, i.e., maximum temperatures during the afternoon and cooling during the early hours of the morning. This result was to be expected, given that there tend to be more days with this type of sky in Western São Paulo State.

Expected variability

The results in Figure 6 were obtained with the CSAT3 (Fig. 2c) installed on the northern façade of the one-story flat-roofed building at the UNESP meteorological station (Fig. 2f) and are the mean values of data collected over a 100-day period at the end of fall and beginning of winter 2015.

The presence of a building in the landscape produces aerodynamic changes in the surrounding environment, with the ascending wind component accelerating in the morning and decelerating in the afternoon (Fig. 6a).

The airflow pattern over the edge of the building, one of the façades of which is at a right angle to the incident wind, is shown in Figure 6b. After sunrise the wind speed increases until it reaches almost 1.5 m.s-1 and the direction of the wind changes from southeast to east. During the afternoon the speed decreases to close to 0.5 m.s-1 and the wind changes back to southeasterly.

The vertical wind component reaches a maximum before TV does, suggesting that the ascending current is driven by radiative surface heating and implying a transfer of energy from the surface to the urban canopy layer. TV follows a smooth cycle with a daily temperature variation of approximately 7°C, indicating that although the 100 days monitored were not specifically chosen, the result is similar to that expected for a clear sky. This finding is not unexpected as clear skies or skies with few clouds predominate at this time of year. Although w is one order of magnitude smaller than (u, v), its temporal fluctuations are

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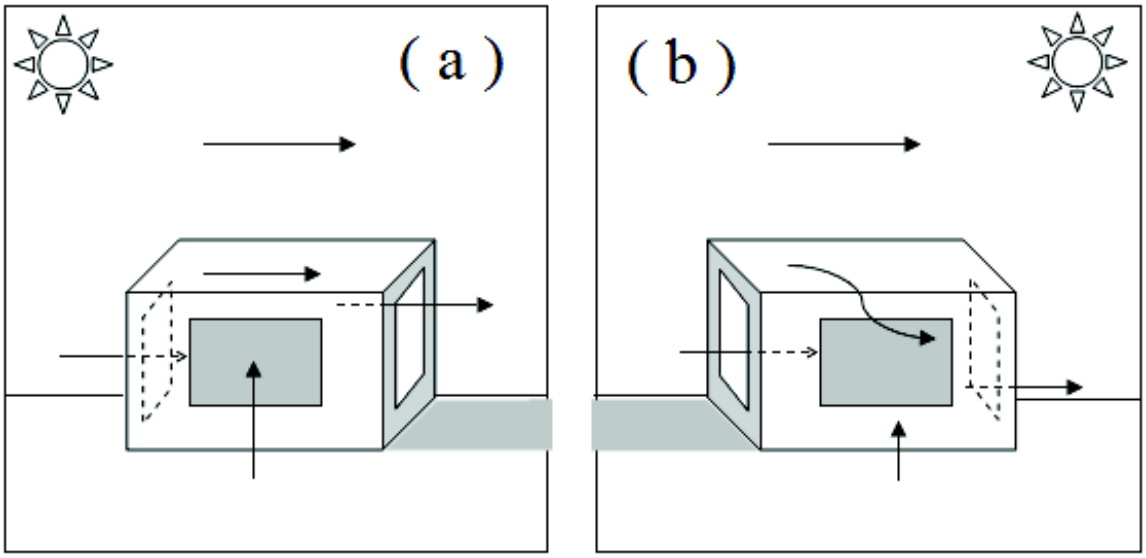

Figure 7.

Schematic representation (based on the results of this study) of the air flow around and through a building whose major axis lies in an E-W direction during the morning (a) and afternoon (b) (modified after Machado, 2016)

of the same order of magnitude as those for (u, v). This indicates that not only heat but also momentum is transferred by the flow w. It is not by chance that (u, v) increases toward a maximum at the same time as the ascending morning current develops, increasing the complexity of any analysis of the presence of the building in the landscape.

The effect of the building on the surrounding airflow

Based on the results presented above, a model can be drawn up to illustrate how the airflow around a building in the urban canopy changes during the day (Fig. 7). At sunrise (Fig. 7a), an ascending current parallel to the northern façade gains strength. This current directs the flow over the top of the building, and the flow remains easterly until the end of the morning. After midday the air is diverted from the top of the building as the sun disappears over the horizon (Fig. 7b), and this situation continues throughout the night until dawn the following day. Without the support of the rising current, the air starts to flow down the walls of the building.

This external effect has implications for the internal space. During the morning the air inside the building acquires the characteristics of the outside air close to the ground (which is hotter and made up of particles from the surrounding surface), circulates inside the building and then leaves through the tallest windows. From midday, and throughout the afternoon and night until dawn the following day, the air inside the building acquires the characteristics of the fresher, higher air, which consists of various particles transported from and dispersed by sources making up the urban structure upwind of the building being analyzed.

Conclusion

The findings of this study can be expected to help identify coherent patterns in the atmospheric turbulence observed close to the surface. By relating an ephemeral timescale of only a few minutes to timescales of the order of hours or even months, eddies of various spatial dimensions can be identified.

Analysis of the seasonal variation in turbulence would appear to be a sensible practice, as it allows a consistent daily pattern to be identified. This pattern proved to be the product of two factors: the spontaneous thermal convection produced by surface heating and cooling during the day and night; and the presence of the building, which generally increased the mechanical turbulence.

The results of this study not only help to understand how the airflows around a building

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develop during the day and night but also allow the eddies in the free spaces investigated to be evaluated with a greater degree of certainty. It is hoped that the findings will prove useful in the design of thermally efficient landscape projects. However, further studies with larger data sets are required to validate the results presented here.

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How to design the metro network for maximal accessibility potential? A comparative analysis of Shanghai

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Abstract. *As metro systems become more extensive they also become more complex, an analysis of the network shape and structure can be of substantive help for planners at early design stages to effectively evaluate multiple alternatives. This study compares the design scenarios of adding a typical circular ring metro line versus a novel alternative using two overlapping ellipse metro line rings. Ring metro lines have been found to be an important factor in network topology and the improvement of metro system network efficiency and reliability. A ring metro line can improve the connectivity and directness of a metro system network and thus improve transit by reducing mean travel time. A highly concentrated and dense central core surrounded by remote residential neighbourhoods, a monocentric city, would make circumferential travel less effective than in larger polycentric city with several sub-regional centres. Using Shanghai metro system 2017 as baseline, we consider the novel morphological alternative scenario of two overlapping ellipses and compare its relative performance to the more traditional ring metro line, by using graph theoretical topological and Euclidean centrality measures, otherwise known as' closeness' or 'accessibility' or 'all to all' mean distance. The comparison between the two scenarios shows that the two overlapping ellipse scenario is better at minimizing mean Topological distance, Mean Euclidean distance is well-correlated to actual travel time, The two-ellipse scenario leads to a reduction of 8% of network mean topological distance, while a simple ring reduces it only by 0.13%.*

Keywords: Urban Morphology, Spatial Design Network Analysis, Metro Network, Accessibility, Shanghai.

Introduction

Major cities in China are building and expanding metro systems as a strategy to improve sustainable mobility and reduce the negative environmental and social consequences of fast-paced motorization (Zhuang & Zhang, 2016). Chinese cities are leading in terms of the planning and construction of metro systems: 28 cities in China have metro networks, and metro systems are currently under construction in 16 additional cities (Lu, et al., 2016). In Shanghai, the high-capacity metro network plays an important role in the urban movement and urban morphology generating pattern. The Shanghai Metro, started in 1993, is one of the fastest growing systems in the world. In 2017, there were 14 metro lines and 365 stations, with an operating route length of 617 km, making it the longest metro in the world. In 2016, the annual ridership of the Shanghai Metro system was 3.4 billion, making it the second busiest metro system after the Beijing metro system. Although still in the planning stages, Shanghai expects to lay another 930 km of new metro track by 2040. As of 2017, Shanghai had more than 200 km of subway under construction. By the end of 2020, the network will comprise 18 lines spanning 800 kilometres. Are these plans effective and suited for the Shanghai region?

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For the assessment of transit networks, traditional contemporary travel forecasting models are data intensive using a large variety of variables including detailed socioeconomic variables (Bierlaire, et al., 2015). More recently, transportation infrastructure and urban form have been shown to also play a major role (Newman & Kenworthy, 1991; Cervero & Kockelman, 1997; Ewing & Cervero, 2010). Both approaches require the use of detailed data sets that are not publicly available in China. In recent years, the literature has focused on the features of metro systems as a physical network with analysable geometric and topological features (Derrible & Kennedy, 2009; 2010; 2011; Hadas & Ceder, 2010; Roth, et al., 2012). The contemporary use of graph theory in network analysis started with communication networks (Shimbel, 1953) and transport networks (Garrison & Marble, 1962; Kansky, 1963), and in accessibility analysis within network geography (Savigear, 1967; Haggett & Chorley, 1969; Ingram, 1971), which is also called spatial separation (Pooler, 1995). In the last 15 years, this has been extended to systematic studies of metro network systems conducted for network analysis purposes that did not include boarding data (Gattuso & Miriello, 2005), related to metro station entry and exit in London and Shanghai (Chiaradia, et al., 2005; Zhang, et al., 2015), and more systematically across multiple network with boarding data (Derrible & Kennedy, 2009). Laporte et al. (1997) assessed three simple networks with star, triangle, and radial-ring configurations with similar total network lengths, similar numbers of stations, except for the triangular network. They compared different factors for metro networks performance such as directness and connectivity. In their study, a radial and ring network was the most performant. Vuchic (2005) classified transit lines and discussed the advantages and disadvantages of radial, diametrical, and ring lines. Radial lines traditionally address the heaviest travel demand from outer to inner city. Diametrical lines connect two outer city areas and pass through the city main centre. Ring lines are laid out around a city centre and intersect radial lines, allowing for transfers and thus constitute an integrated, multipath network. Ring lines improve connectivity between radial and diametrical lines, making travel time shorter by-passing the main centre, reducing congestion in the main centre while networking sub-centres, thus increasing sub-centre inter-accessibility. Ring lines are less usual in North American cities than in European and Asian cities (Saidi, et al., 2014). The reason may be due to the urban configuration of North American cities, which are mainly monocentric, whereas European and Asian cities, while also mostly monocentric, are exhibiting emerging or planned polycentrism (Vuchic, 2005; Saidi, et al., 2014). Some cities have more than one ring, these cities include London, Madrid, Tokyo and Beijing. Other cities such as Copenhagen, Boston, Paris, Washington and Chicago are considering ring lines (Saidi, et al., 2014). Shanghai also has a long-term plan to construct a second ring line (Jian, 2015). The main questions that arise with respect to ring lines are the following: Should a ring line be developed in a metro network? If so where? Is it possible to have more than one ring line? Does the ring line shape matter or not? For Shanghai, Saidi et al. (2016) give a positive answer to the first three questions. They suggest an optimal second ring line for the Shanghai metro system located between 10 and 11 kilometres from the central Shanghai.

The primary motivation for this paper is to offer a review of the ring scenario proposed by Saidi et al. (2016) in Shanghai to compare it to a novel alternative that combine two overlapping ellipse rings using graph theoretic topological/Euclidean performance indicators to assess the two scenarios. In the metro network analysis literature, the question of the shape of the ring is always assumed to be close to a circle. The hypothesis is that in Shanghai two overlapping ellipses (TOE) provide better performance than a simple ring controlling for network length and station number.

The paper is organised as follows. In the first section, we motivate the selection of the two overlapping ellipse rings as an alternative to a simple ring. In the second section, we give an overview of the Shanghai Metro system. The third section introduces a series of metro system graph theoretic performance indicators. In the fourth section, we present the analysis results of the evolution of Shanghai Metro sys-

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tem since 1993, the 2017 baseline, and the two scenarios: a ring line located 10-11km from central Shanghai as proposed by Saidi et al. (2016) and the TOE scenario.

Justification of the ellipse scenario

Two morphological analyses support the justification of the TOE scenario: A shape index approach Shanghai region urban development gradients.

A shape index is a dimensionless index that describes shape compactness and captures partially its morphology. A circle has a shape index of 1.

Shape Index = perimeter2 / 4π * area)
(eq. 1)

Kanga et al. (2012) showed that in 10 cities in China, at intra-urban level, with change in city size (small to large) and in city shape index (compact to dispersed), each individual citizen will need to travel farther daily, and vice versa. Nielsen et al. (2005) proposed a set of strategies to improve transit system performance. Two of these strategies are morphological: (i) adjusting the network to the urban structure to facilitate its legibility by the users; (ii) facilitating transfer to move away from the current many-to-many configuration to all-to-all configuration to favour the network effect (Mees, 2000). In Shanghai, urban development since 1995 has followed two gradients toward Hangzhou and toward Suzhou along the road corridors G15-G2 and S26-S58 (Cui & Shi, 2012; Shi, et al., 2017). We propose that the two overlapping ellipse rings follow these gradients (See Figure 6b).

Shanghai metro system network overview

The changes between 1995 and 2017, of number of stations1 and route length of the Shanghai Metro network are shown in Figure 1. The Shanghai metro network has grown rapidly since Line 1 opened in 1995 with an exponential increase in both number of stations and route length. During 1995 to 2005, the number of stations rose from 13 to 73—a six-fold in-

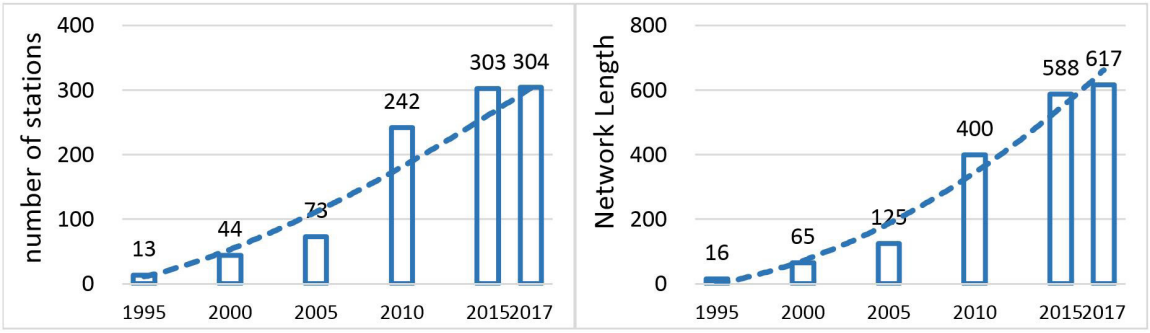

Figure 1. the evolution of Shanghai Metro Network 1995-2017, a) number of stations b) network length

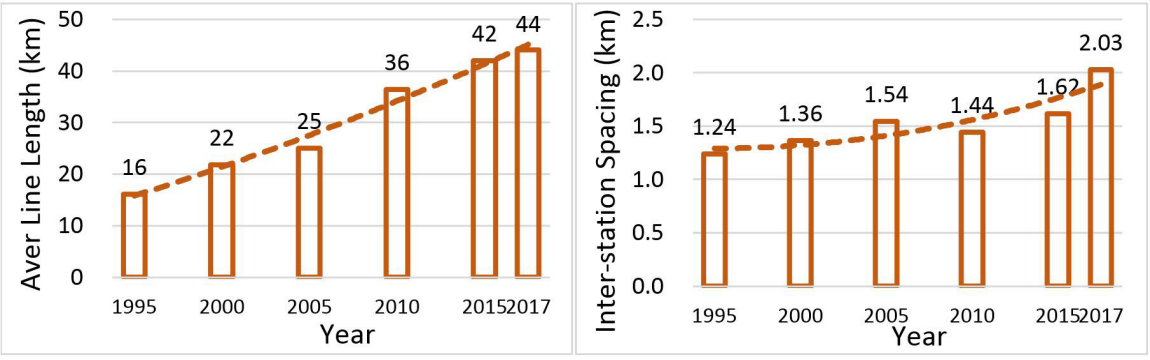

Figure 2. The evolution of average line length and inter-station spacing, 1995-2017

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crease in only 10 years, In the subsequent 12 years, the number of stations increased from 73 to 304 —a four-fold increase based on an already large base figure. During the same period, the total route length increased from only 16 km in 1995 to 617 km in 2017—a dramatic 40-fold increase. The daily ridership in the same period skyrocketed from 240,000 to more than 10 million (Zhuang & Zhang, 2016).

Regional accessibility: Average Line Length & Inter-station Spacing

As network grew, so did the average line length and average inter-station spacing. As can be seen from Figure 2, from 1995 to 2017, the average line length of Shanghai metro network more than doubled, grew from 16 km to 44 km (an average annual increase of 5%) , and the inter-station spacing rose from 1.24 km in 1995 to 2.03 km in 2017 (an average annual increase of 2.3%). Notably, since 2005, the metro system service has been extended to the suburban areas outside the city core. The average line length increased by 45% from 2005 to 2010 (from 25 km to 36 km). This can be explained by the Shanghai 12th five-year urban public transport plan (from 2005-2010) announced in 2005, in which the importance of metro was highlighted for the first time.

Graph level indicators

Derrible (2010, 2011) and Roth (2012) computed graph measure from a connectivity matrix which is not geographically spatialized. In this paper the Shanghai metro system geography was mapped with three elements:

• node - point representing the spatial positions where there is the access to the metro;
• line - sequence of links and nodes representing the routes;
• network - the set of nodes, links and lines.

Each transfer between two lines was considered as a topological distance of two thus added two short links2. A network was created to represent the metro lines network topology and geography using one link between each station. This mapping allow to compute not only topological graph measure but also Euclidean graph measure and as such better understand travel time.

Ring line and TOE ring line scenarios for Shanghai Metro

The Shanghai metro network uses a core ring (Inner ring Line 4) to encircle a core of stations which are characterized by higher line connectivity. Branches radiate from the core and reach outer areas of the urban system. The first ring line, the line 4, is located near the Inner-ring Road.

The Shanghai government has proposed in Shanghai Master Plan 2016-2040 to construct a second ring-shaped metro line near Shanghai Middle Ring road (Figure 3-a) to improve the connectivity and directness of the metro system and thus improve transit by reducing mean

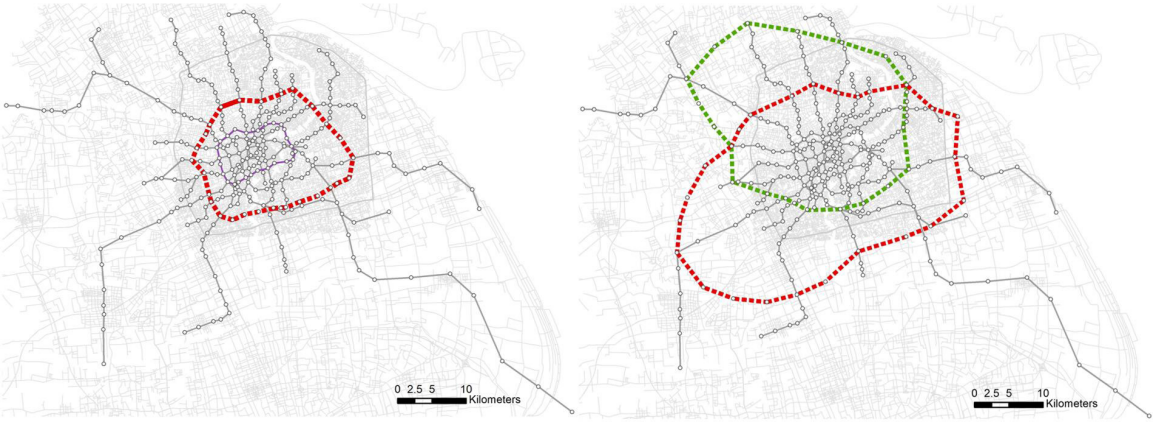

Figure 3. Recommended ring line scenario & TOE scenario in Shanghai

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travel time. Using Shanghai metro system 2017 as baseline, we propose a novel morphological alternative scenario to the ring-shape scenario by using two overlapping ellipses (Figure 3-b). The TOE scenario locates as many metro stations as possible on the future City Subcenters3 and extends the network to the west (Jiangsu) and the south (Zhejiang) to improve suburb-to-suburb connections.

Graph theoretic metro network performance characterisation

Derrible (2012) and Kennedy (2009) showed that network topologies play a key role in public transport ridership level. Saidi et al. (2014) showed the association between ring line ridership and density and line length. Chiaradia et al. (2005) were the first to use closeness centrality-accessibility to analyse the London Underground network. They found that topological configuration of the metro network can explain at least 50% of entry/exit movement at metro stations. A study of the Shanghai Metro system (Zhang, 2014) also showed that the accessibility values of metro network model are highly correlated with entry/exit movements. Shimbel (1953) suggested that one strategy for overall performance was to minimise mean path length. It is a measure of the efficiency of information or mass transport on a network.

Closeness Centrality: Mean Distance (MCD)

Spatial Design Network Analysis (Chiaradia, et al., 2014; Cooper, et al., 2014)4 (sDNA) was used to compute the closeness centrality of Shanghai metro networks. Closeness is a centrality measure which matches commonly held notions of accessibility. Closeness or accessibility is the Mean Distance from all to all. We use sDNA's Mean Custom (Topological) Distance (MCD) average number of link independently of their length and Mean Euclidean Distance (MED) to measure the network closeness (or farness) using distance.

$$MCD(x) = \frac{\sum_{y \in Rx} d_c(x,y) P(y)}{\sum_{y \in Rx} P(y)}$$

Eq. 2

where MCD(x) is the Mean Custom (Topological) Distance for link x, $y \in Rx$ is each other link y in Rx the radius surrounding x, $d_c(x,y)$ is the shortest possible topological distance along a route from x to y, and P(y) is the proportion of y falling within the radius.

Figure 4. Shanghai metro geography, evolution 1993-2017 of Closeness Centrality (topological)

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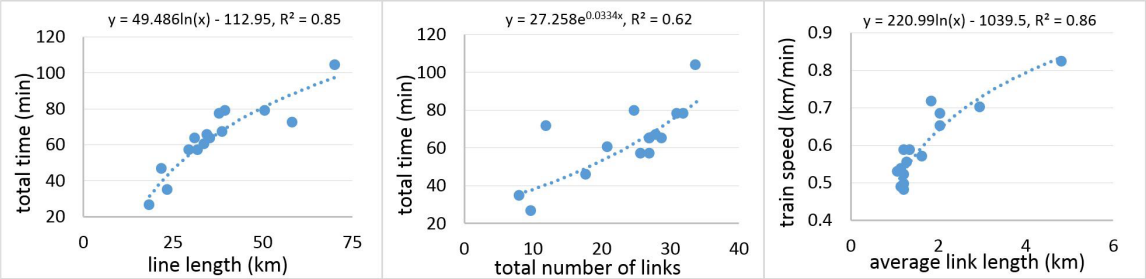

Figure 5. scatter grams showing the characteristics of existing 15 lines (line 1 to line 13, line 2 extension, line 16) : line length against total time taken between the two ends (a), total number of links against total time taken between

					Regional Accessibility		Closeness	
Network	Station Number	Link Number	Transfer Station	Total network length	Aver Line length (km)	Inter-station spacing (km)	MCDn	MEDn
2017 baseline	304	361	54 (18%)	617	44.07	2.02	13.60	14892
Scenario **R**	313	390 (8%)	72 (23%)	695 (17%)	46.30 (5%)	2.22 (10%)	13.58	15302
Scenario **TOE**	320	404 (12%)	77 (24%)	848 (37%)	52.99 (20%)	2.65 (31%)	12.59	17149

Table 1: Summary of results

$$\boldsymbol{MED(x)} = \frac{\sum_{y \in Rx} d_E(x,y) P(y)}{\sum_{y \in Rx} P(y)}$$

Eq. 3

where MED(x) is the Mean Euclidean Distance for link x, and $d_E(x,y)$ is the shortest possible Euclidean distance along a route from x to y.

Mean distance measures the ease of navigating to all possible destinations in radius x from each link. Lower values of mean distance indicate more direct (topological) or shorter paths to destinations within the radius. Table 1 below summarise the analysis results.

Results and Discussion

Topological and Euclidean closeness centrality measures for the network between 1993 to 2017 was computed by sDNA, divided into 10 quantiles and mapped in Figure 4. The Topological closeness measure (MCDn) rose from 4.07 in 1995 to 13.6 in 2017 - a 3.3-fold increase, and the Euclidean closeness measure (MEDn) rose from 5,081 to 14,892 - a 2.9-fold increase. The expansion of metro network has reduced the directness and increased the average mean length of trips.

Compared with the 2017 baseline, both Scenario R and Scenario TOE see a notable increase of number of transfer stations for; the number of transfer stations changes from 54 to 72 (an increase of 33%) for Scenario R and to 77 for Scenario TOE (an increase of 43%), corresponding to only 3% and 5% increase of total number of stations. An earlier study (Derrible S, 2010) showed that few transfer stations tend to retain a "monopole" on transferring in metros, therefore, both networks have good performance on maximizing number of transfer stations.

Compared with the 2017 baseline, both scenarios connect the outer stations together and to the city core, yet increase average line length and distance between metro stations. Both measures for scenario TOE (increased by 14% and 19%) are higher than scenario R's (increased by 5% and 9%), thus scenario TOE provides higher regional accessibility.

The comparison of MCD values shows that TOE scenario works better for minimizing mean topological distance than Scenario R. The TOE scenario has a reduction of 7.94% (falls from 13.6 to 12.59) of network mean distance, while R scenario plan reduces only 0.13% (falls from 13.6 to 13.58).

Considering that the MCDn increased year

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by year in the last 2 decades, it would be especially meaningful to get a lower value by adding the two overlapping ellipse rings.

If we compare MCD to MED the finding is reversed. TOE scenario increase MED by 15% while R scenario increase it by only 3% yet given that the TOE scenario increase network length by 37% compared to 17% for the R scenario, adding twice the length of the R scenario increase MED moderately. As MCD (topological) does not account in link length difference we analyse the MED relationship with travel time.

Figure 5-a shows a strong correlation (r2=0.85) between metro line length and total time taken between the two ends. Figure 5-b shows a significant correlation (r2=0.621) between total number of links for each line and total time. Figure 5-c shows that speed increase as link length increase.

We can conclude that, for MCD is less related to travel time and that MED is better related to travel time. As the TOE scenario has an average link length of 4.85 km it would run about 22% faster than scenario R which has an average link length of 2.47 km. Therefore, although TOE scenario has a 12 percent higher MED than the R scenario (17,149 versus 15,302, Table 1), while the speed on the TOE will be about 22% higher than on the R, the travel time accessibility should be enhanced overall.

Conclusion

In this study, we used a set of indicators to characterize the Shanghai metro system network: regional accessibility and closeness centrality. By looking at the Shanghai metro network from 1995 to 2017, we found that, as the network grew, regional accessibility (average line length & average inter-station spacing) both rose rapidly. However, the mean distance of the network had also a notable increase during the same period, that journeys became longer in general.

Using 2017 as baseline, two strategic network long-term planning extension scenarios of the Shanghai metro system network were assessed: one with a second ring-shaped (R) metro line running concentric with the existing ring line, the other with two overlapping ellipses (TOE) metro lines. A comparative analysis showed that, both scenarios increase significantly the number of stations, route length, and transfer station ratio compared with 2017 baseline. The regional accessibility values and closeness centrality analysis indicated that Scenario TOE works better for maximizing the suburban accessibility and minimizing average trip distance than Scenario R. The two overlapping ellipse rings should be tested as proposals with other transit systems in the world to investigate the ring line shape factor impact on metro system performance. This analysis is especially useful at the strategic conceptual planning phase, to test different network design scenarios alongside conventional transport planning tools.

Authors' contributions: LZ performed the network analysis, wrote the first draft of the paper. AC provided the original concept for the paper and the sDNA software. AC did and wrote the literature review and assisted with contextualisation of results. Both authors edited and approved the final version.

Notes

1. Transfer stations are not double-counted.
2. This approach was taken because some limited market research (REF) has shown that given a choice between alternative routes to the same destination with one line change at station level, passengers chose to switch to the route with the change if the difference in number of stations between the routes was at least two. This makes the effective cost of line change equal to two more metro stops.
3. According to the Shanghai Urban Master Plan 2016-2040 which was announced in 2016.
4. sDNA (Spatial Design Network Analysis) is a plugin for ArcGIS, Autocad, and open source GIS (QGIS) it uses the Shapefile (.shp) or .gdb files and link/node standard to analyze the spatial networks design characteristics using centrality measures and other measures such as severance. It provides many control variables. The software is freely available after registration at www.cardiff.ac.uk/sdna/with full specifications.

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Defining typological process in the transformation of Turkish houses

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Abstract. *Typological process, defined by the Italian Typological School as 'progressive differentiation' among types in a cultural area is a key terminology in morphological studies. It was widely acknowledged that the identification of typological process is problematic for three reasons. First, the judgement on the degree to which the transformation of types is determined continuous is largely subject to individual researchers' opinions. Second, there is no agreement on the exact typological characteristics that are considered in the transformation process. Third, there is limited empirical studies on typological process at articulated scales. This paper aims to bridge these gaps and contribute to the methodological advancement of defining typological process through an empirical study of the transformation of Turkish houses. Eight housing developments from five morphological periods of Ankara since the late 19th century is examined at the building, street and neighbourhood scales. A typological frame involving a set of spatial characteristics defining the types is established at each scale. According to the number of changes in typological characteristics, continuity, partial continuity and mutation are identified, of which the former two categories of transformation are determined as typological process.*

Keywords: Typological process, continuity, mutation, type, typological frame, morphological period, culture area, transformation, housing evolution

Introduction

Typological process refers to progressive changes of types that are widespread in the cultural area and show continuous adaptations to the changing human needs. It has been adopted as one of the theories of change by the Italian School and it is a key concept in Urban Morphology because it bridges between the analysis of the old forms and the design of the new forms (Moudon, 1994; Gauthiez, 2004). It can be established through a comparison of a series of types during their historical evolution where the dominant one replaces the another through the gradual chances undergone by the first one (Caniggia and Maffei, 2001; Gauthiez, 2004). Typological process is thus a tool to explain how the built environment changes and what are the causes underlying these changes (Kropf, 2006). Therefore, it can also help to reveal the robustness of historical types or characteristics for contemporary use. For this reason, various scholars advocated the benefit of continuity in urban transformation for socio-cultural sustainability by recycling the robust historical types in contemporary design (Chen & Thwaites, 2013; Gokce & Chen, 2016; 2017; Rapoport, 1969; Lynch, 1960; Alexander, et al., 1977; Kropf, 2009; Moudon, 1994).
However, defining typological process has always been found challenging (Whitehand et al., 2014). This is initially because there is no clarity how to determine what continuous transformation is; therefore, the judgement is

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largely subject to individual researchers' opinions (Gokce, 2017). Moreover, there is no consensus regarding the data selection and validity in terms of what spatial characteristics and hierarchies should be detected for continuity (Scheer, 2016). Furthermore, this vagueness in the study of spatial characteristics also causes the ambiguity in the way of differentiating the different place scales in the study of typological process. Such studies are currently limited and generally not empirically grounded, although transformation of types has been studied by various scholars at individual scales or limited levels of specificity (e.g. Gygax, 2007; Oliveira et al., 2015). In addition, there is a need to empirically test the applicability of concept of typological process and clarify its definitions in non-European context (Whitehand et al., 2014).

Given the problems mentioned above, this paper attempts to demonstrate a methodological advancement to define the typological process. The following will therefore first briefly review the theory of typological process, accordingly explain the stages to define typological process at the building, street and neighbourhood scales. The study will then define the typological process in the Turkish context by tracing the transformation of house types since the late 19th century in Ankara. Conclusion will be drawn on the practicality and applicability of the framework in other contexts.

Typological process and its fundamentals

Italian School defines typological process as the temporal robustness of a type over a period of time in a given cultural context (Caniggia & Maffei, 2001). It is the process of designing the new types, characteristics of which are gradually adapted from the previous types. Typological process is thus observed during the changes occurred between "the base type" and "the mature type" (Kropf, 1993, p. 96). It is identified by generating a typology relating one type to the other at a chosen scale (e.g. the building, the parcels, the city block) and according to selected typlogical frame setting the criteria for the comparison of the types (e.g. volume, function, density, architectural style) (Moudon 1994). The built form consists of constant and changeable elements (Rapoport, 1969, p. 81). As a result of the study of these elements at a certain place scale, typological process is constructed through the identification of the constant ones over periods of time in a cultural area. Given these, there are four common concepts the studies of typological process that needs to consider: [1] a series of types, [2] typological frame (and the study scales), [3] time span (morphological periods/phases), and [4] the specific location/cultural area.

A series of types are the key in the study of typological process so that continuous or mutational changes are recognised. Types are determined according to the possession of a certain set of mutual features observed in architectural and urban spaces at a certain scale (Chen &Thwaites, 2013; Gokce, 2017). There are synchronic and diachronic types (Caniggia and Maffei, 2001). The former refers to the types, the production of which decreases over a period of time and remain strictly to the period it was introduced but can be observed in different places, while the latter undergoes a series of progressive changes for a significant period of time in the same place (Burkay, 2006). The typological process is relevant to diachronic types where the modified type evolves by keeping the essential characteristics of the previous type.

Typological frame outlines a set of physical characteristics through which the types are defined and typological process is constructed according to their comparison at a given place scale. The transformation of types has been studied mainly in relation to the spatial characteristics of layouts of buildings (e.g. Corsini, 1997; Dufaux, 2000; Oliveira et al., 2015), streets (e.g. Ryan, 2006), plots and blocks (e.g. Corsini, 1997; Ryan, 2006; Oliveira et al., 2015). Although there is no consensus regarding exact elements defining spatial typologies, the commonly analysed spatial features in such studies are spatial configuration, functional zoning, building height to street width ratio, density and land coverage, public-private area relations and access patterns, hierarchy and connectivity and open space design.

Time span is vital to construct typological process since it is the time period during which

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a type transforms and becomes mature and therefore a long time interval is necessary for changes of types to be sufficiently clear (Caniggia and Maffei 2001). Conzen (1960) explains this widely accepted notion in the field of urban morphology with the concept of 'morphological periods' each of which refers some turning points in the design concepts of built environment under the influence of internal and external factors (Chen & Thwaites, 2013).
Cultural area is also key to define typological process because it delimits the territories or context within which types are generated, adapted, transformed or disappeared. Types within the same cultural areas are often affected by the same internal and external factors such as social, political, cultural and economic changes. In other words, types emerged and changed under specific factors that are distinct to a given location (Chen & Thwaites, 2013).

The study of typological process

The studies of typological process have begun over half a century ago, with the studies of Muratori (1960) and Conzen (1960), but the term was used for the first time in 1970s by Caniggia (1976) (Whitehand et al., 2014). To date, the studies have attempted to document the transformation process of the built forms and identify changes in the newer forms from the older ones in different cultural contexts (e.g. Dufaux, 2000; Gu et al., 2008; Whitehand et al., 2014; Maretto & Scardigno, 2016). Some studies further stress the importance of reconstructing typological process and suggest that new forms should adopt robust types or their characteristics (e.g. Corsini, 2007; Gygax, 2007; Racine 2016). These studies aim to benefit design practice especially in the area of conservation through proposed design guidelines for new intervention (e.g. Gygax, 2007; Barke, 2011; Racine 2016).

From the 2000s, typological process has been investigated at multiple scales and specificities, from the room level to the urban level. Studies examined the spatial configuration and room arrangements (e.g. Corsini, 1997; Gygax, 2007; Gu et al., 2008; Oliveira et al., 2015; Maretto & Scardigno, 2016); as well as the building-building, building-plot, building-street relations (e.g. Ryan 2006; Gygax, 2007; Feng, 2014; Oliveira et al., 2015; Racine, 2016), density and land use (e.g. Ryan, 2006; Gygax, 2007), and spatial sequence from public to private (e.g. Oliveira et al., 2015). These studies showed a vast variety in terms of physical characteristics considered in scholars' work.

Recent studies have tried to explain the transformation patterns and changes in morphological periods (e.g. Dufaux, 2000, Whitehand et al., 2014; Racine, 2016; Maretto & Scardigno, 2016). However, very few studies investigated the degree of changes in detail amongst a series of types, of which some can be defined as typological process. For example, Racine (2016) attempted to compare a set of morphological components to identify typological relationships between present and past developments and he called these relationships weak, medium, and strong. Based on these relations, this research intended to determine what characteristics should be continued and what should not in future design. Although it was a limited attempt and the defined relations were not directly associated with the typological process, it can inspire the studies of typological process regarding its empirical validation and measurement.

The review of relevant literature showed that typological process is a widely-acknowledged notion in the understanding of the complexities embedded in the structure of the built environment and the city as a spatio-temporal system (Kropf, 1993). However, there is a lack of consensus in the ways of probing degrees of continuous transformation that qualifies typological process. The problem lies in the ambiguity in its definition and the lack of empirical validation in reconstructing the typological process and uncovering its mechanism (Whitehand et al., 2014). In addition, there is also no consistency in what elements, at what scales should be studied. For these reasons, "the precise nature of the typological process remains elusive" (Whitehand et al., 2014).

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How to define typological process?

In the light of the above reviewed literature and identified key concepts, this study suggests that the typological process can be defined in three stages.

Firstly, a series of types are chosen as case studies that are representative to their specific morphological periods which are identified via the general study of the history of the cultural area in question. In this study, eight housing developments are chosen representing the transformation process of Turkish houses during five morphological periods from the late Ottoman Empire period (the late 19th century) to the present in Ankara.

Secondly, a typological frame is set up through which the chosen case studies are analysed at a given place scale. In this study, the types are identified at the three place scales: building, street and neighbourhood. Table 1 shows the typological frame consisting of a set of spatial characteristics through which types are defined at the three scales in this study.

Thirdly, the types are compared pairwise at the three scales [between the types within the same morphological period and between the types in the different morphological periods] in a chronological order to identify the typological process during their transformation. In this research, three degrees of changes are considered namely continuity, partial continuity or mutation, which are relative to the numbers of changed physical characteristics and the first two of which are considered typological process.

Case selection

Ankara –located in the northwest of central Anatolia and with a long history dated back to pre-historic times – has been chosen as the study area. Ankara is an important city to study the housing transformation not only because of its geo-morphological structure playing an important role in the city formation but also due to being a new administrative and political centre after the proclamation of the Republic of Turkey in 1923, where the housing efforts were thus primarily applied before any other cities in the country. Starting from the late Ottoman Empire period (1890s to 1923) to the contemporary period (2000s), there are five morphological periods identified in the development history of housing in Ankara. Representing specific topological, socio-cultural, political and functional requirements in each morphological period, eight housing developments are chosen by the authors. Table 2 summaries the key features of the development history of houses during these five periods and briefly introduces the chosen cases studied from each morphological period.

In the late Ottoman empire period, the dominant house types were the traditional Turkish houses which had already developed for hundreds of years following the spatial demand of the nomadic lifestyle of Turkish people before they settled in Anatolia. The development of these house types is mainly traced according to the location of rooms and a hall. The most common types and the still existing ones are the types with interior hall (Case I) and with

BUILDING SCALE	STREET SCALE	NEIGHBOURHOOD SCALE
FUNCTIONAL ZONING	ARRANGEMENT OF BUILDINGS ALONG THE STREET	SITE/BLOCK ARRANGEMENT
SPATIAL SEQUENCE	BUILDING ENTRANCES ENTRANCE POSITION DIRECTION CHANGES/NUMBER OF TURNS	BLOCK SIZE AND SHAPE
INTERNAL ACCESS PATTERN/COMPACTNESS	STREET FORM, WIDTH ACTIVE FRONT COVERAGE	SPATIAL SEQUENCE NUMBER OF TURNS
CONNECTIVITY/INTEGRATION	HEIGHT/WIDTH	BUILDING HEIGHT/SPACIOUSNESS
VISIBILITY	SPATIAL HIERACHY	LAND COVERAGE
PERMEABILITY	VISUAL ACCESSIBITY	STREET CONFIGURATION

Table 1: Typological frame defined at the three scales

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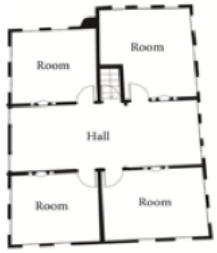
MORPHOLOGICAL PERIODS, CHANGING HOUSING TRENDS, CASE SELECTION

1 — 1890s-1923 → The Late Ottoman Empire Period

- People were still in favour of traditional houses following the spatial principles of nomadic lifestyle.
- However, relations with Western countries caused the emergence of unwelcome new house types.

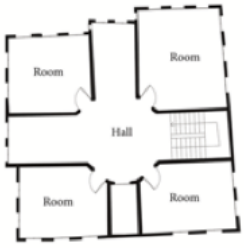
TRADITIONAL HOUSES

Case I



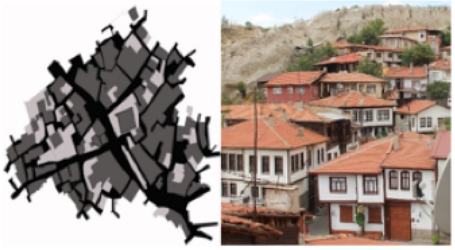
with inner hall

Case II



with central hall

Case I and Case II

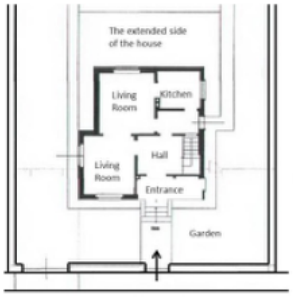


2 — 1923-1950s → The Early Republican Period

- There was a significant housing shortage after WWI.
- The ideal housing types were Garden City Houses.
- However, unwanted apartment buildings became widespread.
- This was the period when Apartmentalisation was heavily criticised.

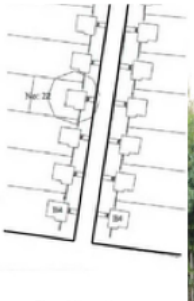
GARDEN CITY HOUSES

Case III



Ground Floor Plan

First Floor Plan



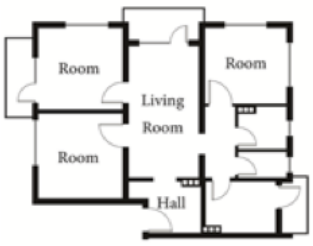
Street Layout

3 — 1950s-1980s → The Modernisation Period

- The construction of informal houses increased dramatically.
- Apartment buildings became widespread and replaced the garden houses.
- This is the period when the apartment lifestyle was well promoted and adopted by Turkish culture.

1950S LOW RISE APARTMENTS

Case IV



4 — 1980s-2000 → The Liberalisation Period

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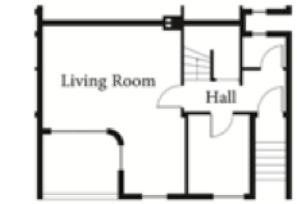
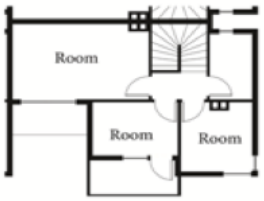
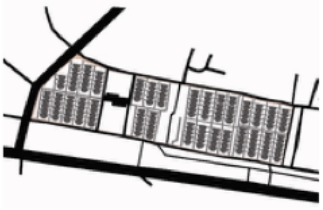
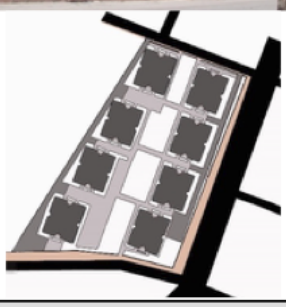
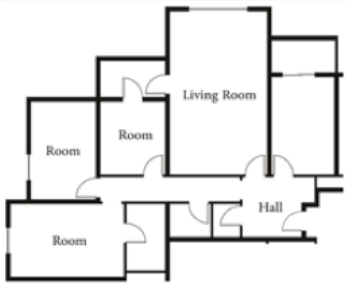
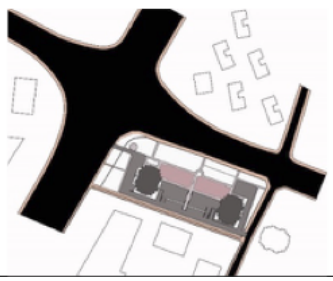
	• This is the period of recession for housing production. • There was a significant decline in the ratio of slums. • Housing cooperatives were established. • Gated communities were initiated.
	Case V / **Case VI** / **Case VII**
MID-RISE APARTMENT BUILDING-GATED COMMUNITIES BY HOUSING COOEOPERATIVES	   
5	**2000 to date → The Contemporary Period**
	• Urban regeneration projects are on the agenda. • Gated communities have become widespread. • Current trend is the widespread of mixed-use housing developments.
	Case VIII
HIGH RISE APARTMENTS	 

Table 2: Morphological periods, changing housing trends, case selection (Guney & Wineman, 2008; Sey, 1998; Altaban, 1998; Guzey 2009, Keles et al., 2009).

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central hall (Case II) introduced in the 18th century but became widespread in the 19th century (Bozkurt, 2009). The rooms in the former are arranged along the two sides of the hall and therefore the hall is internally located (Bozkurt, 2009). In the later, the hall is located centrally between the other functional areas. The house layouts are slightly different, but their associated streets and neighbourhoods share the same spatial characteristics. In both cases, the number of rooms and the size of the houses vary depending on their residents' needs, family size and socio-economic situations. Thus, there is no fixed/rigid house plans for them.

Then, in the following morphological period (The Early Republican Period), garden city houses were introduced into Ankara as a low-density housing solution after the WWI. Bahcelievler housing development (Case III) planned by Hermann Jansen in 1934 in Ankara was the first garden city housing in Turkey and has been used until the 1950s (Kansu, 2009). The settlement mainly consists of two-floor single family detached housing units linearly arranged along the street, with a level entry onto the lower floor where the living room and the kitchen were located, the upper floor is the bedrooms. They are located close to the street line in their individual plots. The entrance to the houses is through a front garden. Compared to the traditional street network, the street layout is more regular and rigid. The development has undergone rapid transformation after 1950s.

The years following the 1950s (the Modernisation period) saw a dramatic increase of the population in Ankara (Keles et al., 2009). With changes in regulations, low/medium rise apartment buildings (Case IV) have become widespread in Ankara (Altaban, 1998) and largely replaced the garden houses. Soon after, Ankara was named 'the city of apartment blocks' in the 1960s (Altaban, 1998). The 1950s apartment buildings are mainly three storey housing developments with high land coverage. Their spatial layout resembles traditional houses in terms of the central location of the main living area (hall), and is similar to the garden houses regarding plot/street design. Currently, in many streets, most of the apartments have been knocked down and replaced by the new apartment buildings. However, the new formation also follows the previous plot pattern even though they slightly vary in their building footprint size.

Despite a high demand of affordable housing in the late 1970s (Coban, 2012), only the houses for mid- and high-income groups were constructed by private developers who were the dominant actors (70%) in the housing market in the 1980s (Burkay, 2006). The urban poor remained in slums which spread continuously in many areas of the city (Erman, 2001). Without adequate financial support from the government, the houses constructed by housing cooperatives were also for mid- and high- income groups (Sey, 1998). One of the examples is the housing cooperative 'Batikent' in Ankara (Coban, 2012). Three housing developments from the Batikent project are selected to examine the typological characteristics in the Liberalisation period. One is a low-rise, high-coverage mass housing development built in 1988 (Case V). It consists of 288 single-family terrace housing units arranged adjacent to each other and back-to-back. The individual units are two/three-floor and arranged along the pedestrian streets. The houses face either west or east and the routes lay north to south. Their front gardens serve as a buffer zone between the housing unit and the pedestrian street. The second one is an example of a mid-rise, medium-coverage mass housing development from the early 1990s (Case VI). The borders of the site are clearly defined, and the site access is partly restricted by the site administration. There are five identical buildings with five floors and each floor consists of four flats. Within the borders of the site, there is a car parking, a playground area and a meeting point. The third one is also a mid-rise, medium-coverage mass housing development from the early 1990s (Case VII). Like Case VI, the site is gated and the access is partly restricted by the site administration. Within the site, there are eight identical blocks linearly arranged in two rows. The blocks are five floors, and each floor consists of four flats. The development provides limited number of car parking but many sitting/resting facilities with well-managed vegetation and gardening.
Not until the 2000s (the contemporary period),

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affordable housing was constructed at a large scale in Ankara to replace slums and squatter houses (Burkay, 2006). Housing cooperatives were not active anymore in later years (Coban, 2012), and private developers and the Public Housing Administration were the main actors (Guzey, 2009). High-rise apartment buildings became the urban norm in the contemporary period. The layouts of these new apartment buildings were inspired by international models and completely different from the previous house types of Turkey. Due to the tension among different social groups, the high-rise apartments are mostly gated (Coban, 2012). Commercial and other uses were incorporated in such gated developments, often on the lower floors. Case VIII is one of the mixed-use gated housing communities. It consists of two 12-floor apartment buildings accommodating 80 flats in total. A car park and a commercial development are located between the two buildings.

The analyses of types according to typological frame at the three scales

This study has conducted 13 pairwise comparisons between the above described cases through the spatial characteristics defined earlier in the typological frame at the three scales (Table 1). The pairwise comparisons have been done in a chronological order. One case in one morphological period is compared to the newer cases that are either in the same morphological period or in the following morphological period. Figure 1 shows the results of these comparisons.

Defining typological process according to the pairwise comparisons

According to the pairwise comparisons of the spatial characteristics in Figure 1, the relation between the cases is defined as continuity where all or most of the spatial characteristics continued in the following case, as seen between Case I and Case II. When the cases have gone through partial changes but some characteristics have continued or partly continued, the transformation is defined as partial continuity. Where all or most of the spatial characteristics have discontinued in the following case, the transformation is defined as mutation. Given this, the relative relations defined between the cases at the three scales are summarised in Figure 2.

The analysis showed that mutation was observed at the three scales between the first two morphological periods. The gradual transformation of traditional Turkish houses (Case I and Case II) has stopped with the introduction of the garden houses (Case III). At the building scale, after Case III, the house types continuously transformed till today with partial changes. At the street scale, following Case III, typological process continued during the next two periods, then dramatic changes have occurred and typological process has stopped. At the neighbourhood scale, the gradual transformation occurred from Case III to Case V. The rest of the cases mainly showed mutational changes.

Conclusion

Typological process is often considered as a fruitful approach to study the evolution processes of building types (Barke, 2011), since reconstructing typological process can help one discover "the rules and laws through which the urban landscape develops and to which any new design could then be related" (Feng, 2014). Currently, there is an increasing interest in sustaining historical continuity in architectural and urban design practice because it benefits residents' sense of place and socio-cultural sustainability. It is widely believed that typological process can inform the management of changes and conservation of the urban built environments (Barke, 2011). However, there is less clarity in its empirical validation because of the issues derived from the judgement on the degree of transformations, the obscurity in the typological frame defining the certain spatial characteristics and the lack differentiation between the different place scales.

This study has attempted to address such issues in the Turkish housing context and has offered a methodological measure to define typological process. It analysed eight Turkish

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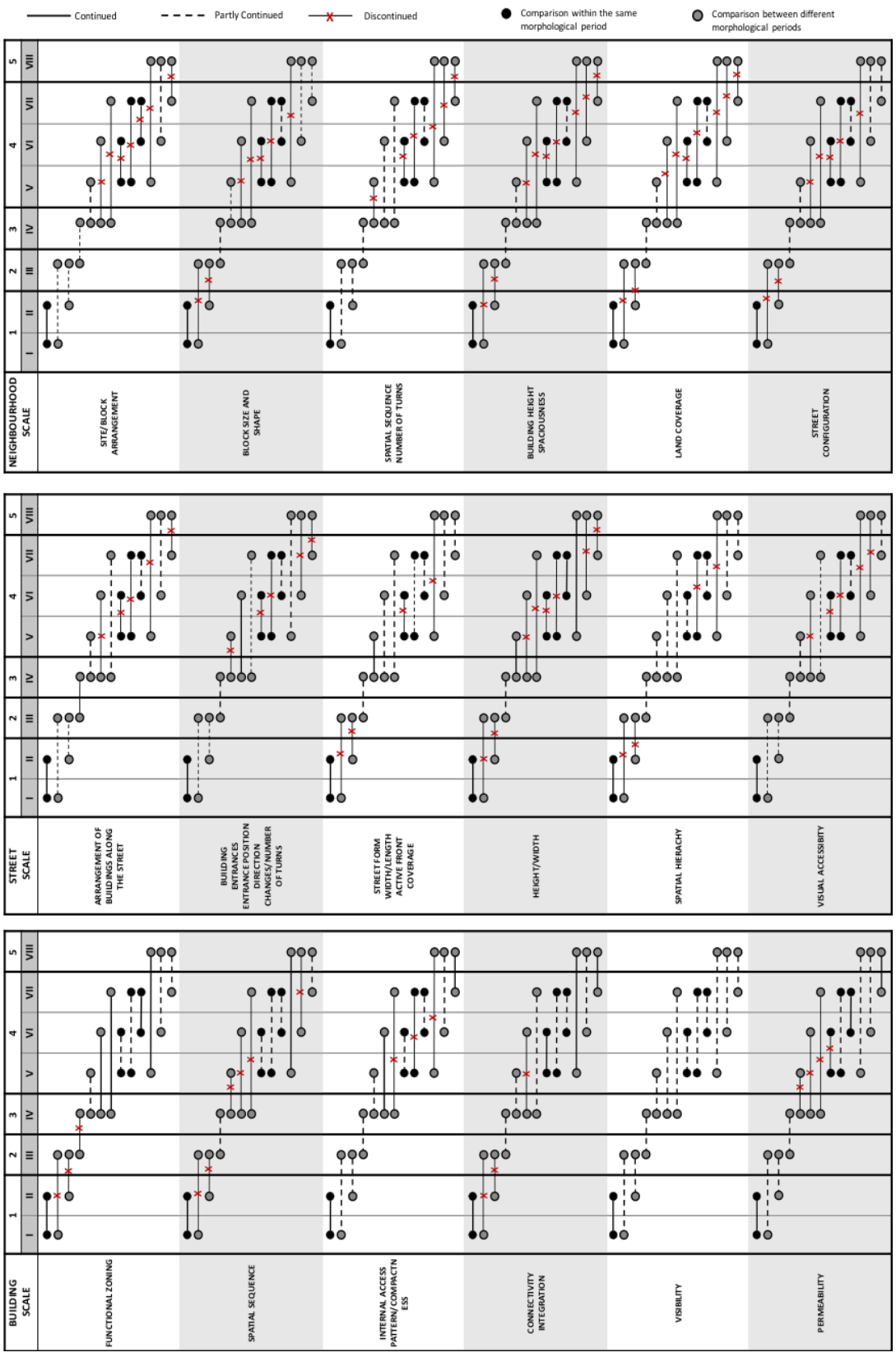

Figure 1. Pairwise comparisons of the cases at the building, street and neighbourhood scales

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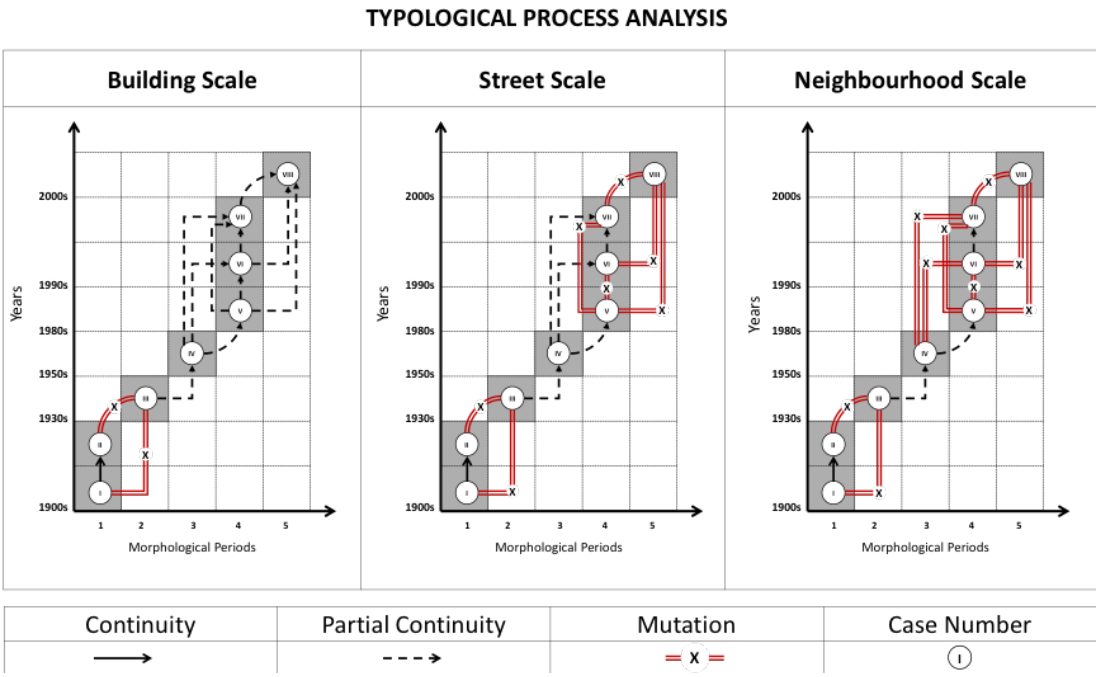

Figure 2. Typological process analyses at three scales

housing typologies representing different housing design concepts of the five morphological periods in Ankara according to the typological frame making the spatial characteristics needed to be considered for the definition of the spatial types at the building, street and neighbourhood scales. The study identified three degrees of changes between the cases: continuity, partial continuity and mutation and the former two are considered as typological process. The study showed that typological process has stopped and started again during the transformation process of Turkish house form. However, the degrees of change were not consistent at the three scales. Typological process was more prominent and lasted longer at the building scale. At this scale, the typological process stopped after the first morphological period and restarted again in the third morphological period. It continued to date with partial changes. More dramatic changes in typological characteristics (mutations) were observed at larger scales. It showed that while at one level typological process is observed, it may not be observed at another level.

The proposed study of typological process through the comparison of a set of spatial characteristics at the related multiple scales is an important contribution to the knowledge because there is no consensus regarding what elements of the built environment should be studied at what scales in relation to typological process. These characteristics extracted from literature as important morphological characteristics are operational, therefore might vary depending on different spatial typologies, place scales and cultures. However, they can still serve as the basis for further research to adopt or revise according to their specific research objectives and can be extended by including other typological and morphological elements of the built form, which needs to be studied further. The three degrees of changes identified in the transformation process are also new to the literature. By comparing the numbers of similarities and differences in the spatial characteristics, the degrees of changes are rigorously and clearly defined which will inform the establishment of typological process.

Overall, although the proposed approach in this study is demonstrated through the Turkish context, the methodology is applicable to other cities and countries and to help the understanding of their transformation processes. Nevertheless, the typological frame, morphological periods and degrees of change can be adjusted according to specific research objectives.

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Researching the morphology of the city's internal micro structure: UPM Urban Parterre Modelling

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Abstract. *As conventional cadastral maps only show building perimeters, they contain no information about the city's internal structure—about the complex interplay of architecture and its socio-economical use. Thus urban planning seems to spare little thought for what really takes place inside the buildings lining a street, although we perfectly know that the potentials of ground floor use and the structure of the correlating public street space are directly related. The Urban Parterre Modelling UPM-method refers to the city's "parterre" as a holistic urban system: it covers both built-up and non-built-up areas. Thus street, ground floor and courtyard are treated as entity, so that their interrelations can come to light. Technically the method represents the merging of a common 3D-city-model and a Comprehensive Ground Plan Survey CGPS—a researching technique used in the 1960s until the late 1990s (throughout Europe, but mostly in Italy, France and Switzerland).*

Keywords: StadtParterre (urban parterre); Ground Floor Use; Urban Space Research; Vienna

Introduction

A clearly new urban research method has been developed and tested in a pilot study by means of an in depth exploration of a typical historical street in Vienna (the streets' length is 190 meters). In September 2015 a new four years' research program was financed by the Austrian Science Fund (Austria's central funding organization for basic research, FWF) and launched at the Department of Urban Design at Vienna University of Technology; under the lead of Angelika Psenner. Within this operational framework the Vienna urban parterre is being investigated in terms of an exemplary neighbourhood in the 9th district, an archetypal GZ area totally rebuilt in the late 19th century. It covers three adjacent roads (A, B and C)[1] and altogether expands a length of almost one kilometre. Preliminary research was informed by an in-depth theoretical and historical approach, covering the following subjects: impact of relevant legislation[2]; urban planning and architecture (elaborate study on the unique architectural type of the 'Viennese GZ townhouse; cf. Psenner 2012a).

In order to better read the streets' position within the larger urban fabric, the biography of the street was extensively researched, including detailed information on layout (topography and urban planning), architectural development (historical and current building plans on the selected lots) and over time use structure development of ground floor and basement premises. Trading documents, business licenses and tax regulations are evaluated in order to enable the modelling as well as the drafting of house-biographies for each single building in the chosen field.

Given the methodological perspective the paper is addressing the following issues:
-How is the UPM, un utterly precise 3D-model of an exemplary sample of the Viennese StadtParterre (urban parterre), made and in

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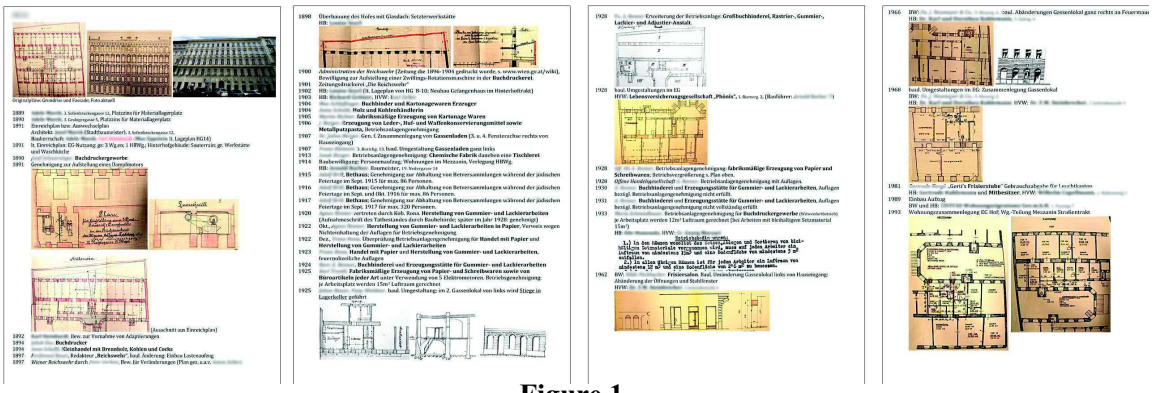

Figure 1.
Exemplary house biography, one out of 70. Source: © Psenner

what does it differ from standard city models? -What are the key challenges in managing and processing the necessary big data?

The Two-Dimensional Comprehensive Ground Plan Survey (CGPS)

Originally, the two-dimensional Comprehensive Ground Plan Survey (CGPS) derives from studies on the relationship between urban morphology and building typology, like the ones by Saverio Muratori in Venice and by Gianfranco Caniggia in Florence and Como (cf. Muratori, 1960 and Caniggia, 1963).

Several such morphological studies were subsequently conducted by Swiss architects and historians: in the 1960s, architects in the canton of Tessin initiated an inventory that was continued at the Swiss Federal Institute of Technology (ETH) in Zurich in the 1970s;[3] further progress in the field was made with a comprehensive survey of Zurich's urban centre under the direction of architectural researcher Margareta Peters (cf.: Peters, 1990 and 1999).

Conventional cadastral maps (called Flächen-Mehrzweckkarten MZK in Vienna) provide no sufficient information about ground floor plans and the structure of urban interiors, whereas a Comprehensive Ground Plan Survey (CGPS) sets buildings in relation to public space and their topographic environment, by thus visualizing the interrelation between the interior life of individual buildings and the public street space surrounding them and therefore accurately useful to examine the relationship between buildings, streets, and courtyards. Beside the ground floor CGPSs often cover the basement and a standard upper floor, some also include a typological register, specifying the particular building type (Muratori, 1960; Caniggia, 1963; Malfroy, 1986).

New approach: Three-Dimensional Urban Parterre Model (3D-UPM)

A baseline set of data is provided by the existing digital cadastral map MZK, which documents detailed land use for the entire municipal area of Vienna. It is a fundamental tool, a matrix that is filled in with ground level plans of individual buildings—covering both historical floor plans and documented building uses as well as most recent conversion records[4], so as to reflect the morphological evolution of the StadtParterre. All plans are then verified on site and, if necessary, adapted and amended, in particular with regard to actual building uses.

Given the importance of ceiling and building heights[5], one of the study's primary objectives is to provide a three-dimensional model of the urban parterre. To do so, the method was developed further into what is called 3D-UPM (Three-Dimensional Urban Parterre Model). This 3D representation of the data—the modelling is done with Autodesk Revit®[6]—now enables profound analysis of the links between buildings' interior and exterior spaces. Subject to the UPM the following matters are discussed: Where is, or was, the basement or courtyard directly connected to ground floor use? How do these interior connections affect

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Figure 2.
3D-UPM: investigating the city at eye level. Source: © Kodydek/Psenner

the entire parterre function? The introduction of 3D and the space usage interpretation are the major differences to the former CGPS-method[7].

The UPM depicts the ground floor is rendered in every detail, while for the standard upper floor and basement a set of simple structural data, such as weight bearing elements (main supporting walls), access points (stairways and corridors) and the façade-structure (opening axes), provides sufficient information. Where the adjoining levels (basement and first upper floor) are directly connected with the ground floor by stairs, doorways or (freight) elevators, they are treated as extensions of the ground floor and therefore represented in detail. Thus the UPM, a particularly sound representation that also includes basic information on ground floor "furnishing" (i.e. colour codes for differentiated use structure and cars/ double parkers) is used to examine the internal relations of the StadtParterre. As it produces precisely the information needed for defining the building's relationship to public space. With rendering the alley's geometric profile (street width and building size) the daylighting conditions on the ground floor and street level are expressively depicted.

The (historic) facade is interpreted as a permeable interface between building and public space, with information on the formal façade design being available as an option. In this sense the UPM represents a special type of 3D urban model, with precise detail data and a ground-level perspective. As known, standard 3D urban models mostly provide a bird's eye view and do not contain the information needed for a ground-level investigation.

Carrying out of the UPM

Due to its high level of detail the UPM fundamentally differentiates from current city models created with City-GML. The LoD Charta was used as point of reference in the modelling process. Yet, the Charta may not be applied fully as the current classification does not offer an adequate category: LoD4[8]—which would be the nearest—differs insofar that in UPM the façade is being handled in its urban structural not in its textural significance. Keeping in consideration that the authors' interest lies within the urban design perspective, little importance was attached to an accurate modelling of façade-textures[9]. After a significant revision of the UPM-method in March 2017 the LoD4 standard is now being applied on every single floor level – initially it was used on ground floor and basement level only.

The realization of the UPM is carried out in five major steps: approach to data and data gathering; data processing; first analysis (preparing and formatting of data; modelling and visualization.

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STAGE	TASK	EQUIPMENT
Approach to data and data gathering	In depth archive research at Vienna Building Authority MA37; extensive on-site field trips	Digital Camera (Sony Alpha. 6000+)
Data processing	Organize data	Microsoft Word, Microsoft Excel
First analysis; preparing and formatting of data	Information extraction; house biographies	Microsoft Word, Microsoft Excel
Modelling	3D-UPM	Autodesk Revit
Visualization	Analysis of the studied object; Comprehensive ground floor study	Autodesk Revit, Adobe Illustrator, Adobe Photoshop

Table 1.
Stages of methodology

The key for the modelling process is precise and detailed information about every single building and their relation to public space. Data is gathered in different archives: Vienna building authority (which holds most of the documents and plans, as well as many handwritten manuscripts), Vienna Museum, District Museum, Austrian National Library (ONB) and Wiener Stadt- und Landesarchiv. Repeated extensive on-site field trips veritably add to the approach.

The building authority archives hold rich information on every single lot in the city; each one has its own dossier, containing detailed documentation on the building process: application plans, construction permits and documented uses of most of the ground floor premises. Therefore, the building authority archives play a vital role in the approach to data. In an in-depth archive research, every single document is being photographed and thus digitalized. The dossier volumes vary in size depending on the building activity over the years and on whether constructions were applied for and recorded.

The historical maps—some of those in real poor condition (see fig.1)—carry a wide range of information such as site plans, sections, floor plans and relevant details. In order to get accurate reproductions, serial pictures of the historic maps are taken, ranging from an overview picture of the whole map to a zoomed in picture of the specific plans. Being the solid base of information for the modelling process, the taken images must not be distorted or blurred; so that key information such as height-level measurements, dimensions of various building parts, annotations and any kind of handwriting are perfectly visible and readable. (Photocopying is not feasible in this stage of data-gathering, because of the bad condition of most plans and because of the large data-amount (big data).

Repeated on-site field trip investigations are necessary in order to verify ambiguity and uncertainties arising on the fact most of the

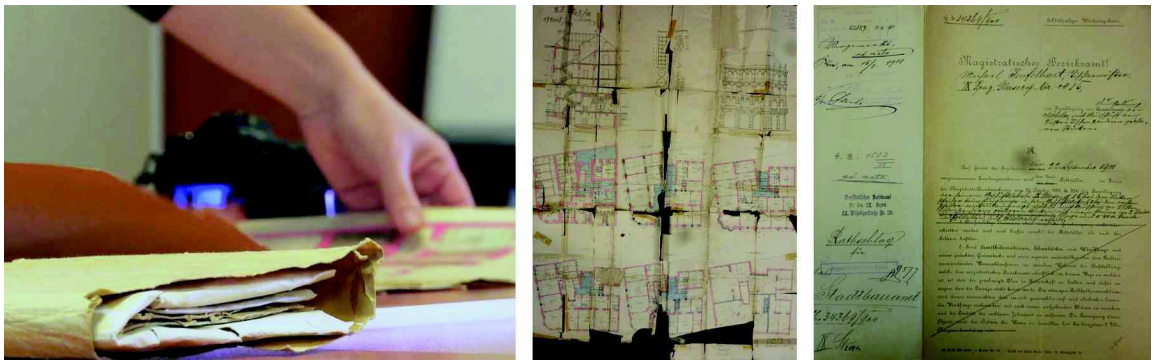

Figure 3.
Historic documents that are archived in Vienna Building Authority Department. Source: left: film-still from video by Karina Hurnaus about the researcher Psenner and the ongoing research project: https://www.youtube.com/watch?v=vUJSA2N-zbA; others: © Psenner

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time the archive dossiers do not dispose the (now common) inventory plans[10]. Therefore, mismatches between historic plans and actual as-built constructions are to be found rather frequent[11].

The actual nowadays buildings are being photographed as well; which proves to be rather helpful for additional information and control. And in order to study the buildings on an urban design level (i.e. permeability of the façade structure) the single house-pictures are merged to form a continuous strip of street-façade-panoramas.

All collected data (archive and on-site) is then unified and organised in an accurate way. This big-data management proves to be rather laborious: firstly, the information is divided by street, every single lot has its own folder, containing the building authority archives information as well as the on-site material. Then this data is being evaluated and prepared for the modelling process.

For creating the UPM the following data is being used:

-the cadastral map (MZK)

-historical plans (building authority and other archives)

-on-site photographs

-3D libraries (used as the basic elements for the model).

The 3D modelling is set on reference to the official cadastral map MZK, which contains

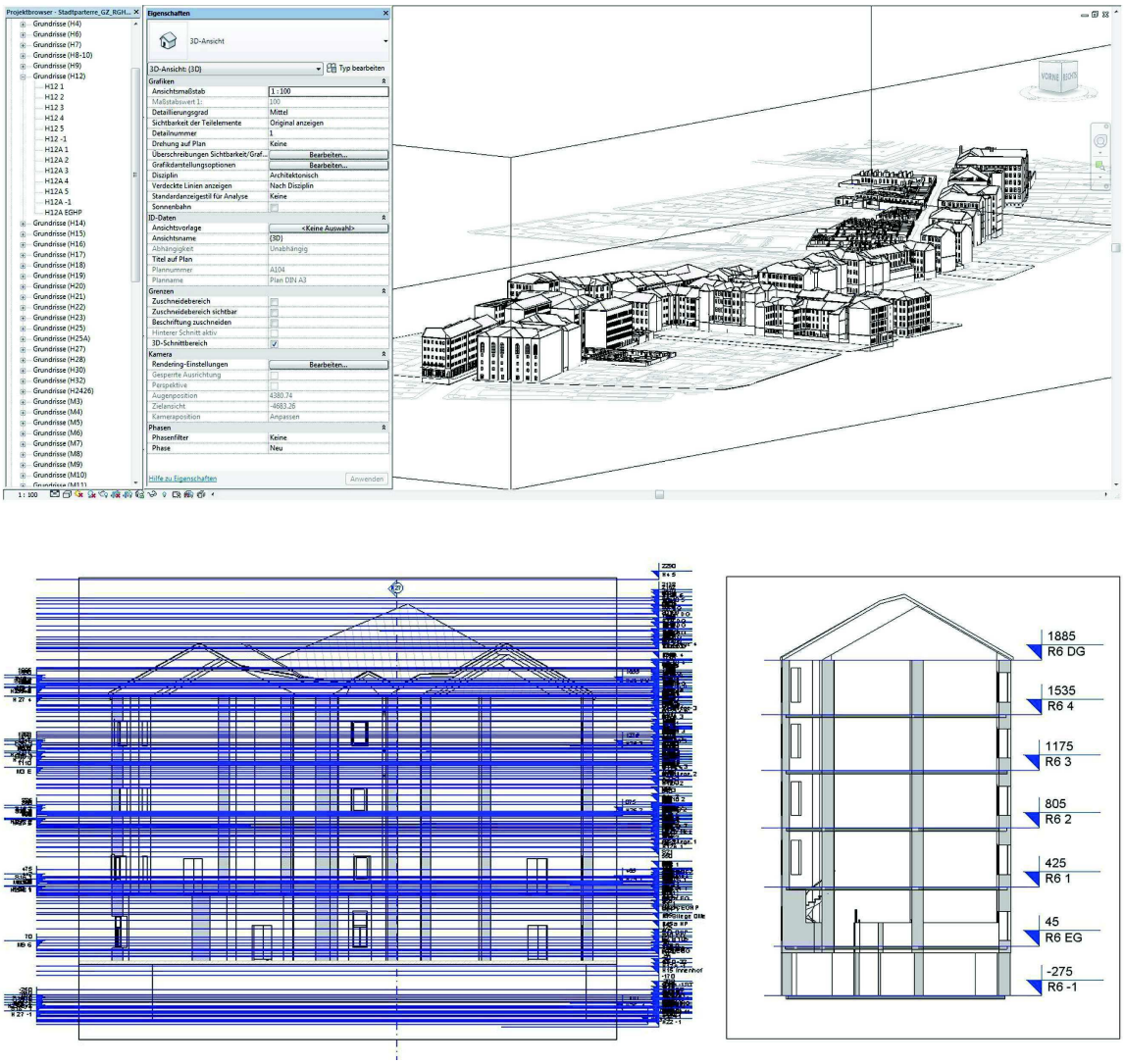

Figure 4.

UPM modelled in Autodesk Revit®; data management: left image showing all levels concerning the model; right: big data is being arranged in a readable way: extra floor plan view for each building containing nothing but the relevant floor plans. © Kodydek / Psenner

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all base-line information; such as street width, outlines of the houses. In consequence this macro-information is being combined with data concerning the micro-structure on edifice-level. The model's high level of detail standard is being ensured by thoroughly incorporating differentiated information derived from the historical building plans:

a. exact building height

b. differing room heights (the historic Viennese townhouse shows varying storey heights: normally the ground floor is the highest, from bottom to top the storey height decreases remarkably; cf. Psenner 2012 and 2014a)

c. roof type, shape of historical roof formations and more resent rooftop conversions

d. level of the ground floor in reference to the topographical level (cf. Psenner 2017b)

e. façade: basic structural elements such as windows, doors and essential tectonic details

f. inner connections to adjacent floors (cellar, basement and upper level): stairs, trap doors, (freight) elevators

g. outer connections to open space: accessibility courtyards; alley doors.

Analysis – dealing with big data

The exemplary StadtParterre being investigated is in the 9th district, an archetypal GZ area totally rebuilt in the late 19th century. The UPM covers three adjacent roads (A, B and C) and altogether expands a length of almost one kilometre. The street stretch formed by A and B is 810 meters long; it counts 56 houses. Street C—which is an orthogonal side street to the previous—measures 144 meters with an additional 14 houses[12]. This adds up to a total model length of 952 meters and a total of 70 buildings.

The modelling is done with Autodesk Revit®, a programme chosen for its coordinated and consistent model-based approach. It allows integrating CAD data, such as the digital cadastral map MZK. The 3D elements—called Families—were selected from Revit® libraries and other open source databases such as Revitcity. Some site-specific elements, such as certain wall constructions, were created in Revit without using a the 'family' option.

In a first approach the research field was divided into five blocks of similar size—as it could not be estimated whether the whole street length (big data) was manageable in one

Figure 5.
UPM showing the research field - use structure analysis for historic status (around 1910). © Psenner

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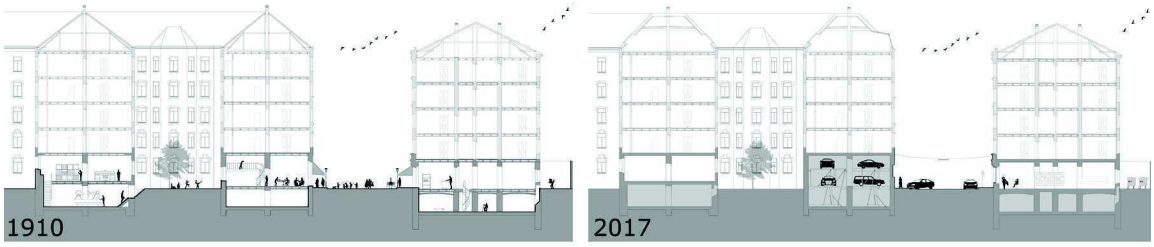

Figure 6.

Section views of the StadtParterre of the 1910-status and the current status; while the historic StadtParterre functioned as a uniform, inter-connected structure, the exchange between the various zones is no longer given today. © Kodydek / Psenner

single model. But during the initial work phase, the data load turned out to be developable so that one big model was created on one single dataset. This means that data managing is becoming a number one feature: The different floor plans of one building are grouped into one floor plan view named after the house number; thus a total set of 70 different floor plan views are created.

With the 'plan regions' tool and by defining cut planes at different heights the programme allows to envision specific areas in order to produce the visualization needed (e.g. for Souterrain and spilt levels, which are quite present in the research area). This facilitates a precise analysis of the interconnection of different StadtParterre spheres over time: ground floor and adjacent rooms in basement or first floor. As two different UPM-phases are being produced—one depicting the status of around 1910 and one showing the current situation—the seminal time factor is taken in.

The information of the afore mentioned house biographies is being processed by including the various uses categorizations of all single ground floor premises via a special colour code schema: green stands for semi-public use (with high use frequency and direct connection to the public street space); orange stands for production, yellow for living, grey for storage and blue for garages. The Revit® tool "Rooms" is uses to marked this reference within the building model base on room-bounding elements. Thus the model offers highly detailed, multi-dimensional information.

The model allows to create section views through every single building, thus revealing precise insight on varying storey heights, on structural information, and on the vertical and horizontal interconnectedness of the StadtParterre, which as we know has to be seen as a holistic urban system.

Outlook

In the pilot study (2012-2014) the modelling had to be outsourced due to budget reasons; whereas in the ongoing research project, an in-house 3D modelling position is provided. Thus the process was adjusted and fitted for the actual research goal. Currently the methodology is again undergoing an evaluation process: by identifying weaknesses—mostly mentioned in the text above—it shall be improved further.

The systematic 3D modelling of the historic structure and the current situation was undertaken simultaneously, which turned out to be rather time consuming; hence the modelling of the historic status shall be performed and finished before applying the changes and adapting it—by using the "phase" tool.

Conclusion

The complex micro-analytical possibilities of the Urban Parterre Model UPM allows to document vacancies and other issues relating to street-use in selected neighbourhoods and to analyse the contributing economic, traffic and social factors. Systematic 3D modelling of the built-up environment and taking inventory of historical, current, and potential ground-floor uses thus will provide a basis to put Vienna's street-level environment in a long-term development perspective as a practical

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guideline for future interventions in various neighbourhoods and for the (re-)designing of individual street complexes[13].

From an international research perspective, another innovative asset of the project is the three-dimensionality of the comprehensive model. Successful regulatory measures in urban planning, administration, and economic policies depend on sound and detailed knowledge of the actual architectural structure as well as the current actual—and potential—use of the street-level environment. Urban Parterre Model provides this information in easily accessible and locally contextualized form. Thus, the development potential of the street-level environment can be clearly identified to inform urban planning.

UPM is a ground-breaking method that can provide data that are highly utilizable for urban research (and planning), including in particular computer-based simulations. The UPM including the historical analysis of the overtime transforming relationship between the built-up and the non-built-up urban street level environment in will be a sound basis for further in-depth analysis. The benefits that may be expected from this approach include that

-the UPM method visualizes the (historical) interrelation between street space and ground floor use over time and identifies existing discrepancies between private use of the street space and the public interest in having other (and yet unavailable) offerings of the street-level environment;

-reliable planning and implementation of concrete improvement of the urban street-level environment will be possible.

In any case, the application possibilities go far beyond the situation delineated in this present study, as the UPM will be usable not only in an urban context, but also in suburban or rural settings, for example, to study and address in regional planning terms certain architecture-related aspects and conditions of the problem of vacancies in rural areas (small towns, rural communes, and villages). Once fully developed, the analytical UPM approach may also be applied to any other critical StadtParterre situation in urban peripheries or shrinking city situations.

Notes

1 For data protection reasons—since plan data for individual buildings in Austria is considered to be private—detailed information about the Viennese StadtParterre (urban parterre) in question are anonymized, when disseminated.

2 Building regulations, commercial code, public health care and road traffic regulations, tax incentives, urban planning, etc. (cf. Psenner 2012, 2014a, 2014b, 2017b).

3 CGPSs are available for most Swiss towns and cities; manly covering the historical city centres; amongst others: Bellinzona, Lucerne, Bern, Solothurn, Biel, Zurzach, Lelandron, Baden, Wil SG, Zurich (old town and industry quarter).

4 Plans are kept on file in the database of the Vienna Municipal Building Authority Department. Unlike in other countries (e.g. Italy and Switzerland), detailed plan data for individual buildings, which contain precisely the information needed here, are considered private under data protection laws in Austria. Which is why all research and findings have to be anonymised in the present paper.

5 Building height is the factor that determines the extent and type of shading of the street space and lower floors. In relation to street width, GZ buildings are rather tall, which leads to disadvantageous daylighting conditions particularly on the ground floor. The typical Viennese multiple-storey apartment building has exceptional ceiling heights (3.20 to 4,95 m), which allows for specific and highly flexible types of use. (Psenner 2012, 2014a)

6 Revit® is a standalone application that includes architectural design, MEP and structural engineering, and construction features. The program was developed as a specific Building Information Modelling (BIM) tool which facilitates a coordinated and consistent model-based approach. It supports easily controllable transparency and fade-in/-out effects based on flexible keys for all objects. Cf. Clayton 2014.

7 The Ponticelli / Naples ZGA includes axonometric plans, which, however, only show building skins (Fioravanti quoted in: Caniggia 1986, p. 336).

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8 LoD4: The building's geometrically detailed outer shell and interior is represented by detailed surfaces and roof shapes. All kind of surfaces and additional movable and non-movable building elements (e.g. balconies, chimneys, stucco, ledges, etc.) may be represented with greater detail as semantic objects.

9 If it proves to be decisive to have precisely visualised façades, the current model can be easily adapted to this.

10 Nearly always (minor) differences between a historic application plan and the as-built construction are detected; as many decisions are to be taken on-site, when problems arise while construction is going on. Nowadays building authorities generally ask for an official "notification of competition", which must include a so-called "Bestandsplan" (inventory plan).

11 Due to the large number of buildings being surveyed, the impossibility to enter those private houses and the given time and financial resources, follow up measurements in every single building is beyond question. For that reason, the MZK, the existing plan documentation and the on-site verifications are used to iteratively approximate the precise form.

12 C shows a high ground floor retrofitting into garages and was chosen for exactly this reason.

13 In order to develop a sustainable solution to the various problems that afflict the Vienna street-level environment, it will be necessary to employ a systemic view of urban structures. One objective of this study is an in-depth analysis and representation of these interrelations.

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Morphological analysis of frontier villages in Cyprus

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Abstract. *Borders may be built for security reasons however; they also demarcate administrative, economic, socio-cultural, ethnic or religious divergence. Borders change the destinies of the societies at both sides because they affect the process of urban development and delimit the economic and socio-cultural interactions. Cyprus has been experiencing an interrupted continuity along the border, i.e. green line, under the rule of UN that divides north from the south. In this regard, the aim of the study is to figure out how the de facto borders affect the configuration of villages upon their existing position. As a part of an ongoing research which investigates all eleven frontier villages and towns located along the border line, this paper only focuses on the morphological and syntactic comparison of four frontier villages. Within this context, initial exploration is about the village morphologies by means of Morphological Regions based on the evolutionary insights of Conzen (2004) and Whitehand (2009). Additionally, considering shifted centrality and transformed social gathering spaces, research discusses the applicability of the comparative analyses of syntactic and morphological methods in order to reveal the characteristics of the frontier villages. The preliminary findings of the research indicate that edge villages located along the green line have a controlled spatial development with dead ends and loop layouts, where the spatial configuration presents an introverted structure. On the other hand, villages divided by the green line, presents a relatively integrated spatial structure developed on both sides of the border, maintaining traditional centrality along with emphasizing forced territoriality.*

Keywords: Urban morphology, fringe belts, edges, axiality, centrality

Introduction

Borders may be built for security reasons however; they also demarcate administrative, economic, socio-cultural, ethnic or religious divergence. Borders change the destinies of the societies at both sides because they affect the process of urban development and delimit the economic and socio-cultural interactions.

Since the complete division of the island and separation of Greeks and Turks after 1974 due to unresolved political situation, Cyprus has been experiencing an interrupted continuity. The border named as green line, is controlled by UN and it divides the island into north and south portions. Division of the island was a critical decision in terms of geography, natural resources and social structure, whereas the differences in the socioeconomic status of both sides affected the development and urban improvement as well. In this regard the aim of the study is to figure out how the de facto borders affected the configuration of villages upon their existing position. As a part of an ongoing research which investigates all eleven frontier villages and towns located along the border line, this paper only focuses on the morphological and syntactic comparison of

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two frontier villages. Within this context, initial exploration is about the village morphologies by means of Morphological Regions based on the evolutionary insights of Conzen (2004) and Whitehand (2009). Additionally, considering shifted centrality and transformed social gathering spaces, research discusses the applicability of the comparative analyses of syntactic and morphological methods in order to reveal the reformed characteristics of the frontier villages. The questions arise in minds 'could it be morphological and syntactic analysis can correlate to each other for finding a better reliable outcomes of the development of city

The preliminary findings of the research indicates that edge villages located along the green line have a controlled spatial development with dead ends and loop layouts, where the spatial configuration presents an introverted structure. On the other hand, villages divided by the green line, presents a relatively integrated spatial structure developed on both sides of the border, maintaining traditional centrality along with emphasizing forced territoriality.

Urban Morphology: Historic Geographical Approach

The study of urban morphology is associated with different views and perspectives. This interdisciplinary characteristic leads to a deeper observation of the origins of urban morphology. As Whitehand (2011) stated that the urban morphology seeks to understand the spatial structure and character of a metropolitan area, city, town or village by examining the patterns of its component parts and the process of their development, morphological studies in urban context are one of the significant methodologies of analysing the physical formation of towns and cities. Additionally, the studies draw the guidelines for urban planning and design that helps to increase the uniqueness and quality of urban environment. One of the aims of morphological studies is help to understand the evolution of built form. Oliveira (2016) defined the study of urban morphology as a way of introducing the element of form in planning processes by removing that element from the realm of arbitrariness. The methodological approach links methodology in planning without disregarding the non-rational aspects of form. This approach makes it possible to discuss the form of towns based on morphological methods.

Urban Morphology Glossary stated that, "The physiognomy of a town or the urban landscape, being the combination of three systematic form complexes, i.e. town plan, building fabric and land use" (Conzen, 1969, p. 131), "the visual appearance of a town" (OED). Many geographers comprehensively examine a town's scenery and its evolution into its modern form (eg. Smailes, 1955). The usual architectural approach tends to view each element of a townscape more as an individual work of artistic merit, and seems to claim that townscaping is an applied art (Cullen, 1961). Sharp, unusually and early for a planner, also makes this point (Sharp, 1968). Probably best defined in non-technical terms as "a wide scenic view of a town or parts of a town, with common characteristics of design" (Johns, 1991, p. 10).

All these aspects have been the subject of geographical investigation (Conzen 1960). Three schools began to work on urban morphological studies: the English school, the Italian school and the French school. In the scope of the English School, MRG Conzen is a pioneer of morphological studies in urban design (Moudon, 1997, p.3). He is one of the founders of urban morphological studies on the geographical level with the historico-geographical methodology at the University of Birmingham, a school that aims to introduce such studies worldwide. Basically, the approach is related to thinking in terms of ground use and functions and to spatial planning.

Townscape Analysis/Morphological Period

In Conzen's study of the Alnwick (Market town in Britain), he determined how the historical development of a major aspect of urban form could be expressed in great detail cartographically (Conzen 1960). To understand this it is necessary to appreciate how the diverse urban form complexes relate

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to one another (Whitehand, Gu et al. 2011). The means of morphological periods, like the geosphere of which forms a concrete part, can be viewed under three distinct aspects, suggesting three corresponding approaches: to with the morphological, the functional, and historical. As a part of geographical reality, regions are strictly speaking unique spaces, individuals with distinctive personalities. However they show many recurrent similarities in specific aspects, like human individuals, a fact frequently overlooked in discussion on regional geography, through perfectly well known to scholarly, as a distinct from essentially didactic, practitioners in regional study. Thus regional geography is by no means condemned to the barren contemplation of the unique, but awaits the building up of a theory of regions on the basis of their comparative study, producing a typology or typologies of regions (Conzen, 2004). Usually Townscape analysis needs two types of researches which are historico-geographical evidence which are documentary, cartographic and pictorial. Addition to this, filed survey is needed by developing the concepts corresponding to observable phenomena and so build up a theory of townscape.

Conzens' morphological period, namely a phase of social and cultural history creating distinctive material forms in the cultural landscape. He improved evolutionary approach to tracing existing forms back to the underlying formative processes and interpreting them accordingly, would seem to provide the rational method of analysis of urban morphology. Conzen's urban morphological study focuses on the town plan, which represents a town in two dimensions including all important characteristics of urban form his study of Newcastle upon Tyne, England (Conzen, 1981), he described the complete method, called an evolutionary method of plan analysis, which is the town-plan study of sequential time periods. In his town-plan analysis approach, he identifies three fundamental elements of the town plan that can be analyzed over time in an evolutionary fashion: the streets and their street system, the plots and their plot pattern, and the building arrangement within these patterns (Conzen, 1968). The evolutionary method of plan analysis provides an understanding of the physical development of urban structural elements, resulting from the city's cultural and historical development (factors that strongly influenced its morphological development), which is an objective of the morphological approach. In the study of Burgage cycle in Newcastle, Conzen also uses an evolutionary town plan analysis as a means to understand its physical development over time The retrogressive method of working back from present-day forms is rejected quite simply because a proper understanding of processes cannot be attained from the analysis of relics, even in the case of the town plan, which produces a more complete collection of residual features than the building fabric or the land-use pattern: those parts of the townscape that have been removed are as important to a theory of townscape development as those that have survived.

Conzen has put major emphasis on the importance of townscape for urban development practices and in two of his papers he has formed a map of townscape for Ludlow (Conzen 1975, 1988) Conzen's townscape are closely related to his idea of the townscape as the 'objectivation of the spirit' of a society. According to him (Conzen, 1968), 'the spirit of past and current societies is represented in the historico-geographical character of townscapes, i.e. the genius loci of Christian Norberg-Shultz.

Syntactic Aspects

Hillier and Leaman (1974) use the term syntax to refer to rules that generate different spatial arrangements, that are assumed to be shaped due to certain cultural considerations affecting social relations. Space syntax on the other hand, is defined as a methodology to represent, quantify and interpret spatial configuration and visual perception of exterior or interior spaces regardless of their scales by means of convex shapes, and axial lines (Hillier et.al, 1987). Among the components of space syntax methodology, integration determines the distance to a convex shape from all

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points within the system. If the real (global) integration value of the shape is high, reaching to this certain shape from any point within the system, is relatively easy and indirect. Relative (local) integration on the other hand, indicates the distance to a convex shape within the system, from its neighbouring shapes. Higher relative integration value means that reaching to surrounding shapes from this certain shape is relatively easy and indirect. On the other hand, if the shape is located somewhere close to the outermost parts of the system, its integration value decreases, leading to an increase in its mean depth value. Connectivity value refers to number of cells directly connected to a shape within the system. If the shape is located somewhere close to the centre of the system, then it means that the shape has many surrounding cells, thus increasing its integration. Connectivity value works parallel to relative integration; one determines the distance to neighboring cells while the other one determines the quantity.

According to Batty's (2001) description in his initial analysis of isovists referring to Benedikt (1979), there is the identification of six geometric measures from which isovist fields could be established: area, perimeter, occlusivity (or length of occluding boundaries within the isovist), variance and skewness of the radial distances around each vantage point, and a measure of compactness called circularity, defined as the ratio of the square of the perimeter to area. Therefore, circularity is not only a measure of how well a space approximates a circle, but is also a measure of the viewpoint's position within the space. For this reason circularity is not only a measure of the shape of a space but also of the centrality of the viewpoint within that space. It is determined by calculating the area of a perfect circle, whose radius is set to the mean radial length of the isovist and then dividing this by the area of the isovist. Batty (2001) defines compactness as the ratio of average to the farthest distance from each vantage point. Compactness value changes between 0 and 1; Indicating that long, narrow, stringy shapes have values closer to 0, while round, compact, circular shapes have values closer to 1. The compactness suggest that adding a linear partition creates more depth than adding a compact, L-shaped or U-shaped partition of the same length. This value is important for us to figure out if the diachronic changes in urban form have also affected the public space uses. The circularity and compactness values give us information about spaciousness and visibility potential of the urban form, whereas the compactness value defines the shape of the obstacle within the visual field, the circularity value denotes the easy perception of a space

Figure 1
Cyprus green line selected villages.

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at a given instance. Space syntax theory suggests that circle or square like spaces can be observed more quickly than long, narrow or spiky spaces.

Methodology and the Case Study Towns

The goal of this study is to analyse how the town developed and transformed by further comparison of the topography with street layouts; parcel shapes, sizes, and arrangements; and building characteristics and placement on their parcel. Then by overlaying these characteristics and conditions, a pattern or Genetic Plan Unit becomes visible. The analysis and outcome of this study can help residents and officials plan future development and decide what of the existing urban fabric is valued and worth protecting. On the other hand, changes in the functional uses also give hints about the spontaneous development of patterns whether they maintain their traditional layout or adjust to the new situation.

As mentioned before, this paper only compares the two border towns Beyarmudu and Haspolat out of the ten as seen in Figure 1. The methodology has twofold analyses, one being morphological based on various observations of the towns and other being syntactic based on computational data of various calculations applied to genetic plan units and building pattern of morphological maps. The boundaries used for syntactic grids are adjusted to the commercial, public and residential uses leaving the farm lands and industrial areas out. The University of Michigan software, Syntax 2D is used in for the syntactic data analyses.

Beyarmudu is an enclave carved out by the Turkish Republic of Northern Cyprus. This small town with a dropping population (only 1196 residents in 2011) is fortunate to have crossing checkpoints for passage across the international border. Beyarmudu has two international borders, the one is passing through the southern part of the city where links to Republic of Cyprus. The other border under British rule passes through the western part of the town. The international border is the town's only fixation line but creates a lengthy edge that shapes development on its south and west sides but gives some breathing room on the east. The north side is truncated by the border, which snugs the east side of the only road into town where no border is crossed. Access to the cross border football pitch is permissible from both sides, and farmers' fields have an invisible line drawn across them that does not hinder the plow. The town's industry is primarily agriculture as the surrounding countryside attests. Beyarmudu is not much of a draw for tourists as it is off the main travel routes and does not have any sign.

Haspolat on the other hand, is a suburb village of Nicosia in Cyprus during the British colonial period. After the war, some parts of the town were left in the buffer zone. As of today Haspolat has a population of 4204 inhabitants. According to the Nicosia master plan Haspolat is developed as a light industrial zone. However, the recent development of university campuses nearby, also reinforce the residential uses in the area, towards main connecting roads.

Morphological and syntactic analyses of Towns

Beyarmudu:

Building Pattern; in Beyarmudu, Figure 2 distinguishes the buildings based on period of construction and architectural styles with pre-colonial and colonial buildings being grouped as one. The periods were greatly determined based on material, elevation above street level, and setback from street. Some buildings also helped with period placement by displaying buildings dates on their façades.

Buildings built before 1956 code changes were frequently built with no or little setback. For example, those built with adobe, a material mostly used pre-conflict, are typically at grade with 30 percent built at the street edge and 51 percent built within one meter of the street. Analysis shows that more than half of the concrete buildings have setbacks of 3.5 to 4 meters placing their construction after 1956. This aligns with the dating of most concrete construction after the conflict. Despite grouping buildings by overlaying various characteristics,

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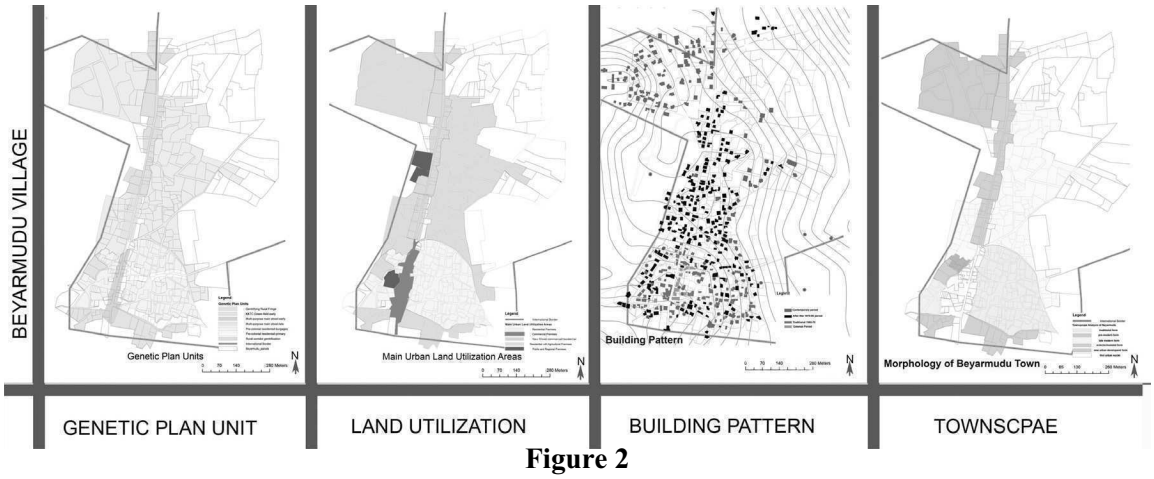

Figure 2
Beyarmudu. Building pattern.

the above pairings and several other attempts do not align in any geographic pattern to suggest Plan Unit. Seemingly, the grouping of materials, elevations, setbacks, and periods are more or less intermixed throughout the town and the characteristics of vertical construction alone could not define plan units in Beyarmudu. The main urban land utilization areas were demarcated based on land use of parcels and period of development. According to this, commercial premise locates at the southern part of the town along the main street. Public facilities take place along the commercial districts on eastern part of the town, whereas the rest of the town has residential uses.

The Genetic Plan Units in Figure 2 were then delineated by compiling all the aforementioned data first as individual layers and the analysis in its compound forms. Ultimately a synthesis, the genetic plan units which were discovered via this process are;

The pre-colonial residential primary – similar house forms by elevation and setback on similar size parcels within the traditional town centre and facing on the main street.

The pre-colonial residential unit – house forms on parcels situated on connecting roads around the strips of pre-colonial residential primary and multipurpose main street early. Between and around the traditional core is mostly generational subdivision of the first settlers' lands and buildings. Town square next to the mosque in the town creates first urban nuclei.

Morphology of Town; as seen on figure 2 first urban settlement located very close to south border with the extension on east to west. After the conflict in Cyprus especially after the international border town has been developed on south to north axis along the main street. The town square located in first urban nuclei attached on the main street. Other morphological area development filled gaps in this pattern and fourth order continued the amorphous parcel patterns into green fields. The result of post conflict and new urban development is somewhat sprawling in shape and space, away from the town centre but ultimately confined by the fixation line of the international border on south and agricultural land on north. The last morphological development is the two-story villa development is only slightly less amorphous because it is happening along geometrically planned roads within the confinement of the border.

Both connectivity and compactness values of Beyarmudu support the sprawl denoted by the morphological maps. As the town expands towards the northern agricultural lands, the visual obstacles tend to disappear. This visual transparency along with high connectivity values enables a second centre within the system that can be converted to public use. Circularity values on the other hand, emphasize the main street as the commercial and public facility functions located here have high visibility levels. Although local integration around this area shows segregation from the system, the linearity of the pattern is reinforced with a shift towards the centre of the system, denoting the mix use facilities of newer periods.

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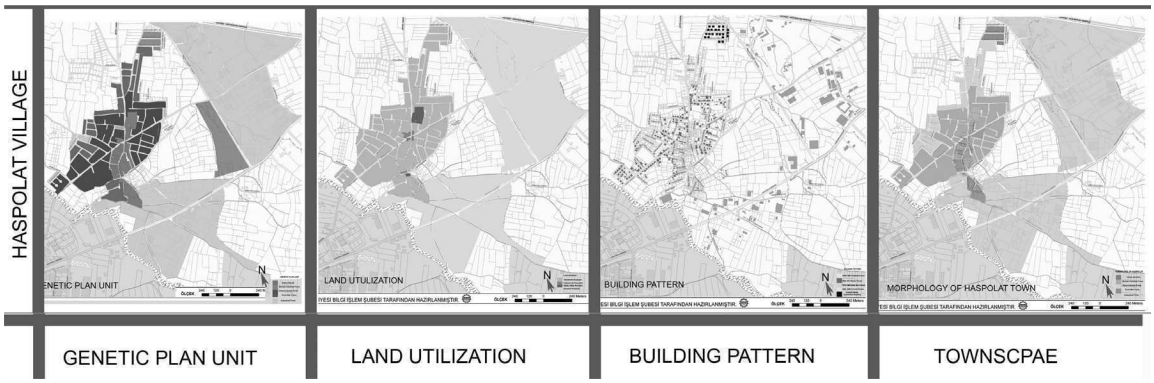

Figure 3
Haspolat. Building pattern.

Haspolat:

Building Pattern; In Haspolat, Figure 3 distinguishes the buildings based on period of construction and architectural styles with colonial and post-war buildings being grouped as one. The periods were determined based on material, elevation, and setback from street like Beyarmudu. Some buildings also helped with period placement by displaying buildings dates on their front façades.

Buildings before 1958 have significance with their façade and their window and door ratios, which signify them from other periods. For example, those built with adobe, a material mostly used pre-conflict, are typically at grade with 20 percent built at the street edge and 80 percent built within one meter of the street. Analysis shows that more than half of the reinforced concrete buildings have setbacks of 3 to 4 meters placing their construction after 1958. The building pattern after colonial period has setbacks from the street line about 3-4 m. with balcony at the front façade. Shading devices on the front façade on the balcony is the main significant element from the street. This aligns with the dating of most concrete construction just before the post-war. After the post war few buildings has been constructed.

The main urban land utilization areas were demarcated based on land use of parcels and period of development. Haspolat has two commercial uses; the one has been located at the eastern part of the town which was developed parallel to the border. But today it loses its character and new commercial premises has been shifted towards the intersection of the two main streets as seen in figure 3, Public facilities take its place along the commercial districts on northern part of the town. Addition to this industrial district has been developed western part of the town along the border and later on, it has been sprawled until the main street. The residential premises have been developed towards the northern part of the town.

First urban nuclei have developed on the eastern part of the town as called traditional plan unit. British Colonial plan unit has been developed along the eastern and western axis of the town. Thirdly Post-colonial units have been developed the surrounding of the British colonial plan unit. During the post-war, new plan unit that called post-war plan unit has been developed towards the northern part of the town away from the border.

Morphology of Town; as seen on figure 3, first urban settlement located very close to south border with the extension of west. During the post-war in Cyprus especially after the buffer zone town has been developed on north axis the intersection of the two-matrix route. The town square located on the traditional core and all commercial and public activities are within the traditional core. While the first urban nuclei have been located in the east, the post-war morphological form shifted to the east and traditional core has been shift there. British Colonial morphologic area has been observed surrounding of the traditional character area towards south to north, but after the war new morphological character has been developed along the northern part of the town. The other morphological area development filled gaps. New industrial morphological form has been

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observed at the eastern part of the town with industrial building pattern, current building pattern and industrial land use function. The result of post-war directly affects the morphology of town by the means of plan unit, land use and building pattern. The centre has been shifted towards the eastern part and it has been transformed to a different morphology.

Compactness values of Haspolat present the new residential development towards the northern sections support as denoted by the morphological maps. The town experiences a fringy expansion towards the north and southeast. The northern development creates a secondary centre with the highest compactness values, and less visual obstacles. Circularity values on the other hand, emphasize the triple centrality of the western zone divided by the main street. This zone dating back to modern period presents high local integration and connectivity values independent from functional uses. Having high visibility levels and relatively high integration levels supports the fringy development of Haspolat.

Results and discussion

As a part of an ongoing research, this study has presented that morphological and syntactic analyses executed on urban scale supports data acquired from different methods. The development of two towns interrupted by a border presents different outcomes. As Beyarmudu continues to develop in a linear manner towards north and therefore its urban nucleus gets deeper in the system, Haspolat develops centrally with unequal fringes.

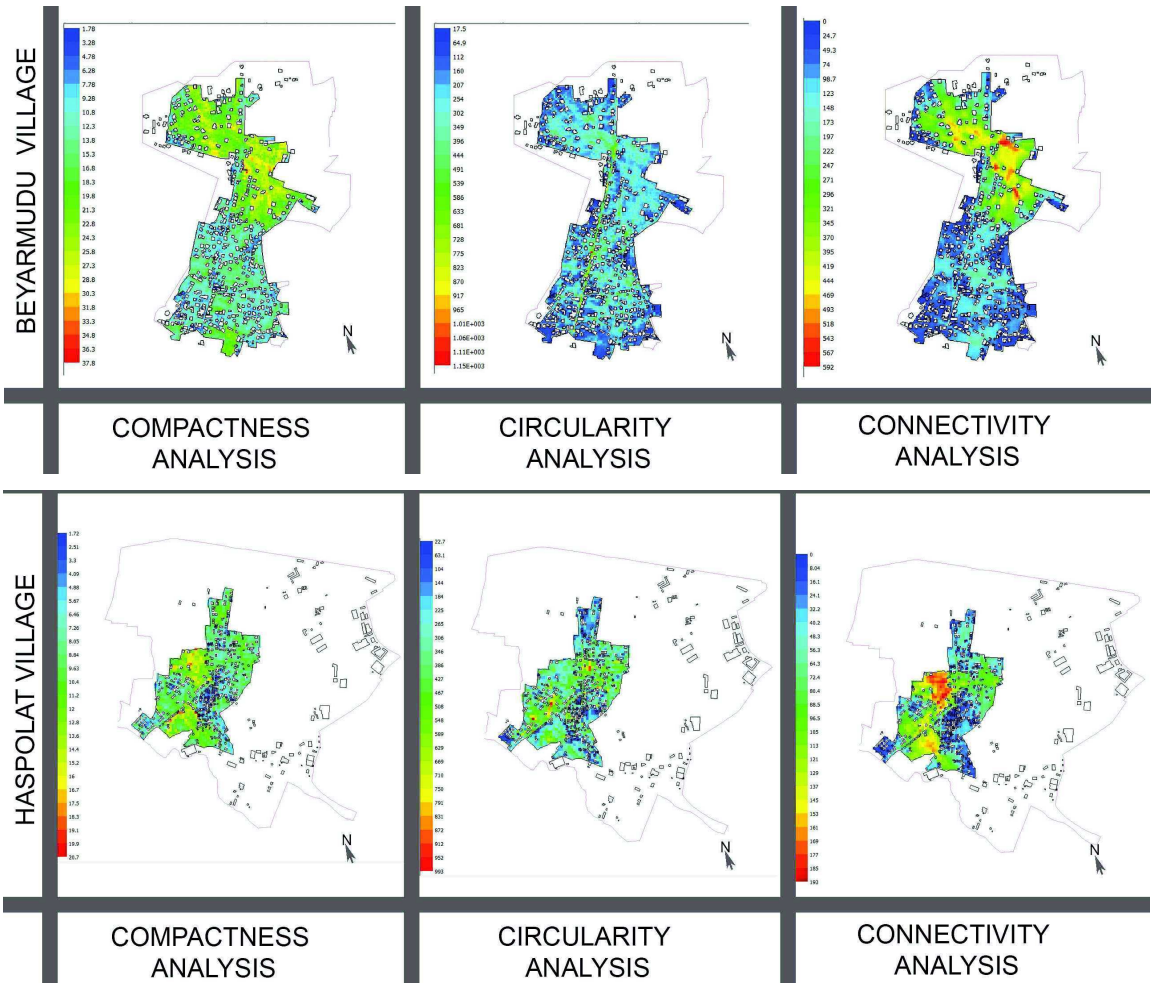

Figure 5
Beyarmudu and Haspolat compactness, circularity and connectivity analysis

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Although northern development creates a secondary centre, Beyarmudu still maintains the main street idea within its linear pattern. However, the vast expansion seen in Haspolat pattern supports sub centre developments which is a hint that the town may expand even further in the coming years.

The human interface on the other hand is not examined in this paper, especially the functional uses, mobility in streets and visual access aspects are among the important data that are needed to be searched.

Conclusion

This study, having explored urban morphology based on historico-geographical approach and syntactic approach; This comparative study suggest that the morphological and syntactic analysis can correlate to each other for finding a better reliable outcomes of the development of city. In this paper, the study of morphological characteristics of the two frontier villages in Northern Cyprus has been analysed.

From a more general perspective, at the end of this study, it is also hoped that the proposed analysis method on urban morphology shaped by morphological and syntactic approaches will help designers, planners, cultural geographers and urban morphologists and architects to find better solutions while they are designing, analysing, planning and/or conserving existing—historic and traditional—urban areas in town and cities also it draws the development strategies for the towns.

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What explains neighborhood type statistically? Mixing typo-morphological and spatial analytic approaches in urban morphology

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Abstract. *Society creates architectural styles and neighborhood types to communicate and promote values. Accordingly, geographers and architects working within the typo-morphological tradition classify neighborhoods by historical periods, urban design, planning paradigms and plan elements, building types and architectural detail. This paper juxtaposes typo-morphological (historical emergence of urban forms through urban elements and pattern typologies) and spatial analytic (city defined by urban form factors and formulas) approaches in urban morphology to assess what explains neighborhood type statistically. The analyses of variance show that many urban form factors (residential and employment density, Floor Space Indexes (FSI), location, income, etc.) are statistically significant in neighborhood type (as a nominal composite variable). Neighborhood typologies can be applied to enrich spatial analyses and urban modelling. The approach can be used in typo-morphological tradition to offer quantitative description to the persistent 'problem of type' and enrich the classification methodology.*

Keywords: urban morphology, neighborhood, typology, typo-morphology, spatial analysis, urban variables

Introduction

Cities are diverse and complex and there are many ways to describe and understand them (Kropf, 2009). Typo-morphological tradition in urban morphology (see historico-geographical and typo-processual approaches in Kropf, 2009; see Conzen, 1960; Whitehand, 2001; Cataldi et al. 2002; Cataldi, 2003) looks at historical emergence of urban forms and typological consistencies (variations of generic urban patterns). The methodology is to identify and dissect various urban elements (Moudon, 1997, p.3; see Conzen, 1960; Lynch, 1960) or to recognize and abstract urban patterns (Marshall and Çalişkan, 2011, p.421; Alexander, 1979). The morphologists in the spatial analytic approach (in Kropf, 2009; see Harris, 1965; Batty, 1976; 2005) build urban models and symbolical representations of cities and their dynamics (Batty, 2016, p.242). The city is defined quantitatively in terms of measurable factors as n-dimensional space and aggregation of N individuals in interaction (Chadwick, 1971).

Swedish typo-morphology has a long tradition (Abarkan, 2009; 2013). Many morphologists argue that Swedish neighborhood typology explains not only residential density, Floor Space Indices (FSI), etc. (Rådberg 1988; Rådberg & Friberg 1996), but also social structure and development tendencies (Engström et al. 1988). The neighborhood type has a distinctive social meaning and status. The social layer of the neighborhood type is preconditioned by the physical form of its emergence and subsequent planning measurements, but defined by general societal and economic development. Trends like globalization, transnational capitalism and network society, change from welfare to knowledge economics, etc.

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redefine the meaning and social status, and subsequently population and social structure in neighborhood types (Engström, 2008). This paper studies the city of Karlstad by combining typo-morphological methodology and statistical analytics. The analysis shows that many urban form factors (residential and employment density, mix of residences and jobs, Floor Space Indexes (FSI), location, income, etc.) are statistically significant in neighborhood type (as a nominal composite variable). The neighborhood typology can be applied to cluster urban form variables or in urban modelling to discuss urban futures from a perspective of typological processes or process typologies (Kropf, 2001). The approach can be used in typo-morphological tradition to offer quantitative description to the persistent 'problem of type' and enrich the classification methodology.

The following section outlines the problem formulation and research hypothesis about neighborhood type. The methodology is described in section 2. Section 3 and 4 present and discuss the typo-morphological study of Karlstad and the results of the statistical analyses of neighborhood type. The last section includes conclusions and directions for a future research.

Problem formulation and research hypothesis

Major social, economic or technological revolutions (industrialization, welfare state or neoliberalism; steel, concrete, asphalt technologies and prefabrication; railways and trains, expressways and automobilism, computers, digitization and automation, etc.) trigger development cycles, building booms which are followed by slumps (Whitehand, 1987). Neighborhoods who emerge during building booms incorporate and display similar architectural styles and plan elements, urban design coding, building and transportation technologies which are specific for that historical era. These neighborhoods become morphological consistent artefacts imbedded in the city.

Society creates architectural styles and neighborhood types in order to simplify communication and promote values (Franck 1994, p.345). Neighborhood types obtain unique social meaning and status, appealing or repulsive to different strata of the population. Individuals sometimes choose and live in their favorite neighborhood type and sometimes they are stuck in a place which does not fit their preference. The taste for housing triggers social mobility and grouping of 'housing classes' (Rex and Moore, 1969; Rex, 1971). Bourdieusien conceptualization of social class by taste helps to understand housing classes. Social classes are groups of agents who occupy similar positions in social space and who, being placed in similar conditions and subjected to similar conditionings, have every likelihood of having similar dispositions and interests and therefore of producing similar practices and adopting similar stance (Bourdieu, 1985, p.725).

Developers create typical homes and neighborhood types in specific historical periods which are appealing to individuals and households. They dictate a housing supply. Typical homes and neighborhood types have particular combinations of physical elements and patterns which produce morphological consistencies, which attract particular population strata. When an individual or household looks for a residence they dream of a particular home and neighborhood. The dream house or apartment is often shared by a group of individuals with similar taste. When the group of individuals finds their particular home and neighborhood it becomes a housing class. Housing classes in typical neighborhoods are often distinctive social groups with similar social and economic characteristics, lifestyle and behavior (Figure 1A). The lifestyle and behavior, e.g. mobility, are often supported or hindered by physical elements of urban form (parking standards, street design etc.). The research hypothesis is that neighborhood type incorporates a range of physical (urban form) variables due to morphological consistencies in historical evolution of cities and indirectly even socioeconomic and demographic variables as a consequence of social grouping and housing class formation (Figure 1B).

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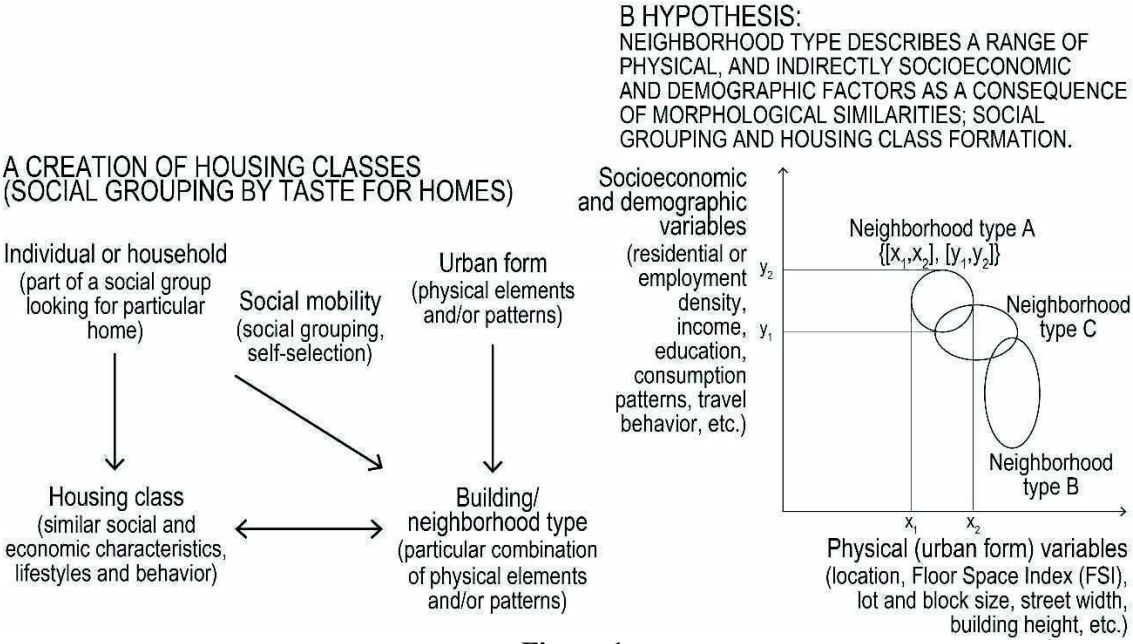

Figure 1.
Creation of housing classes and research hypothesis about neighborhood type

The following section describe the methodology to analyze the research hypothesis.

Methodology

The typo-morphological and spatial analytic approaches define neighborhood types differently. Methods as surveys, observations and classifications are favored in the first, whereas statistical classification which reduce dimensions as cluster or factor analysis are preferred in the second tradition. It is not common to mix qualitative typo-morphological studies and quantitative statistical analyses, even though there are morphological analyses which use descriptive statistics for example for parameters of lots and building footprints (Hall, 2008; 2010) or street patterns parameters (Southworth and Owens, 1993; Southworth and Ben-Joseph, 1997). The following two subsections describe the typo-morphological and statistical method used in the Karlstad's study.

Typo-morphological method

There no right or wrong methodology to classify neighborhood into a typology (Marshall, 2005). There are no two identical neighborhoods in one city. There is never an ideal match between neighborhoods of one type. The creation of neighborhood typology is basically pattern matching based on exploration of the historical evolution of the city, generalizations and abstractions. Genotypes emerge and propagate in specific historical periods. The cities comprise of few hundred generic patterns in many variations (Alexander, 1979). The classification of abstract genotypes and their compilation in neighborhood typology is typically based on: 1) combinations of plan elements (streets, lots and buildings); 2) historical layering of the urban fabric; and 3) building and land utilization (Conzen, 1960; Whitehand, 2001; Birkhamshaw and Whitehand, 2012; Figure 2A). Neighborhood type is often a combination of these elements (illustrated on Figure 2B). Even though there are many possible combinations, only few of them are viable. A combination of a single house (A), a grid street layout (B or C) and a lot division type A would be non-sense in practice. Furthermore, specific combinations of elements are preferred in different historical periods. A neighborhood prototype emerges in certain historical era and if it becomes fashionable as housing solution it is replicated. These neighborhood types

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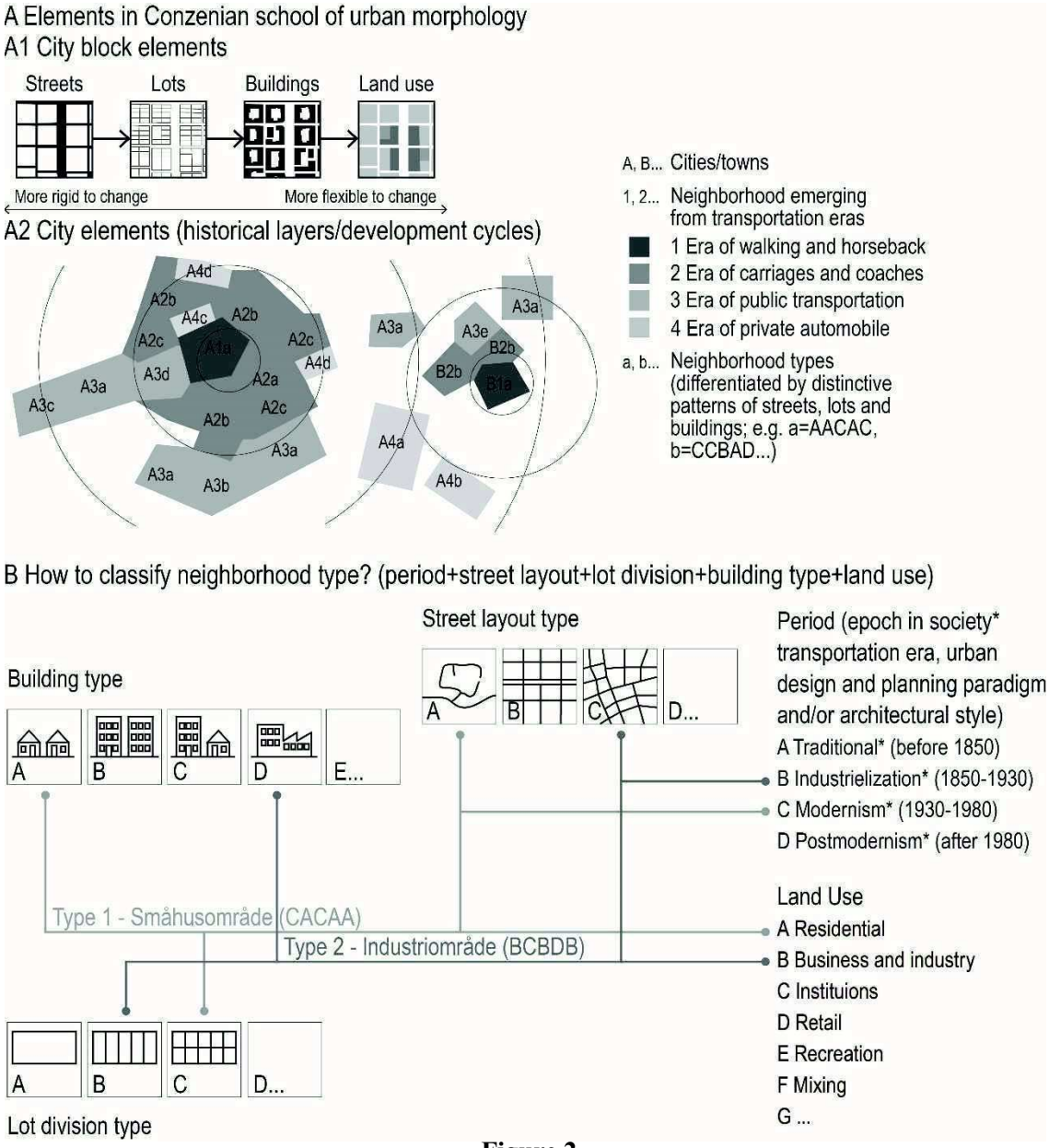

Figure 2.

Typo-morphological method (B) inspired by the Conzenian school (A)

usually have their own history and narrative supporting the morphology (see Panerai et al. (2014) about a classical typo-morphological study of Wester European cities, or Southworth and Ben-Joseph (1997) for evolution of streets in American towns and cities or the transformation of the main street to a shopping mall (Southworth, 2005)).

Swedish typo-morphology has a long tradition (Abarkan, 2009; 2013). Many municipalities (like Stockholm and Malmö) use neighborhood typologies as a background for design codes or building regulations (SBK, 1997; 2000). The report "Denser Stockholm" illustrates typological processes for typo-morphological densification on city block level (SLL, 2009). Neighborhood and building typologies have been developed in Sweden by: 1) architectural styles (Björk et al., 1983; 2003; 2009); 2) design codes and planning paradigms (Rådberg, 1988; Rådberg and Friberg, 1996); and 3) the socioeconomic epochs (Engström et al., 1988). The first tradition is focused on building type, architectural detail, façade design and building materials. Rådberg's (1988) hypothesis is that neighborhood type

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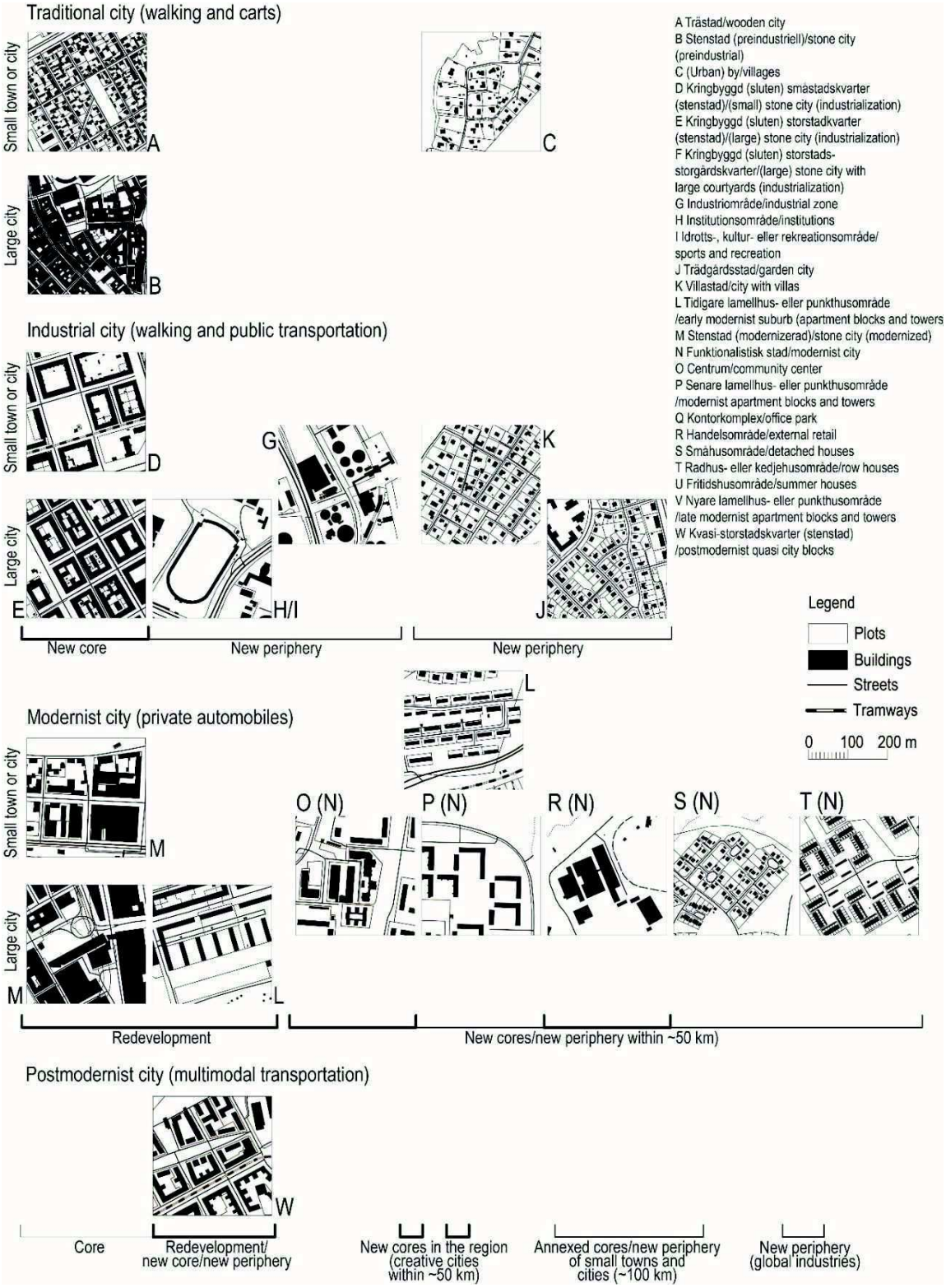

Figure 3.
Swedish neighborhood typology

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explains a range of physical factors as built density or Floor Space Indexes (FSI), lot coverage, number of stories, etc. because these variables changed systematically in Sweden with different urban design and planning paradigms. In his research he found a strong correlation between neighborhood type, place quality and housing preferences in Swedish cities (Rådberg and Johannson 1997; Rådberg, 2000). In the book "Svensk tätort" (Engstrom et al., 1988) the social aspect (population structure and development) and functional dimension was directly associated with the physical factors of built form. The following research showed systematic changes in function and social structure based on physical characteristics. Swedish town centers have long lost some activities during the welfare state redevelepments, but populated city centers and get additional activities (Engström and Legeby, 2001; Engström, 2008).

The presented Swedish neighborhood typology (Figure 3) is developed by combining previous typo-morphological classifications (Engström et al. 1988; Rådberg 1988; Rådberg & Friberg 1996; SBK, 1997; 2000). The typical traditional (preindustrial) Swedish city dispays organic or rectangular street grids with wooden or stone houses organized in city blocks. The names 'trästad' ('wooden city'; Figure 3A) or 'stenstad' ('stone city'; Figure 3B) denote these neighborhood types. The medieval cities were surrounded by villages with detached houses scattered organically in the landscape (Figure 3C). These villages became urbanized with the rapid motorization in the second half of the 20th century. The industrialization produced a very dense urban core, an expansion of the medieval 'stone city' (Figure 3D-E). In a same time, it created an urban fringe of industrial zones, institutional (healthcare and education) and sports complexes (Figure 3G-I). The 'trägårdstad' or 'garden city' (Figure 3J) and its residential suburban 'villastad' or 'city with villas' (Figure 3K) emerged along the first suburban railways on the end of the 19th century. The modernist movement and Nordic welfare state inspired the biggest building boom in Sweden in the mid-20th century. The experimental early modernist apartment blocks emerged on the edges of the old cores and in the suburbs from the 1930s. In the 1950s the functionalist city (Figure 3N), so called ABC-city, mainstreamed. In ABC, A stands for 'arbetsområde' or 'work areas' (office parks and industrial zones), B for 'bostadsområde' or 'residential areas' with apartment blocks (Figure 3P) or row houses (Figure 3T) and C for 'community centers' (Figure 3O). In this period parts of the old cores in the small or large cities were modernized (Figure 3M) and transformed into office parks serving an entire region. From the 1970s a new type of residential suburbs with single detached houses (Figure 3S) emerged. The urban sprawl was followed by external shopping malls (Figure R) and new office parks. The trend in the last two decades is to develop new postmodernist neighborhoods (Figure 3W) on the industrial fringes of the old cores. In the same time the predominantly commercial old cores are refurbished to increase the number of residents.

Table 1 summarizes the characteristics of the different neighborhood types in respect to historical period, street layout, building type, dominant function and daily activity and transportation technology.

The method in the typological study includes creation of typology, surveying, recognition and matching the existing urban patterns in Karlstad with the proposed typical patterns (Figure 3). The identified typical neighborhoods were mapped in Geographic Information Systems (GIS) software (ArcGIS).

Statistical method and data

Analysis of variance (ANOVA) was conducted to examine the geocoded typical neighborhoods. ANOVA is a collection of statistical models used to analyze and compare means and the variation of means between groups (in this case neighborhood types). To assess the research hypothesis a general linear model [1] is proposed for neighborhood type as a nominal variable (SPSS uses an anchor value, intercept $\beta 0$ which equals the mean of the reference group and makes this group redundant in the model):

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$$y = \beta_0 + \sum_{n=1}^{x} (\beta_n * x_n) + \varepsilon \quad [1]$$

x1-n nominal variables (neighborhood types x1-n)/dummy independent variable

β0 mean (anchor in SPSS) for the urban form factor

β1-n parameters (deviation from the mean/ anchor) for neighborhood types (x1-n)

ε error term

The urban form data comed from official statistics. Municipality of Karlstad and Statistiska centralbyrån (SCB, Statistics Sweden) contributed with statistical packages BILPAK, AMPAK and FASTPAK for year 2009 (at NYKO4 level). The location variables were calculated with help of GIS. Lantmäteriet's (National Land Survey of Sweden) Digital Library and municipality of Karlstad provided GIS maps and datasets. There are 6 levels and NYKO 4 in Karlstad are usually wide between 200 m (two by two city blocks in the old urban cores) and 1 km (in the peripheral areas). The neighborhood areas used in this analysis differ from the statistical NYKO4 areas. The original NYKO4 areas labeled with 0 (like 1200) include only the street area. To do a proper calculation for neighborhood areas the neighborhood borders were adjusted and they include part of 0 labelled NYKO4 (street area) plus the consecutive numbers (for example part of 1200 plus 1201 and 1202). The border of the neighborhood goes along axes of streets surrounding it.

Density as number of residents, jobs and residential and commercial floor space (FSI represents a rate between total floor space and neighborhood area) are available through the statistics. The network and Euclidean distances were calculated in meters with Network Analyst in ArcGIS. Network dataset was created with the street network and shortest distances were calculated from the centroid of the neighborhood to the city center of Karlstad (Stora Torget, translated as Big Square). Network Analyst calculates the network distance in meters and creates a shortest line from the origin to the destination which allows to calculate Euclidean distance. The AMPAK statistical package includes number of employed and number of residents in respect to job type. The income was calculated by multiplying the average salary per job type with number of jobs and employed residents per job type. The sum was then divided by the total number of jobs and employed residents to calculate the average salary as Neighborhood Gross Product (NGP).

Typo-morphological study of Karlstad

Karlstad is a small Swedish city with around 60000 inhabitants. It is a vibrant business hub of its region with over 40000 work places. The old core of Karlstad ('stenstad') is surrounded by 'cities with villas'. As many small Swedish cities, Karlstad grew rapidly in the second half of the 20th century. The expressway E-18, the main traffic artery, meanders to better adapt to the delta of Klarälv. Many of the neighborhoods developed with good access to E-18. Three 'modernist cities' ('funktionalistisk stad') surround the old core (with IDs 17, 53 and 36). These 'modernist cities' have typical community centers which have satellites on their own (residential areas, office parks, industrial zones and external shopping centers, etc.) around them. The map also shows that there are patches of urban areas which cannot be easily classified by the proposed typology (Figure 3). Generally, the proposed typology is applicable to classify large part of the city.

Statistical analyses of neighborhood type

ANOVA were conducted in SPSS to analyze different built environment factors and socioeconomic and demographic variables in the typical neighborhoods in Karlstad (Figure 4). The ANOVA tables supported by charts and descriptive statistics are presented and discussed in the following four subsections.

Neighborhood type and density

Table 2 shows the descriptive statistics for different density variables. The standard deviations are comparably small in respect

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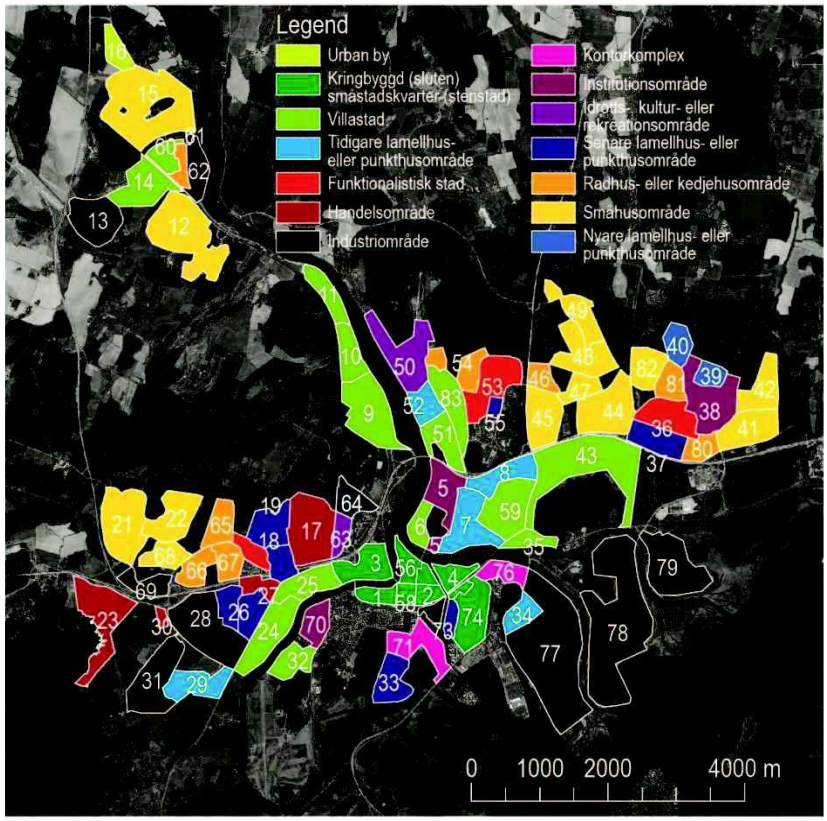

Figure 4.
Typo-morphological map of the neighborhoods in Karlstad

to the mean for the predominantly residential areas. The standard deviations are larger for commercial and industrial areas. This might be due to not well developed typology of commercial and industrial areas. The typo-morphological classifications used (Engström et al. 1988; Rådberg 1988; Rådberg & Friberg 1996; SBK, 1997; 2000) focus in greater detail on residential areas. The sample size is usually smaller for commercial or industrial neighborhood types (between 2 and 4), whereas slightly larger for residential (between 5 and 13). The sample size is small for valid statistical analyses.

Table 3 and 4 show the ANOVA table for population and built environment density. The one-way between subject ANOVA in SPSS revealed a statistical significant effect for residential ($F(13,85) = 13.7$, $p < 0.0005$, $\eta 2 = 0.715$), employment density ($F(13,85) = 7.204$, $p < 0.0005$, $\eta 2 = 0.569$) and population (jobs and residents) density ($F(13,85) = 13.818$, $p < 0.0005$, $\eta 2 = 0.717$). The conducted one-way between subject ANOVA for built environment density (FSIs) also shows statistical significant effect for residential FSI ($F(13,85) = 13.376$, $p < 0.0005$, $\eta 2 = 0.710$), commercial FSI ($F(13,85) = 5.247$, $p < 0.0005$, $\eta 2 = 0.490$) and FSI ($F(13,85) = 8.384$, $p < 0.0005$, $\eta 2 = 0.606$). The charts on Figure 5 illustrate the relationships jobs vs. residents, commercial vs. residential FSIs, and population vs. built density.

Neighborhood type and location (distance from Karlstads's city center)

The descriptive statistics for location are presented on Table 5. The standard deviations are often comparably small in respect to the mean. It is striking that the Euclidean amd network distances between the centroids of the 'modernist community centers' ('funktionalistisk stad') and the central square of Karlstad deviate very little. They are basically like satellites on a same circular path around the old core.

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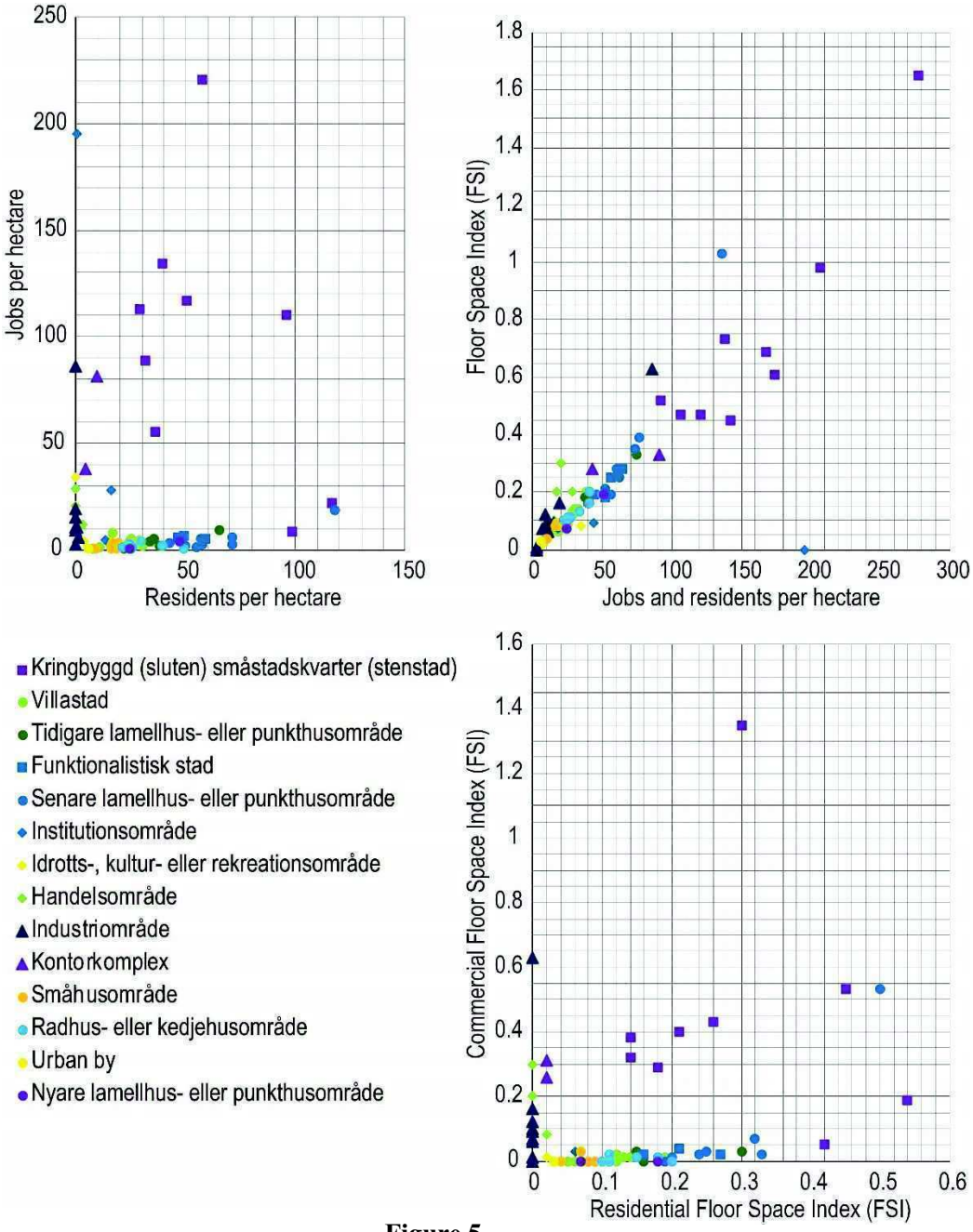

Figure 5.
Neighborhood type and density

Table 6 presents the ANOVA table for Euclidean and network distance to the center. The one-way between subject ANOVA in SPSS shows a statistical significant effect for Euclidean ($F(13,85) = 5.547$, $p < 0.0005$, $\eta 2 = 0.504$) and network distance to the center ($F(13,85) = 5.867$, $p < 0.0005$, $\eta 2 = 0.518$). Figure 7 illustrates the directness relationship between Euclidean and network distance.

Neighborhood type and income

The descriptive statistics for income as average salary are presented on Table 7. The standard deviations are often, especially for the residential neighborhood, comparably small in respect to the mean (roughly 1000 Swedish crowns which corresponds roughly to 100 Euros).

The ANOVA table for income as average

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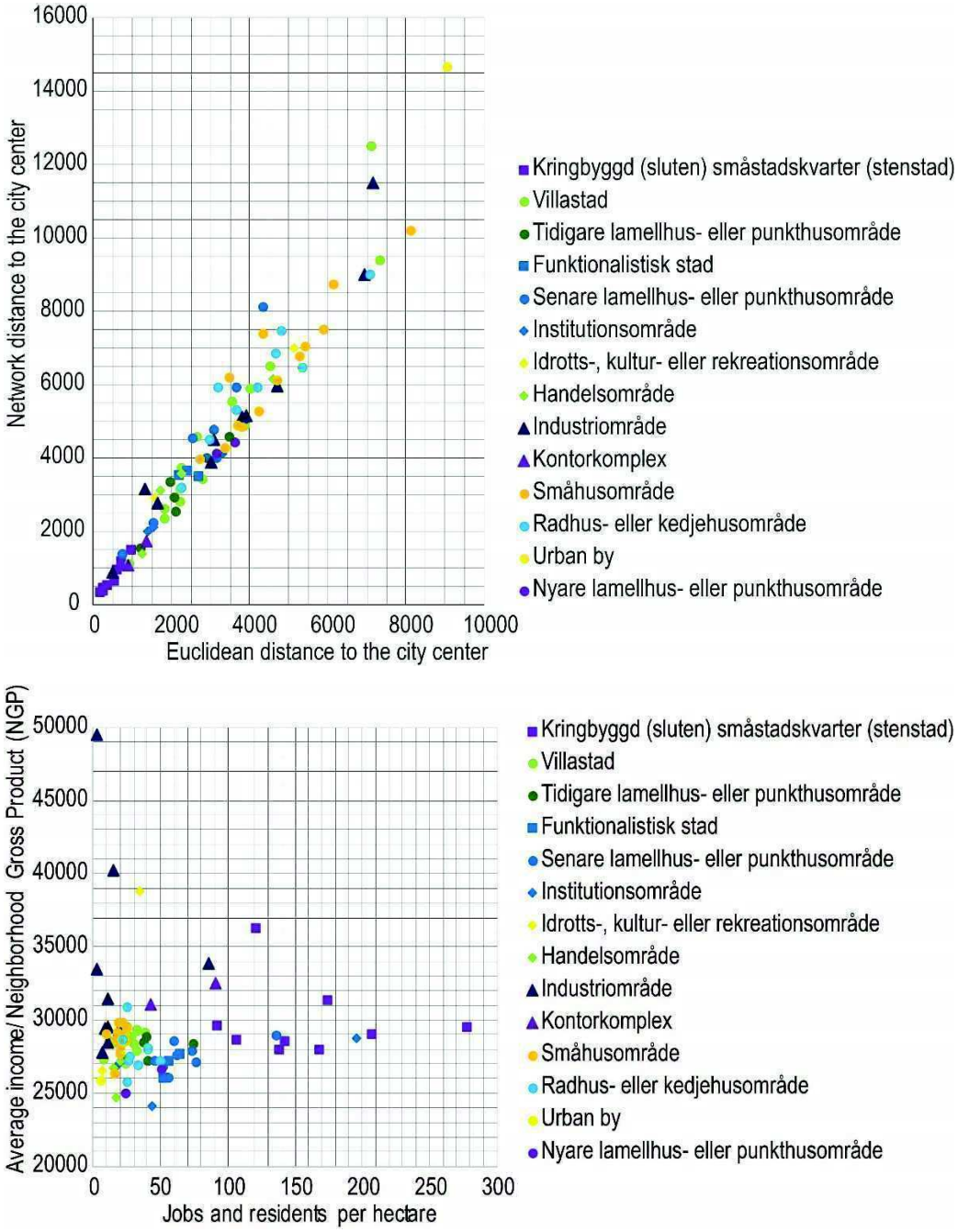

Figures 6 and 7.
Neighborhood type and location (above). Neighborhood type and income as NGP (below)

salary per employed resident and job is presented on Table 8 The one-way between subject ANOVA in SPSS shows a statistical significant effect ($F(13,85) = 3.166$, $p < 0.0005$, $\eta 2 = 0.367$), though slightly lower than for the other variables. Figure 7 shows the distribution of values by different neighborhood types on a scatter plot.

Conclusion

Even though the sample of neighborhoods from the city is rather small (N = 85), the results show high explanation coefficients ($\eta 2 > 0.49$) and statistical significance for all physical (urban form) parameters (Table 9). The explanation coefficients for income is

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lower ($\eta 2 = 0.367$), but in a way it supports the hypothesis that neighborhood type is directly influenced by physical factors, and indirectly by socioeconomic and demographic. The low standard deviations (for residential neighborhoods and high for the other also support the hypothesis that typical homes attract social groups with similar income. The ANOVA method can be applied to analyze and compare means for different built environment and demographic variables. The measures of association in the ANOVA analysis show statistical significance. One city does not harness a large sample to execute a valid statistical analysis, but the method has potential both in urban modelling and typo-morphology, both to analyze and inform in planning (Batty, 2016; Wee, 2016) and to discuss future changes. Overall, methodology from the spatial analytical approach can be used to analyze studies from the typo-morphological tradition and vice versa.

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Appendix

Neighborhood type	Period	Street layout	Building type	Land use	Daily activity	Transportation mode
Urban by	Traditional	Linear	Detached buildings	Agricultural/ residential	Non work hours	Walking/private car
Trästad	Traditional	Interconnected streets	Quadrangles	Mixed/ agricultural	Perpetual	Walking
Stenstad	Traditional	Interconnected streets	Enclosed blocks	Mixed	Perpetual	Walking
Kringbyggd (sluten) småstadskvarter (stenstad)	Industrial	Interconnected streets	Enclosed blocks	Mixed	Perpetual	Walking
Kringbyggd (sluten) storstadkvarter (stenstad)	Industrial	Interconnected streets	Enclosed blocks	Mixed	Perpetual	Walking
Kringbyggd (sluten) storstadsstorgårdskvarter	Industrial	Interconnected streets	Enclosed blocks	Mixed	Perpetual	Public transit
Trädgårdsstad	Industrial	Interconnected streets	Detached buildings	Mixed	Perpetual	Public transit
Villastad	Industrial	Interconnected streets	Detached buildings	Residential	Non work hours	Public transit
Tidigare lamellhus- eller punkthusområde	Early modernist	Interconnected streets /road hierarchy	Detached buildings	Residential	Non work hours	Public transit
Stenstad (moderniserad)	Modernist	Road hierarchy	Complexes	Mixed	Perpetual	Private car
Funktionalistisk stad	Modernist	Road hierarchy	Mix	Mixed	Perpetual	Private car
Centrum	Modernist	Road hierarchy	Complexes (big box)	Retail and services/ community services	Work hours	Private car
Kontorkomplex	Modernist	Road hierarchy	Complexes	Business	Work hours	Private car
Industriområde	Modernist	Road hierarchy	Complexes (big box)	Industry	Work hours	Private car
Handelsområde	Modernist	Road hierarchy	Complexes (big box)	Retail	Work hours	Private car
Institutionsområde	Modernist	Road hierarchy	Complexes	Community services	Work hours	Private car
Idrotts-, kultur- eller rekreationsområde	Modernist	Road hierarchy	Complexes	Assembly and leisure	Events	Private car
Radhus- eller kedjehusområde	Modernist	Road hierarchy	Buildings in rows	Residential	Non work hours	Private car
Småhusområde	Modernist	Road hierarchy	Detached buildings	Residential	Non work hours	Private car
Fritidshusområde	Modernist	Road hierarchy	Detached buildings	Recreational		Private car
Senare lamellhus- eller punkthusområde	Modernist	Road hierarchy	Detached buildings	Residential	Non work hours	Private car
Nyare lamellhus- eller punkthusområde	Late modernist	Road hierarchy	Detached buildings /complexes	Residential	Non work hours	Private car
Kvasi-stadskvarter (stenstad)	Postmodernist	Quasi interconnected streets	Quasi enclosed blocks	Mixed	Perpetual	Multimodal

Table 1:
Swedish neighborhood types and their morphological characteristics
(inspired by Whitehand, 2001).

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	Dependent Variable: Residents per hectare		Dependent Variable: Jobs per hectare		Dependent Variable: Residents and jobs per hectare		Dependent Variable: Residential FSI		Dependent Variable: Commercial FSI		Dependent Variable: Floor Space Index (FSI)		
Neighborhood type	51.50	6.56	5.77	0.78	57.27	5.88	0.213	0.055	0.027	0.012	0.237	0.051	3
Funktionalistisk stad	0.83	1.65	19.25	6.85	20.08	5.80	0.005	0.010	0.195	0.090	0.200	0.082	4
Handelsområde	1.75	2.47	18.90	21.64	20.65	19.16	0.010	0.014	0.045	0.049	0.050	0.042	2
Idrotts-, kultur- eller rekreationsområde	0.19	0.41	17.10	24.73	17.30	24.64	0.000	0.000	0.133	0.181	0.133	0.181	10
Industriområde	9.80	8.47	75.67	104.10	85.47	95.89	0.043	0.038	0.010	0.017	0.053	0.047	3
Institutionsområde	7.15	3.61	59.75	30.90	66.95	34.44	0.020	0.000	0.285	0.035	0.305	0.035	2
Kontorkomplex	61.70	33.19	96.54	64.02	158.24	57.16	0.293	0.146	0.438	0.370	0.730	0.384	9
Kringbyggd (sluten) småstadskvarter (stenstad)	36.00	16.12	1.85	2.33	37.80	18.53	0.125	0.078	0.000	0.000	0.130	0.085	2
Nyare lamellhus- eller punkthusområde	30.80	9.59	1.52	1.19	32.32	9.53	0.130	0.037	0.004	0.007	0.134	0.039	9
Radhus- eller kedjehusområde	65.29	23.31	4.95	5.62	70.23	28.55	0.276	0.106	0.086	0.181	0.361	0.280	8
Senare lamellhus- eller punkthusområde	18.25	3.80	1.48	0.85	19.72	4.02	0.082	0.015	0.002	0.008	0.084	0.014	13
Småhusområde	38.88	16.19	4.04	3.35	42.90	19.28	0.172	0.077	0.014	0.015	0.190	0.085	5
Tidigare lamellhus- eller punkthusområde	5.70		0.10		5.80		0.030		0.000		0.030		1
Urban by	21.97	8.03	2.93	1.93	24.92	8.71	0.101	0.042	0.005	0.007	0.105	0.046	14
Villastad	27.98	25.80	19.48	41.33	47.47	50.69	0.123	0.116	0.091	0.196	0.214	0.254	85
Total	27.98	25.80	19.48	41.33	47.47	50.69	0.123	0.116	0.091	0.196	0.214	0.254	85

Table 2:
Descriptive statistics for density variables

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Dependent Variable: Residents per hectare

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	39961.346[a]	13	3073.950	13.700	0.000	0.715
Intercept	29049.974	1	29049.974	129.468	0.000	0.646
Neighborhood type	39961.346	13	3073.950	13.700	0.000	0.715
Error	15931.004	71	224.380			
Total	122459.570	85				
Corrected Total	55892.350	84				

a. R Squared = 0.715 (Adjusted R Squared = 0.663)

Dependent Variable: Jobs per hectare

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	81615.449[a]	13	6278.111	7.204	0.000	0.569
Intercept	22791.726	1	22791.726	26.154	0.000	0.269
Neighborhood type	81615.449	13	6278.111	7.204	0.000	0.569
Error	61871.435	71	871.429			
Total	175749.660	85				
Corrected Total	143486.884	84				

a. R Squared = 0.569 (Adjusted R Squared = 0.490)

Dependent Variable: Jobs and residents per hectare

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	154721.734[a]	13	11901.672	13.818	0.000	0.717
Intercept	103301.526	1	103301.526	119.932	0.000	0.628
Neighborhood type	154721.734	13	11901.672	13.818	0.000	0.717
Error	61154.610	71	861.333			
Total	407401.180	85				
Corrected Total	215876.344	84				

a. R Squared = 0.717 (Adjusted R Squared = 0.665)

Table 3:
ANOVA table for population density

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Dependent Variable: Residential FSI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.796[a]	13	0.061	13.376	0.000	0.710
Intercept	.535	1	0.535	116.849	0.000	0.622
Neighborhood type	.796	13	0.061	13.376	0.000	0.710
Error	.325	71	0.005			
Total	2.416	85				
Corrected Total	1.121	84				

a. R Squared = 0.710 (Adjusted R Squared = 0.657)

Dependent Variable: Commercial FSI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.583[a]	13	0.122	5.247	0.000	0.490
Intercept	.368	1	0.368	15.844	0.000	0.182
Neighborhood type	1.583	13	0.122	5.247	0.000	0.490
Error	1.648	71	0.023			
Total	3.931	85				
Corrected Total	3.230	84				

a. R Squared = 0.490 (Adjusted R Squared = 0.397)

Dependent Variable: Floor Space Index (FSI)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.280[a]	13	0.252	8.384	0.000	0.606
Intercept	1.786	1	1.786	59.338	0.000	0.455
Neighborhood type	3.280	13	0.252	8.384	0.000	0.606
Error	2.137	71	0.030			
Total	9.305	85				
Corrected Total	5.416	84				

a. R Squared = 0.606 (Adjusted R Squared = 0.533)

Table 4:
ANOVA table for built density or Floor Space Indexes (FSI)

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	Dependent Variable: Euclidean distance to Center (m)		Dependent Variable: Network Distance to Center (m)		
Neighborhood type	Mean	Std. Dev.	Mean	Std. Dev.	N
Funktionalistisk stad	2433	249	3555	76	3
Handelsområde	2453	1491	3533	1980	4
Idrotts-, kultur- eller rekreationsområde	3354	2542	4947	2859	2
Industriområde	3605	2221	5178	3084	10
Institutionsområde	2077	1062	2728	1194	3
Kontorkomplex	1119	321	1403	469	2
Kringbyggd (sluten) småstadskvarter (stenstad)	506	277	768	410	9
Nyare lamellhus- eller punkthusområde	3380	334	4252	223	2
Radhus- eller kedjehusområde	4245	1451	6053	1687	9
Senare lamellhus- eller punkthusområde	2749	1148	4355	2080	8
Småhusområde	4717	1450	6379	1803	13
Tidigare lamellhus- eller punkthusområde	2173	809	2977	1117	5
Urban by	9046		14653		1
Villastad	3365	1908	4877	3022	14
Total	3155	1972	4505	2836	85

Table 5:
Descriptive statistics for location variables

Dependent Variable: Euclidean distance to Center (m)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	164545818.264[a]	13	12657370.636	5.547	0.000	0.504
Intercept	485469731.083	1	485469731.083	212.764	0.000	0.750
Neighborhood type	164545818.264	13	12657370.636	5.547	0.000	0.504
Error	162002736.559	71	2281728.684			
Total	1172703781.000	85				
Corrected Total	326548554.824	84				

a. R Squared = 0.504 (Adjusted R Squared = 0.413)

Dependent Variable: Network Distance to Center (m)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	349926523.751[a]	13	26917424.904	5.867	0.000	0.518
Intercept	1023385830.532	1	1023385830.532	223.052	0.000	0.759
Neighborhood type	349926523.751	13	26917424.904	5.867	0.000	0.518
Error	325754973.826	71	4588098.223			
Total	2400857734.000	85				
Corrected Total	675681497.576	84				

a. R Squared = 0.518 (Adjusted R Squared = 0.430)

Table 6:
ANOVA table for location (distance from Karlstads's city center)

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	Dependent Variable: Average salary (employed residents and jobs)		
Neighborhood type	Mean	Std. Dev.	N
Funktionalistisk stad	26986	827	3
Handelsområde	26822	1655	4
Idrotts-, kultur- eller rekreationsområde	32684	8651	2
Industriområde	33309	6788	10
Institutionsområde	26552	2325	3
Kontorkomplex	31812	1037	2
Kringbyggd (sluten) småstadskvarter (stenstad)	29882	2599	9
Nyare lamellhus- eller punkthusområde	25793	1153	2
Radhus- eller kedjehusområde	27792	1411	9
Senare lamellhus- eller punkthusområde	27531	924	8
Småhusområde	28751	991	13
Tidigare lamellhus- eller punkthusområde	28019	728	5
Urban by	25812		1
Villastad	28607	758	14
Total	28953	3386	85

Table 7: Descriptive statistics of income

Dependent Variable: Average salary (employed residents and jobs)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	353425310.159[a]	13	27186562.320	3.166	0.000	0.367
Intercept	38051118840.251	1	38051118840.251	4431.634	0.000	0.984
Neighborhood type	353425310.159	13	27186562.320	3.166	0.000	0.367
Error	609623752.852	71	8586250.040			
Total	72218727273.000	85				
Corrected Total	963049063.012	84				

a. R Squared = 0.367 (Adjusted R Squared = 0.251)

Table 8: ANOVA table for income or Neighborhood Gross Product (NGP)

	Eta	Eta Squared
Residents per hectare * Neighborhood type	0.846	0.715
Jobs per hectare * Neighborhood type	0.754	0.569
Jobs and residents per hectare * Neighborhood type	0.847	0.717
Residential FSI * Neighborhood type	0.843	0.710
Commercial FSI * Neighborhood type	0.700	0.490
FSI (Floor Space Index) * Neighborhood type	0.778	0.606
Euclidean Distance to Center (m) * Neighborhood type	0.710	0.504
Network Distance to Center (m) * Neighborhood type	0.720	0.518
Income average (employed residents and jobs) * Neighborhood type	0.606	0.367

Table 9: Measure of association of different variable and neighborhood type

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Spatial processes of mass housing estates. Six case studies in Madrid

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Abstract. *Urban regeneration of deprived urban areas is one of the most important challenges of cities. This is recognised by International Urban Guidelines (ONU), as well as the Leipzig Charter and the Toledo Declaration (EU). Several studies have pointed out that mass housing states—the typical Modernist urban form—as one of the most deprived ones. Research has also indicated the physical, social, and economic problems associated to this urban form. Some authors have suggested that the original low spatial accessibility of housing estates within the city's street network could be one in part responsible to their early urban obsolescence. In Spain moreover, fifty years after the construction of most housing states, their initial accessibility conditions have changed. The research objective is triple. Firstly, to consider criteria to study the integration evolution. Secondly, to characterize the integration processes of mass housing estates. This allows a suitable evaluation of each specific case, adding nuances to generic visions. Lastly, to help to stakeholders to propose improvement strategies during urban regeneration processes. Using Space Syntax techniques, this paper shows the analysis of the original (1970s) and actual (2010s) spatial integration of six case studies in Madrid. Research methods also include data collection and definition of analysis scenarios adapted to Spanish datasets and interpretation of results.*

Keywords: Mass housing estates, integration, evolution, Space Syntax.

Introduction

One of the main goals in our cities is to enhance social cohesion, reduce social inequality and promote sustainable communities. Some authors have recognized urban regeneration as one of the most important tools to carry out this purpose (Couch et al., 2011). At this respect, some international institutions have recently shown greater interest in urban regeneration processes. In the last decade, they have produced some key documents as the International Urban Guidelines (UN-Habitat, 2015), the Leipzig Charter on sustainable cities and the Toledo Declaration (EU Ministers for Urban Development, 2007, 2010). All these documents highlight the importance to focus on deprived urban areas.

The typical Modernist urban form, called mass housing estates -henceforth just housing estates-, have been detected by several studies as one of the most vulnerable morphologies (Hernández Aja et al., 2015; Wassenberg et al., 2004). This vulnerability, discussed by several authors from different perspectives -from cultural to technical approaches-, is usually generic for all housing estates (Monclús and Díez Medina, 2016b). However, fifty years after its construction, this idealistic urban form shows more divergences in the current situation of housing estates (Wassenberg et al., 2004, 4). In this regard, it is relevant to study the specificities of different housing estates, focusing on a comparative and

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evolutive perspective. Hence, one of the main objectives of the Ur-Hesp[1] project is to develop a systematic analysis of urban obsolesce processes of functionalist urbanism morphology. Additionally, these systematic analyses could help to improve decision-making processes during urban regeneration of housing estates.

In this way, it is not easy to attend all issues that this morphology concentrate, because of the systemic nature of problems, where physical, social, and economic dimension are strongly related. However, our study is based on a basic assumption: the role of design in these housing estates is relevant, and, in part responsible of their issues. Hence, urban design could facilitate partway improvements in deprived housing estates (Urban Task Force, 1999; Wassenberg, 2013). At this level, the spatial integration of housing estates within the city's street network must be considered. According to this idea: the more integrated an urban area is, the better support to urban life could be (Hillier, 2007, 169).

For that, according to the greatest divergence detected fifty years after housing estates construction, it is interesting to recognize their urban obsolescence as a process. The growth of cities has modified the initial accessibility conditions. Therefore, it is relevant to evaluate their evolution. Previously, researchers have found on space syntax theories a useful tool to better understand the accessibility evolution of an urban area (Arnaiz Hernández et al., 2013; Pinho and Oliveira, 2009; Zumelzu Scheel et al., 2016). Similarly, this study also uses space syntax methods to analyse these spatial processes.

The aim of this study is triple. Firstly, to study criteria to apply space syntax methodology to the spatial integration evolution study. Particularly, our criteria focus on specific characteristic of housing estates, adapted to Spanish datasets, according to the six case studies located on Madrid. Secondly, to characterise the integration processes of mass housing estates. This allows a suitable evaluation of each specific case, adding nuances to generic visions. Lastly, to help to stakeholders to propose improvement strategies during urban regeneration processes.

Methods

Two different analysis have been carried out. The first one is the characterisation of housing estates and their improvement processes performed. At this level, significant literature has been reviewed, developing both an initial and an evolutive categorisation of housing estates characteristics and performances, from a spatial approach. The second one measure spatial integration processes, using space syntax methodology. To establish some conclusions both partially results will be finally compared together.

More in detail, space syntax theory and methodology -described by several authors-, is based on the relationship of spaces flowing in-between blocks, providing a representation of spatial relationships with syntactic measures (Al_Sayed et al., 2014, 7). International scientific community have contributed over the years to improve methods and specialized software. Currently, there is debate focused on axial lines because both the objectivity of drawing process and the consumption of large time and effort, should be improved (Dhanani et al., 2012). At this sense, some authors focus their researches on use of axial lines computer-aided drawings. Others have discussed about the use of centre road lines. Even more, Dhanani et al. (2012) have recently studied the use of open data as Open Street Maps (OSM) in space syntax analysis. They point out two main advantages: the objectivity and the optimisation of time and effort. However, the study concludes with two important advices: firstly, it is important to evaluate the reliability of the cartography before use OSM data. Secondly, there is not clear the influence of pedestrian paths and movements using OSM data. Hence, taking into account these recommendations, our methodology is based on these researches. Next paragraphs describe in detail considerations on data collection, scenario develop, calculation and post-processing, aiming to give an exhaustive description of space syntax methods.

The data collection starts obtaining road centre lines from Open Street Maps (Geofabrik GmbH and OpenStreetMap Contributors, n.d.), an open and updatable database. Considering

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Dhanani instructions (2012) and in regard to our case study, Open Street Map data is one of the most reliable data source. At this sense, national cartography programs complete and update OSM platform. Then, data is download in shapefiles ready to use in advanced cartography tools as Geographic Information System (GIS).

The next step is to develop two models, one of each temporal scenario. OSM data are ready to use as current scenario, once pedestrian routes have been excluded from the model, (Dhanani et al., 2012). However, initial scenario must be drawing using historical cartography. We have selected 1975 as initial scenario because, first, most housing estates had been built. Second, because since then they have passed more than forty years. Last, because National Geographic Institute (Instituto Geográfico Nacional, n.d.) developed two useful cartographies during this year. The first one, represents Madrid province (1:200.000), and the second one, represents Madrid city (1:25.000). Considering both it is possible to draw Madrid metropolitan area during 1975.

The calculation process was carried out using QGis Space Syntax Toolkit v0.1.6. We have considered angular segment analysis, and we have cleared stubs up to 40%. The integration measure is calculated considering both radio n and radio 800 m, to obtain global and local measures. When considering 800 meters, we take into account a proximity integration of ten minutes walking. Finally, we have obtained

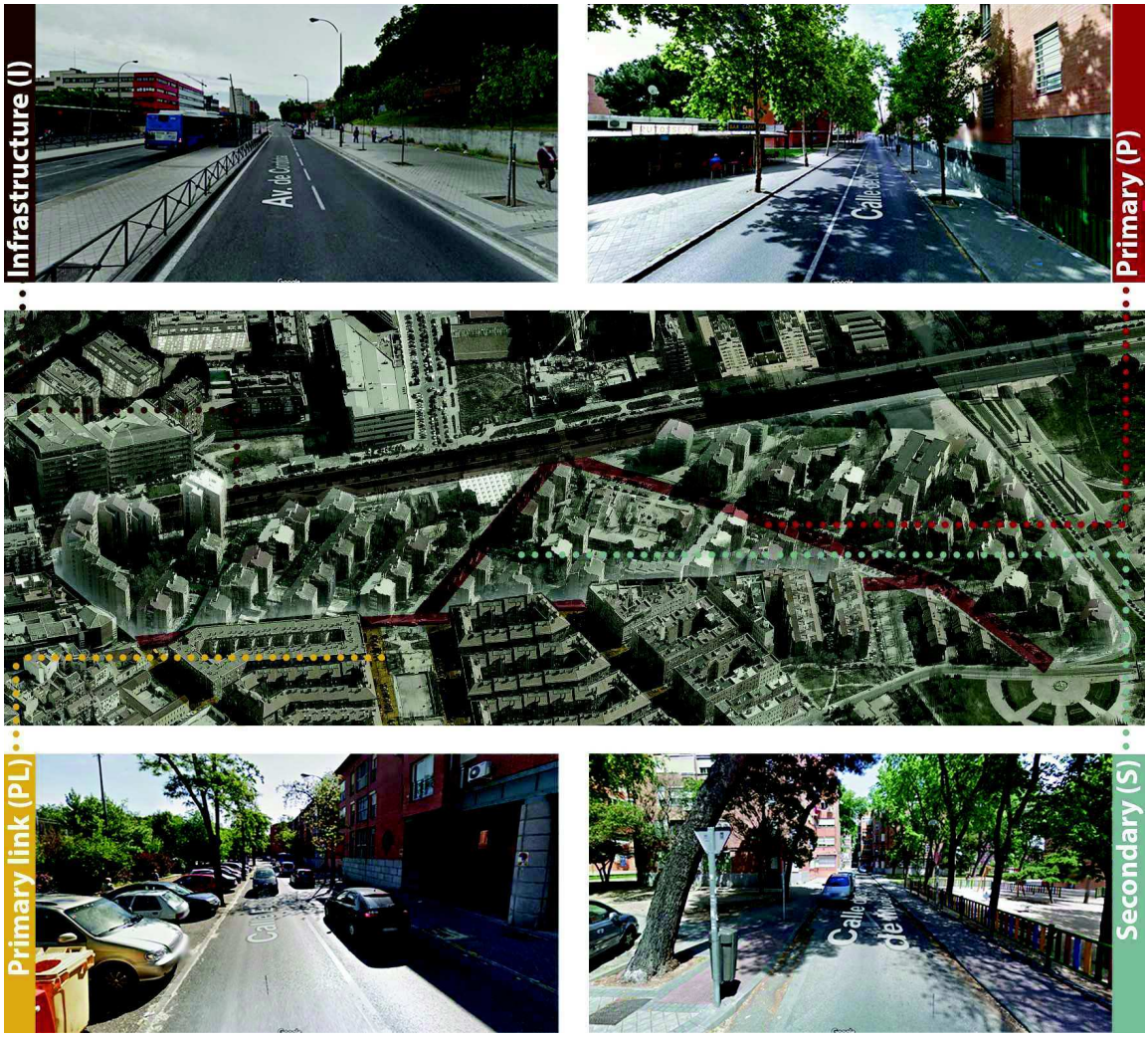

Figure 1.
Types of streets considered

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normalised integration measures, enabling the comparison between both scenarios (Al_Sayed et al., 2014, 78).

As a consequence of housing estates present diversity of street types, four street categories must be considered during post-processing (Figure 1):

-Infrastructure (I) are the main access of many housing estates. They are motorways or great avenues, with a particular non-pedestrian character. The develop of estates, considered as self-sufficient urban areas, depends on the relation between these infrastructures and the whole of the city, especially on a global scale.

-Primary link (PL) are responsible of the connectivity of housing estates with their close urban fabric. The more isolated a housing estates is, the less primary links in its perimeter it has.

-Primary street (P), which constitute the main streets that give structure to the urban area. Many of these streets describe superblocks.

-Secondary street (S) depends highly on the primary streets, and in many cases, they are cul-de-sac. Nowadays many of these streets have lost their pedestrian character to give more capacity to parking areas.

Case studies: six Madrid mass housing estates

Like many other European countries, during the mid-twentieth century Spain faced the urgent need of housing with the construction of mass housing estates or 'polígonos de vivienda' (Turkington et al., 2004). This study focus on the housing estates built in Madrid, considered a laboratory of these urban form and studied by López Lucio et al. (2004). We focus on the period between the 1950s and 1970s. This is the period of maximum constructive activity and shows a change in the trend from quality to quantity (Monclús et al., 2016b). At this sense, it is possible to distinguish two housing estates generations: the first one, corresponding to the decades after the Spanish civil war (1940-50s), is more experimental and presents a greater concern for quality. The second one (1960-70s), influenced by economies of scale, premiums quantity versus quality (Monclús and Díez Medina, 2016a). This is when housing estates become the standard urban form in new urban developments.

According to this consideration, we have selected six housing estates, three of each generation, obtaining a sample of various design solutions (Figure 2). From the first generation, we have selected three housing estates recognized by Do.co.mo.mo by its architectural quality (AA.VV., 2009). Moreover, all of them being about 20 ha. and less than 20.000 dwellings and from the urban point of view, they present some design differences:

A - Fuencarral (1957), located on the north of Madrid. This housing estate is linked since its origin to road and railway infrastructures at the west and the south. It presents a ring of main circulation on which they support secondary streets.

B - Virgen de Loyola (1958), located on the south of Madrid, presents a superblock structure. Inside, the original ring of pedestrian character has been transformed to improve the parking standard deficit.

C - Almendrales (1959) also depends on another important infrastructure to the east. Since its origins it is more connected with close urban network than others housing estates. Inside, it is organized through two diagonal streets, which divide the area in three superblocks.

Second housing estates generation presents bigger promotions (more than 4.000 dwellings and no less than 30 ha), generally with higher densities:

D - Gran San Blas (1959) is located on the natural extension of Arturo Soria (C/ Hnos Gª Noblejas), structured through six superblocks (or plots). During 1979/81 one of these superblocks was redevelop, modifying drastically its urban morphology.

E - San Cristóbal de los Ángeles (1959/64), is located on the south and depends on Avenida de Andalucía highway. In addition, the rail infrastructure creates a barrier both to the north and the east. As consequence, still it shows an enclave character.

F - Barrio del Pilar (1960/72/75) is a private development. Since its origin, it presents more autonomy. This enclave character has now

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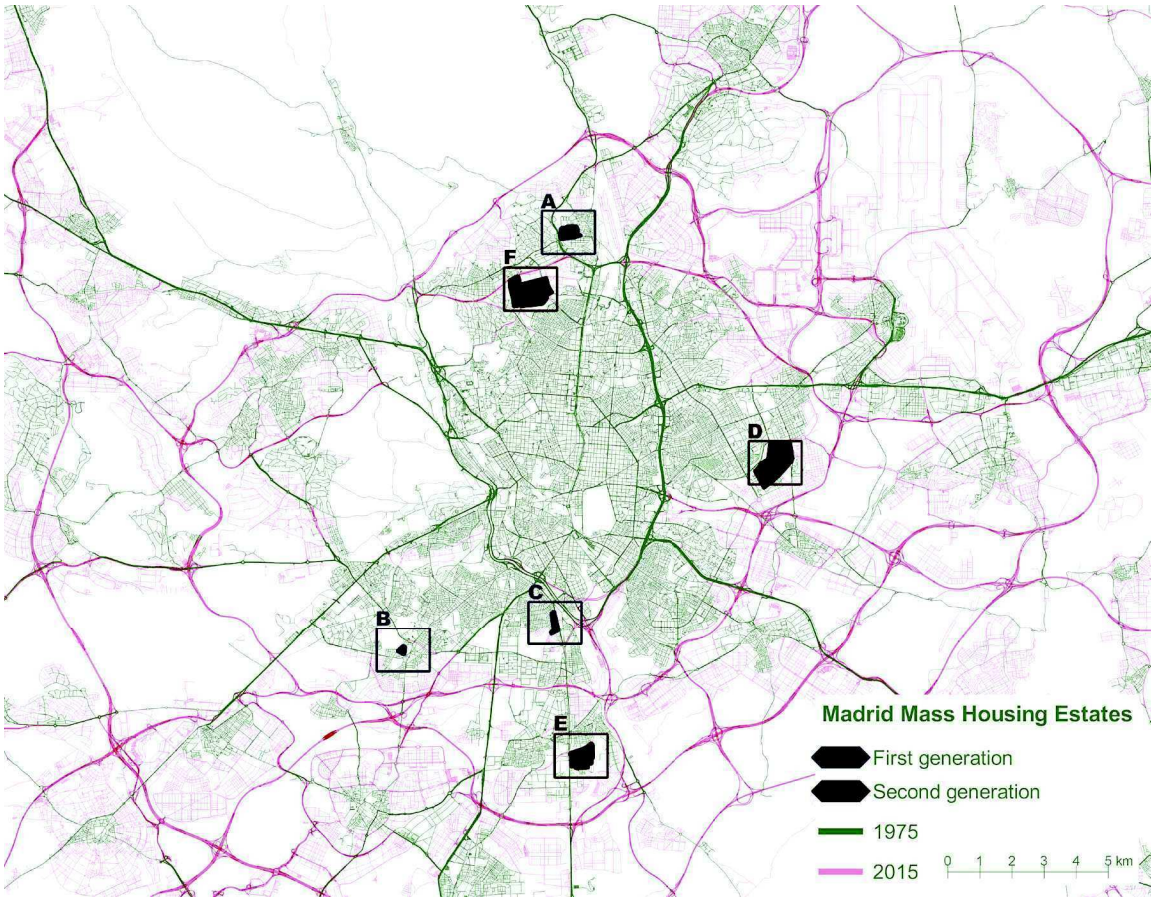

Figure 2.
Urban location of housing estates in Madrid (1975-2015)

been corrected, both for the construction of the M-30 highway, and for the growth of the close urban fabric.

Improvement characterisation

During the analysed period, there have been significant changes in the study cases. At this sense, it is important to point out that improvements are not presented univocally in a housing estate. However, it is possible to classify and summarize them from global to local improvements (Figure 3):

-Improvements by the creation of new infrastructures not directly related: when the new infrastructures do not directly support the housing estate, but help to improve its spatial integration (Loyola, Gran San Blas).

-Improvements by the creation of new infrastructures directly related: where new infrastructures support the housing estates. Its development help to improve the relative position of these urban areas (Barrio del Pilar, San Cristóbal).

-Improvements by the growth of cities in the perimeter of the housing estate: when a greater integration level has been developed by stitching operations -planned or unplanned- between housing estate and its close urban fabric (Gran San Blas, Barrio del Pilar).

-Local significant variations, when the internal structure has been modified as a result of redevelopment operations (Gran San Blas).

-If they no present significant variations (Fuencarral).

Spatial processes: results and discussion

The analysis includes two integration measures: global and local. The first one measures the spatial integration level of an area with respect

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		From global to local improvements				
		Indirect new infrastructures	Direct new infrastructures	City growth in the perimeter	Local significant variations	No significant variations
A	Fuencarral					●
B	Loyola	●				
C	Almendrales		●			
D	Gran San Blas	●		●	●	
E	San Cristobal		●			
F	Barrio del Pilar		●	●		

Figure 3.
Housing estates improvement characterisation.

to the whole city. The second one measures the spatial integration level of an area with respect of its walkable area, considering ten minutes walking -800 meters- as calculation measure.

Global Integration

Considering global integration, it is important to attend to streets categorised as infrastructures (I). The main objective of these streets is to connect housing estates with the whole city. Figure 4 and 6 show global spatial integration measures in 1975 and 2015 scenario. It is true that attending to 1975 scenario housing estates present a peripheral location, as many authors have pointed. However, during the studied period, the evolution is not as homogenous as some authors consider. More in detail it is possible point out three different evolutive patterns, always considering that the whole city has increased its spatial integration level. The first one includes housing estates which integration level increase well above the average. This is San Cristóbal and Virgen de Loyola case, influenced by the improvement works carry out in the south of Madrid. The second one represents housing estates which integration level increase above the average, such as Almendrales and Gran San Blas. The last one represents housing estates which integration increase in the average, such as Fuencarral. This happen because whereas the spatial integration increase in the whole city, no significant improvements has been developed in this housing estate.

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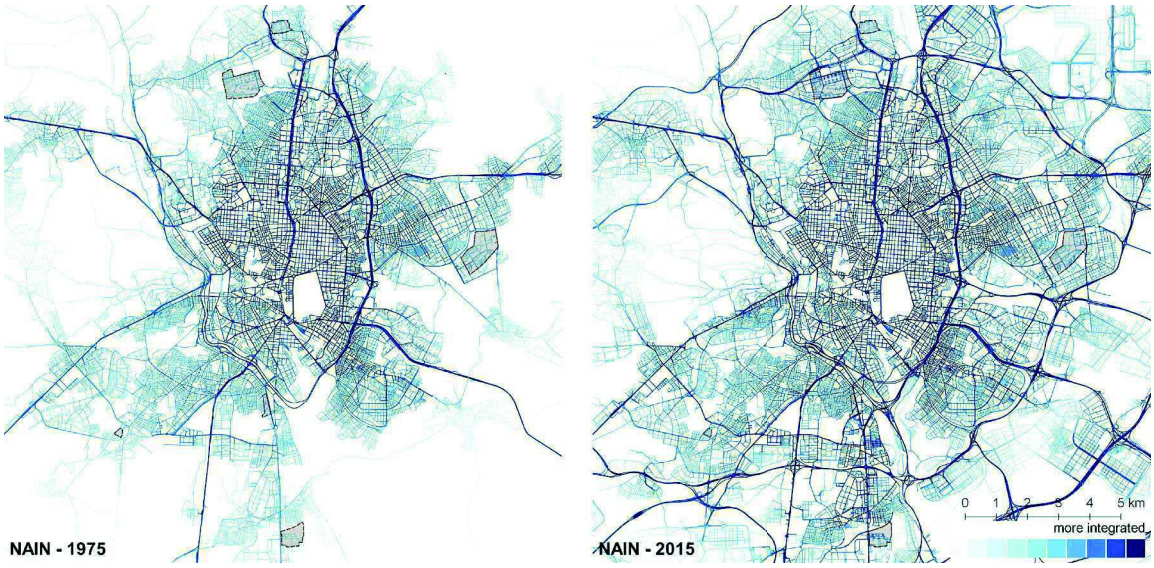

Figure 4.
Global integration map (1975-2015).

Figure 5.
Local integration map (1975-2015).

Local Integration

Taking into account local integration, it is important to considered primary and secondary streets, as well as primary links by their local character (Figure 5 and 6). These streets are more responsible in the develop of urban life, compared with previous streets. City average values show a downward trend, caused by the appearance of more spatial integrated local areas, with a lower absolute data.

Firstly, if primary links are considered, local integration shows the relationship between the housing estates and its close environment. At this regard, results show four different situations: in the first one, housing estates present a good initial integration into the urban fabric, and their results improve during the analysed period. This is the case of San Blas and Barrio del Pilar, where new urban fabrics have been built supporting initial housing estates, improving their integration. In the second one, there is a good initial integration, which has barely improved at present. This

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situation is present in Loyola and Almendrales, where their close urban fabric does not show significant improvements. The third one represents housing estates with an initial mean value, without variations in the studied period. This is the case of Fuencarral, where their close urban fabric is not as well integrated as the other ones, and without significant variations during this period. By last, some autonomous housing estates never had primary links, and during this years, there is not improvements at this level. San Cristóbal case study represent this configuration. As consequence, currently this housing estate shows a large isolation level, because close urban fabric has never been developed.

Secondly, we attend to primary streets, which values show how superblocks work into the urban network. At this level, two different processes have been detected. The first one, where primary streets form a network well-connected with close urban fabric, both since its origin or through improvement performances. In this case the integration level processes are better, as Barrio del Pilar, Gran San Blas and Loyola verify. Currently, all of them present local integration levels above average value. An exception is Almendrales, which present similar characteristic. However, its proximity to a local well-integrated area reduces its values. The second one includes housing estates which primary streets are not connected with its close urban network. As there has not been improvement performances, these housing estates have not experienced integration processes. San Cristóbal and Fuencarral confirm this situation, where their superblocks have a relatively lower level of integration.

Lastly, we consider secondary streets. First

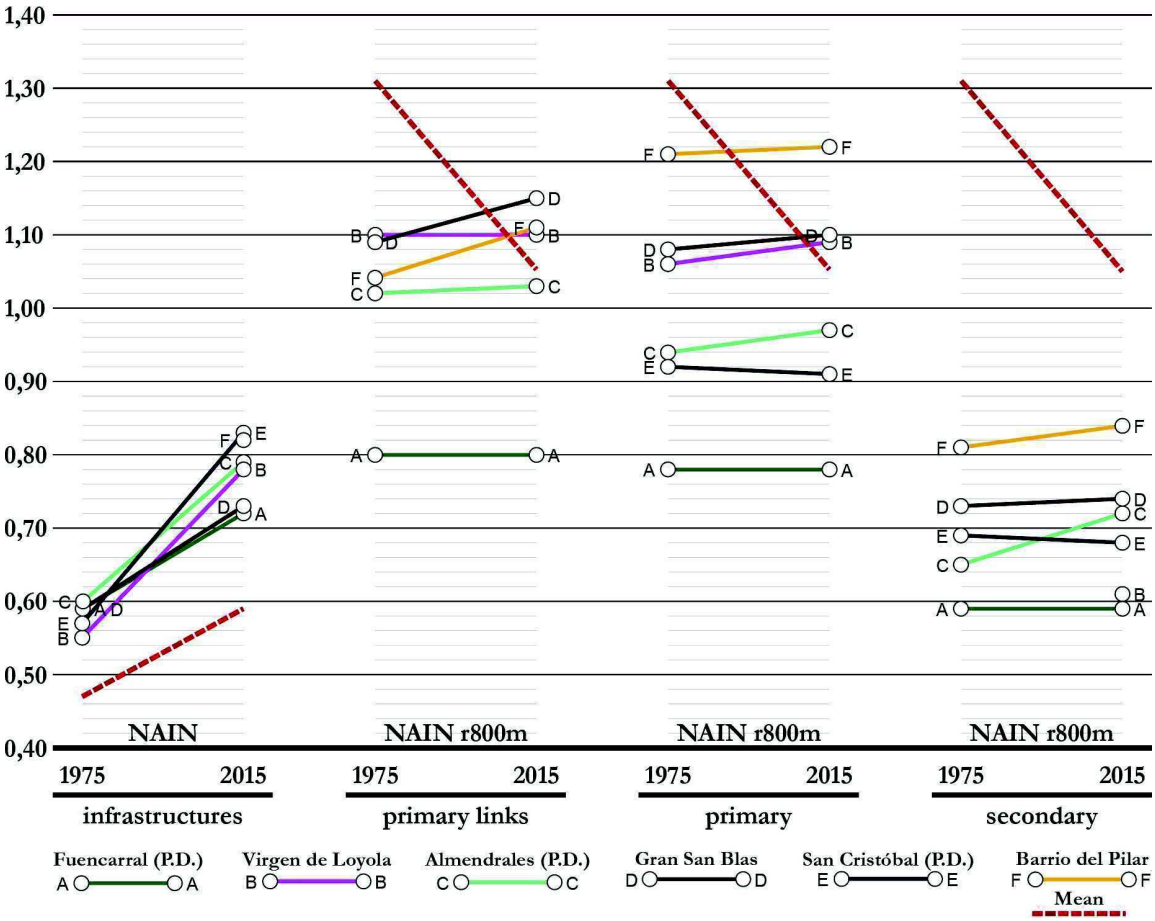

Figure 6.
Integration process results.

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of all, it is important to highlight than any of these streets reach average values. The morphological characteristics of these streets -usually cul-de-sac- is responsible for not developing high integration levels. Moreover, their values depend largely on primary links values and their evolution. As internal structure of housing estates has rarely modified, it is expected not found significant variations. However, Barrio del Pilar and Almendrales, whose cul-de-sac number are lower, are the exception rather than the rule. Also, San Blas differs because in this case, some improvements have been made in a specific superblock. However, these enhancements do not represent major differences at this level.

Interpreting results

This section establishes a relationship between improvement categorisation and spatial integration measures. Firstly, taking into account the initial classification as first and second generation housing estates and based on the results obtained, there does not seem to be a direct relationship. The first -where quality prevailed- are not necessarily better integrated. However, this does not mean that the classification used is not effective, because urban quality depends on many other factors, such as accurate density, compactness, mixed uses, open spaces system, ground floor configurations, among others, and all together must be considered.

Apart from that, there seems to be a link between improvement performances and integration evolution. In this regard, the more improvements a housing estate has achieved, the more successful spatial integration process results. Barrio del Pilar verifies this idea, which improves both its global and local integration measures. The reason is the direct influence of the construction of new infrastructures and the growth and stitching of its internal structure with new urban fabrics. Similar results, considering specific particularities for each housing estate, highlight Virgen de Loyola, Gran San Blas or Almendrales. At the far end, we find the least intervened housing estates. In Fuencarral case study, non-intervention during studies period has meant that its global and local results have not changed in relative terms. In San Cristóbal, it is true that efforts made during new infrastructures construction have influenced better global results. The problem is that local integration has never been improved. In any case, these preliminary results must be confirmed in future steps by including a large sample of case studies.

In the light of the results obtained, the specific analysis of each case becomes useful to identify possible improvement strategies. For instance, these analysis of six case studies has identified the need to implement improvements primarily on local integration. In particular, Fuencarral and San Cristobal housing estates are the most disadvantaged. In them it is necessary to devise strategies that allow improvement especially the accessibility of their urban fabric to the close urban network. These improvements could alleviate the barrier effects of its infrastructures, mitigating its enclave character. As in the example, once considered the particularities of each case, it would be possible to establish individualized improvement strategies. Hence, it seems clear that the study of the integration processes attending specifically to each housing estate is relevant in order to help to stakeholders during urban regeneration processes.

Conclusion

The text has characterised spatial integration processes in mass housing estates. Against some generic visions which indicate poor spatial integration, the study has verified the existence of high divergence between cases, from an evolutive framework. Therefore, in view of the greater diversity of situations, the systematic analysis of housing estates is useful in order to add nuances to generic visions.

For its realization, the methodology carries out on the one hand, the improvement processes characterisation performed in each housing estate. On the other, the spatial integration level is calculated using space syntax technique. The methodology used considers recent scientific contributions, which improves both more objectivity during the drawing process and optimisation of time and effort consumption.

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Results show firstly how city's growth has positively influenced the improvement of spatial integration level of the analysed housing estates. However, those in which more direct or indirect interventions have been carried out -such as new access infrastructures construction, stitching operations between new and existing urban fabrics, etc.- manifest better spatial integration levels. The categorisation of housing estates on first and second generation does not appear relevant, at least a priori, in the characterisation of the level of spatial integration, although it can be useful in many other urban characteristics.

Moreover, this methodology allows to observe in detail each housing estates. It is useful not only to know and characterise better the processes happened, but also as a tool that could help to stakeholders during decision making in urban regeneration processes.

Lastly, during this exploration, we have detected possible research lines. First, future research steps should extend this proposed methodology to other housing estates. Currently our research project works with a significant study case of thirty-two housing estates, located in Madrid, Barcelona, and Zaragoza (Spain). Second, spatial integration level should be combined with other variables such as density, land uses, vulnerability, etc. -more objective-, or open spaces character, public space social activities, etc. -more subjective-, to better understand urban obsolescence processes of housing estates and promote their urban regeneration.

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Notes

1 Ur-Hesp (New challenges for Spanish Cities: the legacy of Modern Housing Projects and options for their Urban Regeneration. Similarities and differences with Western and Post-socialists European models). More info: http://pupc.unizar.es/urhesp/

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Energy efficiency in the urban scale. Case study: Prague, Czech Republic

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Abstract. *Cities are a complex mass of morphological properties of many city fragments, which play a major role in energy consumption. Urban form, urban patterns, or city fragments can also be seen as defined by algorithms or form generators. Cities are designed taking into account infrastructure, city standards and land use regulations. Energy efficiency of the urban form may be understood as the balance between gains and losses of energy, which may depend on a set of parameters mostly defined by the geometrical shape of the buildings and the distance between them. The study starts from the development and analysis of 60 hypothetical models in order to evaluate their energy efficiency potential. The Galapagos Evolutionary Solver is used as a tool in order to find the set of parameters, which brings to the morphological properties the optimal combination of density and surface-to-volume ratio. At the final stage morphological properties of 64 Prague's patterns were selected. Computer simulation and analysis is performed using the models extracted from the virtual Google Earth model of Prague. During the process of evaluation of the samples, the relationship between the urban form and such parameters as plot coverage, surface-to-volume ratio and the incident solar radiation was established and potentially higher energy efficient structures were indicated. As the result of analysis the interrelation between urban form and energy efficiency was established, which allowed to identify the urban patterns with the higher potential of energy efficiency.*

Keywords: Algorithmic modelling, digital city, parameters of energy efficiency, morphological properties, urban pattern, Prague

Introduction

Parametric urbanism can be interpreted in various ways, and for the study of the energy efficient cities the focus is on the display and interpretation of parameters influencing the possible energy gains and losses of the built structures. Centrally-planned urbanism addresses to a big-picture view, and misses all the local details that significantly affect the solution. This centralized approach invariably works through large-scale destruction of existing structures (either man-made or natural), followed by the construction of lifeless non-adaptive solutions (Salingaros, 2011). Parametric urbanism is about development of strategy and channeling of information, analyzing the data before drawing conclusions. It results as a city, where social, economic, environmental and spatial equations are resolved in favor of construction of the most sustainable and efficient urban morphology (Hindi, 2013). Application of algorithms could help city modeling adapt to different measures using algorithmic simulations (Leach, 2009). De Landa (2004) draws some connections between what he calls self-organizations and genetic algorithms of applied scripting patterns.

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Fortier states, that the urbanist nowadays deals with management, logic on the things, reflect on the harmony of the space, dissonance and difference, doing things more comprehensible. The objectives of the profession are different from the 16th century Palladio or 19th Century Urbanism (Fortier, 2003). Owens (1986) explains, that spatial configurations of the city for evaluation are selected with varying degrees of subjectivity and most them is ruled out by non-energy considerations. Salat emphasizes the importance of city density, which is a major contributor to energy efficiency, especially in relationship to transportation (Salat et al., 2012). High density cities increase the social networks development and community interactions (Doherty et al., 2009). Lower density structures demonstrate the lower level of energy efficiency (Rode et al., 2014). There is a common agreement among researchers about the efficiency of compact cities (Große et al., 2016), there are other important issues, such as passive solar radiation and the ventilation factor. With the increase of compactness, the possibility to use natural resources like passive solar energy is decreasing since the tall building may cast shadows and block the natural light and solar heat and reduce the efficiency of passive cooling (Littlefair, 1998).

Buildings are the major agents of energy consumption. Energy efficiency of housing is very difficult to tackle because of its very complex properties related to lighting requirements, construction, privacy requirements and urban regulations. The energy efficient properties should meet at the same time social, physical and economic criteria. Research on surface-to-volume ratio is addressed to find the building typology with the minimal surface area and consequently the minimal potential energy losses, and the maximal built volume. March (1971) suggested, that the most efficient building would be "a half Cube or half sphere". This statement is based on surface-to-volume ratio, where a more energy efficient structure is actually less exposed to the outer environment. Compact, cube-like building actually has the minimum of heat gains and losses, but the large part of the central floor area is not accessible for natural daylight (Behsh, 2002). Outer surface is a major medium of temperature exchange that follows a linear law by which for the same volume the more surface means more energy spent for keeping the same temperature. A low surface-area-to-volume ratio is optimal for a passive, low-carbon building (Thorpe, 2014). Curdes compares the index of surface to volume of different typologies where very obviously modernist high-rise buildings seem to have a good ratio. Poor performance is evident in individual housing, medieval and traditional European urban block structures are identified as energy efficient (Curdes, 2010). Increase of building compacity, which is higher for the structures with the simple footprint and clear undivided volume, reduces the heating and cooling loads of the building (Adolphe, 2001).

Solar radiation has a tremendous effect on energy efficiency, especially through passive solar gains, which is in fact the amount of solar energy that is absorbed by the thermal mass of the building. Exposure of the building or south facing orientation is one of the most fundamental principles which increase solar energy gains. The total gain from solar radiation is defined as the incident solar radiation during the selected period on the facades of a building (Rode et al., 2014).

Wind pressure has a major effect on temperature exchange. The relationship is linear: the more pressure, the higher the rate of temperature exchanges. In winter, the wind movement in the outdoor environment affects heat loss of the building, while in summer the change of wind direction and speed in the outdoor environment affects the ventilation and indoor air circulation. (Huifen et al., 2014)

Methodology

This study aims to find the relationship of morphological properties of urban pattern, such as shape and dimensions of the built units, and its energy efficiency, testing the criteria of density, site coverage, available solar radiation, wind flow and surface-to-volume ratio.

The research is performed by the following steps:

Definition of the set of measurable parameters which influence the energy efficiency of the urban pattern

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Generation of a variety of 3dimensional models, which could be used for computer analysis

Analysis of energy efficiency of the urban patterns according to the selected criteria

Optimization of the dimensions of the main six typologies with the use of genetic algorithms
Analysis of energy efficiency of morphological properties of city fragments of Prague

In order to find the influence of the geometrical parameters of the urban patterns on its energy efficiency, the study starts by generating of a set of hypothetical models or archetypes of urban pattern which may create possibilities for further testing or computer simulations. 60 generated patterns vary from 1 to 10 stories and include Square house, Row house and Urban block typologies arranged with the use of rectangular and circular grid. The Grasshopper definitions (urban morphology algorithms) are designed in a way, that the number of the buildings and dimensions of the built units (the length and the width) are adjusted in the fixed site according to the building height. Samples of the generated models are presented in (Figure 1). At this stage, some other properties which work independently from urban geometry, such as occupant behavior, thermo-insulating materials or human feeling of the temperature are omitted. Energy efficiency of urban morphology is analyzed through comparison of its performance by different criteria such as density and site coverage, surface-to-volume ratio, annual solar radiation, wind sheltering factor, building dimensions and geometry.

The second part of research is based on an investigation of possibilities to find the geometrical properties and the way of spatial arrangement of the most energy efficient urban morphology. The problem of finding the urban pattern with the optimal combination of the high building density and low surface-to-volume ratio was examined with the use of the Galapagos Evolutionary Solver. The Evolutionary Solver requires variables or genes (the height and the width of the generated building), which are allowed to change (Rutten, 2010). Evolutionary algorithms are applied to the pattern definitions in order to optimize the morphologic properties of building blocks in relationship to minimal surface-to-volume ratio and maximal density.

At the final stage, the performance of theoretical generated urban morphologies is compared with the behavior of the groups of buildings, which are extracted from the existing city. Prague is very rich in urban forms with different layers of urban patterns, starting from the European City Block to prefabricated row-houses of the communist era buildings, to postmodern typologies, thus it is an exemplary site for the experiment. The 3D model of Prague is available in Google Earth since 2009 (Mellen, 2009) and the selected parts of it were exported for the further analysis (Figure 2). Different urban morphologies in Prague, including urban patterns of different shapes and models from triangular patterns to hexagons, and from row housing to towers and urban blocks are compared through the tri-fold properties of energy efficiency – surface

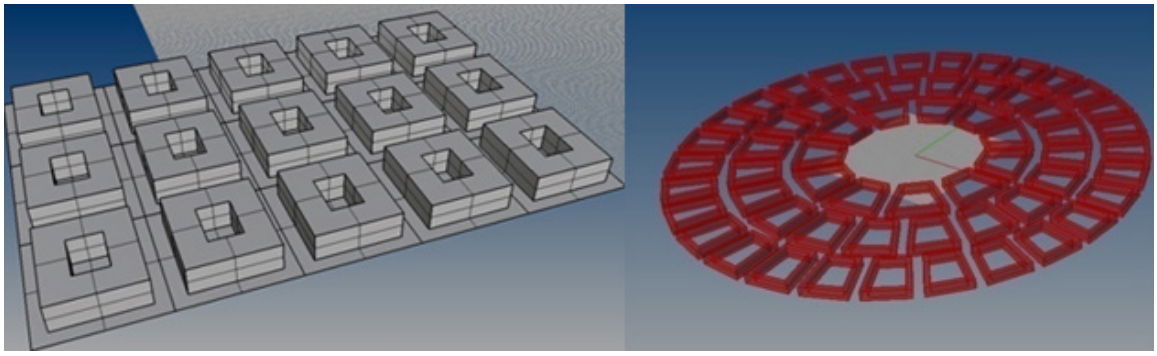

Figure 1. Sample screenshots of 3D models of urban patterns

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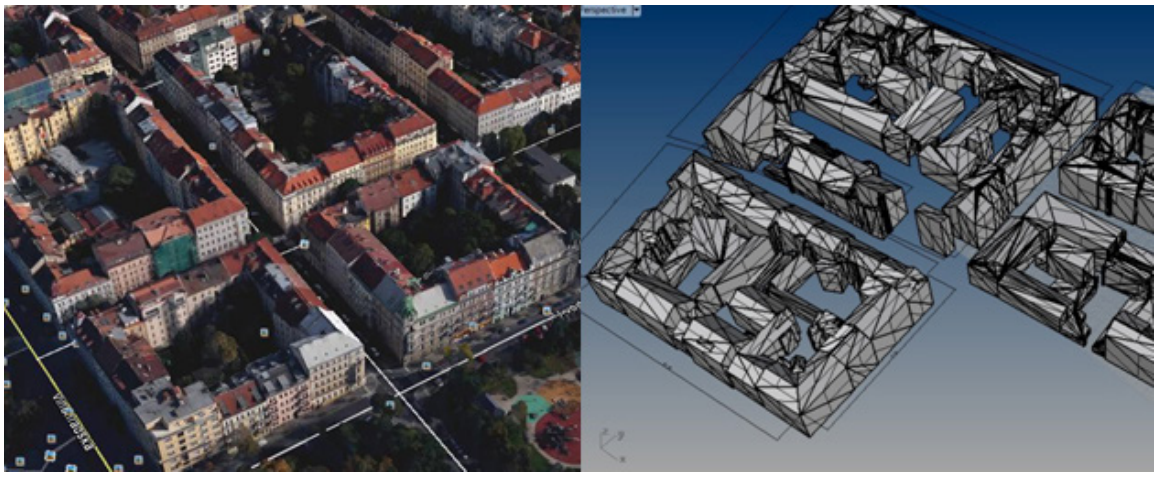

Figure 2. A screenshot of the GoogleEarth 3D model of Prague (left) and group of buildings exported from Google Earth to Rhino (right)

to volume ratio, incident solar radiation and building density.

Measurement and analysis: Density and Site Coverage

Density is one of the most important qualities of urban morphology, which is connected with its energy efficiency potential. The highest efficiency is usually associated with the highest density, which means at the same time reduction of the urban road network, the network of energy supply and rational organization of the urban space. There is no direct connection between the density and the height of the building. At it is seen after the comparison of 60 generated patterns from 1 to 10 floors, for the square- and rectangle-based building, density is increasing only up to 5 floors with the growth of the floor number. For rectangular and trapezoidal urban blocks density is growing proportionally with the increase of the building height. At this stage it is important to understand that the building height can not grow without limits. Tall buildings are negatively perceived by inhabitants. An increase in height requires the increase of the space between buildings and the existence of wide streets.

For every generated urban pattern site coverage ratio is decreasing with the increase of the height of the building. The highest values are noticed for the rectangular and trapezoidal urban blocks, and the lowest values characterize the patterns generated by square-based buildings. Site coverage is restricted by the urban regulations, and for all the low-rise and especially single floor building patterns, it is at least 60%, which is not permitted by the urban regulations.

The task of finding the variety of urban patterns with the maximal density is investigated at the second stage of the research. The dimensions of the same six generated morphologies were set as flexible. With the application of genetic algorithm, the set of the most optimal solutions for the given site was found. The statement, that the highest density is typical for the rectangular and trapezoidal urban block patterns, is proven by the results of optimization. The optimal density is achieved by the application of the 6, 7 or 9 floor buildings; the width of the units may vary slightly. According to this statement, there is no need to use the buildings with maximal height in order to achieve maximal density.

For Prague models calculation of the density was complicated by the fact, that real buildings could have different heights of floors and floor plans configurations at different levels. Therefore, in this case the site coverage is a value, which is more objective. The average value of site coverage reaches the maximum for the bar or tower-shape buildings, since there are no closed or semi-closed courtyard available. It is at the same time an indicator of the lack of private space, which is associated with the specific building. For rectangular, triangular and trapezoidal urban blocks, site coverage ratio is the highest for the filled

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structures and for the urban morphologies with narrow units. In this case it may be observed, that the inner courtyard of the built unit is filled by one or two floors of uninhabited structures, which reduce the private open space. The two groups of the medieval streets have the highest value of site coverage.

High level of density for the urban pattern is associated primarily with the economy of resources and energy. For the real urban situation the connection is not straight. The statement, that higher density may minimize energy losses, is valid only for the generated abstract models, where the distance between buildings is set to provide the minimal solar obstruction angle of 45 degrees. In this case the building receives the maximal solar radiation. In the real city the distances are smaller in many cases, and buildings may cast shadows one to another. The balance between energy gains and losses can be different.

Surface-to-volume ratio

Buildings with the higher surface exposure have more intensive temperature exchange and higher energy losses. High surface-to-volume ratio shows the potential heat losses though the external surfaces of the building. The more compact is the outer envelope of the building, the smaller is the surface-to-volume ratio and the better is its energy performance.

60 generated models of the six basic typologies are designed in a way that the built unit has a simple box-like shape, or in case of the urban block – the perimeter, trapezoidal or rectangular building with open courtyard. At this stage, it is easy to conclude, that the surface-to-volume ratio and, therefore, the potential energy losses of urban block are higher than the compact building due to the presence of void. The performance of the urban block pattern based on the use of rectangular grid is better than the one with the circular grid. For the tower and row house patterns the surface-to-volume ratio does not depend of the type of the spatial arrangement – rectangular or circular. The highest surface-to-volume ratio is found for the low-raised buildings, which makes this typology less energy efficient. The ratio is decreasing with the growth of the physical dimensions of the buildings, which shows the bigger and taller buildings are more efficient. Pattern with tower built units has the maximal ratio, which shows the lowest efficiency of such type of urban development.
Minimal surface-to-volume ratio was used as a parameter for the optimization of generated morphology with the use of a genetic algorithm. The lowest ratio, the lowest potential energy losses and consequently the better energy performance was demonstrated by the urban block patterns. The optimal dimensions of the urban block in application to the given site are relatively small: 70x70m for the rectangular unit and 64x69 for the trapezoid and the optimal height - 10 and 8 floors consequently. This correlates with the conclusion from the previous phase that it is not necessary to apply maximal dimensions to the buildings in order to achieve density and minimize the energy losses. For the units of tower and row house patterns dimensions tend to be maximal, but the use of the specific site provides multiple solutions with the best fitness value.

In the case of Prague, the minimal surface-to-volume ratio is registered for the simple-shaped contemporary structures. These buildings are characterized using the compact volume with a simple geometry, flat roof and lack of the building details. The parameters of the variations of urban blocks, such as square, rectangle, triangle and trapezoid are similar. Examining the variations between the geometries of urban block, the pentagon shape demonstrates higher surface-to-volume ratio, making it less efficient. The triangular urban block may be considered as the most compact structure with minimal energy losses. The specificities of the real morphologies, such as the distance between the two buildings which formed the courtyard, or the narrowness of the pattern and the level of courtyard infilling, slightly influenced the overall performance. The long medieval street has performance equal to the urban block groups, while the courtyard medieval street is closer to the contemporary structures.

It is important to note that the surface-to-volume ratio cannot be observed as the only parameter which affects the energy efficiency

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of the urban patterns. It indicates the potential energy losses, but there are also potential energy gains of solar radiation. In this case it may be predicted that the perimeter urban block will always cast a shadow on to one of its walls, which will reduce the possible energy gains.

Annual Solar Radiation

Solar radiation indicates the energy which is received by all the walls and roofs of the built units of the urban pattern. The higher level of received solar radiation indicates the pattern with higher energy gains, which gives to it the potential to be more efficient. The computer simulation was conducted for the 60 generated urban patters and for the 64 samples from Prague.

At the first stage of research by results of simulation the urban block performs worse in comparison to the other generated patterns. Both circular and rectangular urban block patterns receive less solar radiation, which can be explained by the complex shape of the building with the courtyard, which causes an extra shading of the walls. Incident solar radiation increases with the decrease of the building height for all cases. The relation is not linear, which can be explained by the fact of adaptation of the distances between units according to the heights in the generated model. For the two morphologies based on the use of the square-based building and for the circular urban block pattern, there is a segment between 3 and 9 floors, where the difference in values is minimal.

In the case of the Prague examples, the solar energy which is received by different typologies of urban blocks is higher than the one of the contemporary simple buildings. The blocks with the irregular orientation of sides, such as triangular or trapezoidal are preferable than rectangular. The structures with an open courtyard gain more radiation than the ones with the filled one. The medieval street structures perform the worst. For the contemporary buildings, the simple bar or tower-like building is more efficient than the L-shape or U-shape.

Wind Sheltering Factor

Simulation of the virtual wind tunnel was conducted for an analysis of wind performance of 60 generated urban patterns. The acceleration of wind speed is connected with the decreasing of the air temperature and therefore with potential energy losses. The study was based on the presupposition that in conditions of central Europe it is preferable to create the wind shadow and therefore to prevent the cooling of building surface by the air flow.

In both rectangular and circular form, low storey buildings create a wind shadow for the whole examined area. Up to the 5-6 floors the wind speed is still lower than the average, but for the high-rise buildings, it is significantly higher, resulting in the appearance of wind tunnels between the buildings. The wind speed accelerates more than average along the perimeter of the morphologies, indicating the necessity of additional thermal insulation and wind protecting membranes of the building facades. In the circular pattern, this phenomenon is more evident.

Conclusion

The study is based on the search of the balance between the energy losses and energy gains of the morphological properties of urban patterns. In some cases, the requirement which may enforce one of the elements of this equation, will contradict the other. Nevertheless, it is possible to draw the general set of rules, which may be applicable for different urban solutions. Low energy losses are character for the compact urban structures with high density. For the simple-shaped box-like buildings, the highest reasonable level of density is achieved for the built units of 5 floors. The same height is the best solution for the wind sheltering. Simple-shaped buildings have low surface-to-volume ratio which decreases with the increase of height and perimeter of the building. In this case it is important to note that building dimensions cannot increase endlessly; building height is usually controlled by the urban

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regulations and building width is accepted according to the necessity of direct lightening of the rooms. Potential energy gains of the simple-shaped buildings are higher. Incident solar radiation decreases with the increase of the building height, but it may be noticed that it remains stable from 5 to 7 floors.

The urban block demonstrates the increase of the density with the increase of the building height. Application of the genetic algorithm allowed to identify its optimal dimensions. In order to minimize the energy losses, the side of the urban block should be about 60-70m. Urban block demonstrated the best results in its ability to create a wind shelter. The courtyard remains protected with the use of the building of any height. Meanwhile, in order to create a comfortable flow through the streets, the height of the built unit should not be more than 6-7 floors. The energy gains of the urban block are smaller than of a similar pattern which is combined by the simple-shaped buildings.

The study had been developed based on the climate conditions of Central Europe with the condition of maximization of energy gains and minimization of energy losses. In order to apply the theory to a different place, the balance between these two factors should be changed according to actual climate conditions. Thus, in severe north conditions where the issue of minimal energy losses dominates, compact building shapes and creation of the wind shelter prevails over the potential gains of solar radiation, since the intensity of northern sun is very low. In moderate climates, the issue of wind protection may be less important, but in wet climates the natural ventilation should be encouraged. In hot climates, the situation is reversed and the built form should be designed in order to maximize the energy losses and maximize the shading. The building shape in this case becomes less compact and more porous.

Selection of the type of urban form depends in every case not only on the requirements of energy efficiency, but on the urban context, climate, tradition and other factors. Different typologies from the individual houses, row houses to the residential towers can be applied within the borders of one city, but the factor of selection of the morphology with the correct balance between the energy gains and losses can advance the urban planning towards more sustainable solutions.

The algorithms or form generators could be used in designing the cities of the future or scanning and analyzing existing cities. The concept further advances the ideas of parametric urbanism in an era where information technology could be used as a tool to improve cities and urban form based on the use of algorithms. The generated optimized city could be more energy efficient and socially and economically viable in the threshold between open space and built form.

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Recovering the habitat concept within urban morphology

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Abstract. *The purpose of this paper is to provide an opportunity to explore the Habitat debate within ISUF. We quest that within this concept, as placed by Anne Vernez Moudon in her inaugural paper to Urban Morphology, there is an intrinsic call towards a needed equilibrium between the various dimensions of urban form and a trans-disciplinary approach to the study of urban form, which deserves further investigation. This paper presents the first results of an on-going investigation, which seeks to recuperate the concept of Habitat within urban morphology, while identifying how the concept of Habitat was first explored in a number of international organizations, mostly by the geography and architecture fields, and how did it evolved over time. The early results of this investigation expose the impacts of such evolution on the various problematic and scales of approach of the urban environment, through various historically, disciplinary and geographical contexts. Finally it is believed that the promotion of the study of Habitat today, throughout the integration of typo-morphology, as a methodology, could reinforce the role of social sciences and of transdisciplinary practices within the study of urban form.*

Keywords: Habitat, human dimension, interdisciplinary analysis, urban morphology, urban form

Introduction

The purpose of this paper is to provide an opportunity to explore the Habitat debate within ISUF. We quest that within this concept, as placed by Anne Vernez Moudon in her inaugural paper to Urban Morphology (Moudon, 1997), there is an intrinsic call towards an equilibrium between the various dimensions of urban form and a trans-disciplinary approach to the study of urban form, which deserves further investigation. However, as already recalled by Whitehand (2012) specific constrains seem to have inhibited the full concretization of such trans-disciplinary efforts over time, namely the further specialization of the disciplinary areas. Consequently, as argued by Marat-Mendes (2016), the contributions of the different scientific areas to the development of the study of urban form has been not uniform, whereas those whose focus is mostly placed on the physical dimensions of urban form have gained greater attention and enactment when compared to those that focus on the social dimensions of urban form, thus affecting in turn the above-needed equilibrium above identified by Moudon (1997, 1987) and Whitehand (2012).

Furthermore, supported on previous research which aimed to identify the foundations of urban morphology in Portugal conducted by Marat-Mendes and Cabrita (2015, 2016), and that has exposed the emergence of a typo-morphological line of approach, followed by Portuguese geographers but also architects, that seem to have been influenced by a French school of thought, led by Albert Demangeon (Demangeon, 1926) contemporary to that of the German M. R. G. Conzen (1960), this paper exposes the results of an on-going investigation, which seeks to recuperate the concept of Habitat within urban morphology, to promote a more trans disciplinary and well balanced use of the various dimensions

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that concur to the study of urban form. Complementary, supported on information that confirms the close articulation between the thematic issues considered by architects either in Portugal or internationally, such as the Habitat issue, with the main programmatic and thematic goals under considerations by institutions such as the United Nations (Deyong, 2011; Marat-Mendes and Cabrita, 2015), this investigation aims to contribute to clarify the potential role that the Habitat issue had on enhancing the trans-disciplinary efforts among different organizations and disciplinary backgrounds, including political agendas, in regard to the study of the rural but also urban environment while engaging also with the social domains, and therefore its pertinence for current research. Bringing back the discussion of the Habitat concept within urban morphology today reveals however an opportunity to rethink the foundations of urban morphology itself.

To do that, this paper will first identify how the concept of Habitat was initially defined and explored by a number of seminal works, which the authors of this paper have identified as seminal to the study of urban form in Portugal, but that has revealed also an important international perspective. Secondly, it exposes how such concept evolved throughout specific historical, disciplinary and methodological contexts. And thirdly, it reveals the impact of such evolution on the various problematic and scales of approach by those to which the Habitat issue was central for the study of urban from, including some contemporary contributions from various interdisciplinary areas, which seem to be recuperating that concept, although not explicitly. Thus a draft of the mapping of the evolution of the concept of Habitat is here provided, while revealing the levels of attention, which were being gained at different scientific areas, mostly geography and architecture.

Following this introduction, this paper provides a brief summary of the concept of the habitat, as proposed by well recognized international organizations and therefore it is organized in three parts. The first part exposes the methodology that was followed by the present investigation. The second parts attempts to define the Habitat concept, while the third parte identifies how did the habitat was explored within Geography a Architecture, respectively. Finally, some brief conclusions portrait the main initial lines of thought that have been identified by the present research.

Methodology

The methodology followed by this investigation was twofold. First, it involved a survey of the main sources, which have informed this investigation in terms of the discussion of the 'Habitat', as an intrinsic issue within the study of urban form. This survey was conducted throughout sources both from the geography and architecture domains, which have been identified in previous work conducted by Marat-Mendes and Cabrita (2015, 2016).

These sources were retrieved from two well-known international organizations, because in a specific time of history they dedicated special attention to the Habitat issue, wherein proposing specific commissions to work on such issue. Respectively, the: i) International Geographical Union (IGU) which is an international, non-governmental, professional organization devoted to the development of the discipline of Geography, found in 1922 and that is still active nowadays, and the ii) Congrès Internationaux D'architecture Moderne (CIAM), or International Congresses of Modern Architecture, which is an organization that was founded in 1928 and dismantled in1959, and that was devoted to the spreading of the modern principles in all the main domains of architecture, such as landscape, urbanism, and many other areas.

The identified commissions were the 'Commission of the Habitat Rural' promoted by the IGU, and the 'Comission sur la definition de l'Habitat' and the 'Commision sur la grille de l'Habitat', thee last two promoted by the CIAM for the preparation of the ninth congress of this organization, named as 'Charte du habitat'.

Secondly, this research involved an analysis of the evolution of the concept of 'Habitat' in both identified organizations, but also in a number of other researchers conducted about the thematic under consideration. The goal was to retrieve how has such concept developed

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over time, and how the main interests and problematic under consideration by both geographers and architects, interested into the study of the Habitat seem to have advanced over time.

Thus a mapping of the evolution of the Habitat concept appears important to be clarified, wherein confronted to specific disciplinary, historical and methodological contexts under analysis by the present investigation.

The Habitat

The definition of Habitat is not straightforward, neither unanimous. At present the Oxford Dictionary defines it as the 'natural home or environment of an animal, plant, or other organism'. However, the well-recognized international organization United Nations agency for Human Settlements and Sustainable Urban Development (UN-Habitat) places the debate of the Habitat within the urban dimension. It is precisely on the Report of the Habitat III, where a reflection about the twenty years of urban development analysed by the United Nations is promoted, since Habitat II, and where Habitat is then identified as a durable urban development for living, which should not have a precarious character. A clear message for the need to combat poverty but also precarious housing is therefore underlined, together with the need to identify and implement planning mechanisms which go in line with the goals of the UN-Habitat III report, but also add continuity to those established at the previous conference of UN-Habitat in 2014. The main goal of the UN-Habitat is therefore to improve the living conditions of housing and human settlements, while focusing on the most deprived areas of the world.

From the above it is clear that the contemporary problems which affect humanity, such as the rapid urban development of the world, wherein more that 50% of the population leaves already in cities has obliged organizations such as UN-Habitat to place their focus on the urban dimension of the humanity problems, and in particular on housing. The same occurred 72 years ago, at the first conference promoted by the United Nations, nevertheless the world was not yet so urbanized as today. Durability of shelter and good conditions appears to be the main flags of present urban Agendas of this institution, in a way to promote a Sustainable Development.

On the other hand, if one identifies the concept of Habitat within the 'Dictionaire de l'urbanisme et de l'amanagement' (Merlin and Choay 1988) will find that its meaning is concentrated on the concept of housing, although it starts by identifying the wide spectrum of the concept. The need for housing development in the second half of the twentieth century, immediately after the second world war, seems to have been determinant for modern movement postulate the need of improving the general living conditions of housing and urbanism, while confronting it to the primitive and degraded current housing conditions (Merlin and Choay, 1998: p.323-330).

Fijalkow and Lévy (2008) on their analysis about the evolution of the study of the urban habitat in France between 1900 and 2000, from the urban geography point of view, indicate three distinct directions within the first half of twentieth century. One, which was more rural and regionalist, as a consequence of the rural habitat, and two others which have followed inspiration in Le Play and the hygienist ideas, respectively. Furthermore, these authors claim that with the advent of the World War II the focus of the Geography did radically changed, alongside with the emergence of the massive urbanization issues as the new thematic issue contributed to the disappearing of the geography of the Habitat, but also of housing, an issue which was intrinsic articulated with habitat by the geographers.

It is precisely aware of the volatility that the concept of Habitat assisted throughout time, that this present investigation sought important to delineate the evolution of the various ideas associated to the concept of Habitat, expressed both in geography but also in architecture. The period of time under analysis runs from the end of nineteenth century, through a period of time which is considered by the authors of this paper as the golden period of research on the Rural Habitat, which took place between the two World Wars, until the almost disappearing

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of the issue of the Habitat within the urban question as recalled by Fijalkow (2008) in 1960's. This is done while considering the needs of the present context, which is favourable for an interdisciplinary reflection about the values that a thematic historiography can contribute, including to urban morphology. Furthermore, it is hoped that the preliminary results extracted by this research can contribute to the reading of transitions processes and interests to which society has faced in terms of the thematic issues, methodologies and contexts that have informed those that studied the human environment, including the landscape, settlements, cities but also housing, independently of being rural or urban, but also ways of life.

The lessons that we which to retrieve, although modest, if considering the amount of work that is still to be done on this issue, hopes to stimulate further understandings and investigations about the opportunity of reconsidering the habitat issue as an opportunity to join issues which have been segregated, because of specialization of disciplinary areas, but which should be better articulated if a better living environment is really ambition by urban morphologists in order to respond also the needs of contemporary society, as urged by the Sustainable Development Agenda (UN-Habitat).

Our own definition of Habitat is that it is the overall phenomena that are associated to the human occupation of the territory, including its economic, social, cultural and historical dynamics and that is interrelated with the conformation of its physical and material evolution, at all its different scales of occupation, from the elementary construction to the more complex aggregation, as the city or the metropolis. As indicated by Moudon (1989) Human Habitat is the core and the heart of the urbanization process. It physically expresses the result of different economic and building activities, but also of design options.

It was mainly during the 40s and 50s of the twentieth century that we have identified a widespread interest into the study of the Habitat in the most important architectural and geographical international organisations, including the Congrès Internationaux dArchitecture Moderne (CIAM), the Union Géographique Internationale (IGU), as well as in the main agendas of international organizations focused on the human development, such as the above identified United Nations (UN, 1950). Furthermore, the focus on such Habitat Agenda was places on a rural dimension, which contributed to designate it as the Rural Habitat. However, despite the geographers were successful on defining such concept, the architects in turn, as argued by Mumford (2000, p. 268) have never defined the concept of Habitat with the same accuracy as they defined the four functions expressed in 'Athens Charter'.

The Habitat within Geography and Architecture

The Geography of Settlements is commonly regarded as seminal to the foundation of the Urban Morphology (Gauthiez, 2004 and Heinberg, 2007), Human Geography (stone, 1965) but also Urban Geography (Fialkow, 2008). Introduced as an object of study within geography, the human habit, has allowed an interdisciplinary vision about the relationships between the natural and the physical environment but also the forms of human occupation of the territory (landscape), associated to the ways of life and economic resources.

The Geography of Settlements represents the search for those forms, while focusing on the human settlements, buildings and complementary structures, wherein searching for the patterns of agglomeration of such constructions, and trying to ordinate and classify them by types, including houses or settlements, according to the level of proximity among those constructions, whereas their relative positions within a specific geographical area.

It was precisely under this context that the investigation of the Rural Habitat was incentivized by Albert Demangeon (1872-1940), whom would integrate such topic in 1925 within the International Congresses of the Union Geographique Internationale, and promote the 'Comission de l'Habitat Rural', which was translated to English as the

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'Commission on Types of Rural Settlement' in order to study the problem of the rural habitat. According to Heineberg (2007:p.5) 'German urban morphology has a long history. It was a progenitor of the Conzenian tradition in Britain'. The development of urban morphology owes largely to the German contributions during the first three decades of twentieth century, but also the contribution of M. R.G. Conzen (1907-2000) whom was decisive on the foundation of a School of thought in England, 'essentially German' (Heineberg, 2007: p.6). In particular, the location and the layout of towns were developed under such scope, guided mostly by the work of Geographers such as Otto Schluter (1872-1959) and Friedrich Ratzel (1844-1904), but also other German contributions, whom have allowed to develop the concept of cultural landscape, urban landscape, as a basis for setting this early view of townscapes within a longer-term, on a cross-disciplinary perspectives. Oliveira (2016) and Oliveira and Monteiro (2014) have identified from previous Jeremy Whitehand's publications references a number of influential antecedents for the work and ideas of M. R. G. Conzen, mostly German. Additionally, Whitehand (2001) confirms that it was precisely the German experience, more than his pre-war years in British Town planning and subsequent work in Geography under H. J. Fleure direction at the Manchester University that influenced M. R. G. Coznen's work on the study of Alnwick.

Stone (1965) considers that both German and French geographers of the 19th century were influential on the development of the Geography of Settlements. Furthermore he identifies Ratzel's anthropogeography close to the French human geography developed in later ninetieth century in France, whereas this later influenced by Vildal de la Blanche regional approach.

It would be precisely Blanche's ideas and the work conducted by geographers whom have followed him that would contribute to separate the physical geography from the human geography in France. This was a very different situation from what happened in the United Kingdom as recalled by Larkham (1995).
It would be the human geography in France that would integrate the Habitat, mostly the Rural Habitat, as one of its main object of study. Thus, until the middle of last century, the geography of the Habitat emerged as a sub-discipline within the general geography (Fidalkow and Lévy, 2008: p. 21).

Albert Demangeon (1893-1940) led for almost three decades the study of human geography, in France. In the various works published in the several Annales de Géographie, the principal subject was the dwelling, in terms of types and distribution (Demangeon, 1920) but also the description of the patterns of distribution of the rural houses and contiguous fields (from disperse through intercalary to agglomerated ones) (Demangeon, 1927). From all the work produced by Demangeon one should recall the investigation of the Rural Habitat, which has greatly influenced a numbers of disciples, such as M. A. Lefèvre in France and Belgium, but also the Portuguese geographer Orlando Ribeiro, for example. Furthermore, his exceptional contribution to the successive Commissions de L´Habitat Rural promoted by the IGU, are reported on the several Comptes Rendus of the International Congresses of Geography which took place between 1928 and 1949. It would be his questionnaire of regional geography published in 1909 and that would be later developed as the 'Un Questionnaire sur L'Habitat Rural'(Demangeon, 1926) that would influence worldwide a number of other studies about the rural habitat, including in Portugal, with important trans-disciplinary implications, for example between geography and architecture (Marat-Mendes and Cabrita, 2015).

It was precisely the study of the Habitat, as identified by Lefévre (1926) the most important field developed scientifically out from the human geography. Furthermore, the pertinence of the French geographers because although influenced by German studies (such as Ratzel), but also north American ones (the urban ecology from Chicago School), they have individualized themselves because traced a specific disciplinary field, while facing however the rapid changes from a dominant rural society to an urban society and an institutionalization of the territorial planning (Fidalkow and Lévy, 2008). Nevertheless, Stone (1965) claims that while withdrawal an eventual tendency to

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limit them to the dwelling characterization, the discussion of the concept of the rural habitat would contribute to join the French geographers between 1950's and 1960's from the definition attributed to the German geographers. Later, as recalled by Fijalkow and Lévy, 2008) the French urban geography would absorb the Rural Habitat and turn it to the sociology and the practice of planning, contributing on the late 1950's to the 'geographical interest in rural settlement was being overshadowed by urban analysis and definitions went unpublished (Stone, 1965: p.354). Concluding, the results of the Geography of Settlements have been inadequate to the breadth of the sector. As a consequence, "a great variety of definitions and lack of agreement have led to confusions and lastly, the object of settlement geography is a disperse subject of specialized geography, leading to inadequate study of still existing rural settlements, as if to say, rural habitat" (Stone, 1965: p.355).

The integration of the study of the habitat as part of the human geography in France faced a great dispersion of meanings, by different authors, eventually contributing to the disappearance of the Habitat issue in the Human Geography field, between 1960 and 1970. This occurred precisely when human geography ambitioned to become an autonomous discipline and when Habitat was still the main object of study within the majority of the social sciences disciplines. It would be only in 2000 that geographers would give back attention to the Habitat (Fidalkow and Lévy, 2008).

When it comes to Architecture, it is possible to identify the issue of Habitat in the centre of the architect's debate, in the preparation of the ninth congress of CIAM, which would take place in Dubrovnik in 1956. The commission which was in charge to discuss the theme of CIAM 9, and that has meet at the Working Congress that took place in Sigtuna in 1952, has reported that it had decided not to define 'Habitat' as it would be a controversial task, because of the wide amplitude of available definitions, but instead to formulate an 'introduction to the theme of the ninth congress of CIAM, which was later accepted by most of CIAM members as the 'Charter de l'Habitat'. The work promoted by this commission was informed by a number of reports prepared by the different groups within the CIAM. The commission concludes that Habitat engages two specific dimensions, one that it is more concrete and another one that is more abstract. For the first one it includes everything that is more close to the materiality, and that results from the way that man organizes its constructions and artefacts within the habitat. For the second case, there is an idea of association that people do the habitat themselves.

The commission emphasizes the quality of the several reports which were prepared and subited by the different national CIAM groups for the 1952 meeting at Sigtuna, for the preparation of the CIAM 9 Congress. Moreover, it underlines that concrete problems were discussed within each group report, but that nevertheless it would be important for each group not loose the 'abstract' idea within the Habitat, that was not purely material one. An idea of complexity is underlined. Moreover, it is stressed that habitat is not the sum of several parts but instead an organized structure, that depends on everyone, and might change upon the pressure of individuals. A declaration of 'Habitat' was therefore endeavoured as "Habitat n'est pas 'statique' mais en perpetuelle mobilité suivant la mobilité des hommes et de la societé. Son organisation est toujours renouvelée. Nous deéclarons qui'l n'est pas passif mais qu'il existe entre lui et les hommes un jeu perpétuel d'actions et de réactions, les hommes agisant sur cet Habitat en le pensant et en l'organisant, et cet Habitat réagissant sur les hommes en contribuant à les conditionner et, par conséquant, à les faire ce qu'ils sont" (in the Rapport of the Comission sur le Thème du CIAM, 1952).

Nevertheless, if one goes through the several national groups report, which have contributed to the discussion of the 'Charter de l'Habitat', will identify different topics of interest. From the single housing to the most complex urban structure, the discussion of the Habitat among the CIAM architects exposed a variety of interests, scales of approach and different levels of acceptance of trans-disciplinary perspectives. Additionally, it is also possible to identify distinct methodological approaches.

It was precisely this complex context that

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might have contributed to the separation of the Habitat issue within the work of two Commissions: 'Commission sur la définition de l'Habiat' and the 'Commission sur la grille de l'Habitat'. Whereas the first commission refused to define Habitat, but instead defined the thème of the Congress, the second commission became engaged in identifying the 'relationships' to be included on the Grille for the incorporation on the Charter (CIAM, 1952). The establishment of these commissions was approved at the 3rd meeting of the Congress of CIAM for the preparation of the CIAM 9, on the 28th June of 1952, in Sigtuna.

As it happened with the geographers it is possible to identify among the architects also dispersion on the understanding of the Habitat, despite the efforts of the CIAM organization in finding a general consensus.

Interestingly is the fact that also architects were getting interested on the Habitat issue, as geographers, but why this interest?; was it because of their close ties to the United Nations and the International Union of Architects as claimed by Deyong (2011); and what implications had this situation on the vanishing of the Habitat issue and the abandonment of the Charter de l´Habitat when compared to the Charter of Athens?

A number of questions are provoked when one faces this architects involvement within the Habitat debated. However, when one looks in detail to some of the national groups work in particular, for example that of the Portuguese team that participated at the CIAM X in 1956, at Dubrovnik, will perceive that the Rural Habitat was an important issue. Furthermore, it is possible to identify common lines of interest to geographers whom were working the habitat issue at the time, well informed on Albert Demangeon's work and enquires on the Rural habitat (Marat-Mendes and Cabrita, 2015). Furthermore, the unpublished report of the Charter of Habitat, of Ciam 10, held in 1956 at Dubrovnik is structured in there parts, wherein it devotes its second part exclusively to the 'Charte de l'Habitat', where it includes the Reports of the eight involved Commissions. The issues addressed by each commission were as follows. 1- Formulation of the Chart de l'Habitat; 2 – The present situation of the Habitat; 3 – To select extracts from earlier work of CIAM with relevance to the Habitat; 4 – The problem of cluster; 5 – The problem of mobility; 6 – The problem of growth and change; 7 – Urbanization as part of the habitat; and 8 – Comission of Liason

As recalled by Stone (1965) the lack of a clear definition and the diffusion of ideas around the Habitat issue has contributed to its dissolution among geographers, when in presence of a stronger position as more concrete instruments and tools aloud for planning, including statistics and later on Geographical Information systems. But from the above, we might suppose that the same seems to have happened within architecture. If one recalls CIAM 8, in 1951, Habitat was then defined as the living conditions of the dwelling, at the individual dimensions, but with respect to collective life, implying the scale of living, the house and the city sector. The goal was to guarantee liberty, individuality and creativity conditions to promote diversity of typologies. At Sigtuna, in 1952, habitat was not more than l'Habitation, as expressed on the Report of Commission 4 for the discussion of the Charte de l'Habitat – "L'habitat (le logis, le bloc, l'unité, le secteur de ville etc...)" (CIAM, 1952). Whereas in CIAM 9, in 1956, the goals of the Habitat, were taken much closer to what Lefévre and the authors of this investigation have defined above.

Conclusions

The situation between the two world wars was substantially different from that after the Second World War in 1945, which contributed to development of a number of transitions and changes in all aspect of society, including ways of life and the definition of common goals. For example, the urban phenomenon will gain greater attention, even more than the need to reconstruct the cities or even the rural landscape.

While the development of geography as a scientific area emerges in the second half on nineteenth century, mostly cantered in Germany, with the proliferation of the most innovative ideas; in what regards to the Geography of

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Settlements or the Human Geography it would be in France that we will find, between the two world wars the continuity and the development of the geography discipline, however now focused on the study of the Rural Habitat, whereas trying to integrate with the same presupposes the urban habitat.

However, the complexity of the several realities in presence and other aspects of epistemological and methodological order will not support the persistence of the Habitat as an object of study, with the values and contents that the different approaches had added, mostly after 1945 when attentions were than turned into the cities, entities that would be continuously growth supported by capitalism.

From what was possible to conclude so far, is that from the scientifically point of view, Germany became ignored, contributing to the loss of an important line of thought, even until today, also due to linguistic and publicity motifs. In addition, the growing importance of urban geography and other disciplines, contributed to the emergence and the development of a practice of urbanism and urban and territorial planning, as we know today, to the disadvantage of the rural landscape, but also of other scientific areas of analytical character, including urban morphology, as geographical discipline. It would be in 1994, with the foundation of ISUF that a new multidisciplinary impulse was devoted to urban morphology and that would try to invite different visions, methods and linguistics backgrounds, a situation that the designation of the three schools of thought of ISUF would not be sufficient to portrait.

However, in what relates to the Habitat, as it is discussed in the investigation we purpose that it could integration throughout the typo-morphological approach, wherein recuperating the concept of type within its various levels of analysis, from the housing opening to the territory, wherein suggesting at the same time its aperture to the social sciences and interdisciplinary practice.

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The nine forms of the French Riviera: Classifying urban fabrics from the pedestrian perspective

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Abstract. *Recent metropolitan growth produces new kinds of urban fabric, revealing different logics in the organization of urban space, but coexisting with more traditional urban fabrics in central cities and older suburbs. Having an overall view of the spatial patterns of urban fabrics in a vast metropolitan area is paramount for understanding the emerging spatial organization of the contemporary metropolis. The French Riviera is a polycentric metropolitan area of 1500 km2 structured around the old coastal cities of Nice, Cannes, Antibes and Monaco. XIX century and early XX century urban growth is now complemented by modern developments and more recent suburban areas. A large-scale analysis of urban fabrics is carried out through the new geoprocessing protocol of Multiple Fabric Assessment (MFA). Nine families of urban fabrics, of decreasing urban intensity, are identified and correlated to the historical periods of their production. Projected in geographic space, each family stretches coherently over a whole morphological region. The spatial organization of morphological regions of the coastal cites of the French Riviera follows the same archetypical genotype, mixing concentric belts and sectors, interwoven by new connective fabrics. This data-driven bottom-up procedure is not intended to supersede traditional expert-base analysis of urban fabric. Rather, it should be considered as a complementary tool for large urban space analysis and as an input for studying urban form relation to socioeconomic phenomena.*

Keywords: French Riviera, Urban Fabrics, Morphological Regions, Urban Form Recognition, Multiple Fabric Assessment

Introduction

Recent metropolitan growth produces new kinds of urban fabric, revealing different logics in the organization of urban space, but coexisting with more traditional urban fabrics in central cities and older suburbs (Knox 1992, Ascher 1995, Levy 1999). Having an overall view of the spatial patterns of urban fabrics in a vast metropolitan area is of paramount importance for understanding the emerging spatial organization of the contemporary metropolis. However, this goal cannot be achieved without the use of spatial analysis algorithms allowing a certain degree of automatization in the geoprocessing of urban fabric.

Scientific literature in the last thirty years abounds with methodological proposals for the geoprocessing of urban form. The earliest proposals did not integrate the multidimensional character of urban fabric as defined by the traditional school of urban morphology. In order to better reflect the complexity of urban fabric analysis, Araldi and Fusco (2017) proposed the new methodology of Multiple Fabric Assessment (MFA). This paper will not go in the details of the methodological aspects of MFA but will show what empirical results can be produced on the real-world case study

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of the French Riviera, a metropolitan area of more than 1500 km2 in Southern France.
The paper is structured as follows. The next section will overview available methodologies for the geoprocessing of urban fabrics, highlighting a few peculiar characteristics of MFA. Section 4 will present the case study of the French Riviera. Section 5 and 6 summarize the empirical results for this case study. The former is dedicated to the analysis of urban fabrics through MFA, the latter to the overall spatial organization of morphological regions within the cities of the French Riviera. A conclusion section will summarize the research results and identify possible future developments.

Multiple Fabric Assessment: Geoprocessing the Pedestrian Perspective

The first methods of automated quantitative analysis of urban form focused on selected elements of the urban morphological system. Space syntax (Hillier and Hanson 1984, Hillier 1996) as well as authors like Marshall (2005), even if with completely different approaches, focus their analyses on the street-network morphology. Berghauser-Pont and Haupt (2010) propose a multivariate approach in the analysis of building fabric morphology. Using the elementary unit of the street block, they cross-analyze different dimensions of urban density (built intensity, compactness, open space ratio and building height) to identify typo-morphologies of urban blocks in contemporary cities. Surface distribution of built up elements is also the main concern of fractal analysis of urban form (Frankhauser 1994, Thomas et al. 2007).

The concept of urban fabric, proposed by the traditional school of urban morphology offered a more comprehensive view of urban form at the micro-scale (Levy 2005). Urban fabric is the overall pattern emerging from the interplay between buildings, parcels, streets and site. The scientific community is thus increasingly proposing new geoprocessing approaches capable of integrating the multidimensional character of urban fabric using quantitative analysis and different degrees of computer-aided automation.

The precise objectives of the analysis of urban form inevitably influence the selection of descriptors of urban fabric, as well as the basic units of the analysis. The many analyses focused on micro-climatic or energy-consumption issues (like Long and Kergomard 2005, Puissant 2010, Bernabé et al. 2013) find street-blocks as practical units of analysis or use a superimposed grid. The urban block was also central for the traditional analysis of urban morphologists: its historical permanence allows an easier diachronic analysis of built-up forms within it. The block is finally privileged by Gil et al. (2012) and by Giannopoulou et al. (2014) in a geoprocessing approach.

Another important phase in the geoprocessing of urban fabric are the computer-aided algorithms used to identify different empirical typologies. Pinho and Oliveira (2009) show the potential of GIS platforms to support historical analysis of urban fabric formation and transformation and to typify urban fabrics based on rigorous computer-aided measurement of form elements characteristics. Their identification of urban fabric types in Lisbon and Oporto is nevertheless carried out mainly on descriptors of street-layout, like in Marshall (2005) and no particular algorithm is used to identify the types inductively. Both Gil et al. (2012) and Bernabé et al. (2013) use k-means to inductively identify types of urban fabric using city blocks. The former apply the same method to identify types of streets, as well, integrating a few descriptors of configurational analysis; the latter apply the analysis only on city blocks. Giannopoulou et al. (2014) combine hierarchical clustering with factor correspondence analysis. Fusco (2016) uses Bayesian clustering in order to identify administrative units sharing a same subset of common features of urban form (including some key configurational parameters) and functions.

Multiple Fabric Assessment (Araldi and Fusco 2017) has been proposed to integrate several methodological innovations proposed so far. However, MFA departs considerably from many of the aforementioned works as it is centered on a completely different viewpoint. Geoprocessing methods of urban fabric

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assumed until now the urban layout observed on a plan from the analyst. MFA, as proposed by its authors, is aimed at characterizing urban fabrics as they are perceived by the pedestrians experiencing the urban space. Accordingly to this renewed perspective, spatial units are defined bearing in mind the two fundamental activities that all pedestrians implicitly or explicitly practice: walking along urban streets and looking the surrounding urban environment. The spatial units used for the analysis are defined accordingly. In so doing, MFA follows a pedestrian-centered approach which is already at the heart of Space Syntax. At the same time, MFA is not a configurational approach and aims at including all the relevant aspects of urban fabrics, like other geoprocessing methods. Within MFA, generalized Thiessen polygons around street segments, with visibility thresholds, define a new basic unit from the pedestrian point of view: the proximity band around a street segment (Figure 1). Contrary to the tradition of urban morphologists, who privilege the street-block decomposition given its link to urban morphogenesis, the focus is given to the pedestrian perspective: when standing in public space, people perceive the urban fabric on both sides of the street, not the elements within the four sides of a block.

Morphological indicators are later calculated in these street proximity bands in order to describe the built-up fabric, the street-network fabric, the parcel fabric, the site and the pairwise relations between these fundamental components of urban fabric. Proximity bands of 10 m, 20 m and 50 m are used for the different indicators. A final set of 21 morphological indicators are described in Araldi and Fusco (2017). Some of them are visualized in Figure 2 in order to show their significance for pedestrian perception.

Each street segment proximity band is described by the whole set of morphological indicators. The identification of urban fabric requires a comparative analysis of each value with those assigned to the surrounding street elements, in order to identify relevant spatial patterns. An essential phase of geostatistical analysis is thus necessary: areas of statistically significant higher and lower values for each morphological indicator must be determined. Local indicators of spatial association are used but, in order to respect the pedestrian perspective, the Local Indicators of Network-Constrained Clusters (LINCS, Yamada and Thill 2010) are preferred: consistent patterns of higher and lower values for morphological indicators have to respect the same street connectivity that is experienced by pedestrians moving on the street network.

Finally, as already proposed by Fusco (2016) Bayesian network clustering is used to identify typical associations of the different morphological features within a given study area. Araldi and Fusco (2017) highlight how geostatistical processing is necessary before engaging in multivariate clustering. The goal of the clustering analysis is precisely to detect consistent patterns of closely connected streets showing peculiar morphological characteristics; without preliminary LINCS analysis this result would not be attainable. Finally, Bayesian clustering differs considerably from more traditional k-means approaches: urban fabrics are identified whenever they consistently share a few common characteristics, but they do not need to be homogeneous on all the 21 features described by the morphological indicators. These characteristics are not the same when we consider different urban fabrics, and this is much more in agreement with the findings of classical urban morphology (Borie et Danieul 1984).

The French Riviera Metropolitan Area

The French Riviera is an emerging metropolitan area in Southern France (Figure 3). Once the independent Principality of Monaco is included, this area has a population of more than one million inhabitants over 1500 km2. This space is a unique conjunction of natural and urban landscapes: firstly, the topography, with elevation ranging from the sea level up to 1700 meters of the Prealps (passing through hills and valleys differently sloped). Secondly the socio-political and historical influences on urban development, in general, and urban planning, in particular. Traditional villages

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and suburban developments are spread around three high density urban areas. From east to west, we find: Monaco and its skyscrapers, the most densely populated sovereign nation in the world; the urban agglomeration of Nice with a regular urban grid at its core inspired by the Turin model (Graff 2000), surrounded by hilly and less tightly planned areas. And finally the urban agglomeration of Cannes-Grasse-Antibes characterized by land irregularity together with the car-centered sprawl development of the lasts 50 years (Fusco 2016). All over the French Riviera, XIX century and early XX century urban growth is now complemented by modern developments and more recent suburban areas. The combination of all these elements produces a sequence of urban centers and peripheral areas of different size and different morphology within a unique coastal conurbation stretching from the French-Italian border (to the east) to the Esterel mountains (closing the bay of Cannes to the west).

The perimeter of the study area (Figure 3) does not correspond to any administrative definition. This perimeter is in fact fragmented in several metropolitan local governments, as well as the little independent Principality. It was rather defined in order to include the aforementioned coastal conurbation, as well as most of the sprawling villages in its close hinterland.

The first goal of the analysis is thus to identify and characterize families of urban fabrics within this vast study area. Inasmuch the MFA methodology was used, the approach is inferential and data-driven: we did not want to define the different urban fabrics with expert knowledge, but retrieve them inductively from the geoprocessing and Bayesian clustering of morphological indicators. Careful expert work is then needed to interpret the results and evaluate their adequacy with domain knowledge. A second goal of the analysis is to study the spatial arrangements of urban fabric types within the metropolitan area. Can vast morphological regions be identified or is the metropolitan area a patchwork of small fragments of the different urban fabrics? In both cases, what spatial logics underpin the distribution of these morphological regions? Can consistent patterns of spatial organization be identified within the metropolitan area? What does this reveal on the morphogenesis and the functioning of the French Riviera metropolitan area?

The Morphological Analysis of Urban Fabrics on the French Riviera

The study area of the French Riviera contains almost one hundred thousand street segments. 90% of the them measure between 8 and 350 m. When considering a 20 m proximity band, spatial units around these street segments have an average surface of 1670 m2.

MFA on these spatial units identifies nine different families of urban fabrics on the French Riviera (Table 1). These families are particularly well-defined and well separated in the mutual information space associated with the Bayesian clustering. They also have a different weight in the study area (values given in Table 1 are calculated on number of street segments and not on street segment length). The number of clusters was identified as optimal by Bayesian algorithms of cluster optimization, with the only constraint that each cluster should represent at least 1% of the spatial units in the study area, to avoid data overfitting. As they are arranged in Table 1, they make up a continuum gradient of decreasing urban character. In interpreting the cluster content, we will use the concept of "families" of urban fabrics. Clusters are often made of slightly different urban fabrics, representing synchronic or diachronic variations of a basic type (Caniggia and Maffei 1979). Sometimes similar urban fabrics can also be produced in phases of urban history which are well separated in time. They will nevertheless be included in the same family if they share the same key morphological characteristics defining the family.

The first family is the one of the old constrained urban fabrics of town-houses making up the medieval and late-medieval villages of the French Riviera. They are dense (in the sense of high coverage ratio), made up of adjoining town-houses and small buildings with a high height/width ratio on short streets that can be more or less steep but always present a high street-corridor effect channeling

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pedestrian visual field while moving. Street networks are highly connective and irregular. Street acclivity and windingness is higher in the perched villages and in the oldest city-centers. The "bastide" towns of Valbonne, Mouans-Sartout and Vallauris in the western Riviera are exceptions of street-network regularity but possess all the other defining characteristics of the family. Exceptionally, e few residential developments were produced in the last decades to replicate the urban fabrics of the old villages. The most vernacular type of urban fabric, this family accounts today for only 6.3% of street segments on the French Riviera.

The second family accounts for a slightly larger share of spatial units (9.3%). It corresponds to the traditional urban fabrics with adjoining buildings having characterized the strong urban expansion of French Riviera cities on the flatlands from the early XVIII century until the Second World War. Buildings and parcels are bigger than in the previous family and, above all, street networks are much more regular. The highest regularity characterizes the city-center of Nice (but not its old town, mixing medieval urban fabric with early XVIII century expansions), particularly the neighborhoods planned by the Consiglio d'Ornato (the local planning body) in the XIX century (Graff 2000). Street corridor effect remains particularly important, as well as building frequency, because mega-buildings are only to be found as exceptional additions of the last decades. Sometimes, social housing projects of the last decades or new developments of high-rise buildings are also included in this family. The high-rise developments in Monaco are also exceptional within this family: their street network, although well-connected, is particularly irregular and the height/width ratio would make it a class on its own, had the 1% constrain not been applied in the cluster search.

The family of discontinuous and irregular urban fabrics mixing individual houses and bigger buildings (No.3) accounts for an additional 8.1% of the study area. Many of these urban fabrics started being developed in the late XIX or early XX century, in the form of small subdivisions or even individual self-construction. They have later undergone building infilling, addition and replacement resulting sometimes in important transformative processes. They are thus characterized by less pronounced specificities than the two previous families, as they often mix characteristics of denser traditional urban fabrics, modern discontinuous urban fabrics and even suburban fabrics.

The family of modern discontinuous urban fabrics with big and medium-sized buildings is particularly important on the French Riviera (15.5% of the study area). These urban fabrics are particularly the product of post-war modern developments, following the blueprint of CIAM precepts. The traditional relationship between parcel, streets and buildings is often lost (Panerai et al. 1997, Graff 2013). Street networks are also relatively irregular as meshed arterial roads are superposed to more local tree-like fragments. It is true that some developments like the late XIX century garden-city of belle-époque big buildings on the hill of Cimiez (Nice) are part of this family of urban fabrics, despite their pre-modern appearance. In these neighborhoods, the discontinuity between big buildings was indeed a main departure from more traditional urban fabrics and was correlative to the project of inserting buildings in large, wooded parcels.

The next two families (No. 5 and 6) are made up of two different strains of suburban fabrics. On the French Riviera, suburbs lack the regularity and monotonous patterns typical of North-American, but also of British and other French residential urban peripheries. Land ownership fragmentation, topographic constrains and the importance of self-construction produced landscapes of particularly irregular and heterogeneous suburban fabrics over the last 50 years. Irregular, tree-like, winding street networks with numerous cul-de-sac and prevalence of individual houses with low coverage ratios are the main characteristics of all suburban fabrics in the study area. A difference can nevertheless be made between, on the one hand, the suburban residential fabrics on the hills or in the plain (No. 5), particularly important in the western section of the French Riviera, where street acclivity and area slopes are low and houses tend to be bigger villas and, on the

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other, the constrained suburban fabrics of more mountainous areas (No. 6), especially in the eastern section of the French Riviera, where steep winding roads are the norm and houses tend to be smaller. The prestigious capes (Cape d'Antibes, Cap Ferrat, Cap Martin) are strongly characterized by the first form of suburban fabrics, with exceptionally big villas and swimming-pools. Old villas and mansions from the late XIX and early XX century are here mingled with more modern villas sharing few architectural and stylistic features but contributing both to the same spatial logics of the suburban fabric. Together, these two families of suburban fabrics make up almost a third of the street-segments in the study area.

The family of connective artificial fabrics with sparse specialized big buildings (No.7) is perhaps the most peculiar urban form of the last 40 years of metropolitan development. Its quantitative importance is not huge (only 7.7% of street segments) but it is present in almost all peripheral areas in the interstices between the other families of urban fabrics. Artificial connective fabrics are usually to be found around main arterial roads, highway interchanges and roundabouts. The biggest buildings of the metropolitan area (shopping malls, factories, hospitals, air terminals, warehouses, hangars) are built along these street segments, but at a distance that is not at the scale of pedestrian movement and perception. Most of the technological park of Sophia-Antipolis, north of Antibes, is characterized by this emerging metropolitan fabric. Functional developments around ports and marinas also belong to this family. Of course, street-corridor effect is inexistent in these areas, and coverage ratio is low but, unlike suburban fabric, houses and other small buildings are almost non-existent and culs-de-sac are rare: the street network is highly connective in order to ease vehicular traffic in pedestrian unfriendly environments.

The last two families (No. 8 and 9) characterize the less developed areas of the metropolitan space. Most of them are made of natural land and, more seldom, agricultural land. Buildings are nevertheless always present here and there and the roads and trails (more than the streets) serving these areas are still a channel for pedestrian movement and visual perception. Like for suburban fabrics, a difference can be made between non-urbanized space in the hills and in the plains (No. 8), where landscapes are more open and smooth, and both buildings and individual houses can punctuate the landscape, and natural space in the mountains (No. 9), with long, winding and steep street segments, high terrain slopes, rare small houses, and sometimes panoramic visual fields. Once again, the former are more present in the western section of the Riviera, the latter are more frequent in the eastern section, where the Prealps almost tumble into the sea. Good 21% of street segments in the metropolitan area are characterized by these two families of essentially non-urban fabrics. If calculated in street length, their share would be significantly higher, as the longest street segments are to be found here. We will also remark that metropolitan parks with organized networks of long pathways are to be found in these two families, whether in the plain or in the mountains. On the contrary, most urban public gardens, because of their higher connectivity, shorter segments and presence of technical facilities are much more often classified in the family of the connective, artificial fabrics even if, for once, they are much more a pedestrian-friendly than a car-friendly environment.

The spatial Organization of the French Riviera

When projected in geographic space the clusters identify well defined, large spatial patterns of connected spatial units making up peculiar morphological regions in the metropolitan area. A few sectors mix two families of similar urban fabrics (No. 1 and 2, No. 3 and 4, No. 5 and 6, No. 8 and 9). Areas of fine-grained patchwork of several urban fabrics are particularly rare. MFA makes here a contribution to the long felt need for more clarity in the identification of morphological regions (Larkham and Morton 2011).

Figure 4 maps the western section of the French Riviera, around the cities of Antibes, Cannes and Grasse (up) and the central section, around the city of Nice (down). The old city centers of Antibes, Nice and Cannes (but even Grasse in the hinterland) are clearly distinguishable in brown color (family No.1), surrounded by traditional urban fabric of the

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late XIX and early XX (family No.2). More peripheral urban sectors belong to families No.3 and No.4, often in opposite sectors of urban development, whereas vast suburban areas (mainly family No.5 around Antibes and Cannes, family No.5 west of Nice, but No.6 north and east of Nice) border the outskirts of the main cities. The traditional fabrics of smaller villages in the close hinterland are identifiable as islands within suburbia. We can also observe the importance of suburban fabrics of family No.5 in the capes. Finally, connective artificial fabrics correspond to the urban fringe belts west of Nice and north of Antibes, but also to the technical space around ports and airports, and to the core of the technological park of Sophia Antipolis (where a few modern developments also recreated the morphological characteristics of traditional urban fabrics). The results found for the city of Nice, showing the substantial continuity of traditional urban fabrics of the plain from the most central area towards the North and the East, as well as the relative importance of modern discontinuous urban fabrics in the western section of the city, in the north and on the hill of Cimiez, are in good agreement with more qualitative expert-based analysis carried out by Graph (2014).

The striking similarities in the spatial organization of morphological regions around the coastal cities of Cannes, Antibes, Cagnes-sur-Mer, Nice, Monaco and Menton brought us to the conclusion that, despite the local specificities (like the planned urban grid of Nice or the constrained high-rise developments of Monaco), the cities of the French Riviera show a common genotype of spatial organization. This is represented through the simplified diagram of Figure 5. The archetypical Riviera city has a concentric double core of inner old city and traditional pre-modern urban fabric. Discontinuous irregular fabrics and modern discontinuous fabrics develop on well-defined and opposed sectors around them. Further out, different forms of suburbs were added in the last fifty years, with specific forms on the prestigious capes. A further belt of more or less topographically constrained natural space lies around the suburbs. However, the spatial organization of the metro-politan area cannot be understood without taking into consideration the three following aspects:

1. Old villages are scattered in the immediate hinterland. When they are small cities (like Grasse or Vence), they show the same juxtaposition of urban forms already found for the coastal cities.
2. Connective artificial fabrics are a very peculiar new urban form of the metropolitan development of the last fifty years. They are to be found in the interstices of the urban periphery and suburbs, along main transportation axis and sometimes on the very coastal line, connecting ports, airports, shopping malls and other large urban facilities.
3. This scheme is a module repeated several times within the metropolitan area around each major coastal city. The spatial organization of the French Riviera metropolitan area is thus a doubly self-similar structure: repetition of the same module, on a similar scale, along the coast and repetition of miniature version of it in the close hinterland.

A few exceptional areas depart from this scheme. This is namely the case for the Sophia-Antipolis technological park, north of Antibes. Here, a large matrix of artificial, connective urban fabrics is surrounded by natural areas. Within it, we find enclaves of modern discontinuous urban fabrics and of more traditional urban fabrics with adjoining buildings. The morphological region of the technological park is thus more a mosaic of these three families than a homogeneous area characterized by the presence of a single type of urban fabrics.

Finally, apart from a few noticeable exceptions, the metropolitan area is structured by an urban scheme mixing concentric belts and sectors, interwoven with new connective fabrics, that repeats itself several times from east to west, with some self-similarity at different scales.

Conclusions

MFA is an inferential data-driven procedure of urban fabric analysis coupling the calculus of morphological indicators, geostatistical analysis of spatial patterns and Bayesian clustering. Applied to the French Riviera, MFA

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proved capable of identifying nine families of urban fabrics which are particularly well defined in terms of morphological characteristics. Projected in geographic space, each family of urban fabrics stretches coherently over a whole morphological region. The spatial organization of morphological regions of the coastal cites of the French Riviera follows the same archetypical genotype, mixing concentric belts and sectors, interwoven by new connective fabrics. The whole metropolitan area is finally an assemblage of several city modules with some self-similarity at different scales.

These results could not be obtained through manual calculations or expert-based procedures given the spatial extent of the case study. At the same time, this data-driven bottom-up procedure is not intended to supersede traditional expert-base analysis of urban fabric. Rather, it should be considered as a complementary tool for the analysis of urban forms within a large metropolitan area. The power of this method consists in allowing the analysis of urban complexity of extended areas, identifying key factors to characterize urban fabrics diversity and geographic distribution of significant spatial patterns. Moreover, MFA was conceived as a geoprocessing approach assuming the pedestrian viewpoint on urban fabrics. Morphological indicators where calculated to describe form elements as they can be observed by the pedestrian moving on the street and further geoprocessing analyses use the values of these indicators. In this respect, the urban fabrics identified through MFA analyses are potentially to be cross-analyzed with socioeconomic phenomena which could be related to urban form (like retail activity, crime, housing choice, neighborhood satisfaction, etc.) more than with environmental phenomena (pollution, micro-climate, urban ecosystems, etc.) that are not linked to human perception and exploration of urban space.

Other indicators of urban perception could then be integrated in the MFA analysis, like isovist indicators (Benedikt 1979). Indeed, Batty (2001) describes visual fields modelled through isovists as the interaction of geometry and movement, two founding principles of MFA approach. Stylistic and typological descriptors of observable buildings and of street furniture could also be added, establishing bridges both with researches on urban ambiances (Thibaud 2002) and on typo-morphological analyses. If the goal of the research is not urban form as perceived by humans, MFA approach, with its three defining phases of analysis, can also be applied on other partitionings of urban space, like city-blocks.

A different direction of research would be to cross-analyze "objective" urban forms identified through MFA with "subjective" urban forms in individual and social cognition and representation (Lynch 1980, Cauvin 1984). Morphological regions, as well, i.e. the spatial extent of a given recognizable urban form, could be characterized by their representation in mental maps and their semantical descriptions in textual data. Finally, a diachronic dimension should be added to MFA analysis in order to better support research on urban morphological processes on vast metropolitan areas, a research direction already initiated by Pinho and Oliveira (2009).

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Figure 1. The spatial units of the analysis: proximity bands around street segments.

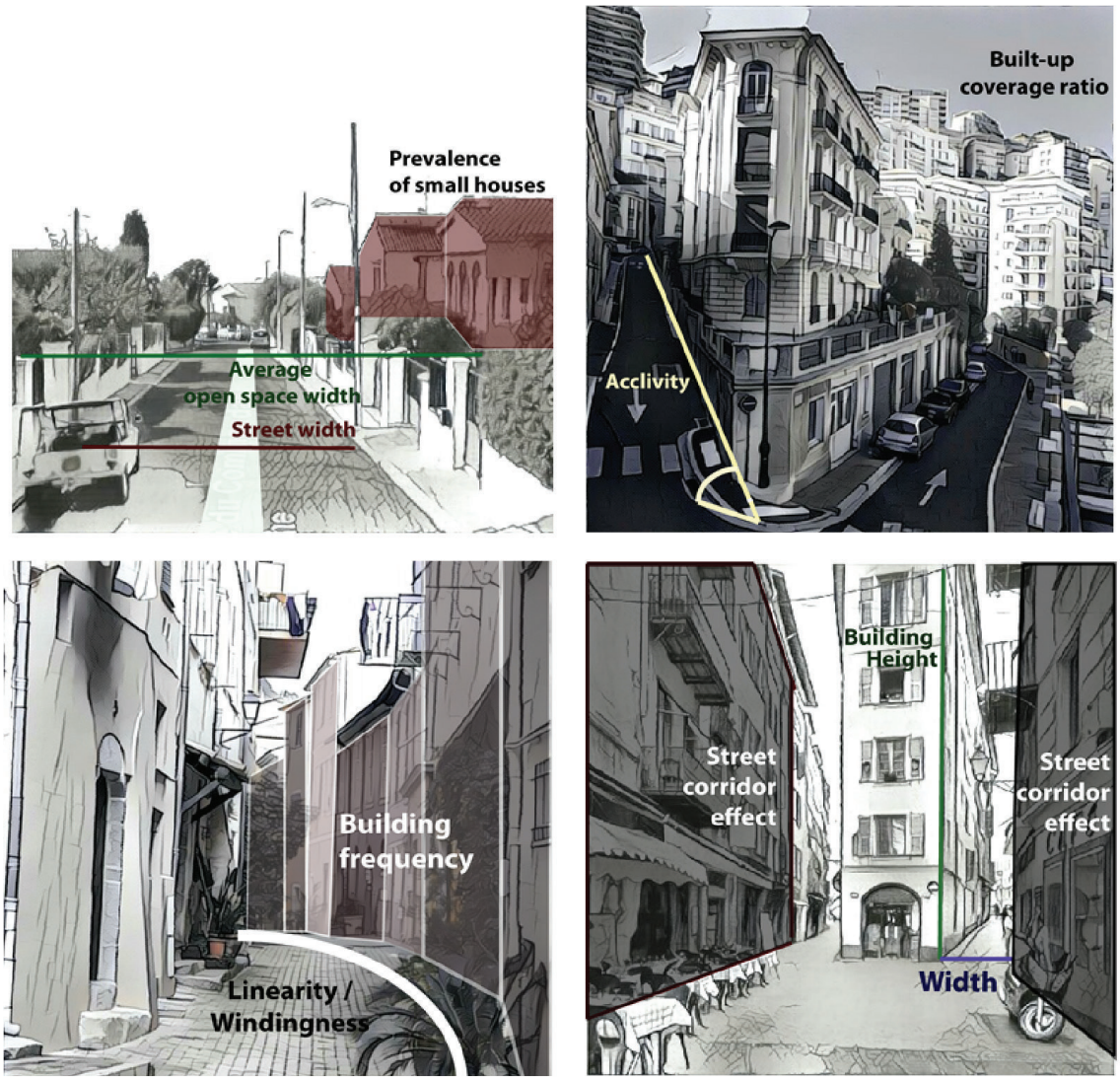

Figure 2. Morphological indicators from the pedestrian point of view.

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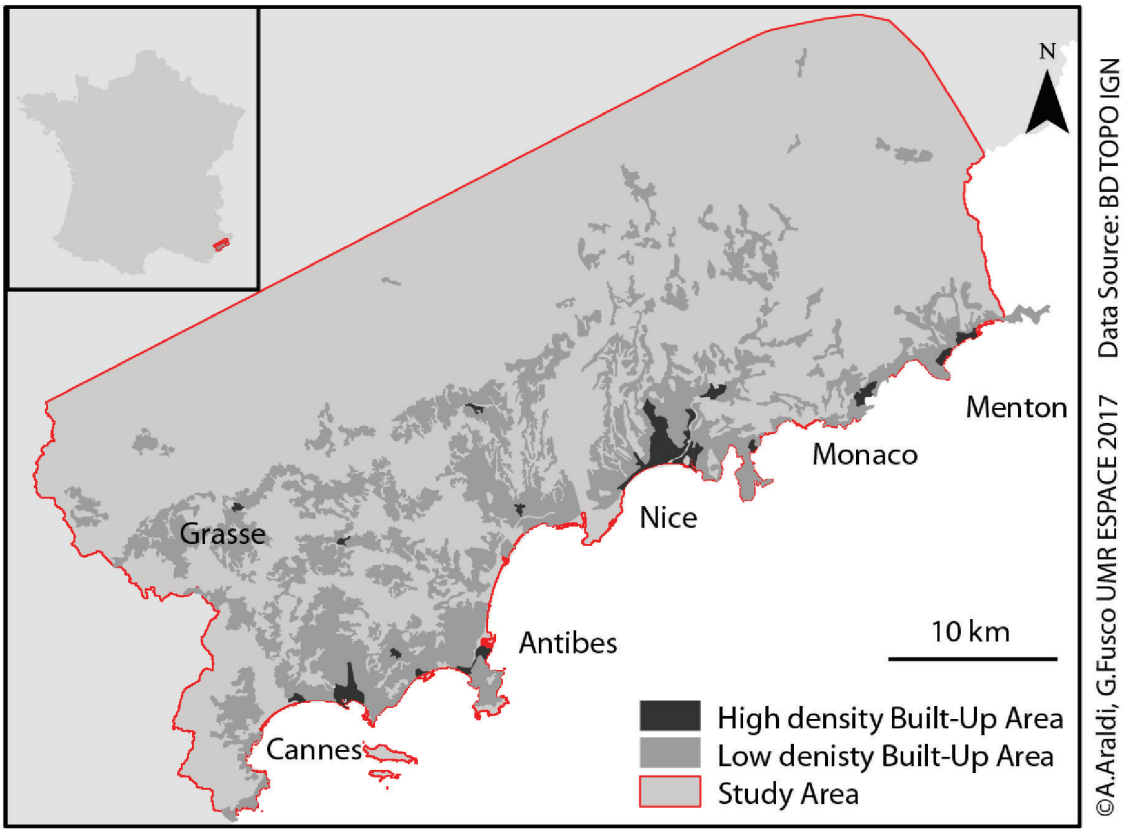

Figure 3. The French Riviera Metropolitan Area.

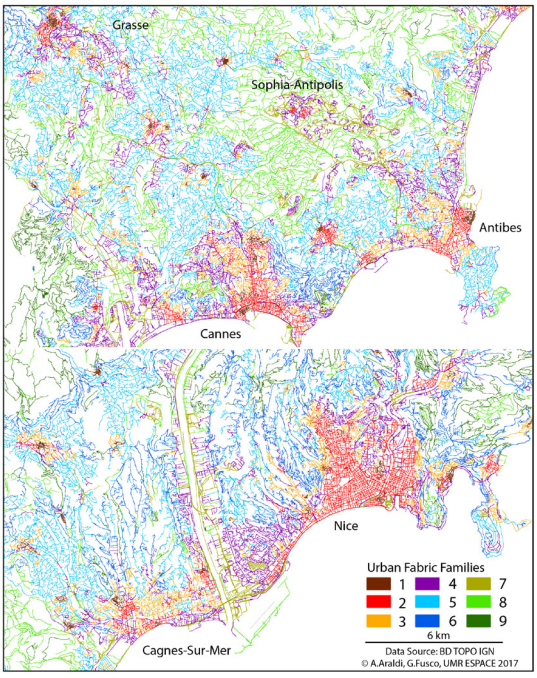

Figure 4. Families of urban fabrics projected in geographic space.

Figure 5. Archetypical spatial organization of morphological regions in French Riviera cities.

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Urban Fabric Family	Weight in Study Area
1. Old constrained urban fabrics of town-houses	6.3%
2. Traditional urban fabrics of the plain with adjoining buildings	9.3%
3. Discontinuous and irregular urban fabrics with houses and buildings	8.1%
4. Modern discontinuous urban fabrics with big and medium-sized buildings	15.5%
5. Suburban residential fabrics in hills or plain	19.8%
6. Small house constrained suburban fabrics	12.4%
7. Connective artificial fabrics with sparse specialized big buildings	7.7%
8. Non urbanized space in hills or plain with sparse homes and buildings	10.4%
9. Mountain natural space with sparse houses	10.8%

Table 1. Families of Urban Fabrics on the French Riviera.

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Quantitative comparison of the distribution of densities in three Swedish cities

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Abstract. *Typologies play a role in urban studies since a long time, but definitions are often rather abstract, ill-defined and at worst end in fixed stereotypes hiding underlying spatial complexity. Traditional typologies are focussing on separate elements, which allow for understanding crucial differences of one spatial feature in greater detail, but lack the capacity to capture the interrelation between elements. Further, they often focus on one scale level and therefore lack to acknowledge for interscalarity. Recent publications define morphological typologies based on quantitative variables, building on the seminal book ´Urban Space and Structures´ by Martin and March, published in 1972, but using more advanced spatial analysis and statistics. These approaches contribute to the discussion of types in two ways: firstly, they define types in a precise and repeatable manner allowing for city-scale comparisons; secondly, they acknowledge cross-scale dynamics important for e.g. living qualities and economic processes where not only the local conditions are important, but also the qualities in proximity. This paper focuses on the comparison of building types in three Swedish cities, using the multi-variable and multi-scalar density definition. A statistical clustering method is used to classify cases according to their measured similarity across the scales. The results show that working with types is a fruitful way to reveal the individual identity of these types, compare cities and highlight some differences in the way the three cities are structured.*

Keywords: Density, cluster analysis, building types, city comparison, interscalarity.

Introduction

Density

Density is a crucial variable in urban studies for various reasons. It is often argued that cities with higher density have a higher level of ´urbanity´(e.g. Lozano 2007). Further, cities with higher population densities are generally found to have lower CO2-emissions due to lower private car use. This is why high density often is promoted such as in several of the UN reports on sustainable development (e.g. Sustainable Development Goals, UN 2014 and UN Habitat's 5 principles for sustainable neighbourhood planning, 2015).

Berghauser Pont and Haupt (2010) have, driven by these factors above, developed a method to relate density to urban form, and more specifically building types, to make this numeric variable a more relevant tool for architects, urban planners and designers. Their method is developed for the very local scale (i.e. urban fabric or neighbourhood), but we all know that density changes depending on the scale it is measured. Amsterdam and Stockholm have for instance similar population densities at the city level, but Stockholm offers three

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times more urban green space per city dweller, because the density of its' neighbourhoods is higher (Berghauser Pont and Haupt, 2010). This offers Stockholm the advantage that 40% of all transport dependent CO2-emissions is cut thanks to these green spaces (Jansson and Colding 2007). This scalar dimension is missed by most current density measures.

What this paper sets out to do is combining the multi-variable method as developed by Berghauser Pont and Haupt (2010) with the multi-scalar approach as proposed by Serra for street networks (2013a). When the first reveals building types on the local scale, the second provides us with an understanding of cross-scale dynamics (Barbano and Egusquiza 2015). It is widely recognized that the study of the built environment ideally requires both fine and large scale analysis to understand urban processes (ibid.).

The aim is to provide a more precise method of measuring density and in a next step a better understanding how density in all its dimensions influences urban life. The means to do so is to develop a typology that includes the scalar dimension as was successfully implemented for networks by Berghauser Pont et al. (2017). They were able to reveal the structure of the city distinguishing four street types. The same kind of analysis, but now using density variables, will hopefully reveal meaningful types where the local density for instance is high and drops when the scale of analysis increases or types with a stable density throughout all scales. Such a multi-scalar understanding of density types not only captures local qualities, but simultaneously contextual qualities, important for living qualities, economic and ecological processes where not only the local density is important, but certainly also the densities in proximity.

This paper will develop such a typology of density including cross-scale dynamics that then later will be used to study the relation between these density types and for instance economic activities and housing prices. Before introducing the cases, describing the methodology and discussing the results, we will first discuss the concept of typologies in urban analysis.

Typologies

In urban morphology types are a central concept and often used to describe singular urban elements (e.g. types of streets, urban blocks, parcels, buildings) or aimed for a description of complete systems (e.g. Caniggia and Maffei, 2001; Conzen, 1960, Whitehand, 2001; Panerai et al., 1977, Panerai et al., 1999). Focussing on separate elements allows for the understanding of differences of one spatial feature, but lack the interrelation between the elements. The understanding of the whole system on the other hand requires a reduction of detail and therefore often lacks precision. This results in often ill-defined types, at

Data Sources	Steps	Description
Laser data		Create Digital Height Model (DHM)
Building footprints	1. Edit map	Calculate average building height
Road-Centre Line map		Translate to amount of floors
		Calculate accessible gross floor area (GFA) and footprint
		Calculate density:
	2. Spatial analysis	1. Floor Space Index
		2. Ground Space Index
		(radius 500m - 5000m)
		Standardize results
	3. Statistical analysis	PCA analysis for GSI and FSI
		Cluster analysis using results PCA

Table 1.
Summary of the methodology.

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worst stereotypes, hiding underlying spatial complexity (Serra 2013a).

Further, classic studies in urban morphology focused mainly on qualitative methods. Only recently, studies of urban morphology have (again) been aiming for classifications or typologies based on quantitative description of spatial elements following the pioneers of this kind of research, Martin and March (1972). They elaborated that a quantitative approach towards urban form and structure is important when the aim is to understand entire spatial systems and specifically the relation between its elements, and an important step towards a comparative assessment of urban environments.

Recently we have seen a revival of this quantitative approach (e.g. Berghauser Pont and Haupt, 2010; Barthelemy, 2015 and Serra, 2013a; 2013b; Serra et al., 2016). In this paper we will draw from these experiences and compare cities using a multi-variable and multi-scalar approach for the development of a typology of density.

Study area

Three Swedish cities are selected for comparison in this study because they, on the one hand, carry certain socio-economic and historical similarities, while on the other hand, vary in size: Stockholm has 935 619 inhabitants[1], Gothenburg 556 640 and Eskilstuna 103 684 inhabitants. The study areas aim to include the whole urbanized part of the cities which not necessarily coincide with the municipal borders. For this reason, we used the Urban Morphological Zone (UMZ) boundaries, as they are defined by the European Environment Agency (EEA) and Eurostat[2]. Because of the highly irregular boundaries of the UMZs, a convex hull[3] of each UMZ was made and this area is used for the study. Finally, to address the possible 'boundary effect', the area which was analysed was 5km larger than the study area.

Methodology

The central methodology used in this paper can be divided into methods for editing the main datasets, spatial analysis and statistical analysis which will be discussed in the section below. The sequence of the methods and how they relate to each is summarized in Table 1.

Density model

The density model is based on laser dataset[4], including coordination and elevation values for each point collected from LIDAR (Light Detection and Ranging). A Digital elevation model (DEM) and Digital surface model (DSM) was extracted from the laser dataset with an average resolution of 2m. Then, DEM was subtracted from DSM to make a new surface model called Digital height model (DHM) which contains the real height values of the features on the ground. Finally, building footprints were added and the average height value of the area covered by each footprint was considered as the height of each building[5]. The building heights were then translated into average amount of floors per building using the average floor height for different functions as given in table 2. These derived floor heights were compared with real count of floors for a randomly selected set of buildings in each city to see whether the deviations are acceptable. On average the error was between 10-15% except for the industrial buildings with a larger error of 23% which, expressed as deviation in amount of floors, is not more than 0,4.

Function types	Storey height in metres		Error rate				Amount of floors	
			Stockholm median	Gothenburg median	Eskilstuna median	*average error*	*real average (RA)*	*deviation from RA*
Residential	3,5	Villa	7%	9%	14%	*10%*	*1,8*	*0,2*
		Block	8%	9%	13%	*10%*	*4,9*	*0,5*
		Modernist	9%	20%	9%	*13%*	*4,3*	*0,6*
Industrial	6,0		23%	28%	19%	*23%*	*1,8*	*0,4*
Commerce and offices	4,5		15%	14%	14%	*14%*	*3,9*	*0,5*
Public	5,0		10%	18%	15%	*14%*	*3,1*	*0,4*

Table 2.
Method to translate building heights to amount of floors and summary of error and deviation.

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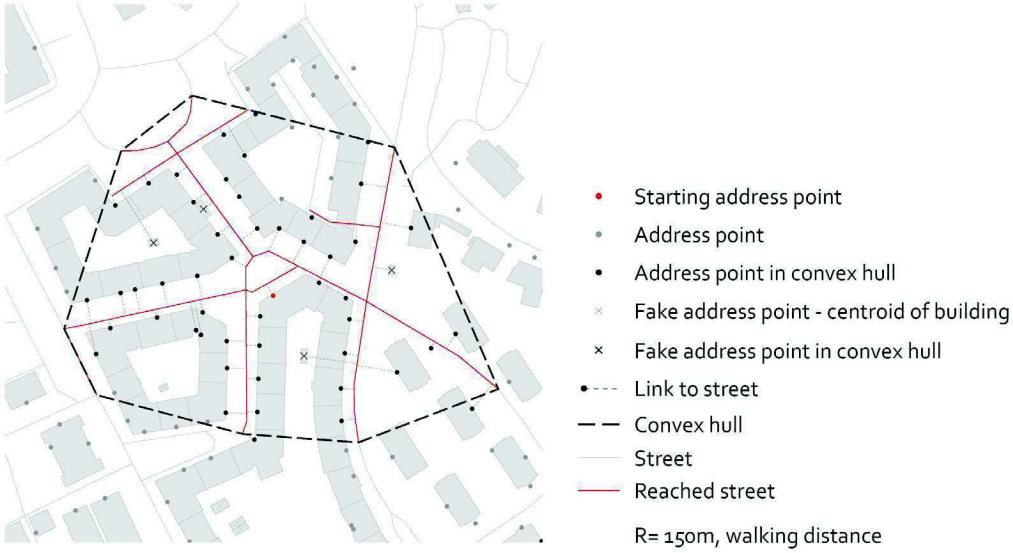

Figure 1.
Method of measuring accessible density including the definition of the area used as the denominator B in the density fraction A/B (i.e. convex hull).

The average amount of floors of the buildings was multiplied with the building footprints to calculate the gross floor area (GFA). The accessible GFA is then calculated by adding up all GFA within the set radius which in the next step is used as the nominator A in the simple fraction of density A/B using what is called the cumulative opportunity measure[6] (Bhat 2001) to calculate accessible FSI. For accessible GSI the area of the building footprints is used as nominator. To make sure only GFA respective building footprints are included that really can be reached via the network, the amounts are loaded on address points which then are used to do the calculations (see figure 1). Secondly, the denominator B is arrived at by calculating the area reached through the network within the set radius. The area is defined by the convex hull connecting all end points of the street segments that are reached (figure 1)[7]. The distance thresholds used are 500m, 1000m, up to 5km in steps of 500m.

Distance, as described above, is measured using non-motorized network models. Non-motorized models include all streets and paths that are accessible for people walking or cycling, including those that are shared with vehicles. All streets where walking or cycling is forbidden, such as motorways, highways, or high-speed tunnels, are not included in the model[8]. We processed the original Road-Centre-line[9] maps with two objectives: first to create line segment maps which we could use in analysis and second, to create comparable representations of the street network in all cities, both in the types of roads included as in the level of detail[10].

The software used for editing and analysis are FME, ArcGIS, Mapinfo and the plugin software PST[11].

Statistical analysis

To be able to describe and compare the cities based on multi-dimensional density results, we performed two main statistical analyses using R software (Gil and Serra, 2017): Principal Component Analysis (PCA) as a means of reducing the ten scales to the most representative scales; and k-medoids clustering to classify the addresses based on their individual density profile, obtaining a density typology. The PCA is necessary to ensure that the variables used for clustering have the lowest possible correlation, which is desirable because co-linearity is known to bias clustering results.

For the statistical analysis of the results we

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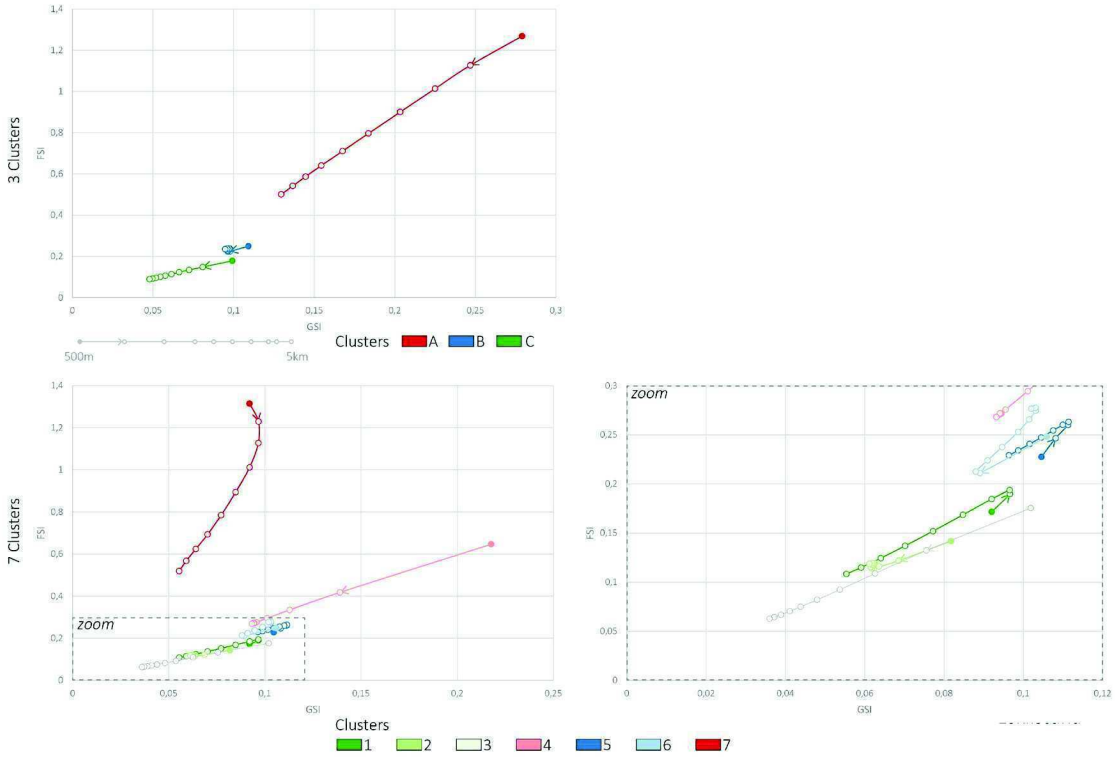

Figure 2.

Scatter plots "Spacematrix" with on the y-axis accessible FSI and on the x-axis accessible GSI showing the results of the clustering analysis (mean values for every scale and cluster).

only consider the address points contained in the study area and ignore all others to avoid using values affected by edge effect. As a first step, FSI and GSI are converted to z-scores to be able to compare and combine them irrespective of the value ranges. Next we run PCA on the density results for all cities following the method proposed by Serra (2013a; 2013b) and developed further by Berghauser Pont et al. (2017). The amount of principal components is chosen using a scree plot where the aim is to find the least amount of components that still explain most of the variance of the original variables. These components are then input to the next step of unsupervised classification with clustering. We use the k-medoids clustering algorithm (also known as Partitioning Around Medoids, PAM) similar to k-means. The k indicates that the algorithm can identify any number of clusters which must be defined a priori. A range of k values is tested and a silhouette analysis is used to study the separation distance between the resulting clusters where values near +1 indicate that the sample is far away from the neighboring clusters while a value of 0 indicates that the clusters are highly similar.

The clustering analysis is performed on the data of the three cities combined using the results of the PCA[12]. Once the cluster solutions are calculated we create a series of boxplots of the density profile of every cluster, plotting along the y-axis the cluster's FSI values and along the x-axis the GSI values. To make these boxplots more readable, only the mean values for each cluster and radius are presented.

Results: multi-scalar density types

The first step of the statistical analysis (PCA) reduced the 10 radii of analysis into three rotated components that meet the two scree plot test conditions and explain 98% of the total variance of the original variables. The scales these principal components represent are the neighbourhood (i.e. radius 500m), the larger district (i.e. radii 1km-2,5km) and the city scale (i.e. radii 3km-5km).

These principal components are then used to

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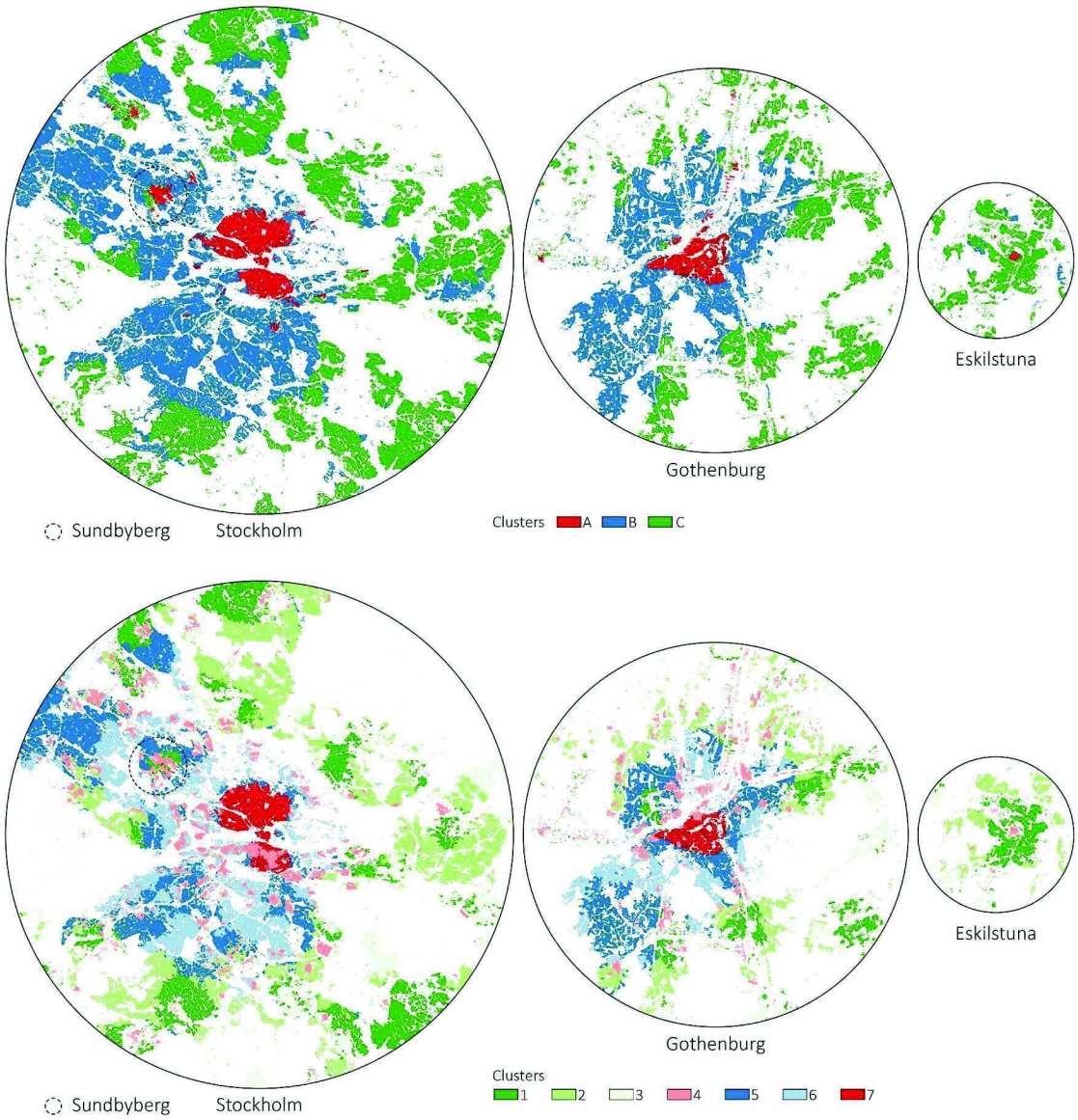

Figure 3.

Spatial distribution of three and seven clusters in Stockholm, Gothenburg and Eskilstuna.

identify multi-scalar density types in the three cities. The amount of clusters (k) was chosen by the identification of an elbow in the silhouette plot where both three and seven clusters were identified as relevant. We tested both and will discuss them in turn below.

Three clusters

The three clusters show meaningful differences, both in the scatter plot (Figure 2) as in the spatial distribution (see maps in figure 3). Cluster A captures the inner city and could be referred to as the first ring of density, cluster B captures the suburban ring surrounding the inner city (i.e. second ring of density) and cluster C is found in the urban areas at the edges of the cities (i.e. third ring of density). Their profiles as shown in the boxplots in Figure 2 show that cluster A starts with a high density (both FSI and GSI) which drops gradually when the radius of analysis increases. Cluster B has a consistently medium density while cluster C starts with the lowest density that drops gradually to even lower levels when increasing the distance from 500m to 5km.

The three rings of density can be clearly identified in Gothenburg and Stockholm,

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where the rings follow a concentric structure with the highest density in the city cores. Further, Stockholm has some sub-centers in the periphery which are not found so clearly in Gothenburg. One of them is Sundbyberg municipality which today is part of the Stockholm urban area. The municipality prefers to call itself a city, which, however, has no legal significance. But as we can see in the density analysis, the area is of similar type as the core of Stockholm and spatially we can indeed speak of Sundbyberg as city because being part of the first ring of density.

In Eskilstuna, the smallest city in our analysis, the second ring of density (cluster B) is absent. Eskilstuna has a dense center, though very small, surrounded by low dense areas that decrease gradually. In other words, Eskilstuna jumps from the first to the third ring of density. This is probably related to the size of the city where one reaches the countryside.

Seven clusters

When using the seven clusters instead, we see that we get a similar spatial division in three so called rings of density where the first ring (cluster A) is sub-divided in two separate clusters: the "urban core" (cluster 7) with a high FSI dropping gradually without decreasing the level of GSI so much and the "sub-center" (cluster 4) with high GSI values, gradually decreasing when the scale of analysis increases (see figure 2 and 3). Further, some sub-centers (cluster 4) emerge in the other rings of density (cluster B and C) and now actually differentiating Stockholm's city center and Sundbyberg where the first is part of cluster 7 and the latter part of cluster 4.

Within the second ring of density (cluster B), we can identify two sub-clusters (clusters 5 and 6). Both have a relative high density (FSI and GSI) and do not change so much when increasing the distance, but there is also an interesting difference in their density profiles. The density in cluster 5 increases first (until radius 1km) to start decreasing at the higher radii. Cluster 6 does exactly the reverse and decreases first (until radius 1km) to increase in density at the higher radii. In other words, cluster 5 represents a denser locality within the second ring of density while cluster 6 represents the periphery reaching higher densities only at a larger distance.

The earlier discussed cluster C (i.e. third ring of density) is divided into three sub-clusters where cluster 2 has the most stable density throughout all scales, representing homogenous villa areas. Cluster 1 and 3 start with similar density values where cluster 1 first increases slightly in density (until radius 1,5km), to then slowly start decreasing and cluster 3 steadily decreases to the lowest density of all clusters at the highest radius (i.e. 5km). Cluster 1 is thus the most "urban" of the third ring of density while cluster 3 represents the peri-urban areas.

Conclusion and discussion

We have shown that working with types is a fruitful way to compare cities. They summarise the complexity of the two density variables measured at various scales and reveal the individual identity of these types. Further, it highlights some differences in the way the three cities are structured at these different scales. Stockholm and Gothenburg show great similarity although Stockholm has more sub-centers in the second and third ring. It is worth mentioning that in Gothenburg a cluster of the third ring of density (cluster 1) is located very close to the urban core (cluster 7) which captures the fragmented city structure very well. The most prominent difference when comparing the three cities, is between the two larger cities and Eskilstuna. The densest cluster ("city core", cluster 7) is not present and the center of Eskilstuna ends up in the cluster "sub-center" (cluster 4). This discrete identification of the density profiles including cross-scale dynamics makes the presented typology an important complement to more traditional density analysis.

A comparison of the local density types following Berghauser Pont and Haupt (2010) with the here proposed multi-scalar density types shows that the types to some extend overlap. This is not surprising because the local density, measured at radius 500m, is also included in the multi-scalar typology discussed in this paper. Some information is

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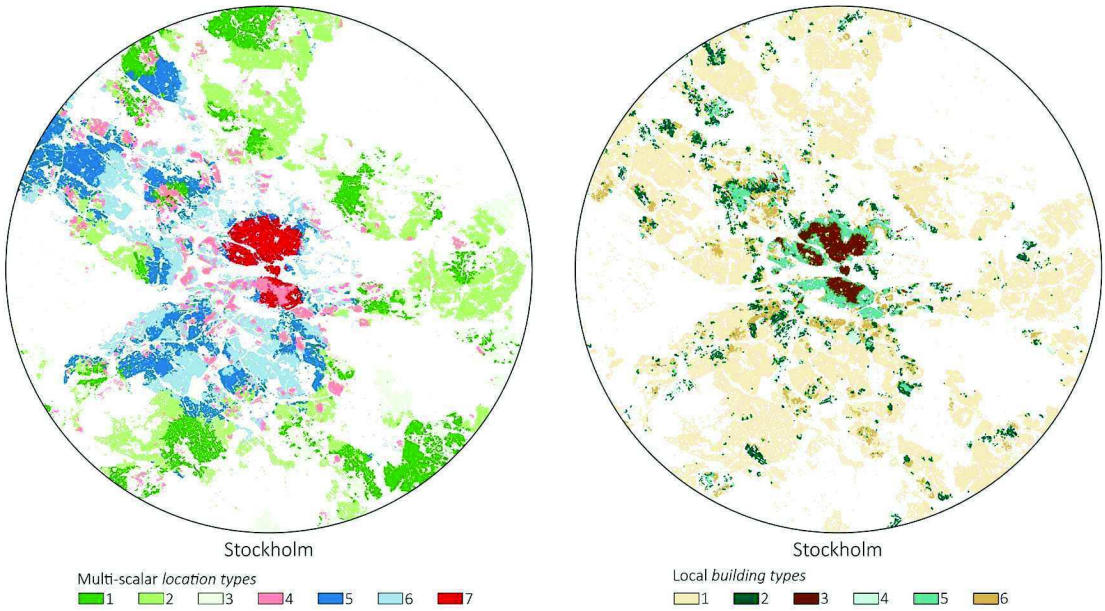

Figure 4.
Comparison of the spatial distribution of multi-scalar location types and local building types in Stockholm (clusters building types: 1 sprawl, 2 suburban, 3 city centre, 4 compact low, 5 compact city, 6 modernistic).

lost using the multi-scalar approach as can be see in figure 4, but the multi-scalar typology also captures more subtle variations, which appeared to be uniform in the local scale. For example the local density type 1 ("sprawl") is now greatly differentiated, depending on its performance throughout scales, or in other words, because of the local types of another kind in the surroundings. We can say that the local density analysis describes characteristics such as building types and the multi-scalar approach presented in this paper describes location types, including what building types are found next door so to speak.

Besides the clustering in types, it is worth mentioning how in two of the three cities, the three basic density rings were found and that, underneath the visible morphologic variability, their spatial structures are characterized by only three basic spatio-functional scopes (i.e. the three density rings). Further, the main aspect of note is the absence of one of these scopes in Eskilstuna which might be something typical for this size of cities. We should study a larger set of cities to be able to draw more irrevocable conclusion.

A lot of interesting new questions were discussed while working at this paper and studying the results of which we want to mention two.

Firstly, when seeing the interesting grouping of cities, we are eager to add more cities. One trajectory is to add more Swedish cities, to see whether we can speak of typical patterns for different sizes of cities. Another trajectory is to add cities from other European cities and other continents to study differences and similarities between them.

Secondly, we can add the other core variables of spatial urban form that will make the trilogy of the main elements of urban form, that is the street, the plot and the building, complete. A Path typology using network centrality measures was recently developed by Berghauser Pont et al. (2017) and the patterns of plots is under development (Bobkova et al. 2017). In relation to this, it would be interesting to develop a typology based on the pairing of these density types, paths and plot patterns using cross tabulation. The same density clusters can hold very different paths and, depending on this grouping, might perform very differently in terms of social and economic outcome. Correlating these ´combined types´ with pedestrian and vehicle flows and economic activities is a natural and extremely interesting next step.

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Notes

1 http://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningens-sammansattning/befolkningsstatistik/pong/tabell-och-diagram/kvartals--och-halvarsstatistik--kommun-lan-och-riket/kvartal-4-2016// (accessed 16-05-2017).

2 Urban morphological zones (UMZ) are defined by Corine land cover classes considered to contribute to the urban tissue and function. A UMZ can be defined as "a set of urban areas laying less than 200m apart" (source: http://www.eea.europa.eu/data-and-maps/data/urban-morphological-zones-2006 (download date 13-7-2016)

3 The convex hull of a set of points, lines or polygons is a closed region (i.e. polygon) which includes all the points, lines or polygons on its interior.

4 Source: Lantmäteriet (https://www.lantmateriet.se/)

5 Buildings with no or incorrect heights (too high, too low, zero or negative values) were corrected using Google Street View or similar online services. In cases where it was impossible to find the building height using above-mentioned methods, we used a buffer around each building separately and considered the average height value of the surrounding buildings as the height of the building(s) in question. The buffer distance chosen varied according to the average density of buildings in that area.

6 This is also known as the contour measure or isochrone measure and in the software used for this paper (PST), it is called Attraction Reach.

7 At the smallest radius (500m), the reached area can be smaller than the reached built up areas due to the layout of the streets (long streets without crossings). The values for GSI > 1 are taken out of the further analysis as they would disturb the statistical analysis.

8 All streets or paths are represented with one line irrespectively of the number of lanes or type, meaning that parallel lines representing a street and a pedestrian or a cycle path running on the side, are reduced to one line. The reason is that these parallel lines are nor physically or perceptually separated, and thus are accessible and recognized from pedestrians as one "line of movement" in the street network. If there are obstacles or great distance between parallel streets and paths, then the multiple lines remain. The aim is to make a skeletal network that better represents the total space which is accessible for pedestrians to move, irrespectively of the typical separations or distinctions of streets and paths.

9 The Road-Centre-line maps used to make the non-motorized network for Stockholm and Eskilstuna originated from the NVDB (Nationell Vägdatabas) and were downloaded from Trafikverket, the official road authority for Sweden (https://lastkajen.trafikverket.se, date of download 15-5-2016, last update 8-11-2015). For Gothenburg, the respective Road-Centre-line map originated from Open Street Maps (openstreetmap.org, http://download.geofabrik.de, date of download 29-4-2016), because the NVDB did not provide enough detail for the non-motorized network, as in the other cities.

10 We followed the same editing and generalizing procedure for all maps aiming to remove errors and to increase comparability between networks. This process included removing duplicate and isolated lines, snapping and generalizing. The snapping threshold used was 2m (end points closer than 2m were snapped together). The generalizing threshold used was 1m (successive line segments with angular deviation less than 1m were merged into one).

11 PST is a plugin tool developed at KTH and Chalmers, available via www.smog.chalmers.se/pst

12 Due to the size of the data set, we used a faster version of the PAM algorithm, called CLARA (Kaufman and Rousseeuw, 1990), which runs on samples of the entire data set.

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Typology based on three density variables central to Spacematrix using cluster analysis

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Abstract. *Since the publication of the book 'Spacematrix. Space, density and urban form' (Berghauser Pont and Haupt, 2010), the Spacematrix method has been linked back to its theoretical foundations by Steadman (2013), is further developed using the measure of accessible density to arrive at a density measure that more closely relates to the environment as experienced by people moving through the city (Berghauser Pont and Marcus, 2014) which then is used to arrive at a multi-scalar density typology (Berghauser Pont et al. 2017). This paper will take yet another step in the development of the Spacematrix method by including the measure of network density in the classification which until now was not used to its full potential. Important for successful classification is the ability to ascertain the fundamental characteristics on which the classification is to be based where the work of Berghauser Pont and Haupt (2010) will be followed addressing three key variables: Floor Space Index (FSI), Ground Space Index (GSI) and Network density (N) where especially the last was not fully included in the earlier work. Besides a typology based on these three variables, this paper will also result in a robust statistical method that can later be used on larger samples for city-scale comparisons. Two statistical methods are tested: hierarchical clustering and centroid-based clustering and besides a general discussion about their strong and weak points, the paper shows that the hierarchical method is more convincing in distinguishing differences in both building type and street pattern that is especially captured with Network density (N). As this method is not useful for large datasets we propose a combination of the two clustering methods as the way forward.*

Keywords: Typology, classification, cluster analysis, density, Spacematrix

Introduction

Since the publication of the book 'Spacematrix. Space, density and urban form' (Berghauser Pont and Haupt, 2010), the Spacematrix method has been linked back to its theoretical foundations by Steadman (2013), is further developed using the measure of accessible density to arrive at a density measure that more closely relates to the environment as experienced by people moving through the city (Berghauser Pont and Marcus, 2014) which then is used to arrive at a multi-scalar density typology (Berghauser Pont et al. 2017). This paper will take yet another step in the development of the Spacematrix method by including the measure of network density in the classification which until now was not used to its full potential.

Berghauser Pont and Haupt (2010) showed that a multivariable density concept consisting of four density variables offers a method to define building types, which these variables separately were incapable of doing. The variables used are well-known indicators of density where

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Ground Space Index (GSI) describes the use of the ground in two dimensions and Floor Space Index (FSI)1 describes the intensity of the use of the ground floor by stacking floor space in the third dimension which brings us to the third variable: the average height (i.e. amount of floors) of the buildings (L). A fourth variable describes the spaciousness (also called Open Space Ratio, OSR) and provides an indication of the intensity of use of the non-built space. It was introduced in Germany in the 1920 to avoid overcrowding and can be derived from FSI and GSI using the following expression (1-GS)/FSI. All four variables can be represented simultaneously in a scatter graph named ´Spacemate´ with FSI on the y-axis and GSI on the x-axis; OSR and L are gradients that fan out over the diagram. By plotting a large number of observations (i.e. neighbourhoods) on the Spacemate, Berghauser Pont and Haupt (ibid.) showed convincingly that building types cluster. High-rise strip types and mid-rise block types with similar FSI position at distinct location on the graph due to differences in GSI, OSR and L (see figure 1). However, one important characteristic of the urban fabric, that is the grain of the street layout, that is street-to-street distance which directly relates to the size of the islands or urban blocks2, is not captured with these four variables. This, Berghauser Pont and Haupt (ibid.) propose, could be captured by measuring network density (N), that is, the length of street network per area unit. Two Amsterdam examples with identical built densities, that is FSI, GSI, OSR and L values, can illustrate this (see figure 1). The Grachtengordel is composed of large islands and thus low N (0.012), while De Pijp with the same built density, has smaller islands and thus a high N (0.023). One building type, in this case the mid-rise block type, can thus be realized with different street layouts, in the same manner as the same FSI can be realised with very different solutions of GSI, OSR and L (recall the example discussed earlier).

Berghauser Pont and Haupt (2010) convincingly argue that network density is needed to develop a typology that goes beyond building types and includes characteristics of the street layout. They show the three-dimensional scatter graph ´Spacematrix´ with FSI on the y-axis, GSI on the x-axis and N on the z-axis and discuss such a typology in concept, but do not use it to develop it. An important reason is that clustering using such a three-dimensional scatter graph is complex and demands "further development of computerized software to manage and analyse data, and to represent the outcome" (ibid., page 190).

The aim of this paper is to do just that and develop a typology of urban fabrics based on the full set of variables discussed above: FSI, GSI, OSR, L and N using statistical methods that can deal with this complexity. Further, the purpose is to develop a method that also can be used in comparative studies of whole cities, which puts requirements to the capability of the statistical method to handle large datasets.
In the following sections the two statistical methods used for this purpose and the resulting clustering will be presented, but before that we will shortly discuss the importance of network density and the possibilities of cluster analysis in more general terms.

Network density

The street system is one of the main entities of the town plan (or ground plan) besides the lot pattern and the building configuration (Conzen, 1960; Moudon, xx; Whitehand, 2001). These three entities street, lot and building are similar to the distinction made by Jan Heeling, et al. (2002) between the public streets (street system) and private islands (consisting of lots and buildings). The combination of streets and a series of islands constitute the urban fabric, or tissue. The main task of a designer, according to Heeling et al., is to combine these two in the best possible manner.

Street space, to use the words of Stephen Marshall (2005), constitutes "the basic core of all urban public space forming a contiguous network by which everything is linked to everything else. This continuum is punctured by lots of private land." For one, built floor space generates movements and causes flows (people, cars, etcetera) that need to be facilitated by the network. In addition, the open space of the network enables light to access the buildings and influences privacy, depending

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on the profile width and the size of the islands (Martin and March, 1972). Further, following the argument of Manuel de Solà-Morales (1978), the grain of the urban fabric is decisive in establishing the relationship between general form and built content where smaller blocks (i.e. islands) provide the greatest proportion of public ways and overall exposure ratio (façade length to area). "This whole interrelatedness of network, islands and building bulk should thus be at the core of a new definition of density" (Berghauser Pont and Haupt, 2010, p. 97) and following this, the development of an urban fabric typology.

Cluster analysis

Cluster analysis is a generic name for a large set of statistical methods aiming at the detection of groups (i.e. clusters) also called automatic classification, numerical taxonomy, and typological analysis. Tryon published a book on cluster analysis in 1939 the method of clustering can be traced back to the major work of Carl von Linné (Systema Naturae, 1735), although at that time not using statistics (Wilmink and Uytterschaut, 1984). Still, even when using statistical method today, cluster analysis is not an automatic task, but an iterative process of knowledge discovery that involves trial and failure. In very general terms we can say that clusters show internal cohesion and external isolation (ibid.). Berghauser Pont and Haupt (2010) did not use statistical methods either to arrive at their building typology based on the four built density variables. Instead of statistical methods, they present a building typology based on the visual interpretation of the scatter graph ´Spacemate´. This might be the reason the last variable, network density (N), was not included in the presented typology and the urban fabric typology, including N, is merely presented as concept. In this paper, we will test the use of two distinct statistical methods for clustering to develop a typology including N: hierarchical clustering and centroid-based clustering. The use of two methods is partly driven by the fact that centroid-based clustering is better suited for large datasets (>200 observations) and therefore fits our purpose to also use the method to study whole cities while hierarchical clustering has the practical advantage of visualising results using a dendrogram that allows to follow all steps in the clustering procedure. We will discuss this more extensively in the method section.

Methodology

As discussed above, two distinct statistical methods for clustering are used for his paper which will be discussed in order below.

Hierarchical clustering

In hierarchical clustering analysis, clusters are defined based on the distance between the data points. The core idea is that objects, in this case neighbourhoods, are more related to nearby objects, in terms of data, than to objects farther away (Wilmink and Uytterschaut, 1984). In the first step, objects are grouped that are nearest, that is, neighbourhoods with most similarity in terms of FSI, GSI, OSR, L and N; the second step joins new objects to these groups formed in the first step, again based on distance, etc. In the last step all objects will be grouped in one cluster. A so called dendogram provides an overview of this extensive hierarchy of clusters that merge with each other in each step. The y-axis marks the distance at which the clusters merge, while the objects (neighbourhoods) are placed along the x-axis. It is possibly this representation (i.e. dendogram) that makes this method very popular as "humans can assimilate information from pictures better than from tables of numbers" (Dubes and Jain 1976 quoted in Wilmink and Uytterschaut, 1984). A drawback from hierarchical methods is that these maximize the clustering criterion in a suboptimal way where the best fusion of objects in the first step results in so called N-1 clusters, followed by the fusion into N-2, N-3 and N-4 clusters which does not necessarily lead to the best fusion of N objects into for instance 4 clusters directly. Such grouping of all samples in a pre-defined amount of clusters

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is what centroid-based clustering is doing and will be discussed below. Another limitation of this method is that it cannot handle large datasets.

Centroid-based clustering

Centroid-based clustering, also called k-group clustering, groups objects in a number of clusters based on the distance of the data points to the clusters centre (i.e. centroids). The k indicates that the algorithm can identify any number of clusters which in most algorithms needs to be specified in advance. This is considered to be one of the biggest drawbacks of these algorithms, because it can be problematic to know how many clusters a particular set of data preferably is divided into. The analysis usually results in a clustering where each object (in our case neighbourhoods) belongs to a cluster or not (i.e. hard clustering), but some methods also allow a clustering where each object belongs to each cluster to a certain degree (i.e. soft clustering or fuzzy clustering). The latter will be used in this paper to be able to see whether neighbourhoods end up in between two or more clusters. In the first step every data point is assigned a random membership grade for each cluster, then an iterative process begins: (1) the membership grades are used to calculate cluster centres, (2) the cluster centres are used to update the membership grades and (3) the sum of the distance between every data point and every cluster centre with the membership grades as weights is calculated. The closer a data point is to a centre of a cluster the larger membership grade it is assigned to the cluster. The iteration stops when the change in sum of the distance from one iteration to the next is less than ε or when n iterations has been done, where ε and n are set in advance.

As mentioned, the number of clusters has to be chosen by the user, in advance. In our case, the clusters should partly correspond to the building types as presented by Berghauser Pont and Haupt (2010) with the addition of N. The choice of the number of clusters is therefore equal to the number of building types presented by Berghauser Pont and Haupt (ibid., figure 21, p 191) where more clusters are added in case of a large variation in N within these building types. The amount of building types was six of which three show a high variation in N, resulting in nine clusters. Further, since we also have an idea about where a specific building type is located in the Spacemate scatter graph, its centres can be estimated which are then used as set starting points for the cluster centres (Table 1). This means that from the iteration process described above (1) is not needed and only (2) and (3) are iterated over.

In-data and software

In both the centroid-based clustering and the hierarchical clustering, we use GSI, L and N as in-data. We use these three variables

	Typology names	**Starting points centroid-based clustering**			
	(Berghauser Pont and Haupt, 2010)	**FSI**	**L**	**GSI**	**N**
1	low-rise point	0,17	1,6	0,11	0,011
2	low-rise strip	0,44	2,4	0,18	0,015
3	low-rise strip	0,47	2,3	0,21	0,027
6	low-rise block	0,78	2,3	0,35	0,027
7	mid-rise strip	0,92	4,8	0,19	0,011
8	mid-rise strip	0,90	4,8	0,19	0,020
4	mid-rise block	1,66	4,8	0,34	0,014
5	mid-rise block	1,70	4,5	0,38	0,022
9	high-rise point/strip	1,35	10,8	0,12	0,010

Table 1. Starting point for the centroid-based clustering for nine clusters (based on the results presented in Berghauser Pont and Haupt, 2010, figure 21, p. 191).

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and not all five variables discussed earlier to ensure that the variables used for clustering have the lowest possible correlation, which is desirable because co-linearity is known to bias clustering results. Of the four built density variables FSI, GSI, OSR and L, the variables that correlate least are GSI and L. FSI is the product of GSI and L and OSR is derived from FSI and GSI using the formula (1-GSI)/FSI. N is independent from the other four density variables and can thus be used without a risk of co-linearity.
For the hierarchical clustering, IBM SPSS Statistics 22 is used and the results will be discussed using a dendogram complemented with figure-ground maps of a selection of neighbourhoods. For the centroid-based clustering the Fuzzy c-means clustering method in Matlab is used. Besides the cluster membership of each neighbourhood, also the degree of belonging will be presented for the clustering using Fuzzy c-means clustering. In both cases, the resulting clustering will be shown in scatter graphs for the three planes of the three-dimensional Spacematrix showing FSI(GSI), FSI(N) and N(GSI).

Study area

The same 111 neighbourhoods (i.e. observations) as were used in the book ´Space, Density and Urban Form´ (Berghauser Pont and Haupt, 2010, p. 125-168) are used except for the medieval areas in Barcelona that because of their extreme high values both in terms of FSI and GSI will annyhow form a seperate cluster. These values are statistiacally speaking outliers and can disturb the clustering. The scale level of analysis is what is called the urban fabric which is similar to the scale and definitions used for a plan unit, as described by Conzen, and the tessuto, as used by Caniggia (Moudon, 1994). The urban fabric consists of a collection of islands, as well as the network that surrounds these islands. Boundaries are drawn in the middle of the streets. In circumstances where there is no street, the boundaries of the fabric are set by the lot boundaries.

Results: Urban fabric types
Hierarchical clustering

The results of the hierarchical clustering are presented in a dendogram (see figure 2) showing that, when the neighbourhoods are divided in only two clusters, the first (cluster I) represent high-rise building types and consists of three sub-clusters (6, 14 and 11) of which a few neighbourhoods are shown as figure-ground maps in figure 2. All other neighbourhoods end up in the second cluster (II). A further division in three clusters results in a subdivision of cluster II into two separate clusters where IIa represent the most dense building types of all neighbourhoods used in the analysis and is composed of two sub-cluster (2 and 8) that are shown as figure-ground maps in figure 2. Cluster IIb groups all other neighbourhoods and is still too crude to distinguish between neighbourhoods with different morphological characteristics such as villa-areas and areas with mid-rise slab buildings typical for the modernist international style propagated by CIAM (Berghauser Pont and Haupt, 2010). We continue increasing the amount of clusters until we arrived at a convincing set of clusters and found this to be 14 clusters. The dendogram in figure 3 shows this hierarchy of grouping neighbourhoods which is so typical for this clustering method with the numbers representing the 14 clusters. Further, the figure-ground maps show convincingly that this statistical method is able to distinguish neighbourhoods with different morphological characteristics, both in terms of building type and N.

The division in 3 clusters grouped the neighbourhoods with similarities in building type (cluster IIa), but still a clear difference in street patterns and size of the islands (i.e. blocks). The subdivision in 14 clusters successfully distinguishes even this important characteristic: the size of the islands in cluster 2 are twice the size of the sizes of the islands in cluster 8 (150m respective 80m in square)3. The same can be seen for the high-rise building types where the subdivision in three clusters (6, 14 and 11) is due to the variations in the grain of the street layout or size of the islands with the smallest islands in cluster 11 and the largest in cluster 14.

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The scatter graphs in figure 3 show the clustering in the three dimensional Spacematrix and the three planes of this graph: FSI(GSI), N(GSI) and FSI(N) respectively. In the FSI(GSI) scatter graph it is clear that the method successfully distinguishes the mid-rise block types (cluster 2 and 8) and high-rise types (cluster 6, 11 and 14). We can also clearly see that the differentiation in network density in the N(GSI) scatter graph which is the reason they end up in different clusters. The two types do not differ when it comes to their GSI values, but differ greatly when it comes to N. Recall the figure-ground maps of figure 2 discussed earlier. The same can be seen for the three high-rise clusters. Three other clusters (9, 10 and 12, in blue points in the graphs) are worth mentioning. These are all of the low-rise type, but differ greatly when the size of the islands (or N) are considered. Cluster 9 has very large islands of 240m in square and cluster 10 and 12 have islands of only 60m in square. Despite the similarities in L,GSI and FSI, they differ in N and therefore form separate clusters.

Centroid-based clustering

The centroid-based clustering with nine clusters and set starting points for the cluster centres resulted in a typology that shows similarities to the building types as discussed by Berghauser Pont and Haupt (2010). In figure 4 both the scatter graphs are shown and an overview of the degree of belonging. In cases where neighbourhoods belong less than 30% to their "main" cluster, the dots in the graphs are marked with a cross and in the table the median degree of belonging of each cluster is given as well as the percentage of neighbourhoods that fit the 30% threshold. Cluster 4 has the lowest levels: the median degree of belonging is only 34% and one third of the neighbourhoods have a level less than 30%. In comparison to the other clusters this is low which means that the neighbourhoods within this cluster are of ambiguous character, that is, they belong to more than one cluster. Berghauser Pont and Haupt (2010) discuss this as hybrid types and this is actually natural for any kind of categorization; there will always be objects that are more or less positioned just in between. However, it can also be an indication of wrong starting setting, which is the amount of clusters and the chosen values for the centroids (i.e centres of the clusters). There can be reason to test clustering with more clusters where some of these in-between neighbourhoods may be defined as new types or other centroid values that could increase the overall degree of belonging. Further, when looking more closely at two of the clusters with low degree of belonging (cluster 4 and 5), we have to conclude that the centroid-based method with the starting settings, is not as successful as the hierarchical method in distinguishing variation in N. Although it is clear that cluster 4 captures the larger blocks, some of the neighbourhoods such as Eixample (see figure 4) with large blocks, ends up in cluster 5 (belonging 24%). Two other neighbourhoods with large blocks are Grachtengordel and Hackesche Höfe both belonging mostly to cluster 4 (31% resp. 28%) and could as well have ended up in cluster 5 as the belonging to that cluster is almost of similar dignity. One reading is that these neighbourhoods are hybrid types (in between cluster 4 and 5), but we argue that more accurate is to add a cluster from nine to ten. This discussion actually confirms one of the weak points of this clustering methods as we discussed earlier, which is the fact that the amount of clusters has to be defined in advance.

Conclusion and discussion

The results of the two methods demonstrate the strong and weak points of the respective methods where the process of clustering using the hierarchical clustering is easier to follow and results in convincing clusters of different morphological types. One might argue that we need rather many clusters (14 clusters), but that is not necessarily negative. The centroid-based method with nine clusters is especially powerful in identifying the in-between types, which is mostly thanks to the application of soft (i.e. fuzzy) clustering. What is further interesting with the use of this fuzzy method is that we

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can speak of archetypes where the degree of belonging is high. The centroid-based-method is thus not only able to cluster neighborhoods, but also show hybrid or in-between types and archetypes. The hierarchical method, however, is more convincing in distinguishing neighbourhoods with similarities in building type, but differences in street layout and block size.

A qualitative comparison of the two clustering methods is shown in figure 5 using one figure-ground map as representative of each cluster. On the left side the nine centroid-based clusters are shown; on the right the corresponding hierarchical clusters. Three clusters using the centroid-based method are identical to the hierarchical clustering results (i.e. centroid based clusters 2, 7 and 9). Centroid cluster 8, though, does not fit the results of the hierarchical clustering at all and different hierarchical clusters fall within one and the same centroid cluster. Also centroid cluster 3 shows a large variety of hierarchical clusters. Here, however, the results partly overlap and the reason more hierarchical clusters are part of the centroid cluster might be the amount of clusters to start with, we started with nine for the centroid-based method and the hierarchical clustering resulted in 14 clusters. The same can be said about the centroid clusters 1, 4 and 5 where the centroid clusters partly overlap with the hierarchical clusters. For these three, we can see that the centroid-based method is not very successful in differentiating between street layouts, or in other words, block sizes. We can thus conclude that the hierarchical clustering is more convincing in developing an urban fabric typology where network density and block size is central. However, the hierarchical method cannot handle large dataset and it would therefore be interesting to test whether we can use the results of the hierarchical clustering and use the centre means of each cluster as input for a centroid-based clustering. In this

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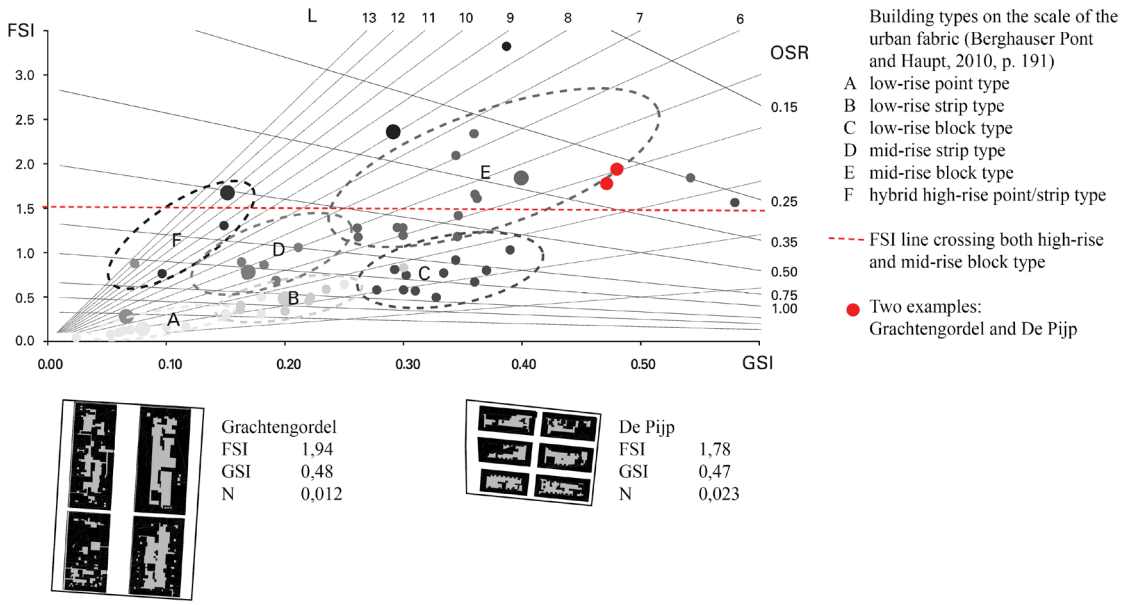

Figure 1. Building typology as presented in Berghauser Pont and Haupt (2010), figure 21, p. 191 and two neighbourhoods in Amsterdam (Grachtengordel and De Pijp) of similar building type, but differences in network density (N).

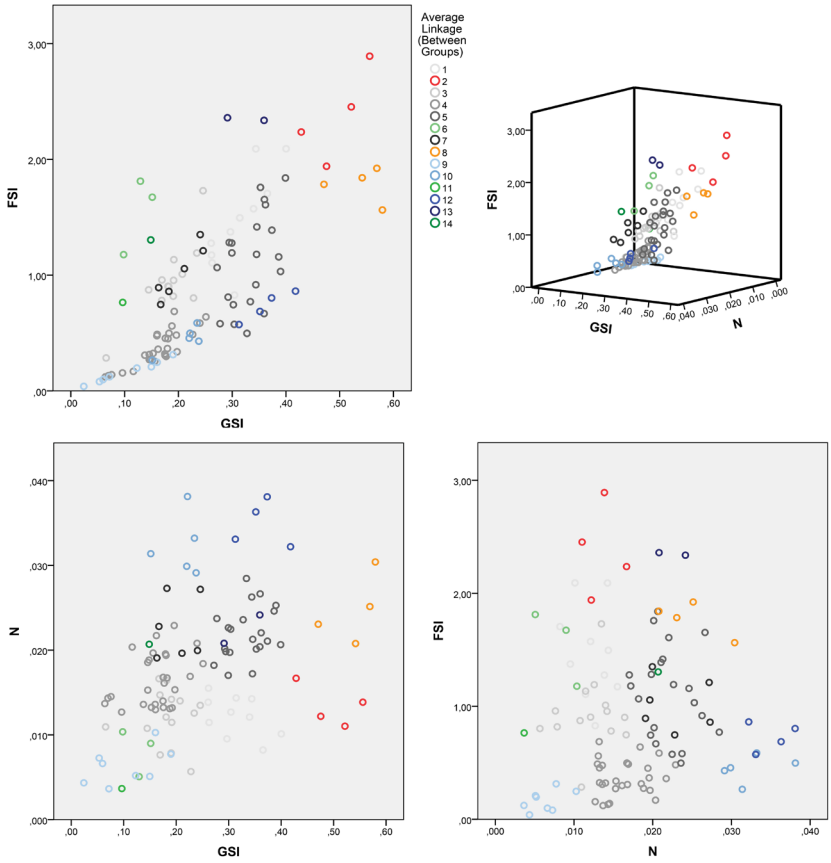

Figure 3. Result of the hierarchical clustering presented in scatter graphs: FSI(GSI), FSI(N), N(GSI) and the three-dimensional scatter graph.

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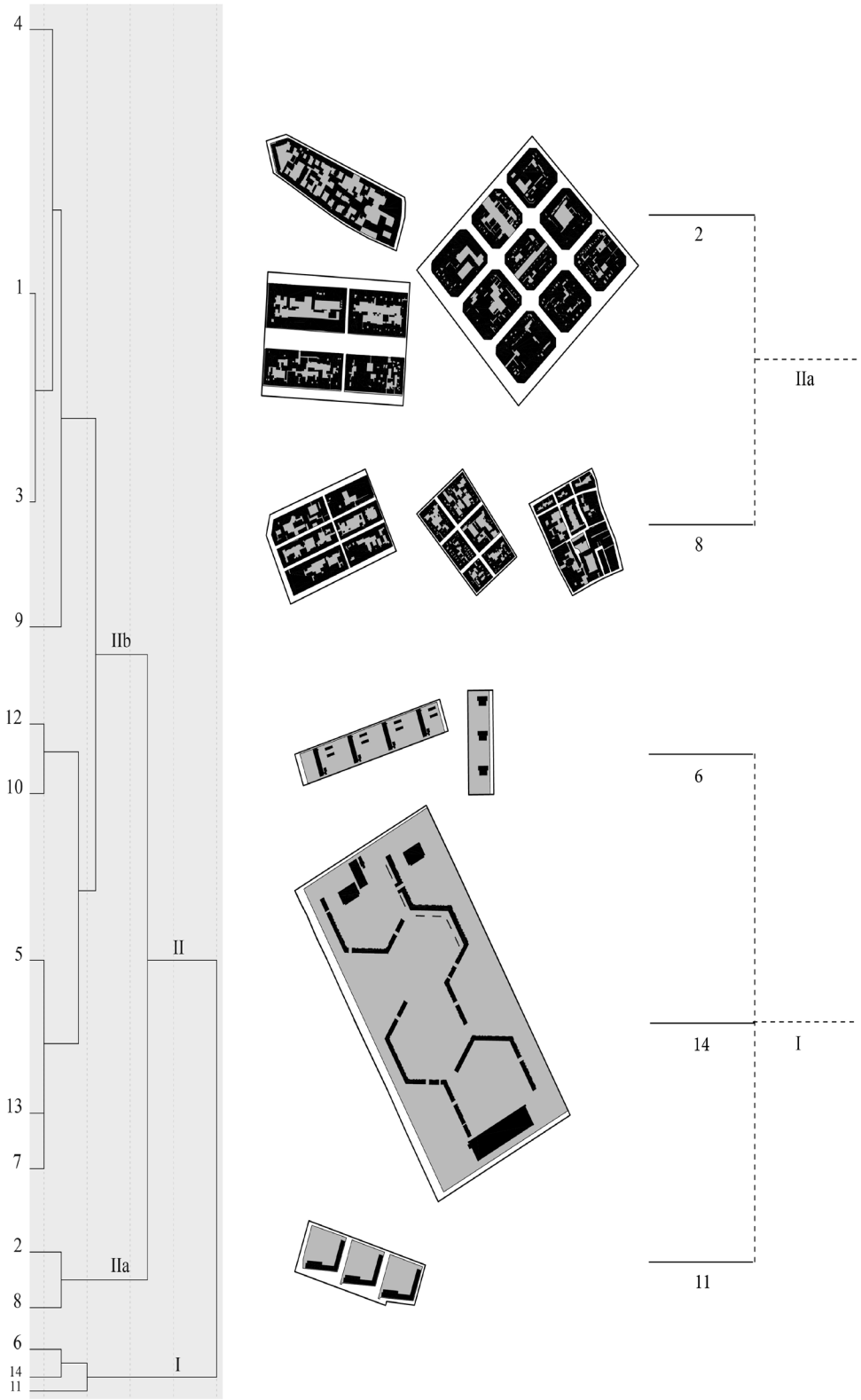

Figure 2. Result of the hierarchical clustering presented in a dendogram and selection of figure-ground maps to illustrate the hierarchical clustering process.

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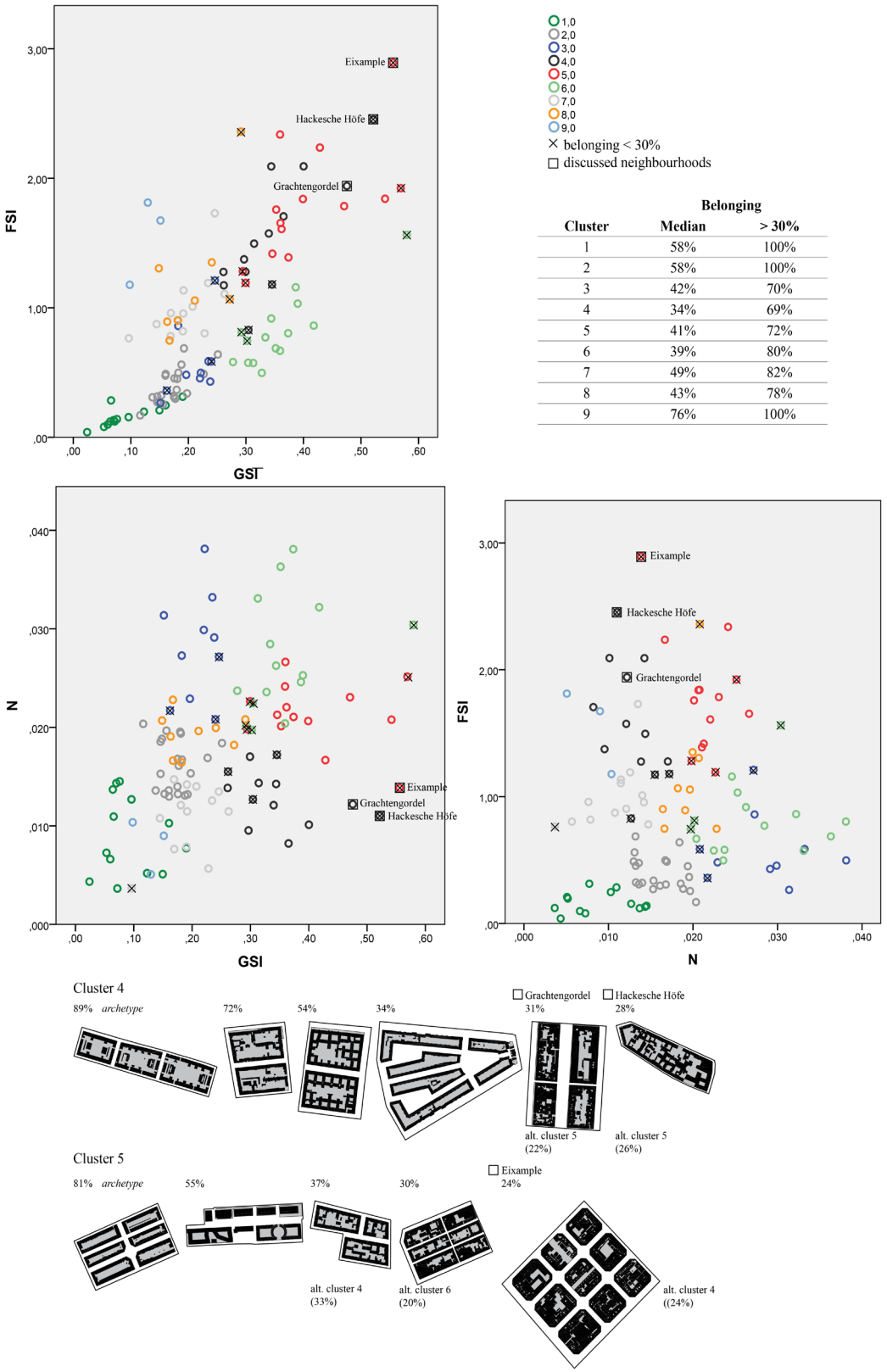

Cluster	Belonging Median	Belonging > 30%
1	58%	100%
2	58%	100%
3	42%	70%
4	34%	69%
5	41%	72%
6	39%	80%
7	49%	82%
8	43%	78%
9	76%	100%

Figure 4. Result of the centroid-based clustering presented in scatter graphs: FSI(GSI), FSI(N) and N(GSI) and table with the degree of belonging of the neighbourhoods to the clusters and figure-ground maps of cluster 4 and 5.

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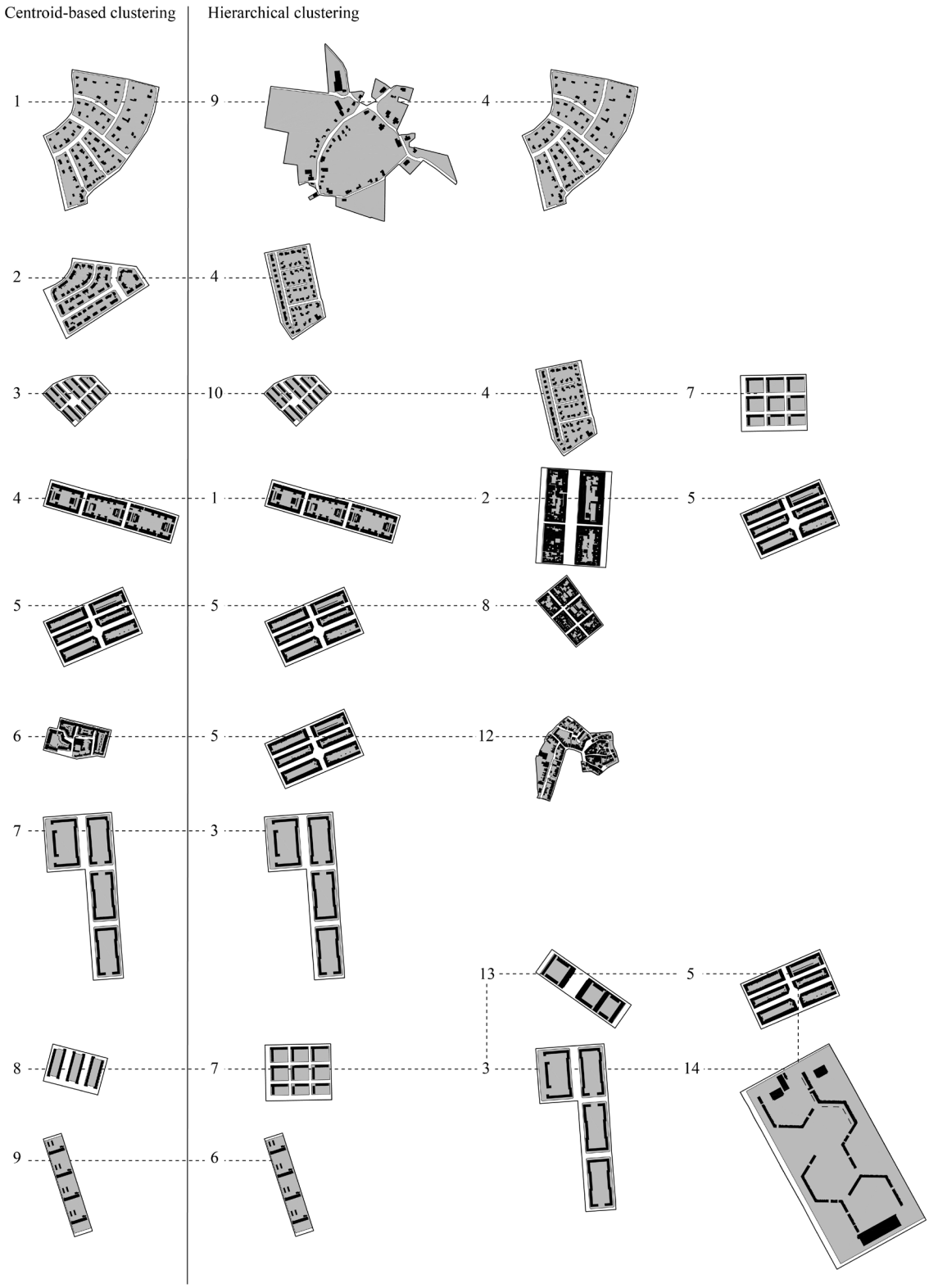

Figure 5. Comparison of the two clustering methods (hierarchical clustering and centroid-based clustering) using a selection of figure-ground maps.

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manner, the strong sides of both methods will be combined. Further study has to confirm this as well as the success of applying this on the scale of whole cities.

Notes

1. A comparable term for FSI, first used in New York City's Zoning ordinance in 1940, is the Floor to Area Ratio, FAR (Noble, et al., 1993).

2. The ancient Romans called their urban blocks insulae, or island, reflecting the topological containment of buildings and land parcels (lots) within a continuum of public space primarily constituted by the system of public streets (Panerai, 2002, p. 11–14).

3. Median N for cluster 2 is 0,013 and for cluster 8 it is 0,024 and block size is calculated as 2/N (see for formulas Berghauser Pont and Haupt, 2010, p. 110).

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Perceptive approaches to the morphological characterization of the urban contour: The case of the peri-urban landscape of Madrid

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Abstract. *A growing city adapts and transforms the pre-existing topography, and with its urban fabric defines an ever-changing contour throughout history; this contour is not a clear line, but rather a fringe, where city and countryside meet and create occupancy systems that are crucial to comprehend the evolution of the urban form. We can consider this fringe as 'proximity' landscapes: landscapes that are perceived when the city is either a destination or a point of departure. The vision from afar, or when progressively approaching the city, provides both locals and tourists with certain landscape and architectural aspects that should be studied, preserved and valued for their ability to generate meaningful spaces. In this communication, we study the surrounding landscapes of Madrid by means of a Landscape Character Assessment, within the framework of the project 'Proximity landscapes of the city of Madrid. From the 19thC to the present' currently in process. Combining graphic analysis of historical cartography at a metropolitan scale with perceptive analysis techniques, special attention is drawn to certain axes and significant lookouts of the city, mapping them and evaluating their visual basins. This characterization leads to distinguishing three main landscape types surrounding Madrid, according to physical, natural and anthropogenic structures: one predominantly natural, one mainly industrial and service-related, and a third one with special historical relevance.*

Keywords: Perceptive analysis, proximity landscape, landscape character, urban form, Madrid.

Introduction

Throughout history, the contour of the city has been an ever-changing element. The fringe where country and city converge varies especially, with the creation of occupancy systems that are crucial to interpret the evolution of the urban form. We can consider this peri-urban fringe as 'proximity' landscapes: landscapes that are perceived when the city is either a destination or a point of departure. The vision from afar, or when progressively approaching the city, provides both locals and tourists with certain landscape and architectural aspects that should be studied, preserved and valued for their ability to generate meaningful spaces.

A new framework for landscape valorization has raised in recent years, revolving around the European Landscape Convention (Council of Europe, 2000) and stimulating the creation of landscape inventories to study, assess and monitor the driving forces of landscape change (Antrop, 2005). A growing sensibility towards landscape protection, valuing concepts such as environment and sense of place, gives way to a change of paradigm that can aid in the creation of a new form of urbanism; one where landscape, considered to have a direct impact on the quality of life of those who experience

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it, becomes the driving tool for its design (Zárate, 2011).

The city of Madrid, due to its location, morphological characteristics, history and large green and forested areas, has great cultural, touristic and environmental interest. It is a paradigmatic case of study not only in Spain, as it is an urban growth model, but also as one of the main European capitals, with similar characteristics to Berlin, London, Vienna or Paris. Projects such as MAD-RE Plan (Sustainable Urban Development Area, 2016) and Madrid CENTRO Project (Urban Planning and Housing Area, 2010) are attempts to change the model of urban development, with an integral approach that includes urbanism, mobility, public space and social and environmental challenges cooperatively.

We take Madrid's City Council 'Plan for the Quality of Urban Landscape' (Urban Planning and Housing Area, 2009) and The Environmental Study of the Autonomous Community of Madrid (Environment and Territorial Planning Department, 2009) as the starting point for our research. The first tackles the study of the urban landscape within the city-centre limits, defining units according mainly to building typology and period of construction, while the second focuses upon the natural landscape of the autonomous community and therefore leaves out the entire urban mesh of the city-centre and its surroundings [Fig. 1a)]. Both reports, of very different scope and scale, fail to address the transitional fringe between city and countryside, where there is not an existing spatial gap, but rather a clash between administration boundaries and land uses [Fig. 1b)]. It is this peri-urban fringe what becomes the focus of our research; particularly relevant areas where a deeper understanding of how urban and natural landscape influence each other can be made operational in future strategies for protection, management and development (Palang et al. 2011).

The dynamic nature of landscape calls for an integrated approach to its study, based upon holism, perception and evolution (Antrop, 2000). Characterization serves as a method to comprehend this evolution of the urban form and contour of a city, combining analytical research with perceptive approaches. We study the surrounding landscapes of Madrid by means

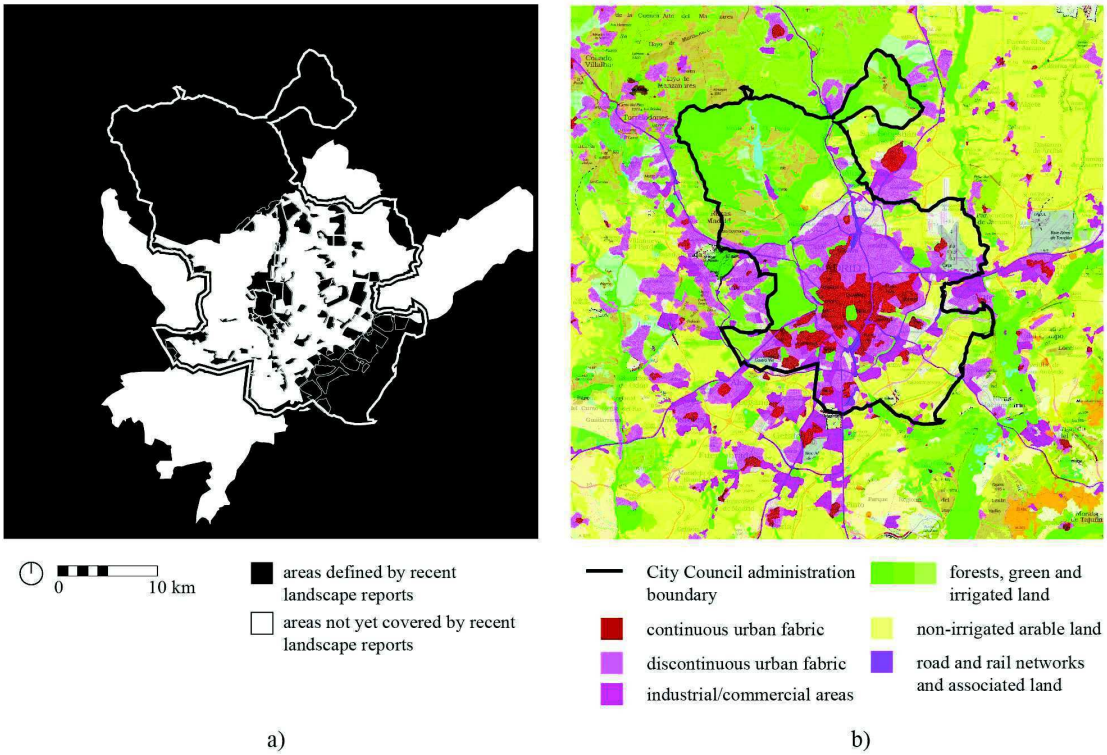

Figure 1.
Natural landscape structures.

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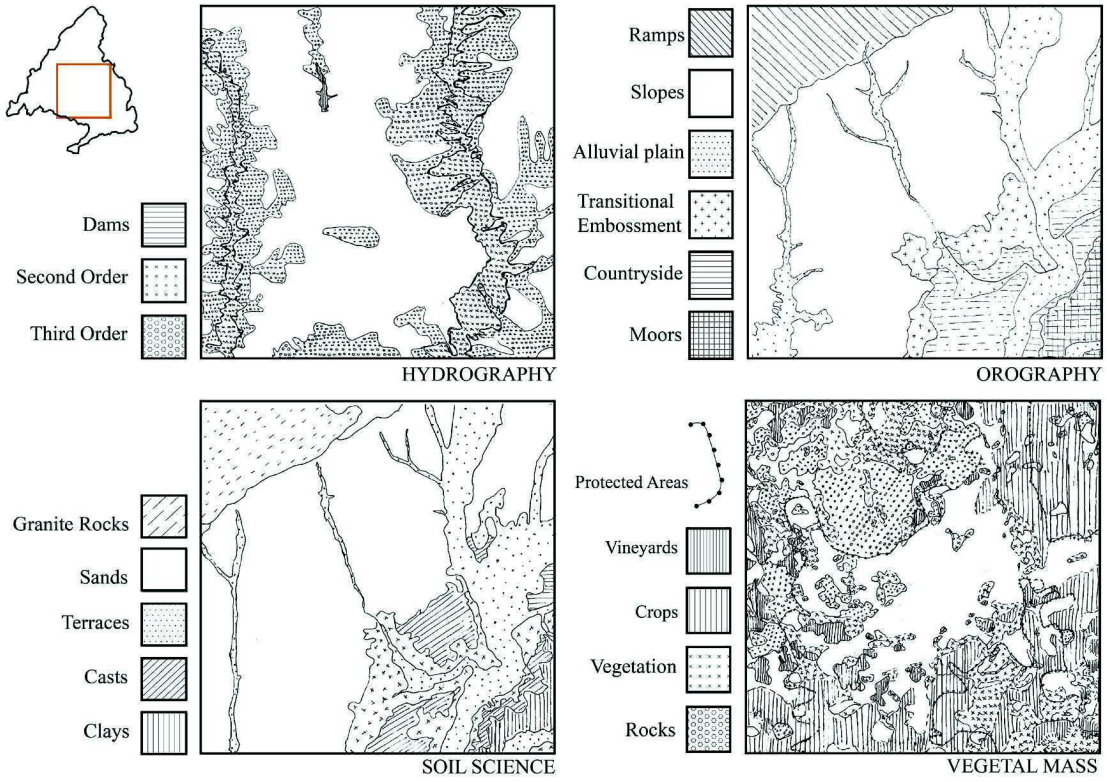

Figure 2.
Anthropogenic landscape structures.

of a Landscape Character Assessment that allows us to understand their configuration and history, in order to guide and inform in decision-making processes towards a more integrated urbanism. The patterns of the distinctive key elements allow for identification of variations and similarities that create sense of place and the unique character of an area. Following on from work in the 1980s, the Countryside Commission of the United Kingdom, among others, developed the technique of landscape assessment, and in 1993 Landscape Assessment Guidance was published. From its outset, in the early 1990s, the "Countryside Character Programme" was designed "to be a framework for helping to incorporate the rich heritage of landscape diversity into present day decisions, not as a process that seeks to prevent activities." (Tudor, 2014).

Overlapping thematic layers at a metropolitan scale, we distinguish between natural and anthropogenic landscape structures. The main factors affecting the first type of landscape structures are terrain (topography), soil, hydrography and vegetation [Fig. 2], allowing the delineation of big morph-structural units that can be adopted as a first approximation of perception units (Gómez, 2012). The anthropogenic structures are the changes specific to human action throughout time (historical evolution) and the various kinds of land use. The configuration amongst them is what generates a certain character of the city, especially significant in urban and peri-urban areas.

One of the main aims of this research is to corroborate the importance of landscape characterization as a tool for analysis, diagnosis and design in current and future interventions, while considering the history of those landscapes prone to change. As Madrid is currently going through several processes of urban renewal, with urbanization plans being rethought, the need for new means to support design decisions has become an ongoing reality. This method's main applicability is to provide a landscape context, guide in evidence-based policy-making, help target resources and identify opportunities for local action.

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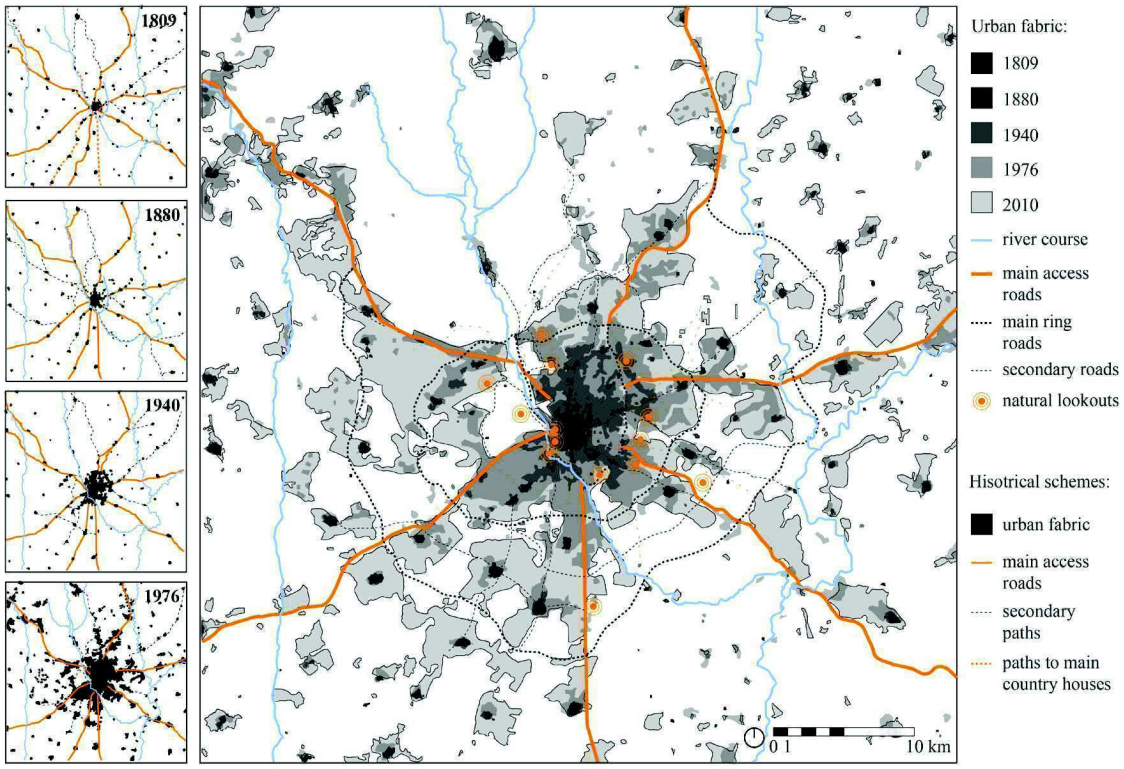

Figure 3.
Historical review of urban morphology, lookouts and main roads.

Methodology

Landscape occurs at all scales, as can the Landscape Character Assessment be undertaken. An approach to understanding how landscape is perceived by people entails constant collaboration between desk and field work, most of which has been focused upon the local scale, starting from particular areas and case studies in order to understand the metropolitan scale that enables the identification of landscape types in the outskirts of Madrid by the means of inductive aggregation, reaching general results from particular premises.

At a metropolitan scale, a historical cartography analysis of the city is developed, putting special attention to the above mentioned 'proximity' landscapes: those perceived when the city is either a destination or a point of departure. The historical plans used as support for this graphical analysis are 1809, 1880, 1940, 1976 and 2010, all of them retrieved from "Planea" database (Autonomous Community of Madrid, 2017), showing relevant stages of growth and transformation of the city [Fig.3]. Stemming from the perceptive components detected in the Landscape Diagnosis Plan of Madrid City Council's 'Plan for de Quality of Urban Landscape' (Urban Planning and Housing Area, 2009), natural lookouts and main access roads are highlighted in this analysis and considered to play a decisive role in the perception of the city and its surroundings throughout time. This cartography has been developed from a metropolitan scale (1:750000) to an urban scale (1:50000).

The perceptive approach is then carried out at a local scale, focusing on the natural lookouts and main access roads to extract perceptive data and select relevant views. Amid these framed views, we discriminate the different characters of the city from the specific sites. Analytical drawings based on these selected views introduce additional information and dimensions beyond the visual frame, focusing on the city-countryside dialogue.

For the lookouts, a 3D digital model of the area of study is generated using data form the

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National Geographic Institute (NGI, 2017), where the named lookouts are located. By means of GIS, a 360º horizontal scanning of a 40km radius from the height of 1.70m is carried out from those points to determine their visual basins. The field work is carried out to contrast the data generated in the previous steps, comparing panoramas with the visual basins, for at this stage certain urban elements (buildings, vegetation…) affect the range of the current views.

We cover the main roads accessing the city centre, starting from the m50, the farthest proximity level, taking pictures along the path every 100 meters, at a speed of 100 km/h, with a frame rate of 3.6 seconds. The variations on the topography and the urban elements (billboards, banners, vegetation…) allow the identification of regions where the elevation of the city is perceptible, correlated with cross-sections that display the slopes during the route and 40km-radius visual basins of particular points.

Observation and analysis applied to the Characterization of Madrid's peri-urban landscape.

The steep cut of the River Manzanares generates a stark contrast between the greenery below (provided by El Pardo Mount, Casa de Campo, Campo del Moro, Florida Avenue and the riversides) and the ensemble of sturdy architectural landmarks above (the Royal Palace and the dome of San Francisco el Grande Basilica, among others). This landscape backdrop is known as the 'cornice' of Madrid; the iconic image of the city, perceived when approached from the west, and which has been represented from the right riverbank by uncountable artists. "Las Vistillas" has been portrayed by painters and photographers and has remain a city-country lookout ever since, where the fringe between them has changed throughout time. San Isidro, another lookout that has strongly evolved over time, is the heart of the popular festivities of "La Paloma", and has been depicted by Spanish well-known painter Francisco de Goya, among others (Pinto, 1995).

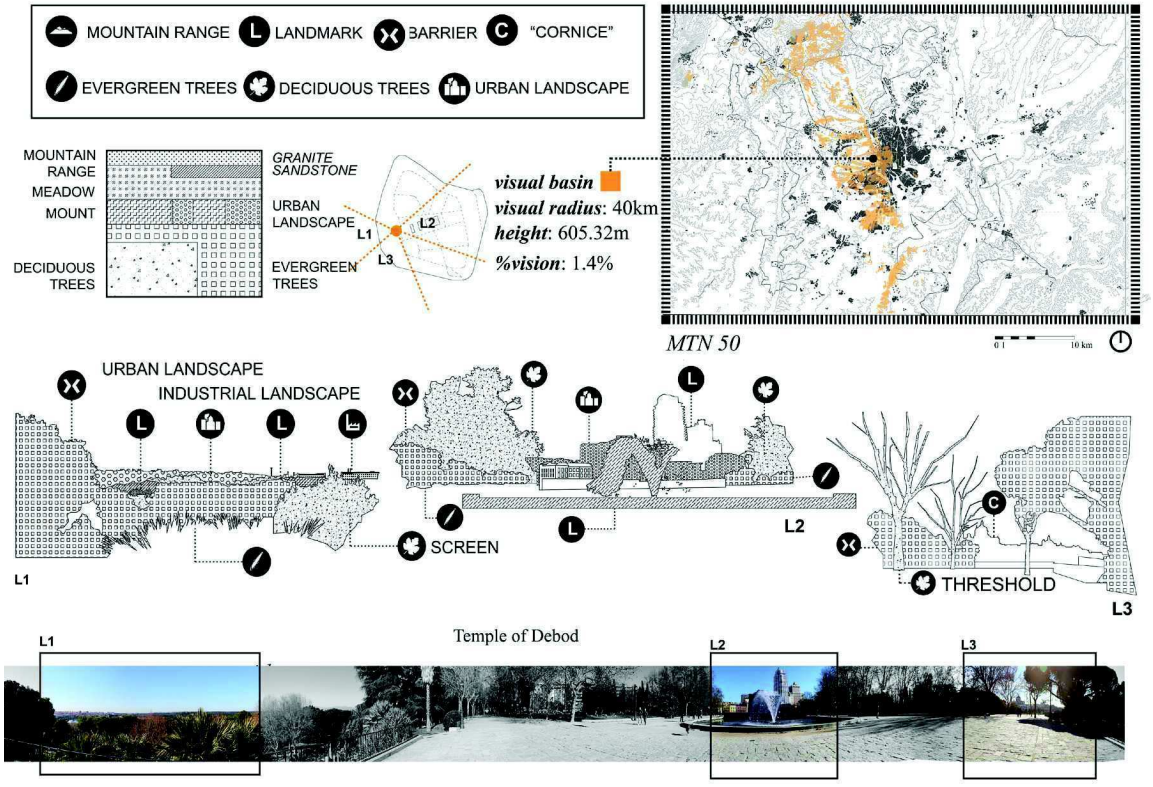

Figure 4.
Data sheet of the Temple of Debod Lookout.
360º panoramas, visual basins and analytical drawings from the lookout.

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Lookouts as witnesses:

Lookouts can be considered silent witnesses of the evolution of the city (Rodríguez, Sáenz de Tejada, 2016). Therefore, a selection of natural promontories is made, according to location, topographical characteristics and historical presence. These geographical points of high altitude from which one can appreciate the city contour are accessible and public. The character of the place will depend on the natural and anthropogenic structures, the urban elements of the surroundings as well as the varying environmental conditions, such as climate, sound or smell that varies over time according to the time of the day or the season.
As a case study, we take the "Temple of Debod" lookout [Fig. 4], a park on the west entrance of the city. The visual basin shows a predominance of views to the west, being able to see the fringe that exists between country and the city, whereas if we look to the East we only distinguish what is at close distance. The landscape is a combination of meadow and mount, where we can recognize the environmental elements of Casa de Campo like the pinewood that surrounds it. The 360º panorama is taken from the West axis of the Egyptian temple located in the centre of the park, situated at 605.32 meters of altitude, and the different elements like the near vegetation or the street furniture act as barrier or landmark, revealing at times iconic views of the city.

As a result of the panoramas and the visual basin, we differentiate three relevant views: one looking towards the countryside, one towards the city and one framing the city's 'cornice', highlighting the different layers in landscape that can lead to a characterization. In the first frame, there is a predominance of the urban and industrial landscape of Carabanchel, a south district of the city, dominated by the towers of the factories nearby and enclosed by both evergreen and deciduous vegetation, with certain urban elements that can act as references, like the rollercoasters of the amusement park

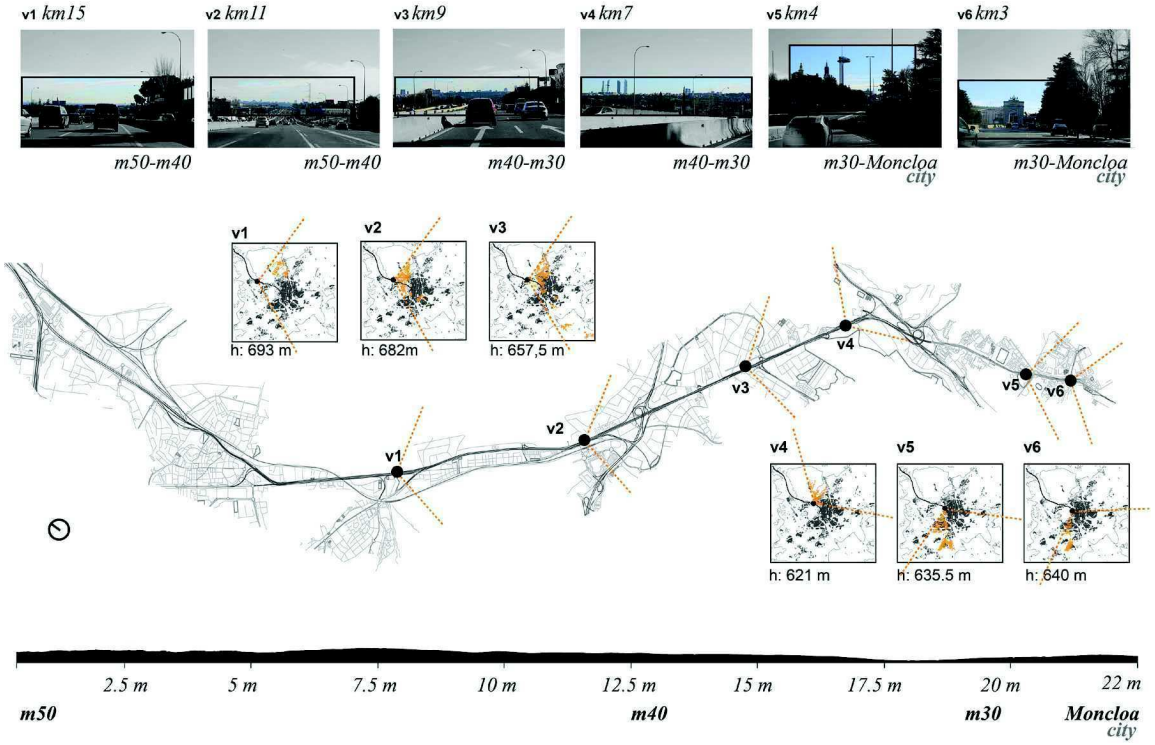

Figure 5.
Data sheet of the A6 road. Highlighted relevant frames, A6 plans and visual basins from the points where the photographs are taken.

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nearby. The second looks directly to some of the city's most recognizable twentieth-century buildings that act as landmarks, with a base of evergreen vegetation and medium-sized deciduous trees. The last one shows the iconic historical view of Madrid, known as the 'cornice', composed by La Almudena Cathedral, the Royal Palace, the domes of San Francisco el Grande Basilica and other churches and old parishes, and the rooftops of the traditional domestic architecture that accompanies the historical architecture.

Main access roads as welcoming entrances:

The main access roads of the city are distributed in a radial way around the city center, and the topography enables the view of the city as a whole in certain sections along the path. There are six major highways that are the current 'arteries' of the city, and some minor roads with historical relevance. Depending on which path we take to the city, the perception varies, depicting and building on the different character types that arise along the city's peri-urban fringe. For instance, the experience approaching the city from the south, where the main elements are billboards and electric stations, is very different from approaching from the west, where natural landscape prevails throughout the route. Simultaneously, there are three concentric roads (m50, m40 and m30) that act as proximity levels to the urban center.

For the analysis, we take the A6 road, the highway that connects Madrid with Coruña, in the northwest of Spain [Fig. 5]. It was built in 1932 as an avenue and transformed into a highway in 1968, becoming the latest of the city's six 'arteries'. A selection of the main points from where the city is perceived is made, with two predominant views per proximity level. Overall, the height of the road descends as we approach the city, with small elevation changes that condition the views.

Through the changes in the topography of said road, there are certain moments when the city, or some of its archetypal elements, are perceived. In the first two frames we appreciate the city as a whole, recognizing the skyline; at times we only appreciate a set of buildings, as in the point v4 where we can see the famous four towers of the north of the city; as we reach the city, individual buildings act as landmarks, like the triumphal arch of Moncloa. The landscape that surrounds the city is predominantly natural, because of the presence of some Royal Places such as El Pardo Mount (north), a Mediterranean mount filled with holm oaks, and Casa de Campo (south), a Mediterranean planted pine wood. Close to the city we find the university campus, with a landscape consisting of pines and cedar trees planted in the twentieth century. They all that act as a plinth of the city, preserving some of its iconic views.

Interpretation of Results and Landscape Diagnosis

New developments of the city can benefit from this methodology, taking the analysis as a starting point of the design process that considers multiple inputs. Landscape Characterization can be used to set the basic guidelines for environmental integration that lead to consistency in terms of ecology, landscape, territory and social activities, having an impact on the sustainability of a project, integrating sensibility and knowledge towards the site, and environmental commitment throughout the decision-making process.

As a result of the inductive approach performed, the local case studies have led to the recognition of areas of different characteristics, where certain elements stand out in the perception of the site because of their historical value, its iconic image or their predominance among other elements. By combining the results of the analysis of the lookouts and the main roads, we arrive to general conclusions regarding the understanding of the city's urban and surrounding landscape.

Linking the areas of similar attributes and taking into account the natural and anthropogenic landscape structures of the city, we begin to differentiate types in the city's peri-urban landscape. The analytical drawings of each unit take part in this identification, as they consider perceptive factors such as the relation between landmarks, barriers, relative depths between planes, sturdiness, continuity, homogeneity or representativeness. From a

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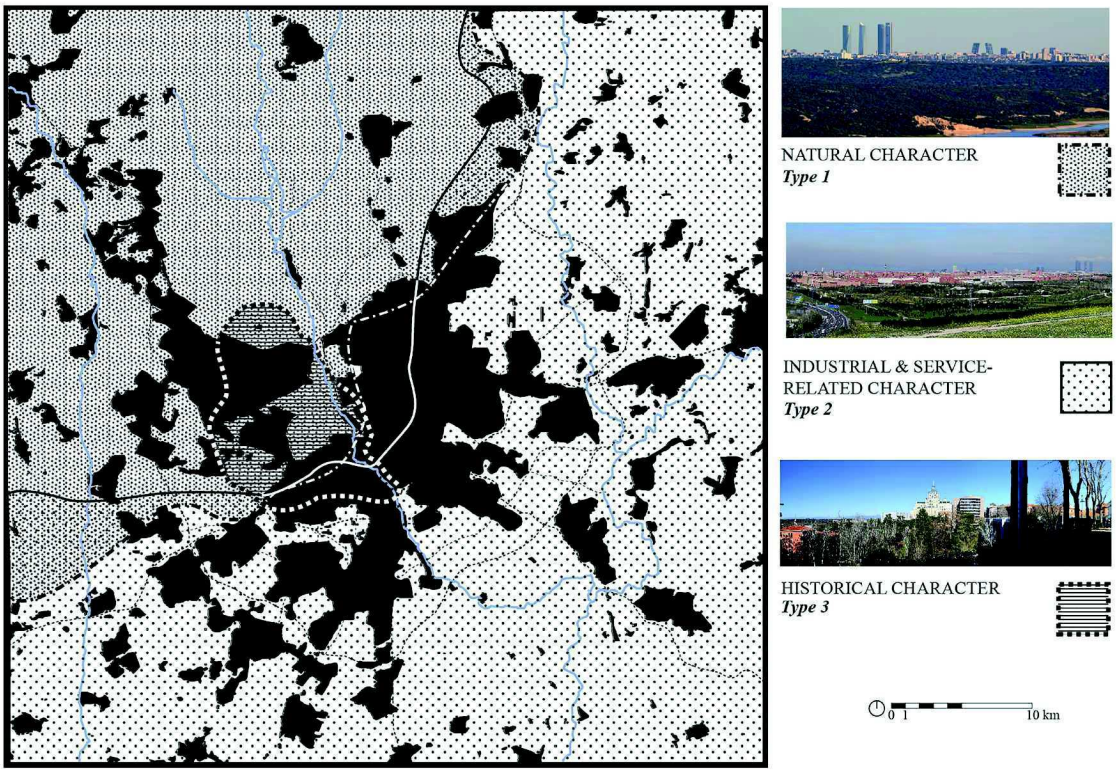

Figure 6.
Urban growth of Madrid with the different types of landscape

historical urban landscape perspective, these iconic views that remain in the collective memory are as important as the image of the historical core of the city, and are highly related to the topographical conditions. These 'proximity landscapes' become an everyday scenery for those experiencing the rural-urban fringe.

The landscape characterization accredits to distinguish three main landscape types surrounding Madrid, according to physical, natural and anthropogenic structures: one predominantly natural, one mainly industrial and service-related, and a third one with special historical relevance [Fig. 6].

-A first type opens to the north, being El Pardo Mount its main feature. Endowed with great ecological and historical value, the vegetation mainly comprises oaks, distributed alongside a Mediterranean mount. There are abundant open spaces, with few architectural elements, intertwined with the vegetation and thus usually hidden by it.

-A second type opens to the south and east. Being the largest of three described in this work, its semi-barren soil characteristics discouraged an urban expansion in that direction in the city's earliest stages. The land did not foster a strong agricultural economy either. The appearance of the railway tracks and stations in the mid-nineteenth century in this area gave way to a proliferation of industrial and service-related infrastructures. Despite the strong urbanization carried out later, the character given by these elements, along with an abundance of residual spaces, can still be perceived today.

-A third type opens to the west and southwest of the city centre. Its main feature is the 'cornice' of Madrid: for many centuries, the welcoming façade for those approaching the city from the west and southwest. Though still preserving its historical value, bestowed by the ensemble of protected architectural and natural structures, due to the scale of the city today, this landscape character is perceived at shorter range than in the case of the other two landscape types described above.

We appreciate a gradation throughout the northwest-southeast axis, reflected on the topography, vegetation and views alongside the Manzanares River basin. The differentiation of types is linked to the 'proximity' landscape

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scales: the first two types refer to a large scale, seeing the city as a whole, and the third type, with the river taking an active role, has an impact at a closer scale, where the iconic view of the historical city becomes the main feature.

Conclusion

Conceiving landscape as a dynamic compendium of factors calls for inclusive and multidisciplinary approaches to valorise it to its full extent. The tools and method proposed in this work could help assemble the issues involved in the study of historical urban landscape and those of current urban landscape, by not condemning historical approaches to a static and untouchable state, but rather making them part of the dynamic environment of a city in constant evolution. This can be extrapolated to other cities, especially those with similar morphological characteristics, like most European capitals. Combining the analysis of historical cartography, 3D modelling, on-site photography and analytical drawings provides a multifaceted vision of what the city means when it is contemplated.

Uncovering layers of perceptive information beyond what is visible, and considering landscape history as instrumental in decision-making processes, becomes especially relevant in peri-urban landscapes; areas in a temporary state of 'city-countryside border', embodying the clash between natural or rural landscape, administration boundaries and urban growth. This fringe, a 'proximity' landscape and everyday scenery for those approaching or leaving the city centre, is frequently disregarded and subject to sudden change. A deeper understanding of the landscape dynamics in these areas can guide towards a more integrated urbanism, facilitating the preservation or enhancement of certain values and places, while enabling evolution and change.

Acknowledgements

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Diachronic transformations of urban routes for the theory of attractors

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Abstract. *Recent urban morphology studies consider urban tissues as living organisms changing in time (Strappa, Carlotti, Camiz, 2016), following this assumption the urban morphology theory should examine more analytically what Muratori called 'medievalisation' (Muratori, 1959), a term describing some of the transformations of urban routes happened in the middle ages. The paper considers the diachronic deformation of routes, and other multi-scalar occurrences of the attraction phenomena (Charalambous, Geddes, 2015), introducing the notion of attractors and repellers. Archaeological studies already do consider attractors and repellers as a tool to interpret some territorial transformations, following the assumption that "the trajectory that a system follows through time is the result of a continuous dynamic interaction between that system and the multiple 'attractors' in its environment" (Renfrew, Bahn, 2013, p. 184). There are different elements that can act as attractors in an urban environment, such as bridges, city walls, city gates, water systems, markets, special buildings, and it is possible to consider each of these anthropic attractors as equivalent to a morphological attractor at the geographical scale. We can even interpret the ridge-top theory (Caniggia, 1976) as the result of attraction and repellence of geographic features on anthropic routes. The territorial scale analysis is the methodological base of the theory, but the attractors herein considered operate at the urban scale, deviating locally across time from a rectilinear trajectory and defining a specific urban fabric. The research interprets and reads the effects of attractors on urban routes and fabrics as a method for the reconstruction of Nicosia's medieval city walls, in continuity between the Conzenian approach (Whitehand, 2012) and the Italian School of Urban Morphology (Marzot, 2002).*

Keywords: Attractors, repellers, urban routes, urban morphology, theory, history.

"He maketh me to lie down in green pastures:
he leadeth me beside the still waters"
Psalm 23, 2, KJV.

Introduction

The attractor theory is a new experimental tool of analysis in the urban morphology field, introducing a diachronic analysis of the configuration of routes. Routes change in time and we can interpret some of the deformations they follow as the result of the attraction or repellence of certain artefacts, defined here as attractors or repellers. Once an attractor appears into an urban network of routes, it may happen that some paths change their configuration and deviate from their former position. Archaeological studies have introduced the same notion of attractor and repeller as a tool to interpret some territorial transformations, following the assumption that "the trajectory that a system follows through time is the result of a continuous dynamic interaction between that system and

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the multiple 'attractors' in its environment" (Renfrew, Bahn, 2013). Mathematicians also use the notion of attractor with a quite different meaning, as a set of numerical values toward which a system evolves in the long term. There is a number of studies on urban planning deriving the notion of attractor from the mathematical concept and applying it to the statistical study of settlement patterns. (Boeing, 2016). Some archaeologists have borrowed the theory of attractors from mathematics to explain cyclical or "strange" transformations using the point, limit cycle, toroidal, strange attractor division (McGlade, 1995), (McGlade, Van Der Leeuw, 1997). Space Syntax studies have introduced the term attractor to name an element attracting pedestrian movement; and other connected concepts such as the spatial layout attraction, the land use attraction and the transport attractions. In this discipline, an attractor is a building or any other feature with the potential of generating trips to and from a place. A negative attractor is instead an element decreasing the natural movement rates. (Hillier, Penn, Hanson, Grajewski, Xu, 1993). The attractor as defined in Space Syntax differs from the one we are introducing here but is useful for the explanation of the theory, as it refers to pedestrian movement, which happens usually before the street itself is built. The traffic may therefore influence the planimetric shape of a route as attracted in time. The route, street or lane is a human artefact and we can study it just like buildings and urban tissues. Moreover the level of permanence of routes is in general higher than that of buildings, while the most buildings are private (base buildings) and only few are collective (special buildings), routes instead are in general public and should be considered as collective artefacts. In the long term, streets can tell much more history than buildings.

Methodology

The object of this research is the analysis of the planimetric configurations of streets in urban environment, recognising typical configurations, and their diachronic transformations due to the effect of the attractors. This analysis can be useful for different disciplines, such as archaeology, urban history, and urban planning. We can define an attractor as an element that deviates a route from its previous configuration by attracting its traffic. A repeller is the inverse of an attractor, an element deforming the configuration of a path by repelling its traffic. An attractor now not existing anymore may be inferred with the formal analysis of the configuration of routes that have been attracted by it, determining a sort of diachronic urban stratigraphy. It is therefore possible to infer the presence, type and position of a former attractor by recognising the deformations of the routes that were attracted by it. In case of disappearance of an attractor or repeller, the configuration of the routes modified can return to its former position or not, depending on the presence of other urban elements preventing its elasticity, as built urban tissues, or even property divisions. I absence of any retaining other structure, once the attraction ceases the route goes back to its undeformed shape. Considering that every route pre-exists its settlement (Caniggia, 1963), the planimetric form of the route depends on a number of elements attracting and repelling its course from the shortest path. These elements, defined here as attractors and repellers, can appear, disappear, or even change position in time, determining through history the complex configuration of the route itself. The changing positions of the attractors and the changing strength of attraction can be recognised and used to interpret the phases of an urban settlement. Once an attractor ceases to exist or ceases to attract, it may happen that the route returns to its unattracted configuration, but in urban areas, urban tissues reduce this elasticity limiting the possibility of reversing the attraction phenomena, freezing therefore the attracted configuration. As a first classification based on the observation of different case studies we considered point attractors, continuous attractors, and shaped or areal attractors. Examples of point attractors may be wells, city gates, bridges, fords, springs, and mountain passes. Examples of continuous attractors are instead city walls, rivers, seashores, lakeshores, canals, while shaped or areal attractors are buildings, infrastructures,

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rock formation, lakes. Attractors can be territorial or urban: some special buildings or urban functions may act as attractors, typically, markets, power seats (government buildings, local administration buildings), churches, monasteries, other religious buildings. The only difference between a territorial and an urban attractor is the urban environment, as a city may significantly change in time. A territorial attractor in a subsequent phase may find itself inside a city, and on the other hand, what was once an urban attractor could today be in an abandoned territory becoming thus territorial. Distinguishing between nodal and polar attraction, includes the notion of pole/antipole and node as defined in the Muratorian theory (Caniggia, Maffei, 1979). The attractor itself is not nodal or polar, but the attraction point can be nodal or polar in relation to how the different routes are converging there, a nodal attractor is determining a branching between two or more routes, while a polar or antipolar attractor determines the origin or destination of a route. Attraction can be deformed or undeformed, where a deformed attraction is visible in the local modified configuration, while routes that don't have a local curvature converge in an undeformed attractor. Attractors and repellers can be simple or complex depending on how the effects of their action re classified, either in a simple form or as the result of different forms merged together. Finally attractors and

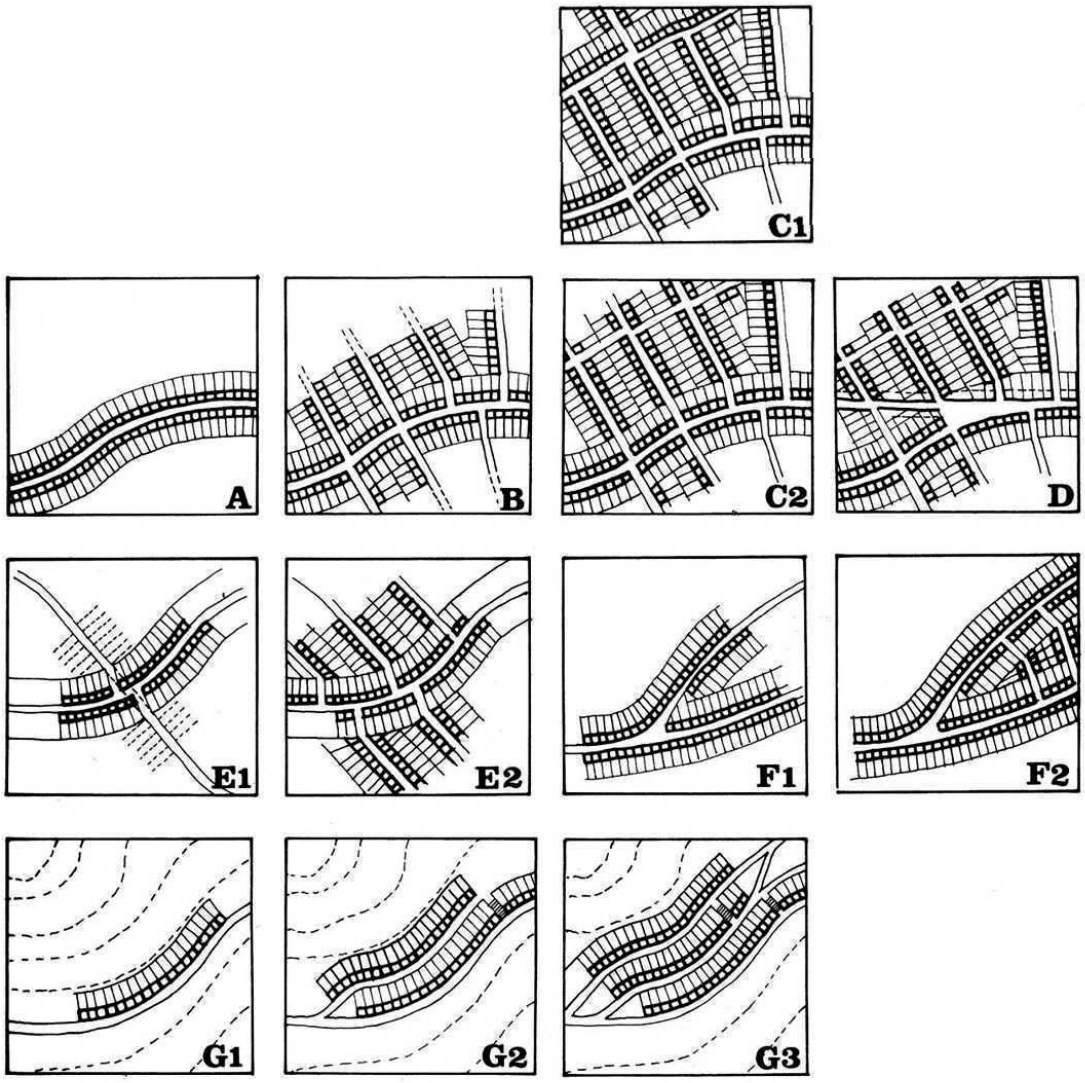

Figure 1.
Variations of urban tissues for different site morphologies (Caniggia and Maffei, 1979).

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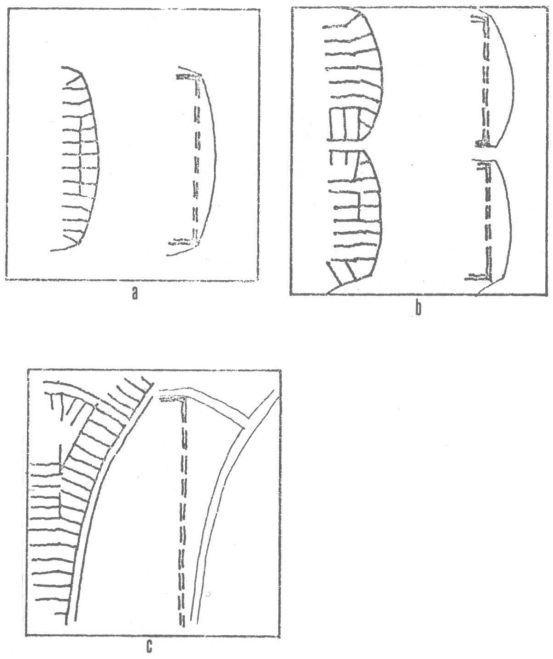

Figure 2.
The medievalisation and the diagonalisation process (Caniggia, 1976).

repellers can be anthropic or natural, depending if they are determined or not by human action. This classification is tentative, and is based on the observation of the attraction phenomena in the urban and territorial environments. The classification is useful to build a taxonomy of attraction cases, based on a binary set or parameters, and to recognise the attractor type. So following the classification there could be an anthropic point nodal undeformed simple attractor, as well as a natural continuous deformed complex attractor. The main characters that need to be recognised in the road network, besides the road curvature and inflection, are the discontinuities in the track, the bifurcations, the intersections and the convergences.

Measurement and analysis

Looking at the variations of urban tissues for different site morphologies (figure 1) (Caniggia and Maffei, 1979). we understand that the urban routes and therefore the urban tissues are strongly affected by the morphology of the site, as if the site was acting like an attractor. Nevertheless, it is not possible, if not in a geological time scale, that the changing morphology of a site affects and deforms the configurations of the routes. Therefore, the attraction of a natural attractor is permanent and not very useful to reconstruct diachronically the changes of the routes. Anyhow the shortest path from one point to another on a flat surface is a straight line, if the surface has a complex form instead the patch tends to follow the minimum energy path. In this case, the morphology of the site acts as an attractor to the route, deforming its theoretical straight shape. The first step in the construction of the theory consists in the classification of the natural attractors. The theory is based on the assumption that every anthropic attractor has an equivalent natural attractor. There are different elements that can act as attractors in an urban environment, such as bridges, city walls, city gates, water systems, markets, special buildings, and it is possible to consider each of these anthropic attractors as equivalent to a morphological attractor at the geographical scale. We can even interpret the ridge-top theory (Muratori, 1959) as the result of attraction and repellence of geographic features on anthropic routes. Even the fringe belt phenomenon can be described as the attraction of the city on the urban services together with the repellence of the built urban issue on their localisation (Whitehand and Morton 2006), (Maretto, 2009). The territorial scale analysis is the methodological base of the theory, but the attractors herein considered operate at the urban scale, deviating locally across time from a rectilinear trajectory and defining therefore a specific urban fabric. A natural point attractor is as an example a ford: the position of the ford, which is in general independent form the morphological configuration of the territory, will deviate the routes following the ridge top theory so to cross the river in that specific point. The equivalent anthropic attractor is a bridge. While the ford in the human time scale probably does not change, and the deformation of the route from its theoretical shape is stable, in the case of the bridge, its existence and position can vary in time, so the deformation of the routes can be dynamic. Following the analogy between the mountain pass and the city gate, it is possible to recognize the typical feature of the bifurcation

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of routes converging from the territory to the city gate. This Y shaped bifurcation (Figures 5 and 6) happens when the construction of new city walls and gates, forces a pre-existing street leading to the city centre to abandon its configuration and merge outside of the city entrance with the other route that attracted the construction of the gate in that position. In this case, one of the routes is acting as an attractor for the position of the gate, and subsequently it is the gate acting as point attractor to the other routes. Therefore, it is possible to distinguish an undeformed route merging into the bifurcation, and a deformed one. We can recognise this configuration in the bifurcations outside of Porta Ravegnana in the medieval Bologna, in this case the Kardo of the roman Bononia, via Aemilia, continues undeformed outside of the roman city walls, while the other routes were attracted converging in the gate. The same phenomenon can happen inside the city, either because the urban tissue is not consolidated yet or with the restructuring of the former urban tissue. A good example of an inner bifurcation of routes for the city gate acting as attractor may be found in Porta del Popolo and the three streets via del Babuino, via Lata and via Ripetta. In this case the via Lata is the unattracted route, the other two, as determined in the XVI century with the Piano Sistino, were designed to converge in the square facing the city gate inside the city. By finding typical configurations of road bifurcations, branching, intersections, and deformations from the straight form, interpreted diachronically, it is possible to construct an abacus of the attractors and repellers, and the deformations caused on the urban routes. With the analytical understanding of a very large number of cases and their explanation in theoretical terms, it will be possible to provide a substantial aid to the study of the history of cities in the middle ages: a historical phase of history that usually lacks documentation for the reconstruction of the urban environment. Recognising these deformations can help us to reconstruct as an example a bridge now not existing anymore. Another natural point attractor is the mountain pass, and its anthropic equivalent the city gate. The linear attractor is instead a continuous structure deforming a route to follow it. Natural continuous attractors are mountain ridges, riversides, lake and seashores. By generalising the ridge top theory, we can say that routes within certain conditions take the shape of the continuous attractors. In some cases, the same element attracting can act as a repeller for other routes. As an example we can consider the ridge top that attracts the route, but if too sharp and steep, deviates the route from its edge (repeller) keeping it though close to it (attraction). City walls are an example of a complex attractor,

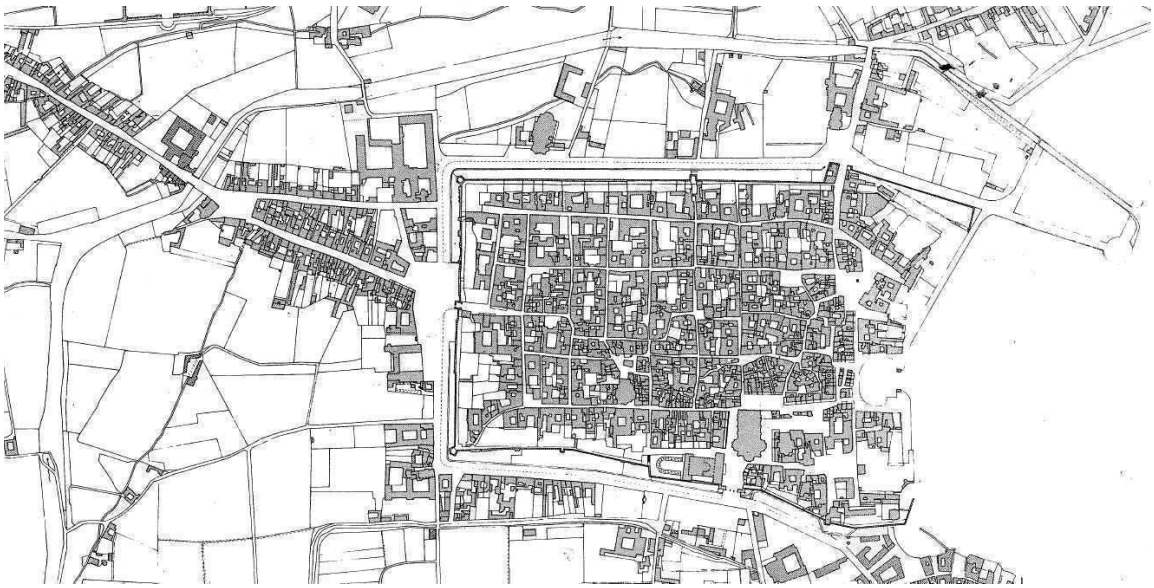

Figure 3.
Como: plan reconstructed from the 1858 cadastre (Caniggia, 1963).

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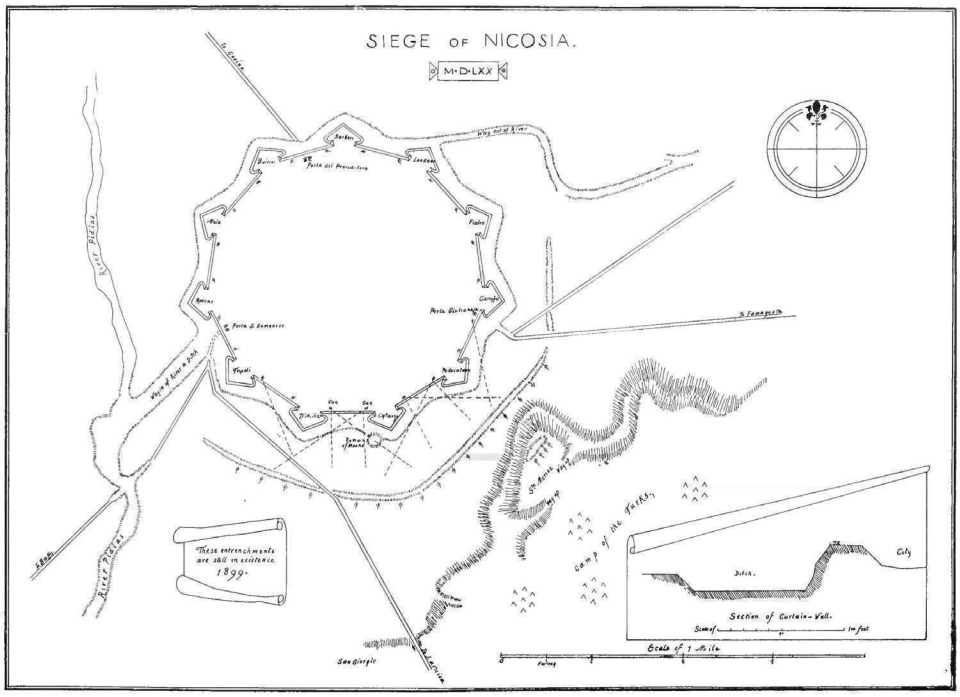

Figure 4.
The attraction of the three Venetian city gates of Nicosia (1567) on the external routes. (Cobham, 1908, p.87).

as generally they attract the paths inside the precinct to follow their perimeter, and instead repel the former path to follow their perimeter on the outside. The city gate instead acts as a point attractor for the inside and outside routes. Very often the position of the gate is attracted by one of the existing routes on the moment of its foundation, while in a second phase the routes tend to converge in the gate ending with the bident or trident configuration. The very same configuration happens usually with a bridge over a river, where the two valley bottom routes on either side of the river are attracted and deformed by the river's shape that can indeed change in time, and the routes converge in the position of the bridge. Figure 5 and 6 are an attempt of categorising the attraction phenomena, and describe in time some cases. The diachronic evolution of a path for the appearance of a point attractor A close to the path is described in the first case. The trajectory of a route from pole 1 to antipole 2 is the shortest path in the time T0; in T1, the point attractor A appears and in T2 it inflects the linear trajectory of the shortest path determining inflection points f1 and f2. It is possible that the bifurcations b1 and b2 appear in T3 as the inflected path takes the role of an alternative course (Figure 5, SA1). The behaviour of the path in case of a repeller R, is not symmetrical as the point repeller R along the path deflects the linear trajectory of the shortest path determining the inflection points f1 and f2 but there are 2 distinct alternatives in the trajectory to avoid the repeller, determining a bifurcation (Figure 6, SP1). The medievalisation as explained by Caniggia (1976), can be interpreted as the persistence of attraction of the street corners, while the street is repelled by the growing urban tissue (Figure 6, CP1). While the diagonalisation (Caniggia, 1976) can be described as the existing precinct of the forum acting as a repeller, and after disappearing the streets take the shortest path as attracted by the block corners acting as attractors. (Figure 6, CP1).

Conclusion

The research interprets and reads the effects of attractors on urban routes and fabrics as a method for the reconstruction of Nicosia's medieval city walls. An ongoing research is

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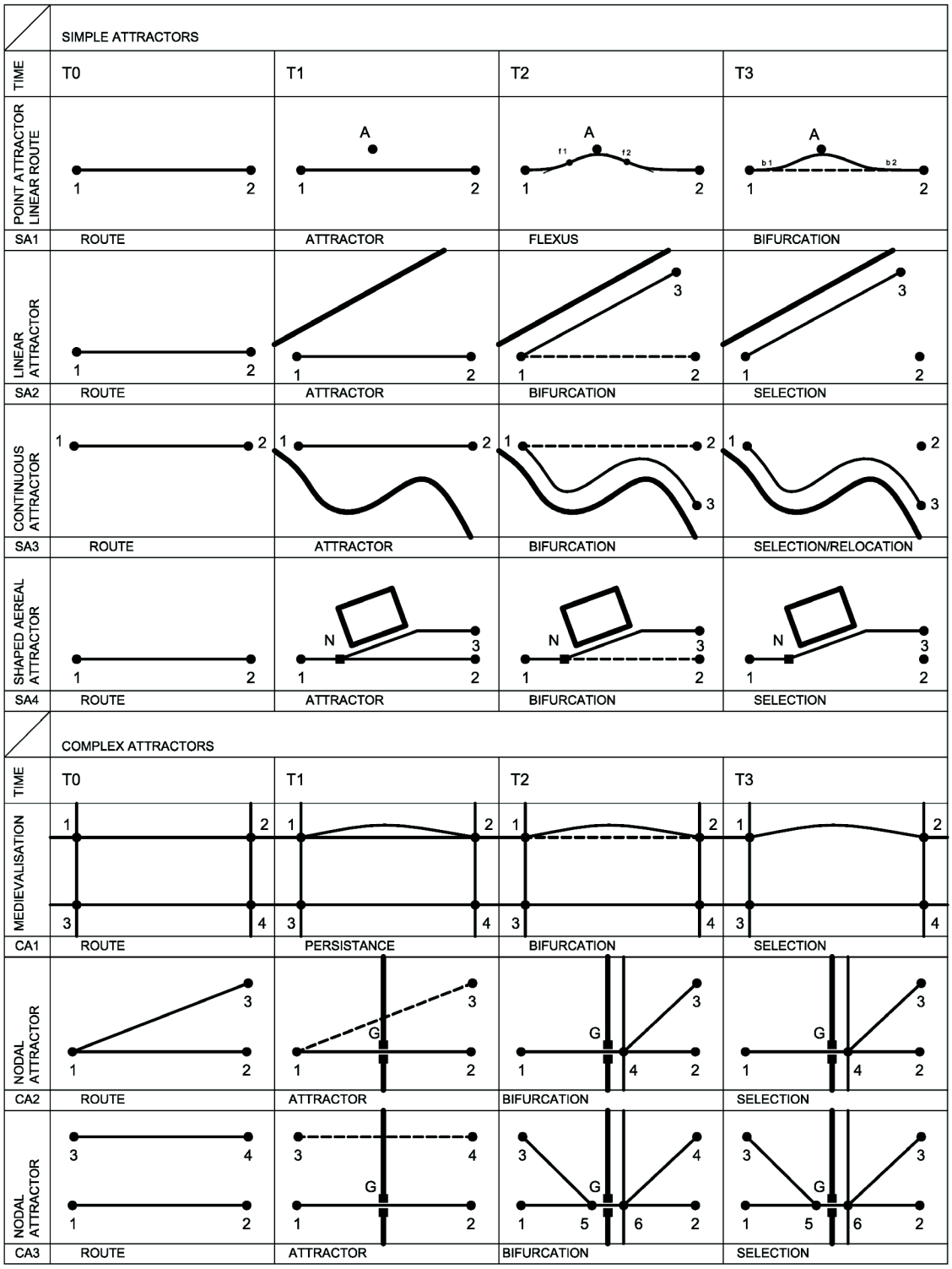

Figure 5.

Simple and complex attractors, diachronic transformation of urban routes (drawing A. Camiz).

aimed at the reconstruction of the different phases of Nicosia City walls, from the byzantine "circla", to the later teichokastron, and the walls built by the Lusignans in the XIV century, comparing them with coeval cases for each phase, such as Bononia (Guidoni, Zolla, 2000), the territorial routes around Cagliari (Cadinu, 1998) and the city of Como (Caniggia,

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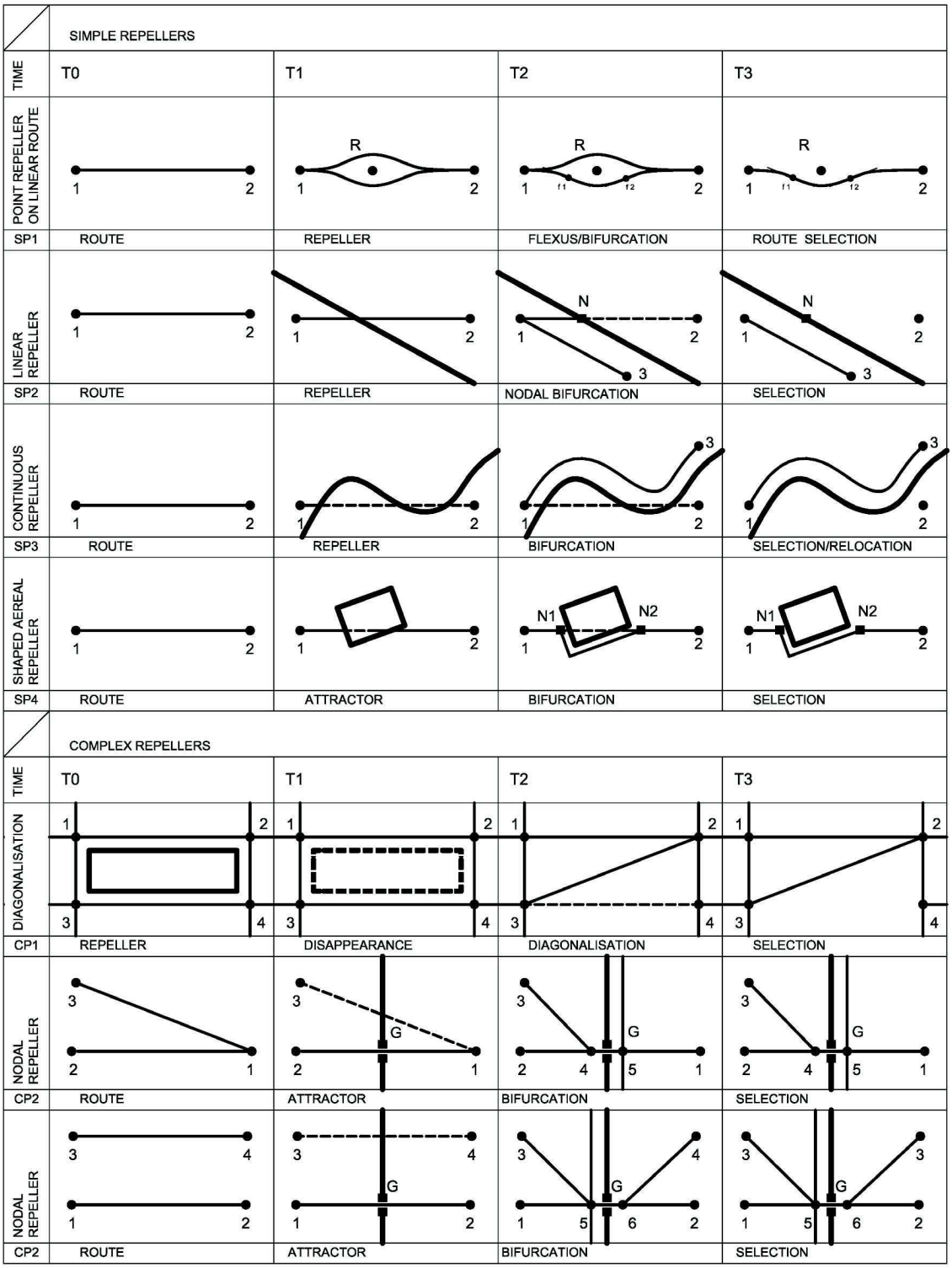

Figure 5.

Simple and complex repellers, diachronic transformation of urban routes (drawing A. Camiz).

1963). The reconstruction is based on the cross matching of historical sources, archaeological evidence and the Muratorian (Strappa, Ieva, Dimatteo, 2003), (Cataldi, Maffei, Vaccaro, 2002), (Ieva, 2015) urban morphology analysis methods: this case study was experimentally proposed for the development of the theory of attractors. The research on the medieval

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walls is not finished yet, so cannot be entirely presented here. Some preliminary considerations on the topography of Nicosia can be discussed as a first application of the theory. The urban settlement of Nicosia started as Ledra in Bronze Age on the top of Agios Georgios hill, next to the river Pedeios (Kanlı Dere), along the intersection of the valley route following that river, and the cross-valley route connecting the Pentadaktylos ridge and the Troodos ridge, and developed as an exchange point between the two sides of the river. Only in Byzantine times, in the X century, the city became the capital of the island, and a surrounding wall was added. After becoming archbishopal seat in 1212, the city grew larger. Nicosia was protected since Byzantine times by a walled enclosure of which very little is known. Later the city was defended by a castle built by Henry I in 1211. A complete city wall surrounding the city was started in 1368 by Peter I and completed by Peter II in 1380. Further works were accomplished by Janus I in 1426, and planned in 1450 following Nicholas V decision. The urban area reached a circumference of four miles, before the Venetian transformation of the city, reduced it to three miles (Mariti, 1792). In 1567 new walls, designed by the Venetian engineers Giulio Savorgnano and Francesco Barbaro, replaced the medieval ones. The construction of the new walls implied the destruction of the older walls, and the infilling of the river, moving its waters into a new moat surrounding the new city walls. A new urban tissue gradually replaced the riverbed, flanked by the sinuous streets that followed its former course inside the ancient city. In Nicosia the three existing bridges, where crossroads connected the two sides of the city, maintained their polar role after the river infilling. The Venetians might have not completed this urban transformation, hence the Ottoman siege of the city in 1570, but in continuity with the precedent administration the Ottoman renovation of the city, used some of the areas above the infilled river. Since then, this area become the city centre. The three bridges disappeared from the urban landscape once the river was infilled, but their trace is still readable in the network of urban routes. The bridges acted as attractors for the urban routes. The crossing point of a river determined by a bridge or a ford, acts definitely as a point attractor for the surrounding existing routes. What is singular is that the Ledra Street check point, the only crossing point of the buffer zone within the walled city of Nicosia, was opened in the same point were in ancient times one of the three bridges was; so the permanence of urban traces acted as a guide for the modern design process. After the opening of the checkpoint in 2008, in the same position of the ancient bridge, all the commercial activities of the walled city of Nicosia were attracted along that same urban axis of Ledra Street, showing a singular cyclical continuity in the attraction phenomenon. In the plan of Nicosia, it is possible to recognise through the inflection and bifurcation analysis a number of meaningful cases. We will propose just a few here, due to the lack of space. The construction of the Kyrenia gate in the end of the XVI century, seems to have attracted the urban axis stemming from the third Royal Palace built in Lusignan times. Maybe in that time the urban tissue was not completed in that zone, and the palace within a fringe belt, was built at the limit of the built area. What is clearly visible in the plan is the attraction of the gate in relation to the urban route, as if the direction of the route was determined by the gate, so to infer that the route developed after the XVI century. In the same area it is possible to hypothesize the presence of a continuous attractor, surrounding the urban tissue, such as a city wall or a moat. On the western side of the city walls, the now called Paphos gate, inflects and bifurcates the outer routes, where the southern one is also deformed by the bastion, acting in this case a repeller. The opening of the Limassol gate in modern times the southern part of the Venetian city walls, attracted the outside routes, and was attracted by the internal ones (Fig. 4). The analysis of a high number of cases of attraction and repellence in urban routes can lead to the further understanding of the diachronic transformation of streets in an urban environment and constitute an instrument for the reconstruction of the different historical phases of an urban settlement, determining the position of city walls, city gates, bridges and other public building

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A multidisciplinary approach to urban fabrics analysis. The historical centre of Valencia

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Abstract. *The themes of reduce, recycle, reuse are at the heart of the challenges that the global society of the XXI century is facing. At the same time, more than two-thirds of the world population lives in cities nominating the latters to play a central role in the near future. For this reason, the search for a methodology for the redevelopment of the historical urban fabrics appears today extremely interesting. Complexity, richness and stratification of the latters make them definitely the most convincing test to set a scientific strategy for the project of urban transformations. But stratification means complexity and complex are the phenomena that characterize the XXI century society. The only convincing way then for the analysis of these phenomena is that of the multi-disciplinarity. The proposed methodology is structured, thus, around a number of disciplines (Urban Morphology, Sustainability, Urban Regulation, Economic Evaluation and Urban Design) on which to set the reading of the urban fabric with special attention to the so called "urban voids" namely all those situations in which the tissue is interrupted due to slumping and demolitions. This aspect is very important because if, on the one hand, it is in these areas where key tissue analysis problems can be seen, on the other hand, it is always from these areas that the main urban, social and economical transformation opportunities can take boot. A Due Diligence of the "urban voids" organised in datasheets/base (for each area) concludes the analysis. The different disciplinary fields work then in a complementary way within a single methodological approach laying the scientific basis for the interventions of urban regeneration within the historic fabric of Valencia.*

Keywords: urban morphology, urban fabric, multidisciplinary, methodology, Valencia.

Introduction

Urban transformation, urban regeneration, urban sustainability are just some of the key words identifying city's trend in this early XXI century. Particularly sensitive is their application to the compact and historical city. Complexity, richness and stratification of its fabrics actually make them definitely the most convincing test to set a scientific strategy for the project of urban transformations. But urban phenomena are extremely dynamic and do not lend themselves to a univocal method. For this reason a multidisciplinary approach has been put at the base of current research structuring a methodology around a number of disciplines

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(Urban Morphology, Sustainability, Urban Regulation, Economic Evaluation and Urban Design) on which to set the reading of the urban fabric with special attention to the so called "urban voids" namely all those situations in which the tissue is interrupted due to slumping and demolitions. This aspect is very important because if, on the one hand, it is in these areas where key tissue analysis problems can be seen, on the other hand, it is always from these areas that the main urban, social and economical transformation opportunities can take boot. This paper represents a first step in this direction. In particular a methodology for a Due Diligence of the "urban voids" will be proposed. It is organised in datasheets in which different disciplinary fields work in a complementary way laying the scientific basis for the interventions of urban regeneration within the historic fabric of Valencia.

Methodology

From a methodological point of view, the first choice was to contain the field of inquiry within the Ciudad Vella. An area extending for 142 ha inside the former Christian wall built up by Pedro IV El Ceremonioso in 1356. The historic city, in fact, has the double circumstance of being, on the one hand, a "contemporary city" in all respects, and therefore a valid ground for verification for all urban transformation processes, on the other hand, to be characterized by a strong stratification. This latter aspect is particularly relevant. Stratification means the wealth of "contextual factors" for which the only way forward, as always, is that of the recovery, reuse, re-functioning, in-fill and so on, all concepts that arise at the base of any reasoning about the future of cities that want to have, today, scientific credibility. The historic city seems therefore to be the most convincing test bench for setting up a scientific strategy for urban transformation projects. The second choice, as mentioned, was that of multi-disciplinarity. In particular, some basic disciplines have been identified around which to build an organic and effective methodological format. The areas in question are those of Urban Morphology, Environmental Sustainability, Urban Planning, Economic Evaluation and, of course, Urban Design as a necessary final synthesis tool. Through an analysis and cataloguing of solares, it was attempted to reconnect them with the built fabric by adopting a methodology set from the beginning on a multidisciplinary basis in order to face ex-ante, in an organic and effective way, the complex issues of the contemporary city without having to send third parties, or ex-post audits, actions that would be out of touch with the methodological context: a methodology capable of developing, therefore, a multidisciplinary strategic format on which to base urban retraining interventions within historic centers. In particular a methodology for a Due Diligence of the "urban voids" has been proposed. It is organised in datasheets in which different disciplinary fields work in a complementary way laying the scientific basis for the interventions of urban regeneration within the historic fabric of Valencia.

Types of Solares

We have seen how the formation of solares, albeit of various nature, results from the demolition or collapse of an existing building. Depending on the size and location of the demolished building, some types of voids can be identified.

In particular, we can outline six typed urban voids typologies, as follows:

-Enclosed. Interstitial free lot, with one front opened on the road

-Through. Interstitial free lot, with two fronts opened on the road

-Head. ree lot at the end of a building line (with one or two opened front roads)

-Angular. Corner free lot, with three fronts opened on the road

-Protruding. Interstitial free lot, with protruding fronts on a road

-Isolated. Isolated free lotto, with four fronts opened on the road.

In addition, there are a number of Aggregate voids that cross several blocks in which the above mentioned categories add to the presence of unstructured open spaces (i.e. never built or otherwise no longer building) that, by size and

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shape, acquire autonomy and a clearly legible identity within the urban fabric. As we shall see later, in fact, the size of solares, is often the result of mergers of several land parcels. It is then easy to assimilate the typological division of the individual lots into their groupings, treating them from now as a single project area composed of different parts. Although it is evident that each Solar has to be analyzed and studied individually, their subdivision into types appears to be extremely useful to provide the basis for a global solution of the phenomenon, the dimensions of which now escape the logic of the "case by case" requiring a common multidisciplinary methodology. An approach that, because of the large and complex nature of the phenomenon can become useful for an intervention strategy on degraded historical fabrics.

Due Diligence Solares

After a first phase of collection and reconnaissance of the data needed to develop the research, and after a detailed cataloguing of all solares belonging within the perimeter of Christian walls, it was decided to select number case studies. The decision on which examples to propose, among the more than a hundred voids found in the historic center, is based on typological and dimensional reasons. Four representative cases of the various types of solares have been then attempted.

Solar A
Location: C. Boatella, C. Valeriola, C. Eixarchs
Type: Head
Total surface area: 826.94 m2
Property: Private
Parcels number: 7
Sub-parcels number: 16
Current State: Abandon
Urban Qualification: (US) Urban Soil

Solar B
Location: C. Corregeria, C. Tapineria
Type: Angular
Total surface area: 160.38 m2
Property: Private
Parcels number: 4
Sub-parcels number: 6
Current State: Abandon
Urban Qualification: (US) Urban Soil

Solar C
Location: C. Cruz
Type: Aggregate
Total surface area: 2018.27 m2
Property: Private
Parcels number: 8
Sub-parcels number: 18
Current State: Partially occupied
Urban Qualification: (US) Urban Soil

Solar D
Location: C. N. Sra. de las Nieves, C. Montorne
Type: Through
Total surface area: 534.69 m2
Property: Private
Parcels number: 2
Sub-parcels number: 4
Current State: Car park
Urban Qualification: (US) Urban Soil

In all four cases analyzed, the surface of an entire solar, administratively, has more than one cadastral reference. This very often is one of the impediments to the rebuilding, since it is virtually impossible to build a property of any kind, on an area, often of a few square meters, divided among multiple owners. It is therefore necessary to gather them to reach the minimum required area of law, which in the case of Carmen (the neighborhood where the presence of the Solares is the largest) is 100 square meters with a street front of at least 6 ml. (Art. 50 PEPRI Carmen). However, it is granted to owners of buildings legally declared abandoned, to demolish and to reconstruct them, although the minimum requirements of the law are not met. In these specific cases, the holder of the property is required to apply for a building permit within two years. After this deadline, the property will be registered with the RMSER (Municipal Register of Solares and Buildings in Rehabilitation). The latter is where ownership of each property passes forcibly to the administration, which decides to entrust it to anyone presenting a project when the owner does not demonstrate the ability, or simply the will, to make other use. Also the owner

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of Solares, if he did not express intention to build in the short term, can ask spontaneously to be registered to RMSER having access to a possible compensation or owned shares of the new building constructed. The RMSER is thus the only tool available to the Public Administration to encourage the owners to rebuild, utilizing the eventual expropriation of the property or in the event of excessive parcelling, to consort and create a spontaneous urban regeneration intervention. If from a historical point of view the origins of these urban spaces are easily found, it is therefore in the legislative and economic spheres that lay the reasons why those voids have not been the subject of attention and speculation on the part of the owners, whether public or private.

From a legislative point of view:

There is a legal order in Spain concerning urban regulations, very complex and articulated on multiple levels of intervention ranging from the most general, national, to the individual intervention plans of the specific district. The main laws concerning the protection and preservation of cultural and architectural heritage at national level are: Law 16/1985 and Law 04/1998, which are developed and articulated in various local town-planning regulations. In the case of Valencia, reference is made to the ROGTU (Ordinance of Ordinance and Urban and Territorial Management) and goes even further into the PGOU (General Plan of Urban Ordination) that regulates the city's urban activity. In our specific case, having contained the field of analysis at Ciudad Vella, the PEPRI (Special Plans for Internal Reform Protection) provide us with the guidelines for the planning and design of any intervention, whether it be restructuring or conservation, falling within the Perimeter of the historic city. "Los solares deberán ser mantenidos limpios de vegetación y restos de inmundicias, vallados con cerramiento permanente de dos cincuenta metros de altura, de adecuada presencia, consistencia y resistencia, cercando la alineación oficial. Deberá propiciarse el adecuado tratamiento de la superficie del solar para evitar el riesgo de accidentes." (Art.3.58.1.d de las N.U. del PGOU).

From an economic point of view:

The word "void" expresses the potential of a container, apparently without content, waiting to be filled with new buildings or new activities. This urban void is the subject of a major economic interest: their use promises both savings with respect to the cost of abandonment, which would result in loss of property and maintenance. To better understand the underlying causes of the phenomenon (why the Solares are often abandoned) a brief market investigation has been conducted in order to know the price and to monitor the trading transitions. By simplifying, here are twelve selling cases:

	Ref.	**m²**	**Location**	**€**	**Building area**	**€/m²**
1	5827	61	El Mercat	270.000	240	4.426
2	E009-02125	418	Torres de Quart	1.150.000	1.739	2.751
3	0077-290532	488	Carmen	1.150.000	2.223	2.357
4	SU-105	450	Ciutat Vella	1.000.000	1.100	2.222
5	46-340-27	103	Carmen	330.000	300	3.204
6	VAL-5850	500	De La Seu	1.200.000	1.100	2.400
7	378	340	Carmen	950.000	753	2.794
8	Bolseria	61	El Mercat	260.000	240	4.262
9	Quart	75	Carmen	315.000	300	4.200
10	Eixarchs	55	El Mercat	250.000	320	4.545
11	Carme	103	Carmen	330.000	412	3.203
12	Xerea	350	La Xerea	990.000	990	2.828
Average		**250**		**682.917**		**3.266**

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The survey above shows how the average price of solares taken in the sample is about 3,000 €/m2, with a surface of 250 m2. This data shift the focus of the problem to the permanence of the latters on the legislative sphere, because, as a building plot in the heart of the historical center, the average market prices turn out to be quite accessible. If we also think of the new, high tourist flows that are now affecting the city of Valencia and the consequent growth of accommodation facilities, we might hope for the natural disappearance of the above mentioned voids if there were no major problems from the administrative point of view.

From an environmental point of view:

Are the solares an environmental problem? From a strictly energy-performative point of view we could argue no. Being "non-places", their more or less virtuous behaviour does not constitute in itself a problem. But as an integral part of a compact fabric such as that of the historic center of Valencia they are a serious problem, even from an environmental point of view. These are places of great environmental concern: excessive shadowing in winter seasons, excess sunshine in summer, Heat Island phenomenon generated by the non-permeable and highly degraded materials that often constitute them, excessive (Canyon effect) or insufficient ventilation and so on. Basically they are places characterized by a strong environmental dis-comfort which makes them unsuitable for urban living.

For this reason an environmental analysis of the solar (case by case) was necessary. Any intervention on the urban voids can not, in fact, be without solving its outdoor comfort conditions. The validation protocol adopted for Valencia has thus provided a reading of the state of facts through some fundamental climatic conditions such as temperature, humidity, rainfall, wind, solar radiation. These were added to the following: findings on the site morphology and the shape and porosity factors of the isolates, light analysis in relation to the altimetric profile of the involved sections and their albedo values, tracing of the solar axonometries on particular days considered "threshold period", from dawn to sunset, from which to obtain the map of shading of the whole solar year.

The phases of the analysis protocol can be summarized as follows:

• Analysis of urban morphology (heights and densities of the isolates)
• Analysis of luminous contributions and distribution of albedo values through the use of solar axonometries and three-dimensional diagrams of the isolate
• Climate and microclimate analysis of the area (medium temperature and wind profiles)
• Analysis of irradiation profiles and solar axonometries.

More precisely, we can talk about microclimate analysis that can be carried out through the effective survey of each void regarding:

• Analysis of thermal comfort,
• Analysis of radiant components
• Wind component analysis
• Visual comfort analysis.

In order to carry out this kind of investigation, specific climatic software has been used to obtain data such as: average temperatures, relative humidity, precipitation percentage, mean values and peak values on irradiation. These data led to the elaboration of solar mapping and shading paths and other thematic maps to determine which areas were most affected by direct sunlight, such as those affected by more shadow hours during the summer and winter seasons.

Similarly, the wind component analysis was performed by comparing the following parameters:

• Dimension of outdoor space
• Wind speed at 2 m high
• Height adjacent buildings
• Direction of the wind, amplitude and location of the open faces of urban solares-urban canyon.

Environmental data are thus some of the necessary tools (along with normative, economic and morphological) to solve the solar problem as a major urban theme.

From a morphological point of view:

The different localization of solares within the historical fabric is perhaps the best way

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to analyze the transformative potential of these voids. If, on the one hand, size, number of faces, soil regime, urban and regulatory requirements are necessary tools for any intervention within the single solares, on the other hand, they are not sufficient to assess the type of intervention that is desirable. It is only the different types of paths on which every single void insists on suggesting, with good approximation, the function (residential, commercial, services, tertiary, etc.) attributable to them, the form and the choice of how to build (if wholly or partially) the solar. It is, in other words, the degree and the level of nodality of each void to indicate its potential function, it is the morphology of the tissue, together with the environmental analysis (conducted on a case-by-case) to suggest the new building form, it is the union of these two elements to define, in the final analysis, the new tissue: the new open spaces (public/private), new paths, heights of buildings etc. Thus, for example, a solar insisting on a Matrix path or a solar linking two Matrix paths or a Matrix path and a Building path will be likely to assume a special non-residential function. If then it is equipped with a sufficient size to allow it, it will in turn be able to accommodate a connection path between two roads. If the shape of the fabric so requires, it may involve the presence of a public (squares) or private space (courts, gardens) to be alternated in the construction and so on. All this, together with specific (regulatory and urban) constraints, allows to develop possible alternative intervention strategies. Strategies that are sufficiently dynamic to adapt to individual case studies but at the same time methodologically coordinated, so as to offer a credible and enforceable solution to the solares problem in the historic center of Valencia and, we believe, of any other historical city that can be assimilated to it.

Conclusion

A multidisciplinary approach to the study and project of the city is now needful, especially when it comes to dealing with issues relating to soil consumption, density, compactness and stratification of the historic city. The case of the solares of the historic center of Valencia was thus the starting point for developing a strategic intervention format in which the urban morphology acted as a scientific base to different disciplines. Thus, it was possible to define a first Due Diligence of urban voids where urban planning requirements, regulatory constraints, socio-economic data, and environmental analysis could be transformed into elements of the same puzzle able to define the context conditions characterizing the urban solares topic. Each of them, obviously, has features of its own that require a specific solution, but within a general format capable of solving the problem of solares on an urban scale, capable in other words of seizing the potentialities (not only the critical aspects) of a phenomenon that for the time dimension and diffusion into the fabric now plays a central role in the redevelopment and regeneration of the city of Valencia.

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Appendix

	Parcel	Parcel Number	Total surface area (m²)	Sub-parcels area (m²)		Cadastral Ref.
	A1	3	210.59	1	176.27	5429813
				2	3.58	
				3	30.74	
	A2	2	46.67	1	26.45	5429807
				2	20.23	
	A3	2	213.32	1	54.24	5429808
				2	159.08	
	A4	3	85.03	1	25.00	5429809
				2	41.21	
				3	18.82	
	A5	2	60.57	1	40.50	5429812
				2	20.07	
	A6	2	75.09	1	49.66	5429811
				2	25.43	
	A7	2	135.67	1	43.83	5429810
				2	91.83	
TOT.	**7**	**16**	**826.94**			

	Parcel	Parcel Number	Total surface area (m²)	Sub-parcels area (m²)		Cadastral Ref.
	B1	1	32.48	32.48		5729503
	B2	1	37.60	37.60		5729504
	B3	2	213.32	1	53.91	5429808
				2	5.97	
	B4	2	85.03	1	20.26	5729506
				2	10.15	
TOT.	**4**	**6**	**160.38**			

Figure 1a.
List of Solares. A and B

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	Parcel	Parcel Number	Total surface area (m^2)	Sub-parcels area (m^2)		Cadastral Ref.
	C1	2	429.98	1	203.66	5633917
				2	226.32	
	C2	3	773.49	1	550.44	5633908
				2	189.06	
				3	33.99	
	C3	2	163.21	1	127.05	563320
				2	36.16	
	C4	2	153.78	1	119.41	5633921
				2	34.37	
	C5	2	10.11	1	15.08	5633903
				2	94.02	
	C6	3	92.17	1	1.45	5633904
				2	78.05	
				3	12.68	
	C7	2	112.98	1	83.10	5633905
				2	39.88	
	C8	2	183.65	1	35.78	5632305
				2	147.87	
TOT.	**8**	**18**	**2018.27**			

	Parcel	Parcel Number	Total surface area (m^2)	Sub-parcels area (m^2)		Cadastral Ref.
	D1	2	122.84	1	117.67	6228107
				2	5.17	
	D2	2	411.85	1	397.29	6228106
				2	14.56	
TOT.	**2**	**4**	**534.69**			

Figure 1b.
List of Solares. C and D

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Location-based density and differentiation – adding attraction variables to Space Syntax

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Abstract. *The central variables in any urban model are distance and attraction (Wilson 2000). Space Syntax research has contributed to the development of new geometric descriptions and measures of distance that have proven successful when it comes to capturing pedestrian movement. However, the description and measurement of attractions has not been central to the field. An important exception is the development of Place Syntax analysis, which concerns new methodologies and software that opens for analysis not only of different kinds of accessibilities in the street network in itself, but also analysis of the accessibility within the network to different forms of attractions, for instance, residents or retail (Ståhle et al 2005). Place Syntax analysis is a generic form of analysis, why we may choose to analyse the accessibility to particular socio-economic attractions, but we may also conceive of a model of 'pure' spatial form – a kind of architectural model of the city. For instance, Place Syntax analysis has been applied in different kinds of density analysis, transforming density measures from area-based measures to location-based measures (Ståhle et al 2005). In this paper, we extend such spatial attraction to not only include the variable of density but also diversity and present results from an extensive empirical study including four European cities, paving the way towards a more complete architectural model of the city including both the analysis of distance and attractions.*

Keywords: Accessibility, density, differentiation, attraction, configuration

Introduction: the need for an architectural model of the city

We will in the following present progress towards what we call an architectural model of the city. The fundamental concern for any investigation of such an entity is the relation between humans and the environment, where the proposed model departs from regular conceptions in two fundamental ways. First, the environment is here not understood as something given but as something created by humans. This implies that the environment is possible to shape according to different ideological principles. Second, the built environment is not conceived of as an entity detached from humans and their activities, why urban space is conceived as an entity structured and shaped in relation to both the human body and human perception and cognition. The latter is supported by psychologist James Gibson's theory of affordances (1977, 1979), where affordances constitute what emerges in the interface between human abilities and physical properties of the environment.

The paper is structured as follows. First,

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the proposed model will be described as fundamentally constituted in accordance with the traditional gravity model, that is, the variables of distance and attractions (Wilson 2000), albeit, distance measures will be drawn from space syntax and attraction measures from space syntax derived research using place syntax analysis (Ståhle et al. 2005). Second, such distance measures will be discussed in relation to the theory of affordances (Gibson 1986). Third, attractions will be defined as variables of spatial form that condition both density and differentiation of human activity. Thereafter, these variables will be tested and evaluated against socio-economic data in Stockholm. In the final section, conclusions will briefly be drawn and next steps suggested.

Urban models: distance, attraction and representation

The central variables in any urban model are distance and attraction (Wilson 2000). Space syntax research has contributed to the development of new geometric descriptions and measures of distance that have proven most successful, not least when it comes to capturing pedestrian movement (Hillier & Iida 2005). However, the description and measurement of attractions has not been central to the field. An important exception is the development of Place Syntax analysis (Ståhle et al. 2005), which concerns new methodology including software that open for analysis not only of different kinds of accessibilities in the street network in itself, but also analysis of the accessibility through the street network to different forms of attractions, for instance, residences or retail (Ståhle et al 2008).

Hence, by an urban model we here mean a model of urban space based on physical and cognitive affordances for humans (Marcus 2015; Marcus et al. 2016). The benefit of such a model is that it allows us to better understand the interaction between spatial form and human activity, which is the primary driver in most urban systems. In extension, this opens up for the practices of urban planning and design to reshape the conditions for human activity and thereby redirect this into new trajectories. Importantly, this opens for intervention also in more aggregated urban systems of human activity, such as social cohesion and local markets. In principle, it also opens for intervention in urban ecosystems (Marcus, et al. 2013).

As a generic point of departure for our endeavour to construct such a model, we have chosen the classic gravity model since it, however out-dated in many respects, extricates the essential variables for any model of cities. Hence, according to Alan Wilson the gravity model identifies three necessary components for an urban model, that is: means to measure distance, means to measure attraction, and a form of representation (Wilson 2000).

Modelling cities: choosing geometric representation

Concerning representation, we support our model on network analysis (Newman 2010), which increasingly is applied in urban modelling (Batty 2013). More specifically, we will build on the kind of description and analysis developed in space syntax research (Hillier 1996). We interpret this approach as architectural in the sense that it conceives of urban space as distinctly structured and shaped by architectural components of built form, such as buildings, landscaping, and in some respects, traffic infrastructure. This approach differs essentially from regular geographic models of cities. First, it explicitly aims to model urban space as structured by built form and nothing else; that is, it importantly does not include any socio-economic or behavioural data. Second, these model does not reflect time in the sense that they change in themselves over time, which may be another reason to call it architectural.

However, this does not necessarily imply that space syntax models should be conceived as static representations of urban structure; rather we should pay attention to how the architectural origin of the models, emphasising spatial configuration structured by built form, bring back both process and behaviour to the models, at least to some degree.

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First, network models, generally speaking, already imply process, since their very essence concerns relations between entities and nothing else (Newman 2010). Relations here typically imply some kind of interaction between entities, usually expressed as flows (Batty 2013). Hence, while not being dynamic in a regular sense, where the structure of the model in itself changes over time, we see that processes may still be written into the model by the fact that what it in the end represents is relations.

Second, the particular version of network models developed in space syntax are grounded in representation based in the human affordances of accessibility and visibility, why they concern the basic conditions under which humans perceive, cognise and act in the environment. This means that what is represented in these models neither is spatial form or human activity but the physical and cognitive affordances that appear in the meeting between the two (Marcus 2015), why we may argue that human behaviour, in a sense, is written into the model.

In the for space syntax emblematic form of representation the axial map, and its many derivations (Stavroulaki et al. 2017), urban space is defined by built form, in the manner discussed above, and broken up into spatial units defined by human visibility and accessibility, represented as straight lines (axial lines). Hence, in analysis, urban areas are represented as the least amount of axial lines covering all accessible space defined by built form. Moreover, network representations in space syntax are peculiar in that they treat 'streets' as nodes and 'street junctions' as links, whereas this normally is treated the other way around, again putting human perception first.
This form of representation, finds strong support in certain strands of psychology, especially in the particular direction taken by James Gibson: an ecological approach to visual perception (Gibson 1979). Gibson supports the idea that humans perceive the environment as a spatial continuum defined by physical form, whether natural or man-made, conditioned by humans' particular faculties of perception. Moreover, he makes the argument that humans typically perceive while moving through the environment, why human cognition and action not only is informed by what is perceived in the present, but also by our memories of places earlier experienced.

Modelling distance: universal distance or centrality

This brings us to the issue of measuring distance in a network model defined in this fashion. Hillier maintains, in accordance with the idea of human affordances, that we interact with space in cities both through our bodies and through our minds and argues that: "in bodily terms the city exist for us as a system of metric distances" (Hillier 2009), while our minds interact with the city through seeing, that is: "as a system of visual distances" (Hillier 2009). The argument for the axial line as a metric of distance can then be made: If we make a straight line crooked "we do not add significantly to the energy effort required to move along it, but we do add greatly to the informational effort required" (Hillier 2003).
Hillier next argues that: "we also need to reflect on the fact that cities are also collective artefacts […] The critical spatial properties of cities are not then just the relation of one part to another, but of all parts to all others […] We need a concept of distance which reflects this" (Hillier 2009:4). Hillier proposes the notion of universal distance as opposed to specific distance, where the latter concerns distance between an origin A and a destination B, while the first concerns the distance from all possible origins to all possible destinations in a spatial system. This distance measure is in spatial analysis more generally known as centrality.
Taken together this means that distance is measured as the mean distance from each node to each other node in the system, where these nodes in our case are geometrically represented as axial lines, which thereby also become a distance unit. In regular network analysis, there are two primary measures of centrality; on the one hand closeness centrality, which measures the mean distance from each node to each other node in the system and, on the other hand, betweenness centrality, which measures how often a particular node is part of routes between all nodes in the system.

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The conception of distance developed in space syntax proves most powerful when tested empirically. Extensive tests in space syntax research, demonstrate how distance measured topologically as amount of changes in direction, or geometrically as amount of angular deviation, both performs considerably better when it comes to predicting human movement behaviour than traditional metric measures of distance (Hillier & Iida 2005). Similarly, it has been shown over a broad range of thematic studies, including the perception of safety, the distribution of retail and the use of urban green spaces, how human movement is an essential 'intermediate system' in explaining the influence of spatial form on such phenomena.

Modelling attractions: accessible density and differentiation

Next, we address the issue of attractions, where we first stress the need to define attractions as an aspect of spatial form rather than as particular functions or amenities (people and things) located in space. We identify two fundamental variables of spatial form originating in the practices of architecture and urban design, first, the densification of space through the addition of floor space, whereby more 'people and things' can be stacked in the same location; second, the differentiation of space by the addition of walls and other forms of boundaries, whereby more categorical differences in 'people and things' can be delimited. In short densification adds space and differentiation divides space (Cf. Bobkova et al. 2017).

For these dimensions of spatial form, we have chosen not to add new geometric descriptions but rather add values for both densification and differentiation as attributes to the already existent nodes in the network model. This has the advantage of providing the possibility to, apart from distance, also measure densification and differentiation as variables defined by human affordances, since what in effect is measured odel, is the accessibility from particular locations through space to variables of density and differentiation, rather than measures of these variables as located in space as a local attribute to that particular location (Cf. Koch 2007).

More particularly, our measure of densification concerns the entity of built floor space, but not as conventionally measured, that is, as amount of floor space per area of land, but as amount of floor space accessible 'through the street network' within a certain radius and then divided by the amount of plot area accessible in the same manner and within the same radius (Berghauser Pont & Marcus 2014). Importantly, distance is here measured in the manner developed in space syntax discussed in the previous section. This adds up to a measure of human accessibility to floor space within a certain radius from a particular location. Obviously, what we are after is not floor space as such but the ability of built form to increase the number of people and things that are accessible from a particular location. This accords with the aim to capture the spatial potential of locations, rather than the specific and momentary situation at a location.

In a similar manner, differentiation concerns the concrete entity of built walls, and other boundaries that define discrete spaces. However, in an urban context this entity multiplies to a degree that soon becomes unintelligible – there simply are too many physically defined spaces in a city if we include the interiors of buildings – why we need to look for a more generic definition. We have identified this to be what in different contexts is called the plot, lot or parcel, that is, the spatial unit defined by land division, equally present in agricultural as in urban landscapes (Cf. Marcus 2000, 2001, 2005; Bobkova et al. 2017). Technically, the variable of differentiation is measured similar to densification, that is, as the number of plots accessible through 'the street network', where distance, again, is measured according to space syntax methodology. The two measures of densification and differentiation are then combined to constitute a variable of attraction, designated as attributes of each node in our network model.

Together, we argue, this constitute, a robust model of the city that at bottom is quite sophisticated, in that it embodies several original shifts from regular urban modelling, while keeping within a set of quite simple but established representations and variables.

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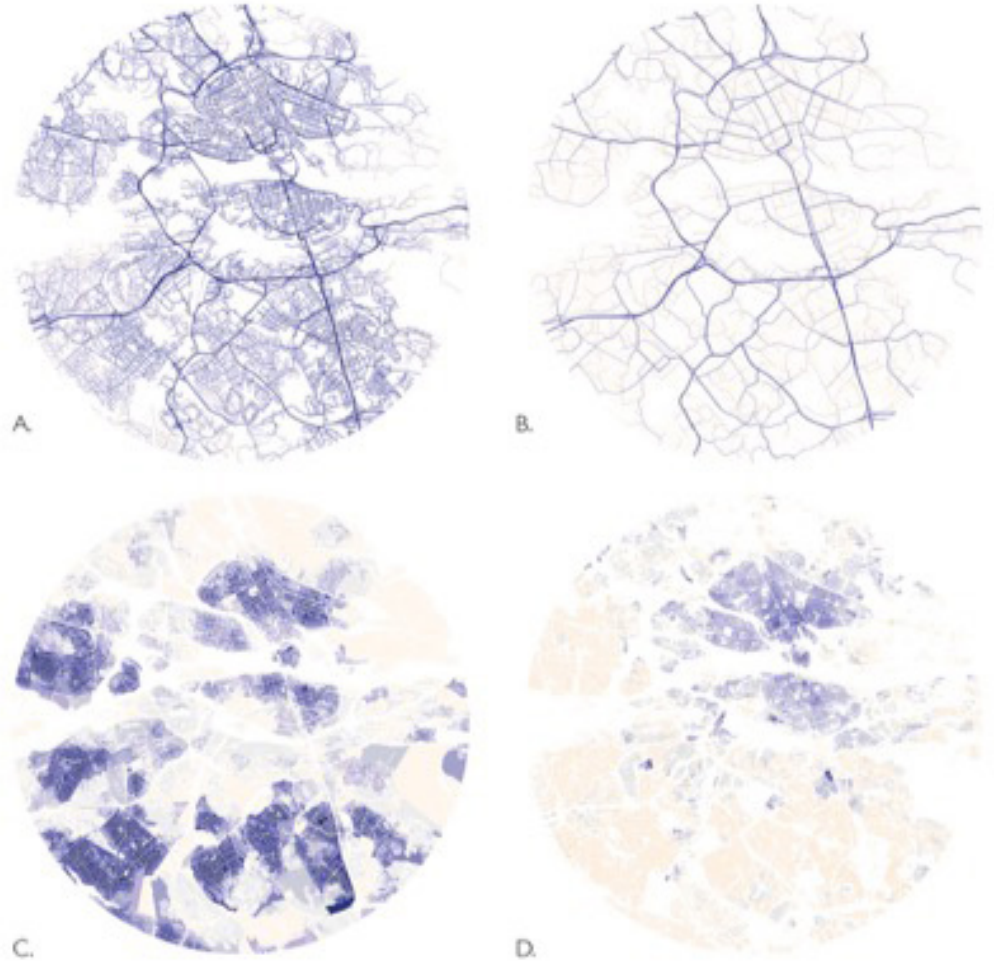

Figure 1. Spatial variables of the model. A. Distance measured as Closeness centrality by angular deviation within a radius of 10 km. B. Distance measured as Betweenness centrality as number of shortest paths that pass through within a radius of 10 km. C. Attraction measured as Accessible number of plots within 500m walking distance. D. Attraction measured as accessible FSI (building density) within 500m walking distance.

Empirical testing: modelling attraction in Stockholm

In this section, we will test these measures of the variables distance, densification and differentiation proposed here by correlating them with socio-economic data. We will run through them individually, first, for the whole central area of Stockholm and, second, for two typo-morphologically distinct areas constituted by, on the one hand, two sections of the inner city and, on the other hand, two villa areas.1 We start with a straight-line correlation of distance and flows typical for space syntax research, where distance is measured as closeness centrality and betweenness centrality in the street network, based on typical representations for space syntax, that is, for closeness, as angular deviation between street segments, and for betweenness as number of shortest paths. These variables are correlated with average daily vehicular flows. We find substantial and significant correlations with both variables and at all radii, why we conclude that we are able to repeat the correlations often found in space syntax research. We may also note that the

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Correlations		
Betweeness centrality Motorized Network		**Average Daily Flow_**
R2km	Correlation coefficient	.457**
	Sig. (2-tailed)	.000
	N	145902
R5km	Correlation coefficient	.581**
	Sig. (2-tailed)	.000
	N	145902
R10km	Correlation coefficient	.653**
	Sig. (2-tailed)	.000
	N	145902
R30km	Correlation coefficient	.734**
	Sig. (2-tailed)	.000
	N	145902
**. Correlation is significant at the 0.01 level (2-tailed).		

Correlations		
Closeness centrality Motorized Network		**Average Daily Flow_log(x+2)**
R2km	Pearson Correlation	.455**
	Sig. (2-tailed)	.000
	N	145902
R5km	Pearson Correlation	.707**
	Sig. (2-tailed)	.000
	N	145902
R10km	Pearson Correlation	.748**
	Sig. (2-tailed)	.000
	N	145902
R30km	Pearson Correlation	.730**
	Sig. (2-tailed)	.000
	N	145902
**. Correlation is significant at the 0.01 level (2-tailed).		

Table 1. Correlations of Betweenness centrality and Closeness centrality with Average daily vehicular flows at the radii 2 km, 5, km, 10 km and 20 km.[2,3]

correlations increase for both variables with greater radii, which makes sense, given that we here correlate with vehicular flows.

Next, we correlate our attraction measures, accessible number of plots and accessible FSI with socio-economic variables: number of residential population, number of ground-floor activities and diversity of ground-floor activities, all measured as location-based measures, that is, measured as accessibility through the street network within a set radius, which in our case is 500 m for all measures. We also include the earlier distance measures as comparison. We here see how accessible FSI correlates strongly and significantly with all the socio-economic variables, especially with both number of ground-floor activity and diversity of ground-floor activity. Accessible plots, however, correlate much weaker, but show a significant correlation with number of residential population and to some degree diversity of ground-floor activity.

We may here conclude that the attraction measure for densification, accessible FSI, proves to correlate very strongly not only to amount of 'people and things' in the form of residential population and ground-floor activity, but also diversity of ground-floor activity, while the attraction measure for differentiation, accessible plots, only weakly correlates with diversity of 'people and things', and actually correlates better with amount of 'people and things', at least in the form of residential population. We may here suspect that amount of 'people and things' to a great degree co-varies with diversity of 'people and things', since a greater number of things is also more likely to contain a greater diversity of things, why we next move to a regression analysis to separate the impact of the different variables. First, however, we may also note that the attraction measure, accessible FSI, correlates better than any of the distance measures.

In our regression model, we are able to identify the relative significance for each measure in relation to the three different socio-economic variables. Starting with residential population we see that the complete model here has the weakest explanatory power of the three, while at the same time being highly significant at 0.42. More importantly, we see that accessible FSI has the highest significance for the model of our measures at 0.44 and that Accessible plots is not so far behind at

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		Accessible Res.Population_500m _Log(x+2)	Accessible Activities_500m _Log(x+2)	Accessible Diversity of Activities_500_ Log(x+2)
Closeness centrality (Motorized Network r10km)	Pearson Correlation	.456**	.592**	.450**
	Sig. (2-tailed)	.000	.000	.000
	N	286860	286860	286860
Closeness centrality (NonMotorized Network r3km)	Pearson Correlation	.336**	.476**	.522**
	Sig. (2-tailed)	.000	.000	.000
	N	286860	286860	286860
Betweenness centrality (Motorized Network r1km) _Log(x+2)	Pearson Correlation	.194**	.183**	.131**
	Sig. (2-tailed)	.000	.000	.000
	N	286860	286860	286860
Betweenness centrality (NonMotorized Network r1km) _Log(x+2)	Pearson Correlation	.186**	.127**	.096**
	Sig. (2-tailed)	.000	.000	.000
	N	286860	286860	286860
Accessible No of Plots _500m_Log(x+2)	Pearson Correlation	.291**	-0,053	.041**
	Sig. (2-tailed)	.000	.000	.000
	N	286860	286860	286860
Accessible FSI _500_Log(x+2)	Pearson Correlation	.500**	.822**	.754**
	Sig. (2-tailed)	.000	.000	.000
	N	286860	286860	286860

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2. Correlations to Residential Population, Accessible Ground-floor Activities, Accessible Diversity of Ground-floor Activities[4,5]

0.33, while the distance measures have less significance. When it comes to amount of ground floor activity, our model proves very powerful, explaining 75% of the dependent variable. Among the measures accessible FSI clearly stand out as the strongest at 0.72, while the second strongest is closeness centrality at 0.20, while the others are very low. Finally, also our model for diversity of ground floor activity proves powerful at 0.63, where, the relative significance of the different measures closely reflects the model for amount of ground-floor activity, and again accessible FSI proves the most significant measure.

We may conclude that the earlier finding that the attraction measure for densification, accessible FSI, proves to have great explanatory power for both amount and diversity of 'people and things', as measured here, is confirmed, but also that it stands out among our different variables, also confirming the earlier conclusion that accessibility to number of people and things also implies accessibility to diversity of people and things. However, we

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a)Accessible Residential Population

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.645[a]	**.416**	.416	1.00571940577728	1.508

Rank		BETA value ('relative significance')
4	Betweenness r1km	0,049
3	Closeness r10km	0,195
2	Accessible No of Plots_r500m	0,329
1	**Accessible FSI_r500m***	**0,444**

b)Accessible Ground-floor Activities

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.852[a]	**.725**	.725	.53309264367816	1.591

Rank		BETA value ('relative significance')
4	Accessible No of Plots_r500m	0,015
3	Betweenness r1km	0,085
2	Closeness r10km	0,203
1	**Accessible FSI_r500m***	**0,718**

c)Accessible Diversity of Ground-floor Activities

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.795[a]	**.631**	.631	.01359468771832	1.752

Rank		BETA value ('relative significance')
4	Betweenness r1km	0,022
3	Accessible No of Plots_r500m	0,064
2	Closenesss (Non- Motorized, r3km)	0,231
1	**Accessible FSI_r500m**	**0,670**

Table 3. Regression models for all Stockholm. Independent variables: Closeness centrality, Betweenness centrality, Accessible number of plots, Accessible FSI. Dependent variables: Accessible residential population, Accessible ground-floor activity, Accessible diversity of ground-floor activities.

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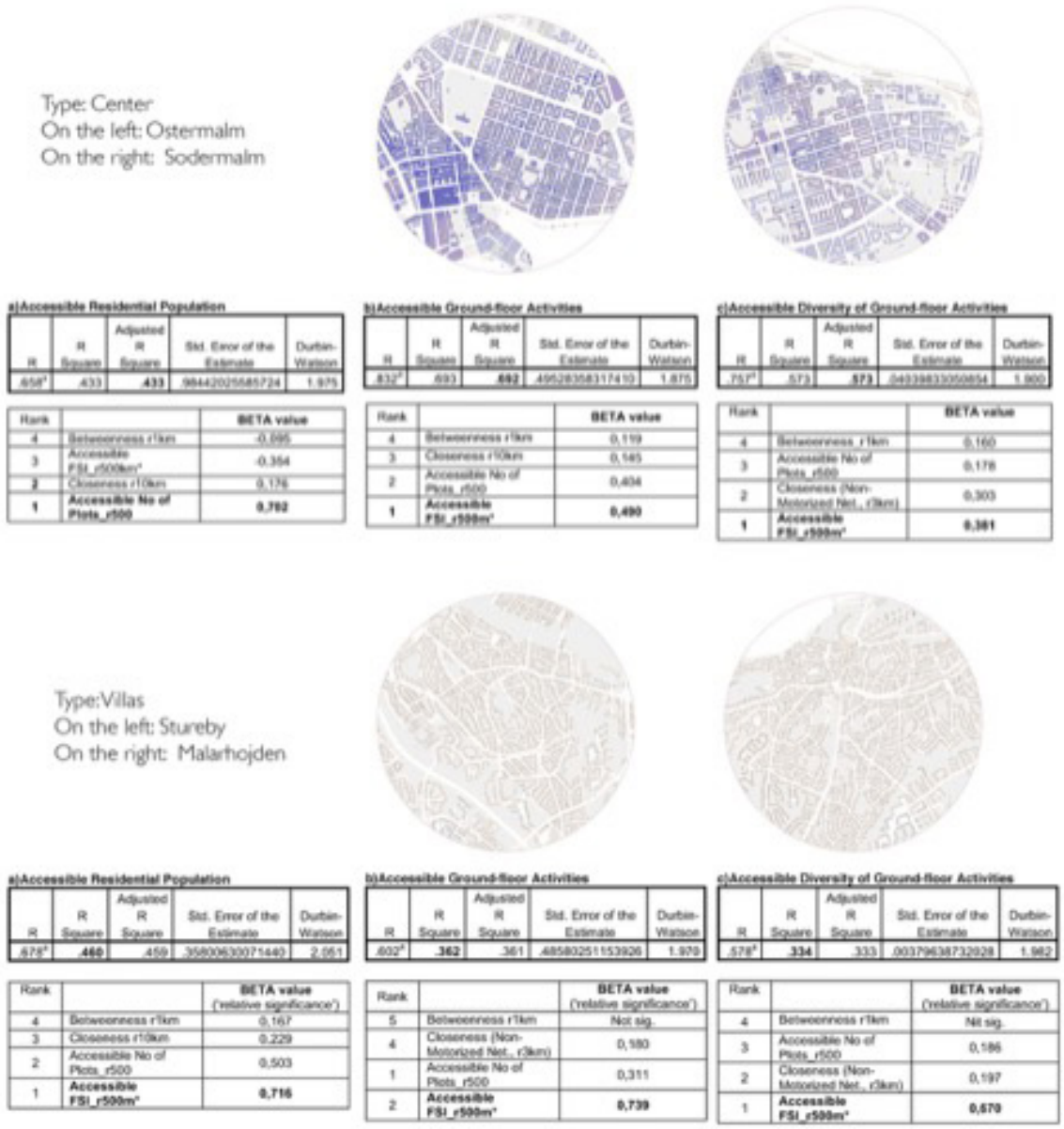

Table 4. Regression models for Type: City centre and Type: Villa areas.

may now suspect that this may vary depending on types of urban areas, why we now move on to a regression model of two distinct urban types.

In the regression model of two urban types, inner city and villa areas, we see that all three models of socio-economic diversity have medium to strong explanatory power, varying between 0.43 and 0.69. Interestingly, for residential population the variable accessibility to plots proves most significant and for amount of ground-floor activity it is second best, almost as strong as the strongest variable, accessible FSI. For diversity of ground-floor activity it is only third, but still fairly strong. Hence, for this particular type of urban area, we may conclude that accessible plots seem to be significant, even though being weakest where we imagined it to be strongest. Even so, this asks for further research.

For the villa areas, we are back to accessible FSI as the most significant variable, however, again accessible plots also prove consistently strong also here. This confirms again the strength of accessible FSI, but also that accessible plots may prove a fruitful measure.

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For both types, we also find that the distance measures have the lowest significance in explaining the socio-economic variables.

Conclusion: towards an architectural model of the city

While these results are preliminary and any conclusions drawn by necessity will be premature, we believe to have found intriguing indications that a typical space syntax model, focusing on the centrality of the street network, may be augmented into a richer model of the spatial form of cities by adding attraction variables of the kind proposed here. However, at this stage it is only accessible FSI that proves truly convincing, while accessible plots need further investigation. Of particular importance for the latter, we suggest, is a more nuanced categorisation of socio-economic diversity.

Notes

[1] The software used was IBM SPSS. All variables not normally distributed are normalised using Ln(x+2). The variables included in the regression models were chosen after collinearity tests. The radii for network variables were chosen among 30 different radii for each variable, based on their correlation to the dependent variables.

[2]Motorized network includes roads which are accessible to vehicles, while pedestrian streets, alleys, paths, bicycle lanes etc. not are included. Non-motorized network includes all streets and paths accessible for people walking or cycling, including those that are shared with vehicles. All streets where walking or cycling is forbidden, such as motorways, highways, or high-speed tunnels, are not included.

[3] Source traffic flow data: The official road authority of Sweden (Trafikverket) (downloaded from lastkajen.trafikverket.se, 15-03-2017). The datasets include vehicular traffic for selected road segments in values of average daily flows. What is counted is the number of vehicles per year for each section measured (road segment) and it is based on 2 to 6 measurements per weekday and weekend in a randomly chosen point within the section. The flow can also be an estimated value. For every road included in the Traffic flow dataset, we calculated the average value of the closeness and betweenness centrality of its road segments.

[4] Besides accessible FSI (Floor space index), also accessible GSI (Ground Space index), accessible footprint and accessible gross floor area were correlated to Accessible Population and Activities. While they all correlated, accessible FSI exhibited the highest results.

[5] Source Population data: SCB (Statistiska centralbyrån) downloaded from geodata.se, 13-02-2017. Source of Building use/activities: Open Street Maps, downloaded from geobabrik.de, 20-02-2017. The software used for calculating Network and Attraction measures is PST (Place Syntax Tool). Download at: smog.chalmers.se/pst.

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Quantitative methods of urban morphology in urban design and environmental psychology

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Abstract. *Urban morphology investigates the physical form of the city and the historical processes behind its formation. Together with the qualitative analysis, the founding fathers of urban morphology also proposed quantitative measures of urban form. Urban morphologists have traditionally resisted computer-based geoprocessing of urban form and their calculations were mainly carried out manually. Thanks to technological developments, the number of quantitative studies in urban morphology has increased and fully integrated geoprocessing. More sophisticated computer-aided analyses enhance the potential applications in urban design and in environmental psychology research. Space Syntax (Hillier 1998) and Multiple Centrality Assessment (Porta et al. 2006) are configurational, multi-scale approaches to the analysis of the urban street networks, but miss the interplay between streets, building and parcels composing urban fabric. Space Matrix (Berghauser Pont and Haupt 2010) and, more recently, Multiple Fabric Assessment (Araldi and Fusco 2017) are geoprocessing quantitative approaches to the analysis of urban fabric morphology. This study has two aims; (1) classify quantitative urban morphology methods and (2) discuss how these methods could be applied in urban design and environmental psychology. First, we will present the evolution of these methods along with the theories in urban morphology from qualitative to quantitative approaches. Then, we will discuss how these methods could be combined and used in two related areas: urban design and environmental psychology.*

Keywords: Urban morphology, quantitative methods, geoprocessing, urban design, environmental psychology.

Introduction

Urban morphologists are rooted from diverse disciplines such as geography, architecture, urban planning, history and sociology. As "urban morphology" helps to understand the creation and the transformation of urban form, it is particularly important for urban design. At the same time, humans are the primary agency of cities and settlements; their perception, cognition, behaviour and preferences have a direct relationship with urban form. Environmental psychologists have been studying the interrelation between "urban form" and "human perception, cognition, behaviour and preferences" since 1960s. Given that, various measures of "urban form" were used vastly in research and practices of urban design and environmental psychology. However, urban morphology is experiencing important developments thanks to the implementation of new geoprocessing approaches to the quantitative analysis of urban form. The use of these new urban morphology quantitative approaches are comparatively minor in urban design and especially in environmental psychology. Discussing how

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quantitative and geoprocessing-based urban morphology could be integrated in urban design and environmental psychology research and practice is the main concern of this study. To pave the way, this study first presents the evolution of urban morphology theories and approaches form qualitative to quantitative methods in terms of their goals, morphological objects and scales. In the second part, it discusses how urban morphology methods can be utilized in urban design and environmental psychology research and practice.

Urban morphology: from quantitative methods to geoprocessing

The origin of urban morphology can be traced back to the works of German urban geographers of the late XIX and the early XX century. The works by Fritz, Schlüter, Ratzel and later Hassinger, Geisler, Bobek and Louis laid the foundations of an accurate historical and geographical analysis of urban forms of the European cities, taking into consideration street layouts, building styles and arrangements, function locations and centralities (Hofmeister, 2004). New thematic maps were proposed where colours and symbols represented the main characteristics of the form elements, allowing for the first time a basic quantification of morphological characteristics over the geographic space.

The classical urban morphology schools after WW2 in Britain, Italy and France developed new original concepts in the study of urban form. For example, Conzen (1960) further developed Herbert Louis' concept of urban fringe-belt and analysed the town plan based on three different components of the plan: streets and their arrangements in a street system, plots and their aggregation in street blocks and building arrangements within the street blocks. Conzen also proposed the concept of "morphological region" which can be defined as a clearly recognizable area within the urban space relying on qualitative measures (such as the expert's interpretation of dimensions of parcels and buildings, connections of the streets). Later, Whitehand (2009), as well as Larkham and Morton (2011) highlighted the need of more clarity in the identification and delimitation of morphological regions.

In Italy, Muratori (1959) and later Caniggia and Maffei (1979) also developed new concepts like the building type and the urban tissue which needed careful measurements of building characteristics and aggregation of buildings within plots and street networks in order to be identified and characterized. But both the British and the Italian school remained relatively qualitative in their use of the measured features of urban form.

Although urban morphology in its early stage did not feel the need to engage in the algorithms of spatial analysis, the endeavour of the French school of urban morphology gives rise to the systematization of quantitative measurements of urban forms. Yet, quantitative urban geographers (like Haggett et al., 1977) were more interested in questions of land use and location of urban functions than on the analysis of urban form at the fine grain of urban fabrics. It is no surprise that detailed measurements were often carried out on limited case studies (paradigmatic examples of urban fabrics, small towns, city-centres). The Versailles school (for example Castex et al., 1980), and even more the Parisian school (Borie et al., 2006) proposed a systematic way to qualify and quantify spatial relations among form elements. Buildings, plots and streets are thus characterized by dimensional, geometrical (i.e. angular) and topological relations that define an urban fabric much more than building styles and functional occupation. Site characteristics (topography, hydrography) and their relations to urban fabrics can also be analysed, as already shown by the German forerunners of urban morphology. Such analytical approaches can be applied via the manuals developed by Borie and Denieul (1984) and Allain (2004).
Quantitative approaches developed between 60s and 80s relied heavily on manual measurement and interpretation of calculus. The only remarkable exception in this overall picture was the research carried out at the Centre for the Land Use and Build Form Studies (LUBFS) at the University of Cambridge. Martin et al. (1972) first introduced the use of computer-aided mathematical models to analyse the morphological characteristics of the built

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environment. Kruger (1977) and Steadman (1983) also introduced the use of graph theory to analyse and characterize both urban fabrics and three-dimensional buildings. For the first time, quantitative approaches in urban morphology became geoprocessing methods that were being developed by spatial analysis. From this moment on, we can distinguish two broad directions of research within quantitative urban morphology: (1) configurational analysis and (2) geoprocessing and spatial analysis (often within GIS environments).

The common goal of configurational analysis is to quantify the capacity of network configuration (street segments, visual axes, etc.) to structure movement and encounter patterns within urban space. The analysis is based on the calculus of spatial properties of form elements that derive from the spatial relations that they establish with all other form elements within the urban space (or within a shorter radius of analysis). Hillier and Hanson (1984) and Hillier (1998) develop a coherent theoretical framework and several methodological approaches to configurational analysis called Space Syntax. The object of the analysis is the urban grid, made up of all open public spaces available for pedestrian movement in the city. The urban grid can be conceived either as a network of interlinked visual axis or as a network of adjacent convex spaces. Once these networks are modelled as graphs, graph-theoretical algorithms can quantify the configurational properties of each network element. More particularly, axial analyses use a dual graph of the axial network, where axes are represented by nodes and intersections by arcs.

Developing on Freeman's structural sociology (Freeman, 1979) and on the traditional graph representation of street networks proposed by transportation models, Multiple Centrality Assessment (Porta et al., 2006a) uses a primal graph of the street network to analyse configurational properties of street segments within urban space. By introducing buildings served by the network, Urban Network Analysis (Sevtsuk and Mekonnen, 2012) adds the influence of the building fabric in producing potential movement on the street network. Besides Axial Space Syntax and Multiple Centrality Assessment; Angular Analysis (Turner, 2000), Continuity Analysis (Figueiredo and Amorim, 2005), Intersection Continuity Negotiation (Porta et al., 2006b), Mark Point Parameter Analysis (Cutini et al., 2004), etc. also aim at quantifying the properties of network configuration. Fusco and Tirico (2016) offer a systematic overview of the configurational approaches.

In brief, configurational analysis has profoundly renewed quantitative approaches to urban form, departing considerably from the analysis of urban fabrics proposed by the schools of urban morphology. In so doing, it focused on the network component of the morphological system and on the potential flows and interaction patterns that they allow.
In another direction, the development of GIS platforms and of spatial analysis algorithms has also allowed the geoprocessing of urban fabric analysis. Here, the spatial relations between contiguous, directly connected, closely related elements prevail over the configurational calculus of relations established between all form elements. Using this approach, Urhahn and Bobic (1994) categorized the city neighbourhoods based on a quantitative and qualitative description of buildings, land-use, mobility infrastructure, etc.

Other authors use quantitative analyses to better explore the descriptive dimensions of selected components of the urban fabric. Marshall (2005) define street typologies and street fabric typologies via new quantitative descriptors of the spatial assembling and complexity of streets. Berghauser-Pont and Haupt (2010) identify typo-morphologies of urban blocks in contemporary cities by cross-analysing different dimensions of urban density (built intensity, compactness, open space ratio and building height) in street blocks. Fusco (2016) uses Bayesian clustering in order to identify administrative units sharing a same subset of common features of urban form (including some key configurational parameters) and functions. Frankhauser (1994) and Thomas et al. (2007) use fractal analysis to investigate the distribution of built up elements in urban form.

As several authors have already pointed out, the precise objectives of the analysis of urban

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form inevitably influence the selection of descriptors of urban fabric, as well as the basic units of the analysis. As far as base spatial units are concerned, grid (Long and Kergomard, 2005), urban blocks (Puissant, 2010; Gil et al., 2012; Bernabé et al., 2013; Giannopoulou et al., 2014) and administrative boundaries (from Urhahn and Bobic, 1994 to Fusco, 2016), are the most common options.

Yet, for urban designers and environmental psychologists the urban fabric should be analysed at a micro-scale that makes sense to city users. To do that, the interplay between buildings, parcels, streets and site needs to be understood. The scientific community is thus increasingly proposing new geoprocessing approaches and different degrees of computer-aided automation to analyse the multidimensional character of urban fabric. Hamaina et al. (2014) were the first to propose a partition of urban space based on a generalized Thiessen polygon starting from the built-up footprint. Araldi and Fusco (2017) use generalized Thiessen polygons around street segments, with visibility thresholds to define a new basic unit from the pedestrian point of view: the proximity band around a street segment. Contrary to the tradition of urban morphologists, these authors focused on the pedestrian point of view. People perceive the urban fabric on both sides of the street, not the elements within the four sides of a block. This difference in basic unit definition increases the potential use of urban morphology in urban design research and practice.

In brief, these considerations on basic unit definition take us back to the goals of the analysis of urban fabric. When the morphological processes are considered, parcel and street block subdivisions seem particularly advantageous. The many analyses focused on micro-climatic or energy-consumption issues (like Long and Kergomard, 2005; Puissant, 2010; Bernabé et al., 2013) find street-blocks as practical units of analysis or use a superimposed grid. With the goal of identifying typologies of urban forms perceived by pedestrians, Araldi and Fusco (2017) use proximity bands around street segments: this approach could be particularly appropriate in the study of urban phenomena related to human perception, like retail activity, crime, residential satisfaction, etc.

Potential Implications of Urban Morphology in Urban Design

Madanipour (1997) defines "urban design" as "the multi-disciplinary activity of shaping and managing urban environments" (p.22). Considering the fact that "urban morphology" aims to understand the process of shaping urban environment, the two disciplines are clearly related. Likewise, the pioneers of urban design (Alexander, 1977; Kostof, 1992) discussed urban design issues via "urban patterns". In other words, urban design is about "creating patterns" and urban morphology is about understanding and evaluating these patterns (Marshall and Caliskan, 2011). Given that, a number of researchers state that urban morphology should make a significant contribution to urban design both in theory and in practice (Whitehand, 2005). Yet, many others criticized the weak communication between the two disciplines. For example McCormack (2013) states that "although urban morphology is fundamentally concerned with the what, how and why of the constitution of the urban fabric, there is little or no knowledge of this essential reality among practitioners of urbanism" (p.45).

The integration of urban morphology with urban design can be discussed in three parts: theories, research tools and applied values. First, urban morphology initiates various theories of urban design. The issues discussed in Urban Design Readers edited by Carmona and Tiesdell (2007) and by Larice and Macdonald (2013) refer to urban morphology quite often. For example, Trancik's (1986) figure-ground analysis and concept of lost space relates directly to urban morphology. The possibilities of using grid in planning (Martin, 1972), the decline of functionalism and the rise of interest in precedent, context, and typology (Kelbaugh, 2002) could not be discussed without urban morphology.

Secondly, urban morphology is used as a research tool in urban design. For example,

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Moudon (2013) labels typology-morphology and space-morphology studies as two of nine research areas in urban design. Urban morphology can be utilized as a tool to understand the existing settlements via decomposing the city components (Oliveira, 2015; Oliveira, 2013) and classifying the existing patterns (Berghauser Pont and Haupt 2010; Urhahn and Bobic, 1994; Gil et al., 2012; Bernabé et al., 2013; Araldi and Fusco, 2017; Fusco and Araldi, 2017), investigating the historical evolution (Giannopoulou et al., 2014; Pinho and Oliveira, 2009). Such studies serve to understand or aim to find a relationship between urban form and urban policies as well as social life (Conzen, 2001) and between urban form and microclimate, thermal comfort, urban cool/heat island and energy consumption (Chatzidimitriou and Yannas, 2016; Bouyer et al. 2011).

Lastly, urban morphology has applied value. Urban design practitioners have long been trying to set the urban design guidelines to create better environments for specific sites. A large number of municipalities in developed countries publish urban design guidelines (i.e. Essex County Council, 2004; Essex Planning Officers Association, 1997). Such guidelines aim to provide suggestions about the ideal forms via discussing the relations between streets, buildings and plots. Yet, they rarely refer to quantitative urban morphology. The discussions about the relations between streets, buildings and plots are mostly intuitive and descriptive. Undeniably, such subjective explanations are not enough to guide design regulations. Systematic quantitative analyses are needed to provide more clear explanations for the implications of design options. Quantitative urban morphology can fill this gap. An important emerging trend in urban design is also parametric urbanism (Schumacher, 2012), giving a new centrality to algorithm- and rule-based generation of urban form. Once again, the challenge will be the capacity of quantitative urban morphology to serve as input and/or reference framework to parametric urbanism, in order to avoid the divergence between morphological studies and design proposals that could already be observed in more classical human-centered design praxis.

Potential Implications of Urban Morphology in Environmental Psychology

Environmental psychology focuses on the interrelation between "physical space" and human perception, cognition, preference and behaviour. Given that the rich set of indicators derived via urban morphology methods would definitely help environmental psychologist to understand, measure and classify the features of physical space which leads differences in people's perceptions and behaviour (Kubat, 2015). The issues discussed in the discipline of environmental psychology involve environmental satisfaction and preference and relatedly quality of life, image of the urban form (identity and place attachment, perceived safety, crowding, privacy, personal space) and environmental perception and cognition (wayfinding, orientation, legibility of space, physical activity, walkability) (Bechtel, 1997; 2002). For all, researchers attempt to understand what kind of urban forms are preferred, evaluated as aesthetically pleasing or legible, can decrease orientation problems, improve physical activity of inhabitants, encourage walking in the urban area etc. This would help designers to understand why people avoid some spaces and prefer to spend time in others (Nasar, 1992). Without understanding this relation between the form and the human behaviour, it is not possible to design with people in mind (Kaplan et al., 1998).

Quality of life studies investigate the formal features of residential areas via measures of transportation safety, presence and accessibility to socio-cultural entities, recreational areas, educational and health facilities (Çubukcu and Erin, 2016) all of which can be measured via geoprocessing. Specifically, space syntax, multiple centrality assessment and similar configurational network analysis models can measure accessibility such as the one used by Marshall (2005). In parallel, the characterization of urban fabrics can be measured via morphological methods such as the ones used by Urhahn and Bobic (1994), Berghauser-Pont and Haupt (2010) and, more

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recently, Araldi and Fusco (2017). Moreover, most environmental aesthetics studies attempt to measure the complexity and coherence in the spatial setting. However, they often rely on subjective measures (people's perceptions). None has used fractal analysis related to human perception, neither in micro (facades, signs) nor in macro scales (street scape, townscape), to measure complexity and coherence, despite its potential to serve as an objective measure.
Studies on the image of the urban form try to define the physical features of coherent and unique urban areas which facilitate social interaction, increase perceived safety, provide enough personal space and appropriate enclosure (i.e. Stamps and Smith, 2002; Stamps, 2005). Some of these physical features (building density and building / plot / street relation) can be measured via urban fabric analyses and typology analyses.

The studies related to environmental perception and cognition investigate the physical components (i.e. number of street turns, environmental diversity, visibility of destination, building height / street width ratio) that prevents wayfinding difficulties (i.e. Evans, 1980; Carpman and Grant, 2002) and decreases perceived distances (Sadalla and Magel, 1980) encourages organic transportation modes such as walking (Cubukcu, 2013; Cubukcu, et. al., 2015a; 2015b). The model developed by Araldi and Fusco (2017) can be utilized in such studies, as it measures urban form from pedestrian point of view. Considering the fact that physical activity and walkability issues are not just related to accessibility and continuity of streets, but also to environmental perception (comfort, aesthetics and safety in routes), Araldi and Fusco's methodology is potentially applicable to studies of environmental perception and walkability. Their objective measures of environmental features from pedestrian point of view make a significant contribution for studies of environmental psychology in general and for studies of environmental perception, cognition, walkability of urban environments in specific (both of which put humans at the centre). An important research perspective for environmental psychologists is to put these "objective" measures of observable form in relation to the "subjective" measures of perceived form, paying attention to the physiological, psychological and socio-cultural factors of human perception and cognition.
The question of neighbourhood satisfaction is a good example where urban morphology analysis through geoprocessing can foster research in environmental psychology and finally produce recommendations for urban design. Neighbourhood satisfaction encompasses housing characteristics, presence of facilities and perceived elements of urban form in the neighbourhood.

Having objective measures of urban form through geoprocessing can enable making a comparison between the urban fabric characteristics observed by the analysts (here through specific geoprocessing protocols) and those perceived by city users or residents. Further analysis could then focus on the evaluation by residents of their own living environment. This evaluation is always subject to social and cultural values; specific survey schemes should thus be developed to understand people's perceptions and preferences. Possibly, ideal urban forms in terms of physical and social needs of the residents of a given neighbourhood could be identified, and these could serve as an approach to produce context-specific urban design guidelines.

Conclusion

Urban morphology investigates "urban form". Environmental psychology, in an urban setting, is defined as the study of "the relation between urban form and human behaviour". Urban design is the process of designing villages, towns and cities to create better living environments for all. Together with the important achievements of traditional urban morphology, new quantitative geoprocessing-based methods are increasing the potential of interaction between urban morphology, urban design and environmental psychology.
The urban design guidelines set by many municipalities should refer to morphological issues to provide better prescriptions to design environments. Subjective design suggestions can be misleading. Use of quantitative urban morphology could make such suggestions more

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objective and more applicable. On a different sphere, quantitative urban morphology analysis of real-world cities could offer a guiding framework to the emerging field of parametric urbanism.

In parallel, since the 1960s environmental psychologists attempt to understand the relation between physical environment and people's thoughts and behaviour. Their findings supposed to lead the theories and practice of architecture, urban design and planning (Lang, 1987). However, environmental psychologists need accurate quantification of morphological parameters in order to control their observations for urban form. Geoprocessing in urban morphology allows this at large scales. Conversely, environmental psychology can suggest new relevant morphological parameters in the study of interaction between urban form and human behaviour.

Considering the improvements in urban morphology (recently taking the pedestrian point of view into account to analyse urban form), one cannot deny the fact that urban morphology is one of the most promising inputs for research and practice in urban design and environmental psychology. More studies are on call to investigate the objective parameters of urban forms (measured via morphological analyses from pedestrian point of view) that improve neighbourhood satisfaction and encourage walking in the neighbourhood.

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Spatial patterns in mass consumption: The fast food chain network and its street patterns, clusters and impact on street safety

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Abstract. *Can the fast-food chain network, to some extent, support the socio-spatial structure and safety of the street? Is there an urban spatial pattern within the 'Chain Network' and mass consumption? This papers dwells on spatial patterns on mass consumption in the global capitalistic cities of London and Tokyo, through the lens of the fast food chain network. Their symbols (for instance, the Golden Arches of McDonalds) are instantly recognizable both by locals and tourists. McDonalds started off as a hot dog stand in California in the 1940s and rapidly expanded across America in lieu of the mass usage of the automobile and construction of freeways. A foreigner can order easily from a McDonalds menu in Tokyo, without speaking Japanese, because the menu is created in a "global language". Fast food chain stores, such as McDonalds and Starbucks, seem to be sprouting in every street corner, even as much as 3 of the same shop on the same street. You don't have to find them, because they will find you. Rather than casting them aside as complex economic or political factors, the first part of the research focuses on its spatial clustering, and to see if there is an intrinsic spatial relationship with high-choice, or highly integrated streets. How far deep does the network go from the highest choice streets? The second part of the research will see if the clusters of fast-food chain, with their "night economy" would lead to safer and more pleasant street and communities. Fast food chains do indeed play a vital spatial role in our physical communities in the 21st century.*

Keywords: Space Syntax, Fast Food Chains Network, Spatial Patterns, Mass Consumption, Urban Street Network, Unplanned Buying, McDonaldssystem, poliorcetics, city and territory.

Research Setting

Fast-food chain networks have been, in most developed cities, relegated to one that is seen as unhealthy, and in some cases signifying a lower class and depicting a crummy, tawdry image. However, they have been observed to serve as "refuge" pit-stops for city-dwellers as well as tourists. For example, a McDonalds in a busy street in Tokyo attracts many foreign visitors because McDonalds has a global symbology that is recognisable to people who don't speak the local language. It is also treated as comfort food because McDonalds has more or less the same menu around the world, with only slight variations. Customers already know what to expect, and usually know what they want without looking at the menu. At the counter, a foreign tourist is also able to order from the menu easily even though it might be written in an unfamiliar language, as the menu is structured in a global language. A businessman or the modern free-lancer is able to use the space comfortably with his laptop and even hold small informal meetings. Young adults congregate at fast-food chains as

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a trendy spot to hang out. WI-FI is provided at most locations. The meals are affordable and self-serviced. One does not need to make extra orders to validate their length of their stay.

These chain-stores produces an interesting architectural spatial narrative in major global cities, though they are usually not appreciated for the extra purposes they serve for the community, urban dwellers and tourists.

The fast food industry kicked off with the McDonald brothers first Hamburger stand in California in the 1940s. It succeeded due to the rise of automobiles and people having the need to stop and have a quick meal when driving, with the least waiting time and cost-efficient as well. The brothers also, after many iterations, came up with the burger production process, kitchen set-up and configuration to ensure a food making operation, from patty to a burger. Everything was designed for maximum efficiency, smooth process with minimum staff.

McDonalds operates ten of thousands of outlets today, and they make a lot of their profit from real estate business. Today, their famous Golden Arches symbol is known worldwide, no matter which culture one is from. The rise of McDonalds had sparked other fast food chains as well, such as Burger King, KFC, Wendy's etc. Today, in London for example, there is a phenomenal rise in the healthier kind of fast food, such as Wasabi, Pret A Manger, LEON, EAT etc. where one has options of dining in or grabbing a lunchbox to go. This is the reality of modern fast food of the global urban city, where fast food is being sold to people who are health-conscious and aware of nutritional values.

In Death and Life of Great American Cities (1961), Jane Jacobs explains how co-presence, or "eyes upon the street" impacts the nature of street life. Firstly, how shopkeepers were vital to the street because all shopkeepers naturally want safe streets for the good of their shops. Secondly, how people on the streets, even though strangers, through co-presence, keeps an unconscious watchful eye on the streets. This research gives a 21st century perspective in our global mobile world, where chain stores are a norm. With this chain network theory, and it being a global symbol, how does that relate back to the co-presence that Jane Jacobs talks so passionately about? Does the city 'produce' in some sense the signs of consumption or is it more a vehicle for the 'reproduction' of a consumer-capitalist society? Is its spatiality decodable in these terms? In the recent film, Citizen Jane (2016), Jane Jacobs discusses how the housing projects in the US has failed because of their obscure locations and absence of street life, therefore inciting more potential for crime. A successful street is a well-used street. This shows the importance of vitality of the street and how important pedestrian traffic is.

In Bill Hillier's article Cities as Movement Economies (1998), he suggests that the closest or most accessible places in relation to all others connect centre to periphery, have the highest flows of people and, as a consequence, function as interface between locals and strangers. The main role of space is practical or instrumental. He also states that "if cities are mechanisms for generating contact, then this means that some locations have more potential than others because they have more by-product and this will depend on the structure of the grid and how they relate to it. Such locations will therefore tend to have higher densities of development, and in turn have a multiplier effect." This 'multiplier' effect is the phenomena that we see on the streets daily, pertaining to the vitality of the street life and flourishing of businesses. This also ties back to the 'co-presence' the Jane Jacobs argues for, for what a successful street is.

This research has significant society impact that firstly, can be defined as the mass consumption network and how consumers are patronising these fast food chain networks as global pit-stops in their daily lives unconsciously. Secondly, understanding the spatial patterns of these mass consumption patterns is vital in addressing issues of micro urban patterns and co-presence, all these would impact how we view and understand urban systems and planning across the global metropolis.

Research Aim and Methodology

Research Aim and Questions

The research aim of the research paper is to 1) Study the intrinsic spatial patterns of the fast-

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food network and analyse the spatial difference of these clusters individually and collectively as an urban network 2) Understand the associations with the city such as retail shop clusters and street crime.

The overarching research curiosity is an attempt to understand spatial patterns of mass consumption in global urban cities, through the lens of the fast food chain network. The curiosity is to also find out if these patterns are different or similar to each other within urban physical space and land-use, and deliberately excluding complex economic or political factors.

1. Is there a relationship between the fast food chain network and spatial street patterns, especially with regards to high-choice street networks?
2. Are there distinguished clusters? How are do they distribute themselves within the cluster?
3. Do fast food chain clusters, in any way, have an effect on street safety? Does it encourage or deter street crime (i.e street violence, robbery, anti-social behaviour etc)
4. Do fast food chain clusters initiate more retail clusters and other restaurants pubs within the same cluster?

My hypothesis is there is a strong relationship between high-choice streets and fast food locations. There is a pattern logic to these clusters. There are distinguished clusters of fast food chains that influences the development of the neighbourhood. With the night economy and co-presence as significant factors, these locations are vital not only to the development of the neighbourhood, but to a certain extent, deter street crime and promote safety of the streets. These fast food locations also go hand in hand with retail and other restaurants/bars to create that effect and plays a part of creating safe neighbourhoods.

Methodology

There will be two parts to this research. The first part will be to study the intrinsic patterns of the fast food chain locations to reveal their clusters and street network patterns, as well as patterns in their building context. And find out how these clusters work. The second part will be to study relationships between fast food chains and the other events: Crime and Retail

In the first part, we will measure the intrinsic spatial patterns of the fast food chain network, and measure them against choice values of each street, based on the Space Syntax theories. We will also see if there is a difference between the different types of fast food group types: Traditional, Modern and Coffee Chains. Following that. We will look out for any spatial patterns in how the clusters are formed using Kernel Density Estimation, Average Nearest Neighbour, to obtain an overall analysis on where and how the clusters are formed. Following that, at the cluster scale, the building and urban context and frontages will be catalogued to spot any common themes.

In the second part, we will study the relationship of the fast food chain network to the society through the lens of street crime rate, as well as compare them with the retail and restaurant land use. Does the chain network affect crime, and does it a have a relationship with the choice value of the street? Does the fast food chain affect the agglomeration of the retail and restaurant location?

Spatial Network Analysis using Space Syntax measures will be used as a baseline to incorporate the above information and factors. This will be elaborated more in the following section.

Measurement and Analysis

Data Selection Criteria. Based on these following factors, 13 unique fast food chains in London were identified for this research.

Food & Beverage Physical Store
Chain Store: Minimum 20 outlets in London
Self-service / No waiters taking orders
Quick Service – No or Short waiting time
Takeaway available
Open to everyone
Open all day
Don’t have to keep ordering to validate length of stay
Affordable - Generally below £8 a meal
Casual Environment

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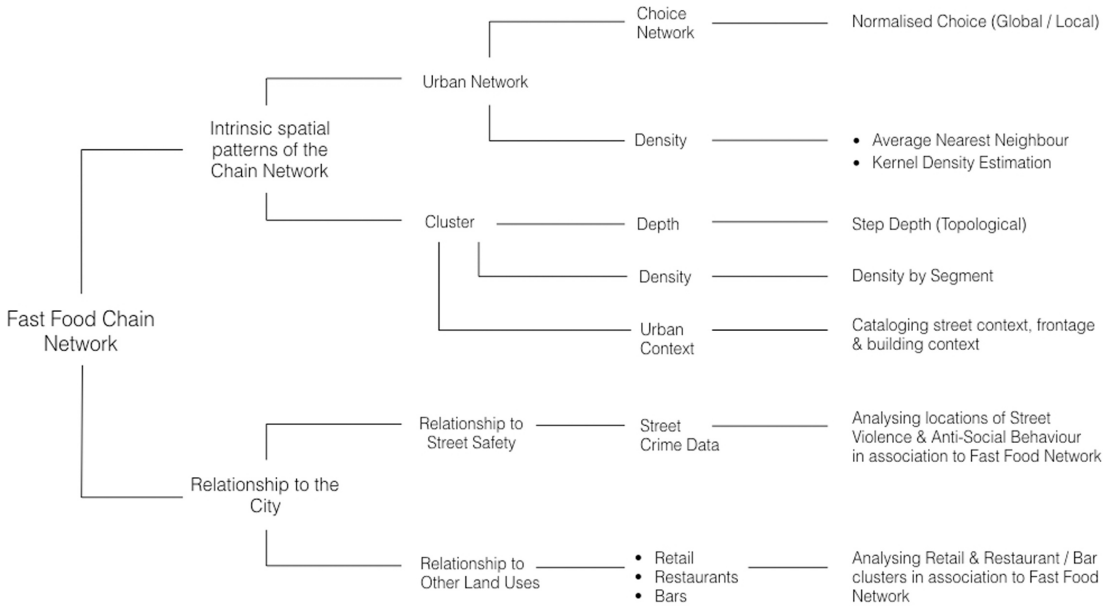

Data Gathering. Based on the results from the Data Selection Criteria, the fast-food locations were gathered through using the Google API. First, geo-data was collected from the chosen 13 fast-food chains in London, from within 30 square kilometres of Trafalgar Square. These geo-data were collected through Google API, using a self-written Python Script, then compiled and edited in a spreadsheet. Following which, they were imported and mapped into geospatial software QGIS, and compared against the results of spatial analysis from Depthmap.

Data Mapping on QGIS
Spatial Network Analysis

Space Syntax spatial segment analysis was conducted on DepthMap such as (Normalised) Integration, (Normalised) Choice at both global and local scales. A 'normalised' calculation allows for a fairer comparison between cities of different sizes, in this case, with Tokyo. Integration values signifies "To-movement", like a destination point. Choice values signifies "Through-movement", like movement flow, on-route. The result produced was specific to London's urban geometry. The Spatial Network Analysis is independent of real human-movement, economic and political factors. It is based purely on geometry, using applied mathematical formulas, algorithms and selected radiuses.

After that, Step Depth Analysis (Topological) was done to look at the proximity and relationship of the fast food chain clusters from the highest-choice streets. Topological step depth measures proximity by the number of turns away from the origin, rather than by metric or radius.

The aim of this analysis is to apply this base spatial results and compare against the geo-data of the fast food locations and other observations from the entire course of research. The DepthMap analysis serves as baseline for comparison and measurement against empirical information and evidences.

The positions of each fast food store are spatially linked to the street network, with each street having their own unique choice, integration and step depth values. The data is then compiled and assessed to find out the specific spatial patterns, which will be described in the sub-chapters below.

In Figure 3, a comparison is made between the Normalized Global Integration (NAIN Global) of the street networks, and the locations of the fast food chain stores. While there is a relative significant co-relation between these

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two, we will later find out in the study that there is more significant result when compared with Normalized Global Choice (NACH Global). This suggests that the locations and clusters of the fast-food outlets has to do more with pedestrian through-movement and flow, rather than a destination point itself.

Average Nearest Neighbour Analysis

The Average Nearest Neighbour tool measures the distance between each feature centroid and its nearest neighbour's centroid location. It then averages all these nearest neighbour distances. If the average distance is less than the average for a hypothetical random distribution, the distribution of the features being analysed is considered clustered. If the average distance is greater than a hypothetical random distribution, the features are considered dispersed.

The average nearest neighbour ratio is calculated as the observed average distance divided by the expected average distance (with expected average distance being based on a hypothetical random distribution with the same number of features covering the same total area).

If the index (average nearest neighbour ratio) is less than 1, the pattern exhibits clustering. If the index is greater than 1, the trend is toward dispersion

Results

Ratio is 0.3, which means the fast food chain network in London is highly clustered. This implies that that there is a reason for these clusters, that might pertain to spatial factors. This result tells us that the fast-food chain network, or rather spaces of mass consumption are not random, but these clusters somehow work together through their spatial structure, to contribute to the city's socio-economic mechanism.

Kernel Density Estimation

Using the Kernel Density Estimation, while adjusting the radius and cell size, the key clusters of the fast food chains are highlighted. These highlighted clusters will be vital when choosing which neighbourhoods should be studied.

Choice Analysis (Normalised, Global)

Normalised Choice x Cumulative Count
Figure 7. (Cumulative Count of Fast Food chains against Normalised Choice values at various scales)

This cumulative count graph shows that, at all scales, from radius 1200m to 10000m to global (infinite), that 90% of the locations climbs very fast to a high choice value. Only approximately 10% of the fast food locations have a low-choice value on the street network.

What this means is that 90% of the fast food locations falls on streets with a high-choice values, implying that these fast food locations have a higher chance of people movement opportunity, or through-movement. This is based strictly on the geometry of the street network, using mathematical formulas from the Space Syntax theory of choice analysis and movement.

This might suggest that fast food locations are using the opportunity of high pedestrian movement (foot traffic) to attract people, and does not actually serve as a destination point. This proves the hypothesis true: That you don't have to find the fast food chains because they will find you. One would just "naturally" pass by a fast food outlet, or a series of them.

Step Depth from Highest Choice Streets - Topological

Topological Step Depth measures proximity of A to B by the number of turns, rather than in a metric quantity. Prior to this study, the assumption I had was that most of the fast food chain stores would located on the highest choice streets, while some would perhaps be 1-turning away.

The results of the topological step depth were surprising. Most of the fast food outlets

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were located one step turning away from the highest choice streets, but what is fascinating is there is higher amount of fast food chains located two steps away, more than the highest street themselves.

There are even occurrences of fast food 3 and 4 steps away, though they are few. This led to the next step of doing a density by segment line, to see if it matches the topological step depth results. The results show an intrinsic spatial pattern of fast food small clusters operating on a cross-shaped or L-shaped pattern clusters, where the clusters are located where it can be visibly seen from each other, and cross road junctions are made use by fast-food locations to gain visibility. This is contrary to my initial assumption that all fast food chains merely operate linearly on high streets.

Ongoing Research

Relationship of the Chain Network with the City

Through initial geo-data-mapping studies, it appears that there is a relationship between street crime (anti-social behaviour, street violence) with the positioning of the fast food chain clusters. There seems to be a higher crime rate when these clusters are not located on high-choice streets, but those lower in value, which is uncanny. Also, in comparing in streets within the same neighbourhood, it appears that the streets with fast food clusters does not have crime taking place on the main street where the chains are, but behind on the inner lanes. However, on the adjacent main street where there are no fast food chain outlets, street crime take place on the main street.

The next study will look at retail and restaurant clusters, to see if there is pattern of growth that relates the fast food clusters to other land uses.

Tokyo Study

In Tokyo, fast food outlets, of those that are similar to London, will be mapped out. Clusters will then be identified and compared against the values of the choice, integration and step depth values. The aim of this chapter of research is to see if where are the commonalities and differences in spatial network across global metropolises.

Summary and Conclusions

Fast food chain clusters and its network are not located randomly. Rather, over the course of this particular research, they have established a non-discursive spatial network that attempts to be deciphered, qualified and quantified by space syntax measures and theories. As of this pilot stage of the study, the urban network (macro scale) has shown interesting and encouraging results in terms of global and local choice analysis. Approximately 90% of all fast food chain outlets are located on streets with a high-choice value, at local and global scales. What this actually means is that the fast-food chain network is highly associated with through-movement (flow) patterns, rather than to-movement (destination points). This discovery alone is a stepping stone towards further investigating individual neighbourhoods and their unique clusters.

At the cluster (neighbourhood) scale, the density by segment analysis was significant in revealing morphological patterns. Unlike what I had speculated before doing this research, fast food chain outlets are not necessarily lined up all in one single axial line. Instead, when the long axial line is studied in individual segments, the fast food outlets breaks up into L-shape pattern clusters. This suggests that these small clusters operate by adjacency, as well as across junctions, to maximize visibility and encourage more pedestrian through-movement. It also reveals that there are occurrences of higher-density fast food clusters that are located on the high street.

Topological step depth analysis informs us that more of the fast food locations are located one step or two step turning away from the highest choice streets, much more than the highest choice street themselves. Another observation done to see those anomalies led me to find out that this might have to do with the amount of visibility. For example, if the shop is facing an open space such as a park or a fountain square, it can get away with being

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on a lower-choice value street. In my ongoing research, frontage as well as building context will be analysed case by case to discover patterns that might factor in to the locations and sustainability of these clusters.

Finally, the relationship of the fast food chain network and its relationship to the city is equally important as their intrinsic spatial patterns and morphology, Currently, at the Space Syntax Lab, the second part of the research is taking place, regarding the fast food chain network's relationship to crime data as well as patterns of other land use, such as retail, restaurants and bars. This is vital as to find out the unseen connections between fast food and the actual operations of the city. A chapter will be done in Tokyo as well, to compare the relationship between the fast food locations and street network. All these will be completed by September 2017 to be presented at the ISUF conference.

Future Research Directions

There are a couple of strategies that could potentially evolve from this current research. First, tracking down the growth and sustainability of these fast-fast food chain stores, to determine if stores which has closed down or survived for a long time, has to do with spatial patterns. Since the stores within a single fast food brand sells exactly the same thing with the same food quality, we can tell the effectiveness of the streets by looking at the closure of shops, or the duration of the shop operation, in years.

The overall direction would be to study retail and purchasing patterns in the broader perspective of spatial mass consumption, in association with space syntax and spatial culture. It is a relevant and current phenomenon in today's global world that we can no longer afford to ignore. I would like to clarify that this research does not deliberately benefit mainstream consumption or the retail monopolies, but rather the aim is to seek out underlying spatial patterns in urban networks that could create and re-create successful and safe streets and neighbourhoods for the future.

Figure 1. McDonalds signage in Times Square, New York City

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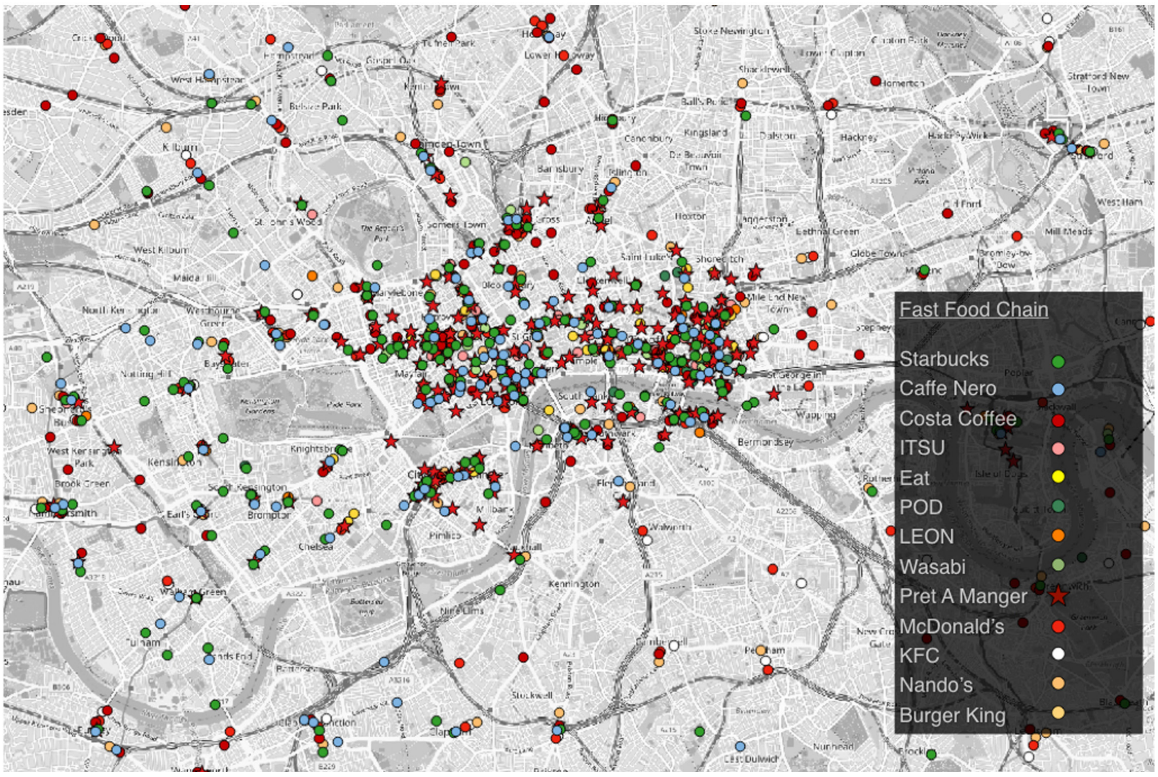

Figure 2. QGIS Data Mapping of 13 fast food chain stores in London

Figure 3. Normalized Global Integration, with all the fast food stores depicted in white circles

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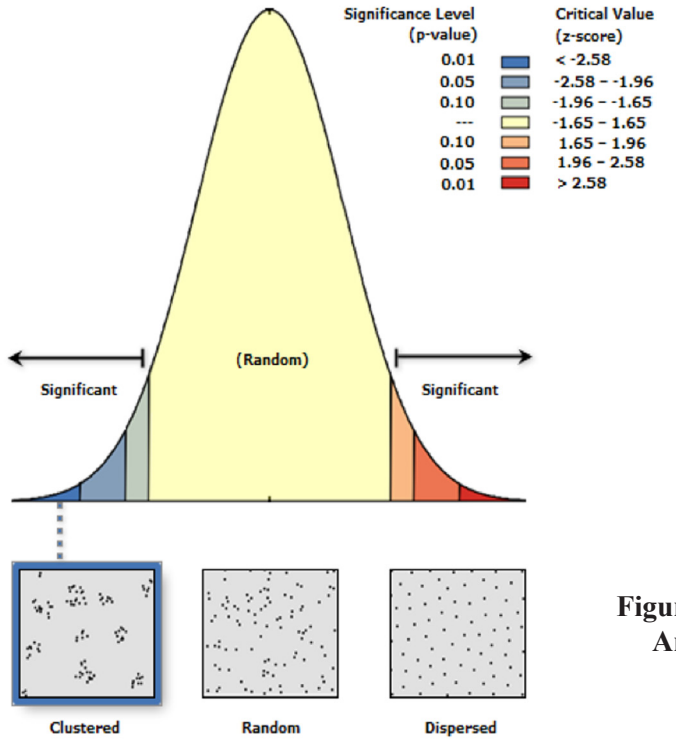

Figure 4. Average Nearest Neighbour Analysis, performed on ARC GIS)

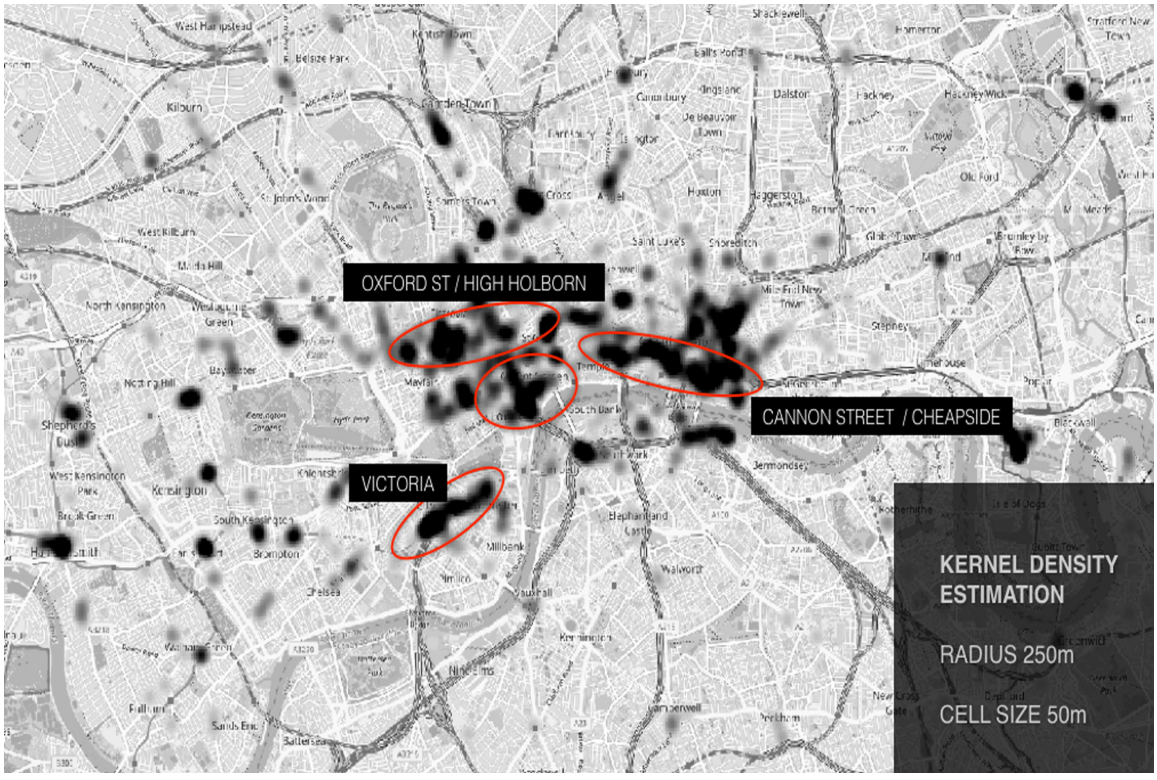

Figure 5. Kernel Density Estimation Analysis, performed on QGIS

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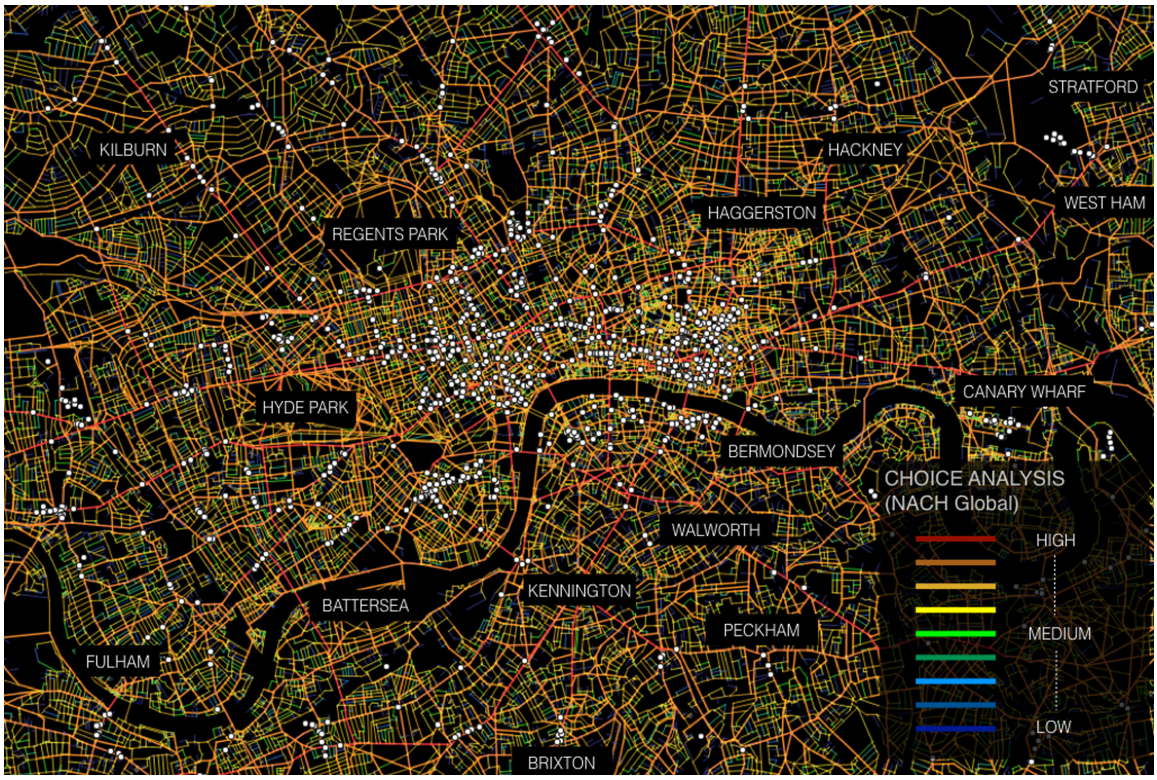

Figure 6. Normalized Global Choice Analysis, with the fast food stores depicted in white circles

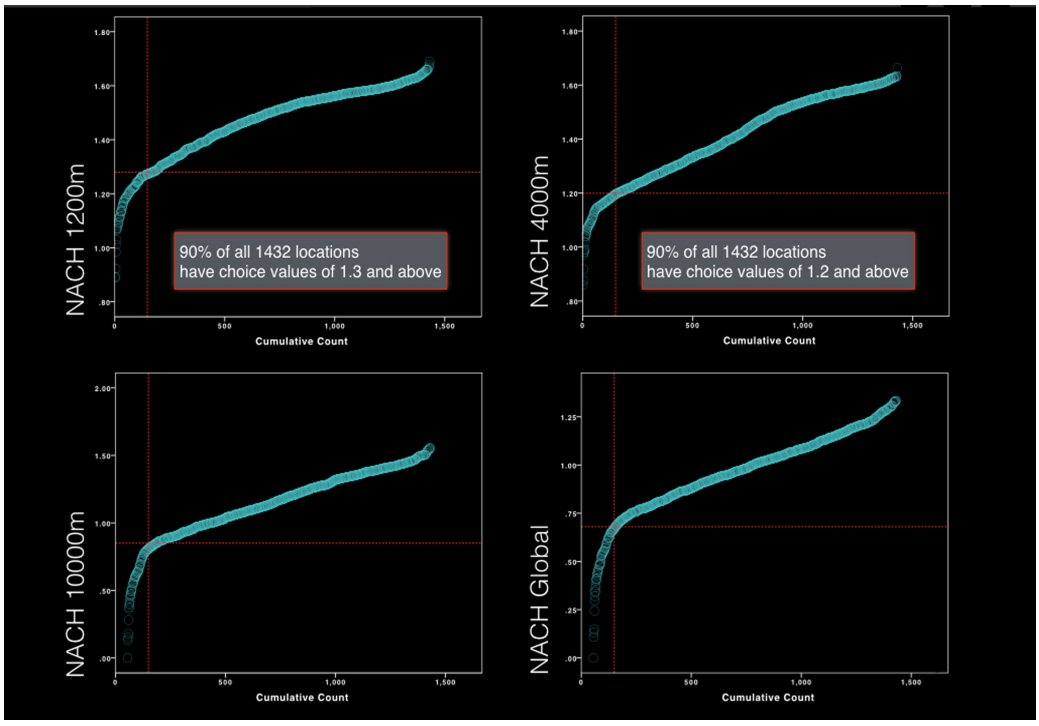

Figure 7. Cumulative Count of Fast Food chains against Normalised Choice values at various scales

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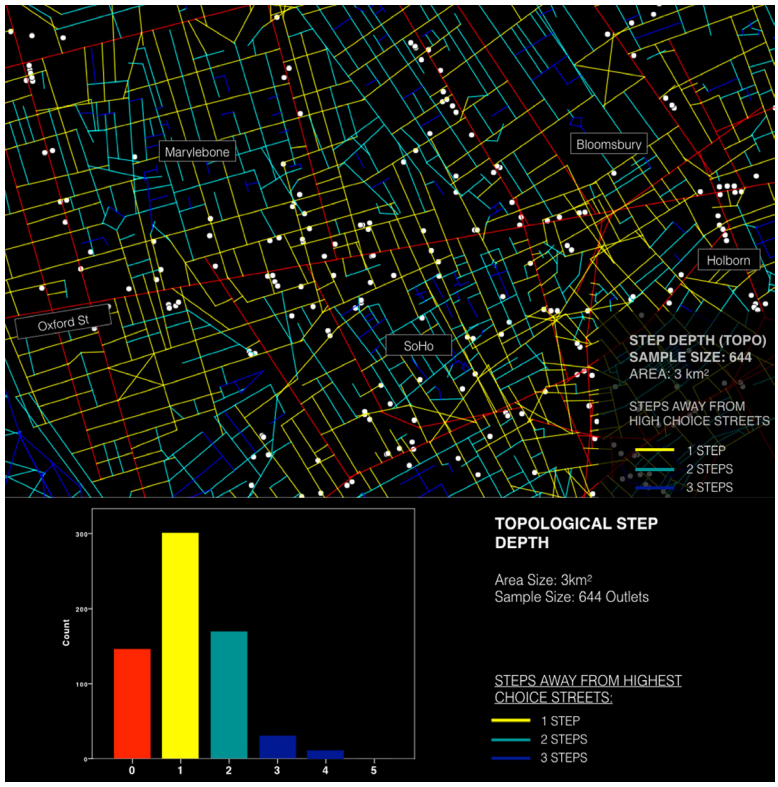

Figure 8. Topological Step Depth Analysis performed on DepthMap

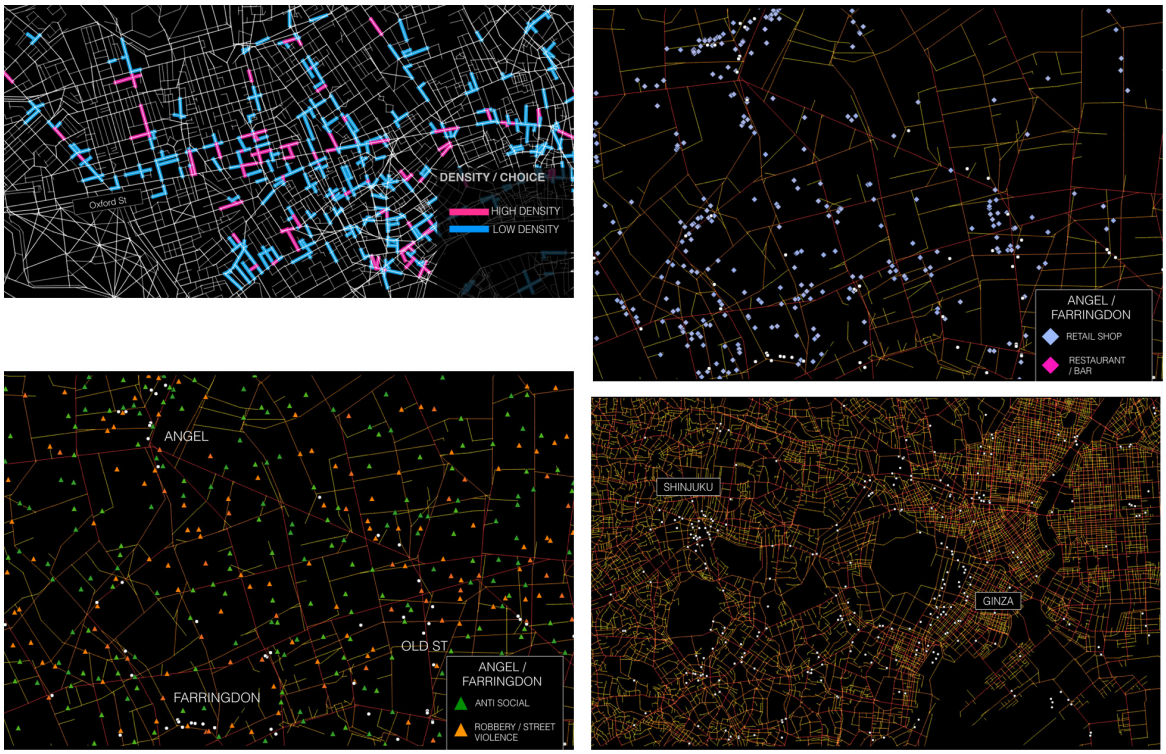

Figure 9. (Above-left)Density of fast food locations by Segment Line in Central London. (Below-left)Mapping of Crime with fast food chain outlets in the City of London. (Above-wright)Mapping of Retail Shops with fast food chain outlets in the City of London. (Below-wright)Ongoing research on the fast food chain network in central Tokyo, Japan

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Visual analysis as a tool for urban intervention in comparative studies

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Abstract. *In recent years, urban design development has been an important topic in Latin American cities such as Medellin, Mexico City and Córdoba, due to the transformation of their urban spaces and new methods used to evaluate the social, morphological and, in some cases, economic impacts that have been brought about by urban development projects. When inquiring about the development process and impact of urban studies, and the inhabitants' relation to a transformed space, it is important to establish the context within which images, drawings and photographs are analyzed, using graphical approaches triangulated with other research methods to define comparative criteria. Also, this paper will show, another example were visual analysis tools where used to understand urban transformation regarding economic process.*

Keywords: Visual analysis, comparative studies, urban intervention, photography analysis.

Methodology

The research projects in which the research group used visual analysis had as object of study the city's urban transformation and its impact in social tissue, cultural and economic process. One of the projects involved comparing different Latin-American cities, its main goal was to acknowledge the impact of urban transformations on five different cities, compare them to find similarities and differences, and define criteria that will help determine whether an urban intervention project responds effectively to social innovation concepts. Achieving this requires an analysis of the space/spaces in which, according to Kuri & Aguilar (2006), the following approaches were necessary:

1. An understanding of the space/spaces as areas with multiple meanings.
2. An analysis from a socio-cultural point of view that allows comprehending the elements of the identities of particular subjects.
3. Specifying transformations over time.
4. Relating them to broader contexts.

Latin-American cities have been transformed by phenomena like superposition, change, disappearance, imposition and, simultaneously, by important, emerging aesthetics that generate new configurations and diverse forms of relating to public place. This is why researchers needed to use different strategies and methodologies to understand these complex phenomena and relations both within and between different cities.

By applying the approaches mentioned above, space can be created where it is possible to read the social dynamics and transformations. To do this, we propose a comparative analysis of multiple cases, along with a methodological triangulation that includes recurrent observation, photographic analysis, and graphical production; the latter as an explanation of the previous two steps

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Figure 1.
Left: Sensory map of the intervention area in Willemstad, Curacao. By Sofia Saavedra Bruno. (Curacao.2013). Right: Sensory map of Via Primavera in Medellín. By Research group MCE. (Medellín. 2017)

of the triangulation. These visual sources are complemented by field diaries containing information arising from interviews that help with approaching community perceptions regarding spaces and their bonds of affection with them (Kuri & Aguilar, 2006).

Triangulating visual research methods

When inquiring about this process, its impact and the inhabitants' relationship to a newly transformed space, researchers suggest using graphical research methods that allow collecting, evaluating, re-elaborating and establishing comparative criteria and identifying the repeated impacts caused by urban interventions. This makes the impacts' current characteristics and others to be considered in the future are taken into account. Observation and question-based methods are the simplest approaches used in urban transformation research, as they take into account different factors. If we understand observation both an ethnographic resource, we can connect it with the concept of being in the same place (space-object), as indicated by Kuri and Aguilar: "there are many ways of being in a place, observing an action. You can look through video recordings and photographs by interdisciplinary groups, chroniclers, from above or from below, with a panoptic vision or 'in situ' experiences, from the outside or from within" (2006, pág. 179)

Understanding change, development and spatial appropriation processes in each of the cities in which this exercise was performed, requires multiple and complex viewpoints and is not simply an exercise in formal analysis, allowing instead a simultaneous sensory and perceptual reflection on the contents of these spaces, to reach an understanding of the dynamics of change established there. As Kevin Lynch says: "Very often, our perception of the city is not continuous but rather partial, fragmented, mixed with other concerns. Almost every sense is active and the image is the combination of all of them". (190, pág. 10).

Sensory mapping

Researchers used different graphical tools, including drawings, to build a sensory map with the purpose of identifying the area where impacts occur, population mobility, use of space and behaviors; all based on how the senses perceive the urban space. Sensory mapping (See Figure 1), for example, allows researchers to express each phase of information collection and easily connect the perspectives obtained. When the senses are set to the task of discovering and recognizing reality, deletions, distortions, additions, and other changes with associational meaning can apply to their interpretations. However, this is not necessarily a bad thing, since they can be combined with other internal and external

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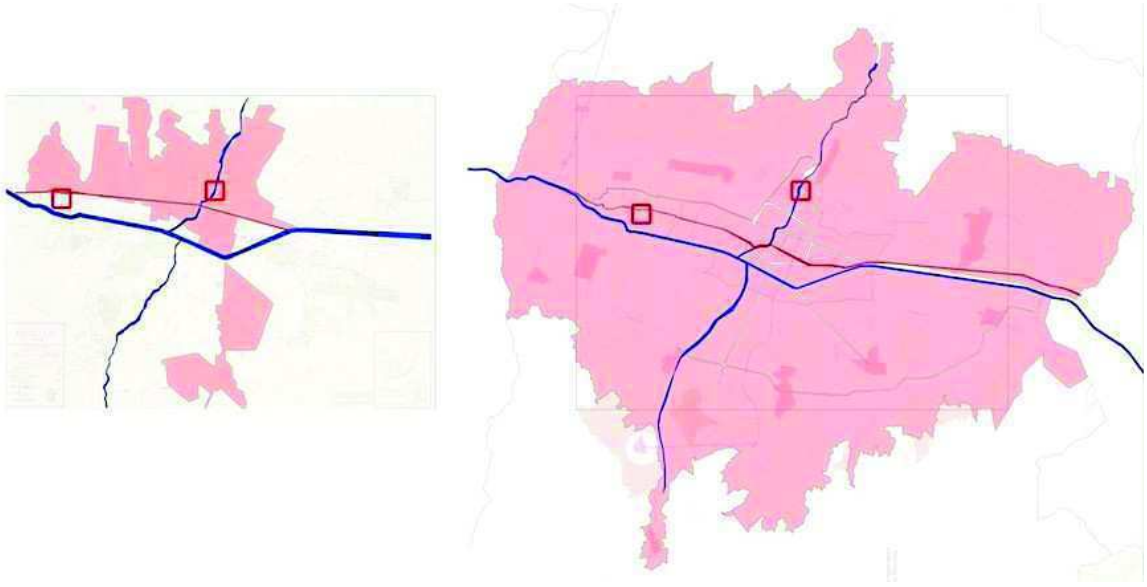

Figure 2.
[Collage by Leonardo Correa Velásquez]. (Medellín.1944). Collage made by redrawing blueprints of Medellin and drawings of the growth of structures within the city of Medellin. Digital archive. Planoteca de Planeación Metropolitana, Medellin.

interpretations to arrive at more conclusive results.

Comparing different sensory maps created in each of the five cities between the communities and the research group allows researchers to identify characteristics, social phenomena and recurrent development ideals the inhabitants had for their spaces, now transformed both positively and negatively.

Drawing and re-drawing as a tool

Drawing is the primary tool for rapprochement. As analysis tools, drawings can be divided into two groups: first, drawing as a form of inventory. Second, drawings which allow viewing the proportions and visual relationships between places and architectural pieces located there through the focus of interest of the person drawing. In the first group of drawing tools, that includes sensory mapping, and most of which are blueprints - technical drawings of the territory or the city, it is possible to clearly distinguish that infrastructure is the furniture and the scenarios which serve as physical determinants for spaces. We can understand the relationships between places and their connections to their immediate surroundings by plotting mobility flows (see figure 2) as the majority of the physical layouts of the cities studied are structured by lines and roads that have conditioned both a sense of territorial ownership and their neighborhoods, as stated by Jane Jacobs: “The streets and its sidewalks, the main public places of a city, are its most vital organs” (2011, pág. 55)

Through these drawings it can be seen how one repetitive policy for new public interventions is to widen public spaces that articulate transitions with buildings and their connections to the main infrastructure, road and landscape conditions. However, in some cases these are not targeted or correlated appropriately. It can also be seen how urban furniture is distributed throughout these spaces and how it connects to activities proposed for them. One can also highlight in these drawings the factors that oppress the spaces, such as noise or lack of infrastructure.

The second group of drawings that analyze places can be called sensory perspectives. Volumetric drawings for instance, which do not require dimensions, provide a proportional visualization of the ways in which places are set up and related to structures and the landscape, as well as the ways in which they are appropriated by residents and passersby. Through this group of drawings we can perceive a description of the place’s atmosphere.

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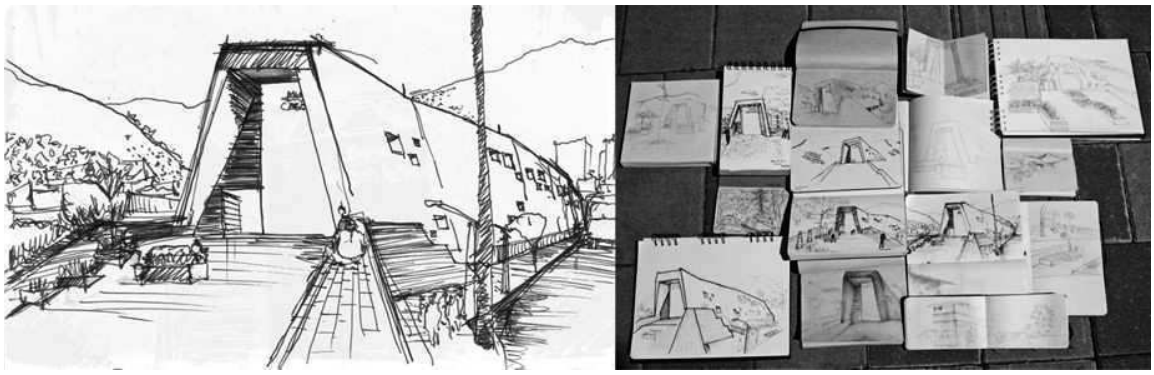

Figure 3.
[Drawings by multiple authors]. (Medellín.2014). Perspective drawings of the Casa de la Memoria building and its contextual relations. Event "Dibujar la Ciudad", Medellin.

"Atmosphere, character, and sensory qualities are becoming key factors in the definition of places, even from an economic perspective" (Zardini , 2005, pág. 24) (See figure 3).

We must clarify that, in these drawings, the recognition of the atmosphere corresponds to the unique structure of each place studied, and that behaviors and shapes are different in each case. However, the elements of these representations end up being the same (streets, sidewalks, furniture buildings), and those that change are weather, light, smell; just as Christian Norberg-Schulz mentioned when referring to the spirit of place, the Genius Loci.

Photography as a research tool

In general, we refer to photography as a method that applies to a wide range of research strategies: from analyzing and interpreting photos taken by research groups to having inhabitants take photos of themselves in relation to the space they inhabit. It is important to acknowledge that,

"Any photograph may have ethnographic interest, significance or meanings at a particular time or for a specific reason. The meanings of photographs are arbitrary and subjective; they depend on who is looking. The same photographic image may have a variety of (perhaps conflicting) meanings invested in it at different stages of ethnographic research and representation, as it is viewed by different eyes and audiences in diverse temporal historical, spatial, and cultural contexts." (Pink, Doing Ethnography: Images, Media and Representation in Research, 2001, pág. 51)

Pink encourages the use of visual technology, but urges the researcher to be versed on what may transpire as a result of combining this method with qualitative research.

The use of images allows a complex understanding of social phenomena based on a visual appropriation of spaces along with new and existing records, building parallels between historic and current user and researcher perspectives. This visual appropriation is a starting point for developing collective visions of the city and how it connects to the social purpose behind macro projects or urban interventions. During the phase of collecting information, researchers used two types of photography: (1) environmental photography with qualitative aspects that encourage evaluating relationships between the space and its users, daily life, and overall atmosphere; and (2) a technique with more quantitative characteristics that helps understand the spaces' physical proportions and morphological behavior. All this is done by using historical photographic archives, and comparing them to photographs taken by the researchers in the field so as to understand different narratives and social phenomena.

As John Berger proposes, the first type of picture used are current-day ones that serve as research tools for describing spatial relationships, trying to find "defining moments" that bring us to events related to the ways of life and appropriation of these places by residents and passersby. Likewise, these images allow describing and identifying the spaces' textures, colors and perceivable characteristics, which

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Figure 4.
[Photographs by Ana Elena Builes Vélez and Leonardo Correa Velásquez]. (Medellín.2014). Field work on the path of Casa de la Memoria, located along the development axis of the Santa Elena stream, Medellin

can point to the aesthetic qualities of the researched environments and population that inhabits them. (Berger, 2000) (See figure 4)

These photographs provide support for drawings and analysis presentations, wherein the correspondence between the blueprints' quantitative emphasis and details to be found in the photographs can be seen.

The second type of photograph incorporated into the analysis, are historical pictures taken by photographers with training in aesthetics and composition and can be found in the photographic archives of the cities where this analysis is performed. (See figure 5)

In these archive photographs researchers can find three factors that define the interests through which the reconstruction of these places was approached. The first one is related to the composition in terms of the figures and the ground; the second, to geometry in terms of vanishing points and the observer's position regarding image configuration; the third one has to do with the idea or concept related to the expression of the subject of the photograph, which refers directly to its context.

Memories are reconstructed by comparing historical photographs, with more recent images showing the progressive or radical transformation of those places. These changes can be described simultaneously from formal, historical and environmental points of view, by identifying the same places of interest or photographed objects and in certain cases with the same focal points in the photographs being compared. It is also important to mention that in many comparative analyses, photographs can be correlated by identifying the observer's point of view and his or her position within the blueprint of the place being studied. In this way information from several pictures can be grouped and overlaid.

Visualizing photographs simultaneously and comparatively - with the goal of establishing criteria for identifying common characteristics amongst the images – is a method of visual analysis belonging to the historiography of the art and its application as a strategy for iconographic analysis. It establishes the basis upon which images are formally studied. This type of analysis requires being complemented by a reconstruction of the cultural images of the environment. This could be done through documents, graphs or additional images.

In this manner, images -and particularly photographs- are not isolated representations in a process of visual analysis. On the contrary, they play a key role in the process of understanding the impact and transformations a place is subjected to by identifying every formal variable that can be extracted from the photograph and simultaneously relating such variables to external documents. Reading and interpreting photographs requires understanding initially that the process will be –very often- tied to the researcher's (or the person analyzing the photograph's) subjective

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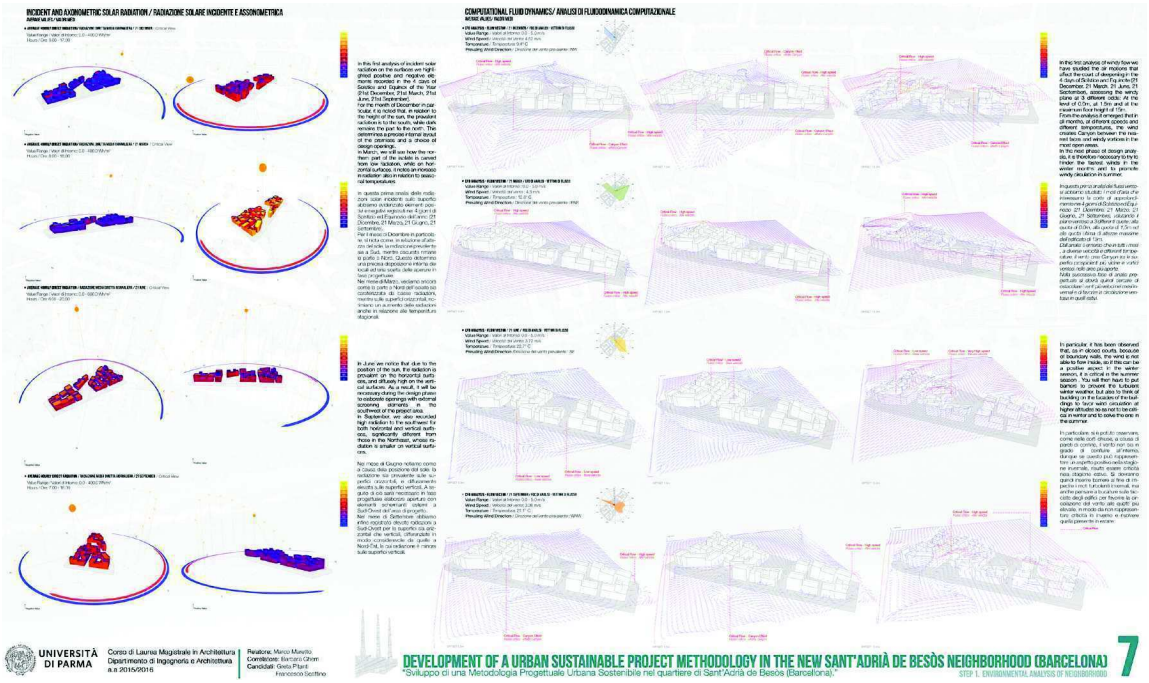

Figure 5.

Collage. [Photograph by Rafael Mesa]. (Medellín.1900). Historical Photograph of the Santa Elena stream's development axis. Digital archive. Biblioteca Pública Piloto, Medellín. Retrieved from: http://www.bibliotecapiloto.gov.co/archivo-fotografico. [Photograph by Rodríguez]. (Medellín.1900). Junín bridge. Digital archive. Biblioteca Pública Piloto, Medellín. Retrieved from: http://www.bibliotecapiloto.gov.co/archivo-fotografico.

critical and interpretative position. It takes a great deal of effort to minimize this risk factor, but becomes necessary when seeking to establish an initial analytical approach through a contextual study of the image. Sarah Pink, in her book Doing Ethnography: Images, Media and representations, recognizes this as an important issue, but also encourages researchers to use visual methods in any context of researcher. So for her "Images are 'everywhere'. They permeate our academic work, everyday lives, conversations and dreams" (Pink, Doing Ethnography: Images, Media and Representation in Research, 2001, pág. 17)

The first step towards removing oneself from a viewpoint that is "too subjective", is understanding the historical and social background of the photograph's author and acquiring knowledge of the techniques he or she used. This allows the critic to approach a more accurate interpretation of the original conditions under which the work was created.

Having acquired a less subjective opinion, the critic can now focus on a context governed by form.

Compositional patterns define every image and make it possible to study them from a formal point of view. However, there are many aspects to and opinions on how to approach a formal analysis. Since the researcher analyzes the image through a filter defined by his or her own perceptions, we can conclude interpretational and subjective points of view now play a crucial role in the process. In consequence, finding the exact description and analysis of an image becomes a great challenge as no linguistic guidelines or precise language exists for decoding the images' meaning.

"This images are actually capable of stealing reality because, above all, a photograph is not simply an image (in the same sense that a painting is), an interpretation of reality; it is also a vestige, a direct trace of reality, like a footprint or a mortuary mask." (Sontag, 2006, pág. 216)

The third reading level is more a correlation between the previous two aspects. It studies the articulation of space and time by looking at types of perspective and rhythmical tensions

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in an attempt to interpret the inner meanings articulated by the image.

The final step is to analyze the message presented by the image. To do this, we must identify key factors pertaining to the photographer's vision and intention and the way his or her image is constructed. These factors include: the location the photograph was taken, the photographer's location, and his or her frame of interest (what the photographer decides to frame and in what direction). All images are influenced and mediated by the intentional actions of their author and the reasoning behind them.

Graphical reconstruction and architectural drawing strategies

Finally, a graphical reconstruction is used as a tool for identifying urban and architectural strategies that suggest connections between usage and the user, seeking to understand and confront the intentions of the urbanists responsible for project development and infrastructure construction. It behaves as a temporal and spatial tracking method.

The exercise of redrawing architectural and urban structures is done to achieve a far wider understanding of the studied area, acknowledging the relationships between the city's structures through morphological drawings, shapes, traces and buildings.

Methodologically, the way in which pre-drawn urban maps are presented, responds to a type of organization known technically as grids. The different planes (depending on their characteristics, focus or topic) are placed relationally on columns or rows. Grids allow communicating and displaying simultaneous issues and their correlations.

This method of presenting information analytically is one of a group of interdisciplinary tools that appeared with the modern movement. It remains valid to the point it can be used for studying development processes and urban transformations as it is able to identify the individual characteristics of each case study. This facilitates comparisons with other cases and simultaneous visualization for continuously validating other studies.

Grids – in most cases - allow time lapse-based evaluations and display the impact and results of putting different strategies and urban development projects in place. They allow an optimal visualization of the structures in the cities being studied and how they compare to each other, with mountains or rivers as initial conditioners for implementation, and existing transportation routes and infrastructure as a second parameter.

The way the city's structure is superimposed upon the territories morphological features directly conditions –mostly negatively- all issues of appropriation and relations within the cities that are being the studied. This negative effect results from the current view of development as an alternative driven by economic benefits. All of this, added to a rapid and inadequate territorial appropriation, is diminishing the importance of having structures that allow for healthy social exchanges and interactions with the landscape.

Using architectural tools, such as drawings and blueprints, we can understand a location's distance, orientation and scale, the spatial characteristics of the areas studied, and can then, by comparing past and present drawings of these places, define a record of the changes that have occurred in its urban layout, road connections and public space. (See figure 6)

The first level of analysis is to graphically locate "trigger pieces", or public buildings built in the last 10 years, in urban blueprints, structured from aerial views where topographical appropriations, relationships with natural structures, changes in paths and increasing or decreasing public space can be compared. In this type of blueprints we can also identify uses and variations that have arisen in relation to urban transformations experienced simultaneously by different places.

The second group of drawings are technical detail blueprints, wherein we can establish a relation between the human scale and the context in order to study the relations of scale between pedestrians, buildings and public spaces. These drawings are mostly sections, quantitative representations of a building's walls, platform, furnishings and ceiling. Analyzing them will identify the spatial strategies used by architects and planners to establish the living conditions and usage of public spaces in relation to the buildings and areas in which they are located.

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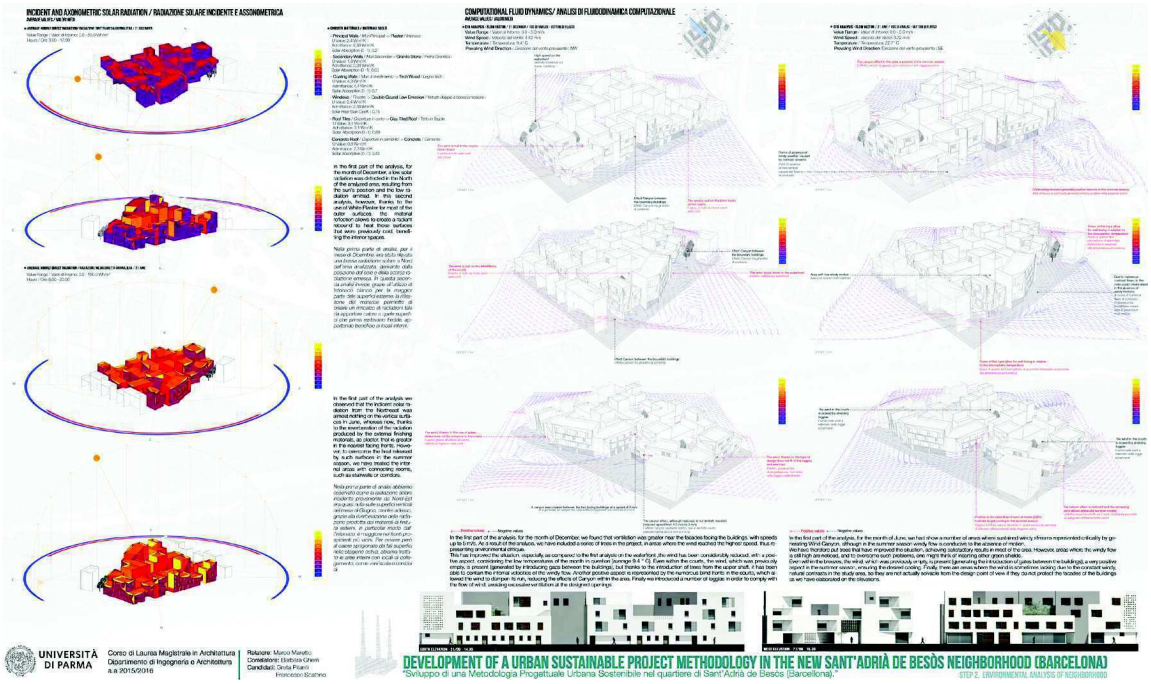

Figure 6.

[Blueprints by Leonardo Correa Velásquez]. (Medellín. 205-2015). Comparative blueprints of areas where trigger pieces were built. Centro Cultural Moravia and Casa de la Memoria, Medellin.

It's important to note that, although these exercises provide data on the urban and architectural morphology of the sectors studies, these results can't simply be formal. There is evidence that the overall interest of the governments that plan cities includes the definition of strategies related to the development of said cities by designing roads and public spaces. Although this strategy provides information on physical conditions, it doesn't reflect social realities with any depth.

These three stages embrace the three dimensions considered in the research to build a wider perspective of the problem being analyzed:

a. Morphological space: consists of all that is observable as "dead areas" with no human interactions: land, natural environment, buildings, equipment, etc. All of these resulting from human interventions.

b. Social, political and economic space: refers to urban practices, citizen participation and private and public behavioral analysis.

c. A connection between the previous two dimensions: the other/others in relation to the space; what/how people represent, perceive and inhabit it.

Conclusion

The three research tools analyzed in this paper: mapping, drawing and photography, define a recurrent method that creates an effect of distance, which increases the effect of designation (Pink & Alonso, 2004) and shows how urban dynamics can articulate submerged realities discussed through the visual sources that were exposed, allowing a closer relationship between the research and the representation that has been made. It is clear that a "static image" offers both advantages and disadvantages. It provides the researcher with the possibility of looking at a situation again from the point of view of any number of observers, expanding their social thinking

By simultaneously looking at various photographs and plans of intervention in different cities, we were able to identify reiterating development processes and similar reactions to urban transformations. The transformations undergone by Latin American cities in recent years have left deep marks mostly in the way formal and social structures are arranged and perceived.

In fact, perceiving each of the analyzed cities and their transformations is a complex

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exercise, since once runs the risk that the image built at first glance by a person with no prior knowledge of the city can be chaotic. Even so, this image may also approach the image of a city renewed through "social planning" instead of simply structural planning. The sensory mapping tool is of great help when approaching this image from a social point of view; it allows delving into what photographs, advertising campaigns or blueprints cannot describe: the "Genius Loci".

Photography is a way to understand times and record changes. Photographic productions are useful for building formal references that account for advancing urban production and architectural constructions, and also for revealing social practices and expressions of life throughout history. Currently, this way of using and producing photography is being adopted around the world, with an interest, not in simply registering large urban developments, but rather in the way in which people relate to the urban environment, their life stories, and the way these connect to economic and social conflict.

Any answer to such a complex question, such as the one posed by this research project, requires restating traditional research methods and involving other non-traditional ones, to thus acquire a global and more complete perspective of these phenomena. The senses, especially sight, allow researchers to analyze external occurrences. Visual exposure allows them to go farther and observe in greater depth other aspects presented by the culture and all the complex details in full. This is why we believe it is important to adopt, and in other cases restructure, other research method that involve a variety of tools to achieve a wider and more complex analysis and understanding of the problem.

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A study of Chinese traditional wetland island settlement combining morphological and narrative analyses

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Abstract. *The Lixiahe region, a low-lying wetland located to the eastern side of the Huaiyang section of the Grand Canal, is characterized by a complex hydrological environment and has changed slowly in the urbanization process. The historical town of Shagou, a representative case of island settlements in this region, has a recorded history of continuous morphological change over six hundred years. Regarding Shagou as a cultural-geographical entity, this article aims at combining morphological analysis and narrative-based cognitive mapping to reveal the characteristic townscape that strongly depends on cultural-geographic complexity. Based on survey work, this article will first define distinguishable plan elements that underpin the spatial form of Shagou: 1) natural context; 2) streets system, and then investigate diachronically different phases of the formation of its spatial structure. On the other hand, based on archiving and data analysis of the oral history study, this article will generate a narrative cognitive map, in terms of paths, nodes, landmarks and areas. In conjunction with fieldwork and documentary records, this study testifies that the method derived from the plan analysis developed by Conzen is applicable to the study of wetland island settlement form in China and that narrative spatial analysis provides important supplemental spatial information. A careful combination of these methods might be used for understanding culturally embedded settlement forms in China.*

Keywords: Chinese traditional wetland island settlement, morphological transformation, plan analysis, cognitive map

Introduction

In literal sense, the traditional wetland settlement indicates a historical habitat with clearly environment-responsive characteristics. This is most notable in the case of Shagou, a historical town lying in a wetland of the Lixiahe region. During the complicated evolution of the hydrological environment in the Lixiahe region, the boundary and configuration of the spatial form of Shagou have consistently changed in the span of over 2000 years. The evidence first comes in the form of a land elevating from a shallow bay which is originating from the Yellow Sea, around 2500 years ago (the Warring States Period). And one group that was well adapted to the unique environment settled down. Based on this resilient topography-responsive form, the habitat experienced significant growth phases. About 1800 ago, the bay transformed into a lagoon and suffered the desalination, which resulting in an emergence of plots of lands. The size of the habitat expanded from one island to a cluster of islands and advanced into the stationary state around 400 years ago (the Ming Dynasty).

However, the morphological changes are not simply a continuous result of natural force, but also a product of social construction, sometimes even radically presented. Benefited from its location on the heartland of the Lixiahe region,

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this settlement has begun to expand because of the increasing number of the migrants since the seventh century (the Tang Dynasty). In response to outside forces originated from the regional trade and population migration, the material forms of the townscape of Shagou became enriched at an unprecedented rate in the fourteenth century AD (the early Ming Dynasty). Henceforward, the role of the town is constantly redefined by the changing social environment, which in turn reshapes the townscape accordingly. Whereas the most intrinsic change happened in the process of urbanization during the 1940s - 1970s, which to a great extend contributes to the form of the town today, a large island surrounded by endless miles of water (Figure 1). This scenic image of the wetland settlement brings Shagou under a new 'social construction', the policy of The Construction of Beautiful Village officially released in 2015, and promotes a process of transforming the town into a tourist town which might probably develop the next evolution of the townscape of Shagou.

It is the interaction of natural force and human force that produces the changeable townscape of Shagou, which might be deduced from archeological evidence of the Lixiahe region (Wu, 1996) or written references to the Shagou town (Yan, 2016) as that shown above. And can we have a further investigation of the growth of Shagou before the modern period and find some basic principles of the morphological phenomena? The fact is that research on Chinese settlement form is generally handicapped by the lack of information, as Whitehand and Gu noted (2007). Compared with the city settlement in China, the rural settlement has more limited documentary records of its historico-morphological development, either folklores or literal works. Whereas Shagou is still a potential case with the survival of its traditional form, for the massive restorations and reconstructions have not taken place yet. It is in this context that, the method of analysis is necessary to get beyond consideration of every detail and find supplementary sources of information.

Methodology

The only cartographic record of the historical Shagou is in one of the military maps made by Japanese (1920), and provides the basic reference to plan analysis. Named 'Shagou', this military map is purposed to show paths on water out of Shagou in all directions. Obviously, Shagou is in an important position for being a center of some function, so it is depicted with details. As this map shows, the Shagou town is on a track of land, which is surrounded but also divided into five parts by water. The outline of the town defined by the circular water routeway present a much similar look from today, however, there are also four water routeways in east-west and south-north directions within the town plan. While these four water routes are completely occupied by roads or buildings today. It is a reasonable presumption that the Shagou town was not on an island but on a cluster of islands and has experienced a metamorphic process.

Identical with the expression of 'Five Groups' from the lore, the town form illustrated on this map has a decisive influence on planning the route of spatial behavior. According to the verbal narrations of the local elders, on the Lantern Fair and the Temple Fair, two of the most significant folk custom tradition, parades with different start and end are both requested to proceed across each group of the 'Five Groups'. From a much narrower perspective of the cognitive sciences in the narrative territory, the verbal narration of the parade route might be treated as a representation of a cognitive map generating from people's embodied experience (Ryan, 2003). The spatial information from a cognitive map can never achieve exact correspondence with the real space, as the verbal narrations do not agree as to the route of the ceremony, but it can be translated into a graphic map which might reveal the spatial relations within the townscape, and thus provides effective supported evidence for the inference from plan analysis (Figure 2).

There is more consistency to substantiate this speculation. A mental model of the spatial relations is repetitive when narrators describe the movements of the ceremonial route, the parade always 'arrives at the temple, and then

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goes over the bridge' or alternatively 'goes over the bridge, and then arrives at the temple'. Where there is a temple there is a bridge and vice versa. The temple and bridge come in pairs as it is shown in the graphic map from people's memorization (Shagou, 2014, pp. 320). Practically, the cognitive map reflects an experience of space which is based on visual cues, the existed material forms: influenced by fengshui for blessing the settlement, the portal of the town is defined by the Zhendong Temple and Zhendong Bridge in the Tang Dynasty (618 - 907), locating on the eastern side of the cluster of islands; The market centre of the town has centered on the location of the Guandi Temple and Wenying Bridge during the period between the Qing Dynasty and the Republic of China (1644 - 1949); The trading market known as 'Chaihang' is near the Chaihang Bridge which was constructed in the Ming Dynasty (1368 - 1644) and blessed by the Caishen Temple which was built on the opposite side of the bridge in the Qing Dynasty (1644-1912).

The cognitive map thus presents sufficient versatility to demonstrate various degrees of detail and precision of the historical townscape, entailing the spatial relations and spatial-temporal information of the material forms that are given meanings. So if we seek to do a plan analysis of the transformation of the town form with the limited planimetric information and the referents from cognitive maps, the preoccupations we focus on must show us not merely a temporal but a spatio-temperal material form, for only by tracing this can we reconnect the cognitive map - the embodied experience to the town form that created it.

Measurement and analysis

The town plan within the Japanese military map suggests the spatial configuration of the historical town form, and the groups can also be recognized as the islands on a ground plan of today's Shagou according to the fieldwork (Fig. 3). The existence of the cluster of islands is a hint impling a form unit called Duotian (a primarily artificial piled-up land in water) of the traditional wetland settlement, which has been verified by the geographical research on the typology analysis of the rural settlements in the Lixiahe region of the northern Jiangsu plain (Jin, 1982). It is sufficiently pronounced to be very clear that Shagou town was on a cluster of islands

Possibly some time in the second century BC, the origin of Shagou is supposed to be one of these five islands as long ago as the Warring States Period (475-221 BC). Boundaries of the first island may be preliminary judged by the eastern area that defined by three oldest also most important temples (Shagou, 2014, pp.319-324; Yan, 2016, pp.252-282; Zhao, 2016, pp.8-11), the Dutian Temple, Zhendong Temple, Wenchang Temple. The first bridge within this town - the Yingxiu Bridge - indicates the two earlier islands, island A and island B, for the emergency of the bridge represents the existed human areas on both sides of the bridge. Also with a geographical responsive name over a long time-span justified by the local, island A is the presumed early habitat that marks the beginning of the existence of Shagou. It is clearly that the outline of the ancient town in each morphological period we have to focus on is the northern and western boudaries.

How the townscape changed in nearly a thousand years following the early morphological period is unknown. It is not until after the mid-Tang dynasty (c. 780 – 805) that Shagou successively shows signs of the westward and the northward extensions of its territory and a basic street system. The sequence of the extensions seems justified both because island A and island C as well as island B and island C are respectively connected by the Zhendong Bridge and the Renhe Bridge in the Tang dynasty, and because the first business street in the town - the Taiping street (Yan, 2016, p.66) - crossing over the Yingxiu Bridge connecting island A and island B previously exists before the Tang dynasty. With regard to the outline of the town in this period, the investigation should continue to turn to the recurrent feature. The location of the Wenying Bridge built in the Tang dynasty (Yancheng Xianzhi, 1583, Wanli edn; Yancheng Xianzhi Chongxiu, 1895, Guangxu edn) marks the existence of island D and conservatively suggests the western boundary.

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And the Jiangyuan Bridge built in the Song dynasty(960-1638) strengthens the connection between island C and island D, which has also proved this speculation. While particular evident in the spatial-temporal information of Hongqiao (Yan, 2016, p.272), support the occurrence of the northern stretch to the island E.

The next period is apparently characterized by repetitions of the former street system, which promotes the first westward march of the town centre. This evident occurs when the organization of the streets has began to reuse the structure of the street system formed in the Tang Dynasty since the Yuan Dynasy (1271 - 1368). With simple principles, this street system is applicable to flexibly reorganize space in a block of certain size. Generally, the block is first divided into four parts by the intersection of two streets that in south-north and east-west but, one being in alignment, and then the bigger part will be subdivided by a 'T' type street or a short street according to different conditions. In Shagou this morphological period also possibly suggests a new street type. The Nandajie and Zhongxingjie setting along the river makes it expedient for the purpose of material exchanges between water-routes and land-routes.

The advent of the Yushikou (fish market) on the north of the Wenying Bridge in the late Yuan dynasty or the early Ming Dynasty (c. 1368) indicates the beginning of significant changes in the town plan, allowing the years from 1368 to 1644 to be distinguished as a separate morphological period. New additions (Plot E) to the town plan correspond closely with an unparallel number of immigration in businesses. As a result, there is a thriving construction about residential area, temple and market. However, this energy importation not only brings about massive material constructions, but also redefined the townscape of Shagou. Inside the cluster of islands, a fishbone shaped structure access running east-west is designed. All north-south streets are joint with either the Qiandajie or the Houdajie, two important market streets taking the place of the Taipingjie and the spacing between every two north-south streets is not of approximate distance, but is decided by the number of the neighborhoods sitting abreast for assuring both the equal accesses and the efficiency of paths. Henceforth, the growth of Shagou's built-up area had long ceased leading to a stationary period of almost 300 years. However, the water inside the town was successively replaced by roads during the period between 1940s and 1970s. The reason for this is that the artificial modulation of the natural environment in the Lixiahe region over 2000 years has result in a recession and pollution of the water. And water-route as a traditional transportation mode has become much reduced in significance as the consequent of the changing transportation modes in recent modernization process. Material forms within the townscape were about to go through a metamorphosis from the moment that water disappeared as an expedient to pave the way for development. Hence, A big artificial island with left un-represented town form is indeed the representation of Today's Shagou.

Conclusion

This study testifies that a combination of narrative and morphological analyses is applicable to the investigation of the transformation of the town form in the terms of the morphological periods and rough boundary of each period, and is enable revealing the predominant phenomena in the process of the transformation. The 'island' (Duotian) presents an environmental responsive meta form with morphological inertia driving the town form to transform in a constant pattern. The street system initially constrained by water evolutes into inextricably interwoven with water. The bridge together with the temple is in part the most significant landmarks defining a specific area in the townscape, but also a traffic node in the street system.

The morphological periods of Shagou as shown in the following:

1. Before Mid-Tang Dyansty (475 BC - c. 780)
2. Mid- Tang Dynasty to Early-Ming dynasty (c.780 - c.1400)

(a)Mid- and Late Tang Dynasty (c. 780- 907)
(b)Song Dynasty to Yuan Dynasty (960- 1368)

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(c)Early Ming Dynasty (1368 - c. 1400)
3. Mid- and Late Ming Dynasty (c.1400 - 1644)
4. Qing Dynasty to Early Republic of China (1644 – c. 1928)
(a)Early and Mid- Qing Dynasty
(b)Late Qing Dynasty and Early Republic of China (1840 – c. 1928)
5. Modern (c. 1945-1970)

Attention to the spatial structure transformation in recent modernization process provides impetus for the points of departure in this study and the methodology based on narrative theory introduces an appropriate method into fieldwork relevant to human's embodied experience. Morphological analysis of this representation of the wetland settlements enables tracking of transformation of the town form in an evolutionary approach ,thereby providing an opportunity to challenge the accepted accounts of the traditional wetland settlement, as being merely an intensely visual idea.

Figure 1. A birds-eye view of the town of Shagou from the northeast direction, 2017. Photographer: Renyuan Hu

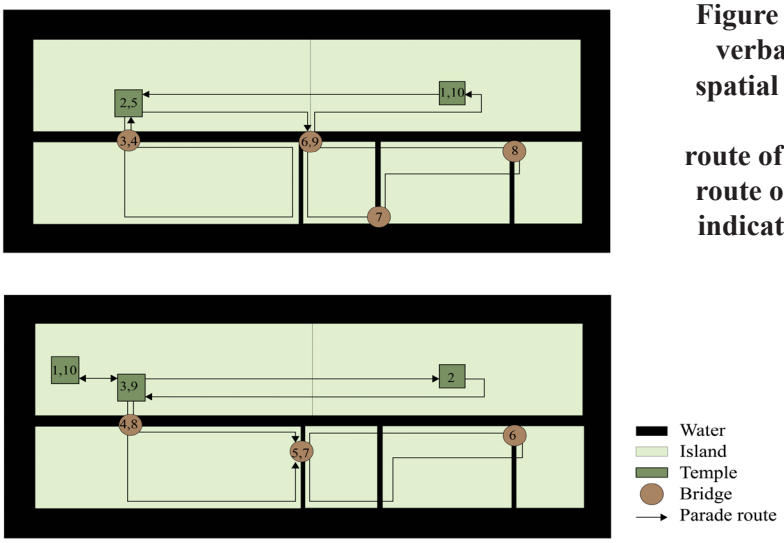

Figure 2.Schematic maps of the verbal narration of the route of spatial behavior, from up to down: parade route of the Lantern Fair, parade route of the Temple Fair (numbers indicate the sequence of the route)

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Figure 3. Plots boundaries (boundaries of the former islands are shown in black dashed) and outlines of the block plans of the buildings: Shagou, c.2009. Based on an unpublished plan prepared by the government of Taizhou, Jiangsu province.

Figure 4. Street - system types and new accretion with plots in the morphological periods of the ancient Shagou, before c. 1945.

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Identify urban spatial patterns based on the plot shapes and building setting in downtown of Nanjing

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Abstract. *The geometric characteristics of modern cities have been difficult to describe that is important for urban design, which deserve to be further interpreted. Taking advantage of Conzen's methodology, the building is tightly related with its plot, which means the certain building pattern can be described by examining the generation of the building arrangement within the plot. Simultaneously, the building pattern is highly affected by the plot pattern it is located. In view of these, plot patterns together with land property and site coding could be taken as the clue for understanding both building patterns and urban spatial configuration. 35 commercial blocks in Nanjing downtown areas are chosen as research samples. Firstly, the internal structure of the blocks will be studied by analyzing the patterns, functions and land utilities of its plots. Focusing on the site coding and regulation, the building arrangement could be clarified and mapped. The results will identify the urban spatial patterns in downtown of Nanjing by mapping the characteristics of plot size, shape, properties and boundary lines. Therefore, the method on describing urban spatial configuration in modern cities could be developed.*

Keywords: Spatial Configuration, Building Pattern, Plot Pattern, Plot Boundary Line

Introduction

With the further development of reform and opening-up, China has experienced rapid urbanization and the physical space of many cities has undergone tremendous changes. As one of the most developed cities in China, Nanjing has a dramatic scale expansion and significant changes in material form. The study of urban morphology is concerned with the material form of the city. And the urban form is the materialized result of the development of urban space. The geometric characteristics of modern Chinese cities such as Nanjing are complex and difficult to describe. The urban spatial form is enclosed by buildings and has a figure-ground relationship with the urban texture. The study of the spatial form could provide new perspectives and methods for the study of urban morphology. Many studies have shown that the spatial form of the city has an important influence on the visual and inner perception. And it is also associated with the wind environment and the thermal environment which is link to health of the public. Therefore, the study of the spatial form especially to make the spatial form descriptive is of great value.

The study of urban morphology contains many different disciplines, and scholars in different fields have different perspectives. But both geographers and architects can come to the conclusion that the smallest unit of the city is the union of the plot and the buildings it contains. Take Nanjing as an example, the roads divide the city into blocks and each block is made up of several or even dozens of plots. Each building is generated in its corresponding plot although it may have different layout patterns and shapes due to the requirements of the owner and the designer's aesthetic. What's

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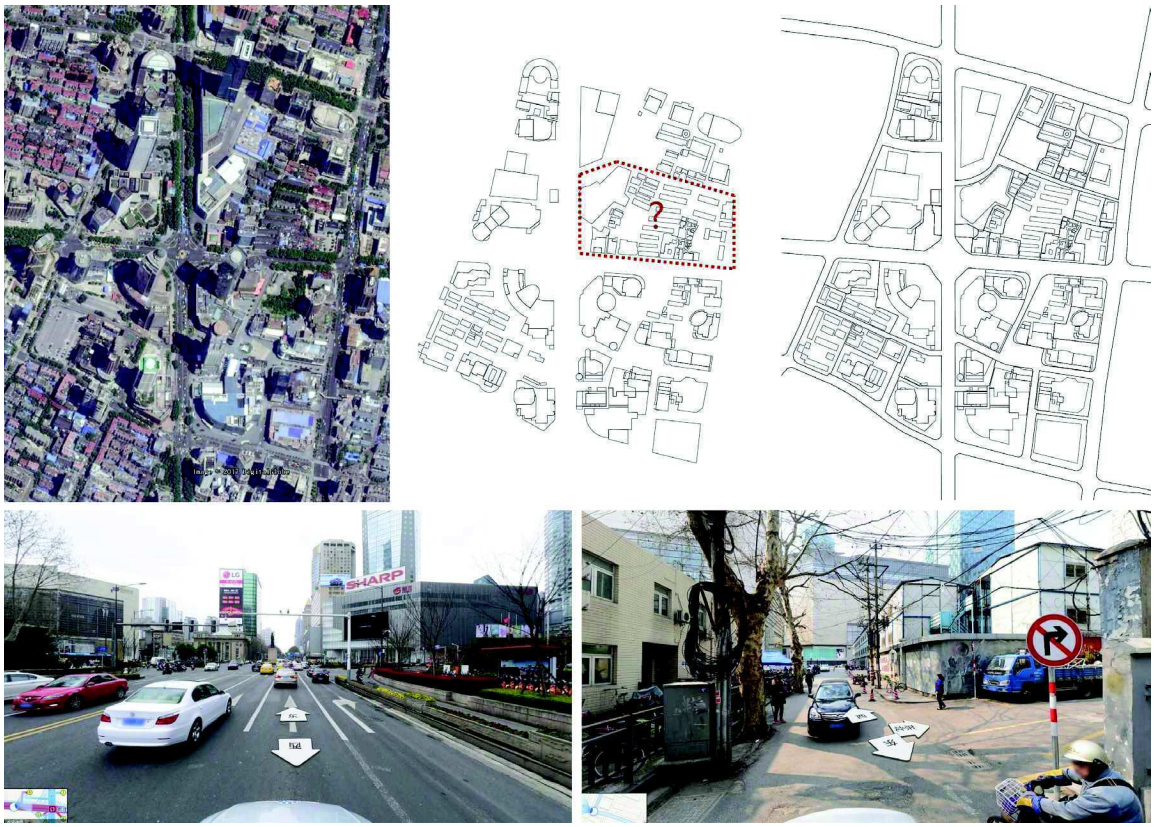

Figure 1.
Four Blocks in City Center of Nanjing

more, the building design must meet the design specifications. Thus the roads and the plot boundaries can be used as a tool for studying the urban spatial form enclosed by the vertical façade of the buildings.

What we need to study is the spatial form between the buildings in the city. One is the spatial form enclosed by buildings on both sides of urban roads, and the other is the spatial form enclosed by buildings between the adjacent plots. Taking the high-density area in the center of Nanjing as an example, the above two kinds of spatial form are studied. Urban roads are mainly divided into four types: expressway, main road, secondary road and branch road. The plots are divided into residential plots and commercial plots from the land use. The spatial pattern of residential plots is already clear and its texture has been quantified. The internal spatial form of residential plots is mainly determined by the sunshine demand and the required volume ratio. However, there are no definite organization rules in the shape and the texture of the buildings in commercial plots. So the research will focus on the space form between commercial plots and adjacent plots.

This paper will focus on the following aspects: for the spatial form enclosed by buildings along roads, this paper will analyze the building concession to the road redline and the layout of the entrance and exit of the building, so that the general rules of the formation of the spatial form can be made. For the spatial form enclosed by buildings between adjacent plots, the plot boundary lines can be used as a tool to summarize, analyze and describe it.

Research and Analysis

The study chooses four blocks in XinJieKou which is the city center of Nanjing as a case (See figure 1). The urban texture of this four blocks is rich and varied, which can be regarded as a microcosm of the complex texture of modern Chinese cities. Firstly, a complete general plan of the central area is drawn based on the satellite map from 2005 to 2017. If you

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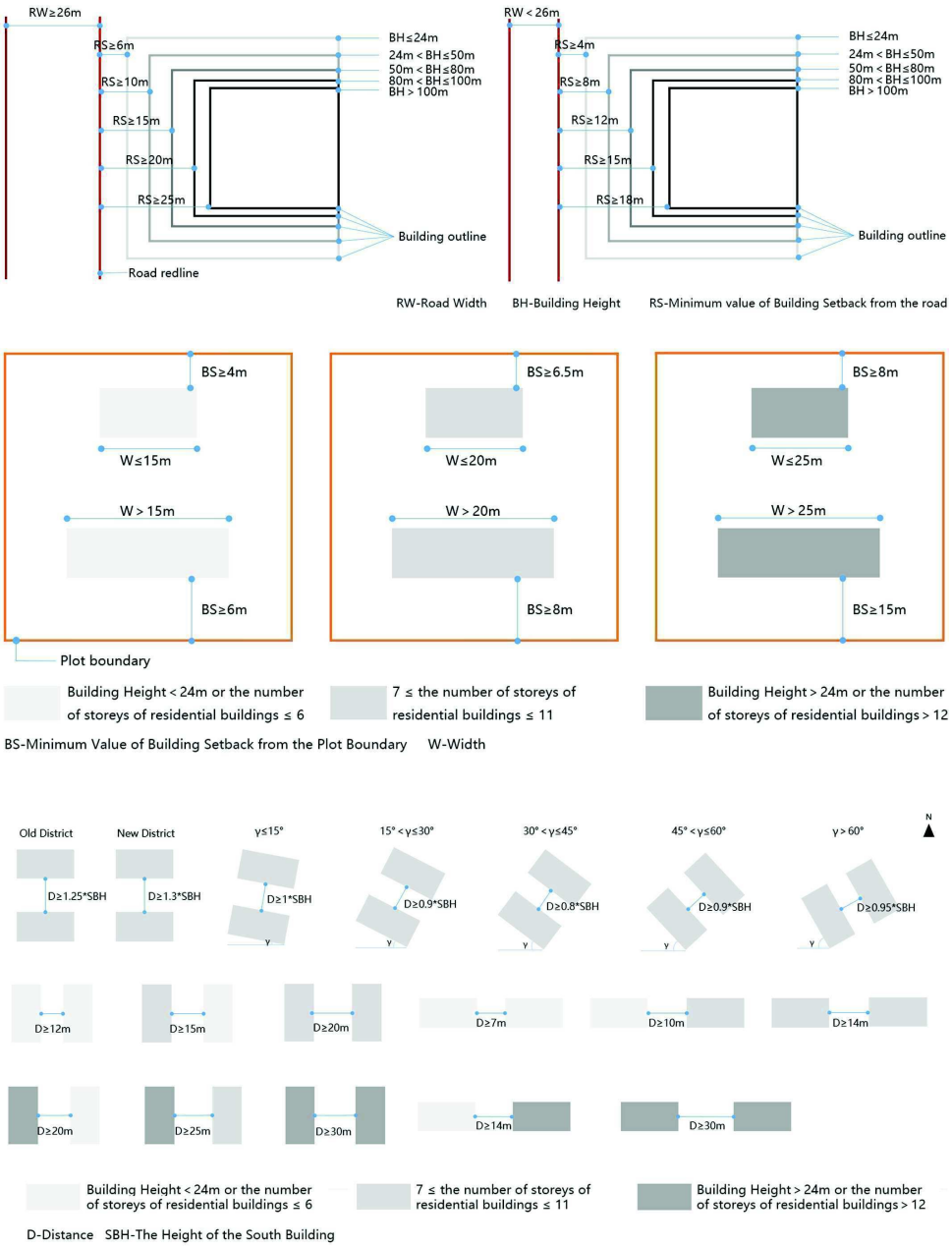

Figure 2.
Diagram the <Implementing Rules of Nanjing City Planning Regulations>,2004

only keep the buildings in the central area, you will find that the spatial form is disorganized and hard to describe. But if you join the city roads and the plot boundary lines in which the building is located, the situation will be different. Combing the road network system to clarify the blocks and the plot groups. Then to clear the plot land use into commercial plots and residential plots. Because the design code of Nanjing is revised and improved over the years, it is necessary to find out the construction date each plot and then to find the design specifications of that year for verification and research. Thus, the analysis of the spatial form between buildings can be found regular.

Research on laws and regulations

Laws and regulations for building patterns mainly include two aspects: the first is the building concession to lines, including road

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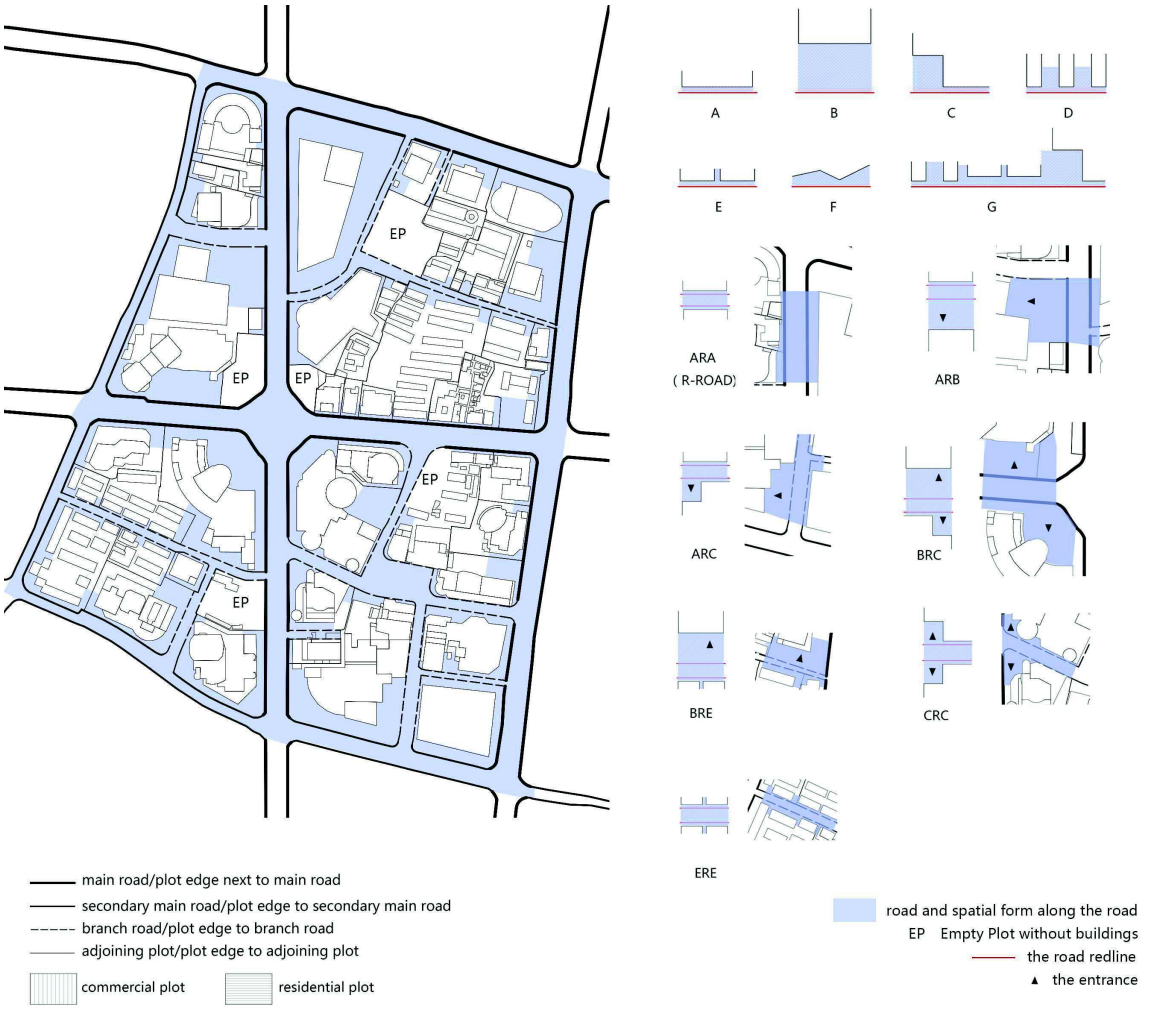

Figure 3.
Spatial Form between Buildings Adjacent to the Road

redlines and plot boundary lines. The second is the required spacing between buildings, which is mainly to meet the sunshine demand and the fire demand.

The building concession to lines is to limit the minimum distance from the building outline to the road redline or the plot boundary line. The concession distance to road redline is linked to the road level and the height of the building. The wider the road is, the higher the building is, the concession distance will be greater. The concession distance to plot boundary line is related with the height and width of the building. The higher the building is, the larger the width is, the concession distance will be greater. The concession distance between buildings especially between residential buildings must meet the sunshine demand and fire demand. And the specification makes different arrangements for parallel layout, vertical layout and slant layout of buildings. Taking the <Implementing Rules of Nanjing City Planning Regulations>(2004) as an example, the requirements are diagramed in Figure 2.

The fire requirements on the spacing between buildings are related with building height and building fire rating. Taking the <Code for Fire Protection Design of Tall Buildings> (2006) as an example, the Table 1 sets out the minimum fire spacing distance between buildings.

Research on Spatial Form

Spatial Form between Buildings Adjacent to the Road

The impact of urban roads on city layout is often very enduring. And most of the historical

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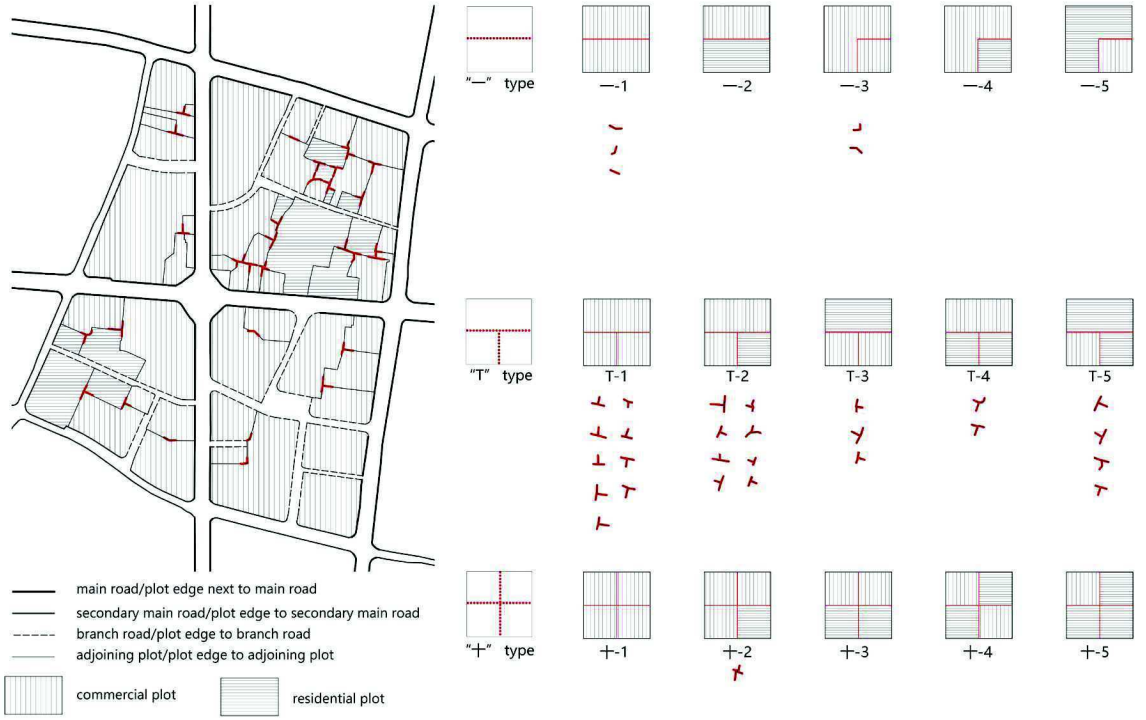

Figure 4.
Combinations of Plots in City Center of Nanjing

roads will be repaired or widened to continue to be used. In the new district of the city, the road network system is planned first and blocks are divided by this system. Therefore, when studying the spatial form of modern Chinese cities like Nanjing, the first consideration is the spatial form enclosed by buildings on both sides of roads.

After combining the requirements of the specification and case study, it could be found that the spatial form between the building and the adjacent road can be divided into two categories: the first kind is to spare a road which can be used as the fire channel. The second kind is to spare a square used as entrance, parking or landscape in the corner of the building or the whole building. Considering the nature of the plot where the building is located, there are seven types of spatial form between the building and the road (See Figure 3). The first is the road space(A) formed by building concession to the road. The second is the square space(B) formed by building concession to the road. The third is the corner square space(C) formed for that the building cuts out the entrance space in the corner. The fourth is the jagged space(D) formed when the north-south road is adjacent to residential plot. The fifth is the T-shape space(E) formed when the east-west road is adjacent to residential plot. The sixth is the irregular space(F) formed because of the building shape, which can be used as road, square or parking. The seventh is the combination of two or more of the first six types(G). The spatial form between the buildings adjacent to the road is combination of the seven types above and the road itself. Theoretically, there are 7*7=49 species of spatial form between the buildings adjacent to the road. And these species may combine with each other along the road, so the spatial form along the road could be very complex. But each type of spatial form can be explained.

Take the central area of Nanjing as an example, there are seven typical spatial forms along the road (See Figure 3). The spatial form could be named by the spatial form of one side + road + the spatial form of the other side, so the seven types can be named as ARA, ARB, ARC, BRC, CRC, ERE. Thus, it is possible to use this numbering method to address and describe the spatial forms enclosed by buildings along city roads.

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Figure 5.
Spatial Form between Adjacent Plots

Spatial Form between Adjacent Plots

In addition to the spatial form between buildings adjacent to the road, the spatial form between adjacent plots is also worth considering. For that the buildings in the city are grown in the plots, their external spatial form is closely related to the plot boundary. Thus the plot boundary line could be used as the tool to study the spatial form.

There are three kinds of combinations of plots (See Figure 4). The first kind is the "-" type which means two plots have one side intersecting. The second kind is the "T" type which means three plots intersect to each other. The third kind is the "+" type which means four plots present a cross shape. Take the city center of Nanjing as an example, there are five "-" –type plots (accounting for 15.6%) and twenty-six "T"-type plots (accounting for 81.3%) and only one "+"-type plot (accounting for 3.1%). The paper focuses on the spatial form associated with the commercial plots and will not discuss the situation when all combined plots are residential plots. According to the land use of different plots, every one of the three types has five different combinations (See Figure 4). Numbering them we can get from "-"-1 to "-"-5, from "T"-1 to "T"-5, from "+"-1 to "+"-5, totaling fifteen numbered types. Statistics on the number of each type among thirty-three blocks in Nanjing are as follows. It can be found that both "-" type and "+" type are few and "T" type is the main type, especially T-4 and T-5 are the largest in number.

Taking the central area of Nanjing as an example, the spatial form adjacent to the plot boundary line is drawn as shown in Figure 5. The number of "+" type is very few. The number of "-" type is few and its spatial form can be

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considered as the case of spatial form along the road when the road width is zero. Therefore, the study will focus on "T" type. There are three main types of space form in "T" type: the first type is the bar space which can satisfy the traffic and fire demand. The second type is the square space which is a partial or whole concession of the building to the plot boundary to form the entrance or parking space. The third type is the space formed by plot boundary and residential buildings. The spatial forms of "T" type are made up of the space above. And the space can also be abstracted into the A to G type in Figure 4. So all the spatial forms can be numbered and described.

Conclusion

Urban texture of modern cities is complex and is difficult to be described. However, the description can be made from the perspective of spatial form between buildings. The city road and the plot boundary line can be the tool for the study. The spatial form is divided into the spatial form along the road and the spatial form between adjacent plots. The design code has regulations for building concession to the road or to the plot boundary. It also defines the minimum distance between buildings for sunshine demand or fire demand. As a result, the design code has great guiding significance for the formation of the spatial form.

The spatial form between the building and the road can be abstracted and simplified into seven types and the spatial from along roads can be numbered and described. The spatial form between adjacent plots are closely related to the combination patterns of the plots. The "-" type, the "T" type and the "+" type are common types, among which "T" type accounts for the vast majority. The study of the central area of Nanjing shows that the spatial form between plots is complex and varied, but the basic types are the same which means the spatial form can also be numbered and described.

Acknowledgements

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Appendix

Table 1

Building type	tower	podium	Other civil building		
			Fireproof endurance rating		
			First and second level	Third level	Fourth lever
tower	13	9	9	11	14
podium	9	6	6	7	9

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Towards new traditional urban fabrics: Learning from London

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Abstract. *Today's towns, as often represented on the web and media, seem almost the same, flattened out on the American model. But European towns still preserve their individuality: if we look at aerial views, for instance, we can see that just little sections are enough to make it impossible to confuse them. And it is not because of some single building or monument. Each of these towns has its own character due to the very nature of its urban fabric. Furthermore, every town is made of several different urban fabrics, each one with its own specific character, which distinguishes it from the others: nevertheless all of them appear as different aspects of the same reality. Which are the common features connecting such apparently different realities? And how can we learn from the past in order to obtain a more livable built environment, in coherence with the traditional town and without interrupting but even promoting its further development?*

Keywords: Urban Fabrics, London Squares, Traditional Town, Built Environment

Introduction

What kind of mental representation do people have of today's towns? Both the media and the web give them pictures showing multitudes of iron-glass skyscrapers, often represented in night views, where the towns may even appear beautiful in their sparkling aspect. But in night or day views they seem all alike, flattened out on the American model. Thus, comparing different towns like that, it's very difficult to identify them.

In the case of London, the object of our research, only a few elements allows us to do it, for example the presence of the river Thames and some small differences between Norman Forster's skyscraper and the similar ones in Barcelona and Tokyo. Let's look at some aerial views of XVII-XIX centuries European towns: in most cases just little sections are often enough to make it impossible to confuse them. And it is not necessarily because of some single building or monument.

Each of these towns has its own character due to the very nature of its urban fabric. That is to say the set of typical features (relationship between streets, plots layout, building types and architectural characters) that identifies every single town making it different from all the others. Although designed and realized in a rather short period and in similar social and cultural contexts, these towns seem quite different one another. Some of them may seem a little monotonous, but all of them have a high degree of urban quality.

This paper represents a new step of my practice's research on traditional urban fabrics in the European cities, started in 2013 and mainly focused on London's fabrics and squares. The choice of London as subject matter has been made taking into consideration the fact that most of the present central neighborhoods were built in a rather short time, from the 1666 Great Fire to the Second World War. They represent one of the largest examples of homogeneous urban growth over a shared building language time. But, although homogeneous, London is not just the same everywhere.

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Even if a great part of the town center is made of several different XVIII-XIX century urban fabrics, each one of them has its own specific character, which distinguishes it from the others. And yet, even if so different, no doubt they all are London.

Look at some aerial views of the central London urban fabric: despite the variety of the individual solutions, they share the same general characters, no matter the time of their construction and the different style of their architecture.

The same we can say about eye-level pictures, showing different street fronts. At the building scale, the differences are even greater, both for the building type's progress (from individual homes to apartments blocks) and for the stylistic changes (from Georgian houses to Victorian ones): nevertheless all of them appear as different aspects of the same reality. And also in this case, no doubt they all are London.

So, which are the common features connecting such apparently different realities? And how can we learn from the past in order to obtain a more livable built environment, in coherence with the traditional town and without interrupting but even promoting its further development?

The formation of London square and urban fabric types.

As we have already seen in some previous reports, we started our research with the close exam of the existing urban fabrics and in particular of the traditional ones. A good basis is given by the 1799 Richard Horwood's Plan of the Cities of London and Westminster, the Borough of Southwark and Parts Adjoining, which is a very detailed map of Georgian London, showing, in many parts of the town at least, besides every house, the allotment of the building land.

If we superimpose this map to a more recent Google map, we realize that while a great part of the town did undergo a deep change, some significant sectors of the old urban fabric still remain, particularly in central-western London, even though many of their buildings have been replaced during the last two centuries. Most of them coincide with the first group of great planned developments that from the second half of the XVII century to the end of the XVIII century began to give London its present urban character.

Each of these developments depends (in part, at least) on an orthogonal street fabric, focusing on an open space, usually a garden square. These squares, often surrounded by uniform buildings after the tradition of the Italian (and then French and Spanish) Renaissance architectural squares, represent perhaps the most connotative elements of London urban fabric. We have pointed out, on Horwood's map and then on the Google map, all the garden squares realised from 1631 to 1799 and still existing, although transformed.

Starting from the late Renaissance Inigo Jones's Covent Garden, we may count up to 30 garden squares (plus three crescent squares – Great Cumberland Place, Highbury Crescent, The Paragon) existing at the end of the XVIII century:

XVII century:

Covent Garden	1631 onwards
Lincoln's Inn Fields	1638 onwards
Bloomsbury Square	1661 onwards
St. James's Square	1662 onwards
Golden Square	1670 onwards
Devonshire Square	1678 onwards
Soho Square	1681 onwards
Hoxton Square	1683 onwards
New Square (Old Square)	1683 onwards
Red Lion Square	1684 onwards
Kensington Square (King's Square)	1685 onwards
Grosvenor Square	1695 onwards
Gray's Inn Square	1699 onwards

XVIII century:

Queen Square	1716 onwards
Smith Square	1713 onwards
Hanover Square	1717 onwards
Cavendish Square	1717 onwards
Charterhouse Square	1722 onwards
Berkeley Square	1739 onwards
Portman Square	1764 onwards
Sloane Square	1771 onwards

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Great Cumberland Pl	1774 onwards
Bedford Square	1775 onwards
Manchester Square	1776 onwards
Hans Place (1870's rebuilt)	1770's
Highbury Crescent	1770's
Cleaver Square (Prince's Square)	1789 onwards
Gloucester Circus	1790 onwards
West Square	1791 onwards
Fitzroy Square	1792 onwards
The Paragon	1794 onwards
Brunswick Square	1795 onwards
Surrey Square (almost demolished)	1795 onwards

We have then examined the main characters of these squares, so as to find out the elements they have in common: the same elements may lately have influenced the many building developments of the XIX (and first XX) C., which transformed London into one of the great European capital cities.

On the basis of the same Horwood's map, we have pointed out the street system upon which the single squares plans are based, the possible presence of special buildings, the layout of the plots and houses that surround them and the sections of urban fabric that seem to be strictly connected to the same squares. Some squares, like the early XVII century ones, appear to be the simple reorganization of wide areas inside pre-existing urban fabrics alongside suburban roads. Others, instead, seem to be the focus elements of widely extended building developments, based on a new street network, along which the same building organization and homogeneous architecture of the square are proposed again. Some refer to special buildings (churches or palaces) and their plans tend to be symmetrical on a central axis. Others seem to depend chiefly on the street axis connecting them to the main roads. None of them lays at the intersection of pre-existing main roads. All of them are surrounded by rows of serial buildings, typologically homogeneous and composing uniform fronts. More in detail, we can notice that the new developments are almost always separated from the main roads by the pre-existing fabrics, seldom involved in the new interventions.

So, the new urban fabrics and squares lay on the back of what we call the pertinent stripe, including all the built lots referred to the same street front of the pre-existing streets. For this reason the layout of the squares depends firstly on the streets which connect them to the same main roads.

In some cases the connecting street becomes the central axis of the square, with or without the presence of emerging buildings (see for instance Bloomsbury, Soho, Hanover, Cavendish, West and Manchester squares). In others, two streets connect the square to the main road: they don't play the part of spatial axis but just define the building line of the new row houses (see St. James's, Golden, Berkeley, Cleaver and Fitzroy squares). In others again, the layout of the square is defined by two couples of orthogonal streets that become the matrix of the surrounding urban fabrics (see Portman, Grosvenor and Bedford squares). We've then tried to go deeper into the structure of the same squares, pointing out the organisation of the plots and buildings that surround the squares and the nearby streets. Besides the layout of the squares and streets, the most relevant element seems to be the division into plots of the building land. We may outline different urban fabric types, seen as aggregative system of several building types.

•Simple fabrics: just one stripe of built plots alongside a street (see for instance Bloomsbury Square, Queen Square, or Bedford Square);

•Double fabrics: two stripes of built plots, facing parallel streets and bordering each other at their back (see Bloomsbury, Queen and West squares);

•Simple fabrics with stables: one stripe of built plots, with row houses facing the street and stables on the back (see Bedford Square again or Lincoln's Inn Fields);

•Double fabrics with stables and mews: two stripes of built plots, each with row houses facing the street and stables on the back, separated by common mews (see Portman, Grosvenor and Bedford squares).

The depth of the plots varies from about 75' to 150' for what concerns the single tissues without stables; it is usually greater up to 180'-200' for the single tissues with stables; these dimensions redouble, in case of double fabrics, and even more in the presence of mews.

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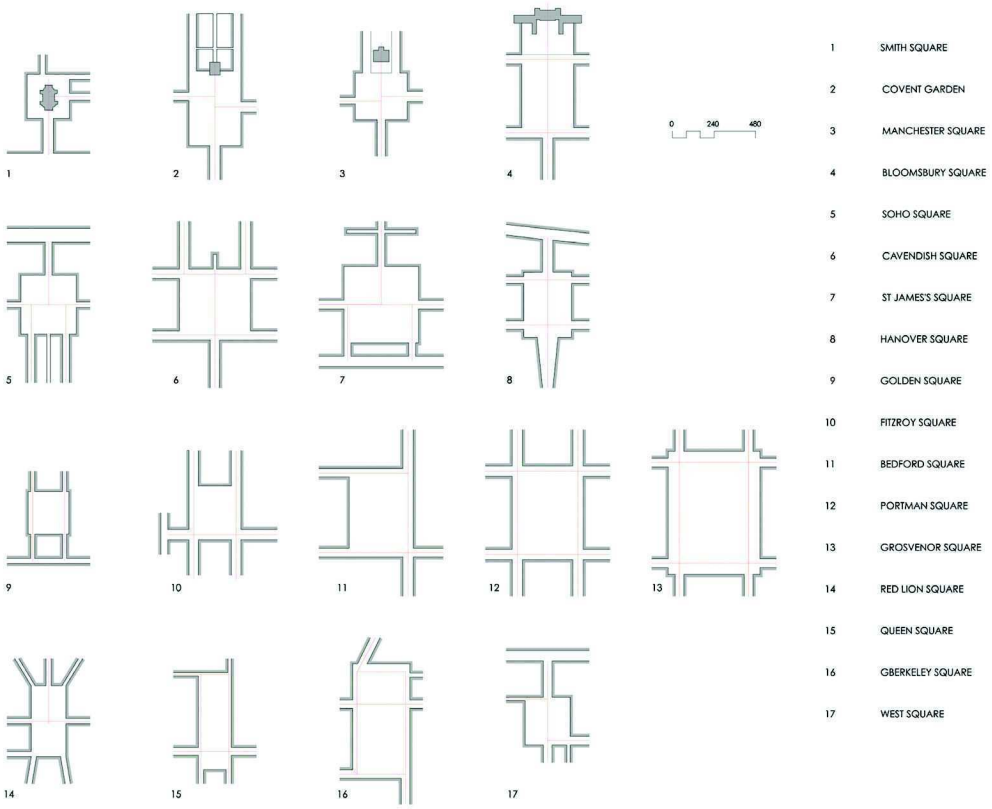

Figure 1.
London squares general layout schemes © GALLARATI ARCHITETTI.

As for their width, it varies much more according to the building types and seems to be proportional to the depth of the houses:

•a 16' average width is typical of the spontaneous building fabrics along the pre-existing roads, but we can find it in some planned new suburban tissues (see West or Cleaver squares): it corresponds to the two-bays (or even one-bay) house-type;

•a 24' to 32' width corresponds to the three-bays house-type, that seems to be the base type of many of the XVII - XVIII century developments (still very well preserved in Bedford Square, for instance);

•a 32' to 48' width corresponds to the four-five bays house-types, a multiple of the first two types: they often seem to be derived from the unification of two smaller buildings or plots (see for instance Portman or Smith squares), but in some interventions they have been directly used as new base types (see St. James's and Cavendish squares);

•lastly, a 50' to 70' width is the dimension of the largest five-six bays, or more, house-types, multiples of two or three of the previous base types (see Hanover, Portman and Grosvenor squares).

We have so far pointed out only the deep structure of these XVII-XVIII century developments: but, how do they present themselves? What kind of formal settlement do they have? As we have seen, most of them have been transformed and their houses often gradually substituted by others with more and more increased dimensions up to include in one single building the whole width of the square front (Portman, Grosvenor, Bloomsbury squares). Basing our vision on the best preserved squares (Bedford, West, Cleaver squares), we may argue that most of the squares were conceived to be homogeneous, composed by the serial repetition of a same single element, the same single building type. To each building type corresponds a specific front elevation, whose rhythmical repetition alongside the entire row gives it its uniform architectural character. Therefore, the squares' architectural uniformity is given by the rhythmical repetition of analogous elements.

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Rhythm may be uniform (A-A-A-A) or alternate (A-A'-A-A').

Sometimes a particular accent (a pediment, for instance) is given to the central element of the row, so as to give an axis to the square (see Bedford and West squares). With the progressive substitution of the original houses much of this character has been lost but we may find it again in most of the great XIX century realizations. In the next 4 synoptic plates we have tried to summarize the main elements we have observed until now.

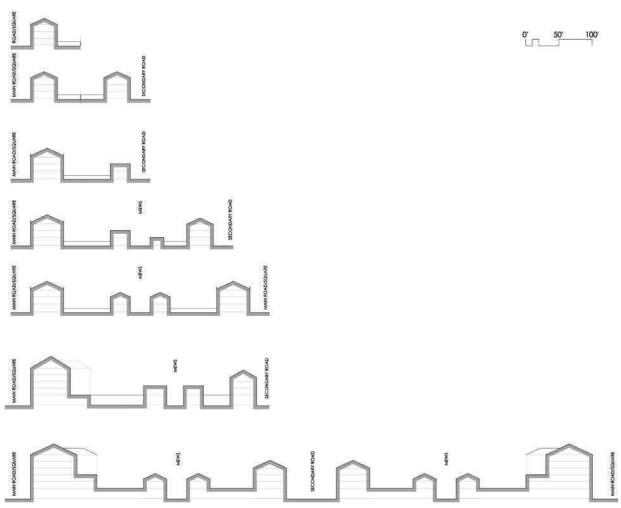

Figure 2.
London fabrics typical cross sections
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1. General layout (Fig. 1):

squares with a central axis and a main building on it;

squares with a central axis, without main buildings;

squares with one or two couples of orthogonal axis;

square with occasional axis system.

2. Urban fabric types:

simple fabrics;
double fabrics;
simple fabrics with stables;
double fabrics with stables and mews.

3. Urban fabric cross sections (Fig. 2):

the progressive development of the urban fabric, from the basic to the most elaborate ones.

4. Street fronts:

the gradual development of the street fronts, related to the progress of the building types and to their rhythmical repetition.

This is only a first draft, but we believe it could be a good guideline for deeper analysis of the urban XVII-XVIII century fabrics and the starting point for a wider study of the XIX century great developments and of the fewer XX-XXI century ones.

The development of urban unit types

Since the beginning of the XIX Century on, the development of new urban fabrics and garden squares blew up.

From our point of view, the starting point may be considered the opening of Bedford Place in 1800 (after the demolition of Bedford Palace) and its connection to the new Russel Square, that launched the great Bloomsbury development north of Bloomsbury Square. In this case a good basis is given by the 1893-96 Ordnance Survey, Five feet to the mile London map, which shows us the detailed situation of London urban fabrics at the end of XIX C.

We could count up to 206 new garden squares (often called simply gardens in the second half of the Century), circuses, crescents, realised during the XIX century, plus 13 at least in the XX and 2 in the first years of the XXI century, all matching more or less the main characters we have found out in the 30 previous examples.

The new developments, often involving wide estates, usually have elaborate plans with many squares and streets on whose basis the urban fabrics are organised; they are always characterised by the presence of extended private and public green areas; the architecture of the houses that compose the single urban fabrics tends to be homogeneous.

Also because of their extension, they still stand as the main elements of London present urban morphology. But they are not the same.

If we examine some of the largest and most elaborate urban expansions, we can see that the new fabrics developed in two very different, although almost simultaneous, ways.

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From the very beginning, there seem to be two ways of conceiving the urban growth:

- an intensive way, with a well-structured system of streets and squares and elaborate fabrics, with a clear relationship among the different house-types and the succession of main roads, secondary roads, lanes and mews (see for instance Bloomsbury, Paddington and Belgravia developments, but also Portman, Cadogan etc.);
- an extensive way, with a more "naturalistic" street and square system and simple fabrics aligned along the same street and square fronts (see Kensington, Clerkenwell, Barnsley developments, but also Chelsea, Notting Hill, etc.).

Both of them are definite London ways.

The second way, a proto-type of the late XIX Century Garden City movement, still enjoys some chance, mainly in some minor centre and suburban developments.

The first way instead (that could better match the actual demand) seems to have been abandoned, at least at the moment, leaving the way clear for "modernist" intensive developments.

Let's now examine more in detail some XIX C. London great planned developments. Their morphology may vary according to four main

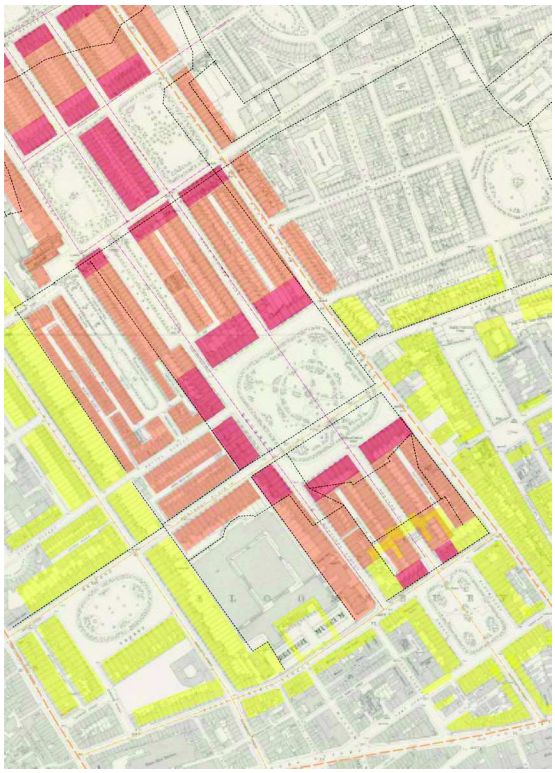

Figure 3.
Bloomsbury development: Urban fabrics along pre existing axes (yellow texture) and new axes (various textures), drawn on the basis of the Ornance Survey Maps
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Figure 4.
Bloomsbury development: Bloomsbury Square, Bedford Place, Russel Square, Gordon and Tavistock Squares © GALLARATI ARCHITETTI.

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urban unit types:

•low density linear fabrics (two rows of plots and houses alongside a route), linked up one another in a loose and apparently casual street system;

•high density serial fabrics, a close system of main and secondary streets (each one with its own two strips of plots and houses) able to take the best advantage of the available land;

•low density simple polarized fabrics: a loose system of squares (surrounded by simple rows of houses) and streets (with two strips of plots and houses);

•high density organic polarized fabrics: a complex and hierarchical system of squares (primary and secondary poles), streets (main and secondary axes) and mews.

As we have focused our research on London squares we've tried to better analyse type 3, simple polarized fabrics, and type 4, organic polarized fabrics, corresponding the first to the extensive way of conceiving the urban growth and the second to the intensive one.

In particular in a previous report we had examined the Clerkenwell development (type 3) and the Belgravia development (type 4), both realized in the first half of XIX C.

Let's now examine two other examples, the Bloomsbury development, in the first three

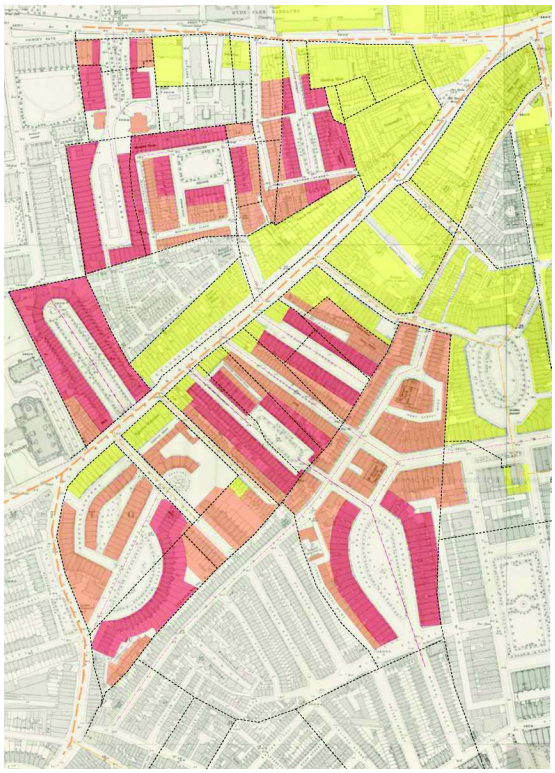

Figure 5.
Knigthsbridge/Brompton development: Urban fabrics along pre existing axes (yellow texture) and new axes (various textures), drawn on the basis of the Ornance Survey Maps © GALLARATI ARCHITETTI.

Figure 6.
Knigthsbridge/Brompton development: Trevor Square, Montpellier Square, Rutland Gate, Lennox Gardens © GALLARATI ARCHITETTI.

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decades of XIX C., and the Knightsbridge/ Brompton development, in the immediately following years.

The Bloomsbury development (Fig. 3, 4), within the Bedford Estate, includes the pre-existing Bloomsbury (1661) and Bedford (1775) squares and the following new ones:

Russel Square	1800 onwards
Bedford Place	1801 onwards
Gordon Square	1820 onwards
Tavistock Square	1820 onwards
Torrington Square	1821 onwards
Woburn Square	1829 onwards

In its original layout Bloomsbury Square used to be organized along a central axis, focused on a main building (Bedford Palace). With the demolition of the same palace, the axis of the square became the main axis of a greater development, corresponding to the new Bedford Place (opened in 1801 and connecting Bloomsbury Square and Russel Square) and Upper Bedford Place (connecting Russel Square to Tavistock Square) and then to the north-west to Euston Square (later completely demolished and transformed).

In this case the boundary lines are given by one preexisting external road (Southampton Row, to the East), and the rear side of a preexisting building tissue facing Gower Street and Bedford Square.

The new urban fabric is organized, at first, by the squares, which are all bordered by homogeneous terraced houses on their four sides; the remaining tissues lay alongside streets parallel to the main axis: the same Southampton Row; Southampton Street-Bloomsbury Square-Bedford Place-Russel Square-Upper Bedford Street and then side of Tavistock Square; Montague Street-side of Russel Square-Woburn Square-side of Gordon Square.

These road axes are laid out according to a close hierarchy B-c-A-c-B on which basis the urban fabric and the building types vary: from the simple fabrics composed alongside Bloomsbury and Russel Square, to the double fabrics between Tavistock and Gordon squares, to the double fabrics with stables and mews alongside Bedford Row and Upper Bedford Row.

As in many other London developments, the mews houses, once just stables on the back of the main buildings, are now independent dwellings, in some ways more similar to village houses than to city houses. The succession of main houses and mews houses gives the urban fabric a new variety and wealth, which can be resumed for further high-density developments.

The Knightsbridge/Brompton (East Kensington) development (Fig. 5,6) is made up of several smaller ones, corresponding to different estates; many of them have road axis, a couple of boundary roads and a central square:

Trevor Square	1818 onwards
Brompton Square	1821 onwards
Montpellier Square	1824 onwards
Rutland Gate	1830 onwards
Beaufort Gardens	1840 onwards
Egerton Crescent	1843 onwards
Ovington Square	1844 onwards
Ennismore Square	1849 onwards
Lennox gardens	1882 onwards

The layout of each single urban unit proposes again the same organization of the XVII-XVIII C. squares, infilling the vacant areas between pre existing fabrics.

Every urban unit has its own center, the square, and its edges (the pre-existing routes and the property boundaries); the square is connected to the thoroughfares by one or two streets which represent the main axes of the new development; both the square and the axis are usually built up with homogenous terraced houses characterizing every single estate.

These various urban units, though so similar one another, are not linked together in an organic design and once completed the whole area appears as the simple sum of several different parts.

Conclusion

Like as the previous analysis of Clerkenwell and Belgravia developments, the present exam of other two great XIX C. developments confirms the existence of two main ways (extensive or intensive as we wrote before) of composing the traditional London's urban fabrics.

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In particular the second one should be further studied and developed as it could give a good answer to the current needs of new residential units, with even more dwellings per hectare than the modern tower blocks tissues and an outcome much more compatible with the pre existing context.

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The impact of a new public transport system on neighbourhoods surrounding stations: The cases of Bermondsey and West Ham with the Jubilee Line extension in London

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Abstract. *The impact of new public transport systems on towns and suburbs has been widely considered to be a significant aspect of urban development. However, spatial configurations which could stimulate transformation around neighbourhood of stations have not been clearly identified. It could be argued that the implementation of transport systems and the creation of new stations would enhance capacity of transport network and accessibility around vicinity of stations. Furthermore, the dynamics of pedestrian flow, generated by new public transport systems, might encourage socio-economic activities around stations. Therefore, the aims of this study are to verify the impact of urban morphology on station neighbourhoods and identify whether stations are embedded in the best location for optimising urban redevelopment. This paper analyses the surroundings of two stations – Bermondsey and West Ham – along the Jubilee Line Extension in London using Space Syntax measures. A spatial analysis with demographic and land use data reveals that the location of stations within urban layout would be the determinant in optimising socio-economic development in the neighbourhoods. It also suggests that Space Syntax could be an effective analytical methodology to understand the relationship between transport system and urban morphology.*

Keywords: Space Syntax, Spatial Configuration, Jubilee Line Extension, Public Transport System, Urban Morphology, Urban Regeneration.

Introduction

In most European cities, public transport systems not only serve traveling and commuting within the metropolis but also help the spatial and socio-economic development of cities and towns. As the largest city in Europe, London has the oldest underground service, which has been known as 'Tube', since 1863. There are now 11 lines covering 402km with 270 stations and serving over 4.8 million people per day in the metropolitan area. With the rising population in London, the demand for travel on the underground system never stop increasing. A new public transport network, Crossrail, which is the additional connection between West and East London will start operating in 2018. Other major cities in Europe also encounter the same increasing of demand on underground service in recent years. With the increasing demand for travel between city centre and suburban, the continuing expansion and intervention of railway infrastructure especially stations become the major impacts on shaping urban structure and economic redevelopment overtime. Stations are not only the 'nodes' where trains arrive and depart within the network but also the 'places' which allow social and spatial patterns emerging into public realms in cities (Bertolini, 1996). Stations

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play essential roles by connecting local street networks and global transport networks as well as providing mobility to transport material and immaterial flows. It could also be seen as the centre of urban area which could facilitate the development of local economies and land values in vicinity of station.

John Urry (2007) proposed that mobility could be defined as different forms of physical travel, transport and communication through time and across various spaces, the overlapping of transportation systems and social entities could support the multiple forms of actual and potential movement. Mobility on public transport networks is recognised as the most sustainable aspect which could facilitate the transformation of economic and social life in cities and towns. Bertolini (2012) also indicated that it is necessary to intertwine mobility, spatial developments, and socio-economic practices in order to enhancing city welfare while urban social and economic activities are increasingly dependent on mobility. Furthermore, it would require integrated disciplines in transport systems and spatial planning to increase sustainability and accessibility in both global and local urban networks. Therefore, it is essential to understand the spatial characteristics of built environment and land use distribution in vicinity of stations for assessing the impact of the new public transport systems on urban redevelopment.

In The Social Logic of Space, Hillier and Hanson (1984) argued that built environment in terms of spatial configuration is significant in supporting everyday movement within street networks. The spatial and physical properties of urban space which is known as urban morphology, generates movement patterns and shapes potential co-presence and encounter, would eventually encourage local socio-economic development and regeneration. Thus, the spatial influence of station neighbourhoods and the relation between built environment and movement patterns might be the keys to evaluate the configurational effect of the location where stations are embedded.

In Movement Economies study (Hillier et al. 1993), the high density of urban structure and land use distribution are the factors of the 'multiplier effect' for generating movement within urban grids. It could be argued that the mechanism of dynamic urban development process with the diversity of land use would support long-term socio-economic development in urban area (Perdikogianni et al. 2006, Vaughan et al. 2015). Based on this concept, this study would examine density of blocks and land use patterns to assess the relation between physical environment and socio-economic properties especially the effect of spatial configuration on urban development in station neighbourhoods.

Most transport and urban research has focused on the relationship between accessibility and mobility within transport networks in regional scale. In this trend of study, stations could be seen as nodes of connector and transport hub. However, the spatial influence of station neighbourhoods and the location of stations which could be the factor to optimise the socio-economic growth has received less attention. The spatial analysis of London Kings Cross Station neighbourhood in the Natural Movement study (Hillier et al.1993), the authors demonstrated that the infrastructure of railway stations would affect urban street networks in connectivity and accessibility which could determine pedestrian movement patterns. Bolton (2015) in the study of railway terminus neighbourhoods in London also suggested that the location and spatial characters of station would influence pedestrian movement patterns and the growth of urban form over time. It shows that the area behind the terminals in London have become less connected to urban grids with the development of stations and their spatial characteristics are different than the adjacent areas. On the other hand, the spatial integration of stations in the existing urban grids and the location of the stations which are the spatial configurational factors have been proved to influence the distribution of land use within both global and local street networks (Mulders-Kusumo, 2005). This study therefore investigates the embeddedness of new stations within urban layout and uncover the topological impacts of spatial configuration on socio-economic growth in station neighbourhoods by using space syntax measurements. The findings would

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indicate the spatial conditions which could potentially optimise urban redevelopment with the new public transport systems.

Background

The Jubilee Line Extension (JLE) was the major London Underground project during the 90s and started to operate in 2000, it plays an essential role in connecting central London with the Docklands and Canary Wharf which are the newly developed financial district in East London. The JLE improves the accessibility over a wide sector of east and south London where the river had long been a barrier to the communication of central London. In the early proposal, the JLE also intends to support the urban regeneration along the route especially to create new job opportunity at Canary Wharf by enhancing the mobility from main terminus, namely Waterloo and London Bridge, and by linking Docklands and North Greenwich with the extension to Stratford.1 The JLE impact study by University Westminster in 2004 reported that the JLE has helped the economic growth on employment and population by enhancing transport service and connection to west and east end. Although the previous study has investigated regional commercial and residential development, but the spatial impacts on the local scale of neighbourhoods around the JLE stations have not been widely examined by urban studies. Therefore, the aim of this paper is to assess the spatial configuration on the selected station neighbourhoods along the JLE, Bermondsey and West Ham, which represent different roles of transport nodes and the areas with particular topological and spatial characteristics. The Bermondsey Station is a completed new intervention without other connected underground service whereas the West Ham Station is an existing one which mainly serves as an interchange transport hub with the connection to Hammersmith & City, District, DLR and National Rail. The neighbourhoods surrounding these two stations have developed into different patterns of urban form and the morphological properties might give different impacts before and after the intervention of the JLE. Therefore, this study aims to evaluate if the stations of the JLE has been successful embedded in the urban grids and how the built environment around the stations influence urban redevelopment.

Research Question

To what extent does the location of stations in terms of urban layout affect socio-economic activities in the neighbourhoods?

To what extent does the urban layout influence the local economic growth in terms of retail and commercial land uses?

Methodology and Spatial Analysis

A spatial analysis of the case study in the neighbourhoods of stations has been developed by utilising space syntax theories and techniques. Space syntax encompasses a set of urban theories and techniques for investigating the relationships between spatial configuration and a range of social, economic and environmental phenomena (Hillier and Hanson, 1984). It has been used to shown that the pedestrian movement patterns in cities are strongly shaped by street network (Hillier, 1993). The analysis based on movement network allows the quantitative measurement to assess “spatial accessibility”. This study applies space syntax methodology to model the street network mathematically and investigate the spatial configuration with land use and demographic data sets. This approach allows the movement generated by the spatial layout in the street network surrounding stations to be analysed.

The Bermondsey Station has been chosen as one of the study areas because it is connected by the JLE next to the London Bridge Station and might bring positive commercial and residential redevelopment. On the other hand, West Ham is another chosen area because it located further away from central London and is an existing interchange hub with other London Underground and National Rail connection. The hypothesis is the neighbourhoods around the West Ham station would benefit with

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the mobility of its transport conditions for investment in both commercial and residential use. However, the spatial conditions are varied in these two stations which might have different impacts on the socio-economic activity and movement patterns.

Stations' Usage and Performance

The stations' usage and performance data could be the indication showing the daily passengers behaviour of stations and the importance of stations to the Underground network as well as the residence and visitors travel patterns. From the JLE stations annual entries and exits number during 2003 to 2015, it shows that Bermondsey has increased from 4 million to 10.2 million while West Ham increases slowly from 2.3 million to 3.8 million. Figure 01 shows that the 2015 daily entries and exits in Bermondsey are three times higher than West Ham. However, the interchange numbers in West Ham is eight times comparing with its total entries and exits numbers. The pie chart in figure 01 also demonstrates the interchange behaviour in the West Ham Station, 88% of trips are related to the Jubilee Line either change from other Underground and rail lines or from Jubilee to others. The data suggests that the JLE brought passengers to both study areas, but the differences are that the Bermondsey neighbourhood has mixed passengers including residence and visitors, while most of the passengers change lines inside the West Ham station and only 12% of passengers come off the station.

The Boundary of Study Area

To define the boundary of the sites, instead of randomly choosing the perimeter radius from the stations, this study uses catchment distance, which is also known as metric step depth analysis in space syntax techniques, to calculate the paths of pedestrians in the station vicinity (Figures 2A and 2B). The reason to define the site boundary by catchment is because this study focuses on the pedestrian walking pattern which connects between the station and everywhere else within the catchment. The 1200m street catchment pattern represents the route people can walk within 15 minutes from the station. It is suggested that 5 minutes to 15 minutes walking distance is the average distance which passengers would cover between destination and station.

The Urban Context of Station Neighbourhoods

In order to understand the influence of the overall morphology on these two station neighbourhoods, it is necessary to investigate

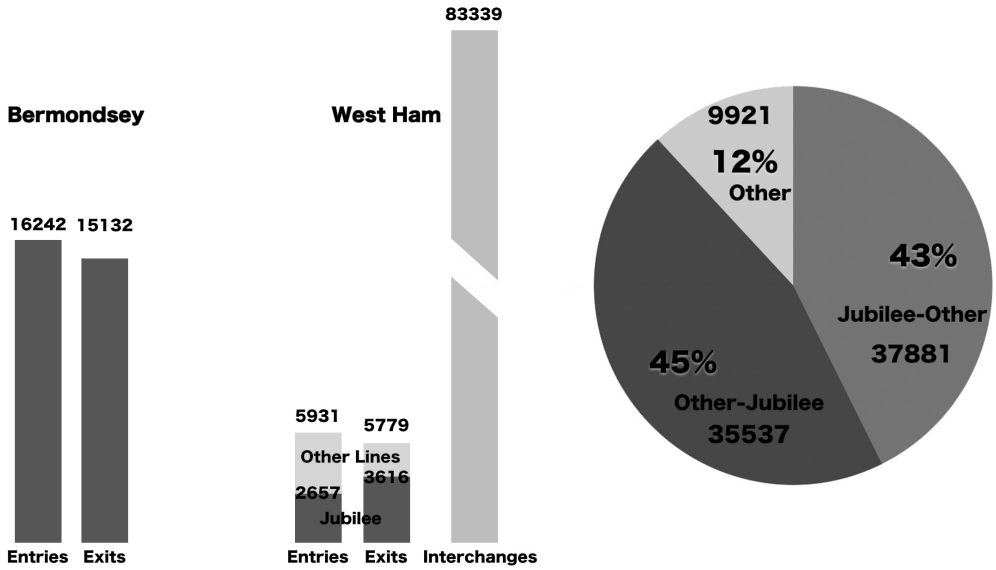

Figure 1. 2015 daily station usage in Bermondsey and West Ham and 2015 Interchange percentage in West Ham Station (Data Source: Source: Rolling Origin & Destination Survey (RODS), TfL Open Data, © Copyright, London Underground Limited, 2017)

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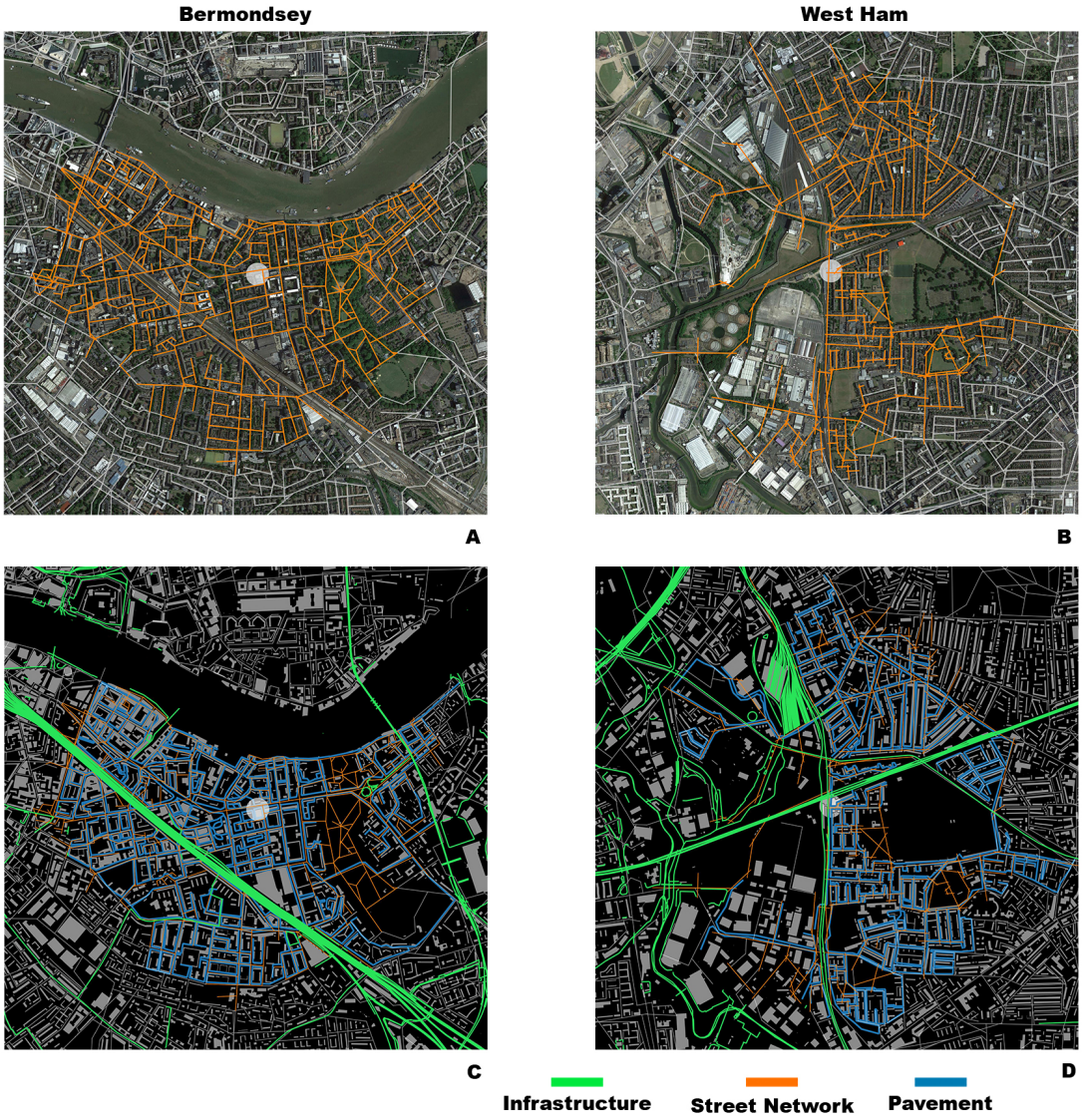

Figure 2. Street Network and Spatial Condition in Bermondsey and West Ham (Base Map Contains OS data © Crown copyright and database rights 2017)

the urban context first. The importance of the relationship between physical activity and built environment has been extensively addressed in space syntax literature. Hillier's (1993) idea of 'natural movement' suggested that the majority of pedestrian and vehicular movement is significantly determined by the structure of urban grids. Therefore, several spatial conditions in the station neighbourhoods have investigated at this stage including the distribution and density of the street network, the connection of pavements for pedestrian, the urban block size, and how the transport infrastructure penetrating or occupying these areas. Figures 2C and 2D demonstrate the overall spatial conditions in both neighbourhoods. Both stations are located on the local main street and connected to the residential area, however, the distribution of the street networks and pavements shows that there is better connection and higher density in the Bermondsey neighbourhood than the West Ham. The average block size in Bermondsey is smaller than West Ham neighbourhood. Furthermore, Bermondsey has little interruption of the transport infrastructure whereas there are railway tracks divided West Ham neighbourhood into four sub areas which might decrease the connectivity for the pedestrian.

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Spatial Analysis – Space Syntax Analysis in Choice (Through Movement) and Integration (To Movement) Measures

The street network around the Bermondsey and the West Ham Stations were analysed by space syntax choice and integration measures which represent two types of network performance. Choice calculates the shortest route from one street segment to another for every pair segments in the system, indicating the possibility that a street segment would obtain 'through-movement' as a part of a route from origin to destination. (Turner, 2005) Integration represents the 'to-movement' potential of a place, the possibility that it would be visited as a destination. (Hillier, 2009) In order to compare these two systems of street network in two different neighbourhoods, both measures have been normalised mathematically. (Hillier 2012) Both global and local measures have been applied in the study to examine the network relationship within the neighbourhood and the connection to a wider region of city.

Figures 3A and 3B show that the normalised integration measure in radius N, representing the 'to-movement' around the station neighbourhood. This measure highlights that both Bermondsey and West Ham stations located on the most integrated street within the study areas. But the connecting streets are relatively segregated from the main streets. The main streets in front of both stations provide higher possibility for commercial use while the secondary streets could potentially become the residential areas.

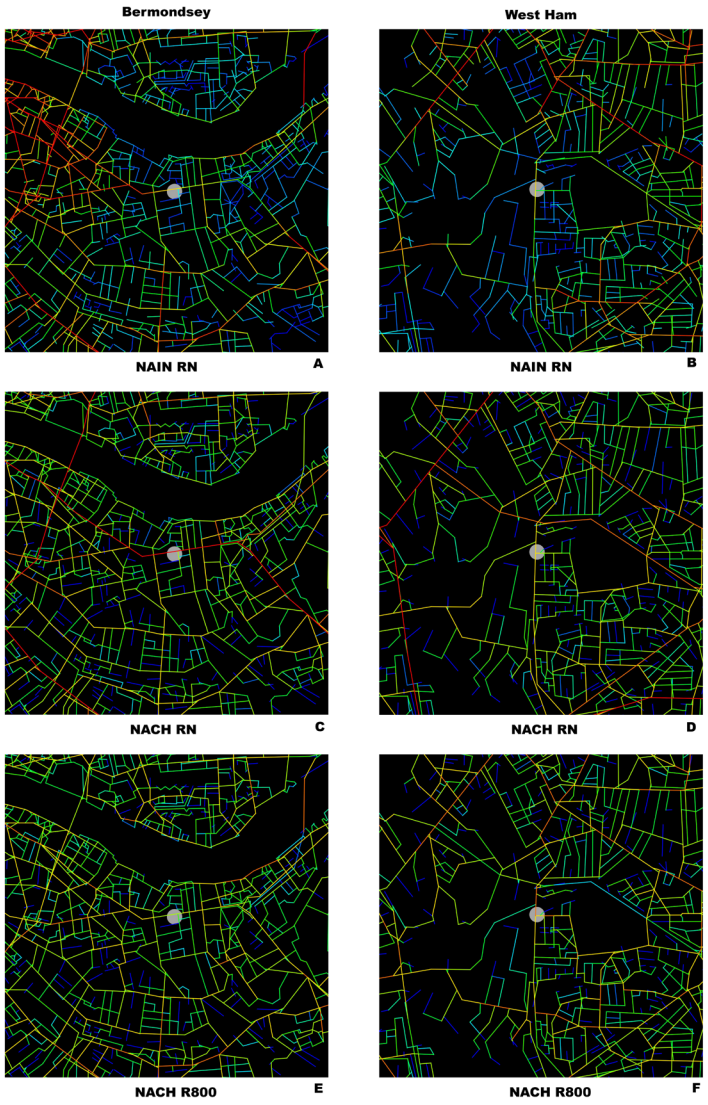

Figure 3. Space Syntax Normalised Intergration Analysis (A,B) and Normalised Choice Analysis (C,D,E,F) in Bermondsey and West Ham

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Figure 3C shows that the highest choice value segment passes through the main street in front of the Bermondsey Station while in figure 3D, most of the high choice values segment street are located far from the West Ham Station. The analysis suggests that the main street of the Bermondsey Station provides higher possibility for the 'through-movement' of global network but the main street in West Ham is not the case.

Figures 3E and 3F show that the choice value in local measures in both station neighbourhoods are relatively low from the overall study area. However, there are more low value of segments around the West Ham Station than the Bermondsey Station. It could argue that the Bermondsey neighbourhood allows more 'through-movement' within the street network. The choice mean value of street segments (Figure 4A) provide the evidence to support the argument, demonstrating that the street network in Bermondsey has higher choice value than West Ham. In other words, the Bermondsey Station has higher accessibility to attract more pedestrian movement and provide more opportunity for encounters than the West Ham Station in the local scale of street network.

A Mean Value of Choice (Through-Movement)

Catchment	NACH	Bermondsey	West Ham
400m	Mean	0.919	0.781
800m	Mean	0.852	0.775
1200m	Mean	0.853	0.789
Global	Mean	0.795	
	Median	0.908	

B Segment Length within 400m Catchment

Catchment	Segment Length	Bermondsey	West Ham
400m	Total	5145m	4382m
	Avg	69.5m	71.8m

Figure 4. Choice mean value of street segments within different catchment areas and Segment length in Bermondsey and West Ham

From the step depth metric analysis in 400m, representing the 5 minutes walking routes from the station, this study calculates the total and average street segment length in both areas. The result (Figure 4B) shows that Bermondsey has a larger number of segment length than West Ham, however Bermondsey has shorter average segment length. It indicates that the street network covers more ground with higher density in Bermondsey area than in West Ham. From previous space syntax study, it has been suggested that the area with shorter street segment and higher density of street network would possibly encourage more socio-economic activity. (Hillier, 1996)

Data Analysis

Demography Data

This study provides demography data sets for evaluating the urban development before and after the JLE in both study areas.

Figure 05 Chart A shows that the population and population density gradually increased from 2001 to 2012 in the Bermondsey area but the population remained the same in the West Ham during this period.

The overall house transactions numbers in the Bermondsey area is more than the West Ham area. In order to avoid the regional economic affect for the comparison in these two areas, this study only focuses on the transactions within 400m catchment of both stations. Figure 05 Chart B shows the increasing house price in both areas. However, the increasing percentage is much higher in Bermondsey than West Ham. It highlights (Chart C) the year between 1999 and 2000 which was the time the JLE started to operate, there is 63% increase in house price in the Bermondsey area which was higher than any other years

Land Use Distribution

Figure 6A and 6B show that the land use diversity in the Bermondsey neighbourhood while the land use type is segregated in the West Ham neighbourhood by the transport infrastructure. Although transport infrastructure also occupied large space of the area, but from the spatial analysis, it could suggest

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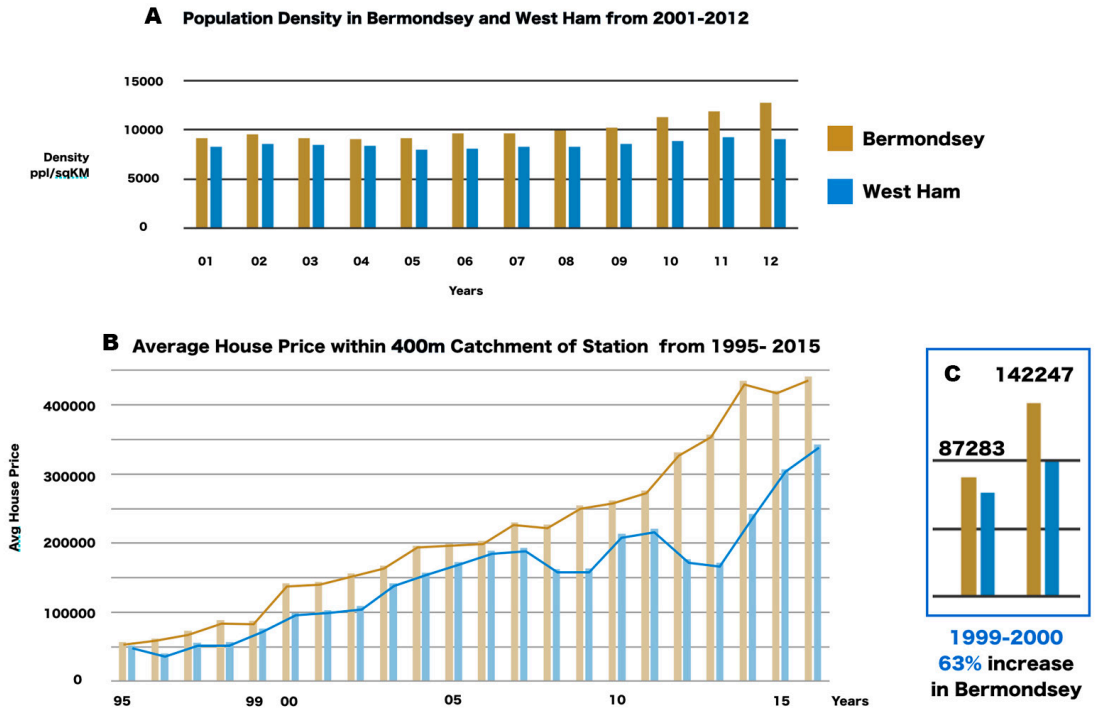

Figure 5. Demography Data (Data Source: Source: Office for National Statistics © Crown copyright 2016, Land Registry © Crown copyright 2017)

that the high density of the street network in the Bermondsey area prevent the negative effect of transport infrastructure by enhancing the connectivity within the street network. These two graphs also indicate that land use types have been mixed homogeneously in the Bermondsey area while in the West Ham area the land use distributed separately.

Site Observation

From the snap shots investigation of both stations and site photos (Figure 6C, Figure 6D), it is clear that the Bermondsey Station area has more pedestrian movement and more retails around the station while the West Ham area has less vitality with transport infrastructure disrupted the street and pavement.

Conclusion, Limitation and Future Work

The analysis of Bermondsey and West Ham Station neighbourhoods allow the street and space networks around the stations to be characterised and compared with the station performance and demographic data sets. The result suggests that the location of stations would bring significant impacts to the neighbourhoods in both physical environment and socio-economic properties. Several spatial conditions need to be addressed in this study for future urban planning and transport development. The station which sits in the place with higher accessibility for pedestrian and diversity in land use would possibly be a more successful intervention to optimise the development not only in local neighbourhood but also in global street and space networks. The spatial analysis together with the land use data demonstrates that urban layout in station vicinity plays an important role in determining both positive and negative influences. It also reveals that how the urban structure in terms of transport infrastructure enhances urban redevelopment not only in morphology but also in socio-economies of

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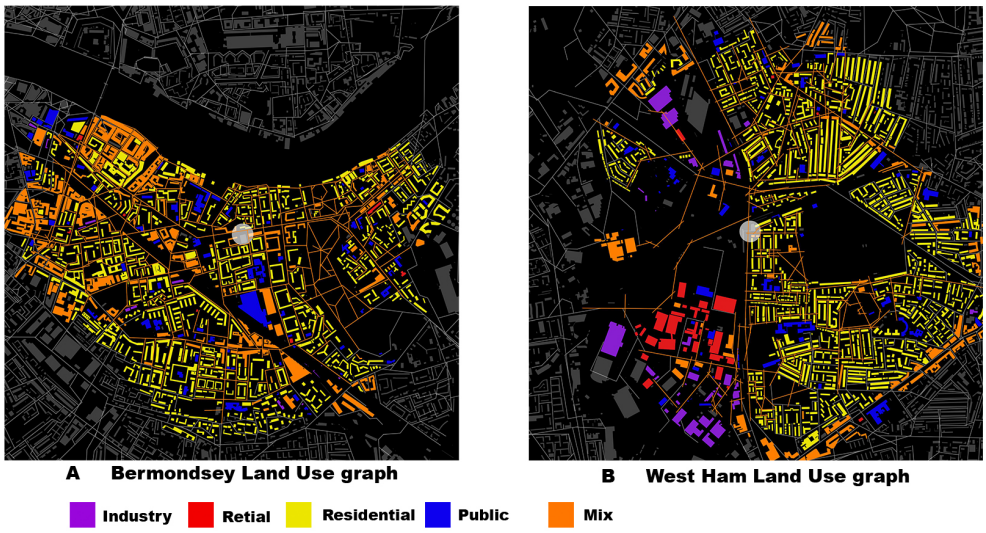

C

D

Figure 6. A,B Land Use distribution graph, C Bermodsey Site Observation, D West Ham Site Observation (Base Map Contains OS data © Crown copyright and database rights 2017)

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station neighbourhoods. However, urban and transport planners still need to be aware that huge transport infrastructure and lack of street connectivity could bring negative impacts to the neighbourhoods. Although the comparison between the Bermondsey and West Ham Station provide the spatial and demographic evidence that urban morphology would give impact on the station neighbourhood, but other factors related to the urban development policy and regional economies still need to be concerned in the future study. There is no perfect pair of stations to be selected as case study, however, a more sophisticate methodology could benefit the evaluation related to the built environment, pedestrian movement, and land use around the station neighbourhood such as the walkability model and the hedonic model in assessing the relationship between accessibility and house price. In order to assess the impacts of the JLE and its stations in the local areas, it still requires more studies on other JLE stations and neighbourhoods to

Notes

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Morphological analysis: to evaluate the pattern of residential building based on wind performance

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Abstract. *Residential morphological patterns are reflection of people's living habits and tradition, local climate and building regulations, so that one of those factors could be studied through in order to understand residential morphological patterns. Based upon our previous study, we do know that in China living habits and local climate mainly influence the shape of residential buildings and apartment patterns, but we do not know whether the pattern of residential plots determined by FAR and sunshine hours are suitable for wind environment related to residential environmental quality. Therefore, it is very significant to evaluate wind environment within residential plots based on the apartment pattern controlled by various building codes. Our study focuses on the pattern of Slab apartments in Nanjing, which are mainly used in China, and selects 40 residential slices with different plot shapes, plot FAR, building heights and sizes. Based upon MATLAB, we have got all geometrical data between buildings among these slices to identify the spatial pattern character of each residential plot. Through evaluating wind environment of these slices by simulation we can obtain wind speed, pressure and age of air and choose the pattern of age of air as the main evaluation factor of wind performance. Correlation analysis will be made between the apartment patterns and pattern of age of air, by doing so, each typical space between buildings will be evaluated. Our study will reveal the relevance of apartment pattern and wind environment, which can be used to support and improve design in the future.*

Keywords: Residential plot, Apartment pattern, performance evaluation, wind environment

Introduction

Residential buildings are the largest region in the city, and residential area morphology is an important part of urban morphology which would be affected by living habits, economic levels, cultural traditions and other factors.

Different patterns of residential areas are the most obvious manifestation of the differentiation of residential area morphology. In order to understand and study different patterns, many scholars have studied these from different points of view. This paper will evaluate and analyze the pattern based on performance orientation.

In Chinese residential area, floor area ratio and sunshine distance are two main factors that influence and restrict patterns of residential areas. Because of Chinese traditional culture, people attach great importance to sunlight right. Therefore, the residential buildings in different years have satisfied the sunshine distance of the corresponding period, people can get ideal natural lighting conditions. With the development of modern society, People put higher demands on the quality of living -healthy indoor and outdoor environment. The natural factor that has the greatest effect on health is wind, except sunshine. In today's society, with population density increasing

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and rapid development of city renewal, a large number of high-rise buildings, vehicles and factories cause serious urban heat island effect, higher average temperature, and a large amount of car exhaust, PM2.5 and other pollutants are gathered in cities and cannot be dispersed. A good outdoor wind environment can greatly reduce these negative impact. Thus the indoor and outdoor wind environment has more and more influence on people's health.

Patterns of buildings will have a decisive effect on wind environment, predecessors have done a lot of research, starting from form elements (including buildings' length, width, height, spacing, density, floor area rate and so on) which decide patterns, and proved that form different factors have different effects on the wind environment.

Mfula, et, al. (2005) discussed the influence of building spacing on pollutant dispersion through wind tunnel experiments. Buccolieri et al. (2010) evaluated air exchange rate of different spacing by numeric model. Feng Yang (2013) discussed the relationship between floor area rate, coverage rate and sky view factor these indexes and wind speed. Bady (2007) discussed effects of building height, street width, and patterns on PFR, VF, and TP. Tingting Hu (2013) discussed relationships between different coverage rate, building height, building pattern and wind speed, VF, pollutant concentrations. Matteo Carpentieri (2015) studied influence of building height on wind speed under specific patterns.

Therefore, this article will evaluate the wind environment of residential area in Nanjing, china, and explore what kind of apartment pattern can produce a better wind environment.

Method

Morphological object of research

Oke et al. (1988) proposed different ratio of building height to building spacing(H/W) that would produce three kinds of typical flow types. According to results of wind tunnel tests, he summed up the function curve of this ratio with different flow types. Oke's classic conclusion that the ratio of building height to building spacing(H/W) will affect wind environment is confirmed, cited and expanded to varying degrees in following articles. Chan, et, al. (2001) studied effects of different H/W and building heights on pollutants at different sites. Simoëns and Wallace (2008) studied diffusion of pollutants at different H/W. Buccolieri, et, al. (2015) studied effects of different lateral and Longitudinal spacing on wind environment. You and Ding (2016) studied influence of different sizes, spacing, and orientation on ventilation efficiency in residential buildings by numeric model.

Therefore, this paper will also cite this classical theory, using ratio of building height to building spacing, to carry out experiments.

Criteria for determining the healthy wind environment

In the environment field, two important indicators to judge wind environment are pollutant concentration and mean wind speed. However, these indicators have obvious shortcomings. The index of pollutant concentration is complex to calculate and calculated by artificially throwing a c (such as carbon dioxide) in the study area, The initial range of pollutant has a strong effect on the accuracy of results.

The wind speed index is statistical data of wind speed in one area, this index cannot determine the direction of wind, and a region with large wind speed does not necessarily bring about fresh air. Therefore, the wind environment will not necessarily be improved, there may be secondary pollution.

According to needs of architecture, this paper makes a reasonable deduction to simplify the judgment standard of healthy wind environment and assist people in architecture in computing and understanding.

A region with healthy wind conditions is an area of little pollutant concentration, winds should travel across this area quickly to take away the pollutants.

So, the value of wind speed will affect the concentration of pollutants and the direction of wind speed should be in accordance with the simulated wind direction to guarantee fresh wind which can take away the pollutant without

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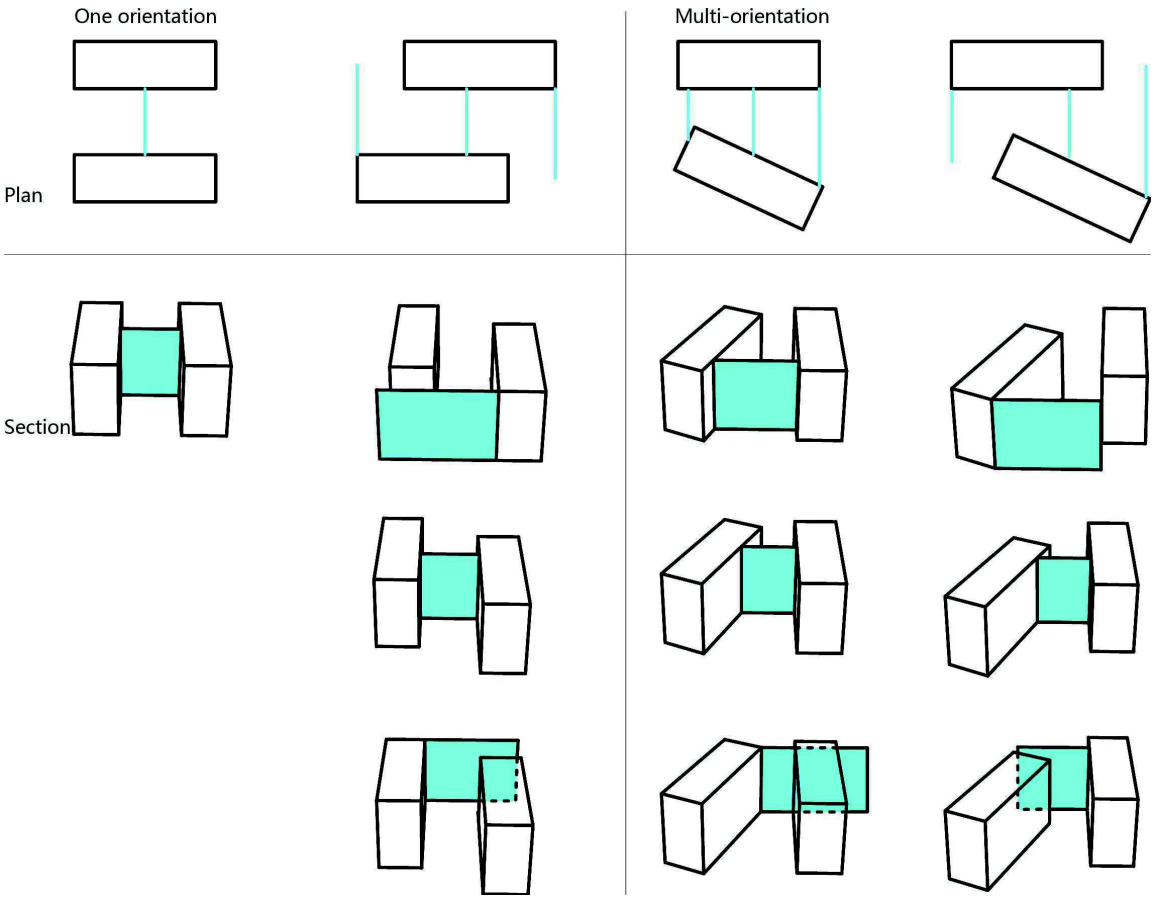

Figure 1.
Ideal patterns

producing secondary pollution. Therefore, this paper takes the windward velocity as the evaluation standard.

Criteria for selecting residential Pattern

The residential patterns have several forms: 'pavilion', 'street', 'court' and 'hybrid'.

Based on Western control indexes, China combines the actual situation and living habits of residents to introduce laws and regulations to limit the shape and pattern of apartment(including sunshine distance, fire separation, green rate and floor area rate). Among them, the floor area rate is to determine developers' economic interests. In order to maximize this index, patterns of China's residential areas are dominated by 'street' and 'point' types.

This paper select the most common type of residential buildings, slab, to study. Different combinations of residential units form different types of slabs, in order to simplify classification, this paper refer to Zhao Qin (2015) which defines patterns of apartments according to the research methods of urban morphology, for slabs, patterns are measured in a combination of apartments' orientations. Single apartment or many apartments parallel to each other as one orientation type, apartments with different orientations are multi-orientation type.

One orientation and multi-orientation also include two different sub-types. The first sub-type is that two buildings on both sides are aligned. The second sub-type is that the two buildings are staggered, some parts are not blocked by adjacent buildings and result in a gap. Each type has different section types, and therefore various ratio of building height to building spacing(H/W), and as heights increase, the ratio varies with each type, therefore, there is a very wide variation in the ratio.(Figure 1.)

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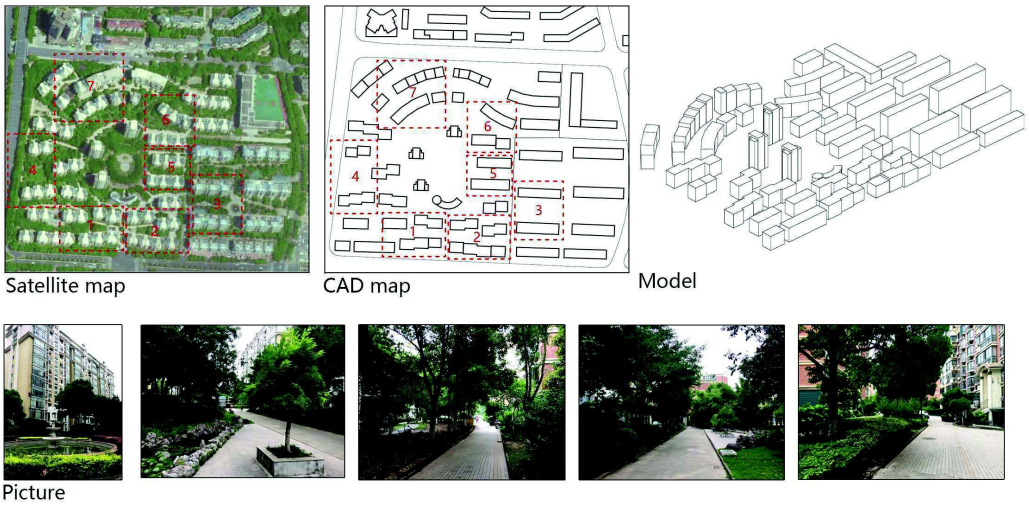

Figure 2.
Research area status

Case study

Case selection

The study area was selected in Hexi District of Nanjing City, near Yangtze River. It is a slice of 800m*1200m restricted by Yangtze River Avenue, River northeast road, Cao Changmeng Street, Qing Liangmen Street. The slice is mainly residential, comprising a small number of public buildings and commercial buildings. This slice consists of 14 blocks, each block containing 1-4 different residential areas. Most buildings are multi-stories(from 6-9) buildings, and there are some high-rise buildings. Cad data comes from the Nanjing City Planning Bureau, some of which have been revised according to the latest Google earth satellite map.

The simulation of wind environment for the entire 800m*1200m slice would take a lot of time and the sample capacity of wind speed data is difficult to meet requirements. So the range of simulation is reduced to the plot scale, and this paper would evaluate the first plot (figure xx). This plot completely covers the 4 ideal types summarized in chapter 2, and according to the ideal types, seven regions are selected for evaluation and data analysis.(Figure 2.)

CFD model set up

The lateral and inflow boundaries are set to be 5H (H is the height of the highest building) away from the buildings, and the outflow boundary, 10H. The height of the computational domain is 6H. Therefore, the blockage ratio is less than 3%, as recommended by Franke et al. (2006) and Tominaga et al. (2008). Totally 1,854,670 tetrahedral grids are generated in this study. The grid sensitivity analysis shows the errors caused by grid resolutions have an unnoticeable effect on the numerical results.

In this investigation, the power law inlet profiles are set as the inflow boundary conditions (Tominaga et al., 2008)

The above settings guarantee the authenticity and accuracy of the simulation, and the simulated wind speed diagrams are as follows (Figure 3).

Analysis

GIS platform for display of enhanced wind environment

In traditional CFD platform, wind speed is scalar data, unable to judge the direction of wind. However, the simulation results can be exported as coordinates with direction. After attaining wind speed values in specific area, GIS platform is used to enhance the display of wind data. GIS platform has a natural advantage in data visualization.

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It is convenient to gather data in different directions together to display.

Besides, data in GIS can be associated with geographic location of model, thus, the location information of a healthy wind environment region can be accurately obtained. Dr. Tang Lian in our team did some visualization experiment with simulation data on GIS platform in the early stage.

Wind speed data was visualized in x, y, z directions and she got ideal results. Therefore, this paper use this visualization system as well

GIS displayed set up

The simulation data of wind speed is imported in GIS platform. Then, select the same coordinate system with simulation and display the value of each coordinates sampling points with actual coordinates information.

Based on the wind speed of downwind (in this study, the direction of downwind is the same with South wind), the values are divided into 10 levels, warm color presenting downwind velocity, cold color presenting upwind velocity (Figure 4).

The calculation and filtering of form elements by MATLAB platform

The advantage of the MATLAB platform lies in the transformation between data and graphics. If it contains enough information, data can be converted into 2-dimensional or 3-dimensional models, and it can process large amounts of data based on the user's own set of rules quickly. Our team wrote a processing program in 2013 in MATLAB platform.

It was based on coordinates and height information of each corner point of imported building. Then building information modeling was re-established in MATLAB and filtered by 0.7 times and 0.4 times of building height. The data of windward and leeward side can be calculated under different wind direction. On this basis, this paper further improve this program to calculate ratio of building height to building spacing in different positions and heights.

MATLAB model set up

Import the CAD data into GIS platform and extract corner coordinates, height information, and building codes for each building, then import the MATLAB platform. Select the number of each building with minimum Y coordinates. With this corner as the starting point, connect each corner to the counter counterclockwise. If the X coordinate of starting point of a line is greater than it at the end point, this line is back side edge, on the contrary, the line is front edge. Then, calculate ratio of building height to building spacing at each front and corresponding back side edge (Figure 5.).

Data analysis

According to the data calculated by GIS and MATLAB, the plot of W/H-downwind velocity is plotted. (Using W/H instead of H/W, because W/H increases with height and could get better effect of plot)(Figure 6-2.)

The downwind velocity corresponds to the y coordinate value at the right of each chart, the W/H corresponds to the y coordinate value at the left of each chart. The x coordinate is the number of the area in which each data is located.

In general, with the increase of W/H, the downwind velocity is also increasing, the wind environment has improved significantly since the sixth storey, W/H also rises to a relatively large value, and a similar ratio does not necessarily produce similar velocity. Then make statistics on all ratios and velocity. (Figure 6-3.)

There are some statistical data. SSE:1107 (The closer the value is to 0, the better the fitting effect;)R-square: 0.04974 (The closer the value is to 1, the better the fitting effect). Therefore, there is no linear correlation between the overall W/H ratio and the corresponding downwind velocity.

Next, make statistical analysis between W/H ratio and the corresponding downwind velocity in the similar region, a similar region refers to the relative relation of adjacent buildings and layout of the surrounding buildings. (Figure

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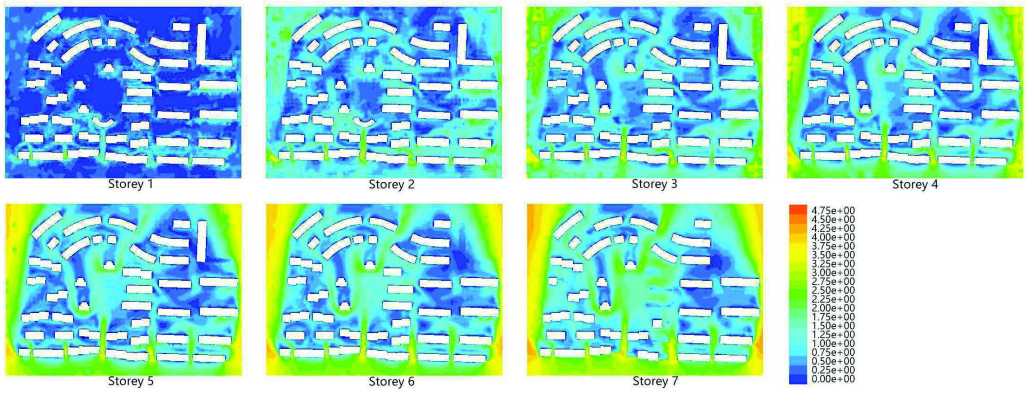

Figure 3.
Simulation results

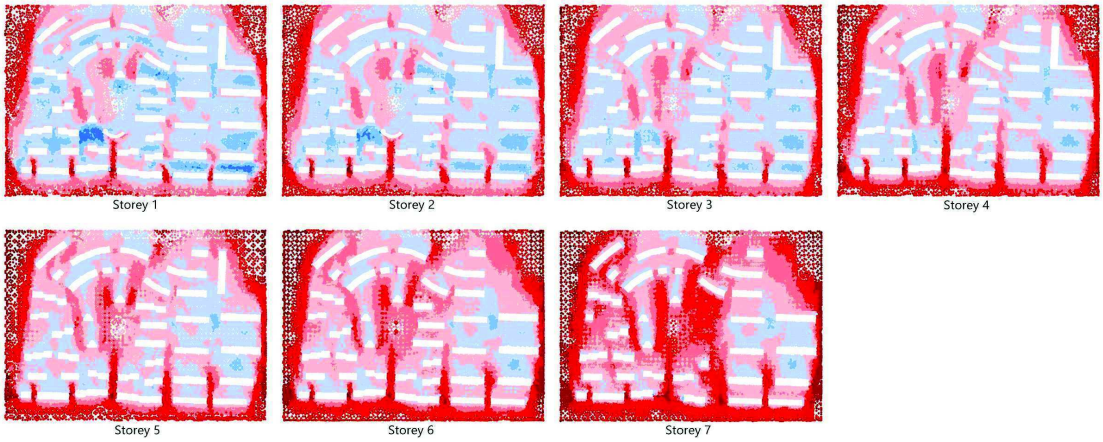

Figure 4.
GIS results

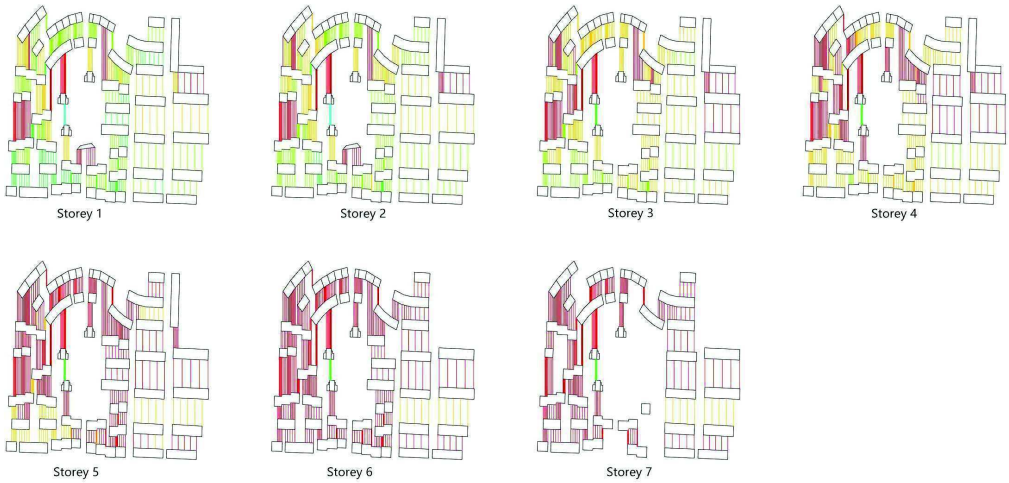

Figure 5.
MATLAB results

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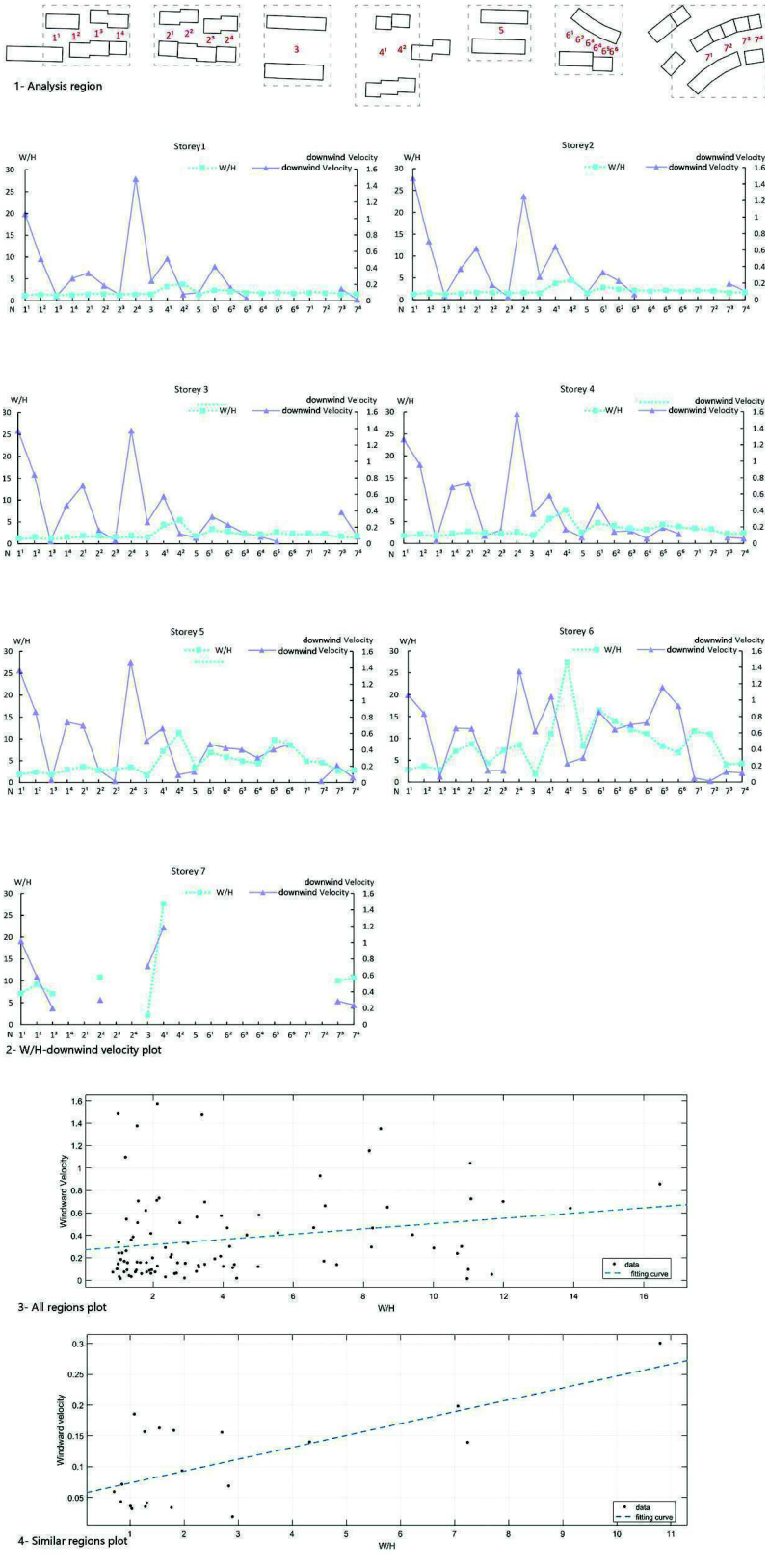

Figure 6.
Data analysis

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6-1. (1^3, 2^2, 2^3)) SSE: 0.05673; R-square: 0.473 From this we can see that there is a linear correlation with partial probabilities between the W/H ratio and the downwind velocity in the similar area. (Figure 6-4.)

Then, a longitudinal comparison of downwind velocity and W/H ratio is made. Region1 (number1^1-1^4), buildings in this area are basically perpendicular to the simulated wind direction and are staggered one orientation pattern. Two distinct narrow corridors of wind have been formed. Under similar W/H ratio, the velocity is always greater in the area near the corridor that it off the corridor.

Region2 (number2^1-2^4), buildings in this area are basically perpendicular to the simulated wind direction and are one orientation pattern with lateral spacing. And the results are similar to Region 1.

Region3 (number3), buildings in this area are basically perpendicular to the simulated wind direction and are one orientation pattern with aligned lateral sides. The W/H ratio is always within 2.5, and the velocity increases gradually with the rise of this ratio.

Region4 (number4^1-4^2), buildings in this area are basically perpendicular to the simulated wind direction and are one orientation pattern with extremely large longitudinal spacing. The W/H ratio is always beyond 3, with the rise of W/H ratio, the velocity is also rising, but there is no obvious proportional relationship between the sets of data.

Region5 (number5), buildings in this area are basically perpendicular to the simulated wind direction and are one orientation pattern. Velocity increased slowly with the increase of W/H ratio, and the velocity increased significantly at six storey when the ratio was greater than 8.

Region6 (number6^1-6^6), buildings in this area has an angle about 60 degrees with the simulated wind direction(counterclockwise) and are staggered multi-orientation pattern. The longitudinal spacing between buildings changes obviously. At the same height, where the W/H ratio is large, the velocity is greater.

Region7 (number7^1-7^4), buildings in this area has an angle about 60 degrees with the simulated wind direction(clockwise) and are one orientation pattern at this angle. The W/H ratio increased significantly but the velocity increased slowly. When the one shelter disappears, the velocity in this region is improved greatly.

On the whole, Region 1,2 and 4 always have better wind environment. Morphological features are as follows: The lateral spacing of region 1 and 2 is small, forming a number of wind corridors, greatly improving the wind environment in the regions. Region4 has large longitudinal spacing so the W/H ratio is much greater than ordinary patterns of residential areas.

Conclusion

For patterns which meet the needs of Chinese laws and regulations, with the height increasing and the W/H ratio increasing, the wind environment will gradually improve, however, the magnitude of the improvement in different regions is not the same.

For all W/H ratio and downwind velocity in all different regions, these did not produce a simple linear correlation, the length of buildings, the formation of wind corridors, the angle of buildings with the simulated wind direction may all have an impact on the downwind velocity.

For W/H ratio and downwind velocity in similar regions, it is assumed that there is a linear correlation between certain probabilities. In the next experiment, we need to add experimental samples and control experimental variables to obtain more accurate conclusions.

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A study on the history of urban morphology in China based on discourse analysis

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Abstract. *Urban morphology is a method widely used in China in the field of urban design and urban conservation. Since its first introduction to the Chinese context about 30 years ago, the key ideas and concepts of urban morphology underwent a significant phenomenon of 'lost in translation'. Different origins of morphological thoughts, different versions of translation, as well as different disciplinary context, have all together led to a chaotic discourse. This paper reviews the key Chinese articles in the field of urban morphology since 1982 and draws out a group of persistent keywords, such as urban form, growth mechanism, evolution and axis that characterize the morphological approach to urban issues, to find unusual evolutionary process. By reviewing the transformation of the definition of these keywords, this paper aims to generate an evolutionary diagram of landmark ideas and concepts.*

Keywords: Urban morphology, terminology, discourse analysis

Introduction

Since the late 1970s, China has changed with a rapid urbanization. The development of hundreds of cities has undergone tremendous revolution in the restructuring of the economy and society. In this process, domestic scholars began to pay attention to the phenomenon of the city itself, trying to break through the traditional observation point of view, in order to re-understand the city and establish a new theoretical urban system. At the same time, the theory of urban morphology has been carried out for over 100 years, and initially set up a relatively comprehensive, clear observation mode, and effective analytical methods. Between the study of local urban theory and the application of western theory, 'urban form' came into being. In 1982, Kang Qi, the professor of architecture in Southeast University then, published 'The Form of the City--a Preliminary Study Outline', first proposed 'urban form' concept, marking the domestic scholars on the formal theory of urban morphology. Over the past 30 years, the urban morphology has gradually become a widely used method in the field of urban design and urban conservation in China, under the constant theoretical research and practical application in a large number of cases.

However, urban morphology characterizes in different school thoughts, different academic origins, and the long history of the development. In addition, factors that domestic research is lagging behind over abroad, and references of the translated versions are selected different, all lead into deviation of its main concepts, study methods, and analysis results. And in the process of localization there has been a confusion of terminology definitions, called 'lost in translation'. When Kang Qi (2011) reviewed urban form in his own theoretical system, he argued that, 'One of my graduate students back from the UK found it that the study of urban morphology has been lasting for a long period in European countries, such

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as Italy, Germany, Britain, France and so on, but my research was relatively earlier and continued in China.' Kang felt surprised about it because he didn`t noticed it before. It shows that domestic development of urban form is originally independent from the European urban morphology, though it gradually interacted by the thoughts of urban morphology then and establishes its framework. Therefore, it is reasonable that some keywords are created in china`s context, some are imported from abroad, and some are mixed together.

Methodology

It can be seen from relative articles published from the year of 1982 to the present that the study on urban morphology has a lot of branches by multiple methods. This article aims to select some representative pieces among literature, trying to interpret the evolutionary process with local characteristics of the terminology, and summing up the features of the phenomenon.

Regardless of its categories, taking articles using 'urban morphology' as keyword from the full-text journal database of CNKI as the basic statistics, the search result comes from 35 journals, reaching a total of 8866 articles.

The Figure 1 clearly shows the trend of the number of articles, which can be divided into three main phases. From 1982 to 1994, the study of urban morphology is still in the initial stage of exploration with a small quantity. From 1994 to 2006, theoretical research experienced a rapid growth period, reaching a relatively high level tenfold over the first phase. After 2006, the number of articles per year is above 500, and the study stays at maturity. The research contents also have different emphasis. The preliminary research focuses on the theoretical analysis, discussing the implication and influenced factors of urban form. Later scholars start to try to interpret the western theory of urban morphology, meanwhile constantly reviews the researches and summarizes the disciplines in domestic theories. In the mature period, 'urban morphology' has been regarded as a kind of inherent method to solve problems in city practice and application, combining with other disciplines and technical analysis methods.

The articles come from 30 disciplines, 35 journals, and more than half of which are from 9 authoritative publications. Over 100 authors contribute to the study, and many of them are well-known scholars, such as academicians form Chinese Academy of Engineering, headmasters and professors in architecture school, architects and urban planners. Considering the publishing year, citation times, the author's authority, the level of the journals and the research categories, this paper selects 32 representative articles as a basic sample, then extracted the key terms related to urban form from each article. These terms are often used frequently with the meaning explained more than one time, which clearly describes phenomenon in the context.

The Figure 3 shows that some of the keywords describe the constituent elements and characteristics of a city, which come from direct observation of the physical elements, such as block, plot, square, plan unit. Those words always have clear and certain definition among most of the articles, but compared with the Western theory, the recognition of its standards is different. For example, the concept of 'square' in the ancient Chinese city is relatively weak and insignificant. Square is an adjunctive place always attached to houses or roads, with the combination of traffic, trade, religious function. Square in Western context is much more formal and solemn. It is the occasion to held public speeches and other political campaigns, gathered a large number of religious and monumental architecture. The definition of 'important places of activity' has been confirmed already. Therefore, although definitions in the context of Chinese and foreign languages are partly similar, there are differences in the final appearance and function due to the different cultural background.

Another part of the key words is to sum up the reasons behind the urban morphology, trying to conclude characteristics of a sort of phenomenon, such as urban structure, evolution, spatial landscape, expansion. Those terms are often abstract summaries of certain features, or static descriptions of dynamic changes in time and space. Therefore, the definition of such terms is much vaguer

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than the first category. The larger scope, incomprehensive and insufficient description, result in misunderstanding of the terms, which needs supplement of other parts of the articles. As for the evolution of the deviation of the word meaning, this paper selected "urban morphology", "growth mechanism", "central axis" to explain how the change happens.

Analysis

1.urban morphology

The study of urban morphology is developed along two lines. One is rooted in the Chinese local city, still in the traditional field of urban research with a strong national style, called traditional concept. The other is from the Western theory, by translation and interpretation of the urban morphology and other urban theory or methodology, such as theories of urban functional structure, and typology. It reinterprets the Chinese city by the mature theoretical system which can be called foreign concept. The former one appeared much earlier while the latter one has a far more profound affection. Two lines developed from independently to collectively, explaining the concept of urban morphology from different perspectives.

When Kang Qi (1982) first proposed 'urban form', the core idea was that the urban form was inner and variable which means the internal implication of the structure is embodied in the external spatial form, and changes dynamically along with time. At the same time, he argued that the external characteristics of the standard is a superposition of economic, social, natural, science and technology, national, human, psychological, traffic and other elements in a certain period of time. This understanding can be considered as a relatively complete explanation of the concept. Kai Gu (2001) argued that the generalized urban morphology, including the social form and the physical environment, was a discipline under the influence of force for various urban activities (including political, social, economic and planning processes) without emphasizing the intrinsic logic of the city.

Kang Qi (1997) added new viewpoint to the research on the basis of the original study, not only emphasizing the inherent form, but also increasing the material and spiritual connotation on it. Meanwhile he put forward to the concept of 'cultural factor', and considered that the cultural factors from the historical events, social change, revolutionary resort will eventually affect the city itself. But this view was removed from the article in 2011, only reserving the concept in 1982.

Except for study of Kang Qi, in some other articles, urban morphology was regarded as a one-sided concept that consists partly of the structure, form, type or urban tissue in a city, often confused with the concept of layout. Instead of giving the urban form a definition, Liangyong Wu (1984) initiated the method of defining the city form with a general idea from several aspects, such as cityscape, layout, structure and so on. The "city form" refers to a series of urban components, such as walls, regional districts, businesses, sites. 'Style' in Chinese writing has two parts, in which the first character indicates local and traditional, and the other refers to the condition of the subject. The meaning of the style is too broad, often used to describe nature or custom. The 'layout' focuses on the relative location of different physical elements. The emphasis is on the feature of a city's structure, not enough to represent the overall meaning of a city's urban form.

As for the interpretation of Western theory, the definition of urban morphology has a certain common comprehension that different schools have different understanding. Two kinds of theories interact a lot in terminology, gradually reaching a consensus that the definition should be divided into broad and narrow sense. Besides Kai Gu (2001), Cui Zheng (2002) also believed that the general meaning of urban morphology refers not only to the urban parts of the tangible performance and geometric condition, but also a complex economic, cultural phenomena and social process, which is the result of interacting human activities and natural factors in a specific geographical environment and certain social and economic development. All of these definitions are influenced deeply by the study of Kang Qi, promoting its theory and

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the construction of the theoretical framework. Figure 4 is drawn by the number of references cited in Kang Qi, Kai Gu and Liangyong Wu. Three of them are the famous scholars in domestic urban theory research, but only citation of Kang Qi and Kai Gu's articles gradually increase during the period. It illustrates that the development is doomed to choose a more mature, perfect theoretical framework, and eliminate one-sided, vague thoughts.

2.growth mechanism

Growth mechanism is an original term in domestic research. It dates back early in time has a break in relative study. It origins in the meaning of internal implication (Kang Qi, 1982). Liu Qinghao (1995) cited Qi Kang's definition of urban form at the beginning of the studying growth mechanism, emphasizing that the connotation of "logic" and the extension of "performance" constitute the overall view of urban morphology together. Zhang Yuxing (1995) proposed that the growth mechanism is an important part urban morphology. He thinks that it embodies the dynamic growth of the form of self-dissipation and self-regulation, reflecting space, time, and human, which is the three most significant elements.

The growth mechanism essentially explores the inherent logic behind the changes in urban morphology. However, the logic behind comprises a complex theoretical system as well, composed of a mixture of factors together, and presenting differently. In this point, as a secondary category of urban morphology, the meaning of growth mechanism is great wider and more difficult to clarify than 'neighborhood', 'plot' and other physical features.

"Growth" refers to accretion and expansion from the center growing spot. There are three general situations: urban extension, land replacement, and city growth ring. Its growth pattern is divided into morphological growth and regional growth. The former is characterized by the type conversion, while the latter includes the expansion and transformation, generating 10 kinds of growth patterns.

Growth mechanism can not only be divided by performance and patterns, but also reflect the different stages of the urban morphology evolution process. When Cui Zheng (2002) concluded "the growth" according to articles from 1990, she suggested that 'there is confliction of the old form and the new function, and then the old form gradually collapses while the new growth spot from the original form are free out ... ... the new form develops to replace the old one and related adaptively to the new function. The evolution of the urban form is a dynamic process between accomplishment and adjustment.' Therefore, 'evolution' can be regarded as the ultimate consequence of growth mechanism, which is the appearance for the growth mechanism under the combined action of many factors.

According to the tendency of four terms, as the rapid growth of articles, the study of growth mechanism is further less than other words. Considering the reasons behind it, due to the excessive dimension of growth mechanism, it has not yet formed a unified definition and classification standard in the Chinese context, and it is not good as 'evolution' on reflecting the changes with time. It is gradually replaced by its various factors. However, the connotation of this term does not disappear, on the contrary, after breaking down into multiple terms, more accurate and detailed explanations of the principle exist in another form of the study.

3.central axis

Central axis is one of the important standards in the traditional urban research methods and design planning in china. The description is always accompanied by directions. Sicheng Liang promoted in 'History of Chinese Architecture' that those axis among China's ancient large buildings in the plane controlling the whole area are known as "central axis", and pointed out that it is only stressed mostly in China than any other countries in the world and has a prominent achievement. Liangyong Wu (1993) suggests in the plan of western district of Beijing that, designers should take good advantage of traditional method that first determine the central axis. For example, the plan should spread the axis northwards to the Fuhai lake in Yuanmingyuan Garden, southwards to Fengtai block, centered in

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Yuyuantan Park, and with ancient city and industrial zone on the both sides, green belt in the middle. Bochong Chen (1992) studies Fuzhou as another example. The design that building up a concrete high-rise building in the central axis among three great mountains severely damaged the layout of historic city. In the traditional sense, central axis is a sequence of nature, landscape, and architectural features. There is not only symmetrical residential distribution on this line, but also natural form of peaks, lakes, as well as palaces, temples and other landmarks. All elements can be regarded as a series of points, and central axis is the logic arrangement of the set of points under certain rules. This design principle reflects that the order in the traditional urban design occupies an important position.

Later the term of 'axis' occurs then as western theoretical research translated into domestic study. The axis is no longer central, iconic, political, and emphasizing on obvious belt area. Yuxing Zhang (1995) analyzed the axis along the river in Nanjing, and finally concluded that this area will form a new urban landscape belt. Chunlan Du (1998) mentioned Paris city developed along the Seine River axis. And Zhuojun Zou (2003) analyzed city of Hangzhou, considered that banded development close to natural green space which can create a good environmental condition, but if the belt city axis is too long, a series of urban problems will follow. Once axis means a region, it is no longer a straight-line shape. As long as it can indicate that the area is different from the surrounding environment, axis can also refer to the bending area, such as the river bank.

After that, the characteristics of the axis are further diluted. Jie Zhang (2003) mentioned in the large-scale urban design that the 20km long urban road axis lacks the perception of actual space and time. Jiantao Zhang (2004) described a road in the urban regional planning. The urban street network is irregular, when land along the road expands to both sides, strengthening the road axis. In the two cases, 'Axis' only retains the meaning of the line. What it corresponds is more figurative, and more refers to a physical element with linear features, such as roads.

The evolution of the 'central axis' experienced deflecting. It is born in traditional design techniques, grows out large-scale city, and formulate a clear reference in modern design. The connotation simplified while the application is more extensive.

Conclusion

Urban morphology, growth mechanism and central axis represent three cases of evolution: fusion, separation and deflection. In addition, there are many other situations, such as substitution, combination, borrowing and so on. Figure 6 presents the evolution of key words.

The occurrence of 'lost in translation' in the research field of urban morphology, partly leads to a temporary misunderstanding of comprehension, but this phenomenon is not entirely negative and disordered. Although the domestic study only develops for a short period, the introduction of foreign theories and methods has accelerated this process, which has improved the depth and breadth of research in recent years. A large number of literature studies have formed a simple selecting model that retains the effective, precise, and popular concept, and meanwhile eliminates ambiguous, demise, obscure parts. The terms of the different sources are continually integrated, while some of which have been solidified by evolution, and some are cross-colliding in a variety of understandings to achieve precise levels and possibly create even new terms.

The meaning of the term is not static, even if the 'solidified concept' is also a 'temporary definition'. As the research discusses new observation, every term with certain meaning can be changeable to refer to new concepts. At the same time, with the paces of city development, new models, influencing factors and analytical techniques are needed in the study. Conceptual improvements or new vocabularies are inevitably generated. Thus, any term is likely to undergo a process of 'changeable - certain – changeable'. In the terms of the view, the phenomenon of terms evolution will be existing for a long time.

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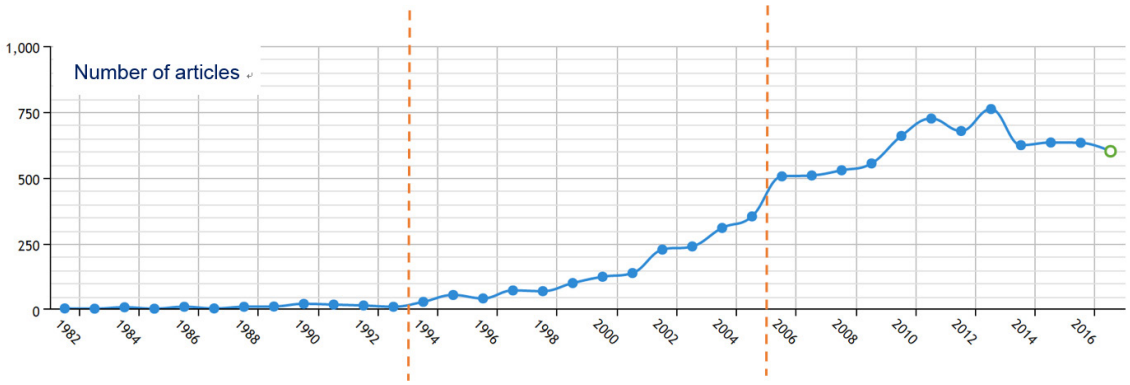

Figure 1. Articles using 'urban morphology' as keyword per year(www.cnki.net)

No.	Title	Author	Journal	Publication Time	Citation
1	The Form of the City--a Preliminary Study Outline	Kang Qi	City Planning Review	1982/12/27	103
2	The Layout Structure of Historic and Cultural City	Liangyong Wu	Architectural Journal	1984/1/31	18
3	The Propagation of Urban Physical Environment and Cultural Connotation	Bingren Xiang	Architectural Journal	1988/11/26	2
4	Study on the Typology of Architecture	Chunyu Wei	Huazhong Architecture	1990/7/2	93
5	A Summary of City, Architecture and Space Structure	Bochong Chen	New Architecture	1992/12/30	2
6	"Landscape City" and China's Urban Development in the 21st Century	Liangyong Wu	Architectural Journal	1993/6/30	97
7	Study on the Historical Characteristics and Evolvement of Changshu City	Jianguo Wang	Journal of Southeast University	1994/11/20	60
8	Ecological Mechanism of Urban Form	Qinghao Liu	City Planning Review	1995/3/9	154
9	The Elements and Processes of Urban Morphological Growth	Yuxing Zhang	New Architecture	1995/11/22	37
10	Retrospect and Prospect of Research on Urban Fringe Belt	Jianming Zhang	Human Geography	1997/9/30	180
11	Context and Characteristics--Cultural Characteristics of Urban Form	Kang Qi	Urban Development Studies	1997/1/23	126
12	Study on Regional Characteristics and Urban Morphology	Chunlan Du	Journal of Civil,Architectural & Environmental Engineering	1998/6/30	80
13	Study on the Formation and Form of the Fringe-belt City	Xi Wu, Hongjie Wu	Huazhong Architecture	2000/12/20	17
14	The Theory and Method of Urban Morphology--Exploring the Framework of Comprehensive and Rational Research	Kai Gu	City Planning Review	2001/12/9	319
15	Review of Research on Urban Morphology in China since 1990	Cui Zheng, Lin Lin	City Planning Review	2002/7/9	352
16	Urban Morphology Research and Spatial Strategic Planning	Jin Duan	City Planning Review	2003/2/9	159
17	Discussion on the Evolution of Urban Morphology and the Dynamic Relationship Between Urban Water Systems	Zhuojun Zou, Jianjun Yang	Planners	2003/2/25	63
18	Study on the Chinese Traditional Urban Space Form from the View of the Theoretical Standard of Urban Form	Yigang Zhou, Yue Yuan	New Architecture	2003/12/10	27
19	From Large-scale City Design to the Daily Life Space	Jie Zhang, Jie Lv	City Planning Review	2003/9/9	176
20	The Application of Urban Morphology Theory in the Planning of Historical Scenery Reserve	Jiantao Zhang	Urban Planning Forum	2004/11/20	52
21	Theoretical Construction and Methods of Urban Land-use Patterns	Lian Duan, Yulong Liu	Urban Development Studies	2006/3/26	8
22	The Basic Summary of the Evolution of Chinese Urban Morphology since the 1990s	Guoping Qiong, Dongfeng Yang, Jianxun Yu	Huazhong Architecture	2010/4/25	15
23	Application of Urban Morphology in the Renewal of Urban Marginal Area	Cong Guo, Tongtong Liu, Yuan Zhan, Delong Sun	South Architecture	2010/2/28	0
24	A new Research Framework -- the Application of Urban Morphological Typology in China	Fei Chen	Architectural Journal	2010/4/20	42
25	The Form of the City	Kang Qi	Modern Urban Research	2011/5/15	20
26	Study on the Relationship between Urban Morphology and Urban Microclimate	Wowo Ding, Youpei Hu, Pingping Dou	Architectural Journal	2012/7/20	61
27	The Dilemma and Solution of Conzenian Urban Morphological Regionalization Theory in China	Sheng Yao, Jintang Chen, Yinsheng Tian	Urban Development Studies	2013/3/26	7
28	The Development and Thinking of Conzenian Urban Morphology Theory in China	Ying Zhou, Yinsheng Tian, Kai Wei	Proceedings of 2013 China Urban Planning Conference	2013/11/16	0
29	A Review of Chinese Urban Morphology in 2003-2013 Years	Huifang Wang, Kai Zhou	Progress in Geography	2014/5/15	30
30	Experiences From Researches About Residential Areas Employing Conzenian Approach	Jintang Chen, Sheng Yao, Yinsheng Tian	Urban Development Studies	2014/2/26	2
31	Distinguishing Characteristics, Exploring Principles of Regional Urban forms: The case of Chengdu and Chongqing	Xu Li, Yue Che, Hanmei Zeng	City Planning Review	2015/5/25	2
32	Use The Urban Morphology Theory Of Krier To Explain The New Cities And Towns Development In China	Gengnan Wei, Kang Qi	Architecture & Culture	2016/7/15	0

Figure 2. Information of articles selected as sample

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No.	Urban Morphology	layout	urban tissue	cityscape	urban structure	growth mechanism	organic	evolution	urban fringe belt	neighbour	block	plot	central axis	typology	square	landscape city	Other keywords				
1	Urban Form	layout								neighbour							Natural force	human force			
2	Urban Form	layout		cityscape	urban structure	growth							central								
3	Urban Form							evolution		neighbour					square		townscape surrounding				
4	Urban Form			cityscape			organic	evolution									behavior model	form and function			
5	Urban Form				urban structure	growth		evolution			block		central axis	typology	square		urban language	urban space			
6		layout									block			typology	square	landscape city	landscape city				
7	Urban Form	layout				growth		evolution		neighbour			central axis								
8	Urban Form	layout			urban structure	growth mechanism	organic	evolution									spatial landscape urban space environment		landmark		
9	Urban Morphology		urban tissue			growth mechanism		evolution													
10	Urban Morphology					growth mechanism			urban fringe belt												
11	Urban Form	layout	urban tissue			growth				neighbour											
12	Urban Form	layout	urban tissue	cityscape			organic										expansion	accretion	transformation		
13	Urban Morphology								urban fringe belt												
14	Urban Morphology	layout	urban tissue										central axis				cultural landscape				
15	Urban Morphology	layout	urban tissue		urban structure	growth		evolution		neighbour								expansion	accretion		
16	Urban Morphology	layout		cityscape							block	plot	central axis				morphological-genetic				
17	Urban Morphology	layout			urban structure	growth	organic				block						shape	urban size	mutual adaptation	function	
18	Urban Morphology	layout	urban tissue			growth	organism	evolution					central axis				strategic planning				
19	Urban Morphology		urban tissue		urban structure					neighbour						landscape city	river system	point	line	plane	
20	Urban Morphology	layout		cityscape									central axis		square		universe model	replacement	rhythm	political city	
21	Urban Morphology	layout		cityscape				evolution	urban fringe belt		block						balanced urbanization				
22	Urban Morphology	layout				growth		evolution	urban fringe belt												
23	Urban Morphology	layout	urban tissue		urban structure			evolution	urban fringe belt		block	plot	central				plan unit space expension	material and immaterial			
24	Urban Morphology		urban tissue																		
25	Urban Morphology	layout									block	plot									
26	Urban Morphology		urban tissue			growth					block	plot		type			traditional form	city plan	skyline	street	road network
27	Urban Morphology														square						
28	Urban Morphology	layout									block						microclimate	street			
29	Urban Morphology	layout	urban tissue						urban fringe belt		block										
30	Urban Morphology	layout	urban tissue		urban structure			evolution			block	plot					townscape	plan unit			
31	Urban Morphology										block						townscape				
32	Urban Morphology	layout		cityscape		growth						plot					residential area				

Figure 3. Key terms in sample articles(Number is the same as Figure 2

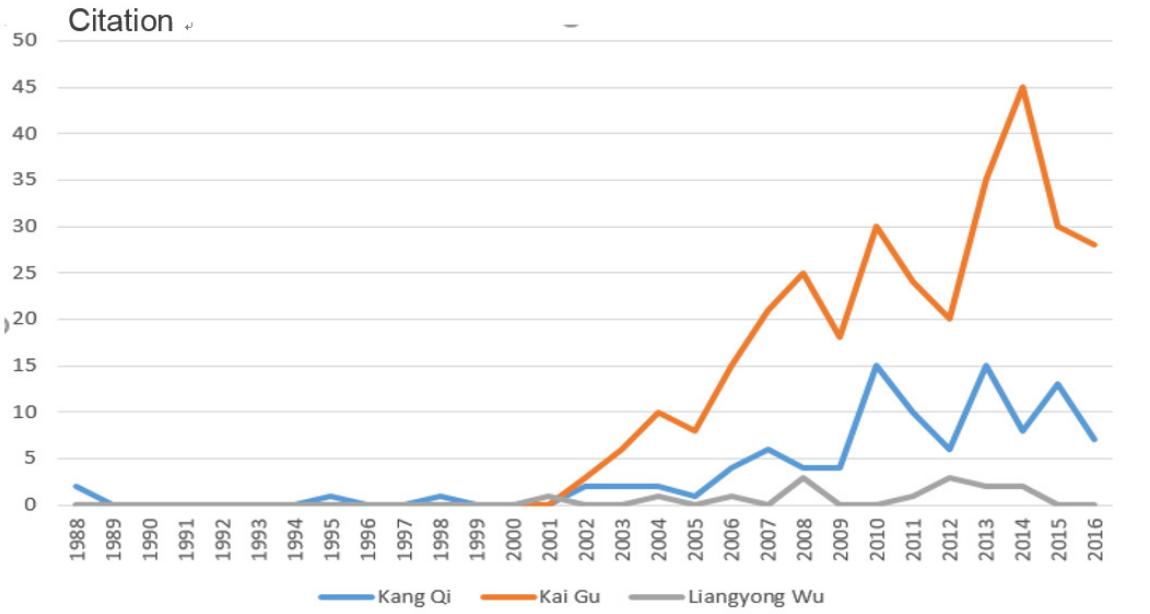

Figure 4. Citation of three well-known scholars` articles

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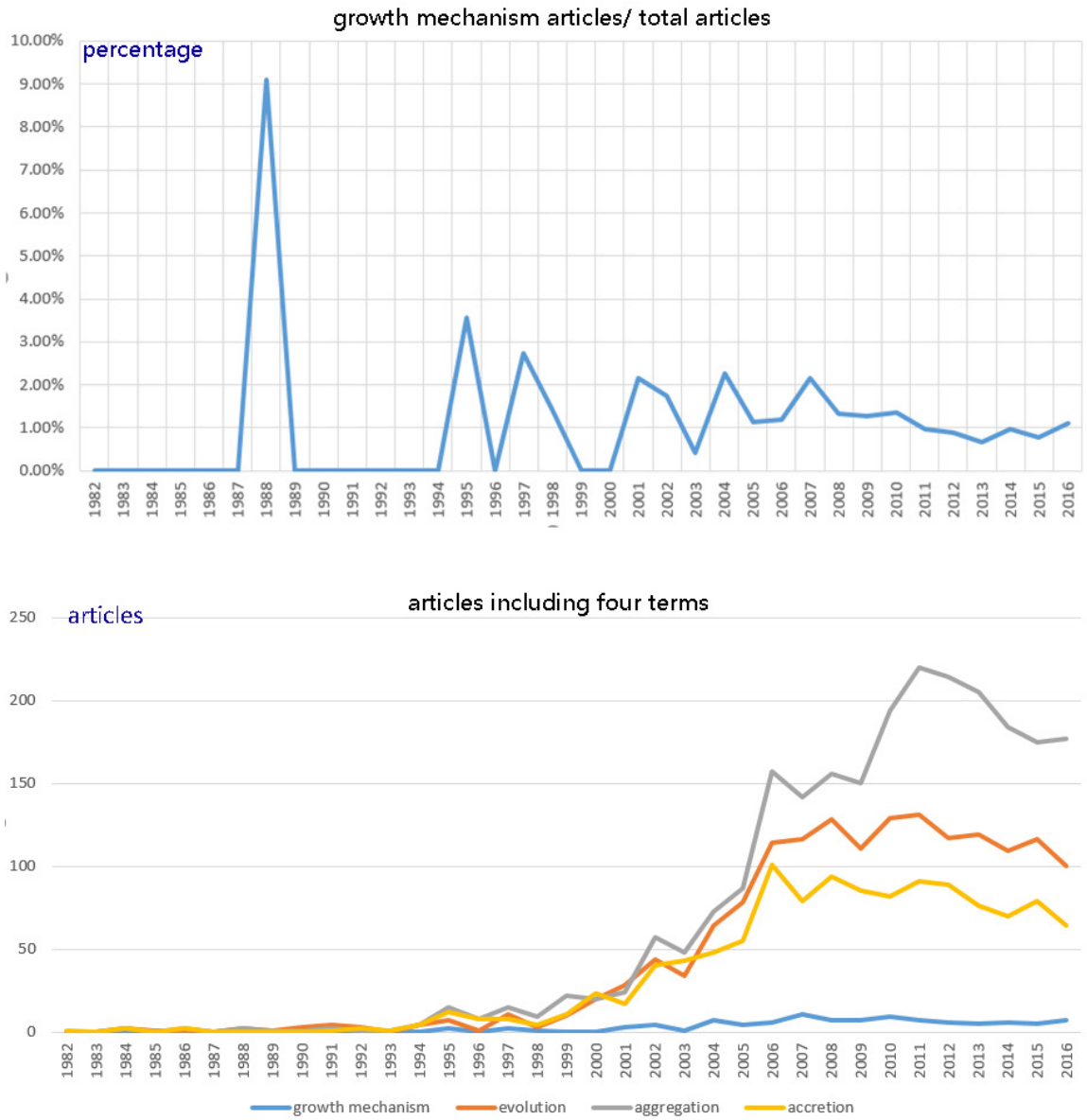

Figure 5. Development tendency of 'growth mechanism'

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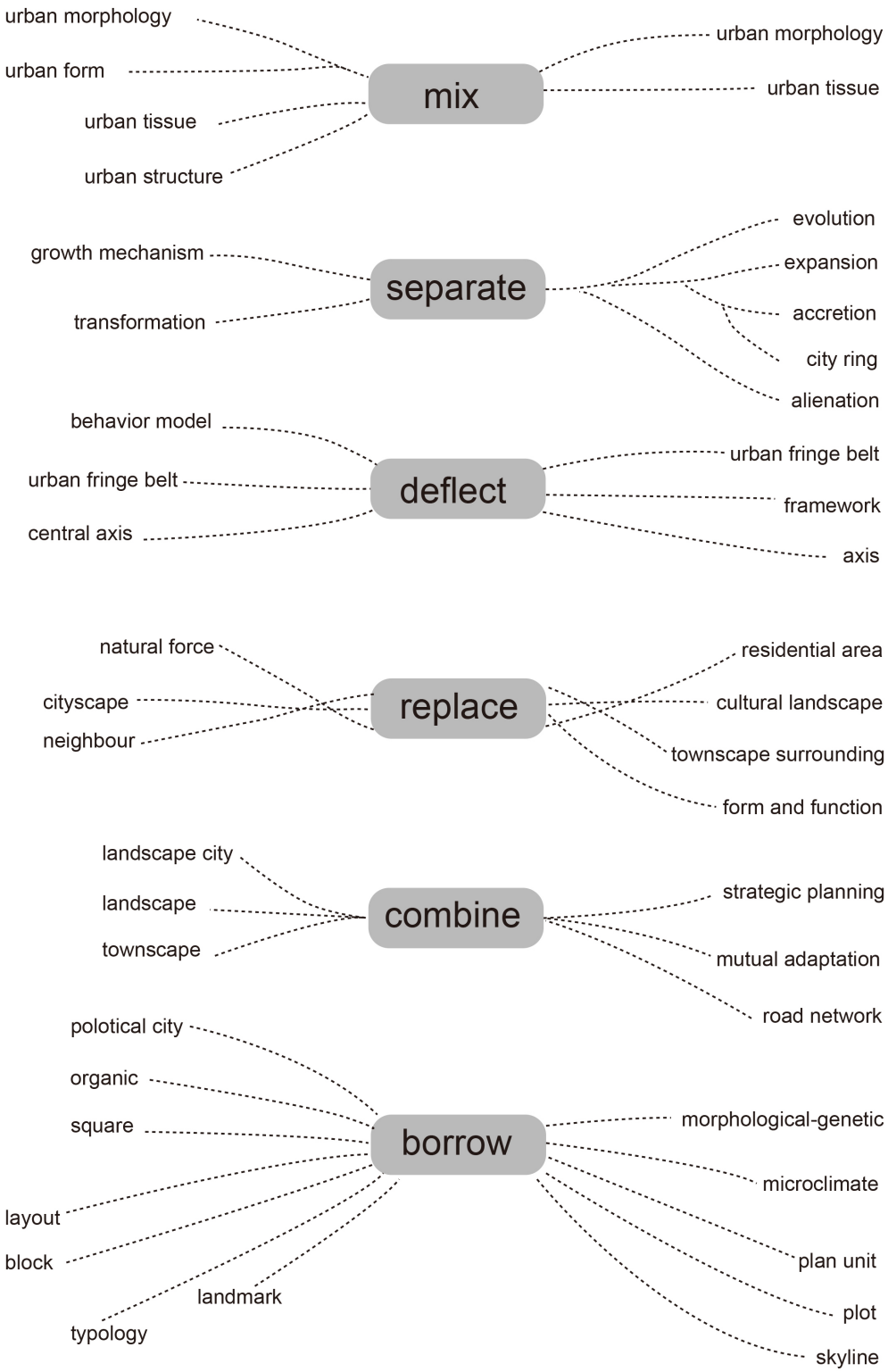

Figure 6. Diagram of key terms evolution

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Huifang Wang, Kai Zhou. (2014) 'A Review of Chinese Urban Morphology in 2003-2013 Years', Progress in Geography 05, 689-701.

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Morpho-based study on urban street spatial configuration: The case of Nanjing city, China

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Abstract. *As the most important part of urban space, street space is often regarded as the urban design object which would be made to reach certain spatial configuration expected by urban designer. As we all know that street space is shaped by the buildings along it, and that the buildings not only belong to different owners but also would be changed through the time. If it is true one might ask how the street space changes and what does this change mean to the urban development. Based upon urban morphological theory this paper investigates the relationships between street spatial configuration and urban development policies, building coding as well as urban activities. Three streets located in the center of Nanjing City with different functions and various land uses along them are selected as the research cases. Though the research this paper will demonstrate that by reading the changes of the street spatial configurations we can understand the social development stages and times, and by evaluating the street spatial configurations through the time we can see how the land policies changed the spaces. The paper suggests that confronting the dynamic phenomenon of the urban street space, urban designer should see urban form as urban morph, which will help designers to make decision more proper and better.*

Keywords: street space, street spatial configuration, urban form, plots

Introduction

Street space is an important part of urban space. To make guidelines to optimize the configuration of the street space is one of the tasks of urban design. While street space is enclosed by a plurality of buildings along the street, which are the results of the demands of land use and capacity index, and of the common control under the multiple regulations of fire distance, sunshine rights, setbacks and etc. Research on the morphological mechanism of the street spatial configuration is the basis of the urban design.

Studies have shown that the form of street buildings are influenced directly or indirectly by urban regulations, plots and plot index (Talen, 2012; Marshall, 2011). For the European and American cities, specific to the street interface form, the urban regulations such as density, fire protection, daylighting and ventilation, have a direct effect on the height, position, width and appearance of the street interface (Barnett, 2011; Green,2011; Kropf, 2011; Talen, 2012). And the urban spatial perception of the skyline, surface, architectural style, materials, street surface activities and other regulations on the shape all have different influence on the form (Kostof, 1991; Marshall, 2011; Lehnerer, 2013). Many architects and planners in China realize that physical space is not only a design achievement, but also closely related to the urban system and regulations, such as land ownership and demarcation, the supply mode of public service, and the tax model etc. (Zhao, 2011). Ding(2007) carried out a special

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study on Nanjing, based on the building size, construction distance, building spacing, architectural façade and other aspects, studying the policy on urban form control strategy. But the detailed effect of the existing regulations and indicators system on the street building forms still need to be thoroughly combed. Especially in the theoretical framework of urban morphology, how the regulations play the role on street buildings on the street/block, plot/building scale? And what elements have specific relevance to the configuration in these scales? These questions are worth exploring deeply.

For this reason, the paper tries to study the mechanism on Morpho perspective, that is, to study how indicators, regulations, streets, plots and buildings work together on the street spatial configuration in Chinese context. Three streets of different locations and functions in Nanjing City are selected as the research cases, where the plot size/pattern, the building capacity, and etc. are calculated, the corresponding regulations such as setback laws of different periods and etc. are collected. The correlation between buildings alignments in the plots along the streets with the regulations and the indicators are analyzed. As a conclusion the research finds that the irregularity of the buildings on both sides of the street space is determined by the setback red line regulations of different periods, the discontinuities of the buildings are determined by fire regulations, division of plots, and functions (commercial or residential). Confronting the dynamic disciplines of urban street spatial configuration, urban design is going to be carried out.

Methodology

In order to deal with these three issues, the method used in the study has two dimensions. Firstly, regarding the plot as a basic unit, the paper sorts out the different age of urban rules and regulations which had direct or indirect effect on street buildings. Then, according to the regulations, the variable models based on the street width, plot layouts and plot index are established. According to the mathematical law of the models, the number□the façade width and the position of the street buildings are analyzed on their relationship with the street width, plot layouts and plot index. To do this, two groups of material are needed. One is composed of the exact boundary of parcel, the time of plot allocation, the planning land use, red line, limit height, land use index, the built height and so on. The other is composed of urban construction laws and regulations for different periods corresponding to the allocation the plots, such as plan guidelines, planning and management of technical provisions, planning and implementation rules, architectural design norms, fire code and so on. Both groups can be obtained through the Planning Bureau and The Planning archives.

Secondly, considering the statistical method of street buildings and their alignment, it is an operable to analyze the shape characteristics of the street buildings in geometrical and quantitive way. The illustration and quantification technology has accumulated for many years in the world (Krier, 1979; Hillier and Hanson, 1984; Salat, 2011). Because of the difference of the urban space in western cities and in Chinese ones, many scholars define new index to quantify the geometry

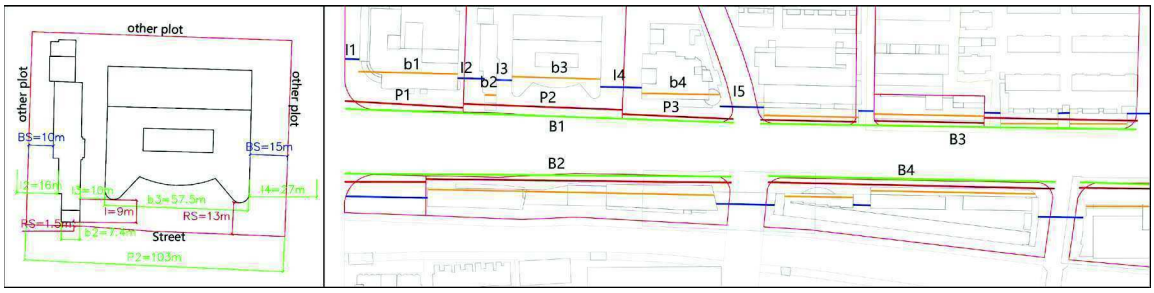

Figure 1.
Measurements of the length of blocks, plots, buildings and building intervals

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of the interface patterns of streets in China. The indexes of integration degree, building correlation and line ratio are put forward and applied (Li, 2007; Qi, 2010). Based on these studies, the paper analyzes the influence of different scales by calculating the ratio of total building length to street, block and plot length, as well as the maximun distance of different setback in blocks and plots. They are regarded as the references in various scale analysis. See figure1, each length of the block, plot, building and buiding interval are numbered, measured and counted. Based on the measurements, the ratio are calculated.

Research on items of urban rules

1. Urban regulations

1.1 Street width

In contemporary city, road is divided into expressway, main road, secondary road and branch. At present, the general red line width of main road in most cities is 35~60m, it is regulated that the public building access with high car flow, pedestrian flow should not be set on both sides of the main road. The general red line width of secondary road is 28~40m. The branch road mainly serves district, the red line width is 16~28. These regulations on the width have restricted the basic width of street. The regulations in different ages are different a bit.

1.2 Building setback regulation

Over year of construction, the buildings on both sides of street in downtown of Nanjing have restricted by laws and regulations in different ages, the main time nodes include 1928, 1978, 1995, 1998, 2004 and 2007.

1) Building setback for road: See the setback regulations in different years in the figure, from 1928 to 2007, there were 16 setback distances, especially after 1995, building of different heights must have different setback. It can be imagined that even if on the same street, the construction year of building is similar, as long as the building height is different, the setback distance will be different, the street wall will be uneven, and much less the buildings on the same street are completed in different years.

2) Building setback for land boundary: See the regulation on building setback for land boundary in different years in the figure, from 1928 to 2007, there were 9 setback distances. The regulation on setback for land boundary means to the street building that as long as the lands are adjacent, there will be 6~30m distance between buildings, which directly decides the continuity of frontage street.

To combine the regulation on building setback for road and setback for land boundary, laws from 1928 to 2007 regulated 43 building frontage positions (Fig.2). There were 26 possibilities of building position regulated by laws in 2004. Laws are formulated on the basis of code for fire protection, seismic prevention, etc., however, the specific influence on the architectural form of street building is not expected.

1.3 Building

Technical Regulation on Urban Planning Management in Jiangsu Province specifies the building base control index, besides regulating the minimum area of building base of residential building and non-residential building of different heights, it also regulates the maximum value of building density and plot ratio. To the building of some type, the plot ratio and building density are restricted. For example, the maximum value of base area of multi-storey residence is 1000m2, the building density cannot be more than 28% in new area, cannot be more than 30% in the old area, the plot ratio in new area cannot be 1.7, and cannot be more than 1.8 in the old area.

1.4 Other

Besides the regulation on building setback, capacity control, etc., the position of frontage building is also regulated by fire protection, daylighting spacing, etc. For example, according to the regulation of firefighting law, “when the length of frontage building is more than 160m, no less than 4m*4m fire lane shall be set. The pedestrian exit spacing should not be more than 80m, when the building length

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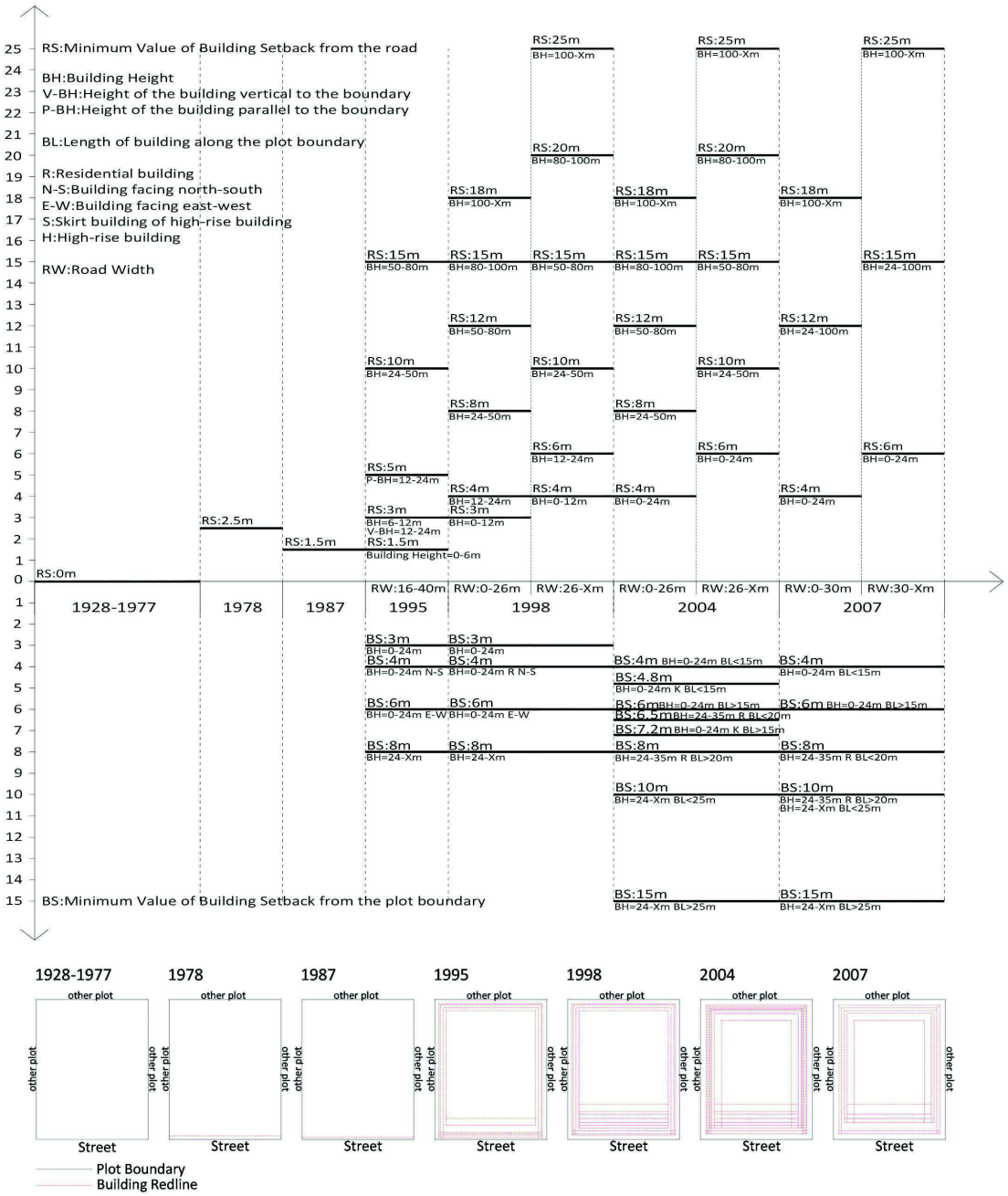

Figure 2.
Summary of setback regulations of successive years

is more than 80m, pedestrian passage shall be added on the base floor;" the building length is restricted by this regulation. For another example, to residential building, daylighting spacing is especially strict, when the frontage building is residential building, the position setting shall also consider the shielding from the existing building in the south.

When the building position is strictly regulated by the building setback law, the plot ratio and coverage rate are restricted, and the fire protection and daylighting spacing regulation are considered at the same time, the form of street building has been initialized and can be changed within the limit in some interval. What does this interval mean to visual perception? Simulating on the model can have preliminary judgment.

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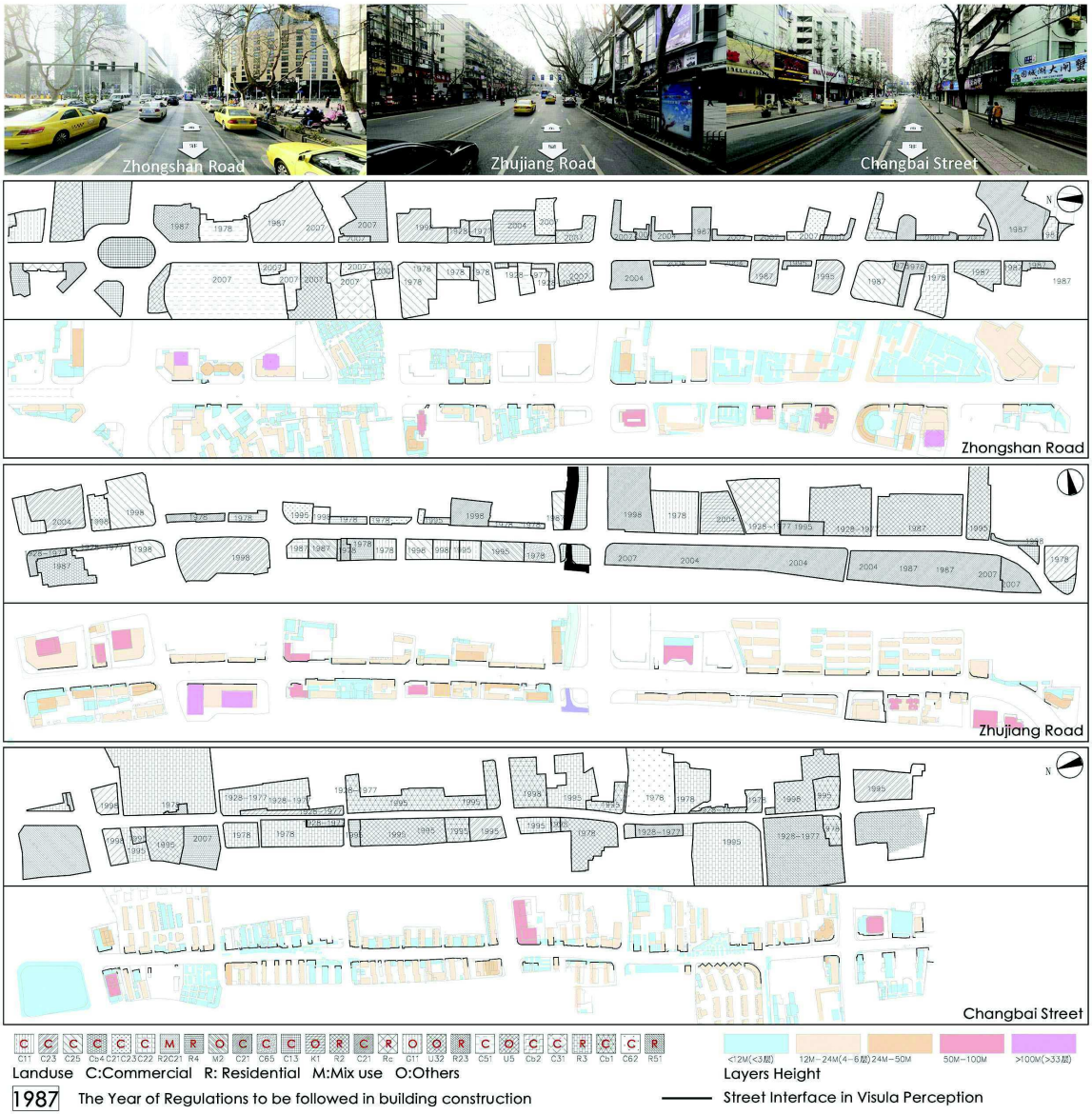

Figure 3.
Basic information of three street cases

Case studies on three streets: Analysis on the causes of layouts of street buildings based on the streetscape ruler

1. Analysis on the street scale

Three 2000m streets in the old urban area of Nanjing are selected in the research for in-depth analysis (Fig. 3). In which Zhongshan Road is the urban main road, the road red line distance is 42-52m, with commercial land and building on both sides. Zhujiang Road is the secondary urban road in east and west direction, the road red line distance is 35m, with mixed commerce and residential land on both sides. Changbai Street is south-north living main road, the road red line is 24m, with residential land and building on both sides. The three street cases correspond with different street widths, different service natures and different orientations respectively.

Later, the researcher makes statistics of block length, land length, land quantity, branch quantity, land nature, building face width, building quantity, building spacing, land plot ratio, coverage rate, building construction year, etc. of the three streets, so as to prepare for analyzing the form composition of frontage

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	Street Length	The Ratio		Branch Road Rnum	Rnum/2km
Zhongshan Road	1880	0.77		21	11
Zhujiang Road	1820	0.71		18	10
Changbai Street	1350	0.65		11	8
	Blength_max	Blength_min	Block Blength_ave	Bnum	Bnum/2km
Zhongshan Road	490	41	135	29	15
Zhujiang Road	400	52	186	20	11
Changbai Street	298	105	192	14	10
	Plength_max	Plength_min	Plot Plength_ave	Pnum	Pnum/2km
Zhongshan Road	340	8	76.4	51	27
Zhujiang Road	198	8	73	49	27
Changbai Street	188	13	73.5	36	27
	bLength_max	bLength_min	Building bLength_ave	bnum	bnum/2km
Zhongshan Road	202	4	52	52	28
Zhujiang Road	186	7	51	55	30
Changbai Street	104	2	21	84	62
			Building Interval		
	llength_max	llength_min	llength_ave	Inum	Inum/2km
Zhongshan Road	85	1	25	44	23
Zhujiang Road	62	2	17	48	26
Changbai Street	62	1	12	78	58

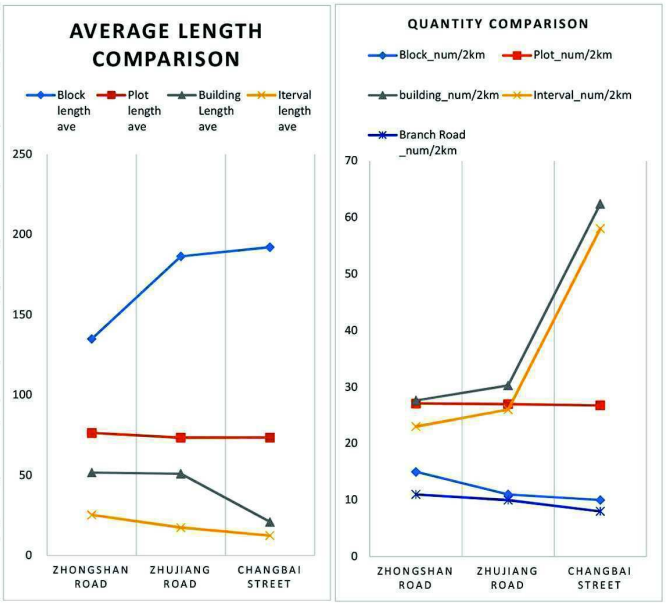

Figure 4.
Basic statistics of three streets

street under the comprehensive function of land, land combination, urban law, land plot ratio, etc. The building data source is the surveying and mapping data of Nanjing Planning Bureau in 1997. The building year is judged according to the image maps in 1949, 1976, 1990, 1998, 2004, 2005-2015.

Statistics show that the quantity of branches of Zhongshan Road, Zhujiang Road and Changbai Street are 11,10 and 8 per 2km. The result corresponds to the average length of the blocks. The value of the average length of blocks in Zhongshan road is the smallest, followed by Zhujiang Road and Changbai Street. The average length of plots along the street of the three street are approximate, the value is about 75m. There are large difference in the value of average width and quantity of buildings, especially in Changbai Street, the quantity value is quite high, but the average width value is quite. In terms of the building intervals, the average value of Zhongshan Road is the largest, Zhujiang Road is the smallest. While considering the quantity of the intervals, the result is on the opposite. The values of Changbai Street is twice higher than the one of Zhongshan road and Zhujiang Road. This means there are more buildings in the plots of Changbai Street. The paper then analyses the causes of these statistics in detail.

2. Analysis on the block scale

Based on the statistics of the 63 blocks in the three streets, in the block scale, the paper calculates the ratio of building length to the block length (use 'the Ratio' in the following text) and the maximum distance of the setbacks of the street building in the blocks (use 'the Irregularity distance' in the following text), then studies their correlation relationship with the block length, the quantity of the plots and buildings, and so on. The main aspects of the influence on the street space configurations are summarized.

The effect of the length of the blocks: Through correlation analysis (Fig.5), it is found that for three streets, with the length of the block increasing, the Ratio has a different trend. Zhongshan Road and Zhujiang Road are positive correlation, that is, the greater the length of the block, the greater of the ratio, The trend of Zhujiang road is especially obvious. The Changbai Street shows a completely different trend. When the length of the block increases, the Ratio is smaller. Because the Changbai Street is the north-South residential street, the buildings along it are narrow. In order to meet the residential area of the sunshine norms, there is a great distance between buildings, and this point also can be seen from the number of buildings. While both

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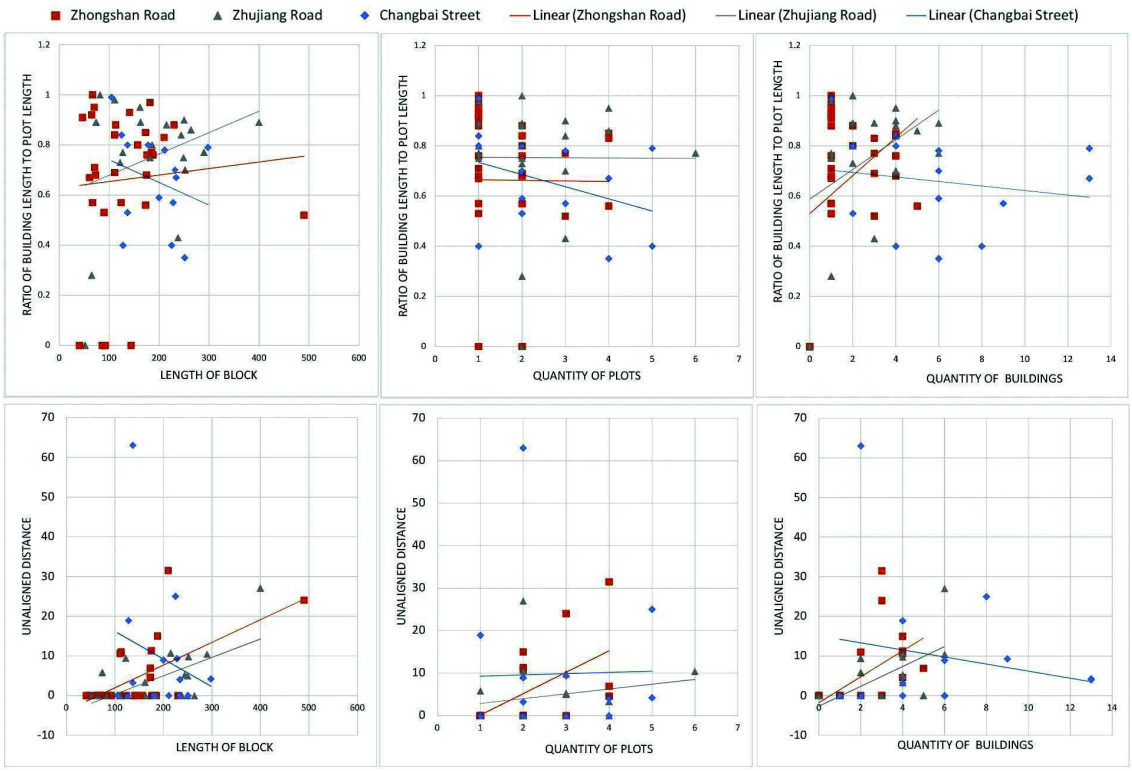

Figure 5.
The correlation analysis between the Ratio and the block length, plots&building quantity

sides of Zhujiang Road are also residential plots, for it is east-west to the street, there is no demands of sunshine spacing between the buildings. Instead, the longer of the plot, the longer of the building. So the Ratio will be greater. In addition, although Zhongshan Road is a north-south street, but the two sides are mainly commercial-type plots which not affected by the sunshine spacing. On the other hand, for Zhongshan Road and Zhujiang Road, the longer the block length, the more obvious the Irregularity. The situation in the Changbai Street is on the opposite, the longer the block length, the Irregularity is less obvious. In other words, for commercial streets, the longer the block, the longer the length of the Ratio, the greater the Irregularity. For the living streets of the east and west, the regular still exists. But for the north-south to residential streets, in the case of buildings without a skirt building, the longer of the plot, the smaller of the Ratio, the more the Irregularity.

The effect of the quantity of the plots and buildings: The results show that for Zhongshan Road and Zhujiang Road, the number of plots in the block is not directly related to the Radio. But for the Changbai Street, the more the number of plots, the Radio is smaller. In Changbai Street, There is no direct relationship between the number of plots and the different concessions of buildings. For Zhongshan Road and Zhujiang Road, the larger the number of plots, the more obvious the Irregularity is. And the more of buildings, the larger of the Radio in Zhongshan Road and Zhujiang Road. But it is opposite in Zhongshan Road. The number of buildings has a similar effect on the Irregularity. In other words, the relationship between the number of plots and the Radio is not obvious. For the north-south residential area, the more plots, the smaller the proportion of buildings. For commercial streets, the more plots in the block, the more likely the building will be different concessions. The larger the number of buildings, the greater the Radio, the greater the likelihood of a building yielding different concessions, except for the north-South Living Street.

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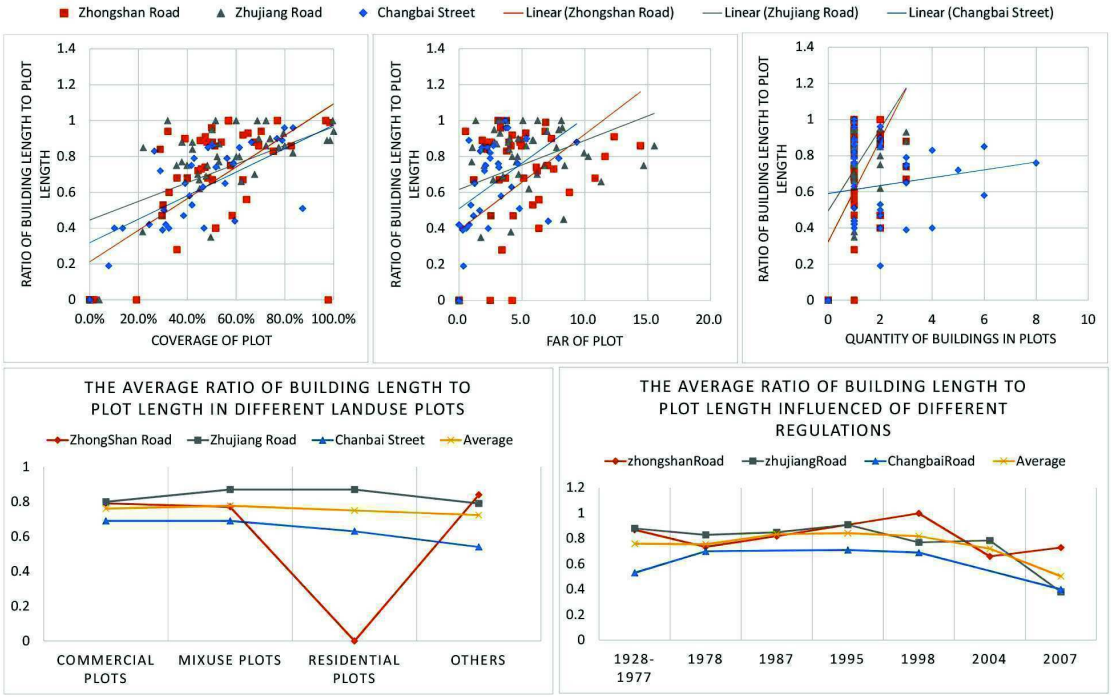

Figure 6.
The correlation analysis between the ratio and the plot FAR, coverage, and etc

3. Analysis on the plot scale

The study then focuses on the ratio of the building length to the plot length (use 'the ratio' in the following texts), and its correlation relationship to the coverage, FAR of the plots, quantity of the buildings, and land use. Based on the statistics of 136 plots in the three streets, the factors related to the spatial configuration of the street space are analyzed.

The effect of the Plot Coverage and FAR: The study finds that the ratio is positive correlation with the FAR and coverage of the plots. That is, the higher the coverage and FAR, the higher the ratio. The statistic of Zhongshan Road and Zhujiang Road shows that there are not many buildings in the general plot (1-3). The more the building, the higher the ratio. The quantity in Changbai Street is much more till 8. Thus, the quantity is not much correlated with the ratio.

The effect of the land use of the plots: The statistics of the ratio of different land use show that for the Zhujiang Road, the value of residential and commercial mixed plot is larger than that of commercial one. Zhongshan Road has no residential plot, the value of commercial plot is comparable to that of Zhujiang Road. The value of Changbai Street is lower than that of other streets, and the ratio of residential plots is lower than that of commercial and mixed ones. As a result, the ratio of east-west street is higher than the north-south street.

The effect of different years of regulations: According to the statistics of different yeas of buildings construction, since 2004, the value of the ratio is become lower. The value of the ratio in 1978, 1987 and 1995 is relatively high. Corresponding to Fig. 2, with the gradual increase of the height of the buildings and the refinement of the regulations of setback and intervals, the street space configuration have changed greatly.

Conclusion

The paper studies and collates the laws and regulations which have an important influence on the Nanjing Street Configuration, and makes a detailed analysis in the street, block and plot scale, and obtains the following conclusions:

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1. The construction laws and regulations and the changing of them have shaped the composition of the street space. The influence exists especially in the setback and intervals of buildings. In the case of Nanjing regulations, the regulations in 2004 and later has led to the separation of the street buildings.

2. Under the control of specific regulations, it is the length of the block and the quantity of the street buildings in the block, not the quantity of plots, that will affect the ratio of the length of the buildings to the length of the block, and in general, the higher the ratio, the greater the Ratio. While considering the North-south residential street, the opposite is true.

3. The ratio of buildings length to the plot length is positively correlated with the length, FAR and coverage of the plots. That is, the larger their value, the large the ratio. The ratio is also related to the land-use, the ratio of the residential plots along the east-west street is higher than that of the commercial plots.

Therefore, before the urban designer intervenes, the street space configuration is the results of city regulations under the conditions of typical blocks and plots. Good urban street space configuration is not only the results of good urban design, but also the results of niche targeting urban rules considering the different conditions of street, block and plot. Under the condition of modern city's high density, the good street space can still exist with the modern operation mode; the good form controlling should include the future-oriented method which synthesizes more factors.

Acknowledgement

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Future scenarios for post-industrial Eindhoven. A fringe-belt perspective

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Abstract. *Research Although fringe-belt analysis is increasingly recognized as sound baseline for research to inform the operational level of spatial urban planning, e.g. urban management plans, little research has yet focussed on its potential on the strategic level of spatial urban planning. In general, strategic urban planning is dominated by quantitative and economically based modes of scenario analysis. More qualitative analytical approaches, such as provided by morphogenetic analysis, are usually playing a minor role if any at all. This paper aims to discuss the potential role and contributions of fringe-belt analysis to strategic spatial scenario planning. For that a plural case study is carried out based principally on fringe-belt analysis in the former industrial region of Eindhoven, The Netherlands. Multiple roles of the present urban fringe-belt composition in the anticipated scenarios of future transformation of the urban region are explored, building on the potential internal modification processes within its fringe-belts to adapt the city to these scenarios. Research outcomes are critically related to the current strategic vision of the city and urban region, to come up with recommendations to come to a more integrated, effective and authentic strategic approach. A pro-active approach towards fringe-belt modification is suggested as efficient urban development strategy, for example, channelling the increasing pressure of intensification of land-use (controlled fringe-belt alienation), or, creating social and economic value by means of fringe-belt adaptation. Results contribute to the debate on fringe-belt development and future transformation in the case of former industrial and post-industrial cities and urban regions, and more specifically, on the distinctive character and role of radial fringe-belts, radial fringe-belt corridors and radial fixation lines, within the changing spatial configuration of the social and economic urban stratification.*

Keywords: fringe-belt analysis, strategic planning, scenario planning, radial fringe-belts, Eindhoven.

Introduction

Many post-industrial mid-sized city still struggle with the effects of the deindustrialisation from the late 70's on, trying to develop new promising socio-economic development paths to revitalise the city, its economy and community, and seeking for new roles or specialisations within the global economic network fitting to their specific strengths in terms of demographic, economic, cultural as well as spatial characteristics (Sassen, 2001). After all different types of cities (based on cultural region, functional structure, social, economic and institutional structure, geographical structure, size, form, history, etc.) respond very differently to the complex and dynamic configuration of global and general trends and processes of the post-industrial era. Specifically for former (specialized) industrial towns and cities, spatial planning for the uncertain future has a strong

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physical dimension, simply because of the fact that a substantial part of its built-up area consists of former industrial sites, containing large amounts of infrastructure, that has fallen into disuse, and abandoned buildings. Typo-morphological analysis enables us to understand the role of space into the cities historical evolution but also to understand the characteristics new developments can build on. 'Urban projects embody an important paradigmatic shift in urban planning from master planning / regulatory planning to strategic planning with a clear emphasis on implementation' (Albrechts, 2006, p.1494). Strong complementarity of planning and urbanism is recognized in their approach: the first often more model-based and viewing from a top-down perspective, the second more casuistic and based on bottom-up experiences (Albrechts, 2006). However, since 'the death of the urban masterplan', in many European urban regions the qualitative morphological dimension of urban planning, specifically with concern to the scale of the entire city or sizable part of the city, seems to have been eroded away (relate to Dutch MIRT). This has generated a gap of topical morphological knowledge between the level of corporate urban ambitions and the implementation level of 'small urbanism' (Scheer, 2013). That void is now found partly filled with a new managerial and administrative machinery and has formed a playing field for neo-liberal forces (Lammers et al., forthcoming; Albrechts, 2016; Wagenaar, 2011). The lack of topical morphological knowledge of the larger urban-geographical scale deprives urban planners and designers of an important analytical key that should work to ground new (strategic) projects in the urban community and its history (Scheer, 2013). For multiple reasons, the historico-geographical concept of the urban fringe belt could be suggested as a promising analytical tool to fill that knowledge gap.

Urban fringe belts and urban planning

Many of the current urban projects in European cities, particularly in former industrial cities, still relate to post-industrial recovery and to urban renovation: the sustainable revitalisation of what in the post-industrial era have become obsolete brownfields. Although this 'project of projects' has many dimensions (De meulder et al., 2004, Busquets, 2001, 2011) it essentially concerns 'the spatial impact on the physical environment of proposals for new development and the spatial coordination of the various functions and activities that they would require in relation to the urban fabric'(Gu, 2014, p. 267). Substantial parts of the geographical patterns of former industrial sites in cities refer to former peripheral locations where, once, during periods of relative stagnation of compact (residential) urban expansion, extensive land uses acquired cheap land. As such, to a large extend, the current issue of post-industrial recovery and physical urban renovation directly relates to the historico-geographical topic of the urban fringe belt (M. R. G. Conzen, 1960, 1981; Gu, 2010, 2014). This notion forms one of five main reasons that account for recent developments of fringe belt theory, focussing on the role of fringe belts in the urban planning context (M. P. Conzen, 2009; M. P. Conzen et al., 2012; Whitehand et al., 2012; Whitehand & Morton, 2003, 2004, 2006; Gu, 2010, 2014; Ünlü, 2013).

A second and third notion frames the position of the fringe belt within recent compact city policy. On the one hand the related debate denounces the diffusion and fragmentation of the contrast between city and country land (e.g. green belts, see Whitehand & Morton, 2004); on the other hand it relates to urban environmental and sustainability challenges (see a.o. Hopkins, 2003); fourthly, fringe belts are involved in the discourse about urban landscape transformations under the conditions of globalization, intercity competition and post-modernity (Gospodini, 2006); and fifthly, from a specific areal development point of view, the urban fringe belt has been identified as an autonomous and independent historico-geographical zone, neither considered from a city perspective nor from a country side perspective, containing its own (intrinsic) developmental logic (Suurenbroek, 2009). Although many studies succeed to reveal the relevance and to stress the urgency for integration of larger morphological and

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historico-geographical structure of cities as entities, into spatial planning contexts, the next question of how to integrate it strategically into a urban planning context is for a large part still remaining.

Therefore, in this paper, the application of the fringe belt approach in strategic urban planning is explored. It seeks to understand how the concept could be integrated into a prognostic research approach. This means that the study is primary a methodological investigation. The general aim is framed by the casuistry of the European, medium sized, former industrial city, represented by the case of Eindhoven (The Netherlands, Southeast North-Brabant). Specific research questions are formulated for the case study.

Post-industrial Eindhoven

Eindhoven started to develop rapidly as an industrial town since 1891, when 'Philips Gloeilampen NV' founded in the historic urban core. Before that time Eindhoven was no more than a small agricultural town, with about 5000 inhabitants. The city grew out to the fifth city of The Netherlands, with almost 225.000 inhabitants in 2016. As such, the city can best be categorized as biggest medium-sized city of the country. Eindhoven is situated in the southeast of the province of North Brabant (figure x), at some 100 km east of the Randstad, and at similar distance to the German Ruhr area in the east and the Belgian cities of Brussels and Antwerp in the south. Most commonly the Eindhoven region is defined as the Metropolitan Region Eindhoven (MRE; formally SRE), consisting of 21 municipalities, together counting almost 750.000 inhabitants. Since a serious economic crisis hit the region in the early 1990's, several economic stimulus programs were launched to strengthen the regional economic structure, currently having led to the officially recognized status of the national Brainport (Van den Berg and Otgaar, 2012; Brainport, 2016). From a national (Dutch) perspective the Brainport concept actually refers to the Mainport (Amsterdam and Rotterdam) status as it was defined in the Fourth Memorandum on Spatial Planning, published in 1988. This memorandum marked a shift at that time from a mainly socially engaged spatial policy to a strong economic focus. In that view urbanity was promoted as a physical and spatial condition that should stimulate economic revitalization (Wagenaar, 2011, p. 514).

Currently, one of the main concerns of the Brainport City Eindhoven is the critical relationship between, on the one hand, the it's prominent status of generally being recognized as one of the most innovative regions of Europe, owing this position to the presence of innovative companies and some renowned knowledge institutions, and on the other hand, the balance of factors that keep the region in that fortunate position. Central to that concern is the fear that the general living conditions in the region aren't attractive enough for corporate staff and excellent skilled knowledge workers to align Brainport Eindhoven with global competitiveness (Lammers et al., forthcoming). The city chose to approach this challenge by working towards 'a quantum leap in metropolization' (BVR, 2014), somehow in line with the approach followed in the Fourth Memorandum. The official recognition as the Dutch main knowledge hub, as of fundamental relevance for the national economy, has substantial implications for the city's urban planning context. With this paper we seek to illustrate an alternative morphological and empirical view, opposing the prevailing economic and managerial view.

Morphological context: Eindhoven's fringe-belts

Although officially registered as a city since 1232 Eindhoven didn't experience substantial outward growth until the second half of the nineteenth century, when it started to develop as an industrial town. The industrial expansion of Eindhoven consists of four morphological periods: early industrial (1850-1920), heydays of industry (1920-1940), late industrial (1945-1970) and post-industrial (after 1970). Each period has been characterized by distinctive planning regimes observable in the urban

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Table 1. overview of Eindhoven's fringe-belt structure

Fringe-belt	form	type
Inner fringe-belt	Tangential	Pre-industrial; fixation line: former city canals and ramparts (Vestdijk, Keizersgracht, Wal);
Middle fringe-belt	Radial	Early industrial; morphological framework: pre-urban street network, geo-/hydro-morphological conditions
	Tangential	High / late industrial; fixation line: middle ring road (Rondweg)
Outer fringe-belt	Radial	High industrial; morphological framework: multifunctional, industrial arterial infrastructure (canal, railway, streets)
	Radial	Late industrial; morphological framework: Dommel valley
	Tangential	Late industrial; fixation line, morphological framework: west-side highway ring road, canal

(Source: own elaboration)

Table 1. Overview of Eindhoven´s fringe-belt

fabric. Related to the shifts between those systems a specific fringe-belt configuration has developed, consisting of six typologically distinct morphological categories (table 1). Recent study has defined the relationship between Eindhoven's form of growth and the form of its fringe-belts (Lammers, et al., 2016, forthcoming a, b). A most striking aspect with regard to Eindhoven's urban growth history is the phenomenon of radial urban growth and the formation of radial fringe belts.

Methodology

The central question how to apply the fringe belt approach in strategic urban planning is explored from two perspectives. (1) the analytical value of the urban fringe belt is investigated, following naturally from the conception of the concept a 'historico-geographical frame of reference within which the phases of development, and physical forms, of previous societies are related to the physical configurations of present cities' (Whitehand and Morton, 2004), towards a similar but now future-oriented analytical concept; (2) the strategic value of the urban fringe belt for the future development of a city (Eindhoven) is explored, relating the characteristics of the phenomenon as a total morphological-geographical configuration and its constituent parts (M. P. Conzen, 2009; Gu, 2014; Hopkins, 2004; Kropf, 2001) to the specific challenges that meet a specific type of city (a European, mid-sized former industrial city).

Methodologically the study builds on previous fringe-belt analyses such as the one on Birmingham's Edwardian fringe-belt (Whitehand and Morton, 2003, 2004, 2006) and the (comparative) case study of the waterfront areas of Auckland and Wellington, New Zealand (Gu, 2010, 2014). These studies intended to explore fringe belts in order to inform decision makers and decision-making, to plan-making and development control. In this paper, aiming to explore the integration of the fringe belt concept into a strategic planning context, the main focus will be on the factors that account for the survival of the fringe belt units (Whitehand & Morton, 2004, p.276). In fact, being concerned is the balanced complex of factors (BCF) which keeps a (fringe belt) plot in any given use. That balance may be related to social, economic and political-institutional variables, but these are in turn generally related in some way to locational variables (Whitehand, 1967, p.232-3). From an evolutionary perspective, or 'through the lens of path dependency' (Zarina, 2013, p.356), the fixity of the BCF within a transformative urban context represents the rationales (relevance) of the plots or plan units for the current and next historical era (post-industrial morphological

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periods). This leads to the assumption that those understanding of the BCF's are of strategic value for the future development paths of the city.

Previous research on the formation and modifications of Eindhoven's fringe belts is taken as a starting point to identify, describe and contextualize the BCF's. Via the detailed investigation of several topical cases of fringe belt modification trends, the related BCF's are decomposed into their social, economic and political-institutional and locational variables to create a platform for cross-relating urban morphology to the variables that constitute the top down formulated corporate image of the city (Oliveira, 2016; Whitehand, 2010). Framing a scope for this paper we chose to focus in particular on the ambition to spatially prepare the city for a substantial increase of inhabitants as described in the city's housing vision (Eindhoven, 2014), which is directly related to the city's Brainport status and the consequential conformation to the MIRT protocol (see above).

The cross relation of bottom-up morphogenesis and the top down formulated urban ambitions could lead to sets of multiple micro scenarios per case. The idea is then, that, building further on those flexible sets, larger and higher level urban scenarios can be composed in multiple and flexible arrangements. These scenarios can be applied within multiple types of strategic planning processes. For instance they can be used in a participatory planning context (Secchi and Viganò, 2009; Chakraborty & McMillan, 2015; Zapata & Kaza, 2015); or to integrate more flexibility in the process, for instance by the application of 'by-passes' (see Viganò, referred to in Peleman & Pelger, 2015), or by providing a plural alternative to commonly use of one preferred scenario (Zapata & Kaza, 2015; Chakraborty & McMillan, 2015).

Results

The basic taxonomy of Eindhoven's fringe belts (table 1) strongly correlates with the spatial division of the different types of balanced complexes of factors which keep the fringe belt plots in their use (BCF's). In this section, firstly four types of complexes will be described and parsed into their economic, social, cultural and political-institutional dimensions, and linked to the specific (local) types of fringe belts; then concluding the cross-linking between bottom-up morphogenetic evidence and top down formulated housing vision will be illustrated and discussed.

Balanced Complexes of Factors

(1) the first BCF is described as 'the locational inertia induced by increased investment in sites' (Whitehand & Morton, 2004). This concerns the fact that when a city grows, the relative centrality and the land value of a fringe belt plot increases. Then the continuation of the fringe belt land use can only be justified by intensification of use, which implicates capital investment in additional buildings (Whitehand, 1972). These findings were basically related to research of public institutional plots and land uses. When applying the theory specifically to industrial fringe belts, as is the case in Eindhoven, several notes have to be considered. Most relevant in this is the fact that, although also public institutions experience operational changes in time due to societal and political shifts that may affect the economic justification of the use and possession of their buildings and land (e.g. the alienation of the site of the inner city municipal hospital in the eastern part of Eindhoven's IFB into CBD land use), for private fringe belt land uses (such as industrial land uses and to a certain extend also private institutions) the impact of sectorial shifts in the economy is a much larger and more fundamental. In Eindhoven particularly the high industrial radial OFB has experienced the effects of the disruption of the balanced complex of factors that accounted for the continuity of the type of land use (the industrial crisis). The industrial land use in especially the western fringe belt corridor has almost completely transformed into other types of land use, partly adapted to other fringe belt land uses, partly alienated. The primary economic value of the buildings and infrastructural elements had diminished substantially and is translated into a rather

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socio-cultural value. The eastern corridor has until now still hardly been affected by fringe belt modification. Only where the corridor merges with the eastern part of the tangential IFB most fringe belt units have been alienated into compact typologies of residential land use.
(2) A second complex of factors of inertia is the 'dependence on fringe-belt features that develops among other land users in the vicinity' (Whitehand & Morton, 2004). This complex concerns situations where fringe belt land use units are, in addition to a physical embedding, also are deeply integrated into the social, cultural and economic structures of the surrounding urban fabric. Whenever the continuation of land use of these units is challenged, involved agencies easily develop into the formation of local pressure groups (Whitehand & Morton, 2004). In Eindhoven these situations are mainly observed in the early industrial radial MFB. In these cases often tactics of informal claiming of space are involved.

(3) The third complex is the 'limited rationality of the plot'. This type of complex refers to the view that the contemporary urban landscape is the product of an accumulation of individual decisions by private bodies, businesses and authorities, each answering to their own 'minimal rationality' (Ryckewaert, 2002 referring to Secchi, 1996). However, in this case the issue of minimal rationality is viewed from the perspective of urban form. The concept is based on the situation in which a land use experiences protection to change based on the fact that the plot form and size doesn't meet the general requirements for the realization of building types that serve more intensive land uses (see also Apostel et al., 2008). The strength of this factor depends on the typological variety of demand for housing in an urban region, so strongly related to a region's economical and societal structure. In Eindhoven these situations are mainly observed in the early industrial radial MFB.
(4) the fourth complex is the 'contrast in plot-size-variety'. This concerns the contrast in plot sizes between larger fringe belt plots bordered by multiple small adjacent plots (Whitehand & Morton, 2004). This complex is mainly morphologically defined, but is strongly linked to the socially, culturally and economically embedding of the land use in the surrounding urban fabric (complex 2).

Micro cases and sub-scenarios

The micro case study concerns a comparison between four fringe belt units of the early industrial radial MFB, situated in two different corridors: the MFB corridors of the districts of Stratum (the 'Museum quarter'-unit) and of Gestel (the 'Bergstraat'-unit, the 'Palingstraat'-unit and the 'Hallen'-unit), two on a similar distance close to the CBD (Museum quarter and Bergstraat) and two at a distance to the CBD of respectively about half a kilometre (Palingstraat) and one kilometre (Hallen-unit) (figure x). We found significant difference in the way how those three perimeter blocks respond to the increasing transformative pressure that they all experience. These differences are found being clearly based on the differences in typo-morphological and land use configurations to which they have evolved from their formation onwards. Most characteristic in this is the changing relationship between the perimeter plot series and the internally situated plots that they surround. The two BCF's involved are the limited rationality of the internal plots and the extreme plot-size-variety.

The radial MFB is constituted of a radially distributed series of primary and secondary perimeter blocks which morphologically relate to the typical forms and measurements of the antecedent rural framework of the streets, paths and routes. The larger internally situated plots, that are surrounded by perimeter plot series facing the public domain of the street network, exhibited limited rationales for residential urban development within the relatively narrow local scope of demand for typological variations during the industrial phases of urban growth (a prevailing demand for ground-floor family housing with back gardens). Due to this limited rationality for residential development the land market value of those larger plots was relatively low and thus accessible for a certain scope of fringe belt land uses (Lammers et al., 2016, forthcoming). This stable frame of factors got disturbed when the demand for

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typological variation expanded during the last decennia of the post-industrial era. This is illustrated by the micro cases. The inner block plots of the Museum quarter-unit are recently alienated from their fringe belt land uses (originally suburban villa plots and industrial plots) into an ensemble of small household apartment buildings above an underground parking (ca 90 dwellings/ha) and several built extensions of hotels, situated along the radial urban exit route (Stratumsedijk – Aalsterweg - Leenderweg). The definitive modification had been preceded by a process of urbanization of the perimeter plot series, as most of the suburban (manufacturer's) villas transformed into offices and hotels. Although the final modification of the fringe belt unit still met substantial resistance from surrounding land users, it can be reasonably assumed that, besides the change in the limited rationality for development on the fringe belt plots, also the urbanization of the perimeter plot series has played a crucial role. This relates to a second complex of factors of resistance, this time caused by the high contrast in plot-size-variety. That contrast was reduced in two ways, firstly, due to the fact that plots of the perimeter series were joined with the internal plots (hotel extensions) and secondly, that the intensification of the inner area increased the functionality of the land uses on the perimeter plot series, for instance through the development of an underground parking space partly available for the offices in the perimeter.

All the negotiations that led to the final business case for the development were part of the urban planning process. Within that process, where several parties were involved (land owners / entrepreneurs with their architects, a management office, urban designer and the municipal authority), considerable attention was paid to the development of project-specific morphological regulations. Most relevant from that perspective was, firstly, the idea to link the maximum height of the internal plot development to the un-visibility of the building masses viewed from the public domain (the surrounding streets), which exhibits intentions of streetscape conservation; secondly, a level playing field was created for following individual development initiatives on other internally located plots in the block, by designing regulations that should account (guarantee) for the autonomy of each new project. This was translated into the prescription that new buildings had to be situated along the plot border line, with their front facades oriented inwardly (back to back development). From the comparison to the recent transformations of the three cases in the fringe belt corridor of Gestel some significant differences can be highlighted. For instance when concerning the limited rationality of the Bergstraat-unit, the stable frame of factors also got disturbed. This time under influence of the increasing functional differentiation of the CBD. However, here, the development of a hotel on the internal fringe belt plot of a former match factory met relatively stronger opposition as the perimeter plot series contain fewer CBD land uses (office villas and hotels) and more residential use. In this case the contrast in plot-size-variety proved to be a much stronger resistant factor than at the Museum quarter development. Another striking factor was the informal claiming of the plot by the people living in the neighbourhood, who used it for years as an urban allotment garden (de Bergse Tuinen). In the longer run the resistant factors didn't turn out to be able to keep the use of the fringe belt unit as the developers found themselves confirmed in their intentions by municipal policy. But the course of the process indicates a certain areal condition where factors that account for the surviving of the radial fringe belt corridor seem to be broadly integrated into the historico-geographical structure of the corridor. This indication is emphasized by the cases of the Palingstraat-unit and the Hallen-unit. The first unit contains an internal block park: De Vergeten Tuin (the Forgotten Garden), which is also a plot claimed by neighbouring residents. The site is managed by a legalized group of squatters which occupy an old factory building (owned by the municipality), situated at the perimeter of the block on the side of the Palingstraat. The garden is open for the public on regular basis. Many of the back gardens of adjacent houses in the block perimeter are openly connected to the park.

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Conclusion

The findings presented can be synthesized into two main hypotheses which can form the basis of the higher level strategic scenarios. Firstly, it can be argued that for all primary and secondary perimeter blocks of the total early industrial radial MFB, to more or less extend, the limitation of the developmental rationales regarding to the modification of its units is decreasing due to the general as well as regional societal changes (for instance the general increase of smaller households in cities and, for Eindhoven, the increasing diversification of its social structure, both driving an increasing demand for typological variation in housing). This drives on a new level, other complexes of factors to take over the account to keep the fringe belt plots in their current use. For instance the contrast in plot-size-variety and the dependence on fringe-belt features that develops among other land users in the vicinity. Both of these complexes concentrate on the relationship between the internally located fringe belt plots and the perimeter plot series of the blocks, however in a different way than before. On the one hand, this new relationship changes the way how the existing city responds to new economic, societal and cultural influences, and on the other hand, it brings other intrinsic differences to the surface.

This introduces to the second conclusion, concerning the thesis that the currently prevailing compact and concentric spatial policy model as presented in the strategic housing vision (Eindhoven, 2014) doesn't match with the empirical model. Although situated on a similar distance to the CBD as the Bergstraat-unit, which alienation process experienced substantial governmental involvement, the Museum quarter-unit showed to be modified largely in harmony with the longer term transformation of the area. Although this resulted in an alienation of the fringe belt unit, morphologically the structure still expresses a clear and attractive typological distinction of the urban structure. For the units of the Gestel fringe belt corridor it is suggested to apply a different planning approach. There the factors that account for the surviving of the radial fringe belt corridor seem to be integrated more broadly into the historico-geographical structure of the corridor, which somehow accounts for a valuable sustainable areal urban condition.

In general it is concluded that the integration of a historico-geographical or, particularly in the case of the European, mid-sized former industrial city, a fringe belt approach into a strategic planning context can substantially improve the path towards developing an urban environment for an excellent and authentic quality of live, and with that the strategic value of a cities intrinsic character profile, as a base for spatial distinctiveness. This would anyway make the general claim of many strategic planners to build on a cities DNA a much more plausible one.

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Urban landscape assessment

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Abstract. *The valuation of the urban landscape as an important element in the quality of life and the sustainable development of the city constitute an incipient field of investigation from a new perspective that adds meanings and values. It starts from the concept of valuation as a system where the tangible and intangible values that the population and the experts assign to it are considered. These include formal, economic, environmental, social, cultural... issues and the relationships among them. The consideration of the opinions of experts from different disciplines, together with the preferences expressed by the population regarding the spaces they inhabit on a daily basis and their aspirations, strengthen the sense of belonging and the identity of the place as key elements in the perception of landscapes Urban that allows to contribute new qualities, criteria of integration and contemporary values to any type of intervention. These strategies and intervention procedures start from the complexity of the city as a system and incorporate the perception that citizens have or will have of their immediate environment. An analytical-qualitative methodology is proposed for the appraisal of the urban landscape assessment by the experts based on the systemic and perceptive factors that characterize the landscape. Its practical application to the Campanar area in Valencia has allowed us to validate it as a process that leads to the identification of values, pressures and driving forces; the evaluations are carried out in terms of quality objectives and actions to improve the quality of the urban environment.*

Keywords: urban landscape, streetscape, landscape value, landscape assessment, landscape preferences.

Urban form and landscape

From the European Landscape Convention (ELC, 2000) we mean by landscape any part of the territory, in our case the city, as it is perceived by the citizens. The character, the structure that gives it identity, is determined by certain natural and / or human factors and their relationships, it is an open system, in terms of systems theory, or an ecosystem, while relations are given among them and their environment.

The urban form and the physiography of the environment are the structuring factors of the urban landscape. Public space and edification (architecture) that give corporeity to the urban scene, are the fixed elements, the scenic background. On them are articulated others of variable character such as gardening, urban furniture or those linked to human activities; and moving elements such as vehicles, animals and people, elements of the landscape and recipients of it.

We can talk about landscape because all these elements are perceived (Goldstein, 2011). The city, understood as a system, is the object and the landscape, its perception by the population. The factors that characterize an urban landscape may belong to the system (systemic) or to its perception (perceptive).

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TYPE / SCALE	GLOBAL LANDSCAPE	SETTLEMENT LANDSCAPE	INTRAURBAN LANDSCAPE	URBAN SCENE
AMBIT	City or metropolitan area	Urban edge	Neighborhood, Landscape area	Street, square, crossing
PERCEPTION POINT	External / internal	External	Internal	Public space
PLANNING	Master Plan Regional Plan	Master Plan Development plan	Development plan Urban Project	Development plan Urban Project Urbanization project

Figure 1. Scales of urban landscapes

Among the perceptive population, we can distinguish two types: the experts, who require justification of scientific or technical basis of their branch of knowledge in their judgments and non-specialists, who establish them from the experiences lived there depending on your feelings, emotions and intentions; a statistically representative number of them can be considered an opinion of the population.

The perception of the city and its forms varies according to the scale and points of perception linked (Image 1). The global urban landscape is what gives us the bird's eye view and covers the entire city or metropolitan area and its surroundings; in the extra-urban or settlement landscape, perception is formed from its edges and accesses and in the intra-urban landscape, the city is perceived from within, strongly linked to the urban form, its architecture, its public space and the relations between both. Linked to this we find the urban scene or limited public space with which the perceiver is placed in sensory relation and establishes long bonds in the form of emotions and feelings (Lynch, 1960).

The process of attaching value

The urban landscape assessment is the process of issuing judgments linked to the perception of the city. These judgments can vary depending on the purpose or interest, times, social groups, knowledge of the place, etc. The Council of Europe (2013) considers that the landscape bears within it value systems that integrate social values, heritage values -both natural and cultural- and economic value. Punter (1982) comes to consider that valuation is a phase of perception. For Aguiló et al. (1998) the value that is assigned to a landscape has interdependent components that are knowledge, feeling and emotions that form an interrelated complex value system.

We understand by quality the judgments emitted only by experts. Quality is an incomplete value. The assessment of a landscape requires knowing the quality set by experts, and the judgments and aspirations of the rest of the population (resident and transient) (Collado and Gómez-Pardo 2007).

It can be expressed in a qualitative way whose communication capacity has no limits or quantitative used by the objective aspect that the mathematical figures transmit although they continue transmitting subjective judgments.

The methods according to the criteria used may be synthetic, analytical and mixed (Aguiló et al., 1998; Hallet, 1996). Synthetic methods (also called global or direct) understand perception as a holistic process, which proposes that what we experience is more than the sum of its parts. The valuation, of subjective character, is made from the consideration of the landscape as a whole. Analytical or indirect methods perform the assessment based on the analysis and description of landscape components, usually weighted with categories and statistical methods of classification. These methods tend to be longer and more costly. At present many of the methods combine the two approaches, synthetic and analytical, in order to accumulate the advantages of both.

Of the most relevant international experiences, we highlight the American methods of assessing the visual and sound landscape (Smardom et al., 1986; Shaffer 1977) against the English methods of assessing the landscape character with its Landscape Character Assessment, and its two phases: characterization and the issuance of judgments or opinions (Swanwick, 2002).

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Methodological proposal for the urban landscapes assessement by experts

Based on the postulates of Landscape Character Assessment and ELC (2000), integrated in the Valencian landscape legislation, we propose a mixed, analytical-qualitative method for the technical evaluation phase, or quality, of urban landscapes to from the defining factors of their character. This does not affect to the valuation by the population.

The issuance of a judgment by an expert seems to be linked to the analysis. We could say that there is no pure global value of an expert regarding issues that are the subject of his study or work. It is very convenient that it be so because, although the judgment is subjective, it must be reasoned and respond to an absolutely rigorous and grounded analysis. Objectivity in absolute terms does not exist, but the tendency resulting from the judgment of a panel of experts and the preferences expressed by the population can be somewhat similar.

Analytical methods have usually been linked to forms of quantitative expression, which in our view, distract from the value of their purpose. Valuation concerns the whole process, which allows us to identify its state (deficiencies, satisfactions, potentialities, trends, dynamics, objectives, etc.) and propose the measures and actions necessary to reach the quality parameters desired by the People who inhabit or transit. Landscape intervention requires the phases of identification, characterization, assessment, proposal of quality objectives and actions (Council of Europe, 2000). Valuation is not an end in itself but an instrumental phase of the process.

We conclude by talking about perception in the differentiation between systemic factors -linked to the city understood as an open system- and perceptual factors –all of which make us perceive it in a certain way-. From the own investigations developed since 2007 as well as from AGUILÓ et alt. (1986), ESTEBAN Y NOGUERA (1981), HALLET (1996), LYNCH (1960), MATA (2003), PANERAI (1986), RUEDA (2012), SMARDON (1986), SOLÀ MORALES (1997), SWANWICK (2002) and ZOIDO (2010), we propose Images 2 and 3 in which some of the main factors of the character of urban landscapes and their perception are structured.

From a complete prior characterization of the landscape, a complex and global structured assessment could be undertaken in a manner similar to that characterization factors that have been organized. For a more clear exposition of the analytical-qualitative method that is defended, an example of an evaluation of the character of the urban landscape for Campanar area in Valencia is shown below. (Image 4).

It is necessary to identify certain limitations of this proposal because evident limitations of space and frame (urban morphology). First, the assessment is made by the authors and not by a panel; this lack of space and frame has been addressed using suitable bibliographical sources. We do not collect the previous characterization, but the tables that we propose for its elaboration. We trust that the references in the text will bring the reader to the elements being evaluated. The necessary perception studies and their corresponding maps are not incorporated. Neither have the preferences of the population, derived from participatory processes, which must be taken into account and limited to technical evaluation or quality, have been collected.

Example of technical evaluation from the character of an urban landscape: Campanar area in Valencia.

Territorial integration

The plain, water and climate are the physiographic base of the territory on which the city of Valencia is based and allow for the development of the Huerta, a space with a geographical structure and singular landscape with a spatial pattern and cultural elements and peri-urban agriculture of high international value. Urban growth often leads to irremediable loss of soil with a great agricultural wealth and the loss of population and the millenary culture linked to it, having been and being the main territorial tension that causes a significant loss of values of the old rural landscape of the Huerta.

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SYSTEMIC FACTORS
TERRITORIAL INTEGRATION FACTORS
Physical environment
Climate, geomorphology, soil, water, vegetation cover and fauna. Territorial structure and processes of occupation of soils. Landscape areas
Green Infrastructure
Basic territorial system composed of the areas of most relevant environmental, cultural, agricultural and landscape value; the critical areas of the territory whose transformation involves risks or environmental costs for the community; and the territorial framework of ecological corridors and functional connections that relate all the above elements.
Settlement Landscape
Skyline of the settlement; Facade or edge conditions; Composition of volumes. Relationship with their environment from the main points of perception, especially access to the settlement. Color and texture. Unique elements: milestones and impacts. Landscape fragility. Acoustic, olfactory and tactile sensations.
Urban Integration
Relations with the existing urban and metropolitan structure; connection to adjacent tissues and potential connectivity on foot, in non-motorized vehicles and public transport network; effects on the parcel structure and the pattern of settlement of the buildings.
Urban Metabolism
Consumption and availability of metabolic resources (water, energy, building materials, food production) and the capacity of solid waste recycling and effluent treatment. Emission of pollutants in relation to the capacity of the atmosphere to disperse them. Acoustic, luminous and electromagnetic conditions; population exposed to levels not allowed by law.
Climate change
Mitigation of its effects and resilience or adaptability to new scenarios (floods, water resources decrease, temperature increase, forest fires).
SOCIO-CULTURAL FACTORS
Population
Composition of the population according to profiles of age and sex, maternity / paternity; level of occupation by sectors and average income; life habits; consuming patterns.
Social inclusion
Level of social inclusion regarding age, sex, ethnic origin, disability, etc .; access to housing and equipment. Vulnerable urban spaces.
Culture
Historical; cultural activities; symbolic; cultural patterns of the population; associationism.
DRIVING FORCES
Politics
Policies that can produce, directly or indirectly, significant changes in the patterns of landscapes or their perception, or promote the achievement of the objectives of landscape quality.
Economy
Economic value of the landscape and its weight in the productive sectors. Profile of the companies, annual volume of work differentiating by uses and types, urbanized area, etc. Patterns of preference (which is and how the product is accessed, which landscape factors are willing to pay, fashions, referrals), production (self-promotion, small promotion, promotion linked to soil operation) and marketing (direct, local operators, promotion at the regional, national or international level).
Legislation
Legislation on environmental issues, land use planning, town planning, housing, property rights, landscape and those related to the management and governance of the territory and urban areas. Plans, programs and projects
Public opinion
Media and other opinion and fashion generators that influence the preferences of the population with respect to their environment
URBAN MODEL FACTORS
Materiality
Density and soil occupation; buildability; internal structure of the neighborhood or functional unit: location of facilities and public spaces, layout of the road network. Centralities. Network of spaces for daily life.
Functionality
Mobility by private vehicles, public and non-motorized transport. Complexity in urban uses; identification of mono-functional nuclei with exclusive patterns.
FACTORS OF THE URBAN FORM
Urban Fabrics and Systems
Urban fabrics: Historic center, *Ensanche* , Compact, Open-plan construction, Single-family dwelling, Polygons, Suburban, Marginal, Tertiary, Industrial. Systems: road, transport, equipment, infrastructure. etc.
Public space
Types, plant, trace, section, perimeter materialization, materials, topography. Habitability of the public space, vegetation. Structure of the collective image of the city (Lynch): itineraries, landmarks, nodes and borders. Landscape fragility
Building Types
Use, type, use of ground floor, plot, location in building plot, volume or number of floors. Covers
Forms of buildings grouping on the block or urban unit
Architecture
Style, school, age, author, patterns. Ground floor and plant type, section, facades: color texture of the enclosing materials, rhythm (facade width), composition, grain (of bodies flown), decorative elements.
OTHER ELEMENTS OF THE URBAN SCENE
Variable elements
Gardening: Morphology, species, size / age, color, annual cycle
Ground-floor: Use dominant advertising, relation with the public space (occupation with tables exhibitors, awnings, etc).
Use of public space: Private motorized traffic, private non-motorized traffic, pedestrian circulation, parking, terraces, games, sports, tents, fairs, parties, relaxation, communication, demonstrations. Ephemeral Art
Urban furniture : Type of pavement: material, color and texture; type of Lighting: design, color of light, level of Brightness y; type and elements of furniture: design, materials. Type and elements of play areas.
Mobile Elements
People: Volume, exclusive use of public or shared space, activities. Residents, tourists. Ethnicities
Vehicles: Type (motorized, non-motorized), volume of traffic, speed and noise, surface parking, heavy traffic. Shared or exclusive use of space with non-motorized vehicles and pedestrians. Public transport.
Animals: urbanized wildlife (rodents, insects, birds, etc.) pets
Immaterial elements
Climate: sun exposure , color of the sky, quality of the air.
Time: Evolution of the scenes perceived throughout the daily and annual cycles
Safety: Lighting, traffic of people and vehicles, use of low floors, length of routes without escape or help.
Cleaning: waste in the streets and public spaces, waste containers, remains of recreational and festive activities, lack of maintenance of facades and urban furniture.

Figure 2. Factors of characterization of the urban landscapes. Systemic factors

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PERCEPTUAL FACTORS
Percipient
Main points of perception of the urban settlement (roads, routes, roads, cattle tracks, "lookout", points of concentration of the population, etc.) and intra-urban landscape (most frequented routes and means of transport, nodes, centers of tourist attraction, etc).
Qualitative and quantitative estimation of people who perceive the scenes (number, origin and duration of perception).
Structure
Structure of the visual basin: distance, angle, shape and scale. Visibility maps. Visual units. Visual fragility.
Identification of emission points of non-visual stimuli and propagation factors. Sound and olfactory maps.
Visuals
Elements: points, lines and shapes. Properties: color and texture. Relationships: scale and spatial configuration, contrast, spatial dominance, singularity, visibility. Modifying variables: direction of light, movement, seasonal cycles, position and angle of the observer, distance, visual acuity.
Acoustic
Elements: natural, human, artificial sounds and sound signals. Properties: intensity. Analysis: uniqueness, pleasing, absence of noise. Modifying variables: distance
Olfactory
Elements: odors (aromatic, putrid, ...). Properties: intensity. Analysis: uniqueness, absence of noxious or unpleasant odors. Modifying variables: wind direction.
Touch
Elements: temperature, pressure changes, humidity, pattern pavements. Intensity: singularity, absence of unpleasant tactile sensations.
HOLISTIC PERCEPTION
Holistic perception: feelings and feelings that the scene produces together. Emotions

Figure 3. Factors of characterization of the urban landscapes. Perceptual factors

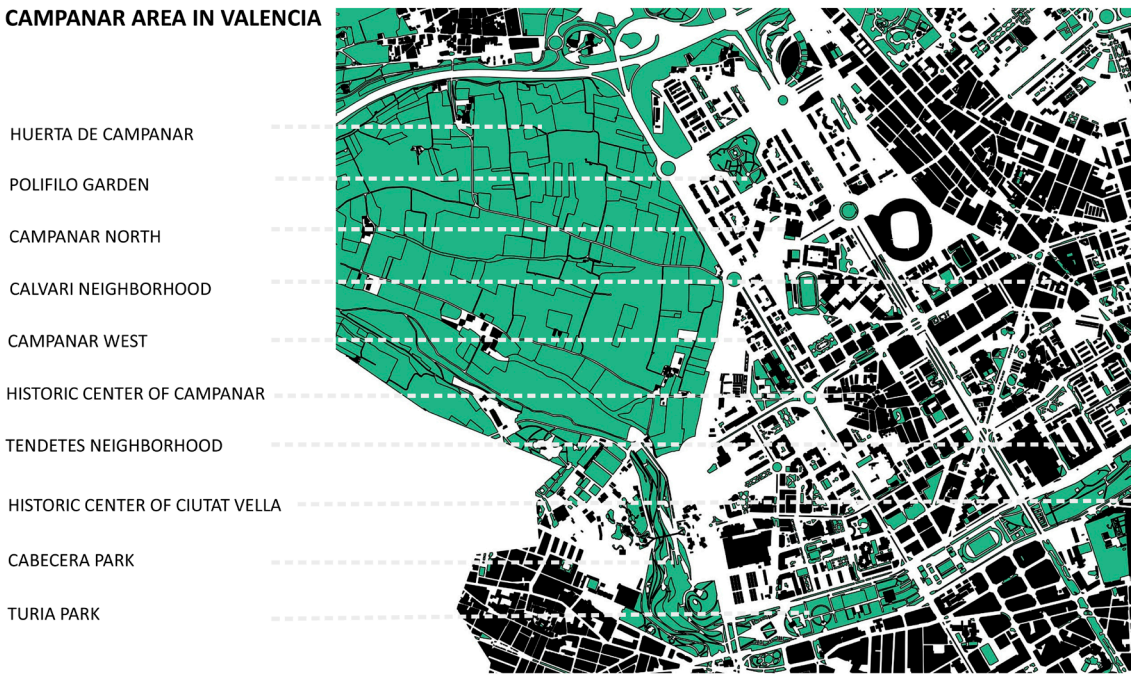

Figure 4. Map of the area of Campanar

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Campanar is functionally integrated by means of powerful roads, which offer certain advantages, but with a negative balance: they break the continuity of the roads that cross it (Campanar and Paterna roads), they cause excessive distances between crossings for pedestrians, turning onto an inaccessible barrier; the intense traffic is a focus of atmospheric, acoustic and visual pollution and in its metropolitan section (CV-30) they break the continuity of the Huerta de Campanar with the one of Paterna being confined; it isolates important elements of the Urban Green Infrastructure (River, Turia park, Cabecera park, garden of Polifilo, and rest of the Huerta de Campanar) that could bring greater landscape, environmental and cultural value, in addition to an incipient tourist attraction.

It was a municipality located to the north of the river Turia with its small rural nucleus and its huerta crossed by roads, ravines and ditches until its annexation with Valencia. The few remaining historical remains have an interesting environmental, social, patrimonial and cultural value at a local level. The ancient nucleus that is the best-preserved part, with the church and its powerful bell-tower, is only rarely visible from the neighborhood, but preserves the rural character of the settlement of high identity value.

Its edges, seen from the Turia Park, the viewpoint of the Cabecera Park, the Huerta de Campanar and the access from the Ademuz motorway, form emphatic volumes, crowded, without rhythm or clear criteria of composition. The south front, which flows to the Turia Park, has a high-block treatment, creating a screen, interrupted by three large containers (two shopping centers and the bus station). It is worth noting the modern movement town planning scene that is observed from el Puente de les Arts with three serial front screens, the same treatment of neutral facade and an encounter with street level articulated by by a green area that minimizes its height. In the extreme west, the execution fails to meet the initial proposal. From the facade recessed to the Huerta it is worth noting the excessive height and the interruption on the agricultural mesh and the pattern of this periurban agrarian landscape so flat and open with a high value. From the CV-35 there is a structured scene and with modern neutral architecture from Hall of Congress by Foster, but of an excessive scale for its territorial integration (Image 5).

Image 5. Settlement Scenes
A) Facade of the Turia Park. B) Ademuz motorway facade. C) Facade of the Turia Park. C) Facade Huerta de Campanar.

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Socio-cultural factors

With 37.084 inhabitants, the area has 10.6% of its population at risk of urban vulnerability based on municipal demographic and socio-economic data (2016), concentrating on the Calvari neighborhood.

The population is based on socio-economic profiles, with some symptoms of exclusivity. The population of the central third, which embraces the old Campanar, responds to middle classes seated on an ordinary landscape. The latest developments in the west and north (Sant Pau) offer settlement models that respond to the type of residential area closed with common services (swimming pool and play areas) with a social exclusivity that generates a landscape very much appreciated by a population of high socio-economic level.

The population lives without conflicts. According to the municipal survey of 2017, it appreciates the values of security, tranquility and neighborhood coexistence. Also the proximity to the center of the city and the offer of services throughout the neighborhood and rejects the dirt it presents. There are various cultural and social associations and various citizen platforms.

Driving forces

The planning of this zone begins with the Valencia Metropolitan Plan (1946) and the Law of Limited Rental Housing (1954). It coincides with the stage of greater demographic and urban expansion of Valencia in the 60's, when the creation of the metropolitan area was formed. Master Plan of 1966 will originate development plans in the area. Finally, with the Master Plan of 1988 and the new Valencian Urbanism Law (LRAU 1994), the area that remains to be developed in Campanar becomes a test bed for the new urban planning instruments. In terms of power, the urban form went from being in the hands of public power, which must offer integrated and long-term quality growth for its citizens (1946-1994), to being in a strong economic sector that competes to offer the market attractive products and maximum profitability (developer).

The revision of Master Plan (paralyzed in 2011), provided for the reclassification of Huerta land in the new sector (R-6) and the union project of the V-30 with Master Rodrigo avenue (round of Mislata). The Territorial Action Plan of the Huerta de Valencia (Generalitat Valenciana, 2016) and the Natural Resources Management Plan of the River Turia, could return the value to the Huerta de Campanar once again. The Urban Land and Rehabilitation Law (2015) and Planning and Landscape Use Law of the Valencian Region (2014) can be the engine for new values for urban regeneration.

Factors of the Urban Model

The studied area does not respond to a single plan but to three partial plans, from different times developed with tensions and modifications (Pérez Igualada, 2005), accompanied by a progressive loss of urban quality. We will differentiate between Center Campanar (PP8) delimited by the current Burjasot avenue, General Avilés street, Maestro Rodrigo avenue and Turia Park; the West Campanar (PP8-B) adjacent to the former and delimited by these three axes and by Pío Baroja avenue; and North Campanar (PP24-A) developed to the north of General Avilés street and around Valencian Cortes avenue.

It dominates the construction of isolated blocks in height and large pieces destined to commercial centers, hospitals, educational, sports, administrative and service centers that break the projected form and add elements of urban and metropolitan centrality. Based on data from the municipal census (2016), the total density is 74 housing per hectare and 150 habitant per hectare with a compactness, in terms of gross residential building index (RBI) of 1.26 m2tr / m2s, aceptable values from the point of view of sustainable urbanism, slightly below those proposed by Rueda (2012) (100-160 housing per hectare and 200-400 habitant per hectare).

It is structured by large routes, arranged in mesh allowing for a super-block with sides of 500 to 600 meters. The intensity of road traffic and average speed is very high, degrading the quality of the public space and being a focus of environmental, noise and visual pollution. The traffic on the interior roads is medium level and

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the parking pressure causes a degrading effect of the public space. The building is surrounded by an important network of free spaces, with enough vegetation. In general, they are of average quality, although appreciated by the resident population and of low legibility, the zones of Tendetes and surroundings of Valencian Cortes avenue should be excluded.
The district presents a mixture of uses and segments of population that enrich the urban scene by the flows that it generates. The ground floors are generally reserved for tertiary uses (shops and varied services). This general rule separates the northern zone with buildings of exclusive and selective residential use. The pedestrian mobility, both internal and of passage is abundant and the public transport service balanced with the average of the city. Its compactness makes its maximum dimensions (2 km north-south and 1.75 east-west) and its distance to the center of Valencia (3 km maximum and 1.75 km average) provide perfect conditions for pedestrian movement and by bicycle, increased by the flat profile and mild climate.

Factors of the Urban Form

To the East, of Tendetes neighborhood, the blocks of five floors constructed by cooperatives, with housing on ground level; are articulated in serial form flanked by buildings of greater height and commercial use on the ground floor in the North and South fronts; to the East the first closed blocks built according to the Master Plan of 1946 are maintained. The trace of the inner road is arborescent with pressure by the parking lot. On the facade, only bodies are seen flying in the form of open terraces. It provides a scene of a certain quality from the urbanistic point of view.

In the center, around the old town of Campanar, the blocks are privately already built in accordance with the Development Plan of 1961 and of mixed use with commercial business on the ground floor that serves as a union by pairs of blocks of two space from V to VIII floors, forming small blocks that are perceived at street level as if it were a closed building in compact block. These units are articulated by seriation perpendicular to the main communication routes, being representative the series of Vall de la Ballestera. Altogether it is an ordinary landscape of average quality. Campanar historic center maintains its fabric of historical center with typology of cases de poble (country houses) and semi-detached and a public space of domestic scale that provide scenes of interest. All this isolated from the outside by the blocks that surround it. (Image 6)
To the West, an urban transformation developed from a business initiative (PAI PPR-11 and

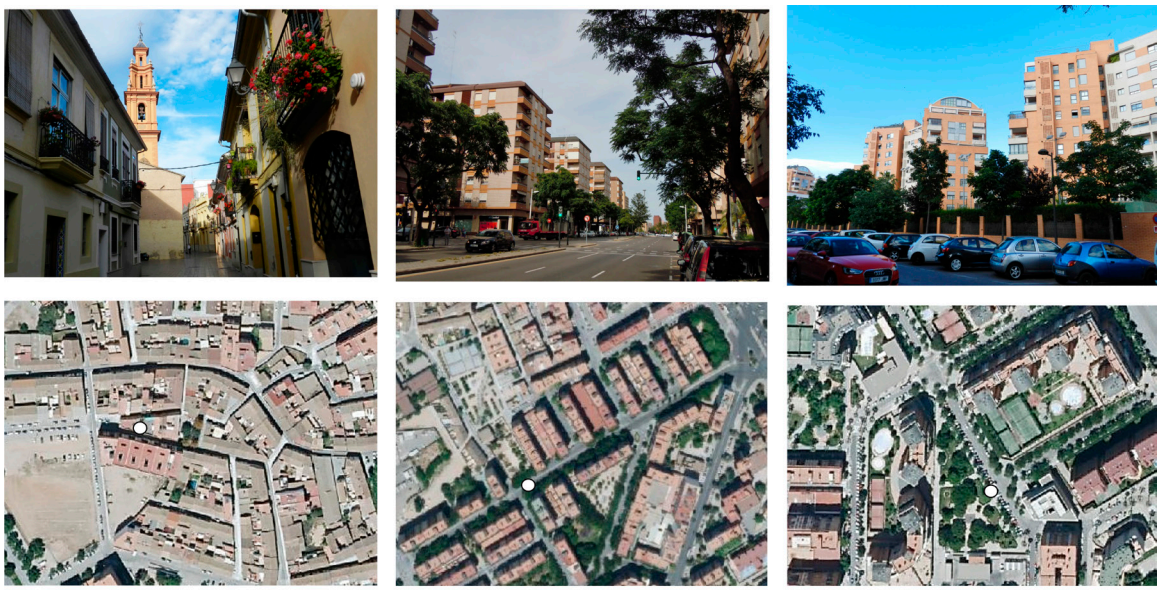

Image 6. Urban scenes and forms
A) Historic Center of Campanar b) Modern City XX century c) New developments XXI century

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PPR-12) with open construction and private equipment in a closed plot. It maintains the tracing of the great routes of rapid circulation with the resulting super-block in whose interior, independent form promotions of high blocks are developed without common structure. In the ground floors, commercial use alternates with the fenced plot that separates public space from private community equipment with exclusion profiles. Urban form generated by the demand that generates a varied but disordered landscape and of dubious urban quality.

To the north of General Avilés, there is a first crown developed based on the old PP-24A of 1975, which is the most structured, with low open construction. The second, PPR-1 of 1991, absorbed the complex of the Professional Schools of San José, on a large plot of the rustic layout, superimposing a reticular arrangement with super-block outside the territorial structure on which it was based. Around the powerful axis of Valencian Cortes avenue (section greater than 100 meters), linear blocks of XV plants of neutral architecture, interrupted in the crossings by singular buildings of questionable quality. The set defines a singular power scale. Commercial activity in ground floor is maintained. A second line is materialized by units constituted by isolated blocks of alignment forming semi-enclosed blocks with internal community equipment. The low floors are destined to houses that are separated from the exterior public space by enclosed terraces of opaque vegetable fence. This generates a scenic background with acceptable architecture but static and empty in daily life.

Other elements of the urban scene

In the background constituted by the urban form the variable, moving and intangible elements present in the city play a very important role in the configuration of the landscape and the urban scene.

The surface of public space occupied by cars, in circulation or parked, is excessive, this being the reason why its habitability is low around the roads as well as in the most isolated ones. The number of vehicles also generate acoustic, visual and atmospheric pollution that is the direct cause of a very high value decrease in all the studied areas.

The use linked to commercial exploitation of public space (especially pub terraces, restaurants and coffee shops) is worrying in some areas of greater of pedestrian traffic, although there have been no cases of expulsion of pedestrian activities and nocturnal rest. Medium-sized commercial spaces with their own image dominate the neighborhood. The presence of banal elements is scarce and linked especially to shopping centers.

The vegetation and water always add a lot of value to the urban landscapes. The second one is present in the Cabecera Park, garden of Polifilo, irrigation channels and fountains. The public space is well endowed with gardening, although a more careful selection of species that provide shade and reduce the sensation of heat in the environment is lacking. Porous pavements are remarkably scarce. Of the hard pavements it is lacking the uniform treatment of the same and of the urban furniture that, in general, do not add value.

Perceptual factors

For the evaluation of the exterior landscape or landscape of the settlement, we have chosen as points of perception the urban edges of the Sant Jose Bridge, the Campanar bridge and the Turia Park; Observatory of Cabecera park, Huerta de Campanar and access by Ademuz motorway. For the interior landscape, the main articulating routes and the internal routes of the assessed area were routed a different times.

From the visual factor, we must refer to color and texture. The area does not have a definite color, its use is random and its range unlimited, from the browns in all its variants to pure and metallic colors. The perception of urban green is acceptable but can be improved. The same occurs with texture, but with mastery of the brick that coexists with the polished surfaces.

The acoustic factor of background noise is present continuously in all areas, being more pronounced in the fast and intense circulation routes, descending in the internal zones and disappearing in the center of the old Campanar with an atmosphere of calm where the square recovers the sound of the children's games and the bells.

With regards to the sense of smell, air pollution prevents any smell, except in open

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spaces such as the Turia Park or the Huerta de Campanar, and there are no unpleasant odors. From the tactile point of view, the texture of hard artificial pavement is almost continuous, with few spaces with natural porous pavements. There are few textures in the building, the street furniture or the green areas that invite to be touched. There are no noticeable differences in temperature and humidity sensations compared to the rest of Valencia, except in the Huerta and river area.

Overall rating

The Campanar is an ordinary landscape with the character of the modern movement in the south part and of expression of economic power and market urbanism to the north. The scene dominates the disorderly episodes, with low readability, with strong pressure of motorized traffic and parked vehicles, low habitability of the public space and areas of social exclusion. Nevertheless it has an acceptable presence of green and with large areas of complexity in uses and people and with a remarkable identity in the past (the old Campanar and its Huerta) despite the loss of physical references. The imperceptible elements of light, climate and character of the population and the proximity to important elements of the Urban Green Infrastructure make that the residents positively value their belonging to the neighborhood by the feelings of tranquility, security and coexistence.

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Towards the contemporary city. Reading method of post-unification restructuring of Trastevere in Rome

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Abstract. *Trastevere, the only area of the historic center of Rome (together with the Vatican / Borgo complex) located on the right side of the Tiber river, shows a morphological structure that depends on the pre-existing substrate, both road that typological, which was modified during the post-unity period by the establishment of the Tiber fronts and, above all, by the opening of Viale Trastevere. In the way of thinking about urban morphology as a scalar product of the factors that influence each other, in particular building typology, local structure, overall structure and territory, and that contribute together to generate an organism, it is therefore possible to read this part of the historical center as the last product, but not definitive, of a "process". The reading method on the consolidated structure, later renovated in a post-unification era, is based on the analysis of the most abundant building typology and on the permanence and derivations of local typological processes that led to the formulation of the "line house" in nineteenth-century line, the predominant building type of roman expansion in nineteenth-twentieth century. The reading of the restructuring, understood as synchronic action on the historical center, has been implemented instead by the analysis of synchronic variations at "line house" through the research of all projects registered for the edification of each block. Thus we can see how the blocks resulting from the transformation, in the logic of a restructuring "contromaglia" like the one for the opening of Viale Trastevere, will be the result of the disconnection of the existing blocks in which the building type adopted has had to adapt to a lower return situations: a reading of a synchronic action on a diachronic process that gives us the modern morphological apparatus.*

Keywords: Restructuring, Rome, Trastevere, process, reading method, tools, analysis in urban morphology

Introduction

Viale Trastevere, a post-unification axis that connects Ponte Garibaldi with the actual railway station, divides the Rione Trastevere in two different areas: the west side, that in this particular period shows receptive characteristics, and the east side that preserves intact its historical peculiarities. This difference depends on the different development the two areas have suffered in the period following the unification of Italy. Despite these different characteristics, the two areas are crossed by the same existing route, Via della Lungaretta, that connects Piazza Santa Maria in Trastevere with Ponte Rotto. This axis, the matrix path of the area structure, is closely connected with the others matrix paths of the Rione: Via della Lungara – that connects the Vatican with Santa Maria in Trastevere through Porta Santo Spirito and Porta Septimiana –, Via dei Vascellari/San Michele – that connects Porta Portese with Ponte Rotto –, and Via di San Francesco a Ripa – an eighteenth-century axis that connects Santa

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Maria in Trastevere with San Francesco a Ripa complex –. The predominant building type is the mature "Terraced house", the result of a process of tabernizzazione or insulizzazione of domus that came from the imperial structure and leads, through intermediate stages, to the pre-unification local morphology. These intermediate stages are represented by "case a profferlo", "case a corte", "case con portico", that together have led to the formation of the predominant roman building type. In the way of thinking about urban morphology as a scalar product of the factors that influence each other, in particular building typology, local structure, overall structure and territory, and that contribute together to generate an organism, it is therefore possible to read this part of the historical center of Rome as the last product, but not definitive, of a "process".

The action of transformation understood as restructuring of consolidated area sees the intervention fit within a context in which there is a two-way nature of the relationship between three dimensional stages: the single house – or rather a particular way of doing homes in a particular period and in a particular place, result of a diachronic process – influences the block as well as the block influences the single house; the block affects the local structure as well as the local structure, especially if undergoing renovation, affects the block; the local structure, viewed as a subset of the city, influences the city as well as the city influences the local structure; finally the single house influences the city as an organism and vice versa.

Through the analysis of the most abundant building typology and of the permanence and derivations of local typological processes, we can understand how the lapse of time between the last years of the temporal power until the conquest of Rome will mean the affirmation of a "multi-family raising" process of individual houses in terms of elevation, recast and restructuring of individual sectors, as a symptom of the evolution of society and as fundamental basis for the affirmation of the building type undisputed master of Rome unification: "la casa in linea" according to the nineteenth-century intentionality" that will be adopted as basic type for contromaglia restructuring of the area, represented by the opening of Viale Trastevere and generating the synchronic variations to the building type.

Unlike what has happened to the post-unification expansion tissue in which the fund structure built underlies the design of the block as the unit of constructed for the allotment for the opening of the Viale Trastevere we are still facing a restructuring with all that implies in terms of sizing. The axis, until the interception of Gianicolensi walls, dwells in a north-south direction within the constructed perpendicularly to the west-east existing axis, crossing each time areas of differentiated shape and age: the area of Via della Lungaretta; the area of saturation and creating a new "pole" related to operations, implemented under the pontificate of Pius IX, concerning the construction of the Tobacco Factory, the Mastai square and the basic building tissue originated from this sector; the seventeenth-century axis area of Via San Francesco a Ripa, with its segment of mature "terraced house" and already recast for the formation of online types according to the "nineteenth-century intentionality", and the area of complex to the south of San Cosimato. A "contromaglia" restructuring generates synchronic variations that are «[…]the application of a same type, of the same "concept of home" in abnormal situations compared to those more appropriate to the type producing therefore "lower return" buildings […]»

Methodology

Understanding the real significance of the operations made in post-unification period within the historic fabric of the Trastevere area needs as a fundamental tool, the analysis of the formation process of the local structure and of the building typology. This type of "transformation", in its distinction of being a general action implemented in a defined lapse of time – although in the case of the opening of Viale Trastevere we will see what this time appears dilated in a 60/70 year period for logistical internal reasons – can be defined as an anthropic intervention caused by a number of contingencies within a context or "environment" as a product with global organic unity characteristics. These "peculiarities" are caused by the

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fact of being the result of a prolonged process in history. This "global organic", in the case of Rione Trastevere, is the result of centuries of tissue formation and growth at the same time with the foundation and blossoming of specialized complexes which in this case will constitute a series of "polarity", when read in the local reading scale, and "nodality", if read in the reading scale that takes into account the urban aggregate as a whole. Consequently, the analysis of the built took into account a series of specific steps that in their diachronic development and their connection characteristics between close periods have led to today's figurative, typological and structural area "form".

To carry out the study, a number of cartographic tools have been used in order to reconstruct the "formation history" of the context. First of all we can mention the historical planimetric maps that we can define useful for "diachronic understanding of the whole" through the tissue analysis implemented in synchronous manner as regards the period after the sixteenth century: the maps of Rome of Leonardo Bufalini (1551), Mario Cartaro (1576), Antonio Tempesta (1593), Giovanni Maggi (1625) and Giovanni Battista Nolli (1748). Within these maps there is certainly the most valid and precise instrument and it is placed within this category only because it lacks the size and nominal specifications of the individual properties. Subsequently the "punctual synchronic understanding" tools such as the Land Registry Pio-Gregorian and plants collected by Professor Ermanno Polla, useful not only for understanding the general structure of the area but also the typological characteristics and nominal size of the individual properties surely resulting from trim paths of Trastevere. In particular, having identified the texture of the fabric not only at the time of preparing the land registry Pio-Gregorian but also to its preunification next update we can found the various expropriated particles, demolished and / or processed – including appliances – to allow 'opening of Viale Trastevere in order to quantify in terms of geometric-dimensional view of the various lots intended as the laying of the various synchronic variations on the type used and to recognize, through these features, the typological and formation tissue system.

After reading the typological process related to the building's consistency in its demolished and surviving parts the results of archival research will be exposed at the Capitoline Historical Archive.

Measurement and analysis

Until the first half of the nineteenth century, the analysis of the Gregorian Catasto and their brogliards give us, from all the fabric analyzed in this research, a single-parent consistency with poor melting of the properties. Most cadastral units seem to follow the dimensional characteristics in terms of depth and road width, relative to the types of houses from which they are derived. The length on the road stands on the size of the single cell - with the exceptions due to the synchronous variants to the carrier type, such as houses built on corner batches, restructure or clogging - and the depth ranges from single cell to double cell depending on Type with the possible addition of a front portico / loggia or as a witness to the type of "derivation" or as a witness of a type not modified in a procedural manner. The functional characteristics associated with the number of plans reported by the brogliards give us a basic construction compartment, normally consisting of only two floors, one of which is for residential use and the other for "shop" or "granary" use, property of a popular social class incapable, for lack of capital, to "rent" or "raise". A change can be seen through the consultation of the Capitoline Historical Archives. In relation to a series of cadastral units, related in particular to the paths of Via della Lungara, Via della Lungaretta - albeit limited - , via San Francesco a Ripa, Via dei Vascellari / Via San Michele and the Ponte Sisto area, a number of instances are filed for "restoration and erection" in the period from the middle of the eighteenth century to the capture of Rome. In fact, these operations can be recorded as "multi-family raising" processes of units that, being the result of a "distinct" typological process, contribute to "distinct" typological results. In the area of Ponte Sisto there are several processes of "multi-family raising" of mature

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"schiera" houses through the increase of the second cell in the inner area; in the area of Via della Lungara and Via di san Francesco in Ripa, instead, it is possible to find "multi-family raising" processes by merging and raising two mature "schiera" houses with displacement of the stairwell and possible partial loss of appearance in the interior area. In fact, this process, although apparent in the Trastevere Rione in many synchronous variants, leads to maturation of the typological process relating to the formation of the "line house", the "supporting" type of residential housing project from the eighteenth-century expansion phase. It is very important to note the advent of the "intentionality" of the nineteenth-century project relating to "line house" modification / redesign. Most of the reconditioning interventions involve not only a variation of the stairwells and of the horizontal and vertical distribution apparatus, but also a substantial change in the figurative apparatus expressed by overlapping the "critical and intentional" intervention of the architect / engineer on the results of the typological process: the introduction of the rhythmic wall, the axiality and symmetry, and the plan hierarchy.
Unlike what has happened to the post-unity expansion fabric where the building compartment undergoes the design of the block as a unit of measure of constructed as regards the parcelling for the opening of viale Trastevere we are still faced with a restructuring with all the features of sizing. The restructuring axis, up to the interception of the Gianicolensi walls, extends north-south orthogonally to the pre-existing west-east route through different forms of conformation and era: the Lungaretta area; the area of saturation and the creation of a new "pole" related to the operations made under Pius IX pontificate concerning the construction of the Tabacchi Manifacture, of the Mastai Square and of the basic building fabric originating from this sector; The area of the seventeenth-century axis of Via San Francesco in Ripa, with its suburb of mature "schiera" houses, and the area of the complex south of San Cosimato.

Thanks to the consultation of a series of documents stored in the Capitoline Historical Archives it is possible to reconstruct from the chronological and causal point of view the history and structure of the opening of Viale Trastevere. Despite a series of acts relating to "public utility" expropriations stemming from the plans of 1873 and 1883 indicate the properties through which the new axis will have to pass the first settlements and constructions take place in those areas where the "machinability" of the expropriation sector did not have to consider the existing buildings: the south part of Via San Francesco in Ripa on the east side of today's Viale Trastevere. The history of the restructuring is divided into:
all the operations involved in the opening of a "road to Trastevere Station" which could be subdivided into the first buildings on the south side of Piazza Mastai on the east side of the postunit axis (1887), in the "section" of the existing block at Piazza Sonnino (1891), in the construction of "specialist" buildings in the part towards the Gianicolensi walls, practically coexisting with the "compensation" of the blocks on the west side of Viale Trastevere at Piazza Mastai (1907 and 1914) and in the dimensional and functional redefinition of the blcok of Via San Gallicano / Viale Trastevere / Vicolo Mazzamurelli (1921);
all the operations relating to the opening of a square - first Piazza d'Italia and later Piazza Giuseppe Gioacchino Belli - tangent to the planned Lungotevere and in front of the new Garibaldi Bridge (demolition and erection between the nineteenth and twentieth centuries);
all the operations relating to the arrangement of the space in front of San Crisogono, today's Piazza Sonnino, divided by the square of Italy - to which it was joined in the first plans - which caused the retention of the Anguillara Tower used in the first Years of the twentieth century to host the "House of Dante" (from the first decade of the twentieth century to the immediate postwar period).

Although we are in front of basic building, the formal and figurative apparatus is inspired by the vocabulary of the Roman special building which in second instance influences the typological organism in its construction and functional distribution.

We can assume it as an "ideal carrier" - ideal because most of the buildings are a synchronous variant of the same carrier type - for the formation of the postunitary apparatus for the restructuring of the ward the "casa in linea"

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with a symmetry axis with a double structural organism consisting of three parallel portions parallel to the facade, two exterior and one intermediate and with transversely opposite scaffold walls (barycentric and double ramp). The triple-body distribution system with the baricentric entrance-corridor system in the second deep bay and usually longitudinal to the road front serves the two zones, night and day, hierarchized according to the appearance.

Conclusion

Postunit interventions in preunit Rome can be summarized in demolitions for "enlargement or opening of roads" for mutated / added polarity. The first category - the enlargement of existing roads or paths - makes it easy to perceive the immediate "yield" of the use of a "type" in non-anomalous situations. Among these "restructurings" it is possible to include, although in part, the opening of Corso Vittorio Emanuele II with all qualitative appreciation already in the "giovannian" era. Relatively to the second category, it is possible to find the adaptation of a predetermined "type" within an anomalous situation, which produces a less productive product: a synchronous variant. In this category of intervention it is possible to include a series of operations carried out in the "inherited" constructed one of the most important, for the strength and the effects it has caused, surely represented by that complex of works and actions that have led to Opening of Viale Trastevere.

This restructuring has caused the structural and dimensional synchronous "reformulation" of the block, which instead, within a diachronic training process, is "self-made" according to the various competing factors to form the urban organism in its entirety; the adaptation of the type of construction "in linea" with the nineteenth-century intentions to anomalous building areas and therefore producing synchronous variants to the carrier type assumed; the involvement of a series of contingent factors, such as the public interest or, more often, the interest of the individual, which overall affect the body.

The analysis of the individual buildings of Viale Trastevere carried out through the consultation of the individual projects deposited was taken to fully understand the causes and results of the "formulation" of the synchronous variants.

The result is a series of criticalities that necessarily arise from the "formulation" of a synchronous variant adopted on "contromaglia" restructuring.

These criticalities in a diachronic process are self-crushing. The current legal apparatus also protects these anomalous areas because they are now considered "historical". The aim of the research was to "read" the causes and effects of a restructuring to identify possible "critical" correctional areas.

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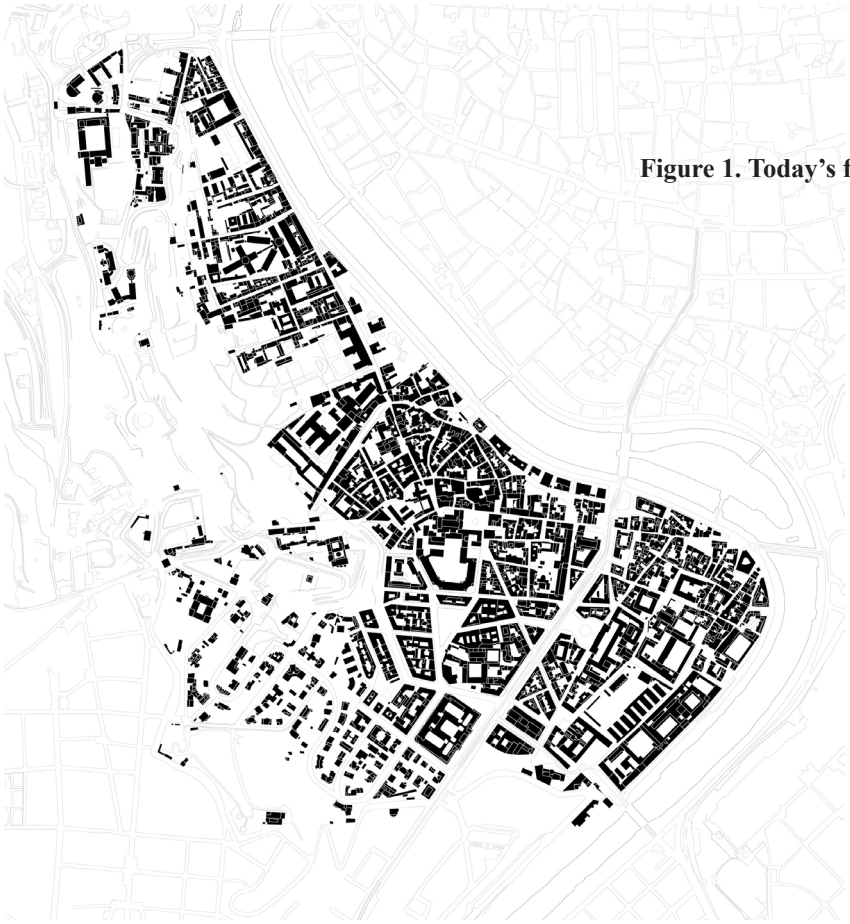

Figure 1. Today's fabric of Trastevere

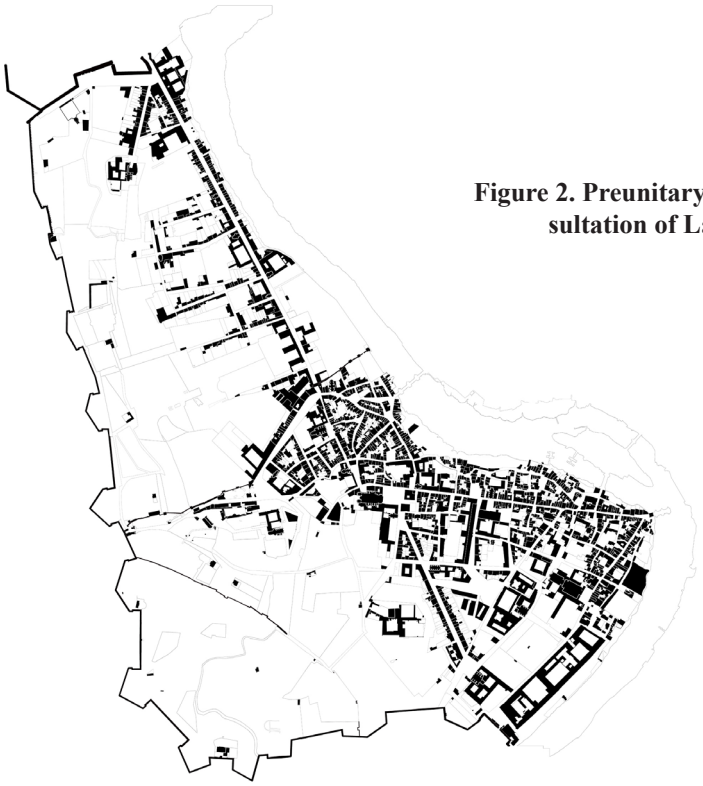

Figure 2. Preunitary fabric of Trastevere from consultation of Land Registry Pio-Gregorian

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Figure 3. Post unit demolition of Trastevere

Figure 4. The opening of Viale Trastevere

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Figure 5. Post Unit buildings of Viale Trastevere

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Morphological evolution of the fringe-belts of Krasnoyarsk

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Abstract. *Urban fringe-belt phenomenon in cities of Siberia hitherto was poorly investigated. Thus, it constitutes an extremely broad research area. Phases and processes of formation, transformation and alienation in urban fringe-belts examines at the case of Krasnoyarsk from the 17th to mid 20th centuries. Relation of changes in fringe-belts structure and political and socio-economic contexts is evidently at all periods of their physical formation. Natural fixation lines (topographic features, body of big river, and development of small river valley) and man-made fixation lines (city walls, railway corridor) influenced to the formation and evolution processes of fringe-belts and urban fabric generally. Railway was a turning point in the city expansion and contributed to overcoming of the power natural fixation line as the Yenisei river. Unlike the urban core, right bank of Krasnoyarsk formed as a linear city with specific fringe belts. Detailed analysis of Krasnoyarsk city plan indentifies several morphological units separated by fringe-belts. These fringe-belts are characterized by distinctive road network, variety of land-use units and heterogeneous forms in plan. It presents difficulties for reconstruction projects of modern city. An approach for renovation of these territories needs to depend on urban morphology methodology.*

Keywords: Fringe-belt, Siberia, urban morphology, fixation line.

Introduction

The fringe-belt concept is one of the most important concepts in urban morphology which provides a possibility to analyze existing urban layout. Currently Fringe belts evolution of cities of Europe, China, New Zealand and Brazil have been the focus of attention of urban morphologists and had been studied in detail. Urban fringe-belt phenomenon in cities of Siberia hitherto was poorly investigated. Thus, it constitutes an extremely broad research area. In this example it seems to be interesting to clarify an influence of cultural, political and economic contexts to the formation processes, structure and land uses of fringe belts in Siberian cities.

The emergence of cities in Siberia is one of the most important periods in the history of Russia associated with the assimilation policy of the Siberian territories and was occurring in several stages. As a result, the arising of cities was unspontaneous process and took place under strict state control. It affected on the choice of the places of cities foundation and the initial planning structures. Wooden walls of burgs as a means of fortification were a characteristic feature of Siberian settlements at the 17th century and served as a fixation line that affected to the origin of fringe belts land uses beyond its borders. In subsequent periods there was a dependence of the changes in the structure of fringe belts from the administrative status of cities, industries and topographical conditions.

There are several key stages in historical and geographical development of Krasnoyarsk from the time of city's foundation to becoming as a major Siberian city. These stages affected

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to the formation of Krasnoyarsk fringe belts in particular and the morphological structure of the city in general.

Topographic features of the territory had been determining the compact city structure for four centuries and restraining the development of urban fabric within the boundaries of one landscape zone. This factor gave a distinctive parameters to fringe belts.

Methodology

Analysis of the historical and geographical development of Krasnoyarsk morphological structure was carried out on the basis of archival materials, surviving descriptions of the city in different historical periods, comparison of the fixation city plans (1701, 1748, 1894, 1902, 1906) and city plans (1774, 1828, 1898, 1924, 1934) and of land use analysis.

Measurement and analysis

The emergence of Krasnoyarsk in 1628 as a military burg is associated with the first stage of Siberian lands development. Krasnoyarsk burg was erected on a high pointed cape at the confluence of the small river Kacha into river Yenisei that surrounded on the west by the Afontova Hill and in the north by the Karaulnaya Hill along the left bank of Kacha. The planning structure of the Krasnoyarsk small burg was as an irregular quadrangle measuring 100 by 120 meters following the natural outline of the cape.

Krasnoyarsk burg walls acted as a fixation line for the city's growth and provoked the appearance of fringe land uses like in many medieval cities in Europe and China, surrounded by walls. At the first decades after the burg formation a shortage of land resources within the city walls has led to the placement of agricultural lands outside of the city walls and to a chaotic housing development that was concentrated along the main transport routes according to the surviving descriptions. However, cartographic evidence of this information doesn't exist.

Cartographically fixed fringe land uses arose in connection with the increase of population, the appearance of the trading quarter and the second row of city walls in 1659. The unclosed structure was the feature of the second burg wall. The fortifications of the trading quarter were absent from the south, from the side of the Yenisei. This is due to the fact that the large river and steep bank served as a means of fortification and also as a powerful natural fixation line for the city development, which was insurmountable at the early stages of Krasnoyarsk formation. Subsequently, forge and several enterprises were located along the banks of the Yenisei river forming partly a fringe belt, that didn't left any imprint at the city morphological structure.

The inner fringe belt of the late 17th-mid-18th centuries was formed outside the burg in the north of the city wall and on the left bank of the Kacha, under the slope of the Karaulnaya Hill. This inner fringe belt is visible clearly in the modern structure of Krasnoyarsk. In 17th-mid-18th centuries inner fringe belt included small skinnery, soap and candle enterprises, stockyards and chaotic suburban residential development of the Zakachinskaya Sloboda. The following mention of contemporary are encountered about it: "... some of the others still lived ... over the Kacha river in spate of the city plan "... (near the road to Yeniseisk city)" [ ]. This quotation emphasizes the characteristic spontaneity and unregulated occurrence of fringe belt, revealed in the studies of M.R.G. Conzen (1960) and J. W. R.Whitehead (1988). By the end of the 18 century many Siberian settlements including Krasnoyarsk had loosed their military-defensive significance. The wooden burg was preserved as a planning element of the city structure.

The fire of 1773 became a turning point in the city development of Krasnoyarsk, introducing own corrections into urban growth. The period of post-fire restoration and the slump in the urban sprawl provoked the emergence of the western fringe belts of the late 18th century and early 19th centuries. The urban free-pattern that had been formed before that time was destroyed completely with all the fortifications. A regular rectangular grid of streets with proportions characteristic only for Krasnoyarsk and its historical and

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topographical conditions was laid. Street blocks - "kurtina"- were adopted as a structural unit of the city plan with dimensions of 150 x 270 meters and 125 x 250 meters.

In the city's new plan, the dependence of the tracing of streets from urban fortifications was red that was marked by M.P.G. Cozen (1960). There was the originated of the consequent street along the lost western wall line, according to his terminology. The same processes of the dependence of the streets emergence from city walls were revealed and studied in numerous Russian investigations (Bondarenko I. A., Mazur L. D., Rappoport P. A., Tzarev V. I.).

The placement of religious institutions took place on the periphery of the city in accordance to the established urban traditions. The Vsechsvyatskaya Church and the nearby cemetery that functioned until the 1820s, the prison and the preserved natural forest on the bank of the Yenisei formed the fringe belt of the 18th and early 19th centuries. At the end of the 18th century, the western fringe belt of the 18th and early 19th centuries formed with the fringe belt of the 17th and mid-18th centuries an almost continuous structure bounded from the south and east by water arteries and relief. At this stage the fringe belt of the 17 - the middle of the 18th centuries entered to the stage of a functional consolidation and a physical growth along the base of the Karaylnaya Hill. There was a number of manufacturing enterprises, warehouses, mills and non-regulated residential houses. The free plan configuration and uneven street network of the fringe belt 17 - the middle of the 18th became particularly evident in contrast to the regular urban fabric of the city of the late 18th century. Also, the processes of alienation were noted that occurred in the 20th century. The comprehensive secondary school mill and residential houses were built on the site of the mill. By the 21st century, communal and economic facilities and warehouses define the main functional saturation of the fringe belt of 17 - the middle of the 18th centuries.

The fringe belt of the late 18th and mid-19th centuries

In 1822 Krasnoyarsk became the administrative and trading center of the Yenisei Governorate. This fact served as the next impetus for the modifications of Krasnoyarsk morphological structure. The phase of active urban growth and residential development has came and the area of the western fringe belt of the late 18th and mid-19th centuries embedded the city structure. The processes of morphological, functional transformations of the fringe belt of the late 18th and mid-19th centuries have been beginning by this moment. The transfer of the central core of Krasnoyarsk has occurred that previously occupied an eccentric position on the site of the lost small burg.

Due to the lack of land in the existing city center, commercial and public institutions there were transferred to the periphery of the city. The new city center was located within the boundaries of the fringe belt of the late 18th and mid-19th centuries and entails the appearance of trading rows, the Bogoroditse-Rozhdestvensky Cathedral, Novobazarnaya Square (later renamed the Revolution Square) and residential buildings.

From the middle of the 19th century to the middle of the 20th century, functional transformations continued to occur in the western fringe belt of the late 18th and mid-19th centuries. The House of Soviets (now the Government of the Krasnoyarsk Region) was built on the site of the Bogoroditse-Rozhdestvensky Cathedral, in the mid-20th century the Kvant plant replaces the Vsechsvyatskaya Church with the subsequent placement of commercial spaces in the 21st century. This is commercialization processes of the fringe belt are evident. Despite the fact that these processes occur differently in the socialist system, this phenomenon confirms the economic theory of urban fringe belt development J. Whitehead. There was the garrison military hospital, the regional library, the secondary school. The alienation processes of the fringe belt are observed along the embankment of the Kacha, where there was a residential development.

The planning structure of the fringe belt of the late 18th and the mid-19th centuries is clearly reading in a modern urban fabric. Despite the fact that it was embedded in the

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city structure and planned according to regular principles, The size of plots is allocated against the background of the adopted single module of blocks. The large natural site of the forest, which became an city garden and the territory in the north from it are embedded in an urban fabric in parameters twice exceeding the "kurtina". There is a distinctive street pattern inside the boundaries of the fringe belt and the street-road network is characterized by less intensive traffic. Currently, a large number of green and public spaces (Gorky Central Park, Revolution Square, Surikov Square and Garden named

G.V. Yudin on the left bank of the Kacha) emphasizes the former fringe position of the central territory. There is a low density of buildings with the dominance of administrative, social and warehouse buildings.

The prison area has also undergone functional transformation. The Theater Square was at this place in the middle of the 19th century and the Lokomotiv stadium was laid in the second half of the 20th century.

The fringe belt of the late 19th and early 20th centuries

The fire of 1883 was the precondition for the formation of the fringe belt in the late 19th and early 20th centuries. Krasnoyarsk was built mainly of wooden buildings and was again destroyed completely by fire. It again delayed urban development.

By this time, the city's border approached the western topographic fixation line as Afontovo Hill.

At the foot of the Afontovo Hill begins to developed fringe land uses. The decision of the city authorities to forbid a wooden construction in the historic part of the city and speculation with the land affected to spontaneous localization of wooden buildings at the periphery. Wooden buildings retained traditional manor character, differing from a new stone building of the center. The displaced prison, the parish school, the Parade Square (modern Red Square) and Ostrozhnaya Square, the Alexander Nevsky military church and the soldier's settlement were concentrated simultaneously with the wooden houses under the slope of Afontova Mountain. In the middle of the 20th century the radio plant was established on the site of The Alexander Nevsky military church.

The urban fabric of the city undergoes a new wave of transformation with the construction of the Trans-Siberian Railroad in 1895. The railway line stretched in the meridional direction at the west of the existing building and on the path of its supposed development. The fringe belt of the late 19th and early 20th centuries, which was poorly formed up to that time, was fixed by the strip of the railroad diversion. The railway corridor became as structural and planning axis of the development and attracted the location of the railway station, railway workshops and warehouses. Thus, a large zone of the "false" fringe belt was fixed at the foot of Afontovo Hill. Since the first decade of the 20th century these territories were included in the city boundaries. In the future, this zone will continues to be filled with fringe belt functions. There are a military camp, a brick factory, a combine harvester food base and numerous manufacturing and storage facilities. The growth of the population (in the period from 1897 to 1923 the number of inhabitants of the city increased from 26,700 to 60,400 people) was accompanied by the development of the following landscape terraces - Afontovo and Karaulnaya Hills. New urban areas Nikolaevskaya, Alekseevskaya and Pokrovskaya sloboda gave Krasnoyarsk the forms of disperse development.

The construction of the railway bridge in 1899, which connected the left and right banks of the Yenisei River contributed to overcoming the powerful natural fixation line. Krasnoyarsk found a dismembered structure of the plan that is actively developing at the present time.

A concentration of fringe belt land uses along the right bank of the Yenisei and the railway line are marked. Since by 1924. a brick factory, a timber mill, a paper mill, and a halt-harbor appear are appeared at this place.

At the beginning of the 1930s the government adopted a resolution about the concept of the industrial Krasnoyarsk development. It provided for the formation of the city as an

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industrial center and the emergence of new urban and social forms. In this connection, the Master Plan of the City of 1934 solved the tasks of locating the main heavy industrial production and functional zoning of the right bank of the Yenisei. At the same time, free access to the Yenisei was provided single, undivided residential areas and its coastal zone was designed in the form as a wide range of gardens and parks. It also presumed for the removal of the railway to the foot of the mountains, which at that time divided the right bank into two parts. But, as practice has shown, the set of existing factors led to the disagreement between the designed plan and the backlog of a number of adopted principles for implementing of the Krasnoyarsk Master Plan. The consequence was the origin of spontaneously emerged, contrary to the Master Plan of the city, unplanned land uses patterns that formed the fringe belt of the 20th century. It had a significant impact to the morphological structure of the right bank of Krasnoyarsk.

The railway tracks, which remained at their former location, and the Yenisei River as a main transport arteries, production resources and fixation lines attracted the unsettled location of industrial productions. As a result, the residential areas of the right bank were separated from the Yenisei, in spite of the adopted design decisions. The natural and man-made fixation lines the Yenisei and the railway corridor became the key factor that determined the linear character of the fringe belt of the 20th century. The fringe belt of the 20th century include the Krasnoyarsk Machine Building Plant, the Pulp and paper mill, a cement plant, a timber processing industry, manufacturing and storage facilities.

Large production complexes provoked the formation of associated residential areas and workers' settlements. For a short period from 1931 to 1939. The number of city residents increased from 82,800 to 186,100 people. The new linear city was formed from residential blocks of the right bank for several years. This was an alternation of residential areas and extensive parts of the fringe belt, that divided urban fabric into several connected poorly territories, presenting a serious problem for the functioning of a modern city.

Currently, morphological structure of Krasnoyarsk is a segregated spatial structure, divided into several morphological regions by obvious fringe belts. Fringe belt were formed spontaneously under the influence of political, social, administrative, economic and technogenic factors.

Conclusion

The conducted study of the fringe belts of Krasnoyarsk confirms the phenomenon of urban fringe belts in different cultural contexts. A number of distinctive features of Krasnoyarsk fringe belt are revealed as a result of evolution analysis. It is a spontaneity of occurrence, a low density of buildings, a complicated land uses, a low density of street network.

Urban fringe belts of Krasnoyarsk have a number of specific features, which are primarily due to the landscape characteristics of the city (Fig. 1). Topographical fixation lines predetermined the origin and shape of the most read distinctly the fringe belt of the 17th-mid-18th centuries and the fringe belt the mid-19th-early 20th centuries and the 20th century. For these fringe belts the concentric configuration of the plan is not typical. During the period of the city's formation, fringe land uses consolidated their position along the slopes of Afontovo Hill and Karaulnaya Hill. The loss of city walls as a fixation line for the fringe belt of the late 18th and mid-19th centuries and inclusion to the central part of the city determined exposure to the processes of functional transformations. At the moment, the functional saturation of the fringe belt of the late 18th and mid-19th centuries meets the needs of the city center and plays an important recreational and administrative significance for the whole of Krasnoyarsk.

There is a partial fusion of the fringe belt of the late 18th and mid-19th centuries with the fringe belt of the mid-17th to the mid-18th centuries into a single structure. Similar phenomena are also observed in the Turkish city of Mersin (Unlu, 2013).

Linear industrial fringe belts of the 20th century on the right bank of the Yenisei River is represented complexity for the renovation process of the modern city.

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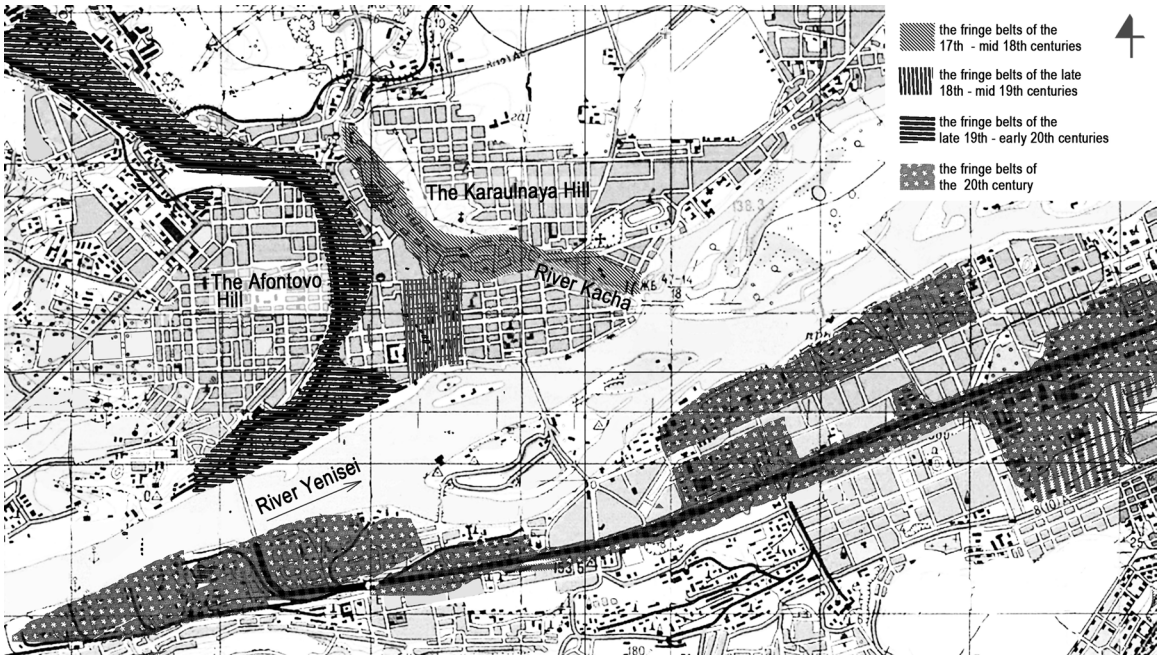

Figure 1. Fringe belts of Krasnoyarsk

Because it contributed to a fundamental change in the physical characteristics of the city. If the fringe land use along the railway line as a man-made fixation line retains its character, then the fringe belt along the Yenisei coast is a subject of alienation processes. These territories are occupied by the residential development zones. In this case, the design and placement of residential areas occurs locally without considering the fringe belt as a single interconnected structure. The lack of attention among designers to the concept of fringe belts and the historical prerequisites of origins and features of distinctive land uses excludes the possibility of adopting coordinated projects for the reconstruction of a modern city and complicates their implementation.

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Virtual reconstruction of urban environments from historical photographs through Image Based Animations (IBA). The Plaza de la Virgen de Valencia around 1870

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Abstract. *The recreation of the historical environment of emblematic urban spaces in our cities through interactive technologies, allows to extend their knowledge among the interested users while contributing to its assessment. When the documentary bases are photographs it is possible to carefully model the recorded elements using photogrammetry techniques based on 3D primitives, so that by means of an immersive navigation limited to certain points of view, an appearance of acceptable tridimensionality is obtained, where only isolated images of dispersed frames are available. The virtual recreation can be completed increasing its realistic appearance through its edition with animations of objects (for example, carriages) and characters, texts, musical setting, etc. The results can be presented in formats such as video or navigation through virtual reality helmets. From a selection of the first historical photographs of the Plaza de la Virgen, that we have obtained searching in several documentary sources, our multidisciplinary team is interested in a reliable, realistic and pleasant presentation of the urban environment of one of the most representative places in the city of Valencia, whose spatial configuration has changed significantly over the years.*

Keywords: Virtual reconstruction, historical urban environment, image based animations

Photomodeling fron geometric primitives

Image Based Animations use photomodeling with geometric primitives for partial 3D recreation of a scene, starting from a 2D image as a photograph, a painting or a vintage engraving. This mode of photogrammetry starts from the use of spatial geometric forms, simple to treat mathematically, to achieve the convergence of the model, and has been successfully tested in well-defined models, as the architecturals.

In the photogrammetric field, interest in these formal patterns is based on theoretical studies on specific aspects, such as those carried out by Lang and Schickler (1993) concerning to semi-automatic systems, Lin et al. (1994) assuming the buildings as parametrized blocks (boxes), or Bergevin and Levine (1993) about the relation of 3D objects and their two-dimensional images, to name only a few. Other more general approaches are due to Braun et al. (1995), who put together a general photogrammetric project strategy, or El-Hakim (2002), which incorporates these recognition techniques into a broader automation strategy for architectural reconstruction projects. An interesting precedent in the field of computer applications

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has been I-MAGE (Image Processing and Measurement Assisted by GEometrical primitive), presented by ARPENTEUR (Architectural PhotogrammEtry Network Tool for EdUcation and Research), one of the first software photogrammetric packages on line.

The convergence of the model starts from the consideration of certain formal categories for an extraction of metadata of interest. For this purpose, a limited series of three-dimensional solids, such as cubes, pyramids, wedges, etc., are used, so that, when they are "nailed" to the vertices of a 2D object, this allows their three-dimensional reconstruction. The constraints of these geometric primitives play a double role. On the one hand they verify determining conditions in the orientation procedure of the frames, which can also include the calibration of the cameras, with sufficient data. On the other hand, they allow us to approximate the formation of the photogrammetric model, that is, the position, rotations and dimensions of objects, through homological correspondences, in the manner of the classical constructions of projective geometry. "The algorithm uses the edges that are marked on the photos to solve these parameters and rarely do you have to concern them with." (PhotoModeler Shape-based Projects Manual).

As for the requests of each form, the number of variables depends of their internal geometry. In the case of a box, the parametrization algorithm requires a total of 9 data: 6 corresponding to its location (3 translations and 3 rotations), combined with the own transformation parameters (length, width and height), whereas a truncated wedge, for example, needs ten parameters (because it has two widths compared to the box's one width parameter). In the early stages, many of the parameters are considered free, so that in the more general case, an extreme adjustment occurs (at an unknown scale, in a system defined by the base form and with a single camera without distortion), which is being improved by adding new shapes and new cameras.

The cast of 3D primitives available is a basic feature in order to the versatility of the procedure. Computer applications offer a collection of basic shapes such as box, pyramid,

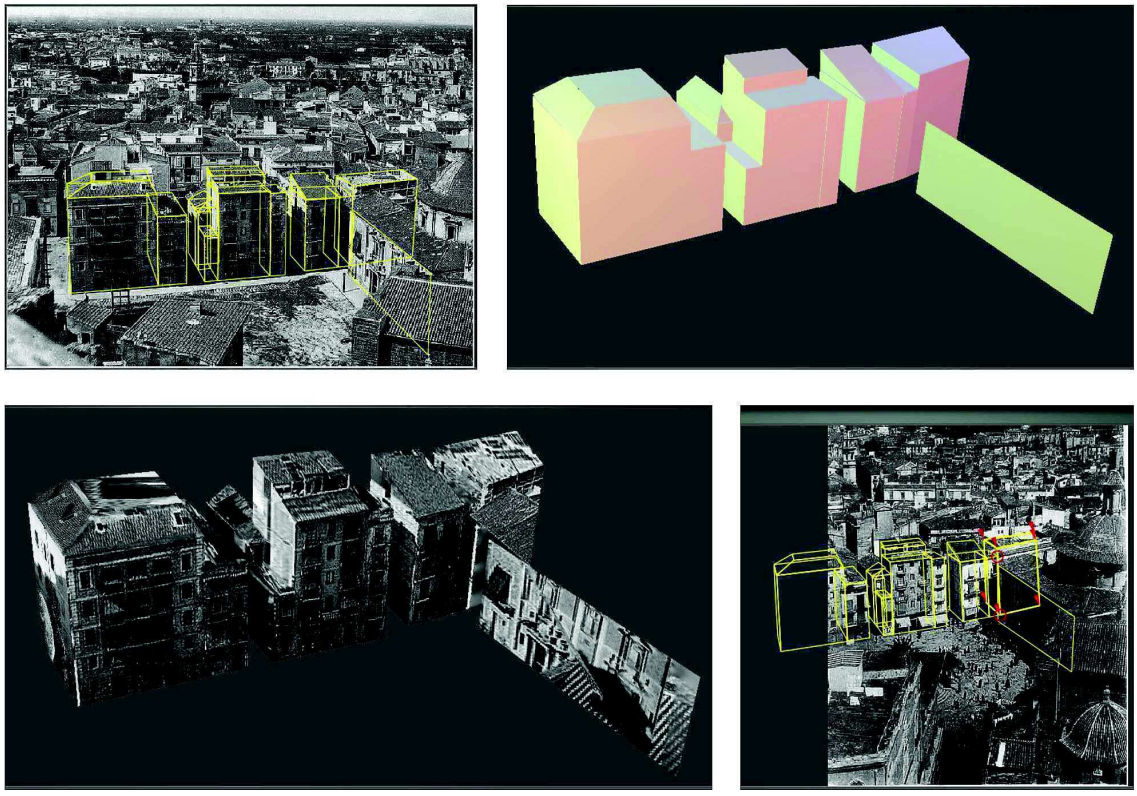

Figure 1.
Photogrammetric model

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Figure 2.
Original images

cylinder, or covers (with 2 or 4 waters), useful for camera adjustment and modeling (exterior orientation). The possibility of working with cameras without previous calibration allows to incorporate frames or also cuts of them, even from different cameras, and thus to quickly model buildings and urban environments from several image sources, registered with different points of view and levels of detail. Since, the project will be more reliable, from the metric point of view, and more complete at the documentary level, if two or more overlapping images are available.

In the evaluation phase, other primitives, generally 2.5 D type, complement the previous ones. These are generally editable contour functions, that is, they allow the incorporation of new vertices, such as extrudable polylines, or polygons that determine surfaces and planes visible only from the interior of the scene. It is possible also to complete the scene with standard linear or surface elements.

The use of the three-dimensional vocabulary is complemented by a series of syntactic rules that solve the relative location of some forms with others.

That is, when adding a new primitive to the project, its positional relation must be defined with respect to any previous one, since this information is necessary to produce its orientation by bundle adjustment, as can be deduced from the strictly geometric point of view. The most basic rules in this respect are concentric (defining the Tx and Ty translations), stack (stacked on the previous form defining Tz), and align (defining the Rx, Ry and Rz spins), as well as their additions.

These instruments, along with many other features, such as the possibility of duplicating objects, welding vertices, or adding new objects on the inside face, etc., allow solving most of the difficulties that occur in projects of this type. Both, the quality of the modeling, as well as of the mapping of phototextures, increases with a greater number of converging shots available in each project.

Reconstruction of the scene and camera movement

A Photo Based Animation with geometric recreation is the result of a set of photogrammetric and editing techniques, which allow to obtain a three-dimensional approach of a model with insufficient information available for a complete digital restitution.

It starts by recognizing the proper geometry of the photographic image or engraving, in order to implement a photogrammetric restitution by means of the commented 3D primitives technique.

In this way it is possible to solve both the inner orientation parameters of the cameras, and the 3D interpretation of the motifs that are considered appropriate.

Then, it is a question of integrating the 2D image together with the partial restitution, relocating and scaling it according to the elements of external orientation obtained directly from the frame.

For this purpose, principles of projective geometry, based on the homological relations between the real figure, its plane to plane decomposition, and the consequent 2D

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projections, result important.

Once the modeling is embedded into its own visual pyramid, that is, the set of radiations associated with each orientation, a Photo Based Animation offers a dynamic but limited vision of the spatial perception of the scene.

To do this, all parameters of the immersive camera to be created are set. Basically, a movement of the position (new projection), together with a displacement of the target, producing a straightening of some of the orientations (new section of the projective beam), and if appropriate, also adjusting the FoV to enhance the final illusion effect.

The project consists, therefore, of some three-dimensional elements restored, on the one hand, and on the other, of the original photographic background.

The first, once adjusted within its real position, are those that lead the spatial appearance, while the latter add realistic details. For this, it is necessary to animate a small camera movement, which shows new planes of the 3D model.

At the same time, observing the 2D background of the initial photographic image from another angle, inevitably produces a small discrepancy between its position in the "re-photographed" image and the true one, which would correspond to a complete real model.

The same must be delimited so that it is not very pronounced, thus determining the limit of the sequence imposed by this interesting hybrid configuration.

The transformation of the Plaza de la Virgen of Valencia around 1870

In a broad outline, around 1870 occurred two important changes in the formal configuration of the Plaza, which led to the loss of the previous medieval period balance: the renovation of the private buildings on the north and west fronts, and the demolition of the town hall in 1859, after a fire, and the subsequent decision to landscaping this space next to the old Audiencia (today Palau de la Generalitat). The new private properties of the northern and western fronts damaged the environmental quality of the Plaza, as can be seen in the photographs of that time, because their formal characteristics were not adequate: poor material quality and excessive height in relation to the Cathedral and the Basilica. The two photos that we present of the north front (courtesy of José Huguet archive), along with our dynamic reconstruction of the scene, emphasize it. To this purpose, we have integrated in them a partial 3D modeling of this front, adding an alpha channel to make transparent the original image area occupied by it, since it has been placed in the back of each photo to avoid overlaps. In the videos that we have attached, we present a limited movement of the parameters of the recovered cameras, in order to create a small animated sequence. They have been filtered and trimmed to improve their realistic appearance. Also some characters have been added.

Links to the videos

Image 1: https://1drv.ms/u/s!AjJBFl_kTMn7q2Qjc1VP1MwyoHbp

Image 2: https://1drv.ms/v/s!AjJBFl_kTMn7q2joRrLvJ4kQPfTH

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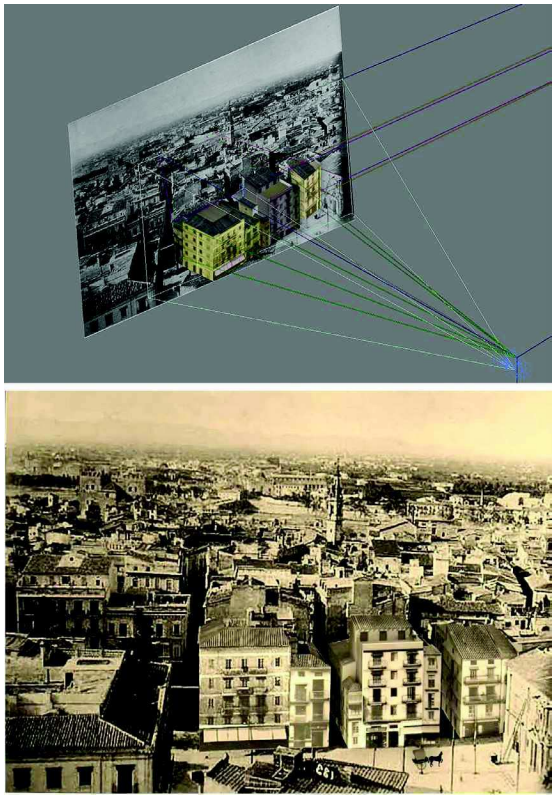

Figure 3.
Photo 1. Frame 1

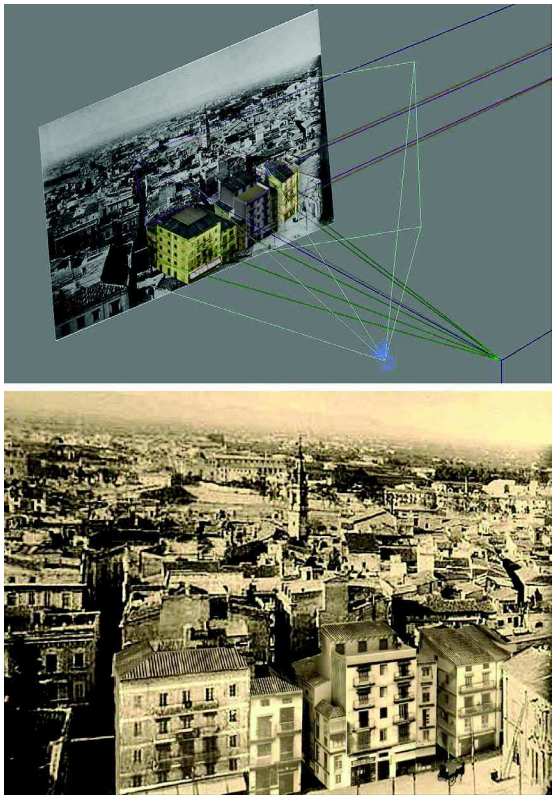

Figure 4.
Photo 1. Frame 440

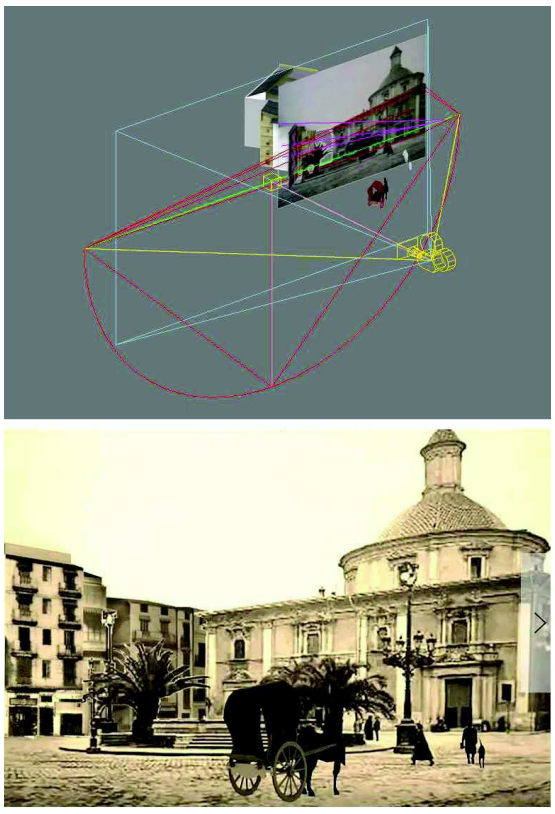

Figure 5.
Photo 2. Frame 1

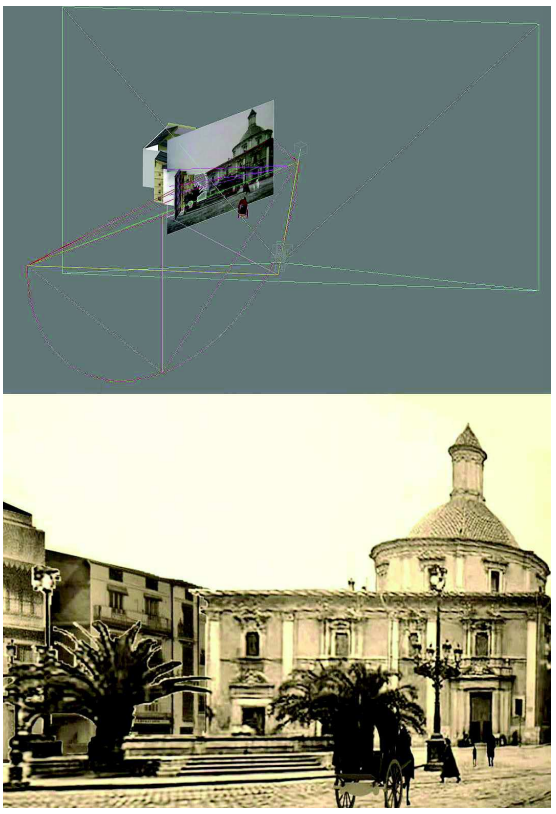

Figure 6.
Photo 2. Frame 440

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Conclusion

Unlike the usual techniques of photo animation, with "2D TO 3D" appearance (for instance Constantini A. 2016, or SAB 2015), Image Based Animation is characterized by the modeling of some elements of the scene, so the result is a hybrid 2D / 3D model. When this reconstruction starts from photogrammetric techniques with parametrized 3D primitives, its metric reliability is proved.

Thus, a more realistic visualization of the scene is possible, taking advantage of all the original details that are not restored, along with the three-dimensional view of the others, which brings more expressiveness, when only incomplete information such as photographs, pictorial images or engravings, is available.

These models, edited as videos or by means of formats for immersive navigation, can contribute to bring people the knowledge of historical scenes, doing it in a dynamic way, overcoming the habitual static vision of the original images.

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Urban efflorescences of the global and the local: An analysis of the territory of Gipuzkoa (Spain)

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Abstract. *The present study deals with the changes generated in the last decades by the increasing globalization in order to discern its influence on the urban structure of Gipuzkoa. The incidence of globalization in the processes of urban transformation is perceived, on the one hand, in the tendency towards the concentration of economic activities and, on the other, in the stimulus received by the local level and by the specialization, as generators of urban concentration. The urban forms that have arisen in this territory as a result of the global exposure present a varied typology as a consequence of the multiple scopes and scales in which they have been developed. Far from pretending to cover them all, the present study analyses a sample of urban processes and effects that have taken place in the territory of Gipuzkoa in the last decades, such as: science and technology parks, specialized networks around local products, processes of museification of industrial and rural environments, or expansion of the tourism services network. The study of these processes will attend both to their particular urban manifestation and to their territorial incidence, through the use of diverse sources and techniques to obtain a map in which they can be studied together. The resulting map of the sum of the different indicators will reveal characteristic spatial patterns of this centrality associated to the effect exercised by the sphere of the global over the local.*

Keywords: urban centrality, global exposure, territory of Gipuzkoa, spatial patterns

The centrality of local phenomena of global scale

This article addresses the changes produced in recent decades by increasing globalization, with the aim of discerning how far they have impacted the urban structure of Gipuzkoa, and tests an approach method meant to ascertain the spatial qualities distilled from their urban manifestation.

While discussion of globalization phenomena is a subject that has been discussed at length from multiple standpoints, this reading's objective is to study the centrality caused by that phenomenon by means of new urban events and to identify the characteristics specific to it in the particular situation of the territory of Gipuzkoa. Because if something does seem evident in the extensive literature around this question, it is the growing importance acquired by the differentiation of urban settings and territories in the context of increasing homogenization taking place on the world stage.

The theoretical framework in which the research is situated draws from some of the globalization characteristics indicated owing to their effects on the spatial geography, resorting for that purpose to authors such as Sassen (1991), Castells & Hall (1994) or Hall (1997), who among other aspects discuss questions associated to the high urban concentration

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of economic activities, higher even than what took place during the industrial stage. Among other questions, the implications of technological development and the economy of services based on ICTs (information and communication technologies) on territorial concentration phenomena are analyzed.

On the other hand, reflections around local development in recent decades have shown the importance of the territorial aspect within the development processes and policies that drive them. Various authors (Dematteis, 1990, 1995, 2003; Camagni, 2006; Magnaghi, 2000) have underscored the new centrality granted to the local and the place as a result of changes brought on by globalization processes. From this standpoint, global networks do not operate solely in a de-territorialized flow space but are rather supported on particular places and nodes so that they interact with the specific advantages and resources of each place. Hence, global processes can not only create de-territorializing and fragmentation phenomena but also stimulate new territorial connections able to produce advantages or provoke resistances that strengthen local identity (Castells, 1997).

Aims and Methodology

The investigation presented here derives from a doctoral thesis of broader scope addressing the approach to the complex urban reality of the territory of Gipuzkoa, from the perspective of urban centralities and their relevance in the urban construction of this territory as a whole. Given the various approaches that the centrality paradigm has had, the investigation interprets the motives of centrality as a convergence of interests that generate urbanity and modify preceding occupation and urbanization patterns, contributing to gradual construction of the territory. The study thus aims to ascertain the urban characteristics and spatial qualities of the motives of centrality which have shaped and shape the current urban reality of a territory as intensely urbanized as the one analyzed.

Among the more recent motives of centrality is the effect exerted by global exposure and its economic impact on the urban areas of Gipuzkoa. Its study is approached on two scales: on the one hand its urban effects are analyzed via different graphic and analytical resources and the gathering of significant examples of its distinct urban manifestation, and on the other, for the purpose of building a centrality map that reflects the different intensities that each of those manifestations have had, the territorial reach of that centrality throughout the region of Gipuzkoa is studied, based on statistical and analytical sources of diverse nature.

Global specialization scenarios

Economic activities in the global network: science and technology parks

The first of the urban manifestations studied was linked to urban concentration processes that originated in the framework of the service economy, with high technological content. Even though this kind of concentration tends to locate in metropolitan centers, the Guipuzkoan context presents certain particularities derived from its preexisting industrial fabric, whereby its industrial base is broadly distributed along the length of its valleys.

First of all, the San Sebastian Technology Park was established in 1994 in the area of Miramón. However, besides the San Sebastian park, in 2000 the Garaia Innovation Pole was established in Mondragón in the Alto Deba district, associated to Mondragón University (MU). Furthermore, as most available ground at the Miramón campus in San Sebastian is developed, in recent years it has expanded southward in the municipality of Hernani, in the area known as Galarreta. On the other hand, in an evident trend toward a network configuration in the R&D&I (Research, Development and Innovation) sphere, the original San Sebastian Technology Park changed its name to Gipuzkoa Science and Technology Park after incorporating the Eibar and Galarreta campuses. The recently founded Goierri Innovation Pole in Ordizia, on a notably smaller scale, was built around the Goierri Vocational School following the arrival of Mondragón University and a high-level technological entity.

Due to its age, the Miramón campus is the high-tech space presenting the highest level of

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Figure 1. Gipuzkoa Science and Technology Park, Miramon Campus, San Sebastian

urban development. Situated on a territory of hills and dales south of the San Sebastian bypass highway, its operational area encompasses more than 130 hectares, for the most part developed. It was set up as a business park conceived as an area for mixed installation of company offices, high-tech economic activities and various public facilities, with the support of commercial and recreational services and infrastructures, a low-density residential area and a large park. The different uses are spread along three hills that run north-south and join at the south end, so that the technology park is surrounded by an extensive and lush urban park in close contact with nature.

The attached plan (fig. 1) shows the diverse building typology comprising the park, with buildings of different sizes and forms, despite complying with the mandatory current planning limit of three floors above ground (maximum reference height of 13.5 m). Plans calling for four floors underground and the sloped site of most buildings given the uneven topography have led to different urban configurations, and therefore many of the buildings are partially buried and face the valley bottoms.

Some of the park's buildings host one single large company, while others were conceived to house various companies or technology centers. The limits between public and private domain are in turn marked either by garden spaces, with a vague boundary between the two, or by fencing and controlled accesses for the closed premises. The highest degree of definition of the limit between public and private ambit occurs in some cases with the presence of a single company with high technological focus that for security reasons opts to restrict access to its property. Such is the case of the four plots situated in the southwest end of the park, three of which belong to one single large technology corporation. On the contrary, most of the buildings located along the central hill host various technology centers and companies and their developed surroundings comprise garden areas and surface parking, with open pedestrian access. As for the urbanized public domain space, it is characterized by a substantial presence of garden areas and surface parking which combined with the openness of most of the plots endows this urban setting with environmental attributes. However, despite the relative closeness to the city and the availability of public transport service, this is a space with a very high incidence of private transport.

Boosting the local and specialization as generators of urban concentration

Beyond the cited phenomena of concentration of urban activities, the new global exposure which territories are subject to generates new urban dynamics as a result of the specialization phenomenon. As Ascher (2001) describes, a double process of homogenization and differentiation occurs: homogenization, because the same economic players are present with the same rationales in all countries and cities; differentiation, because interurban competition is higher and more far-reaching, exacerbating the differences. While the possible choices do increase, the local territories' contact with the global makes the differences manifest and encourages their exploitation. The global thus stimulates the local, due to the comparisons established; its existence is due to this. That

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diversity of territories is precisely what makes people, assets, capital and information shift locations.

Specialized networks around localized products

The new global exposure that territories are subject to has generated new urban dynamics owing to the specialization phenomenon, and the field of localized products is one of the ambits on which it has had the most impact. Some of the dynamics that have arisen around them have specific characteristics and are associated to certain territories, projecting them globally in a heretofore unprecedented manner.

One of the products that has witnessed a notable boom in recent decades is txakoli wine, whose production had fallen to historic minimums in the early 1980s. Efforts to revive this production activity have impacted the characterization of this coastal region's rural landscape, marked by steep slopes geometrically patterned with its distinctive vineyards (figs. 2 and 3).

Figure 2. Txakoli vineyards and wineries around Getaria)

Figure 3. Txakoli vineyards in mountainous landscapes around Getaria

Another local product that has notably revived in recent decades is cider, around which some consumption habits have been generated with particular territorial incidence. At present, even though apple cultivation remains relatively low, a new activity has strongly emerged around cider houses, associated to cider tasting as a social and gastronomic event. Its origin lies in the ritual of txotx, a custom which began as a private tasting among wholesale purchasers who visited cider houses to taste and choose ciders at the beginning of each season. In recent years such events have gradually opened to the public, becoming a notable gastronomic happening. Thus, beyond the consumption of bottled cider per se, cider houses nowadays offer a traditional menu that includes tasting cider that is consumed directly from the storage casks.

The enclaves where such events take place have different typologies that have evolved from the original farmhouse, specialised in the cultivation and production of natural cider. The gradual increase of visitors who from January to April make pilgrimages to gather around tasting the cider menu has in the last two decades led to a proliferation of cider houses, especially in the area of Astigarraga and Hernani, along with expansion of some of the traditional cider houses (fig. 4). The typological diversification of the cider houses

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has resulted in establishments that vary depending on their closeness or distance from urban environments and with respect to their size and architectural character, which runs from isolated farmhouse able to host a hundred diners to large establishments resulting from successive expansions, such as Petritegi, with capacity for 400 diners, or Iretza, an industrial building converted into a restaurant/cider house, which evokes the rural world through the display of out-of-context rural items (fig. 5).

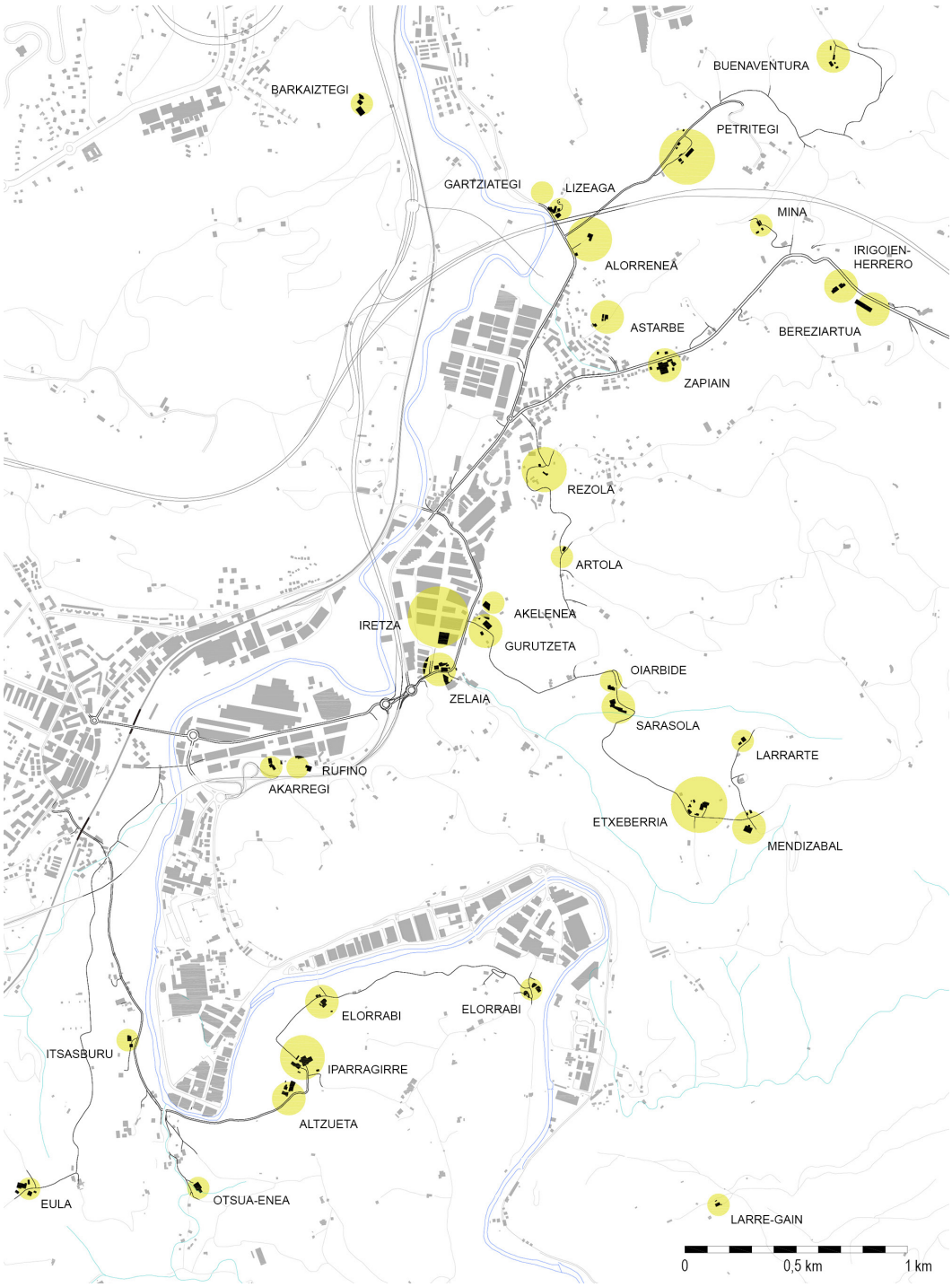

Figure 4. Cider house network around Astigarraga and Hernani

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Figure 5. Cider houses in Astigarraga

Museification of industrial and rural environments

Demand for alternative forms of tourism has led to expansion of the heritage concept via the discovery and enhancement of the value of the legacy associated to economic activities that have disappeared or are in decline. Such initiatives are meant to generate new economic activities linked to cultural tourism and, because they are well-entrenched, they can contribute to the territorial development of the areas where they occur. One of the strategies used in that revaluation has sought to implement adaptive reuse of mining resources by opening museums and creating greenways along old mining railroad lines. This category includes the Arditurri Mining Reserve in Oiartzun and the Leintz Gatzaga Salt Museum.

Besides mining activities, since the second half of the 19th century the industrial milieu has been the object of concern regarding the use and safeguarding of installations inherited from earlier periods, a task encompassed in the scope of industrial archaeology (Valenzuela, 2003). But this only significantly expanded from the middle decades of the 20th century on, coinciding precisely with the departure point of the major crisis affecting the industry. The strategy of occasional adaptive reuse of old industrial buildings does not therefore engender new urban elements. Rather, what is new is the use made of them, creating dynamics and flows entirely different from the preceding ones. Examples of such establishments include the Arms Industry Museum in Eibar, the Agorregi ironworks and mill complex in Aia, the Machine Tool Museum in Elgoibar, the Bentalejua Museum in Mutriku (fishing and traditional port activity) and the Albaola Basque Maritime Factory in Pasaia (traditional shipbuilding). One more contemporary-oriented strategy of this type was the opening of the sculptor Eduardo Chillida's studio in Legazpia as a museum-workshop.

The legacy of the agrarian production space also forms part of the cultural heritage, in so far as the organization of space by and for rural life is the result of a long historical process, resulting in territorial formations that entirely deserve the status of inherited cultural asset and hence deserve in themselves the condition of culturally-rooted historical heritage (Ortega, 1998; cited by Valenzuela, 2003). That heritage includes the rural areas' means of communication, such as roads, trails or pathways, which have huge potential for the practice of alternative forms of tourism, along with the various built elements that were used for farming activities, meant to house farm-workers or animals and tools, including buildings meant for artisanal or industrial manufacturing activities and those serving the population (schools, wash-houses, shops, etc.). In the context of a subsistence economy and prior to the appearance of the food industry, the transformation of certain agricultural products in situ and their provisioning also led to very inventive solutions for mills, fulling installations and wineries. In Gipuzkoa this category includes the Rincón del Pan in Legazpi, the Gorrotxategi Confectionery Museum in Tolosa, the Basque Cider Museum in Astigarraga and the Aikur Bee Museum in Urretxu. This kind of museum, despite its small size and occasional distance from major urban centers, has an undeniable ability to mobilize tourist flows.

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Expansion of the tourism services network

The tendency toward specialization and diversification observed in areas such as gastronomy or museums has also been reflected in the overall web of tourism services as a network needed to accompany new flows associated to different territorial uses deriving from globalization. Among others, those services include the hotel accommodation network, whose study can cast light on whether the hotel infrastructure in its different variants is accompanying the different global dynamics identified. In this regard, the extensive network of rural residences and agro-tourism facilities that have recently proliferated in Gipuzkoa seems to sustain the necessary complementariness the new tourism trends would require.

In the culinary field, the 'new Basque cuisine' label and its international standing have brought global renown to the San Sebastian area for its restaurants, with two of them among the world's ten best (in 2012). It is significant that despite all of them being close to San Sebastian, the gravitational hub of reference, many deny at the same time any allusion of closeness to the urban, rather emphasizing references to the rural. This image contrasts with the new headquarters of the Basque Culinary Center, whose aim is to train and focus on research, innovation and the transfer of knowledge and technology in different areas of the culinary sciences. It is located in the heart of the Miramón business park, thereby asserting its link to the world of innovation.

Territorial extent of global effects: building the map

The varied urban manifestation that has arisen as a result of the Gipuzkoan territory's global exposure has shown the different ambits wherein the global incidence has been reflected. The study of its incidence on the current urban structure will therefore require observation of a broad range of indicators that can render account of its territorial extent. Given the obvious difficulty of gathering in this study all facets and spheres impacted by the global phenomenon, the detection and examination undertaken aim to provide a sufficient sampling so that some of its main characteristics can be ascertained.

The objective pursued has been to seek quantifiable data which, duly dimensioned, could be used to representatively map that centrality. The diverse nature of the phenomena grouped under the umbrella of the global/local dialectic brought with it the need to quantify urban elements of very different kinds, whereby the techniques used and the data processed have been varied. As a result, besides the fact that in each case the precise location and number of each element analyzed (museum, technology center, hotel accommodation, cider house, etc.) has been compiled, a decision was made to dimension each of them, using different criteria for that purpose. That distinction resulted from the specific characteristics of the phenomena analyzed in each case, so that in the study of hotel accommodation the option chosen was to quantify the number of places offered by each hotel (number of beds), while in the case of cider houses reference was made to their capacity (diners). However, in the case of urban elements of a certain size, such as museums, technology or university centers or convention centers, the option was to use the built roof surface corresponding to each building or place destined for those uses. Contrariwise, in cases such as cheese production centers, rural residences or haute cuisine restaurants, the option was to analyze only their location, as their dimensioning was insignificant due to their very similar sizes.

The sum of the different urban manifestations linked to the global phenomenon required various techniques and sources that resulted in the mapping whereby they could be jointly studied. The consequent map (fig. 6) enabled analysis and cross-referencing of very different aspects of this new centrality which have manifested in recent times in Gipuzkoa.

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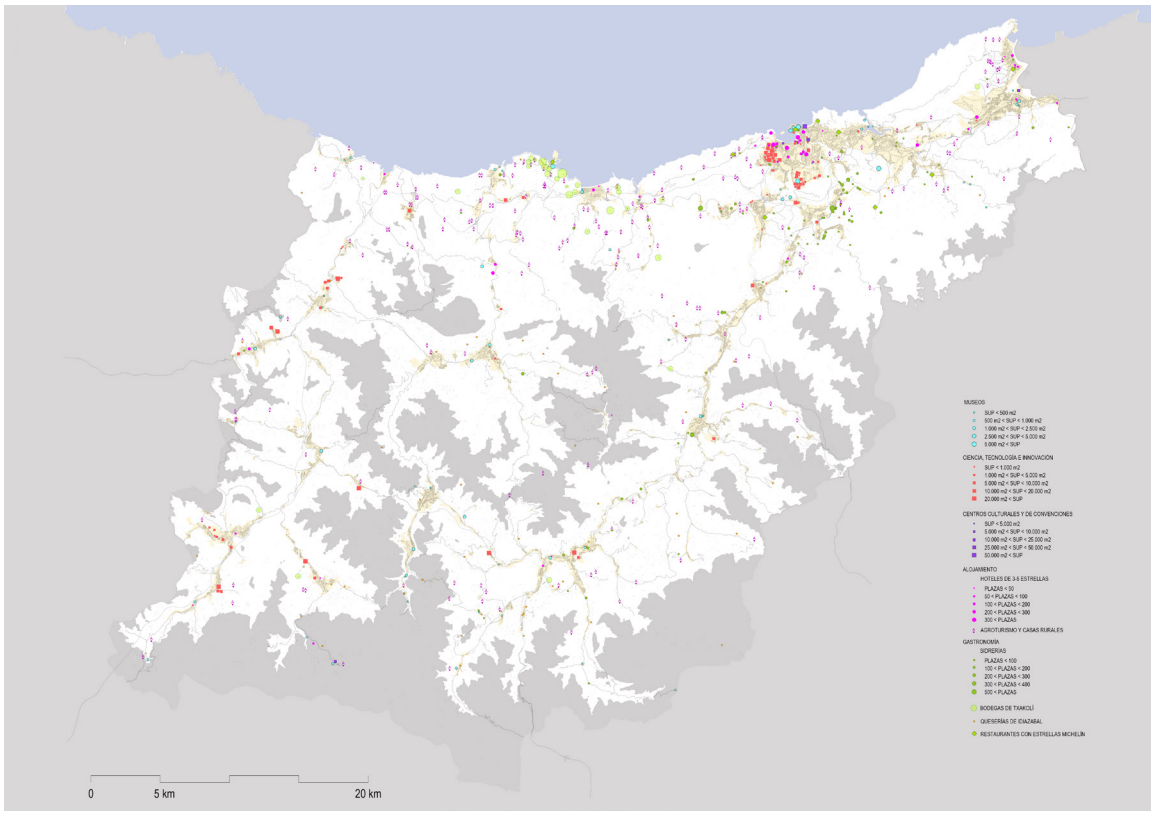

Figure 6. The centrality map of the urban efflorescences of the global and the local in Gipuzkoa

Urban efflorescences of the global: Conclusions

The patterns of territorial distribution presented by the different urban manifestations studied refer to the revival of a Gipuzkoa that is the result of a phenomenon of crystallization, a sort of efflorescence that has taken place in the interaction of the global with the local. It seems that that crystallization has been produced over the specificity of accumulated and entrenched assets, such as activities that pertain to daily life or economic activities of past eras, gaining new significance owing to the galvanizing effect of global exposure. Their manifestation has taken placed discontinuously, with tensions toward certain areas, which although not physically communicating with each other are indeed doing so via global networks.

In some cases, such as in the technological nodes, the manifestation of a unique architecture becomes hugely relevant, such as the 'O' shaped headquarters of Orona in Galarreta or the head office of the Garaia Innovation Pole in Mondragón. Conversely, on other occasions, the urban expression of that centrality is less obvious, as it results in the generation of high intensity flows in eminently rural contexts by users foreign to those contexts. This diversity recalls the heterogeneity presented by the spatial manifestation of this centrality, in both the scopes it encompasses and its urban effects and territorial distribution.

The heterogeneity that its territorial distribution presents results from the fact that most cases concern urban efflorescences linked to past prestige, so that the respective manifestation is produced where there was an urban nerve, albeit minor. As shown by the study conducted, the centers are occasionally nourished by the proximity of an urban fabric, such as in Mondragón, Oñati or Eibar. In other cases, such as in the San Sebastian area, they tend to distance themselves from more

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consolidated areas, supported by accessibility guaranteed by the road network. And in many other cases, such as in the scope of localized products, specialized museums or rural accommodation, they are associated to the recovery of previous activities, regaining and highlighting centralities and urbanities that were weak or had disappeared. The diverse nature of such manifestations is indicative of the complexity that characterizes this centrality, which presents a different degree of dispersion as a result of its distinct catalyzing basis.

Another question where the global context has become evident is the Atlantic condition of Gipuzkoa, manifested via the acquired relevance of the coastal setting. It should be noted that the coastal condition had not been so forthrightly expressed since the creation of the first ports in the context of building the pre-modern Gipuzkoa. However, while that first manifestation led to urban settlements concentrated in specific locations along the rugged coast, the global phenomenon is not limited to the coastline and has greater depth and extent toward the interior. The very intense revaluation of the coastal zone is thus characterized by exploiting the singularity offered by the proximity of the coastal and the rural. A widening of that fringe has therefore occurred, penetrating around 10 km into the territory, as the proximity of beaches, although very few, becomes relatively important, while conversely the establishment in rural surroundings of high landscape value is exploited.

Although urban efflorescences derived from global exposure occasionally emerge in places close to each other and relatively concentrated, their nature is sporadic and fragmented. In most cases this involves a non-focused urbanity, where high accessibility is becoming less significant than other attributes such as environmental quality. That sporadic nature entails the opening of a new field of possibilities in a territory like Gipuzkoa, where the distribution of inherited urban entities is amply present. What is significant about this new urbanity in that context is that it reinforces the idea that the current territory of Gipuzkoa is formed by a sum of accumulated centralities which with the right stimuli can help revive debilitated environments and thereby promote territorial balance.

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How does urban morphology influence the walkability?

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Abstract. *It is known that the Modernism greatly influenced the way people use spaces, the car use was prioritized, changing the function of the street from a meeting space (human scale – Gehl, 2010) to a passage space (motor scale). It is in this context that this paper aims to present the aspects that interfere in the walkability with focus on different urban morphologies. For this purpose, the study was applied to three neighbourhoods of Lisbon (Portugal) with different morphological characteristics: Graça (organic mesh), Campo de Ourique (regular mesh) and Telheiras (contemporary mesh) and then for the analysis methodological were applied their respective axial maps – derived from the Space Syntax Theory (Hillier and Hanson, 1984). The findings show that, as some authors (Hillier and Hanson, 1984; Handy, 1996; Holanda, 2002; Medeiros, 2013) state, there are differences in performance between different urban forms. According to Jacobs (2000) and Gehl (2010), modern spaces or those that suffer the influence of modernism have morphological elements that repel people, which make the space almost desert, without life. Therefore, it is concluded that depending on the morphological characteristics present in the space there will be more or less life. In other words, the greater segregation between the morphological elements, lower the presence of people in public space.*

Keywords: Urban Morphology, Urban Mobility, walkability, Space Syntax, Lisbon.

Introduction

Among the topics related to the performance of urban spaces, mobility has been one of the most widely debated. However, the discussion about this issue poses a paradox between non-motorized transport and the encouragement to individual transportation, which affects sustainability.

Based on this premises, this paper explores the ways in which different urban morphologies affect displacements on foot, by bicycle and by car (individual transportation) in three neighborhoods in the city of Lisbon (Portugal). In order to do that, axial maps, segment maps and visibility maps from the Theory of Social Logic of Space are used. In addition, countings of pedestrians, bicycles and vehicles are carried out in the three neighborhood in order to validate the results.

Urban Morphology

The act of walking is assumed to favor a coherent understanding and experience of the city, for reasons explained by different disciplinary fields. Walking around a city can be interpreted in terms of points of origin and destination, or the ability of places to become routes or points of arrival, as discussed by Hillier (2008). There seems to be an underlying logic in the process of organization of urban spaces that affects the choice of paths, which

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expresses the preference of individuals for one or another.

Discussing the organization of spaces implies not only considering the urban structure as system of interdependences, but also understanding how the form of the city influences the act of walking. This component may play a greater role than it was once estimated, actively conditioning the flow of pedestrians.

Urban form is understood as a geometrical composition of the elements that make up a city (streets, buildings, blocks, facades, street furniture, vegetation, etc.) in terms of dimensions and proportions. In addition, it is important to explore the concept in light of the way the elements that integrate the urban space are arranged and relate to each other, either from a bi or tri-dimensional perspective. As relations matter and result in hierarchical variations, we intend to carry out a reading of the topological context.

In the literature, urban form has historically been categorized by their differences in layout. In his work "Wanderlust: a history of walking", Solnit (2001) poetically and accurately portrays the distinction between traditional urban form (cohesive) – or pre-modern (Holanda, 2013) – and contemporary (isolated) – post-modern (Holanda, 2013).

On the same topic, Medeiros (2013) emphasizes the two types of urban form mentioned by Kostof (1992); Kostof (2001) - the irregular/organic and the regular/grid/ orthogonal/chess board – when comparing a sample of cities, both in Brazil and abroad. Nevertheless, when analyzing the articulation of the urban fabric and its impact on displacements, the author highlights that the main issue is not whether the city falls in one or other classification, but rather how the articulations take place in the city. Aspects of seaming, connection and relations between the various axes seem to be more relevant than the layout itself. Thus, the quilt pattern is considered the most negative scenario for urban mobility, even from the perspective of walking: the apparent planning expressed by the regularity of the layout comes undone due to the lack of global intention that prevents coherent levels of articulation amongst the parts.

For urban mobility, understanding the form entails understanding the geometrical and topological aspects simultaneously, focusing on relations. It is the understanding of the articulation of elements that make up a city – be it the street layout or the compacity of the buildings, the preferential means of transportation or the distances to overcome – which deserves the focus because this articulation seems to play a substantial role in an individual's process of displacement in space.

Urban Life

Some scholars have presented premises for fostering urban life in the public spaces of a city:

Jacobs (2000): emphasizes the need of having diverse uses and adequate density of residences in each neighborhood;

Gehl (2010): believes that the ground floor must be accessible to pedestrians, and highlights the need for neighborhood streets to present a high number of doors per hectometer;

Alexander (2006): highlights the need to have spaces of higher complexity and believes that urban spaces should not be segregated, even the children's playgrounds, in order to incorporate the city to the child's play space.

Salingaros (2006): points out the need to there being several connections (pedestrian pathways) in a city and these connections should be linked to a great number and diversity of activities.

The basic premises of these authors, used as the theoretical foundation of this paper, are essentially (a) diversity of uses (mentioned by all four, but emphasized by Jacobs); (b) the complexity of the space's form from Alexander; and (c) the many connections to a large number and diversity of uses, highlighted by Salingaros as essential for life in public spaces.

In order to confirm the premises of these authors regarding life in urban spaces, we carried out a joint analysis of the syntactic aspects of the urban form and vehicles and pedestrian counting in three neighborhoods – Graça (organic grid), Campo de Ourique (regular grid) and Telheiras (contemporary grid) – in the city of Lisbon, with different morphologic and syntactic characteristics.

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Methodology

Space Syntax Theory

In regard to the study of the built environment, the Theory of Social Logic of Space or Space Syntax (Hillier and Hanson, 1984; Hillier, 1996; Holanda, 2002; Medeiros, 2013) contributes substantially to the debate, when aligned with the strategies for reading the urban form derived from the systemic view (where parts of the city should be linked to create an integrated whole - Derridá, 1971; Foucault, 1971; Capra, 2003).

The main objective of Space Syntax is to investigate the relationship between the built environment – the building or the city, roughly referred to as architecture – and society – seen as a system of possibilities of encounters (Holanda, 2002).

The theory offers techniques for understanding and representing space, including the structure of the street network, providing materials that allow the researcher to investigate the city through its urban articulations.

According to Hillier (2001), by placing an object here or there within a spatial system, certain predictable consequences will affect the spatial configuration of the environment. These effects are quite independent of human desires or intent, but can be used by humans to achieve spatial and social effects.

Of the representation techniques recommended by Space Syntax for configurational studies, two are of particular interest for this research: visual fields (map of visibility) and lines (axial maps).

The linear representation is obtained by tracing the street network in the form of lines, based on the cartographic resources available, in order to reach the minimum number of lines that represent direct access throughout the urban fabric. After processing these lines, it is possible to generate a matrix of intersections, from which the representative values of its axial interrelationships are calculated by means of Depthmap ® software.

This procedure results in the calculation of the total matrix of intersections of the system, which takes into account all the connections from all axes. We obtain a value called Rn, where R is the radius (how many axes we want to consider from another axis in the system) and n is the unlimited number of connections. The values obtained from the representation and quantification of urban space at the desired level are called value or potential of integration. These values can be represented numerically or by a chromatic scale or gradient, ranging from red (most integrated), to blue (more segregated).

More integrated axes are those more permeable and accessible in urban areas, from which all the other axes are more easily accessible. They usually entail topologically shorter paths that can be reached from any axis of the system.

As the focus is the pedestrian, visibility maps are also used, because they show the presence of pedestrians in the space more clearly. Pedestrians are represented by dots which vary in color depending on their position, using the same color scale of axial and segment maps (from red to blue, with warm colors representing greater visual accessibility and cooler colors decreased visual accessibility).

Counting

The counts were carried out based on the Gate Method (Grajewski, T. and Vaughan, L., 2001), which consists in drawing an imaginary line crossing the street space (taking into account sidewalks and cycle lanes if present) and set a time period of 2.5 minutes for counting moving people, bicycles or vehicles, at each gate (counting point). As the present paper deals with entire neighborhoods, a route was chosen for each one.

The counts were carried out in typical days (Monday through Thursday) of a typical month (October) in morning (between 7:30 and 9:30 am) and afternoon (between 5:00 and 7:00 pm) peak times. It is also important to highlight that the counts were performed following the direction of the route, in order to compensate possible quantitative mismatch of the gates,

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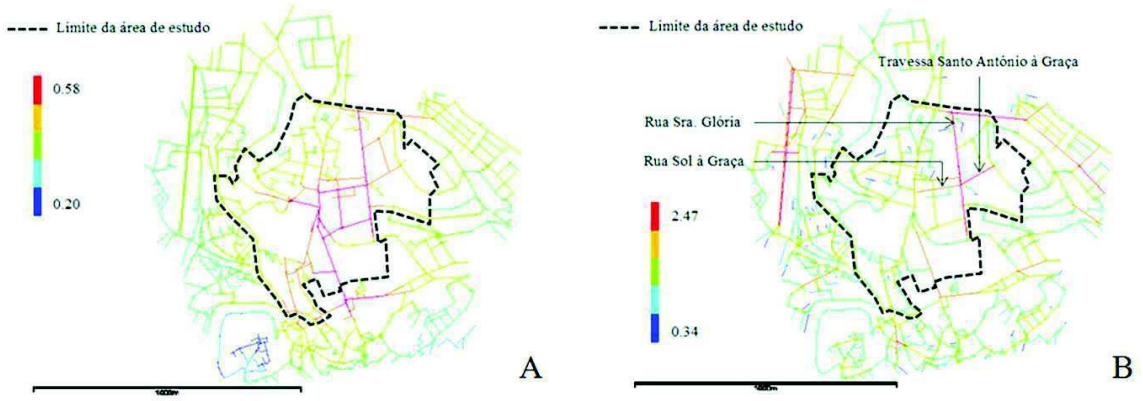

Figure 1.
Graça - (A) Axial map (integration Rn) and (B) Axial map (integration R3), both with immediate surroundings of 300m

since counts were carried out within a two hours interval.

Measurement and analysis

The current limits of the city of Lisbon, with 84.6 km2, encompass a relatively stable urban structure, in the Portuguese province of Estremadura and the core of a metropolitan area (AML – Lisbon Metropolitan Area – Figure 1A) encompassing almost 2.8 million inhabitants and reaching a territory of 2,962.6 km2.

The neighborhoods were chosen because of the distinct aspects of their street grids, which in turn are a result of historical processes of consolidation of peculiar urban fabric. Graça is characterized by an irregular street layout, resulting from the diachronic appropriation of the terrain. Campo de Ourique is an example of a regular grid, similar to a chessboard. The neighborhood of Telheiras presents a grid derived from the premises of modern urbanism, using recurring contemporary solutions such as great voids, presence of main axes and secondary streets, road ring, cul de sacs, etc.

Axial and Segments Maps

The neighborhood of Graça has a predominantly irregular layout, resulting from a specific process of adaptation to the site. The layout of streets very closely resembles the so called 'Portuguese way of making cities', a peculiar way of creating urban settlements by adapting to the terrain. The area presents T shaped crossings and the blocks are irregular in both shape and size. These characteristics are reflected in the indicators, as shown in Figure 3A.

In terms of average global integration (Rn – 0,40) (Figure 3A and Table 1), Graça has the lowest average of the sample, due to its labyrinth like organization (Medeiros 2013). The rugged terrain and the steep slopes decrease the number of possible routes between any two given points.

As for the analysis of radius 3 (Figure 1B), it is possible to notice that the larger (and straighter) axes are those that show better integration results, and potentially correspond to local centralities. However, there is no diversity of land uses in these streets, which are predominantly residential.

The area of Campo de Ourique is characterized by an essentially regular layout, with predominantly X shaped crossings. Consequently, the blocks are also regular, with roughly the same size and proportions. The chess board urban grid favors a greater number of possible routes, in any two given points of the system, which result in higher syntactic indexes (Figure 2A).

In the analysis of the local aspects of Campo de Ourique (integration R3), it is possible to notice the underlying logic in the absence of a clear hierarchy is practically the same proportion of the global (Figure 2B), which does not happen in Graça, for example.

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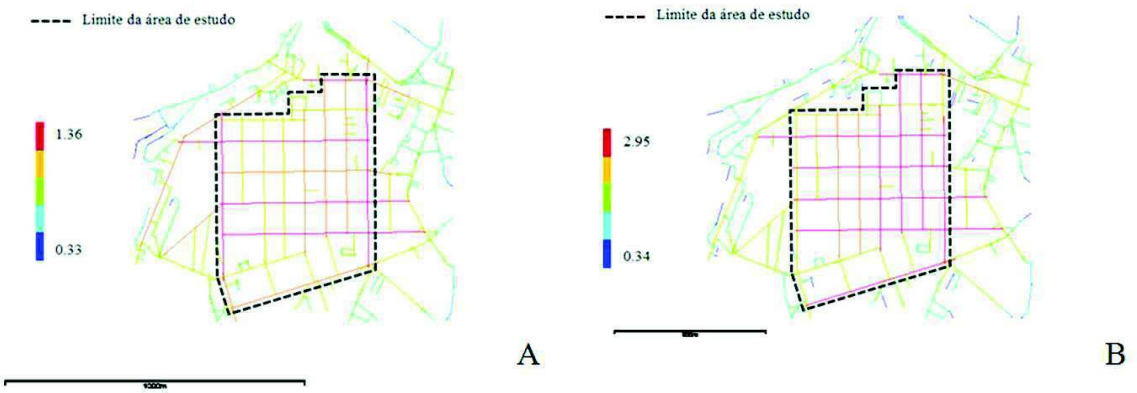

Figure 2.
Campo de Ourique - (A) Axial map (integration Rn) and (B) Axial map (integration R3), both with immediate surroundings.

Campo de Ourique (Table 2A) presents the highest average global integration in the sample (0,74), presenting straight global axis that cross the neighborhood north to south and east to west. Considering the counts carried out, we can infer that the layout fosters motorized displacements instead of pedestrians.

The neighborhood of Telheiras has a very different layout, when compared to the other two, and it is a result of the contemporary experiments using a modern matrix. Its grid does not present a clearly defined pattern, since it sometimes resembles Campo de Ourique and in others it presents an apparently 'ordered' irregularity: there are both T and X shaped crossings, and the presence of excessively long blocks is frequent (with no regularity in terms of size and shape). Such features foster lower integration indexes, as illustrated in Figure 5 and Table 1.

It is possible to see that Telheiras (Table 1) presents an average global integration (0,48) slightly higher than Graça, since there are streets that cross the neighborhood east to west (Figure 3A) and which pass under the expressways. Therefore, there aren't any great disruptions, which makes this neighborhood more permeable/accessible.

Locally, the analysis of radius 3 (Figure 3B) shows that the more integrated axis are the same as in analysis of global radius n, which is a very similar behaviour to what happens in Campo de Ourique. There seems to be greater synergy between the systems of these neighborhoods (when comparing global and local performances) in relation to Graça (Figures 3A and 3B).

The segment map presents greater compatibility with the data of Transport. The axial map, however, is of crucial relevance because it encompasses the hierarchical characteristics of the system, therefore the simultaneous use of both strategies of analysis is paramount.

Making a comparative analysis between the syntactic results of the three neighborhoods, one can infer that, in general, the neighborhood of Graça is the one with best performance in the maps of 'isofoot' (the one which takes into account the obstacles at the foot level and not at the eye level – isovist). Although the area presents lower average integration values – despite a clearly defined hierarchy – there is a lower incidence of very broad spaces. The setting facilitates the reading of space by pedestrians (Hillier, et al., 1993), in addition to being considered good for urban living according to the precepts of Jacobs (2000), Gehl (2010), Alexander (2006) and Salingaros (2005).

In regard to the neighborhood of Campo de Ourique, it is important to highlight its position of superiority in terms of system integration due to the regularity of the grid. This means that, somehow, the grid is democratic in terms of homogeneity of relationships, being positive for motorized traffic. However, the high performance in here does not mean it is overall satisfactory, because from the perspective of the pedestrian, evidence indicates that grids

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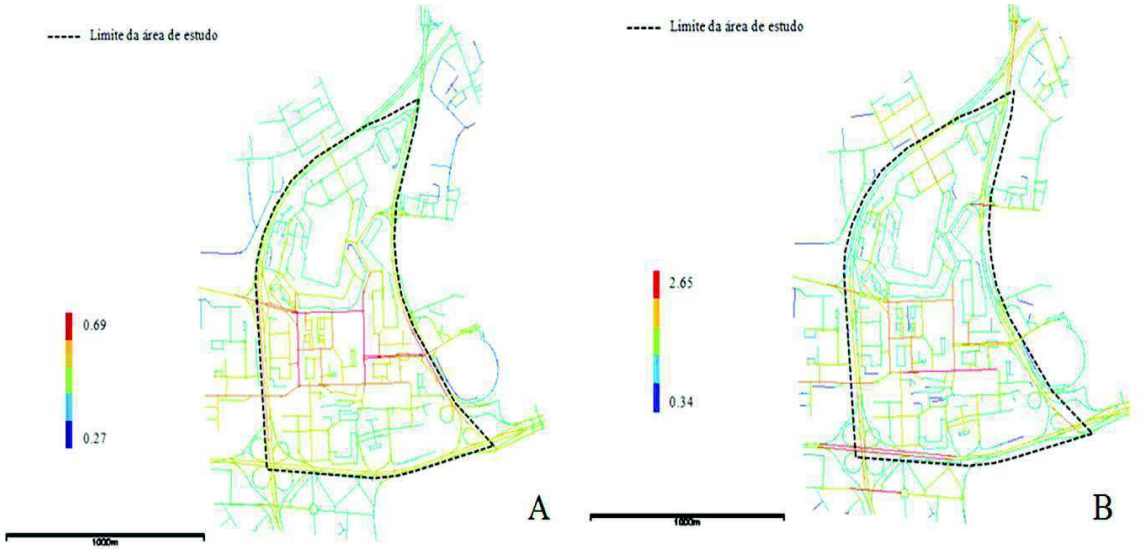

Figure 3.
Telheiras - (A) Axial map (integration Rn) and (B) Axial map (integration R3), both with immediate surroundings.

with a clear distinction in its street hierarchy are more easily understood. Both axial and segment maps, and the 'isofoot' are relevant for understanding patterns, once they provide strategies for identifying repetition, with proximity and distances between the areas analyzed.

Telheiras presents a context that would be less inviting for urban life, an observation which is aligned with the observations of Jacobs (2000), Gehl (2010), Alexander (2006), Salingaros (2005), etc. Its integration values, compared with the other two examples, are in an intermediate position just because it is connected with the neighborhood through strong east-west articulation axis. Moreover, even in the axial maps and in the isovists and ISOPE, the connection problem can be seen: the inner part of Telheiras is poorly connected, with the frequent presence of dead-end streets, isolated buildings and little diversity of uses. All these aspects discourage urban life, the experience of neighborhood, the possible encounters. These syntactic aspects are ratified by the countings carried out.

Visibility Maps

In terms of system visibility, we decided to analyze visual connectivity from the perspective of the feet (henceforth referred to as 'isofoot'). In this analysis (Figure 4), it is possible to notice a different performance between the neighborhoods, due to their distinct form characteristics.

For the system of Graça (Figure 4A), it was verified that the greater connectivity of the system is along structural axes, that is, Rua da Graça, Largo da Graça and Rua Sapadores. It is important to highlight that, although Rua Senhora Glória presents a high value of integration (Figure 1A), its visual connectivity does not present meaningful values, maybe that is the reason why the street does not attract commerce and, consequently, movement.

The analysis of visibility at the level of the foot in Campo de Ourique (Figure 4B) shows a substantial alteration in behavior of the area around the church and the square, that go from warmer to cooler colors as a result of the presence of obstacles for the feet, such as gardens and fountains.

This change reverberates in the results of other sites in the neighborhood, with greater importance to the crossings at Rua Ferreira Borges – eastern limits of the neighborhood – in which its knots go from yellow to orange and in some cases to red, exhibiting greater visual global connectivity. These findings seem to be aligned to the reality of flow in the neighborhood, shown in the counts performed.

It is worth noticing that in the 'isofoot'

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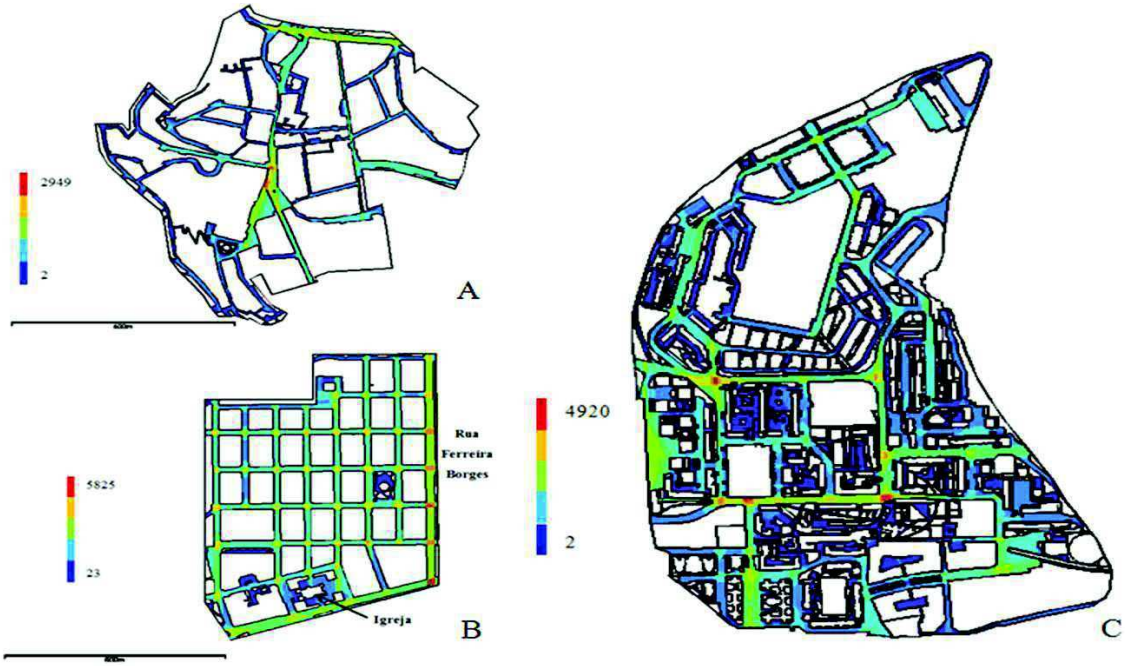

Figure 4
Isofoot map (visual connectivity at the feet - 2) of Graça (A), Campo de Ourique (B) and Telheiras (C) with their immediate surroundings.

analysis (Figure 4) the most connected points are those that correspond to the crossings, in the same manner that happens in Campo de Ourique. However, in Telheiras, X shaped crossings are rare and T shaped crossings are more common.

Counting

In regards to the counts carried out in the three neighborhoods under study, the results were analyzed separated by means of transportation – motorized (cars) and non-motorized (on foot or by bicycle) – in order to identify similarities and distinctions (Table 2).

When comparing the absolute data for the three neighborhoods, Telheiras stood out for presenting the highest flow values for all means of transportation. However, due to the discrepancies between the number of counting points in each neighborhood – Telheiras presents almost seven times more gates than Graça, and almost twice as many gates as Campo de Ourique – we decided to carry out a proportional analysis. In order to do so, the number of people counted was divided by the number of gates in each neighborhood, and the results are presented in Table 2.

The findings indicate that the values for Telheiras are the lowest in almost all categories, except number of bicycles. Telheiras has thus the lowest movement flow (both for pedestrian and vehicles), which indicates less urbanity – in the words of Holanda (2002), due to few "eyes to the street", as described by Gehl (2010).

It was also found that the neighborhood of Graça had the second highest volume of pedestrians, with an average of 158 people per hour, and with 145 vehicles per hour (on average, for each gate). Although Graça

Table 1
Syntactic Indexes.

Neighborhood	Average Integration Rn	Average Integration R3	Average Depth	Average Axial Connectivity	Visual connectivity - eye	Visual Connectivity - foot
Graça	0,40	1,27	7,81	2,78	711.24	669.48
Campo de Ourique	0,74	1,35	4,20	2,81	2785,24	2186,91
Telheiras	0,48	1,21	6,38	2,63	2012,64	1036,65

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Table 2
Total and average flow per neighborhood.

	Campo de Ourique	Graça	Telheiras
Pedestrian flow	4980	7110	17868
Flow of Motorized Vehicles	10152	6516	31092
Flow of Non-Motorized Vehicles	42	18	390
Number of gates	45	26	303
Average number of pedestrians per gate	191,54	158,00	58,97
Average number of motorized vehicles per gate	390,46	144,80	102,61
Average number of non-motorized vehicles per gate	1,62	0,40	1,29

presents a well defined hierarchy in its grid, where the flow tends to be concentrated in certain streets, it still contains higher average movement of people and vehicles than a contemporary grid.

The neighborhood of Campo de Ourique, in turn, had the highest average flow of both pedestrian (192 ped./h) and motor vehicles (390 veh./h). This fact is possibly associated with a fairly flat topography and greater accessibility as explored by syntactic analysis of space.

Telheiras had the worst performance in relation to both, the movement of people (with an average of 59 per hour) and vehicles (with 103 per hour), always on average per gate. The measures suggest a possible non-aggregating characteristic of the area, the result of large empty spaces, as well as social characteristics of the population.

It is possible to observe, based on the countings, that the neighborhood of Graça is the only one to present a certain balance between the flow of pedestrians and motorized vehicles, demonstrating, in a way, that there is greater interaction between the different modes of transport. Campo de Ourique and Telheiras, on the other hand, have a similar behavior, since they exhibit nearly double the number of motor vehicles in comparison to pedestrians.

Conclusion

The paper aimed at verifying how the form of the spaces interferes in the act of walking and in order to achieve that, complementary methodological strategies were used.

The results obtained from the three strategies adopted (axial maps/segment maps, visibility maps and countings) show that the form is a determining factor for the act of walking, since the morphologic and syntactic aspects can grant more or less urban life to these spaces.

It was possible to verify that organic grids (as in the neighborhood of Graça) and regular grids (as in the neighborhood of Campo de Ourique) – considered by Alexander (2005) as complex – are the ones that foster more urban life in the urban space. In contrast, contemporary grids (as Telheiras) – considered by the author as non-complex (for the case of this research) – present less urban life, that is, there are fewer people walking around the space, as ratified in the countings.

It is important to highlight that the syntactic aspects are relevant, but must be analysed together with other strategies, since they present non-absolute and potential flow results. From this standpoint, the counting of pedestrians was the strategy that helped characterize the neighborhoods and place them within the context of urban life.

In face of the arguments presented above, we can infer that urban form is paramount for the presence of people in urban spaces, that is, the morphologic and syntactic characteristics of the city space play a relevant role in urban life. This restates the importance of Space Syntax in the study of walkability – which was analyzed in greater details in the Doctorate research of Barros (2014).

Therefore, the ingredients for a successful and pedestrian friendly space must encompass an urban form whose relations (Hillier and Hanson, 1984) incorporate the complexity inherent to space (Alexander, 2006), diversity

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of land use (Jacobs, 2000), and an adequate number of doors for high level movement (Gehl, 2010), because they provide a greater level and diversity of connections between activities (Salingaros, 2005).

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Towards a typomorphology of public spaces: Relating place type and measures of enclosure

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Abstract. *Architecture has a rich vocabulary of morphologically defined elements, but urban design has relatively few. This is believed to limit the ability of urban designers to articulate, compare and share ideas on urban spatial typomorphology, and hence limit the richness and diversity of different types of urban morphological intervention. This paper reports on some exploratory steps towards identifying aspects of the challenge of creating a 'typomorphology' of open space components related to enclosure. The paper first introduces the site used for morphological analysis; describes some of the identifiable place locations on the site; and then develops and demonstrates two measures of enclosure (εP and εS) for capturing some of the qualities of those place locations..*

Keywords: Typomorphology, place type, area structure, enclosure, courtyards, housing estate, participation, urban design.

Introduction

Architecture is endowed with an extensive lexicon of elements, a large proportion of which are, by their nature, morphological. Traditional architecture, in particular, has a rich vocabulary – from architraves and entablature to purlins, lintels and squinches. A classical column on its own contains a raft of detailed elements that are inherently morphological – a simple Tuscan column, for example, comprises sub-components such as: plinth, fillet, torus, apophyge, astragal, neck, echinus, abacus, cyma reversa, ovolo, corona and cyma recta (Hopkins, 2012:64). Modern architecture, though typically more stripped down (morphologically and lexically), nevertheless has its share of morphological components from podia and piloti to ribbon windows and curtain walls.

In contrast, the vocabulary of urban morphological features seems to be much more sparse. Granted, it is possible to identify many street types – and associated spaces such as alleys (wynds, closes,...) and squares (piazzas, circuses…) (for example, Marshall, 2005, identified aa multitude of examples of street type). However, this range of street types seems relatively limited, especially in terms of those types defined morphologically. In particular, there seems to be a lack of a way of describing many of the kinds of space that lie between the scale of a whole street and an individual building or building component.

This potentially raises the question as to whether urban design is poorer for its lack of such detailed articulation, as it is possible that designers have a reduced or diminished 'palette' of possible interventions, individually and in combination – to learn from.

If a design – or an artwork, such as a sculpture – is truly unique, of utterly unprecedented form, a singular creation devised form the imagination of an individual designer – then there is perhaps less need for the articulation and naming of component parts, as the end product is conceived and executed as a whole. At the other extreme, if urbanism is considered as simply an emergent assemblage of buildings and spaces, with no design intent considered

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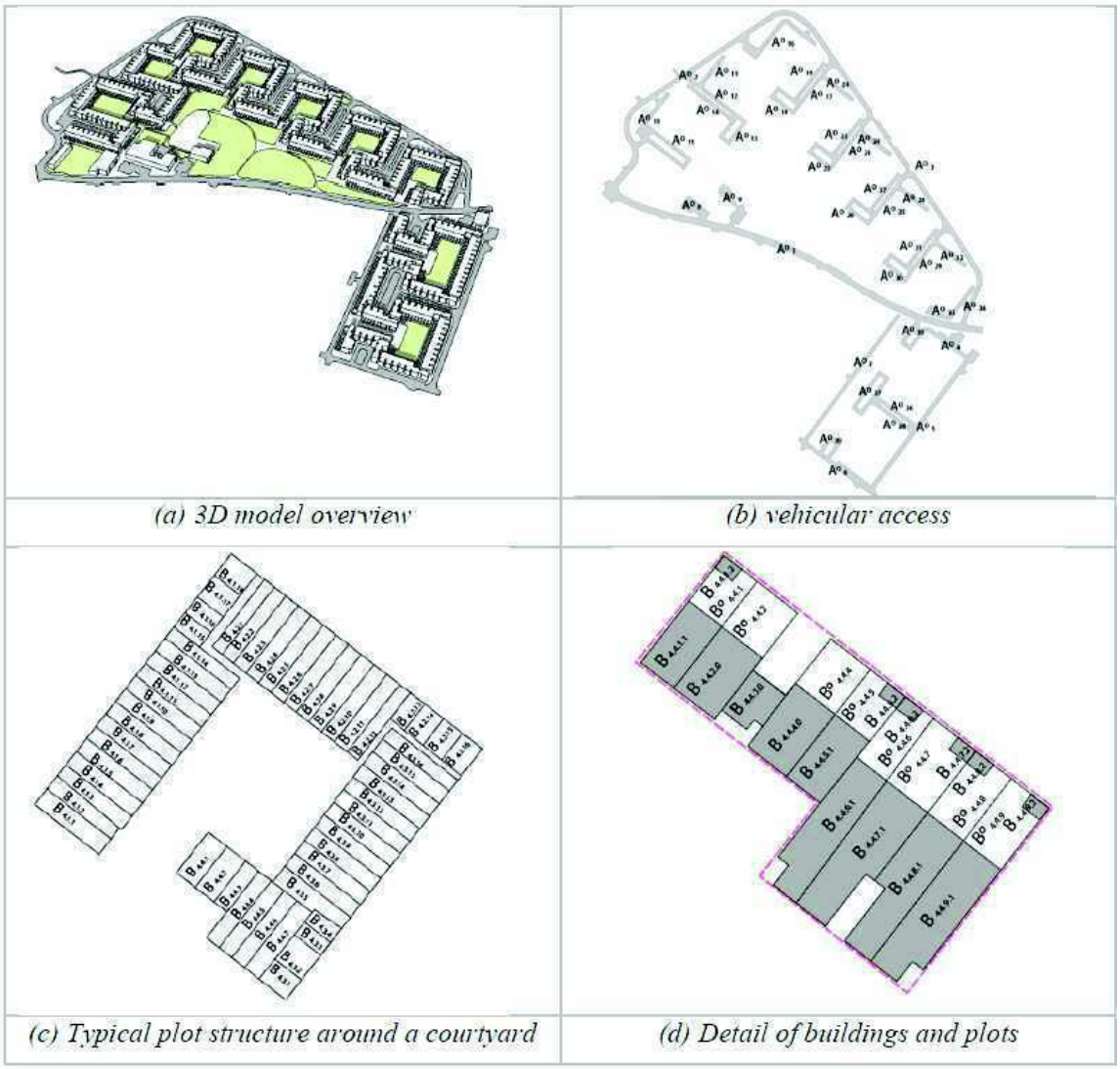

Figure 1.
Representations of the Pollards Hill housing estate, London.

necessary or desirable, then it is fine for spaces to be created from leftover design operations on buildings and other positively intended interventions without those emergent spaces needing to be catalogued or named.

However, for all other, in-between cases – surely the majority of contemporary urban design scenarios – the value of named components lies in the ability to identify and articulate parts in relation to wholes, to build up parts of an urban fabric over time, incrementally, and to compare and share knowledge of those resulting designs and spaces.

This leads to an agenda for creating a richer lexicon of urban design components relating to the configuration of public space.

The need for this is further intensified by the advent of digital design software, where options for interventions need to be articulated, and in participatory design scenarios, where multiple actors – many hands – need to be able to compare and share ideas for interventions I the creation of the urban fabric.

Creating ontologies for identification of possible design elements is an ongoing project (see for example, Berta et al., 2016). But the emphasis tends to be on architectural objects, or more generally physical solid interventions (from trees to benches), or else two-dimensional surface treatments (grass, paving) while the articulation of kinds of open space configuration or place type seem less well developed.

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This paper reports on some exploratory steps towards identifying aspects of the challenge of creating a 'typomorphology' of open space components, in part defined by enclosure. The paper first introduces the site used for morphological analysis; describes some of the identifiable place locations on the site; and then develops and demonstrates two measures of enclosure (*εP and εS*) for capturing some of the qualities of those place locations.

This paper is a snapshot of work in progress; it is part of a larger programme of research addressing typo-morphology and the use of types of intervention in an online design platform for participatory urban design of public spaces (Caneparo et al., 2017).

Methodology

This paper reports on some analysis carried out at a site at Pollards Hill, south London (Figure 1). This is a housing estate (14ha, built in the 1960s/70s) in the form of a distinctive 'Greek key' configuration of linked courtyards, where housing blocks partially enclose rectangular green spaces, linked by narrow alleys. Figure 1 shows the morphology of the plots and blocks, interpreted in terms of its area structure (Marshall, 2015). The development and demonstration of the place interpretation and enclosure is carried out within this paper. There is no scope within this paper to detail the online platform itself or the typological interventions therein but these can be found in Caneparo et al., 2017, and other any subsequent papers.

Distinctive Places

This is an informal analysis of what are felt to be distinctive places within the housing estate. This is admittedly subjective, based on the authors' experience of the site on a few visits, and further research would be needed, to work with residents to get other perspectives on the perception of the distinctive places. The emphasis here is on morphologically defined places rather than those aspects of place generated by other means (for example, the informal appropriation of discarded furniture, or use of benches for social – or anti-social – activities).

Figure 2 shows an attempt to distinguish what might be some morphologically defined

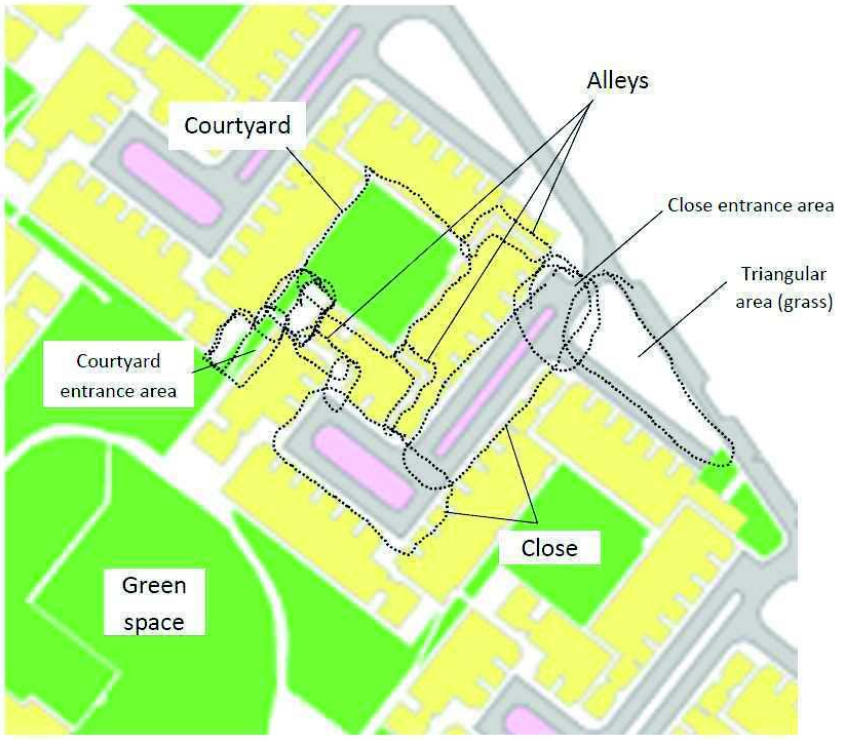

Figure 2.
Different morphologically identifiable 'places'. The dotted lines are deliberately vague to indicate that these are not definitely pinned down spatially.

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Table 1.
Description of different places identified in Figure 2

Place	Description
Courtyard	This is a publicly accessible, more or less rectangular space bounded on four sides but with four access ways off it. The courtyards in this case do not appear to have formal names, other than being identified by the Closes that they back on to.
Close	In this case the 'close' is not necessarily a morphologically coherent category; here, the Close is comprised of two different types of space: an elongated street section and a more enclosed, courtyard-like space. In fact the generic term CLOSE typically refers to a small enclosed alley, which may even be enclosed by or pass through buildings, to being a non-morphologically specific generic street name (cf. 'Street', 'Place' or 'Court').
Alleys	These are the third of the three most distinctive places (as interpreted by the authors). Like the courtyards, they do not appear to have any formal names, but they are distinctive enough spaces to be the identifiable subject of discussion about the locality (e.g. relating to access and security).
Green space	The green space extends beyond the area of focus of the present exercise; it is clearly a visible and identifiable 'place' with its own name (Donnelly Green), though it is not clearly bounded spatially.
Triangular area (grass)	The triangular grassed area could be thought of as a definitely identifiable 'place' although it could also be considered a 'leftover space'; it appears to be not used for anything while an individual left over' triangular space might not attract much notice, the fact that this is one of a series of such triangular spaces probably increases the identifiability of the space as a distinct and not accidental space. Note: at the time of writing, one of these triangles is occupied by a contractor's site offices. This lends a definite sense of enclosure both in facing the adjacent residential facades, and within its own boundary walls, and demonstrates how much use could be made out of this small, awkwardly angular space.
Close entrance	There is a sense of a sort of threshold space here. When approaching this point from the outside, the somewhat undistinguished facades of the residential blocks are broken by the close, to reveal a 'busy' space with lots of cars parked, and trees, giving glimpses of the interior of the closes that is not otherwise visible from the perimeter road.
Courtyard entrance	There is a sense of a sort of threshold or transition space or spaces here. Through here, one moves from the wide open space of Donnelly Green to the more enclosed space of the courtyard. In fact this transition spaces acts as a sort of 'throat' between two wider spaces. This space is morphologically intricate or ambiguous and is analysed further below.

'places'. Here some natural language terms are used which could be interpreted as types of space: COURTYARD; ALLEY; CLOSE; while in some cases we refer simply to a description of the space. These places are described in Table 1.

It is then possible to observe in more detail the different morphologically tractable or definable spaces. A preliminary analysis is carried out in Figure 3 (overleaf).

In Figure 3 the first cases are based on rectangles while the more complex shapes are at the bottom (L-shaped and dumbbell); these latter can of course be seen as composites

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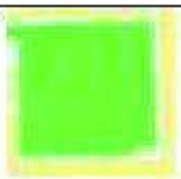
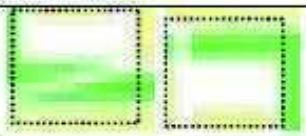
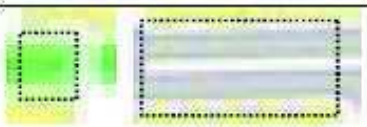
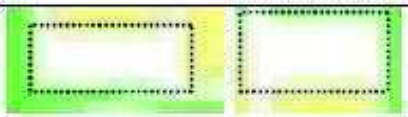
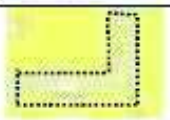
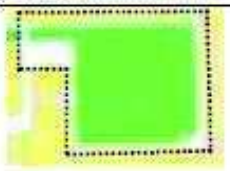
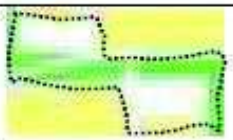
Element (plan)		*Element (description)*	*Geometry*
(a)		Courtyard 'square'	Square or rectangle fronted on 4 sides
(b)		Close or 'square' or 'court'	Rectangle fronted on 4 sides
(c)		Partially sided square, with access on 3 sides (one wide aperture occupying one side and two partial openings)	Rectangle fronted on 3 sides
(d)		Partially sided square, with access on 2 sides (one wide aperture occupying one side and one narrow opening)	Rectangle fronted on 3 sides
(e)		Throat: has walls/ enclosure on two parallel sides, joining two wider spaces. The more elongated form could be called 'street'.	Rectangle fronted on 2 parallel sides
(f)		Alley – lined by (mostly blank) walls or fences either side, with some doors	Rectangle fronted on 2 parallel sides
(g)		(left) Raised patio / platform, or (right) flat patio; enclosed on two sides by walls of buildings.	Oblong fronted on 2 sides
(h)		This has two frontages at right angles with a relatively large aperture between them.	Space defined by frontages on 2 sides
(i)		Dog-leg alley – alley with 90 degree bend.	Thin L-shape (hexagon)
(j)		Courtyard with 'panhandle'	L-shaped (hexagon)
(k)		Transitional space with narrow throat and a patio at either end.	Dumbbell (octagon)

Figure 3.
Abstracted morphological elements of different types.

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comprising sub-components from the categories above. In this analysis the following different aspects are be used to distinguish cases:

1. The number of sides fronted;

a.Whether these are wholly or partially breached by access ways;

b.Whether, in the case of two sides, those are parallel or perpendicular;

2. The proportionality of sides (e.g. whether the space is elongated in the direction of passage between parallel frontages or not; or square);

3. The number of accesses per frontage;

4. Whether the interior of the space is paved (footway), roadway/parking, or grass (though this distinction is not interpreted systematically in the above example);

5. The absolute size of spaces (this is used to select spaces and the resolution of shape boundaries in the first place).

It would be possible in principle to further distinguish

6. Whether the ground plan is level or has level changes (this is not systematically distinguished in the example above);

7. The angularity of boundaries could also in principle be distinguished, though in this example in all cases the boundaries are more or less orthogonal;

8. The orientation (e.g. south-facing) could also be distinguished;

9. The type of boundary (e.g. wooden fence or concrete wall or façade with windows, etc.).

We can note some relationships between the different cases as follows:

1. Two of the most prominent elements – (a) courtyards and (b) closes (the end part) – could be considered part of the same morphological class (though, separate sub-classes if we distinguish the presence of roadways, etc).

2. Similarly, two other prominent elements – (f) alleys and (e) closes (middle part) – could be considered to be part of the same morphological class (though in separate sub-classes, if we distinguish the latter as a 'throat' where it links between two more open spaces, which is not the case for the alley).

3. In principle we could distinguish morphologically between a 'throat' that was wider than it was long (case e, left) and one that was longer than it was wide (case e, right);

4. We can note the morphological similarity between cases (c) and (d), though these are distinguished by size, presence of greenery, and the slightly different access arrangement.

5. Cases (g) and (h) are distinguished by the latter being not so spatially well defined, and the rectangle indicating enclosure could be larger or smaller, according to purpose.

6. Cases (i) and (j) demonstrate how two very contrasting spaces (almost diametrically opposite in sense of spaciousness) could have the same geometric definition.

7. Case (k) shows an example of a composite space made up of five other elements, namely (g) (c) (e) (c) (g)[1]. This case could be an example of typological fluidity, as the existence of the 'transition space' could be either considered to be the whole of (k) or just the spatially more focused 'throat', (e).

8. Case (j) could also be said to feature a degree of ambiguity, about where exactly the courtyard (a) starts or stops, as the space 'flows' through to the throat (e). The space (j) itself is a composite space comprising (a), (c) and (g).

9. Finally, one could note that the union of a straight-sided alley (f) and the small 3-sided square (d) could be interpreted as a kind of differently proportioned dog-leg alley (i).

We may draw the following conclusions from this analysis:

1. From what appears to be a rather small-scale courtyard area with simple rectilinear elements, there is yet quite a rich diversity of micro-scale places that are morphologically definable;

2. From the cases considered, and the dimensions revealed (at least half a dozen actively used, perhaps more than ten implicit in principle), it is clear that a much larger set of classes and sub-classes could be generated;

3. There is not an exact correspondence between place type and morphological (geometric) definition;

4. There seems to be a relationship between the sense of ambiguity and the more complex shapes;

5. The more distinct place types seem to be related in some way with enclosure – a topic we now investigate in more detail.

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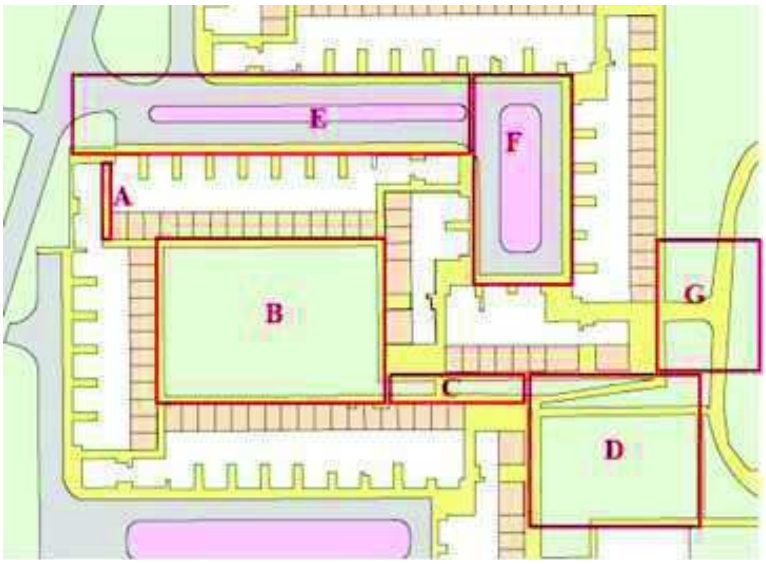

Figure 4
A selection of seven spaces (A–G) for further analysis in terms of enclosure.

Enclosure

The aim here is to see if we can characterise different types of space by their degree of enclosure. This implies using some indicator(s) of enclosure, as well as an agreed means of identifying what spaces to recognize as distinct entities to be measured in the first place.

A general point here is that we already distinguish some kinds of space, implicitly, by their degree of enclosure, or at least by physical proportions: for example, a STREET is wider than an ALLEY, while both imply a degree of enclosure in the vertical plane, as opposed to being a ROAD or PATH in open space. Similarly, a STREET implies a space that is elongated in one direction relative to the other two, while a SQUARE implies something extensive in both horizontal dimensions.

In the case of Pollards Hill, we can identify a number of spaces that seem to form more or less distinct entities. Here we select seven for further analysis; for simplicity we use rectangular cases (Figure 4).

We can express these loosely, typo-morphologically, as follows:

• Space A is an ALLEY (a rectangular part of a dog-leg);

• Space B is a COURTYARD;

• Space C is a transitional space (including the THROAT previous identified);

• Space D is a three-sided space, which could be regarded as an 'arm' of the continuum of Donnelly Green;

• Space E is the 'STREET' part of the Close;

• Space F is the 'COURT' or 'end' part of the Close;

• Space G is a partly defined portion of the wider green space of Donnelly Green.

One possible measure of enclosure is to consider the fully three-dimensional extent of enclosure of space, which could include consideration of a number of possible indicators, including fractal dimension. However, it proves in practice much simpler to work in terms of degree of enclosure. Here we demonstrate two measures of enclosure: perimeter enclosure (εP) and surface enclosure (εS), which have been developed for the present purpose.

Perimeter enclosure (εP)

This is an indicator of the two-dimensional enclosure of a space, where enclosure implies a bounding by the third dimension, while openness implies access. We can define an indicator εP (perimeter enclosure) as the proportion of the perimeter that is enclosed. (This implies physically bounded in the third dimension, whether or not that boundary is punctuated by access, such as a doorway). Obviously the value will depend a lot on where the boundary of the space is drawn (Figure 5).

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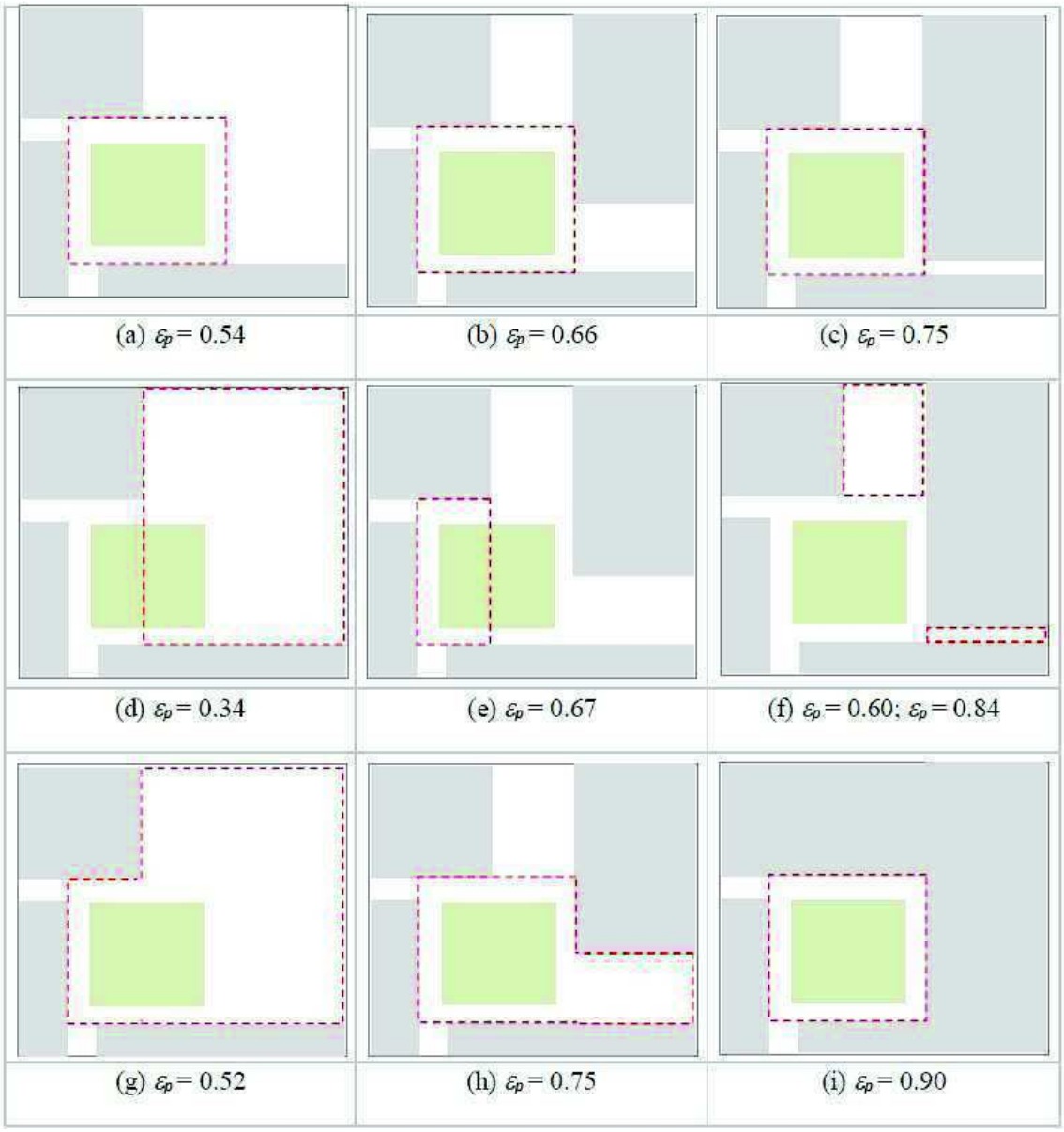

Figure 5.
Degrees of perimeter enclosure for hypothetical example layouts.

The first row in Figure 5 shows the effect of adding increasing lengths of building frontages, leading to increasing values of εP. The first column shows the effect of including more of the larger open space (reducing εP), or introducing an L-shaped boundary which picks up more frontage, raising εP as we go from (d) to (g). The second column also demonstrates this effect, for a different layout. Case (f) shows how a section of street, being open at both ends, could have a lower enclosure than a square, but if it is elongated enough, enclosure could be higher. Case (i) shows an example of very high enclosure. This could also simulate a case where the white areas are roads, and pedestrian alleys are present but not represented, i.e. where a low resolution interpretation of an area omits some of the unenclosed access ways, and therefore generates an artificially high measure of enclosure. Note that the reference polygon area (red lines) of case (g) is the sum of that of cases (d) and (e); the εP value is in between those two.

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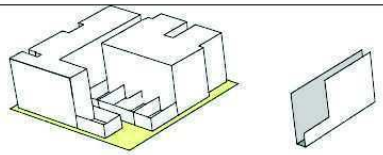
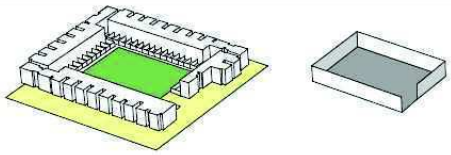
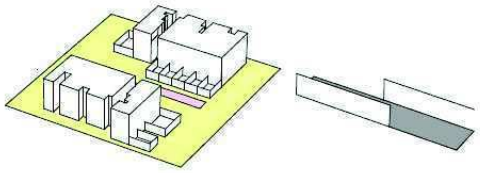
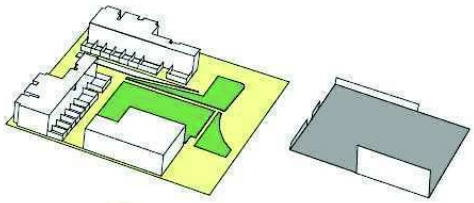
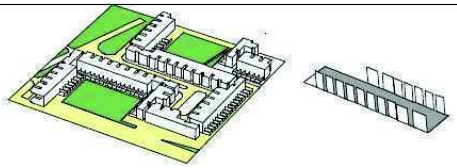
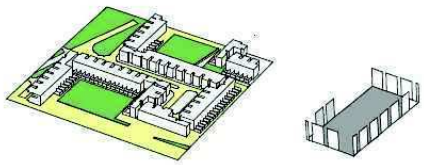
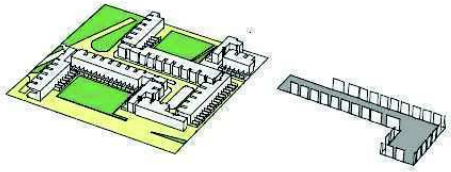
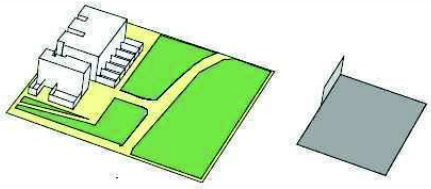
Type of space		*3D context and surfaces considered*	*Perimeter Enclosure* (ε_P)	*Surface Enclosure* (ε_s)
A	ALLEY, linking closes and courtyards		0.906	0.745
B	COURTYARD		0.925	0.516
C	Transitional space, open at either end		0.476	0.489
D	A partly defined space (fronted on 3 sides)		0.427	0.403
E	The 'street' part of the 'close', a transitional space		0.450	0.432
F	The 'closed end' of the close, a mostly defined space		0.438	0.498
E+F	'L' shape space (the whole 'close')		0.493	0.459
G	A random, amorphous open space		0.136	0.287

Figure 6.
Calculated values of perimeter and surface enclosure for selected spaces.

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Surface enclosure (εS)

Whereas the perimeter enclosure only takes account of the presence of the vertical dimension, as defining enclosure of a polygon on the ground plan, we can introduce a measure called surface enclosure which takes account of the physical extent of the vertical dimension, i.e. height. Clearly heinght has an important perceptual dimension as well as physical influence on the spatial definition of a place – relating to access, the sense of enclosure, spaciousness, etc.

Here we define surface enclosure as follows:

$$\varepsilon_s = \frac{S_0 + [(\varepsilon]_p * C * h)}{S}$$

in which εP indicates peripheral enclosure and εS indicates three dimensional surface enclosure; So represents the area; S is the area of surfaces, C is the perimeter of the space, and h indicates the average height of the surroundings, such as comprising building facades and garden walls.

By simplifying the above function, we can see that

$$\varepsilon_s = \frac{S_0}{S} + \frac{C}{S} * \varepsilon_p * h$$

Generally speaking, for a given εP, the higher εS of the space indicates the higher value of height (h). (This interpretation is based on the presumption that the area of the space is not that large.) Further consideration of the C/S value or shape index (depending how defined) may also allow interpretation of the relative influence on εS. A possible suggestion here is that by combining two enclosures (εS and εP), we could have a better way to depict the characteristics of three dimensional spaces.

Finally, we depict below (Figure 6) some examples of enclosure values for the spaces shown in Figure 5.

Here we may note the following:

1. The two most enclosed spaces (by both enclosure measures) are two of the most distinctive places identified – namely, the alley (A) and the courtyard (B). In terms of perimeter enclosure, these two are significantly higher than all the rest, while they are moderately higher than the rest in terms of surface enclosure.

2. The third most enclosed space is either the whole Close (E+F) (measured by perimeter enclosure) or the 'closed end' of the Close (F) (measured by surface enclosure).

3. Hence there seems to be a relationship between distinctive places and enclosure, at the level of resolution (and subjectivity of interpretation of 'distinctive') considered here.

4. That said, the Close (however measured) is only marginally more enclosed than the next spaces (e.g. street, transitional spaces) (C, D, E) and these could all be considered in a second, mid-level category (with F and E+F); while the 'amorphous' space (G) would be a separate, third category of low enclosure.

5. The surface enclosure measure picks up cases where there is a higher degree of vertical enclosure, with the ALLEY having the highest value of surface enclosure, as one might expect of a narrow passage with walls on both sides.

6. The perimeter enclosure value is higher than the surface enclosure value in 5 out of the 8 cases.

7. It is interesting to consider the case of comparing E, F and (E+F). For surface enclosure, the value of (E+F) lies between that of E and F, while for perimeter enclosure, the value for (E+F) exceeds that of both E and F.

8. For case (G), the enclosure values could be made arbitrarily large or small (within limits) by varying the size of the ground rectangle, while the boundary façade remains constant.

Conclusion

This paper has identified different distinguishable spaces or 'places' and considered the extent to which those are related to morphology. It is found, so far, that those place types are not uniquely defined morphologically (i.e. there is not a one to one correspondence between morphology or geometry and place type); however, there seems to be a strong relationship between the more prominently distinguishable place types and degree of enclosure (always subject to the subjectivity of judgement on what is a 'distinguishable' place type. Moreover, it is found that there seems to be a relation between the more ambiguous and transitional spaces and the different ways that

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those could be constituted, or put another way, the more complex shapes (which can be broken down into more, smaller constituent parts) tend to be associated with more ambiguity about whether they are distinctive places or not (again, subject to subjectivity).

Clearly, the foregoing work can be further investigated in more detail, but more importantly there is a need to research the actual (commonly understood) 'distinguishability' or 'imageability' of the place types by consulting a wider range of people, such as local residents, which could also be augmented by doing a content analysis of planning and other documents referring to the different parts of the site.

Overall, this paper suggests the value of enhancing the vocabulary and definition of morphological elements towards a typo-morphology of public spaces. This could enhance the likelihood of establishing a richer palette of interventions for the positive shaping and configuration of public space, whether by traditional urban designers or participative design platforms.

Acknowledgement

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Notes

1 Clearly, it would be possible to map the relationships between these spaces in terms of containment relations (cf. areas structure analysis, Marshall, 2015) but this is not done here due to space constraints.

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Can speed enhance our understanding of the role of spatial connectivity? The creation of a 'Spatial-Speed' map

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Abstract. *Throughout Latin America urban cable-cars have fast become a normal sight with urban transport systems, taking residents and tourists to and from previously isolated locations. As the popularity of these new modes of transport grows, it is important to understand the role spatial connectivity plays in integrating previously segregated communities. This is possible using a Space Syntax methodology to analyze the connectivity of a spatial network. However, this does not take into account different forms of movement affected by transport or local landscape. Therefore, the aim of this paper to explores the use of 'speed' as a measurement to enhance our interpretation of spatial connectivity, through the case of Medellin. 'Speed' is used because it provides a clear indication of connection times between different parts of the city and is comparable throughout a variety of conditions, such as transport and walking. An average speed is therefore calculated for each segment of Medellin's spatial network, including all forms of transport, and is then combined with the results of a standard Space Syntax analysis, forming a hybrid 'spatial' and 'speed' map. For accuracy, the results are tested against a pedestrian movement survey conducted locally nearby each cable-car station. The findings indicate that by introducing 'speed' as a weighted measurement, the overall spatial network of the city is not significantly improved, yet when the area surrounding each cable-car is examined closely, local 'through' spaces is clearer, especially when spatial conditions, or the user, is nonstandard.*

Keywords: Space Syntax, Speed, Spatial Connectivity; Medellin.

Medellin and The Urban Cable-Car

Medellin the second largest city in Colombia has recently become one of the most talked about cities in the world, due to its rapid transformation from a violent, drug cartel controlled city to a city that aspires to be more socially inclusive. This transformation has been encapsulated by new forms of urbanism that aim to engage the poorest communities and a municipality that inspires to integrate all of its citizens into one city. The most important urban upgrading project used to develop this was 'Proyecto Urbano Integral' (PUI)[1] and this aims to increase the quality of life for inhabitants, focusing on areas where poverty and violence is most visible. Its strategy focuses on an integral and comprehensive approach, providing each project with three main components – a physical, social and institutional component. Yet, one of the most essential elements to its initial success was the newly opened urban cable-car, which connected the previously isolated neighbourhoods and this intriguingly was not initially a part of the program. However, it quickly became more than just a simple transport connection, it enabled the upgrading projects to become a part of the citywide transformation process and opened up the neighbourhood (and the realities within) to all citizens of Medellin. This saw major changes occurring in some of the most violent and poor neighbourhoods of Medellin and with it much international acclaim.

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This brings to the forefront the importance of the urban cable-car in this upgrading programs and allows us to speculate the important role of spatial connectivity in the overall transformation process of Medellin's informal settlements. In the past this has been explored using Space Syntax (Goodship, 2015a) (Goodship, 2015b). Here the spatial analysis of the city reflects many of the standards patterns that would be expected. As the informal settlements showing a high level of centrality when a anaysed at the local scale, then the city centre shows a higher levels of integration at a larger scale and the most important 'through' routes are picked for local urban centres. Then when the cable-car is introduced to the analysis the impact, while very small, is picked up and shows where the cable-car connects best with the rest of the city, thus allowing the local urban centres surrounding each station to have transform differently.

However, the locations of the cable-car lines are on very steep slopes and when the results of this analysis are examined more closely, specifically at a local scale, (Figure 1) it becomes apparent that the analysis does not pick up elements that may hinder movement, such as steepness or poor road conditions. The steepness and complexity of the locations of each cable-car line can be easily understood in 3-dimenstions and with the contour map of the city. This is essentially why the cable-car transport system became so successful, since it could traverse up and down the steep valley faces unhindered. From this brief overview it is easy to appreciate why the steepness of certain streets may influence forms of natural movement in and around each cable-car station. So while Space Syntax has a tradition of accurately recording movement, via its 'to' and 'through' space measurements, it is possible that it's 2d dimensional method of measuring space may not pick these types of local variables that affect local movement.

Local Movement

In order to understand how the local landscape affects local movement, a series of walking exercises where performed around each of the six cable-car stations (not the interchange stations), each roughly the same length and time. These exercises used GPS to record the elevation above sea level and the time and length of each walk so that an average speed can be calculated. While these measurements are associated solely to the author of this paper and therefore should be used as a valid indicator for a whole community, it does provide some basic movement evidence to confirm the influence the local landscape has of movement.

This shows that local movement and landscape is very similar for all the stations, apart from La Aurora. As the average walking pace for these five stations are between 3.28 – 3.67 km/per hour, which is significantly slower than the average pace of 5km/per hour on flat land and at La Aurora the average speed is 4.42km/per hour. This is also reflected in the average elevation height of each site, as on average the difference between the highest and lowest points of each walk is between 160 and 210 metres, whereas at La Aurora this is only 116m. This unsurprisingly demonstrates that the flatter the land the easier it is to move freely. While it is hard to use this type of data to develop scientific findings, as only one participate is used, these basic statistics are enough to make it apparent that the landscape is effecting movement differently around each station.

While it is evident that the local landscape is affecting movement, what is also clear is that public transport is connecting citizens to different spaces in the city at different speeds. This is important because the spatial connections of both the cable-car and the overground train system are included as equal connections within the spatial analysis of the previously discussed research.

The differences in transport speeds can be recorded in the same way as the walking observations. The average speed of the cable-car is recorded between 10.91 and 12.85 km/hour and the average speed of the overground train is between 31.79 and 33.33 km/hour. These are the average speeds recorded for the full length of each line, thus there are points along the line where the train travels faster or slower and during rush hour the time spent at each station maybe longer. Then when 15 different local bus routes (not the BRT) are recorded the average speed was 16.52 km/hour.

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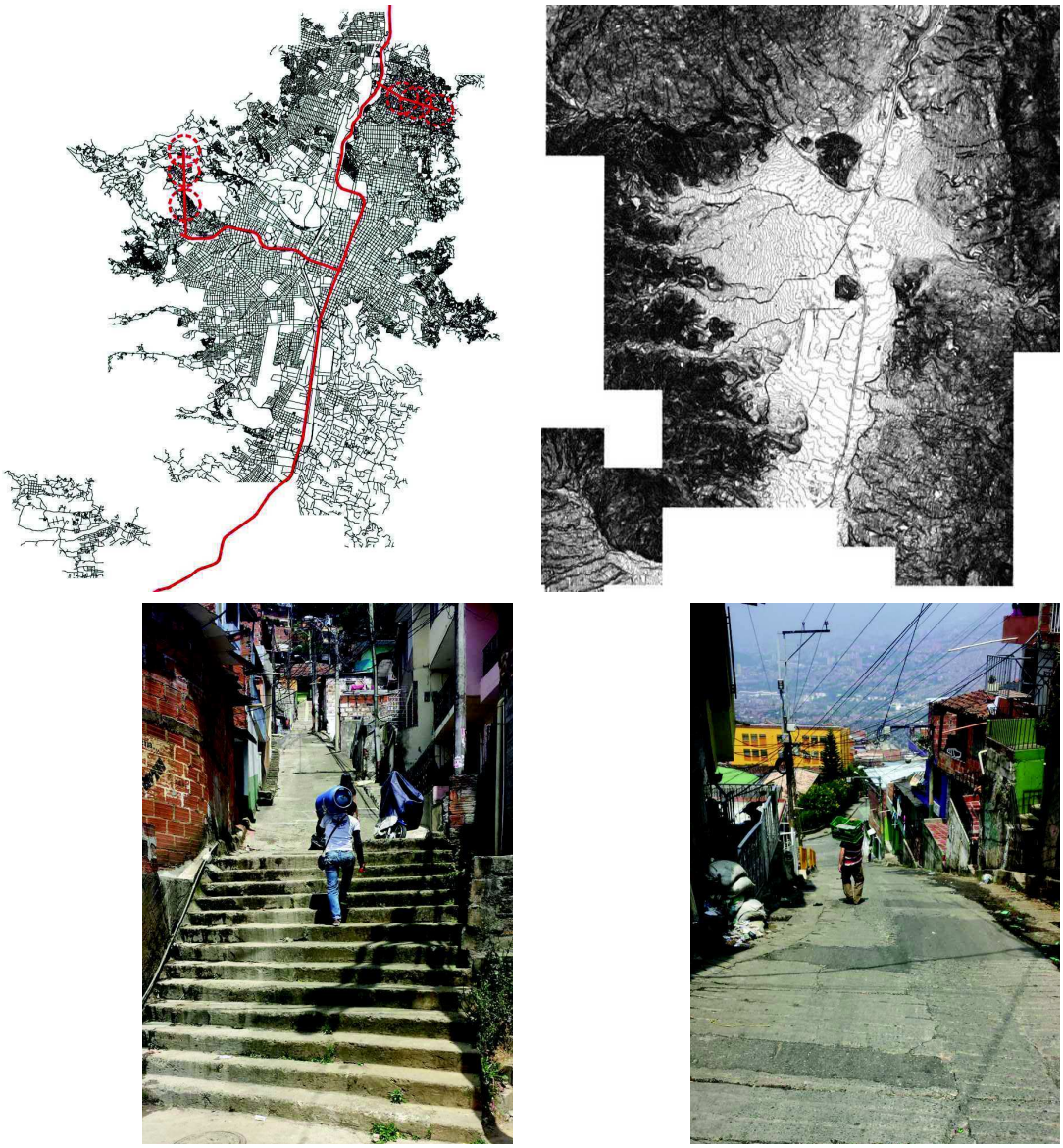

Figure 1.
Local Landscape. A) Medellin Urban Grid. Red line denotes Metro transport system. Dotted red circles denotes Cable-car stations. B) Medellin contour map. C & D) Calle 105 in Santo Domingo, a typical steep street found in an informal settlement

What these results clearly demonstrate is the way different spaces in the city are connected by alternative forms of transport (not including private vehicles) and how the connectivity of each is comparable by speed. For example, if someone used the Metro system (both the cable-car and overground train) to go from the Santo Domingo to the San Antonio in the city centre, this would take 22.5 minutes and using a bus to travel to the same destination would takes 30 minutes, though this can be heavily affected by traffic. Then to walk between Acevedo and Santo Domingo this takes around 45 minutes because it is up the slope, whereas the opposite directions is much shorted at 30 minutes. Understandably, connections between similar spaces vary significantly between different forms of transport and landscape. While this is very obvious, in cities like Medellin movability is very important when understanding the role of spatial connectivity, since these significantly affect the way different spatial connection (Figure 2).

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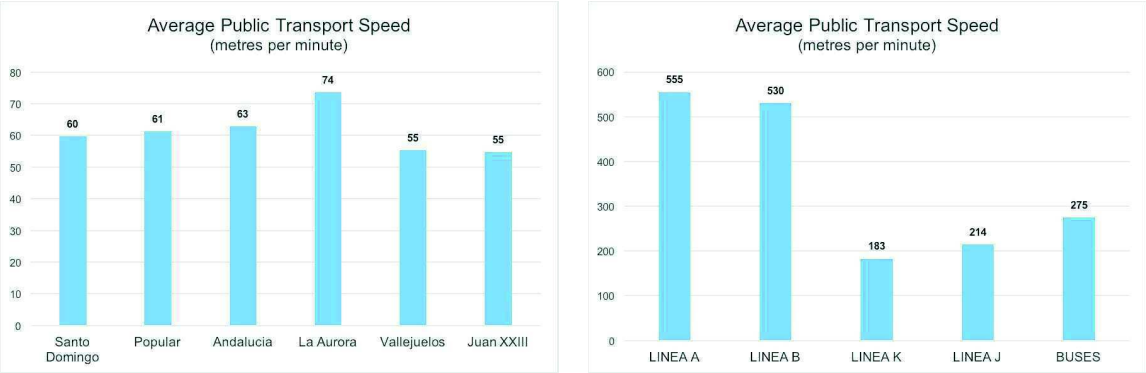

Figure 2.
Varying Movement Speed. Left - Average walking speeds within surrounding areas of each cable-car station. Right – Average public transport speeds in Medellin

Spatial Connectivity

This bring into question the use of a two-dimensional spatial analysis technique to measure the impact, since local conditions are clearly influencing movement. So, while Space Syntax has a long established connection to urban theory that can 'link physical aspects of the urban system with its functional, social and behavioural aspects, directly and seamlessly' it could be possible that it's two dimensional restrictiveness may prevent these local conditions from being a part of the analysis (Karimi et al 2013).

As Vinicius Netto points out 'few sociospatial approaches have been quite so polemical and stirred quite so many different responses from scholars of the city as space syntax' (Netto, 2016). So whilst Space Syntax has established itself as a both a reliable methodology and a well-respected urban theory, there are still many detractors. He further explains that many cite its epistemological limitations and 'accuse the theory of excessive formalization and geometric reduction, questioning its capacity to represent the city, its morphology and transformations, and the partial way in which it captures the complexity of the social world' (Netto, 2016). This suggests that Space Syntax can be seen to create a world that is almost exclusively pure geometry and structure, to allow its analysis to focus on configuration and hierarchies. Yet, building heights change from one location to another, thus modifying movement - taller buildings acting as generators of greater movement (Ratti, 2004). Then another commentator Stephen Read points to two commonly stated weak features, 'one is its tendency to treat the urban object as a thing bounded by the limits of the densely built fabric of the centre; the other, to treat all movement spaces equally when it is quite clear that different classes of physical space in the fabric of the city perform quite differently at the levels of urban speed and function and at the level of the human experience of space and time' (Read, 2005). Hence, while it provides 'indices associated with forecasting trip volumes, these are not based on models which stimulate processes of movement and thus do not provide methods for predicting the impact of locational changes on patterns of pedestrian flow' (Ratti, 2004). This presents the argument that Space Syntax can be seen to negate the way that urban mobilities and everyday dynamics affect the space of the city, especially at the level of the individual.

When we consider how we connect between the spaces, walking is of the most basic form of human movement. However, people do not simply overcome distances, 'they move within cities with different objectives, such as to do shopping, to socialize, to go to some particular space or only to wander. Everyone moves in his own way, with their unique mental and physics distinctive peculiarities and motivations. However, human behavior is based on a number of shared decision-making parameters and spatial accessibility restrictions imposed by the environment where it occurs.' Yet, it can be said that this dynamism and individuality is generalised within Space Syntax with the

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analysis instead the focusing on the larger object (Zampieri et al., 2009). If we do not consider movement in all its dimensions we are simplifying the reality by 'reducing the way we understand the pedestrian's behavior, disregarding important attributes like: ambiance; socialisation elements; health and rest; and aesthetic' (Zampieri et al., 2009). With this we start to understand the complexities that surround the simple act of walking from one space to another and whilst Space Syntax map these conditions depending on connectivity, for the individual there are many local factors that influence the simple act of walking between two points.

Alan Penn points out that Space Syntax as a theory 'measures how specific 'space' is constituted by its relations to all other 'spaces' in a system, while the theory consider an individual's identity to be constituted, not only by their subjective view, but also by the view of all others in the social group' (Penn, 2003). He points out that 'there is considerable interest in understanding the mechanisms at the individual level that give rise to these observed regularities in aggregate behavior' (Penn, 2003). This is because the dimension of time within which individuals experience the spatial and social environment is always changing. The time dimension brings with it the issue of metric space since individuals can only move within a relatively constrained range of speeds. Stephen Law et al further discuss how 'in an age where citizens are connected in an endless city of intertwining social, transport and communications networks, there is a need for Space Syntax analysis to look beyond the street network in exploring how different networks impact upon today's society' (Law et al., 2012). Thus arguing that 'the decrease in travel time through faster modes of transport, allows for a further accumulation of towns and the emergence of the metropolis. Underground stations emerge as multi-modal hubs with high volumes of pedestrian activity, land use intensity and specialization. They play an important role for the spatial economy and shift town centres from the original location' (Law et al., 2012). To prove this Law et al created a series of experiments to demonstrate how certain neighbourhoods in London located next to underground stations are better integrated. This is not attempting to reinvent Space Syntax, but instead build upon what is successful and push for a for stronger integration between the traditional configurational analysis and geographical analysis from other sources, to create more dynamic analysis (Law et al., 2012).

For many critics Space Syntax is not fulfilling its potential as a method for understanding the dynamical forms of the contemporary city (Ratti, 2004). However, both Read (2005) and Netto (2016) clearly conclude that Space Syntax in its ambition is a way to understand complex effects, on the horizontally distributed social body of the city and its physical infrastructural movement. It ability to focus on and fully understand one key element of city – space – and connecting it to various socio-political and economic conditions has made it a very power theory in recent times. Therefore, while its neutrality in measuring space maybe seen as a weakness, it is also its greatest asset (Netto, 2016).

The Objective

To understand the role spatial connectivity plays in the transformation process of an informal settlement it is important to understand what is meant by spatial connectivity. Typically, Space Syntax measures connection points within the spatial network of the city and these can then be associated with certain local conditions. Yet, as discussed, the way each individual moves between these points varies dramatically on the mode of transport and the local landscape. In order to further explore the role of spatial connectivity this paper explores the worthiness of weighting the spatial network of a city with the dynamic measurement of 'speed'. At its purest form 'speed' represents the simplest method for measuring the connection times between of different parts of the city and can represent multi forms of movement, such as public transport and walking. Therefore, this article examines the influence that extreme topologies and unhindered transport systems have on the connectivity of a city and investigates if the variable 'speed' can improve the way spatial connections are understood. This is done through the case of Medellin, with

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a specific focus on the areas surrounding the cable-car transport system. This is because it provides an extreme topology with steep valley faces, where many informal settlements are located and offers a unique form of direct transport that floats over homes. This is not aiming to create a new complete methodology or contradict past ones, but instead explore and discuss how the dynamism of space can be better understood to allow the varying movement of individuals to be included in the spatial analysis of a city.

Methodology

In order to achieve this the paper attempt to examine a method that can combine local dynamic speed variables with the previously calculated spatial analysis results for Medellin. To do this an average 'speed' is calculated from two modes of movement - walking and public transport - for each segment of the spatial network previously developed (Goodship, 2015a). At this point it should be made clear that this does not include micro-buses, as whilst these are the most popular form of transport in Medellin they are very unreliable and difficult to record. Therefore, they are omitted for the ease of developing initial results. First the public transport speed is taken from the average speeds provided online and verified onsite using GPS and then the walking speed is calculated using the 'Tobler's Hiking Function' (Magyari-Sáska and Dombay, 2012). This uses the steepness of the landscape, the length of the walk and the average speed for a flat surface (5km/hour) to calculate the time needed to walk a define route, which can then be converted into an average speed. To make this an automated process for the spatial model, a local contour map is converted into an elevation raster image (each pixel has an elevation value), this then allows the start and finish point of each segment of the spatial model to have an elevation value, then the 'Tobler's Hiking Function' can calculate the time needed to walk each individual segment in both directions. These results are then converted into a speed value and used to create an average 'speed' map of the city. These results are then weighted against the previous spatial analysis results by normalising the 'speed' and 'spatial' results separately and then combined together to create 'speed-spatial' values for each segment.

These results are then correlated to local movement in and around each cable-car station. To do this a movement survey counts the number of people moving through an imaginary gate at 16 different locations within a 500m radius of each station entrance and is completed during a weekday between 5pm and 7pm. The movement survey is then correlated to the spatial analysis results, both including and excluding 'speed', so that a comparison between the two set of results can be made. This should allow the merit of 'speed' as a dynamic variable to become apparent and provide clear findings to form an in-depth discussion into its use. The aim of this paper is not to provide a comprehensive and complete model but to test the hypothesis that movement speed influence spatial connectivity, so that further explorations into its use can be performed in the future.

Results

When Medellin was previously modeled using standard Space Syntax measurements, the results were generally as expected yet, when these are examined more closely it is apparent that the analysis does not pick up elements that may influence movement, such as the steepness of the landscape and different modes of transport. Hence, there is the potential failing in this analysis. Therefore, to examine these potential failings a speed map of the city is produced, taking into account the movement of walking and transport and then this is combined with the previous spatial analysis to examine if there is an improvement in the results.

From this initial speed map, it is clear that the areas located on steep slopes have the slowest average speed and the area on the flat have the fastest and while this is very predictable it does verify the methodology. Also the areas with the slowest speed are often where the largest concentration of informal settlements are located. This shows similarities with the municipality's map for socioeconomic classifications and average land-values,

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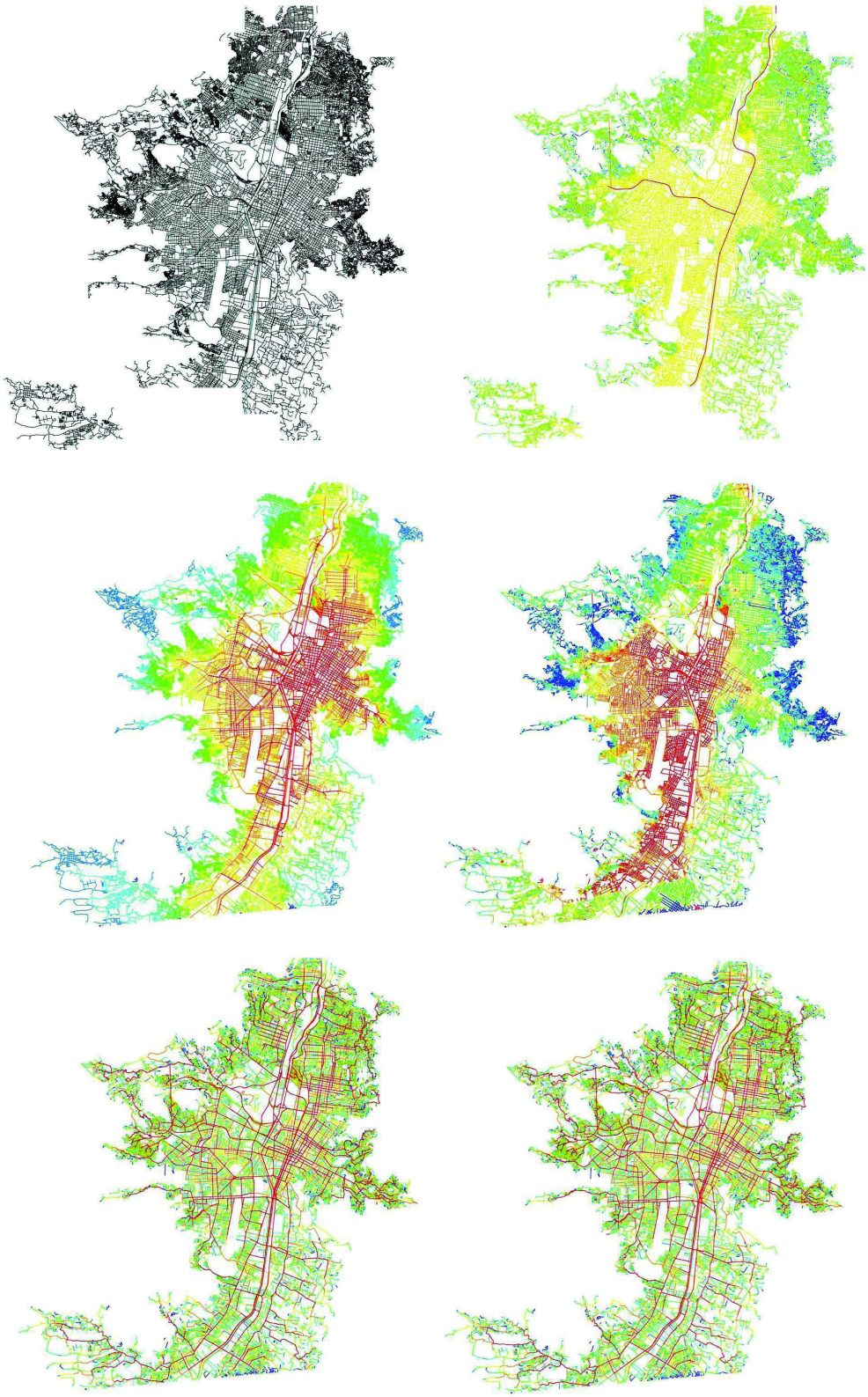

Figure 3.
Speed Maps. A) Medellin's urban grid un-analysed. B) Medellin speed map. C)Left - Standard Integration Map, Right – 'Speed-Integration' Map. D) Left - Standard Choice Map, Right – 'Speed-Choice' Map.

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suggesting it is possible to spatially link that the poorest and most deprived areas in Medellin with the steepest areas of the city, locations where affluent citizens would least like to live. Then, when this map is examined more closely around each cable-car station it is possible to observe some initial findings. Such as the roads that run perpendicular to the stations usually run along the flattest areas of each location and thus have the faster averages speeds, whereas the roads that run parallel to the cable-car line are much slower. Curiously these perpendicular roads are often picked up as important 'through' routes in the spatial analysis.

From this it is clear to observe that the segments surrounding each station have a significant number of low speed streets connecting to the cable-car. For example, at Santo Domingo along Calle 105 (Figure 1), which was picked up as an important 'through' space in the previous spatial analysis, the average speed is 1.7km per hour, yet along the main routes of Carrera 31 and 32, which are perpendicular to the station, the average speed is 3.39km per hour. This confirms that this method is picking up the large differences in movement previously demonstrated using GPS.

However, while the speed map shows basic urban information about the city, it would be difficult to say that this demonstrates anything that is not obvious to the general observer or is more advanced than a contour map. Yet, it represents a dataset that can be easily combined with the values previous generated using standard Space Syntax measurements, in an effort to examine if the accuracy of certain spatial connections within the city are improved (Figure 3).

When these values are combined it is possible to observe initial findings by visually analyzing the results. When the previous measurement of 'Integration' includes the weighted value of speed there is a change in the citywide map, with the main areas of centrality appearing to be smaller and more defined, with significant areas to the east and north of the city. This suggests that 'speed' provides a more accurate account of the whole city. However, at the local scale integration visually remains the same. When the same study is completed using the measurement 'Choice' there is very little impact to the overall city network of 'through' spaces, yet when the results are examined more closely around each station, the local 'through' space appears clearer. This is mainly observed between the metric radii of 1250 and 3000, which represents the network most closely associated with walking.

Hence, the introduction of speed as a weighted variable starts to show previous floors in spatial analysis more accurately to local conditions. However, it is important to test the relationship of these results to real movement patterns and this will also provide an opportunity to establish whether or not the 'speed' variable has improved the spatial model's relationship with movement.

When the measurement of 'Speed-Integration' is correlated to the movement patterns there is no significant changes in the correlations and this is understandable because only the large citywide maps show change. Hence, locally measured movement patterns are very unlikely to be altered. Yet, when the measurement of 'Speed-Choice' is correlated to the same movement patterns there is a general improvement with the correlations. However, the distribution of the highest and lowest correlations within the analysed metric radii network are all exactly the same. This show that whilst speed is improving the correlation coefficient values for each analysed network the actual finding in relations to the impact of the cable-car are largely unaltered (Figure 3).

These results reveal that when the 'speed' variable is added to the choice measurements 'through' space correlated better to local movement and this is understandable because the value of choice has traditionally been associated with local movement.

While this starts to demonstrate the worthiness of 'speed' it is useful to examine if the same pattern is observed between different cases, since each of these have different types of landscape. Hence the results for each cable-car line and station will be compared and this will be examined using just three different metric radii, which each represent a different urban scale (Serra and Pinho, 2013) and only the results for 'Choice' will be investigated, since they most closely represent movement. Starting with the comparison between each

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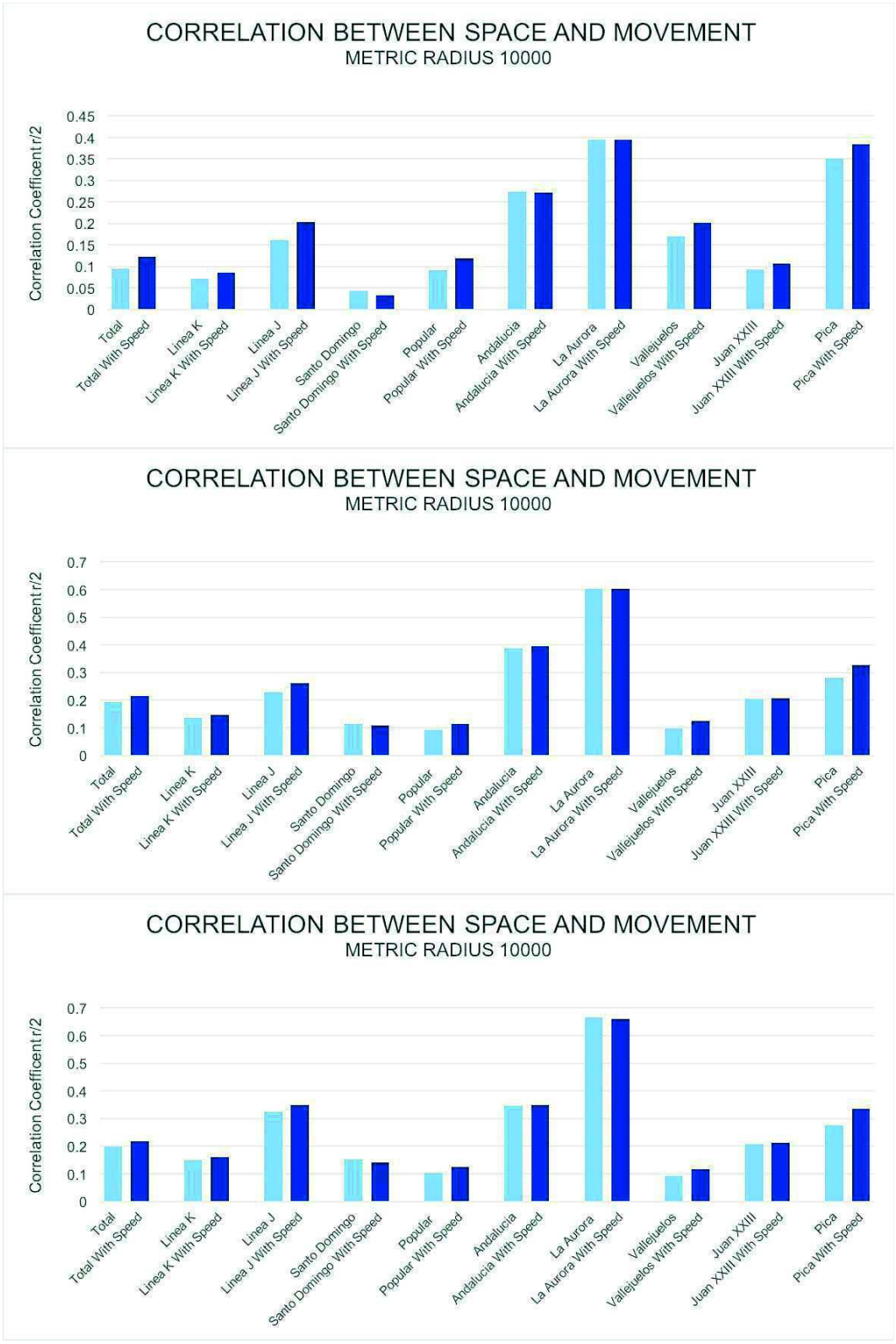

Figure 4.

Space and Movement. The correlation coefficient values between movement and space. Light Blue columns indicates standard spatial analysis; Dark Blue indicates 'Speed-Space' analysis. A) Metric Radius 1000. B) Metric Radius 3500. C) Metric Radius 10000.

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line both Linea K and Linea J the biggest improvements are at the metric radius 1000 with an increase between 15% and 21%, whereas with the metric radii of both 3500 and 10000 the improvements are smaller between 12% and 7%. This generally represents the same trend for all movements combined and as before the correlation coefficient values still remain low. This shows that the smallest network analysed, metric radius 1000, is improving the most and this is understandable since it is the most relatable network to walking, whereas the larger networks relate stronger to the road network (Figure 4).

However, when the surrounding area of each cable-car station is compared the results are more varied. For example, the stations along Linea K all show different results, at Santo Domingo the introduction of speed worsens the correlation at all three metric radii by between -32% and -6%, yet at Popular it improves this by between 24% and 17% and at Andalucia there is virtually no difference. For the stations along Linea J, at La Aurora the changes are very minimal, then at Vallejuelos the differences are again significant being between 21% and 15% and at Juan XXIII again the metric radii show positive changes between 14% and 2%. Similar to Linea K each case shows very different results, yet the landscape at each station along Linea J is also very different and as expected this should affect the results. This is because at La Aurora, which was recorded as the flattest case the results are virtually unchanged, whereas at both Vallejuelos and Juan XXII for metric radius 1000m, which represents a walking network, the changes are more significant. Then at Linea K the landscape is similar between each case, however the results are very different and this is most likely the effect of the larger attraction of the cable-cars. Here the cable-car is more

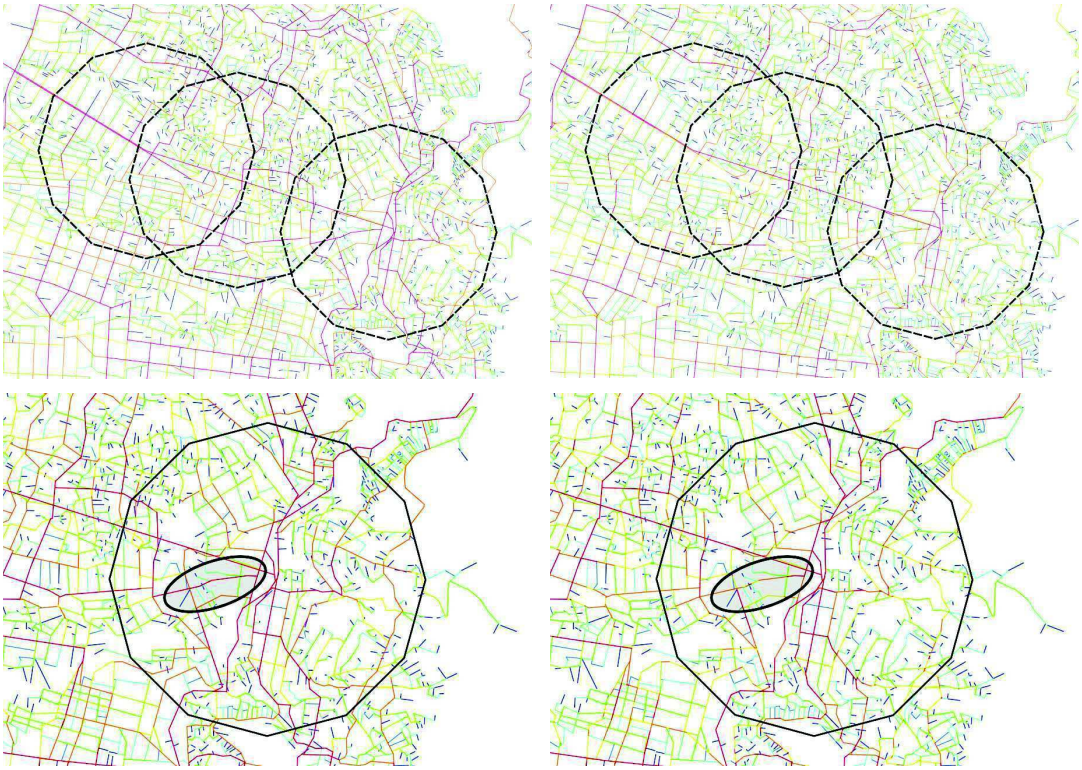

Figure 5.

Local Speed-Choice Results. A) Standard Choice at Metric Radius 3500 for area surrounding Linea K. Dashed circle indicates studied area for each cable-car station. B) 'Speed-Choice' at Metric Radius 3500 for area surrounding Linea K. C) Standard Choice at Metric Radius 3500 for area surrounding Santo Domingo. Highlighted circle indicates Calle 105 (figure 1). D) 'Speed-Choice' at Metric Radius 3500 for area surrounding Santo Domingo. Highlighted circle indicates Calle 105 (figure 1).

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heavily used, especially at Santo Domingo, this has the effect of encouraging a lot of movement towards each station no matter the condition of the pathway. Hence, at Santo Domingo the correlation worsens because the attraction of the cable-car and its nearby local commerce encourage pedestrian to use paths that have low spatial values. Whereas at Popular and Andalucia the cable-car's popularity is less, so movement is less likely to draw towards each station.

This can be further demonstrated by completing a similar study on a case that has a comparable landscape but no transport hub to attract movement. This is done using the case of Picacho on the opposite side of the valley to Linea K. Here the introduction of speed improves all three metric radii by between 8% and 18%, similar to when all movement and each cable-car line is related to the speed-space network. It is also worth noting that unlike the other cases the correlation coefficient values here are reasonable between 0.3r/2 and 0.5r/2, both with and without 'speed'. This demonstrates how the relationship between space and movement is often skewed when there is a central point of attraction.

While the relationship between local movement and space can often be influenced by local attractors, when individual streets are observed that are known to be affected by landscape the exact impact of combining speed can be measured. When Calle 105 at Santo Domingo was previously examined it was shown to be significantly slower than other street in the neighbourhood, yet the spatial analysis indicated this street as being an important 'through' space. However, when the exact values for this street are examined with 'speed' its importance decrease as the spatial values generated drops by 37% at metric radius 1000, and also at the other metric radii of 3500 and 10000, by 9% and 18% respectively. Whereas the other street that was also examined Carrera 31 and 32, while there is also a drop at metric radius 1000 by 27%, there is an increase in the values at both metric radii 3500 and 10000, by 7% and 9% respectively. This starts to show that the streets that are most affected by the landscape see a decrease in the spatial values calculated and this is most noticeable at a walking scale (Figure 4).

So while the introduction of speed increases the correlation coefficient between space and movement within local areas the influence of 'speed' is even higher when individual streets are examined. Hence, its use starts to show a more localised representation of each local urban grid, yet when the impact of a spatial connection like the cable-car is sought this method does not alter the overall results.

Findings

By introducing speed and combining it with the previous space syntax analysis of Medellin the 'to' space become more reflective of the city as a whole and the local 'through' space was easier to interpret.

This is because the central integration zones are more central and to the west of the city and reduces the areas to the north and east of the city centre that were previously well integrated. This intuitively represents a better image of the main areas of centrality, as the areas to the north and east of the city centre are very steep and harder to walk. However, when the speed-integrations values for each individual case study is examined visually there are very few differences. So while speed is helping to clarify the integration values for the whole city, it is doing very little to improve the understanding of each individual case.

Yet, with the choice-speed measurements it becomes clear speed is enhancing the interpretation of natural 'through' spaces within the local areas surrounding each case study. Speed also makes local movement patterns easier to understand, as it demonstrates how local natural movement can be better understood. In Santo Domingo, the introduction of speed decreases the importance of steep streets like Calle 105, yet it also increases the importance of streets like Carrera 31 (Figure 5). This starts to further suggest speed is helping to improve the understanding of natural movement. This is also noticeable at La Aurora, where the landscape is relatively flat in comparison to other stations, so the introduction of speed does little to improve correlations. Yet there are also local attractors that influence the relationship between movement and space as the cable-car stations and surrounding commerce encourage

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people to move towards them even if the roads are badly connected or very steep. This is less noticeable at cases like Picacho that do not have central points of attraction.

Yet, when the same measurements are observed at a city scale, the use of speed is less relevant, since none of the major through routes are altered. Therefore, the use of speed improves the integration results for the city's most central 'to' spaces, then with choice it makes local 'through' spaces, specifically where natural movement occurs, easier to understand.

While the combination of 'Speed' and 'Choice' improves the visual interpretation of the local areas and enhance the correlation with movement by between 10 and 15%, when the distributions of the top and bottom correlations are observed these rarely alter. Therefore, if this is examining the impact of the cable-car and not the role of the landscape, the introduction of speed does very little to alter the findings, since the most significant metric radii with the highest correlation coefficient values are exactly the same as the standard spatial analysis. This demonstrates that the use of speed in understanding the overall role of the cable-car in the transformation process of each informal settlement is not greatly improved, since the same findings are available without this measurement.

For this one individual case, it is clear that speed offers a variable that can alter and enhance spatial analysis results. This is specifically useful for cities like Medellin where the landscape and urban fabric prevent homogenous spatial analysis, therefore movement patterns need to be observed differently and speed provides a good solution to alter a spatial model. With the introduction of a measurement like speed it is possible to make the city more dynamic for the individual and mode of transport (Fig 06). For example, if a candy floss seller is unable to use the cable-car and metro overground train, they are most likely to use the bus or walk, so with the use of speed the spatial analysis model can be adapted for that individual who has specific needs. However, the real benefit of introducing a 'speed' variable to the analysis of a city like Medellin, is that it starts to include the three-dimensional element on the local landscape, which is hugely significant here and this helps to represent pedestrian movement in a clearer manner.

Reflections

The introduction of 'speed' creates a uniformed increase in the correlations between movement and space and this is also visually demonstrated in the spatial network of the city reflecting a more intuitive representation of the city. Yet there is little change in the distribution of the highest and lowest correlations for each analysed network, indicating that the measurable impact is not improved. Therefore, it is worthwhile reflecting on some of the elements that need refined for future research.

As the analysis includes a speed measurement for both metro-train and cable-car transport connections the most popular form of public transport in Medellin, the micro-buses are not included (Sarmiento et al., 2013). So while this form of transport is hard to map, as previously mentioned, it is still important to include this in future studies since it is an essential from of transport for this city. It is also worth noting that the speed of the public transport represented at average speed for the whole line, but this does not include the transition times through each stations or varying speeds for different parts of each line. This is important for the overground train, since it travels at different speed between different stations and waits longer at certain stations during rush hour, whereas the cable-car speed is fixed.

Another potential failing with testing the results is the movement survey. The speed weighted maps show clearly walking paths at a local scale and by tested this against the onsite observations these results should be verifiable, yet the movement survey was limited to 16 main junctions within 500m radius of the cable-car station. This is because the movement surveys are a part of a research project that focusses on the impact of the cable-car and not testing 'speed' as a measurable variable. Hence, to improve accuracy future movement surveys should cover a larger area and include more pathways on steep inclines.

While the local movement survey and exact public transport speeds used to confirm the

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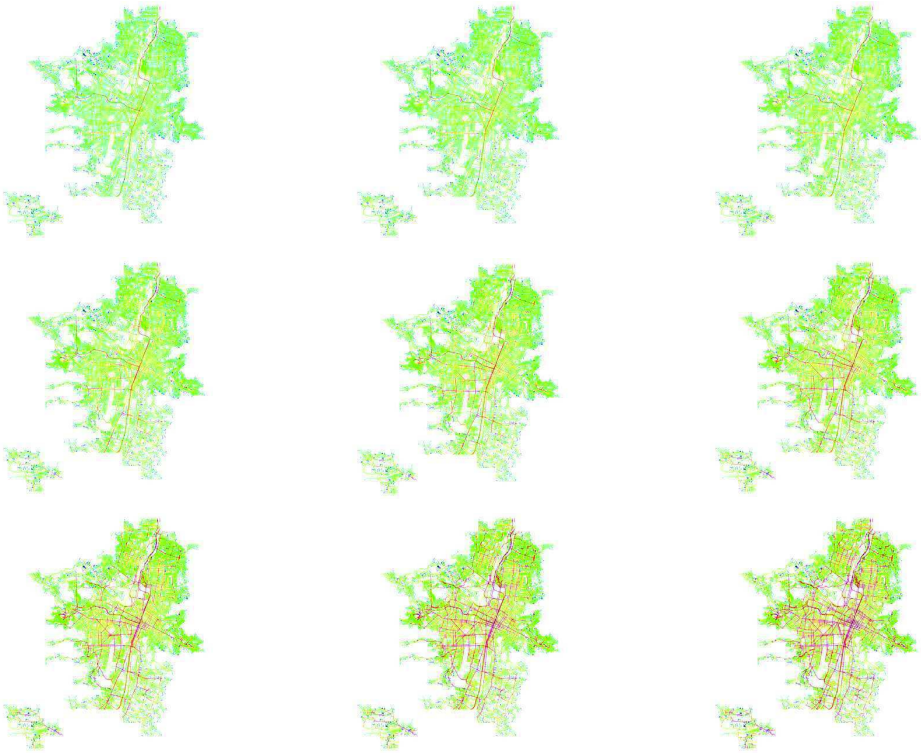

Figure 6.
Dynamic Speed-Choice Potential. 'Speed-Choice' results using different average speeds. A) 'Speed-Choice' at 2km per hour. B) 'Speed-Choice' at 3km per hour. C) 'Speed-Choice' at 4km per hour. D) 'Speed-Choice' at 5km per hour. E) 'Speed-Choice' at 6km per hour. F) 'Speed-Choice' at 7km per hour. G) 'Speed-Choice' at 8km per hour. H) 'Speed-Choice' at 9km per hour. I) 'Speed-Choice' at 10km per hour

results are not extensive enough to prove this is as a complete method, there is still enough evidence to suggest 'speed' could be fruitful for future spatial analysis. This is because the methods used here to formulate the speed map show clear merit and when combined with spatial analysis local improvements are observed. This could then provide a better opportunity to understand the spatial impact of different forms of movement. This is especially important when considering individual needs, as certain physical and social restriction often hamper movement, so the dynamic measurement of speed and mode of transport could be adapted for each individual case.

Conclusion

While this research strives to understand the impact of urban cable-cars, it is important to understand and evaluate the role that space has played in reconnecting isolated areas. One of the most reliable methods for doing this is Space Syntax. It has an established and trusted association with measuring and predicting the impact of spatial interventions and in the past has been used to discuss the transformation process of informal settlements. Yet with the case of Medellin, its steep sloping valleys force people to move differently making the use of Space Syntax questionable, since it does not traditionally pick up these local factors. It is for these reasons this paper has explored the worthiness of 'speed' in spatial analysis. It provides a pure value for the connection between different spaces representing the way individuals move along routes, whether steep or flat and accurately shows different forms of transport. So, by acknowledging that urban space is something more dynamic that simple linear connections, this provides an opportunity to explore how it can be perceived in different locations and through different mechanism that connect us from one space to another.

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Urbanization dilemmas in Delta Cities. Interdependencies between formal and informal urbanization processes in Barranquilla, Beira and Ho Chi Minh City

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Abstract. *Research Delta Cities in developing countries face problems of water risks while also dealing with enormous population growth. Recent urbanization is increasingly taking place in high risk areas. When looking into these recent urbanization processes, we can discern two different dynamics, formal and informal ones. They relate in different ways to green, grey and blue infrastructures, and have their own formal and informal institutional drivers. Modern technocratic planning methods do not positively interfere with informal city growth. On the contrary, often water problems are shifted to the lower and informal parts of the city. Inclusive green planning should take into account local urbanization practice.*

Keywords: Informal urbanization, green infrastructures, delta cities, developing countries, inclusive green growth

Introduction

Global challenges will most heavily impact those areas where the world's population is concentrated; in urban regions. These challenges are further concentrated in urbanizing deltas, where both natural and socio-economic pressures on the city are often emphasized by, on the one hand a high economic value, and on the other increased vulnerability from water-related consequences of climate change. It is clear that urbanizing deltas, regions in which people are, for their quality of life, strongly dependent on the assets as well as the risks of the natural ecosystem, are most vulnerable (Ligtvoet et al, 2014).
Starting point for the research is the fact that in Delta Cities there is a struggle between urban growth and water issues. Due to the natural condition, there is strong correlation between local and systemic issues in urbanization. (Meyer & Nijhuis, 2013) Planning practice is dealing with this issues most often in rational and technocratic ways. But there is a huge gap between what could be called a rational, integral planning approach based on risk assessment and what is feasible in the day-to-day urban reality. Cities are poorly understood. Different urbanization processes interfere with each other in sometimes not so predictive ways. Morphological research can outline the character of the spatial problems cities are facing. It can structure these problems and can identify driving forces of urbanization processes. The gathered knowledge can be used to make improvements in local projects and planning strategies. The Netherlands Environmental Assessment Agency carried out a morphological case study research in three delta cities: Ho Chi Minh City in Vietnam, Barranquilla in Colombia and Beira in Mozambique (Bijlsma et al, 2017, to be published). Their common denominator is their position in deltas or river basins, but these cities are quite different in various other aspects. Recent urbanization processes were analyzed with the aim of finding local and systemic leverage points for inclusive and green growth.

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Methodology

Of particular interest is that growth in these cities takes place in a very different way from that of the top down planned delta of the Netherlands. The dynamics of water and city are traditionally aligned in the Netherlands with the discipline of the planning and drives on cooperation from a number of essential institutions, including water boards, state waterways and municipalities. Current urbanization trends in emerging economies take place in a less organized way. The city is growing through planned and unplanned urbanization.

To analyze the spatial dynamics in these delta cities we use the Dutch layer approach. This approach has proven its services in the adaptive planning of the Dutch Delta (Meyer et al., 2015). In order to cope with the informal urbanization in developing countries, a further conceptual distinction has been made between the formal planning of hard infrastructure and building tissues on the one hand and the soft, natural infrastructure and informal tissues on the other. In addition, a relationship has been established with the (local) economy, leading to the 6 vertices of the conceptual hexagon model. By adding the upper vertice it becomes clear to what extent morphology is related to a locally rooted lifestyle of the inhabitants. (Fig 1)

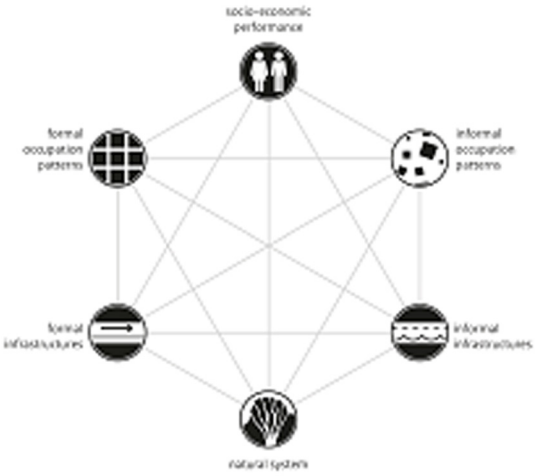

Figure 1. The hexagon model: the Dutch 'layer approach' with a formal and informal side

The hexagon model is helpful in constructing a story about local urbanization that explicitly addresses the (mutual) relationship (s) that soil, infrastructure and formal and informal urban developments can have with one another and with the local economy. By connecting the elements of the hexagon model based on the insights from the morphological analysis, a first qualitative impression of the dominant relationships occurs within formal and informal urbanization. The hexagon can be applied for analyzing spatial as well as institutional relationships within different urbanization processes. "Drawing lines in the hexagons" creates an image of the cohesion and (possible) interrelated mechanisms that play a part in restoring the resilience of the delta. The three cities are analyzed through the scales: with the hexagon as a guidance the scale of the neighbourhood is related to the different city systems.

The delta system: the struggle for space between city and water in three cases

All deltas in the world face a growing population which is increasingly occupying vulnerable grounds, because of population growth and urban pressure in central areas. This is also the case for our three study areas. The natural condition of the delta is roughly defined by altitude in relation to the sea level. In our three case studies, we see large differences in altitude. It defines if the urban water problem comes from the sea, river or sky. Ho Chi Minh City has developed on the higher sides of the river beds. The city of Beira sits in a swamp, protected by dunes parallel to the coast, and Barranquilla has developed itself on steep slopes.

The delta issue is further defined by the urban growth. Also urban density, which has impact on petrification and subsidience of soils, is important. These aspects differ for our three cities. Ho Chi Minh City is our biggest city, has a steep growth rate and high densities. The city of Beira is small, but has grown substantially in the last decades. At the same time the density is still relatively low, with a lot of farm plots in the city. Barranquilla has the highest density

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of the three. If we analyze the spatial growth patterns we see that in all our three case studies the city initially developed on the safe and higher parts. Now that urban pressure is rising, also the more vulnerable areas in the central parts of the cities are being urbanized. In Ho Chi Minh City we see recent urbanization in the central river beds, in Beira in the swamp areas and in Barranquilla in the flood plains and landslide areas. (Fig 2).

The flood risks differ for each city, and depend on vulnerability to sea movement, river flow and precipitation. The actual flood risk in Ho Chi Minh City and Beira comes from different sources, but in Barranquilla extensive rainfall is the major problem. Also the interdependency between local developments and the urban water system vary. In Ho Chi Minh City and Beira the interdependency between local and systemic urban water issues is much greater than in Barranquilla. The amount of formal and informal growth varies for each case. We provide an indication based on different, mainly local, sources. In Beira large parts of the city are developed in an informal way. Also in Ho Chi Minh city this is the case. Both cases show a fine interweaving between formal and informal urbanization patterns. In Barranquilla the amount of informal tissue is small, due to the fact that informal areas are quickly formalized. Here we see a large segregation between formal and informal areas. (Fig 3)
The struggle between the space for city and the space for water is fought in the centrally vulnerable areas, which have been urbanized in the last 15 years. How do poor and rich people build in these vulnerable areas, and how do they influence the water system? We look at urban expansion that has taken place in vulnerable areas over the past 15 years.

Formal and informal urbanization of flood prone areas.

To illustrate the research method we use the case of Ho Chi Minh City, formerly known as Saigon, in the Dong Nai river basin as an example. We zoom in on two recently built neighbourhoods in Ho Chi Minh City, which are constructed in vulnerable areas. One is situated in the Thu Duc district. Here urbanization took place in a more or less unplanned and informal way. The other one is Sunrise City, former District 7. Here the urbanization has a planned and formal character. The urbanisation at these two locations results in entirely distinct morphologies, as seen in the sections of the two areas (Fig 4).

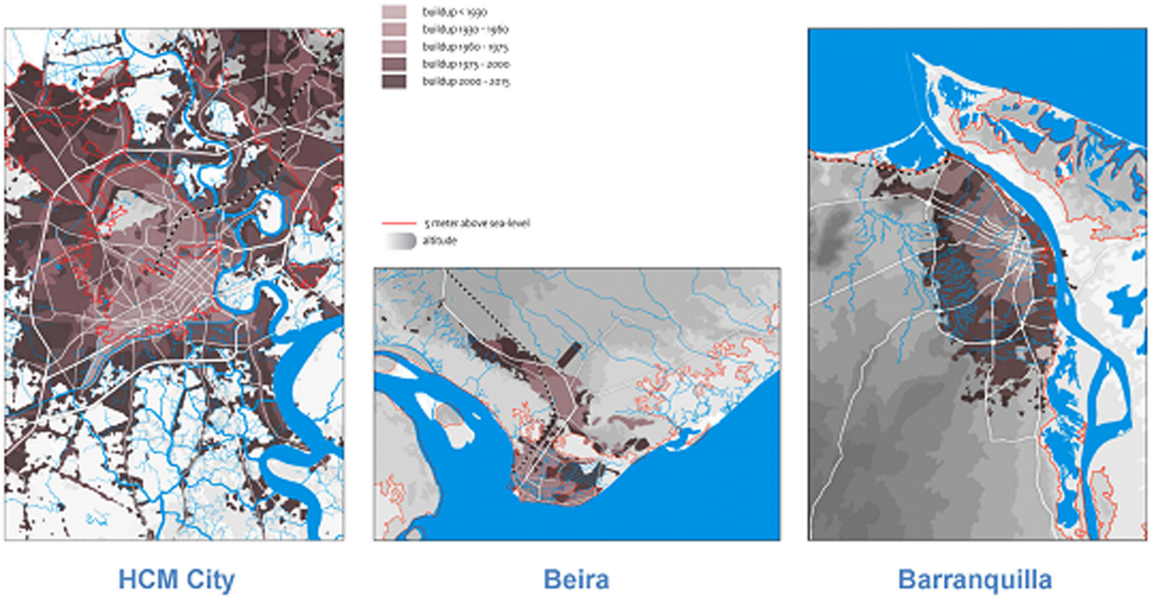

Figure 2. urban growth from 1950 to 2015 in Barranquilla, Beira and HCMC

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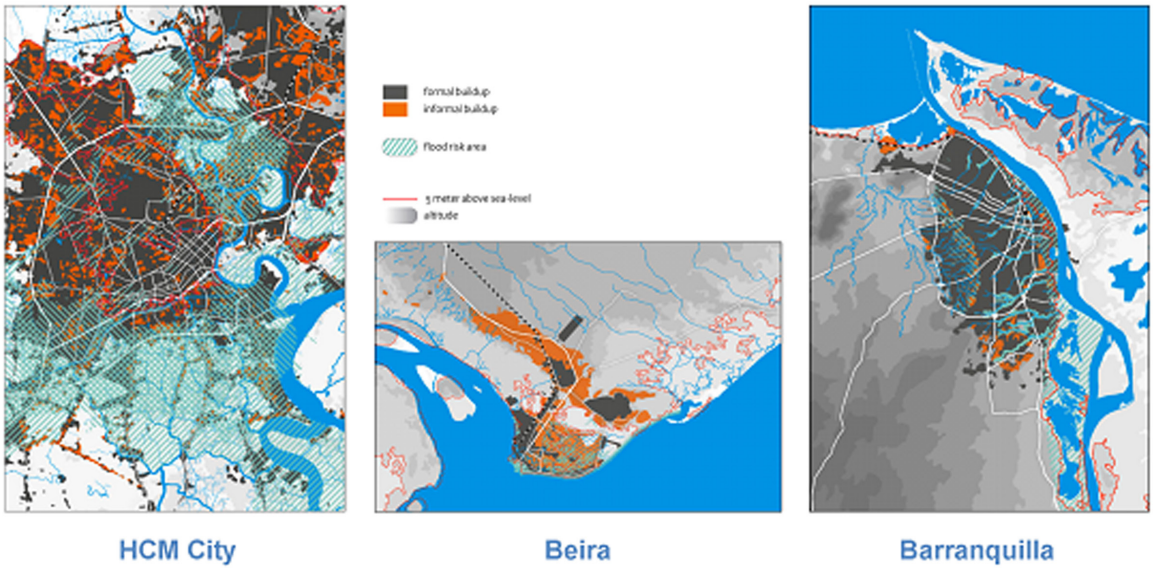

Figure 3. dispersion of informal settlements in Barranquilla, Beira and HCMC

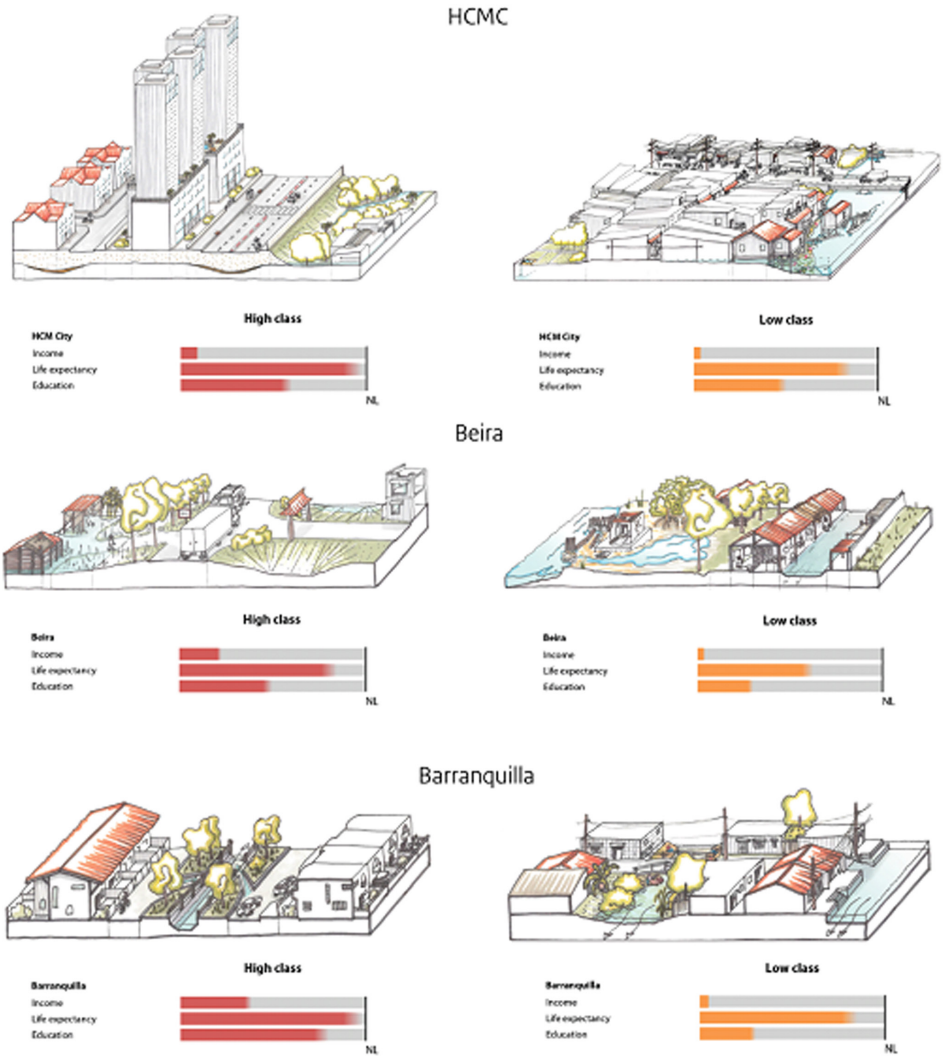

Figure 4. formal and urbanization of flood prone areas in Barranquilla, Beira and HCMC, 2000-2015

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Taking the morphological relationships in the hexagon as a starting point, it's possible to identify the most important participants for the established urbanization process in this area. Informal urbanization is mostly realized by local capital. Local investors and commerce is putting efforts in building houses, roads and local economy. Local roads and watercourses are maintained by public authorities. There is also some foreign investment, mostly related to new highways and sluice gates. Local authorities, like the district wards, have a mediating role between informal and formal institutions, the formal and informal side of the hexagon.

The formal district of Sunrise City was also built in the flood plains in the last 15 yeards. It is a large commercial residential development. In the layout of the area, different types of plots and buildings were included:
Along the main road we see large highrises and commercial facilities like shopping malls, and indoor recreation.

Within the district along the connecting roads we find individual plots with apartment houses and small commerces, like beauty saloons and coffee shops.

3. Inside the building blocks we find individual residential villas, single family houses, around collective gardens and a pond.
Project developers in large-scale residential expansion districts in South Saigon are creating different growth patterns. New city structures are not attuned to the old river beds; canals are drained and entire city structures are built onto a thick foundation of sand, with not much room for water storage. Thus, a new artificial city system is imposed to the former natural system. The two systems are poorly interconnected, each with their own water system and infrastructure. – this might enlarge water risks but also might lead to segregation between rich and poor areas, replacing the earlier mix of the two along the old roads.

The neighbourhood is constructed in one go. It has a rational lay out and new types of public and collective space emerge here, like motorways, gardens and ponds. Although the project mainly consists of dwellings, also different types of commerces emerge along the connecting roads. The informal economy is not so big as in Thu Duc. There is also a large formal economy here.

If we describe the spatial relations of the Sunrise city growth pattern we see that the most important physical relationships are between formal occupation patterns and formal infrastructures, like roads and artificial water infrastructures. Also local economy is related to both aspects, in new building forms like indoor malls, but also within new interpretations of the traditional shophouse. The development is detached from vernacular infrastructures and the natural system, but also relates to it in the sense that it has reduced the original floodplains.

If we identify the most important participants for this local urbanization process in this area we see that the urbanization is mostly realized by participants and investors from outside the area, and is facilitated by local authorities for the construction and connection of the roads and watercourses. The existing vernacular urban pattern is at some points connected to the new constructed urban layout, but not at all points. The main participants of this particular urbanization process are all on the formal side of the hexagon, and there is little connection with the informal side.

In Ho Chi Minh City these different urbanisation processes of flood prone areas occur simultaneously. If we relate these urbanization patterns to the urban system at the level of the city or the region, we see some trade off between formal and informal processes. How do these processes affect to the urban water and infrastructure system, what are the interdependencies between the different layers? In this case we see that new connecting roads trigger local economy and formal urbanization. And we see that both formal and informal occupation reduce the local capacity of the floodplains, each in its own way. However formal urbanization is moving problems elsewhere. By closing off watercourses and raising groud levels the water storage capacity of the river diminishes – with increased flooding in the lower, informal parts of the city, as a result.

If we look at our three cities we see some similarities. (Fig 5) Formal urbanisation is connecting to gray, hard and artificial

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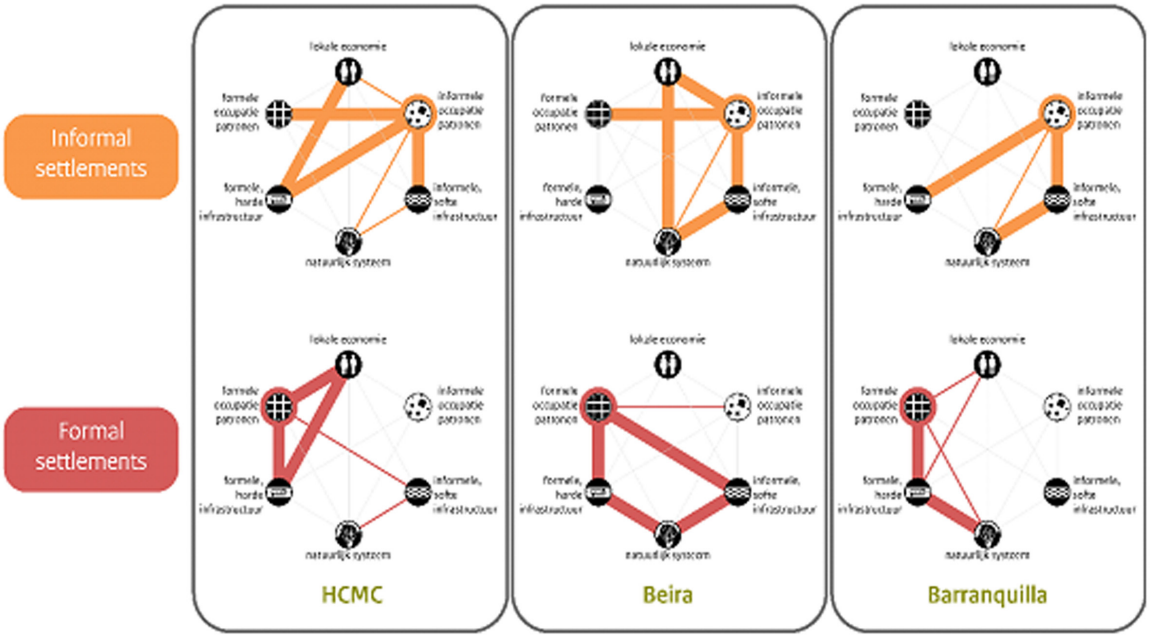

Figure 5. Mapping interdependencies in the hexagon model in Barranquilla, Beira and HCMC

infrastructures. Its development is planned by government authorities and supported by the financial sector. Informal urbanisation is settling amidst green infrastructure, using adaptive tactics that are in line with the local culture. But we also see differences. The hexagons show that urbanisation processes differ. Also the interdependency between local developments and the urban water system vary. In Ho Chi Minh City and Beira the interdependency between local and systemic urban water issues is much greater than in Barranquilla. A proper understanding of these distinct processes and the mechanisms behind them, is a prerequisite for inclusive, sustainable improvement.

Conclusion

The analysis of historic development of the delta shows that over many years a specific, cultural smart way of dealing with the risks of living in a delta was developed. People knew how to build infrastructure and houses in a way balancing the assets and the risks. The mass urbanization seems to bring an end to this culturally embedded, smart urbanisms. Technical solutions are too easily imported. This is a real loss as it leads to not just to increased vulnerability but also to a loss of the social-cultural identity of cities.

The analysis of formal and informal urbanization processes reveals that the formal development strategies and the tactics of informal communities have completely different logics and mechanisms. In most cases these do not reinforce each other. On the contrary, they show strong trade-offs. Different urbanization processes interfere with each other in sometimes not so predictive ways. Informal urbanization takes place incrementally and sits in green infrastructures and natural environments. Formal urbanization is connected with grey infrastructures and displaces both informal settlements as well as water problems to other parts of the city. Both these urbanization processes are embedded institutionally in particular ways: informal urbanization makes use of local capital and informal institutions, while formal projects generally make use of FDI and formal institutions. Infrastructure is embedded in its own way, with a strong link to national governments (ODA) and intergovernmental organizations such as (in particular) the World Bank.

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Formal (government) strategies in spatial planning often do not take informal patterns of urbanization into account, or effects of displacement that result from formal projects (for new settlements, green or grey infrastructures). Green and inclusive growth is hard to achieve with modern technocratic planning methods, because these are often unable to interact positively with the local culture of urbanization. Introspection and use of local knowledge is necessary to achieve the much-needed tailoring of urban projects. A new research agenda for inclusive and green growth should focus on translating lessons from the Western planning theory to local urbanization practices. This calls for new transdisciplinary ways of research and planning, with the involvement of both local and international partners.

The hexagon model was employed to ascertain the most relevant relationships and key local actor organizational processes. It further facilitated in assembling academic system knowledge about deltas and wetlands, expert knowledge within local projects and neighbourhoods along three distinct lines of natural risk, urbanization processes and governance capacities. The hexagon model can be broadly applied in two scenarios. Firstly, within the local context, it can be applied in short-term tactics in combination with long term city and water strategies. Second, through its application, inter-urban learning is strengthened to create specific learning groups based on similarities of local projects to identify stakeholders to establish new partnerships.

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Historic-geographical and typo-morphological assessment of Lefke town, North Cyprus

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Abstract. *Morphological analysis in cities have been employed to conduct the research on the urban form and fabric of the place, that helps to determine the conservation plans or strategies of towns that reveal clues to their own history (Whithand,2001). Such analysis methods are a process that reviews the evolution and evaluation of towns throughout history. This paper focuses on, Conzen's and Caniggia's ideas, MRG Conzen's historic-geographical approaches (1968) on planning level and Caniggia's typo-morphological process (2001) on architectural level. Those methodologies help to understand the transformation procedure of different regions of city throughout the years and recovering how the city elements and urban hierarchy are interrelated. Additionally, the focus of this paper is to study the town's morphological transformations, regarding its spatial, geographical and historical combinations. Within this context, Geographical and historical surveys done on the whole town of Lefke, in north-west Cyprus, and a detailed explanation on the typo-morphological analyses of some particular regions will be given in this article. One of the significant character that makes the town unique is its historical background which lay down with an organic urban pattern from Ottoman period. Lefke town was first formed with a medieval character, and through centuries of functional and physical transformations, has been highly influenced by British extensions, which were either prearranged modifications affected by socio- natural, economic, and political situations, or instinctive and spontaneous changes. All these historical factors, along with its geographical features, make Lefke an interesting case to be studied with an urban typo-morphological approach.*

Keywords: Historic-geographic approach, Typo-morphology, Urban form, Lefke town.

Introduction

The morphological study of city has central objective for the understanding of urban Form, creation and transformation processes, spatial structure and character of human settlements through an analysis of historical development processes. It is also trying to understand the organization of its various elements and structures in terms of their physical characteristics. In this essence, urban morphology is used as an important assessment tool or method in determining the change transformation processes of urban fabrics, making sense of the historical roots of spatial and functional structures and bringing them to the present day (Topçu 2012). This analysis takes into account the urban fabric is the result of an evolutionary process (Conzen 1960). Understanding the city as a dynamic space and habitat as human communities. Planners, architects, landscape architects and engineers must, seek to have a broad vision of urban patterns, particularly on how it works and is organized (Oliveira,2013).

As Conzen (1981) stated that the most morphological analysis is defined by three fundamental physical elements: buildings and

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their building pattern, plots and plot pattern, and streets and can be understood at different levels of resolution. Commonly, four are recognized, corresponding to the building/ lot, the street/block, the city and the region. Moudon, (1997) argues that "Urban form can only be understood historically since the elements of which it is comprised undergo continuous transformation and replacement" (Moudon, 1997).

Accordingly, this study aims to analyse Lefke's morphological characteristics, which have developed throughout many years, and try to explores urban morphology based on two pioneering morphological studies: Gianfranco Cannigia's theories of typo-morphological understanding, and the evolutionary insights of M.R.G. Conzen. Taking the Lefke town as a case study, seeks to understand the spatial structure and character of a city by identifying the patterns of its components and the process of its development. Therefore, this analysis, includes a historical framework, and also analyzing physical structures at different scales. According to Conzen in 1960, land use, building structure, plot pattern, and Street pattern are considered. Analysis of physical forms focuses on street patterns, plot patterns, and building patterns by comparing cartographic sources and historic maps (Carmona, 2003).

Morphological Studies

The development of urban morphology, which constituted a component of urban geography as a subject, contain and crosses several different disciplines like architecture, philosophy, archaeology, history, anthropology as well as ethnography. Urban Morphology studies dates back to the beginning of 19th with Schutler (1899) and developed started to practice more commonly at 20th century. Morphological studies have been practice with three different perspectives in British (extension of German), France and Italy. Starting in Germany with Schutler (1899) by considering geographical point of view, in France with Phillipe Paneria and Jean Castex and sociologist Jean-Charles De Paule (1972) considered architectural and sociological perspective. On the other hand, Durand (1780) in Italy study typo morphologic analysis by considering architectural conditions. Starting of morphological studied by above mentioned names, it became a theory by Saverio Muratori, the pioneer of Italian schools. Following C. Aymonino, A. Rossi and G. Caniggia, G. Cataldi and Stappa, morphological studies continued and developed by pioneer of British schools, MRG Conzen as well as J. Whitehand, Karl Kropf ve Gu., Oliveria.

MRG Conzen (1981), started his morphological studies by defining the elements of the town; which concerning the aspects; street and the connections within street pattern, plot and street-plot relationship, as well as the buildings and the layers which consider the buildings plans within the blocks. While mentioning the historical process of the town by using fringe belt, he analyses the land utilisation, building pattern and genetic plan unit in order to reach the townscape. In Conzen's approach, Initial work in the field focused on analyzing evolution and change in traditional urban space (Carmona, 2001). Conzen describes how the integration of landscapes affects the early development of urban morphology (Whitehand, 1987) and the contribution of Conzen is mainly on the use of town plans which provides a source for historical study of urban morphology (Sima & Zhang, 2009). This kind of urban morphological study is from the geographic view and concentrates on how the elements of settlements shape the urban structure (Sima & Zhang, 2009). There are several examples of this type of urban morphological researches. For instance, Conzen (1988) carried out a town plan analysis of Alnwick and Ludlow in UK, and Muratori (1960) made a topological study in Venice town.

In 1996, morphologists from different disciplines such as geography, architecture, sociology, history and planning established the International Seminar on Urban Form (ISUF), an organization that acknowledges the expansion of urban morphology as an emerging interdisciplinary field. ISUF aims to provide a platform for the exchange ideas, theories and information about projects among a wide range of readers (http://www.urbanform.org).

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Methodology of the Study

As mentioned above morphological studies deal with many discipline and different approaches as a result of the formation of disciplines. Those studies started with MRG Conzen with his work for Alnwick (1969) and Ludlow (1975). MRG Conzen defines townscape as the general appearance of the town landscape. Historical period during the development of the town considered as a major aspect in order to put forward overall image. Similarly, he defines the characteristic of the town by considering natural and man-made environment. Building type, land use and plan units are the elements which overlapped together in order to form the townscape (Conzen,1969,257). By overlapping those elements, morphological characteristics and character areas are re-joined. Accordingly building types examined and grouped based on to their periodical characteristics. Following that, functions on the selected site examined and generalized which are defined in order to find out how they create the land use pattern on macro scale. Finally, to analyze plan units, by analyzing the relationship of the parcels that buildings located and neighbouring parcels, street /square in the block are examined. At the end, it aims to figure out the general characteristic of area by using the morphological regions. Morphological regions are defined by overlapped of those three elements. Setting up the criteria by using morphological regions, for the areas which will be developed within the town is considered as the most important aspect of the mentioned method.

By matching the above-mentioned aspect urban morphological are defined. Townscape plays an important role in defining urban development areas as well as on developing strategic decisions by local authorities. The unified form and the differences of those form the others within the same system are defined morphological regions. By doing that, building types, land use and plan units are shown with their common aspects and each section mapped hierarchically. The juxtaposition of three plan elements gives the overall townscape. By doing his townscape analysis MRG Conzen (1988) studied in to four different ranks according to their hierarchic importance as shown on the list below.

Town center or historical core, Plan unit, and neighbourhood which characterized by the region Within this context, study aimed to extend MRG Conzen's townscape method to the Lefke which have the trace of multicultural aspects. As a result of that It is planned to suggest the sets of principles for the future developments as the goal of the study. While doing this study, building typology has been analysed in order to understand the street silhouette, the relationship between building and its components in order to find out the compatibility of the pattern. Addition to this this typological classification will help to understand the overall typological view in the townscape.

Addition to this analysis typological analysis has been followed by Gianfranco Cannigia, who developed the dynamics of urban form, shaped by its component types and their evolution, throughout its historical development. He called these dynamics a "typological process". Caniggia's basic concerns were the historical formations and transformations of these types, as well as the urban fabrics that resulted (LEVY A., 1997). He was interested in how typological processes linked to more general mechanisms of cultural transmission, from generation to generation. Caniggia's work focused on the conceptual and political basis of architectural design and composition. (Caniggia G., Maffeig.L. 2001). According to Caniggia methodology this paper deals with his concepts through three different headings: (a) building, (b) urban tissues and (c) settlement organism/urban organism.

Study area: Lefke Town, Cyprus

Lefke is an important example of middle age town in Cyprus which shelter of different several cultures. In orderly the town ruled by (MÖ 4000), It is obvious that Byzantines lived in this town. This was first found out when the Ayorgi church was converted to a mosque called Piri Pasha mosque. Byzentiness

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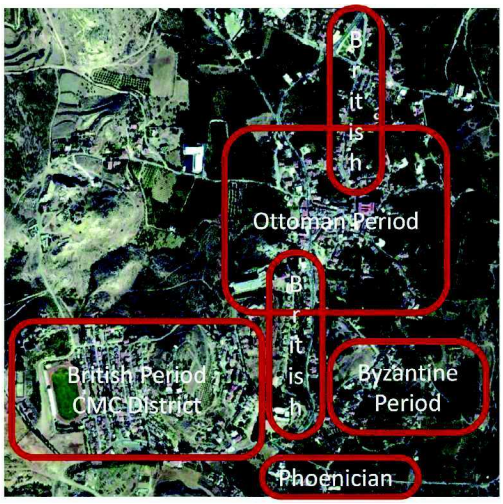

Figure 1.
Schematic periodical development of Lefke (Zafer Comert 2013)

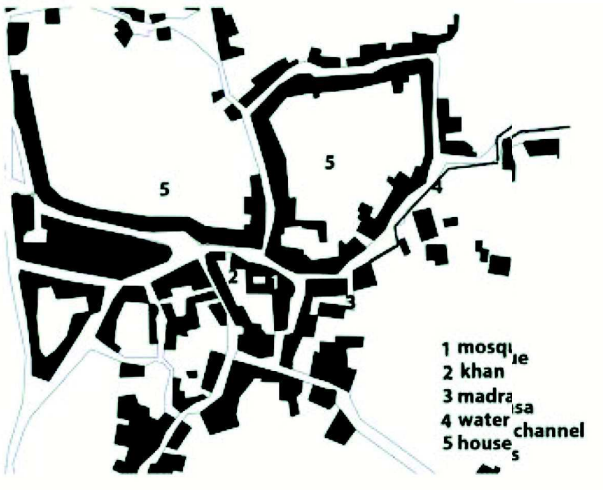

Figure 2.
Lefke Town Form During Ottoman and British Period (Comert & Hoşkara 2013)

lived in Cyprus between (789-1489), After the Byzantine period Ottoman conquer the island and at that time Lefke became one of the province of Ottomans' in Cyprus. When island hiring to British in 1571, Lefke became the most important industrial town at Cyprus, the reason for this is the establishment of Cyprus Mines Cooperation (C.M.C) until 1974. There are four different land uses in the town which, are gardens and agriculture with 38%, dwellings 7%, roads 16%, and built environment 39% of Lefke (Iskan Bakanligi Sehir Planlama Dairesi:1989).

As seen on the schema on Figure 1 periodical development of Lefke started by Phoenicians settlement on the south of the cooper mines. Within this period beside the cooper mine, building the water channel can be seen as an evident of urbanization of the town (Ferlison,1986). During Byzantine period, the town started to shaped around st.Yorgi church by designing organic pathways. As it seen on Figure 2 during Ottoman period, town center moved and developed towards to north direction. Within this period khans, mosques, madrasah and many mansions located at town center while residential areas developed around that area (Figure 2). Lefke traditional core served as an important town for Ottomans with its narrow one-way streets and dens pattern. During British period, the use of copper mines cause settlement to moved towards to south and west with grid formation. By its designing with residential, social and recreational areas for copper mine workers, Settlement which located on west, shows the characteristics of suburb for Labours (Lavender,1962). Therefore, the center on the south hosted the residential areas, for people whom not working on the mines, beside the public building and spaces. Town pattern took its todays form by additions during British period (Lavender,1962). Land use of the city pattern have not been changed during the years, still town center which has been shaped in ottoman perioud seen as mixed use area (commercial and leisure promisses also public and community promisses), and residential units are mainly in the north and CMC districts (Figure 3).

Typo-morphological assessment

Lefke has significant with its own characteristics, within this study morphological development of Lefke town has been analysed in terms of building typology, street character and morphological regions. As a case study, the focus will be in a specific part of city which contain the historic core with the residential area along the organic shape street pattern, water channel, and agricultural lands Figure 4.

In order to understand the building typology, three elements have been investigated for the selected area; Plan typology, façade typology and plot typology.

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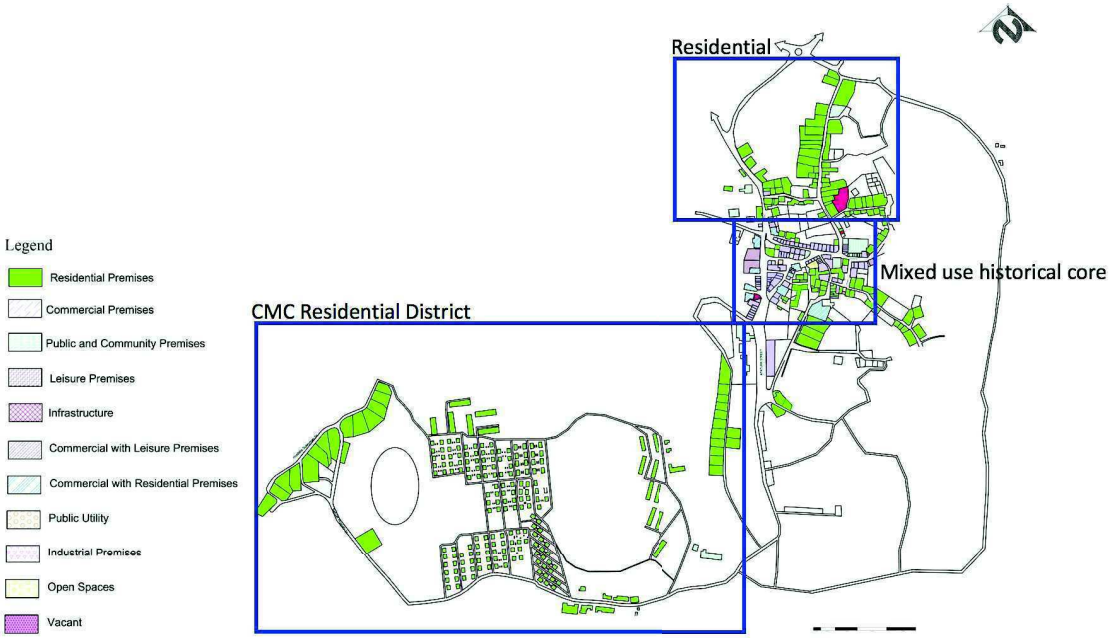

Figure 3.
Lefke Town land utilization analysis

Plan typology analysis shows that this area has a basic plan from British till early modern periods, just some addition to the plans may have done according to their needs and requirement. Mostly it is composed of two living room, bedrooms, separate kitchen, and the toilets at the back. Houses has one main entrance called sofa, and two rooms are located surrounding this sofa. All those rooms face to the main street. Although the buildings dated back to Ottoman period, only two dwellings have been survived until today. When British come to the island they analysis the way of lifestyle of Cypriots and workers living units had been design according to this observation.

In CMC part, like traditional core all worker's kitchen and toilet is separated from the main unit which follows the characteristics of the city. But houses for engineer (usually they are British and American) all the functions designed in the same place (Figure 6). After 1960 Building plan is influenced by war and new city rules and regulations, more different plan could be seen in the contemporary construction. All the places are designed under one shelter whereas before generally kitchens and toilets are separated from the buildings in the garden.

Facade Typology analysis in this area shows that, residential building from British period in the Denis Efendi Street, are one story buildings which have got a pitched roof, windows and door ratios are 1.2 in large size and on the row, that is same with most of the other residential British building in the whole city, but as an exception there are two story's building from British period that has smaller windows in the first floor with ratio 1.1 and larger one in second floor with ratio 1.2. From elected period (1960-1970) in the same street you can see different size of windows with mostly 1.1 ratio and doors dimensions are same, and they are located in the middle. In the commercial part of the site again all of the buildings are belongs to the British period, they have large doors in booth 1.1 and 1.2 ratios and just two window with ratio 1.1.5 and the other one 1.2. Building's door and windows from TRNC and contemporary periods are almost different according to the size and ratio, different size and ratio in one building could be seen. While considering the facade, the typologies of elected buildings are more different than others and it is not fit to the context, different windows size and façade characteristic create this disparity (Figure 5).

"Conzen emphasized the plots and their plot pattern and the building arrangement

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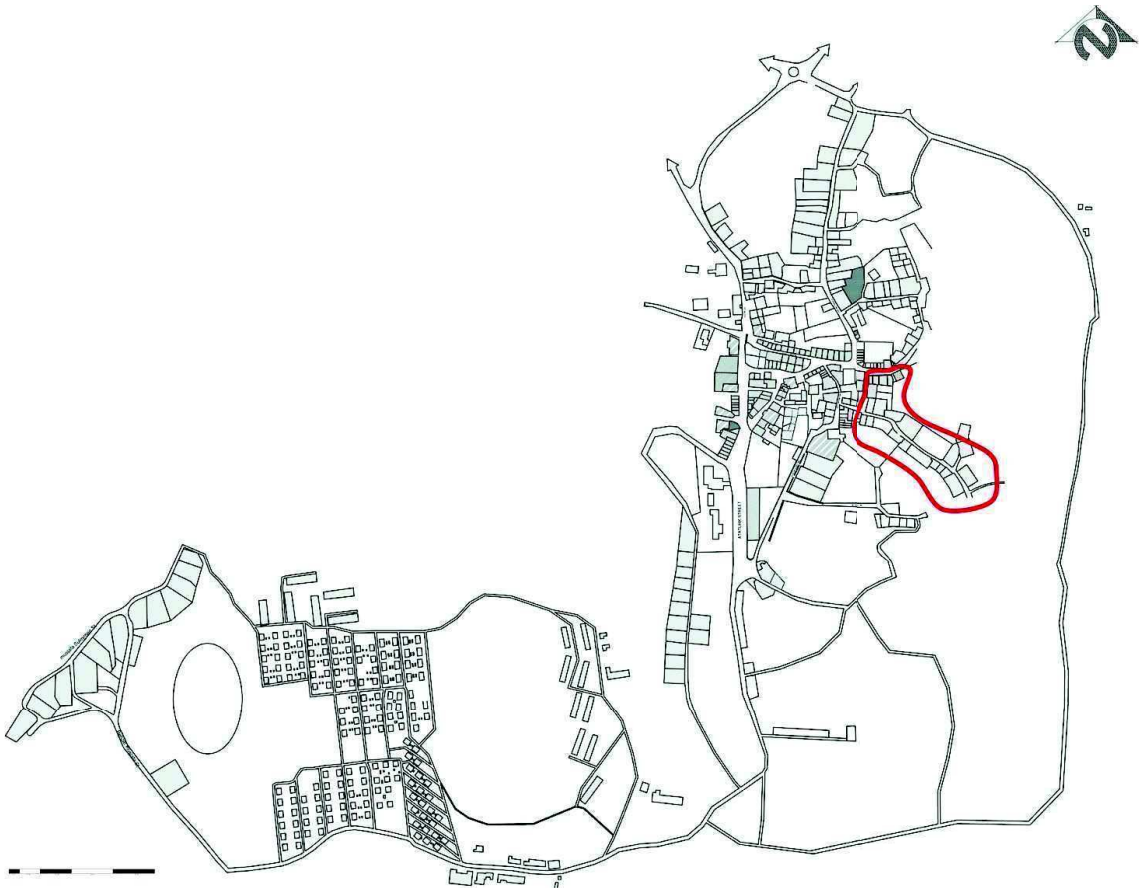

Figure 4.
Location of the selected area in Lefke Historic Town Center

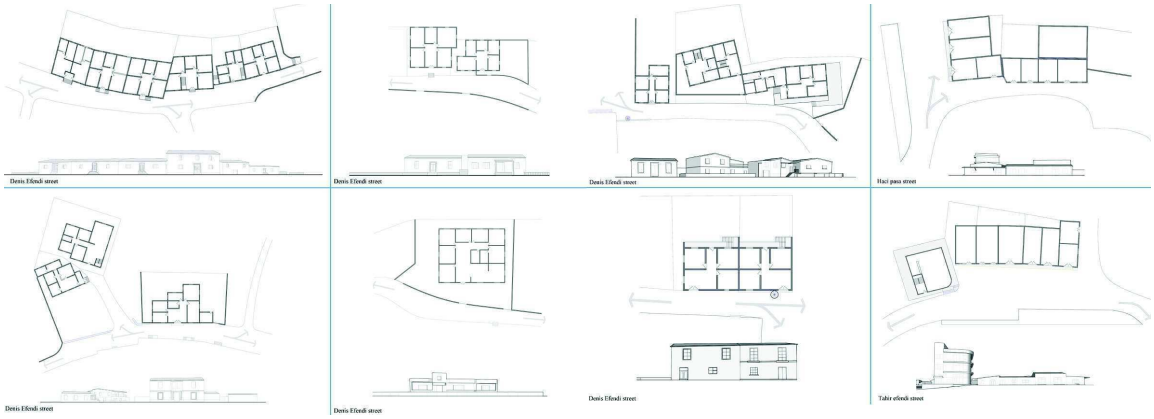

Figure 5.
Facade Typology of selected area in Lefke Historic Town Center

within these patterns for the plot typology analysis". As observed on the site plan, in the commercial premises part mostly plots has small and medium rectangular shapes with the ratio 1.2 and in the street corners 1.3. There are also houses with the rectangular shape with the ratio 1.2. On the other hand, the plot typology in the Denis effendi street is different, most of the house's plot shapes are bigger and irregular, instead of two small square shape with empty plot between them and two big rectangular shape with the ratio 1.2. Also as an exception in this analysis there is L shape plot in the middle of commercial plots, as a result it could be consider plot divisions of the area as an organic plot pattern together with the agricultural pots

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between them (Figure 6). As seen in traditional core mostly plot typology carries the same character with its rectangular formation. Especially at commercial district plots are reputed with the same proportion as seen in Figure 6.

On the other hand, CMC part as observed on the site plan, the plot division is only performed on the engineers' and foremen's houses. therefore, the plot typology of the foremen's houses is irregular; more or less, their ratios are similar (1.2). Another plot typology is observed with the workers` housing district: all the plots show the characteristics of amalgamated typology resulting in a rectangular big block (ratio: 1.3/1.4), which then has several houses—generally 8—in the same block. Within these blocks, every two houses share a common toilet (Figure 6).

According to the observation from the site, and by considering the street and plot relation, it can be determined that British houses are mainly developed along the street with their front façade attached to the street, defining the street pattern. There also some detached building with the small front yard and private garden from early modern and contemporary periods, with the bigger plot size.

Pertinent and elevated

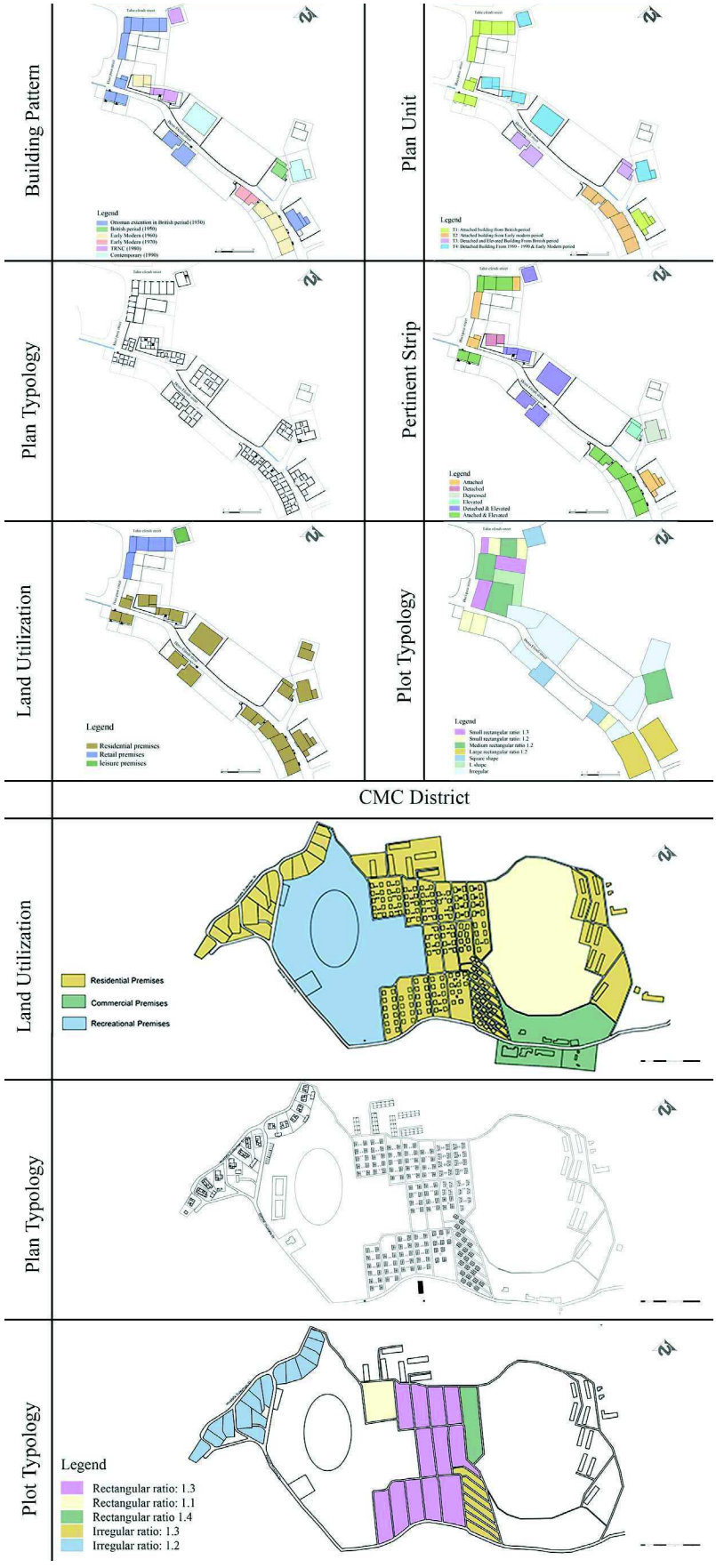

Figure 6.
Typo-morphological analysis of the selected area in Lefke Historic Town Center

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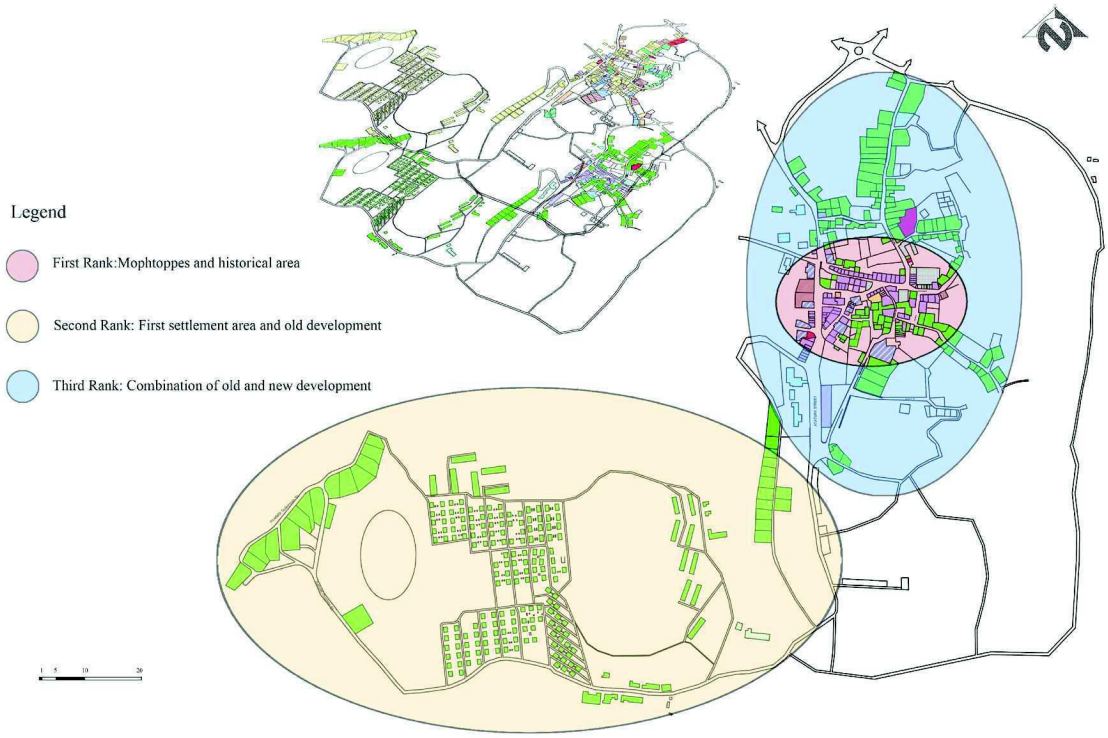

Figure 7.
Lefke Town Morphological region analysis

character which create a different pertinent strip typology in the site it could be a result of topography, With the influence of the topography, Buildings are mostly elevated, and in the sloppy part of the site approximately one meters higher than the road, even the attached buildings which are not elevated from the street have level differences, that called "su basman" in Turkish, in order to prevent from the rain water. Also, another significant factor that affect the street pattern not only in this area but in the whole city is the water channel, the water is used for the agricultural purposes in the city (Figure 6).

Those water channel along the street makes the street character special especially at the historical core. It has been observed as an open channel system on Danis Efendi St. and some parts of Atatürk Street. Rest of them are covered with the sidewalks in 2000. On the other hand, CMC part street formation is totally different than the traditional core. Street pattern formed as a grid system and all the waste water from kitchen was carried with channels next to the street. All waste water channels carried on specific site for re use. But today all the channels are inactive because of the necessity of today life style. Sidewalks are lay along those channels.

Townscape Analysis

Plan unit, land utilization and building pattern are the main three factors which analysed in this study for understanding the town scape in this area. "Plan unit represents the relationship between building types, street characters and plots", Addition to this, position of the building in the plot and their relation with streets are analysed in order to figure out the plan unit. In the analysis, the area mostly divided to 15 plan units has been observed; Different plan units had been observed on the streets and avenues within Lefke traditional town pattern. Planning regulation, articles, and caps are the reason for that condition. Until 1948 buildings designed attached to each other with the same line of the main road. According to the new roads and buildings regulations after 1948 with cap96, the buildings within the town, including town center, had been built 5m away from the

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road and 3m away from the sides. Accordingly, different street patterns can be seen on the same street in relation to the buildings which built in different periods according to different regulations. For example, Danis Efendi plan unit is the British buildings attached to the street with the rectangular plot shape, detached and elevated with irregular and square plot shape which includes three buildings, attached and elevated building from early modern with the back yard, And the detached buildings from contemporary and early modern which placed in the middle of large plots. As a result of that it is not possible to see a homogenous plan unit within the town. On the other hand, CMC part also shows another plan unit type because of the amalgamation of the plots and buildings locations, positions and building style.

From following the historical process of whole lefke town, it is clear that the town center had preserved its commercial function up todays. It had been observed that only three building demolished and changed their function to residential buildings. Moreover, the public buildings are located at the end of commercial area as a border between residential and commercial areas. Finally, the Educational district is located adjacent to residential area. According to Conzen land utilization classification, selected area also contains three different types of land utilization. Commercial premises in Haci pasa and Tahir Efendi street, where its connect the east part to the center of the city. In the west side of the commercial area, Mosque is located in the centre of the traditional core in front of municipality and marketing (bazaar) area, and leisure premises in the ground floor of tow story residential building as a coffee, restaurant. Residential premises, includes all of the building in Denis effendi street, located in the eastern part of the historical core (Figure 6).

Addition to this, the establishment of CMC district sub center has been created a different land use in this district, which is also contains three different types of land utilisation; includes housing districts, commercial districts and recreational district. The recreation district is an area that has never been mentioned by Conzen in his land utilisation classification.

As mentioned, building pattern studies of Lefke town shows the historical formations and transformations of the city, and examining its historical development. Lefke were developed through various historical periods which creates variety in the city pattern, Traditional core carries its significant character where shows the impact of British period but building styles are recopied from the Ottoman style. Extension of the traditional zone is signifying with its modern period development and this formation starts with extension of Atatürk street and Küçük İzzet St. In the selected area majority of the buildings had constructed in British period between 1930 – 1950, mostly with the Ottoman extension, after that eclectic type or early modern period between 1960-70 constitute a significant amount, From Turkish Republic of North Cyprus and contemporary also a few buildings have been found. This variation in Building pattern does not terminate too much changes in the plans till 1980. It demonstrates that they follow the previous plan type, just some additions may have been added, also after 1960 some changes have been done, especially in dimensions of pitch roofs, because of the rules and regulation (Figure 6).

Morphological region

In order to analysing the morphological region in the lefke city the whole city map have been considered and analysed, in this analysis three criteria's; building pattern, land utilization and the plan unit have been ranked and overlapped. The results demonstrate 3 certain ranks: in the first rank, the initial urban nuclei with the historical buildings which are located in the city center and continue to the west part with more commercial and public facilities and activities, create a unique characteristic for the city and make it different than other parts. The second rank includes the first settlement area, which contains CMC housing district and mostly British housing area in the south part of urban nuclei. Combination of old and new buildings ranked third and mostly take place in the north and center part of the city, because of less significant values than the other and its fragmentation around the city.

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Conclusion

Morphological analysis method By MRG Conzen firstly used in UK, then in Japan and China and applied on different geographies and cultures later. The mentioned method has been continued to use and applied to different cities all around the world in order to understand the evolution of the urban form. Accordingly, the same mentioned method has been applied to Lefke Traditional Town Center, as one of the four historic urban quarter in Northern Cyprus which has a traditional urban pattern that shaped by a medieval character and have been significantly impacted by British influences.

The historical assessment area of Lefke shows the traces of the ottoman culture, and the identity of the places strongly carries ottoman influence. The organic pattern of the city has been also influenced by the existence of topography, agricultural land and water channel, Despite, within its overall organic urban pattern, there are well-scaled narrow streets, a number of public buildings and irregularly shaped public spaces at the intersection of streets and/or in front of public buildings.

According to the result of the applied method, Traditional dwellings and settlement pattern of Lefke have been investigated throughout the morphological analysis and ranking the analysis revealed the different characteristic of the city pattern, that defined the valuable parts of the city which needs to be preserve and protect. Also, the investigation has shown that Lefke has an urban form and place identity which has relation with its physical factors and historical development. An urgent conservation and rehabilitation action, with good urban management, is needed in this area. Any intervention for the purposes of repair, renovation and rehabilitation in the district should have the goal of conserving the typological and morphological characteristics of the district. Morphological studies are important in terms of development, perceiving and sustainability of town form. Urban forms are identified by using the morphological analysis and it gives the planning and conservation strategies for the future. The proposal for the future of the study is;

•To understand how the urban form will be conserve and sustain in the future

•To put the principles for further development

•To define the sustainable morphological criteria

•To sustain the urban form for future

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Space Syntax in an idiorrhythmical conglomerate: the case of Jardim Piratininga, São Paulo, Brazil

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Abstract. *This article aims to contribute to urban design alternatives in the Jardim Piratininga neighborhood and to offer subsidies for future Urban Intervention Projects (PIU).This area, located in the East Zone of the Municipality of São Paulo, was defined by the 2012 Strategic Master Plan as Special Zone of Social Interest - ZEIS. It is presumed that the studied area, considered as an emerging urban fabric stratum that lacks in a large part of basic urbanization infrastructures, holds in itself the potential for a future re-adaptation and complementation of its roadway. The methodology that will be used in this analytical approach of the urban form, known as Space Syntax, seeks to provide: support for decision making; tools to calibrate these decisions; evaluate proposed scenarios; as well as combining other methods and tools. This methodology enables to confirm something we probably already know - the need to complete 'mesh design' in contemporary cities urbanized areas that have a diverse constitution from that ones observed in more sedimented and stable fields (consolidated city). As a result of the research done for this article, there will be presented some possibilities of transformation of the neighborhood roadway according to diverse scenarios, but based on the dynamics of the place itself, and also with the surrounding urban fabric.*

Keywords: Space Syntax, idhiorrhythmical conglomerate, Jardim Piratininga, Urban Intervention Project, scenarios.

Introduction

This article is the result of a partnership between the Research Group called Urban Issues: Design, Architecture, Planning and Landscape - Q.URB, and the Group of Studies of the Urban Form in Brazil - FU.bá, both based at The Faculty of Architecture and Urbanism of Mackenzie Presbyterian University. It is also an extension, in Brazilian lands, of a workshop conducted by the Lusophone Network of Urban Morphology - PNUM, at the Faculty of Engineering of the University of Porto, in 2015.We are dear to the concepts, methodologies and theoretical references contained in the derived e-book, which was published with the results of this research work (OLIVEIRA, MONTEIRO, 2015). More specifically, we find it unnecessary to make introductions or major theoretical insights into Space Syntax and its vast field of practical experimentation and theoretical refinement: we consider this basic bibliography and ongoing research, from the seminal text published by Hillier and Leaman in 1976, The classic Space is the Machine of 1996, until arriving at contemporary researchers that produces in Portuguese language, as Medeiros (2006) and Viana (2015).

For this particular article, we accomplished

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a exercise using space syntax concepts whose development resulted in a restricted but sharp local analysis. We dare to say that the approach in which this task was performed implies observing, reflecting, analyzing and acting in an area of infrastructural enclaves, precarious settlements, environmental fragility and social vulnerability, in the complex context of a contemporary metropolis like São Paulo. In this context, we consider the idea of metropolis as a problematic and imprecise concept, but which designates a global condition that can be identified in local sphere situations, as discussed in David Cunningham's The Concept of Metropolis (2005).

Considering this scenario, the case of Jardim Piratininga, located in the East Zone of the Municipality of São Paulo, is emblematic, since it is an area circumscribed by notable physical barriers: highway, railroad, circumvallation stream and a large industrial plant deactivated. Those are the elements that structure this portion of urban fabric and that give peculiarity to this portion of territory (Figure 1). The only reasonable way to overcome the obstacles represented in the image that are the only exclusive access routes to the consolidated urban fabric, are two small tunnels that cross the railroad. They are short enough not to allow a fire truck to go through in case of causality, for example (Figure 2). Other prominent

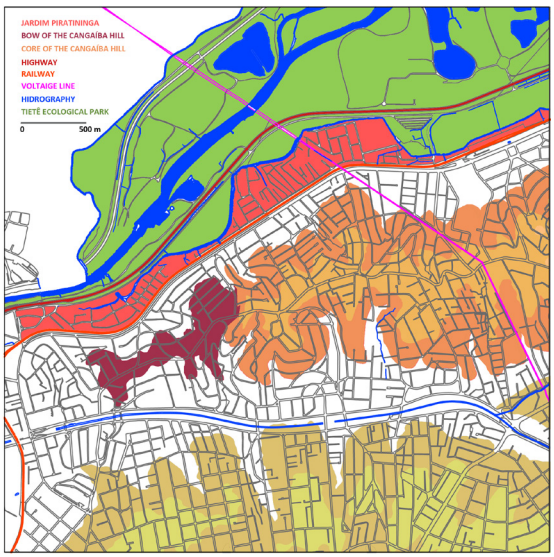

Figure 1. Set of Analysis (authors, 2017)

Figure 2. Wormhole: the tunnel that crosses the railroad (Leonardo Gobbi, 2016)

Figure 3. A tree mass in a stream mouth (Municipal Housing Department, 2016)

elements in this article analyzed landscape are: a tree mass in a stream mouth (Figure 3); the Cangaíba Hill; the valley bottom roads denominated Assis Ribeiro Avenue and Governador Carvalho Pinto Avenue; and the electric transmission line.

The tunnels of Jardim Piratininga are like an "wormhole": a dimensional crevice that leads passersby, when crossing it, to a completely different destination from the place of origin. That`s why we consider Jardim Piratininga as an idiorrhythmic conglomerate endowed with its own rhythm, a conceptual figure proposed by Paola Viganò to address the reflection, description and analysis of contemporary urban phenomena. The term is also referenced in Roland Barthes work, in which the author analyses the very urban condition of how to live together. Such phenomena, defined by Viganò

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as a sort of phantom of the epoch, a "widespread uneasiness" in the face of its complex and banal condition, would be endowed with the character of porosity, and therein would the difficulty of defining its condition lie:

Porosity refers to density, distance, to taking into account elements of ecological racionality, but it also has deep social implications. In the broadest sense, the phantom is perturbed by reflections that concern the sustainability of our acts, of projects and decisions; a complex theme, dense with ambiguity, that simultaneously deals with ecological, social and economic questions. Beyond all rhetoric, sustainability is still considered a radical choice for a project, for a prosecutor, an inhabitant; for a city and a territory (2006, p. 336).

At this point, we have already found a fundamental intersection between the expression proposed by Paola Viganò to address the contemporary urban phenomena - porosities - and the Space Syntax theory, enunciated by Bill Hillier: the urban form as a result of a series of decisions, which can be complex or antagonistic to one another, but which reveals, as material evidence of an urban form, the very substratum of the human condition that takes place there. It also brings the notion of sustainability and/or resilience closer to any decision to be taken in terms of urban fabric transformation, considering that even local interventions may have a reflection on metropolitan dynamics. Conversely, metropolitan interventions may reduce or increase drastically the integration conditions of local fabrics[1].

Based on these theoretical references, we sought to contribute to urban design alternatives in the Jardim Piratininga neighborhood, and to offer subsidies for future Urban Intervention Projects (in portuguese, PIU), since this area was defined by the 2012 Strategic Master Plan as a Special Zones of Social Interest (in portuguese, ZEIS). It is assumed that the studied area, considered as an emerging urban fabric stratum that lacks of basic urbanization infrastructures, holds in itself the potential for a future re-adaptation and complementation of its roadway.

This exercise image results are opportune, since many areas of metropolitan borders, constituted by precarious and/or irregular settlements, lack either a planialtimetric survey in their totality, or an update of the existing cartographic bases. In the case of Jardim Piratininga, until the beginning of 2016, only some most consolidated part of the urban layout was on the bases of the City Hall, and there were no surveys of thousands existing buildings. Thanks to the work of the Urban Issues Group of Research (Q.URB), carried out with public agencies in conjunction with the residents' neighborhood association (Claro et all, 2016), the Municipal Housing Department provided an updated and detailed planialtimetric survey of the entire area, thus enabling the necessary basic documents for territory analysis with the space syntax tool.

Methodology

The first step of the analysis consisted in drawing the axial map of the area, with dimensions of 3.50 x 2.75 kilometers, a spatial cut that was based on relevant elements of the urban structure, considering a minimum reference diameter of 2 kilometers from the object of study. The axial map consists of the smallest set of the largest observable lines walkable by pedestrians, defining convex spaces and their connections. It is interesting to note the presence of staircases, alleys, alleys, tunnels, walkways and even unpaved tracks in the area. These urban elements guarantee, in the absence of larger infrastructure, a certain capillarity to local fabrics.

The second step of the analysis was based in the use of the DepthmapX-0.30, a software used to generate the performance samples of the existing urban shape, according to the determined internal parameters, which were: Connectivity; Choice; Mean Depth; Global Integration [HH]; Local Integration (R9); Synergy - Total Integration [HH] R9 R9. In sequence, this procedure was repeated in order to establish four hypothetical transformations of the urban form, ranging from more subtle interventions to a more radical situation, with two large interventions. The third step of the analysis has considered comparisons among

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the samples of the same parameter, verifying which are the constants and the variables according to the four hypotheses proposed.

Measurement and analysis

In general, the existing situation revealed that the Jardim Piratininga is,globally and locally, less integrated than the other local fabrics of the analyzed set. It means that the constituent spaces of Piratininga are less close and less accessible than the others with which it relates, in the whole of the urban fabric in which it is inserted. It also has spaces less connected to others and, in addition, it has the segments with a greater mean depth.

In the existing set, the local fabrics that stand out with greater synergy are the "bow" of the Cangaíba Hill, as well as its two valley bottom roads that surround it, Governador Carvalho Pinto Avenue and Assis Ribeiro Avenue. Other outstanding elements are the hillsides bridging the relief, as Puruá Street, Bartolomeu Cadres Street and Coronel Meireles Street. In Jardim Piratininga, Adelina Linhares Street, the one with the tunnel and that shelters the street market-place on Saturday, stands out as the main transverse axis of Jardim Piratininga, making direct connection with the consolidated fabric. And, in the longitudinal direction, Olga Artacho Street, where several elongated and stretched streets connect (Figure 4).

Conversely, in the whole of the that urban woof, the crust of the Cangaíba hill also presents a greater branching and fragmentation, showing local fabrics more spatially segregated and similar, in degree, with Jardim Piratininga. However, while the crust of the hill has a more constant pattern, formed by the intersection of broken lines, the Jardim Piratininga, a flat area of lowland, consists of more heterogeneous tracings. This situation is ironic because it reveals a mode of construction that has made

Figure 4. Existent Situation: Total Integration [HH] R9 R9 (authors, 2017)

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it impossible to standardize more regular grids, even in flat zones.

The hypothesis 1, defined as a minimal, punctual intervention, considered a link between Jardim Piratininga and Vila do Sapo, to the East, two isolated neighborhoods due to the presence of a large urban void: an abandoned industrial lot, like so many others that are located along the railway. This lot is the object of urban and social housing projects, but there is still no clear definition regarding its effective transformation. We believe that a connection on the ground floor level is fundamental to a greater flow capacity for the Jardim Piratininga and a consequent supply of basic urban services, factually limited by the small section of the existing tunnels. However, the analysis from the space syntax, has revealed that this kind of connection would not affect the the global and local integration of Jardim Piratininga, rather than the synergy of Vila do Sapo, the actually most segregated local fabric of the whole.

The hypothesis 2, defined as a minimal intervention, although more comprehensive, consisted in complementing the route of the border road along the circumvallation stream, as well as punctual connections in some of the several dead ends of Jardim Piratininga routes, thus increasing the permeability of its layout. It was also proposed, based on this trajectory, the requalification of the stream mouth that constitutes the most significant tree mass of the entire area. Hence, in the same way as hypothesis 1, the modifications proposed in the layout do not modify the condition of integration, although, with a greater regularity of the tracing. We have perceived a subtle increase in the levels of integration, tending to the middle, as well as a greater regularity between its parts.

It should be said that, regarding hypotheses 1 and 2, even if they are more modest interventions compared to what can be imagined and proposed, they are not new propositions but long considered ones. This case demonstrates that, in the case of São Paulo, a contemporary metropolis, the question of idiorrhythmic conglomerates is related to the absence or insufficiency of large works that contemplate and reduce spacial segregation that characterizes this type of situation.

Based on this last quote, hypothesis 3 proposes a more radical intervention: the reconversion of electric transmission lines and towers, a specific metropolitan infraestructure which, through hills and other obstacles, make up straight fissures and barriers in the territory. Even though this approach is not new, it's important to remember that metropolitan energy supply is guaranteed at the expense of physical barriers and fragmentation of local fabrics and that, however, such a constraint can also become an opportunity to provide architecture infraestructures to the metropolitan areas, paraphrasing Alberto Varas.

It is worth mentioning that usually the axes designed by eletric infraestrutures have mandatory side deflections, defined by law and that their dimensions vary according to the electric charge capacity, which retreats as a safety measure as well as public health. But such limits are rarely respected, and what is observed is all manner of subversion of the norm, from occupations existing on the edges of the axis, as well as circumscribed and below (Figure 5). So, what Hypotesis 3 proposes is the reconversion of this infrastructure by burying all electrical wiring, a large and heavy work that would allow the creation of a new road axis and could even be thought from infraestruture modalities that priorizes light vehicles on rails and bicycle paths. Here, it is not a matter of discussing the cost of these measures, but rather that they respond, as hypotheses, to demands both local and global. Hypothesis 3 also considered a direct link

Figure 5. Deviation from the rule: the high voltage line (Aya Saito, 2015)

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crossing the railroad, which would imply in some work of transposition, or catwalk, or viaduct or tunnel. We know that this kind of work, being intervention after an existing situation, implies a greater degree of complexity, including the character of the metropolitan infrastructures, more specifically the railroad. However, we understand that it is feasible, especially in segments that are already made up of curves, the implementation of a second extension as a line segment that would not compromise the flow of the system, even if it implies, locally, in works of considerable size.

Hypothesis 3 confirmed, albeit partially, a suspicion: that a transverse axis of metropolitan character would increase the integration of Jardim Piratininga to the whole of the region fabric. It confirmed only partially, because the increase of integration was noticed more in the analyzed set than in the area that interests us, the Jardim Piratininga. In this case, the increase in integration was more circumscribed to the proposed axis, not spreading.

The hypothesis 4, even more radical, proposes a new longitudinal road which, also by its extension, would substantially alter the design of the Jardim Piratininga, which has its urban form, currently, by the circumvallation stream (Figure 6). It should be said that this stream defines a border between the Municipality and the State, since it defines the limit to an area of the Tietê Ecological Park. However, such a stream, whose sinuous design is a specter of the meanders of the old times Tietê River (Claro et al, 2016), far from integrating the whole of the park, is rather a frank and anachronistic barrier that stops the urban occupation that occurs there.

What Hypothesis 4 offers us is the possibility of verifying and demonstrating the advantages of revising an urban design through a radical intervention that would imply reviewing the zoning barriers themselves, not only property,

Figure 6. Hypothesis 4: Total Integration [HH] R9 R9 (authors, 2017)

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but land use and responsibility, including environmental parameters. And, among the conditioning barriers, the circumvallation stream, which eventually contracts and dilates the local tissue, is the only urban element that subsists as an anachronism, since the effective barrier that defines the biome of the park itself is the Ayrton Senna Highway. The area circumscribed between this last barrier and the stream is the soccer fields, effectively residual. This is a fundamental issue facing the prerogative of the social function of urban land, also contained in the 2012 Strategic Master Plan, which inevitably comes up against more complex conflicts and problems involving a greater diversity of actors and interests.

Conclusion

This brief study proves that the application of Space Syntax responds to effective demands related to the territory in question, since it is in course a neighborhood urban plan. It demonstrates that this theory and methodology can offer a variety of available parameters in order to provide subsidies to the plan development.. Certainly the material produced and knowledge acquired will be able to serve this work, fueling other concerns and subsidizing the analysis of other eventual hypotheses. We believe that this is the main contribution of this study so far, and we have good expectations of its future developments, since only the first battery of tests was carried out, stimulating new approaches and propositions.

The space syntax tool proved to be valuable in demonstrating the current condition of the place as a fruit not only of its borderline constraints but, above all, of its insertion in a larger context. The exercise made clear what should be the content of the necessary interventions in order to effectively transform a idiorrhythmic conglomerate with the characteristics of Jardim Piratininga: a stratum of a little porous and accessible urban fabric, very cloistered and segregated. It has also revealed how the boundary characteristics that condition some specific area can make it peculiar and exceptional, and at the same time problematic and disregarded. Many times, these situations seem to be irremediable or a simple subsistence of an apparently perfectly sanctionable misconception, that would be provided if the appropriate measures were taken, even if they are radical ones.

Notes

[1]Term used as Coelho (2013)

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Study for a new definition of the southern side of Prato della Valle in Padua, Italy

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Abstract. *Research The boundary wall of the Santa Maria della Misericordia convent continuously delimited the southern limit of the Prato della Valle space in the southern part of Padua's historical centre. Its presence was one of the elements that more than two century ago inspired the enlightened proposal by Andrea Memmo, the Superintendent of the Republic of Venice, and Domenico Cerato, a design professor at the University of Padua. Subsequently the straight and continuous limit was replaced by the discontinuous architecture of the Foro Boario entrance, built in 1913 according to a design by Alessandro Peretti; this weakened the overall solution based on an elliptical shape and the communicative power of the nearby basilica of Santa Giustina. The examination here presented dwells on these limits, simulating the virtual introduction of architectures with a continuous front to the southern edge of the Prato della Valle. One example is the Nelson-Atkins Museum of Art built in Kansas City between 1930 and 1933, based on a design by the brothers Thomas and William Wight, and expanded in 1999 by Steven Hall. The study generally confirmed that the compactness of the building's front newly provides strength to the late 18th century Memmo's creative intuition, which gave a sense of unity to the general emptiness thanks to the certainty of its borders, and gives again the Basilica of Santa Giustina its monumental size. This paper investigates the composition of heterogeneous fragments, excerpts from the inventory of collective memory, and the resulting unpredictable architecture in an urban context.*

Keywords: Imaginary City, Possible City, Memories, Urban Setting, Prato della Valle, Architecture and Enlightenment.

Introduction

This is a study set in Padua, a city in Northeast Italy. For four hundred years, Padua was part of the Serenissima Republic of Venice, until the end of 18th century. The subject addressed implies the reminder of the very crucial period when Padua on the one hand was reached by the ideas of Enlightenment, on the other was briefly occupied by Napoleon's Army, which closed many churches, monasteries and convents. Wide parts of the urban tissue became abandoned, without users and functions.

In particular, the place here considered is a large area of open space in the southern part of the city called Prato della Valle (Figures 1, 2). A general method for initial verification of the potential offered by the planning project was applied to this specific place for finding out how to tackle a theme of great delicacy in the specific case of Prato della Valle. Premising all that follows is the conviction that the building currently in place on the southern side of Prato della Valle is largely inappropriate compared to the quality of the synthesis built here in the Age of Enlightenment at the end of the 18th century.

So a method based on principles of potential interchangeability of context and the monument was applied to this particular

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case. It involves accepting the transfer of notable works of architecture outside the original environment and verifying the role and outcome in a different location. This is the reason why this contribution is considered by the authors relevant to the conference's theme of "City and territory in the globalization era". Globalization is an opportunity to evaluate the opportunities for enhancement of the context in question in presence of monuments whose relationship with the place is unconvincing.

A similar procedure that tests the possibility of enhancement of the context and the monument was experimented by the greatest architect of romantic classicism, Karl Friedrich Schinkel, and can be seen in one of his best known designs called Large composition, how Milan Cathedral should be situated (1810). So the monument of the Lombard city is represented on a hill that overlooks a large city on the coast, perhaps Trieste, in order to test a new version of the relationship, here between architecture and nature. It is one of the most well-known anticipated explorations carried out in the past in a planning method facilitating upstream project verification aimed at the evaluation on the one hand of the impact of a new architecture on the environment, and on the other hand, of the opportunity to enhance a given place.

Karl Friedrich Schinkel assembled architectures and built places in several other designs, as Piazza aperta sul mare con motivi veneziani (Square on the sea with Venetian themes) and Disegno di città immaginaria (Design of an imaginary city) both painted at the beginning of the 19-th century. Luciano Semerani has observed that his love of ancient Greece brought Schinkel to favour the topological relationship between the objects, "which he placed to constitute a minute face-to-face dialogue with great correlations with the urban structure". Observing the views of the buildings recomposed by Schinkel in the reciprocal dialogue and in relationship with the context, it is notable that Semerani writes "Schinkel's interest is almost never in individual monuments or architectural ruins but he usually shows them inserted in generous sweeping landscapes (…). Schinkel interprets the landscape and composes images". It is a matter of "working by memory, by citations, by transposing objects outside their normal context" in a "real and true invention of context, an attitude that also lives in 'visionary' architects". (Semerani 1982). It is not by coincidence that Schinkel was firstly a painter and a scenographer, and among the other important architects Hendrik Petrus Berlage trained as a painter before embarking on a career as an architect, and Le Corbusier painted on a daily basis.

Similarly, the interest that the famous Venetian painter Giovanni Antonio Canal, known as Canaletto (1697-1768), shows in some of his mid-18th century canvasses constitutes a point of reference for this methodological direction. Not only Palladio's Rialto Bridge project appears with a certain frequency in the views of Venice painted by Canaletto, but the artist represented in his painting Caprice with buildings by Palladio of 1756-59 the Palladio's Bridge with two other works designed by Palladio, Palazzo Chiericati and the Basilica, that are part of the city of Vicenza. The bridge, the Basilica, and Palazzo Chiericati are placed in the scene and commented on as if the artist wanted to present a view of an urban context effectively observed by him. In the chosen environment, Canaletto juxtaposes architectures from other places and epochs providing form to new spatial connections, thereby verifying unthought-of opportunities to compose buildings and monuments that modify the space. Through the practice of constructing by using perspective, architectures put into play acquire a new relief that attributes power to both the context enriched with new value and to the individual projects in their renewed conversation and/or interaction with the context.

The architect Aldo Rossi is author of one of the most significant comments about this work of art. "What matters most in this frame is the theoretical construction, the hypotheses of a theory of architectural planning in which the elements are formally prefixed and defined but in which the meaning triggered at the end of the operation is the unexpected but authentic original meaning of the research" (Rossi, 1975). The architectural project in Canaletto's Rialto is compared with the place

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and inevitably interacts with it by proposing alternatives to the real city.

The place of study. Prato della Valle as an expression of the Enlightenment culture

The place of study, what the Rialto in Venice was for Canaletto and the hill of San Giusto overlooking Trieste was for Schinkel, in the case considered in this article is Prato della Valle in Padua and especially its southern side, where the wall delimiting the fields of the convent of Santa Maria della Misericordia rose (Toffanin, 1988). The old complex of the Benedictine convent particularly flourished in the mid-18th century, and the convent still existed in the years in which the Age of Enlightenment project for Prato della Valle was designed and developed and may be considered to have constituted an inspirational element. It was suppressed under Napoleonic laws in 1808. The church and church tower were demolished and part of the convent was transformed into housing. Then later all of this was demolished once and for all so that the Foro Boario and the Stadio Appiani could be built in the 1930s.

Figure 1. Aerial view of Prato della Valle, Padua. Current state.

The long wall of the convent's fields therefore constituted the southern limit of the Prato della Valle wide space when Andrea Memmo (1729-1793), from 1775 extraordinary Superintendent of the Serenissima Republic of Venice, instigated the initiative to redevelop the marshy area of Prato della Valle and transform it into a meeting and business centre for the whole city. Memmo was assisted by the Abbott and architect Domenico Cerato (1715-1792). The project, that was in line with similar breath-taking ideas realized in European capitals, was approved by the Venetian Senate on the 3 August 1775 (Zaggia, 2016) and was subsequently several times subject to rethinking and variation.

The layout is based on the design of an elliptical island at the centre, known as "Isola Memmia" in honour of its creator, Andrea Memmo. The island was created through the relocation of a great deal of earth, about ten thousand cartloads (Radicchio, 1786), to reclaim the marshy land. It was surrounded by an artificial canal, crossed by four bridges on the axes of the ellipse. The shores were lined with a double row of statues representing illustrious Paduans, including adopted figures and Padua natives. The water was supplied by the Alicorno canal, largely covered today. According to the original version, the island was to accommodate a wooden structure containing fifty-four shops, designed to follow the elliptical form of the canal. However, this original concept was later limited only to the south part of the ellipse, before being abandoned altogether.

Memmo lived in the 15th century palace situated at the northern entrance to Prato della Valle and could thus oversee the work being carried out. He planned for the area's commercial relaunch to coincide with an overhaul of its sanitation. Prato della Valle was to be transformed into an appropriate setting for the local seasonal fairs and events that were traditionally held there, whilst also being suitable for providing refreshment for the population.

Numerous depictions testify to the presence of the wall that was solidly capable of responding to the elastic nature of the island. All of the views show the continuous masonry of the convent delimiting the southern side of the wide open space. The mid-18th century painting by Canaletto shows the Prato della Valle space before the transformation during the Age of Enlightenment, with all of the southern side in view and the green grass of the land in the convent appearing above the

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masonry of the enclosing. Furthermore, as shown in the painting of Lorenzo Sacchetti (1759-1835) of 1775 or 1776 and in the views of Daniele Danieletti, the straight wall that delimits the property of the convent does not seem to have been modified during the construction of Memmo's project. Of particular relevance to our purposes is the view drawn by Giuseppe Subleyras (1781-1794) and engraved by Francesco Piranesi (1758-1810) showing a continuous three-storey building that contains the spaces used to transact business, closing with a straight development which conceals the church of the Misericordia the southern side of Prato della Valle. In 1786 Subleyras depicted a building whose uninterrupted length covers the distance that separates the monastery of Santa Giustina to the east and Palazzo Verson to the west (Figure 3), implying the "movement of the business functions outside the island" (Donvito 2016). According to this proposal, the view in all directions from the island would have remained free and this would only have been used as a public garden.

Figure 2. Prato della Valle. Drawing by Stefano Codroipo, copy of the original by Giovan Francesco Bacin, 1767.

The Foro Boario architecture

The current conformation of the southern tract of Prato della Valle arose in the first part of the Twentieth Century and is still composed of the entrance building to the Foro Boario (Figure 4), which is the livestock market that has been held in the middle of the square's large open space since 1775. As Renzo Fontana writes, "after having discarded various proposals and projects to move the market elsewhere, in 1913 the local council bought the area, property of the Padri Armeni, and the project to build the Foro Boario was entrusted to the engineer Alessandro Peretti. Construction work began in 1914" (Fontana, 2000). The area bordering on the southern side of the Prato della Valle was therefore used for this specific function that was maintained until a new Foro Boario was built in Corso Australia outside the historic centre of Padua after the Second World War.

Figure 3. View of Prato della Valle with an imagined continuous three-storey building on the south side. Drawing by Giuseppe Subleyras engraved by Francesco Piranesi, 1776.

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The style adopted by the new architecture does not seem to be important here but is still well described by Fontana: "The language is impressed on an eclectic taste with the prevalence of motifs from the classical-renaissance list (columns, pediment, metope and triglyph frieze, gabled windows, with ashlar work on the ground floor)". Above all, Peretti's Foro Boario is characterised by the lack of continuity of the long façade, composed of alternating detached volumes, with large gaps and empty spaces between these volumes, the opposite of the full straight façade that historically delimited this space. In fact, Nicla Bedin says that the façade "is composed of three blocks overlooking Prato della Valle with two symmetrical lateral bodies, joined together by terraces and open galleries" (Bedin, 2004). The façade of the entrance into the large area of the new livestock market, which will soon be completed with ceilings and stalls, "is born as a multifunctional construction, 135 metres long, in which post and telegraph offices, banks, and veterinary centres will be hosted."

The proposal of verifying the result that would have been obtained using an architectural solution closer to the compactness of the historic limit of this space is specifically motivated by the fragmentary nature of the solution built between 1913 and 1914, with a greater attention being paid to the functional and aesthetic requirements of the Foro Boario and less to provide a general coherence of the buildings around the elliptical square. On the other hand, this appearance had already been noted at the time. In fact, Mario Universo writes "here we have a project that is (…) another drop-scene of stone, so magnificent outside but empty inside, 'a luxury job, useless and unproductive' as the chairman of the Chamber of Commerce R. Mion defined it in 1914" (Universo, 1986). It should be also added that the bibliography does not contain particularly positive opinions regarding the Foro Boario.

Simulations

In order to carry out the initial evaluation of how Prato della Valle would present itself if its southern side were still composed as it was in the past, that is, deleting the perforated incoherent façade of the Foro Boario which deeply weakened the strength of the revolutionary design by Memmo and Cerato, two different architectures have been virtually placed in the site. These architectures are two masterpieces with compact and continuous façades, located to redefine the boundary that historically defined the marshy public space and, after the end of the 18th century, the pressure of the ellipse that gave it form.

The first hypothesis involves a construction by Schinkel standing on the south boundary of the elliptical square, the Altes Museum (Figure 5) which overlooks in Berlin another garden,

Figure 4. Alessandro Peretti, façade of the Foro Boario, 1913.

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the Lustgarten. The Altes Museum was planned and built between 1823 and 1830. The building structure brings together for a very unified outcome its composite elements, characterised by its regular design offering immediate readability, and its reciprocal juxtaposition. On the façade facing the Lustgarten, or the Prato della Valle in this virtual hypothesis, the eighteen ionic columns between the two corner pillars, designed without pediment, are placed at the front of a shallow portico, blurring the border between the external open space and the interior area. Behind the portico are the stairs that connect the vast open space of the park to the upper floor. One could imagine an extension of the colonnade beyond its actual dimensions to widen the proposed divider, balancing the ellipse of "Isola Memmia".

Prussia's first public museum, originally called the Königliches Museum (Royal

Figure 5. The Altes Museum in Berlin by Karl Friedrich Schinkel in place of the Foro Boario building. Imagine by Andrea Andolfatto and Nicolò Cappellari, students at the course of 'Architectural and Urban Composition 2', Department of Civil, Environmental and Architectural Engineering, University of Padua).

Figure 6. The Nelson-Atkins Museum of Art, Kansas City, by Thomas Wight and William Wight in place of the Foro Boario building. Imagine by Francesco Cavazzini and Marco Vettore, students at the course of 'Architectural and Urban Composition 2', Department of Civil, Environmental and Architectural Engineering University of Padua).

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Museum), was designed to house the art collections of the royal family. The location of the headquarters of an important cultural institution in Prato della Valle is not the only one hypothesis of this type thought for this vast space transformed by Enlightenment. A few years later, in 1824, Giuseppe Jappelli proposed a project for the east side, which involved another important building complex dedicated to culture - the city university. In the first half of the 20th century, an additional proposition, probably formulated by the architect Quirino De Giorgio, would have proclaimed the spatial inadequacy of the Foro Boario to match the powerful form of "Isola Memmia". After the creation of the entry to the livestock market, between 1937 and 1940, the design of Padua´s headquarters of the National Fascist Party obscured Peretti's chaotic building complex from the views offered from the heart of "Isola Memmia".

The second hypothesis closes the elliptical square of Prato della Valle to the south by using the architecture of the Nelson-Atkins Museum of Art in Kansas City designed by Thomas and William Wight and built between 1930 and 1933 (Figure 6). The museum was extended with a new building by architect Steven Hall who won the tender in 1999 but it is the stone background of Wight and Wight that particularly fits the architecture desired in the exercise presented in this paper. The dynamic tension produced by the elliptical shape of the island breaks against the wall of the museum, as it happened with the wall of the Santa Maria della Misericordia convent in the proposal of Memmo and Cerato. The compactness of Wight and Wight's neoclassical façade strengthens Cerato's design conferring unity to the open space of the elliptical square by providing the certainty of well-defined boundaries on its edges.

The insertion of Thomas and William Wight's architecture also allows for an evaluation of the presence of water, which we know was once not limited to the canal around the island, but existed as an open-air stretch of the Alicorno canal in the south-eastern part of the Prato della Valle.

Conclusions

The juxtaposition of well-known architectures to provide form to new spatial connections in the environment verifies new opportunities to compose buildings and monuments that modify the space. The inventions resulting from the union of individual architectures into unitary visions that do not organically belong together is a particular iconography in which buildings abandon the passive and ornamental function thanks to which we have got to know them and reacquire an actively elevated role in the project.

The effectiveness of this method is reflected in the actual experiences of many photographers and digital designers who have been studying the theme of context by varying the elements it contains, using features that are or were found in other places or in other times. Anton Rapponen, Chris Helgren, Alexey Kondakov, Julien de Casablanca, Julia Fullerton-Batten and Alberto Alicata are just a few of the many artists that can be cited, united by their invention of context through the combination of real and imagined elements.

The focus on the southern side of the Prato della Valle in Padua also offered an opportunity to verify a possible reading of the composition of the architecture as a result of a way of thinking based on form rather than function, an aesthetic development that recognises form as a repository for the values of the community in the representation of urban spaces.

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Murcia and Sant Mateu. Plots form and band of pertinence. Meaning for architectural design

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Abstract. *Some our studies of urban morphology, implemented on historical and contemporary urban fabric maps, allow us to believe that the shape of the lot and of band of pertinence of a pathway are essential to reading the formative urban process. Different phases of formative process of an urban center seems, in fact, to be recognizable in the of shape of lot and interaction between lots and path. These morphological shapes (lots) are the result of different centrality that are produced in the building fabric and, consequently, the restructuring pathways are important for understanding rules and causes of urban and architectural transformation of the city. This paper aims to offer a contribution to the definition of the elements of urban morphology. This research, part of a series of research, carried out in the Lab. Lettura e Progetto dell'Architettura of the Faculty of Roma (Sapienza), tries to be implemented in some case studies: Murcia and Sant Mateu.*

Keywords: Sant Mateu, Murcia, Urban morphology, band of pertinence, formative process.

Introduction

In the last 3 years, working in the LPA (Lettura e Progetto dell'Architettura) laboratory research activities, led by prof. Giuseppe Strappa, i've been experimenting reading of urban tissues in order to understand how urban transformations can offer suitable information for the definition of present-day architectural design, both in the type of building style and in the role, that the building must have at the level of tissue and urban organism.

The particular occasion of these two Degree theses, which were developed in correlation with some professors of the Architecture Faculties of Murcia and Valencia, offered me the opportunity to experience the reliability of this morphological analysis method. A tool that was mainly improved on the Italian cultural landscape. That is recently focused on the comparison of cadastral shape, buildings forms and through the study of bands of pertinence of these routes, as well as the modalities and polarities, within the urban fabric, that step by step, they have regenerated the urban form. The aim of this research activities was to formulate a theory on the formation process justifying the various urban polarities that are alternated inside the urban center. And that through which it was possible to trace the basic lines for a new urban phase design and for an architectural solution congruent to the inherited form of the fabric and congruent with the present day demands. (fig 1)

In both studies, presented on this occasion, one has initially attempted to reconstruct the formative process of urban fabric, to start from recent forms and urban restructuring. Then, by subtracting of these first, one tried to highlight the previous phases and the matrix structure, which probably, directly related to the natural morphology of the territory, it has determined the place and the form of this original settlement.

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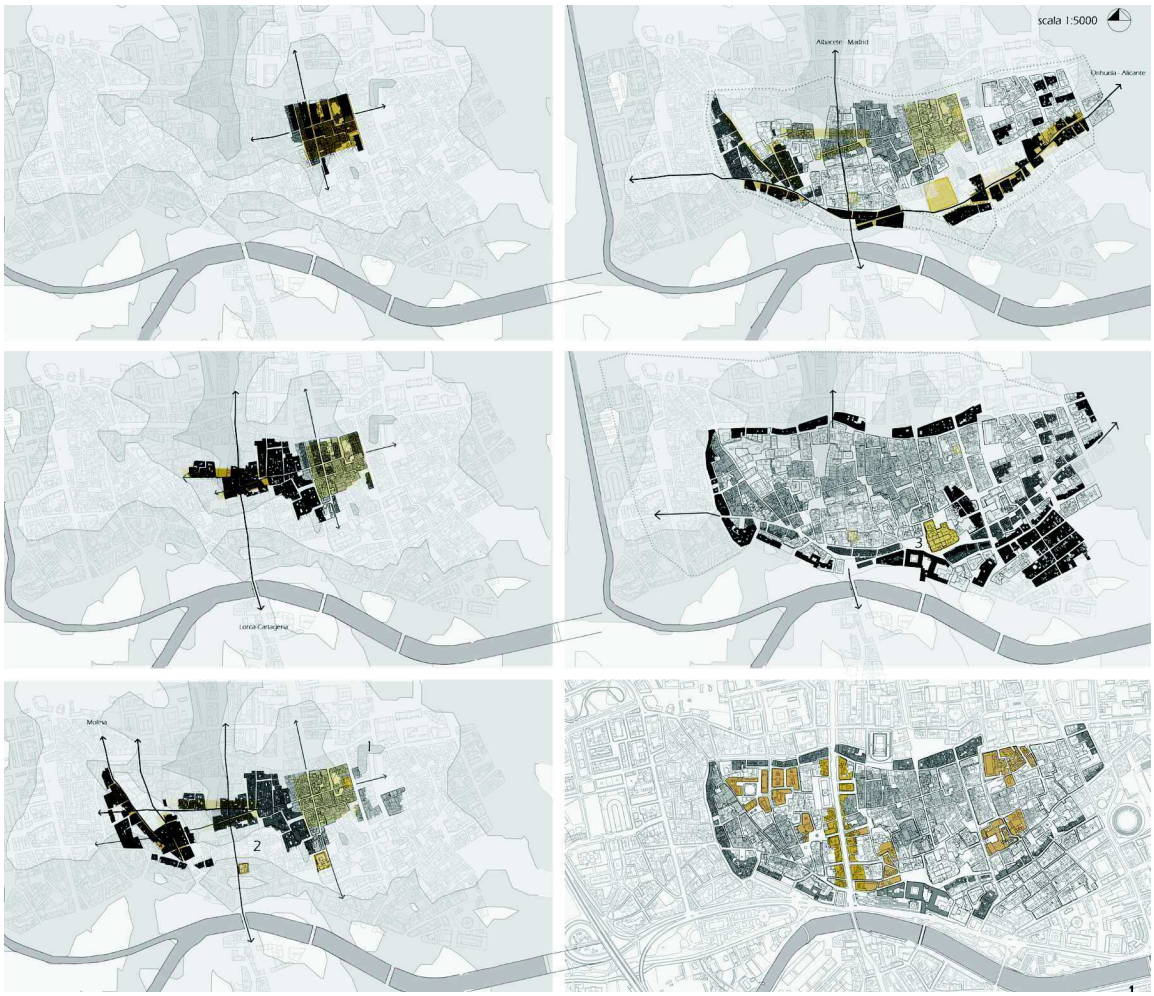

Figure 1.
Murcia: Phases of the formative process

Murcia

The subject of this architectural design in Murcia, that has been performed on this thesis, concerns the transformation of a residential building into a special building, destined to become an hotel. The building, which is the object of this degree thesis in architectural design, situated in the Plaza Martinez Tomel, is placed at the intersection between the ancient walls of Murcia, just near the bridge over the river Segura, and the path of refurbishment (puente vjejo), that in the last century, it has cut into two parts the ancient urban fabric. The reenactment of the morphological phases of the City's historical fabric, it has highlighted the current trend, that is directed towards a new layout, towards a new significant urban pole and in the direction of a consequent specialization of the residential building.

The analysis of the urban morphology and the diachronic formation of the restructuring paths, that have historically overlapped in the urban fabric, (fig 2a, b) have highlighted the tendency for formation, inside the urban fabric, of a new nodality, exactly in the vicinity of the building considered. An urban polarity that implies, obviously, a necessary design reflection on the fabric and consequently for the characters of building type.

Therefore, the thesis proposed that La Plaza Martinez be returned as urban polarity. This is to solve the problem of urban connection through a subway that would free the traffic from the historic route. This in order to return, the great urban refurbishment avenue, to the old center as a new linear square, and with the dignity of unifying polarity, that in the drawing

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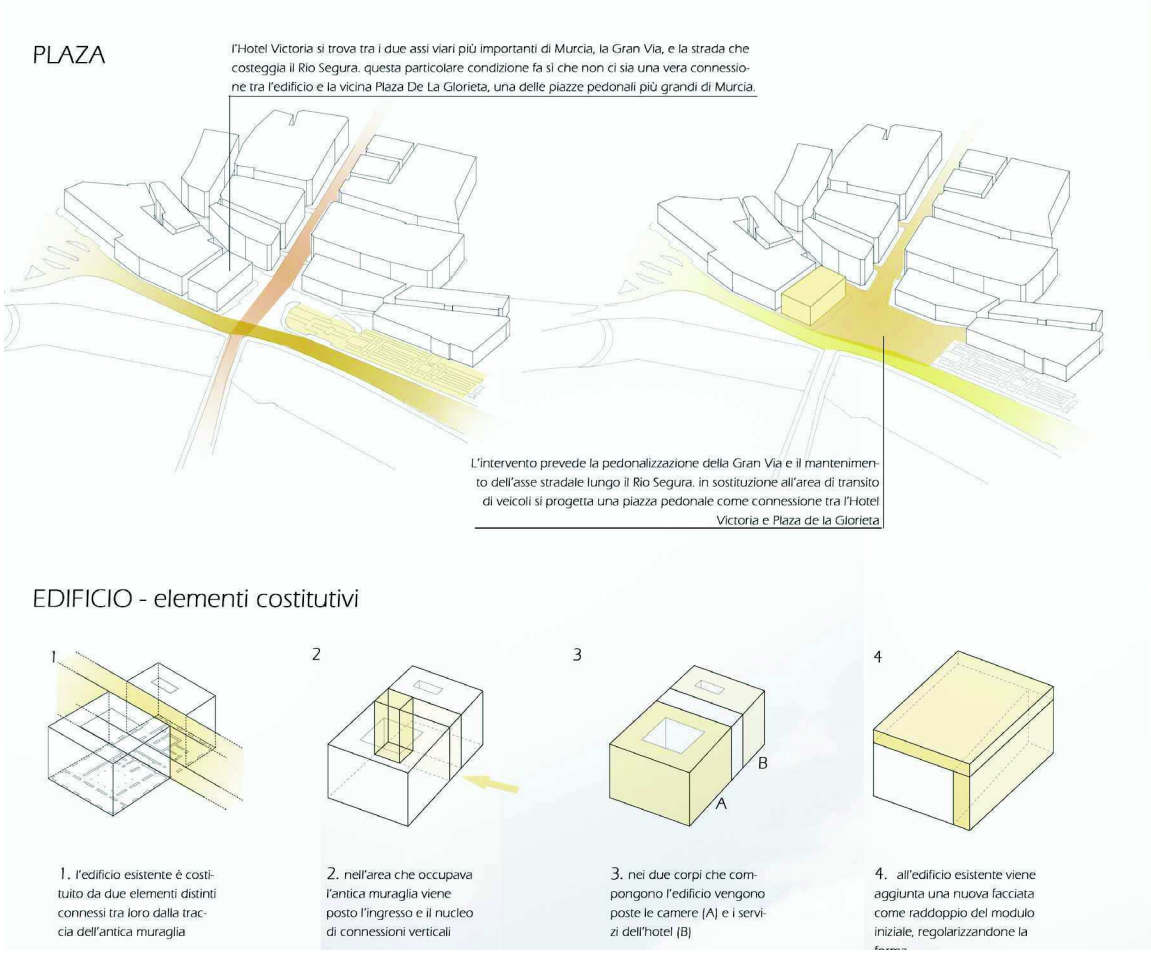

Figure 2.
Murcia: urban role and character of the building. Present day situation and architectural design

of the pavement remembers the ancient urban design. (fig 3a, b)

The building's specialization has become possible through the juxtaposition of a new building body, useful to transform a secondary prospect into main facade. So this new facade turn the facade toward the Plaza Martinez, placing it in an axial position with respect to the gardens lying behind the Town Hall and the Palacio Episcopal. The proposal to place a new building body over a secondary facade of the residential building, permit to transform the public space in a square that has the task to serve the new "palace".

The addition of a new fruitful and distributive system imposes to the building the special character. The added system transforms the most "antinodal" structures into the front and main elements. He turns the back in the front by reorganizing its serving structures (in the building), to impose a new-look to this particular urban polarity.

Sant Mateu

Similarly, the case study of Sant Mateu, also produced for a degree thesis and with a correlator of the University of Valencia, has been developed after the analysis of characters of the urban morphology of the ancient center.

As in the Murcia thesis, even in this second example, the urban fabric was examined through the forms of individual cadastral plots, put in relation to the paths and polarities that have come, gradually, to form. The warp and the shape of the cadastral particles allowed us to highlight the various restructuring paths that have overlapped in areas that were differently orthogonal. Originally related to territorial

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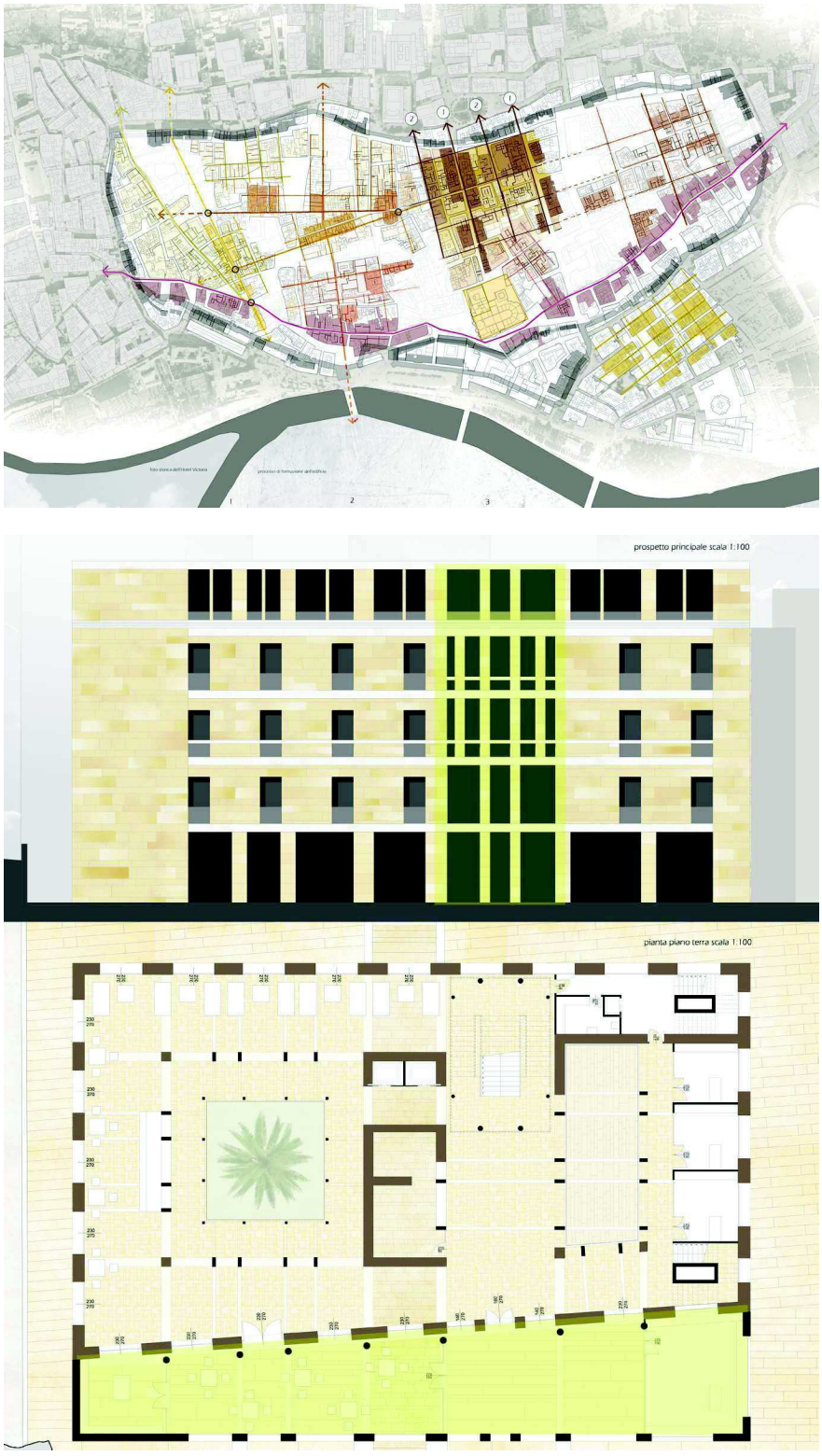

Figure 3.
a. (above) Murcia: Reading of the bands of pertinences to the urban fabric
b. (below) Murcia: architectural design

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matrix road or to subsequently planned areas. Thus, the sequence of overlapping or juxtaposed building phases has been rebuilt, organized on mature paths or urban reorganization, reorganized through new refurbishment paths.

The subject of the architectural design has been an old winery. As the buildings was abandoned, we have reconsidered the edifice as an exhibition place and tasting-room for wine-related productions.

The building, originally placed in an antinodal position, can develop a new urban nodal role with this new definition. (fig 5)

The building located on the edge of the historic fabric, was an industrial building characterized by a hypostyle room divided into three large parts serving and served at same time.

The building has located to the margins of a suburban planning organized in relation to the Carrer de la Quatremitjana avenue. Old winery had in nodal position the entrance serving, used for entry of raw materials into the intersection of perimeter paths.

The design hypothesis, which proposes the transformation of the building like exhibition space and tasting of the vineyards, suggests the overturning of the façade of the building and the addition of a new entrance structure destined to receptive and distributive function.

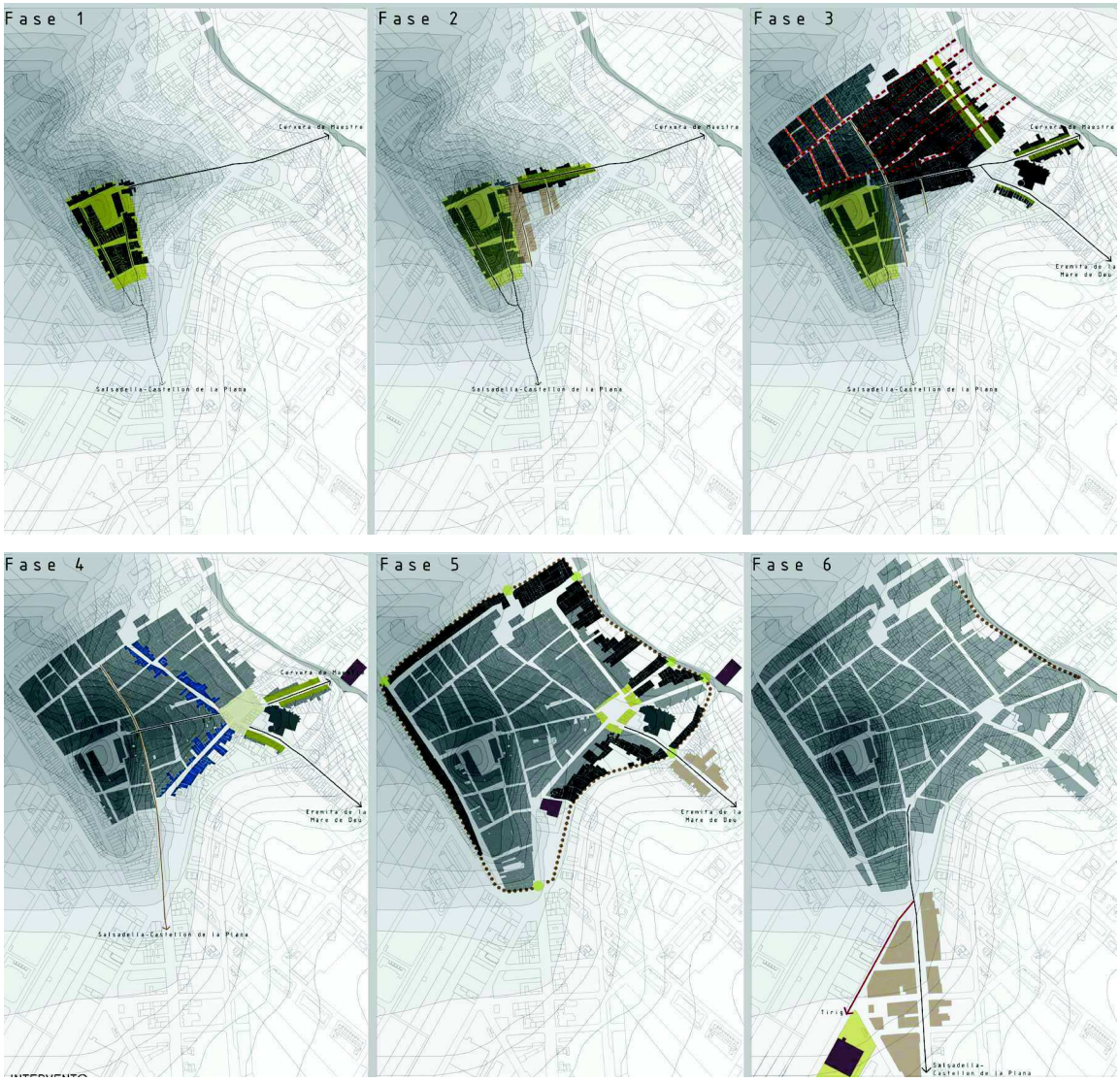

Figure 4.
Sant Mateu: reading of the bands of pertinences to the urban fabric and hypothesis of the phases of the formative process

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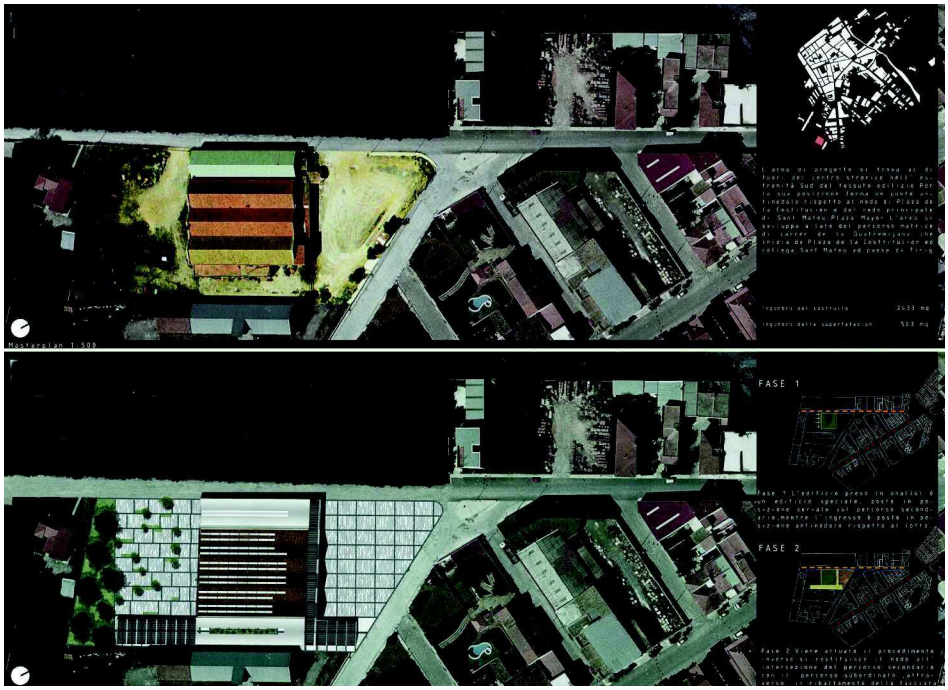

Figure 5.
Sant Mateu: present day situation and architectural design

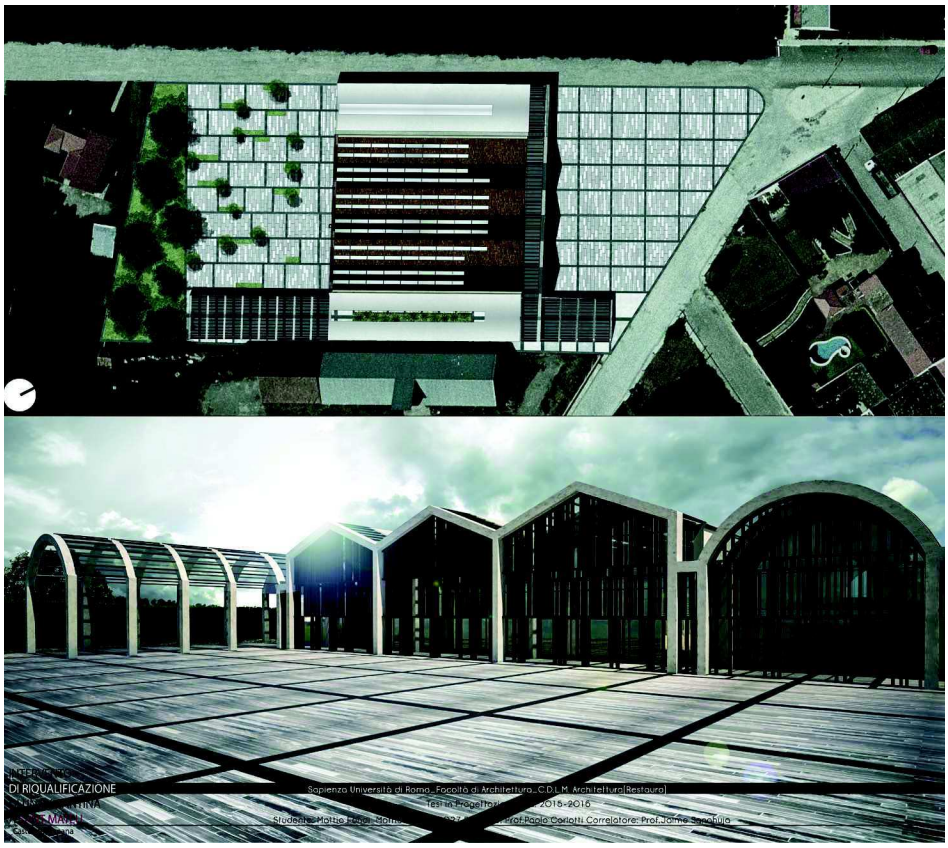

Figure 6.
Sant Mateu: architectural design. Nodality in the urban tissue and new definition of the urban organism

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New atrium changes, in so manner, the frontal urban space, that has reconsidered as a square, as an exterior pertinence of this renewed building.(fig 6)

Conclusion

The analysis of the pertinence bands and the shape of the plots, in relationship to the route and to the block, allowed us, in both cases here, to expose the usefulness of the reading of the urban fabric and of the formative process. To suggest for architectural design in the historical fabric, possibility of insert a new paths urban knot together with a new building. To include A new architectural and urban design inside the similar historical process that had materially determined the history of the city.

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Tourist settlements in the Comunidad Valenciana coast: A Typological Map

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Abstract. *The system of tourist settlements on the Mediterranean coast presents a great complexity, as well as its geographical, landscape, morphological, urban and architectural conditions like for the varied way of relating to it the social and economic groups involved. The purpose of the communication is to expose the research about the need and the possibility of actions providing tourist settlements with urban and territorial cohesion, and enabling new proposals where what is decisive is not only acting on the parties but, globally, on the conditions that defines the scenes of action. In order to deal with the complexity of the tourist development on the Valencian Mediterranean coast, we proposed, as a first step, the identification of settlement types where, contrary to the buildings type, it will be necessary to apply mechanisms that take into account there are structures in the process of evolution. As Giorgio Grassi (1973) already said, a classification is not a type but allows an approximation to it. This has allowed the development of a "Typological Map of Tourist Settlements in the Comunidad Valenciana" where situate case studies while reading the territory as a whole and each settlement in relation to others settlements. A map to add data, based on the definition of parameters related to structure, urban form and architecture, but also to the relationship with the coastal physical environment, and selected for their capacity to provide data for the research purposes.*

Keywords: Typological Map, Tourist settlement, Valencian Mediterranean coast, Complex System.

Introduction

The touristic settlements system on the coast shows profound complexity both because of geographic, landscape and urban conditions and also because of the scheme of elements to be considered. We refer to "complexity", in accordance with Edgar Morin (2004), as a network of heterogeneous, inseparably connected constituents. Likewise, a complex system is the one in which it is possible to find a network of events, actions, interactions, retro-actions, decisions and chances which create our phenomenal world (Morin, 2004). When addressing the concept of complex system, it is necessary to take into account the set of elements (or parts) interacting with each other and with the surrounding environment . In this sense, its intelligibility cannot be found only within the system but also in its relation with the environment; this relation is not a mere dependency but has to be seen as a constitutive element of the system.

Complexity is the starting point from which it is possible to establish strategies for sustainable regeneration of touristic urbanisation in order to improve physical and environmental conditions of the Mediterranean coastal strip; moreover, complexity encourages a vision of the territory as the simultaneous expression of unity and diversity, as a system of differences, according to Mar Loren (2014). This is the main goal of a typology map of Comunidad Valenciana touristic settlements that, as a tool for analysis, allows analysing the territory as a whole and each settlement in relation with its closest environment.

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On the other hand, this strategy allows us to imagine action scenarios according to information, indeterminacy and random elements participating or even disrupting the course of the action. To this effect, the strategy has to fight against randomness through a comprehensive search for information, combining different knowledge sources.

In this work, the typology map of touristic settlements on the Comunidad Valenciana coast has been analysed on the basis of parameters chosen considering the development of "Estrategias para la regeneración sostenible de asentamientos turísticos en la costa mediterránea" ["Strategies for the sustainable regeneration of touristic settlements in the Mediterranean coast"].[1] This is a research project which originated from the hypothesis that it is possible to find effective solutions to the touristic settlements' regeneration that, as a factor for economic, social and territorial development, do not imply territorial, structural, architectural or landscape disruption but, the other way round, that could become a driving force for territorial regeneration implying its recovery, restoration and reuse. The research project, whose results are collected in the publication Orilla marítima. Territorio litoral (2015) [Seashore, Littoral Territory], does not propose specific projects but looks into the need and possibility of actions and projects, and their recommended orientation, underlining the necessary effort in order to construct realities which are more and more multidimensional, transnational and transversal. (Figure 1)

Touristic settlements on the littoral

For the sake of clarity, it is necessary to specify the nature of the subject of study – the touristic settlement –, as the city is also the urban way of living, a network of relations between constructions and behaviours. Thus, at another stage the identification and participation of the dweller will be necessary, as a co-creator/author and active participator–

Figure 1.
Calpe, Marina Alta. Alicante.Views from Peñón de Ifach.
https://commons.wikimedia.org/wiki/File:Vistes_des_del_penyal_d%27Ifac,_Calp,_Marina_Alta.JPG accessed 20 May 2017.

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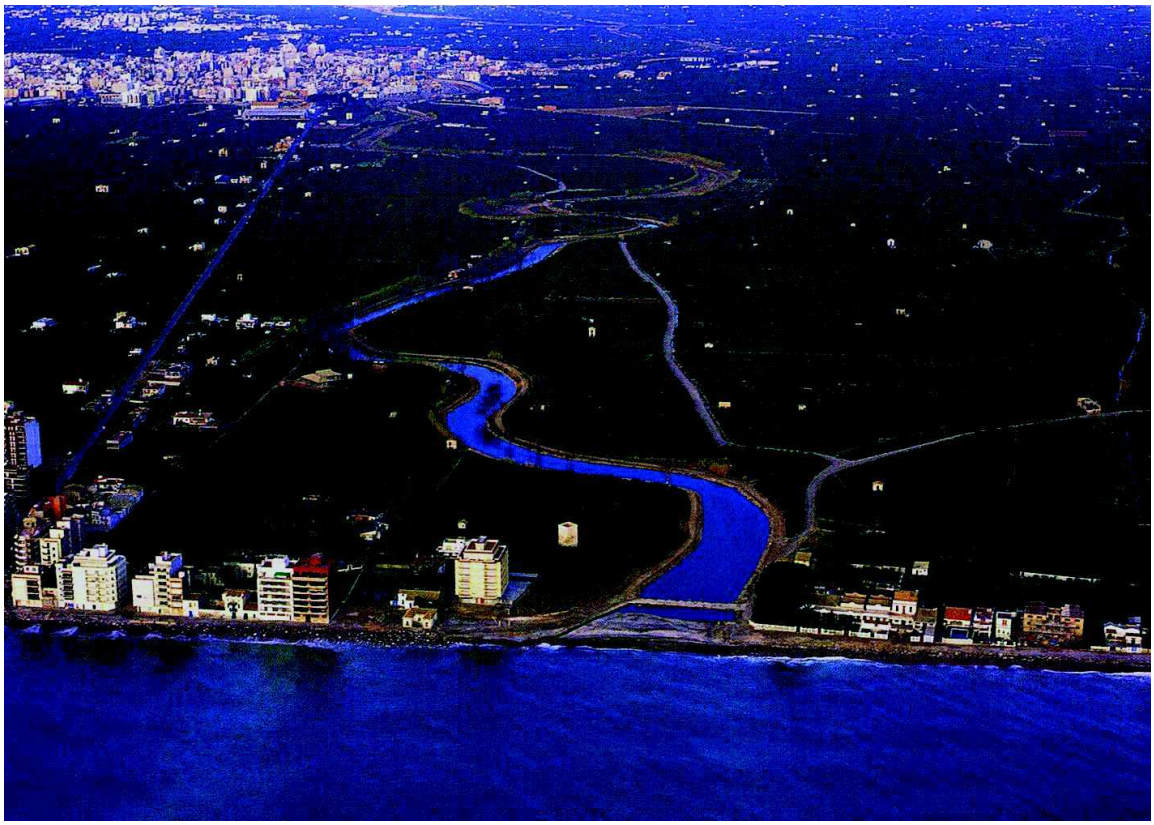

Figure 2.
The Ana river north of Grau de Burriana, Plana de Castellón. In Salvador Peiró (photo) (1989). Guía de la Naturaleza de la Comunidad Valenciana (Levante, Valencia) 501.

voluntarily or involuntarily – in building the city and in interpreting the dialogue between the territory and its dwellers, its scenarios and time frames. All this, for the purpose of this work, in a specific geographic area: the coast, a constantly changing and evolving system, with a high ecological value and a considerable biodiversity, a space of transition between terrestrial and marine systems and in which there are intense interactions and exchange processes.

On this littoral, it is possible to find a settlement method developed over the last decades of the 20th Century, which has been transforming large coastal strip areas with a high urban growth from juxtaposed constructions to a built-up continuum. Such interventions entailed functional and landscape territorial changes. It has been an urbanisation of holiday villages and seasonal supply, firstly based on relations between urban historic areas (characterised by urban functions) and first coastal settlements (foundation of economic, agricultural and fishing activity mainly), and later based on a series of accommodation, catering and services buildings that started taking up and over territorial areas unspoilt until then. The evolution of these settlements was firstly subject to factors such as hydrography, communication ways or economic activities on the coast but also residential areas. All factors contributed to the creation of a large mesh with an increasing dispersion towards the interior, facilitated by motorisation and improvements in the communication structures, with the consequent increase in mobility flows, complexity in the use of soil and settlement types. A territory in which, as Mar Loren (2014:19) said in reference to Costa del Sol, "dwellers from different zones run into each other but seldom look at each other, they use the same infrastructures but they rarely go to the same place".

Accordingly, getting to know the touristic settlement means both to consider its characteristics, tourist reception device and

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the consequences of its implementation on the territory, and also its population, social interaction, positioning strategies and reasons and consequences both on the welcoming population and on its surrounding environment population. These are dynamic aspects of this issue which, in the Comunidad Valenciana, are even more visible concerning due to the big presence of second home settlements for native population alongside with the strictly touristic activity, sharing resources and territorial structures. However, as Alfonso Fernández y Arsenio Villar (2011:598) stated, "the extraordinary proliferation of second homes, with the consequent pressure on resources and structures (beaches, soil, water, landscape, communication and supplying infrastructures, water treatment, etc.), ended up damaging the tourist experience in those areas"; so that this second homes proliferation was pointed out, even by travel agents, as the main problem of the touristic model on the Andalucia and Spanish coast. (Figure 2)

Dealing with tourist reception device and starting from the diversity of ways that tourism can take on, we consider that the touristic settlement is the expression on the territory of the way of living created for touristic purposes and as a consequence of specific occupations, conformations and transformation of the space, social and socioeconomic relations etc. – both during touristic influx and also when this influx decreases or stops, both on the welcoming population and on its surrounding population. We have to consider, as Amos Rapoport (1977) pointed out, that contrarily to the idea of landscape and climate determinism, geographic location is not a construction imperative. Or, according to Almeida, Mora i dos Reis (2010:9-10), "architectural forms change in areas where geography hasn't changed, as for example on the Mediterranean coast".

Throughout this research, each settlement has been identified from the point of view of toponymy and of its identity, administrative or geomorphological character, defining throughout the Comunidad Valenciana littoral a total number of 205 touristic settlements in 60 coastal municipalities. Among those, 49 in Castellón province in 16 municipalities, 58 in Valencia province in 24 municipalities, and 98 in Alicante province in 20 municipalities. However, regardless of the number of settlements and in order to better understand the dominant implementation structure in the Comunidad Valenciana it is also necessary to be aware of the coastal length considered: of the 418.354 lm taken into account, 272.154 lm (65%) present a consolidated urban front. (Figure 3)

Classification

From this point of view, the understanding of the situation of touristic settlements on the Mediterranean coast cannot be based only on the accumulation of specific data on each settlement. But also social circumstances, economic conditions, physical support of the territory and population habits show sufficient common features in order to suppose that there is a limited number of settlement types.

In the architectural field, the existence of these basic structures is considered settled to such extent that Aldo Rossi (1979:69) stated that the type is "the very idea of architecture". But the interesting matter for our purpose is not the building types but the implementation of settlement types, and in order to understand them it is necessary to use classifying methods which take into account that these are not complete accomplished realities but structures in a process of evolution.

As Giorgio Grassi (1973) said, a classification is not a type but allows us an approximation. In this sense, a settlement type as the one we suggest has to be seen basically as a tool that helps us obtaining a useful classification for our research goals. Every classification is based on a criterion or on a coherent combination of them, and it is not possible to say that some criteria are better than others unless this is based on if they are more or less capable to give us useful data for the research goals. Thus, one of the first works accomplished in the research Touristic settlements on the Comunidad Valenciana coast in order to make it effective in the creation of an intervention strategy, was the creation of a Typology Map. For this, it has been necessary to establish classification criteria, to rank them according

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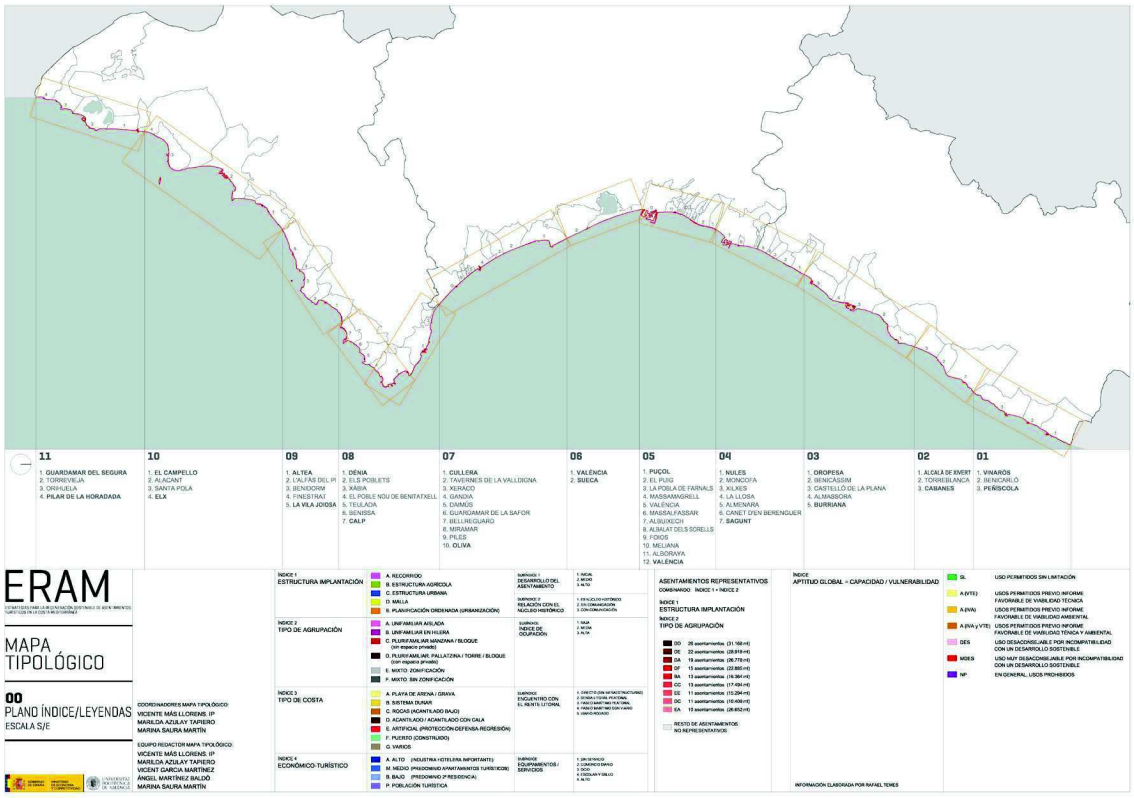

Figure 3.
Typological Map. Sectors and Legend.

to their effectiveness and decide the degree of interdependence among them.

Typology map of the Comunidad Valenciana touristic settlements.

As Leslie Martin (1975) explained, cities are built from quite a simple range of situations: a network of streets, the plots created from this network and the buildings' distribution on them. However, the understanding of their relations is essential in order to rethink the cities structure.

The first approach has been the establishment of four indices grouping interdependent criteria while also establishing typifying sub-indices, for the need to consider different development degrees of the settlements.

1. Implementation structure, differentiating groups around a road axis or according to the consolidation of the pre-existent agricultural structure in systems based on an orderly planning aiming at touristic or second home exploitation, cities intentionally created by planners as Christopher Alexander (1968) defined them. We added the mesh on the way, a kind of board establishing the rules of the game, according to Martin (1975).

Sub-indices define the degree of development and point out the degree of connection between the settlement and urban areas and their functions. The degree of development of the settlement is an indicator of a situation in time, while high development levels shall determine possible actions.

2. The second index is the predominant grouping type in different structures.

It is about determining what building types there are within the settlement and their distribution in it; all this, differentiating between the field of one group (isolated single-family home, grouped single-family homes, multi-family dwellings in blocks or towers etc.) and of other groups where it is not possible to establish a predominant type because there are various types at the same time, regardless of motivation or evolution in time. Anyways,

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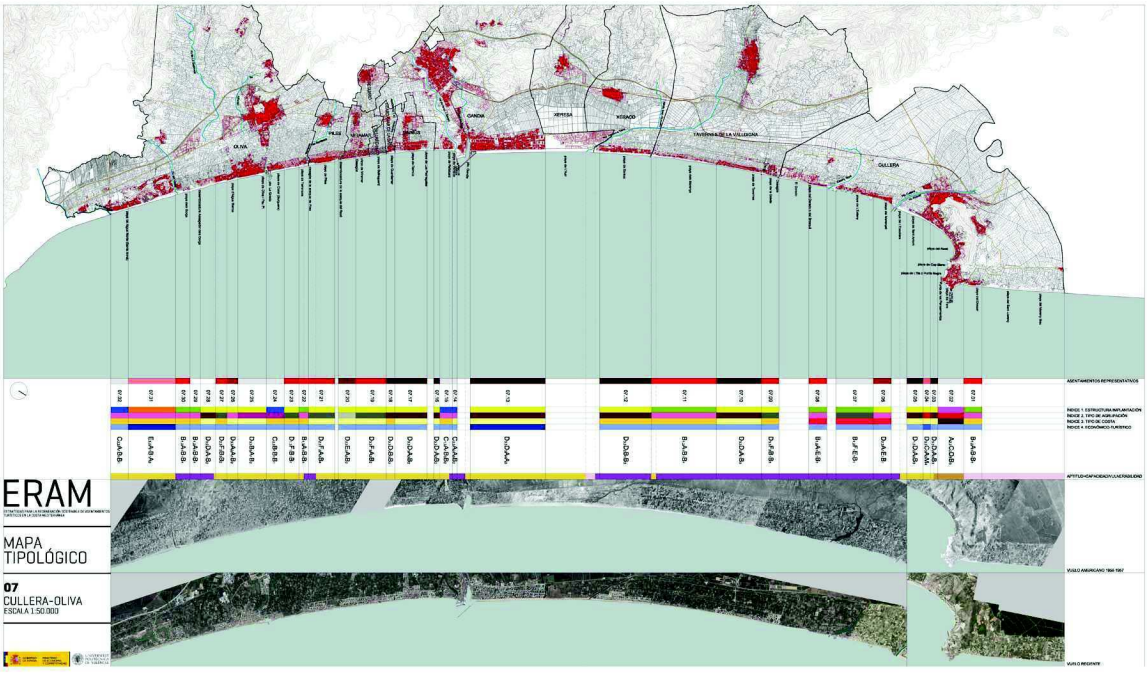

Figure 4.
Typological Map. Sector 07. Cullera-Oliva. Valencia.

the important aspect for this study is not the architectural type but its consequences on the urban space; for this reason the sub-indices point out the concentration and occupancy degree or, in other words, the presence of available spaces. All this together with the urbanising process development degree on the territory allows us to define a qualitative and quantitative evaluation of functional and formal features of settlements and consequently suggests scenarios for the implementation of settlement regeneration strategies.

3. The aim is to analyse the influence of the coastal line, with a diverse morphology on the Mediterranean coast, both from the point of view of natural elements and of actions, especially those aiming at protecting the coast. A specific aspect is port spaces and beaches created by port structures, their position regarding the city and especially their dimension.

The sub-index defining the way in which those are connected to the coastal line is relevant: seafront promenades, shore paths, traffic streets etc.; the presence or not of transition areas where to find or not different structures. This connection, always present, will show the level of accessibility and connection between the settlement and the coastal line.

4. It is clearly hard to analyse the unregulated accommodation supply, and for this reason the economic-touristic parameter classifies settlements according to touristic industry or second home. The sub-index shows, in this case, the different levels of services in the settlements and its analysis can provide us with new ideas about mobility within the territory.

Methodology

The indices listed generated a typology map of touristic settlements on the Comunidad Valenciana coast from which it is important to highlight the “settlement register”, defined by the four indices in the current situation, characterised by the corresponding sub-indices.

The map, with a 1:50.000 scale, has been developed from the cartographic base of municipalities with access to the sea and, each one of those, with 500 metres of littoral front, in an attempt to create a unitary base on which it will be possible to gather such a diverse information both in terms of variety of sources and in terms of formats and media where it is available.

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Toponymy was established based on the documents provided by Instituto Cartográfico, from the contents on the portal Terrasit of Generalitat Valenciana and the "Beaches Guide" of the Ministry of Agriculture, Food and Environment, as well as from fieldworks and various municipalities' websites. Finally, among the different grassroots works, the chosen criterion has been the one from the Plan de Acción Territorial del Litoral de la Comunidad Valenciana (2006)[2] [Territorial Action Plan of the Comunidad Valenciana littoral], which divides the Comunidad Valenciana coast in eleven units. As stated in its report, the areas subject to different regulations, even though they all have in common a strong urban pressure on the coastal line with the consequent massive occupation of the territory. .

The map describes each settlement accrding to four points of view; each one interpreting an index, with an added fifth one defining how suitable the territory is for urbanisation. (Figure 4)

1. In reference to Index 1 –settlement structure-, the results refer to the number of settlements and to percentages according to the total number of settlements. 46,34% of the total are built with a mesh structure, different in dimensions and shapes; on the other hand, an agricultural structure is present in only 7,80% of the settlements. Anyway, the development rate is high as well as urban functions.

Another key aspect is the analysis of this index according to sectors and provinces, referring both to the number of settlements and of the length of the coast affected by the settlement structure. In this sense, the mesh structure, predominant in the Comunidad Valenciana as a whole, is predominant in length as well even though it has a lower presence in the Alicante province (37,76%) – where there are 63,63% out of the 44 settlements with planned structure- than in Valencia (56,90%) or Castellón province (53,06%).

Alicante as well shows a high degree of development of the settlement, and just 5,26% of total is on an initial level.

2. In reference to Index 2 – grouping type – we analysed the settlements characterised by single-family homes (detached or terraced), by multi-family dwellings (with or without free private space) and where the different types can be found: in almost a third of the total of settlements (31,70%, 35,12% y 33,17%) there is each one of the groups. Neither considering the province of location can we find a predominant grouping type, except for maybe multi-family dwelling in Alicante, in Valencia mixed types in Valencia and single-family homes in Castellón.

On the other hand, in 54,15% of settlements, constructions occupy between 25 and 50 % of the soil.

3. The analysis of geomorphological features of the coast as the third index – coastal type- characterised by a sub-index referring to the way in which the different types are connected, allows us to add to this work the component of urban coastal landscape, considering the coastal length as a significant value.

The index "sand/gravel beach" has the highest number of settlements in each one of the three provinces as well as the largest coastal length. Of these settlements, 67,31% have a "seafront promenade" way of connection; it is important to highlight that 23,08 % of connections are "direct", with no infrastructure.

4. The fourth Index or economic-touristic parameter, as already underlined, classifies settlements according to their relation with the tourism industry or with second homes sector and it is characterised by a sub-index that analyses the presence of different services and facilities, a useful necessary aspect in order to plan actions.

In this sense, concerning the facilities of "predominance of second homes" –the highest number of settlements in the Comunidad Valenciana , 56,10%- none of them has a high level of facilities, whereas 37,39% in the Comunidad as a whole has been classified as "without services" and 33,04% as "daily-use businesses".

Starting from indices and typifying sub-indices, the "register" of each settlement and the typology map of touristic settlements took shape, settlement by settlement, sector by sector, province by province. It has been possible to add new data according to the needed information in each one of the cases.

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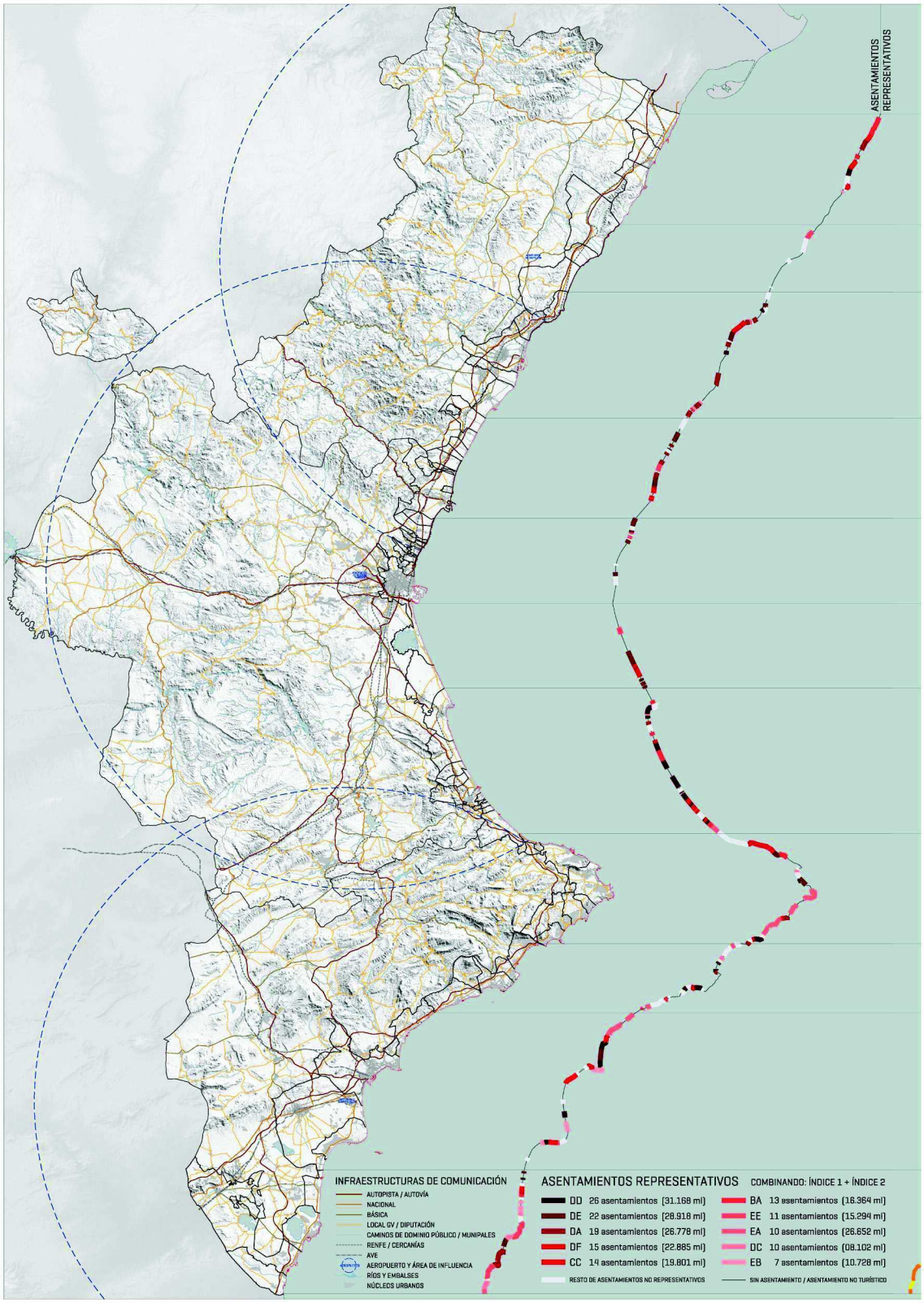

Figure 5.
Typological Map. Summary Map.

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Adding new indices and variables, and logically decreasing the number of "type" settlements, we started with 95 D-settlements until we got to 12 settlements with the type DDAB; in other words, touristic settlements on the littoral, accounting for 14.490 lm of coast with a mesh settlement structure on which the predominant construction is a multi-family dwelling with private space (closed to public access), with a sand or gravel beach and a predominance of second homes with a higher concentration in the sector Cullera-Oliva in the Valencia province. (Figure 6)

Anyways, the most recurrent "register" is, regardless of the second index – grouping type -, D_AB; namely, touristic settlements on the coast with a mesh structure, sand or gravel beach and predominance of second homes, accounting for more than 43.000 lm of urban coast.

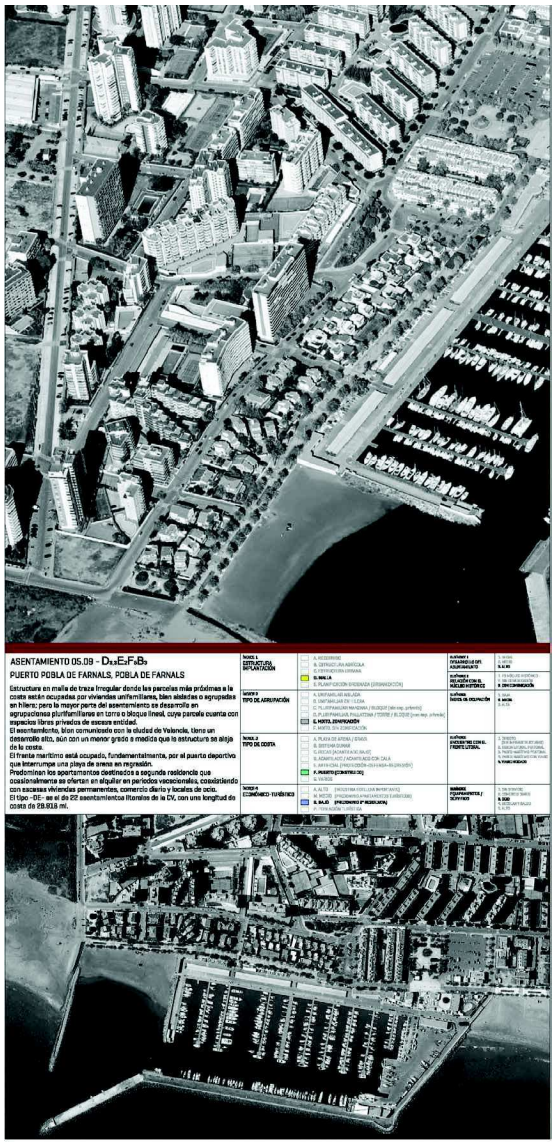

Figure 6.
Pobla de Farnals Marina. Valencia. Touristic settlement 05.09. DEFB..

Conclusion

More than 272 km of the Comunidad Valenciana littoral present a consolidated urban front[3] with diverse settlement methods, mostly residential, and diverse densities.[4] Such diversity, with its corresponding malfunctions, contradictions between the area's geographic features and the settlement model, which requires and tries to take over the "first line" of the littoral front, creating an important alteration on its functioning, as for the cases of building on dune ridges or obstructing river mouths, even if they lay on vulnerable or dangerous areas. (Figure 5)

Strategies for the sustainable regeneration of touristic settlements will have to enable, through concrete actions, conservation and improvement of the coastal line as a landscape valuable element, protection of coastal natural spaces and access to the coast, conjunction between design and management or approaches willing to boost engagement, always keeping in mind the leading role of tourism and its direct consequences on social, cultural and educational life but also on the economic sectors.

Likewise, strategies are based on key ideas such as a global and multidisciplinary vision of reality and need to consider, in different scenarios and scales:

a) The value of the environment, together with weather conditions, cultural, environmental and landscape assets.

b) Tourist demand in the Comunidad Valenciana that, in 2009, welcomed more than 23 million tourists. This demand is mostly domestic and people staying in second homes, being the beach the main reason for their stay, maintaining the seasonal nature of demand as a structural feature of littoral destinations, except for Benidorm.

c) Renewal of usual destinations through the

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creation of new tourism and leisure resorts on the side-line of the pre-existent urban structure, creation of emerging spaces on the pre-littoral front and inland, urban tourism boom or creation of new touristic products.

d) Territorial asymmetry both from a geographical point of view and the seasonal nature of the activity.

e) Heterogeneity of the touristic settlement types on the littoral urban front of Comunidad Valenciana in a residential building model, which requires and tries to take over the "first line" of the littoral front. This heterogeneity can mean, sometimes, extra and differentiating touristic assets.

f) Acknowledgement of the residential nature, being Comunidad Valenciana, according to data from the 2010 Documento de Base del Plan Estratégico Global del Turismo de la Comunitat Valenciana [Base Document of the Global Tourism Strategic Plan of Comunidad Valenciana], the first Comunidad Autónoma in volume of second homes (around 17% of the national total amount).

g) Given the continuity of touristic space, the touristic-territorial planning has to refer to resources, infrastructures and environmental management etc. further beyond local reality, boosting territorial cooperation. However, we have to admit that there is a lack of experience of action and supra-municipal strategies in terms of urban and touristic planning.

h) The value of participation and society-landscape interaction for a double goal: boosting sustainable and respectful behaviours towards the environment and improving information, participation and joint responsibility processes. Such involvement increases the sense of responsibility, which is the fundamental element for a sustainable development.

In particular, an action on the settlements with a mesh building structure, sand or gravel beach and predominance of second homes, enables considering the mesh as a productive grid, the sea front as a structural and shaping element of the settlement and urban life, enabling the transformation of second homes into permanent homes in specific accessible and equipped settlements on the coast. Each case will require a research and analysis of the requirements – access, communication, supply, management, health services, teachers… - in order to establish both the possibilities and the limits of such action, both for homes that have to guarantee high comfort standards and for urban areas that need the design of diverse and heterogeneous spaces through the development of specific projects for specific places.

Notes

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2 2006, Plan de Acción Territorial del litoral de la Comunidad Valenciana. Generalitat Valenciana. Conselleria de Territorio y Vivienda. Dirección General de Planificación y Ordenación Territorial.

3 To that, it is necessary to add more than 30 km of coasts (7% of the total length) considered in the planning as programmed urbanised soil; the coastal line presenting any protected natural area accounts for about 134 km, 30 % of the total length.

4 Leaving historic urban settlements on the littoral line and spaces for infrastructures (i.e. ports) to one side, being just a few industrial and tertiary uses, the majority of the urbanised front is intended for residential uses.

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Hermeneutics and principles of quality in urban morphology

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Abstract. *It is common to ascertain the loss of quality in the urban form during the 20th and 21st centuries, especially in the current globalization scenario, and in comparison to the previous centuries. Relevant authors of the cultural and artistic critique such as Erwin Panofsky, Ernst Gombrich or Enrique Lafuente Ferrari have defended the identification of the quality in the works of creation as the fundamental objective of the critique. Due to this, the research and identification of the quality features in the urban form are pertinent in order to have useful instruments to correct this contemporary cultural loss. It is therefore proposed the identification of quality principles of urban form from a hermeneutic point of view. That is to say, each of these principles as capable of opening a certain horizon of comprehension of a specific perspective of quality. For example, we can aim at: beauty, scale, amenity, grace, order, etc. Each principle, offers then a horizon of understanding and also of urban creativity that assembles into this work from the analysis of operative subprinciples and their verification on specific expressive cases of urban form, in both, historical and current aspects. The principles in turn can intertwine offering cumulative and transverse quality options. Therefore, what is sought, is to offer a pertinent and structured hermeneutical tool for the analysis of urban form in its values of quality and excellence.*

Keywords: hermeneutics, principles of quality, urban form.

Introduction

It is common to ascertain the loss of quality in the urban form during the 20th and 21st centuries, especially in the current globalization scenario, and in comparison to the previous centuries. On the contrary, in the historical city, especially in the heritage city, we can frequently appreciate a noticeable quality in the urban form. Rudolf Arnheim has eloquently written about this current situation: "We observe unmistakable signs of weariness, lack of discipline and responsibility. The design of many buildings, furniture and garments is an example of this decadence. The most disgusting symptoms are translated into an extravagance without limits, vulgar tastes and to trivial thoughts. We are too prone to accept little and to abandon the definitive effort, without taking advantage of all the resources, and to ignore what it used to be the condition sine qua non for worthy art. This insufficiency is reflected in the low quality of most of the works and in the lack of valid criteria for their approval in the mass media" (Arnheim 2001, p. 10). We want to underline the absence of criteria.

On the contrary, the accuracy of the quality values is the role of the architectural and urban criticism in their respective areas. The eminent Spanish theorist and art historian Enrique Lafuente Ferrari (1985, p. 26) said: "In general terms, criticism is a subtle and mysterious ability to perceive the most intimate and valuable qualities in things, people or artworks.

These qualities sometimes appear and sometimes even hide within a whirlpool of secondary and superfluous flaws. This perception of quality, this distinction between the secondary and the essential, is for me the most eminent critical ability, and indeed it is not only carried out for works of art."

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Methodology

The quality of urban form that in the past was developed from a sort of good sense and collective taste and was slowly and deliberately preserved, must be nowadays achieved in a conscious and polite way. The collective taste in urban form is not the same anymore due to lack of sensitivity, an accelerated pace in the urban transformations, usually giving priority to economic profit, etc. We must then develop a disciplinary education in the matter.

Therefore, the research and identification of the quality features in the urban form is relevant in order to dispose of the corrective tools in the face of this contemporary cultural loss. For this reason the identification of these quality parameters from a hermeneutic point of view is proposed, that is, principles capable of opening a certain horizon of understanding and enjoyment of a specific quality perspective and also a horizon of conscious creation.

It is here understood that the quality in urban form is always connected to the user and the urban life. Form has quality only when it is valuable functionally and aesthetically according to the integrated experience of the user.

Firstly, as we said, it is necessary to pay attention to the splendid achievements in urban form reached in the past, analyzing the diverse principles which originated that quality. It is in this way that we will understand and value better the city of the past. The history of the architectural theory can help us in this sense, by means of the principles that appear in many treatises and essays. These principles are cornerstones for a good practice and have greatly influenced the practice of architecture and urbanism during these historical periods. It is in this way that principles such as beauty, decorum, grace, ornament, taste, etc. appear. Then, it is possible to look into the treatises by Vitruvius, Alberti or Palladio, but also into the essays of the XVIIIth and XIXth centuries. In that way, we'll be conceptually improving our critical vision of the past.

Both the urban form of the past and the historical treatises and essays present a combination of very valuable principles that should be enlarged with other contemporary principles of quality extracted from the phenomenological and psychic experience of the city.

If we go in depth into the analysis and meditation, as Ortega y Gasset (2012) said, of those quality principles in urban form (beauty, elegance, decorum, etc.) we can deduce that they also open other several diverse ways in the process of obtaining quality. We can call them subprinciples of quality. For instance, beauty does not appear isolated; on the contrary, it offers a wide range of distinguishable options such as harmony, elegance, delicacy, refinement, technical perfection, etc. Therefore each of these aspects constitutes a subprinciple of beauty.

Now we are going to provide two testimonies that back and support the necessity of a qualitative deepening in the direction that we are developing. On the one hand, Rudolf Arnheim (2001, p. 11) states: "the qualities that convey human values can be described with considerable accuracy, but many of these descriptions cannot be quantitatively verified by means of measurement or recounting of data. They share this trait with many other facts of the spirit and nature, and it doesn't prevent them from existing or being important".

For his part, Ernst Gombrich (2004, p. 190) confirms this idea: "…and this is what critics did in the ancient times, and what they have been doing ever since, that is, to analyze and to subdivide areas for its admiration, and to articulate the multiplicity of human experience within the canon".

The comprehension of quality principles and subprinciples of urban form is even more needed in order to verify real historical or current cases of urban excellence. It is necessary to study specific urban examples that show an evident quality in the form. It is possible in this way to create a catalogue of typological concretions of form, supported with cases, from the quality principles and subprinciples that have been analyzed.

Besides a better understanding and valuation of the city of the past and that of today, such a critical profile of the principles of excellence can contribute to overcome the poorness of form in the contemporary city, with new project conceptual resources. In this way, each

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principle offers a horizon of understanding and also of urban creativity.

The principles and subprinciples in turn can intertwine offering cumulative and transverse quality options. Therefore, what this work expects is to offer a pertinent and structured hermeneutical tool for the analysis of urban form in its values of quality and excellence.

Such way of acting is related to classical research in urban form. An example of this is the one carried out by Gordon Cullen in The Concise Townscape (2001) or that of Christopher Alexander in A Pattern Language (1980).

These studies try to determine certain principles or concepts of form and their clarifying with examples. The difference with these works that are more general is that in here the goal of these principles is to grasp directly and specifically the quality hints of urban form quality.

The principles or concepts are in turn ideal to be used as keywords to consciously channel creativity in urban design.

Measurement and analysis

Principles

Without an intention of thoroughness and offering evidence to the critical contrast with other possible interested authors, we initially expose six quality principles of urban form

Figure 1.
Place Vendôme, Paris, by Jules Hardouin-Mansart. Example of the principle of beauty.

Figure 2.
Kiefhoek quarter, Rotterdam, by J.J.P. Oud. Example of the principle of scale.

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together with a real expressive case of city. Each principle contributes with a type of value that is beneficial in terms of form.

Beauty (Figure 1)
Taking advantage of Thomas Aquinas definition, pulchrum est quod visum placet, we will define beauty as that which is pleasant to the spirit contemplation. Philosophy and aesthetics authors have witnessed many variants of beauty –or subprinciples, as we have called them here–The aesthetics expert Tatarkiewicz says: "there have been many attempts of classifying these varieties of beauty. A list of exceptional perfection can be found in the work of Goethe. Among these varieties he names the following ones: depth, invention, expressiveness of form, sublimity, individuality, spirituality, nobility, sensitivity, good taste, aptitude, convenience, power, elegance, courtesy, plenitude, wealth, zeal, charm, grace, glamour, skill, brightness, vitality, gentleness, splendour, sophistication, style, rhythm, harmony, pureness, correctness, and perfection. Although it is a long list, it is not as thorough as it should be, and it does not take into consideration aspects such as dignity, magnificence, exuberance, poetry and naturalness" (TATARKIEWICZ 2007, p. 186).

Figure 3.
Streets in Córdoba, Spain. Example of the principle of grace.

Scale (Figure 2)
It is the right size of the urban form in relation to the inhabitants or users, in such a way that it generates in them a sensation of functional and psychological comfort. Therefore, if they have the right scale, buildings and urban spaces could contribute to a sensation of welcome and empathy for the citizens.

Grace (Figure 3)
It constitutes the kind and friendly aspect of the urban form.

Amusement (Figure 4)
It constitutes the manifold and stimulating aspect of the urban form.

Decorum (Figure 5)
It is the way in which urban form is adapted to different purposes and social meanings.

Identity (Figure 6)
It is the coherence between urban form and the identity values of the community that embraces it.

Subprinciples

Now we are going to address the subprinciples of beauty in the urban form, that is, the multiple varieties of beauty present in the urban form. The principle of beauty is the one that possesses the biggest amount and diversity of subprinciples. It is for this reason that we will study it in detail and with special dedication in this work. Beauty, understood as the quality that pleases the citizen's spirit, is the most outstanding quality principle, and consequently it requires a preferential attention due to its richness; this attention corresponds to the one that beauty has received through history. Some relevant subprinciples of beauty are going to be explained now in a general way:

Harmony in buildings
Here we refer to a classical expression of beauty. When the diverse is in many cases based on

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Figure 4.
Urban Landscape of Amsterdam city. Example of the principle of amusing.

Figure 5.
Park Crescent at London by John Nash. Example of the principle of decorum.

Figure 6.
View of Santorini, Greece. Example of the principle of identity.

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the relations of mathematical proportion and in some others it is simply connected to the inspiration of the taste alone.

Harmony with the natural environment
It is the right and pleasant way in which the city is integrated inside its natural environment.

Pertinent presence of nature inside the urban form
Here we refer to parks, gardens, fountains, etc., that are qualified in diverse ways in the urban landscape.

Chromatism for the well-being
Its goal is the citizen's happiness. This is achieved thanks to the strong emotional value of colors.

Virtuous sequence of spaces and forms
The perception of the urban beauty is not only static, but also dynamic since the citizen moves through successive areas of the city.

Virtuous essence
The mere essence is not enough for beauty. There has to be some merit in that essence.

Perceptual clearness
It is what comes pristine and close to the senses. It also refers to sheer geometries and to the unmixed colours. This pure beauty was praised by plato.

Happy clarity
This concept does not only refer to the simple luminous clarity, but to the perceptual clarity stimulated by visual happiness.

Rhythm and musicality
They are qualities of fascination and dynamism of the form.

Elaborated light
The play of light and shade, the nuanced light, the nuanced shade, the creation of atmospheres, in the city at its different hours.

Manifestation of life
The communication of life through form is perceptually invigorating and transmits existential vigour, being a vehicle for beauty.

Valuable expressive power
It refers to cogency and to the intense and admirable communication.

Serenity of form
It is pleasant for the spirit, according to the taste of ancient greeks.

Kind delicacy
Delicacy and kindness are in themselves pleasant to the spirit.

Qualified refinement
It supposes the elaboration of the fine and the exquisite.

Elegance
Elegance in itself is always a vehicle of beauty.

Humble charm
It is another vehicle for beauty and it is characteristic of zen aesthetics.

Wealth of form
It supposes the abundance and qualified diversity of forms or the accurate presence of ornaments.

Freedom and flexibility of form
It makes the forms confident and meritorious.

Graceful lightness
It is a source of charm.

The virtuous curve
The curve has emotional repercussions and undoubtedly implies pleasure when it is virtuous.

Qualified textures
They are a source of interesting sensorial and psychological communication.

Technical perfection in construction
It conveys evidence of good realisation and the corresponding experiential satisfaction.

Conclusion

Our final goal in this work is to address the

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quality in urban form; not through superficial intuitive attitudes, but from conceptually structured intuitions based on shared quality experiences.

It is in this way that a new conceptual perspective of research is opened and offered to other researchers who are looking for achieving certain critical consensuses so needed today in order to face a bigger quality of form in the contemporary cities.

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City and territory
in the Globalization Age

8. Urban green space

The role of historical green spaces in the identity and image of today's cities: The case of Madrid

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Abstract. *The image that a city offers when approaching it, depending on its topographical situation, the drawing of its borders or its urban form, generates a perceptive construction, for both locals and tourists, with the potential to become an iconic image and therefore play a part in the collective imagery. The character and value of those landscapes is largely determined by their green spaces, preserved in most European cities for their ecological or historical significance. Being able to recognize the worthiness of these proximity visions, in the context of today's growing cities, is of fundamental relevance in order to enhance the sense of place, amongst other community values. In this communication, we study the above-mentioned aspects in the image of the city of Madrid, within the framework of the project 'Proximity landscapes of the city of Madrid. From the 19thC to the present' currently in process. Through a landscape analysis of a selection of iconographic representations of the surroundings of the city, we draw special attention to the presence of historical green spaces throughout time, and its relation with architectural landmarks in the progressive construction of an iconic image of the city. From here, we can deduce the relevance that these elements have in the generation of a recognizable character and the decisive role of protection mechanisms in order to preserve it.*

Keywords: landscape history, proximity landscape, city iconography, sense of place, Madrid.

Introduction

The urban fabric grows in a way that adapts or transforms the existing topography, which makes the city contour a changing figure throughout history. This urban contour is not a defined line, but a fringe where city and country collide (Sorokin, Zimmerman, 1929). In this area where rural and urban converse, spaces from the urban structure intertwine with elements of land management, cultivation areas, suburban farms, woods and fields, etc. (Rodríguez, 2011), becoming, over the ages, defining elements of the image of the city. We can consider this fringe as 'proximity' landscapes: landscapes that are perceived when the city is either a destination or a point of departure.

The image that a city offers when approaching it, depending on its topographical situation, the drawing of its borders or its urban form, generates a perceptive construction, for both locals and tourists, with the potential to become an iconic image and therefore play a part in the collective imagery. Just as we see the historical architecture of our cities, the cultural heritage, as 'memory containers'… landscape, open spaces and views should be considered heritage elements as well (Cano, 1985) and therefore generators of meaning and identity for the city.

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The character and value of border landscapes is largely determined by their green spaces, preserved in most European cities for their ecological or historical significance. In the case of the city of Madrid, besides the suburban farms from medieval times, the presence of the Royal Places close to the capital since the Spanish Hapsburg dynasty has played a significant role. Both pre-existing conditions of the site evolved throughout time transforming into public green spaces that are nowadays part of the city's network of parks and open spaces. Being able to recognize the worthiness of these proximity visions, in the context of unceasing urban growth and transformation, is of fundamental relevance in order to enhance the sense of place, amongst other community values, in line with the actual trends of urban greening (Urbano, 2013).

In this communication, we study certain aspects in the image of the city of Madrid, within the framework of the project 'Proximity landscapes of the city of Madrid. From the 19th Century to the present' currently in process. Firstly, we make a general overview of the transformation processes in the most relevant periods of the city's history from a morphological perspective, locating the most significant green spaces in said process. Then, we analyze the presence of these parks and fields and their characteristic features in a selection of iconographic representations of the city, drawings and views (depicted by painters, geographers and architects), to end with a valorization of the historical green spaces inside the current network of green spaces of Madrid.

Methodology

We undertake a critical analysis of historical cartography (among other documentary evidence) to detect landscape patterns, structural elements and areas of urban-rural dialogue along Madrid's contour line. This is done in four relevant stages of the city's development: early 19th century (before its first urban enlargement plan), late 19th century, mid-20th century, and the present time. The evolutionary analysis allows to detect the permanence of certain relevant green spaces, playing a key role in the shaping of the peri-urban landscape of the city.

The historical plans used as basis for these graphical analyses are 1809, 1877-81, 1940-1976 and 2010, all retrieved from the database "Planea" (Autonomous Community of Madrid 2017). The main roads to access the city (which provide perceptive lines of interest), the lookouts and the green spaces are highlighted in this analysis.

For the study of the above-mentioned aspects of the image of the city of Madrid, we make a landscape analysis of a selection of iconographic representations of the surroundings of the city, drawing special attention to the presence of historical green spaces throughout time, and their relationship with architectural landmarks in the progressive construction of an emblematic image of the city.

The green spaces of Madrid throughout History

Medieval Madrid settled over a rugged, hilly terrain, east of the Manzanares river course. The dells formed by its streams determined the direction of the main streets; footprints which we can still find in the city's urban morphology of today. A succession of walls and taxation fences girded the city center up to the late 18th Century. The demolition of the last fence, commanded by Philip II in 1625, began in the mid-19th Century to undertake the enlargement plan.

Regarding the surroundings of the city, until 1900 Madrid had numerous orchards in the urban contour, but one could also find them inside the walls, as reflected in historical cartography, chronicles, stories of the city and travel books (Rodríguez, 2011). The abundance of these orchards and gardens endowed the city with a certain character, in close relation to its surrounding countryside. The considerable number of country houses that appeared in the periphery (along the main roads, especially in certain rural cores near the "Villa de Madrid") were also key elements in the composition of

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the city's peri-urban landscape (Lasso de la Vega, 2007). These country houses, despite their productive origin, played a fundamental role as recreational spaces; for the nobility′s use at first, and later for the bourgeoisie′s as well.

During the 18th Century, the surroundings of the Royal Palace were landscaped and urbanized (Martínez, 2008), bridges and monumental gates were built in the perimeter of the city (Ortega, Martínez & Marín, 2008), as well as tree-lined promenades in the proximity of the river, designed for the public's recreation and aiming to confer a monumental look to the accesses to the city. For the first time, there was a conscious decision of putting value into the city's exterior image. The restocking and lining of the urban greenery in the contour starts to be regulated, as a precursor of the future 19th-century transformations. The main entrances to the city were the road from the Guadarrama mountain range in the northwest (from the El Pardo Royal Place to Madrid), Extremadura road from the west, Alcalá de Henares road from the east, and Toledo road from the south. These were 'Royal paths'; cobbled, wide and properly treated, suitable for saddles ('horseshoe roads'). The north access, from Burgos, was the only one suitable for carriages ('wheel paths') (Terán, 2006). Important green urban limits were sited to the west (Casa de Campo, El Pardo mount and la Florida promenade along the river) and to the east (the Buen Retiro Royal Place). Of all these green areas, only the Buen Retiro was incorporated inside the city walls, however they were all, except for the Florida promenade, to be used solely by the Crown. Therefore, the public only had access to outside walkways, the river banks, and some private gardens of the suburban farms as vegetated open spaces (Figure 1). The spaces from where one could contemplate the city and its immediate vicinity were mainly located along the northeast access, following the course of the river, and in the soft hills of the surroundings of the Alcalá and Valencia paths (Rodríguez, Sáenz de Tejada, 2016).

In the times of Ferdinand VII, urban transformations (Oriente and Armería Squares, Viaduct of Bailén Street, 'Cuesta de la Vega') created a new visual connection along the 'Cornice', from the Royal Palace to the San Francisco el Grande Basilica. At the same time, works were done to upgrade the Royal Places of the periphery, the river was channeled in its pass through the city, and the exterior promenades were improved and enhanced with the planning of both Pirámides roundabout to the south and Fuente Castellana Avenue to the north. The latter embodied the vertebral axis along which the city would grow. Meanwhile, the south area outside the walls was populated with warehouses and industrial buildings that, from the mid-19th century onwards, proliferated around the railway tracks and stations (and especially around the bypass linking them). Towards the mid-19th Century, all important roads (Guadarrama, Burgos, Extremadura, Alcalá, Valencia, Toledo and Aranjuez) were already "Royal roads", and the lookouts from where the city could be perceived as a whole were the same as those from the beginning of the century.

The transformation of the Castellana promenade in the main entrance to the city from the north was first proposed in Carlos Mª de Castro's preliminary project for the enlargement plan of the city of Madrid, in 1857. In this project, blocks would be extended in a half-crown shape to the north and east of the city center; an idea that Zuazo and Jansen would later pick up in their proposal of a north-south structural axis for the future growth of the city in the International Competition of 1929 (Pinto, 2001).

In the mid-20th Century, Madrid annexed many of the rural cores surrounding the city center throughout the two decades after the Spanish Civil War. The urban fabric would then start, during the second half of the 20th Century, to fill in the voids. However, this urban growth would be respectful of both Casa de Campo and El Pardo Mount, Madrid's major 'green lungs'. Thanks to the preservation of these two elements, the city's north and west peri-urban landscape upholds, up to today, its natural character (Figure 2). Nuñez Granés designed in 1909, commissioned by the Town Hall, a "Periphery Management Plan", extended across the whole surface of the municipal boundary, in a way that the small hubs of

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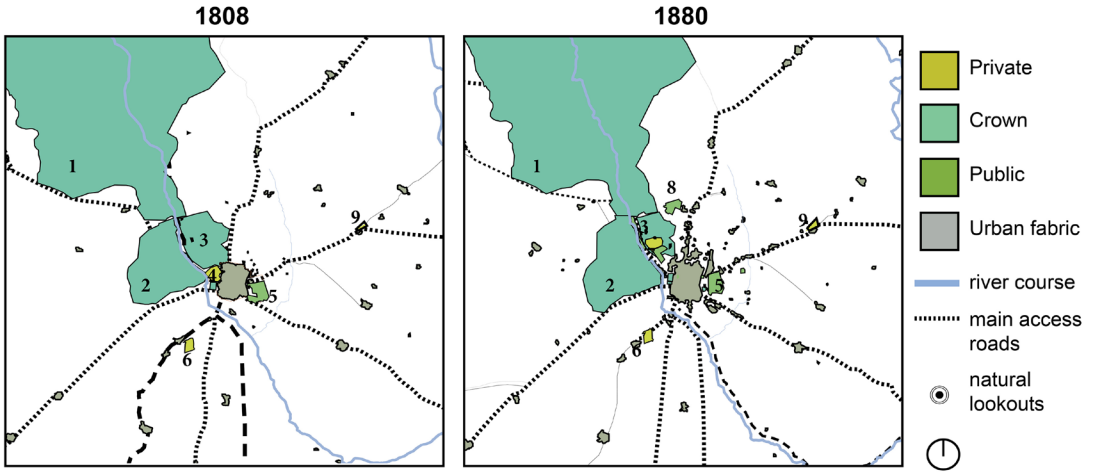

1. El Pardo 2. Casa de Campo 3. La Florida-Moncloa 4. Principe Pío Mountain 5. El Retiro 6. Vista Alegre 7. Parque del Oeste 8. Dehesa de la Villa 9. El Capricho

Figure 1. Historical green spaces and its evolution in the city of Madrid, 19th Century.

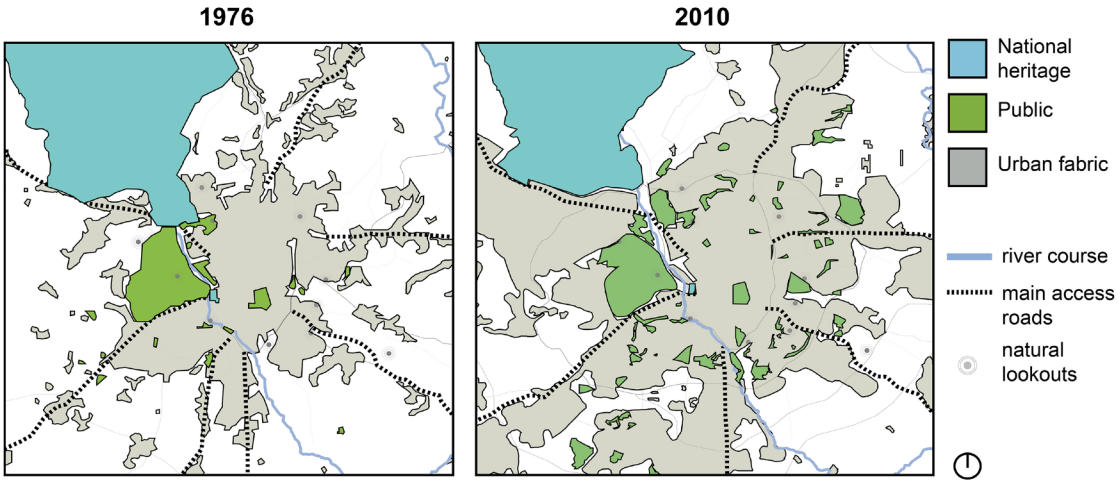

Figure 2. Historical green spaces and new developments in the city of Madrid 20th-21th Centuries.

working population scattered around Madrid became incorporated in the general structure of the enlargement, still with great voids in its construction (Pinto, 2001). It created a new belt that connected the outskirts' urban cores (between each other, and with the city center) by means of large 'arteries', distributing the main uses. El Pardo was presented as an urbanized park for the upper class, and to the east there was working-class housing and industrial land. Between the enlargement, the small cores and the former colonies, wide parks and green areas were disposed. Although not completed, it had a profound influence in the subsequent urban formulations prior to the Civil War.

In the first half of the 20th Century, the national and community roadway system was established, similar to the current one, being the six national roads the principal accesses of Madrid. The city has grown so much that most of its lookouts have been incorporated inside the urban mesh, and only from the farthest can the city be perceived as a whole (Rodríguez, Sáenz de Tejada, 2016). Regarding the open spaces, El Retiro (renamed as Park of Madrid) and Casa de Campo became property of the municipality in 1868 and 1931 respectively. In the late 19th century, the Oeste Park was built ex novo, acting as a link to the last part of the city's enlargement with the Royal Possessions of the

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Principe Pio Mountain and Moncloa. In the early 20th Century, over a sizeable proportion of Moncloa's grounds, the university campus was erected. Conceived as a garden-city, as a transitional space towards Casa de Campo and El Pardo, it would help preserve the ecological and landscape values of the northwest part of the city, as well as ensuring the perception of the iconic view of the 'Cornice' from the west (although this was strongly altered by the urbanization of the riversides). The silting of the shore with buildings in the 20th Century (especially in the south's right margin) blurred the view of the city that painter Francisco de Goya depicted in his design for a tapestry from San Isidro's meadow.

Since the end of the 19th Century, the development of public parks, with green areas and leisure facilities, was a primary goal of both the municipal authorities and private enterprises, where the known as 'recreational gardens' emerged as parks exclusively devoted to recreational activities. Some of the most relevant examples of this are Las Delicias, El Tivoli, Apolo, Buen Retiro (in Cibeles), the Eliseo Madrileño in today's Fuente del Berro, the Oriental Gardens, the Parisiana in Moncloa (in the area of San Bernardino), and the Portici in the River Manzanares. Renovations were also made in El Retiro, creating the 'Beasts House', the 'Car Walks' and the 'Cow's house'. Similarly, there was a 'Leisure Center' in Madrid's development company in the Linear city of Arturo Soria. All these actions followed hygienist programs, with gardens and sport facilities that equipped the neighborhoods with green open spaces, becoming a general trend throughout the 20th century.

The green spaces in the city iconography of Madrid

The steep cut produced by the River Manzanares generates the city's west façade, the 'Cornice'. The preservation of large Royal possessions such as the El Pardo Mount, Casa de Campo, Campo del Moro, and the riversides, endowed the view with broad masses of trees and greenery. Alongside, the architectural sturdiness was provided by the great mass of the Royal Palace and the powerful dome of San Francisco el Grande Basilica, over a backdrop of smaller domes and towers. To the left of this ensemble, the towers of Plaza de España (built as emblems of modernity in the mid-20th Century) have become indispensable to the 'Cornice' of today.

This is the iconic image of Madrid, and has been represented from the right-side riverbank by uncountable artists throughout the years. From the comparison of several paintings and today's views we can identify the evolution and permanence of certain elements and assess the important presence of the historical green spaces.

In the view painted by Antonio Jolie in the late 18th Century (Figure 3), we appreciate a peri-urban landscape that would remain similar up to the mid-19th Century. The architectural elements perched above the cliff offered an image of power and representativeness while the uses below, at the riverside level, were mainly residual; orchards, public washing facilities and small factories serving the city, however not considered worthy of being inside its boundaries. In Brambilla's 19th Century view (Figure 4), the same elements arise, but with a growth of the foliage of the wooded areas and a sharper representation of landmark buildings such as the Royal Palace and the scattered popular architecture of the laundries and industrial buildings near the river, intentionally showing the contrast between the formal city and its surroundings. In these representations, the green element provided by the vegetation located in the traditional tree-lined promenades (where the trees were now starting to become well-grown) and the Royal Possession's gardens act as a frame to highlight the architectural landmarks.

The section of the River Manzanares passing through the city was channeled in the first half of the 20th Century, while Segovia Bridge, rebuilt after the Civil War, is still today an important access to the city center. The view of Madrid from this point, looking to the south, has been subjected to interference by buildings that filled the right margin of the river along the 20th century (Figure 5). The decline of the green areas endangered the inherited image of the urban landscape configuration.

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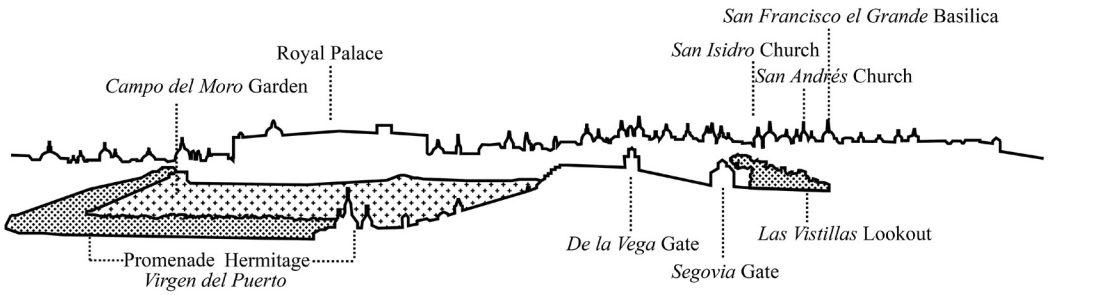
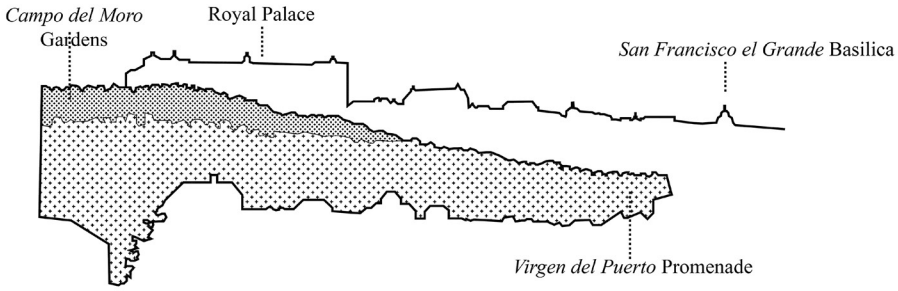


Figure 3. Landscape analysis of the painting Vista de Madrid by Antonio Jolie (ca. 1750).



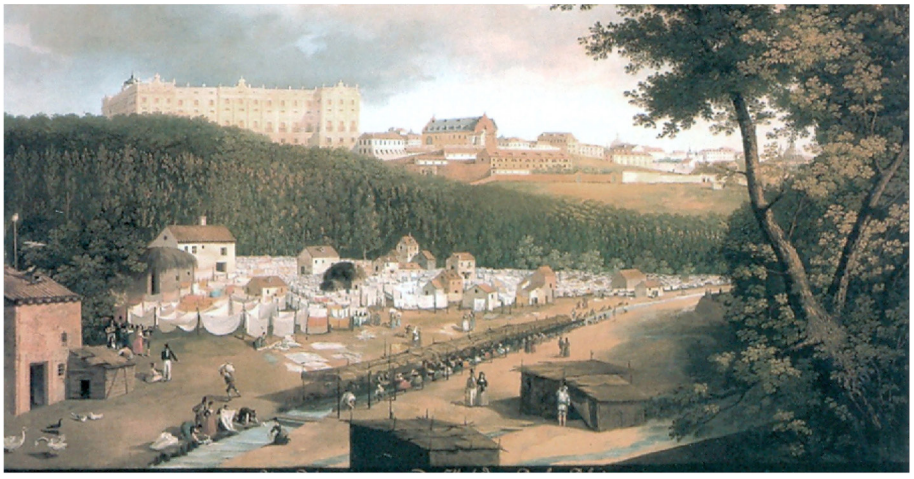


Figure 4. Landscape analysis of the painting Vista del río con parte de Madrid y Real Palacio by Fernando Brambilla (ca. 1830).

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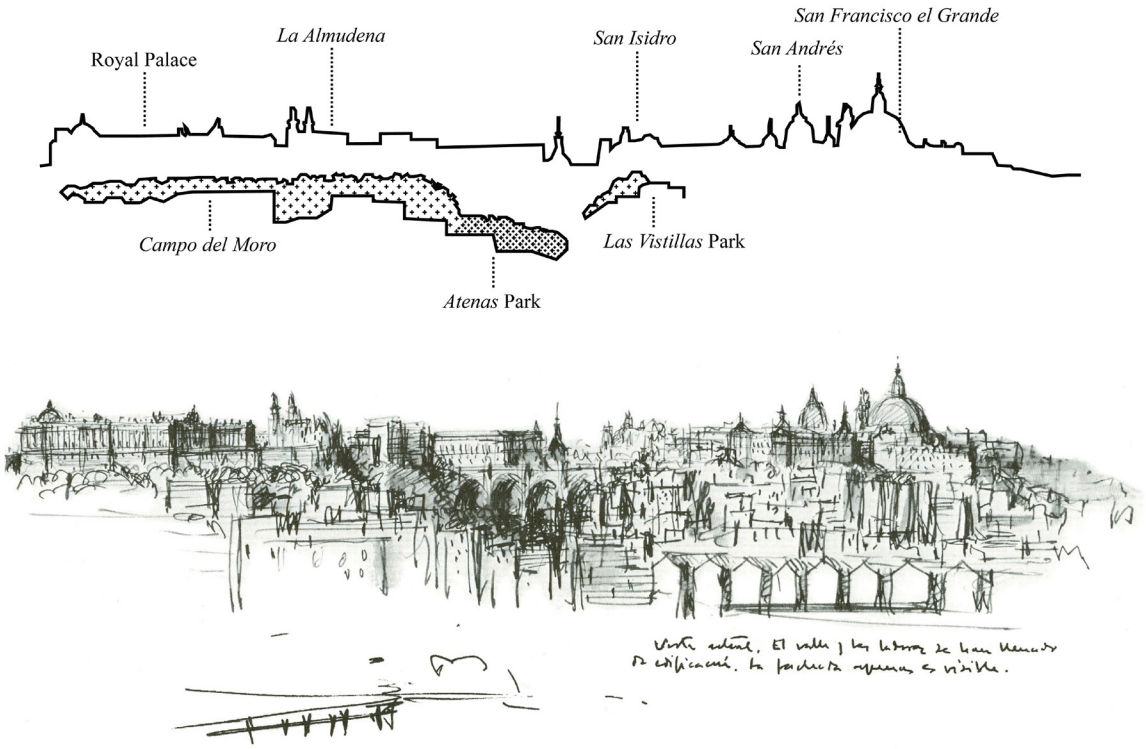

Figure 5. Landscape analysis of the drawing "Cornisa" de Madrid by Julio Cano Lasso (ca. 1980).

The green spaces of Madrid today and the role of the historical ones in the public space

The sensibility towards landscape features and views of the city is nothing new, but with the emergence of the urban landscape concept, and especially with the recent historical urban landscape concept (Velasco, 2010) (as a counterpoint to the 'generic city'), the importance of considering landscape values within the contemporary urban planning techniques has been revealed (Zárate, 2011). This is mainly because of its potential to generate and preserve the character of the cities. Landscape and its unique elements become a paradigm of balance between heritage, urban development, land occupation and sustainability (Cruz, Español, 2009; Zoido, 2002). It is essential to maintain these remarks, especially in the peripheral visions of the city; and area easily devalued in its cultural and natural issues (Wester-Heber, 2004). Preserving the historical urban landscapes is as important as valuing the everyday landscapes that any citizen or tourist navigates while approaching the city, preventing them from becoming wastelands with industrial and residual canisters.

Madrid, and especially its surrounding landscape, has strongly evolved since its medieval state. However, the permanence of certain key elements on its west and southwest side (such as the historical green spaces and the architectural landmarks) guarantees the role of this historical landscape in the collective imagery of the city.

Recent works have been integrated in the design of Madrid Rio, an Urban Renewal Plan (2008-2010). Taking great part of the M-30 ring-road underground allowed for the design of a large green urban corridor along the riversides. In this way, whereas before there was a stronger contrast between the city and its river, today the river is fully integrated in the city life. Projects like this, that focus their attention on the green open spaces to

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make the city appealing to the pedestrian, along with architectonic interventions like the Royal Collections Museum, contribute to the restoration of the historical memory of the urban image and green open spaces by the riverside (Figure 6). Green areas and views are integrated in a system of open spaces designed at a metropolitan scale. These historical spaces should not be left isolated, as often happened with the creation of new urban parks. Consistency between historical parks, urban promenades and new parks in a wide spatial context, at an urban and metropolitan scale, is deemed necessary to maintain the legibility of the landscape, building on the capacities of said landscape to tell the story of the site, enhancing its identity and integral value (Antrop, 2005).

Conclusion

Within the urban landscape, the contour of the urban fabric (fringes between remnants of natural and artificial) is where the landscape is particularly sensitive and vulnerable. The distant or progressive vision when approaching a city, as in the case of Madrid, becomes part of its identity. This is reflected, for instance, in the views of the 'Cornice'. This fact reflects the importance of preserving certain ensembles, including the historical green spaces, and not only the architectural elements.

Madrid strongly changed its image since the mid-19th Century with the bourgeois enlargement, as well as after the Civil War in the 20th Century. However, vestiges and footprints of former agricultural spaces and gardens remain, as well as traces of the successive concentric urban growths. Throughout this process of growth and transformation, the surrounding landscape has also evolved, though the city's geographical and topographical situation, still today, provides views of great character and significance.

It becomes apparent that preserving the landscape value of urban environments is a

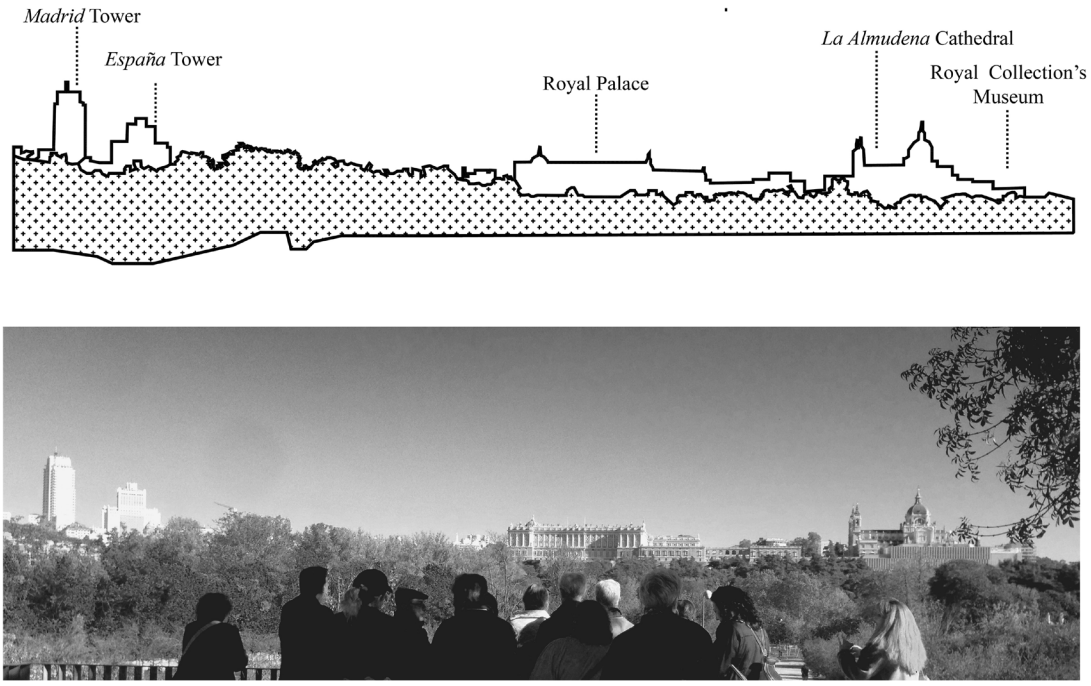

Figure 6. View of the 'Cornice' of Madrid from the Huerta de la Partida lookout, in Casa de Campo, 2017.

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complex issue and memory in the urban and landscape field should be based on respect for both the historical and natural processes, focusing on the green spaces (inherited or contemporary) for their ability to combine both natural and historical facets and provide a strong environmental character to the perceptions that the city offers.

As important as preserving the historical urban landscape of the urban historical centers, is to value the everyday 'proximity landscapes', the access landscapes, the medium-scale views and the complex spatial relations arising from the overlapping of periods. Landscape should be enjoyed, lived, but it is also witness of the history and memory of the city. Being able to recognize the worthiness of these proximity visions, in the context of today's growing cities, is of fundamental relevance in order to enhance the sense of place, amongst other community values. We can deduce the relevance that the green spaces have in the generation of a recognizable character and the decisive role of protection mechanisms to preserve it in urban-regeneration actions and in new urban growth plans.

Landscape perception, with all its complexity and historical load, can activate the memory; where the past experience lives and where we can identify the character of a place. Thus, gazing upon the city's views, the relation between urban and rural in the peri-urban space, as well as the views from inside the city towards the countryside, should not be circumstantial factors left to chance, but a fundamental heritage element to consider as a design component in the interventions in contemporary cities. The calling of urban open spaces, what they are destined to be, is a consequence of what they have been; but at the same time, certain elements of the urban identity of the past should be preserved in a way that they can integrate new elements of the identity of the future.

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The virtual earth. The case study of the Rose garden in Alcoy

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Abstract. *The Viaducte des Arts at the Coulée verte René-Dumont in Paris (1993) or the High Lane in New York (2009) have managed to increase the urban quality in large areas of their cities. In both cases, a costly infrastructure of disused highways was reused to generate a planted promenade or a linear park getting back a dynamic point of view at a height of about ten meters above the city. With the perspective of the time elapsed since its construction we must conclude that, although their structural singularity does not make them exportable to other cities, their simple constructive conception does. In them there is a common denominator that we can define as virtual earth. That concept is linked to the current technical capacity to generate green spaces over spaces of any other use. It is a new fertile land that allows the resolution of the complex problem produced by the accumulation of uses and requirements in the same place. In the present study case the objective is to recover an urban garden in Alcoy, known as la the Rose garden, without having to reduce the number of parking spaces of the garage that was built under it. At the same time, the project has to meet the surface requirements of an earthen mantle necessary to consider restored the use of green zone. The solution solves in eighty centimeters of thickness a manufactured earth capable of assuming bulky trees that return to the city and to the Rose garden their lost atmosphere.*

Keywords: virtual earth, green space, urban garden, underground parking

Prolegomena

The Rose Garden (Rosaleda) or Constitution square (Plaza de la Constitución) was a green area permanently used by the children of the neighborhood because it provided a generous play area safe from cars. In October 2001 the City Council approved the project for the implementation of an underground car park and in two years the new plaza was inaugurated with the concession of the garage for the next twenty-five years. Immediately the environmental group La Carrasca began a long legal battle to restore the status of green zone according to the parameters stipulated in the municipal building regulations. After fourteen years the citizens have had the necessary time to see the darker side of the built project.

It is now in a state of considerable deterioration, both inside the garage due to numerous leaks, as well as outside due to the graphiti and vandalized walls. On the other hand, as a parking only one sixth or fifth of its capacity is used. For the outer spaces we can verify that the design strategy of dividing the space into two platforms united by a monumental staircase was a mistake since that staircase has become an additional architectural barrier that separates both levels instead of uniting them. Fortunately the cafeteria has remained in full activity linked to the pedestrian traffic of the sidewalks because citizens go to the kiosk with the usual custom they had before the works.

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Figure 1.
The Rose Garden on its original state and after its transformation into a parking. ©VVV

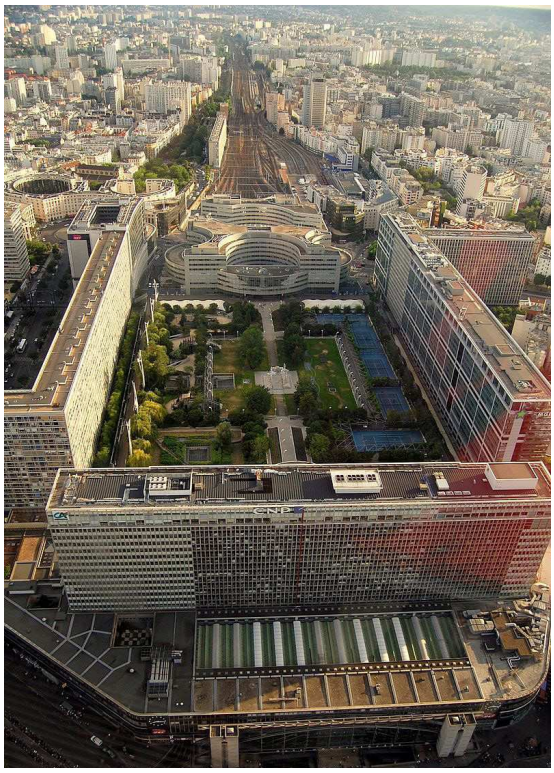

Figure 2.
The Atlantic garden on the roof of Montparnasse Station in Paris. ©wikipedia

References of the project

If we remember the popular acceptance of the viaduct of the Arts in the Coulée verte René-Dumont in Paris (1993) or the New York High Lane (2000) we can identify an evaluate some of the reasons for their success. In addition to reusing an old depreciated infrastructure naturally assumed by the city, there is also their evident and polite distance from the car. The work of integrating the various uses and the connection with the city responds to its local conditions, however, what is common in both cases is the construction of a stratum of land located above the road surface. This virtual mantle, depending on the thickness, the selection of land and the irrigation system, allows the stability of a vast diversity of plantations. Therefore it is the singular element that at present we must have in mind an study for all the urban conflicts in which the presence of the traffic invades an extensive surface turning it into an unusable and inhospitable zone for the citizen. Although at first it can seem contradictory, these surfaces can gain new value and use through the implementation of an artificial elevated green area wide enough to mask its lower uses. In this sense the Atlantic garden is a green space that covers the complicated railway infrastructure of Montparnasse station where the TGV links Paris with the Atlantic coast. The 35,000 m2 deck contains large landscaped spaces as well as some areas for games and sports. It was designed by landscape architects François Brun and Michel Péna in 1995 with quite adverse external conditions as it has an almost continous perimeter of tall buildings that hinder the entry of sun. Apart from the inevitable noises the user of the upper garden is no longer aware of the lower activity as a train station, and this is the reason why that humble layer of earth becomes such a powerful tool for the urban planner.

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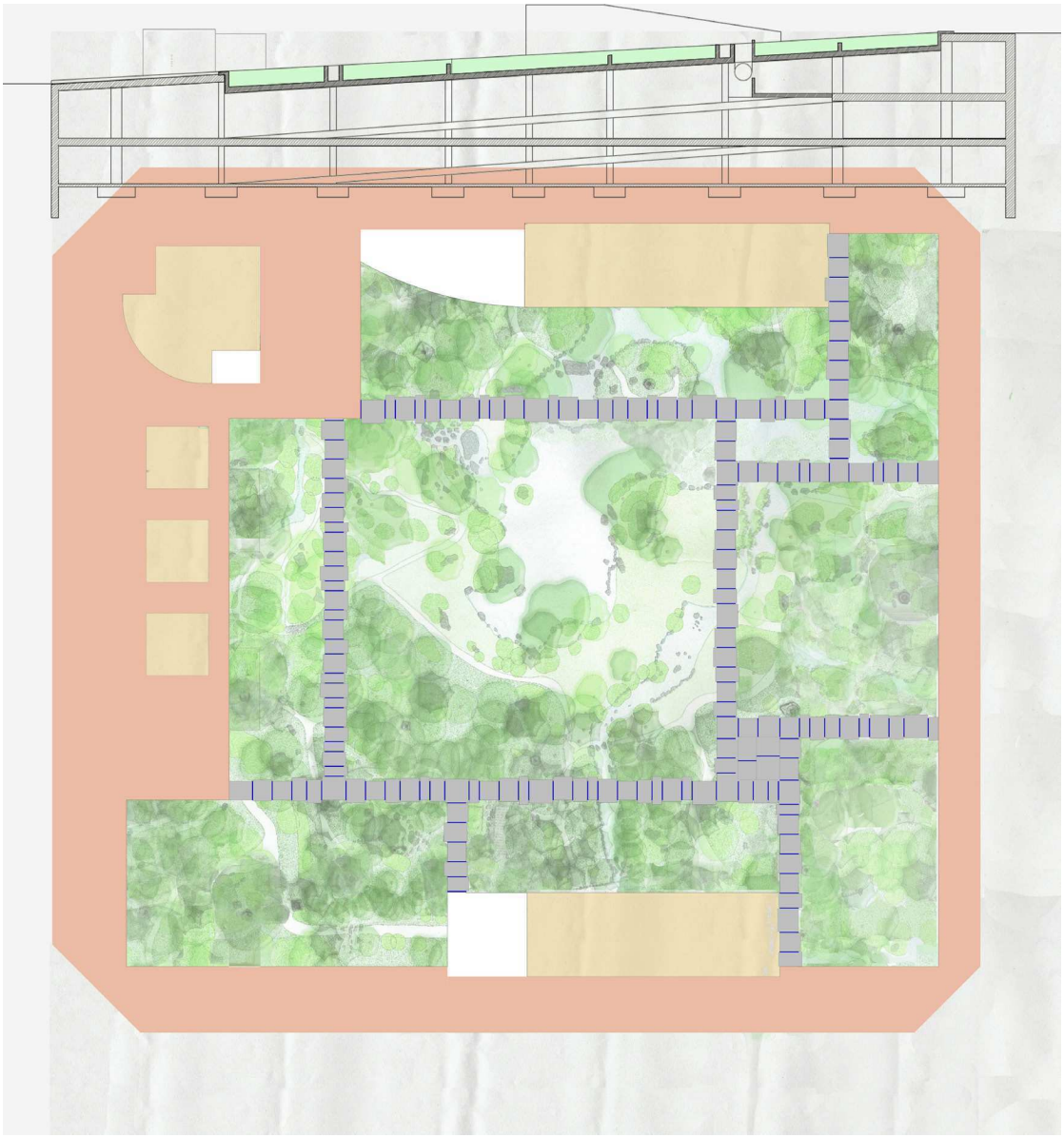

Figure 3.
Plan and section of the new project for the Rose Garden and garage. ©VVV

Decisions of the project

The simplest solution to the conflict of interests that concentrate in Constitution Square consists of rendering it compatible the use of a green zone with the concession of the underground garage. The new project aims to return to the old garden its condition of urban green area of public use according to the court order that demands the restoration of the green area of the Rose Garden. To do this, it is necessary that at least half of the square must be gardened with a layer of earth of a minumum of eighty centimeters whose surface is at the same level as the sidewalks that surround it.

Once accepted the strategic convenience of the demolition of the two platforms that form the current roof of the garage, it is then possible to think of a new and unique inclined landscaped surface with the same slope as the two side streets, Góngora and Joan Valls. Then all the decisions of the project prioritize the needs of the garden and adapt the needs of the parking, such as the accesses and vents, to the flat topography that the new square assumes when modifying its levels according to the levels of the surrounding streets

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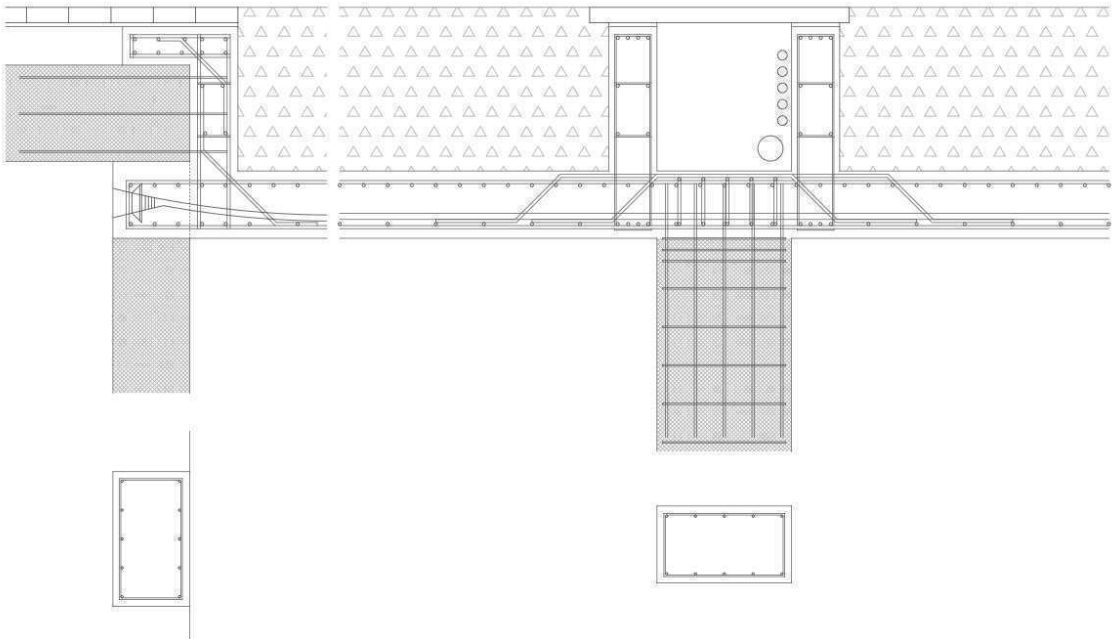

Figure 4.
Detail of the border connection enthe gallery that strengthens the slab, separates the earth on each side of the pedestrian path and holds the tubes for drainage, electricity and watering, ©VVV.

The entrance and exit points of the garage are transfered from their current position excessively in the center of the square and are now inserted next to the sidewalks in order to maximize the visually free interior space of the garden. Both accesses in Góngora Street and in Joan Valls Street are kept, but are now narrower and they also integrate in the same structural strip the pedestrian entrances and exits with the aim of avoiding a dissemination of volumetric elements that would interrupt the garden. Therefore the intrusion of the parking activity has now been minimized and only the two ramps emerge in volume. The stairs and toilets remain hidden. The access ramps, being located next to the sidewalks, act as effective separators of the danger and noise of road traffic.

In a way they are now the guardians of the Rose Garden as they shield the garden by slightly closing its central space and producing a confined ground where the user perceives the quiet sensation of a protected nature.

The paths of the garden intersect perpendicularly so that the pedestrians can move to any of the four streets that border the Rose Garden. Path crossings also offer larger paved surfaces that support a contemplative function without having to tread the ground. There are no diagonal paths although diagonal lines have been used in the design of the garden. The layout of the green areas of the garden arises from an iterative process on the theme of the nine squares in which the central square has been extended to its maximum dimensions so that children can use it as a playing space located as far away as possible from traffic

Building the virtual earth

The ground surface on which the new trees and vegetation grow rests on a new concrete slab that will be supported on the existing pillars of the garage.

These pillars have a dimension of 40 x 70 centimeters and their disposition is determinant for the layout of the paved paths of the garden since under each path there is a row of pillars. Linking the setup of the paths to the existing concrete pillars aims to increase the resistence

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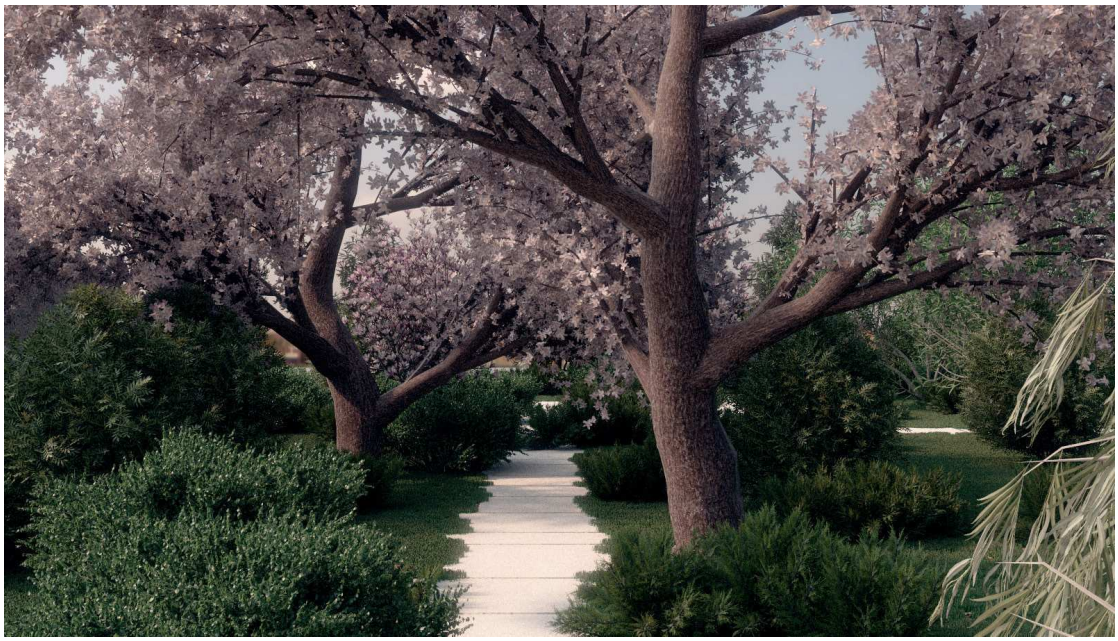

Figure 5.
View of the interior garden along the paved path. ©VVV.

of the slab as each path is built as a gallery in which the walls are two 70 centimeters concrete beams that are used to limit the layer of earth on both sides of the gallery. The pavement rests on the two beams and closes a gallery space free of the weight of the earth. In fact the network of galleries that is formed is useful and necessary to house all the garden facilities such as lighting, irrigation and drainage, which are usually buried and without the possibility of a simple registration or maintenance. So this solution, in a vitruvian way, is at the same time structural, functional and definer of the image of the garden.

The roof slab is thus furrowed by beams that increase its rigidity and therefore allow to reduce its thickness and weight, a prime issue in this project due to the necessary interior height for the garage and the considerable weight and loads of the garden. Although it is possible to implement a 35 centimeters slab solution with abacus, it is preferable to eliminate the presence of the abacuses and build a poststressed slab since the accessibility around the perimeter of the slab is guaranteed as a consequence of the necessary 80 centimeter earth layer. In addition, the technical justification of this solution is found in the fact that the natural waterproofing of the concrete would no longer be affected by microcracking. In a poststressed slab the concrete is compressed and therefore there are no areas of tensile stressed concrete in contact with the earth, as it would happen in the area of the abacuses with the solution of a traditional slab. Waterproofing with bituminous, asphalt or EPDM sheets is not considered due to its deformability and easy accidental breakage, especially because there are better solutions based on mass waterproofing with silicates or waterproof mortars.

The new Rose Garden could be considered as an ideal example for the disposition of that virtual stratum of earth since it benefits from the inclination to optimize the irrigation of its surface. Both Calle Góngora and Joan Valls have an approximate 5% slope so that, as a consequence, the garden surface has also a 5% tilt. This allows each piece of land delimited by the gallery-paths to effectively collect the water used for irrigation by different strata of gravels that envelop the drainage pipes. Drainage ensures the health of the roots of the trees by avoiding both the lack of oxygen due to flooding as well as the proliferation of fungi. In addition, the water can be evacuated or used as a continuous renovation for a pond.

For the garden there are several local trees and shrubs such as rowan tree, ash, quercus

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Figure 6.
Aerial view of the Rose garden at night, with the paths lighted. ©VVV.

faginea or yew tree (taxus baccata). Other species are also present due to the coloration of their leaves, their flowers or their fruits, such as strawberry tree, jacaranda, Japanese cherry, parrotia persicum or white flower magnolio. In the upper zone there is a row formed by yew trees and cedars, the only conifers of the garden. In the lower zone, the most luxuriant and tallest trees were planted, such as platanus orientalis, acer pseudoplatanus or the Babylonian salix. The roofs that protect the access ramps will be landscaped with rose plants arranged in terraces. The decision has the double objective of avoiding accessibility to the children and to recover the name by which the garden is known: the Rose Garden.

The paths will be paved with granite slabs eight centimeters thick and six different sizes that stand on the walls of the galleries. The granite slabs are arranged irregularly to draw a broken contour in which nature enters and leaves its edges and creates a vibration that would not exist with a precise and straight limit. The contact between the slabs is made by a linear set of glass bricks 6 centimeters thick, named Catolux, that, besides introducing a different texture on the paths, allows a continous illumination. The luminaires are two linear LED beams, of warm and cold light located under the strips of catolux. This solution avoids the emergence of lighting poles that are often subject to vandalism and allows to regulate the intensity and temperature of color more suitable for the different time bands.

Conclusion

Morphologically the city is recognized from the order of its masses and its gaps. The order comes from the paths of the streets, bridges, squares, interior gardens, outer gardens, parks and rivers, as well as the arrangement of built masses. In terms of relief there is a solid mass represented by the volumes of the building and a hollow mass of streets, squares and gardens where the natural green mass grows. The presence of the green mass results in the

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appearance of a particular atmosphere in urban places and this results in an increase in the environmental value perceived distractedly by the user. When the exterior garden is kidnapped by building pressure or absorbed by the layout of the streets, it is possible to restore that vestige of land to the city by constructing a virtual layer of earth that hides beneath the function or activity that justified that original capture of the earth. To serve the city the land has always been subordinated to the street or to the building, but a time has come when its dearth has produced the appreciation of its value as a morphological unit.

With the garden terrace Le Corbusier recognized the need to restore the land consumed by the imprint of a house and wanted to show that this commitment was part of the architecture of the modern movement. Now we must consider the virtual land as a principle of modernity that allows us to solve not only the old dilemma of land ownership, but also a wide range of conflicts and functional requirements that cities must face and solve at street level. It is the mission of modern urbanism to identify the variables involved in each complex problem that the city presents and to propose solutions in which the environmental quality of the zero level is instituted as a right of the citizen. It is the way to make the identity of the city persist and be reaffirmed in time.

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New York High Line as urban catalyst: Impact to neighborhood

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Abstract. *The High Line, an abandoned elevated railway structure on Lower Manhattan's West-side, converted into the public park is among the most innovative urban renovation projects. The meatpacking district with industrial taste, transformed to one of the most fashionable areas in New York would not be realized without the impact of this unique Urban Park, the High Line. The story of how it came to be is a remarkable one: two young citizens with no prior experience in planning and development collaborated with their neighbors, elected officials, artists, local business owners, and leaders of burgeoning movements in horticulture and landscape architecture to create a park celebrated worldwide as a model for creatively designed, socially vibrant, ecologically sound public space. More than 8 million of visitors are counted annually. The research will clarify the process of the High Line's execution, its mechanism of urban transform, and impact to the neighborhood chronologically, and will discuss and theorize this urban regeneration as an outcome of catalytic effect of Urban Green Space.*

Keywords: Urban Catalyst, Urban Regeneration, Reuse, Green Network, Abandoned Elevated Railway.

Introduction

Recently, the method of urban regeneration, called "Urban Catalyst", draws more attentions in Europe and America. In this paper, "Urban Catalyst" is defined as a catalyst promoting the chained regeneration in the city, as if it acts like catalyst in the chemical reaction. Unlike the conventional development method such as "Scrap and Build" in the period of economic growth, it offers a significant character which promotes changes to the surrounding areas beyond the boundary of the development site. It would be an extremely effective method such as Japan, which is in a mature phase, not growing anymore, but, rather declining and shrinking. The point is unlike a conventional development method, urban catalyst makes changes beyond its boundary. There could be many examples observed as a result of "urban catalyst", even if they are not recognized as it is, which influenced positively around its surroundings and regenerate the areas.

This paper revolves around the interesting story of the evolution of one of the most important modes of transportation in the history of mankind. While some say its use declined over time, the stages of its metamorphosis in terms of functionality to be analyzed and confirmed its revival like a phoenix. Four important eras in the history of transportation in the United States are: The Walking-Horsecar Era, The Electric Streetcar Era, The Recreational Automobile Era and The Freeway Era. Though these eras specifically state about paradigm inventions in the field of transportation, it mainly focuses on human accessibility and mobility. No doubt that they played a key role in transforming the urban fabric, but another important invention in the history was the Railway system which was a significant step in making the world a much smaller place than it is today.

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Objective

The main objective of this paper is to study this brownfield revitalization project, and its impacts on the immediate surrounding urban fabric and its mechanism of revitalization. The meatpacking area and West Chelsea area was known for last place in Manhattan for investigation. The High Line triggered the recent development for no questions. However, in 1990's there is a movement of artists and art galleries relocating their bases from SOHO (South of Houston Street) to Chelsea Area. Clusters of Gallery could be observed mainly between 10th Avenue and 11th Avenue and between 20th Street to 27th Street. Also, one of the premier names in American fashion, Diane von Furstenberg was founded in 1972, and moved to the Meatpacking District in 90s. The contrast between "High-end Fashion" and Low-Key Labors of Industry, added the special attention to the district. DVF is renowned for its iconic wrap dress and signature prints, DVF has grown into the global luxury lifestyle brand it is today. The company, headquartered in New York City, has expanded to four full collections and accessories.

Those initial interventions, generated the base for regeneration and urban transformation. Further analysis will be conducted to clarify the mechanism and impact of Urban Catalyst.

Literature Reviews and History of High Line

Drawing an inspiration from the Promenade Plantée (elevated railway converted to the linear park in Paris), led to the development of this project in the West-side of Lower Manhattan. The High Line Park stretches 1.45 miles and is an elevated park on the disused New York Central Railroad also known as West Side Line. It runs from Gansevoort Street, through the Meatpacking District and Chelsea market area, and ends on the northern edge of the West Side Yard of 34th Street. The first phase of this elevated park opened in 2009, followed by 2nd and 3rd phases in 2011 and 2014 respectively,

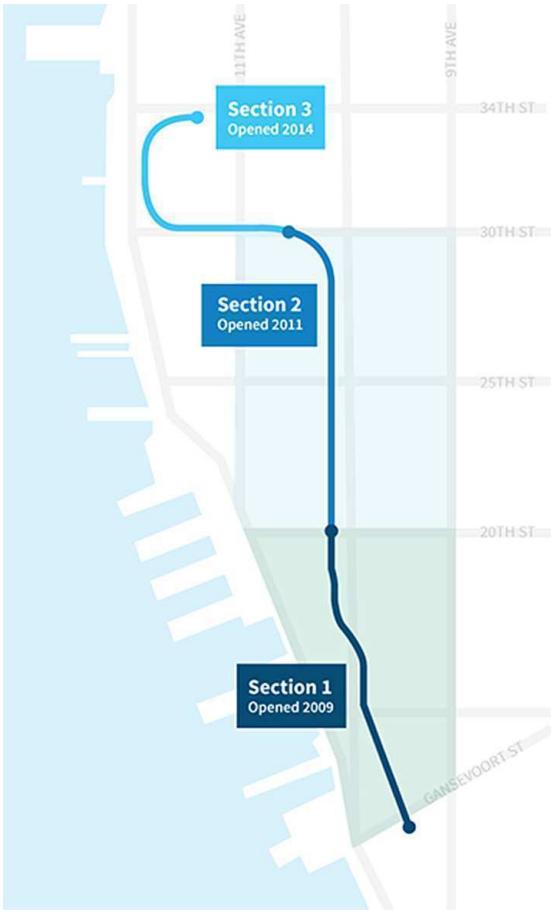

Figure 1.
Map of The High Line in New York City with Phasing

and the most recent addition to this park was the phase 4 which opened in 2015 (Lopate, 2011) (See Figure 1).

The City of New York sanctioned street level railroad tracts in downtown Manhattan's Westside to ship freight in 1847. It then hired men to wave flags in front of the trains for safety purposes. But due to high number of accidents occurring between the freight trains and other traffic it was infamously known as the "Death Avenue" (Gray, 2011). After several public debates and opposition for this hazard, finally in 1929 the city agreed to remodel the West Side Improvement Project (High Line History, 2009). The new proposal consisted of building an elevated highline that eliminated 105 street-level railroad crossings, and it was conceived by Robert Moses.

Thus, the elevated line became a transportation system which was in sync with the immediate built environment and which

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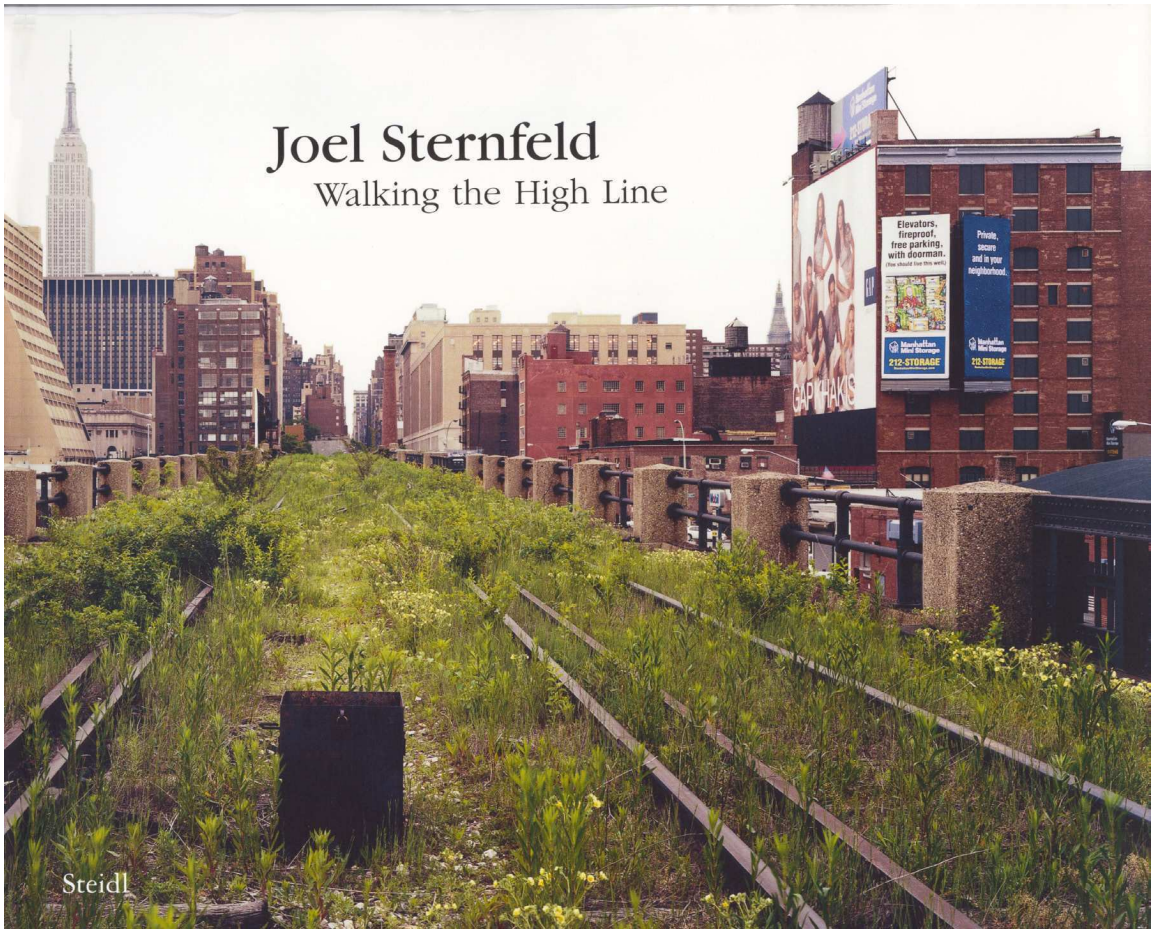

Figure 2.
Natural Vegetation on the High Line, Left Abandoned for Decades.

was able to directly connect factories and warehouses that had milk, meat packing, and manufacturing goods businesses. It helped a lot in the transportation of goods without any hindrance to the traffic on the streets. At a point in time there were hundreds of small meat packing shops operating every single day in this vicinity. Whereas today one can see a line of bars, boutiques, fashion houses, cafes and restaurants which have totally transformed this place from grit to glamour (Gregor, 2010).

The High Line is an art deco masterpiece of industrial design, massive yet elegant. It is characterized by the geometric patterns of the guard rails. It is constructed out of layers of steel and millions of rivets making it an amazing piece of engineering and construction. Due to the growth of interstate trucking in the 1950s the rail traffic throughout the nation dropped. The last train ran on this line in the 1980s (High Line History, 2009). The High Line stayed neglected for another decade which made it a breeding ground for homeless, trans-sexual prostitutions, robbers and drug dealers, making it a fringe criminal pit. The residents in the neighborhood believed that it had become the main source of urban blight and so it was finally slated for demolition in the 1990s.

This is when locals Robert Hammond and Joshua David, who didn't want to see the High Line go, to save it from the wrecking ball formed the non-profit organization, "Friends of the High Line" in 1999. In the summer of 1999 when they visited the top of this elevated highline all they saw was a mile and a half of wildflowers growing up with the magnificent views of Manhattan, the Statue of Liberty, and Hudson River. This old piece of urban infrastructure had been converted into linear gardens 37 feet above ground. And then, the campaign to save the High Line gained momentum. The New Yorkers loved the idea of meadows in middle of the city (High Line History, 2009) (See Figure 2).

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This urban redesign project was addressed meticulously by the design group, associated with the Friends of Highline, New York based, Diller Scofidio + Renfro architects, and James Corner Field Operations landscape architects, up to a micro level which led to the design of elements like ramped elevated benches which stood for the elevated line, walkways and planting beds revealing exposed train tracks, seeds and grasses evoking the primal wilderness which took over after the line was abandoned. The landscaping for this place was based on the classic design principle of "scripting a path or a journey" (Trail of the Month, 2011).

The way one is brought along the High Line, the various meandering paths and turns, the varying overlooks and the dramatization of how one views the city is strongly embodied in the design. Another design idea was that of a "slow stare" i.e. when one arrives, from the busy street life, up on the High Line you get to pass from under the structure where one can almost touch the beam and the rivets, and look around at the foliage never realizing that you actually walked 3 stories up to get there. As one walks on the High Line from the southernmost terminus one can see the old, preserved landmark Chelsea market area of the city giving you an elevated view of what this industrial neighborhood looked like in the old day. Also there are dedicated places on the High Line for food vendors to sell organic and locally produced goods which bring back the essence of a food line, which brought meat and dairy into the city, synonymous to what this place was in the olden days.

Even though the vegetation looks natural, it takes a lot of efforts to maintain this artificially planted greenery (Foderaro, 2013). It is highly designed and cared for to look natural. Because the landscaping required a lot of maintenance, the city opens volunteering opportunities for the residents of the city to take part in the activities of gardening. It also opens vistas for interactions and learning. Other unique design features of this project include an urban amphitheater overlooking the busy 10th Avenue street of Manhattan, the shallow water fountains that mimic the springs and Diller-von Furstenberg sundeck plaza and which offer the wide view of the Hudson River and the western sunset (Lopate, 2011). Even though the High Line costs $100,000 million worth of investment to build, but it generated $2 billion worth of private investments.

Zoning Change to Prevent Gentrification

On June 23, 2005, the City Council approved the Department of City Planning's proposals for zoning text and map amendments affecting the West Chelsea area in Community District 4 Manhattan. The area is bounded generally by Tenth and Eleventh Avenues from West 30th Street south to West 16th Street. The proposal would create the Special West Chelsea District to provide opportunities for new residential and commercial development, facilitate the reuse of the High Line elevated rail line as a unique linear open space, and enhance the neighborhood's thriving art gallery district. Facilitated in large measure by the West Chelsea rezoning, the City Parks and Planning Departments, are working closely with the Friends of the High Line on the $85 million restoration and conversion of Manhattans High Line into a lush green linear park located on the West Side (See Figure 3).

Bulk modifications were applied to 10th Avenue, 24th – 28th streets (C6-2 District): The maximum "Streetwall" height was reduced from 145 to 125 feet to ensure new development relates to the scale of existing buildings along this portion of 10th Avenue. Also, Inclusionary housing provisions were modified by the City Planning Commission and the City Council within the Special West Chelsea District to provide additional opportunities for the creation of housing for lower-, middle- and moderate-income households. Lots which have transferred floor area from the High Line Transfer Corridor would be permitted to further increase floor area through the provision of inclusionary housing in C6-3 and C6-4 districts. The preservation option of the inclusionary housing program was modified to encourage the use of this option, and the use of public subsidies was made available to encourage the use of the Inclusionary Program and ensure permanency. The use of 80/20 financing and changes to the Inclusionary Housing Bonus (IHB) described above would generate approximately 1,000 units of affordable housing as a consequence of the creation of the Special District.

The West Chelsea rezoning proposal contains

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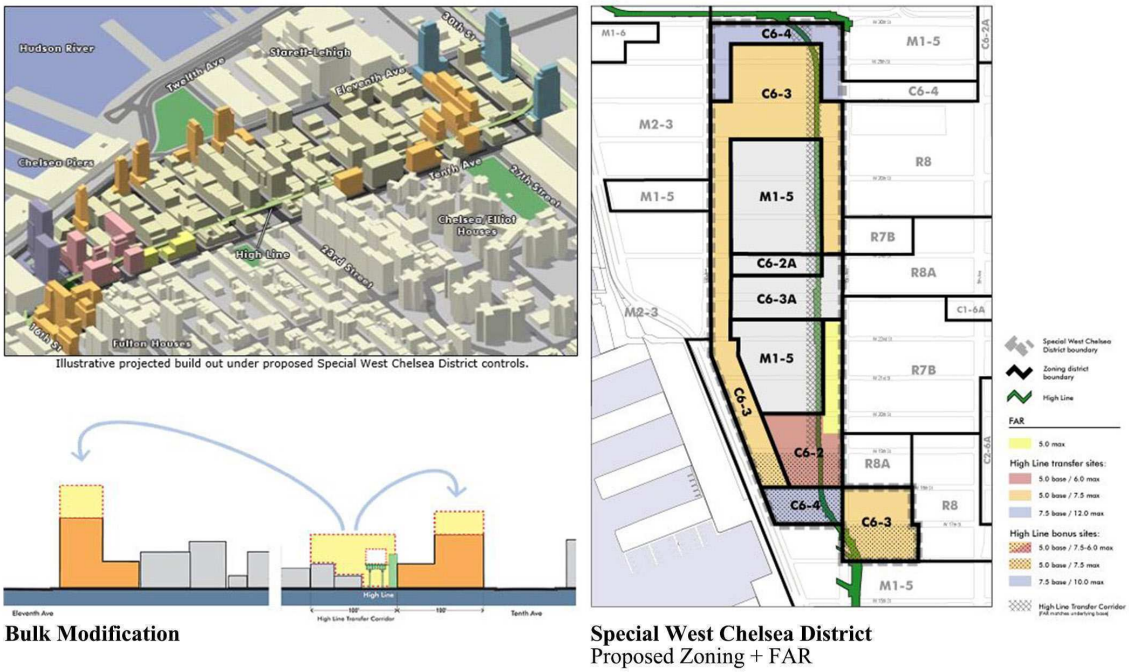

Figure 3.
Field work Zoning Change to West Chelsea District

provisions intended to enhance the proposed High Line open space and to ensure that adjacent developments engage with and relate to the High Line. To encourage preservation of light and air around the High Line, the proposal would allow development rights to be transferred from High Line properties to designated receiving sites within the Special West Chelsea District. New development along Tenth Avenue, adjacent to the High Line, would also be subject to a series of building bulk and use controls to encourage connections to the High Line and the preservation of light, air and views.

The rezoning proposal would create a High Line Transfer Corridor (HLTC). The HLTC would generally be 100-feet wide and would contain the entire High Line structure and portions of adjacent lots between West 18th and West 30th Streets (indicated on the Proposed Zoning map). Owners of property within the HLTC would be permitted to transfer their development rights, equivalent to the base FAR for the property, to designated receiving sites within the Special District. The construction of stair access to the High Line would be required as a condition of the transfer on some properties. Separate site selection and acquisition actions would transfer control of the High Line to the City and would facilitate the implementation of a master plan design for the High Line open space.

The Special West Chelsea District would permit residential and commercial development along Tenth and Eleventh Avenues and on some of the midblocks, outside the core of the neighborhood's art gallery district. Regulations governing building height and setback respond to the unique features of West Chelsea, including the neighborhood's many early 20th century loft buildings, the adjacent Chelsea Historic District, and the Hudson River waterfront.

Methodology

In this research, to obtain a general and background information on the research area (Meatpacking District and West Chelsea District), GIS map of Manhattan was used as a platform of urban transformation. Series of hearing surveys were conducted, to meet with Annie White, Department of City Planning, New York City, Cub Barrett, Director of Communications, the Friends of High Line, Matthew Johnson, Associate Principal & David Allin, Associate, Diller Scofidio + Renfro, Todd

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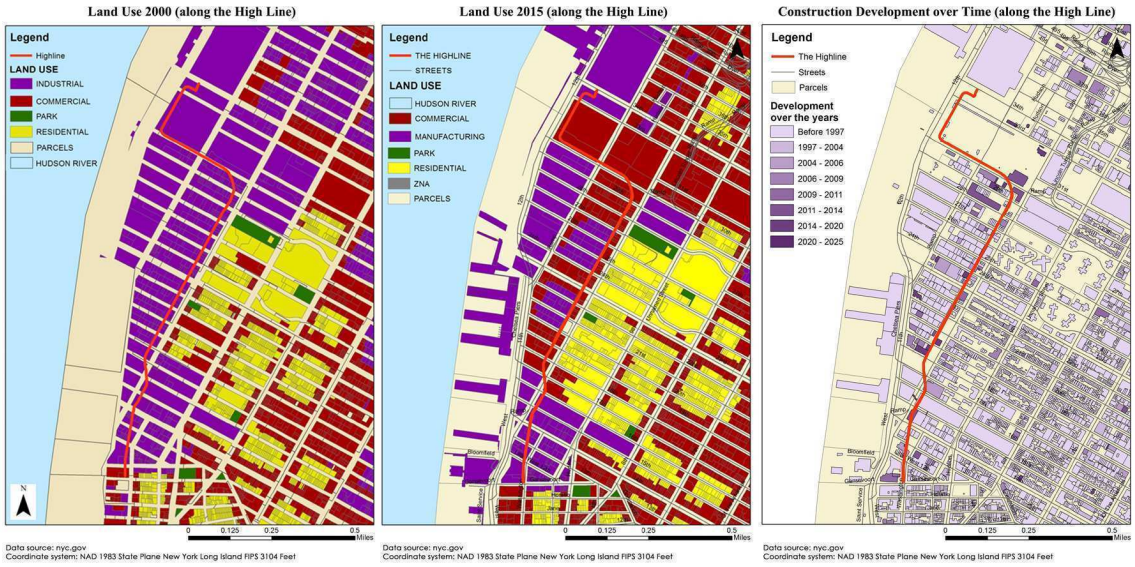

Figure 4.
Zoning (2000, 2015) and Construction Development along the High Line.

Schliemann, Partner of ENNEAD Architects LLP, etc. Also, historical maps (1891, 1920, 1930, 1950, 1970, 1990, 2010) were obtained at the New York Public Library.

West Chelsea Zoning Proposal by New York City Planning was obtained and analyzed as well as applied to the GIS map. From the Google Map, 723 businesses address and classification was obtained, and made contact to obtain the opening data of businesses.

Measurement and analysis

Figure-4 shows the change of zoning and Construction development through the year along the High Line.

723 Businesses called/researched, and information obtained based on 61.3% of 723 samples.

In summary, 91 of the surveyed businesses have been there prior to the 2000s (See Table-1).

- 2009- 1st Section of High Line Opened
- 2011- 2nd Section Opened
- 2014- 3rd Section Opened

Prior to initial opening: Average turnover per year: 12.3

Years following opening: Average turnover per year: 23.6

Almost a 100% increase was calculated.

Property Value Changes

The median resale price for real estate in Chelsea reached $2,143,287 in May of 2016. This is over 100 percent more than the real estate value in the "comparison area" just one block to the east and is over 75 percent higher than the rest of Downtown Manhattan.

Section 1 of the High Line, completed in 2009, has one of the highest resale and rental values in the area. And, Section 2 of the High Line, completed in 2011, has lower property value than section 1, but is still 7% higher than the rest of Manhattan. Another nine buildings are under construction near the High Line, which had a median asking price of $7,122,500 in May 2016.

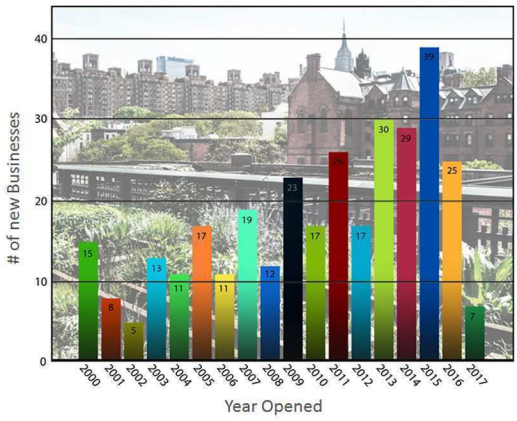

Table 1.
Year of Opening in Business around Chelsea District.

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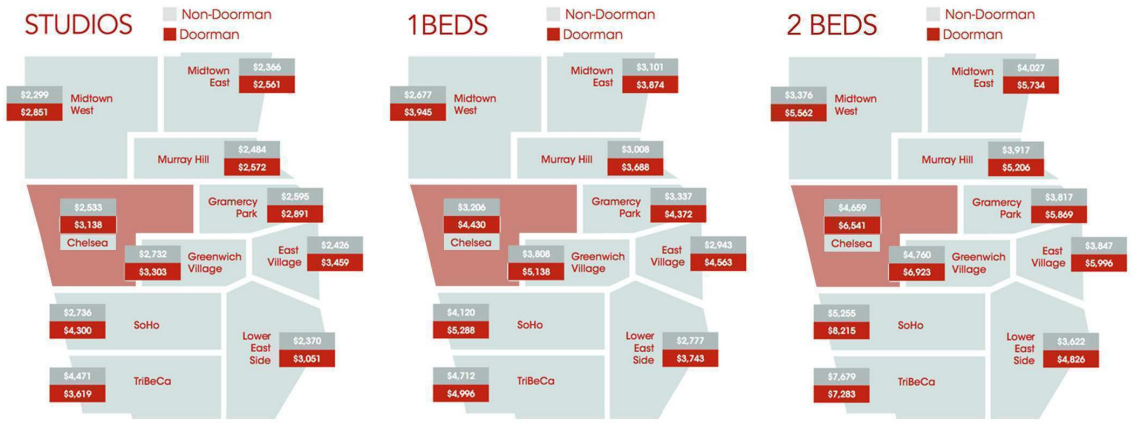

Figure 5.
Price Comparison: Chelsea District and Surrounding Districts.

In 1995, the average cost was as follows; Studio Apartment: $1,342, One Bedroom Apartment: $1,970, and Two Bedroom Apartment: $3,190.

In 2009, when the Section 1 of the High Line completed, the average cost was as follows; Studio Apartment: $2,325, One Bedroom Apartment: $3,316, and Two Bedroom Apartment: $5,139.

In 2011, when the Section 2 of the High Line completed, the average cost was as follows; Studio Apartment: $2,595, One Bedroom Apartment: $3,654, Two Bedroom Apartment: $5,646.

In 2014, when the Section 3 of the High Line completed, the average cost was as follows; Studio Apartment: $3,138, One Bedroom Apartment: $4,318, and Two Bedroom Apartment: $6,382.

Figure-5 shows the average price of apartments in category with Studios, 1 Bedroom Apartment, and 2 Bedroom Apartment (Non-Doorman / Doorman).

In April of 2017 the price of rent for a studio apartment in the Chelsea district was $2,533 without a doorman, and $3,138 with a doorman. The district is split half and half on residences with and without doormen.

In April of 2017 the price of rent for a one bedroom apartment in the Chelsea district was $3,206 without a doorman, and $4,430 with a doorman. The district is split half and half on residences with and without doormen.

In April of 2017 the price of rent for a one bedroom apartment in the Chelsea district was $4,659 without a doorman, and $6,541 with a doorman. The district is split half and half on residences with and without doormen.

Conclusion

Opening new businesses in both West Chelsea and Meatpacking District clarified the impact of High Line well in a higher degree. Zoning changes promoting the development along both 10th Avenue and 11th Avenue, which helps preserving the character of "Art Gallery" district, as well as preventing the gentrification. Further research is planned to investigate detailed transformation, such as street base, avenue vase, to clarify the gratitude of impact travels parallel or perpendicular to the High Line, also how those factors interact with pedestrian flows.

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Reconfiguring welfare landscapes: A spatial typology

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Abstract. *The post-war Danish public housing estates were a cornerstone in the construction of the Danish welfare society. Green open spaces played a central role in creating a framework for "the good life" in the many new public housing estates, which is why we propose to call them welfare landscapes. Today, these welfare landscapes are facing new challenges such as social segregation, extreme rainfall caused by climate change and changing uses. Therefore, they are increasingly being transformed, yet often with little or no interest for their existing spatial qualities. The welfare landscapes are insufficiently researched and knowledge about their spatial characteristics needs to be developed and communicated to preserve their inherited spatial qualities and to use these qualities as a resource for developing contemporary welfare landscapes. This paper aims to contribute to understanding the spatial characteristics and qualities of Danish welfare landscapes in order to create a better basis for their reconfiguration. Based on typo-morphological case studies of three public housing areas in the metropolitan area of Copenhagen this paper proposes a preliminary spatial typology of welfare landscapes from the small scale of the individual green space to the territorial scale. This typology will provide a basis to explore possible future development scenarios for Danish welfare landscapes through research-by-design.*

Keywords: Public housing estates, green open spaces, welfare landscapes, transformation, spatial typology.

Introduction – Welfare Landscapes

The post-war Danish public housing estates were a cornerstone in the construction of the Danish welfare society after the Second World War. Today, roughly a million Danes live in public housing estates, countrywide 17% of the population and in the metropolitan area of Copenhagen the number is as high as 22% (Socialministeriet 2016). The Danish public housing estates, before 1996 in Danish called; Almennyttige boliger (which could be translated with "housing for public benefit"), and after 1996; Almene boliger (public housing), are originally build as publicly supported housing, constructed by governmentally approved housing foundations (Vestergaard 2017). Danish public housing estates supplies a large proportion of the Danish population with affordable housing and are inhabited by both privileged as less-privileged people, but with the majority of the inhabitants in the lower half of the income distribution (Socialministeriet 2016, p.2). The public housing estates build in the decades after the Second World War stands for a significant proportion of the overall Danish public housing stock, with more than 80,000 housing units constructed in each of the decades of respectively the 1950's as well as the 1960's, and more than 100,000 units in the 1970's (Socialministeriet 2016, p.4).

Central to the post-war public housing estates were the open spaces and landscapes which played a crucial role in creating a

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framework for "the good life", which is why we propose to call them 'welfare landscapes'. A great number of the Danish post-war public housing estates possess unique architectural and spatial qualities, and have been important architectural references internationally (Boye 1948; Hiort 1952; Woudstra 1995; Treib 2002).

However, the welfare landscapes are currently undergoing substantial changes due to a range of different challenges. This includes among other things ghettoisation issues being linked to the planning and architecture of the public housing estates calling for action (Bjørn 2008) and climate change leading to new climate adaptation projects advised to take place in the open spaces of the estates (Landsbyggefonden 2014). Therefore, the welfare landscapes are increasingly being transformed, yet often with little or no interest for their existing spatial qualities. Despite the architecture and planning of the post-war public housing estates being well described (see for instance, Bæk-Pedersen 2005; Tietjen 2010), substantial knowledge about the welfare landscapes is surprisingly lacking. Knowledge about the spatial characteristics of welfare landscapes needs to be developed and communicated to preserve their inherited spatial qualities and to use these qualities as a resource for the future. This paper aims to contribute to understanding the spatial characteristics and qualities of Danish welfare landscapes in order to create a better basis for their reconfiguration. Based on typo-morphological case studies this paper proposes a preliminary spatial typology of welfare landscapes, which will provide a basis to explore possible future development scenarios for Danish welfare landscapes through research-by-design.

The project draws on a Henri Lefèbvre (1991) inspired relational understanding of space, where space is understood as both process and product, and the output of the relationship between respectively materiality, discourses and practices. The project seeks to understand how the material characteristics of welfare landscapes were constituted, including the ideas behind the materialisation of different welfare landscapes. Further to understand how welfare landscapes have been and are being transformed in relation to changing ideas about welfare, communality, urbanity, cultural heritage, traditional dichotomies as well as changing spatial practices. Central to the research is the presumption of the existence of some approximations of ideal types of welfare landscapes in possession of unique spatial characteristics. The concept of the ideal type is here to be understood as: "an abstraction of features from empirical reality and their embodiment into a unified conceptual scheme of hypothetical validity" (Merriam-Webster 2017). This paper presents some of the preliminary studies of the material characteristics - the matter, shape and structure of three iconic Danish welfare landscapes thought to possess some ideal spatial principles recognisable in a large amount of the Danish welfare landscapes.

Three Preliminary Ideal Types of Welfare Landscapes

Three preliminary ideal types of welfare landscapes have been defined based on existing

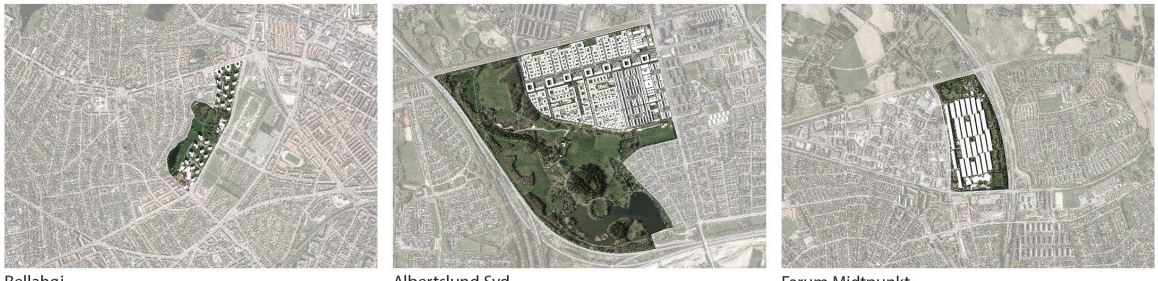

Figure 1. Three ideal types of welfare landscapes

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literature on the architecture and layout of post-war public housing estates (see for instance: Tietjen, 2010; Bæk-Pedersen, 2005; Nygaard, 1984). On this basis, three iconic cases in the greater metropolitan area of Copenhagen have been chosen to exemplify the three preliminary ideal types (Figure 1), representing different materialisations of welfare landscapes respectively: pastoral scenery in relation to Bellahøj (1951-1957), structural patterns in relation to Albertslund Syd (1963-1968) and topographic megastructure in relation to Farum Midtpunkt (1970-1974). The three cases are in a Danish context well-described and central in the literature on post-war Danish public housing (see for instance: Nygaard, 1984; Tietjen, 2010; Bendsen et al., 2015;)

Bellahøj was the first high-rise development in Denmark constructed between 1951 and 1957, situated in the area of Brønshøj towards the centre of Copenhagen. The development consists of a park landscape with 28 free-standing buildings of between 9 and 13 stories having a total of approximately 1300 units (DAC 2017). Albertslund Syd built between 1963-1968 was among the first and largest accounts of prefabricated building developments in Denmark, situated in the western part of the metropolitan area of Copenhagen. The development is built as low-rise and divided into areas with courtyard buildings and row houses towards the periphery and apartment buildings along a canal in the middle of the site. Albertslund Syd has a total of 2200 units (Lind & Lund 2005). The third case of Farum Midtpunkt was built between 1970-74 and situated in the northern part of the Copenhagen metropolitan Region. The buildings of Farum Midtpunkt consists of stacked apartments with own garden terraces. The buildings are placed parallel to each other and lifted above the terrain with large parking spaces on the groundfloor, separated by strips of thicket, and has a total of 1650 units (Lind & Lund 2005).

The first two cases, Bellahøj and Albertslund Syd, represent two different typical materialisations of welfare landscapes, whereas Farum Midtpunkt represents an exception. The case of Bellahøj represents the park settlement with free-standing high- or low-rise buildings situated in a park landscapes which forms a continuous 'pastoral scenery'. This type was primarily constructed in the 1950's but already developed in the interwar period (Tietjen 2010, p.88). The case of Albertslund Syd represents another typical type of public housing estates; an additive structural pattern of open spaces enclosed by buildings. Albertslund Syd can be perceived as an early variation of a low-rise high-density building layout. The low-rise high-density type becomes popular from the late 1970s onwards (Tietjen 2010, p. 104). Within architectural, urban design and landscape architectural theory the two cases of Bellahøj and Albertslund further stands for well-described spatial situations. The two cases have the classical types of respectively the courtyard building and the detached villa as central components in their respective building designs. Further Bellahøj and Albertslund Syd also represent approximations of two opposing spatial situations within urban design theory as described by Rowe & Koetter (1978, p. 62): "(…) one an accumulation of solids in largely unmanipulated void, the other an accumulation of voids in largely unmanipulated solid; and, in both cases, the fundamental ground promotes an entirely different category of figure-in the one *object*, in the other *space*.". However, from a landscape perspective there is more to the open space than what can be described by *void*. Where Bellahøj from an architectural perspective might be described as solids in a void, it can from a landscape architectural perspective be perceived as a continuous pastoral landscape. Further for the case of Albertslund Syd the voids in the solid can be described as a pattern of enclosed gardens (See for instance Aben & Wit 2001). Further Bellahøj and Albertslund Syd can be seen as representatives for two different approaches to how housing estates should be conceived as either open high-rise or dense low-rise, a central theme in the Danish post-war architecture and planning debate (Nygaard 1984). In a Danish context the latter became the most popular and wide-spread type of post-war housing. The third case, Farum Midtpunkt, falls outside of the typical categories and represent an exception

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within welfare landscapes. Farum Midtpunkt is in opposition to Bellahøj and Albertslund difficult to depict using traditional means of representation as respectively building and landscape in many ways are difficult to separate and describe independently.

Methodology – Describing the spatiality of Welfare Landscapes

The methodology applied has included a multi-method approach drawing on Typo-morphology as described by Moudon (1994). This includes using a method derived from Contzen's *town-plan analysis* (1960), looking not only at the structure of roads, plots and buildings but extending it further to also include more natural features in the landscape as for instance the contour lines. This is done through analysis of historical maps, original architectural drawings as well as by the use of GIS. Steenbergen's (2008) approach of using drawing as a tool of enquiry in design research has played a central role in the initial studies. As described by Steenbergen (2008) the act of drawing can serve as an answer to a formulated question leading to new questions arising: "Each drawing is an answer to a question, which in turn poses the following question" (Steenbergen 2008, p.23). So far the studies have approached the cases from a plan view mainly but the intention is to do further studies looking at the cases from other angles and with a more sectional perspective, elaborating on and questioning some of the first findings.

Past / Present Terrain

Comparing the past and present terrains for the three cases reveals how different degrees of terrain manipulation has been taking place as part of the construction of the public housing estates involving and approaching the existing landscapes in different ways (Figure 2). The initial question proposed for this study was concerned with, the relationship between the past terrain, before the construction of the individual estates, and the terrain of the present day. Past terrain maps, from before the construction of the public housing estates, was as part of this study created, based on vectorising and tracing Danish historical topographic maps 'Lave Målebordsblade' created between 1901 and 1971. Several different features were traced as part of this process, including buildings, plots, paths, roads, railways and more natural elements as forests, wetlands, waterbodies and terrain curves. However, for this study only the terrain curves and waterbodies/wetlands were in focus and brought forward in the final drawings. The present terrain maps, also showing terrain curves and waterbodies/wetlands, were based on the Danish topographic Kort10 dataset, which is deemed to a large extend to be identical to the situation of the finalised construction of the three public housing estates.

Bellahøj has of the three cases the least degree of terrain reconfiguration as the majority of the terrain remains the same. Smaller adaptations have been necessary in order to incorporate the buildings into the landscape and some new features have also been added, like a small amphitheatre. The case of Albertslund Syd stands out as an example with a more proactive approach to adapting the terrain. In the northern part of the case site, where the housing estate is situated, the surface has been reworked which includes making room for a major canal stretching across the entire site. South of the housing estate, but still part of the case area, is a large parkland with a mount and a lake. Comparing the present map to the historical map it becomes evident that the mount is an enhanced feature of the past terrain. The visible water features in the landscape also has its roots in a past feature of the terrain as the historical map reveals how a bog was situated at the site. The third case, Farum Midtpunkt, has had the most radical approach to the existing terrain as very little from the past terrain can be recognized. Farum Midtpunkt becomes the example of a total terrain adaptation where large volumes of soil are rearranged leaving no traces of what was before. The reconfiguration of the terrain consists of large areas becoming largely flattened as well as accumulation and formation of new large land forms to screen the

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estate from the highway situated to the east of the estate. A range of new questions arise as part of this study, which could be investigated further. This includes asking, in relation to the original decision on where to position the housing estates, if and how the geology of the respective case sites determine the design and composition of the public housing estates and their welfare landscapes? The overall findings challenge the general conception of post-war public housing estates as purely reshaping the context and landscape in which they are placed as some of

the studies show that the existing terrain in fact has been incorporated into the final design.

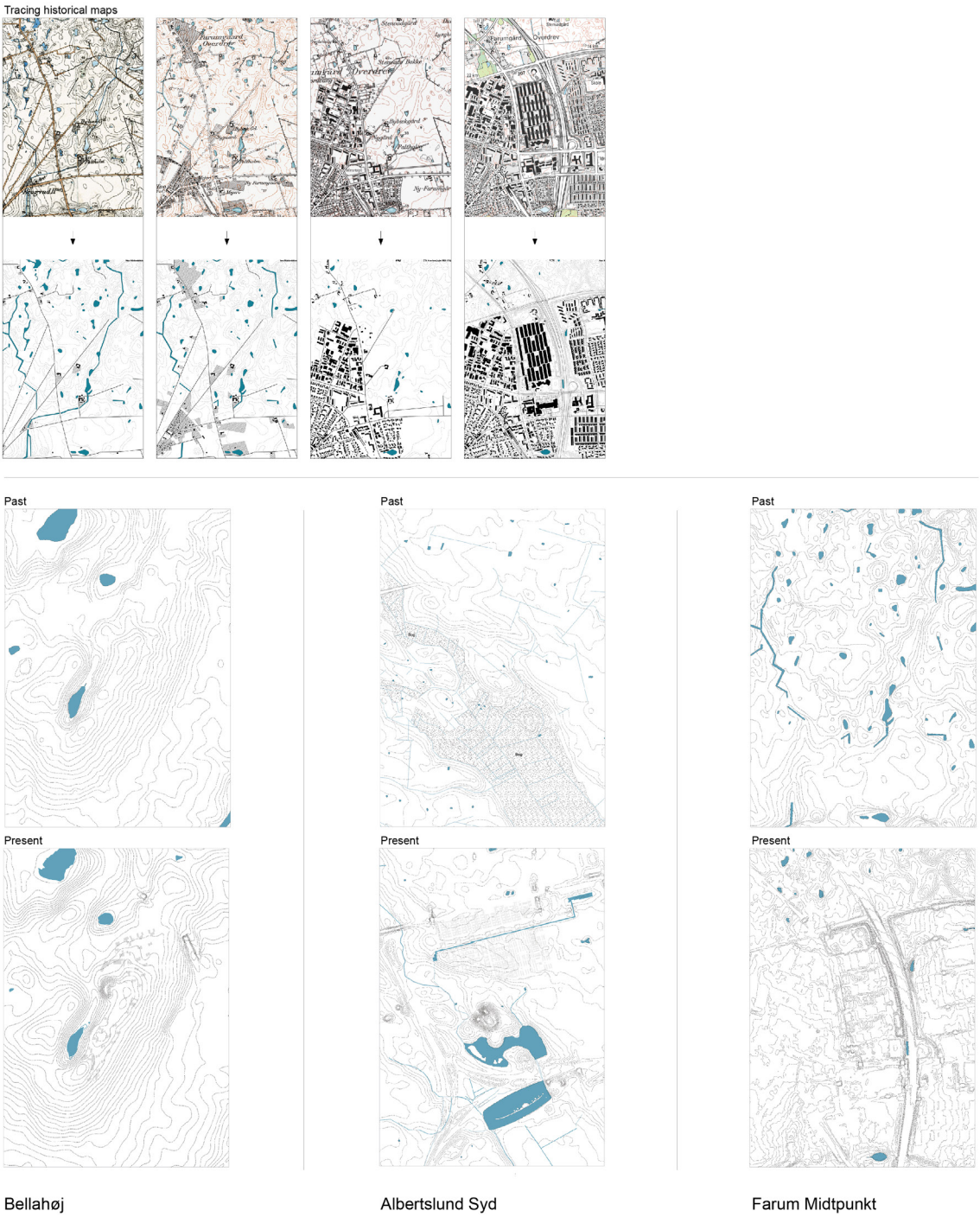

Figure 2. Tracing historical maps and comparing past and present terrain configurations for the three cases

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Built and Open Space relationship

The three cases differ in their figure-ground relationships, as well as in the amount of respectively built and unbuilt space, in the following denoted as built and open space (Figure 3). This study has its starting point rooted in the question; how is the relationship between respectively open and built space for the three individual cases? Open space is in this study understood as space which is open to the sky. In opposition, built space is to be understood as the building mass. The first two cases, Bellahøj and Albertslund Syd, are different in the relation between built and open space. Bellahøj consist of a very large amount of open space in comparison to built space, and the buildings are placed as objects within a larger open space. Albertslund Syd consists of an equal amount of open and built space. However, the built space here constitutes the open space which is defined by the appearance and form of the built space. The third case, Farum Midtpunkt – described as the Topographic Megastructure, represents a third situation where the built and the open space are entities difficult to separate. The ground floor of the built structure is horizontally open and a large proportion of the built structure is covered by garden terraces being open to the sky. The building becomes a landscape and vice versa with no clearly marked boundaries between the built and the open space.

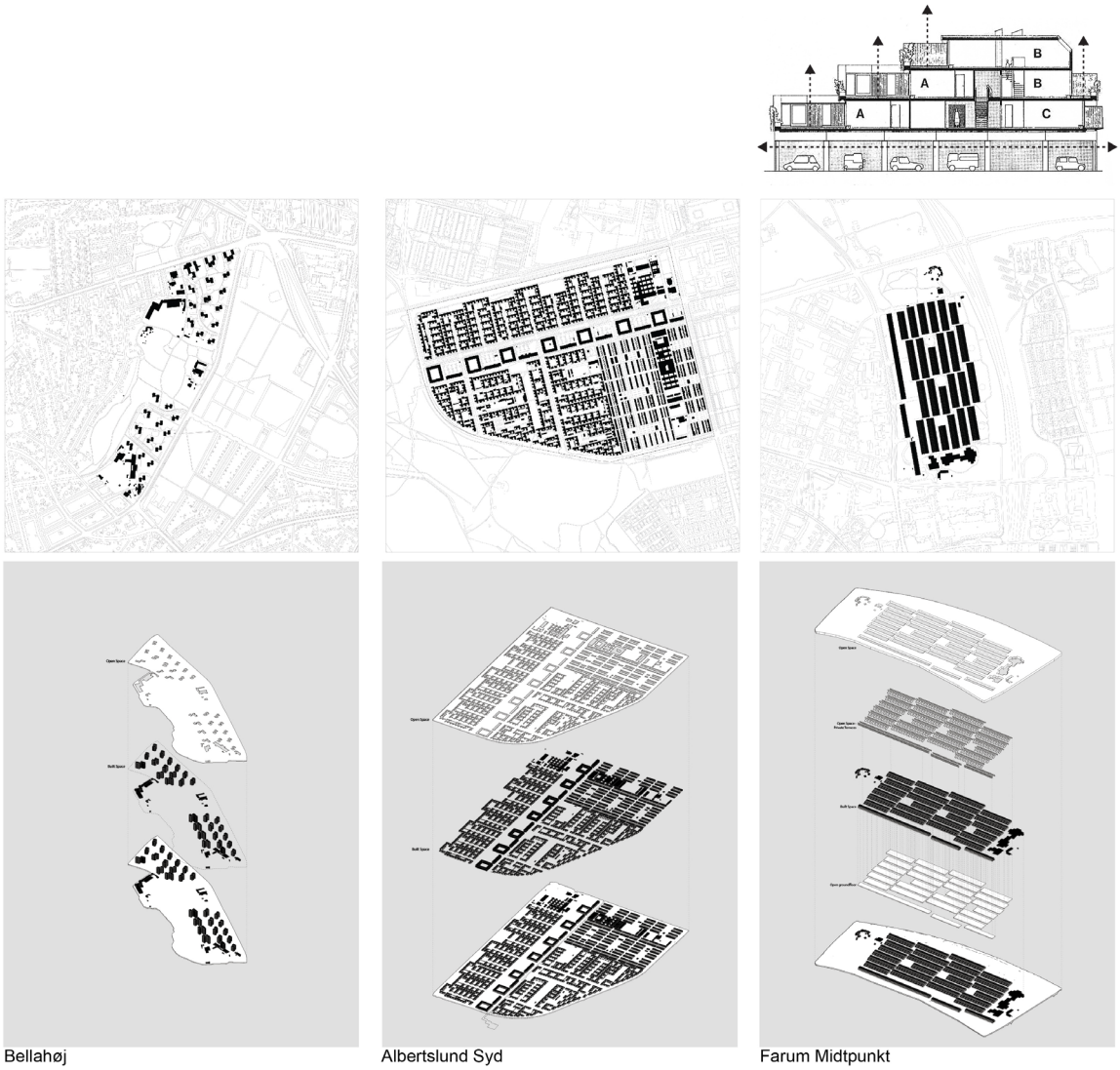

Figure 3. Figure-Ground and relationship between built and open space for the three cases

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Welfare Landscapes – green or grey?

Understanding the quantities of the open space surfaces has led to challenging the initial idea of the welfare landscapes as being merely green. The following study was sparked by asking into what constitutes the open spaces in terms of respectively hard and soft surfaces (Figure 4). In this study the open space surfaces were based on GIS data acquired from the Danish Geodata Agency and divided into respectively green/blue and grey surfaces. The green surfaces consist of permeable areas at large, including highly maintained surfaces as simple lawns, flower beds and ditches as well as areas less maintained including thickets and forest areas. The grey surfaces included impermeable and hard surfaces at large, including asphalt and paved surfaces of any kind; roadways, parking space, squares etc.

Bellahøj is in the study characterised by having a large amount of green and blue surfaces in comparison to grey. The surface is overall green but consist of a larger concentration of green towards the centre whereas the grey areas are concentrated towards the built-up areas facilitating entrance to the buildings at the site. On the contrary, Albertslund Syd has a significantly larger share of grey surfaces than green. The grey surfaces form a consistent carpet covering the entire site whereas the green surfaces appear fragmented and minor in size. Farum Midtpunkt is to the north and east bordered by large primarily green areas whereas the path system dominates towards the centre of the site leaving more areas grey. New questions arose as part of this study, including asking, what are the more specific elements of respectively green and grey surfaces and how is the distribution of these elements across the sites? Further the origin and reason to the surprisingly large amount of grey surface for two of the three cases could be investigated. One explanation could, according to Nygaard (1984), be inspiration at the time of conception taken from the Mediterranean regions and the Arabian Kasbah buildings. This source of inspiration stands for a fundamentally different idea of what makes the urban fabric than the Le Corbusian vision of towers in the park, in which Bellahøj on the contrary fits.

Figure 4. Distribution of respectively hard and soft surfaces for the three cases

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Mobility

Further understanding what constitutes the open space led to a study focusing on the mobility and movement systems of the different sites (Figure 5). All three cases have different kinds of traffic separation dividing movement across the sites into respectively space assigned for pedestrians, cars and parking. In Albertslund Syd central roads are connected to centrally located parking spaces across the entire site. In the original layout emphasis is put on crossings making it possible for pedestrians to pass underneath the roadways without any risk of harm. The pedestrian path system serves as access routes to the individual housing units but also connects smaller squares and playgrounds. Access to the surrounding region is thought to take place either by car or by local so called s-train which through the local Albertslund Station links the site to the metropolitan public transportation network. The most radical separation of pedestrians and cars is found in Farum Midtpunkt where the entire ground floor is assigned for cars and parking whereas the upper level is for pedestrians and bikes. The access to the site is primarily thought from a car perspective but also with smaller pathways connecting the site to its surroundings. Besides a few bus routes passing in the periphery of the site no direct major link to the metropolitan public transportation network, as the s-train station in Albertslund, exists. A unique feature in the original conception of Farum Midtpunkt was how movement across the site initially was supposed to take place through the buildings. This act of letting the built structure become part of the overall path system and thereby publicly accessible again leads to the boundary between what is open space and what is building becoming blurred in the case of Farum Midtpunkt.

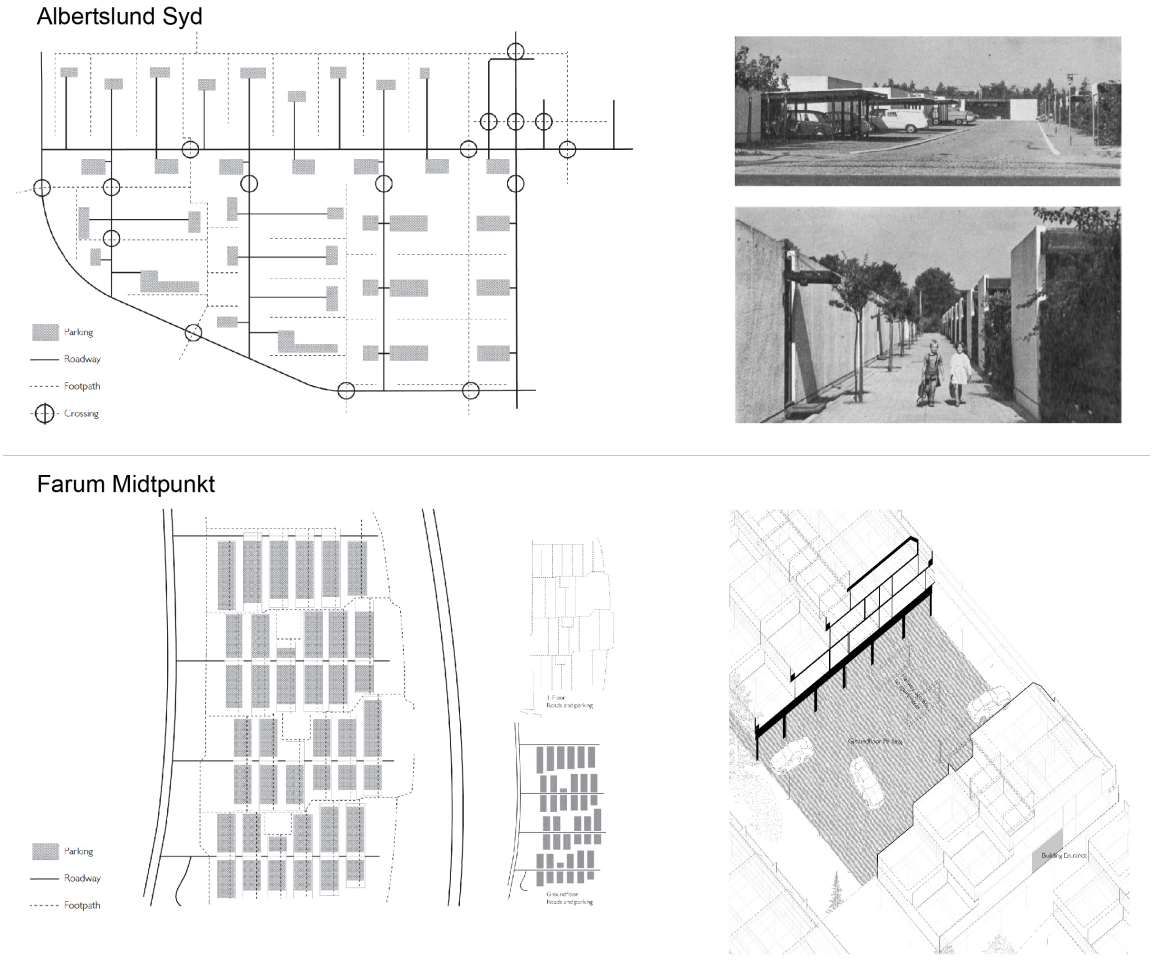

Figure 5. Mobility – Traffic separation for Albertslund Syd and Farum Midtpunkt

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Between home and common

The final study to be described in this paper is concerned with the relationship between home, the space assigned for the individual, and the common, the space assigned for the collective (Figure 6). The question put forward as part of this study asked, how is the division and hierarchy between the private and the common. The study consisted of tracing aerial photographs and highlighting parts which were deemed to belong to different spheres, moving from the most introverted to the more extroverted. Bellahøj was the most homogeneous of the three as it primarily consists of large publicly accessible and extroverted surfaces. On contrary, Albertslund Syd has a much more heterogeneous division of spaces, gradually moving from introverted and enclosed garden terraces, only accessible for the individual inhabitants, to more open and collectively accessible small courtyards, squares and pedestrian walkways. Farum Midtpunkt has a similar structure as Albertslund Syd moving from what it privately accessible to something more collectively accessible. The study revealed a need to explore the cases with different means as the current study did not manage to grasp the full complexity of each of the cases. It is expected that moving through the spaces on the ground level has the potential to reveal aspects not visible through an analysis from above. In combination, the two different methods of approaching the space will possibly be fruitful.

Figure 6. Between home and common

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Conclusion

The initial studies of the three cases have overall supported the choice of the them as being representatives for three preliminary ideal types, representing different materialisations of welfare landscapes. Bellahøj, the pastoral scenery, is characterised by the least degree of terrain manipulation and has a very large proportion of open space in comparison to built space. The surface in the Bellahøj case is significantly more green than grey and characterised by the green areas being large and cohesive. The initial study of the relationship between home and common revealed Bellahøj as having a more direct relationship between the private sphere in the building and the outdoor common than the other cases. Albertslund Syd, the structural patterns, has been constructed with a larger degree of terrain adaptation than Bellahøj but also with existing terrain features being enhanced as part of the final design. In Albertslund Syd there is a more equal distribution of respectively open and built space but with the built space in general constituting the open space. The surfaces are in Albertslund Syd to a large extend grey and the green space appear more fragmented and non-cohesive than what is the case in Bellahøj. The study of the relationship between the home and the common revealed how there is a distinct system and a graduation from what is private to what is common. Farum Midtpunkt, the Topographic Megastructure, represents the third and most radical kind of welfare landscapes. Farum Midtpunkt has the most comprehensive terrain adaptation of the three with a complete remake of the past surface. The built space and open space are tightly interwoven and creates a distinctly different situation than the two other cases. Further the pedestrian path system used to be integrated with the buildings blurring the boundary between building and landscape. The initial studies foci from a primarily plan view have been useful but has also revealed the necessity for additional studies from other angles taking place. This both to elaborate on some of the new questions arising as part the studies as well as to describe the cases from a more in-depth view.

Acknowledgement

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On the formulation of green open space planning parameters: A parametric tool

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Abstract. *Greenery can affect spatial characteristics such as relationship between hard and soft surfaces and activities inside open spaces. Among different types of greenery, trees have influences on usage patterns and comfort in open spaces. Trees and hard-soft surfaces in fact form the basis of green open space designs. On the other hand, there has been an increasing number of studies on using parametric tools to design urban environment recently. Despite the success in urban fabric planning by parametric tools, the utilization of these tools to design open spaces with a relatively smaller scale has not been revealed. Even worse, parameters that should be included in a parametric design tool for open space planning are still unknown. Accordingly, the primary objective of this study is to develop a parametric design model for green open space design. By investigating the design characteristics and concepts of different open spaces, parameters for a parametric tool to design green open spaces had been identified. Specifically, hard-soft surfaces in relation to the distribution of trees and entrances to the open space was investigated. This study also aims at developing a methodology for parametric design when designing green open spaces. Results from this study will provide designers with an additional layer of information when designing open spaces.*

Keywords: greenery, green open spaces, parametric design

Introduction

Public open spaces are considered one of the basic elements of urban morphology (Palmer & Thérond, 2012). They are important parts of the urban landscape and should be conceived as "outdoor rooms" within its neighborhood (Rogers & Urban Task Force, 1999). Due to the increasing awareness about urban sustainability, it is not unusual to have greenery and trees inside public open spaces. These spaces, commonly known as green open spaces (GOS), can provide social, ecological and economic benefits to both individuals and public.

For society, GOS could be regarded as a sort of urban oasis to escape from traffic, noise and pollution of cities (Chiesura, 2004). Places such as urban parks were considered locations for meeting strangers (Thompson, 2002). GOS could even render esthetic enjoyment for individuals (Zhou & Parves Rana, 2012). Previous studies also showed that GOS could help to promote health and well-being of individuals (Maas et al., 2006). Easy access to GOS such as parks could help to increase the level of walking and physical activities of individuals (Giles-Corti et al., 2005), which would in turn enhance physical health. Positive correlation was suggested between risk of stroke mortality and low exposure to green spaces (Hu et al., 2008). GOS also possessed the capability of stress restoration for human beings (Grahn & Stigsdotter, 2010). Ecologically, GOS could help to regulate urban micro-climate and mitigate urban heat island effects and air pollution (Whitford et al., 2001). Apart from these social

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and ecological benefits, linkage was suggested between property values and the existences of GOS. For example, a study in Spain showed a positive correlation between proximity to green spaces and prices of houses (Morancho, 2003). Because of the multiple benefits of GOS, more efforts should be put on optimizing the design of these spaces.

Regarding the design of urban spaces, there has been an increasing number of studies which explored the feasibility of applying parametric design models in the field of urban design. There are four main advantages for applying parametric urban design models. They are 1) Capacity to quickly generate large generic design; 2) Capacity to add detailing in the early stages of design with little effort; 3) Maintaining the model's 'intelligence' throughout different stages of design; and 4) Facilitating easy testing by changing parameter settings (Steinø & Obeling, 2013). To this end, extensive efforts have been devoted to developing methodologies and models for parametric urban design. There were studies which focused on identifying the parameters for parametric urban design models (Beirão & Duarte, 2009). Efforts have also been put on developing algorithm to organize street network in cities (Schneider et al., 2011). Besides, there have been attempts to reveal the possibility of utilizing parametric urban design models for large scale urban planning projects (Koltsova et al., 2011). Although promising results were delivered in previous studies, the parameters for designing GOS were still unknown. Even worse, no attempt has yet been made to investigate the possibility of applying parametric design for individual public open spaces. As a result, it will be of paramount importance to develop a parametric design model for GOS design.

Accordingly, it is of the main interest in this study to develop a parametric model for designing GOS. The current study also aims at identifying the parameters for such parametric model. Another objective of this study is to investigate the methodology for developing a parametric model for GOS design.

Parametric model for GOS design

Conceptually, the parametric model for GOS design can be expressed by means of a mathematical function:

$$Z = F\big(f(x_1, x_2, \cdots, x_m), g(C)\big)$$

In this function, Z is the final design output of the model. xi's are the parameters and C is the collection of site conditions / constraints adapted in the parametric model. f is a function describing the relationship among various parameters. g is a function describing the relationship of various site conditions / constraints. F is a function describing the relationship among parameters and site conditions / constraints. m is the total number of parameters. It can be seen that the function is mainly formed by two parts, namely the site conditions / constraints and the parameters. It would be vital to define these two parts in order to successfully develop a parametric model for GOS design.

Design attributes for GOS design

Various design attributes could be included in the parametric model. In a study by Lo et al. (2003), extensive literature review has been performed and a total of 23 attributes which would affect GOS design were identified. However, these attributes were mainly related to the internal design of GOS. Attributes related to the immediate surroundings and geometries of the open spaces were not revealed. Besides, the relationship of hard and soft surfaces, as well as the internal connections in the open spaces were not considered. When it comes to the environmental performance of GOS, attributes revealed in the study were mainly related to thermal performance. Acoustic comfort, which should also be an important factor, was not considered. As a result, attributes related to the surroundings, hard-soft surface relationship, internal connections and acoustic comfort of open spaces were appended to these original 23 attributes. Table 1 shows a list of these attributes.

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Model development

Definition of virtual site and attributes included in the model

Ideally, it would be desirable to develop a model which can adapt to different site conditions. Different geometries, sizes and immediate surrounding conditions should be able to be modified in the model. However, as a pilot study, it has been decided to treat these site conditions as constants in the parametric model. As a result, a virtual site for the model was defined. There were a number of pre-defined conditions which were related to the virtual site. These pre-defined conditions were mostly derived from a brief survey of 19 open spaces

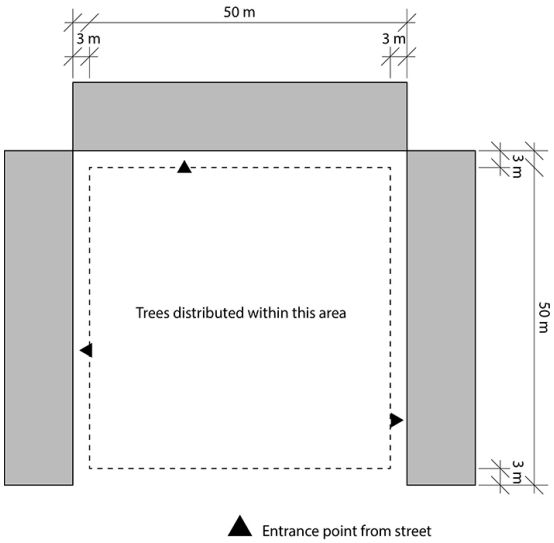

Figure 1. Pre-defined conditions of the virtual site

in Krasnoyarsk, Russia. Firstly, it was assumed that the open space to be designed was in the shape of a square with dimension 50m x 50m. Second, the site was enclosed in three sides by buildings, which means that one side of the open space was facing a street. Third, there was only one entrance from each building to the open space. Figure 1 shows the pre-defined conditions set for the virtual site.

Due to the limitation in resources in this study, only five attributes which were considered the most essential and foundamental for GOS design listed in Table 1 were included in the parametric model. They are the number and distribution of trees, the relationship between hard and soft (greenery) surfaces, the entrance point from the street to the open space, the entrances from buildings, and the path connections between the entrances.

As a model for GOS design would be developed, it would be important to first of all consider the trees in the space. There were some constraints when distributing the trees. It was assumed that trees would not be planted on hard surfaces. There would only be trees on soft surfaces. It was also assumed that trees should be placed at least 3 m from the buildings. This was to prevent trees to be distributed right at the edges of the buildings. Trees in the model were of three different sizes. They were big, middle sized and small trees. Besides, there could be paths (internal connections) among all the entrances. Only the shortest paths among the entrances would be generated as model output. Table 2 summarizes the attributes included in the parametric design model.

Software tool

A number of criteria were identified when choosing the software tool for developing the parametric models. First of all, the operation of the model should be intuitive. No programming skills should be needed when using the model. To this end, a graphical user interface (GUI) would be preferred. Besides, it would be preferable if no special software is needed when using the model. Moreover, the model should be able to be accessed easily on the internet. This is considered vital as this will mean that designers can access to the model virtually anywhere and anytime. Although there are quite a number of powerful software tools (such as Grasshopper for Rhino 3D and Autodesk Maya MEL) for parametric model development, they all share a common drawback that the model created by these tools cannot be accessed on the internet. As a result, it has been determined that developing an online model would be the best option. PHP, which is a web programming language, and threejs javascript framework were combined to develop the model in this study.

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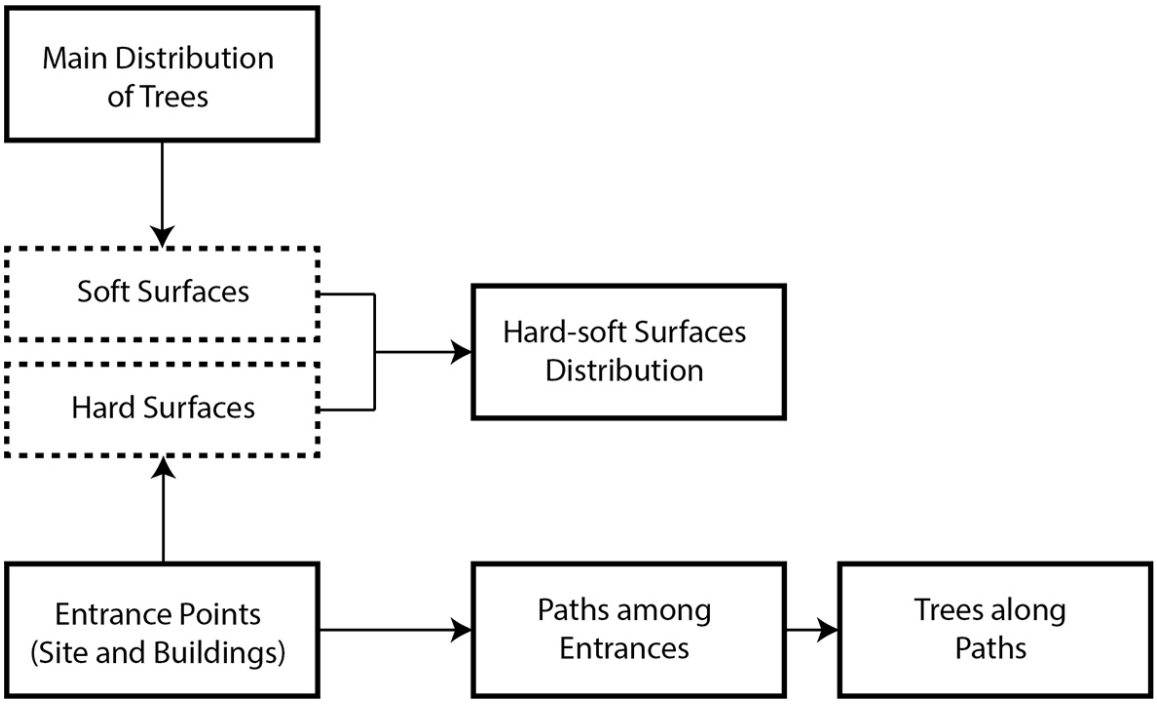

Figure 2. Structure of the parametric model

Parameters and structure of the model

Although it has been determined that attributes listed in Table 2 should be included in the parametric model, they were not the parameters themselves. As a result, it would be vital to define the parameters based on the attributes included. The values of the parameters should be modifiable when using the model. The change of value of a parameter would affect the results generated by the model. Table 3 shows the parameters the model.

The structure of the model and the flow of generating the final design output are shown in Figure 2 and 3. Distinct points of distance interval 1m were defined in the site. There were in total 51 x 51 = 2601 points. These points could be defined as hard or soft (green). Positions of trees would also be at some of these points. The first layer of parameters which was defined in the model were the number and distribution of trees. The trees were basically distributed in the open space with a random function. The second layer of information deployed were the green surfaces in the site. There would be green surface within a certain diameter of a tree. The diameters could be modified individually for the three types of trees in the model. On the other hand, the force field of the entrance points would affect the diameter of hard surfaces around the entrances. In reality, the power of the force field could be due to the density of people around the entrance points, connections to important amenities outside the site and so on. For example, the power of the force field could be higher if there was a bus stop at the entrance point of the site. In this study, however, the reason for having a particular power of force field was not considered. It would be the decision of the designers to play with different values of power of force field when exploring design options. It was assumed that the power of the force field followed the inverse-square law. The power of it became weaker when the distance between a particular point in the space and the entrance point was longer. Depending on the power, the force field could override some areas of green surfaces and make it become hard surface. The resultants of force fields of the entrance points and the green surfaces governed by the distribution of trees would be the distribution of hard and soft surfaces in the open space. The paths among the entrances were defined by A* algorithm, which is an algorithm to search for the shortest path between two points. There could

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be paths among all the entrances, or paths only from the main site entrances to the entrances of buildings. Another additional layer of the parameters is the trees along the paths.

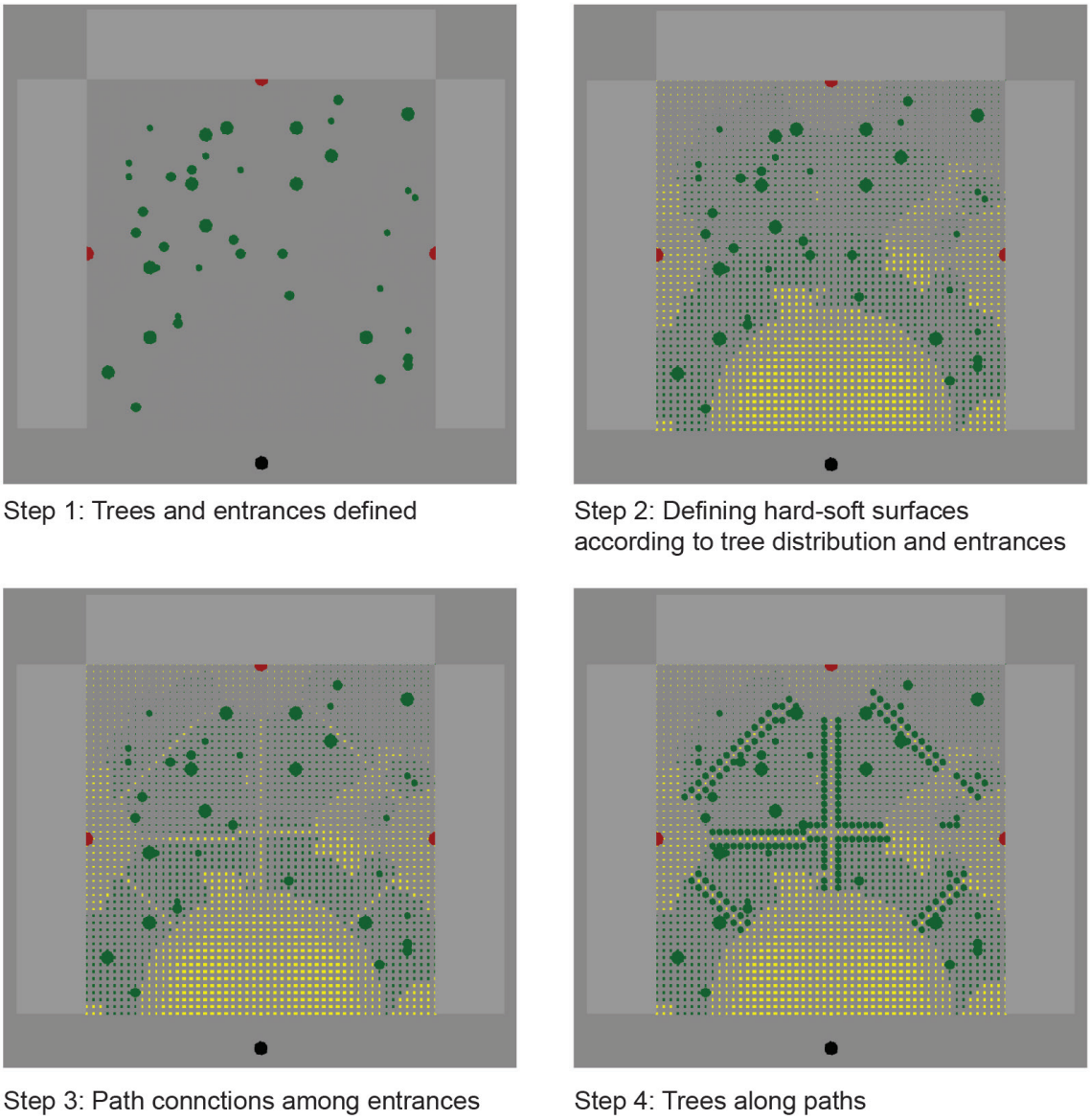

Figure 3. Flow of design output generation

Discussions and conclusion

In this study, the parameters for a parametric model to design GOS were identified. They included, but not limited to, number and distribution of trees, diameter of soft surfaces surrounding trees, positions and force fields of entrance points, paths connecting the entrance points, as well as trees along the paths. Although the number of parameters included were limited in this study, they were considered the most basic and essential parameters for a parametric model for GOS design. Besides, a structure of the parametric model was proposed. The distribution of trees would firstly be defined. With both tree distribution and the entrance points, the relationship between hard and soft surfaces would be defined. Meanwhile, the path connecting the entrance points would be defined according to the positions of the entrance points. Lastly, trees along these paths would be generated.

Although the feasibility of utilizing parametric model for GOS design was demonstrated in

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this study, it is essential to note that the design generated is not meant to be the final design solution. Instead, the output of the model is to facilitate the generation of different possibilities and alternatives in the early design stage. Usually, designers will only consider one element of design (trees or internal paths for examples) at a time in the early design stage. The model can help to unfold different elements at the same time at this stage. This can probably help designers to have better understanding of different design options when they start the design process.

It should also be noted that the approach in this study has to be further explored. As per the current model, the conditions and constraints of the site could not be modified. This could limit the application of the model in real sites. Consequently, it would be desirable to make the model more flexible in a way that the site conditions and constraints can be input. It is recommended that conditions such as size and geometry of the site could be modifiable within the GUI in future studies. Another weakness of the current model is that trees were distributed with a random function. A more solid mathematical function could be defined for tree distribution in future studies. For instance, tree distribution could be related to the building enclosing the open space, or the shadow projected by the buildings. Nonetheless, the model in this study should have laid a solid foundation for future development of parametric GOS design.

Table 1. Attributes affecting GOS design (modified from Lo et al. (2003))

Category	Attributes
Site	Location
	Size
	Geometry
	Entrances
	Buildings surrounding the site
Greenery and Planting	Trees
	Hard-soft surface relationship
Facilities	Amount of seating
	Seating materials
	Orientation of seating
	Sitting height
	Integral sitting
	Sculpture
	Fountain
	Paving
	Internal connections
Amenities	Food
	Programs
	Toilets
Environmental performance	Solar access
	Temperature
	Wind
	Sound level
	Glare
Others	Visibility
	Accessibility
	Visual complexity
	Safety
	Management

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Table 2. Attributes included in the parametric design model

Attributes	Description
Surfaces	• Hard or Soft (green) surfaces
Trees	• Only on soft surfaces • 3 Types: Big, Middle sized, Small • At least 3 m from the edges of buildings
Site Entrance	• Entrance facing the street
Building Entrances	• One from each building to the green space
Internal Connections	• Street entrance to building entrances • Among building entrances • Shortest path between two entrance points

Table 3. Parameters of the model

Parameters	Description
Number of tree	• Values: 10 to 300
Soft surfaces surrounding trees	• Distance (radius) from a tree that would be of soft surface • Individual values for each of the three types of trees • Values: 1m to 10m
Site entrance point position	• Any position along the edge of site entrance facing the street • Values: 0m to 50m
Site entrance point force	• Force field to make area surrounding entrance point to become hard surface • Power of the force field declines according to inverse square law • Values: 1 to 10 (as a scale; 10 denotes the highest power)
Building entrance point positions	• Any position along the edge of each of the buildings • Values: 0m to 50m
Building entrance force	• Force field to make areas surrounding building entrance points to become hard surface • Power of the force field declines according to inverse square law • Values: 1 to 5 (as a scale; 5 denotes the highest power)
Path among entrances	• Shortest paths between two entrance points • Values: no path at all; path connecting site entrance to building entrances only; path connecting all entrances
Trees along paths	• Trees along the paths connecting entrances points • Values: Yes; No

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Transformative urban railway: Ankara commuter line and lost landscape

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Abstract. *Being major transportation infrastructure of the 19th and early 20th centuries, the impacts of railways on cities have highly directed urban studies; deforming material edge of cities, encouraging urban extension, forming new territories, and speeding up urban development. However, in recent decades, with newly emerging landscape infrastructure practice, a new idea for a more integrated infrastructure and landscape system has started to be formulated. Railway strips, occurring as territories where solid-void morphology of cities becomes illegible, emerge as generators in the formation of urban green network. Within this framework, Ankara commuter line that mark outs a route approximately 37 kilometers in length in the city, is a remarkable case for a motivating discussion on railway and landscape confrontation. Penetrating the city in east-west direction, the commuter line integrated with a rural landscape –covering orchards, truck gardens and creeks- that was serving as a recreational field for citizens until 1950s. However, the transformative nature of the railway encouraged the development of new urban lands, industrial areas and neighborhoods along its route, and erased the characteristic landscape fabric. The continuous landscape integrated with green, water and railway infrastructure became fragmented covering only some splits of green and water. In this respect, this study dwells on the lost landscape of the commuter line by mapping the fragmented continuity of the railway, green and water infrastructure from 1950's until today to show the limited, but potential interaction of these three systems in the current urban fabric.*

Keywords: urban railway, urban landscape, Ankara, commuter line, landscape infrastructure.

Introduction

Railways, conceived as major transportation infrastructure in the dissolvement of the material city borders, introduced a new speed that encouraged the (re)formation of urban territories after the 19th century. Increased accessibility with the development of the railways transformed rural lands into suburban neighborhoods and triggered the urban expansion. This makes railway lines prevailing in the development of urban form and also in the formation of urban fabric. However, their challenging spatial manifestation -being both generator and eradicator- makes them notable also for urban landscape studies. Being generators, they have encouraged the formation of new urban districts; while they might be also named as eradicators for erasing rural landscapes. Therefore, their spatiality cannot be easily comprehended through the well-known figure-ground mapping and reading. Their shifting role certainly requires an in-depth study that dwells on their changing spatiality in different times and in different scales.

By this means, this study intends to discuss railway-city confrontation through discovering

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the transforming landscape fabric along Sincan-Kayaş commuter line in the city of Ankara. Being a peculiar example of the urban railways, Sincan-Kayaş commuter line demarcates a line approximately 37 kilometers in length in east-west direction within the city. Commuter line, once penetrating a rural landscape intertwined with creeks, orchards, truck gardens and plantation areas, now pierces densely built urban fabric of Ankara. Hydrography and vegetation that was forming and characterizing the rural and spontaneous landscape along the commuter line, have been entirely erased since 1950's, when rapid urbanization process started. The interplay among the railway, water lines and green areas that was forming a filigreed landscape morphology and fabric, were interrupted with the development of new land use patterns. This process ended up with the fragmentation of the landscape fabric compromising covered or canalized water lines and remaining patches of green as reminiscent of a previously integrated system.

Transportation Infrastructure and Landscape: Towards an Integrated System

Recently emerged discussions and practices through landscape urbanism have reminded the disregarded hybrid urban spaces to the urban agenda. Post-industrial lands and urban infrastructures are sites where landscape urbanism has introduced predominant strategies to moderate the complex relation between nature and city, rather than seeing them as two opposing and binary milieus (Waldheim, 2002). Herein, urban railways, demarcating a territory in cities, might be discussed as key (infra)structures where the relation between city and nature might be (re) discovered through landscape strategies.

Indeed, recent rapprochement between infrastructure and landscape in the urban landscape literature might find its conceptual origin in landscape milieu. Infrastructure as an artificial ecology highly integrated with landscape that intrinsically manage the flow of goods, people, animals, energy and resources before the construction of engineered infrastructure. As mentioned by Carlson (2013), "Landscape is inherently infrastructural: it mediates, produces, facilitates and transports. As a network of infrastructural function and flow, landscape …becomes the operative platform of human existence; where landscape exists, so does infrastructure" (Carlson, 2013). This inherited quality doubtlessly approves the need for a filigreed landscape fabric that puts infrastructure as a generator, rather than peripheral armature. Transportation infrastructures, by manipulating the surface, trigger urban development; "Infrastructure prepares the ground for future building and creates the condition for future events. Its primary modes of operation are; the division, allocation, and construction of surfaces; the provision of services to support future programs; and the establishment of networks for movement, communication, and exchange" (Allen, 1991, p.54).

Besides their impact on the (de)formation of urban macroform, grounding a network that penetrates urban surface, transportation infrastructures also emerge as "collective spaces" in expanding cities (Wall, 1999). Being "both a response to, and generator of" horizontal urban expansion, infrastructures are more than backdrops of urban development. They serve as interfaces where we communicate with larger systems (Bélanger, 2013). Their multi-scale character delineates a network that highly contributes to urban and landscape fabric. Transportation infrastructures provide macro scale relations and flows while forming pointlike spaces that serve for providing transition and communication among different systems and scales. Compared with other mode of transportation infrastructures, railway lines are more integrated with human scale spaces; such as stations. Within the railway network, stations might be identified as nodes where larger continuous systems meet and interact with the local ones. As Bertolini and Spit (1998) propose, apart from defining a node, having a particular spatial typology and impact area, stations might be also recognized as places; "…harbor district, airport city, or station neighborhood", which "reflect a particular kind of interaction with the area, the direct surroundings and the urban region in which these modes are located" (Bertolini & Spit, 1998, p.15).

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In this prominence, railways, being bold, strict, wide, continuous, linear infrastructures, identify particular settings within the urban morphology. Decoding railways through three major components of urban morphological studies, stated by Moudon (1997) as form, resolution and time, might generate motivating discussion on their spatiality. Differing than the essential physical elements of urban form –buildings and their related open spaces, plots or lots, and streets- (Moudon, 1997) railways generate atypical relations and spaces within the city that cannot be decoded through solid-void /figure-ground mapping. Their confrontation and interaction with(in) the urban fabric offers diverse settings that might be explored in different scales and at different resolutions such as; "rural landscape–railway", "city-railway", "neighborhood/district–railway", "station-railway".

Another aspect of the railway lines is their transformative quality that generates continuing land use and spatial changes all along their neighboring environment. The timeline and pattern of the transformation is critical, not only for understanding the spatial history of the railway, but also for the development of future urban landscape strategies. As argued by Tatom (2006), cities should discover new modes of relation with transportation lines and expose them as urbanistic opportunities rather than technical necessities; "from utility to amenity, from infrastructure to urbanism" (Tatom, 2006, p.181).

Regarding this theoretical framework, the main focus of this study, Ankara commuter line, offers a motivating discussion on the lost urban landscape and its possible recall for an integrated landscape infrastructure. Understanding the commuter line at different levels of resolution, might expose both its challenging position and possible contribution for the city of Ankara; a connector line in east-west direction / a barrier that split neigborhoodscape; a generator for new land use development / a destructive force for rural landscape. All these states expose railway as an operative line with shifting dispositions and perceptions within the urban timeline of Ankara.

Changing Landscape Fabric along the Sincan-Kayaş Commuter Line

Emerging as transformative lines in the cities, impacts of railways on the (de)formation of the urban fabric have been undoubtedly visible in the urban history of Ankara. Commuter line, following the extension of the Ankara-Baghdad railway infrastructure to Kayaş -east of the city- started to operate in 1928. First journeys between the city center and Kayaş was for recreational purposes with a restricted schedule, rather than serving for inner city transportation. (Emiroğlu & Uzmay, 2013, p. 46). In following years, with the emergence

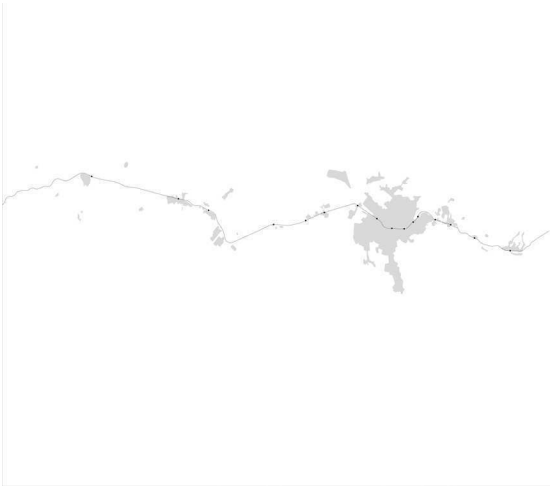

Figure 1.
Sincan – Kayaş commuter line and urban macroform in 1950s.

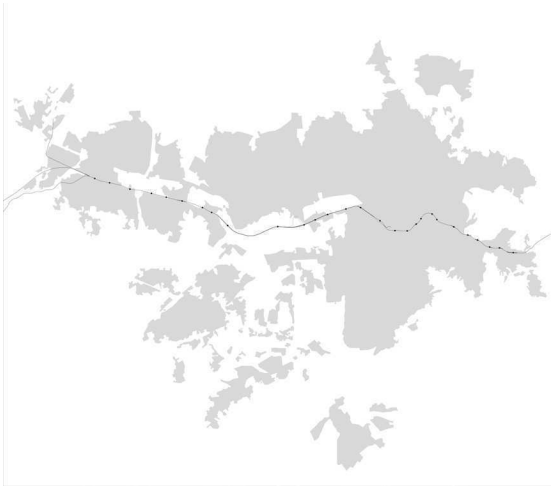

Figure 2.
Sincan – Kayaş commuter line and urban macroform in 2010s.

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of regularly scheduled passenger carriage, the commuter line became the first public urban transportation of the Republican Period Ankara by connecting the urban center –Yenişehir- to the suburban districts and villages of the city (Tekeli, 2010). Rural lands where commuter line facilitated the daily access, started to emerge as new suburban neighborhoods of the city and were replaced with the built fabric. With the expansion of the urban surface, commuter line that was connecting the city center with the suburban neighborhoods has emerged as an urban railway wedged within the city (Figure 1-2).

Today, penetrating the city in east - west direction –between Kayaş and Sincan-, the line compromises 28 stations that serve for inner city public transportation[1]. This makes Sincan-Kayaş commuter line a connection stripe within the city. On the other hand, by demarcating a bold track with its rigid railway infrastructure, commuter line interrupts the access and continuity in north-south direction. Particularly, horizontal stratification along the commuter line caused by accompanying linear structures and spaces -multi-lane roads, elevated junctions, spontaneous vegetation and linear greens- creates an urban fissure (Baş Bütüner, 2010) that marks commuter line as a barrier zone.

Apart from the fissure generated by the commuter line, the encounters between railway and its neighboring landscape and built fabric are also critical for decoding the railway morphology and spatiality. Atatürk Forest Farm[2] lands, industrial areas, housing districts/neighborhoods, military zones, urban transformation sites, creeks and unoccupied lands have been some of the fragments aligned along the commuter line. This makes commuter line "an element of order" (Waldheim, 2011) that intersects and confronts with various landscapes and urban milieus rather than being single purpose transportation infrastructure. Discovering the shifting and multi-dimensional mode of relation between landscape and commuter line is critical for future landscape infrastructure strategies.

Ankara commuter line offers a characteristic case by identifying a territory where three infrastructures –transportation, green and water- coexist. However, the interplay among green areas, creeks and railway line that was once forming a landscape fabric, was highly damaged after 1960s. The railway zone was mainly regulated by transportation-based strategies and planning approaches rather than spatial concerns. This formed a sharp disruption / disconnection between the commuter line and its surrounding environment and designated railway as an isolated line.

The above mentioned two arguments -changing spatiality and shifting role of the commuter line- have affected the landscape fabric that might be easily mapped in the urban timeline of Ankara. Taking the city center as the reference node, the east part of the commuter line –between Demirlibahçe and Kayaş- was aligned with Hatip Creek and intermingled with a green fabric covering vineyards, orchards and truck gardens almost for eight kilometers. This green strip served as prevalent recreational field of the city until the construction of the first squatter houses in Mamak district in 1960s (Özaslan, 2014). In 1970s, the landscape fabric of the east was mostly erased and replaced by squatter neighborhoods (Şenyapılı, 1970; Öncü, 1979) (Figure 3).

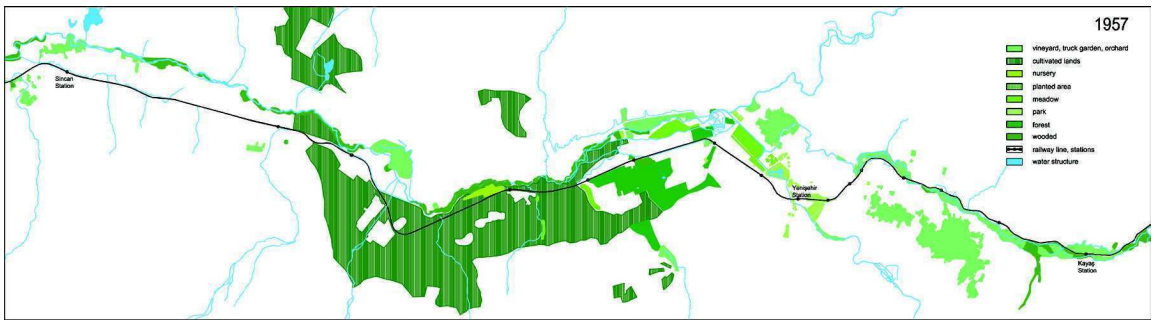

Figure 3.
Coexistence of three infrastructures; green, water and railway (based on 1957 Ankara Map)

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Unlike the dense green of east, landscape fabric along the west part of the commuter line was loose. The flat lands of the west were mostly designated for industry, public institutions and military use. Only Atatürk Forest Farm lands, serving as productive and recreational landscape of the capital city in republican period, were delineating a considerable green surface at that part of the railway stripe in 1957 Ankara map (Figure 4).

The macro scale landscape enfolding the commuter line in 1957 map has drastically changed in following years. Cultivated lands of Atatürk Farm Forest and green stripe –vineyard, truck gardens and orchards- of the east which were forming a rural landscape have shrunk and were replaced by built fabric. The dramatic loss of the green and water interrupted the intermingled landscape along/ of the commuter line and created a solitaire transportation infrastructure within the city. As mapped in 2013 landscape fabric diagram, continuous green infrastructure along the commuter line in 1950's was replaced by small scale neighborhood parks that were constructed to reclaim some of the leftover interface spaces between the railway and the city. Similarly, creeks were tamed to prevent flooding and water infrastructure reappeared in the form of fragmented canalized water line. This transformation has triggered the loss of the characteristic landscape fabric –green, water and railway infrastructure- and also revoked macro scale contribution of the commuter line in the construction of a continuous landscape infrastructure.

In this respect, promising coexistence of the railway and allied landscape has to be discussed through the varying confrontation between these two milieus at different levels of resolution. For this purpose, aside from discussing the transforming landscape of the railway stripe, diverse patterns of the landscape fabric might be also decoded through the maps of Ankara. Changing land classification and legend of the 1957 and 2013 Ankara maps clearly expose the distinctive qualities of the earlier landscape and its dramatic loss in time. As represented in Table 1, landscape fabric along the railway was compromising variety in topographic morphology, vegetation, occupation and water elements[3] in 1957 map. When compared with 2013 map, 1957 map clearly exposes the diversity and complexity of the landscape fabric, covering cemetery, forest, plantation areas, nursery, truck garden, vineyard, orchard, woodland, deciduous trees and creeks, and their reduction both in size and in surface diversity. Although some reminiscences of the former landscape fabric -deciduous trees, canals, plantation areas, park- partially exist today along the commuter line, they are lacking of integration. Transformation triggered by urban development and fragmentation caused by enlarged roads eliminated the diversity and produced a built fabric divided by the railway line. However, the new fabric transmits several landscape space typologies that might contribute to the formulation of an integrated landscape infrastructure along the commuter line;

Linear Patches. Rural landscape, experiencing double transformation, was invaded first by squatter houses by 1960s and later replaced by apartment blocks, as seen in Mamak and Gülveren cases. Current urbanized scenery of Mamak and Gülveren totally erased

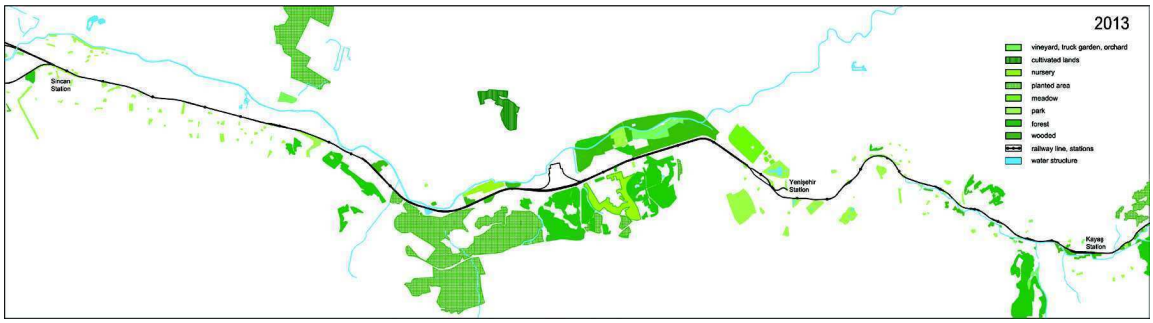

Figure 4.
Fragmented landscape along the commuter line (based on 2013 Ankara Map)

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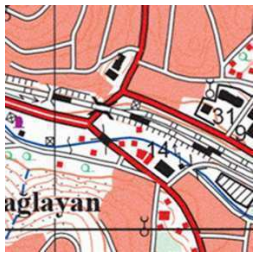
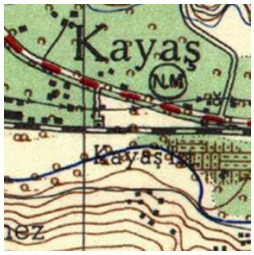
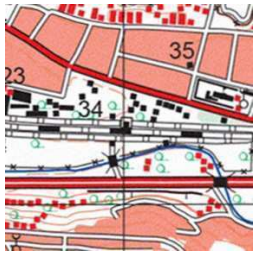
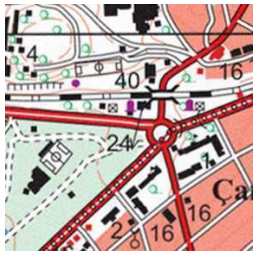
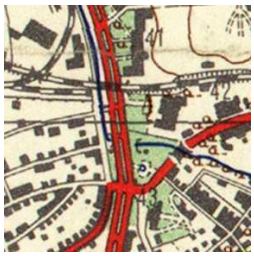
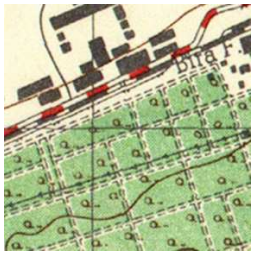
Table 1.
Changing Landscape along Sincan-Kayaş Commuter Line

Landscape Fabric (1957)		**Landscape Fragments (2013)**	
	Mamak Railway Hatip Creek, Truck garden Deciduous trees		**Mamak** Railway Canalized Hatip Creek Deciduous trees Linear neighborhood park
	**Kayaş** Railway Hatip Creek Truck garden Orchard Deciduous trees		**Kayaş** Railway Canalized Hatip Creek Deciduous trees
	Gülveren Railway Hatip Creek Cemetery Truck garden		**Gülveren** Railway Deciduous trees Plantation area
	Kurtuluş Railway Forest		**Kurtuluş** Railway Deciduous trees Park
	**Sıhhiye** Railway İncesu Creek Urban park		**Sıhhiye** Railway Deciduous trees Park
	**Atatürk Forest Farm** Railway Nursery Vineyard Ankara Creek		**Atatürk Forest Farm** Railway Nursery Deciduous trees

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the productive and recreational characteristic landscape. In both cases, today, the railway line accompanied either by linear greens with spontaneous vegetation or linear neighborhood parks. However, discontinuous character of the linear green does not contribute to form an integrated landscape fabric.

Landscape Reminiscences. Atatürk Forest Farm that partially keeps today its territorial boundaries along the commuter line, lost its characteristic landscape with the appropriation of agricultural and recreational lands for different purposes. However, the farm still retains some reminiscences of the Republican Period's cultural landscape that convey great potential for a possible continuous landscape system along the commuter line.

Unoccupied Terrains. Despite the urbanized scenery of the railway zone, several unoccupied vast lands are still present along the commuter line. As appears in Kayaş, vacant lands with spontaneous vegetation and canalized creek, might perform as reserve areas for the construction of a landscape infrastructure.

Urban Greens. Compared with the other parts, some fragments along the commuter line were also in urban character in 1957, as seen in Kurtuluş and Sıhhiye cases. Although these greens mostly keep their boundaries, they lost some of their landscape quality due to the fragmentation and partial transformation.

Conclusion

The morphology and spatiality of the urban railways expose peculiar conditions in cities. Considering landscape infrastructure approach and practice, urban railways have gained a critical position in the development of landscape strategies. They have emerged as one of the key urban components to moderate complex relation between nature and city, rather than being single purpose transportation armatures. The promising integration of railway and landscape, being two opposing milieus, triggered the establishment of new urban landscape forms and relations.

In this prominence, Sincan-Kayaş commuter line in Ankara represents a distinctive case of urban railways. The presence of three infrastructures –green, water and transportation- displays a spectacular scene which necessitates an in-depth examination of the landscape fabric in different time and resolution. Intermingled landscape, covering vineyards, orchards, truck gardens, cemeteries, plantation areas and creeks in 1957 map, has been dramatically destroyed and fragmented with the construction of large scale transportation infrastructures and expansion of urban surface. However, commuter line still demarcates an important reference track for the creation of a continuous urban landscape fabric in the city of Ankara. Currently existing landscape typologies -linear patches, landscape reminiscences, unoccupied terrains and urban greens- along the railway might be considered as potential grounds to recreate variety in topographic morphology, vegetation, occupation and water elements. In this way, aside from having a critical review on the changing spatiality and lost landscape along the railway, it will be also possible to develop several spatial strategies to recall previously integrated landscape infrastructure.

Acknowledgments

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Notes

1 Since 2016 July, Sincan-Kayaş commuter line is under construction for the implementation of Başkentray Project that intends to improve transportation capacity of the railway. The project covers an extensive improvement of the technical infrastructure with new lines and stations.

2 Atatürk Forest Farm (AOÇ), established on 52.000.000 m2 of land, is an integrated and comprehensive landscape project that

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intended to introduce modern agricultural and industrial production techniques, as well as to create a recreational and social milieu in early republican period. The farm generated a cultural landscape from the infertile lands of the early republican capital city, Ankara, where rural and urban cultural practices were serving in an interplay. Although, today, the boundaries of Atatürk Forest Farm enormously fragmented and shrank, the farm still expose a considerable territory having unquestionable potential in the generation of a future urban landscape ecosystem. (Kaçar 2011; Çavdar 2014)

3 For further discussion on landscape and its representation see Cartographic Grounds by J. Desimini and C. Waldheim; "The terrestrial ground has multiple physical components: its topographic morphology, its surface material, and its occupation or use. To depict the ground is to describe all of these. Land classification departs from the representation of terrain to describe occupation of the land: cultural and agronomic land uses, vegetation and the material characteristics of the earth's surface. Land-use maps call out the actual and possible uses of lands; they are explanatory and projective" (Desimini&Waldheim, 2016, p.113).

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Agro-Urban Landscape: the case study of Monteruscello

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Abstract. *Studies on morphology and on the urban form should not be detached from social aspects and from the responsibility of architects and policy makers. The issue becomes even more complicated in the case of cities with a high number of buildings under public ownership or urban areas of great dimensions. In Italy there is a very rare case of recent urban foundation that is the neighbourhood of Monteruscello in the city of Pozzuoli, in South Italy. Built in the 1980s to face the problem of bradyseism events that had made uninhabitable the historic city areas, Monteruscello today, for its dimension, can be considered a "city in the city" with the 90% of the buildings under public ownership. The neighbourhood's project was designed by Agostino Renna who developed it through analogical composition with fragments referred to other places and cities. The architect applied an urban model based on morphological studies, adapting it to the specific geography of the site. Till now the neighbourhood has never acquired its own identity becoming one of the most degraded areas of the city. This paper deals with the issue of urban form and morphology starting from the study of Monteruscello from the initial design project and the related critical issues through a new experimental design project of an agro-urban landscape that involves fifty hectares of public green spaces - now abandoned - turning them into agricultural land for urban use and growth resource.*

Keywords: Urban Renewal, Morphology, Process, Landscape, Agriculture.

Introduction

This paper presents an urban proposal for the borough of Monteruscello, at the periphery of the city of Pozzuoli, in South Italy, describing it together with theoretical investigation on the issues of morphology, urban process and landscape, all tightly related to the case-study. The proposal aims to convert the open un-used areas of the borough into urban agriculture land and to trigger from here a process of urban transformation investing economic, social and physical aspects.

Pozzuoli is a city in the Campania Region, and more specifically within the volcanic area called Phlegraean Fields. In March of 1986, under the emergency of bradyseism, about 20,000 people were moved from the ancient city of Pozzuoli to the new neighbourhood of Monteruscello, built beyond the hills around the gulf. The new urban landscape was not able to become - and still is not - a place of reference for the life of the residents, lacking of spaces of uses and meanings, besides being architecturally designed and carefully studied from an urban point of view. The families who had the opportunity, once the emergency had ended, returned to live in other areas of the city, and today only the most disadvantaged part of the population lives in Monteruscello. Problematic social conditions are combined with a difficult urban environment, in particular for the character of emptiness, anonymity, and decay of the common spaces. While Pozzuoli

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is a city strongly related to its history and heritage, with relevant archaeological remains, Monteruscello has to deal with the problems connected to the public housing and new urban interventions.

The proposal here presented aims to solve some of the problems within the neighbourhood through a design strategy that invests the open areas of the neighbourhood. The project is winner of the UIA-Urban Urban Innovative Actions funding program promoted by the European Union. It addresses urban issues left open.

The borough layout project was developed in reference to Italian theoretical studies on the city and on the morphological form. The neighbourhood had been designed in detail in every part and also the study of the green spaces had a significant role. Monteruscello's realisation was eventually realised of separate parts and the green spaces were left as indefinite areas. Today, the neighbourhood has 50 hectares of unused green spaces of various size, and most of them are interstitial to the residential areas.

The presented proposal shifts the point of view from the form of the city to the enlarged territory observed in its complexity and within a variety of issues. While the morphological studies of Italian school interested the built parts of the city, we now aim to look at the city through the open green spaces. This paper relates, through a theoretical and design oriented reflection, with the spheres of morphology and landscape with the aim of reasoning on a link between the two themes through a design project that rather than working on the built, introduces a process of transformation and urban growth for the neighbourhood centred on its landscape dimension.

Urban model within the reality

Confronted with the emergence of the bradyseism that struck Pozzuoli in 1983, political decision-makers faced the problem with a definitive solution by quickly building a new neighbourhood to accommodate the people and respond to a possible strengthening of the phenomenon. The chosen site was an agricultural land with widespread rural construction, located in a peripheral condition with respect to the city of Pozzuoli but still central to the Phlegraean Fields. The University of Naples was in charge of the project with the architect Agostino Renna responsible for the design project. The great dimension of the intervention together with the task of designing many public buildings made Monteruscello an exceptional project opportunity. Now days, it is one of the most recent example of public housing district in Italy built from the scratch and due to its dimension it could be defined as a public city. The design is based on a morphological study of an autonomous urban centre with public and residential buildings that come together and with a hierarchy of pedestrian passages, streets and large roads that connect it with the other parts of the city of Pozzuoli.

Agostino Renna design project starts with a reflection on the urbanization of the Phlegraean Fields characterized by parts that are built over time and which create an urban progression that grows moving from the sea toward the countryside. Monteruscello is conceived as part of this system as a new urban cluster between the countryside and the urbanized border. «The reference model - Renna writes - for the entire urban structure can be that of a linear city, built in parts, where at its extremities there are the historic centre of Pozzuoli and the new settlement; this can become [...] the centre of reference for the extensive urbanized countryside» (Renna, 1984). After having defined the urban role of the new Monteruscello, Renna designs the overall project of the district from the idea of using «a simple and regular geometry, in which the repetition of the an urban module leads to a logical order that controls the numerous parts and the elements» (Renna, 1984). The measures and the elements dimension of the new neighbourhood form are derived from the study of the characters of the historic city and its architectural heritage. Renna draws on a repertoire of ideas which he reuses manipulating and adapting them to the specific site.

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Figure 1.

The neighbourhood is conceived in separate parts, from both a morphological point of view and for realisation timeframe. In this process, the partitioning - like mosaic tiles - is a gimmick used to simulate the city's history and its growth over time. The overall design and the set of parts are held together by «an absolutely rigid physical reference system, a modular network based on harmonic relationships. This network stretches invisible threads on the territory so that every house, road, and tree can find, at any time and independently, its defined place» (Renna, 1984). The design project is based on different dimensions that correspond to the scale of the neighbourhood, to the autonomous small town cluster, and to the territorial scale, all recognizable at the morphological, architectural and functional levels.

The neighbourhood is subdivided into three main parts. The first, at the highest level and visible from afar, corresponds to the core of the borough with the main public buildings. The second part, at a lower level, is composed of an archaeological park at the centre, surrounded by residential areas with predominantly single-family houses. The last part houses the railway station, retail and offices. In all the three areas there are housing buildings of different types and with different formal and dimensional hierarchies. Also the variety of

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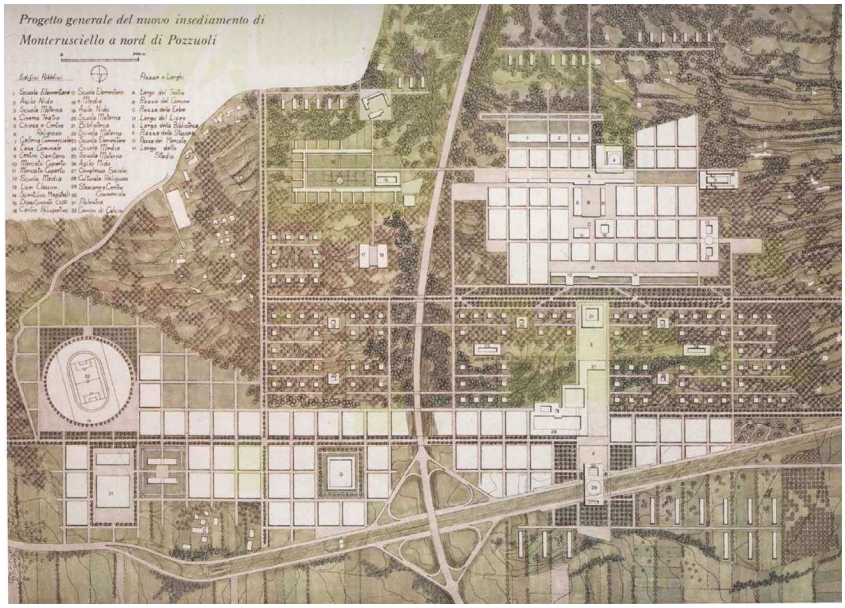

Figure 2.

the street dimension responds to hierarchical-dimensional criterion underlying the design. In the upper part of the city, the urban fabric repeats the structure of a traditional historic city made of small blocks, squares and public buildings that «play an "evocative" role on the historic city. In a city built in a single time and with repetitive building techniques, - Renna writes - the public building can express its individuality in the sense of the normality, the already seen, that is the familiar». (Renna, 1984). While the public buildings need a design project that would reinforces the relationship with the urban core, the housing buildings have to have on the contrary a different character. «Here the form is not so important, it is the typology the essential issue. A courtyard can be beautiful only because of orange trees; a road can take advantage of a row of mimosas from which it takes its name or for the pergolas of wisteria rather that for the particular design of the houses; it matters more the lively atmosphere of a square or the silent shade of a garden than the refined design of a prospect» (Renna, 1984).

The design project of the vegetation and the tree system were considered important landscape features since the beginning. The elements of nature are entrusted with the dual role of preserving the character of the pre-existing countryside and of marking the collective public spaces. «Recovering the features of the countryside within which the buildings are immersed, marking the great paths and collective places with pine trees, giving character to a road through the use of precious trees, making a garden cosy and familiar with fruit trees» are some of the peculiarities indicated for the green spaces. In relation to the transformative power that would have been derived from the correct definition of the green spaces, «the relative poverty of the housing becomes secondary, and it is possible to overcome the rush and lack of good building technique» (Renna, 1984).

The neighbourhood realisation has never been completed. Housed and abandoned early by those who had the chance to return to the city centre, Monteruscello combines problems of architectural deficiencies and social issues. The highest degradation is seen in the unrealized structures from the original project, resulting in authentic urban voids, forming with their loss, interruption of the use of the urban space and consequent abandonment even of the nearby areas. A further level of degradation is represented by the realized but still un-used buildings, which are today in a state of neglect. The reason of Monteruscello's failure is perhaps to be found in the incompleteness of its realization and in the bad quality of the prefabrication used

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for the building construction, while meantime there are also underlying morphological issues still open to question. Though the design project took into account the morphology of the site, the abstract and modular forms did not easily adapt to the complex actual topography. The design project was concentrated on its urban form; the actual condition opens up a question: is the definition of an architecture form sufficient to realise the urban environment

Figure 3.

Designing a process: architecture as part of a set of actions

Now days to face the topic of Monteruscello regeneration, rather than looking at the urban form, it is necessary to involve areas and spaces left in the rift between the city's design and its construction. Among these, the nearly 50 hectares of unused open areas become an opportunity for a regeneration of the neighbourhood in relation to landscape and production. A strategy of transformation was therefore studied for the open areas of Monteruscello. Rather than a fixed design project, the proposal is a set of actions, which enables and triggers a process of transformation.

The processual approach is here seen as the right response to the contemporary condition. The design project becomes a complex set of different levels and topics, able to adapt itself to new scenarios for the same place from time to time. The multi-temporality of the project is one of the central issues: in fact, urban transformations have elastic dynamics and varying reaction times. The design experiences of James Corner Field Operation or Michel Desvigne and Christine Dalnoky, for example, prove that it is necessary a phased approach, a multi-time and multi-scale process. A clear example is the Freshkills Park Landfill Competition in 2001, designed by James Corner Field Operations and Stan Allen. Concerning this, Alexander Wall comments it with reference to the general view of the Landscape Urbanism, a cultural approach to urban planning and architectural design emerged as a theory at the end of the 1990s: «Many Landscape Urbanism projects, like Fresh Kills Park by Field Operations have a 30 year phasing plan. This is because of the time that remediation of brownfield sites takes and also the funding (economic conditions) that is available. Issues of change are also important as Landscape Urbanism projects are responsive and must anticipate change as well as responding to it». (Wall, 2004).

The processual approach does not only involve time issues, it also affect the design project on a conceptual level, changing it from static to dynamic. Desvigne and Dalnoky write concerning with their project Lyon Confluence in 2001: «The slow method - four-year of studies - is to explore the territory according to certain themes, to identify the mechanisms at work and to imagine their mastery theme by theme or stratum by stratum. The objective is to conceive, not a project but a series of projects. We do not envisage a hypothetical and illusory definitive state, but a succession of states corresponding to different stages of metamorphosis. The exterior surfaces are born, disappear, move according to the evolution of the buildings and the rhythm of the releases of land. They constitute a kind of moving mapping in the image of the rotation of agricultural crops. While the order suggested the composition of

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a 30-hectare unit park, we propose a "system of parks", diffuse and mobile, which invest immediately in a temporary or perennial way, any available external surface ». (Dalnoky and Desvigne, 2001).

Along these lines, our proposal rather than a traditional architectural design project, has the form of a planned process involving a variety of disciplines within a set of connected actions at different scales and velocities. The process has the main goal of urban poverty reduction in the neighbourhood, where poverty is understood both in social and economic sense and within the physical environment. The project concept is built upon the presence of vast public property areas - seen as a resource - and their use for urban agriculture; other actions are anchored to it involving economic, social and urban issues.

Urban agriculture – implemented through bio-intensive and organic techniques - is used as the trigger of the process of transformation: a chain of interconnected urban policies will generate effects on the social economy, on the production and on the physical environment. Agriculture has been connected to a production and marketing circuit where the natural materials from cultivation processes will be transformed to be used for ecological construction and placed on the market. Both the agriculture and the production circuit will be managed through an educational programme, which will prepare young and jobless people to the organic agriculture and production practices. The creation of a Cooperative at the end of the educational cycles will ensure the continuity of the cultivation, that is the sustainability of he project itself. An additional educational track will prepare to the innovative business opportunities connected to the agriculture. The proposal also envisages connections with the local market in order to tighten the network of food production. The involvement of schools and institutions, together with local associations will occur through specific events. Finally, the architectural intervention will make use of abandoned public buildings, refurbished to provide the necessary facilities to run the agriculture and production practices, and will define spaces for events, pedestrian and cycle paths within the agriculture areas in order to allow the integration and use of agriculture within the urban environment.

All the actions of the process are connected within a system that envisages cross-relations and mutual interactions. The architectural design project is one of the actions, loosing that central role that had before within the morphological approach which characterised the original Renna design plan.

A new urban role for the agriculture

Central to the proposal is the implementation of agriculture within the open un-used areas of the borough. Now days there is a new interest in agriculture and it has become a common practice to include cultivated areas within the cities such as communal gardens and allotments, educational farms and even rooftop farms. In reality, city farming is not a new idea; the Incas settlement of Machu Pichu, Peru, to cite a famous example, included a residential area together with a terraced one, dedicated to intensive crop. What is though changing now days is the role and meaning assigned to agriculture. Rather than opposite to the city, it started to be seen as included in it or we could also say that it is the city itself which is considered in a broader view which allows a variety of environments to be comprised within its meaning - cultivated land as well as areas occupied by large structures and infrastructures. As a consequence the traditional dichotomy city/countryside is overcome and new creative relationships can occur with the presence of agriculture within the urban realm. The impact can affect not only the physical environment but it also involves the social and the economic levels, in particularly ecological balance, sustainability, and food production. Moreover, agriculture becomes part of the city's landscape: while before it was seen just from a production's perspective, today it has gained a landscape interest.

Several theoretical investigations on the subject – such as the work by Pierre Donadieu - and design project experimentations reinforce this topic, starting from the Desvigne and

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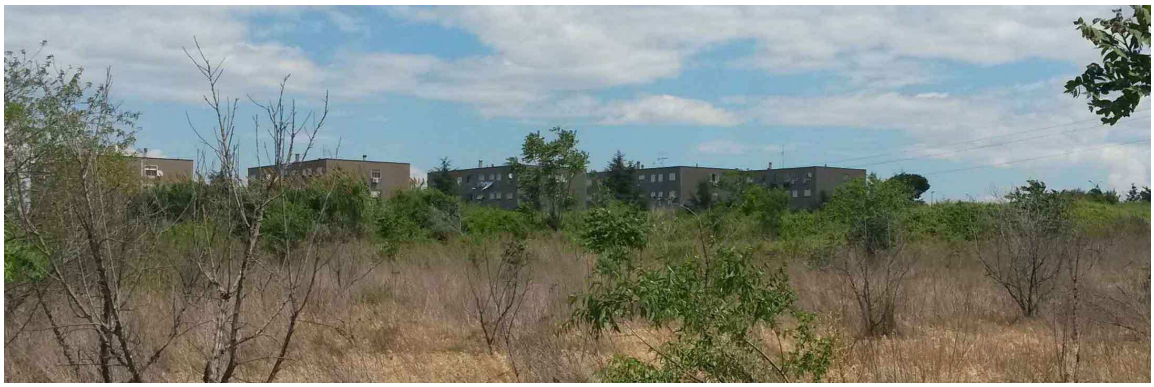

Figure 4.

Dalnoky landscape design projects of the 1990s such as the Parc de la Lironde in Montpellier or the urban park of Théols at Issoudum, where the space is considered neither part of the city nor of the countryside, but an urban living environment within nature.

Along these lines, our proposal for the Monteruscello neibourhood, investigate opportunities between the built and the agricultural areas for the definition of a new agro-urban landscape. Prior to its construction Monteruscello was a predominantly agricultural area; historical sources refer to the agrarian nature of the area already at the time of the colonies of Pozzuoli and the nearby Cuma. The proposal project aims to implement agriculture within the permaculture approach, which is oriented to the recovery of traditional crops, meeting the agricultural vocation of the area. Moreover the envisaged bio-intensive techniques will generate a dense vegetation, which will act as an urban garden that will change during the year, according with the seasons and the cycle of crops.

New interpretative paradigma: from architecture to landscape for a search of new relationships

The architectural design project studied within our proposal aims to define those spaces that allow the integration and use of agriculture within the city; outdoor areas designed for pedestrian paths, event space, covered areas, seating, skate parks and cycle path, all studied along portions of farmland so that architecture and cultivated areas can together become a new landscape for leisure, recreation and educational activities.

The architectural project has been set within an enlarged view which departs from the mere formal approach. It starts from a re-reading of Renna site plan in order to understand its reasons and goals. This has been then observed within the actual reality that revealed that some of the choices resulted abstract while other had been absorbed by the common use. This was the case for example of some staircase and pedestrian paths to which we decided to connect with. The project studies a new system of paths and crossings between the cultivated areas and the built areas. Here a significant feature is the presence of archaeological traces within the abandoned green areas. An archaeological park had been envisaged by the Renna site plan but was never realized. The urban fabric, modular and geometric, has no relation with the archaeological findings and it has also disclosed the possibility of exploring the continuity of some of these traces. Fragments of Roman walls and cisterns reappear among the expanses of green areas, now abandoned. Some old rural buildings also appear in the open areas, without any relationship with the street structure. All these existent traces tell us of a different territory in respect to the current city with directions that almost cut across the geometric urban layout of Monteruscello. The project proposes to retrieve

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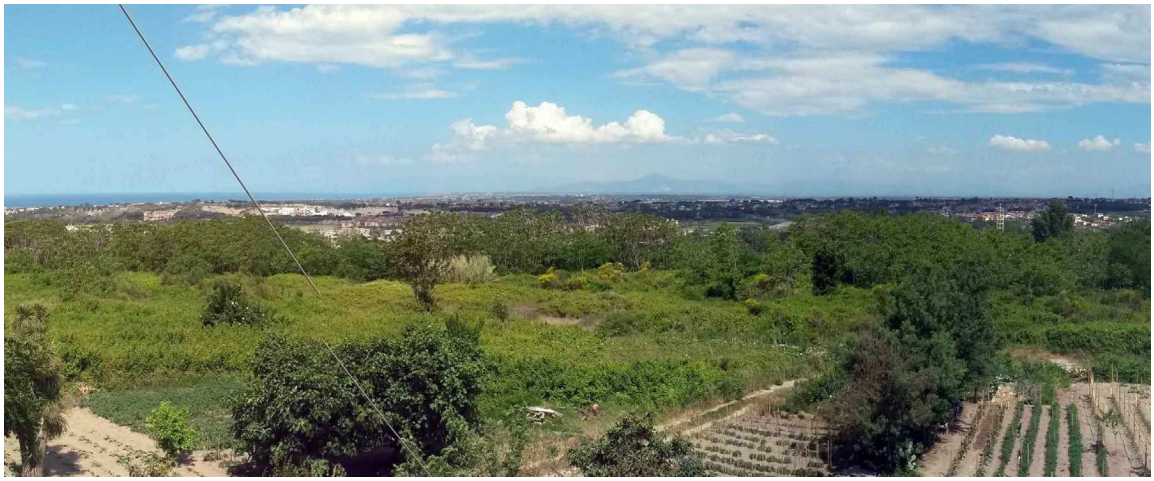

Figure 5.

the city's ancient trails in order to realise new pathways that enable pedestrian cuts through the abstract road grid. All the new elements – paths, benches, coverings and so on – follow those old traces directions instead of those of the grid. They also point toward specific views, in order to re-orient oneself. While the neighbourhood is autonomous from all the pre-existent geographical references, our project is defined through a new set of relationships which are found outside the actual quarter layout, toward new visual horizons that include the ancient part of the city and the coast, the archaeological site of the Greek Cuma, as well as a quarry and other reference points within the landscape. The goal is to create territorial references.

Also the cultivation is design planned, together with the agricultural experts, in order to reinforce the main territorial directions and the planned view points, and to recreate difference of levels through terraces and high grounds, that is to design a topography that the tabula rasa of the new neighbourhood had erased.

Our project therefore shifts the point of view towards the landscape and from here - through nature, topography and the geographic repositioning through selected views - it intends to rethink the urban spaces of the neighbourhood, together with the paths, the natural and the morphological characters. The construction of the agro-urban landscape thus becomes the construction of a new image of the city, of a different way of living its spaces and crossing it, opening towards a strongly landscape dimension.

Conclusion

Today Monteruscello still divides the scholars; some are still anchored to the ideas which generated the neighbourhood foundation project - a defence which takes the form of taking sides of the Italian morphological school -, others consider it an example of urban design and theory failure, being its problematic state a proof of their invalidation.

We believe it is still possible to work within the reality without having to necessarily define ideological positions. Along these lines, the first step of the work has been the understanding of Monteruscello design project, that is the investigation of the morphological aspect. From here issues of form were overcome by a processual approach, which allowed the integration of social aspects and new relational purposes which linked the architectural solution to the landscape.

The proposal here presented reverses the traditional point of view in dealing with urban issues referred to the city form. The project starts from the study and the use of abandoned green areas and retrieves morphological issues concerning the built areas through a critical reflection on the use and the role of a new agro-urban landscape within the neighbourhood. Morphological issues underlying the city's design are addressed to a wider discourse

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where the urban study rather than the resolution from the top of problems of urban form, aims to consider a variety of aspects and takes into account the territorial dimension of the neighbourhood, seen in its actual geography.

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Resistance & permanence of green urban systems in the Globalization Age

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Abstract. *The rapid transformation and the trivialization of landscapes in Wallonia (BE), require reformulating tools and objectives of morphological studies. Built fabrics and landscapes show the effects of abandoning or losing interest in the interrelations between natural and human actions. This contribution focuses on studies of cities and territories that have ceased to be the object of spatial policies attentive to the relationship between the need to live, maintain or care for green or natural spaces. After the systematic reduction of urban environments to simple green covers, morphological reading allows the recognition of traces of park systems or green infrastructures, whose communities often do not remember. The research's focus has shifted from the building to the green space structure. This displacement of interest makes it possible to find commons cultures that have acted on the territory of Liège (industrial city) on the one hand, through the building's extension and on the other hand, through the project of forests, walks, squares, parks and public gardens. Now, these fragmented places become the main resource for reorganizing natural and human systems in order to offer new - social and spatial - coherence for tomorrow. Thus the historical green systems become a strong structuring link which serves to seek new dialectics of balance between existing fabrics and green systems. This system's regeneration stands, on the one hand, to the hybridization of materials - water, green and buildings - and, on the other hand, to the physical and mental memory of the inhabited environments that populations keep. Green systems impose themselves as powerful vectors for the construction of new socio-spatial balances of cities and territories of globalization, as in the study case for the landscape systems in Liège and for the water and landscapes infrastructure in Chaudfontaine.*

Keywords: Public space, park system, green and water infrastructure, morphological green writings, landscape memory.

Introduction

The critique of the city and the territory of globalization developed from the notion of the green space system allow to question the role of these places in their cyclical emergence and diffusion in contemporary urban policies. Planning rediscovers the environment through the infrastructure vision. However, it reduces the landscape aspects to surfaces and natural environments to corridors composed of an undifferentiated green that has already been ironically called "green carpet" (Hooftmann, 2007). This brings us back to the images of a modernity dominated by a surging force that engulfs and smoothes: the green flow, a minimalist turf that infiltrates all the interstices of cities and landscapes reduced to disintegrated bodies.

Globalization's topic is an opportunity for resistance approach against the call of new sirens of the functional layout which, by reusing the term of green space, still impose rhythms and paradigms of thoughts blindly

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subjugated to the economy and the technology. Terminological re-borrowing is a game that plays a major role in the logic of reaffirming globalization. Indeed, false new concepts are re-introduced with adaptive adjectival phrases that transform them in designations, such as social economy, green infrastructure, environmental technology and others, without any substantial change in their modes of action or in the consideration of materials or in the ability to offer adapted solutions. We are witnessing the resurgence of slogans which remain tools of smoothing diversity in favor of strategies that are insinuated at the local level to dissolve meshes, woven in time, and weaken the thick physical and mental relationships that characterize the places of life. We want to emphasize the urgency to return to the meaning, origin and identity of the green space in the city, in order to make it a critical tool of resistance to contemporary conceptual pressures based on terms whose meanings are completely reversed and standardized.

Moreover, if green space is still a form of a natural system in the city, what about geomorphological conditions or human reinterpretations integrated in the form of various artifacts which carry the aesthetics of new types of Third Nature? The 21th century, beginning under the aegis of ecology, seems to offer the same questions as the hygienist 19th century, but in the denial of history, time and the process of sedimentation of places dispossessed of bodily experience and spatial perception. It is the loss of these qualitative dimensions and the risks that this contribution is intended to testify through the analysis of two cases of studies concerning the Walloon territories in Belgium: the cities of Liège and Chaudfontaine.

Methodology

The green space in Wallonia (Belgium) is a topic that questions the process of mutating inhabited environments. However, it remains little studied, as there is still little interest in the readings of its origins, traits and modes of formation. It remains to be understood whether the green space designates places that have been formed spontaneously or as a result of punctual projects. Often used as a functional strategy, urban spaces should be considered as the visible face of an unstable relationship that makes it possible to understand the feeling of belonging of the inhabitants and their capacity to appropriate the places to insert their prospective visions through urban and landscape projects. Starting from this lack of in-depth knowledge, we believe that from the notion of green space we must understand the role and the ideologies that enabled it to embody the urban policies of the 19th century. But it is also necessary to understand the reasons for its loss of influence over time and to establish the opportunities that this subject still offers to reconstitute the spatial, perceptual and environmental chains which our living environments are cruelly lacking today. It is with this objective that our method refers to the natural and human morphologies as well as to the complex writings of nature and culture of which the system of the green spaces can still constitute today an indicator of great interest.

The methodology adopted relates to the comparative reading of historical maps rich in transformation's marks, which can be made to reappear in order to render thickness and significance to territories, reduced to the state of functional objects, from which they do not remains more as a sign of cartographic distinction, than the differentiation of colors designating, in a zoning logic, their destination. The interpretive reading of the maps and the diachronic analysis carried out on the basis of these documents are complemented by the in situ observation of these sites which are now reduced to zones of activity or to free surfaces, however, submitted to strong land pressure. On the basis of the process of reading reengaged, on the map and in situ, we establish new interpretations, even stories or new writings which serve to render voice, visibility and recognition to the ordinary and especially to multiple neglected existing spaces considered such as residues from functional cutting. Today these spaces, without names and without identities, are the weakest places of the territory and the most difficult to defend against the indiscriminate occupation of the soil resource.

As it was practiced in England in the 19th

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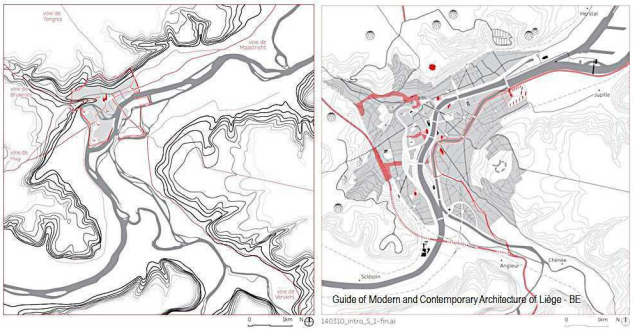

Figure 1.

Figure 2.

century, it is necessary to reverse the reading of these non-places in order to recognize them as common places. This reversal represents the interactive part of a finalized method of making a new look emerge, capable of transforming the territorial divisions into systems of writing bearing signifiers and intentions of projects to be re-appropriated and recycled as if they were materials whose economy, utility and lost meanings must be re-learned. Thus, morphological elements will be used less to propose a new constructive logic than to reconstruct the chains of broken signifiers (Eco,1972). In this way, the generic green spaces, which are specific to the era of globalization, can claim to be recognized again as materials for re-aligning the territory rather than being relegated to the state of residues of a voracious economic division into consumption space.

The originality of the method used to practice spatial reassembly is due, on the one hand, to the narrative and significant dimension of the re-reading process and, on the other hand, to the notion of green space in itself. Indeed, from this type of space, it is possible to reconstruct several types of systems in order to reorganize the materials of the territory. The green space, thus, imposes itself as an inexhaustible resource to reinvent new logics of interrelations between parts of cities and territories. This gives the design process a more open dialectical and interdisciplinary character that allows for more flexible relationships between the different components of the same system. Green spaces become catalysts for reinventing the project's modes and temporalities: it is no longer a fixed formal solution, but rather sketches or scenarios that impose themselves as flexible and adaptable hypotheses. The green space is thus a strategy for rethinking the city and the territory as it is at the same time a material, a spatial category and an open system perfectly suited to multiple readings and trans-scalar interpretations from which it is possible to cause the emergence of adaptable logics to the continual mutations of the environments.

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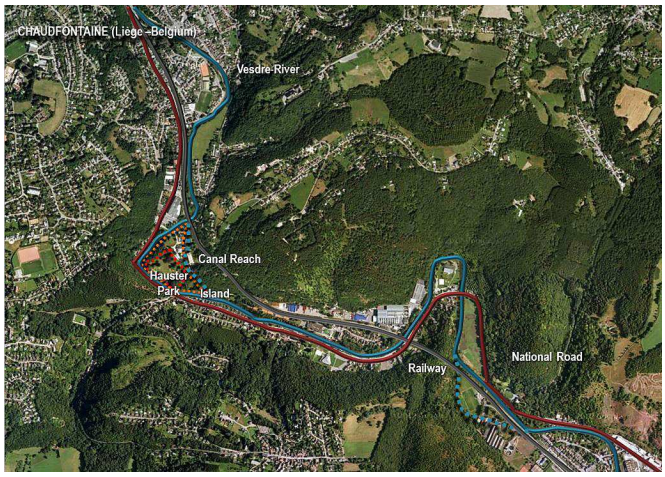

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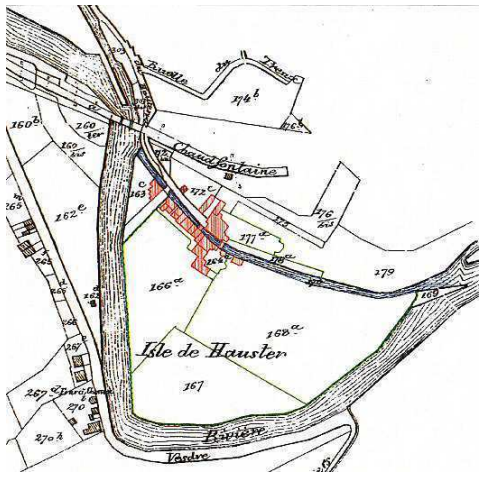

Figure 4.

Context, materials and discussion

The two chosen studies' cases concern cities of different sizes which, however, have common characteristics: urban valley sites; strong links with the waterways that cross them and feed them; the 19th century voluntarist development projects that produced high quality green spaces systems, followed in the 20th century by ignorant actions of landscape intentions or the embellishment concretized in the past. For several reasons, these cities have been the basis of projects which have profoundly modified the physical configurations of places: in Liège, the secondary waterways are drained and the main river-course is changed by inscribing a new network of public spaces, in order to assume the project of the bourgeoisie; in Chaudfontaine, on the one hand, the thermal qualities of the water sources are exploited and, on the other hand, the river is used as a driving force through the creation of channels which feed the industries, and enhance the residences and the gardens. Both take advantage of the geomorphological characteristics of places with vagabond and capricious waters in order to stabilize the lands and to channel the rivers, while building ambitious projects of architecture and nature. However, the 20th century mutations produced in both cases an over-investment of the valleys with a progressive loss of the traces which constituted the visible part of projects of parks and gardens. To this material loss of the marks graved on the ground and of the vegetation's persistence have to be added the spatiality's' and intentions' forgetting of an era when the hydraulic project of domination of the rivers was often accompanied by a spatial qualification based on informed choices of plant forms and species. Morphological reading applied to the natural contexts of origins and the progressive forms of inscription of human appropriations allowed making visible the logics or the reasons (Berque, 1993) of all the stages of transformation of places. Indeed, the nature of the green space has allowed to offer open spatial solutions, suggesting appropriations of multiple places and for this reason, particularly adapted to play a major role in the process of restoration of meaning to unmarked and degraded territories, henceforth inscribed in the imagination of the populations as lost spaces, or even non-existent or sites reduced to the state of waste.

a. The Boverie park, a green urban system of the 19th century in Liège.

The study of public parks' system, set up in the 19th century as part of the remediation and modernization of the fabrics of the old city, is the basis of two different research projects: on the one hand, the analysis of the urban growth published in the guide of modern and contemporary architecture of Liège (LabVTP, 2014) and on the other hand, the international competition for the extension of the Museum of Boverie (Ricciotti, Hautecler, Occhiuto, 2011). In both cases, the study of morphological mutations was not the object of the request,

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but it was a prerequisite for research, which is part of the methodology adopted by the LabVTP "City-Territory-Landscape" (ULG). On the one hand, this approach is part of the classical logic of the morphological studies of the Italian school (Muratori-Caniggia) and, on the other hand, in the cultural movement of French landscapers through the thought of Michel Desvigne who defends the idea of "landscape as a prerequisite" (Desvigne,2002). Indeed, the two approaches start from the fine study of the natural or geomorphological conditions that found, favor and suggest the exploitation and the continuous transformation of the territory. These converging glances recognize the role of geographical features as the generator of all types of human inscription, ranging from road and parceled cuttings of fields and suburbs to the more complex forms of large urban agglomerations. If the landscapes are the revealing supports of these multiple types of traces, all the artifacts due to human action are the expression of the close interrelations existing between man and nature. The originality of the artifact that today constitutes the city of Liège is precisely the intense dialectic maintained between natural and human actions: what allows us to call it a landscape-city. Here mutations have followed a slow process of human domination on the natural forces. Indeed, the original geomorphological site, with the feature of an archipelago, has been gradually converted into a large valley marked by the Meuse and its tributaries completely channeled and/or dried. Today, the landscape-city of yesteryear has physically and mentally disappeared, just like the titanic work of landscape rewriting done in the 19th century through hydraulic drainage works. Today, there is hardly any trace left in the collective memory.

The research is thus based on a work of reading and measuring of the pre-existing traces mainly constituted by numerous water lines. From every historical period there remain the marks of the effects produced by water on the earth. These traces are inscribed or incised on the body of the original landscape and remain legible, even though the different layers of material brought by the advancement of the urban form, at each backfill of water lines or at any time when the need for building land has led to the redesign of the geography of the site. From these superimposed readings, the centrality of the notion of movement emerges in a tangible way and is adopted as an indispensable parameter for understanding, thinking and reconsidering the architectural and landscape space. Its importance is confirmed by Vittorio Gregotti who defines territory as an "acted matter" to be linked to the continuous human need to "reinvent new geographies"(1986). These words resonate in Giuseppe Dematteis's concept of "implicit project" (1995), which recognizes the existence of internal dynamics within the territory (natural and human) and anticipates, on the one hand, the theme of the imaginary, understood as a resource and the principles of co-action, interrelation and shared perception, as defined in the Landscape definition, established by the European Landscape Convention (CEP-ELC, 2000). The knowledge of the substrate on which the system of green spaces is inscribed, generated by the park of Boverie, restores the significance to the project. Indeed, the conceptualization of the states reached by the landscape materials allows not only to understand the deep meaning of the movement in the original character of the Meuse valley, but also offers the opportunity to reconsider the cultural and symbolic importance of the projects of green systems for the city and its inhabitants in the 19th century.

From the comparative study of historical maps clearly emerges that the waterways were the main resource for redesigning the city and its public spaces. Moreover, they constitute wide corridors that welcome new tree-lined boulevards. Apart from a few strategic nodal sites, usually located on the banks of the Meuse (Poste, Coronmeuse, etc.) or close to the collegiate (Hautecler, 2017), the city did not have large planned public spaces. The nineteenth century marked the beginning of an era of equipment and modernization that made both new fabrics through the creation of urban extensions (Fragnée, St. Léonard, Bressoux, Droixhe, Longdoz) and types of Parks and public gardens. This renewal project is closely linked to the development of the industry, supported by a dense rail network, but also by the adaptation

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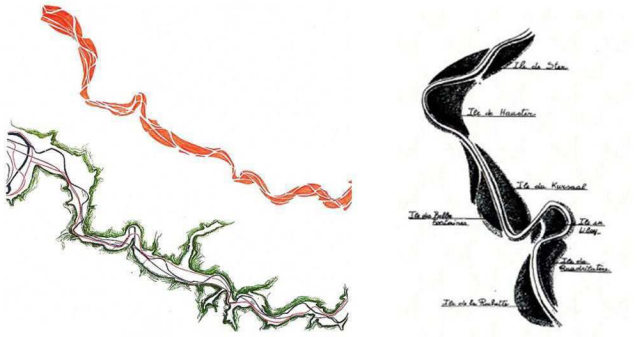

Figure 5.

of existing waterways to the new needs of river transport. From 1850 onwards, the project of the waterways became a major challenge to make one of the most important cities in the Middle Ages, a center that remained attractive in the modern era. To this end, the course of the Meuse is redesigned and the arms of the Sauvenière and the Ourthe are gradually dried up. From this water management operation for the redesign of the Isle and commercial development along the river flows, follows the project of the Derivation Canal, which collects the waters scattered on the right bank, and the modification of the course of the Meuse, regulated, smoothed and controlled flow. But what distinguishes this project is the political determination, the technical solidity and the existence of a bourgeois culture carrying economic and cultural valorization objectives. The system of green spaces, starting with the Boverie, is taking shape at that time thanks to the mastery of hydraulic techniques and in response to the growing needs of commercial exchanges linked to industrial development.

By comparing the historical maps, it appears that the site of the inscription of the park of the Boverie occupies former floodplains and meadows intended for rural walks out of town. Several documents testify to this moist campaign atmosphere. But maps of Blonden and Kummer reflect on the ancient geography of the places a precise geometric trace that corresponds to the project of formation of this thin strip of land that divides the waters of the Meuse from those of the Ourthe to the southern entrance of Liège. Between the straight line of the waters of the Derivation and the stretched arch which marks the western shore of the land, remains an artificial island on which will be implanted the "Garden of Acclimation" and the "Boverie Park". On the island, the traces of the old parcel, conditioned by the flow of water coming from the arms of the Ourthe, create an oblique line that gives shape to the urban block built on the "Rue du Parc". This line will turn into a green dike culminating on a hill that marks the articulation between the two green spaces. The Park, reworked several times, is the site of development of the Exposition of 1905. Of this project remain some buildings, but especially an English garden composition. At this time, the green spaces are composed by the Boverie and the quays which, on the Meuse they are connected to the development of the Fragnée district, while on the Derivation they are deployed in the form of a linear garden on which have been grafted the neighborhoods of St Vincent, Fétinne and Vennes. Thus the park maintains a centrality which still has a strong landscape character as well as beautiful banks on the Derivation and on the Meuse. To the left bank, the system of green spaces created in the 19th century gradually expanded through the composition of the terraced gardens (points of articulation with the linear system of the banks on the Meuse), the park of Avroy and the Botanical Garden (Center of gravity of a new neighborhood of bourgeois housing). The network is developing by creating new districts, some linked to the presence of university buildings, acting as real builders of the city and its green spaces. In these places of greater dimension are added the linear structures formerly corresponding to the streams. These sites, of variable width, as in the case of the boulevard d'Avroy and the Terrasses, are

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systematically redesigned as green walks composed by tree-lined malls. Thus, all of these new urban layouts, mostly constituted by soil removed from the river's grip, gradually form a green structure that penetrates the entire city, redefines it, and qualifies it by conveying new ways of life linked to the system of walking, strolling and leasure with sports on lawn and water. It is only from the 1960s that these places have been the scene of an over-densification and sudden modification of urban landscapes. The project of a vast network of expressways modifies the rhythms of the uses and at the stroll follows the speed and the distanciation from the edge of the river, linked with a growing oblivion of the values and the spatial and landscape qualities of this green heart which seemed to float on the water. The Parc de la Boverie is still the center of a system of green spaces to rediscover today. This study, by making the reappearing of the palimpsest of nature and architecture constituted by the park, made it possible to question the opinions on this type of space by opening to a probable inversion of the policy of exploitation of the system of green spaces.

b. Park Hauster as a part of the island system on the Vesdre in Chaudfontaine

In the case of Chaudfontaine, too, the question asked did not concern the city's green space system, but only a grassed area which once was only part of a larger park. The trans-scalar reading made it possible to take the necessary distanciation to resituate this small piece of territory within a wider system, constituted by the narrow valley of the Vesdre, following the rhythm of several meanders. The land of Hauster, after the digging of a canal of exploitation of the waters like driving force for the industry, became an artificial island which punctuates the course of the river. The raised land was shaped to host the industrial building, the manor house and the English-style leisure park. This property has been progressively deconstructed until the last stage of unbundling of the parts of the building, constituted by the separation between the residence and its garden. The project of closing this residual green space, operating however as a public park, is at the origin of a re-reading of the places, in situ and through the historical maps, from which we were able to replace this fragment of territory in its own landscape and urban system. Indeed, this land, which seemed to be a site isolated from the rest, like an island, proved to be an important part of a territorial system developped between two great meanders formed by the river. By re-reading the territory as an artifact mainly drawn by lines and islands, we were able to understand that the natural system of the valley, formed by the course of the river, accompanied by its plains and hills, was transformed by the addition of lines of canals, roads and railways. These marked the territory by superposition, by practicing engravings that transformed each meander or other land division into islands, showing the effects of an infrastructure development which has completely fragmented today the city and its properties, such as Hauster where the castle and the park were split. Faced with this situation, the reading of the maps, combined with a reassembly of the tesserae of this territory, made it possible to present the Hauster terrain as one of the plains forming part of a de-structured river system, to be reconstructed starting from the creation of a system of collaborative public spaces extended along the valley territory of the town of Chaufontaine. Thus, as in a "Mobile" of Calder, the terrain of Hauster is re-inscribed in a system dealing with the course of the Vesdre which supports a series of green spaces whose relations and equilibriums must be restored. From this imagined concept, the public spaces system becomes obvious again, and Hauster's project becomes the start of a more ambitious program which will take a longer time to requalify several spaces of this revealed system, as well as the water and river spaces, which have been relatively little considered up to this point.

Conclusion

In both cases, the re-reading of the geomorphological conditions that allowed and even suggested the project, has revealed to be an indispensable step for the reconstruction

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of the knowledge in order to give to the green spaces their deepest meaning. By overcoming the state of being just places of natural aesthetics in the city, the new green spaces may re-acquire corporeity, naturalness, temporality, systemic equilibrium and open a new era for links' reconstruction between the inhabitants and the natural spaces offered to them by projects for new sustainable space systems. The descriptive and narrative dimension of this approach is not only a method for deepening the knowledge of the studied places. But it is also a necessity in order to restitute to the inhabited and transformed places the possibility of telling stories, encounters and natural and human contingencies that have changed them in what they have become today. The narrative dimension thus becomes a tool for the research and for the understanding of the cultural intentions that have transformed places. But at the same time, it allows to transform each place into a moment of learning concerning the collective culture that impresses all inhabited territories. Green spaces, through this rediscovery of the links with the geographies of the sites, can be re-read as a major element of the urban and landscape composition, since they represent a jewel case or a spatial condensation which contains the materials of the natural systems but also the cultural interpretation forms that the inhabitants have given and still give to all landscape that they live and experiment from the inside.

In conclusion, what has today become an inconsistent green carpet is actually one of the main vectors of transformation that allows to reacquire environmental consciousness, the perceptual depth and the renewal of cultures and aesthetics whose green spaces are the guardians, since their entry in town as public urban parks. The desire to give to the system of green spaces a qualitative value, focused on perception and project aspects of living space, today becomes an act of resistance in opposition to urban policies that have reduced this type of place at the status of "Empty boxes" no longer allowing any form of re-appropriation. Thus Project, Material, Time, Relationship and Narrative can constitute the basic elements of a paradigm of resistance to spatial and functional smoothing to which green space has been subjected in the age of globalization.

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Greening in narrow urban spaces. An urban development concept for the old town of Berlin-Spandau

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Abstract. *Since October 2015 the government of the federal republic of Germany is developing a national dialogue on the future development of the National Strategy for Sustainability made in 2016. The development is marked by the Agenda 2030 which was adopted by the United Nations for Sustainable Development in 2015. Therefore, the major global challenges must be addressed by all means of sustainable development, trying to reduce hunger, poverty, lack of education as well as environmental and climate issues. All these objectives are addressed to all member states of the European Union, which raises the question: How can the new global sustainability goals be implemented at the national level? What has to happen in Germany to further promote sustainable development? The article focuses on the objective of sustainable urban development in Germany, exemplifying the case oft he oldtown of Berlin-Spandau, a district of the City of Berlin. Firstly, the priority objectives will be demonstrated, later on implementation strategies will be explained. The practical application will be demonstrated after a short, theoretical introduction. Thie project itself was realized under the supervision of the author at the University of Hamburg and demonstrates strategies of greening that not only improve the climate of the city but also reinforce social cohesion through its planning measures.*

Keywords: Urban Greening, Urban Planning, Berlin, Sustainability, Germany.

Introduction

In recent years, an exponential population growth had to be registered. Since the year 2008, more people lived in cities than in the countryside. As a result, many large cities are increasingly expanding at the expense of green and open spaces, in order to meet the demand for space and, in particular, the demand for housing (Gabot 2012). This development must be counteracted, as green areas have a positive impact on the urban climate and the human wellbeing. In the future, the increasing demands on urban areas have to be coordinated through new ideas and concepts. Here, particularly densely compacted spaces identify a major challenge for the integration of urban green. This raises the following questions: How can cities protect their green spaces, despite the enormous pressure on areas? How can new green spaces be created in already heavily compacted areas? How can the open space planning be firmly anchored in the future urban planning processes? What are the demands placed on urban greening and what qualities does it offer?

Offering a certain basis for the further course of the article, two current topics of the recent urban development in Germany will be explained in the following sections. This includes the land competition in cities and housing supply. In the further course of the articel, the topics “Green in the City” and “Living Values of Urban Development” will be explained, by that reflecting the importance of green areas in cities.

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Land use competition in cities:

Floor areas are generally used very differently. For example, agriculture and forests play an important role in the land area, while urban and metropolitan utilization play the major role in metropolitan regions. In Germany, 114 hectares of land are used each day for settlements and transport purposes. In addition, there are industrial, mining and nature conservation areas. The problem that arises with the use of floor space is that they can always be used only for a single specific purpose. In addition, the floor surface is basically finite and can not be increased. The result is the emergence of a strong competition on area utilization. Facing this challenge, the urban planning is obliged to question and find out the most useful use of an area again and again. Furthermore, for many years, public spaces and floor areas are not in public property anymore. Nowadays, the land area belongs to the state area and is subject to the right of ownership (Menzel 2008).

Housing supply

Due to the relaxed housing markets in Germany in the past, housing policy has received less attention. The result is a decline in construction in the larger cities, which has lead to a shortage of the general offerings of housing. In addition to the quantitative deficits, the issue of sustainability is becoming increasingly important in the context of a housing supply. The special requirements on the stocks of housing, and thus their quality, have become more extensive. Here, climate protection and energy saving are important topics in the energy rehabilitation of existing means of housing.

Also the increased demand for affordable housing with additional support and service offers is becoming has invreased significantly in the course of growing the demographic development in Germany. Furthermore, the volume of support services for of 12% of all households shows, how expensive the housing market is, especially for the financially weak. Thus, it has to be concluded, that the housing supply is currently an acute topic in urban planning which has to be controlled by means of politics (Kort-Weiher 2011).

Methods and structure of the project

The project took place during the winter semester in 2016/2017, which means from October of the year 2016 until February of the year 2017. The key research question was defined by the Federal Institute for Urban Building and Spatial Research in Berlin and worked out in collaboration with the University of Hamburg, Department for Urban Planning.

In favour of processing the key research question, different thematic maps were made, which were based on own local observations and desk research. Until the final presentation of the work results, in February 2017, certain milestones were defined and scheduled. The project contained the following steps:

First, a theoretical research was conducted, which focused on theoretical foundations about the topic of urban green. The central challenge was to integrate the topic of urban green in confined spaces and find suitable design options. All the specified research was supplemented by literature on the latest topics of city planning. The results depicted the most important topics and new ideas for solutions. Hereupon they were linked with the local conditions to develop new adjusted solutions for the study area.

In a second step, an inventory was conducted, which contained two dérives and observations of the historic district of Spandau. A dérive represents a concept of psychogeography and describes the unplanned, situationist procedure of the agitation through the urban space to perceive an area unprejudiced.

The next step was the analysis of the collected data. The analysis looked at both the urban as well as the social spatial infrastructure. Within the procedure of the analysis, various information was collected and numerous analysis maps were created.

In a third phase an inventory oft he existing urban green in the old town of Spandau was made. The existing city green in the historical center of Spandau consists of isolated trees and facade greening in the courtyards. Most noticeable were these many green facades

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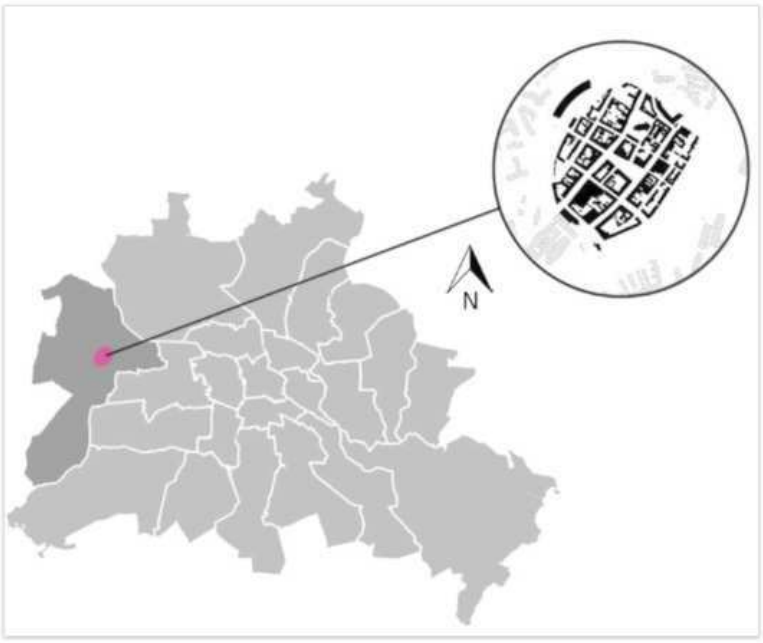

Figure 1.
Figure ground plan of Berlin-Spandau.

overgrown with ivy, most of them in the courtyards and some in the front of the buildings. After a short conversation with a neighboring resident, it was found out that the reason why the facades are greened is to protect the facades against graffiti. All green spaces included the trees and the green facades have been mapped. In further investigations for more potential green spaces in the historical center of Spandau the different states of the roofs were analyzed. In the following projectwork suitable areas for selective roof greening were identified. These areas have also been mapped. Especially noticeable is the big roof surface of the "Karstadt" department store. Although there are just a few green spaces in the historical center, the center itself is surroundes by green spaces.

As a result of the analysis a general principle for spatial planning was created, which served as a guide for the concept work. The developed concept, in turn, contained one overarching concept and six various thematic areas.

In the final step, a second scenario was made to identify possible future trends, which could be caused by the compiled concept and could in addition no longer be processed within the frame of the project.

All the projects' phaseses were summarized in a conclucion on how urban green can respond to the needs of sustainable urban development in Germany and Europe. The example of Berlin-Spandau is therefore to be seen as a role model for urban situations that require solutions for spatial competion due to densed use of city spaces.

Localization and recent situation of Berlin-Spandau

The area of investigation Spandau-Oldtown, the historical center of Spandau, is located in Berlin, the capital city of Germany. Spandau-Oldtown belongs to the city district Spandau in western Berlin and is situated on the Havel river. Spandau is one of the main centers of Berlin (Senatsverwaltung für Stadtentwicklung und Umwelt 2015). The history of Spandau is older than the history of Berlin and is marked by its medieval past (Berlin.de). The figure-ground diagram shows the medieval basic structure of the historical center of Spandau, which is characterized by a large central plaza, the traditional enclosed block-situation with courtyards, high building density and typical narrow streets.

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Today the city is famous for its historical sights like the citadel of Spandau, the churches St. Nikolai and St. Marien, the city hall of Spandau and a part of the remaining old city wall.

The largest pedestrian zone in Berlin is also located in the historical center of Spandau (Berlin.de) It is embossed by over 300 different public-specific ground-floor usages like retail trade, gastronomy, cultural institutions and service providers (Partner für Spandau Gesellschaft für Bezirks-Marketing mbH). The paved pedestrian zone has an old-town charme, but there is a lack of seating accommodations and too little greenery, like everywhere else in town. Many feasts and events are regularly organized in Spandau-Oldtown spread throughout the year.

The most popular venues are the reformation square, the central plaza and the town hall market square. These places are sealed public plazas with a low quality of stay when no event takes place. The reformation square has only a few green spaces and they are all separated by fences. The seating possibilities in all the plazas in the historical center are not very inviting. The existing seating accommodations look out of place and do not fit together. They are partly demaged, vandalised with grafitti and dirty. Altogether it can be said, that Spandau-oldtown has just a few public green spaces in its center, which is also characteristic for a medieval city.

Oldtown-Spandau is framed by green corridors along the river Mill Ditch ("Mühlengraben") in the east and the river „Havel" with an inlet of the „Spree" river in the west. The greened waterfront „Shore of Limes" ("Lindenufer") along the Havel river was redone with the collaboration of local residents in numerous citizen participation processes. The remodeling ended in the year 2016. (Bezirksamt Spandau von Berlin). The grafittis and dirty walls on the „Shore of Limes"are conspicuous. A quay wall with railings along the "Lindenufer" acts like a barrier between water and promenade, which makes the Havel river not experiencable. The old mill ditch is situated at a lower level than its accompanying pedestrian route. At some places fences and the steep and craggy slope a long the sides prevent the direct access to the water. All along the mill ditch some places are not accessable because of fences. Most parts of the green spaces are inaccessible.

The full existing potential of local recreation in Oldtown-Spandau is untapped because of missing possibilities to experience the water and the low quality of lingering in the shore area.

Not only the blue- and green areas act like a spatial barrier, the existing traffic infrastructure acts similar. The main street "Am Juliusturm" is situated at the north of Spandau-Oldtown and connects the city district Spandau with the center of Berlin. In the west it culminates in the street "Altstädter Ring".

The streets course follows the perimeter of the former city wall. The extent and the high frequency of the roads also build a spatial barrier, which separates the historical city center in the north and the west. The spatial boundary in the south of the area is defined by exposed railway network. Within the city the large pedestrian zone predominates, with its small side streets. The historical center of Spandau is very well connected to the public transport system by the underground, rapid trains and busses.

Spandau-Oldtown is characterized by both residential and mixed use. The residential use is mainly situated in the western and eastern areas along the green corridors and the waters „Mill Ditch" and the Havel river. Retail trade spaces in the ground floors concentrate mainly in the core of the area. For example in the roads „Carl-Schurz-Straße" and „Breite Straße" which belong to the large pedestrian zone (Senatsverwaltung für Stadtentwicklung und Wohnen, 2016).

The city district Spandau is not only known for its historical center but also for its social problems. Spandau is a fast growing district in Berlin. In the year 2015 Spandau had almost 37.137 residents distributed over a surface area of 8,03 square kilometres (Senatsverwaltung für Stadtentwicklung und Wohnen – Berlin, p. 9). The largest cluster of inhabitants are in the working age between 25 and 65 years (Bezirksamt Spandau von Berlin 2013). The center of Spandau, which also includes the historical center, is more strongly affected by social problems than the rest of Berlin and the entire district Spandau.

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This development is caused by the high unemployment rate (Bezirksamt Spandau von Berlin 2013, p.11) and a high proportion of foreigners with insuficient language knowledge (Bezirksamt von Spandau). Social district work and the strengthening of the integration should tend to improve against this trend. Many of social institutions are located in Spandau, for example the society for interculturally living together“ („Gesellschaft für Interkulturelles Zusammenlebene. e. V.“) and church organisations.

In conclusion, it may be said that Spandau-Oldtown is able to offer a diverse mixed use along the pedestrian zone, a wide variety of events and historical sights. Out of witch potential meeting areas could be created. But on the other hand, the historical centre is separated at various levels to the outside.

The waters, the two main streets “Altstädter Ring” and “Am Juliusturm” and the railway network are spatial barriers and segregate the Spandau-Oldtown of significant historical and current places, like the citadel of Spandau. The result is an enclaved situation. Some of the important functions get lost, like the possibility for animals to cross the interrupted green zones and corridors. The final aim is to break through the existing barriers and take the opportunity to develop the functions of the historical center of Spandau on the different levels.

The accessibility and possibility to experience the waters and the existing green paces should be ensured. It is important to support the strengths of the area to encrease the value for the inhabitans of Spandau. The data shows that the historical center is located in a socially heavilly burdened social space. However, it is apparent that many social services are already in place. Through the urban planning measures meeting points and places in the public space are an urgent need to support the social connections of diffrent inhabitants of Spandau.

Selected Planning areas of Berlin-Spandau

The concept mainly consists in individual interventions at six different locations in the old town of Spandau. These interventions are

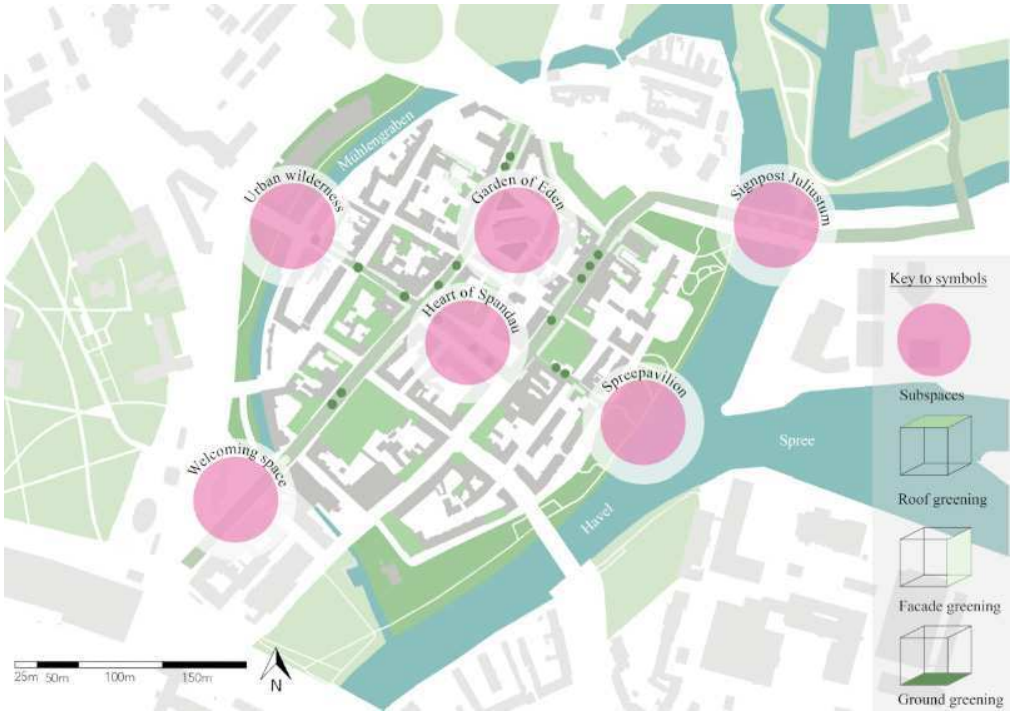

Figure 2.
Model of intervention and creation of six thematical zones in the oldtown of Berlin-Spandau.

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Figure 3.
Model of the river „Mühlengraben“ (rendering)

supposed to display the possibilities to establish various kinds of green in dense urban spaces with different circumstances and needs. Beside the three levels of greening, which will take place in every area, single solutions matching the respective spaces were developed. The mentioned interventions will be elaborated in the next sections.

Urban Wilderness

The Mill Ditch („Mühlengraben“) in its current state is rarely accessible and perceptible for residents and visitors. The revitalization of the stream is the first step to improve the the quality of water and green spaces. By creating a more natural landscape, the Mühlengraben will meet three needs in the old town of Spandau.

Firstly, it will provide a natural habitat of flora and fauna, which will be able to develop itself freely. Secondly, the stream will be used as an educational space to establish the natural awareness of the population. Partnerships with the local school and the new established „Spree river Pavillion“enable an improved understanding of the native wild life. Furthermore, the Mill Ditch will serve as a local recreation area and as a local meeting point which combines both the quality of green and of water.

The garden of Eden

The sealed Reformationsplatz has hardly any quality of stay and is characterized by the St. Nikolai church in the centre of the place. The planning of an communal garden will enliven the central and historical spot. A new group, formed by members of various institutions like the parish, the local school and refugee houses, will organize the planting of the garden. By that, the new community garden will help to combat prejudices and foster mutual understanding and will become a place of daily peaceful coexistence, mutual learning and recreation. Additionally an open kitchen beside the garden will create a space for common cooking and dinners and hence reinforce social cohesion.

The heart of Spandau

Because of the high sealing, the neglected seatings and the destructed playground, the marketplace of the old town of Spandau has an dull atmosphere and no quality of stay. The appearance of the marketplace will revalued by new homogeneous seatings, which can be moved flexibly. The playground will be renewed and a new water surface created. The water surface also functions as a playing field and can be drained if necessary.

The sealing will be broken up at certain spots and spaces for greening will be created. The weekly market therefore still can take place without any restrictions. The Marketplace will become an attractive public space and a vibrant central venue, promoting multiple social use.

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Figure 4.
Model of „the Garden of Eden“ at Reformationsplatz in the oldtown of Berlin-Spandau.

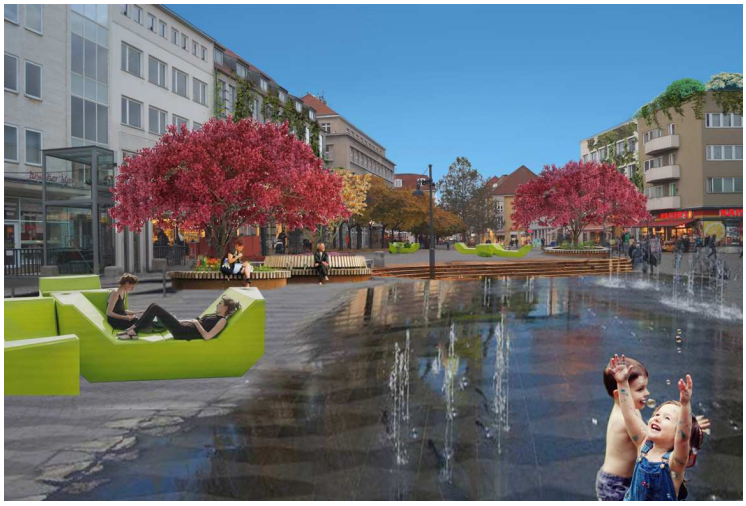

Figure 5.
Model of the heart of Spandau.

The Spreepavilion

The „Shore oft he Limes“ (Lindenufer), situated on the river Havel, has just been renewed and functions as a local recreation area. A new established community house, the „Pavillion of the river Spree“ (Spreepavilion), will empower the „Shore oft he Limes“ as a local meeting point for everyone. The „Pavillion of the river Spree“ has recreation rooms, a sun terrace with a view to the Havel and a roof top garden. It offers many various activities and is a starting point for outdoor activities like bicycle tours or public tours through the old town of Spandau. Originating from the community house, there will be green impulses in form of one-sided planted walls set at the „Shore oft he Limes“. The unplanted side of the walls will be let free to get designed by young people. The primary objective of the „Pavillion of the river Spree“is to bring different people together on a day-to-day basis and to enhance social interaction in a green environment.

The welcoming space

The space in front of the town hall functions as a connection between the city centre of the old town of Spandau and the public transport services. However, its complete sealing makes the place appearing not very welcoming. By installing planted walls, the place will be given a new shape which will lead arriving people into the city centre. In addition, there will be a rental service for green bicycles. These bicycles are equipped with a small green space, which can be merged depending on the number of bicycles. By that, social interaction will be supported and additional green brought into the old town of Spandau. The new greening

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and planted seatings will encourage people to use the place and invites them to linger around.

Signpost Juliusturm

The Juliusturm bridge runs over the river Havel and connects the old town of Spandau and the citadel. In its current state the bridge is dominated by traffic and offers no quality of stay for pedestrians and cyclists. The quality of stay will be increased by planted roadside greenery. Furthermore, the bridge will be used as a viewpoint. Signposts on the ground will create perspective lines to historic buildings and green or blue spaces. Information boards will transmit knowledge about the shown sights. The purpose is to increase the attractiveness of the bridge and to lead more people to the old citadel.

Concept

The green corridors

The approaches to face the described challenges of "green in narrow spaces" are presented in the following example the old town of Spandau. In addition to interventions at individual locations, the establishment of "green corridors" are the objective.

The "green corridors" run along the main connecting lines of the old town, as due to the circumstances of tight and sealed spaces, it is hardly possible to plant classical uncovered spaces on the ground. Therefore, the greening along the corridors takes place on three levels: the first level is the horizontal greening of roofs, the second level comprises a vertical greenery of building facades or walls. The third level includes the vertical greening of the ground, often by using flexible planting walls. The aim of the concept is to always implement at least one level of the greenery along the corridors, to create a green connection of the subspaces. For this type of greening, all the places were analyzed to identify potential areas. An exclusion criterion for facade and roof greening in many cases is the historical protection of of houses and buildings, a challenge that had to be dealt with. The basis for the green areas was set by the creation of a plant catalogue, which lists native trees, shrubs, climbing plants and herb plants which are to

Figure 6.
Model of green spaces, green corridors and trees in the oldtown of Berlin-Spandau

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use in the meant areas. These lists are to help laymen with finding suitable plants, aiming on the planting and maintenance done by the inhabitants of Spandau-Oldtown. The concept ist that the neighborhood management divides the green areas and gives the responsibility of planting to interested citizens. This leads to a better identification of the inhabitants with their own neighborhood and strengthes the social interactions.

The historical path

To create further connections within the area of Spandau-Oldtown, adventure paths which are highlighted by information boards and markings will be created. The historic past is visibly reflected in the old town of Spandau, especially in its medieval ground plan. Also many historical buildings such as fortifications, the citadel, the town hall, or the St. Nikolai church are well preserved. This particular identity of the district will be made by a historical path. In addition to information panels and flyers, apps will be used to promote the attraction of new interest groups. The reference here is the example of the app "Kulturpunkte Hamburg" (Cultural Points Hamburg) which has been designed by the ministry for cultural development of the city of Hamburg (Kulturbehörde in Hamburg) (Kulturbehörde Hamburg). Spontaneous, free and interactive exploration will thereby be supported in Spandau.

Financing and maintennace

In the following section of the text someof the developped ideas to support the financing will be presented. The financing concept fort he measures and maintenance of the greenery has been designed at different levels. As the measures of the concept affect public and private ownership, the main goal was to create high motivations for the citizens to participate in the financing of the greening measures. This refers in particular to the comercial part of Spandau-Oldtown: the shop owners are to be motivated of an economic advantage by the greening of their buildings. From an economic point of view, the greenery offers an attractive and pleasant environment, which encourages the pedestrians to stay for a longer time in the central areas. This hence helps to win new customers.

The gastronomy also benefits from an attractive surrounding that makes people staying longer and concume more. Furthermore, tourism is benefiting from the upgrading of the public spaces, resulting in an increased value of the areas in Spandau Oldtown (Stadt Bruchsal 2015, p. 8 f.).

Next funding instruments are direct grants for private individuals, this also to achieve a higher spread of green space through private commitment (Optigrün). The inhabitants are thus given the opportunity to design their own neighbourhoods. In addition, sponsorships are planned for the plantings, especially in the form of "tree sponsorships". Oriented on the campaign that was launched by the ministry for environamental protection of Berlin in 2012, a concept of tree sponsoring has been created. The aim of the campaign was to increase the value of living in Berlin and to help promote climate protection by activating the entire population of Berlin by contributing to tree plantings. Private persons as individuals or groups are financing a tree for the amount of 500,00 euros and later on select a place and a tree species for their donated tree. Co-financed by the campaign it therefore will be planted. (see Senate Administration for Environment, Transport and Climate Protection). This campaign was highly successful in Berlin and will be implemented in an adapted way to Spandau-Oldtown.

A further financing possibility is the organization of planting projects in the district with the help of entrepreneurial sponsors. To give an example: unemployed people in the neighborhood will be involved in the practical greening realizations, with the aim of integrating them into long-term-jobs, of maintaining the greenery measures. These practices have been realized in other german cities like in Witten, here by the "Witten Society for Employment and Employment Promotion" (Wabe). The aim of the program is to promote disadvantaged urban districts and to improve social interaction. Projects like this are funded by the European Social Fund (ESF) and by the

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Federal Ministry for the Environment, Nature Conservation, Construction and Nuclear Safety (BMUB) (Wabe).

Conclusion

The old town of Spandau offers a lot of positive locational factors, such as diverse commercial structures, an extensive gastronomic offer, numerous events and a historically embossed character. On the other hand, problems arise, such as a high degree of sealing or the lack of perceptibility of green and blue spaces. These negative factors are detrimental to the advantages of the site, as there are hardly any greenery and blue spaces inside the old town, which in turn means that the quality of life is reduced and therefore the number of residents and visitors will be decreasing on the long term.

In general, the displacement of green and blue spaces to the surrounding area, the large pedestrian zone and the historical basic structures have created an "enclave situation" that spatially separates the old town from its surroundings.

The structures of the Oldtown of Spandau do not adequately meet the needs of it's inhabitants and decreases communication and social participation. The public spaces are primarily used as transit spaces. In addition, there is an abundance of social problems such as a high unemployment rate, child poverty, a high number of migrants. These problems however have to be faced by social district work and political influence. Nevertheless, the planning presented greening measures contribute to enable the new areas functioning as places of social exchange and cohesion.

Using the example of the Oldtown of Spandau, the concept of the "green corridors" along main connecting axes placed on the three surface levels (roof, facade, ground) serves as a model for other strongly sealed and historically embossed cities. By specifically planting the main connecting axes and using other open space planning measures, such as the realization of a community garden or the renaturation of the watercourse of the "Shore of the Limes" and the rivers "Spree" and "Havel", highly compressed public space is given a dynamic and future-oriented quality of habitation. Complementary tools, like the plant catalogue and the creation of a historical path, support the increasing of the identification with a place, giving it character, atmosphere and by that a higher quality of staying. For those planning measures an important necessity is the intense involvement of the population, giving the inhabitants the possibility to adapt the public spaces to their own future needs.

All in all, the explained barriers are broken by the presented planning concept. It initiates the "blossoming" of a neighbourhood both spatially and interpersonally.

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