

CHAPTER 3, URBANIZATION AND DE-URBANIZATION

*Geography and consequences of urban population growth, sustainable growth
Shrinking cities - a new chance for polis*



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ANALYSIS OF CHILEAN METROPOLITAN AREAS, THE CASE OF SANTIAGO, AND CONCEPCION. LOCATION PATTERNS AS BUILDING LICENCES 2002-2010

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Abstract

The study seeks to describe the growth of Chile's main cities, especially in the cycle 2002 to 2010. This series presented a growth economy averaged around 7%, with the consequent growth in the residential construction sector. In that sense, there is an increase in housing prices that impact on real estate products offered. This period was characterized by neoliberal policies, in a low-density city center rings in their peri central an impact on the urban fabric of the city.

Communes as Ñuñoa; Providencia and Recoleta, in the metropolitan area of Santiago, Viña del Mar and Con Con, in the metropolitan area of Valparaiso, Chiguallante and San Pedro de la Paz in the great conception, are obvious example of this process as it grew up, estate submitted higher-priced products of past and pointing to families in training, with prices can only pay the highest decile of income each metropolitan reality.

To conclude, it requires new public policies that analyze the problem pericenter ring and also agree on the elements themselves beyond the city economic growth.

Introduction

The rapid expansion of Latin American cities and therefore the subsequent growth of urban areas has led metropolitanization processes that began in past periods. This expansion is explained by economic dependence throughout the history of national economies on other economies, through a series of stages that come from its inception linked to its functioning as enclaves of other metropolises (Geisse, Corragio, 1970) and for its location and design they allowed its development. Initially allowing contact and economic exchange with other territories. In a second growth period it is explained by the need to respond to the international situation, in which the economic model is characterized by giving emphasis to local production, leading to the policy of import substitution. Thus, they born national industries, increase services, work and

thus the scene of the cities, the result of increased rural-urban migration, concentrating the population in urban networks that were giving rise to different clusters is transformed. endogenous growth

Reopening the international economy is the third stage in which metropolitan areas respond and deliver better conditions for production and exchange with other economic centers, as they have similarities in their development and structure. At this stage centralization, where all activities converge in these areas it is emphasized. An example is the joint global social integration and territorial development of the model set by the agglomeration Buenos Aires, Rosario and Cordoba La Plata in Argentina.

Economic processes have been influential in the development of cities and the type of growth that they have had historically. Recent decades, due to the globalization process has led to the growth and transformation of large cities, becoming urban and economic centers for their countries and the region, resulting in restructuring and functionalization of cities. In this context patterns of land occupation due to mobility, urban agents and the organization of productive terms based on the cluster system and involving the urban centers nearby.

The cities in the region and metropolitan areas are the platform where new strategies of consumption and production, represented by shopping centers superstores, urban highways or gated communities arise. They have in common the rapid growth and urbanization have experienced, exceeding the speed with which strategies are made for planning the territory. Giving rise to urban problems such as fragmentation and territorial segregation. These spatial transformations are cross throughout the region, is that lives Mexico City, configured as global city and is what Chile is experiencing in terms of urban growth and metropolization.

Chilean Metropolitan Areas

Urbanization in Chile, has been the product in the first instance by the development and exploitation of natural resources, whose environments have been generated human settlements, determining the location of the cities and on the other by the different forms of organization of the economy (Hidalgo, De Mattos, Arenas, 2009)

In the context of globalization, the Chilean cities have taken on different structures, where the dispersion of the buildings in the area has been growing, outpacing the concentration centers and giving way to the occupation of the periphery, structuring a new geography with the growth of urban sprawl ranging covering the nearby territories, increasing their limits to be occupying rural areas that are initially to carry the expansion of the city limits and be part of new areas and demographic trends.

Economic transformation and concentration product of globalization, has led to changes in the spatial configuration of cities, leading to segregation and fragmentation, socio-economic and administrative terms, creating inequities in the quality of public services in the equipment of cities and triggering new territorial processes, understood not only as the overflow of administrative boundaries.

According to the above and according to data from the National Statistics Institute (INE), the national urban population is distributed in 248 cities. Some meeting made up of a set of spaces with an independent urban boundary, linked together by frequent public transport systems,

constituting a single unit from the functional point of view, originated 27 cities in clusters (MINVU). According to the official list of cities in 2007, INE defines three metropolitan areas in Chile, from north to south: the Metropolitan Area of Valparaiso and Valparaiso Metropolitan (AMV), Metropolitan Area of Santiago or Santiago Metropolitan (AMS) and Metropolitan Area Concepción Concepción or Metropolitan, the largest in terms of population and area the AMS with 5,638,820 inhabitants (2002 population census) and having among its components the capital.

Metropolitan areas are characterized them interact economically and socially different territorial units, areas or immediate centers, beyond planning, spreading to nearby areas whose limits are the actions exerted on each other within an imaginary line.

In official terms, the General Urbanism and Construction (OGUC) defined as urban area the "land area located within the city limits, for the harmonious development of population centers and existing activities and projected by the instrument of territorial planning "that way and within the urban planning, the unit when it exceeds 500,000, goes to the category of Metropolitan area for purposes of planning. That is, when there is an overflow of administrative boundaries, both in population and territories, phenomena such as agglomeration or conurbation occur, understood as a "Set of various urban centers initially independent and contiguous along its banks, that growing eventually form a functional unit "(Royal Academy of Spanish Language) and are those that lead to the formation of a metropolitan area. In this case, the metropolitan areas are the metropolitan area of Santiago, the great Valparaiso and great Concepcion.

Methodology

To describe the evolution of the Chilean metropolitan areas the georeferenced bases each of the municipalities that make up metropolitan areas and building licences approved within the period for each of them are selected. Of them only selected those who are destined for residential use, whether houses, which are defined as houses or buildings will be those multi-family housing, corresponding to collective Building, consisting of independent functional units such as departments.

Next to selected licences, an analysis by each community component of the metropolitan area is carried out, as the area in which the requested permissions, whether urban or rural area, understanding them according to what defines the OGUC (General Ordinance be built Urban Planning and Construction). urban area is the land area located within the city limits, for the harmonious development of population centers and existing activities and projected by the instrument of territorial planning and rural territory located outside the city limits, the latter being one imaginary line defining urban areas and urban sprawl established in territorial planning instruments, differentiating them from the rest of the communal area.

Later the licences granted in urban areas are selected, classifying single-family dwellings (houses) by grouping system, ie if buildings are continuous, isolated or paired. It means building isolated, separate the demarcations, located at least distances resulting from the application of the rules on grazing and estrangement to be determined in the instrument of territorial planning, one that is located from the demarcations conflicting or competing sides of the same premises and occupying the entire front of it, keeping the same plane facade with the adjoining building

and the height sets the instrument of territorial planning is the continuous building and finally the semi-detached building, is the It is corresponding to two buildings emplaced from a common boundary, keeping the same line of facade, height and length sarong.

Subsequently, the building is classified according to height, for it is taken as a unit the number of floors or levels built. According to the above, one to three stories is considered family house, four stories or more is considered tall building or multifamily housing. For purposes of the study, the classification into categories is done, and this is housing a flat, two-story, three-story, four-story, five to ten floors, between eleven and twenty stories and the latest is twenty stories or more.

Taking classified data according to each of the categories and in the number of licences, number of dwellings built surfaces and calculating indices and Shannon location is performed.

Santiago, Metropolitan Area (AMS)

Santiago Metropolitan Area includes the municipalities of the Province of Santiago, the urban areas of the municipalities of Puente Alto, San Bernardo, Peñaflor, Padre Hurtado and Pirque; the towns of Alto Jahuel, Buin and Viluco (in Buin), Bajos de San Agustin (in the town of Calera de Tango), Hill (district of Colina), Batuco, Lampa and Colina Station.

This metropolitan area was the first to be recognized as such. It is the capital of the country in economic, administrative terms and in terms of size, being covered by the largest number of communes and concentrating about 40% of the population. Therefore, there are complex networks of exchange and mobility between places of residence, work and services are further enhanced in certain sectors and a strong housing market activated. Those sectors that are characterized by one or other type of building are analyzed from the approved of the various components of the AMS commune's permissions.

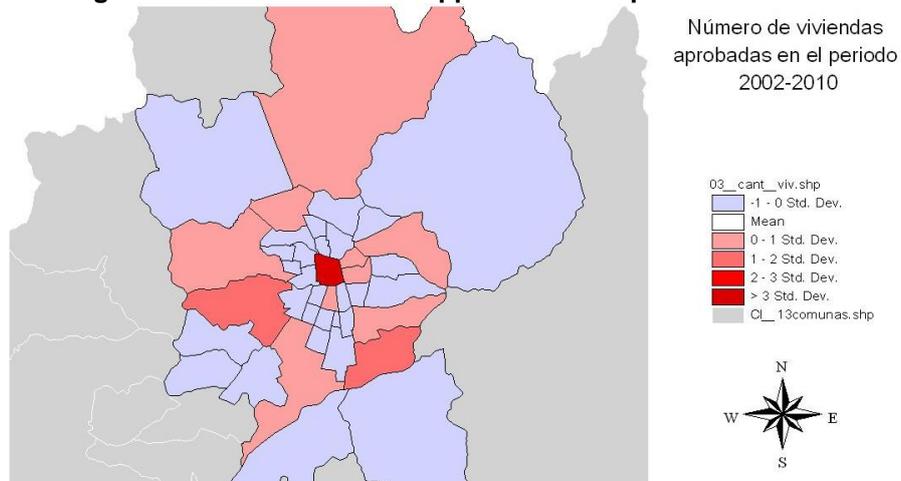
During the study period metropolitan area of Santiago it approved 29,485 building licences, bringing 506,747 homes, equivalent to 3.7118.013 Sqr meters.

Within the period, Hill and Forest communes were more building licences had approved. 2008 represents the year with as much approval in the communes of Santiago Metropolitan, within that year the district with the highest rate of approval was Hill, followed by the commune of Puente Alto, communes located on the outskirts of Santiago and have land available for building. The second pick permit approval was 2003.

If one compares the number of approved housing (Figure 1) the situation changes, as in the period, Santiago is the municipality that has the highest number of approved with 109,461 units, equivalent to 22% of the total, followed by Puente Alto, while the communes located in the south of Santiago, had less activity, with just 567 homes approved in the period was Lo Espejo, followed by the Farm 616, while the surface they provided was 71,620, 0.2% of the total.

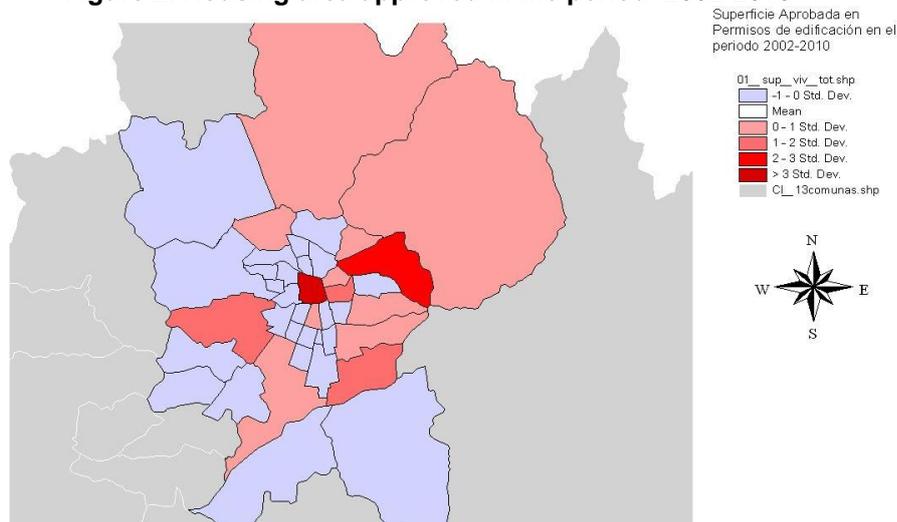
Now the total area, is still Santiago commune with the largest number of square meters, but the municipality of Las Condes appears as the second. In this community only 29,711 homes, equivalent to 72% of Puente Alto were approved and yet the surface of which is greater in 428,567 m², leaving the input surface of the latter commune in third.

Figure 1. Number of homes approved in the period 2002-2010



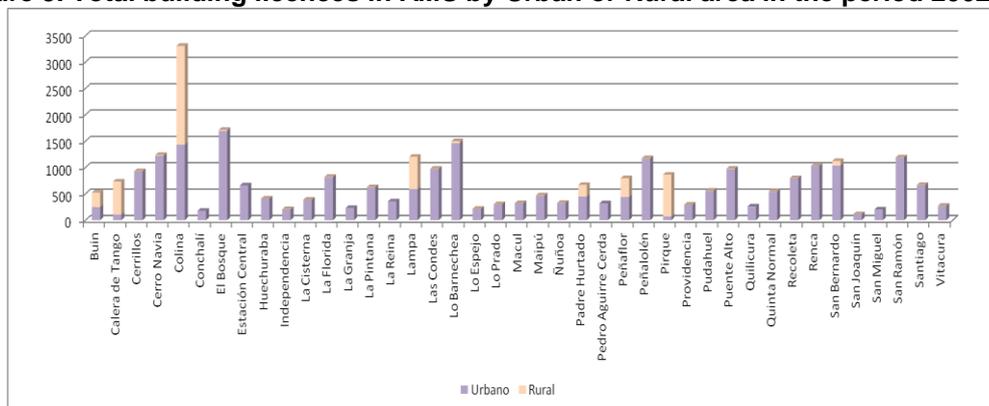
Source: own calculations based on building licences

Figure 2. Housing area approved in the period 2002-2010



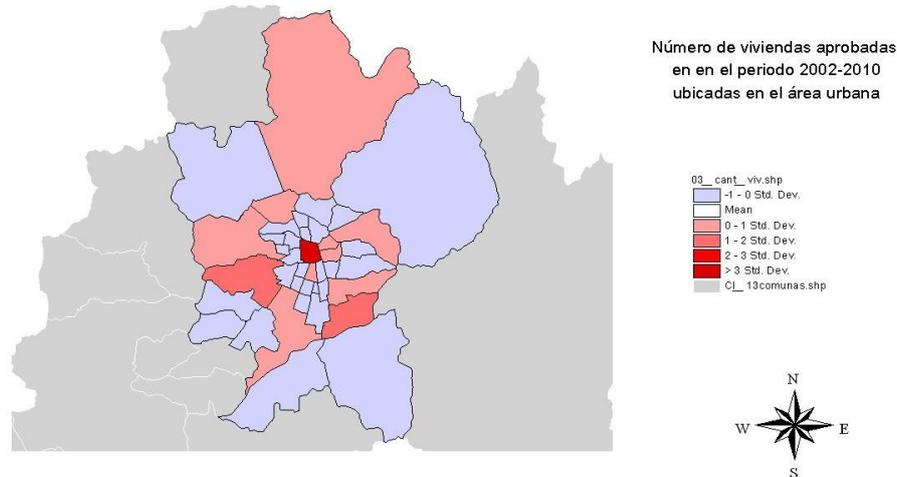
Source: own calculations based on building licences

Figure 3. Total building licences in AMS by Urban or Rural area in the period 2002-2010



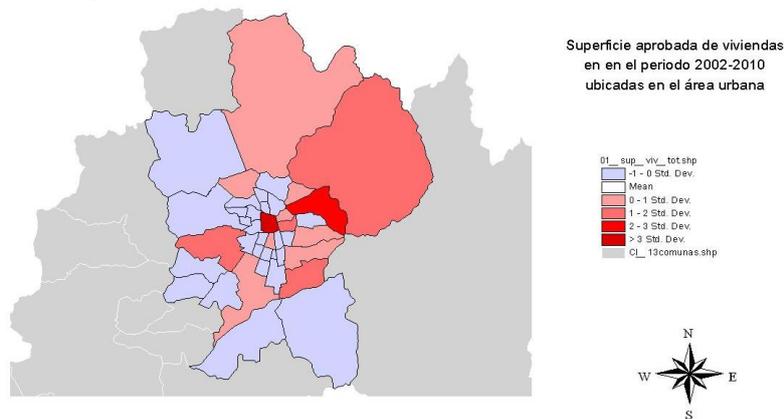
Source: own calculations based on building licences

Figure 4. Number of homes approved in the period 2002-2010 located in the urban area



Source: own calculations based on building licences

Figure 5. Housing area approved in the period 2002-2010 located in the urban area



Source: own calculations based on building licences

They could see that the largest number of licences approved in the period up to dwellings of a floor and two floors. Emphasizing the position of El Bosque in the number of licences and corroborating the trend Santiago Metropolitan low-rise housing.

In terms of number of homes, you can see that are distributed outside the ring Américo Vespucio, mainly to the west. The commune with the largest number of housing of approved floor was Maipú (dark red), followed by Puente Alto, but square meters speaking, the commune which authorized the largest amount of surface was Maipú, followed by Hill and Puente Alto contrary to include Providence, with only 16 approved homes and 1,598 m².

Regarding building licences approved for housing two floors, the year 2008 is where most accepted. 37% of the licences are located in the communes Lo Barnechea, Colina, Peñalolén and Puente Alto. (Table 10). The location of housing approved two floors, is similar to that of a floor, ie, are located around Santiago, 163,169 houses of two floors joined the real estate market, of which 55% understand it They are spearheading the four communes authorizations.

Lo Prado, meanwhile is the commune surface lower contribution made, with only 3,478 m². If you compare can see that the buildings are located in the same communes, but there are some that regarding the number of dwellings, representing the surface is greater. Such is the case of communes like Las Condes.

The housing market is more limited three-story, which is reflected in the number of licences by municipalities, as there are many communes in which a single permit is approved, registering no participation. Examples are communes like, Buin, Macul, Peñaflor or Renca. or simply communes that have no records in this type, as are the towns of Calera de Tango, Cerrillos, Cerro Navia, Lampa, Lo Espejo, Lo Prado and Padre Hurtado to name a few. While Puente Alto, Lo Barnechea and Huechuraba have the highest number of approved housing, so does the approved surface, only that majorities change, ie, first Lo Barnechea is found, it still Puente Alto and Huechuraba.

The typology of 4 floors, is one of the less preferred because of all communes of AMS, 63% have approval of licences in this category. Pudahuel, with 3,184 homes commune is the largest number of licences accepted. Meanwhile comprising the surface is within the same communities that concentrate housing, but there are differences in the contribution of surface they deliver versus the number of approved housing.

Of total communes of AMS, there are eight of them that have no present this type of housing in the period, among them are Colina, Lampa, Lo Espejo, Peñaflor, to name a few. 2006 is where most authorization of building licences of this type is recorded, being Providencia commune approved the largest number of licences both in that year, as in the whole period, accepting 134 equivalent licences to 22% from the total.

Figure 69 you can see that the largest number of approved housing is concentrated in the center and east; where Santiago, Providencia and Las Condes are those that predominate in the housing market between five and ten floors.

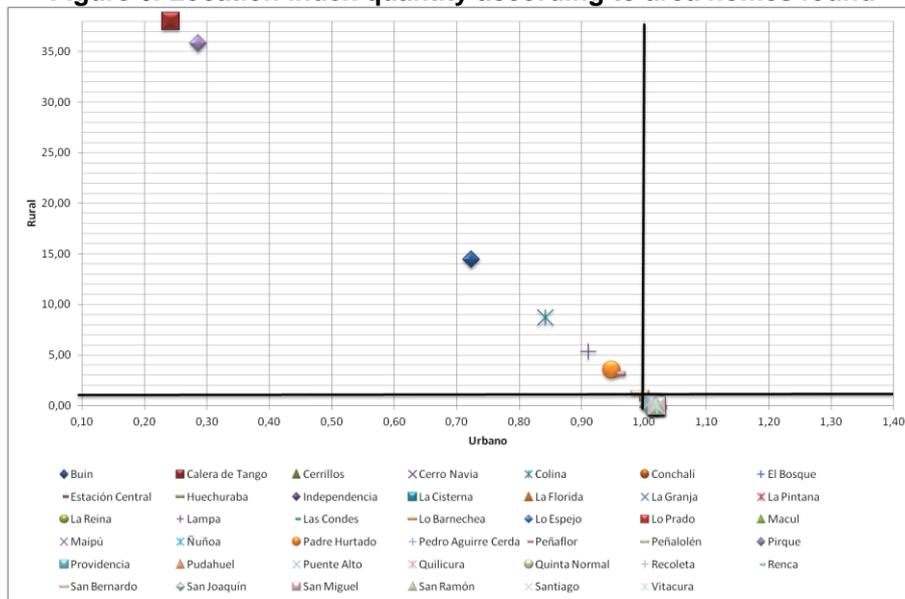
As for surfaces, Vitacura outpaces Providence, becoming the second municipality with the largest number of square meters approved 561.514m², after Santiago with 608.059m². In the third majority is Providence with 490.324m².

To the extent that households are growing in height, the number of municipalities that participate in the typology is reduced. In the case of housing between eleven and twenty floors, total 726 approved licences it is between 20 communes. Maipu approves only one permit, in contrast to 150 Ñuñoa, leaving it as the commune with more licences approved. 2005 is when the greater acceptance of building licences in such housing occurs.

Santiago again, it is the municipality that has the largest number of approved housing, followed by Ñuñoa and Las Condes comprising 56% of total housing between eleven and twenty stories. larger area is located in the communes of the east and center of Santiago, with the municipality of Las Condes, which approved the largest area, together with Ñuñoa and Santiago with 3,717,152 m².

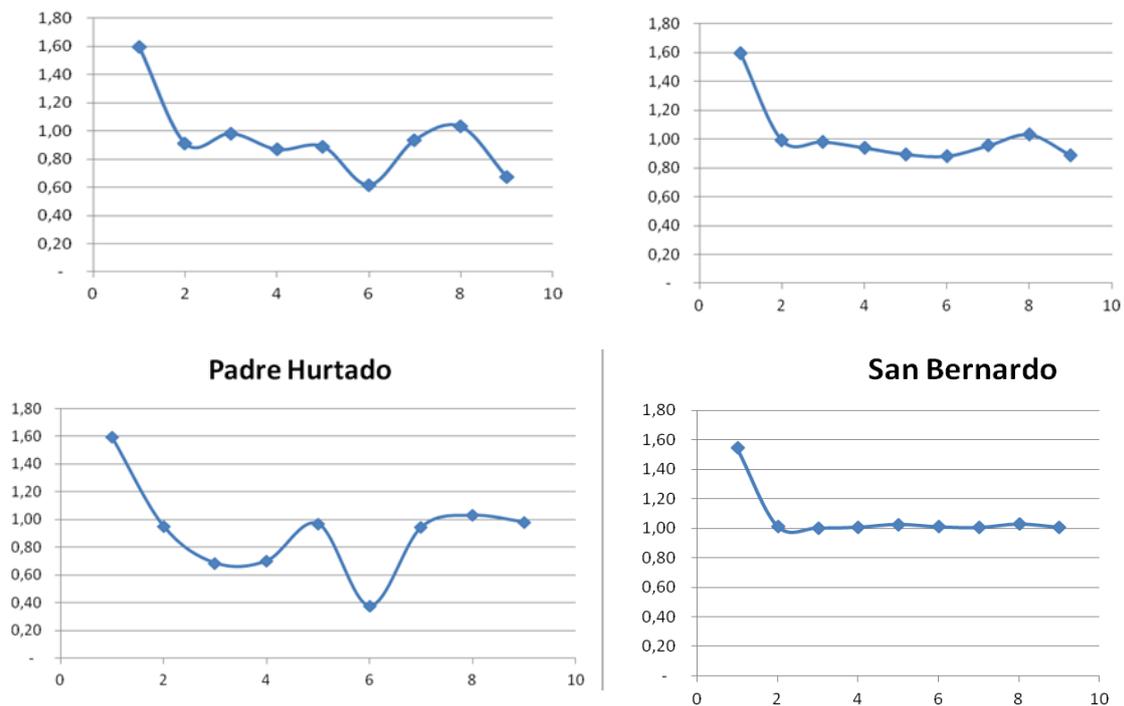
You can see that there is a clear specialization of the districts having their homes located in rural areas, finding Calera de Tango as having a higher rate of localization, followed by Pirque, Buin and Hill, while other municipalities place their homes in urban areas. They comprise the surface; follow the same behavior of the number of homes.

Figure 6. Location index quantity according to area homes found



Source: own calculations based on building licences

Figure 7. Index Urban housing locator commune period 2002-2010



Source: own calculations based on building licences

The behavior of the communes that have rates close to 1 in urban location location, and more than 1 in rural, ie, have homes located in both areas. The trend is that there is a decrease in

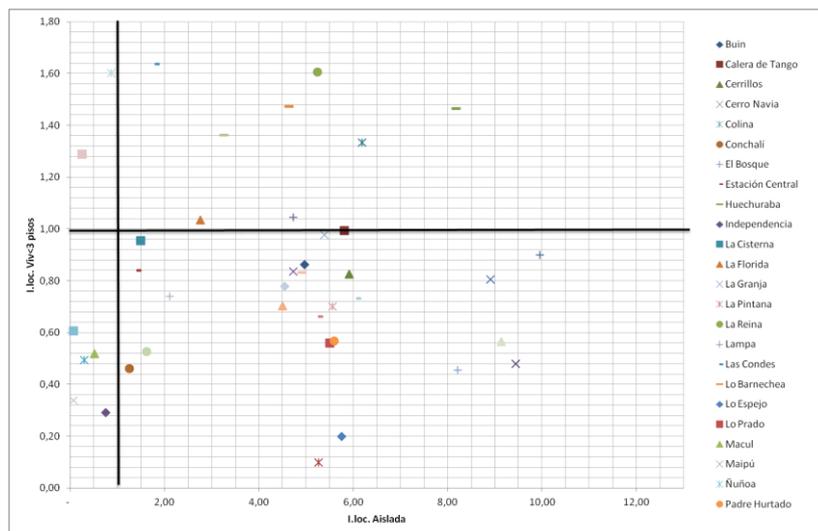
locating housing in urban areas. Although San Bernardo almost no variations in the period, only a drop from 200 to 2003 onwards remains around 1. On the contrary who show great variations is Padre Hurtado, having sharp diminutions in 2004 and 2006 , thereafter remaining is rising close to 1, ie maintains its specialization in rural areas and activity in rural areas is not enough to be significant. The number of communes AMS, has a varied location of their homes, although it is possible to distinguish those communes that specialize in certain types, it is also possible to see those not specialize in one type and presenting different types of housing. Graph 50, you can see that specialized in housing communities are isolated Pedro Aguirre Cerda, Cerro Navia, Calera de Tango, Lo Espejo, La Pintana, while those with lower housing three floors, are San Miguel and Vitacura.

The isolated and less than three-story homes are located in the communes of Huechuraba, Lo Barnechea, Queen, Peñalolén and mainly Hill. Graph 52, helps differentiate more clearly the location of housing in terms of approved surfaces, confirming the location of housing in the communities described above.

Pirque, Pedro Aguirre Cerda, Cerro Navia, San Ramon, Lo Espejo, Calera de Tango, La Pintana, Peñaflor, Quilicura and Cerrillos are communes that have lower housing 3 floors and paired, as the main type of construction. La Granja, Puente Alto and Maipú, the number of residential places them into this category but not a clear majority. The same indicate the surfaces of the housing of this type.

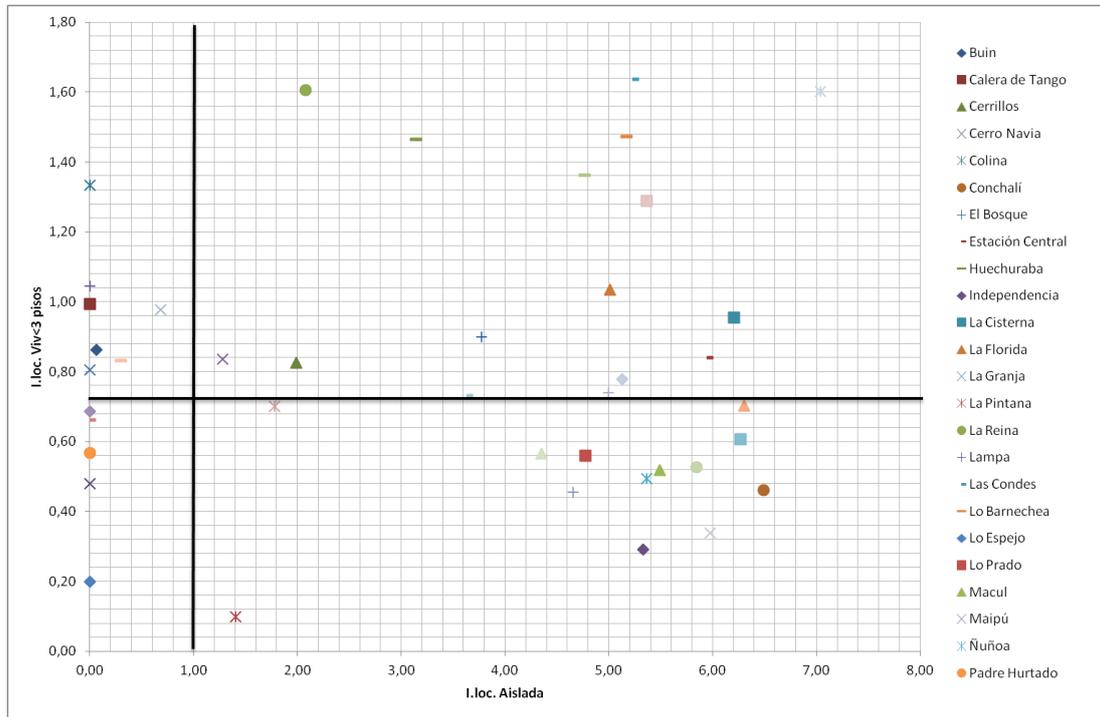
Lo Espejo, Cerro Navia, Pedro Aguirre Cerda, San Ramon, La Pintana, Pirque, Peñaflor, Quilicura and Pudahuel, are communes which by its number of homes, the index tracking the ranks as specialized in older housing three floors of the type paired. Huechuraba, Colina and Lo Prado, although characterized by paired housing type, are low. Macul, Pedro Aguirre Cerda, Independence, Pudahuel and San Ramon are consolidated in this type of housing per square meters approved for this category.

Figure 8. Location index surface isolated dwellings less than 3 floors



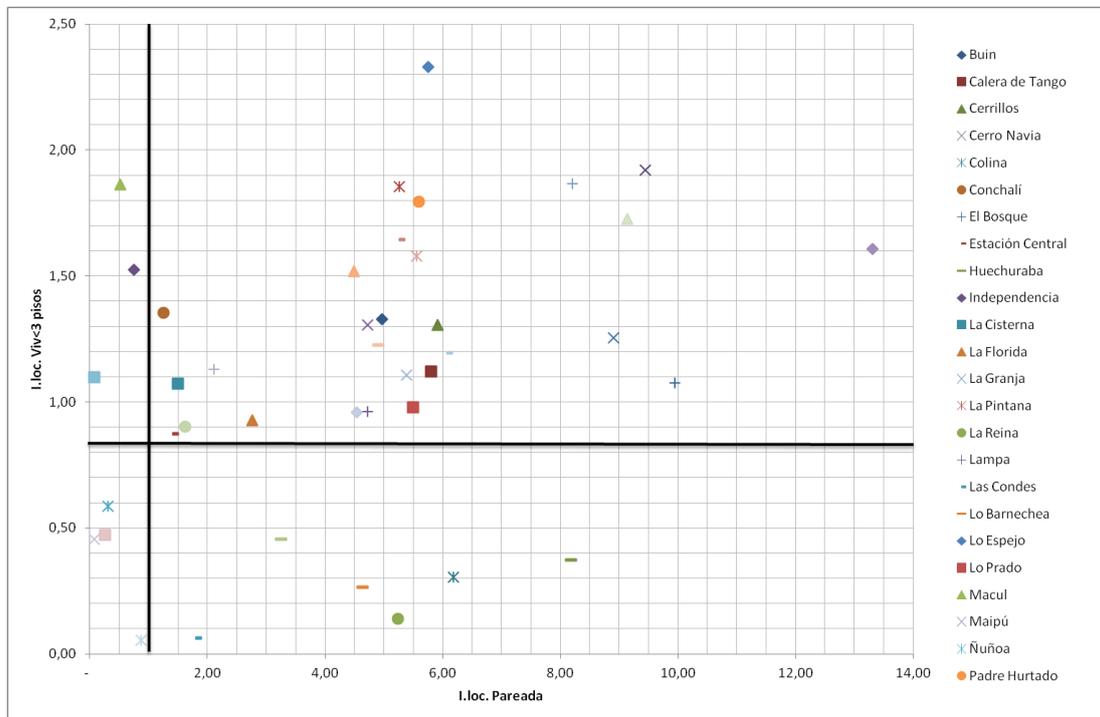
Source: own calculations based on building licences

Figure 9. Location index isolated dwellings surface greater than 3 floors



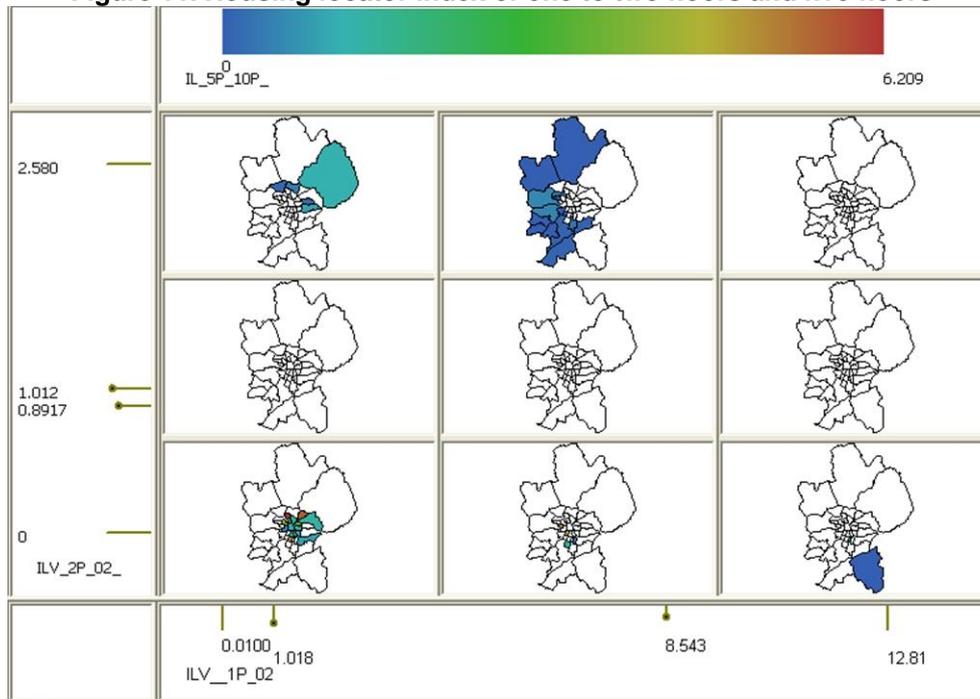
Source: own calculations based on building licences

Figure 10. Location index surface semi-detached houses less than floors



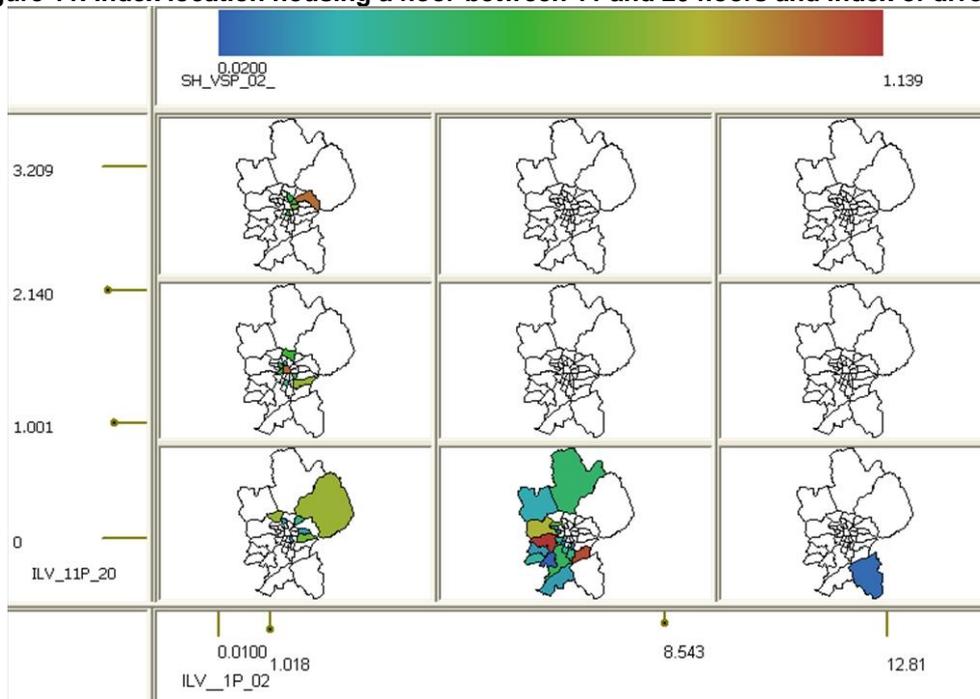
Source: own calculations based on building licences

Figure 11. Housing locator index of one to two floors and five floors



Source: own calculations based on building licences

Figure 11. Index location housing a floor-between 11 and 20 floors and index of diversity

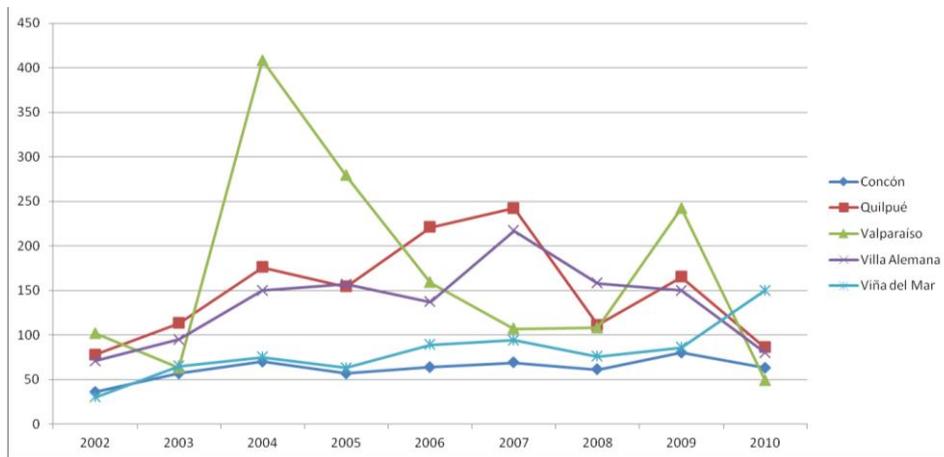


Source: own calculations based on building licences

Great Valparaiso (AMV)

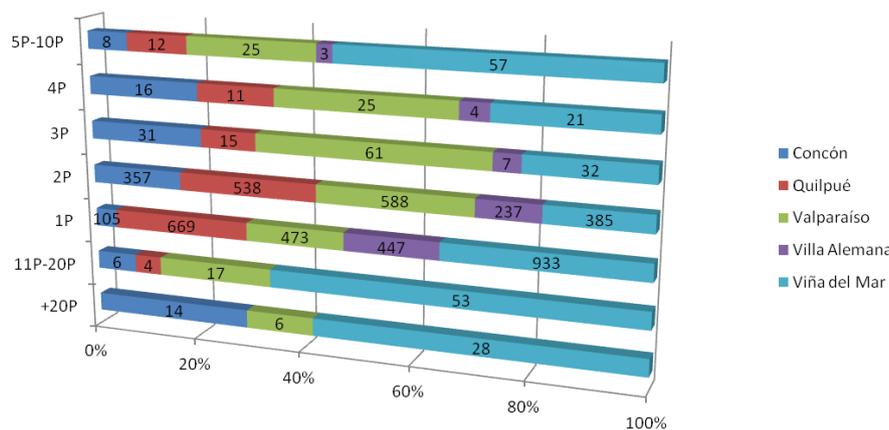
It is known as metropolitan area of Valparaiso, the communes comprised Concon, Vina del Mar, Valparaiso, Quilpué and Villa Alemana. While the metropolitan area of Valparaiso, presents, enough to be a pole of attraction, subcentraliity equivalent to the metropolitan area of Santiago, its characteristic proximity as its tourist attractions, allow to recognize it as a region of real estate high pressure core activities economic activity . It is for this reason that the analysis must be established for real estate activity by observing the number of building licences and the number of approved surfaces according to the different types mentioned above.

Figure 12. Total AMV licences by municipal terms in the period 2002-10



Source: own calculations based on building licences

Figure 13. Total AMV permissions communes in urban areas by number of floors 2002-2010



Source: own calculations based on building licences

Vina del Mar is the municipality that has approved the largest number of building licences in the period 2002-2010 and specializes in high-rise buildings, as housing activity concentrated buildings in all categories over the five floors. Quite the opposite of what happens with Villa

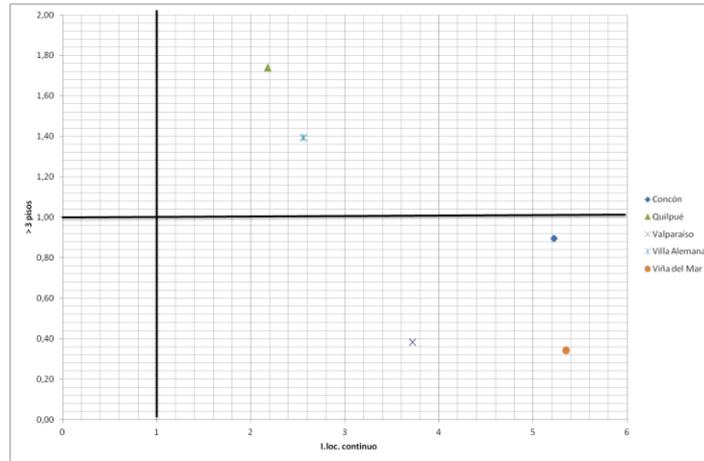
Alemana which has only 13% of licences which are focused on what homes are lower four floors. Among Valparaiso Quilpué and 47% of total licences, but mostly single-family houses are concentrated. As for number of dwellings and surface, which concentrated most activity are the homes of two floors with 19,075 units, followed by 11,019 units represented by the buildings over twenty stories. Of the total housing licences approved a flat between the years 2002-2010, Vina del Mar has 36%, followed by 25% of the commune of Quilpué (Figure 17, Figure 21), but as to what happens with surfaces, Quilpué and Valparaiso are the districts that have 50% of the AMV. Viña del Mar the third municipality with the largest area.

Dwellings in buildings between five and ten stories both in number of licences and number of households are concentrated mainly in the town of Vina del Mar, with 55% of the total throughout the period, except in 2008 where Valparaiso had a higher amount approved in this category, followed distantly by the commune of Valparaiso and Quilpué permissions. The surfaces of the housing between five and ten stories are concentrated, as the number of homes in the town of Vina del Mar, taking the same trend as the number of homes.

In the market for older homes to twenty floors, interior communes, Quilpué and Villa Alemana, the metropolitan area of Valparaiso have no share and remains Vina del Mar commune specializing in housing higher, with 56% of the housing. Concon in this type of housing, has a greater presence, being in second place with 245,481 m² equivalent to 30% of the total in the period approved surface. The communes that specialize in smaller homes continuous three floors, are the inner metropolitan districts of Valparaiso, Quilpué and Villa Alemana concentrating its real estate activity is this type of housing in number of homes and built in the 2002-2010 period surface. As older homes three floors and continuous, the number of homes approved during the years studied are concentrated in the same communes mentioned, but in area can say that Villa Alemana does not specialize in that category, as its location index for older homes three floors is 1.04. Quilpué is the only municipality that specializes in semi-detached houses less than three stories, because in terms of number of homes and surface index is greater than one in both categories, while Valparaiso slightly passes the index when compared with the surface representing that category, it is confirmed that it is not specialized in this type. (Figures 13 to 15). The same behavior exists for older semi-detached houses three floors, count the commune of Quilpué is the only thing you can say specialized in this type of housing. In conclusion, this commune specializes in semi-detached houses of all heights.

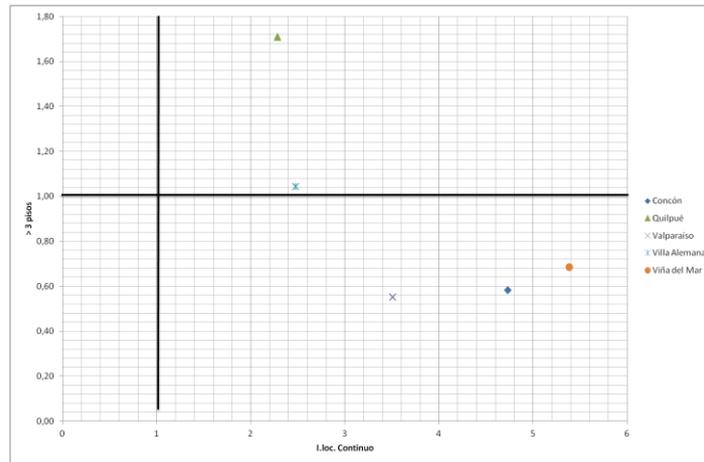
It is confirmed that the communes of Vina del Mar and Concon specialize in multi-family housing, being the one with greater participation in the real estate market Viña del Mar. The communes of Villa Alemana, Valparaiso Quilpué and in houses, even though Valparaiso also have buildings within its approved licences, it is who has the primacy in area within the group of houses. In the Figures between 17 to 20, communes with the results of location indices regarding the different variables are shown.

Figure 13. Location index homes continue higher to 3 floors



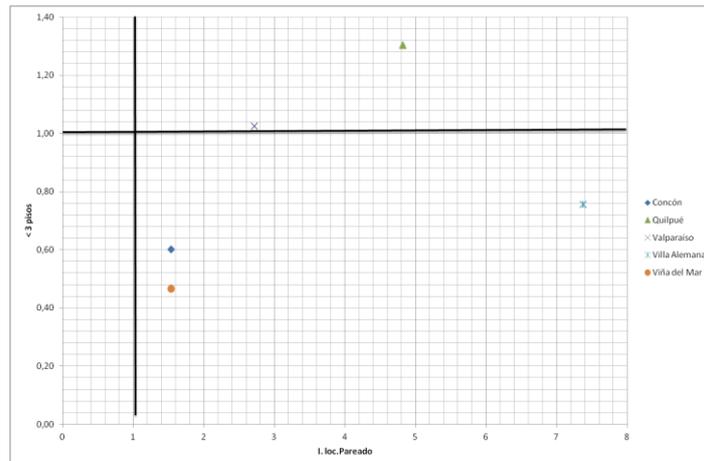
Source: own calculations based on building licences

Figure 14. Location index homes continuous surface higher to 3 floors



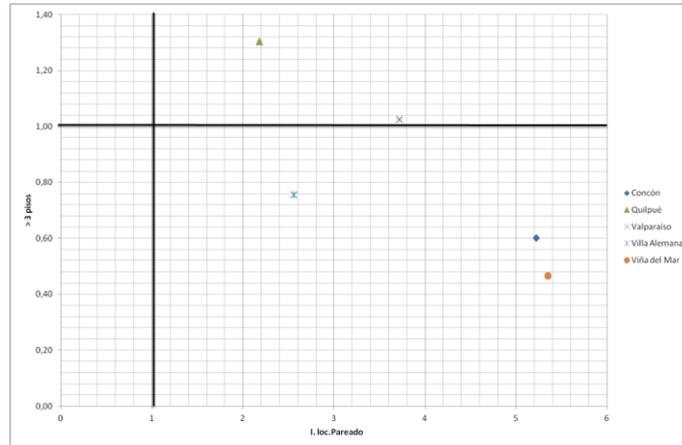
Source: own calculations based on building licences

Figure 15. Location index of semi-detached houses less than 3 floors



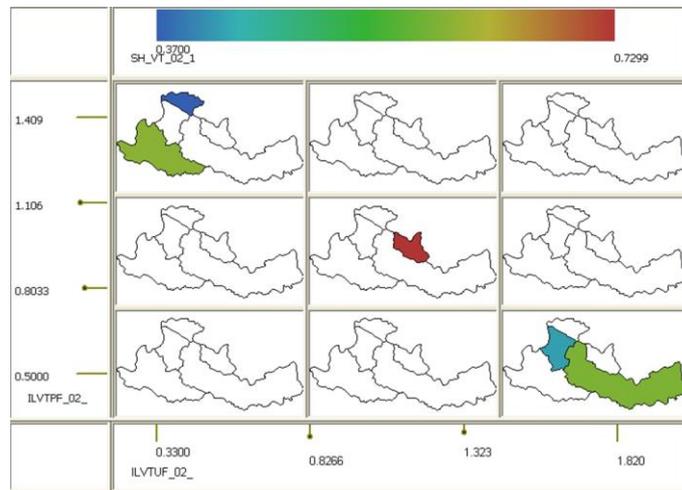
Source: own calculations based on building licences

Figure 16. Location index of semi-detached houses more than 3 floors



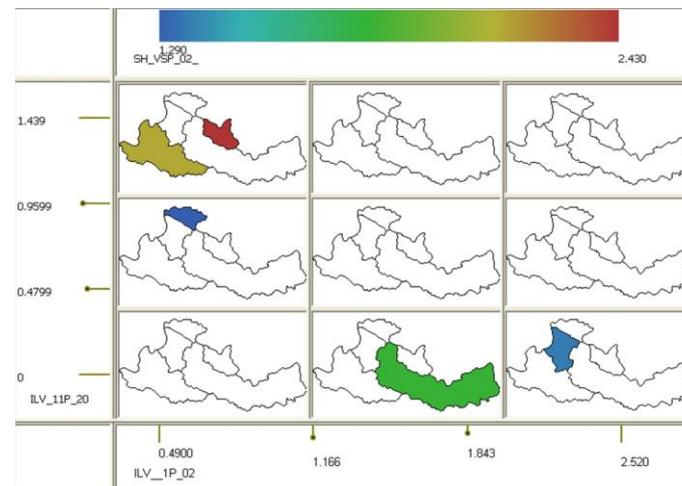
Source: own calculations based on building licences

Figure 17. Location index of single-family housing and diversity index



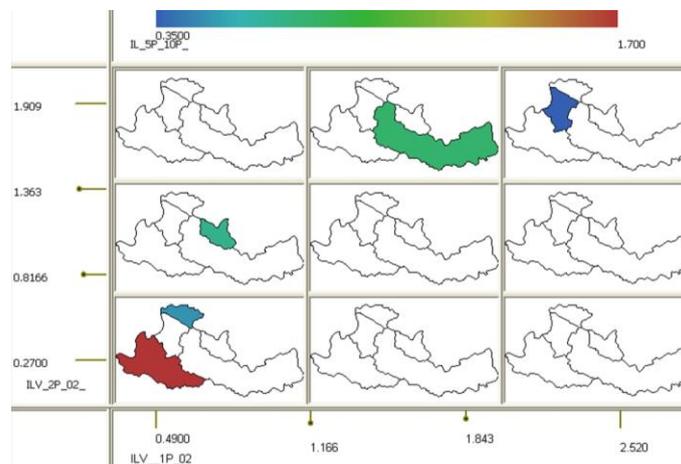
Source: own calculations based on building licences

Figure 18. Index location housing a floor between 11 and 20 floors and diversity



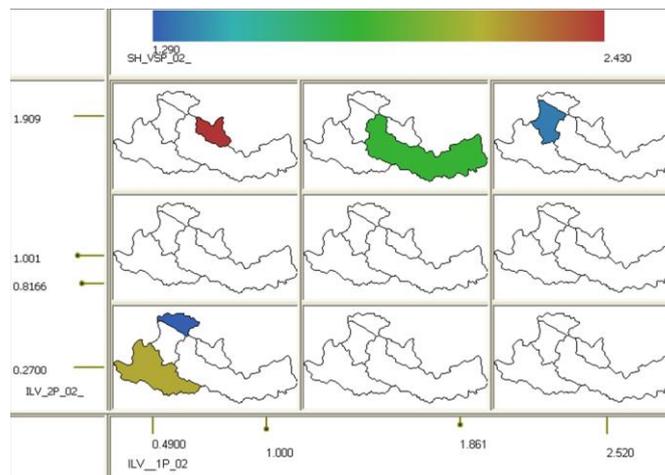
Source: own calculations based on building licences

Figure 19. Location index housing 1 and two floors and housing locator index between 5 and 10 floors



Source: own calculations based on building licences

Figure 20. Housing locator index of a floor - two floors and diversity index

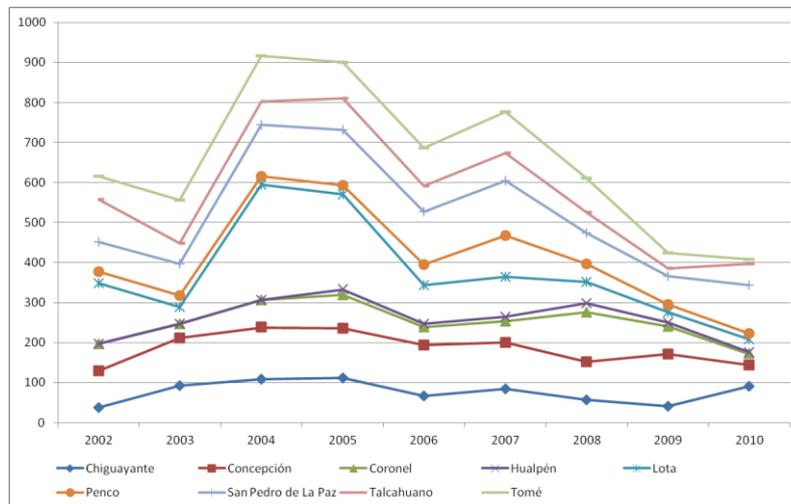


Source: own calculations based on building licences

Metropolitan area of Concepción (AMC)

The metropolitan area of Concepción is formed by the urban areas of the municipalities of Concepcion, Chiguayante, Hualpén, Penco, Talcahuano, San Pedro de la Paz, Tomé, Coronel and Lota. Nationally, it is the second metropolitan area in size and importance due to the different economic activities carried out, including the port and industrial activities. For this reason it is generated in the area, a real estate activity of great dynamism and should be studied from building licences approved in the mentioned period. Of the total approved in the metropolitan area of Concepción, 5,892 licences were in urban areas, ie, 97% of them. With only 3% in rural areas, the towns of Concepcion and Tomé are have the highest number of approved licences in rural areas

Figure 21. Total licences for AMC commune in Urban area



Source: own calculations based on building licences

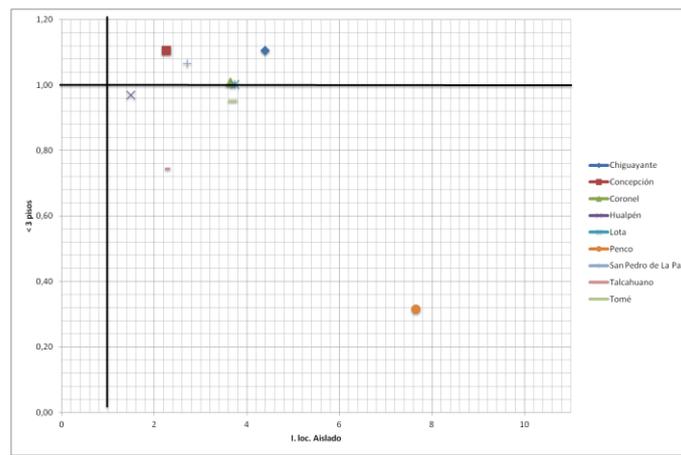
Licences two-story homes were approved overwhelmingly in 2005, in the municipality of San Pedro de la Paz, this being the same commune with most in the total period. The number of homes approved two-story San Pedro de la Paz, Coronel and Concepción are communes that meet the most number of houses, including three account for 65% of the total. As for square meters, the same communes are those that provide the largest area. Most building licences approval of three-story housing occurred in 2007, that year San Pedro de la Paz, approving a third of all licences in that year and in the period. Concepción, it is the municipality that contains the highest proportion of households. Penco, San Pedro de la Paz and Chiguayante are other communities that contribute to the number of approved dwellings and the total square meters allowed in the period.

Licences housing four floors approved in the period, have no regular behavior, about one Concepción is the municipality that approves of such licences in almost the entire period, other municipalities as Coronel, Hualpén, Lota, Penco and I took no recorded activity in this type of housing. Moreover, in the years 2002.2005 and 2009 are not approved for such licences in any commune and 2010 is when the largest number of permit approval four story is recorded. It is noted that the number of four-story houses are mainly located in the municipality of Concepción and Chiguayante, between the two cover 86% of the market of this type. Regarding the surface, the behavior is the same, but they amount to 13% of the surface of the commune of San Pedro de la Paz.

The Coronel no records of approved housing licences between five and eleven floors. With 16 approved licences, 2006 is when the largest number of licences, of which 38% are approved in the commune of Concepción was approved. You can see the location of dwellings of this type, they are concentrated in Concepcion, with 3546 homes, followed by San Pedro de la Paz, with 2321 and 1408 Talcahuano with housing. From the surface they represent and their location is the same behavior. Communes have their greatest activity in the rural area are Tomé and Penco, although they also have components in the urban area. On the other hand Concepcion

and Coronel have a rate close location to 1 in both categories, so you can say that do not specialize in one area, the only municipalities that can be said urban are Talcahuano, Chiguayante, Lota, San Pedro de la Paz and Hualpén. The location of isolated dwellings and lower three floors are mainly concentrated in Penco, Chiguayante, Lota and Coronel, although Concepción and San Pedro de la Paz have a higher rate of location 1 in both categories is not significant enough, but according to the floor area, the location index according to the surface confirms that both communes specialize in this type of housing.

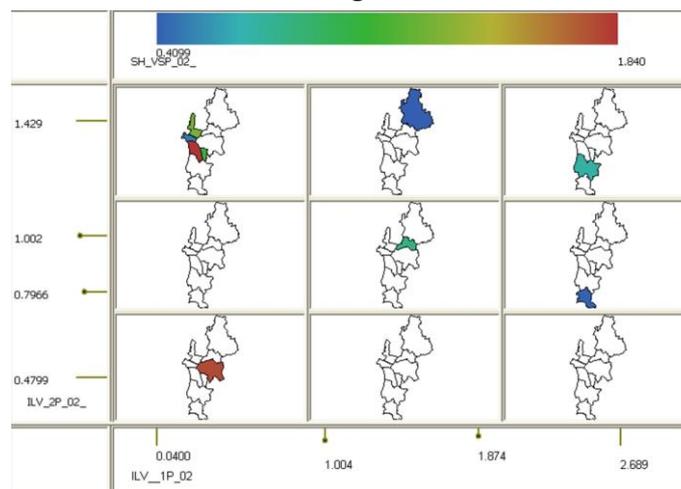
Figure 22. Surface location index isolated dwellings less than 3 floors



Source: own calculations based on building licences

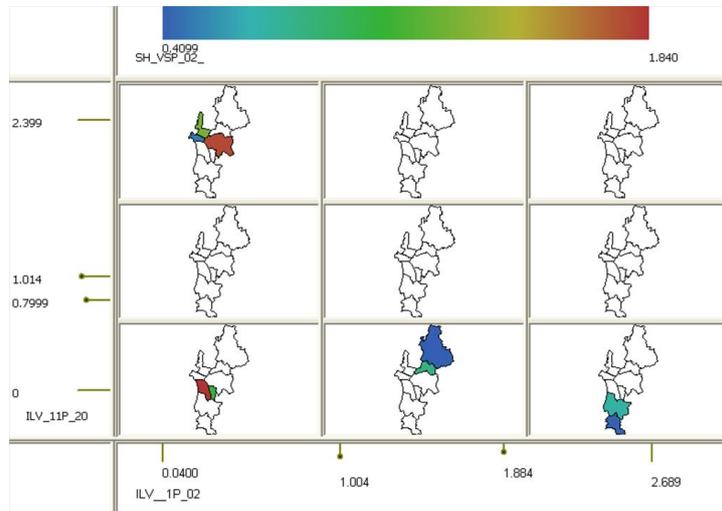
Concepción and Talcahuano are the districts that concentrate the homes of greater height and design, indicates the level of diversity of buildings. If what is analyzed is the surface, Talcahuano ranks as the municipality that gathers the largest area of housing higher. Among the figures 23 to 24 communes with the results of location indices regarding the different variables are shown.

Figure 23. Index location housing a floor-two floors and diversity



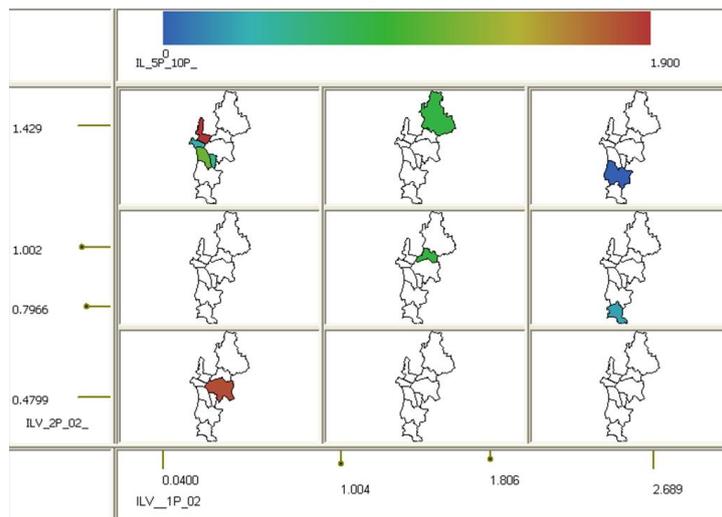
Source: own calculations based on building licences

Figure 24. Index location housing a floor between eleven and twenty floors and diversity



Source: own calculations based on building licences

Figure 25. Index location housing a floor-two floors and five floors



Source: own calculations based on building licences

Conclusion

In the period studied all Chilean metropolitan areas increased building licences approved, growing with them the number of homes built into the housing market and the available surface in different construction types analyzed.

Trends in the location of the houses follow a clear direction during the period, that direction is what leads to regional specialization and concentration of homes around the capital's metropolitan area, which was favored by policies aimed to improve transport, communications and general urban infrastructure, which has led to geographical mobility and the incorporation of new land for residential development in each of Chile's metropolitan areas.

The metropolitan area of Santiago covers forty surrounding municipalities, which form a large urban sprawl that has spread to urban boundaries, incorporating new land to help the housing market. That is what represents Colina, which is the municipality that has the highest percentage of households located in rural areas, due to the expansion and projection of these new lands within the AMS. This commune is the second at the metropolitan level in the concentration of houses after Puente Alto, this indicates that the outlying areas, allow the growth of housing in extension and with respect to adosamiento, the isolated type, having land available for construction and at a lower value. If the surfaces used are compared, one can speak of spatial segregation, as the commune of north is well above the 57 m² average surface of houses in the municipality of Puente Alto, not including about 390 m² average Eastern sector housing Vitacura, Lo Barnechea and Las Condes. On the grounds of the periphery growth by extension is allowed, in the center construction by densification, thus, is favored Santiago is the district that concentrates the buildings of greater height, followed by Las Condes and Providencia. From the clusters found, it is evident that the growth of urban Santiago has been made from the Peri, policentralización and urban fragmentation, setting patterns defined location and thanks to public works in recent years has intensified. De thus, one can identify extension housing estates, condominiums in suburban areas, especially in the north, while the south is associated with social housing projects, which correlate with the associated surfaces of each house. Moreover pericentral communes have grown by densification as there is a greater demand in these sectors because of its location and equipment. Finally the central districts, although there have been intensifying and growing by densification, because of the advantages they represent in location and infrastructure, has been driven by the policies associated with subsidies for urban renewal that have helped improve neighborhoods that were of They abandoned some form renewing these sectors

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IDENTIFYING URBAN HEAT ISLAND: THE BARCELONA CASE

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Key words: UHI, climate change, LST, NDVI, land use, urban sprawl.

Abstract

There is a large consensus that cities have a special role in the process of climate change. Cities are responsible for 75% of global energy consumption and 80% of GHG emissions, both due to "lifestyle" generated in the last 150 years and changes associated with urbanization process in the era of globalization and urban sprawl. The specialized literature has devoted many efforts to analyze the contribution of urban systems to climate change, occupying the Urban Heat Island (UHI) an important place in studies on urban climate. In this sense, the use of remote sensing technology has allowed detailed mapping of (daytime) land surface temperature (LST) for urban and metropolitan systems. These studies have demonstrated the key role played by vegetation, impervious soil and land uses to explain differences in the spatial distribution of LST. However, the information provided by satellites has important limitations: especially the low resolution of the thermal band of night images. MODIS, for example, provides valuable information on the night LST; however, the spatial resolution of the thermal band is about one km², scale clearly insufficient to identify accurately the spatial structure of the UHI. In the opposite site, Landsat offers a more acceptable spatial resolution (30 m² / pixel for the visible bands of the electromagnetic spectrum as well as 60 to 100 m² / pixel in the thermal bands), but does not provide information about night soil temperature. In addition, it is at night when the urban heat island becomes more evident. Therefore, to determine the night LST in an appropriate scale (as offered by Landsat) remains a significant challenge in studies aimed at identifying the spatial structure of the UHI.

In Metropolitan Area of Barcelona (AMB, 3,200 km² and 4.8 million inhabitants), the (day) highest temperatures are not in the CBD but in areas that are more peripheral specialized in economic activity such as industrial parks, producing a "donut" in the spatial distribution of the LST. Bare soil also shows a (day) high surface temperature. In contrast, sprawled areas have a less pronounced LST. The spatial structure of the LST, however, changed significantly during the night: compact and sprawl areas maintain high levels of heat, facing the agricultural soil,

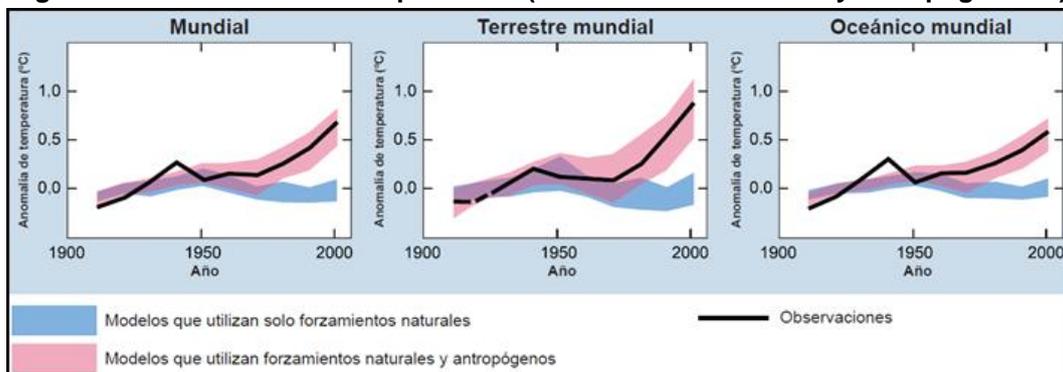
which cools more sharply as also happens in the industrial land. UHI appears therefore overnight.

This paper aims to show the spatial patterns of Urban Heat Island in the Metropolitan Area of Barcelona at medium scale (30 m² / pixel). It develops a new methodology aimed at modeling the night temperature at one km² resolution (MODIS) and then extrapolating this methodology to a most accurate scale of 30 m² / pixel (Landsat). The study allows identifying differences in (night) LST according to the distribution of land use, quantity and quality of the vegetation, intensity of urban sprawl, spatial distribution of economic activity and type of urban morphology (continuous vs. scattered urbanization).

Introducción

“El calentamiento del sistema climático es inequívoco, como evidencian ya los aumentos observados del promedio mundial de la temperatura del aire y del océano, el deshielo generalizado de nieves y hielos, y el aumento del promedio mundial del nivel del mar” (IPCC 2007¹, pág. 2). De los 12 años comprendidos entre 1995 y 2006, 11 figuran entre los más cálidos en los registros de temperatura terrestre mundial existentes desde 1850. Este aumento de temperatura está distribuido por todo el planeta y es más acentuado en las latitudes septentrionales superiores. Las regiones terrestres (fig. n. 1) se han calentado más aprisa que los océanos. La variación de las concentraciones de gases de efecto invernadero (GEI) en la atmósfera, y las variaciones de la cubierta terrestre y de la radiación solar, alteran el equilibrio energético del sistema climático. En este sentido, el origen antropogénico de los cambios observados (Trenberth et al., 2007²) parece hoy un hecho igualmente incontrovertible. Las emisiones mundiales de GHG por efecto de actividades humanas han ido en aumento desde la era preindustrial, entre 1970 y 2004 este aumento ha sido del 70%. El resultado de los diferentes modelos de la evolución de las temperaturas de la superficie terrestre, evidencian el protagonismo de los forzamientos de origen antropogénico, respecto a los de carácter natural. Estas tendencias continuarán produciéndose, acelerando incluso, a lo largo del siglo XXI. Los modelos de simulación del clima muestran un elevado nivel de coincidencia respecto a que las emisiones mundiales de GEI seguirán aumentando en los próximos decenios, con las políticas actuales de mitigación de los efectos del cambio climático. “De proseguir las emisiones de GEI a una tasa igual o superior a la actual, el calentamiento aumentaría y el sistema climático mundial experimentaría durante el siglo XXI numerosos cambios, muy probablemente mayores que los observados durante el siglo XX” (IPCC 2007, pág. 8).

Figura 1. Evolución de las temperaturas (forzamientos naturales y antropogénicos)



Fuente: IPCC 2007

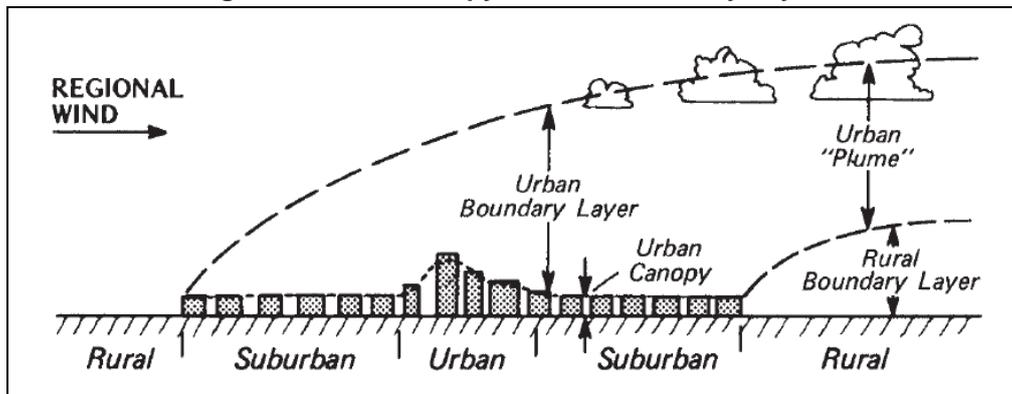
Existe un elevado consenso acerca de que las ciudades tienen un protagonismo especial en este contexto de cambio climático. Según el Centre for Human Settlements (UN–HABITAT) las ciudades son responsables del 75% del consumo global de energía, así como el 80% de las emisiones GEI (<http://www.un.org/press/en/2007/gaef3190.doc.htm>). Con independencia que estos datos estén o no sobredimensionados y de que no exista todavía un protocolo estandarizado para el análisis de la contribución de las ciudades al cambio climático, como sucede en cambio para los países, no cabe duda que el estilo de vida generado a partir de la industrialización y muy particularmente los cambios asociados a la urbanización son elementos determinantes del calentamiento global. Dicha contribución de la urbanización al cambio climático es de doble naturaleza. Por una parte, por la generación urbana de GEI, lo que contribuye de forma determinante al calentamiento global del planeta, y por otra, a la concreta radiación generada por la superficie del suelo urbanizado, la cual determina un flujo de calor sensible y latente en virtud del tipo de cubiertas urbanas, así como a su grado de humedad.

A pesar de que el clima de las ciudades depende fundamentalmente de factores de carácter regional, como la latitud, el relieve o la distancia a las masas de agua, también es afectado por factores locales y de micro-escala, como las características de la estructura urbana, la topografía y superficie de las cubiertas de suelo, la vegetación o el calor antropogénico generado por el metabolismo urbano (Lowry, 1977³; Oke, 1973⁴). Existen diferencias significativas en el clima de las áreas urbanas comparadas con las de carácter rural (Oke, 1987⁵). El efecto de la isla de calor urbana (UHI) describe la influencia de las superficies urbanas en los patrones de temperatura de las áreas urbanas en contraposición a las áreas circundantes. Los materiales artificiales (especialmente el asfalto y hormigón) usados usualmente en las áreas urbanizadas son una de las principales causas. Aparte de las zonas áridas y semiáridas, la UHI muestra temperaturas más altas en las zonas urbanas que en las zonas rurales y depende de diversos factores, como la latitud, la altitud, la topografía, el tamaño de la ciudad y la estabilidad atmosférica.

La acumulación de calor en las ciudades no sólo afecta a los entornos urbanos, sino que también tiene efectos a escala local e incluso global: la isla de calor urbana (UHI) se encuentra estrechamente vinculada con el cambio climático general (Roth et al, 1989⁶). Cambiando los usos permeables y húmedos, característicos del espacio rural, por los secos e impermeabilizados propios de pavimentación y edificación de las áreas urbanas se afecta de forma acusada el balance energético y la temperatura del suelo (Guo et al., 2012) así como muchas otras propiedades como la evapotranspiración, la infiltración de agua en la superficie, el sistema de drenaje, entre otros factores, que afectan al clima y al conjunto de ecosistemas.

Los efectos de la UHI se manifiestan en diferentes escalas. Pueden distinguirse dos tipos de UHI: la “canopy layer heat island” y la “boundary level heat island” (fig. n. 2). La primera depende de la rugosidad del suelo generada por los edificios y la copa de los árboles, con un límite superior situado justo por encima del nivel de las cubiertas de los edificios. En esta capa, el flujo del aire y los intercambios de energía vienen gobernados por procesos de microescala que dependen de las características específicas de la superficie. La segunda se sitúa por encima de la primera, con un límite inferior sujeto a la influencia de la superficie urbana. En la capa límite urbana, que es la parte de la capa límite atmosférica por encima del nivel de los edificios cuyas características están afectadas por la presencia de la urbe, la UHI opera de forma distinta, tratándose de un fenómeno de escala local a mesoescala, controlado por procesos que operan a mayor escala espacial y temporal.

Figura 2. Urban Canopy & Urban Boundary Layers



Fuente: Oke (1987)

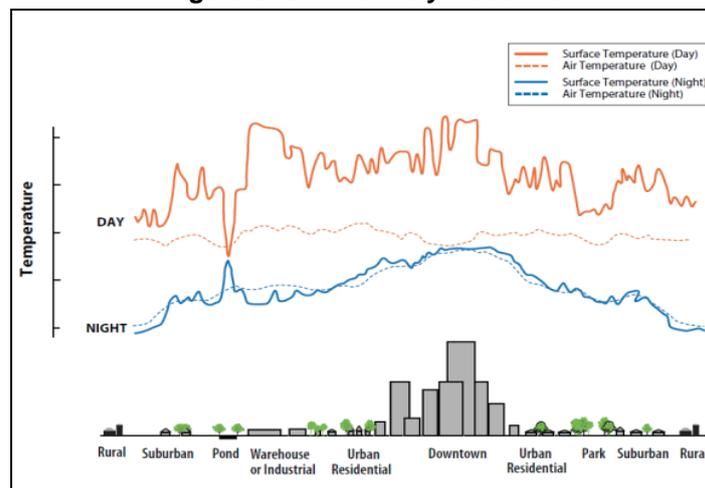
La *temperatura de la superficie terrestre (LST)* ocupa un papel fundamental en la generación de la UHI, al representar un factor determinante de la radiación de la superficie y el intercambio de energía (Weng, 2009⁸), además del control de la distribución de calor entre la superficie y la atmósfera (Oke, 2006). En resumen, la LST regula el ambiente térmico urbano. Por ello, es necesario el modelado y predicción de los cambios ambientales así como el análisis y la comprensión de la dinámica de la LST y su relación con los cambios de origen antropogénico. La LST sirve como un indicador importante de los procesos físicos, químicos y biológicos del ecosistema y está influenciada, junto a la latitud y tipo de clima, por variables de tipo geográfico, como la elevación, orientación y pendiente, entre otros muchos factores que condicionan la incidencia de la radiación solar en la superficie terrestre, junto a las propiedades de las cubiertas y usos de suelo, como son el color, la rugosidad de la superficie, la humedad, el material, etc. La temperatura de la superficie terrestre regula las capas bajas de la atmósfera. Por lo tanto, se la puede identificar como una variable climática clave y factor crítico para el medio ambiente urbano, dado que la LST modula el equilibrio de la energía (Tan et al., 2009).

La *composición de las cubiertas de suelo* es uno de los principales factores que influyen en la LST, en particular el porcentaje de cada tipo de cobertura terrestre que ocupa el área urbanizada. El área construida, asimismo, puede tener un impacto especialmente alto (Zhou et al. 2011). La temperatura de la superficie terrestre tiene, por lo general, una correlación positiva con la superficie impermeable de carácter urbano y negativa con la ocupada por bosques y zonas con vegetación. La disminución de vegetación influye en los saldos de calor, lo que lleva a un aumento de LST, al mismo tiempo, la precipitación y la evapotranspiración tiene la tendencia opuesta. En la literatura especializada está especialmente bien documentada la relación existente entre la LST con las cubiertas verdes y el Normalized Difference Vegetation Index (NDVI). El NDVI, junto a otros indicadores de vegetación, ha sido ampliamente usado como un indicador de la cantidad, calidad y desarrollo de la vegetación, así como del impacto en la misma de la urbanización. Los trabajos que han analizado la relación NDVI-LST muestran, por lo general, una correlación negativa entre ambas variables. De igual manera se ha demostrado la existencia de una relación positiva entre la superficie impermeabilizada (impervious surface) con la LST. Por su parte, otras investigaciones han demostrado la correlación positiva existente entre la LST con distintos indicadores de intensidad de la edificación, como por ejemplo el NDBI (Normalized Difference Built-up Index), lo que representa que la isla de calor urbana es más alta en las áreas edificadas respecto a las no

edificadas; dicha variable, han indicado diversos autores, es más esTabla que el NDVI, al no depender de forma acusada de la estación del año, así como por tener una relación más abiertamente lineal con la LST que el índice de vegetación (Li & Liu, 2008). Asimismo, se ha demostrado como la LST está relacionada no sólo con el tipo de vegetación sino también con la humedad del suelo y la densidad demográfica. Aplicando técnicas de teledetección (*remote sensing, RS*), Weng (2001¹³) analizó la expansión urbana y sus impactos en la LST, obteniendo que la expansión urbana causaba el crecimiento de la LST en 13.01 K.

El acceso al RS ha hecho posible el estudio generalizado de la LST y, en consecuencia, de la UHI a escala local y regional. Sin embargo la gran mayoría de los trabajos se ha limitado a esTablacer la temperatura de suelo de día, puesto que los sensores satelitales de mayor resolución (Landsat, por ejemplo), devuelven tan sólo información del espectro electromagnético diurno. Sin embargo la UHI es un fenómeno principalmente nocturno (ver figura n. 3), lo que sugiere la necesidad de incorporar otros sensores operacionales que ofrezcan información de la banda térmica nocturna, como MODIS. El gran problema, sin embargo, es que éstos tienen un nivel de resolución mucho más bajo, ofreciendo una imagen poco detallada de la isla de calor urbana.

Figura 3. UHI diurna y nocturna



Fuente: US Environmental Protection Agency (2008)

Por otra parte, *el planeamiento urbano tiene una transcendencia fundamental para informar, coordinar e implementar medidas para mejorar la calidad climática de las ciudades frente al cambio climático global* (Alcofrado & Matzerakis, 2010). Sin embargo, no parece existir una sensibilización al respecto, siendo escasas las iniciativas para adaptarlo por tal de aumentar la resiliencia urbana al cambio climático. En este sentido la reflexión permanece todavía en el campo teórico, no habiendo descendido a la arena de la práctica de la planificación. A pesar de la abundancia de estudios científicos producidos a lo largo de las últimas décadas acerca de los efectos de la urbanización en el clima, así como de los demostrados perversos resultados que en la salud y en la calidad de vida de las personas generan los eventos extremos resultado del cambio climático, el planeamiento territorial y urbano aún no parece haberse adaptado al mismo (Arellano & Roca, 2015).

La presente ponencia tiene por objeto modelar la UHI del Área Metropolitana de Barcelona (AMB, 3,200 km², 4,8 millones de habitantes) a una escala intermedia, equivalente a unos 30-100 m²/píxel, mediante la utilización cruzada de las imágenes satelitales de MODIS y Landsat, con el fin de una herramienta adicional para la toma de decisiones en el diseño y planeamiento de la ciudad.

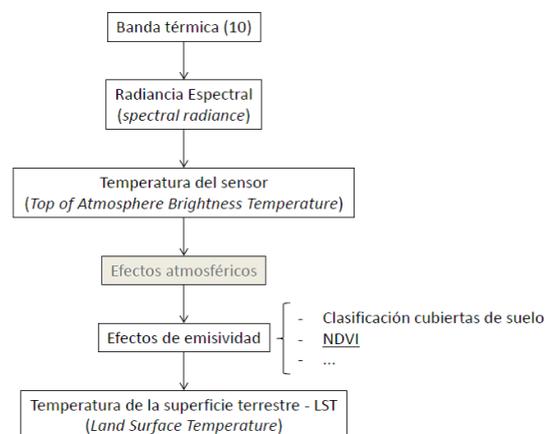
Metodología

Las imágenes satelitales que se utilizarán son MODIS, (por medio de su sensor Advanced Spaceborne Thermal mission and Reflection - ASTER) y Landsat-8 (con sus sensores OLI - Operational Land Imager y TIRS - Thermal Infrared Sensor). El primero con una resolución (diurna y nocturna) de 1 km²/píxel, y el segundo (sólo diurna) con 30 m²/píxel para el sensor multi-espectral OLI y 100 m²/píxel para las bandas térmicas. Las imágenes analizadas corresponden a la época de inicios del otoño (octubre).

La obtención de la UHI del Área Metropolitana de Barcelona se llevará a cabo por medio de la siguiente metodología:

1. En primer lugar se obtendrá la *LST de día* por medio de Landsat (OLI & TIRS), con una escala de resolución de 30-100 m²/píxel. Dicha LST permite determinar el tipo de cubiertas de suelo que radian mayor temperatura diurna, permitiendo verificar la hipótesis de que la artificialización elevada del suelo contribuye de forma positiva a la generación de la UHI. La metodología que se emplea para obtener la LST consiste en convertir la codificación numérica (Digital Number-DN) de la banda térmica (infrared thermal) en que se facilitan las imágenes satelitales en unidades físicas. Para ello: a) se trasforma el DN en radiación espectral (spectral radiance); b) se calcula la temperatura de luminosidad en el sensor (at-sensor brightness temperatura). Esta temperatura no tiene en cuenta el tipo de material o de suelo que emite la energía captada, por tanto equivaldría a la temperatura emitida por un cuerpo negro (black body); y c) lo anterior conlleva a realizar una última corrección del valor obtenido introduciendo la emisividad (emissivity) de los materiales del suelo, a partir, por ejemplo, del índice de vegetación NDVI (Normalized Difference Vegetation Index) o el NDBI (Normalized Difference Building Index). La figura n. 4 reproduce el proceso seguido.

Figura 4. Metodología para la obtención de la LST

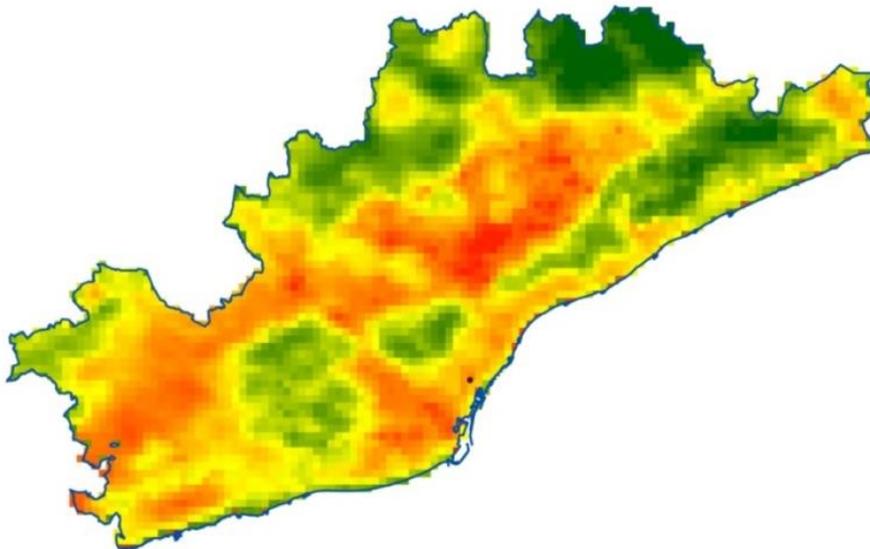


2. Mediante un procedimiento similar al descrito en el punto anterior, se obtienen las *temperaturas de suelo de día y noche* por medio de MODIS (ASTER), con una escala de resolución de *1 km²/píxel*. La obtención de la LST diurna y nocturna permite verificar la hipótesis de que son los usos urbanos más intensos los que atesoran de noche una mayor cantidad de calor, contribuyendo de forma determinante a la generación de la UHI.
3. Finalmente se ensaya un proceso de conversión de la temperatura de noche obtenida a baja resolución (1 km²) a alta resolución (30-100 m²/píxel) por medio de la construcción de un modelo explicativo (OLS). Dicho modelo, generado a partir de la información asociada a la escala de la imagen de MODIS, se aplica a la escala pormenorizada de Landsat, lo que permite comprender con un grado de verosimilitud razonable el proceso de enfriamiento nocturno de las distintas cubiertas de suelo, verificando la existencia de la UHI del caso estudiado.

Resultados

El análisis de las imágenes ofrecidas por Landsat y MODIS permite la obtención, por medio de la metodología desarrollada en el epígrafe precedente, de las temperaturas diurnas de suelo del Área Metropolitana de Barcelona (así como de las temperaturas nocturnas, en el caso de específico de MODIS). Las figuras n. 5 y 6 muestran las LST diurnas obtenidas mediante las bandas térmicas de los citados satélites. Como se puede observar, ambas imágenes muestran un patrón parecido, existiendo una correlación entre ambas LST relativamente elevada ($R^2 = 0,727$, figura n.7)¹.

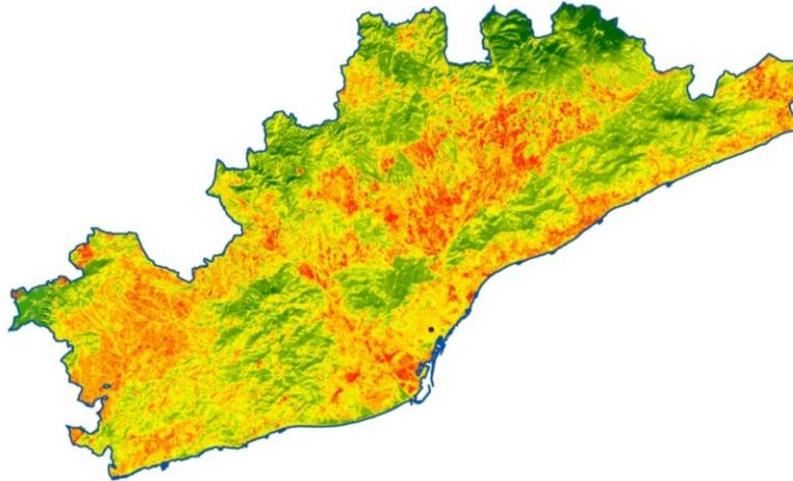
Figura 5. LST diurna (MODIS, 1 km de resolución)



Fuente: MODIS. Elaboración propia

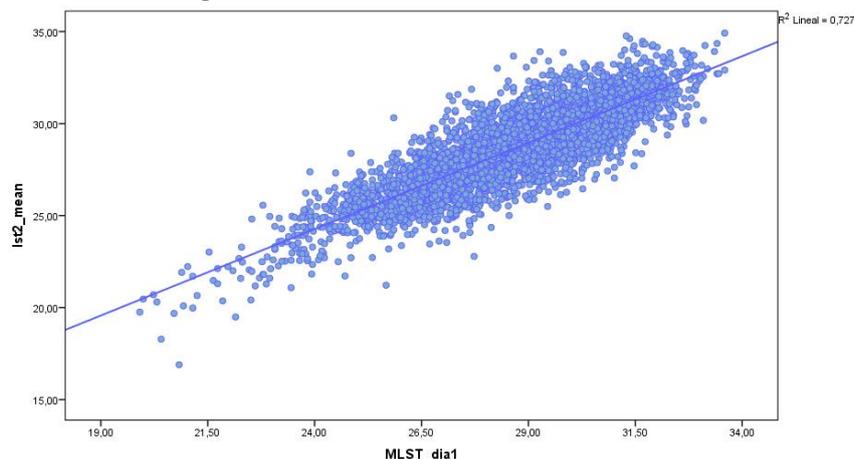
¹ La obtención de la R^2 citada se refiere a la LST de los 3,759 píxeles contenidos en la imagen de MODIS en relación a la LST media obtenida para esos mismo píxeles a partir de Landsat.

Figura 6. LST diurna (Landsat, resolución 30 m)



Fuente: Landsat. Elaboración propia

Figura n. 7 LST MODIS vs. LST Landsat



Fuente: MODIS, Landsat. Elaboración propia

El análisis realizado confirma la existencia de la isla de calor urbana en el Área Metropolitana de Barcelona. El suelo artificializado, según Corine Land Cover (CLC), alcanza mediante el análisis de la imagen MODIS una temperatura media diaria de 29,7 °C, mientras que el suelo no artificializado 28,3 °C. Dichos resultados son similares según la LST obtenida a partir de Landsat (30,1 vs. 28,2 °C).

Sin embargo, las temperaturas de día vienen parcialmente sesgadas por el sobrecalentamiento de los suelos agrícolas, parcialmente desnudos en la época otoñal². La tabla n. 1 muestra para las principales cubiertas de CLC de las temperaturas diurnas de MODIS y Landsat, junto a alguno de los principales indicadores utilizados.

² En otoño, una parte importante del suelo agrícola pierde, para la latitud del Área Metropolitana de Barcelona, cuotas significativas de vegetación. Es el caso, especialmente, de la viña, una vez producida la recolección de la uva, así como del cereal. El suelo, "desnudo", acumula importantes cantidades de calor durante las horas de insolación diurna, presentando una imagen térmica muy distinta de la imaginada en las representaciones clásicas de la isla de calor urbana.

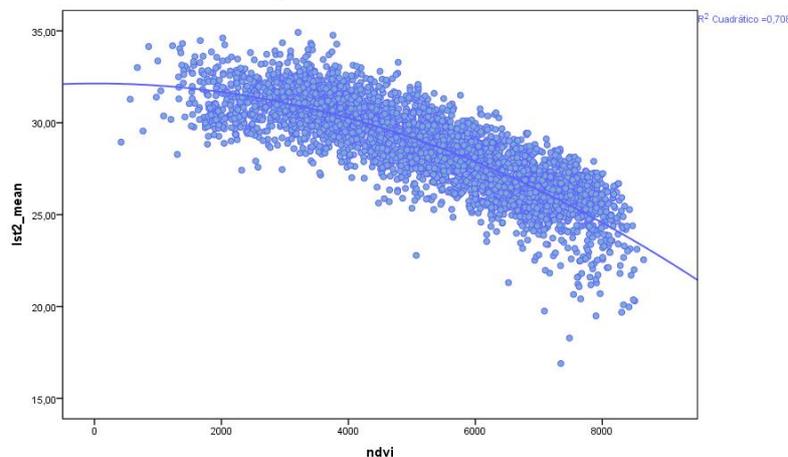
Tabla 1. LST para distintas cubiertas de suelo

Corine	NDVI	NDBI	Emisividad	LST Landsat	LST MODIS
Compacto	0,173103	0,208387	0,888741	30,4517	30,3514
Disperso	0,331724	0,106548	0,953275	28,8689	28,8026
Industrial	0,149585	0,195983	0,869183	32,3301	31,2106
Otros Usos Urbanos	0,226186	0,173915	0,890682	30,0831	29,716
Agrícola	0,315412	0,168982	0,947661	30,6329	30,0684
Forestal	0,509443	-0,055711	0,975901	26,1898	26,934
Otros Usos Rurales	0,422224	0,050236	0,968013	28,1666	28,3466

Fuente: MODIS, Landsat. Elaboración propia

El uso industrial junto al residencial compacto alcanzan las temperaturas de día más elevadas. De forma opuesta, el uso residencial disperso, relativo a las áreas caracterizadas por sprawl, observan una LST mucho más suave. En este sentido se confirma una correlación claramente negativa entre el NDVI y la LST, contribuyendo el grado y la calidad de la vegetación a la suavización temperaturas diurnas. Efecto beneficioso de la vegetación que queda plenamente confirmado tanto en el suelo forestal como en el resto del suelo rural (otros usos del suelo distintos del suelo agrícola y forestal), que son las cubiertas con menor temperatura de las observadas en el caso de estudio. La figura n. 8 muestra esta elevada correlación entre el NDVI y la LST ($R^2 = 0,708$)³.

Figura 8. LST vs. NDVI



Fuente: Landsat, MODIS. Elaboración propia

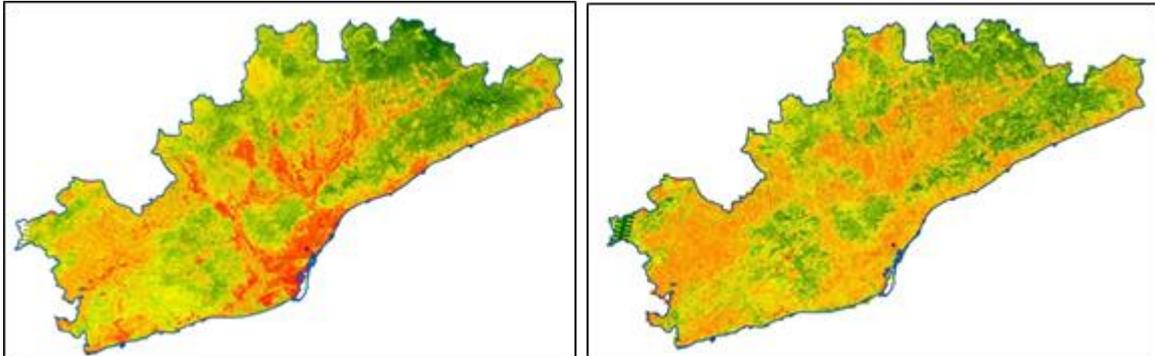
La elevada temperatura del suelo agrícola, con un NDVI parecido al suelo residencial disperso pero acusadamente más caliente, no permite sostener, para la época estacional de las imágenes, la existencia de una clara y definitiva UHI diurna⁴. Al “donut” generado por la LST del suelo industrial, más periférico, se le añade el caliente suelo rural ocupado por la agricultura.

³ La figura muestra la LST media de Landsat obtenida por píxel de 1 km (MODIS) vs. el NDVI suministrado por MODIS. En caso de utilizar la LST de día de MODIS, como variable dependiente, la R^2 alcanzada (por medio de un modelo cuadrático) es 0,660.

⁴ El hecho de haber utilizado una única imagen, relativa a la época otoñal, dificulta el entendimiento de la UHI diurna. Un refinamiento posterior al trabajo que aquí se presenta debería incluir las imágenes de primavera, verano e invierno.

Por su parte, la utilización del NDBI no permite resolver el problema de discriminar el efecto de los suelos desnudos en la LST. Como se puede deducir tanto de la tabla n. 1 como de la figura n. 9 los suelos agrícolas obtienen, por lo general, un elevado NDBI.

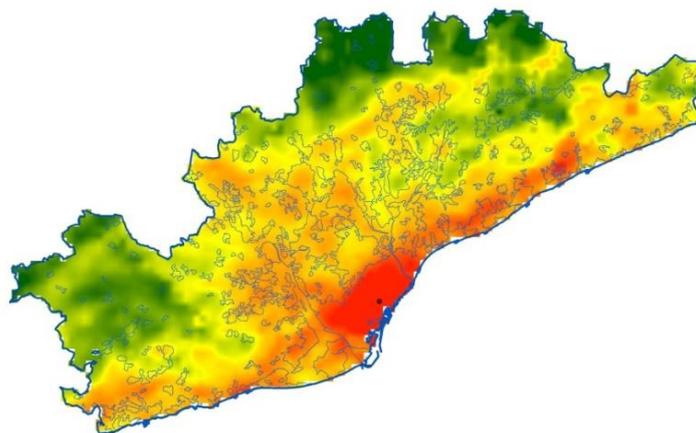
Figura 9. NDVI vs. NDBI



Fuente: Landsat. Elaboración propia

La LST nocturna, en cambio, ofrece una imagen mucho más nítida de la UHI metropolitana de Barcelona (figura n. 10). Los valores máximos de la LST noche aparecen, por lo general, asociados a las zonas de mayor artificialización, en especial Barcelona ciudad y su continuo urbano, que alcanza las temperaturas nocturnas más elevadas. También la línea litoral, con una mayor proporción de suelo urbanizado, o los enclaves altamente artificializados del Vallés, muestran una temperatura más acusada. No obstante, la temperatura nocturna dista de mostrar una relación lineal con el grado de urbanización. Otros factores como la cercanía al mar, o la altitud determinan también la LST de noche. Especialmente determinante es el efecto marítimo, que en la época del año analizada (inicio del otoño) mantiene elevadas temperaturas en la costa, provocada por la acusada inercia térmica del mar.

Figura 10. LST nocturna (MODIS, 1 km de resolución)



Fuente: MODIS. Elaboración propia

Sin embargo, y a pesar de que los factores geográficos condicionan de manera acusada la temperatura nocturna, emerge una clara isla de calor de origen intrínsecamente urbano. *El suelo artificializado tiene, de media, más de un grado de diferencia respecto al suelo no*

artificializado (16,67 frente a 15,39 °C). Como muestra la tabla n. 2, el suelo residencial compacto, el residencial disperso así como el resto de cubiertas urbanas y el suelo forestal denotan una mayor inercia térmica, con reducciones de temperatura entre la noche y el día inferiores a los 13 grados. Frente a los anteriores, el suelo industrial y, sobre todo, el suelo agrícola, observan reducciones mucho más acentuadas (con más de 14 e incluso 15 grados Celsius). La UHI emerge con toda claridad: aun con la reducción de la LST industrial, todas las categorías de cubiertas de suelo urbanizadas alcanzan temperaturas nocturnas superiores a las cubiertas rurales. Es de destacar, en este sentido, la elevada temperatura nocturna del suelo residencial disperso, característico del urban sprawl, a diferencia de su más moderada LST diurna.

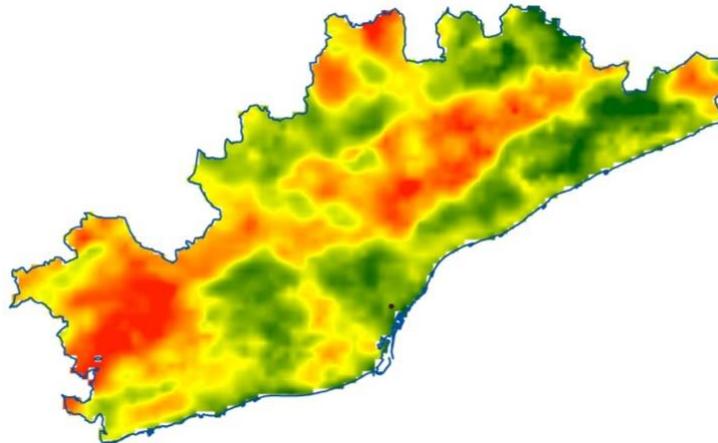
Tabla 2. Diferencias de LST diurnas y nocturnas

Corine	LST (día)	LST (noche)	Diferencia
Compacto	30,3514	17,62809	12,72331
Disperso	28,8026	16,17281	12,62979
Industrial	31,2106	16,51994	14,69066
Otros Usos Urbanos	29,716	17,05805	12,65795
Agrícola	30,0684	15,06178	15,00662
Forestal	26,934	15,23426	11,69974
Otros Usos Rurales	28,3466	15,32152	13,02508

Fuente: MODIS. Elaboración propia

Por su parte la figura n. 11 muestra la diferencia de temperatura entre el día y la noche según MODIS. Puede observarse que las zonas más centrales y urbanizadas (especialmente el continuo urbano de Barcelona) así como las cubiertas de suelo forestal tienden a tener un menor enfriamiento nocturno (color verde), a diferencia de las áreas agrícolas (mayormente desnudas) e industriales, cuyo enfriamiento es más acusado (gama de rojos). No obstante, también intervienen de forma significativa factores de orden geográfico, como la cercanía al mar. En este sentido se contraponen la depresión y cordillera litoral (con menor enfriamiento) a la depresión pre-litoral (con diferencias de temperatura día/noche más pronunciadas).

Figura 11. Diferencia entre la LST de día y de noche (MODIS, 1km de resolución)



Fuente: MODIS. Elaboración propia

A fin de explicar la variación de la LST nocturna suministrada por MODIS se ha ensayado un modelo OLS. La tabla n. 3 presenta los resultados. El modelo, a pesar de obtener un modesto nivel explicativo ($R^2 = 0,58$), limitado por la exclusiva inclusión de variables explicativas que pudiesen más adelante ser aplicadas a la escala de resolución de Landsat⁵, permite comprender los factores explicativos de la formación y distribución espacial de la LST. Los factores geográficos participan de forma significativa en el modelo, como por ejemplo la altura respecto al nivel del mar ("DTM"), la distancia a la costa ("Dist_costa"), la orientación ("orientació") o la pendiente ("pendent"). El NDVI ("mndivi" y "mndivi_corine") confirma su contribución suavizadora de la LST. Igualmente, se confirma la importante significación de las cubiertas de suelo ("corine_rec"), segmentadas en virtud a las cubiertas de CLC ("MLST_dia1_corine"), así como por la distancia al mar ("MLST_dia1_corones_corine_rec"). Estas últimas variables, unido a la contribución negativa de la distancia al centro metropolitano ("Dist_Centre"), ratifican la existencia de la UHI nocturna en la AMB.

Tabla 3. Modelo OLS de la LST nocturna

Resumen del modelo^b

Modelo	R	R cuadrado	R cuadrado corregida	Error típ. de la estimación
1	,763 ^a	,583	,582	1,08252

a. Variables predictoras: (Constante), mndivi_corine, Orientació, Dist_costa, Dist_Centre, Pendent, Corine_rec, MLST_dia1, DTM, MLST_dia1_corones_corine_rec, mndivi, MLST_dia1_corine
b. Variable dependiente: mlst_nit1

Coefficientes^a

Modelo	Coefficients no estandarizados		Coefficients tipificados		t	Sig.
	B	Error típ.	Beta			
1 (Constante)	40,4457015672	1,399			28,913	,000
Dist_costa	-,0000502338	,000	-,297		-18,944	,000
Dist_Centre	-,0000161871	,000	-,124		-11,051	,000
DTM	-,0039855700	,000	-,543		-26,592	,000
Orientació	-,0004865825	,000	-,029		-2,699	,007
Pendent	,0165971210	,001	,191		13,963	,000
Corine_rec	-,1309106575	,017	-,136		-7,691	,000
MLST_dia1	-,1034591827	,018	-,137		-5,908	,000
mndivi	-,10638771573	,241	-,107		-4,417	,000
MLST_dia1_corine	-,2923398718	,041	-,275		-7,073	,000
MLST_dia1_corones_corine_rec	-,2769668444	,026	-,261		-10,838	,000
mndivi_corine	-4,4747101596	,577	-,376		-7,757	,000

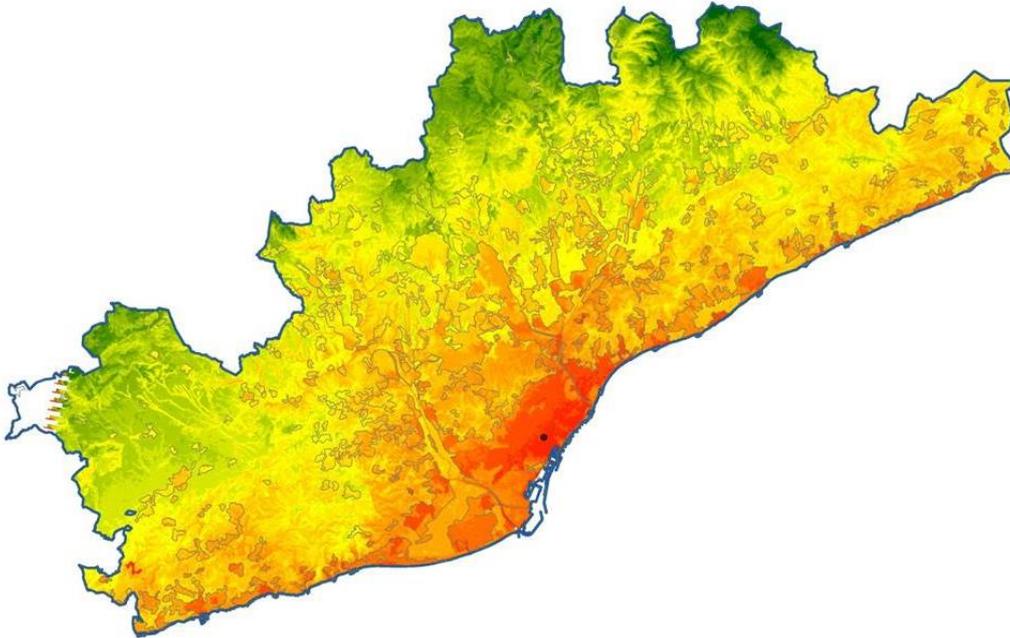
a. Variable dependiente: mlst_nit1

Fuente: MODIS. Elaboración propia

La aplicación del modelo anterior a la escala de resolución de Landsat (30-10 m²/píxel) permite visualizar con un mayor grado de precisión la LST nocturna del Área Metropolitana de Barcelona. La figura n. 12 representa la imagen del modelo OLS anteriormente expuesto, adaptada a la escala de resolución de Landsat. La superposición de la LST con los contornos urbanizados obtenidos por medio de CLC evidencia la existencia de una marcada UHI en la AMB y para la época estacional analizada.

⁵ El ensayo de un modelo OLS con variables "nocturnas" en vez de "diurnas" es acusadamente más explicativo de la variación espacial de la LST, del orden de un 70%. Sin embargo, como se ha indicado más arriba, el objetivo del modelo consiste en replicar la distribución espacial de la LST nocturna con la información proveniente de Landsat, y de esta manera alcanzar una resolución más detallada.

Figura 12. LST nocturna a 30-100 m/píxel



Fuente: MODIS, Landsat, CLC. Elaboración propia

Conclusiones

La realización del estudio que aquí se presenta confirma la existencia de una clara Isla de Calor Urbana en el Área Metropolitana de Barcelona. Tanto la información resultante de Landsat (día) como de MODIS (día y noche) confirma una mayor concentración de calor en las superficies artificiales resultantes de la urbanización respecto las de carácter rural. El análisis de la imagen térmica nocturna, así como de la diferencia día/noche ratifica la hipótesis de que es especialmente durante la noche cuando emerge la UHI. Sin embargo la LST nocturna tan sólo ha podido ser obtenida a baja resolución (1 km²/píxel), lo que presenta una imagen excesivamente poco detallada de la isla de calor de Barcelona. Por ese motivo se ha ensayado un modelo para trasladar la estructura de la LST nocturna obtenida mediante MODIS a una mayor resolución, de 30-100 m²/píxel, equivalente a la resultante del satélite Landsat. La comparación entre ambas imágenes de elevada resolución, diurna y nocturna, evidencia con toda rotundidad la existencia de una acusada UHI en el Área Metropolitana de Barcelona.

Los resultados obtenidos sugieren que la UHI puede ser modelada, a pesar de las limitaciones de información sobre LST nocturna. Es importante destacar la importancia de este tipo de estudios con el fin de introducirlos en la práctica de la planificación urbana y territorial por tal de poder anticipar los efectos climáticos de la misma y permitir, en consecuencia, incrementar la resiliencia de los sistemas urbanos al cambio en el clima.

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SOCIAL CONFLICT IN RESPONSE TO URBAN SPRAWL IN RURAL AREAS. URBAN RECONFIGURATION OF THE MEZQUITAL VALLEY AS INFLUENCE AREA OF THE MEGALOPOLIS OF MEXICO CITY

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Key words: Urban sprawl, Mexico City Megalopolis, Social conflict, Mezquital Valley.

Abstract

The urban sprawl of metropolitan areas involves complex processes of coexistence between urban and rural dynamics, the functional redefining of central urban areas and rural areas or urban-rural surrounding transition generates land conflicts. In this paper the context of Mexico City megalopolis and its expansion process, will be discussed in the new specialization of the central city to tertiary services and increasing the value of land, it has resulted in the expulsion of the industry and social housing to the increasingly distant urban periphery. The urban

development by strength of small towns that surround Mexico City, has generated various social conflicts that claim the right to a healthy environment and territory. The aim of the paper is to analyze the process of urban expansion of the megalopolis of Mexico City to the region of Mezquital Valley, with main emphasis on urban and industrial growth and the emergence of social conflicts in response to these territory changes. The research method is the quantification of urban growth detected by statistical data and monitoring social conflicts related to urban expansion in Mezquital Valley. By the work has been revised three emblematical and recent cases of this social movements: the *Ciudades del Bicentenario* project, movements against cements industries and the MSW management project *SIGIR: Valle de México*. The main conclusions were that urban expansion has generated social and environmental impacts, for populations that are exempt from the benefits of central urban areas. These new peripheries require a comprehensive urban planning, which are considered social needs and environmental rationality. Otherwise they become bonded areas that grow in marginal conditions and are affected by the progress that generate them benefits away from them generates new problems.

Conformation of Mexico City megalopolis

The concept of megalopolis, was introduced in 1961 by J. Gottman, to describe a region in exercising their area of influence on diverse metropolis, and other medium cities, that depend of the great urban areas. The characteristics proposed by Gottman of a megalopolis area: the growth of cities, the division of labor within a civilized society, the development of world resources. The author comment that the megalopolis is a particular new type of region, but is the result of age-old processes, that had conform this complex urban areas. They contain several metropolitan areas and acquire an own personality (Gottman, 1961: 4).

Another definition of megalopolis is offered by Lang & Dhavale, which considered the existence of trans-metropolitan clusters, in which a special connectivity is observed. Based on the concepts of *space places* for physical distribution of built environment. And the *space of flows*, or sets of connection that links places via transportation systems and business networks. A way to test realizer geographical complete is by considering places and flows in space (2005: 4-5). In their work they presented the megalopolis as a unit of analysis necessary in the present, which is determined by the global economy, based on the elements of place and flows to determine its location and boundaries.

The authors defined megalopolitan areas as: areas that combines at less two, but may include dozens of existing metropolitan areas; Totals more than 10,000,000 projected residents by 2040; Derives from contiguous metropolitan and micropolitan areas; Constitutes an organic cultural region whit a distinct history and identity; Occupies a roughly similar physical environment; Links large centers through major transportation infrastructure; Forms a functional urban network via goods and service flows; And, creates a usable geography that is suitable for large-scale regional planning (Lang & Dhavale, 2005: 5-6).

Given the above characterization we found that Mexico City and the eight surrounding metropolitan areas, can be classified as a megalopolis, since they meet the characteristics of delimitation proposed by the authors. Mexico City has presented an increasing expansion throughout the twentieth century, due to being the most important urban area of the country.

Conformation as metropolis expanded at first a regional crown formed by the municipalities of eastern and northern Mexico State. But its expansion and regional influence has led to the creation of a megalopolitan area consisting of the metropolitan areas of Cuernavaca, Cuautla, Puebla-Tlaxcala, Tlaxcala-Apizaco, Tianguistenco, Toluca, Tula, Pachuca, all present adjacent municipalities to the metropolitan area of Mexico Valley.

Table 1. Metropolitan areas that conform the Mexico City megalopolis

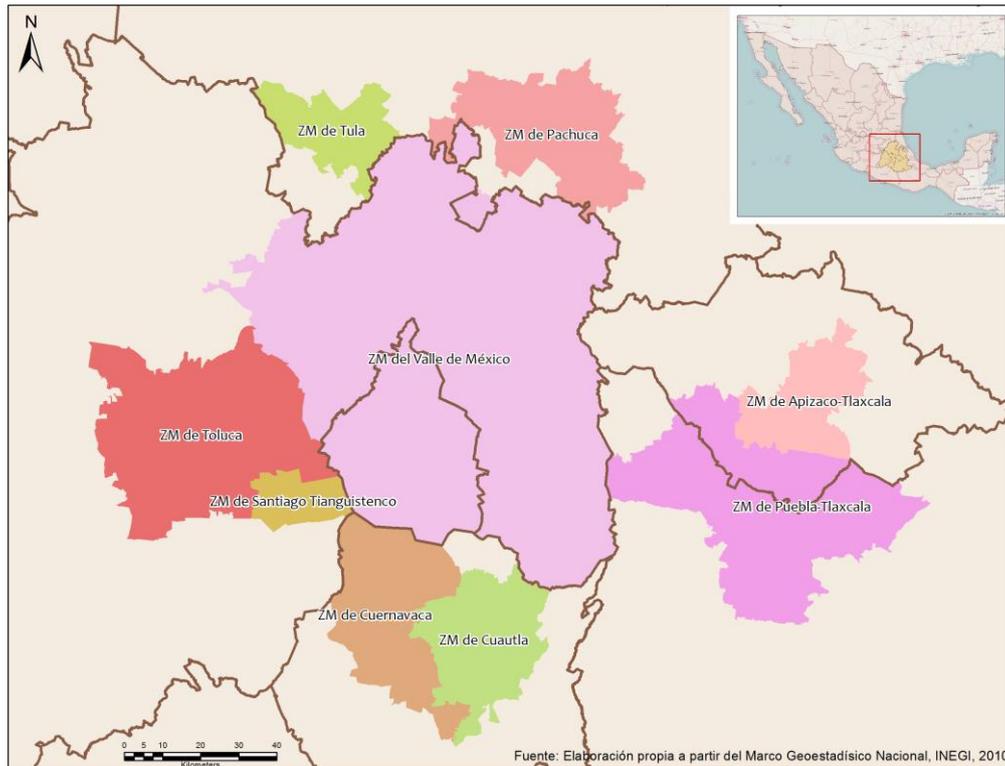
	Metropolitan area	Population 1990	Population 2000	Population 2010	Municipalities 2015	Urban average density (hab/ha)	Land area (km ²)
1	Cuernavaca	587 495	798 782	924 964	8	70.7	1 189.9
2	Cuautla	279 697	372 256	434 147	6	51.1	979.6
3	Puebla-Tlaxcala	1 776 884	2 269 995	2 728 790	39	76.6	2 392.4
4	Tlaxcala-Apizaco	303 779	408 401	499 567	19	34.7	708.1
5	Tianguistenco	92 830	127 413	157 944	6	56.4	303.4
6	Toluca	1 110 492	1 540 452	1 936 126	15	64.8	2 203.2
7	Tula	140 438	169 901	205 812	5	30.1	591.4
8	Pachuca	276 512	375 022	512 196	7	76.3	1 196.5
9	Mexico Valley	15 563 795	18 396 677	20 116 842	76	160.1	7 866.1
	Total	19 544 427	23 660 117	26 591 424	181		16 240.7

Source: Self elaboration whit data of CONAPO, et. al. 2012.

The megalopolis has a population of over 26.5 million habitants, by 2010, in addition to a complex communications network. The municipalities that compose it keep different characteristics in terms of economic activities that they develop and the population density. In the regions urban and rural areas are confronted, while Mexico City is demanding more space for urban development. By the eighties began a process of de-industrialization of Mexico City, due to the vocation towards tertiary activities. As a result the surrounding areas received the industry that the capital city expelled.

As Escamilla & Santos pointed: the expulsion of industry activities out of Mexico City as generated "a transformation of peripheral agricultural areas use discontinuous patterns of urban-rural land; circulation intensifies goods, people and capital by technological advances in transportation and communications; trendsetting manufacturing location to the periphery... where the concentration of productive activities and urban population concentrated in some cities, later redeployed in intermediate cities, process called *concentrated deconcentration*". (Escamilla & Santos, 2012, pp. 7) This concentration, involves the surroundings metropolitan areas and another intermediate cities, which has been receiving productive activities and population, making grow the area or influence of the capital.

The principals areas to receive industrial facilities was corridor Toluca-Lerma, Puebla and Mezquital Valley, in this last one, it has concentrated high pollution industry. In addition to this the site has been the natural destination for the urban sprawl of Mexico Valley metropolitan area. In this process several social conflicts have taken place, as a result of the constant tensions that arise between the habitants of this area and the new urban configurations that take place on its territory.

Figure 1. Map of Mexico City megalopolis

Source: Self Elaboration whit data of Marco Geoestadístico Nacional (Inegi, 2010)

Urban and Industrial development of Mezquital Valley as an impact area of Mexico City's megalopolis sprawl

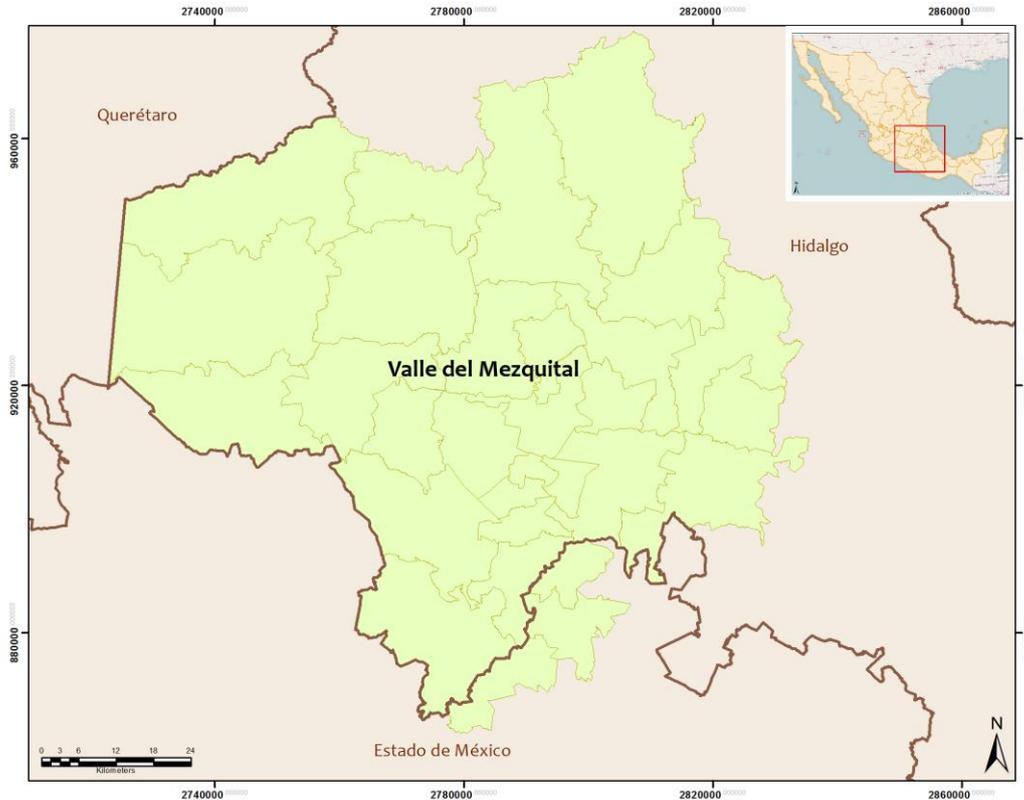
Mezquital Valley, also called Tula-Tepeji industrial corridor, is a micro region catalogued as that, for its cultural, physical and functional characteristics. Is located 60 kilometers far to Mexico City. Its extension includes 27 municipalities of Hidalgo State and 3 of Mexico State (see Map 2), whit a population of 1,050,810 habitants. From 1990 to 2010, its population increase was 147%, highlighting the municipality of Huehuetoca a 392% increase in population in the period. Other municipalities that stand out in terms of population growth are Tula, Tepeji, Ixmiquilpan and Actopan. Similarly it is in those municipalities where it has the largest concentration of industries and jobs of the micro region.

Unlike the constant in the rest of the megalopolitan area on Mezquital Valley, productive activities dominated industry, taking 36% of the population employed, predominantly on commerce and services. While the population employed in commercial sector is 33% and 30% service sector.

In the period 1989-2009, the number of workplaces totals increase 385%, while the number of employees increased by 342%, the above speaks of an accelerated economic and employment development. These workplaces increased 225% in the industrial sector. While an increase in

commerce was 430% and services 565%. Resulting in an increase of 36,869 employees in the three sectors 1989 in 126,030 employees for 2009.

Figure 2. Map of location of Mezquital Valley



Source: Self Elaboration whit data of Marco Geoestadístico Nacional (Inegi, 2010)

However wages in the three sectors have increased very little, considering inflation and the purchasing power of the population by 2010, and comparing wages between 1989 and 2009 in the industrial sector increased remuneration for employees was only 9.66%. For the commercial sector the increase was 27.5% and for service sector the increase was 20.9% in twenty years. As we can observe the micro region has experienced major changes in the period of study, from the transformation towards industrial activities, to the increment of the population, generated by the location of social housing in the area. Analyze social movements come from the conflict of interest inherent in the confrontation of urban development and rural. Below we review three of these conflicts that have taken place in recent years in the area of study.

Social conflict as response of urban sprawl

In the last twenty years the Mezquital Valley, has become a peripheral housing area of Mexico City. Its proximity allows transfers are made on a daily basis allowing access to low-cost housing a large number of working people who could not afford the high rents in Mexico City.

Similarly, the industrial growth of the area population generates attraction, by manufacturing employment.

However, although the conditions may seem favorable for the area, the affectations that region of Mezquital Valley suffers from the growing urban sprawl brought about the influence of the megalopolis are innumerable. In the last ten years, there have been social movements of resistance in opposition to urban development megaprojects that affect human and environmental health, and impact the territory. In Mezquital Valley there are numerous industrial parks, an oil refinery, a thermoelectric plant, seven cement plants and is also an agricultural production area that for decades has used the sewage from Mexico City to irrigate their crops.

These conditions have led to a concentration of pollutants in the area, which was considered the most polluted region in the world by UNESCO in 2005. "The seriousness of the matter can not be quantified only in its environmental dimensions, but now in human... the pollution of this region is present in soil, water and air, causing diseases such as cancer, the first recorder case of anencephaly, and communes respiratory and skin diseases" (Proceso, 2005, pp.1). Environmental issues in the area have affected human health, industrial activities and housing in outlying areas that demand public services, these developments have created social tensions on various issues affecting communities.

Social Movements as effects of urban sprawl: Ciudades del Bicentenario

The problem of population growth concentrated in Mexico City megalopolis, is a challenge for the governments involved in this territory. Mexico City undergoes a process of gentrification led to rising urban land, which has forced the expulsion of low-income population into even more remote peripheries. Initially (1980s) the urbanization expanded on neighbor municipalities in the State of Mexico, monopolizing of poor housing towns like Nezahualcoyotl, Ecatepec and Valle de Chalco. The subsequent expansion in the early twenty-first century, is given to municipalities of Hidalgo, affecting Pachuca metropolitan area and to Mexico State, particularly in Toluca metropolitan area. Currently the Federal and Mexico State governments have developed a social housing program called *Ciudades del Bicentenario*.

The former aims to create: "population centers selected for their location, their ability to receive significant population increases, to be able to accommodate infrastructure and strategic facilities and being in position to have any means of sufficient communication network to allow regional and national articulation. The purpose is to concentrate infrastructure and equipment in strategic population centers for land use planning... This must be model cities, self-sufficient, properly planned and highly competitive" (GEM, 2007, pp. 3). The *Ciudades del Bicentenario* are projected to accommodate 2,125,000 habitants and 492,000 social housing by 2020, the development of six of these urban centers is projected in Mexico State (in the municipalities of Almoyna de Juarez, Atlacomulco, Jilotepec, Huehuetoca, Zumpango and Tecamac) (GEM, 2007, pp. 10-15). All of them located in rural areas, being subject of rapid urban development. In this section we will refer to the one located in Huehuetoca, belonging to the region of the Mezquital Valley and which has led to a social resistance against the project.

The *Ciudad del Bicentenario* located in Huehuetoca plans to built 104,100 houses, for 447,700 inhabitants, and the installation of industries in 822 hectares, which will generate about 61,600 jobs (GEM, 2007, pp. 13). Yet eight years into the project are multiple critics towards it, since the integral development has been limited to the residential building, without a strategic planning services and efficient mobility to workplaces, and have not captured the alleged industries for job creation. The municipality has not received a significant increase budget to attend basic services (water, sewer, electricity, garbage collection, security, etc.): “They present in water shortages terminus generals, deterioration of structures and some equipment, and mobility problems. Thousands of homes are uninhabited and/or abandoned” (Alcántara, 2013, pp. 1).

Opposition to the project by groups organized in Huehuetoca and neighboring municipalities, comes from the detection of flaws in the plan, such as those mentioned above. It is reported that the development has concentrated a large number of new homes in the area, which are in competition for basic services that the municipality must provide, but do not have the economic or operative capacity for its endowment. Also the emergence of different social pathologies such vandalism, theft and robbery and social rupture: Usually it is low-income families, where adults require travel long distances daily to workplaces, leaving children and adolescents alone most of the time, so that about broken families. The location of these large housing developments in rural municipalities with deficient infrastructure for mobility, congested roads. For residents of these new housing complexes, daily transportation to workplaces, represent a major economic and time investment, which becomes the deterioration of their quality of life.

So far, the development of *Ciudades del Bicentenario*, has only meant the rise of real state markets near the project (Espinosa-Castillo, 2014, pp.9), for the benefit of private companies. Communities in opposition denounce the dispossession suffered from their lands and natural resources: “The implementation of this strategy has generated diverse populations within the state territory, have been deprived of the use and enjoyment of the various natural assets that have protected and conserver ancestrally, because the purpose of government of Mexico State is to take these goods to consolidate catastrophic urban and industrials mega-developments named *Ciudades del Bicentenario*, hidden under a discourse of modernization, economic development and competitiveness” (CDHZZL, 2015, pp. 7).

Once started the projects, the state government has not followed up on their development, so this type of housing is not sustainable, as was the claim. The result is the appropriation of agricultural soils in the generation of homes that do not contribute to personal development of its habitants and generate conflicts whit first residents, who see their territory transformed into rapid urbanization without direct benefits for communities and for new residents who don't have the basics services that need.

Social movements against cement plants.

Mezquital Valley has large areas of limestone and other quarries, it is why mining for extracting various rocks has been a traditional economic activity. The first cement plant in this area, settled in the early twentieth century in Atotonilco, then followed installing cement plants in Mezquital Valley. Currently exist three in the municipality of Atotonilco, one in Apaxco, one in Huichapan,

one in Tula and another in Santiago de Anaya. Their environmental impacts are felt in different processes, as it is a opencast mining activity, the extractive process generates dust that promote airway diseases and deposited in soil, vegetation, water and crops. The second part of cement productive process involves spraying the stone from the application of heat cement kilns used as fuel oil derives, like industrials and waste tires. Since 2012 the incineration of municipal solid waste (MSW) from Mexico City began, causing the impact of air pollution increases.

Conflicts against the cement industry began in 2009 in the municipalities of Atotonilco and Apaxco, as a result of poor management of industrials wastes to be incinerated on Holcim cement kilns. Community detected chemical leakage from Ecoltec (the plant of transfer industrial waste, to be incinerated in the cement plant). These leaks were seen as strong smell of chemicals in the environment and the wastewater discharge Ecoltec, towards river. The consequences were the death of cattle that drank river water, then two strong explosions inside Ecoltec plant, but the event that most alarmed the community was the death of eleven farmers who died by accidentally inhaling toxic fumes from Ecoltec downloads. These events led to the formation of a social movement whit people of both municipalities which kept Ecoltec plant, closed for two years. Currently continued the resistance against the harmful effects of four cement plants in the two communities and the waste transfer plan Ecoltec.

Another conflict arose in Huichapan in 2012, when the incineration of MSW from Mexico City began in the Cemex cement plant. The residents of the municipality perceived strong and unpleasant odors from the plant, this triggered a series of protest and actions that gradually led the government to order stop the incineration of MSW at the plant. However the cement companies located in Hidalgo (Holcim, Lafarge, Fortaleza, Cemex and Cruz Azul) work whit state government legalizer MSW incineration and overcome social resistance by legal means.

The lasts conflict came against cement plants in the community of Santiago de Anaya in 2013, as resistance to the installation of the cement plant of the Fortaleza Group. In the installation of this industrial facilities, did not have the necessary permits from state and local governments, in addition to the irregularities during construction. The neighbors have denounced what they were overrun their land for the installation of powers lines, as having suffered damaged to their homes. So far the authorities have not given a favorable response to the residents, after the damages they have suffered.

Allegations of communities to cement industries are of a various kind, ranging from the invasion of a property, environmental pollution, the effects on human health, to the loss of human lives. Lack of planning leads to the coexistence of communities whit these industries, mostly settled in the middle of urban areas. But another important discontent community factor, is the collusion between business and government to carry out productive projects, even at the expense community well-being.

Conflicts for the management MSW: SIGIR-Valle de México.

In 2014, three municipalities in Mexico State signed an agreement for the creation of a body for the management of MSW, the called Intercity System of Waste Management (SIGIR-Valle de Mexico) was agreed by the municipal presidents of Huehuetoca, Apaxco and Coyotepec. The purpose is handling 160 tons of garbage daily, which are produced by 166, 474 inhabitants of

the tree municipalities. The agreement establishes the creation of a public organism that charged for the disposal of each ton of garbage a price proposed by the self organism, not by the municipalities. The organism will have own juridical personality, its own assets and budget, while municipalities undertake the purchase of the land for the operation of SIGIR-Valle de Mexico, pay staff salaries and operating costs. As well pay for the ton of waste dispose by the organism (AHAC, 2014, pp. 9-10). The organism may also market the MSW and foment the marketing of products derived from waste (AHAC, 2014, pp. 21).

Upon learning of the existence of the agreement between the tree municipalities concerned citizens began the opposition to it, that's the risk by means of waste incineration, a situation that has had a bad antecedent in Apaxco for the presence of Ecoltec and Holcim cements. The landfill for SIGIR-Valle de Mexico, will be located in Apaxco (Gallegos, 2015), being the only one of thee municipalities that as a cement plant, the MSW allocated to the plant for incineration. The opposition also contemplated that the costs of maintaining the SIGIR-Valle de Mexico, represent an arbitrary measure of the municipalities, which are subject to the cost that a particular wants to impose, taking as an added benefit the marketing of the sale of recyclable and merchantable waste.

The organism would be available any decision on the handling of waste and generate property for marketing and disposal in cement kilns: "the goal (of SIGIR-Valle de Mexico) is realize any activity related to the service public of clean, collection, transportation, treatment and disposal of solid waste" (AHAC, 2014, pp. 8-9). In that sense run any inherent action to it as gathering, reception, transportation, storage, use, recycling, processing, marketing and disposal of MSW, special management included hazardous domestic waste. Having the faculty of hiring third parties for such activities. A group of citizens in Apaxco begun a program of zero waste, that consist in the recollection, commercialization, recycling and composting of waste. The pilot program has been successfully applied in Santa Maria barrio of Apaxco. The aim is to demonstrate to local government, can be a sustainable way to manage the MSW, obtaining a profit of the activity and avoiding the pollution of incinerated waste in cement kilns. (Carrasco & Vargas, 2015, pp. 104-105)

The waste transfer centers is a initiative also applied in another states; Hidalgo is to work whit these schemes for waste management, "In march 2016, the Environment Secretary announced the creation of two waste transfer centers that will be located in Huichapan and Mineral del Monte. The first will receives waste from six municipalities, while the second will provide services to eight. The claim is that these transfer center *modernize* the treatment of waste, turning it into electricity, by thermic treatments" (Jimenez, 2016, pp. 1). In regard is wing incineration or co-processing of waste, highly pollution activities. "Besides aims the construction of such facilities in Tula, Tepeji and Ajacuba" (Jimenez, 2016, pp. 1).

This form of MSW treatment is a way to profit from waste. The initiative is driven largely by cement companies that charge to local governments by incineration. The expectative of those companies is to promote a National Waste Law, where these are considered as raw material subject to exploitation as fuel on cement kilns.

Conclusions

Population growth and attraction of Mexico City megalopolis is inevitable, since pre Columbian times this human settlement has been the main urban area of the country, represents an economic and cultural dynamism. Its influence is undisputed on a national and international level, becoming one of the largest and most important cities in the world and a point of financial influence in Latin America. Its economic, political and social development has been so rapid urban sprawl, which brings environmental and social problems, which become territorial conflicts.

The lack of interest in a rational and responsible territorial planning towards the environment and communities causes conflict and confrontation. In words of the affected communities: "From our experience, we observe the existence of a constant dispute, mainly between indigenous communities and government authorities, for control of common goods, among which water and earth" (CDHZA, 2015, pp. 6). Conflicts in the study area continue to rise, it is therefore necessary that the authorities seek ways of development that take into account the needs and welfare of its inhabitants.

Acknowledgment

Members of different social movements of Mezquital Valley, which have provided information necessary for conducting this research are appreciated: ProSalud Apaxco, Atotonili, Comunidades por la Vida, Ciudadanos de Atitalaquia pertenecientes a la Asamblea Nacional de Afectados Ambientales (ANAA), Movimiento Indígena de Santiago de Anaya and Ciudadanos Unidos por el Medio Ambiente (CUMA Huichapan). Likewise we thank the Mexico's National Council of Science and Technology (CONACyT), by funding provided for the development of the research project: *Movimientos Sociales por la Defensa del Territorio. Caso de los movimientos sociales en contra de la industria cementera en México, 2000-2017*. Convocatoria de Investigación Científica Básica SEP-CONACyT 2014.

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Appendix

Table 2 Municipalities that conform Mezquital Valley Region

	State	Name	Population 1990	Population 2010
1	Hidalgo	Actopan	40 613	54 299
2	Hidalgo	Ajacuba	12 704	17 055
3	Hidalgo	Alfayucan	16 830	18 879
4	Hidalgo	El Arenal	12 650	17 374
5	Hidalgo	Atitalaquia	17 626	26 904
6	Hidalgo	Atotonilco	19 327	31 078
7	Hidalgo	Cardonal	17 731	18 427
8	Hidalgo	Chapatongo	11 108	12 271
9	Hidalgo	Chilcuautla	13 697	17 436

10	Hidalgo	Francisco I. Madero	25 554	33 901
11	Hidalgo	Huichapan	33 479	44 253
12	Hidalgo	Ixmiquilpan	65 934	86 363
13	Hidalgo	Mixquihuala de Juarez	31 137	42 834
14	Hidalgo	Nopala de Villagran	13 456	15 666
15	Hidalgo	Progreso de Obregon	17 156	22 217
16	Hidalgo	San Agustin Tlaxiaca	19 941	32 057
17	Hidalgo	San Salvador	25 674	32 773
18	Hidalgo	Santiago de Anaya	12 457	16 014
19	Hidalgo	Tasquillo	15 090	16 865
20	Hidalgo	Tecozautla	27 224	35 067
21	Hidalgo	Tepeji del Rio de Ocampo	51 199	80 612
22	Hidalgo	Tepetitlan	7 430	9 940
23	Hidalgo	Tetepango	6 871	11 112
24	Hidalgo	Tezontepec de Aldama	31 651	48 025
25	Hidalgo	Tlahuilpan	11 508	17 153
26	Hidalgo	Taxcoapan	18 264	26 758
27	Hidalgo	Tula de Allende	73 713	103 919
28	Mexico	Apaxco	18 500	27 521
29	Mexico	Huehuetoca	25 529	100 023
30	Mexico	Tequixquiac	20 784	33 907
Total			714 837	1 050 703

Source: Self elaboration whit data of Inegi, 1990 and 2010.

ARE CONSUMERS WILLING TO PAY MORE FOR RESIDENTIAL ENERGY EFFICIENCY IN EMERGENT MARKETS?

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Key words: Energy efficiency, Real estate market, Willingness to pay

Abstract

In most of the countries, energy efficiency has been delegated to the dynamics of real estate markets, after regulating a minimum legal (although not optimal) efficiency level. So, it is expected that high efficient housing stock receives a market premium that, at least, equals the over-cost invested in improved thermal insulation and more efficient appliances. Theoretically, under such a mechanism developers are fostered to promote sustainable housing schemes. Nonetheless, the question of whether residential users do pay more for more sustainable housing remains to be explored in emergent markets where green labelling is still not legally implemented. This paper explores the impact of energetic efficiency of housing on demand's willingness to pay in Santiago de Chile. In doing so a contingent valuation approach is used in order to extract the structure of preferences for different levels of energetic efficiency for the residential market of houses. Results reveal that a significant proportion of respondents are willing to pay (WTP) a quantity that surpasses the cost of green investment. The results of a regression model aimed to explain the factors that lay behind WTP suggest that it is positively

influenced by: income level (indirectly measured by the price range of the requested house), educational level and demographics, being households with small children who pay the most. These results have important implications on the design of public policies aimed to improve the energetic efficiency of new housing developments.

Introduction

In most of the countries, energy efficiency has been delegated to the dynamics of real estate markets, after regulating a minimum legal efficiency level. So, it is expected that high efficient housing stock receives a market premium that, at least, equals the over-cost invested in improved thermal insulation and more efficient appliances. In that sense, the relationship between the sales price and the access to the real estate financing determines the maximum to pay for the dwelling, generating a supply curve where the cross elasticity of demand for the different attributes (e.g. improvements of the thermal envelope) is clear, generating a trade-off between them.

This research is focused on the residential real estate market of Santiago de Chile since this constitutes a niche that, despite that it is associated to a very significant segment of the middle-incomes population (in the last years, the private housing supply have been always in a range between 30,000 and 40,000 units) (Ministerio de Vivienda y Urbanismo 2016), has practically not been studied in terms of their energy efficient attributes. A first approach showed - based on data from the *Portalinmobiliario.com*¹ - that the positioning of the attribute of double glazing in windows has increased from 5% in 2007 to 29% in 2014, with respect to the total supply of apartments. On the other hand, the increase in thickness of the thermal insulation in walls has changed from 4% in 2010 to 10% in 2014, for the case of houses (Encinas 2015). In that sense, these attributes are frequently presented as isolated elements without considering the thermal performance of the dwelling as a whole system, in the sense proposed by Directive 2010/31/EU (Official Journal of the European Union 2010) and the Energy Performance Certificates (EPCs). Then, the question of whether residential users do pay more for more sustainable housing remains to be explored in emergent markets such this, where also green labelling – such as EPCs –is still not implemented as compulsory. This paper explores the impact of energetic efficiency of housing on demand's willingness to pay in Santiago de Chile. In doing so a contingent valuation approach is used in order to extract the structure of preferences for different levels of energetic efficiency for the residential market of houses.

Methodology

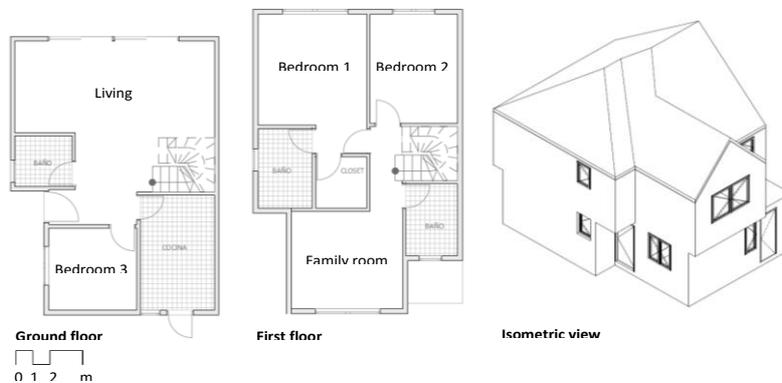
Definition of building typologies by means of cluster analysis

In the field of the real estate analysis, submarkets are usually defined according to price ranges with the aim of establishing supply niches. However, this kind of approach – exclusively defined as a function of supply prices – forgets that real estate markets can compensate the lack of some specific attributes with other attributes or amenities. Therefore, a multidimensional approach is required allowing for the integration of a series of indicators and attributes with the

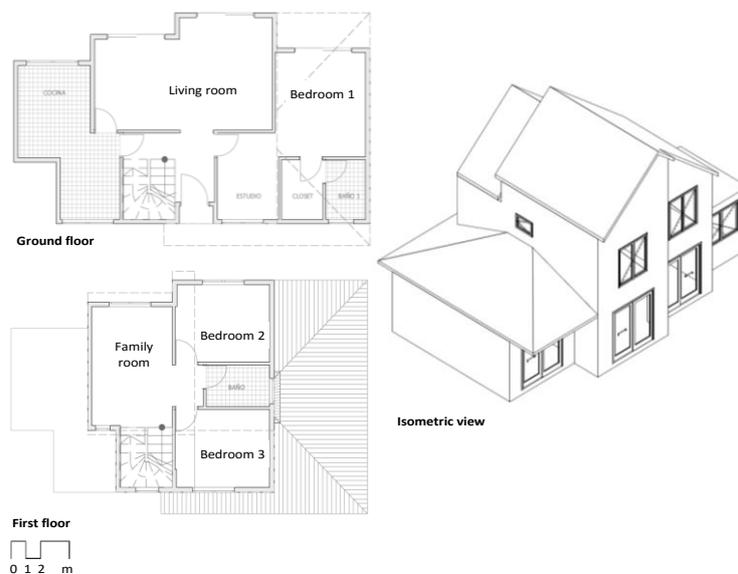
¹ *Portalinmobiliario.com* is the most important search engine for property, apartments and houses for sale and rental in Chile.

aim of being developed at the level of their value chain. This paper proposes a methodology based on clustering methods, which was implemented based on the *Portalinmobiliario.com* database. According to this procedure, 8 house typologies were defined by means of a hierarchical cluster analysis using the Ward's method, and considering the factor scores of a previously conducted Principal Component Analysis (PCA) as input variables for the clustering process. PCA was applied considering both supply price and area [m^2], and also 4 energy efficient attributes: double glazing in windows, the increase in thickness of the thermal insulation in walls, thermal solar collectors and water-efficient appliances. For the aims of this paper, 3 house typologies that represent the whole range of prices of the real estate market (Figures 1 to 3).

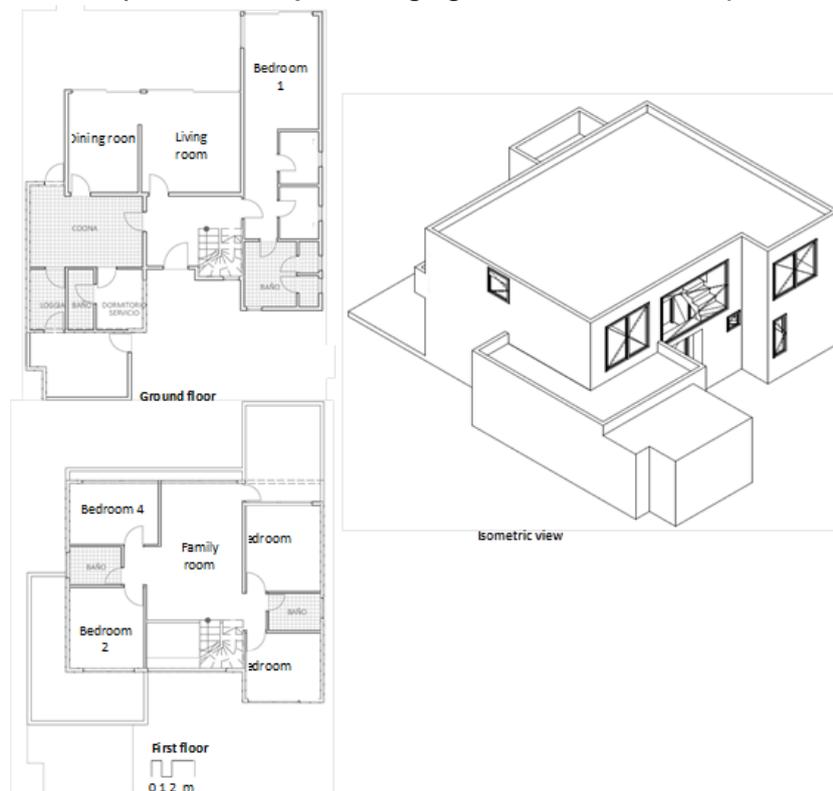
**Figure 1. Floor plans and isometric view for typology 1
(Houses with price range lower than 98,000 €)**



**Figure 2. Floor plans and isometric view for typology 2
(Houses with price range between 131,000 and 164,000 €)**



**Figure 3. Floor plans and isometric view for typology 3
(Houses with price range greater than 262,000 €)**



Life-cycle cost analysis as tool for reaching the optimum building envelope

Life-cycle Cost (LCC) analysis is a framework that was originally developed to provide designers with cost information to guide them by specifying the estimated total incremental cost of developing, producing, using, and retiring a particular item (Asiedu and Gu 1998), and has been more recently when an application to the whole building design has been proposed. Thus, a technique used to estimate the total cost of ownership has been developed under the name of Life-cycle Costing, with an interesting contribution to sustainable construction, since it proposes a long term vision in opposition to the traditional perspective that aims the immediate profitability along with a minimum investment, and ignoring their future economic and environmental impacts (García-Erviti, Armengot-Paradinas, and Ramírez-Pacheco 2015). This technique allows comparative cost assessments to be made over a specific period of time, taking into account relevant economic factors both in terms of initial capital costs and future operational and asset replacement cost.

LCC analysis has recently received a new impulse by the European Union thanks to the directive on the energy performance of buildings, Directive 2010/31/EU (Official Journal of the European Union 2010). According to this regulation, the requirements for energy performance and building elements should be set with the aim of achieving the cost-optimal balance between the investments involved and the energy costs saved throughout the lifecycle of the building,

without prejudice to the right of Member States to set minimum requirements which are more energy efficient than cost-optimal energy efficiency levels.

This directive was complemented by a Commission Delegated supplement to establish a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements. Among other concepts, the most important one that is defined in this document is the LCC, which represents the sum of the present value of the initial investment costs, sum of running costs, and replacement costs (referred to the starting year), as well as disposal costs if applicable (UNE-EN15459 2008; Official Journal of the European Union 2012):

$$LCC_{\tau} = C_i + \sum_j \left[\sum_{i=1}^{\tau} (C_{a,i}(j) \cdot R_d(i)) - V_{f,\tau}(j) \right]$$

where:

τ means the calculation period

LCC_{τ} means life cycle cost (referred to starting year τ_0) over the calculation period

C_i means initial investment costs for measure or set of measures j

$C_{a,l}(j)$ means annual cost during year l for measure or set of measures j

$V_{f,\tau}(j)$ means residual value of measure or set of measures j at the end of the calculation period (discounted to the starting year τ_0)

$R_d(i)$ means discount rate for year l based on discount rate τ to be calculated

Such analysis requires a whole and complex methodology that includes a building simulation software tool and most cases an optimization method. This paper presents a new methodology based on the combination of a simplified and a detailed building performance software tool, as well as, an LCC analysis method that allows reaching the exact solution in a very low CPU time. ISO 13790 was chosen as the calculation algorithm for the implementation of routines for building energy simulation. This standard gives a quasi-steady simplified calculation method for the assessment of the annual energy use for space heating of a residential or a non-residential building (ISO 13790 2008). This model was adjusted from the results of a dynamic-state building performance tool, carried out by means of TAS software (Environmental Design Solutions Limited 2016). The obtained root mean squared error (RMSE) for the model resolution was 0.13%, 2.09% and 1.16% for typologies 1, 2 and 3, respectively.

Finally, a sensitivity analysis was applied for all the proposed typologies based on this calculation procedure. The uncertainty was propagated on the model from 4 input parameters related to the thermal envelope (U-value of walls, windows and roofs, along with orientation) which were uniformly distributed through a Monte Carlo model. Indeed, a sample matrix of 10,000 samples by typology was defined from the combination of these input parameters and their corresponding distributions, obtaining the annual heating demand per unit area [kWh/m²/y].

Willingness to pay for residential energy efficiency by means of a contingent valuation method

From a constructive point of view, the housing stock is massively built by masonry and reinforced concrete construction, with 38.6% and 22.5% with respect to the total number of dwellings from the private market in the Santiago Metropolitan Area, according to the statistics from the National Statistics Institute (INE, 2015). However, these building systems traditionally had not incorporated thermal insulation in their building wall envelopes, which should be understood in the context of the current national Thermal Regulation, which defines the requirement of 1.9 W/m²K as a maximum U-value for external walls for this thermal zone. This standard can be reached by means of an increase in the height of the bricks and/or incorporating improved cement mortars (in terms of lower thermal conductivity). Since masonry corresponds to the most common building system applied in houses, in practice, after the introduction of the Thermal Regulation, they are still built without thermal insulation. This situation was also noted for the OECD, which recommended the incorporation of “effective thermal and energy standards” for the Chilean housing market, with the aim of improving the building quality, protect public health and reduce air pollution (Caldera 2012).

In order to assess the willingness to pay (WTP) for a more energy efficient house (in terms of improvements in the thermal envelope of the house typologies), participants of a survey were asked to directly state such a quantity using the contingent valuation framework.

Such a technique builds on the idea that changes in individual’s utility can be expressed in terms of compensatory variation, and thus it is possible to express it in monetary units. Namely, we have used an open ended format in order to extract the WTP for extra benefits coming from an upgraded energy efficiency. One of the main shortcomings of open end formats is the confusion that may produce on respondents the absence of any guide. For that reason, participants were informed about the marginal costs and benefits in energy expenses for each of the possible energy saving elements (Figure 4).

Figure 4. Willingness to pay for improvements in the thermal envelope for typology 1 as it was asked in the questionnaire survey

Considering that the house you are looking to buy has the minimum building elements according to the national regulation (single glazing in windows and masonry walls without thermal insulation):

Are you willing to pay for incorporating energy efficiency improvements as an extra cost in your new house?

As reference, the following table present some values. For example, upgrading from single to double glazing and adding 80mm of thermal insulation in walls has an additional cost of 1900 €, but, it represents savings on annual heating cost of 270 €.

Type of window	Thermal insulation in walls	Additional cost	Savings on annual heating costs
Double glazing	Without thermal insulation	500 €	80 €
Double glazing	20 mm of thermal insulation	1300 €	190 €
Double glazing	80 mm of thermal insulation	1900 €	270 €
Low-e double glazing	110 mm of thermal insulation	2600 €	320 €
Low-e double glazing	200 mm of thermal insulation	3900 €	360 €

Invitations to participate in the survey – constituted by 11 questions and implemented through an online questionnaire – were sent between 21st and 25th August 2015 by e-mail to registered users from the Portalinmobiliario.com database that have been looking new houses to buy in the Santiago Metropolitan Area. The survey framework presents a sample size of 378 respondents, with 5.04% of margin of error and a confidence level of 95%. Due to the characteristic of the survey, these results were considered as appropriate.

Results

One of the main purposes of the LCC analysis is to obtain the case corresponding to the minimum LCC (that can be identified as the “optimum case”), but there are many other cases of interest, especially those in the proximity of the efficient frontier. For the purposes of this paper, LCC was expressed in terms of LCC savings (with respect to the base case), where the higher point in the cloud represents this “optimum”. All cases in the also called Pareto front represent the best, i.e. cheapest, combinations for their correspondence final heating demand. Far from the proximity of this efficient frontier are cases that should be avoided, since the same heating demand can be obtained with lower LCC savings. Other points of interest in the efficient frontier are (Figures 5 and 6):

- (1) The base case (which complies with the minimum requirements of the Thermal Regulation)
- (2) The north-oriented base case (in comparison to the original south-oriented)
- (3) An improvement in the type of window (from single to double glazing)
- (4) The optimum case
- (5) An improvement in the type of window (from double to low-E double glazing)
- (6) The best case (from the point of view of heating demand)

Figure 5. Efficient frontier according to the type of window for typology 1

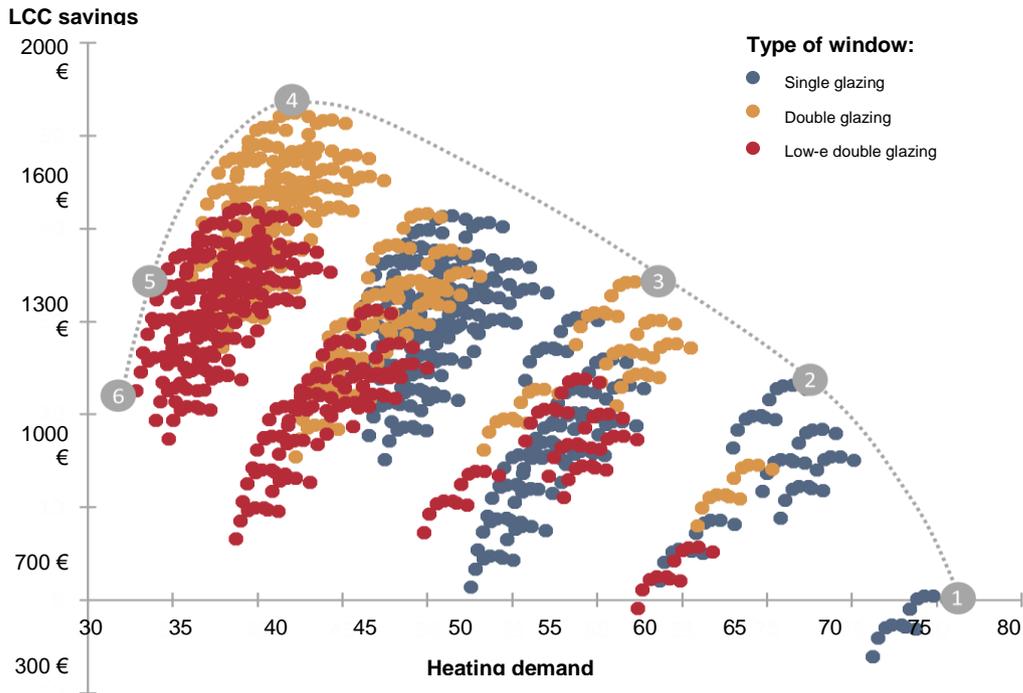
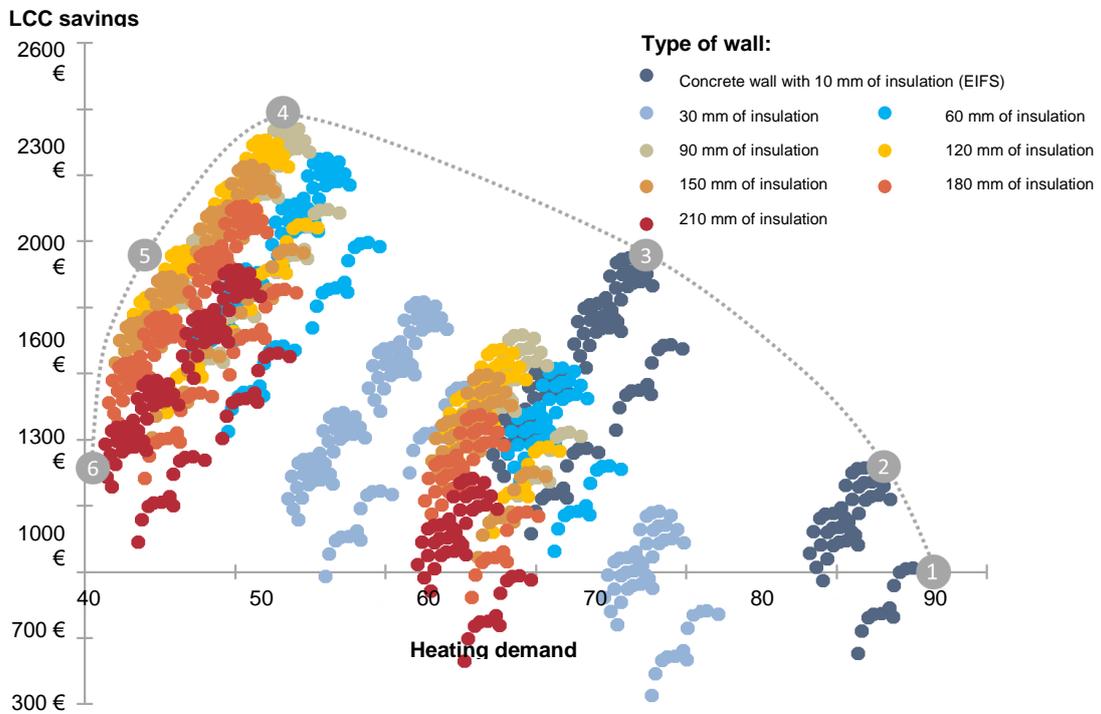


Figure 6. Efficient frontier according to the type of wall for typology 3



According to the results, the optimum case is reached by the incorporation of double glazing in windows and a range between of 80-90 mm of thermal insulation in walls for the 3 house typologies (expressed in the Figures 5 and 6 by the most extreme cases). The characterization of the 6 points of interest from the efficient frontier is also presented for typologies 1 and 3 (Tables 1 and 2, respectively). It is important to notice that the building systems considered in the case of walls for both typologies are different, since they represent also different building quality standards.

Table 1. Characterization of selected cases for the optimization model of typology 1

Cases*	Description	Orientation	Investment	Type of window	Type of wall**	Type of roof***
1	Base case	South	6300 €	Single glazing	Masonry wall without thermal insulation	80 mm of thermal insulation
2	North-oriented base case	North	6300 €	Single glazing	Masonry wall without thermal insulation	80 mm of thermal insulation
3	Upgrading from single to double glazing	North	6800 €	Double glazing	Masonry wall without thermal insulation	80 mm of thermal insulation
4	Optimum case	North	8100 €	Double glazing	Masonry wall with 80 mm of thermal insulation	100 mm of thermal insulation
5	Upgrading from double to low-e double glazing	North	9400 €	Low-e double glazing	Masonry wall with 110 mm of thermal insulation	170 mm of thermal insulation
6	Best case	North	10000 €	Low-e double glazing	Masonry wall with 200 mm of thermal insulation	200 mm of thermal insulation

(*) Corresponding to the points of the efficient frontier from Figure 4

(**) Considering EPS 15 kg/m³ on the inner side of the walls along with 10 mm plasterboard layer as interior finishing

(***) Considering mineral wool 40 kg/m³ along with 10 mm plasterboard layer as interior finishing

Table 2. Characterization of selected cases for the optimization model of typology 3

Cases*	Description	Orientation	Investment	Type of window	Type of wall**	Type of roof***
1	Base case	South	21100 €	Single glazing	Concrete wall with 10 mm of thermal insulation	80 mm of thermal insulation
2	North-oriented base case	North	21100 €	Single glazing	Concrete wall with 10 mm of thermal insulation	80 mm of thermal insulation
3	Upgrading from single to double glazing	North	22500 €	Double glazing	Concrete wall with 10 mm of thermal insulation	80 mm of thermal insulation
4	Optimum case	North	25700 €	Double glazing	Concrete wall with 90 mm of thermal insulation	100 mm of thermal insulation
5	Upgrading from double to low-e double glazing	North	27400 €	Double glazing	Concrete wall with 180 mm of thermal insulation	170 mm of thermal insulation

6	Best case	North	29500 €	Low-e double glazing	Concrete wall with 210 mm of thermal insulation	200 mm of thermal insulation
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(*) Corresponding to the points of the efficient frontier from Figure 5

(**) Considering EPS 15 kg/m³ on the outer side of the walls based on EIFS construction

(***) Considering mineral wool 40 kg/m³ along with 10 mm plasterboard layer as interior finishing

Willingness to pay (WTP) for improvements in the thermal envelope of dwellings – as was obtained by the questionnaire survey – was established from the cumulative frequency histograms, dismissing the protest votes (for example, users that are not willing to pay because they think that already pay too much for their house) and establishing associations with the strategies obtained through the LCC analysis model (Figure 7). In this sense, as it can be observed, the maximum WTP varies from 3900 € to 8400 € with respect to the best case (point 6 in Tables 1 and 2) for typologies 1 and 3, respectively.

Finally, between the models that can explain the WTP, a lineal regression with a coefficient of determination (R^2) of 0.4 was selected, which is represented by the following equation:

$$WTP = 2,373,337 X_1 + 1,563,196 X_2 + 681,749 X_3 + 627,160 X_4 + 379,598 X_5 + 300,357 X_6 + 938,163$$

where X_i are the independent variables that explain the model and correspond to:

X_1 means houses with price range greater than 262,000 €

X_2 means houses with price range between 164,000 and 262,000 €

X_3 means houses with price range between 131,000 and 164,000 €

X_4 means houses with price range between 98,000 and 131,000 €

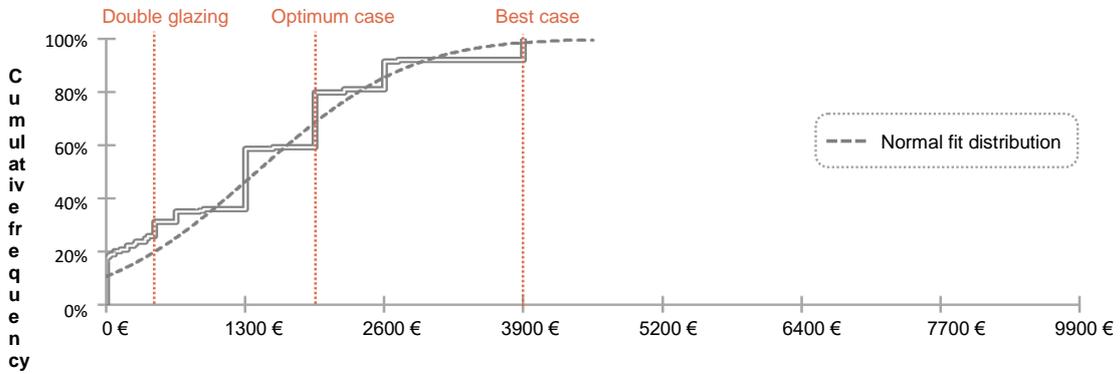
X_5 means users with postgraduate studies and that declare some kind of environmental action

X_6 means couples with children less than 5 years of age

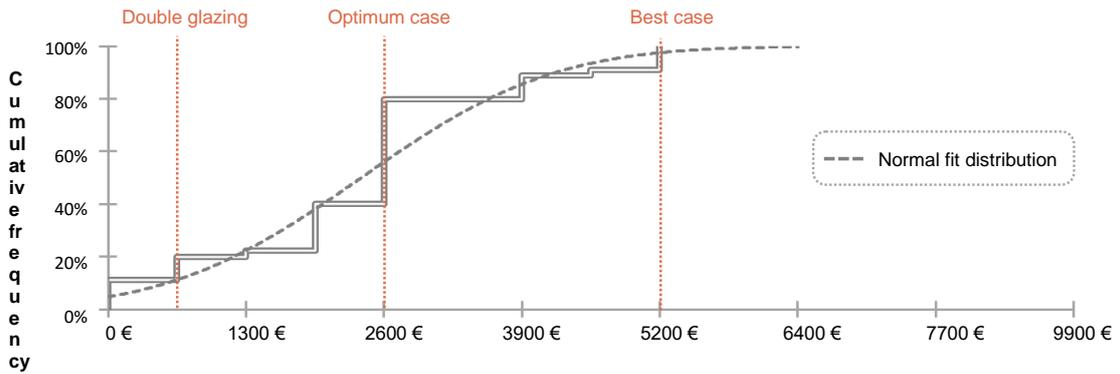
The results of a regression model aimed to explain the factors that lay behind WTP suggest that it is positively influenced by: income level (indirectly measured by the price range of the requested house), educational level and demographics, being households with small children who are willing to pay the most.

Figure 7. Willingness to pay for improvements in the thermal envelope of dwellings with respect to the LCC analysis model of the 3 house typologies

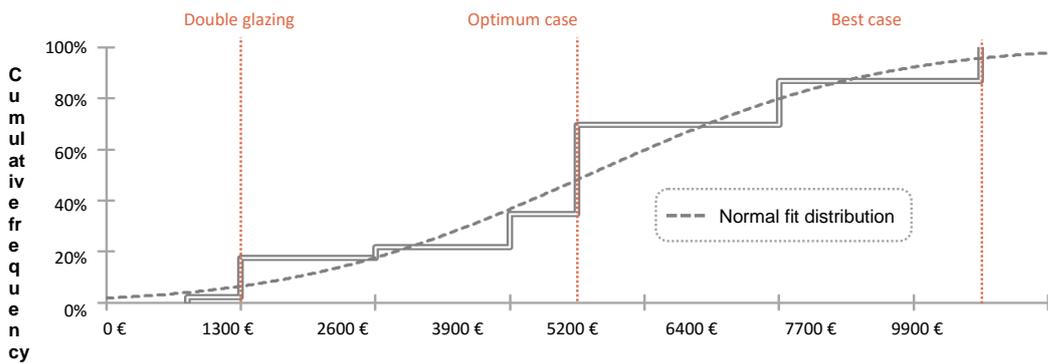
Typology 1 (houses with price range lower than 98,000 €)



Typology 2 (houses with price range between 131,000 and 164,000 €)



Typology 3 (houses with price range greater than 262,000 €)



Conclusions

According to the Energy Ministry of Chile, the residential sector represents 21% of the total energy consumption at the national level. Given this situation, it is clear that housing market represents a very relevant target for reducing its impact in terms of energy consumption, especially in the case of Santiago, which supply has been always in a range between 30,000 and 40,000 units in the last years. One of the methodologies for approaching energy efficiency is known as Life Cycle Cost (LCC) analysis, which has received a new international impulse by the European Union thanks to the directive on the energy performance of buildings. Such analysis requires a whole and complex methodology that includes a building simulation software tool and most cases an optimization method. This paper presents a new methodology based on the combination of a simplified and a detailed building performance software tool, as well as, LCC analysis method that allows reaching the exact solution in a very low CPU time. By means of this method, 3 building typologies - representative of the real estate market of houses in Santiago de Chile – were optimized in terms of their thermal envelope, which was represented by means of an efficient frontier with 6 points of interest. According to the results, the optimum case is reached by the incorporation of double glazing in windows and a range between of 80-90 mm of thermal insulation in walls for all building typologies. In order to assess the willingness to pay (WTP) with respect of the strategies obtained through the LCC analysis model, participants of a survey were asked to directly state such a quantity using the contingent valuation framework. Results reveal that a significant proportion of respondents are WTP a quantity that surpasses the cost of green investment. The results of a regression model aimed to explain the factors that lay behind WTP suggest that it is positively influenced by: income level (indirectly measured by the price range of the requested house), educational level and demographics, being households with small children who are willing to pay the most. These results have important implications on the design of public policies aimed to improve the energetic efficiency of new housing developments

Acknowledgements

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PATTERNS OF NON-PLANNED OCCUPATION OF THE PERI-URBAN TERRITORY OF THE HUERTA DE MURCIA, 1929-2015

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Key words: Peri-urbanisation, patterns, dispersion, Murcia.

Abstract

The peri-urban area of the Huerta de Murcia, around the city of Murcia, in southeast Spain, fundamentally dedicated to agriculture, has undergone a process of peri-urbanisation during the past 40 years, caused by un-regulated construction.

This agricultural area of about 10,000Ha originates from the ninth century, and is linked to an extensive network of canals channelled from the Segura River. This long-established irrigation system provides a much divided and fragmented agrarian morphology.

Most building has been carried out over the last 4 decades, mainly of family housing but also of holiday properties, and this construction has not been regulated, resulting in a spontaneous phenomenon of dispersed occupation.

Despite an apparent spontaneity and disorder in this occupation, this study uses an analysis methodology based on ortho-photographic series and cadastral data to show the existence of occupancy patterns, which vary over different periods.

The analyses of these patterns, in addition to a proposed classification, are the main subjects of the study, and will show how goals and methodologies for intervention and action may be set up.

Introduction

This report consists of a study of informal occupation by housing and other construction in the Huerta de Murcia, a phenomenon which is clearly visible especially since the 1980s. In the

second decade of the 21st century, this peri-urban dispersion around the city of Murcia has reached a level that is of great concern, as the original agrarian landscape has been transformed into rural-urbanised land with a very high residential population, yet with no guarantee of the minimum conditions applicable to urban areas, and endangering its use as viable agricultural land.

The study begins with a global analysis of the area of the Huerta de Murcia, divided into homogenous units of land, for which a study is carried out using combined data from the ortho-photographic series available on the SitMurcia website (www.sitmurcia.es) and cartographical cadastral data.

Using both sources of information and GIS software, the aim is to obtain a global image of all construction in the area during the different historical periods shown by the ortho-photographic collection.

The methodology applied in the study allows qualitative and quantitative conclusions about the analysed phenomenon to be analysed. The objective of this report is to present the results of the qualitative analysis, which will demonstrate conclusions on the determining factors of this disperse growth and establish graphic, geographical, urban and social patterns that have marked the occupancy phenomenon in the Huerta during different periods. This information will be presented alongside the principal quantitative values of the process, which will produce a global framework of the phenomenon according to periods and areas.

The final objective is to determine a series of proposals for intervention, with the aim of reversing or at least stopping this unsustainable process that can only lead to the area becoming a 'diffuse city' (Indovina, 2000).

Geographical and cultural context

The Huerta de Murcia is a natural area located close to the city of Murcia, in southeast Spain. The land was originally used for agricultural purposes in 825 AD following the Arabic colonisation of Spain, and an irrigation system was created around the Segura River, which runs through the valley where the city of Murcia was built.

The complex irrigation network, over a thousand years old, created an agricultural landscape of high cultural, aesthetic and patrimonial value, in the face of an arid climate interspersed with torrential rainfall. The area has been the focus of numerous studies in the last forty years, both geographical (by Calvo, Andrés, Serrano, Zapata, and Sempere), and more recently, urban (by Cano, García, Ros, and Roselló).

The urban-rural dichotomy of the landscape has existed for longer than a thousand years, and endured throughout a continuous process of transformation, which until well into the middle of the 20th century was dominated by the rural and agricultural activity. But the 1960s saw the beginning of two significant phenomena that would break the status quo and champion urban development.

One change was the unprecedented growth of the urban footprints of the city of Murcia and the urban centres located within the area of the Huerta. This growth has continually expanded the urban landscape of the thousand-year-old city, and is the same phenomenon that has affected practically all Spanish cities during this period, due to migration from the countryside to the

cities and a spectacular increase in population, and to the improvement in economic, social and political conditions.

The other influence was a slow, invisible but inexorable process that grew from the lifestyle changes of the population. City residents wanted a more relaxed life, and acquired the wealth to obtain the transport that brought the freedom to live where they wanted, and so they found desirable locations in the Huerta, just a short distance from the city, but where they could feel in touch with the countryside and its rural customs.

The Huerta de Murcia also forms a part of the irrigation systems of the valleys of the Segura and Guadalentín Rivers, which make up one of the most extensive cultivated areas in Spain. The different irrigation systems connect with others throughout the valleys of the region and link with the numerous urban populations of the Mediterranean arch (Lorca, Murcia, Orihuela, Elche, Alicante and other towns), to form one of the most important peri-urban areas of the Mediterranean.

Figures 1-2. Peri-urban context of southeast Spain. Area studied: Huerta de Murcia



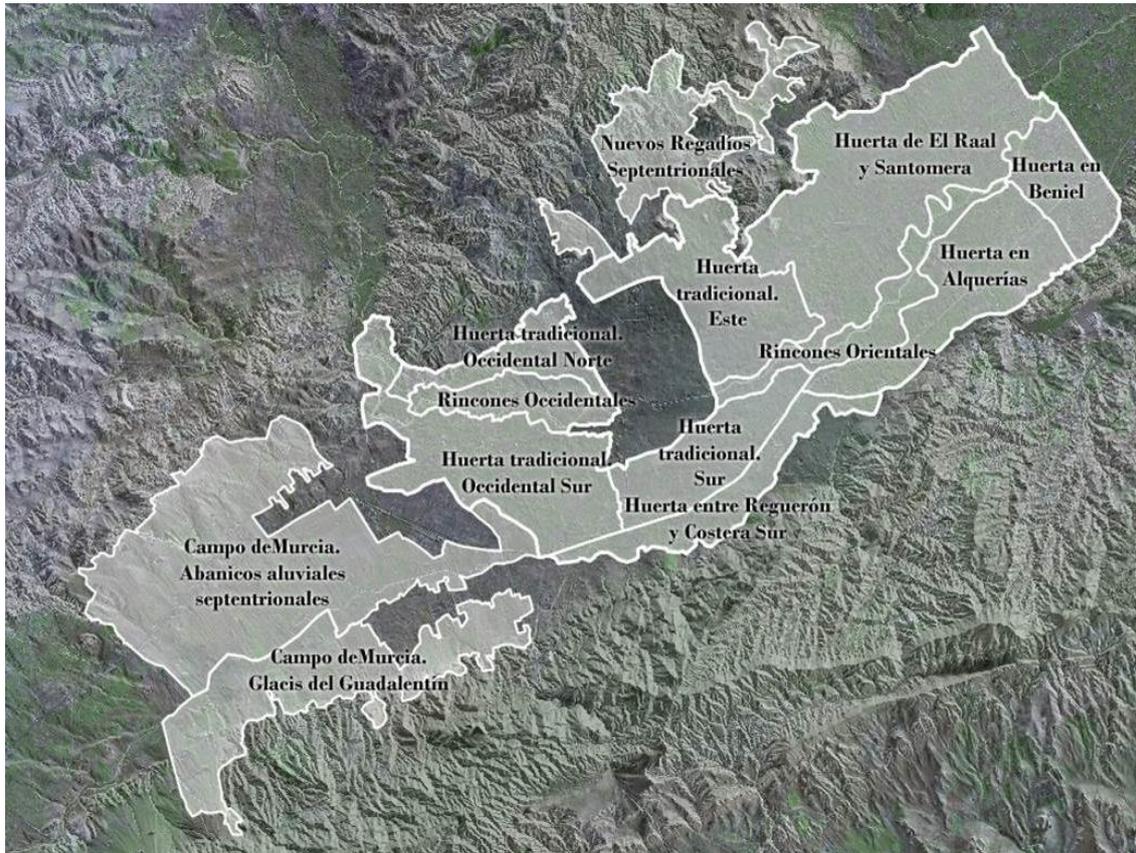
Source: Created from SITMurcia images (www.sitmurcia.es)

There have been few studies until now that have analysed this as a global phenomenon, although some partial studies have been carried out, and these can be compared with similar studies of other European regions (by Calvo, 1972; Ferrario, 2009; and Entrena, 2005).

Agrarian morphology and units of land

The agrarian morphology of the Huerta de Murcia is a product of the long-term transformational process of the units of land that began in the 9th century. Geographical studies (Calvo, 1972) have tended to apply morphological factors to divide the Huerta into three areas.

However, in 2011, the Landscape Strategy for the Region of Murcia defined fifteen homogenous units of land within the area of the Huerta de Murcia, based on an earlier study by Mata Olmo conducted in 2004. For each unit constituting factors were established: geoformations, hydrography, vegetation coverage, use of the terrain, elements of the agrarian structure, settlements, and road networks. Indicators of quality were also determined, providing measures of the quality or vulnerability of the landscape.

Figure 3. Units of land in the Huerta de Murcia

Source: Created from the Land Atlas of the Region of Murcia

This study applies the criteria for these established units of land as they relate to the traditional morphology of the Huerta, which is fundamentally determined by the characteristics of the agricultural plots, factors related to the possibility of occupancy and change of use, as well as regulations governing urban planning.

Methodology

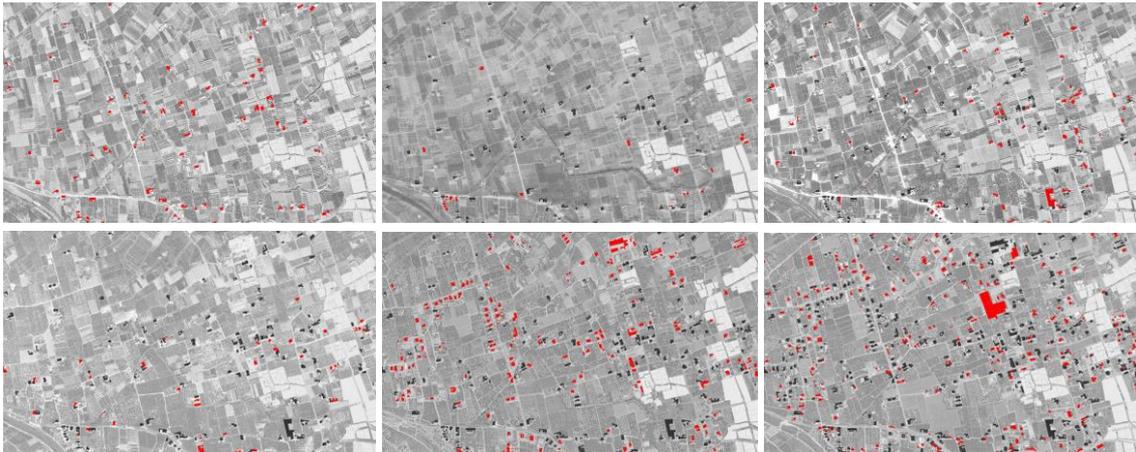
The research was initiated with a pilot study (by Ros and García in 2012) which analysed a section of the western Huerta. This study formed the first stage of the project, and served as a trial for the methodology techniques used to study the patterns and causes that have marked the transformation of the Huerta de Murcia.

The study was carried out using the ortho-photographic series, and a follow-up study was carried out manually according to date of construction and the relevant plots of land. Once all the data had been extracted, the areas of land, and the graphic and urban patterns, were studied numerically by period (CONAMA, 2012).

The second stage of the project expanded the area of study to cover the whole of the Huerta de Murcia, from the Contraparada dam to Vereda Real on the border with Alicante. The recent transformation process of the Huerta de Murcia has been analysed, taking into account only the

land that maintains its traditional agricultural usage and excluding urbanised land (towns and suburbs) and land categorised for urbanisation in the General Plan, which has already been classified as urban by the Land Registry Department. Such urban land has been excluded because it denotes the complete substitution of rural land for land dedicated to a new urban purpose. The study aims to analyse only the 'transformation' and not the 'substitution' of the uses of the land of the Huerta.

Figures 4-9. Analysis of housing by period, western Huerta



Source: Created from SITMurcia images (www.sitmurcia.es), 1928-1946-1954-1981-2001-2015.

Having determined the area of study and the relevant landscape, the methodology was set as the following:

- Downloading ortho-photographs of the study area (Sitmurcia portal), from 1928, 1946, 1956, 1981, 2002, and 2015.
- Downloading Shapefile land registry maps corresponding to the study area, including important data on the height of buildings, and using GIS¹ software to ascertain the areas of agriculture, construction, and occupancy.
- Integrating the maps, and assigning each building in the registry (once confirmed as correct) to the oldest point at which it appears in the ortho-photographs.
- Comparing the maps with the ortho-photographs of the equivalent year for individual analysis.
- Extracting quantitative data, creating data tables and encoding graphics and numeric tables.

A second process consisted of localising growth patterns in different areas of the Huerta in different periods, using a subjective analysis of maps with buildings of different periods, with the aim of establishing systemised hypotheses to establish proposals for future work.

¹ Open source gvSIG Geographic Information System software was used for the study. (www.gvsig.com).

Information obtained

The most relevant data extracted from the global study is presented below:

Table 1. Numerical data of occupancy by period and accumulated construction

	1928	1946	1956	1981	2002	2015					
	SURFACE (before 28) (m ²)	SURFACE (m ²)	Annual Increase by period (%)								
El Raal and Santomera	36,498	30,697	4.67%	33,949	5.05%	108,166	4.28%	249,498	5.68%	237,801	3.99%
Alquerías	5,977	15,177	14.11%	22,813	10.78%	50,747	4.62%	88,487	4.45%	114,645	4.81%
Eastern Corners	11,692	6,978	3.32%	12,132	6.50%	30,983	4.02%	22,343	1.72%	36,837	3.37%
East Murcia	19,888	5,931	1.66%	21,623	8.38%	43,770	3.69%	98,631	5.15%	104,583	4.24%
Between Reguerón and Coste	24,383	137	0.03%	10,545	-	43,730	4.99%	56,236	3.40%	76,899	4.38%
West (south)	72,392	9,884	0.76%	52,666	6.40%	91,733	2.72%	119,325	2.51%	228,460	5.08%
Western corners	18,988	22,502	6.58%	16,387	3.95%	47,082	3.25%	41,480	1.88%	81,992	4.31%
West (North)	21,253	5,369	1.40%	28,382	10.66%	29,509	2.15%	61,168	3.45%	90,392	4.77%
South	40,854	2,802	0.38%	19,406	4.45%	38,124	2.42%	81,961	3.86%	119,232	5.01%
Total Huerta de Murcia	251,925	99,476	2.19%	217,903	6.20%	484,039	3.40%	819,129	3.70%	1,090,994	4.48%
Accumulated area:		351,401	2.19%	569,304	6.20%	1,053,344	3.40%	1,872,473	3.70%	2,963,467	4.48%

Source: Created using the methodology described

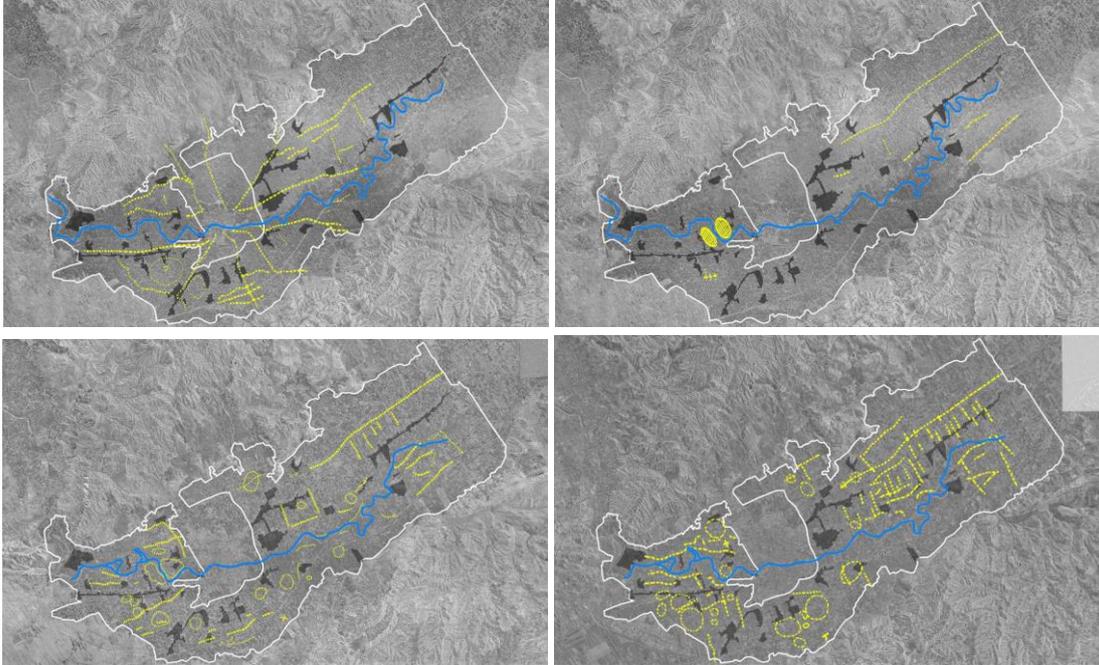
- The total land area taken up by buildings in the Huerta de Murcia (excluding the areas previously detailed) has increased from 251,925m² in 1928 to 2,963,466m² in 2015, which is almost eleven times the occupancy of land existing in 1929.
- By carrying out an analysis of the occupied (and construction) areas by period, and extrapolating the information according to year, it was observed that, notwithstanding the initial situation when hardly any areas were occupied, after 1956 a continual annual increase of occupied land was established of around 4% on the total occupancy of the previous year.
- Although these percentages remain stable, the accumulation of buildings contributes to a twenty-fold increase of the net land area where there is annual construction in each period.
- It is notable that despite the apparent saturation of some areas of traditional rural land, during the period from 2002 to 2015 the rate of growth was slightly increased each year. This trend was reflected in all areas, including the most saturated.
- The relationship between areas of occupancy and areas of construction remains constant in practically all the analysed series. The value of this relationship (construction m² / occupancy m²) is around 1.26 – 1.28.
- This data is notably similar in practically all the homogenous units of land analysed.

Patterns of occupancy

Once the principal numerical data was demonstrated, it was compared with the patterns of occupancy observed through the different historical periods, which were obtained using the individual yearly maps (see the methodology detailed above) and a system of visual analysis of

the trends in the new housing constructed in each period (housing marked in red in figures 4 to 9).

Figures 10-13. Patterns of occupancy by period in the global study



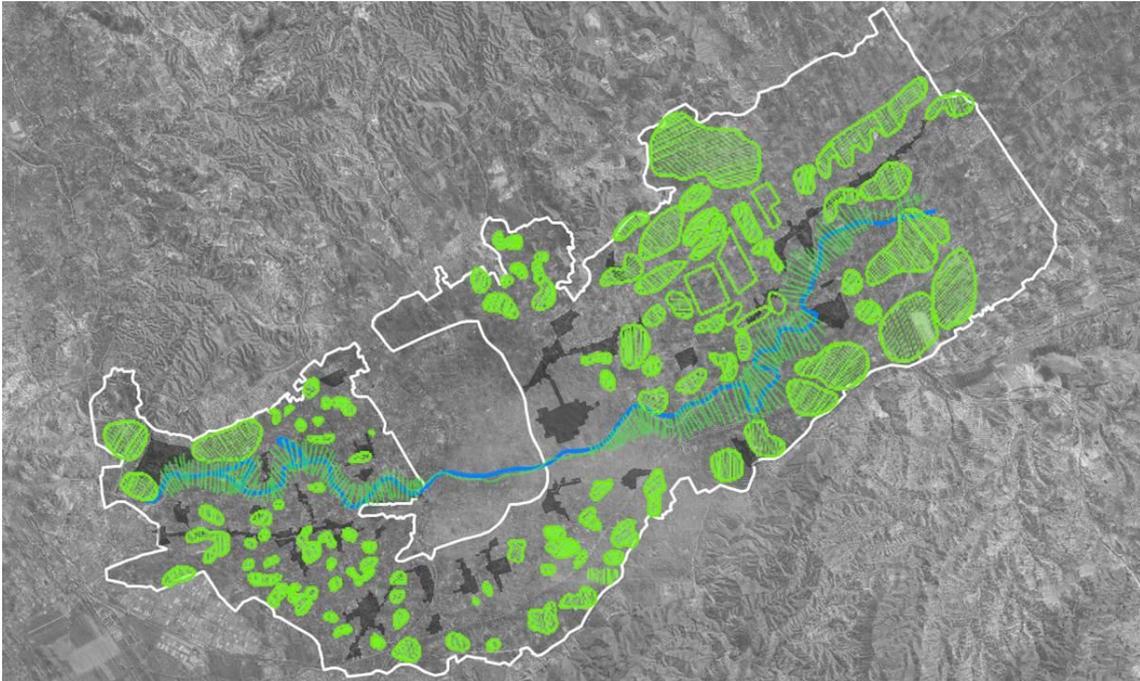
Source: Created using the methodology described. Patterns 1928, 1956, 1981, and 2002

Patterns by homogenous areas of the Huerta de Murcia

This visual observation and the creation of the pattern revealed the following results:

- In 1928 the housing found initially is localised along two linear areas: the principal roads and pathways of the Huerta, and the main irrigation routes and waterways.
- In 1956, owing to the periods during and after the Civil War, there is almost no significant growth in dispersed housing. Housing is located mostly on the principal roadways, although homogenous areas of dispersion are starting to appear in the west.
- In 1981 the increase is significant, localised mainly in the homogenous areas of dispersion in the western and southern Huerta, and around a network of secondary roadways leading off the main roads in the eastern Huerta.
- 2002 shows the greatest saturation of all the growth stages, with housing appearing along a second line of main roadways, on secondary roadways, and even along a third set of roads. Individual housing also appears in homogenous dispersion in large areas of the south, due to the saturation in the west.

It is almost impossible to create a pattern of occupancy in the photo for 2015, as there is a combination of all the previous patterns in almost all the analysed areas of the Huerta.

Figure 14. Pattern of pockets of remaining rural area in 2015

Source: Created using the methodology described

For this reason, the study was finalised in 2015 with an analysis of the areas of 'productive rural land' that have reasonably subsisted until the present day, and which might possibly become new agricultural land in the future, if the current process of disperse occupancy in the Huerta de Murcia can be stopped, either by urban regulations or by inspection and control.

This land currently consists of a scattering of unconnected rural areas, smaller in the west and south and larger in the east, which could be used as a base to implement strategies for urban, ecological, social or patrimonial projects for the Huerta de Murcia.

Individualised typological patterns

From the visual observation of localised areas and successive stages of configuration, the following patterns were also extracted showing the development of dispersed occupancy, which are repeated across the analysed region, although some prevalence of certain areas is shown.

Up to five different possible distribution trends for housing produced over a period of time have been identified, as shown by figures 15 to 20:

Figures 15 - 20– Individualised patterns of dispersed occupancy

Source: Created from the methodology described. (1.- Specific dispersion in the east; 2.- Linear dispersion in the west; 3.- Homogeneous dispersion in the west; 4.- Specific grouping on road intersections; 5.- Linear dispersion around a roadway enclosing a pocket of rural land)

1. Random and homogeneous dispersion of housing in the east, which shows a dispersion pattern that is more regular and geometric, as housing is localised along the gridwork of roadways.
2. Linear dispersion in the west – groups of housing on the edge of a main roadway, creating continuous lines of housing on both sides of the roadway.
3. Homogenous random dispersion in the west – groups of housing distributed randomly on main and secondary roads, waterways and other locations, due to the accumulated building saturation in the west.
4. Specific grouping at road intersections – groups of houses are created, which finally constitute a factor of the rural population, and even produce commercial activity and individual characteristics.
5. Linear dispersion creating enclosed pockets – producing non-productive pockets of rural land, enclosed by the linear distribution shown in pattern 2.

Figures 21-24. Outline of patterns of occupancy

Source: Created using the methodology described.

Conclusions

The analysis of the generated and processed data and information, assessed according to quantitative numerical, and graphic morphological strategies, demonstrates the following conclusions:

1. The dispersion of occupancy of the peri-urban territory of the Huerta de Murcia is a occupancy model that has been created spontaneously, by the individual activities of inhabitants who have established new (first and second) homes, in accordance with the studied migration trends from the closest urban centres (Murcia and its suburbs).
2. This model of occupancy has been sustained over time and perpetuated historically, and includes some periods of greater extension, but which since 1928 has not seen any recession or deceleration, and has produced an average annual increase of 4% of the occupied area throughout this period.
3. The analysed phenomenon and its comparison with the range of urban regulations in the city of Murcia (the 1978 General Plan and the 2001 General Plan for Town Planning), show that the model of dispersion sits on the margins of the regulations, which in turn clearly indicates a high level of defiance of urban laws and the permissiveness of the authorities in respect to the phenomenon described.
4. Although the process has been spontaneous, the described patterns of occupancy are formed, which while stable, undergo small developments during each time period, and pass through the following stages:
 - a. Occupancy along the principal roadways of the urban landscape.
 - b. Occupancy along secondary roads, waterways, and a second line of principal roadways.

- c. Small specific groupings, on road intersections with linear occupancy.
 - d. Areas of homogeneous dispersion (mainly in the west).
 - e. The creation of pockets of unoccupied rural land, following the continuous dispersion of occupancy.
5. The current existence of the aforementioned unoccupied pockets of rural land offers the principal opportunity for future projects focussed on stabilising the process, and on maintaining an agricultural, rural and cultural environment that can co-exist with the new peri-urban areas, accommodating their own agricultural-related production and leisure activities, which could include the following:
- The integration of the unoccupied pockets of land in the European Network of Green Infrastructure, as defined by the European Commission (Ros, 2014).
 - The promotion of agricultural economy, highly-specialised cooperatives, global ecological agriculture, local markets and high-quality specialist products.
 - The acquisition and rent of plots for urban leisure, in places close to urban centres.
 - The creation of sustainable educational agricultural systems, linked with education centres for young children and teenagers, to develop the green economy and sustainable management of the area.
 - Promotion of the existing irrigation network, for touristic and leisure purposes.
6. All the above demonstrated conclusions point clearly towards one resolution, and that is the inexorable and urgent need to draw up a Special Plan for the Comprehensive Protection of the Huerta de Murcia, which includes the specified proposals in addition to further proposals that would result from its creation.

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VIRTUAL REALITY OF THE SUSTAINABLE IMMATERIAL URBAN NETWORKS. SIMULATION CO-BENEFITS APPROACH AS AN STRATEGY TO SURVIVE IN THE DYSTOPIAN CITY

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Abstract

In order that we can create cities that can adapt quickly to change, we can look at the co-benefits as a strategy for a fast implementation in a view of the contemporary city that want to have immediately results in a smart position in the information age.

On the premise of an individual transformation point of an ecological baseline to the highest collective level, a city must be planned and adapted to provide itself with minimal dependence and in a neutral equilibrium with the nature. The co-benefits will help us to decrease the correlational break between economy, society and nature, under an inclusive environment of highest social inclusion.

Using the theoretical approach of Foladori, Castells and Smith, and making use of virtual tools of modeling and simulation; we can confirm and anticipate, which are the better strategies to be employed in the actual macro contemporary city. This network model is like a strategy of transformation for the environment and the huge impacts made in this global, dual, faster, green and smart time.

Objective

Propose a conceptual close up of the co-benefits as a strategy to survive in the dystopian city, through the simulation and modeling of the better and the worst scenarios that could represent the conceptual, virtual reality of the sustainable immaterial urban networks.

Opening

The deep transformation of the actual world and their imperative interchange of services and goods, create a lot of questions not only in the way on the livelihood population ever increasing, but also on the mechanisms on which that support is possible, with an equitable basis covered on the principles of social justice and balance with an encroaching environment and decreased

resources (Yory, C. 2004:15).

So to reflect the question of what can we do arise from this, do we need to anticipate the change? is the change anticipating us? How can we adapt to our reality? Is the reality adapting to us? And how can we survive in the age of the dual and dystopian transformation?

It is necessary to understand the concept of virtual reality and urban network and how it arises in this new paradigm through the information technology (IT).

While intangible sustainable urban networks will be link to this paradigmatic process, characterized by this new communication system based on the digitalized and interconnected integration of multiple modes of communication, which include and cover all cultural expressions in multimedia communication system according to the mention made by Castells, M. 2011. 407.

In his book the network society vol. 1; this new communication system transforms the space-time and also reintegrate it into functional networks or collages of images, a space of flows that replaces the places space in the city, and is also able to re-configure the sustainability urban network to add a dynamic, planning process under the premise of the social, and economic preservation of our planet.

In this process of constant change and seeing this from an historical point of view, this new communication system, organized in the electronic integration of all modes of communication, it is not an induction of virtual reality, it is the virtual reality. It is virtual in practice, and it is real because has a real existence. The reality as an experience has always been virtual, because it is always perceived through symbols formulating practice with some meaning. Virtual reality is a system where the same reality is complete captured, submerged and packed in a scenario of virtual images in the world of making believe, where appearances are not only on the screen through which it communicates the experience, and become experience (Castells, M. 2011: 405-406).

The development of the ability of prospective thinking seeks to generate long-term visions, to know the different currents of thought on the study of future and apply it to different areas of knowledge, emphasizing the design stage and proposed strategies for construction (Gandara, G. Osorio, F. 2014: 24).

It is necessary to use this approach to place ourselves and anticipate the purpose of configuring a close up of the co-benefits approach; based on the current necessities to anticipate the changes, the vulnerabilities and environmental, economic and social pressures, through a real, sustainable, and intelligent approach. For that reason has decided to handle the co-benefits approach as these come to offer a new opportunity for development and management of win-win policies through co-benefits between developers, residents, the environment, and through policy measures that provide immediate and measurable actions, which biases left by the proposed approach to sustainability and likewise be diminished is introduced as a method of preventing the current problems in terms of planning urban, sustainable growth, shrinking cities, as well as poverty reduction, risk, vulnerability and inequality, accessing vital resources under a model of inclusiveness and social cohesion.

It is important because the ability to develop systematic and global views is essential to understand the multifunctional complex of elements that condition and determine a greater or

lesser degree in the future of an object of particular study. This whole process has the objective to facilitate the generation of multidisciplinary intelligence in the generation of alternative futures in a short and long term, immaterial and intangible urban dystopian city networks, dual, global, informational, green and smart.

Understanding it better, the current problems in cities, not only comes from the loss of sense of belonging caused for the globalization impact, the enormous social contradictions, or the economy. It is also a problem the increasing migration to the cities, and as Yory (2004) tells us, by the inability of adopting new policies about the urban development and the sustainability. It is necessary to resolve situations of lack of governance, poor conditions of habitability, poverty and low economic productivity.

This is why it is important to understand how we can approach to the conceptual perspective of co-benefits as a strategy to survive in the global dystopian city; that would allow us to anticipate change without it anticipating us, first and from the perspective of a systematic approach and a comprehensive strategy based on a win-win for everyone.

The methodology used is constituted under the premises of the prospective development and it is based on the regulatory approach of the quantitative-qualitative method, the study consists of 4 phases: 1. understanding the context (problem tree method); 2. Visualizing the strategy (SWOT); 3. Drawing the future (prospective SWOT); 4. Building the Future (bet modeling scenarios).

Making with this a conceptual perspective that focus on the co-benefits and immaterial sustainable urban networks in the city so we can visualize, and anticipate the possible consequences of changes in it.

Theoretical framework

Delimitation of the object of study (contextual theoretical framework)

- A. *Product line: Urban networks and virtual reality; sustainability and co-benefits (characterization of the type of supply in production: foliage).*

Urban network and virtual reality

To place ourselves at the base of this research it is necessary to understand the context in which these terms are adopted for the network society and city network. Because the technology does not determine society, but also society dictates the course of changing the technology, however, technology is important because it reflects the ability of societies to transform, it is also seen that technological innovation depends on a mode of interaction complex, and as we referred Castells, in 1970, it constitutes a new technological paradigm around information technology. This new system where a new society is linked to the process of change that is capitalist and informational is born a techno-economic system of informational capitalism that is also arising. It is attributed to this new paradigm of 1974-1979 the increasing in oil prices threatened to put inflation at uncontrolled upward spiral until the 90's, putting a decisive effort on deregulation, dismantling the social contract between capital and labor model based on the stability of growth; so that a new change in the system can include greater

flexibility and adaptation to assimilate the growing changes that are necessary. This technological flowering was bound and rapidly adopted and set in the culture of freedom-oriented, technological innovation and entrepreneurship that resulted from the US fields of the 60's, joined this libertarian spirit, the Internet as we know, also by technological warriors Service Advanced Research Projects arises at this time Department of Defense (DARPA) to avoid making Soviet destruction of American communications in a possible event of nuclear war.

All these changes make the creation of a new technological paradigm that influence globally the society, the economy and the environment as it is constituted.

The characteristics of this new technological paradigm based on the theory proposed by Castells in his book "The rise of the network society Vol. I" which are based on information as a raw material, or are the technologies acting on the information, not just the information acting on the technology. It also refers to the pervasiveness in individuals for adoption to their way of life, they have a logic interconnection entire system or set of relationships and are related on the interaction and it is distinguished by its flexibility, self-expanding, self-generated and the recombining information.

The informationalism spirit that moves this new paradigm consists in diverse subjects and organizations, adapting to the new environments and market structures. It is a multifaceted and virtual culture, the experiences are created in cyberspace and as mentioned by Finkelievich 2010, the construction of cyberspace is strongly linked to the decline of the traditional idea of the city, where the spirit of informationalism as mentioned by Castells (2011: 223-227) is the culture of the relative accelerated destruction to the speed of opt electrical circuits that process their signals and a new type of space called space of flows in which it is possible to modify and rebuild the functions of the city. Where the unit is the network and where the space does not unfold a photocopy of society, where space is also time crystallized and material support are social practices that share the time. The flows are not just elements of social organization but they are also the expression of the process that dominates our economic, political and symbolic life in the so-called network society.

The space of flows is the material organization of social practices in shared time that work through flows, this space of flows shapes the support of the process and functions of the network society formed by an electronic circuit that impulse where the communication network is essential. Therefore, places do not disappear but its logic and meaning are absorbed by the network, connected through nodes and based on the electronic network and where as adding Muxi and Montaner (2014: 80) essentially is no longer tangible, it has ceased to be solid and has fade into thin air. It is now global and it is part of a fluid world, where these dizzying changes of information and communications technology make visible a global world that exists in terms of what the mass media transmit. Thus, there is only what is present in the media.

From this point of view, there is a global world, in which Castells (2011: 444) adds that under this new paradigm, a global city acts more as a process than as a place, therefore, the global city becomes the place where key production activities and informational global economy are generated.

It speaks of a spatial organization of the dominant managing elites, in which the decentralization trends and the multicentrality city meets with the redesign of exclusive spaces and isolated what

Finquelievich called the destruction of public space and the militarization of the city, or what Muxi and Montaner (2014: 104) identified in today's world characterized by the duality between a cosmopolitan class and with many global means, and what may be called servo-proletariat, who works invisibly in the trash work and that comes with a fast, shallow and quality life that is conditioned and do not have a continuity. It is urgent and impersonal, this is where the architecture, history and culture converge. it captures an imaginary world of possibilities unlimited by the media, which passes the passage of "a new city" city-network, this transition to the network society is defined as the city of the new economy, focusing as mentioned in the knowledge and the information that is global and works on networks (Castells, M. Excerpted from Finquelievich, 2010: 620). This combination of factors -offshoring new information- and power systems the new concept of a "global factory" (*fábrica planetaria*) from Muxy and Montaner that allows a product that is designed in New York and in real time, it receives this information in the large eastern factories of China.

Under the conceptualization of Gilles Deleuze and Felix Guattari has emerged a new way of thinking, a rhizome, in which the rhizome has no structure, or binary, or tree or branched, or genealogical: it is a chaotic, underground reality leak, like rats fleeing or ivy growing without plan (Muxí and Montaner, 2014: 83).

It is clear therefore that due to the emergence of new technologies and the increasing demands for being in a competitive, productive, fragmented and dual world, has generated a global dystopia in which a kind of imaginary world is designed, recreating the collage images and the virtual information technology. Which is considered undesirable, although this dystopian place or bad place (from the Greek dys and topos) to be highly flexible, self-generated, self-expanding and with recombining information is presented as an opportunity and a challenge to extrapolate some options to adopt this new way of doing city in a virtual network society, in which an empowerment spread of education, the citizen participation and the care of the natural and built environment is promoted. Expanding the use of new consumerist technologies to achieve a much broader spectrum and generate important markets, this also allows the use of this new technological revolution for sustainable and comprehensive development of urban networks in the city.

Sustainability

It is necessary to understand the different stages about this concept; by the way we use the perspective make by Yory (2004):

The first stage is the beginning of the 70's, where issues of "nature" and "environment" under the figure of "environmental economics" had an important progress and proposals like the one made by Jevons to insert the "equity marginality" the Hotelling with "negative externalities" and the proposal by Georgesu-Roegen in 1971 derived from the second law of thermodynamics.

The second stage marks the emergence of the "environmental revolution", it arose the first conference of the United Nations Conference on Environment and Development that had place in Stockholm 1972 "One Earth"... The Club Report Rome 1972 MIT, where the "environmental issue" became almost a fashion that trivialized the concept. The NGOs, the eco-business, the green parties, and the eco-opportunism arise.

The third climactic stage in the evolution of the Middle Environment-Development relationship, was marked by the creation of the World Commission on the Environment. It occurred in 1987 Brundtland Report "Our Common Future" where it was denominated "sustainable development". Currently, several authors like Gutierrez and Gonzalez (2010), Lopez (2014), Foladori, and Pierri, (2005) among others refer to the inherent problems in adopting the concept of sustainable development by announcing that, what we call development is its currently an unsustainable and self expression global sustainability that can not be achieved by extracting more resources of the planet. As well as sustainability does not have a single expression, and should be seen as a process rather than a predefined target in space and time, so, there is not a unique concept of sustainable development, its validity and possibilities of implementation will depend on the conditions, deadlines and scales of each area.

Similarly, JDS Architects says we have a "cool" problem: the "green" and "sustainable" in which mention that architecture have made more than a desire task. It is cool to consider the sustainability as a proliferation of green pixels worked in Photoshop, but not eloquent, intentional and enthusiastic shots in position on the matter ... His philosophy is that architecture should shift its focus from the idea of "support" to the "habitability"(JDS Architects. 2014:122, extracted from ecological Urbanism).

Yory, talks about how the concept of "Island of sustainability" (*islas de sustentabilidad*) can occupy the possibility of design a Land-Use Planning based not only on what is "fixed" in the city but in its inherent mobility, in this case "islands" act as "lighthouses" that guide the process of development through, and not a single route, but leaves a whole network of possibilities open (Yory, 2004: 100).

On the current concern about these matters, and seeing it tangible in the climate summit (2014) where these subjects were treated to boost economic competitiveness and sustainable prosperity for all, and at the next meeting 2016 Habitat III governance and urban law, urban planning and regulation of housing, infrastructure and basic services, urban economy, sustainability and climate change, cities and post-conflict, equity and inclusion, in which seven themes are established.

It is vital that we can link the technological revolution to sustainable development, so we take advantage of this system to make it a large network of overall performance in pursuit of a multifaceted inter-operability of economic, environmental and social areas. While this integration is not carried out, the hypothesis that arises is to be followed in a real imbalance, away from the virtual reality in cyberspace acts in an intangible dimension, the effects of climate change caused by lack of environmental restrictions, endanger our existence. It is clear therefore that several solutions have been proposed with the Kyoto protocol or the Bruntland report, however due to their lack of application, scope and operation, as well as heedlessness governments and people often see that the goals takes a long time (in this society of immediacy and changes in one click), it is necessary a method to help and facilitate in a shortest time, to achieve this necessary goals. Emerging strategies help to maximize the effects of the inter-operability of this system to be deployed self-expanding and multiple benefits between society, environment and economy to be achieved and enjoyed in a short time, but with impact equally in the medium and long time, due to a new term emerged, and it is able to propose strategies

for the immediate network society, self-expanding, self-generated and with high scalability and survivability in a comprehensive and joint way as a win-win strategy for everyone, that is the co-benefits approach.

Co-benefits

The terms of the collateral benefits appeared in the academic literature in the 1990s and generate a great interest in the time of the Third Assessment Report (AR3) and in 2002 it was published by the Intergovernmental Panel on Climate Change (IPCC).

The concept of co-benefits that addresses US EPA, Manila Observatory and CAI-Asia in a study called "the co-benefits of climate change response: Situation in Asia." (Castillo, et al 2007: 6-7) and show us some of the most important definitions about this:

- *"The concept of a "co-benefits strategy" or a "co-control measure" states that it is a single activity or policy can generate multiple benefits across varying sectors or fields of study"*
- *"The Intergovernmental Panel of Climate Change (IPCC) Third Assessment Report on Mitigation, differentiates "co-benefits" as benefits intended as the primary objective of certain actions or policies from those that are not".*

Co-benefits are essential to the progress of work, integrating climate change linked to other issues such as air quality, energy, transport, and sustainable development in general (Castillo, et. Al, 2007).

In recent years, the terminology has been used-benefits in three ways:

- "Development of co-benefits" it refers to the legal benefits of climate change policies such as improved air quality clean technology to have better jobs.
- "Climate co-benefits" it refers to the global climate change benefits of development plans. This point of view emerged in response to the belief that countries will focus on climate before development (Schipper, 2008).
- "The climate and air" concerning the multi-directional impacts of intervention usually air pollution. It is employed on the community air pollution, and climate heaters such as carbon black ... (Bond, 2008).

Meanwhile Allison Smith 2013 presents another definition in his book "The Climate bonus: the co-benefits of climate policy" in which she explains that:

- *"The co-benefits are the additional benefits we get when we act to control climate change, above and beyond the direct benefits of a more stable climate. They are sometimes referred as "multiple benefits" of "synergies". They don't include direct benefits of climate policy derived from a more stable climate. "*

In conclusion we will refer to the concept of co-benefits defined as an intentional decision regarding a hybrid concept aimed at specific targets in different areas with strategies co-control that reduce global warming, pollution, vital conservation for energy resources, food and also considers other specific benefits of great importance as the improvement of urban planning, cost reduction and return periods of capital and maintenance, reducing health impacts, and improving the economy.

Under the implementation of public policies, focused on a "win-win" approach between nature, people and industries which would mean an additional impact for the benefit of all intervention measures in different time scales.

Dividing them into six categories I. Clean Air; II. Greener earth; III. Secure energy; IV. Less waste; V. Stronger economy; VI. Health & Wellness (based on Smith. 2013).

In the view of technological development through new information technologies, that are integrated by networks, multi-node and multi-faceted, in which flexibility, scalability and survivability of dynamic and convergent models allowed to interact in the network society. Thanks to its inter-operability have become an important part of social development in a global scale, as well as the economic development of cities, creating in them macro centers, materialized with the network company and convergence with all the problems of today's world. The duality of Cosmopolitan segments and garbage life (*vida basura*) brand as well as the emergence of major economic powers while major environmental disasters, put at stake the reality of this new global system and homogenizer and its new immaterial networks in the urban context and under the precept of sustainability, a new line of analysis of intangible sustainable urban city networks become as fantasy and reality and as a dystopia in the city who is achieved. Where is not only important to believe presented in the collage of characteristic images of this virtual reality, as well as new nodes expressed in cyberspace of the space of flows. If the consequences of this system as it is not plausible, being ephemeral and timeless, have linked us to circumstances where we want to be outside or just engaged with an image, but however the impact of this system beyond the intangible are linked to tangible impact of a cataclysmic anthropogenic system that we have developed on the planet we inhabit.

For all that, to link the advantages of this new technological paradigm, we have the opportunity to create equally viable, self-programmable, self-generated and self-expanding strategies with flexibility, scalability and survivability inter-operation in a short-term; so we could achieve a network society in the current global immaterial convergence with the material capability to be mutated into a new integral dimension involving economic, social and environmental impact of this dystopian, dual, sustainable and smart world.

B. Production capacity: conditions involved in the production of the co-benefits and intangible sustainable urban networks

Informational City and global networks

The revolution in information technology has been useful to carry out a fundamental restructuring of the capitalist system of the eighties, to be layers to become an advanced system of capitalism that, in the alternative line of this type of social organization emerged in our historical period, the so-called statism in which he tried to redefine the means of accomplishing its structural goals while preserving its essence.

The meaning of restructuring (*perestroika* in Russian) failed because of their inability to assimilate and use all systems and embody the principles of informationalism in the new information era (Castells, M. 2011: 39), carried out by some countries such as China and Russia.

In the information age mentioned Castells (2011) is remarkable the beginning of a new urban form based on the informational city, due to the nature of the new society based on knowledge, organized around units and networks and composed in part by flows, the informational city is not a form but it is a process characterized by the structural domain of the space of flows, a geometry of nowhere and development of exurban constellations with a functional vague interplay of different units and process in a given urban system over distances, maximizing large communication networks.

Rainer Randolph (2000) points to another kind of disappearance of the city, the urban object. It perceives cities, not as an actor, not as nodes of regional, national or global networks, but as network cities. Transformations and urban representations reflect a new quality of movement of goods and merchandise, services (information) and people both in the city and among the cities, where the movement becomes increasingly "virtual" (informational or immaterial) and necessary urban telemetric equipment, contemporary metropolises assume the character of network; They are oriented toward the essence of network city, weakening the urban reality material (extracted from Finquelievich, 2010: 621).

Globalization and Global City

The informational and global economy is organized around command and control centers. As the global economy expands and incorporates a new market, it also organizes the production of advanced services that are required to manage the new units that join the system and the conditions of their connections, always changing. The phenomenon of the global city can not be reduced to a few urban centers of the upper level of the hierarchy. A process involves advanced services, production centers and the markets of a global network, with a different intensity and a different scale. Globalization stimulates regionalization, evolutionary architecture of information flows in the global economy. (Castells, M. 2011: 411- 414).

This is how the architecture and geometry of the informational and global economy arises, in which the structure of this economy is characterized by the combination of a durable Architecture and a variable geometry; The architecture of the global economy provides an asymmetrically interdependent world, organized around three major economic regions. Among the three key regions, Europe, North America and Asia Pacific; Inside there is a visible architecture competition and dynamic processes of change that make the global system of economic processes in a variable geometry. The differential location of these types of work also determines the prosperity of the markets as an income generation depends on the ability to create in each segment of the global economy value (Castells, M. 2011: 173-175).

If we accept the concept of globalization as one that characterizes the contemporary condition, the term "global city" (trends from the last quarter of the twentieth century) can be used. It crises of an urban model marked by functionalization of the whole territory, diffusion and dispersion of urban areas that make up a mosaic of fragments. Unrelated the elements of the global city that are present are the highways; the drastic systems of access control, skyscrapers and shopping (Montaner and Muxí. 2013, p. 115-121).

In 2011, substantial changes are evident in three types of phenomena that characterize the cities, territories and states at the beginning of the century. First, with respect to capital, has

completely transformed a scenario that tends to dialyzed, between global metropolis that leverage capital flows and capital is actually delocalized... the business structures are no longer visible... second modern societies are hybrid and are formed by a mosaic of subcultures. The third variable are the technologies that enhance communication in a fragmented landscape, immigration live in real space both source and destination (Montaner and Muxí. 2013: 79-81).

We conclude with the foresight shown by Branzi in which some recommendations are made for the formulation of a new Charter of Athens (Branzi 2014: 110, extracted from ecological urbanism...): 1st Urban refunctionalization; The 2nd major transformations by microstructures; 3rd The city as a high-tech favela; The 4th City as a personal computer each 20m2; Models of the 6th & 7th urbanization weak blurring boundaries and foundations.

Metropolises and cities

According to the UN report (2000) from 2000, just over 50% of the world population lives in cities, to be affected, particularly the cities of the "Third World", since it estimates that of the 20 megacities (cities with more than 8 million habitant's population 14 are located in Latin-American countries (Yory. 2004:21-24).

Megacities are larger agglomerations of human beings with more than 10 million inhabitants. in 1992. In that size is not what defines if the nodes of the global economy. Megacities can not be considered only in terms of size, but also in terms of its gravitational power toward major regions of the world, they articulate the global economy, connect the informational networks and concentrate global power. But they are also the depositories of all segments of the population that is struggling to survive.

They concentrate the best and the worst. The most significant about the megacities is connected on the outside with global networks and segments of their own countries, while they are disconnected within local populations that are functionally unnecessary. This distinctive feature to be globally connected and locally disconnected, physically and socially, which makes megacities a new urban form. They are discontinuous constellations of spatial fragments, functional parts and social segments (Castells, M. 2011: 436-443). This global network of cities creates a new global economic geography, which crosses national borders and traditional north-south division of the industrial economy.

According to Zygmunt Bauman, it refers to the "Liquid Life" which is based on the speed of change, precarious work and the continuous increase in the areas of exclusion (Montaner and Muxí. 2013: societies. 104-105).

A sample of how a city should be made are the called "alternative cities" an example of those cities are Curitiba, Seattle, Bogota, and Medellin, each of them shows well-managed cities with a critical and active citizenship that can be the key to improve the world (Montaner and Muxí. 2013: 128-142).

In another proposal made by Branzi, 2014, it sets up the concept of "the weak Metropolis" to be applied in the metropolitan, stating that models with a weak development are based on the cohabitation of semi-rural and semi-urban areas. The weak metropolis it is not a system of architectural boxes, but an enzymatic territory of permanent change, consisting on a personal

computer each 20m², is not the metropolis of the future but the present in which the quality of it lies in the quality of its objects (Branzi. 2014: 112 extracted from ecological urbanism).

Another reference is introduced in the ecological urbanism which proposes to multiply the lines of thought on the contemporary city to include environmental and ecological concepts... it promises to adapt the specific conditions of the ecological, economic and social circumstances of the contemporary city... In which involves generating alternative futures... Bhabha adds "it's always too early or too late to talk about future cities" (Waldheim. 2014: 114 extracted from ecological urbanism).

Thus, as proposed for Finquelievich, Cities in the Information Age should be producing innovation and wealthy means, capable of integrating the technology, society and quality of life in an interactive system that produces a virtuous circle improvement, not only of the economy and technology, but of a society, culture and environment (Finquelievich, 2010: 617).

C. Powers (roots) available technology, human resources and organizational design for the production of intangible sustainable urban networks in the dystopian city

In 1970, a new technological paradigm is organized around the information technology (Especially in the US) linked with the emergence of the Internet in which the result was a network architecture, which could not be controlled from any center, consisting of thousands of autonomous computer units and networks that have innumerable ways to connect, upgrading the electronic barriers.

ARPANET, the network established by the US Department of Defense eventually became the basis of a network of global and horizontal communication networks with thousands of exponential growths.

The ability or inability of societies to master technology, particularly those that are strategically decisive in each historical period, defined largely destination, technology embodies the capacity of societies to transform, Mokyr also considers that the State is key on explaining the technological backwardness factor. An understanding of the relationship between technology and society is that the role of the State, either stopping, sparking or managing technological innovation is a decisive factor in the overall process, as it expresses and organizes the social and cultural forces that dominate in a given space and time. From 1974-1979 increases in oil prices threatened to put inflation at uncontrolled upward spiral until the 90s, putting decisive effort to deregulation, dismantling the social contract between capital and labor, model based on the stability and growth, which contributes to the emergence of a new economy worldwide: informational and global. Because the productivity and competitiveness of units or agents in this economy fundamentally depends on its ability to self-generate, self-programmable, and recombining information knowledge effectively in the global network. The production, consumption and circulation are organized on a global scale, either directly or through a network of links between economic agents.

Thus, the mention of Castell (2011) the productivity enigma dispels through the output and input over time. Profitability and competitiveness are the real determinants of technological innovation and productivity growth. So within the architecture and geometry of the informational and global economy it is visible in dynamic processes of competition and change that make the global

system of economic processes in a variable geometry resulting from these processes of innovation and competition interacts with architecture, produced by history an economic order in the world, inducing the creative chaos that characterizes this new economy.

With this new movement it is able to move from mass production to flexible production, on the formulation of Piore and Sabel where "production accommodates to change without trying to control it," a model of industrial craft or customized production. Within this framework arises the business flexibility for small and medium-scale based on multidirectional networks that are materialized in franchises and the subcontracting under the cover of a huge company, which generates interconnection strategies to emerge. Thus the great company changes its organizational vertical business model to suit the essential conditions that indicate the fast, economic and technological change.

Flexible production maximizes the response of economic agents to enroll a quickly change in their units. It also increases the difficulty of controlling and correcting articulation errors, but it is flexible and self-programmable, this means that it has the ability to restructure, recombining information and reintegrating it with the logic of the enterprise system, with units interconnected in real time, (Castells, M. 2011: 196) that factor allows the emergence of the network enterprise of the informational and global economy.

The spirit of informationalism is the result of diverse backgrounds, the first of them is the culture of the mass media with the emergence of mass society in which "the medium is the message", then the culture of new media communication and the diversification of the masses in which "the message is the medium", later with the great multimedia broadcast as a symbolic environment in which "the message is the message" and finally a centralized multimedia issuance system in which "make believe and do it" culture of the ephemeral, where time is compressed and ultimately refuses, as a primitive replica of the production turnover.

While at the same time context, climate change becomes a key point on the design, planning and configuration of objectives and policies due to major pollutants produced by the economic system that was inherited from the industrial system, it is still a challenge in the information's revolution.

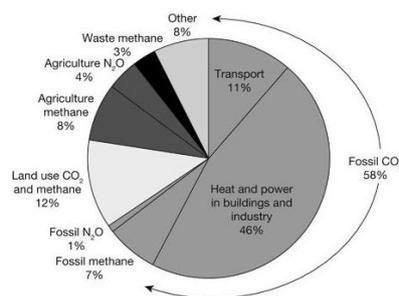


Figure 2.1 Global greenhouse gas emissions, 2008

Source: Smith, A. 2013.

Conclusions chapter

The current literature explains a new process in which we are bound as a network society of quick change, in the same way the literature goes to the proposal and conceptualization of new

places that produce this new technological revolution, through the space of flows in the cyberspace with virtual nodes, units and networks. In a convergent line we found the sustainable development in which the literature talks about building measures to reduce the impacts of the economic and social industrial and technological macro-development, based on a new category of analysis called co-benefits that offers the promise that we can be able to anticipate to the climate change in the era of the global systems.

Hypothesis, what we are expecting to find?

With new converging lines between technological paradigm and sustainability development in relationship with the co-benefits we could anticipate possible changes in a flexible, adaptable, inter-operable and smart path, considering the co-impacts that are implied in the intentional decisions that test our livelihood in the planet where we live.

Methodology

The prospective methods can be classified in a continuum from quantitative to qualitative and vice versa. Taking as a quantitative a time series analysis used for the problem tree chart of Marc Giget. Moreover, the qualitative end, future will be primarily the result of the analysis and interpretation made by the experts.

Methodology development

The research is carried out in several steps, starting with a review of the literature regarding to the sector of urban networks and virtual reality, sustainability, co-benefits, climate change, and metropolis to establish the theoretical background of this investigation.

In this research, we used the competency tree chart proposed by Marc Giget that seeks to systematically represent the object of study to obtain a diagnosis of their past, present and future. In these case, focused on the available technologies, broadcasts, programs, and systems used for the production of intangible sustainable urban networks in the dystopian city. In the core production capacities are reflected: the conditions involved in producing the co-benefits for urban networks and virtual reality, in which the variables are stipulated as to the informational city and global networks, globalization and metropolis; while in the product branches they were located in this case properly to urban networks and virtual reality, sustainability and co-benefits. With the mapping of the past it was allowed to place the organization in a historical reality understanding the aspects that remain constant, and its ability to evolve, while the mapping of future risks and opportunities that allow us to take on challenges in the construction of the desired future.

Time intervals:

The last time interval spanning from 1987 to 2009; this is between 2009 and 2012, and the short-term future goes from 2013 to 2016. The time periods are posed by the composition of key moments in the development of cities and sustainability agreements and the emergence of the new paradigm technology from the 80s.

Structuring the tree diagram: A. Product Line

A. Product Line (foliage): characterization of the type of supply of the organization

- Urban networks and virtual reality
- Sustainability
- Co-benefits

B. Production capacity (trunk): conditions involved in the production of sustainable housing through the co-benefits.

- Informational City and global networks
- Globalization and Global city
- Metropolis city

C. Powers (roots) available technology, human resources and organizational design for the production of intangible sustainable networks in the dystopian city

- Materials, systems, networks and technologies
- Programs (supply and service quality).

Swot

SWOT analysis is a tool to complete the diagnosis, since it allows analyzing the internal influences, represented by the strengths and weaknesses, and external influences, formed by the opportunities and threats presented in the sustainable immaterial urban networks through the co-benefits.

A SWOT analysis was performed for each of the representative areas of the competency tree chart from the information that is identified in the theoretical proposals of the experts.

Modeling scenarios

Less active role in society	More government support		More active role in society
	2 Their times	3 Great times	
	1 simple times	4 our times	
	Less government support		

Source: own creation based on Gándara y Osorio, 2014.

- Scenario 1 *Simple times*: represents the worst situation that can happen: none of the actors involved appreciates technology and sustainability. The government does not carry out actions to support the impacts and the technological gap. In addition, that society still does not become aware of the collateral benefits of technology and sustainability so they decide not to adopt it.
- Scenario 2 *Their times*: represents a context where despite the government efforts to encourage the use of technological means and sustainable strategies the society still rejecting them.

- Scenario 3 *great times*: represents the ideal situation under they could achieve the technological gap and the sustainability process, increasing the collateral benefits with the environment, society and economy integration.
- Scenario 4 *our times*: even though the society is aware of the great advantages that have the sustainability projects and the information technology, it is not a government priority.

Results, conclusions and discoveries

It is necessary to use new methods to achieve sustainability objectives and projects.

The adoption of information technology and communication could be a key point on the development of this new immaterial system, in a way that could specify the real results in a short time and at the same time hold implications for the future. This system is highly flexible, self-expanding, self-generated, adaptable and self-programmable, with scalability and in a inter-operability process integration with the environment, economy and society.

The State has an important role in getting the network society to adopt new strategies around information revolution and new alternatives to create a environment-friendly city; implementing programs and politics for the population, companies and developers, and adding new and better practices in the lifestyle, and getting agreements with companies to generate low environmental impact products, could generate more desirable scenarios in the short and long time.

Modeling these possible scenarios of co-benefits in the urban network of the dystopian city, we could be able to clarify their times, the great time, the simple times and our times, and where we can reach the outlined strategies to penetrate in the society, having a gap between an environmental and a technologic process in the global network.

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SOCIO-CULTURAL AND ENVIRONMENTAL BENEFITS FROM FAMILIAR ORCHARDS, IN SEMIRURAL LOCALITIES AT CENTRAL HIGHLANDS OF MEXICO

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Key words: agroecosystems, familiar orchards, semirural localities, sociocultural and environmental benefits

Abstract

The aim of the study was to analyze the sociocultural and environmental perception of agro ecosystems with familiar orchard (AEFO) owners, in semirural localities at ecological transition zone of the State of Mexico. Methodology includes four steps: Geographic characterization of localities and AEFO; 2) Analysis of social benefits that orchards provide; and 3) Analysis of the

influence that AEFO has over familiar life quality. The investigation was realized at twelve localities in three municipalities of the State of Mexico, mean by structured and semi structured interviews, accomplished with on field direct observation. Familiar orchards provide to families multiple social, environmental, ecologic, economic and cultural benefits; they contribute to have medicinal, condiments, ornamental, even ceremonial plants; for familiar consumption, sales or exchanges. These spaces are also managed for small scale domestic animals nourishment, to obtain fuel material, raw material for construction and fences for protection. Therefore, familiar orchards are considered important agro ecosystems at semirural localities, that function mean by complex relations between all their components. The sociocultural and environmental benefits provided by these multifunctional productive agro systems, may become an important strategy of social cohesion and alimentary security for rural families, and at same time, one way to preserve the regional natural resources.

Introduction

The family orchards have been developed over hundreds of years by peasant and indigenous communities. They retain a wide variety of crops (FAO, 2005). They have trees, shrubs, vegetables, tubers and edible roots, grasses and herbs that provide food and condiments, medicines and building materials. They are a combination of edible, medicinal and aromatic plants and fruits useful for family consumption (GTZ, 2008; Rivas and Rodriguez, 2013) achieved through adaptation to the place, climate and cultivation techniques. They are sources of production and income throughout the year, even without using sophisticated agricultural inputs (FAO, 2005; GTZ, 2008). The composition and the use of crops vary according to life circumstances and needs of families in rural areas (GTZ, 2008). It is a sustainable agroecosystem developed by generations in ecological, agronomic, cultural, social and physical aspects, which are considered one type of agroforestry systems (Rivas, 2014).

However, these agroecosystems present problems in the environmental and socio-cultural areas, among them the presence of pests in trees, the lack of pest control, only few new trees and poor maintenance trees cause low productivity. Also the loss of traditional knowledge for the management of family orchards, the low participation of family members in the care of family orchards and the distribution of the land as an inheritance to the grown children threatens the continuity of family orchards. In addition to this, there is a lack of recognition of the benefits that the Agroecosystems with Family Orchards (AEFO) gives to families. Also the way of urban life exerts pressure to make these spaces disappear. For these reasons, families can begin a process of abandonment and the consequent loss of family orchards agroecological tradition.

The importance of this study is notable for documenting the perception of families about the socio-cultural and environmental benefits from family orchards. The hypothesis of this paper is that families have a positive perception about the benefits these systems can provide. The objective was to analyze the sociocultural and environmental perception of families who have family orchards in three municipalities, at the ecological transition zone of the State of Mexico, through field observation and application of semi-structured interviews with 180 heads of households. This work is part of a wider investigation. The overall objective is the

agroecological analysis of AEFO at the municipalities of Malinalco, Tenancingo and Villa Guerrero, State of Mexico.

Current family orchards are the result of the interaction between people, soil, water, animals and plants (Gaytan *et al.*, 2001; Juan, 2013). They represent an ethnological heritage of the first order with a traditional knowledge passed down from generation to generation. Its role has been, for centuries, to supply food to the family, but it currently features a playful and occupation paper, although the important role in the conservation of many species and varieties of cultivated plants *in situ* should not be forgotten. (Rigat *et al.*, 2009).

These traditional agroecosystems offer countless examples of sustainable agricultural practices: 1) They are based on poly-culture planting ; 2) They maximize the safety of crops using low levels of technology; 3) They have a limited environmental impact and adaptation to local conditions ; 4) They contain varying cultures and adapt to wild crops; 5) They do not depend as much on external inputs such as pesticides, fertilizers or artificial irrigation; 6) They make extensive use of renewable and locally available resources; 7) They have active recycling nutrients; 8) They conserve a biological diversity; 9) They use production to meet local needs; 10) They are relatively independent of external economic factors and 11) They are built on traditional knowledge and culture. (Gliessman, 2002; Gliessman *et al.*, 2007).

The appropriation of nature is an expression of the implementation of the strategy of multiple uses that responds to a rationality that is both ecological and economic. It is based on a local ecological knowledge; it is tradition that passes from one generation to another (García-Frapolli *et al.*, 2008). For Massieu and Chapela (2007) traditional knowledge is closely related to cosmogony and livelihoods of communities because its purpose is to strengthen the values of management of plants, seeds, animals and forms of organization. Therefore, this knowledge is essential to sustain and preserve the important environmental role of subsistence farming, which promotes diversity and accumulated knowledge about plants and living organisms interacting as part of the ecosystem.

According to Toledo (2005) traditional knowledge is a product of a network of relationships and practices that have developed over thousands of years of peasant and indigenous communities. It consists of beliefs (*cosmos*); knowledge that people keep in their minds, the structure or the elements of nature, the relationships established between them and their useful application (*corpus*), as well as the set of productive practices, which combine their knowledge system on their environment and about their development in daily life (*praxis*).

According to the FAO, 842 million people are chronically hungry because they cannot afford adequate food. Worldwide, 70% of people live in rural areas of developing countries (FAO, 2015). Production systems needed to meet food needs in these areas. One option is family farming, whose priority is labor force, with limited access to land, capital resources and use of multiple strategies of survival and income generation access (AFAC, 2011). This concept includes groups of farmers and farm families engaged in producing food for self-consumption, providing food and many other products on food supply. They are a starting point, like a recognition of traditional knowledge and ancestral wisdom of farm families (FAO, 2015). They combine tradition, innovation and science to promote the environment, fair relationships and a good quality of life. They also empower communities to take control of their food production

needs, providing systems that can be handled by them, sustainably and locally adapted. These small productive units are the key to food security. (AFAC, 2011).

For Vallejo *et al.* (2013) the socio-cultural perception is a subjective understanding of social action, understood as human behavior from meanings and motives that are generated in the individual's consciousness by attributing subjective meanings to their actions, generating experience and knowledge, called "common sense", which guides individual actions socially accepted.

Social perceptions of the environment are cognitive systems that recognize the presence of opinions, beliefs, values and norms on the environment, which determine the attitude for the conservation of nature. They are the product of a perception and social value shaped by emotional, cognitive and willingness of the inhabitants' components into the environment (Bertoni *et al.*, 2010). For Fernandez (2008) they are the relationships that occur between humans and nature, related to the management of natural resources, considering the cultural, ecological and climatic processes and their meaningful role in every society.

The analysis of attitudes identifies cultural, symbolic and cognitive components that support the patterns of interaction society (Bertoni *et al.*, 2010), oriented with nature. Cunha *et al.* (2010) mention the relationship between the physical environment and the reflection on the relations of the media with the subjectivity of each person, where the answers or demonstrations are a result of these perceptions from local knowledge.

Methods and material

The stages of this work are three, a) Geographical characterization of localities and AEFO, b) Analysis of social benefits offered by family orchards c) Analysis of the influence of AEFO on the quality of family life. The geographical characterization began to limit the study area. It was based on the political-administrative division of the State of Mexico and three municipalities were chosen. Through field observations 12 localities with family orchards were identified. For precise location, latitude, longitude and altitude of the localities were determined. From the location of physical characteristics such as physiography, topography, climate, geology, soil and vegetation were reviewed. To determine the socioeconomic characteristics, data from the XII Census of Population and Housing (INEGI, 2010) was processed, which allowed calculating the total population, the population structure by gender, education level, the economically active population (EAP) the economically inactive population (EIP), the population with access to health care and housing facilities.

Through direct observation and field work 15 family orchards of each locality were chosen and a semi-structured interview that yielded the perception of families about the benefits and the influence of AEFO on the quality of family life was applied. The analysis of social benefits offered by family orchards included three groups: Ethical-aesthetic that includes variables recreation and landscape, living and family relationships, family organization for the management and maintenance of the family orchards, the man-nature relationship in relation to new generations and community relations for the exchange of scientific-educational food in which traditional knowledge is discussed, environmental education in agroecosystems and

allows research on natural processes in these environments. Sustainability and food security strategy favored all these aspects.

For the analysis of the influence of family orchards on the quality of family life, the semi-structured interview was used, considering indicators of the UN to highlight the social importance, which are: food, housing, clothing, health, education, occupation and recreation, from income obtained from the sale of products that the AEFO have.

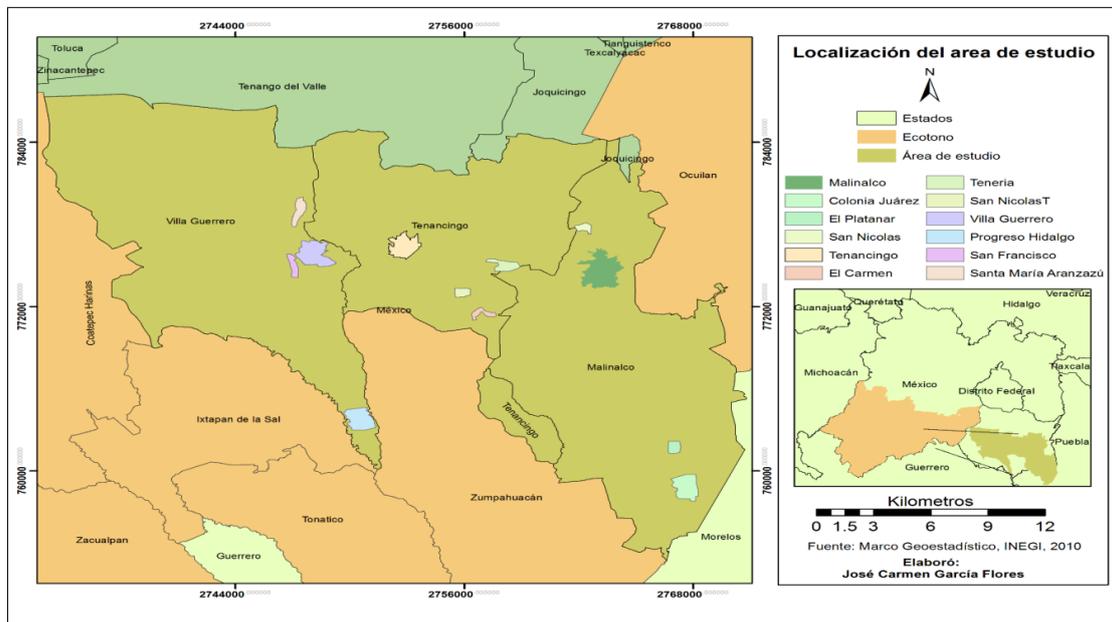
The study population were families with family orchards. The study area consisted of three rural villages and one urban locality by each municipality, 12 locations in total. The study was performed from January to March, 2015. The sample size was 180 householders from 20 to 85 years old. The surveys were conducted at the home of each of the respondents. The confidence level was 95% with a sampling error of 5%. The sampling method was "snowball", a technique allowed to form a network of informants through the application of a previously designed data collection questionnaire aimed primarily at households that have family orchards (Santana *et al.*, 2013) fifteen interviews were conducted in each locality.

The data collection was done by the family orchards on field work and two instruments were built, one was a questionnaire to analyze the agricultural ecosystem and the questions were closed. The other was a test to know the fate of agroecosystem products. Both were answered at the same time. Piloting instruments were made, allowing corrections, which were also checked with the relevant local civil authorities to carry out the study in each community.

The application time of the interviews was approximately 30 minutes in order to meet the socioeconomic conditions of the family, land characteristics, management practices and maintenance of family orchards, perception of social benefits by having the family orchards, as well as the economic benefits of family orchards, barnyard animal and vegetable area. For the analysis of the results, a Statistical Program for Social Sciences SPSS (version 22.0) was used. The study area is located in the Ecological Transition Zone (Ecotone) of the State of Mexico, Mexico, which comprises 24 municipalities in the state. Latitudinal and altitudinal derived gradients, representing a region of geographical, ecological and socio-economic importance, being a transition zone between the Nearctic and Neotropical biogeographic empires, shows plants and animals representative of both empires. In the tradition of the family orchards, there is an environmental, social and agroecological impact due to the association of herbs, and to the traditional ancestral knowledge put into practice, allowing rural families have a wide variety of trees and animals within the AEFO.

The localities analyzed belong to the municipalities of Malinalco, Tenancingo, Villa Guerrero and State of Mexico. They are located in the parallel 18° 48' 58" and 19° 57' 07" north latitude and 99° 38' 37" and 98° 35' 45" west longitude, with an approximate land area of 614.19 km² (Figure 1). The area has differences in altitude; the lowest points are presented in Malinalco with 1,580 meters, and the highest in Villa Guerrero with 3,760 meters (INEGI, 2009). The latitudinal and altitudinal location of the study area are important because they favor the presence of different climates, soil types and vegetation observed in these municipalities, conditions that favor the practice and tradition of the family orchards.

Figure 1. Localities studied on municipalities and state context.



Source. Prepared based on INEGI, 2010

The type of climate, soil and rock types prevalent in this region benefit people to develop agricultural activities achieving sociocultural adaptation and experimentation in family orchards with a vast agrobiodiversity of herbaceous plants, shrubs and trees. From 12 localities included in the study area, three of them are municipal capitals and nine are rural communities.

Results

Characteristics of the agroecosystems with family orchards

Table 1 shows the components of AEFO, the most common components of agroecosystems are housing, patio or deck and water sink, the fence and the yard, but the area of compost and vegetable observed are in less than one quarter of the AEFO.

Table 1. Components of agroecosystems with family orchards

Components	Number of orchards with different components
Home	179
Patio or broker	136
Water sink	134
Siege	96
Poultry breeding animals	75
Vegetable area	21
Composting area	18

Source: Prepared based on fieldwork, 2015

Based on field observations and interview information it is obvious that people do not devote space and time to make compost and have vegetable, perhaps because they have no knowledge or habit for recycling organic waste as composted. The most common practice observed was pulling the leaves, branches, fruit peels and kitchen waste directly into the base of the trees.

Only 21 people interviewed have the knowledge and habit of producing vegetables. As the surface of the family orchards, almost 40% of the family have a lower family orchard of 560m², whereas 40% between 561 and 1060m² surface, including various components of AEFO. Family orchards are generally between 500 and 1000 m².

According to ubieties of the family orchards, 52% are located in front of the house, 19% in the back, 16% and 13% left to the right. The distance between these components, in 81% of cases, is 2 to 7 meters. Both location and distance make easy monitoring and keeping. About the state in which there are family orchards was observed that 70% were maintained, and it is considered that 15% of the total AEFO is being lost.

Table 2 presents the various species of animals that are part of the agroecosystem. In most family orchards coexist chickens, pigs and to a lesser extent, horses, rabbits and sheep; species that provide various products and services, with limited space requirements, they can coexist in the family orchards. Regarding animals manure, half of the respondents said they left them outside, where the animals perform their droppings; almost a quarter of them place them directly into the trees and another quarter relocates them to their agricultural fields. This gives evidence generally unaware of the technique to transform it and use it to produce compost, but they use it directly as organic component of soil.

Table 2. Animals present in the agroecosystem^a

Animals	Number of orchards where they were present
Chickens	73
Hens	64
Pigs	30
Horses	19
Rabbits	18
Sheep	11
Turkeys	6
Cows	6
Ducks	5
Goats	2

^a In the same orchard can be present several animal species

Source: Prepared based on fieldwork, 2015

The AEHF featuring hedgerows are made with plants that are mostly fruit trees interspersed with other shrubs, wire or fence, as a way to take advantage of the space to have plants and

food. Just under a quarter of fences present plants with thorns, perhaps a little-used practice as a safety measure for children and animals, due to the proximity to housing.

Mothers are responsible for the family orchards because they stay longer in the house, so they spend part of their time taking care of the plants. Regarding the time devoted to this task, 79% of respondents spend between 2 and 8 hours a week, in which they perform maintenance activities. Only 1% employ more than 24 hours a week, which is understood as these agroecosystems do not require as much care as a purely ornamental and decorative garden.

On the other hand, in 108 family orchards men make pruning trees, as well as the work of making compost in 32 cases; weeding is a task that requires tearing or cutting herbs, done in 100 agroecosystems; for pest control, with either a chemical or natural preparations in 32 cases. 31 family orchards have trees and men paint the base of the plant, with a mixture made with prickly pear, lime and water to prevent insects and pests. This can be because the father has the knowledge to carry them out and it involves physical exertion (Table 3).

Table 3. Most commonly performed activities by father

In charge	Pruning	Natural fertilizers	Weeding	Pest control	Liming of trees
Father	108	32	100	32	31
Mother	23	13	26	10	4
Son	18	13	31	6	12
Daughter	1	0	5	0	1
Grandfather	4	1	0	0	1
Grandson	2	0	1	1	2
Total	156	59	163	49	51

Source: Prepared based on fieldwork, 2015

The activities attributed to the responsibility of the mother include planting trees, done in 32 cases; cleaning family orchards involves sweeping the dry leaves of trees in 132 family orchards; watering them is another activity registered in 104 occasions. In 87 cases women make harvest of family orchard, this is because the mother is responsible for feeding, therefore she chooses new trees to plant and decide which fruits can be used to supplement the family diet (Table 4).

Table 4. Most frequently activities performed by mother

In charge	Tree planting	Cleaning the home garden	irrigation	Crop products
Mother	32	132	104	87
Father	24	34	42	52
Son	8	8	18	10
Daughter	3	8	8	6
Grandfather	2	0	0	1

Grandmother	1	4	4	0
Grandson	1	0	0	0
Total	71	186	176	156

Source: Prepared based on fieldwork, 2015

Weeding is done in 169 family orchards, manually, i.e. with machete, a hoe or tearing the grass by hand; 11 times equipment was used through a brush cutter; and in 4 cases they used herbicide. Hand weeding may be because it is a highly selective activity, because the complex association of particular species of these agroecosystems. To irrigate family orchards, people use different sources of water. At 134 family orchards they use water from municipal drinking water systems, and in 15 cases the water of domestic activities was reused, which can be attributed to water distribution for the various activities related to housing. The use of techniques for the most common irrigation was buckets, presented in 105 agroecosystems, perhaps because it is the mother who carries out this activity, consequently women both manages and provide water inside the house.

The frequency with which the owners of the studied family orchards produce compost is carried out in 41% of agroecosystems; the most frequent practice they do is letting decompose organic waste at the base of trees. The materials used are the leaves of trees, household waste, manure, grass and ashes. The compost is then reintegrated into the family orchards 52 times, while in 18 cases they lead it to the agricultural parcel. It is clear that in many family orchards composting was not carried out, probably because the owners are unaware of the benefits of composting techniques and do not invest time for processing. A strategy that families use to make organic waste products from the kitchen was found in 62 cases as a cheap strategy to maintain the animals. 54 respondents answered that wastes are deposited in the garbage truck.

Sociocultural and environmental benefits derived from family orchards

One of the questions that were asked to householders was why the family has orchards, in order to meet and emphasize the importance AEFO represents to them. Table 5 shows why people have and take care of their family orchards. The main reason is to meet the needs for food, this due to the number and variety of trees that there are in the family orchards by providing foods that complement their family's diet, because families make use of the products of these agroecosystems.

Table 5. Causes for having a family orchard

Reasons to have the garden	Replies
Cover food needs	105
Shadow	67
Nice weather	46
Source of income	8

Source: Prepared based on fieldwork, 2015

Food products that families consume from the AEFO were perceived in 177 times. The family orchards give them fruit, but also medicinal plants for health care, for condiments or for food preparation. Less often they take advantage of leaves, egg, milk, vegetables and stems, this show that it is a system from which a variety of food and medicinal products are obtained. The main use of the AEFO for the family is to provide food. However, space is used for other purposes such as carrying out recreational activities that are explained in Table 6. Both recreation and ornament highlight the importance of these systems for families to have recreation.

Table 6. Other uses for AEFO

Uses	Replies
Recreation	86
Ornament	78
Family reunion	42
Leisure time	12
Events	11

Source: Prepared based on fieldwork, 2015

Table 7 shows some of the social and cultural benefits and environmental services that people perceive to have from the family orchards, and the most frequently mentioned are the contribution of shade and as animal shelter, followed by maintaining moisture and food for animals. But people interviewed identified various uses that they apply in other activities, as functions related to different traditional ecological techniques that they have preserved and varied environmental services that promote productivity and quality of life.

Table 7. Sociocultural benefits and environmental services that owners and communities receive from family orchards

Goods and services	Number of people who consider the benefit
Shadow contribution	130
Animal shelter	124
Maintains humidity	88
Animal feed	71
Branches tutor	62
Provides sheets	60
Branches to close	38
Repel pests	30
Avoid grass grow	20
Prevents soil erosion	12

Source: Prepared based on fieldwork, 2015

Management that families make of the AEFO provides them with various socio-cultural benefits, such as: the provision of shade (130 people) with two main functions: creating a comfortable microclimate to the home and as a way to keep moisture in the agroecosystem, which is managed by intercalating trees, shrubs and herbaceous plants to maintain soil cover and to prevent fast evapotranspiration. As animal shelter (124 people), not only for wildlife, also for raising chickens, which at night are safeguarded and protected in the branches of trees to avoid being attacked by predators. The use of branches as support refers to the fact that family's plant, at the base of a tree, species of climbing vegetables such as squash (*Sechium edule Sw*) or pumpkin (*Cucurbita pepo L*), so that trees serve as a support for growth and production.

In these agroecosystems, the leaves of the trees are harvested for three uses, the first is to let them stay in the place where they fall, as ground cover to keep moisture; the second use is to feed small animals like rabbits and third use is composting. The branches in some family orchards are used to delimit the property limits. In a few family orchards owners perceive they have plants that can be useful to repel pests, such as the case of rue (*Ruta graveolens L*). Among other benefits they understand that from the accumulation of leaves and the presence of trees and shrubs the growth of grass and erosion can be prevented.

The perception of the holders of AEFO about the benefits they receive from their family orchards allowed 121 respondents state that they obtain products used for household consumption. 70 owners said they contribute to their health through consumption of healthy products, which are not produced with agrochemicals. Also they perceived the generation of clean air and medicinal plants, which helps them to attend sickness conditions and the presence of plants favors their family wellness. They highlight the economic benefits of the sale and exchange of products that complement the family diet in 15 cases. The reason why they are preserved because families are interested in keeping them because of the benefits.

Regarding environmental benefits, most villagers believe that the family orchards provide them with a pleasant climate and that by staying in the shade of trees can shelter from the heat and maintain a more uniform temperature throughout the day and humidity that favors a comfortable home environment. They also receive ethical-aesthetic benefits offered by the presence of birds and other wildlife animals that come to eat the fruits or sleep during the nights. This is part of recreational activity and for teaching their children to take care of nature. In 127 cases, the main reason why people are responsible for maintaining the family orchards is because they simply like it; 47 of them mentioned as motivation to get the food. Just over a quarter of respondents consider taking care of family orchards as a recreational activity.

Traditional knowledge that maintains and reproduces the families in the AEFO has led them to create a cultural tradition of management, which has been acquired through empirical practice of these activities. Continuous and systematic observation of the agroecosystem functioning is a natural process. Regarding the knowledge they possess to maintain the family orchards, 64% of respondents received it from their father, because it is a traditional practice passed from generation to generation, through father to son. The transmission of knowledge about maintenance is shared by 53% of holders. In 72 cases it is to children, in 12 times to grandchildren and in 9 times to neighbors. As expected 90% have not received technical assistance for the maintenance of agroecosystems, being a traditional knowledge in these

municipalities. However, 50% of families are interested in receiving training to improve the state of the family orchards.

Identifying social benefits have to do with family interactions and relationships with others outside the home. The family orchards allows to the owners to relate with other people; more than two thirds of the respondents believe that these agroecosystems foster coexistence with neighbors and family members themselves, it reiterates the importance of family orchards in family and social cohesion. The ways in which the family orchards allow people to relate, mostly is linked to the exchange of products, because it is a way in which families can supplement the family diet with other foods that do not produce in their own family orchards.

Conclusions

Through the management of family orchards, culture develops because are present customs; traditions and beliefs like the use of objects for protection of plants and the use of plants to attend diseases of respiratory, digestive and cultural affiliation diseases. At these agroecosystems people has been integrated adaptation and conservation of trees, shrubs and herbaceous species.

The AEFO redound in economic benefits for families as surplus products of orchards are sold or exchanged, contributing to family income in season when jobs are scarce, although the main destination for AEFO products is consumption. They are an alternative income generation for families derived from sale of surplus products and favor family household savings brought about by self-consumption.

Being a traditional practice were persons participate and are imitated ecosystems' natural processes it is possible to maintain biodiversity along the time, and ensure its preservation. This allows family integration mean by work distribution for AEFO management; and even to relate with other families through the products exchange such like fruit, seeds, leaves and plants.

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EXPANSION OF FUNCTIONS OF URBAN AREAS TO RURAL AREAS: THE CASE OF KALWARIA ZEBRZYDOWSKA

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Key words: expand, rural, suburb

Abstract

The town of Kalwaria Zebrzydowska, located ca. 40 km from Cracow is a constantly developing center of the furniture industry established in the 19th century. It is a formal capital of the Kalwaria Zebrzydowska municipality, whose administrative borders include 11 villages. However, practically speaking, the area along the main east-west road (national route no. 52), from the access road in Brody, may be considered as one big urban area. It is an example of an area in which borders between towns and adjacent villages are indicated only by name plaques, often indistinguishable from advertising boards. Buildings typical for, and originating from, urban areas, expand beyond the town's borders in a free and uncontrolled manner. The town grows chaotically, its structure changes, i.a. through creation of new functional areas, also expanding beyond formal borders, decreasing the significance of the town center and introducing changes to the communication structure. Moreover, urbanized rural areas change as well, becoming a suburb, or, as in the case of this town of 4.5 thousand inhabitants, a quasi-suburban area. The process seems inevitable, if not natural. How does Kalwaria Zebrzydowska function today? Where are the borders of its constantly changing structure? What will be the fate of such „expanding” towns?

Introduction

The town of Kalwaria Zebrzydowska, the administrative center of Kalwaria Zebrzydowska municipality, has 4,500 inhabitants. As it is situated not far from Cracow or Bielsko-Biała, it has direct access to important supra-local routes, facilitating its development in many fields, i.a. as a furniture industry center, tourist and pilgrimage destination, or as a residential infrastructure for bigger neighboring cities. It is well-known for the Sanctuary of Our Lady of Angels that is located there; it is included in the UNESCO World Heritage List and visited by many tourists from all

over the world. The other – and equally important – area of development is the local, time-honored furniture industry. It is the most influential factor in terms of spatial transformations, in the town as well as beyond its administrative borders. It is a part of a larger, traditional region, encompassing also parts of the adjacent municipality, Lanckorona (e.g. the village of Izdebnik), stretching out from the east, along the national route no. 52. Therefore, the part of Kalwaria Zebrzydowska municipality that seems to be most affected by those transformations is the village of Brody, located along the eastern border. Its location – along an important, supra-local communication route – influences the formation of an urbanized „road” landscape, consisting of a combination of production, service-provision, and residential development along with the necessary infrastructure, creating an atmosphere that resembles more the adjacent town than a village. Although transformations are visible along the entire border of Kalwaria, the problem is the most notable – and the most interesting in terms of this analysis – in the village of Brody; therefore, I shall focus mainly on this area.

The aim of this study is to answer the questions concerning transformations of Kalwaria Zebrzydowska’s urban area. Where is the border between the urban and the rural part, if urban development goes beyond the borders, creating more and more „satellites” that continue to appropriate the open rural area? How do we refer to the transforming space – is it an expanding town, a transforming village, or maybe a new entity altogether? What will be the fate of such an area?

In order to answer those difficult questions, an analysis of Kalwaria Zebrzydowska itself, its neighboring villages, as well as the definition of the term of „town/city”, is necessary. It will constitute a basis for further study of existing problems as well as allow to draw conclusions bringing us ever nearer to answers to questions mentioned in the introduction.

Kalwaria Zebrzydowska – a handful of facts concerning the analyzed area

Before I start to analyze Kalwaria Zebrzydowska as a town, it is worth to mention some hard data concerning its geography, demography, etc. The development scheme for Kalwaria Zebrzydowska and neighboring areas is presented in Figure 1.

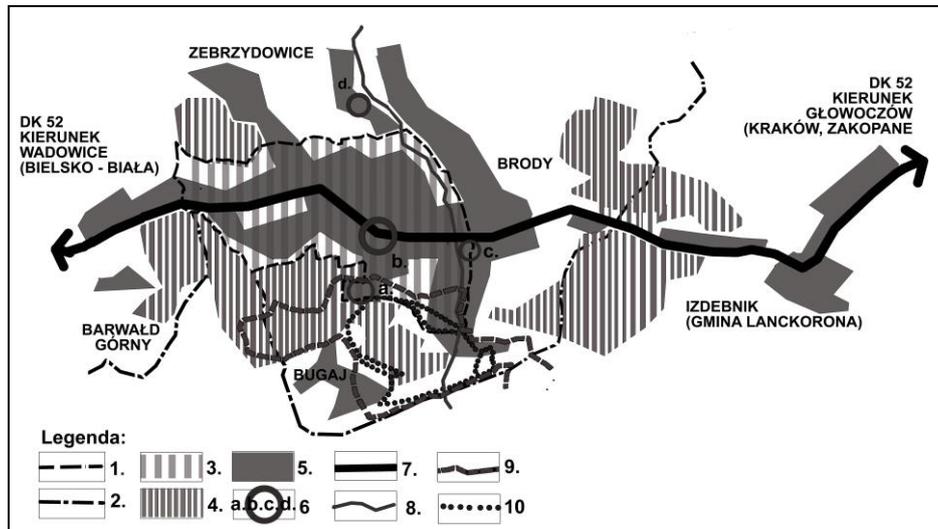
The town of Kalwaria Zebrzydowska is located in south-eastern Małopolska region, and it is located in the vicinity of important urban centers (35 km to Cracow, 14 km to Wadowice, 50 km to Bielsko-Biała). It is the seat of municipality authorities, consisting of the town of Kalwaria and 11 villages. It has 4,500 inhabitants¹ – constituting 23% of inhabitants of the entire municipality (19 615²).

The region’s history reaches back to 1601, when Mikołaj Zebrzydowski built a chapel on the top of the Żarek mountain. The chapel gave rise to a large monastic complex (including today the villages of Bugaj and Brody) and Kalwaria’s Stations of the Cross, based on the Calvary of Jerusalem’s layout. It was supposed to be a park intended for prayer, with chapels presenting the life and death of Jesus and Virgin Mary. Kalwaria quickly became an important destination for pilgrims from Poland and other countries. What was unique, even back then, was the scale of the complex, and its exceptional character.

¹ Source of the data: Kalwaria Zebrzydowska Municipality Office

² Ibid.

Figure 1. Development scheme of the analyzed area



1 –Kalwaria Zebrzydowska's town border, 2 –Kalwaria Zebrzydowska's municipality border, 3- the town's administrative area, 4 – forests, 5 – urban areas, 6 – main service areas: a. Sanctuary, b. town center (market square), c. Brody village center, d. Zebrzydowice village center – Convent of the Brothers of Saint John and the parish church, 7 – national route no. 52, 8 –Cedron river, 9 –UNESCO-protected area border, 10 – Kalwaria's Stations of the Cross.

Source: Author, on the basis of SUIKZ (spatial development conditions and directions) of the Kalwaria Zebrzydowska town and municipality

A large area, designed in detail and embedded in the terrain, taking into account not only its nearest surroundings, but also the entire landscape (Mitkowska, 2003). As the interest of pilgrims continued to grow, the village of Zebrzydów was established in 1617, at the foot of the mountain, near the route to the Monastery. It was supposed to serve as accommodation for tourists (Jackowski, 1995). For more than 150 years Kalwaria (named thus after it was joined to the Austrian Partition) was a small town, famous mostly of the Monastery and local industry whose significant part was, even back then, furniture production. A breakthrough came in the period of 1786-1790, opening the region to the world: central-Galician route, an important route of the Austrian Partition, from Lvov to Biała (today – Bielsko-Biała), was built. Not only did it allow the pilgrims to access the Sanctuary, but strongly influenced the development of the town itself – reinforcing its role of an industrial center (Chadam, 1984).

Today, furniture industry continues to be the dominant branch of local industry. Furniture is produced in many different forms throughout the whole town, e.g. in big production and service factories, smaller, detached buildings and in residential buildings. The national route 52, crossing the market square, is also very important. This historical route's significance is not only commercial and communicational – it is an axis of the common furniture production area (in the Kalwaria and Lanckorona region).

Production sites grow dynamically, in town as well as in neighboring villages. As there are no common policies for the area's development, it is carried out in a chaotic manner, e.g. in terms of location or form of development, which influences the shape and quality of the space and limits the growth of other industries (including tourism and agriculture), in spite of favorable

natural and landscape conditions. An important step towards solving that problem was adopting of the „Town and Municipality Spatial Development Conditions and Directions” document³ by the local authorities in 2015, providing guidelines for development of areas comprised in Local Spatial Development Plans (currently in progress). However, it should be admitted that the policy provided for in the Conditions and Directions shall not resolve the existing problem of excessive urban development of the area.

The municipality whose center is Kalwaria Zebrzydowska can boast a rich natural and cultural landscape. It is topographically diverse, richly wooded (especially in the southern part), and the local fauna and flora is subject to different forms of nature conservation (such as Natura 2000 on the river Cedron). Its attractiveness as a tourist destination is enhanced by valuable monuments and complexes of monuments. The most important is the Sanctuary and the Stations of the Cross, visited annually by 1.2 million pilgrims⁴ and subject to special protection resulting from its presence at the UNESCO World Heritage List. Apart from the Sanctuary, the Convent of Brothers of Saint John in Zebrzydowice and numerous historical residential and religious buildings as well as farm buildings can be found there.

The center of the municipality is surrounded on each side by rural areas, remaining in close relation to them in many ways. On the eastern side it shares borders with Brody and the Lanckorona municipality (Fig. 2 and 3). The municipality border in Brody starts along the edge of the forest; from there, along the national route 52, the number of buildings increases; it is dominated by production sites and service facilities, as well as several residential buildings. The center of the village, where commercial services prevail, blends with the town’s spatial structure, whereas the residential part of the village, where smaller production facilities operate, develops mainly along roads running north and south.

To the west, it shares borders with villages of Barwałd Górny and Barwałd Średni, and further on – the municipality of Wadowice. In this region, an important part of the space is the abovementioned route, generating service and production areas; the main part of the village’s structure is organized along this road, going north and south. However, the scale and prevalence (in terms of quantity) of services and industry in the village’s general structure is considerably lower. It is more varied (not dominated by furniture industry) and more focused on the local community.

On the northern side it adjoins the village of Zebrzydowice. The border between the town and the village is thin, but, contrary to places mentioned above, it seems the most natural. It is dominated by structures similar to most of the town’s (apart from the center; mostly detached houses with small backyard service and production premises), being its natural continuation. Elements that distinguish Zebrzydowice from other villages (and the town) is a higher percentage of green areas and, strongly influencing the landscape, the historical buildings of the complex of the Brothers of Saint John. Its towers, as well as the church, constitute local dominants, surrounded by overmature stand and thick riverside greenery near the Cedron river.

³ Resolution no. VI/44/2015 of the Town Council of Kalwaria Zebrzydowska of 23 April 2015 amending the Spatial Development Conditions and Directions of the Kalwaria Zebrzydowska Town and Municipality

⁴ Source of the data – Centrum Kultury, Rekreacji i Sportu w Kalwarii Zebrzydowskiej (Culture, Recreation and Sports Center in Kalwaria Zebrzydowska)

From the south, it adjoins the village of Bugaj and forested land surrounding the Sanctuary. It is the least developed peripheral area of the town. Its significant part are the Stations of the Cross, starting at the Sanctuary and passing through the neighboring forests. Due to its location and integration with religious paths (many of which lead straight across the residential area), it is the least built-up and inhabited village. Its landscape consists of many old houses and farms surrounded by green areas. The lack of extensive spatial development stems from restrictions required by the strict preservation regulations imposed i.a. by UNESCO.

Figure 2. Access route to the built-up area of the village of Brody.

Development dominated by service and production facilities.



Source: the Author

The conclusion that can be drawn from the abovementioned facts is the following: the growth of the town area, as well as of neighboring areas, is extensive. Its result are changes in the structure of the center itself, as well as adjacent areas. The border between the town and villages changes, becomes blurred. It gives rise to the following questions: how can we define a “city” or “town”? Where are its borders? Do they change, or maybe it is the city/town that transforms? Or perhaps a new entity is created? In order to define problems, determine principles of functioning and consider possible future solutions, I shall try to refer to theory and find existing, or define new, theoretical patterns. The first step of this process shall be an attempt at finding a definition of “city/town”.

City/town – what is it? Definition

The question concerning the definition of the city (or town) is not easy to answer. However, it is relevant and helpful in terms of determination of its properties and processes specific for its theoretical borders, and in consequence, identification of changes that give birth to phenomena mentioned above.

This problem was tackled i.a. by Anna Agata Kantarek (Kantarek 2013), Marek Kowicki (Kowicki, 2014), Eugeniusz Rydz (Rydz, 2006), Krystian Heffner and Arkadiusz Halama (Heffner, Halama, 2012), as well as Agnieszka Wojtowicz-Wróbel (Wojtowicz-Wróbel 2013). Encyclopedic as well as literary sources are also worth mentioning.

According to the Polish version of the Encyclopedia (Encyklopedia, 1998), a city or a town is: „a settlement unit created historically as a result of settling of people intending to pursue non-agricultural professions; it is distinguished by extensive development, infrastructure – e.g.

transport system, water and energy management system, and production of goods and services, also for non-local recipients"

How does the definition work in the context of Kalwaria Zebrzydowska? No doubt it:

- *is a settlement unit created historically as a result of settling of people intending to pursue non-agricultural professions(...)* A settlement established near the Sanctuary, serving as accommodations for pilgrims, gave rise to the town (Chadam 1984).
- *It is distinguished by extensive development (...)*. In the discussed area, there is an extensive development of residential buildings – detached houses, residential complexes, along with numerous service and production facilities, extending beyond the town's administrative borders.
- *It is distinguished by (...) infrastructure – e.g. transport system (...)*. The town is the communication center of the municipality – the main intersection, organizing the circulation in the whole region, is located in the market square area.
- *It is distinguished by (...) production of goods and services, also for non-local recipients.* Today, Kalwaria Zebrzydowska is an intensively operating furniture industry center, delivering furniture to non-local buyers in the country and abroad. It is also the seat of the municipality's authorities and the center of other public services and local offices.

Another relevant definition is the one from the Encyclopedia of Architecture (Pevsner, Fleming, Honour, 1992), describing „*a settlement with a high population density, mostly non-agricultural, characterized by extensive development concentrated along communicational routes (streets, squares, boulevards) and around squares (agora, forum, marketplace), divided into districts, blocks, and parcels*”. Kalwaria Zebrzydowska is built around a market square, from which streets forming blocks and parcels radiate. The abovementioned definition does not mention services, meanwhile emphasizing the spatial shape.

For now, instead of spatial and geographical approach, let us focus on the city/town concept in terms of community, as suggested by the classic of literature, William Shakespeare, in his *Coriolanus*: „What is the city but the people?”⁵ (Shakespeare, 2003). According to him, it is the people – the community – that determine the „urban” character of a place.

The town of Kalwaria Zebrzydowska – what is it? where is it?

Having presented an overview of facts on Kalwaria Zebrzydowska and the theoretical background of a city, we shall now move on to identifying elements of the abovementioned definition within the town, and through it – to attempt to define its borders. The question still remains – which borders? Of the town, of the village, or maybe something in between the two?

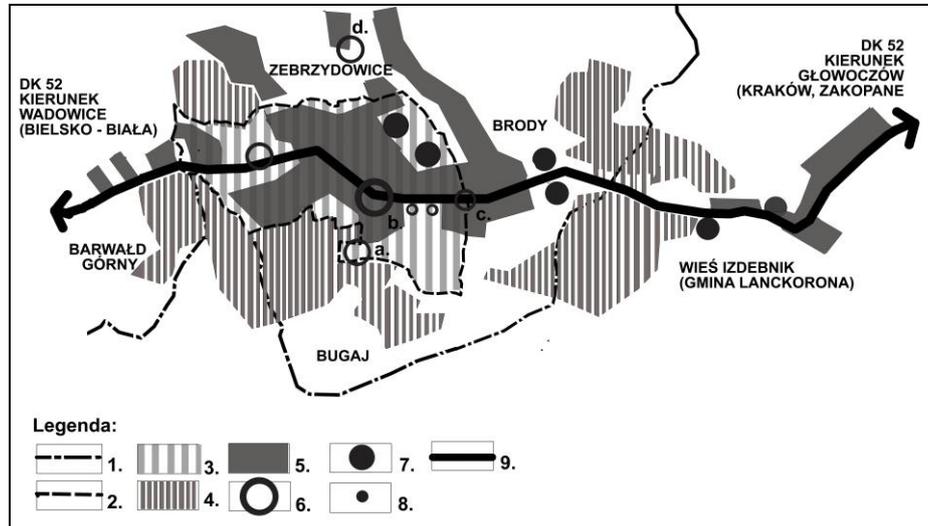
According to the definition from the Encyclopedia (Encyklopedia, 1998) referred to above, Kalwaria is a settlement unit, whose spatial structure is highly developed; it has a road and technical network infrastructure and it produces goods and provides services to non-local recipients.

The layout of service points along the national route is shown on Figure 4.

⁵ “What is the city but the people? Citizens. True, The people are the city.” (Szekspir, 2006)

Figure 4. Location of service and production facilities within the analyzed area

1 Kalwaria Zebrzydowska's municipality border, – 2 –Kalwaria Zebrzydowska's town border, 3- the town's administrative area, 4 – forests, 5 – areas with production, service and residential buildings with predominance of furniture production, 6 – main service centers, 7 – areas with majority of furniture production facilities, 8 – significant service areas, not directly related to the local furniture industry, a. Sanctuary, b. town center (market square), c. Brody village center, d. Zebrzydowice village center – Convent of the Brothers of Saint John and the parish church, 9 – national route 52.

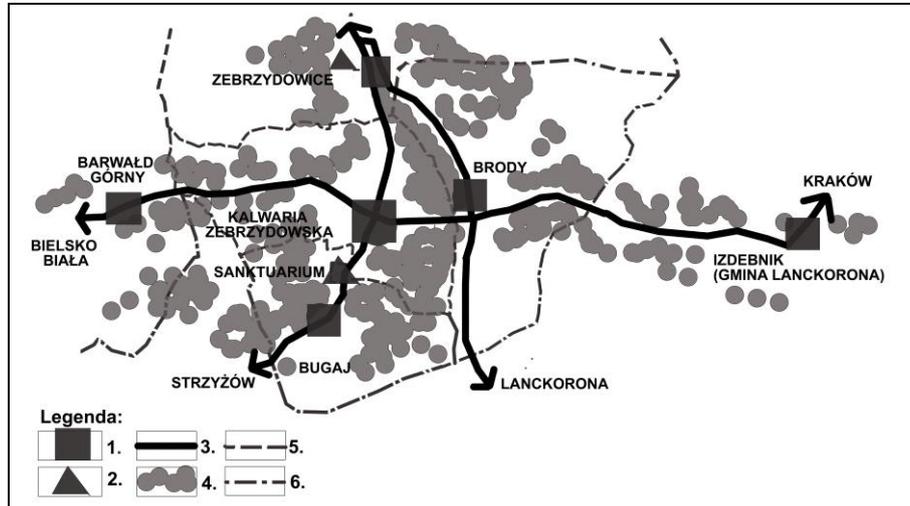


Source: Author, on the basis of SUIKZ (spatial development conditions and directions) of the Kalwaria Zebrzydowska town and municipality

According to the entry in the Encyclopedia, the analyzed urban area goes beyond administrative borders that, on the eastern side, i.e. in Brody, seem to extend beyond the compact residential and service structure. It is therefore necessary to mention – again – the national route, an extension of the historical „central-Galician route”. Figures 5 and 6 demonstrate schemes of probable development of the area, as a consequence of the abovementioned change. It may be considered as a turning point for the structure of the entire area. It was an impulse for transformation, moving the center of the town's life (first of all, in terms of economy, leading to displacement of other domains) to places with a better communicational access – ensuring better contact with external areas, and as a result, e.g. free movement of people and goods, etc. Of course, it was mostly beneficial to closest areas that successively grew, „claiming” the space, at the cost of smaller units. Thus, today, Kalwaria is „absorbing” the center of Brody, expanding the industry to new areas. Thanks to its location, the center of the village has become an extensively developed „suburb”, i.e. an extension of the town, blending with it along the national route, filled with service points whose location was generated by an easy access. Rural functions of this area have long since disappeared, giving way to production and services. Residential buildings are dispersed; there are no animal pens. Many houses fulfill two roles: that of a residential building and of a small service point. The road generates circulation, from which also other service facilities benefit, in open green areas or parcels with an agricultural potential, located along the route. As their creation is a chaotic process, service points tend to blend, forming a uniform entity. Due to their attractive, exposed location, they are surrounded by many advertising billboards, complementing this peculiar landscape.

Figure 5. Situation before the „central-Galician route” (today national route 52) was built – possible development plan

1. Centers of local settlements, 2- Important points generating circulation – Sanctuary in Kalwaria Zebrzydowska and the Convent of Brothers of St. John in Zebrzydowice, 3 – main routes, 4 – greenery – open areas, outside building clusters, 5 – current border of the town of Kalwaria Zebrzydowska, 6 - current border of the town of the municipality of Kalwaria Zebrzydowska.

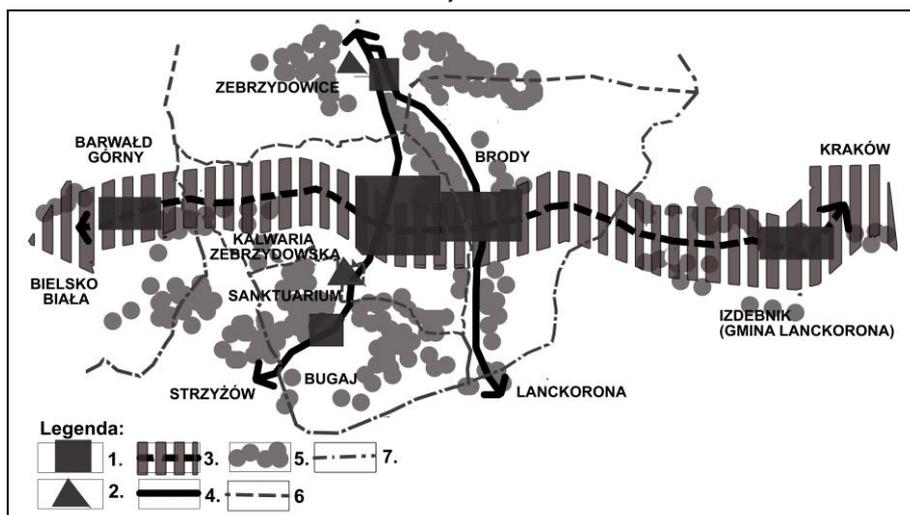


Source: Author, on the basis of SUIKZ (spatial development conditions and directions) of the Kalwaria Zebrzydowska town and municipality and archives of the Provincial Art Restorer in Krakow.

Figure 6. Current situation -

i.e. after the „central-Galician route” (today national route 52) was implemented.

1. Expanded settlement centers along the route 52, 2 - Important points generating circulation – Sanctuary in Kalwaria Zebrzydowska and the Convent of Brothers of St. John in Zebrzydowice, 3 – National route 52 and the adjacent service and residential area, 4 – remaining roads, 5 – greenery (incl. forests) – open areas, outside clusters of buildings, 6 – current border of the town of Kalwaria Zebrzydowska, 7 – current border of the town of the municipality of Kalwaria Zebrzydowska.



Source: Author, on the basis of SUIKZ (spatial development conditions and directions) of the Kalwaria Zebrzydowska town and municipality

The hypothesis that it is a town with expanding development is proven by the second definition referred to in the preceding subchapter – the entry from the Encyclopedia of Architecture (Pevsner, Fleming, Honour, 1992). It sustains the spatial value of the place, as the key factor, pointing out a structure with a center, and a fixed, hierarchical layout of streets, blocks, parcels, etc. All those elements can be found in Kalwaria Zebrzydowska, whose center is the market square, joining the main routes. Although today, because of its development, it is no longer the center of local life (that moved to side streets and the square), its central position remains crucial. It can safely be ascertained that with appropriate spatial modifications (firstly, removal of transit traffic and the accompanying infrastructure), it is still possible to restore its original function of the town's life center. The abovementioned definition suggests that a city or town exists to the extent that the space is developed. After analysis of the plan of Kalwaria, it is safe to say that adjacent rural areas are in fact urban areas, i.e. related to the town's spatial system. However, if we define the urban area as a developed area, how do we classify the areas located at its administrative borders, with functions that definitely are not agricultural: service and production facilities? They are a direct continuation of elements of compact urban development, its big „satellites” – pioneers of transformation of space that, until recently, was rural; those facilities are followed by numerous new projects. Separated from compact building clusters, they constitute a structure that is hard to define: it is no longer rural, but still not urban. According to the foregoing, we have drawn closer to answering the question of where to look for borders in an urban space, still different from administrative borders. The answer remains ambiguous. The aforementioned spatial definitions should therefore be complemented with a sociological perspective, indicating, as Shakespeare suggested (Shakespeare 2003), that it is the city's inhabitants that define the city. *They are the city.* If definitions fail to fix the spatial borders, we should focus more on the inhabitants, on local communities, and to try to determine where are the borders of areas used by them, and subsequently – how to define the area beyond those borders, that they do not need and do not use, a supra-local area.

Craftsmen are an important part of the population of Kalwaria Zebrzydowska: small as well as big companies, producing furniture or providing furniture-related services. Many of them continue the family tradition for generations, in backyard workshops or bigger establishments. Considering that community remains in the heart of this analysis, a community that changes the town, shapes and inhabits it through development of various undertakings, it is safe to say that it is the entrepreneurs who contribute the most to the town's growth. They build their workplaces and homes for their families, and through their lives and work, they stimulate the life of the town. Therefore, the town borders can be drawn at the limits of its inhabitants' activity. In the light of the above, it is necessary to mention the areas described above, situated within formal borders of villages, in which, in between the dispersed buildings, production and service facilities begin to appear (mainly along the national route) and which have been classified as urban structures. This leads to yet another issue. As the inhabitants of those areas have always lived beyond the town's borders, they do not consider themselves as part of the urban structure. The development does not indicate that the parcels in which they live and work are rural (or non-urban), as their function is related to services, not agriculture. There are also big production facilities, constituting separate „entities” outside the town, used by owners and employees who

stay there only temporarily. In the discussed „social” context, they do not „belong” to any of the spaces: neither rural nor urban. Their role is not to serve the town, but rather non-local clients. Their location outside the town is determined, apart from good accessibility in terms of logistics, by the size of the facility, that needs a lot of space to be built. They do not belong to the city, because they do not influence its structure or activity in any way. Neither do they belong to the village within the borders of which they are situated.

Conclusions

Kalwaria Zebrzydowska is an example of a town *expanding* beyond its administrative borders. In the ongoing process, three types of highly active areas are created, whose borders change continuously.

The first area is the town, successively absorbing adjacent structures, inhabited by people actively participating in shaping the life of the town.

The second is a formally rural area, as it is located outside the town, and the intensity of development as well as agricultural functions still classify it as a village (areas north and south from the town).

The third (mainly the village of Brody, sharing the eastern border with Kalwaria) is the most difficult to define – a „public” and service area, housing mostly service establishments, successively becoming a typically urban area.

It seems that in the case of medium-sized towns, such as Kalwaria Zebrzydowska, the town’s borders are difficult to define and the *expansion* process is troublesome to analyze. It is only possible to control the process and continue it in a more deliberate manner, i.e. modify its direction in order to avoid changing the borders of the village and reinforce the new entity in problem areas. An adverse effect could be the loss of the nature of the urban center and transformation towards a shapeless structure, slowly becoming a remote suburb of Krakow.

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POPULATION AGEING AS A CHALLENGE FOR ARCHITECTURAL AND URBAN DESIGN. CASE STUDY: CONCEPT OF HYBRID SENIOR UNIT IN CRACOW (POLAND)

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Abstract

The patterns of declining fertility and mortality over the past two decades have led to significant shifts in the age structure of the world's population. Although most advanced in Europe and North America, population ageing is occurring, or will soon begin, in all major areas of the world (United Nations, 2013). How these cities are facing that challenge? Will future cities and architectural designs be inspiring by a greying population? Due to a growing problem of society ageing, the topic of architectural design of senior housing developments is more and more relevant in a global context.

This paper proposes a series of design questions of how urban design and architectural ideas could contribute towards improvement life condition in future cities. Design solutions related to a series of case studies of senior housing are presented, with the main focus on the diploma concept of the Hybrid Senior Unit in Cracow (Poland) aimed at a multifaceted integration: architectural, urban and social.

How to Be Old

It is easy to be young, (Everybody is,

*at first.) It is not easy
to be old. It takes time.
Youth is given; age is achieved.
One must work a magic to mix with time
in order to become old. (...)*

*In time one will be very old.
In time, one's life will be accomplished.
And in time, in time, the doll—
like new, though ancient—will be found.*
[May Swenson]¹

Introduction

Population Ageing is taking place in nearly all the countries of the world, also Poland. According to the recent assessment of World Population Ageing (United Nations, 2013), the share of older people (aged 60 years or older) increased from 9 per cent in 1994 to 12 percent in 2014, and is expected to reach 21 percent by 2050. What more: the older population is itself ageing. The share of older persons aged 80 years or over (the 'oldest old') within the older population was 14 percent in 2013 and is projected to reach 19 percent in 2050. If this projection is realized, there will be around 2 billions of older people (over 60), included 392 million people aged 80 years or over by 2050. These figures make impressive headlines for breathtaking reports on Ageing Population and Urbanization, which are being discussed at conferences globally, but such statistics are meaningless without asking how these cities are facing that challenge, and mostly, will the future cities and architectural design be inspiring-ageing?

How to plan our habitats in the field of health, social welfare, economy and spatial planning, when the number of pensioned is highly increasing. How would it reflect on urban-space, living-space and whole attitude to housing environment issues?

This paper proposes a series of design questions of how urban design and architectural ideas could contribute towards improvement life condition in cities. Design solutions related to a series of case studies of senior housing are presented, with the main focus on the diploma concept of the Hybrid Senior Unit in Cracow (Poland) aimed at a multifaceted integration: architectural, urban and social.

Background

A booming senior population, changing household structural dynamics and increasing wealth have created the conditions for a new growth market: providing housing for seniors. Senior housing has been a hot topic and a strong commercial real estate investment class for several years. *"According to Real Capital Analytics, senior housing and care facilities year-over-year sales volume increased by 30 percent in the second quarter of 2014. This asset class*

¹ Swenson, May; *Poems Old and New*. Mariner Books, 2000.

encompasses various niches; it is no longer just your grandparents' nursing home or your parents' 55+ community" (Graphe, 2014). Due to the current situation and forecasts, the senior housing design is a huge challenge. There are more and more research, reports, rankings as well as competitions² that are trying to identify the key features that create adult-friendly environment.

The recent ranking of Best Cities for Successful Aging (Milken Institute, 2014) indicates several separate factors that most effect the quality of life for older adults. These include not only health and wellness, crime rates and weather, transport, economic and job conditions, but also housing and social engagement factors that help create safe, affordable and connected communities. Regarding the features that especially belong to the problematic of senior housing, there are many factors highlighted by the Global Age-Friendly Cities: A Guide³ (divided into 9 groups: Affordability, Essential Services, Design, Modifications, Maintenance, Ageing in Place, Community Integration, Living Environment). From an architectural and urban perspective, the following features seem to be the most important:

- Housing is made of appropriate materials and well-structured.
- There is sufficient space to enable older people to move around freely.
- Housing is appropriately equipped to meet environmental conditions (e.g. appropriate air-conditioning or heating).
- Housing is adapted for older people, with even surfaces, passages wide enough for wheelchairs, and appropriately designed bathrooms, toilets and kitchens.
- Housing is modified for older people as needed.
- Housing is not overcrowded.
- Equipment for housing modifications is readily available.
- Housing is located close to services and facilities.
- Affordable services are provided to enable older people to remain at home, to "age in place".
- Housing design facilitates continued integration of older people into the community.
- A range of appropriate and affordable housing options is available for older people, including frail and disabled older people, in the local area.
- Older people's housing is integrated in the surrounding community. (WHO, 2007, pp. 35-36)

Human, Sustainable, Vital, Attractive – looking for a Perfect Space, in which we would like to live when we grow old

The diversity of the features listed by reports and rankings shows that an integrated approach in the context of an ageing society seems to be a major source of success of cities in the XXI century. It means that an attractive urban and architectural environment should be well adapted to the needs of the inhabitants (aging society), in harmony with a functioning economy (having

² i.e.: Age-Friendly Innovation Competition, The Philips Livable Cities Award Philips Livable Cities Award, Access City Award.

³ The Guide highlights eight areas of urban living. Apart from the area of housing, there are: outdoor spaces and buildings; transportation; social participation; respect and social inclusion; civic participation and employment; communication and information; and community support and health services.

regards "the silver economy"⁴), assuring good social relations (integration and countering social exclusion)⁵.

Particular attentions in architectural and urban design process should be paid to social role of common areas as integration sites. Presence of people in the space, adding vitality to it, is tantamount to the life of a city (or - in smaller scale – of a neighbourhood). Therefore, leaving free space or designing space for living seems to be a key task of rehabilitation initiatives. Hence, a designer should often start not with a concept of the building, but of the "area between" - the common area to be used by all residents, the place where community life could flourish and make the place alive (makes the place safer and nicer to live in). Evoking the concept of a "city as a machine in motion" it must be said that *it is the people that set the city in motion. A city must be filled with people in motion. Today, a human being is becoming rarity in the city*" (Pawłowska, 1996). Hence, it is the architecture itself, the spatial arrangement that we should use to encourage a user not only to enter, but also to stay for some time in this space, meet and spend time with other people. *"Research shows that people prefer semi-closed areas while fully-closed space arouses anxiety and sense of claustrophobia in the case of high-rise building"* (Schneider-Skalska, 2004, pp. 51).

It seems, therefore, that low rise high density type of arrangement is a perfect solution for residential areas, enabling residents or visitors to use green passages and spaces to move around human scale buildings. Yet, it should be remembered that clear space needs to be left between the buildings, allowing for taking a look into the distance or encouraging people from outside to pass through the area. As G. Schneider-Skalska puts it: *"openness plays a fundamental role in evaluating residential space"* (2004, pp.106). Surprisingly enough, this openness of space very often translates into greater openness of its residents. Highly disadvantageous phenomenon is enclosed housing estates, so popular nowadays. They create inaccessible areas - excluded from walkway network. Low rise buildings have also psychological advantages. Living (or staying for long periods, e.g. at work) at heights (above 5th storey) may have adverse effect on human health. *"This is explained by a simple mechanism: apartments situated at high levels take people off the ground; they separate them from normal daily social interactions taking place on the streets, pavements, gardens, or porches. People are left to themselves in their apartments and going out to the world requires from them making a decision which is formal and uncomfortable. So, if they have no particular purpose to go out, they'd rather stay in, alone."* (Schneider-Skalska, 2004)

Another issue is the need to belong or - looking from the perspective of the designed space - the need for identity of the place (may manifest itself in the building façades or unique spatial arrangement). We tend to describe a place with some distinctive features as a place with the soul. We are able to identify with it and feel at home there. It seems reasonable to treat residential premises dedicated to older people as any other residential space. The arguments

⁴ „The Silver Economy” covers new market opportunities arising from public and consumer expenditure related to the rights, needs and demands of the (growing) population over 50.

⁵ An integrated approach in the context of urban renewal and ageing society, is developed by, i.e.: A. Labus, *Starzejące się społeczeństwa europejskie XXI wieku w koncepcjach odnowy miejskiej*, Wydawnictwo Politechniki Śląskiej; Gliwice 2014, G. Korzeniak (ed.), *Zintegrowane planowanie rozwoju miast*, IRM, Kraków 2011 and A. Zborowski (ed.), *Demograficzne i społeczne uwarunkowania rewitalizacji miast w Polsce*; Instytut Rozwoju Miast; Kraków 2009.

presented above should be given adequate consideration when designing facilities for senior citizens, addressing the needs of the society at the present stage of development.

Contemporary examples of old people's facilities - solutions that work

a) *Yew Tree Lodge, Hillingdon (UK)*

Yew Tree Lodge complex of assisted living homes in Hillingdon was built in 2009, based on the design by Duggan Morris Architects. Each unit is comprised of a bedroom, a living room with adjoining kitchen and a bathroom adapted for physically disabled people. Apart from 12 residential units, the building also accommodates common living rooms and kitchens. Elegant, simple architectonic form perfectly matches the English tradition. Modern detail is a sublime accent on the brickwork façade finishing.

Figure 2. Yew Tree Lodge, Hillingdon



Source: Photo by Edmund Sumner, online: <http://dugganmorrisarchitects.com/>, (date of access: 2016-03-01); <http://www.designboom.com/architecture/duggan-morris-architects-yew-tree-lodge/>, (date of access: 2016-03-12)

It was assumed that the residents of the complex would be old people (both couples and persons living alone). Each apartment is autonomous, equipped with emergency buttons to call for medical help, if necessary. Residents may, via building manager, order cleaning or catering services. Particular emphasis is placed on expanding neighbourly relations. To facilitate it, there is a common living room and a garden; there are also various initiatives organized (e.g. afternoon culture and entertainment events). Such facilities - although they are interesting solution for people capable of living on their own but requiring some assistance - are not common in Poland yet. Maybe it will be a “missing link” between independent living and having 24-hour medical care provided by a nursing home.

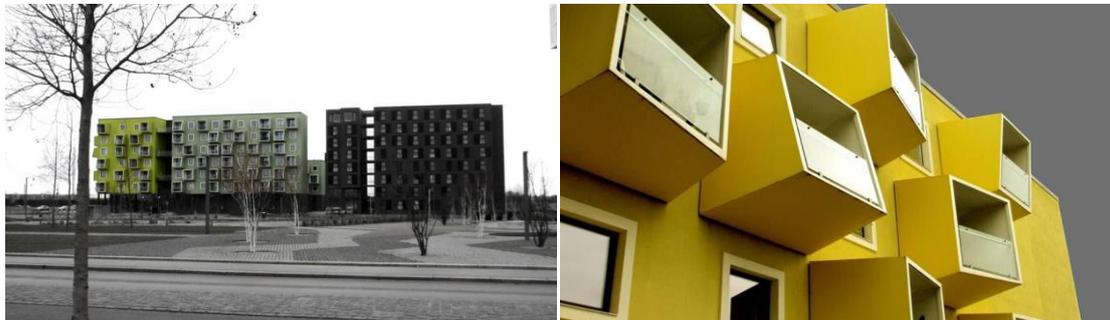
b) Haugmotun Sykehjem, Notodden (Norway) - a house for people suffering from extensive dementia.

Despite harsh climate of Northern Europe, the lives of residents of the centre concentrate in the garden. It is a unique garden - a sensor one. The centre has been designed by landscape architecture studio of Nils Skaarer, based on the research by Ellen Elizabeth Grefsrød. Special emphasis was put on the scents of plants and the sounds they produced when moved by the wind. There is also water here - its sounds complement the sensor picture created by the whole garden. Another important element of the garden are typical farm animals. The garden has a very positive influence on people staying here - by observing familiar forms, catching familiar scents or sounds, they can more easily recall the events from their lives. Residents are encouraged to angle in the stream running across the area, and to look after the farm animals kept in the complex.

c) Ørestad Plejecenter, Copenhagen (Denmark)

Senior citizens' house accommodating 114 residents, situated in the Ørestad was designed by JJW Arkitekter. It is adjusted to the needs of people requiring continuous, often quite extensive, assistance. The residents are aged from 57 to 104; many of them stay in the centre permanently. Any person who is not able to live on their own, can apply for admission to the Ørestad Plejecenter; the costs of staying are paid by the government. Ørestad Plejecenter combines attractive architectural form with well-designed functionality.

Figure 3. Ørestad Plejecenter – façade, detail



Source: Photo by Ida Mikołajska

The building has a characteristic design of balconies - on one side of the building they face the street, on the other - the garden. Vivid colours of the façade finishing surprisingly well harmonize with the surroundings - they have been appreciated not only by the Scandinavians. The centre has become a cult example of unconventional approach to the form of such facilities. There are so many people wishing to visit the centre, coming from all around the world, that the institution had to employ a special person to guide the visitors. Although the building is situated in the city, occupying a quarter, its functional arrangement was inspired by a traditional Danish homestead. The rooms (mostly single, with only two intended for couples) are comfortable and

- although rather small - allow for separating the sleeping area with a sliding wall. Each room has a balcony. Although bedrooms and bathrooms have no individual or unique features and resemble hospital interiors, the living area is furnished and arranged individually, e.g. with pieces of furniture and mementoes taken by residents from their former homes. Rooms are arranged into small neighbourhood units (4-10 rooms per unit), with common areas and kitchens. Interior design of common areas - although it may seem rather cold - has typical Scandinavian character and is well accepted by the residents⁶.

Figure 4. Ørestad Plejecenter – typical floor plan / plan of a single residential unit



Source: online: <http://www.jjw.dk/?projekt=orestad-plejecenter>, date of access: 2016-03-10.

Figure 5. Ørestad Plejecenter – common areas



Source: Photo by Ida Mikołajska

Residents of the centre have usually considerable walking difficulties and problems with taking longer walks or trips. Therefore, the common garden - plays a very important role in the complex. There are many hard surface areas to facilitate wheelchair movement. There is also a place adapted to serve as a boulodrome.

⁶ Date based on an interview and web page of the institution; online: <https://www.google.pl/maps>, (date of access: 2016-02-23).

Figure 6. Ørestad Plejecenter – a wheelchair-bike walk / electronic seal

Source: Photo by Ida Mikołajska

In spring, summer and autumn, picnics are organized at least once a week for all residents. An interesting element of equipment are wheelchair-bikes allowing for taking a resident for a ride. They are a perfect solution when a younger family member comes to visit a resident and they can both go for a ride. Another unusual device is an electronic seal - a feat of engineering (not convincing to everyone, though) that can be hugged, responds to touch, and produces sounds. The seals have been introduced because, unfortunately, keeping real pets here is very limited for hygiene reasons. According to the personnel, the seals have proven very useful in many cases.

A Concept of Hybrid Senior Unit in Cracow (Poland) - an attempt at synthesis

Poland is also faced with the phenomenon of an ageing society. From the beginning of century the number of children and youth is decreasing rapidly. Drastic changes in the demographic structure is not only influenced by natural factors (difference between births and deaths) and elongation of an average lifespan but also an impact of emigration of Poles (especially after Polish accession to the European Union and the gradual reduction of barriers to access to labor market) (Główny Urząd Statystyczny, 2012).

Theoretically, a model of multi-generation family (3 - 4 generations live together - helping one another) is still dominating in Poland. This model is still perceived as the best, however, real lives of many Poles considerably differ from the theoretical assumptions. Young generation is constantly on the move, has less and less time to take care of the family and home. A response to the changing way of life is the emergence of various care facilities, so called "old people's homes". Yet, there are still very few such facilities intended for people who are no longer able to live on their own. A separate category, still very rare, are day clubs, universities of the third age, activities in culture centres, book clubs for the retired etc. Having analyzed the current tendencies of evolving needs of the Polish society and examples of foreign senior centres, the authors of the present paper have proposed a solution that may adjusted to Polish reality, offering a synthesis of desired features of a place addressed to the elderly.

Multi-faceted architectural and urban planning renewal concept

This paragraph presents a concept of hybrid senior unit in Cracow - a diploma project of Ida Mikolajska, developed in the Faculty of Architecture of the Cracow University of Technology⁷. The project is an attempt of the integration of greenery and architecture, adapting the development to the needs of elderly residents, focusing in particular on the needs of the disabled, creating social space that allows the care home residents to integrate with other residents of the development, thus enhancing the former's quality of life.

The area selected for the planned complex is particularly attractive - a former manor and a park in Cracow. The area is well communicated with the city centre and serviced by public transport, only 200 m distance from a tram terminus (approach to the city center takes ~20min). The main street running towards the city centre is only in a 200 m distance from the complex so getting to the city center by car is easy and takes only 14 -25 minutes (in rush hours). Due to extensive vegetation, despite traffic artery nearby, the area is peaceful and quiet, offering atmosphere typical for single family housing area. A true advantage of the location is greenery, complemented by a Park Jerzmanowskich. The historical complex was entered in national register of monuments. The first manor was built in this place in XVII century and in 1810 the Park was brought into being.

Figure 7. Plan of the Hybrid Senior Unit



Source: Diploma project. Regeneration of Palace and Park Jerzmanowskich complex. New system of three combined/related structures (supported/assisted living housing, senior center with lodging house and activity hub and conference center) based on historical composition

The Complex craves for regeneration and making it useful. Hence, the idea to convert the manor house and adjacent buildings into a small conference centre, former utility buildings - into senior citizens' centre and to transform the area occupied by neglected allotment gardens - into

⁷ A diploma project was developed under the supervision of Jacek Gyurkovich, Prof. PhD, DSc, Eng., Arch, and Ewelina Woźniak-Szpakiewicz, PhD. Eng., Arch.

a quarter of assisted living homes. Newly designed buildings would match the height of the existing ones. Vehicle traffic within the Complex would be limited to the minimum - only privileged vehicles and technical services would be allowed. Underground car park is envisaged. Multi-faceted integration is envisaged on social level - renewal of the area in a manner encouraging people to use it; locating various age groups in adjacent areas (senior citizens' centre, conference centre, schools and kindergarten); introducing new objects facilitating integration and activeness: swimming pool, service provision facilities, cafes, gym. Concurrently - on the urban planning level – regeneration of the park (and integration with greenery system and bike trail network); creating attractive space which encouraging people to use it; refurbishment and giving new functions to unused, neglected buildings having significant aesthetic value; extension of existing buildings in order to enclose inner courtyards and create defined, harmonious inner spaces; construction of a residential quarter, matching the existing tissue and complementing the new organization of the space.

Hybrid – a synergy of complexes having different yet compatible functions

The idea is to create an area for older people requiring continuous care, but also for the self-reliant ones wishing to use the facilities and participate in interesting activities. Therefore, the author have decided to create a complex comprised of three formally separated components, but all located along common communication and composition axis.

The key design tasks are:

A) The expansion and upgrading of existing 19th century utility buildings within the manor house complex. The buildings are to acquire new function of a Hybrid Senior Unit, with rooms to accommodate approx. 100 residents, a small palliative care unit (18 beds), day care area, full catering service, sports facilities (indoor and outdoor), space for the university of the 3rd age, for organizing celebrations and practising various activities or hobbies.

B) The construction of a new residential quarter, where assisted living homes are to be located. The quarter would consist of 4 rectangular modern buildings that match the existing complex.

C) Upgrading of the manor house – refurbishment of the existing buildings and adapting them to the new functions. Demolition of some buildings presenting no value. Adding new buildings to complement the existing composition layout. Creating a modern courtyard area within the manor house - not to compete with the existing buildings, but to highlight their value.

The overriding objective of the design is compositional, functional, and communicational integration of existing development, preserving its individual character. It is also envisaged that the old historical park will be complemented with - fully developed – other green areas. It will form comprehensive facilities for practising sports and leisure activities and also serve as screen vegetation protecting the area from noise and other nuisances.

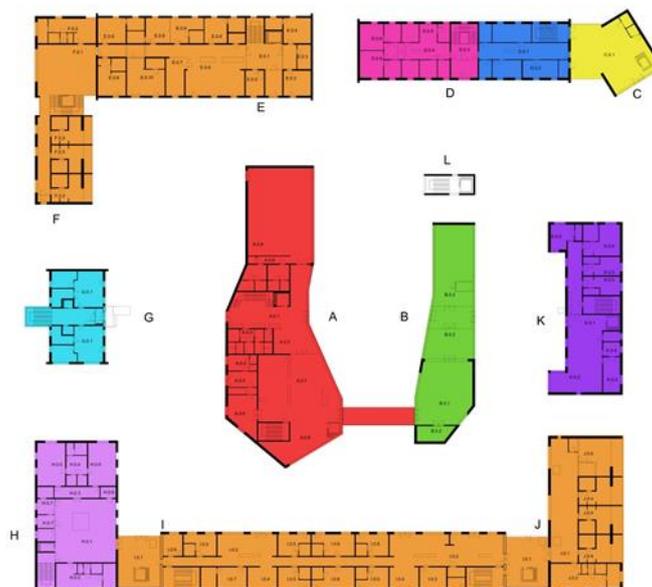
The designer's aim is to avoid constructing a hospital-like building. Anonymous, cold interiors, long corridors, floors separated by stairwells inaccessible to the handicapped - such arrangements prevent creation of space which should be perceived by the residents as their home.

The architect wants to take advantage of the small - human scale - existing buildings. New buildings would be of similar size and proportions. An important element affecting the perception of the space as quiet, cozy, and human-friendly is the use of wood as finishing material. Unique combination of the old and the new and arranged greenery will help to create a unique area with its own identity. Inner courtyard will offer the opportunity to spend time with other people in a friendly environment. Creation of "meeting points" is to encourage residents to take their time outside. The structure of the Complex is to facilitate the development of social relations - a division into small neighbourhood units is proposed, with common kitchens, living rooms, gyms, etc. The Complex is intended for a "new" generation of the retired - people using computers, the Internet, cell phones - in most cases used to numerous activities. It is designed for people enjoying modern architecture. When preparing the design, particular attention was paid to universal solutions - fit for all users, regardless of their physical or mental condition.

Senior Citizens' Centre

A key element of the concept is the Senior Citizens' Centre combining residential premises for permanent stay and auxiliary facilities having various functions: medical and rehabilitation assistance, catering, education, leisure, hobbies.

Figure 8. Hybrid Senior Unit - function plan



Source: Diploma project; Senior center - representation of colours: red [A] - Organized activity hub, green [B] - hobby hub + green house, yellow [C] - entrance, navy blue [D] - administration; pink [D] - health and rehabilitation block, orange [E, F, I, J] - pension/lodging house, bright blue [G] - staff apartments, light purple [H] - palliative division, violet [K] - guest house

Separate apartments for complex employees will be located. Due to the size of the complex, the designer plans to create a hotel for visitors. The central point of the composition will be two new buildings of irregular shape: a centre of social life for the residents: the ground floor will

accommodate catering and eating facilities with a large dining room and canteen and a large multi-purpose room. Normally, it can serve as a gym, on special occasions, it can be easily converted into a hall capable of accommodating all residents and employees of the complex. The upper floor of the building will be occupied by the university of the third age and rooms for additional activities. There will be a greenhouse-orangery, where the residents will be able to look after plants and a small carpenter's shop, also accessible to the residents.

Architecture

The decision was to retain all buildings forming the "walls of external arrangement. The existing (retained) buildings - rectangular in shape - are made of bricks, with double-sloped, mostly tiled, roofs and gable walls jutting out of faces of longitudinal façades.

To avoid formal chaos, the following principles have been applied:

- The existing buildings will retain their almost unchanged external form;
- New larger windows will be introduced in the existing buildings (but the historical arrangement will be preserved);
- Glass link buildings will be constructed to link the existing and new buildings.
- Simple colour patten will be applied in new buildings: off white, pale grey, natural wood;
- New elements, constituting extension of the existing ones, will retain their basic form (e.g. double-sloped roofs).

Figure 9. Hybrid Senior Unit



Source: Diploma project

Green common area - meeting and integration place

The internal area of the existing rectangular arrangement of the Senior Citizens' Centre will be enclosed with new corner buildings and divided by means of two new buildings in the centre into two smaller inner courtyards. This will create small inner areas, of human scale and proportions, visually enclosed, with only small clearances allowing for taking a look outside the complex. When being outside, people tend to look for places when they will be sheltered from the back and have a broad view to the front, beyond the area directly in front of them. Access road with walkways (shared zone) is planned in the complex. Lamps located along the road will enable comfortable use of the walkway after dark. Lights will be situated at the height of 120 cm and

directed downwards, not to disturb the persons sleeping on the ground floor. Main road will be complemented by irregularly arranged pathways. Benches, resting areas, swings, tables with chess boards, outdoor working out facilities, etc. will be located along the paths. *“Shape the common land so it has some enclosure and good sunlight; and so that smaller and more private pieces of land and pockets always open onto it; provide communal functions within the land; and connect the different and adjacent pieces of common land to one another to form swaths of connected play space.”* (Alexander, 1977, pp. 340)

An architectural form of the complex is characterized by simplicity, which is harmoniously integrated with the surrounding greenery, arranged with a lot of fantasy. Various species of grass and creeping plants are planted in round concrete "pools" of various heights. A wide range of plant species is planned in order to create the effect of a sensor garden. Small trees, also fruit ones, are planned, which bloom beautifully in the spring. Four roofed bike storage places are planned in the Complex. The centre will be equipped not only with ordinary bicycles, but also with tricycles (to give a chance for a ride to people not able to ride a bike) and rickshaws enabling a carer or a visitor to take a wheelchair person for a ride. The integration of the greenery and the architecture that results in producing wide range of public spaces (different scale and charactes) was one of the main assumption of the presented concept.

Conclusions

Societies permanently face more and more new challenges. It seems that in closest decades one of essential requirements is counteraction to loneliness or even social exclusion of older people. Cities as the centre of cultural, social and political activity, are a hothouse for new ideas that influence other communities. If quoting Jean Nouvel: *“Each new situation requires new architecture”*⁸ – the question is – how space should be shaped to provide elderly not only with decent living conditions but also ensure their widest possible participation in social life? What would be the role of architecture in creating age-friendly environment?

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‘ATTRACTIVENESS OF SMALL AND MEDIUM-SIZED TOWNS AS PLACES OF RESIDENCE’¹

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‘This town is a living town, where the space inside buildings is complemented with useful external areas and where public spaces stand a better chance to function properly’²

Abstract

There are many causes of the ‘drop in the attractiveness’ of small and medium-sized towns. Nevertheless, the key problems are the urban sprawl beyond the town limits, changes in the social and economic structure, and degradation of urban space. Irrational spatial management is reflected in empty, undeveloped areas in towns, and in the dispersion of development to the outskirts of towns. Other issues of towns, relating to the aesthetics, the quality of urban spaces are unclarified ownership-related legal issues, which translates into ‘empty’ uninhabited townhouses in good locations in towns. Each city, each small and medium-sized town, is a system consisting of two related and cooperating elements: the spatial environment, and the social environment. Relations between the spatial and social environment lead to processes which have their effect on the quality of life and residence of man. Discernible changes in the social structure of town inhabitants (such towns are usually inhabited by older people, the young tend to leave) are caused – among other things – by unemployment, low income, as well as people’s habits. Poor material condition of town residents, a lack of any external capital, largely reduce its ‘attractiveness’. There are stimulators that improve attractiveness, and these are e.g. planning, economic, and cultural stimulators.

¹In the Polish geographical literature (besides the context of international comparisons) the notion of a medium-sized town is not clear. In most cases the range of population between 20 thousand to 100 thousand is defined to be characteristic for this group of urban centres. Nevertheless, doubt is raised in the subject of both the upper and the lower limit of this range, changed by authors depending on their research purposes. Most often this results from the debatable character of classification of towns with the population of 20-100 thousand into small and medium-sized ones (Kwiatek-Sołtysek, Runge 2011). Furthermore, heterogeneity of medium-sized towns is also emphasised. Towns above 50 thousand of inhabitants – according to some scholars – constitute a different quality compared to smaller towns (Stasiak 1994; Parysek, Kotus 1997).’ P.129 Metodologiczne problemy badania miast średnich w Polsce” Runge A. , Prace Geograficzne, issue 129, Institute of Geography and Spatial Management, Jagiellonian University, Cracow, 2012, METODOLOGICZNE PROBLEMY BADANIA MIAST ...

²P.31 J. Gehl , ‘Życie między budynkami. Użytkowanie przestrzeni publicznych.’ Cracow 2009

Keywords: attractiveness, quality – value, adaptive capacity, location's potential, destination's potential

Introduction

Numerous contemporary small and medium-sized towns have become rather unattractive places to live for their residents. This fact can be confirmed by vacancies – empty flats and residential premises, visible in centres of towns. Tenements, due to a lack of their inhabitants,³ have been subjected to progressive degradation, as well as decapitalisation, which has a largely negative effect on the image of the town. Uninhabited buildings lead to the lack of their profitability, which in turn causes a lack of funds for their renovations, and in doing so it contributes to the drop of the quality of life and residence there. Owing to the fact that tenements do not satisfy the basic human needs, they become deserted. An example for this phenomenon could be the town of Oświęcim. (Photo 1)

Photo 1. Oświęcim. Devastated corner tenement at Klasztorna street and Mały Rynek – vacant building



Source: Photo by K.Paprzyca 2013

Photo 2. Renovated corner tenement at Klasztorna street and Mały Rynek



Source: Photo by K.Paprzyca 2015⁴

The depopulation of buildings, tenements in centres of small towns, has led to a situation where they gradually become deprived of diversity and richness of social life. Towns become more and more abandoned by young people, who no longer see any development perspectives in them. They are inhabited by older people, who due to economic reasons have no opportunity to

³ 'The population density ratio for Oświęcim belongs to high ones and reaches 1330 persons per km² (data of the Head Statistical Office for 2012). Oświęcim, with the population of nearly 40 thousand, occupies the fourth position amongst cities and towns of Małopolskie Province. A visible tendency is a dropping number of inhabitants of Oświęcim.' P. 47, *Development Strategy of Oświęcim for the period 2014-2020*.

⁴ OŚWIĘCIM. A tenement at Klasztorna street has regained its former glory - Oświęcim ...
www.oswiecimskie24.pl/newsy,12594-oswiecim-oswiecim--kamienica-przy-klasztornej-odzyskala-blask

change their residence.⁵ The phenomenon that should certainly raise concerns is the birth rate. In Oświęcim, it has been negative since 2001 (incessantly, except for 2007). The migration balance for Oświęcim in the period 2001-2012 is negative. For several years now the number of deaths in Oświęcim has been growing, and the number of births has been going down. There are, however, more and more people inhabiting locations adjacent to the town of Oświęcim.

The main phenomena connected with the depopulation of small and medium-sized towns are: development expansion towards the outskirts, changes of the social and economic structure, and degradation of the urban space. Irrational spatial management is demonstrated in empty, undeveloped areas in towns and in the dispersion of architecture in their outskirts.⁶

A small and medium-sized town today is also a town of consumption, mobility, places – non-places⁷, a town of people who are strangers to each other, degraded tenements whose owners are often unknown. The potential of a small town, connected with the life of the society within it, has been slumbering. Streets have become spaces whose only goal is to enable to get from one place to another, not staying there much longer. People have lost any willingness to undertake any social activity.

Streets, squares (Photo 3. Kościuszki square in Oświęcim) have been ascribed with a function of mobility. Due to its advantage streets have lost their basic meaning, which is experiencing. Today, each person uses a car, and in doing so they do not feel any relations with the surrounding area, with the environment they stay in. Both the spatial environment and the people who inhabit it cease to exist for them, and thus a car contributes to social isolation. The consequence of these phenomena is the fact that people withdraw from the public life.

Photo 3. Oświęcim, Słoneczny square. Devastated tenement with a gallery to the right – vacant premises. 2015



Source: Photo by K.Paprzyca 2015

⁵ In terms of the age structure, the dominating group are people in the working age; however the number of people in the post-working age has been relatively growing. The ratio of people in the non-working age per 100 persons in the working age was rising over the last three years: 60.7% in 2009, 61.0% in 2010, 62.1% in 2011, to 63.3% in 2012. A distinct constant growth of the number of people in the post-working age is particularly observable, which should be defined as a definitely unfavourable demographic tendency.' P. 49. *Development Strategy of Oświęcim for the period 2014-2020*.

⁶ 'An opposite tendency is noticeable in the adjacent rural commune of Oświęcim, where over the last ten years the population has been systematically growing, which results from the fact that some residents from multi-family complexes build one-family houses on the outskirts of the town, and in doing so changes the place of their permanent residence to the territory of the commune of Oświęcim. It should be stated that the town and the commune constitute one functional area, and in the period 2004-2012 the total population dropped from 57,963 in 2004 to 57 643 in 2012.' P. 48 *Development Strategy of Oświęcim for the period 2014-2020*.

⁷ 'If any place could be defined as an identity-related, traditional, and historical place, the space which cannot be defined as identity-related, nor relational, nor historical, defines a non-place'. P.53 Marc Augé, *Nie-miejsca. Wprowadzenie do antropologii hipernowoczesności*, Warsaw: Wyd. Naukowe PWN, 2012,

A low quality of public spaces evokes many negative emotions, such as e.g. a feeling of threat for the safety of users of a specific space.⁸ This in turn contributes to their unwillingness to stay, live there, but also in their unwillingness to use it. At a certain stage neglected, degraded spaces become nobody's land, evoking no memories and emotions whatsoever. The market and monetary economy, as well as many other phenomena of the 20th and 21st century, have brought about a situation where the model of a town street has been transferred to shopping malls. This has led to a situation where streets cease to be shopping streets, and people get stranger and stranger to each other. Names of merchants, craftsmen, businessmen, often deriving from the towns, which used to be displayed on signboards of many shops, have been replaced with brands of unknown origins and by mass production. Houses, tenements built by well-known families in towns have been replaced by developers, who are often oriented towards profits and luring customers. Life unification has become particularly well visible in clothing. Impersonality, anonymity of urban life has translated into our private lives. Man has become part of the world, dominated by constant rush, constant motion, moving from one place to another. The former diversified society that one could encounter in streets of towns before, has been replaced by 'a lonely crowd'⁹. People silently rush home, convinced that nobody can see them. And knowledge in a public place is a result of observation only, without the need to participate in this life. They want peace and quiet – a model absent from towns before. Isolation of people, unwillingness to talk to each other, has become man's defence by being silent and withdrawal.

People have become more and more separated from each other. Strangers who arrive in town become even stranger, and thus the idea of meetings with strangers thanks to which people develop is lost. Strangers do play an essential role in man's life, as the risk of the willingness to get to know others contributes to the enrichment of sensations and experience.

Economic potential of towns¹⁰

The town of Oświęcim is located in close vicinity to important economic regions: the Upper Silesian Industrial Region, the Cracow agglomeration, or the city of Bielsko-Biała. It is an industrial town, very attractive for the development of this sort of business activity, with well-educated sector of services and trade. Business activities display considerable diversity, with the chemical industry being the dominating branch, followed by mechanical and

⁸ According to..... 'public space is a certain ideal we pursue, and which is probably impossible to reach. Public space should satisfy these three conditions referred to above. It should be accessible to everybody, it should be shaped in cooperation with everyone, and it should provide values in a specific society, acceptable ones, recognised as noteworthy.' P. 21, Prof. dr hab. Krzysztof Pademski, Materials from the Seminar 13.10.2008, Poznań

⁹ Riesman, *Samotny tłum*, Wydawnictwo vis-a-vis/ Etiuda, Cracow 2011. It is one of the most important books devoted to the 20th-century sociology, by an author who coined the term of a 'lonely crowd'.

¹⁰ 'According to the data of the Head Statistical Office as of the end of 2012, the economic potential in the town of Oświęcim was formed by 4336 national economy entities entered in the REGON register. Most of them, as many as 4169 (96.1%) constitute entities which belong to the private sector, amongst which the leading role is played by sole traders. They account for 2793 entities, which is 67% of all enterprises. Over the last 10 years the number of sole traders has changed slightly (the highest drop took place in late 2010 and early 2011), but it is still maintained at a constant level. Hence the market of entrepreneurs in the town can be recognised as very stable. A considerable group of private entities are commercial companies (357 entities). The list below demonstrates that the dynamism of entrepreneurship in the private sector is dictated largely by sole traders, which testifies to the resourcefulness of the town inhabitants.' *Development Strategy of Oświęcim for the period 2014-2020* Pp. 53, 54.

electromechanical industry and the production of construction products and construction engineering.

The shrinking chemical industry of the Chemical Plant in Oświęcim, later on Dwory Chemical Plant, has brought about the occurrence of empty lands and halls vacated by companies, shrinking of the job market, growth of unemployment. The Municipal Zone of Business Activity and the Oświęcim Business Incubator have come into being and have been contributing to the creation of new jobs and the development of the local entrepreneurship. These activities increase the investment attractiveness of the town and its region considerably. The growing interest of businessmen in the town is also visible in the area of the Municipal Zone of Business Activity, which is located on the grounds of the former Chemical Plant (Synthos today). Additionally, a Special Economic Zone was established on the land held by the town, within the scheme of the Cracow Technology Park. A growing number of business entities¹¹ for the city means the increase of taxes, which have a positive impact on municipal investments and the improvement of the quality of public services. It is a very important element of the municipal promotion outside, especially for business.¹²

Thanks to the business activity and the opportunity to concentrate companies in one location, the aesthetics of the town has been improving. The Oświęcim Commune has a positive attitude towards cooperation with investors, it also applies different forms of incentives. The goal is to activate the town and to attract investors. The town has also prepared grounds which can serve as the location of industrial, commercial and trade facilities. A good investment climate, an increase of its attractiveness as a town favourable for investments, translates into the increase of income, which in turn has its effect on the quality of public services and the economic growth of the town.¹³

Besides Synthos S.A. the largest industrial plants in this area are: Austrotherm Sp. z o.o., Solvent Wistol S.A., Chemoservis – Dwory S.A., or Chemorozruch Sp. z o.o. These are predominantly production companies supporting construction engineering, chemistry, or producing specialist machines. Another industrial complex is located to the west of the town, in Zasole near Kolbego and Leszczyńskiej streets. This is the location of such companies as e.g.

¹¹ Besides Synthos S.A., the largest plants in this part of the town are: Austrotherm Sp. z o.o., Solvent Wistol S.A., Chemoservis – Dwory S.A., or Chemorozruch Sp. z o.o. These are mainly companies producing for the purposes of construction engineering, chemistry, or producers of specialist machines. The second industrial and technical support complex is located in the western part of the town, in Zasole, near Kolbego and Leszczyńskiego streets. Companies located here are e.g. Pol-Marley, El-trans, MZK sp. z o.o. in Oświęcim, as well as large wholesale companies of construction and renovation products, such as: PHPU Euromar, Budgips, Eltel-Hurt Sp. z o.o., EUROCOLOR.”, p. 53 *Development Strategy of Oświęcim for the period 2014-2020*.

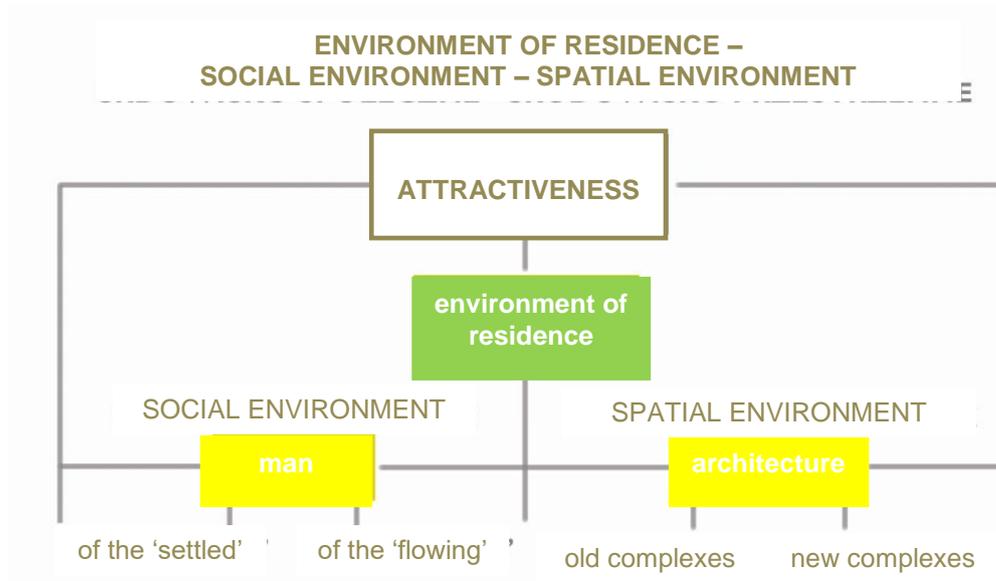
¹² ‘The Municipal Economic Zone, offering investment plots equipped with all utilities. Under the decision of the government from 2008, plots with the surface area 5.5 belonging to the Town of Oświęcim were allocated to the Special Economic Zone within the scheme of the Cracow Technology Park. Within the structures of the Municipal Economic Zone there functions the Oświęcim Business Incubator, whose goal is to support small and medium enterprises and professional activation of the unemployed. The year 2013 saw the beginning of an investment connected with the extension of the business activity zone ‘Nowe Dwory’, for which the town had obtained over PLN 6 million from the EU funds. The town’s contribution in this project is ca. PLN 4 million. P. 45 *Development Strategy of Oświęcim for the period 2014-2020*, http://web.um.oswiecim.pl/strategia-uwagi/strategia_rozwoju_miasta_oswiecim_na_lata_2014-2020.pdf

¹³ ‘In 2011 the income of the Commune – Oświęcim Town reached PLN 128,272,011.77, and the expenses were somewhat higher and reached the level of PLN 128,790,697.35. Nevertheless, this situation is better than over the previous two years, when expenses were higher than the income of the commune by several million PLN. In 2012 the income of the commune reached over 135,075,069.19, and its expenses PLN 141,184,860.86.’ P.42 *Development Strategy of Oświęcim for the period 2014-2020*, http://web.um.oswiecim.pl/strategia-uwagi/strategia_rozwoju_miasta_oswiecim_na_lata_2014-2020.pdf

Pol-Marley, El-trans, MZK sp. z o.o. in Oświęcim, as well as large wholesale companies of construction and renovation products, such as PPHU Euomar, Budgips, EUROCOLOR, Eitel-Hurt sp. z o.o.

‘Attractiveness of urban spaces’ – a condition for living in towns

Figure. 1. Housing environment – social environment – spatial environment



Source: the Author's study, graphics by A. Wielebińska¹⁴

For many years now in Poland there has been a deficit of flats. Despite the growth of the number of built flats, processes such as the drop in the sizes of families, the growth of one-person households, contribute to maintaining the statistical deficit of flats. The renovation gap, caused by the lack of modernisation of the existing residential buildings, and the lack of renovations carried out in them, has been systematically growing, too. These problems are visible in towns. These are problems connected with low living standard. They have a direct effect on the social, spatial, and economic sphere.

The situation connected with the spatial and housing infrastructure in towns is diversified. It is a result of differences in the level of development of the local policy, but also of historical conditions. The ownership structure is diversified, and therefore, the investment layouts are different, too.

The problem of the drop of attractiveness of urban spaces in small and medium-sized towns is caused by the fact that the needs of man – the resident and user of this space - are not satisfied. The phenomenon of outflow of inhabitants from urban areas in small towns means that they begin to lose their 'attractiveness' as a place fit for living, for staying in.

¹⁴ Texter - Współczesne środowisko mieszkaniowe – Multi-authored monograph, K. Paprzyca, Racjonalne wykorzystanie przestrzeni miejskiej w miastach średniej wielkości – jednym z warunków ich rozwoju. 2015
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*'Each person is bound with some space. Public space should, therefore, stand for a space being the subject of interest of many people, a space accessible to everyone, comprising streets and squares, which constitute a certain spatial system.'*¹⁵ The appearance of public spaces, their quality, testify to the town, to its people. It can evoke diversified emotions, from the threat for safety, to aesthetic sensations. In friendly spaces people are willing to stay, to go back to, whereas they tend to avoid the neglected ones. The intangible values in the space, thanks to which places have their climate, their mood, are also important. Currently, these images have been losing their significance, as attention is focused on the technology, The fact that the same technologies are applied everywhere in the world and the global scale of architecture are responsible for the occurrence of nobody's land as a result.

Relations between the spatial environment and the social environment have always generated important social processes (Fig. 1). Properties connected with a specific place are also important – *location, neighbourhood, accessibility*. Nevertheless, crucial significance for the process of shaping of the quality of urban spaces, their attractiveness, has the value of urban spaces, which has been divided into:

- Instrumental values,
- Situational values,
- Existential values.¹⁶

Relations between the spatial environment and the social environment generate important social processes of:

- Identification,
- Integration,
- Information – communication,
- Cognition,
- Selection of making decisions and achieving goals,
- Emotions,
- Aesthetics.

The determinant of these interactions between the social environment and the spatial environment is the quality of urban environment, its attractiveness.

For medium-sized towns to be attractive, there needs to be constant care for the quality of their urban environment. A lack of it constitutes one of the reasons for essential differences, tensions, distances, conflicts in the relations between man and the spatial environment.

The conflicts referred to above have a considerable effect on the attractiveness of the urban environment, often being one of the causes of depopulation of small and medium-sized towns.

¹⁵ K. Paprzyca, Jakość publicznej przestrzeni w miejskim środowisku zamieszkania – wybrane zagadnienia. Czasopismo Techniczne, Architektura, Publishing House of Cracow University of Technology, 2010,

¹⁶ Instrumental values are: functional character of space (division into streets, squares, fields, interiors, etc.), easiness of reading of the architectural and urban planning layout and its socially perceived status (the old – the new, the pretty – the ugly, etc.). Situational values comprise feelings of physical and mental safety or threat, possibility of identification with a certain space in social and cultural categories, the feeling of transparency or anonymity, possibility of assuming the social roles of choice, and opportunity to fulfill one's prestige and personality. Existential values comprise all those which are a source of emotions, which provide aesthetic and intellectual sensations and incline to discover values contained in structures and objects of a symbolic significance, as well as in the architectural and landscape surroundings. Ibidem, p. 57 A. Majer, Socjologia i przestrzeń miejska, Warsaw 2010

A dynamic adaptive capacity is a potential of a place, and a potential of destiny. These two properties enable to search for opportunities (market, technological, organisational chances to adapt, to regenerate of a specific place), as well as qualities connected with the improvement of the urban environment, the improvement of its attractiveness. This allows to experiment and to transform, sometimes to change the way of thinking about a place. A place which exhibits the qualities of high functional and spatial flexibility is also a place which has a considerable adaptive potential.

Degradation of many urban spaces: streets, squares, is caused by the lack of vitality of these places. We encounter places which are completely forgotten, useless, although located in the centre. The fact that nowadays the space of man's living plays a somewhat different role than in the past has its effect, too. Spaces cease to be inherited, the links with the place of residence weaken, in return for constant migration, change of the place of life and work.

Photo 4. Oświęcim, Kościuszki square



Source: Photo by: K. Paprzyca

There are still places in urban spaces which in spite of everything still have some power that one sometimes is not able to resist. Despite the fact that buildings, tenements are empty, uninhabited, decaying, they still influence our imagination. We go back to the forgotten times by displaying photographs of long-dead people on the elevations. (Photo 4. Oświęcim, Kościuszki square (Photo by: K. Paprzyca)).

In Oświęcim there are actions undertaken connected with the reconstruction of tenements by the Housing Associations, thanks to which the quality of the urban space has been gradually

improving – Photo 2. Oświęcim. Renovated corner tenement at Klasztorna street and Mały Rynek (Photo by: K. Paprzyca 2015).¹⁷

Needs and aspirations of people. Man – place – relations

Anthropology of place recognises that ‘taking root’ produces people, which means that local inhabitants are people who come from certain places that belong to them.¹⁸

Phenomena that are inseparably connected with ‘taking root’ are identification with a place, and the willingness to leave a trace, which will restore the emotional sense to places and town quarters, the opportunity for a network of relations between man and a place to exist.



Photo 2. Oświęcim, Mały Rynek (Photo by: K. Paprzyca)

Due to the lack of place and residences, man becomes spiritually homeless. The value of a place is a leading element in urban spaces, of the quality of urban spaces, and therefore in the quality of life of residents.

Formerly, man created himself in the public sphere; in the private one, via his experiences, he was fulfilling himself in a family. Today, all activities undertaken by people are driven by ambitions, by set goals. The value of mutual support has been disappearing. The contemporary times are the times of hotels, railway stations, terminals, where people see each other briefly –

¹⁷ One example of very positive activities of the town of Oświęcim is the renovation of the tenement at Klasztorna street / Mały Rynek, which was carried out by the Housing Association, Housing Association – flats – official portal tbs24.pl/

¹⁸ The notional status of an anthropological place is ambiguous. It is only an imagination, partially materialised, created by inhabiting people on the subject of their relation with the territory, their relatives, and others.’ Marc Augé, *Nie-miejsca. Wprowadzenie do antropologii hipernowoczesności*, Warsaw: Wyd. Naukowe PWN, 2012, p. 37.

these are spaces of solitude, which enforce our feeling of uprooting; they do not have any properties of identity.¹⁹

Many such places, along with galleries, have become places which are supposed to provide people with the sense of comfort, community - places of depleted expectations, 'charming artificial places', which only lure with their charm, offering no essential values to man.²⁰

Before, towns and cities were places of the creation of values important for the development of civilisation: material, cultural, spiritual, aesthetic, and emotional values, as well as processes of identification, communication and social exchange, information, and many others. The quality of the urban environment has always generated the quality of life of its inhabitants.

The relation between man and a place becomes a key in all discussions and values connected with an optimal quality of urban spaces, and therefore with their attractiveness. Due to the lack of places, man feels spiritually homeless, isolated. A well-organised urban space releases specific social processes, connected with getting to know, using, shaping. Since childhood man is in contact with architecture, he stays in its vicinity. Hence its enormous effect on man, on his personality, aesthetic sensations, tastes, opinions.

Summary

The objective of medium-sized towns is competing for development factors and groups of recipients. We can compete for people, investors, but also for the inflow of funds (e.g. from the EU). Therefore, it could be easily stated that the competitiveness of small and medium-sized towns consists in the creation of an offer which will make the town stand out, so as to attract people to it and to increase the social and economic benefits.

Hence medium-sized towns should have values and attractions which will convince people to choose them as their places of residence, as their places of recreation, as their places of work. Since each urban area has its own diversified set of attractions and values, it is necessary to properly diagnose the development opportunities for different potential functions connected with a specific town.

Improving the attractiveness of neglected areas in medium-sized towns should become a starting point for all activities undertaken in towns. The objective is to revitalise areas for social needs: to stimulate urban areas, to improve the quality of the urban environment, to improve the value of urban structures, to optimise the relations between man and the urban environment, to optimise the conditions of life and residence.

In the spatial and social aspect, the phenomenon of improving of the attractiveness of towns connected with processes of transformations of the urban tissue, is aimed at the implementation of tasks which satisfy the needs and preferences of diversified users of towns. An attractive

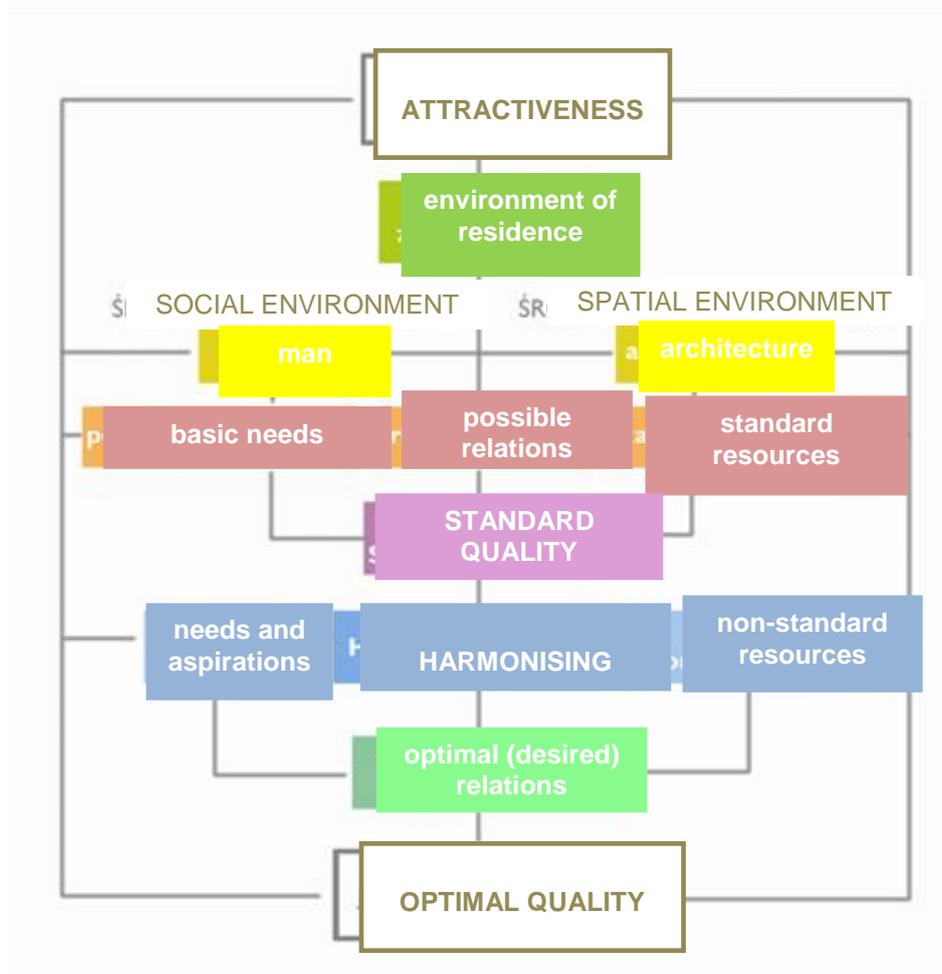
¹⁹ Values of social perception of public spaces constitute the subject matter of research of urban planning, as well as of sociology and environmental psychology. In sociological considerations, one should pay special attention to studies devoted to urban space in connection with social issues and with man. Patrick Geddes, sociologist and natural scientist, in 1904 delivered a speech in which he talked about making use of sociological knowledge when building cities. His greatest continuators were Lewis Mumford, Paul A. Bell, Florian Znaniecki, Stanisław Ossowski, Aleksander Wallis.

²⁰ M. Auge, *Nie – miejsca, wprowadzenie do antropologii hipernowoczesności*, Wydawnictwo Naukowe PWN, Warsaw 2012, Marc Auge is a world-famous French culture ethnologist and anthropologist.

urban space should exhibit properties of the quality of the space of places and the quality of their residents' lives as follows:

- Relating to urban planning
- Social
- Economic
- Environmental.

Figure 2. Attractiveness of small and medium-sized towns



Source: the Author's study, graphics by A. Wielebińska²¹

The presented features, spatial, social, and economic values of the town, shape the image of the town effectively. They also mean that the town develops, that it has a potential in terms of its usability, which makes it possible to satisfy the needs of users of the town.

²¹ Texter - Współczesne środowisko mieszkaniowe – Multi-authored monograph , K. Paprzyca , Racjonalne wykorzystanie przestrzeni miejskiej w miastach średniej wielkości – jednym z warunków ich rozwoju. 2015 texterbooks.com › Ekonomiczne › Ekonomia , Monografie wieloautorские ,

The fields of development which may contribute to the improvement of the attractiveness of small and medium-sized towns to a considerable extent:

- Construction engineering and spatial planning

It refers to activities for the benefit of the creation of conditions fostering the development of investments and housing construction. The goal is – without limitations – to stop the outflow of residents thanks to the creation of favourable living and leisure conditions.

- Culture

It refers to tasks aiming at shaping and strengthening of the local identity – creation of a platform for intergenerational and social integration.

- Public safety

It refers to activities whose effect will be growth of the feeling of safety amongst residents.

- Promotion

It refers to activities consisting in building of a new image of the town.

- Economy

It refers to activities for the benefit of intensification of the economic development of the city.

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HALLE-NEUSTADT – THE SHRINKING ICON OF MODERNISM

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Key words: shrinking city, new towns, modernism in urban design, depopulation

Abstract

Halle-Neustadt, built as a new city for the workers of the chemical industry, was recently celebrating its 50 years of existence. The former pride of socialism is now facing dramatic shrinkage, with the population drop of 46%. The paper presents the history of the city – its growth and fall. It discusses the demolitions which took place in the city and the simultaneous 2002-2010 IBA Saxony-Anhalt revitalisation programme, including the post-evaluation facts. The Kompetenzzentrum Stadtumbau workshop conducted in 2014 by HTW Dresden, TU Delft, CUT Krakow, Gent University and UT Chalmers – a project carried out under the auspices of the City of Halle and the Land of Saxony-Anhalt offers a new perspective onto the problem. The final results and strategies developed within the framework of the project raise the question of relations between an urban form and the community. The problem manifests itself by uneven distribution of population between the modern Neustadt and the traditional Altstadt – the latter still featuring the authentic historic block structure. Serving for over millennium as the centre of Halle – Altstadt, saved from the ravages of wars, now renovated and vibrant with life, exemplifies the return of people to their identity - to the traditional sense of the city.

New towns in the modern history of Europe

For many decades, the post-war urban history of Europe was based on the universally accepted pattern of urban planning which was based on the assumption of growth. The fundamental requirement to secure accommodation for the populations of ruined cities and to restore urban areas to usability was gradually changing the cityscape of the continent. The urgent need to create some space for living and working called for immediate action rather than the laborious and slow processes of reconstruction, postponing them until “better times.” The vast areas of damage, which also affected central districts of cities, required quick remedy so that some accommodation could be offered to the people returning home. Even Warsaw, where the re-emergence from ruins was heavily charged with symbolic significance, was unable to resist the pressure of time – the reconstruction works striving to preserve the historic forms of the city were stopped in the 50s. Countries of the so-called Eastern Bloc, created after the war, were

soon faced with a new totalitarian regime. The new ideology did not spare cities – the hope for a better world, ideologically supported by the enforced vision of a socialist state, demanded new urban projects which would create the new “correct” values.

New towns were created primarily to provide accommodation for the workers employed in the dynamically developing industry. Although the needs they were to cater for were really urgent and thus the cities were built in haste, they made a mark in the history of urban design since their creators tried to develop a new pattern. Nowa Huta – implementing the concepts of socialist realism – is highly valued with hindsight and it is considered to have found a permanent place in the newly born dualism of the old Kraków and its new district. The characteristic “baroque” urban layout of Nowa Huta is now legally protected as a site of historic value. The quality of its architecture, making reference to the motifs of the historic Kraków, demonstrates that its creators valued continuity and tradition, though in a new form, and showed respect for the spirit of the place.¹

In the German Democratic Republic, Halle Neustadt was the flagship realisation of the new town concept, breaking up with tradition and following closely the ideology of modernism. The history of Neustadt, existing for more than 50 years, now a district of Halle, inspires reflection on the effectiveness of planning and its consequences.

“Ha-Neu” – ideology and creation

The foundations for the new town of Neustadt were laid in 1964. The act establishing the city was confirmed by an administrative decision of the 12th May 1967. Halle-Neustadt, also known as “Ha-Neu,” was for the party apparatus of that time the flagship construction project of the German Democratic Republic. For the First Secretary of the Socialist Unity Party (SED) – Walter Ulbricht – personally, Neustadt was one of the more important and, which he probably did not expect, one of the last undertakings.² Ulbricht was well known for his hostility towards the historic heritage and the strictly functional approach to urban planning. An example of his attitude could be his decision to demolish the historic St. Sophie church located in the centre of Dresden, so dramatically bombed during the 2nd World War. In the face of the fact that so few structures of historic value had survived the war, the decision to demolish the church was very controversial, yet – as it was explained – it was necessary to make way for the planned tram line. However, Ulbricht will be remembered in the urban history of Europe primarily because of the resolution to erect the Berlin Wall. The history of Neustadt is in many aspects related to the history of the Wall, as its fate has been permanently tied to the post-war history of Germany.

Neustadt was built in the vicinity of Altstadt Halle – a site which was unique at that time as it had emerged intact from the war inferno. The decision to locate the new town at this particular site was not unusual in those days. We could invoke here the parallel situation of Nowa Huta and old Kraków, the latter also miraculously saved from being ruined during the WWII. Both Halle

¹ The chief designer of Nowa Huta was Tadeusz Ptaszycy, and his team included: Bolesław Skrzybalski, Janusz Ingarden, Adam Fołtyn, Stanisław Juchnowicz, Tadeusz Rembiesa, Janina Lenczewska, Tadeusz Janowski and Andrzej Uniejewski.

² Walter Ulbricht died in 1973.

Altstadt and Kraków are important cities of great history and with important universities – the Martin Luther University (in Halle) and Jagiellonian University (in Kraków). Halle-Neustadt and Nowa Huta were designed as huge urban complexes for the populations of up to 100,000 residents, the only difference being that Nowa Huta was never an independent city, it has always been a district of Kraków.

The location of working class Halle-Neustadt emphasised forcefully the new dimension of socialism – a city breaking up with the past. The socialist party leaders deprecated the value of the historic Altstadt Halle with its petit bourgeois development, characterised – as it was then presented – by poky underlit courtyards. Neustadt was also a city, which was to highlight the equal status of both entities and ultimately the superiority of the new place as the one offering its new residents bright flats, green yards, modernity and comfort. Altstadt and Neustadt were connected by a central communication route – the Magistrale. The artery of Magistrale had 6 lanes of traffic and was 6 km long. The introduction of the burdensome function of transportation brutally thrust into the area of the historic Altstadt seems to confirm the thesis that the new city was more important than the old one. Another decision that seems to be puzzling from the contemporary perspective is the controversial resolution to mount the thoroughfare onto a flyover running through densely built up areas, level with the upper floors of historic town houses.

The form of Halle-Neustadt and its location was heavily affected by ideology from the very beginning. The city was designed for the workers of the chemical industry, employees of the neighbouring huge chemical plants – Buna and Leuna. Communication between the city and the industrial sites was to be provided by a fast agglomeration railway, with the railway station located in the centre of the city. The design team, led by Richard Pulick, included Joachim Bach, Karl-Heinz Schlesier, Horst Siegel and Harald Zaglmeier. Neustadt was a model modernist city. Functionally, it remained primarily an enormous dormitory – 90,000 people lived here at its best times. The most distinguishing feature of the urban design was its grandeur. Architectural solutions, based on the great slab technology, enabled systematic and relatively fast construction of the gigantic for its time project. However, in spite of the efforts to introduce some quite interesting detail, they were characterised by excessive spatial unification, which has turned out to be one of the major problems of this area, even now.

The demographic disaster

In the case of Halle-Neustadt, the contemporary demographic situation and its derivative spatial situation should be considered in the context of the whole region. The land of Saxony-Anhalt has been continuously losing inhabitants for quite some time now. The process started already in the early 50s, yet it became really significant in the period following the reunification of Germany. The fall of the Berlin Wall marked the beginning of a very difficult process for the cities of East Germany, for many of them – the beginning of ruin. The newly acquired liberty enabled German citizens to migrate freely within the new common borders, which turned out very tempting for the people hitherto living in isolation. The transformation commenced following

1990 also entailed deindustrialisation, reaching 80 – 90 % in the region, whose contribution to the poor condition of many cities is indisputable.

The number of inhabitants in Saxony-Anhalt dropped by over 18% in the period between 1995 and 2015.³ At the same time, the population of Saxony is rapidly aging. The average age of the people living in Saxony-Anhalt is the highest in the whole area of Germany, it was 45 years in 2007 and is still growing.⁴ A lot of cities have suffered depopulation reaching 20 – 30 % in the last two decades. The only cities which have registered growth are Dresden and Leipzig. Adverse demographic processes may and most probably will continue to increase. Estimates show that by 2040 the population may have shrunk to a half what it used to be 90 years before.⁵ The decline of the magnificent history of Halle-Neustadt coincided with the fall of the Berlin Wall. In 1990 Neustadt was incorporated into Halle (Saale). The date could be viewed as a symbolic beginning of the end of the socialist ideal. Changes were taking place very fast. The population, deprived of any employment opportunities, started gradually to abandon their flats. In years 1992 – 2009, the population of Halle-Neustadt shrank by 46%.⁶ Now it is practically a half of what it used to be in 1981, when the number of inhabitants amounted to 93 thousand. So, the contemporary population size, which is approximately 45 thousand, means an enormous shrinkage of the city.

The diagram presented here, showing the number of inhabitants of Halle-Neustadt against the background of the whole Halle starting from 1972, demonstrates huge oscillations in its demographic structure. In the first decade, we can see a rapid growth, with the size of Neustadt population almost doubling. Negative changes in the area first appear in the late 80s, the population rapidly shrinks after 1987, with the decrease reaching its peak in the 90s. The prospects for Neustadt are still rather pessimistic – the uncontrolled process of population loss may lead to the demise of the city.

The downward demographic trends in Neustadt are reflected in the diagram showing Halle as a whole. However, the population decrease in other areas of the city seems less dramatic. Interestingly, the demographic curve for Halle has clearly levelled out in recent years, or has even minimally grown. It may lead to important observations suggesting that, contrary to Neustadt, other districts, including Altstadt, have stabilised their social, demographic and spatial situation [Fig. 1].

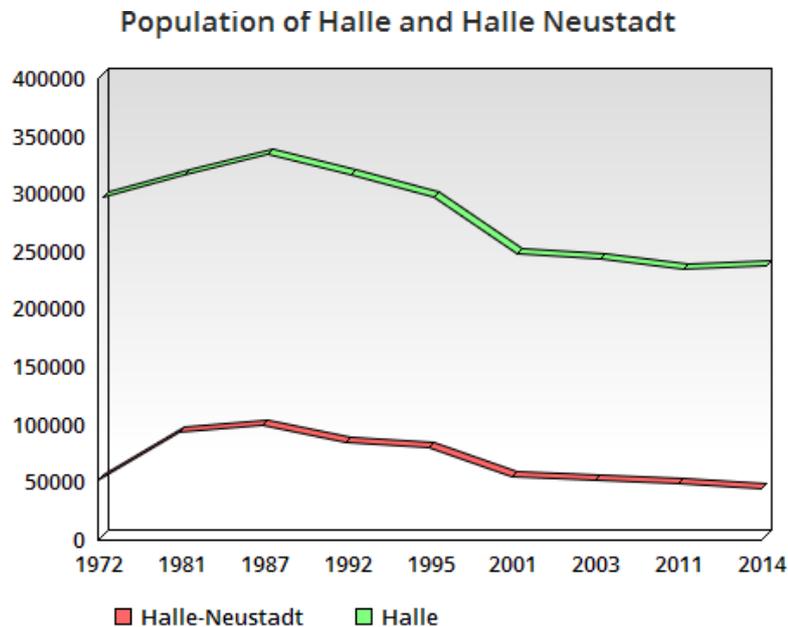
³ Based on the data from portal www.citypopulation.de [as of the 10th Feb. 2016].

⁴ See: www.sachsen.de [as of the 10th Feb. 2016].

⁵ See: *International Building Exhibition...*; R. Sonnabend 2015, after: KARO*Architekten & urbicon.com.2010.

⁶ Source: Stadt Halle, Amt für Bürgerservice, Soziodemographische Daten – Halle-Neustadt, http://www.spi-ost.de/data/document/document_935_837.pdf; [as of the 10th Feb. 2016].

Figure 1. Comparison of estimated populations in the area of Halle and Halle Neustadt



source: Stadt Halle, Soziodemographische Daten – Halle-Neustadt, http://www.spi-ost.de/data/document/document_935_837.pdf; www.citypopulation.de; [as of the 10th Feb. 2016].

IBA – in search of alternative solutions⁷

The difficult demographic perspective has provided the impulse for a number of remedy actions. The experience of urban planners and architects who have been trying to address the problem of city population shrinkage in Saxony-Anhalt within the framework of the International Building Exhibition IBA Urban Redevelopment may offer a host of interesting observations. The activities of IBA in years 2002 – 2010 covered 19 medium size towns, including: Aschersleben, Bernburg, Bitterfeld-Welfen, Dessau-Roßlau, Halberstadt, Hansestadt Stendal, Köthen, Lutherstadt Eisleben, Lutherstadt Wittenberg, Magdeburg, Merseburg, Naumburg, Quedlinburg, Sangerhausen, Schönebeck, Staßfurt, Wanzleben, Weißenfels as well as Halle.⁸ The project was carried out by Saxony-Anhalt in cooperation with Bauhaus Dessau Foundation and Saxony-Anhalt State Development Company SALEG. From the very beginning the assumption of the IBA was to refrain from trying to create one template for the actions. In each case it tried to relate to the identity and the characteristic features of a given town, viewing them as the aspects which should be supported and promoted. In each case, the project participants were seeking to discover an individual spatial typology specific for the area that would be suitable for the population shrinkage process in this particular area. An important component of the works was using green areas as enlarging and redesigning green areas is one of the fundamental

⁷ Material prepared on the IBA programme as presented on the following websites: www.iba.stadtumbau.de; *International Building Exhibition...*; R. Sonnabend 2015; *IBA Urban Redevelopment Saxony-Anhalt 2010*.

⁸ The programme was led by Omar Akbar (until 2008), Philipp Oswald (from 2009) and Rüdiger Schulz.

transformation models in cities with high depopulation rates. A lot of actions were of an experimental nature. Transfers of residents and demolitions were a difficult and less-than-glamorous challenge, requiring extraordinary commitment on the part of the local community.

The IBA team dealing with Halle asked a very important question: what is the significance of Halle-Neustadt for the whole city? What will happen to Halle when Neustadt finally meets its end? The remedy programme was called *Dual City: Halle (Saale)*, i.e. a city composed of two interrelated parts. Naturally, the most striking problem was the obvious disproportion of the two organisms. How could Altstadt, with its history of 12 centuries, be compared to Neustadt, whose history hardly goes back 50 years? This polarity of history has made a clear mark on the city of Halle. Altstadt started to flourish again after 1990, when its historic development had been renovated and revitalised. At exactly the same time Neustadt started to feel very strongly the economic turbulences of the period and the outflow of inhabitants.

The IBA decided to focus on the actions carried out in the vicinity of the Magistrale connecting both districts. The Magistrale itself also became part of the programme. The brutal ingress of the artery into the historic part of the city and the excessive traffic volume were some of the arguments used in the discussion debating the options of limiting its functions. In 2006, inhabitants of the area put forward an initiative to tear down the Magistrale altogether,⁹ it was never realised, though, and the artery continues to be the major link between Altstadt and Neustadt.

The IBA undertook seven interventions into spaces selected from the whole area of the city of Halle, which highlighted the significance of its both major parts and the necessity of creating interrelations between them. The island of Saline located on the Saale river also became a key area. The island, once a salt mining site, now features a defunct industrial port. The project proposed to connect the island with Altstadt by a pedestrian bridge. Revitalisation of the island was to bring the old town closer to the new one. The IBA suggested building a small port to be used by practitioners of water sports, accompanied by an open swimming pool.

Two projects were successfully completed in the area of Neustadt. The first one, related to the district centre, was aimed to activate young people, so the idea was to build a modern skate-park. The project proved to be successful and, with hindsight, it has fulfilled its role. Now the park is under the supervision of a youth club, which solution ensures that it manages to balance its finances without public funding. It is a venue of various tournaments, including pan-European ones. Regardless of the weather, the skate-park attracts young users. Visible from the tram, it constitutes an attractive place in the centre of Neustadt. The park is situated in the close vicinity of the main building housing the local administration, offering – inter alia – assistance to the unemployed. There is an open street market next to it, which may not be over-exclusive, but it is eagerly frequented by the inhabitants of the area.

The actions of the IBA were also meant to accentuate the possible transformation of the former complex of housing block estates into a friendly residential district. The area selected for that purpose was Tulpenbrunnen square, which was redesigned and furnished with small services. The project was realised in cooperation with the inhabitants. An important feature of the project

⁹ See: Guratzsch D. (2016)

was creation of a proper communications link between the square and the centre. This was achieved by creating a park alley – the Green Gallery – lined with sculptures of the GDR era. This part of Neustadt has indeed benefited from the IBA actions undertaken successively with subsequent projects being implemented. The housing development situated along the park was revitalised, and now it boasts the most elegant residential building in the district.¹⁰

The IBA programme was of an experimental nature. Diversity and individual approach to each of the topics were important elements of the works. The actions in the area of Saxony-Anhalt were founded on the involvement of the local community, which was to safeguard the acceptance and the lasting effect of the complicated transformational processes. The commentaries evaluating the programme included the opinion that one of the most important outcomes of the IBA programme in the case of Neustadt was engaging the inhabitants in changing the image of their city, even if the practical results of the implemented solutions may be judged in different ways. The social dialogue was to ensure acceptance of the initiated actions, all the more needed as the IBA programme was accompanied by a series of demolitions in the whole area of Halle. The demolitions were part of the process of adjusting the city to the new demographic situation. In 2000, there were 150 thousand flats in Halle, 26 thousand of which remained vacant. In consequence, the city initiated the process of making the development less dense, by tearing down some of the superfluous buildings. The years 2002 – 2009 saw the demolition of over 11,700 housing units.¹¹ Thus, the IBA programme was to a certain degree an important step towards raising the community spirit, as it had demonstrated that demolitions are not the end of the city history, but a move to improve its image.

Further remedy programmes – Kompetenzzentrum Stadtumbau workshop

In the years 2013 – 2014, the authorities of Halle entered into cooperation with the organisation Kompetenzzentrum Stadtumbau, which was to coordinate further revitalisation works. I was able to participate in these works. A meeting took place in November 2013¹² in order to explain the situation of the town/district. The Halle authorities emphasised that in spite of the enormous expenditure, reaching 37 million euros, the contribution made by the IBA and other projects, the revitalisation of Neustadt had failed. The district was still plagued with enormous problems, and its future remained uncertain. In the meantime, 4,400 flats were demolished out of 40,000 existing ones, which amounted to 11% of the total Neustadt housing stock. A decision had been made to modernise the remaining housing resources as part of the revitalisation process, and, as a result, 60% flats were completely and 30% partly renovated. A small number of flats had been sold. Now, most of the residential buildings are still owned by three local housing societies. Despite all the financial outlay, the demographic situation in Neustadt has not improved. Most inhabitants of the district are elderly people who came here in the 60s. Today,

¹⁰ The budget of the project exceeded 1 million euro.

¹¹ Source: www.stadtumbau.de – Halle (Saale) Balancing Act Dual City...

¹² 15th Nov. 2013 – the meeting included the following participants: representatives of the Halle city authorities, representatives of the Kompetenzzentrum Stadtumbau Departments of Architecture and Town Planning and experts: A. Mensing-de Jong from Dresden University of Applied Sciences, Micha de Haas from TU Delft and K. Racoń-Leja from CUT Cracow.

the typical family living in the area consists merely of two people, and there is a growing number of one-person households.

The city authorities announced that laying down a new tram line in 1999, connecting Neustadt with the other parts of the city, was considered a success, the only downside being that it was done so late. A shopping centre was built at the heart of the district and the main pedestrian zone – the Neustadt Passage – was renovated and furnished with attractive park furniture and greenery.

Apart from the shrinking population, Neustadt has another problem to cope with as its centre is getting more and more deserted. The symbol of the failure of this area are the high towers – former symbols of splendour – now abandoned and empty. The five towers were to counterbalance by analogy the five towers situated in the Altstadt market square – the four towers of the Virgin Mary Church and the fifth so-called Red Tower. For years, the towers performed the function of hotels for workers and students' dormitories. Today, only one of them is used as office space for the city administration, whereas the remaining four are gradually falling into disrepair. For years, the city has been looking for a concept or an investor that would have an idea how the buildings could be put back to use, otherwise the towers will have to be demolished, which is a costly and time-consuming process.¹³

Kompetenzzentrum Stadtumbau, which got involved in the actions aimed to save Neustadt, is engaged in a wide array of activities related to urban areas activation in Saxony-Anhalt. They initiate and coordinate revitalisation programmes in cooperation with academic and scientific circles, experts and other stakeholders, including city authorities, representatives of the Land of Saxony-Anhalt, the media, local communities and entrepreneurs. Several universities have been invited to participate in the works, including the coordinator – Dresden University of Applied Sciences, as well as TU Delft and CUT Cracow, University in Gent and UT Chalmers.¹⁴ The works included a week-long workshop in Halle,¹⁵ where students were asked to develop variants of urban planning strategies. Students continued working on their design projects also after the workshop was over, and the results of their work were presented to the local community and subjected to public debate. An important part of the programme carried out by the Kompetenzzentrum was dissemination of the workshop results in the form of exhibitions and publications, also available online.¹⁶ The designs were also presented in Neustadt during the celebrations of its 50th anniversary in October 2014.

¹³ At the end of 2014, the demolition variant was the most probable.

¹⁴ The project initiated by the authorities of the city of Halle and the land of Saxony-Anhalt was led by Kompetenzzentrum Stadtumbau headed by director Jo Schultz. The coordinating university was Dresden University of Applied Sciences represented by Angela Mensing-de Jong, TU Delft was represented by Micha de Haas, CUT Cracow by Krzysztof Bieda and Kinga Racoń-Leja, University in Gent by Peter Uyttenhove and David Peleman and UT Chalmers by Michiel Ekegren.

¹⁵ The workshop lasted from 18th to 24th March, 2014. A year before, the topic of the common workshop was the shrinking town of Schierke-Wernigerode. The participants came from three universities: UoAS in Dresden, TU Delft and CUT Cracow.

¹⁶ The outcomes of the workshop in Halle were presented in the publication *Studentischer Workshop zur Stadtteilentwicklung: Halle-Neustadt* (2014); www.kompetenzzentrum-stadtumbau.de [as of the 10th Feb. 2016].

Record of the observations made on the condition of the 50-year-old city¹⁷

Zoom out

The 50th anniversary of Halle-Neustadt was the right moment to stop and ponder over its history and also to try and evaluate the consequences of the urban actions undertaken here. The design principles of Neustadt include numerous positive aspects. Although the overall composition follows the modernist urban model, it nevertheless exhibits certain effort to create a street in the more traditional sense by aligning the buildings with the edge of the road. The tram line seems to promote communication between Altstadt and Neustadt. Looking at the general correctness of the urban plan, it does seem surprising that the demographic statistics are so bad, the plan most certainly does not explain why it should be so.

Zoom in

Observations made *in situ* seem to throw some light on the depopulation processes going on here. First of all, Neustadt seems to be hugely out of scale. The Magistrale, with its width reaching even 80 metres at certain points, creates a gigantic barrier between the more active north and the southern part of the district, which is characterised by a slower rate of growth. Housing blocks are disproportionately large, making it difficult to develop bonds within the community of residents. Small services and shops situated in the central courtyards function rather poorly. The peripheries of the district bear the traces of demolitions. Neustadt simply ends abruptly and without warning. An epitome of the town's excessive scale is a block of flats – 380 m long and 10 storeys high. The building used to be considered the largest in the former GDR, it could provide accommodation for 2,500 people. The paradox of history may be seen in the contemporary function of this building – it is used now as an old people's home. The building has its own medical service and a post office, yet the huge structure is devoid of any individual features. Identical windows offer no chance of creating a sense of identity, no matter how much the residents want to make them look different by adorning them with individually chosen curtains. It is one of the more scary visions of the end of life or city.

Large distances are an obstacle in accessing the centre of Neustadt, which is important as there are virtually no basic services in the housing complexes. Public transport is rather infrequent, especially in the evening. The organisation of the municipal transport discourages young people from moving into the district, as they find it difficult to get from there to university or to the vibrant and lively Altstadt. It is symptomatic that first year students live in Neustadt, whereas the students of more senior years move closer to the historic centre.

The centre of the district is a truly depressing sight. Vacant high-rise towers have been wrapped in nets which are to protect them from pigeons. The main problem of the centre, though, is that it is in no way connected to the railway station. The new shopping centre functions well and is keenly visited by residents, whereas the Neustadt Passage, once the city's pride and glory, comparable to Prager Strasse in Dresden, seems rather deserted now. A considerable

¹⁷ The recorded observations were made by the author in March 2014.

difference in altitude discourages visitors from using the lower level. In spite of heavy investments, the attempt to create a closer connection between the Passage and the shopping centre on the one hand and the railway station on the other has failed.

Towards new visions – designs by the students of CUT

Developing a concept that might provide a solution to the difficult condition of the city required an experimental approach. The students participating in the workshop in Halle in March 2014 continued their design projects on their own. The team led by prof. Bieda and me developed several possible variants of urban design for Halle-Neustadt.¹⁸ Different remedies to Neustadt shrinkage were considered. One of them was the proposal to use the areas freed from development and the extensive courtyards within the housing blocks for urban farming. Kamila Głodowska and Michał Matraszek suggested numerous farming forms, such as private back gardens, community gardens, educational and institutional gardens, farming businesses as well as landscape designs using edible plants. The food grown in these gardens was to be sold at green markets, which would promote the concept but also help reimburse some of the cost. The concept of urban farming would also find application in the form of vertical farms ultimately occupying the vacant high-rise towers in the centre. However, such project may only be successful if it engages the local residents on a mass scale, who would also require training in gardening and farming. This aspect of the concept was evaluated negatively by the inhabitants of Neustadt. Nevertheless, the idea of eco-district may find more resonance among young people. [Fig. 2]

¹⁸ The variants were diploma design projects prepared at the Faculty of Architecture of Cracow University of Technology by the team supervised by prof. Krzysztof Bieda and co-supervised by dr Kinga Racoń-Leja and composed of the following students: Julia Kosa and Konrad Limanówka, Tomasz Guziak and Kamil Trojan, Kamila Głodowska and Michał Matraszek, Karolina Sadowska and Patryk Urbańczyk, Dagna Pękala, Ewa Machnik and Anna Oleksy; the diplomas were successfully defended in 2014.

Figure 2. The model of addressing the city shrinkage featuring the concept of urban farming; authors: K. Głodowska and M. Matraszek. Diploma design project prepared at the Faculty of Architecture, CUT; supervisor: prof. Krzysztof Bieda, co-supervisor: dr K. Racoń-Leja.



Figure 3. Neustadt as a university district, authors: K. Sadowska and P. Urbańczyk. Diploma design project prepared at the Faculty of Architecture, CUT; supervisor: prof. Krzysztof Bieda, co-supervisor: dr K. Racoń-Leja. The buildings related to the academic function have been marked red.



An interesting model of addressing the district shrinking was created by Karolina Sadowska and Patryk Urbańczyk, whose concept was based on transforming Neustadt into a university district. Teaching facilities and research laboratories concentrated in the centre of the district would become the heart of the former residential neighbourhoods, which were planned to be transformed into a sort of students' campus. A distinguishing feature of the new centre would be hybrid buildings – the existing vacant towers, renovated and turned into mix-use facilities, attractive both to the local residents and prospective students. [Fig. 3] This concept would require involving and potentially relocating the existing university amenities, both in the old Altstadt and the nearby Leipzig. It would also entail finding new business companies interested in research into new technologies and willing to get involved in this academic project.

Several concepts were suggested to address the problem of transformations within the central areas of the district. An important element of these concepts was preservation of the high-rise towers as symbols of Neustadt's former glory. Dagna Pękala suggested adapting the interiors of the towers for server farms. Server farms would fit into the concept of urban, but also architectural, recycling and reuse. The heat generated by the farms could be used to heat the neighbouring buildings and for water heating. Façades, furnished with integrated wind turbines, would ensure ventilation of the interiors. It is an innovative solution, in line with the contemporary concepts of providing services to global corporations requiring vast spaces for their servers. [Fig. 4]

Fig. 4. Architectural reuse – adaptation of the existing buildings for use as modern server farms; author: D. Pękala. Diploma design project prepared at the Faculty of Architecture, CUT; supervisor: prof. Krzysztof Bieda, co-supervisor: dr K. Racoń-Leja.



A prominent component of the new strategies put forward by the CUT students was the centre of Neustadt with its existing high-rise towers, which all the revitalisation concepts were striving

to save from demolition. Students also suggested reinforcing the role of railway by a closer integration of the existing railway station with the transformed centre of the district. The ideas how to attract new residents included a concept to create recreation and sports trails, or even using the high walls of the buildings as climbing walls for sports climbing. In order to integrate Altstadt and Neustadt, several new functions were proposed for the island of Saline, taking into account the issues related to flood hazard. Actions transforming the housing blocks were also featured among the revitalisation concepts, they suggested bringing the existing development to the right scale by lowering the height of buildings and loosening the compact street frontages. Lesser services were also to be introduced creating small centres activating the local community.

The future of Neustadt

A lot of *new towns* are now faced with difficulties. The already mentioned Nowa Huta is no exception to the rule. However, time has done by this town more kindly due to its urban identity but also to the strong bonds existing between the spaces and their inhabitants. The district became the arena of struggle for democracy in Poland as well as for the freedom to practice religion – following a long battle, the local community were finally able to have a church built, which became part of its ultimate success. Today, some inhabitants of Nowa Huta see the future of their district as separated from Kraków, and motions to transform it into an independent town are frequently submitted to the city hall. So, it would seem that in this case the invisible bond between a place and its inhabiting community has been created.

Will the dismantling of Halle-Neustadt ever be completed? The most important component of Neustadt – the town established in 1964 – was its community. The people who came to the town when it was brand new have always been and unfortunately still continue to be its most stable group. These are the people for whom this town was created. The history of Neustadt is practically the history of one generation who came here to build a better future. The first photographs of the town radiate with the enthusiasm and commitment of its inhabitants. The generation of newcomers, the majority of whom were in their 20s at the time, have spent their whole lives here, their children were born and raised in this town. Today, these enthusiastic young people from the past are in their 70s, so for the majority who have stayed in Neustadt the town is a place where they are going to spend their waning days. Faced with the fact that its population is slowly passing away, Neustadt is losing the grounds for its existence, its perspective ends here. A question thus arises whether a new generation may emerge who will fill the gaps in the structure of the town. What will happen to Neustadt?

Difficult duality

The past, the present and the future of Neustadt cannot be considered without taking into account the context of the whole city. From the very beginning the fates of Neustadt have been intertwined with the history of Altstadt and it has not been an easy relationship. Reunification of Germany accelerated the disaster that had been looming over Neustadt, but at the same time it allowed Altstadt to open a new chapter in its history by initiating the process of the old centre

renovation. Today, Altstadt has flourished as the heart of a city of unique history and identity. The university functions have integrated well with the old urban structure and they harmoniously serve the community. Interestingly, the historic centre has enjoyed quite a surge of interest in recent years. Residents from neighbouring districts are moving into Altstadt, flats for rent are highly popular with students and young people. Developers as well have started to shift their focus into this area. The return to Halle-Altstadt is in a profound sense the return to the essence of the city, with its tradition, culture and architectural as well as urban works, layer after layer forming the thousand-year-long history of the place. A city of such strong identity is very difficult to compete with. Looking at things from this perspective, the future of Neustadt seems to be even more uncertain.

Halle-Neustadt is one of the more interesting towns in which the 50-year-long history encompasses both the process of the town creation and its gradual decline. Half a century of Neustadt includes both the initial optimism of the organism in *statu nascendi* and the depressing vision of the town's downfall. Halle-Neustadt was a model town, and as such, it may serve to demonstrate that models created to cater for the needs of ideology age fast, especially if they are based on urban unification and architectural typicality. Is a revival of a town so strongly connected with the now defunct industry at all possible?

Neustadt has survived the fall of the Berlin Wall and the transformations following the year 1989, yet how much longer will it survive? The case of Halle-Neustadt clearly demonstrates that the most important component of a town are its inhabitants. It proves how dangerous are urban planning experiments where towns are created instantaneously for a community of uniform age and social background. Neustadt is now facing the prospect of ending its existence, which is, unfortunately, one of the more likely scenarios, unless some new generation is found that would be willing to bind their fates with this place.

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EU MIGRANT CRISIS AND INCREASING DEMAND FOR MODULAR CONSTRUCTION: MODULAR SOCIAL HOUSING COMPLEX FOR REFUGEES IN MUNICH

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Abstract

More than a million migrants and refugees crossed into Europe in 2015. The number of asylum applications received in 2014 in EU Member States has risen by 25 per cent compared to the same period in 2013 and it is still increasing (The UN Refugee Agency). The current migrant crisis in Europe is described as the most serious since the Second World War. Reception Centers that provide homes for asylum-seekers and refugees, both as individuals and families, in most EU countries are overcrowded. Due to a growing problem of the lack of infrastructural facilities, the topic of modular construction is more and more relevant in european context.

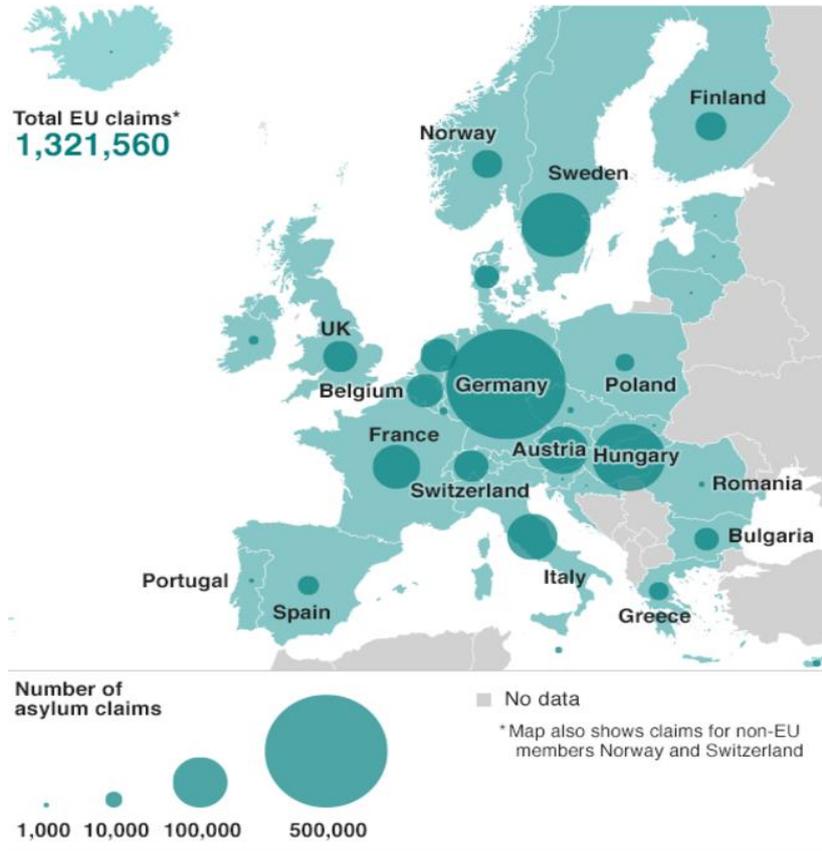
The article deals with the problematic of increasing demand for modular buildings as an answer (time, and cost effective) for European migrant crisis that requires delivery of the housing infrustructes in a very short time frame. The author asking the question about the near future of the modular social housing. How would it reflect on urban-space, living-space and whole attitude to modular construction issues? What is the role of the architect during the process of design-build? Is it possible to make references to "beauty" in the context of modular construction? The focus will be placed on the project based on permanent modular construction (PMC) - the modular social housing complex, implemented in July 2015 in Munich (scientific partner of the project is the Faculty of Architecture, Cracow University of Technology).

Introduction

The European refugee crisis is described as the most serious since the Second World War, driven by the wars in Syria and Iraq, as well as conflict and instability in Afghanistan, Eritrea and elsewhere. According to Eurostat, in 2015, EU member states received over 1.2 million first time

asylum applications, a number more than double that of the previous year (Eurostat, 2016). The highest number of first time applicants was registered in Germany, with 35% of all first time applicants in the EU Member States (Eurostat, 2016). These figures have direct impact on the increased demand for modular construction, especially on the German market.

Figure 1. Asylum claims in Europe, 2015



Source: Eurostat

Reception Centers that provide homes for asylum-seekers and refugees, both as individuals and families, in most EU countries are overcrowded. There is a huge lack of housing, schools, kindergartens, etc. Traditional construction is not able to carry this challenge in such a time frame. For example, experts say that more than 400,000 apartments are needed in Germany to meet increasing demand (Tomkiw, 2016). Regarding the long-term process characteristic for traditional, on-site construction, that numbers seem to be a huge challenge for the construction market.

The EU migrant crisis creates the situation in which, virtually, all investments are implemented "at once". That is one of the reason of increasing number of investments based on the modular construction technology (Permanent Modular Construction) that - when compared with traditional construction - can provide the buildings in a much shorter time frame. The schedule reduction is the biggest incentive that this method of construction esures. It is also one of the

largest claims that the industry has and the majority motivation as to why permanent modular construction is used in the projects (Smith, 2015, p. 20). As evidence of the changing approach, it worth to mention that many of the public tenders in Germany require the modular construction, instead of traditional (i.e. City of Hamburg, City of Munich). This is absolutly a great opportunity for the modular industry market grow. At the same time, this challenge carries a major threat. The design and build proces characteristic for modular construction industry very often limits the role of architect and architectural design. The most promoted features are related to schedule-reduction, cost-reduction, number of units and multiplication. The values such as relation to the urban context, estethic and architectural form seem to be overlooked. How would it reflect on urban-space, living-space and whole attitude to modular construction issues? What is the role of architect in the modular construction industry? Is it possible to make references to “beauty” in the context of modular construction?

Background - the advantages of modular construction

Modular construction is a process in which a building is constructed off-site, under controlled plant conditions, using the same materials and designing to the same codes and standards as conventionally built facilities – but in about half the time (Fig. 2). Buildings are produced in “modules” that when put together on site, reflect the identical design intent and specifications of the most sophisticated site-built facility – without compromise (Modular Building Institue). There are two types of modular construction: Permanent Modular Construction (PMC) and Relocatable Buildings (RB). Permanent Modular Construction is a method of construction that greatly differs from temporary buildings, such as construction trailers or mobile homes. According to the definition of Modular Building Institute, PMC is *an innovative, sustainable construction delivery method utilizing offsite, lean manufacturing techniques to prefabricate single or multi-story whole building solutions in deliverable module sections. PMC buildings are manufactured in a safe and controlled setting, and can be constructed of wood, steel, or concrete. The structures are 60% to 90% completed in a factory-controlled environment, and transported and assembled at the final building site (MBI)*¹. PMC, as an off-site solution, has marked as a higher qulity, faster to market and greener solution than traditional stick built, site built construction. They are custom-designed commercial buildings much the same as their traditional site-built counterparts (MBI Website). In many cases, using PMC does not change the design, structural system, or options for finish materials. The main difference is the mothod of construction (Piper, 2015, p.17).

Many studies and report indicate the undeniable superiority of modular construction over traditional buildings². According to the recent report “Permanent Modular Construction: Process,

¹ A recent report by the National Institute of Standards and Technology and the National Research Council (US Department Commerce) identifies modular construction as an underutilized resource and a breakthrough for the U.S. construction industry to advance its competitiveness and efficiency, [after]: Why Build Modular, (online):http://www.modular.org/htmlPage.aspx?name=why_modular, (date of access: 2016-04-15).

² One of the most recent report is: Smith R.,E.; Permanent Modular Construction: Process, Practice, Performance, University of Utah, Integrated Technology in Architecture Center, College of Architecture and Planning, Raport, April 2015.

Practice, Performance”³ published in 2015 by the University of Utah, there are following key findings which prove several advantages of permanent modular construction, when compared with traditional construction. Regarding the Quantitative Analysis, there are following results:

- Schedule: 39% saving,
- Cost: 16% saving,
- Quality: 5.4 Average Change Orders,
- Safety: 0.25 Average Safety Incidents.

Regarding the key benefits of using permanent modular construction, there are following:

- Schedule reduction during construction phase,
- Quality of product (monitoring system ensures stable, constant quality),
- Site Operations (Smith, p. 3-15).

Figure 2 Diagram of Modular Construction Schedule vs. Site Built Construction Schedule



Source: Modular Building Institute

However, when analysing numerous documents and articles, included mentioned above⁴, is noted that one important element is frequently omitted - architectural design, aesthetically pleasing. Nevertheless an architecture based on modular construction should still belong to works of art. According to theory of Vitruvius, a good building should satisfy the three principles of durability, utility and beauty (Latin: *firmitas, utilitas, venustas*)⁵. Unfortunately, the majority percent of the modular buildings demonstrate the reduction of architecture to numerical parameters and engineering⁶. The assessment criteria usually concerns execution time, manufacturing time, assembly time, as well as number of units. It also refers to international competitions on modular construction, including the biggest world competition “Awards of Distinction” organized each year by the Modular Building Institute (as a part of the World of Modular event in US). The aesthetically pleasing is not really considered in many modular construction developments. Obviously it is a statement that does not refer to all the modular construction projects.

³ The research focuses on commercial construction and does not include single family residential. The research uses a case study method to compare PMC projects to traditional site built projects globally for construction performance parameters such as cost, schedule, quality, and safety.

⁴ i.e. reports published by the Modular Building Institute.

⁵ Vitruvius, *The Ten Books on Architecture*, Harvard University Press, 1914.

⁶ One of the good

Boom of Modular Social Housing in Europe

According to the *European Construction Market Forecast from 2015-2020*⁷, the construction industry is expected to prosper in the near future and it is expected to have a steady growth pattern. 2015 was a very important year for the construction industry in Europe. As the table presents, the biggest growth refers to the new residential sector. In 2016, the growth is much higher, comparing to the previous year and will gradually increase up to 2020. Basing on that figures we can indicate the boom in the residential sector. Regarding German market, extra push to construction boom gives refugee influx. German public sector is doubling its funds for social housing to more than 4 billion euros up to 2019 to cope with the asylum seekers (Nienaber, 2015).

It is uncertain how much of the construction market permanent modular construction (PMC) constitutes in volume. However modular broadly is estimated to make up 3-5 % of the total construction industry (MBI, 2011) and is still growing. At Bauer Holzsysteme (Germany), orders have been placed for more than 100 modular buildings in 2016, up from 20 delivered this year. Max Boegl, which is also making modular buildings for refugees, is experiencing the same upswing. "We're noting sharply increased demand since October and we expect this trend to continue next year" (Nienaber, 2015).

Table 1 Total output development by market segments – % growth rate in real terms

	2013	2014	2015	2016	2017	2018	2019	2020
New Residential	-4	0,1	2,6	4,6	3,7	5,0	6,2	7,6
New Non-residential	-5,2	0,6	2,7	2,1	2,3	3,1	4,1	4,7
Building R&M	-0,3	1,4	1,6	1,1	1,4	1,8	2,2	2,6
Civil Engineering	-4,2	1,4	2,2	2,6	2,7	3,7	4,4	4,9
Total	-2,7	1	2,1	2,2	2,2	2,9	3,6	4,2

Source: European Construction Market Forecast from 2015-2020

But what does this demand actually means - aside from economic benefits - for the modular construction and built environment? Facing such a big challenge in a very short time frame means that the risk of failure is much higher. From the architectural and urban perspective, the failure mostly refers to the architectural design and the quality, resulting in an impact on the urban landscape and the society. Providing fast solutions often brings associates to temporary shelters, low quality, grey boxes or containers. Indeed, many projects are planned as temporary accommodations, that in three or five years will be relocatable or will just collapse. Fortunately, a considerable percentage refers to objects design as permanent. Recalling again German construction market, is worth mentioning the statement of Thomas Bauer, head of the Confederation of the German Construction Industry, who argues that the construction in

⁷ European Construction Market Forecast from 2015-2020, (online): <https://buildingradar.com/construction-blog/european-construction-market-forecast/>, (date of access: 2016-02-15).

Germany of permanent apartments for the refugees to use shouldn't be ruled out because economically, providing them with temporary accommodations on a long-term basis is not feasible. The main reason is relatively high cost of the investment, considering "a short life". The temporary shelters costs about 1,000 euros per square meter. While spending a little more than 1,300 euros per square meter would already make it possible to construct normal residential buildings which will meet basic standards and will be serviceable for up to 30 years.⁸ *"If we have a great demand in the segment of low-cost apartments for refugees, why don't we build in line with the standards that were in place fifteen years ago?"*, he said, recalling that many Germans currently reside in such apartments.⁹

Time and money are indeed the key benefits of factory-built construction versus traditional construction, and the main reasons of increasing demand for permanent modular construction. The more, it is good to see, that next to those key advantages that define at the same time important boundaries for the whole design and build process, there are examples, in which the values such as design - estetic pleasant constituted an important element of the project.

Modular Social Housing for refugees¹⁰ - an attempt of integration of numerical parametrs and aesthetics

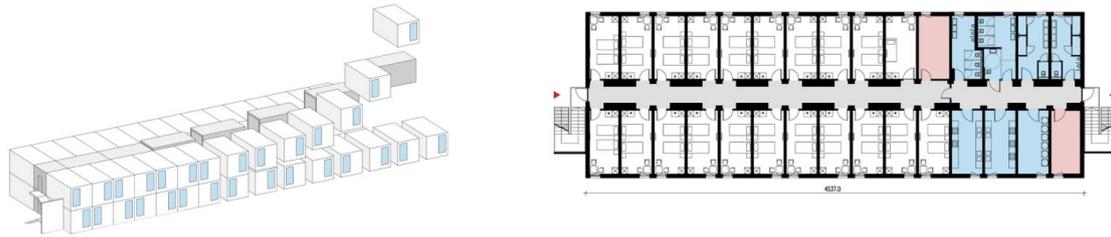
Modular Social Housing in Munich is a three-part development, comprising two housing and one office building. It is situated on the outskirts of Munich, surrounded by lush green areas. Low-rise horizontal buildings fit seamlessly into their immediate context, their elegant anthracite facades framed by trees preserved on site. Two residential buildings consist of 75 modules each laid out in a straightforward pattern: corridor modules running along the central axis with perpendicular units containing all the functions located on both sides. Each buidling offers 43 double rooms for 86 people. The gross floor area of the buildings is 1,416 square meters and the gross covered area is 718 square meters. The circulation is completed by two external steel staircases flanking the building at both shorter facades. Interior quality was the architects' priority. Rooms were designed and manufactured together with finishing, furniture and equipment to achieve perfect detailing and harmonious experience for future inhabitants. Special care was taken while producing toilet and kitchen units with finishing made of high-quality Corian and waterproof Pfleiderer boards.

⁸ *Large-Scale Social Housing' For Refugees Could Bring Germany Building Boom*, (online): <http://sputniknews.com/europe/20151218/1031972664/germany-apartments-construction.html>, (date of access: 2016-04-11).

⁹ *Ibid.*

¹⁰ Basic information about the project: Location: Munich Germany; Usable area: 2 800 sq.m.; Number of units: 163; Beginning of the off-site production: 6 April 2015; Beginning of on-site: 29th May 2015; The end of on-site assemble: 20th June 2015; Total Cost: 3,2 mln Euro. Design & Manufacturing: DiamondModule (BrilliantModule Sp. z o. o.), Poland; Team: M. Śpiewak, G.Schaaf, D. Kalinowska, A. Trybek, M.Korzeniak, E. Wozniak-Szpakiewicz (Faculty of Architecture, CUT), M. Dudek, A. Odrzywolek. Support: students from the Faculty of Architecture of Cracow University of Technology (CUT) Scientific Partner: Faculty of Architecture, CUT

Figure 3-4. Diagrams of the social housing building: an axonometry and ground floor



Source: BrilliantModule Ltd. (DiamondModule)

Figure 5-6. Modular Social Housing - Exteriors



Source: BrilliantModule Ltd. (DiamondModule)

Technical Innovation, Cost Effectiveness & Sustainability:

For the manufacturing process is used high-performance CNC machines. The assembly lines are specifically prepared for the production of modular buildings. The production lines is under monitoring system that ensures stable, constant quality and the continuity of the production process, confirmed by the Certificate of Consistency of Performance 1488-CPR-0499/W (ETA-14/0466). The fully-equipped modules for the “Modular Social Housing” were produced at a factory in Poland (Skawina, close to Cracow) and then transported to its destination (around 950 km). The technology allows modular units to be complete, requiring only small patches of

the facade and corridor finishing to be installed in-situ. At the construction site modules were assembled on concrete foundations and covered with wooden roof frames. The whole process of installation on site was just few weeks long.

The project's energy design is aimed to meet the high requirements of the German EnEV (Energieeinsparverordnung). This is achieved by providing best quality thermal insulation, carefully designed to avoid thermal bridges resulting in low values of heat permeability. All parts of the building envelope are tested and certified in terms of thermal, acoustic and fire-proof performance. A highly efficient heating system provided by the Swiss brand Zehnder is integrated into modules' ceiling structure. It is operated using a heat pump to reduce energy loss. Each room is equipped with an air conditioning system¹¹. Rooms are lit by large floor-to-ceiling windows ensuring sufficient amount of daylight. Whole roof area of the smaller building was covered with photovoltaic cells to provide energy for the complex.

Figures 7-9. Modular Social Housing - Interiors.



Source: BrilliantModule Ltd. (DiamondModule)

¹¹ radiant conditioning comprise of a network of panels which boast dual heating and cooling functionality, rapid response times, very good controllability and high energy efficiency.

Figures 10-11. On-Site Assemble

Source: BrilliantModule Ltd. (DiamondModule)

Conclusions

Despite the overwhelming presence of the modular construction developments lacking high aesthetic values which are a carrier of negative connotations, there is more and more projects that present the changing approach to the modular construction market. Permanent Modular Construction gives a huge possibilities for architectural creations. The key benefits mentioned before - competing for traditional technology - that are the result of an advanced technology - are also a base of a much wider range of aesthetic options that allow designers to achieve architectural variety (i.e.: for the building envelope¹², with all the speed and quality benefits of building off site). That approach can now deliver award-winning architecture and landmark buildings. However the EU Migrant Crisis creates very threatened situation in which all development are implemented in a high rush, with the main focus on the meeting the necessary number of units. It does not announce a positive scenario of the future of modular

¹² Exteriors and interiors. Regarding exteriors, options include a palette of attractive colours or claddings such as cedar, terracotta tiles, stone, composite metal panels, brick, and render.

construction. Therefore it is important to emphasize the value associated with aesthetic. Otherwise in a very short time, modular buildings will be despised and stigmatized. Let's modify the main password of the Modular Building Institute: "Smarter, Greener, Faster", by adding extra phrase "Eesthetically Pleasing".

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