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Ecological Urbanism

The Superblock urban model in the case study of Barcelona

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Marco Polo descrive un ponte, pietra per pietra.
-Ma qual è la pietra che sostiene il ponte? – chiede Kublai Kan.
-Il ponte non è sostenuto da questa o quella pietra, - risponde Marco, - ma dalla linea dell'arco che esse formano.
Kublai Kan rimane silenzioso, riflettendo. Poi soggiunge:
-Perché mi parli delle pietre? È solo dell'arco che m'importa.
Polo risponde: -Senza pietre non c'è arco.

I.Calvino Le Città invisibili

Introduction

The “urbanization” process represents one of the most debated issue of the twentieth and twenty-first century, not only by the ecological point of view but also for its social and economic consequences. In fact, if it is possible to adopt solutions or sign agreements promoting a reduction of the ecological footprint at a global scale (CO^2 emission, resource consumption, energy production, etc.), it is more difficult to administer the urbanization’s social-economic effects that are clear at urban scale. In this sense, the term “Sustainability” and in particular its evolution “Sustainable urban development” has become very famous. It would promote a City respectful of the environment, which at the same time ensure an urban social-economic level able to satisfy all the citizens’ needs.

In this research, I examine the concept di “Ecological Urbanism” promoted by Salvador Rueda, director of *Agencia de Ecología Urbana de Barcelona*. The urban approach presented by the Spanish planner would be an innovative methodology able to ensure all the sustainable urban aspects, promoting a complete environmental sustainability but also ensuring the best level of Urban Habitability. The crux of his urban approach is the restoration of the entire street network, and the creation of orthogonal grid, which realize a new urban fabric distinguished by a new urban dimension, the Superblocks. The Superblock – Supermanzana or Superilla in Spanish – is a new urban dimension between the buildings’ block and the neighbourhood. Inside it, the local street will be close to the crossing traffic and the road platform will become an entire public space for the daily uses of all the citizens. In this way, Salvador Rueda would ensure the ecological, social and economic urban sustainability.

The aim of this research is to comprehend if the “Ecological Urbanism” urban approach represents effectively an innovative methodology able to produce real sustainable outcomes on the urban system, or if it is only an evolution of the planning movements born during the ‘90s on the ideas of Green City, Eco-City, New Urbanism and Green Urbanism. The study is tackled firstly by the historical conception of the "urban sustainable development" and analysing the scientific literature in order to compare the Rueda's approach with other cases. Subsequently the research focus on the specific Ecological Urbanism methodology, its theoretical framework and the implementation tools proposed. It’s interesting to understand how much the Ecological Urbanism approach and the

Superblock model are connected and interdependent one to the other. Finally, the Ecological Urbanism is faced practically on the case study of Barcelona, where the Administration according to the *Agencia de Ecologia Urbana de Barcelona*, directed by Salvador Rueda, would implement the Superblock model on the whole city. During my research period, I have been to Barcelona, in order to survey directly to the application of the Ecological Urbanism approach and to see in person the realization of the first Superblock pilot project. During the journey, I had the possibility to meet a lot of the actors involved in this project, comparing with them in order to understand better the urban approach and its implementation.

The research is divided in three sections:

The first one presents the role of the city in the framework of "sustainable development" and why it has become so important. In fact, in the last decades the "urban sustainable development" has been integrated by the most important institutional agreements becoming one of the main global goal for the 2030. Next, it's focused the specific role of the urban planning of the street's public spaces in the "urban sustainable development", since it is one of the main aspects of the Ecological Urbanism. So, it's considered how much the international agreements have considered this particular aspect of the urban planning, and how much the role of urban design has been considered by the main planning movements of the '90s. At the end of the first chapter, I present the concept of "Ecological Urbanism" according to the two authors that during last decades have promoted a new urban approach: Mohsen Mostafavi and Salvador Rueda. I focus on their references, in order to underline the origin of their approaches and show any differences between the two authors. Subsequently, I have dedicated the second and third chapter of my thesis to the urban approach of Salvador Rueda, analyzing his theoretical framework and the practice realization on the Barcelona's case study.

Therefore, in the second chapter the Ecological urbanism approach promoted by Salvador Rueda is presented in order to study deeply its theoretical framework and the tools suggested for its implementation. First of all, this urban approach would integrate the two most debated issues of the sustainable city: the efficiency and the habitability. In fact, a sustainable city from the environmental point of view doesn't correspond immediately to a liveable urban system, so the Ecological Urbanism has introduced another restrictor that is the Urban Habitability. The concept of Urban Habitability has to optimize the urban habitat

living conditions and promote a comfortable space for human interaction, but ensuring at the same time the as little as possible ecological footprint. In this way, the theoretical approach would suggest a more sustainable city model that presents the following features: Urban compactness, Urban Complexity, Metabolic Efficiency, Social Cohesion. Moreover, Rueda with the support of the *Agencia de Ecologia Urbana de Barcelona* has realized a validating indicator system in order to ensure the urban level of sustainability. The list of the 50 indicators can be used according to the urban area of intervention, and it could be very useful before and after the urban transformation in order to help the technicians to individuate the priorities and decide the actions to implement. Moreover, I present the two specific tools for the realization of the Ecological Urbanism presented by Rueda: Urbanism on three level and the Superblock model. I focus particularly to the Superblocks, that represent the strategy for a new urban model. In fact, it seems the the crux of the Ecological Urbanism that has influenced majority the application of the Rueda approach, and that provide to realize the sustainable city. Finally, in the second chapter I presents some cities where the Superblock has been already adopted.

In the last part of my thesis I show the application of the Ecological Urbanism in the case study of Barcelona. First of all, I introduce the Catalonian capital starting by an historical background, and looking back briefly to its urban evolution. In fact, in 1857 the engineer Ildefons Cerdà has won the commission for the new city expansion, promoting an orthogonal street network that will be the main Barcelona's characteristic, identifying even now the city in the world. Successively, I centre the attention on the Superblock project that has been proposed for the first time by the Agencia de Ecologia Urbana de Barcelona to the city Administration almost 15 years ago. In this way I present the several pilot projects that have been occurred during the years, even if the City Council was not able to conclude anyone of them. Only in 2016, the political party "Barcelona en Comù" has started the new Superblock program "Omplim de vidas els carres" in order to realize finally the innovative urban model. So, I have analysed this implementation process, combining two dimensions of analyses: the first one at the urban scale, in order to present the main principle of the Ecological Urbanism; and the second one at the Superblock scale, so as to show the local transformation of the city. I would understand what is the methodology structured by the Barcelona government in order to renovate the Cerdà grid, and at the same time to reach the four features of the sustainable city (Compactness and

functionality, Complexity, Efficiency and Social Cohesion) theorized by the Ecological Urbanism. In conclusion, I have reported a valuation about the Ecological Urbanism in order to define what could be the strengths and the weaknesses of this urban approach, and the opportunities and threats for the urban system.

1. The sustainable city

During HABITAT III it has been confirmed that currently the 54% of the world's population lives in urban areas and it could be more than the 70% by 2050 (UN, Habitat III, 2016). This exponential growth of urban population represents a challenge not only by the environmental point of view (depleting resources, increasing wastes, pollution, climate change and deterioration of life-supporting ecosystems) but also for the economic and social global systems. In this future scenario, the Quito's conference on Human Settlements has confirmed the key role of the urban system for the achievement of a sustainable world. Indeed, Joan Clos, the Secretary-General of HABITAT III, has fixed how "in this unprecedented era of increasing urbanization we have reached a critical point in understanding that cities can be the source of solutions to, rather than the cause of, the challenges that our world is facing today" (UN-Habitat, New Urban Agenda, 2016, p.6).

In the paragraph 1.1.1 I introduce how the role of the city has become so important in the sustainability idea and how concept of "urban sustainable development" has been integrated by the institutional agreements during the last decades. In fact, it has been considered as one of the global goal by the "Agenda 2030 for Sustainable Development", in order to mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change. Subsequently, I focus on the specific role of the urban planning of the street's public spaces, as one of the aspects of the urban sustainable development. I analyse how the global and European agreements have considered this particular aspect of the city planning, paragraph 1.1.2, and which urban planning movements have considered this space in the sustainable urban design, paragraph 1.1.3. In fact, the importance of the street's space has increased starting by the '90s, but it has been officialised in a definition of Public Spaces only by the Barcelona Declaration: "Public spaces are all places, including streets, publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive" (Barcelona Declaration for Habitat III "Public Spaces", 2016, p.1). Finally, in the paragraphs 1.2.1 and 1.2.2, I present the Ecological Urbanism as new urban approach. Since 2010, it has been promoted by two different authors, M. Mostafavi and S. Rueda, as a 'new' sustainable approach to the city. In these paragraphs, I focus on their references, in order to underline the origin of their approaches and show any differences between the two authors.

1.1. Urban sustainable development

The concept of "sustainability" has been debated during the last decades of the twentieth century, but the idea about the unsustainability of modern growth level has a much longer history. In this paragraph, I don't face the origin of the sustainability that could be related to several aspects of the economic growth, social conditions or the environmental issue. Instead, I focus about the notion of "Sustainable development" that has been emerged during the '80s on the concept of sustainability, particularly related with the Earth natural conditions (Limit of Growth, 1972) and that has developed around the three concerns: environmental, equity and economy. According to the rising attention about the human pressure on the Earth and human systems, the United Nations started to focused their attention on the global growth and development processes through a series of international conferences. The more important step is the first Conference on Human Environment (Stockholm, 1972), which has debated for the first time developing policies, human rights and environmental issues. For the first time the economic exponential growth in a finite world has been questioned, and during a phase of growing international attention about the environmental issue, in 1987 during the famous Bruntland Report[1], the definition of the "Sustainability development" has been officialised. The definition of sustainable development set the base for the *United Nations Conference on Environment and Development*, (Rio de Janeiro, 1992), where they were treated mainly the solutions to combating climate change problem, as the CO2 emission reduction and the renewable energy production. Additionally, the Rio Summit resulted important for two outcomes more, the Agenda 21 (a non-binding, voluntarily implemented action plan so as to increase the sustainable development at local level) and the United Nations Framework Convention on Climate Change (an international environmental treaty that based the agreement for the Kyoto Protocol and Paris Agreement and the CO2 emission global reduction). Thirty years after the first Conference on Human Environment and ten years after the Rio Conference the Unite Nations has organized the World Summit on Sustainable Development (Johannesburg, 2002), in order to confirm the agreed about the climate change resolutions and to reinforce a collective responsibility for a social and economic sustainable

[1] In 1987 the United Nations World Commission on Environment and Development, coordinated by the Norway Prime minister Gro Harlem Brundtland, has published the report "Our Common Future", also known as "Bruntland report". It defines the sustainable development as: ""development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

development at different levels: local, national, regional and global. Finally, in 2015 the United Nations have adopted the 2030 Agenda for Sustainable Development in order to mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change. The 2030 Agenda has been built on the success of the Millennium Development Goals, adopted following the Millennium Summit of the United Nations (New York, 2000), and it provides 17 Sustainable Development Goals to reach in the next fifteen years.

1.1.1. The origin of urban sustainable development

During these decades of rising interest about the sustainable development policies it emerged how the global Goals defined by United Nations require to be adopted at a local level in order to be put into practice. So, the urban dimension became rapidly the reference so as to apply the big objectives and the City was soon the subject of specific sustainable policies. The United Nations has organized three UN Conference on Human Settlements (HABITAT) recognizing the magnitude and consequences of rapid urbanization, in order to encourage a global sustainable urban development. According to the Conference on Human Environment, in 1976 it was organized in Vancouver the first HABITAT conference in order to increase the social responsibility of the international community and carry out the quality of life of human beings promoting settlements at human scale. Moreover, the Vancouver declaration underlines how the urban policies have to satisfy the human basic needs (food, shelter, clean water, employment, health, education, training, social security) without any discrimination, giving the priority to the most disadvantaged people. The second Conference on Human Environment, HABITAT II, was organized twenty years later in Istanbul. In this date, it was reaffirmed the "commitment to better standards of living in larger freedom for all humankind" however underlining "with a sense of urgency, the continuing deterioration of conditions of shelter and human settlements" (UN-Habitat, 1996, p.1). So, it has been adopted a Habitat Agenda in order to increase the key role of the cities and towns as centres of civilization, generating economic development and social, cultural, spiritual and scientific advancement. The last Conference on Human Settlements, HABITAT III, has taken place last year in Quito. It has received its impetus from 2030 Agenda for Sustainable Development (Goal 11 - Sustainable cities and communities) and the Paris Agreement on climate change, in order to present a "New Urban Agenda" able to guide the future urban

sustainable development. The new document would to increase the correlation between good urbanization and development, underlining “the linkages between good urbanization and job creation, livelihood opportunities, and improved quality of life, which should be included in every urban renewal policy and strategy [at] every level of government, from national to local” (UN-Habitat, 2016, p.6).

Over the years, the European Council has recognized through several meetings and conferences the international agreements about the sustainable development and the key role of the urbanization process in this global challenge. “The green paper on the urban environment” (1990) has been the first document redacted in order to guide the European cities to a better future, promoting the reduction of the soil consume, limiting the sprawl phenomena and developing compact cities. After that, it has taken place a series of Conference on Sustainable Cities and Towns[2] in order to confirm the importance of sustainable urban development at the local government level (Aalborg, 1994), engaging local authority as the main facilitator of the Local Agenda 21 (Lisbon, 1996), and giving higher priority to the urban sustainable development as the basis for a sustainable European society (Hannover, 2000). Moreover, according to the Lisbon Strategy[3], the European Council has adopted in 2001 the first Sustainable Development Strategy (SDS), which for first time combine the sustainable development principles in a single framework[4]. The SDS has been renovated in 2006 introducing the objective of a ‘territorial cohesion’ and the promotion of a ‘knowledge-based economy’. Finally, the SDS has been renovated for the third time in 2010 promoting a new strategy called “Europe 2020"[5]. This new plan introduces a vision of Europe’s social market economy for the 21st century able to come

[2] Aalborg (Aalborg Charter) 1994; Lisbon (The Lisboa Action Plan) 1996; Hannover (Hannover Call) 2000; Aalborg+10 (The Aalborg Commitments) 2004; Seville (Taking the Campaign Forward) 2007; Dunkerque (The Dunkerque Declaration) 2010; Geneve, 2013; Bilbao (The Basque Declaration) 2016.

[3] The Lisbon Strategy (2000), was an action and development plan designed for the economy of the European Union between 2000 and 2010. Its aim was to make the EU *"the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion"*.

[4] Climate change and green energy; Sustainable transport; Sustainable consumption and production; Threats to public health; Social exclusion, demographics and migration; Conservation and management of natural resources; The war on poverty in the world and the challenges in terms of sustainable development.

[5] Europe 2020 puts forward three mutually reinforcing priorities: Smart growth (developing an economy based on knowledge and innovation); Sustainable growth (promoting a more resource efficient, greener and more competitive economy); Inclusive growth (fostering a high-employment economy delivering social and territorial cohesion).

out stronger from the crisis and delivering high levels of employment, productivity and social cohesion, according to the environmental challenges.

1.1.2. The urban planning of the public spaces in the institutional agreements

"There are no clear limits to the periphery, nor it its structure sharply defined. At the extreme, urban areas negate the concept of the city itself: they become post-urban phenomena" (Green Paper on the urban environment, 1990, p.6). In this way, the Green Paper on the urban environment has defined in 1990 the spread of urbanization, encouraging to stop this sprawling phenomena and the realization of a city compact, dense and high quality. Assumed that the modern city (suburbia city model) based on the car economy, represents the opposition of the sustainable city (Camagni *et Al.*, 2002), in this paragraph, I stress how much the role of the urban planning, and in particular of the urban design of the public spaces, have been taken care by the sustainable development institutional debate. In fact, due to the high presence of world's population that lives in urban areas, the cities are inevitably the place of emerging issues, included social exclusion, rising inequality, economic disparities over the consequences of an excessive environmental pressure. So, according to the global agreements, the urban dimension has always covered a key role into the diffusion of a sustainable development. Especially in Europe more than in the United States during the '90s, after the introduction of the Agenda 21 (Rio Summit, 1992), the urban systems have acquired a fundamental role for the local application of the sustainability guidelines, and the debate on the sustainable development has started to questioning the relevance of the urban design on the urban sustainable development (Beatley, 2000). In fact, in 1991 the European Commission has launched the Sustainable Cities Project, and an Expert Group on the Urban Environment, has identified the principles[6] of the sustainable development and the mechanisms needed to pursue it. They have redacted in 1996, The European Sustainable Cities Report, which represents one of the first guide focusing on sustainable urban development and the integration of environmental objectives into planning and management urban strategies. The Report has presented 'compact city' shape as the most efficient urban model, in order to reduce the soil consumption, ensure the urban biodiversity, and increase the quality of life. It has

[6] Principles of Urban Sustainability: 1) Urban management; 2) Policy integration; 3) Ecosystem thinking; 4) Cooperation and partnership. EC, *European Sustainable Cities*, 1996.

given the priority to the integration of the environmental aspects on the spatial planning, but it considers very important also the mobility issue promoting traffic calming solutions. Moreover, the report has proposed a high valuation of the open space within the urban fabric, recognizing their social functions in terms of meeting places and areas for entertainment, recreation and relaxation. Finally, in opposition to the modern city ideal (suburbia, zoning and low-density area) the Sustainable City Report has encouraged mixed land use schemes so as to create a balance between houses, jobs and facilities. This urban mix should be implemented at the neighbourhood or even more local scale, in order to reduce movement needs of the citizens, to increase the economic vitality of an area, and improve the urban quality in general (CE, *European Sustainable Cities*, 1996). So, the European Sustainable Cities Report has been one of the key documents of the Second European Conference on Sustainable Cities (Lisbon, 1996) and, it was for the following decades the main reference for a systematic framing of the sustainable development issue. However, the planning approach promoted by the international agreements had a strategic role addressing environmental, social, economic, health and cultural issues for the benefit of all, but it had not considered deeply the role of the physic public space in the sustainable development issue. Only some years later it has been growth the awareness that the urban density is not synonymous of sustainability, at least for the complete conception of sustainability (ecological, economic, and social), because a compact city could realize a sustainable urban system by the ecological aspect but unsustainable by the social or economic point of views. It's the 'paradox of the compact city', which highlights the inverse relationship between sustainability and liveability (Dessì, 2015). That means it is necessary promoting the density urban model without a better use of the spaces in the existing urban fabric. So, the concept of urban sustainable development has been started to be combined with the ideas of quality and liveability of the public spaces, re-using empty space, and taking care to the urban design. In this way, ten years after the first European Conferences on Sustainable Cities, the European Commission has adopted a new common vision in order to create “cities and towns that are inclusive, prosperous, creative and sustainable, and that provide a good quality of life for all citizens and enable their participation in all aspects of urban life” (CE, Aalborg+10, 2004). Nevertheless, also in this agreement the urban quality aspect that have been considered are limited to the buildings’ architecture, limiting the public space to the result

of the urban development of the built city. Only in 2007, the public space has been inserted for the first time in an international agreement, the Leipzig Charter on Sustainable European Cities, considering it as part of the natural framework within which all built development is set, rather than simply the 'space left over after planning'. So, the quantity and the quality of the public spaces, has acquired a fundamental role for the urban sustainable development, conceived like the "sum of all the cultural, economic, technological, mobility, social and ecological aspects" (EC, Leipzig Charter on Sustainable European Cities, 2007, p.3). The Leipzig Charter has started to encouraged the interaction between urban planning and architecture in order to create "attractive, user-oriented public spaces and achieve a high standard in terms of the living environment" (EC, Leipzig Charter on Sustainable European Cities, 2007, p.3), highlighting the importance of infrastructure planning and the role of the street public space. In fact, subsequently, it has been emphasised the connection between the mobility and the sustainable development issue, not only considering the modal share but rather the key role of the streets as "an essential requirement for establishing a pleasant environment for the urban population and also for the global attractiveness and competitiveness of the city" (EC, Toledo Declaration, 2011, p.3). These intentions have been officialised at European scale by the European commission in 2016 with the adoption of a EU Urban Agenda (Pact of Amsterdam, 2016), so as to address the complexity of urban challenges for a smart, sustainable and inclusive growth.

Finally, the importance of the public space has been institutionalized also at a global scale, firstly by the Agenda 2030 that promotes an "universal access to safe, inclusive and accessible, green and public spaces" (UN-Habitat, *Transforming our world: the 2030 Agenda for Sustainable Development*, 2015), and secondly by the New Urban Agenda that highlights the role of the public spaces in the integrated dimensions of sustainable development: social[7], economic[8] and environmental[9]. Moreover, the New Agenda adopted

[7] UN-Habitat, New Urban Agenda, 2016, p.20. (37) "We commit ourselves to promoting safe, inclusive, accessible, green and quality public spaces, including streets, sidewalks and cycling lanes, squares, waterfront areas, gardens and parks, that are multifunctional areas for social interaction and inclusion, human health and well-being, economic exchange and cultural expression and dialogue among a wide diversity of people and cultures, and that are designed and managed to ensure human development and build peaceful, inclusive and participatory societies, as well as to promote living together, connectivity and social inclusion".

[8] UN-Habitat, New Urban Agenda, 2016, p.22. (53) "We commit ourselves to promoting safe, inclusive, accessible, green and quality public spaces as drivers of social and economic development, in order to

in Quito has presented an innovative point of view, considering the streets as public space on a par with squares, waterfront areas, gardens or parks, and not only a place for mobility. It suggests the idea that a well-designed and high quality public spaces network are able to "bringing people into public spaces and promoting walkability and cycling with the goal of improving health and well- being" (UN-Habitat, *New Urban Agenda*, 2016, p.32). The relevance to the streets in the conception of the urban public space has been defined by UN-Habitat over the course of the Habitat III preparatory process. In particular, UN-Habitat has presented in 2012 the notionof 'prosperous city'[10] which identify the role of well-designed street pattern like one of the main features of a city so as to be defined prosperous. Furthermore, the following year with a specific document 'Streets as public spaces and drivers of urban prosperity' the UN-Habitat has promoted a holistic approach to streets as infrastructure but also as public spaces, in order to explain the key role of the 'prosperous street' for the urban system. In fact, a good street pattern could boost infrastructure development, enhancing environmental sustainability, supporting higher productivity, and promoting equity and social inclusion, embracing the concept of liveability and urban quality of life. Moreover, the document highlights as "The desire to go 'through' a place must be balanced with the desire to go 'to' a place." (UN-Habitat, *Streets as public spaces and drivers of urban prosperity*, 2013, p.30), so the connectivity in terms of planning as well as design is one of the fundamental feature of prosperous streets in order to encourage walking and social interactions. Finally, the UN-Habitat has promoted the definition of Public Spaces in the Barcelona declaration on Public Spaces: "*Public spaces are all places, including streets, publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive*" (UN-Habitat, *Barcelona Declaration for Habitat III "Public Spaces"*, 2016, p.1). This declaration has confirmed the role of the street's public spaces, promoting their role like the extension of the private buildings "street and the

sustainably leverage their potential to generate increased social and economic value, including property value, and to facilitate business and public and private investments and livelihood opportunities for all".

[9] UN-Habitat, New Urban Agenda, 2016, p.26. (67) "We commit ourselves to promoting the creation and maintenance of well-connected and well- distributed networks of open, multipurpose, safe, inclusive, accessible, green and quality public spaces, to improving the resilience of cities to disasters and climate change, including floods, drought risks and heat waves, to improving food security and nutrition, physical and mental health, and household and ambient air quality, to reducing noise and promoting attractive and livable cities, human settlements and urban landscapes and to prioritizing the conservation of endemic species".

[10] In 2012, UN-Habitat has created a tool to measure the sustainability of cities: City Prosperity Index (CPI). This Index is composed by five dimensions: Productivity; Infrastructure development; Environmental sustainability; Quality of life; Equity/social inclusion; Governance and legislation.

house are interrelated spaces" and suggesting the presence of 35-50% of public spaces connected by a streets network. Moreover, it has been regarded the fundamental role of the public character in the public spaces that has to be guaranteed and its privatization avoided even if the use remains public especially referring to streets and built environment open spaces like squares. Worldwide trends at different scales put this issue as priority highlighting the need of a mutual positive relation between public and private space, including housing and residential blocks.

1.1.3. The urban planning of the public spaces in the urban design approach

During the second half of the twenty century the professions of urban and landscape architecture and the role of urban design emerged largely in reaction to the rapid city expansion. In particular, since the '90s the urban design has debated several sustainable approaches to the role of the cities, due to the growing attention about the human pressure at global scale (depleting resources, increasing wastes, pollution, and deterioration of life-supporting ecosystem, etc.) and according to the national and international agreements about the urban sustainable development (Stephen et Al., 2000). In the scientific literature, it is possible find a lot of different definitions about sustainable urban development in North America, Europe and elsewhere, that can be synthetize into the "Ecological and Sustainable Design" (Toros et Al., 2011). This new approach of the urban design promoted first of all to rethink the urban system in order to limit the negative human impacts and to minimize the ecological footprint of human activities. Moreover, the designers, experts and policy-makers have moved to increase the importance of the planning and the urban design at several scales (neighbourhoods, districts, cities, and regions), in order to merge the three aspects of sustainability: ecological, economic and social. In this paragraph, I expose a list of the most interesting urban approaches present in the literature that since the nineties worked to implement the sustainable city. In this way, I would emphasize the features of the different approaches and highlight the role of the public spaces in the urban design. The urban approaches presented are: Eco-design, Eco-Villages, Urban Ecology (Eco-cities), New Urbanism, Green Urbanism and Eco-district.

Eco-design is based on the sense of responsibility of the humans about our planet and it has been defined by Ken Yeang as "Managed use of an ecosystem's processes and non-

renewable resources through *ecomimicry* [so the] design of human communities and built environment that emulates the model of nature's ecosystems." (Yeang, 2010, pp.78-79). In this urban approach, the presence of the nature into the urban context plays the key role, and it includes any form of design that minimizes the human impacts on the environment's living processes. The six primary principles suggested by Yeang (2010) are:

- Balance ecosystem abiotic and biotic components;
- Reduce dependency on non-renewable energy;
- Minimize resources depletion and waste;
- Preserve existing ecosystems and biodiversity;
- Use compact space in building and development;
- Good water management.

Even if the Malaysian ecologist and architect has written a book in order to comprehend all the instruction and principles to design, he doesn't cover all the design requirements (Feizi et Al., 2014) as the design of the public space, limiting his attention on the integration between buildings and nature.

Eco-Village, according to the Global Ecovillage Network, is an "intentional, traditional or urban sense of community that is consciously designed through locally owned, participatory processes in all four dimensions of sustainability (social, culture, ecology and economy) to regenerate their social and natural environments" (ecovillage.org). So, the crux of the Eco-Village urban approach is the community around the project, which works to provide a nurturing social and cultural environment with a low environmental impact lifestyle. The 'Urban community' is a human scale neighbourhood where people know each other and care about them. It presents a common vision so as to reinvent urban life, more sustainable, collaborative and participatory; where citizens can live close to the work place and have access to the essential services without the car (Whitaker, 2009). So, the Eco-Village approach promotes the principles of urban sustainable developments, in particular the social and cultural community's aspects, but it doesn't promote a specific urban design of the 'villages' or its public spaces.

Eco-Cities is the urban approach promoted by Richard Register that has reported to the urban system the approach of Urban Ecology. The Urban Ecology is an environmental movement developed during the '80s that "studies the interactions of organism, built structures, and the physical environment, where people are concentrated" (Forman, 2014,

p.3). So, Register has proposed an idea of city that take into account the ecological carrying capacity of the city's bioregion (Sharifi, 2016), suggesting to consider the city like a living system. He promoted to "making the city's function fit with the patterns of evolution, following the builder's sequence (starting with the foundation i.e. land-use pattern and infrastructure); reversing the transportation hierarchy (stating with the pedestrians, bicycles, rail, and then accommodating trucks and other vehicles); and building healthier soils and enhancing biodiversity" (Register, 2010, p. 184). This urban approach has highlighted urban development process, related in particular related to the natural connection between the urban system and the environment. So, it doesn't face in a deep way the theme of the urban design and the projection of the public spaces.

The **New urbanism** approach was born in United States during the eighties as a hypothetic alternative to the traditional American planning approach, car-based and low-density. It is not possible to identify a single leader of the New Urbanism, because it has grown according with several ideas and approaches, but it has been formalized by the Congress for the New Urbanism that has published the CNU Charter in 1996. According to this document (CNU, 1996) the New Urbanism approach advocates the city compactness and the preservation of agricultural land; and it has introduced two principles such as traditional neighborhood design (TND) and transit-oriented development (TOD). Moreover, the urban design assumes a strategic role in the New Urbanism, which promotes the importance of urban physical solutions and well-designed spaces in order to "support and encourage social interaction" (Ellis, 2010, p.278). So, the planning of the streets and public spaces has assumed a main role in the neighborhood planning, suggesting that the common spaces should be designed for the pedestrian as well as the car (Ellis, 2010).

The **Green Urbanism** urban approach is considered as an evolution of the New Urbanism approach, endorsed by many American architects and planners, developing in addition a more ecological method in design and functioning (Beatley, 2000). Timothy Beatley is recognized as the reference of this movement and he recognizes 'green urbanism' in those cities that present the following features:

- Strive to live within its ecological limits;
- Designed to function in ways analogous to nature;
- Strive to achieve a circular rather than a linear metabolism;
- Strive toward local and regional self-sufficiency;

- Facilitate more sustainable lifestyles;
- Emphasize a high quality of neighbourhood and community life.

So, the Green Urbanism approach promotes a better use of the public spaces for the daily activities, including social and mobility activities. For instance, it emphasizes the ability to walk or ride bicycles, in particular at the neighbourhood urban dimension, creating highly liveable (and ecological) cities (Beatley, 2000). A particularly innovation that differentiates Green Urbanism from the other urban approaches is its attempt to develop assessment tool for performance verification and monitoring (Sharifi, 2016). The most famous one is probably the LEED ND, which regarding the public spaces has promoted the valuation about the presence of walkable streets, access to the public spaces and street network (LEED ND, 2009).

The **Eco-District** is a specific movement that present a local dimension to the urban sustainable development. Rob Bennett, founder if the Portland+ Oregon Sustainability Institute, has defined the Eco-District as "a neighbourhood that generates all its energy from on-site renewables, collects and recycles rainwater and waste, and prioritizes pedestrian, bike and transit access. It combines mixed-use, mixed-income development; neighbourhood scale parks; schools, community centres, and services and enhanced IT infrastructure." (Kemp et Al., 2011, p.110). So, the Eco-District approach presents again particularly attention to the ecological aspect of the neighbourhood, but in addiction it encourages a new 'smart' approach. According to the Portland Eco-Districts projects, some examples of potential projects are: Smart grid; Bike sharing; Green streets; Safe routes to schools; Tree planting campaigns; Transportation demand management; Car sharing Bike lanes; Sidewalk improvements; Urban agriculture; Public art;Green maps; Multi-modal transit (*The Eco-Districts Framework*, 2013).

Due to the influence by the Sustainability concepts, all of the urban approaches are united by the common interest to the ecological aspect. The Eco-design focus about the integration between building and nature, the Eco-district promotes self-sufficiency solutions at neighbourhood scale, etc., however they don't pronounce a clear definition for the design of the streets and public spaces. The one that presents the most interest about the role of the street as public space in order to increase the urban sustainability is the Green Urbanism. Anyway, the public areas are often considered as the key in order to

reach the social sustainable goals, but their limited relevance about the urban approach is probably due to the relevance 'car-oriented' society. This problem shows how much is difficult to reverse the role of the streets, from a place for motorized vehicular to a place for people. In fact, it's necessary to integrate the urban design with the mobility policies, in order to transform the street's space in a real community space as defined by the New Urban Agenda. In this way, I present a short description of the public mobility policies that during the last decades have worked in order to reduce the urban traffic and rehabilitate the role of the streets. Limiting the study to the inner (neighbourhood) streets, it's possible assume according to Corazza (1999), that the traffic management and mobility control should be based on three main elements: Protection from crossing traffic, Protection from vehicles and Prohibition or strong restriction to non-residential vehicles parking. The principles that should be adopted to reach these goals are:

1) Strengthening of the street role through the urban design and road connection;
2) Integration between local roads and the basic roads;
3) Accessibility from every point in the urban street network;
4) Basic street design in order to minimize the negative impact of the traffic;
5) Strategies in order to reduce dependence by the private car.

The first urban design solutions have been adopted already by the '70s, but their goal was not the recovery of the street as public space, but rather they have been moved by a reflection on the street perception and pedestrian safety. Especially in some cases in the North Europe, the local administration has adopted street design solutions (alternating straight lines with disassembly and/or tightening) through a strictly space separation, in order to slow down the vehicle's speed. In the following decades, due to an excessive car diffusion in the cities and a growing attention to the global environmental issues, the role of the street has been discussed. The debate between the role of the streets for car mobility or for a social goal, has been faced with the implementation of traffic calming solutions at neighbourhood scale. So, the problem has become the design or redesign of existing neighbourhood streets, starting from the real needs of its inhabitants. In this way, it has been considered for the first time the concept of integrated planning, suggesting a street's space able to be used both by the cars and the people. That means an increased attention about the mobility policies (public and private transport) and new urban design solution (for the street social function) (Corazza, 1999). The main tools that have been implemented

during the last decades to increase the urban habitability of the street's space are the Woonerf, the Erf and the Zone30.

The **Woonerf**. The word has a Dutch origin and it means literally "living yard" or "residential grounds", because it would represent the street's space out of the private propriety as a common space and not only a propriety of car mobility. It was implemented firstly Delft (Netherlands), where thanks to a speed reductions (30km/h), traffic calming solutions, and "obstacles" for crossing traffic, it was realized a new street typology for the recovery of the street's space. In the Woonerf it's not forbidden the crossing traffic, but rather the new designing high quality urban spaces tries to modify the car-driver behaviours and to make feel the car as "guest" and the pedestrian as "landlord" of the street's space, discouraging traffic from entering the area (Chasan).

The **Erf**. It's an evolution of the Woonerf concept that enlarge the approach of the "erf" ("terrain, area") to all areas, extending its scope to non-strictly residential areas. The second innovation presented by the "erf" model is the new approach of sharing space between pedestrian and motorist, avoiding the imposition of a low speed by "obstacles". Thus, it goes from a concept of coexistence to a concept of sharing space, thanks to a mutual attention between pedestrian and car drivers. In this way, it's possible to maintain the different street's users at the same level. According to Corazza (1999), it's possible to identify six features of the Erf:

1) The erf must consider local streets, within the traffic has origin or destination; the crossing traffic is avoided;
2) The street design must be such as to force a slow-moving circulation;
3) The street design should be implemented on one level, avoiding the division between carriageways and sidewalks;
4) The entrance and the exit of the ERF must be recognizable;
5) Parking must be signalled on the ground;
6) The erf could be characterized by a specific function: residential, commercial, etc.

The **Zone 30**. It is a simplified evolution of the Woonerf and Erf street models, it is largely adopted around Europe in order to reduce the traffic congestion into the local streets and increase the safety street (Corazza, 1999). The Zone 30 is defined by CERTU (Centre d'étude des transports urbains, 1994) as "a section or roads' sections constituting a homogeneous traffic zone, where speed is limited to 30 km/h and whose entrance and exit

are announced by special signals" (Corazza, 1999, p.143). Nevertheless, it hasn't adopted a particular urban design approach to the inner streets' space, but its first goal is a speed reduction, from 50km/h to 30km/h, that can be achieved with speeds limit, some specific signals or specific obstacles. In this way, the Zone 30 is less rigid from the urban design point of view and for the principles of space sharing, but it is more adaptable to the different neighbourhoods. Specially thanks to its low cost of implementation, it is the urban model for traffic calming more diffuse into European cities (Socco et Al., 2007).

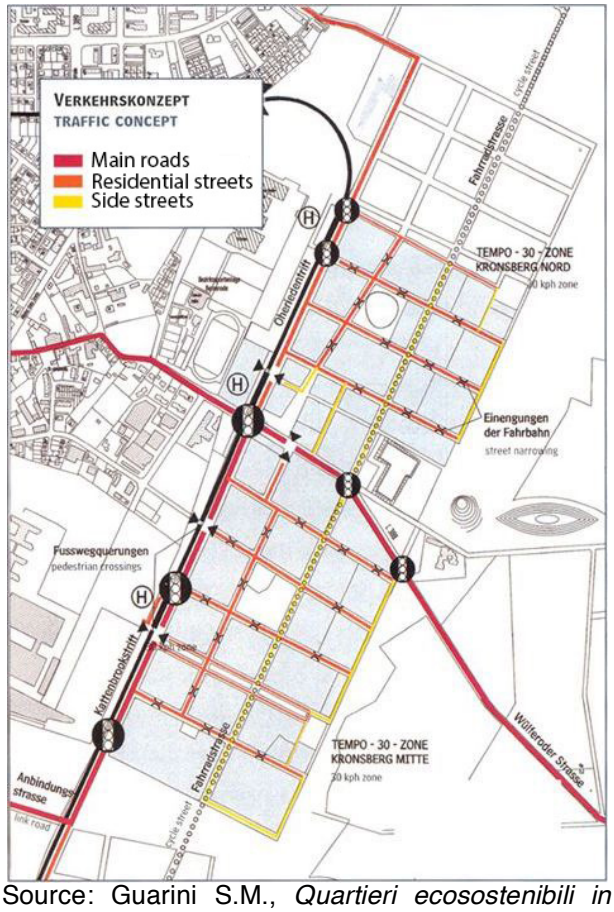
In conclusion, it's not easy to define clearly the management of the street's space like public space, because its control affects many aspects of urban policies (land management, ecological aspects, mobility, social and economic policies, etc.). Therefore, it's necessary a holistic vision of the urban project, which could mix the policies with the physical development of the roads, keeping in mind who are the users of these spaces: the citizens. According to Corazza (1999) the citizen become the hub of road design, it "is a pedestrian, but at the same time is car driver, resident, participant in decision-making processes, is involved in the verification processes. The indications of its needs, the study of its behaviour, the fulfilment of its needs is the basis of the success of the liveable streets" (Corazza, 1999, p.145). So, it's necessary to look the citizen in order to understand how to design the streets and to restore those "neighbourhood relations" that the traffic has destroyed.

At the end, I present some of the most famous application of urban renovation, where the street's space has been considered like one of the main axes for the achievement of the sustainable city. These neighbourhood have been realized in different years and promoted by different actors, but it's evident how the restoration of the streets as real public space represents the perfect tool for the implementation of environmental solutions (mitigation of heat-island effects; implementation of biodiversity; rainwater recovery; etc.), productivity (benefits of agglomeration economies; polycentric urban development; intensify urban nodes and corridors to maximize the benefits of concentration, etc.) and social cohesion (promotion of mixed-used; involvement of marginalized groups; improvement connectivity between neighbourhoods and access to services, etc.).

- **Krosenberg, Hannover, Germany**

The district (150ha) is located in the southern part of Hannover and it was built in the late 1990s in connection with the EXPO 2000, giving the possibility to the Administration to plan the intervention in a coordinated way with the Exposition. According to Stephen (2009) the district incorporates almost every urban sustainability or ecological design element. It has been realized with the aim to respond at high energy standards so that to reduce of a 60% the CO2 emission compared with standard construction practice, and at the social and economic sustainable goals, implementing specific urban policies. (Guarini). Moreover, the urban design responds to the all sustainability criteria debated during the '90s: high-density, multi-family housing, correspondence with public transport network and with a car-minimal grid (Stephen et Al., 2009). The street's public spaces have been recognized as a daily life urban space and it was designed in order to simplify its use by the people (Image 1.1.1). The entire district has been defined as a traffic-calmed zone, and the streets have been divided in two levels: basic street and local street. The first one represents the infrastructures along which the vehicular traffic to the neighbourhood is concentrated; the seconds represent the connection between the basic road and the residential buildings, and here is not permitted crossing traffic (Guarini). Moreover, the streets network, the inner space inside the building blocks and the green areas are interconnected in order to merge the public, semi-public and private spaces and create a unique network.

Image 1.1.1: Krosenberg, Hannover, Germany



Source: Guarini S.M., *Quartieri ecosostenibili in Europa*, Osservatorio Città Sostenibili Dipartimento Interateneo Territorio - Politecnico eUniversità di Torino, Torino p.11

- **Beddington Zero Energy Development (BedZED), London, England**

The BedZed district has been implemented to restore a dismantled industrial area (29ha) of Sutton suburb in the south of London. It has the aim to cancel the polluted emissions for domestic energy consumption, according to the Zero Energy Development principle. The project, completed in 2002, has been designed by Bill Dunster Architects and it includes a mix of housing and workspaces (Stephen et Al., 2009). The goal of the self-energy sufficiency has been realized thanks to: a centralized system powered by chopped wood, a photovoltaic panel system and mini-turbines wind system, that cover all the district consumptions and in some moments, produce an energy surplus (Guarini). Regarding the public spaces the BedZed has reversed the car oriented street spaces and the space for pedestrians, limiting the crossing traffic and designing the road layout keeping vehicles to walking speed, so giving the priority to the pedestrian mobility (Image 1.1.2). Moreover, the mobility system has been focused on the use of public transport, it was planned by the beginning thinking to the relation with the urban tram and bus network and it was integrated with a car pooling system (Government's Energy Efficiency Best Practice program, 2002).

Image 1.1.2: BedZED, London, England

Source: www.zedfactory.com/bedzed Accessed June 2017

- **Vauban, Freiburg, Germany**

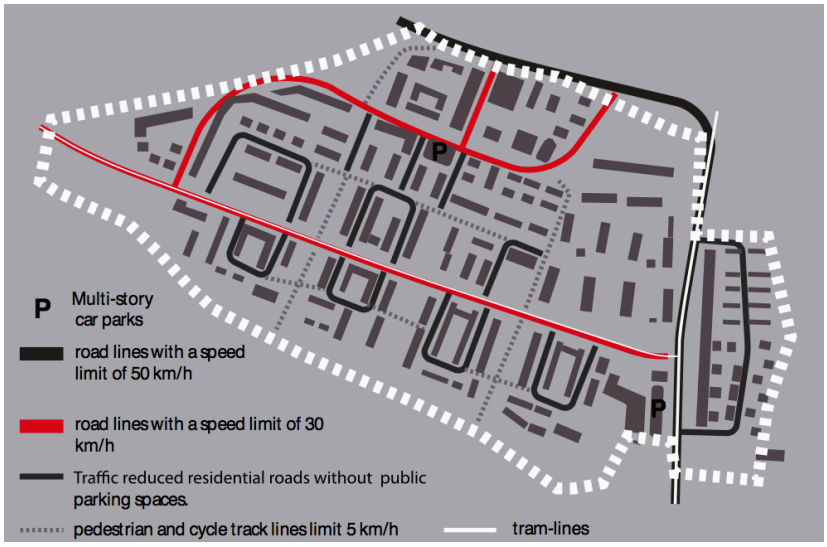
The Government's Energy Efficiency Best Practice program (2002), *BedZED – Beddington Zero Energy Development, Sutton*, GENERAL INFORMATION REPORT 89, Garston,p.

The Vauban district (38ha) is located in the south part of Freiburg, on the site of an old French military base. It has been promoted by the City Council as "a sustainable model district" with buildings low energy consumption and using renewable resources (Toros, 2011). According to the principles of eco-district model, it has been projected promoting a social and environmental sustainable approach. About the social aspect the most relevance intervention was a participatory process (Forum Vauban) that has accompanied the project in order to involved as much as possible the civil actors. The environmental sustainability has been sought thanks to a series of technologies applied at neighbourhood

scale: a cogeneration power plant using wood chips, solar heating panels system and a waste reuse system for the water and domestic solid waste (Guarini). Regarding to the road system it is possible to affirm, according to Leoni, Dematteis (2011), that in the case of Vauban district the public space design has played a fundamental role for implementation of sustainability principles. The road network has been divided in four levels (Image 1.1.3):

- Main road (50 km/h): the connection road between the city and the district. It's an external road to the district and it permits all the traffic typologies.
- Central road (30 km/h): the road that going through to the district and distributes the vehicular traffic on the local roads.
- Traffic calmed area: the roads of connection with the residence or the work place. They are closed to the crossing traffic. They are closed street or cul-de-sacs.
- Cycle and pedestrian path: the entire neighbourhood is permeated by a network of pedestrian and bike paths, in order to encourage a slow, sustainable and safety mobility.

Image 1.1.3: Vauban, Freiburg, Germany



Source: Leoni et Al. (2010), Vauban: district of the "green streets", Course of Urban design, Politecnico di Milano, p.8

The integration of all the street networks has been possible by several design features that use a new composition of materials that traditionally make up the roadway. It has permitted to create a street continuity between the private, semi-public and public spaces, encouraging the walkability. Moreover, the design of the vehicular lanes in the local streets would to give a human dimension to the street space, discouraging the transit of cars with spaces for pedestrians, cycle routes and green areas. In conclusion, the solution adopted at local scale permitted to give the space of the road a new meaning and a new use that goes beyond that of vehicle mobility to become a space of sociability and increase the urban quality of the district (Leoni et Al., 2011)

- **GWL, Amsterdam, Netherlands**

The GWL terrain is a neighbourhood (6ha) located in the West District of Amsterdam that has been built between 1995 and 1998. The project has been designed by the architect Kees Christiaanse and the landscape designer Adriaan Geuze, along a participatory decision process which has involved local residents. The intervention consists of 17 buildings that are arranged to form a high-density perimeter, while the inner areas remain open, including plenty of green public spaces, wide pathways and safe areas for children to play (Foletta, 2011). So, the area is completely car-free, and the only inner streets are for the emergency vehicles (Image 1.1.4). This radical solution has permitted to destiny the spaces available between the buildings for the community uses (children's play areas, shared gardens, etc.) and creating a high quality urban level and sense of community in the neighbourhood. Regarding the vehicles, there aren't private parking in the buildings (600 residential units), and the only available spaces are around the neighbourhood (129 on-street parking spaces are located on the side of the district) determining a ration Parking Spaces/Residence: 0.20. So, the district, that is the most density urban area of Amsterdam (23.000 in/km2) has completely changed the role of the car in the city, and destined the use of the inner streets for public uses (Beatley, 2009).

Image 1.1.4: GWL, Amsterdam, Netherlands

Source: Foletta N. et Al. (2011), *GWL Terrein, Amsterdam The Netherlands*, in Europe's Vibrant New Low Car(bon) Communities, Institute for transportation and development policy, New York, pp.20

1.2. A new urban approach: Ecological Urbanism

Over the last decades several planning approaches have been adopted to promote urban methodologies able to satisfy the three aspects of sustainability (Ecological, Economic and Social) and reduce the human impact on the earth. I have selected one of these approaches that has been developed at the beginning of the new millennium, the Ecological Urbanism, and I have studied its theoretical structure and the implementation process. In this paragraph I present the two specific authors that have developed the Ecological Urbanism, Mohsen Mostafavi and Salvador Rueda. Studying the authors, it is possible to connect their theoretical framework to several architectural and planning movements of the last century, but both would present their model like an innovative urban approach. Anyway, between the two methods there are some differences, but they are both agree to the importance of the urban design as a tool in order to re-connect the city and ecology. Subsequently, I focus the second and third chapter of my thesis to the urban approach of Salvador Rueda, analysing his theoretical framework and the practice realization on the Barcelona's case study.

1.2.1. Ecological Urbanism according to Mohsen Mostafavi

Mostafavi has coined the term for the first time 'Ecological Urbanism' publishing a book with same name in 2010. In this book Mostafavi doesn't give a specific definition of an urban approach or a principles' list for an innovative urban model, but he has realized a compendium of brief contributions by more than a hundred authors in order to renovate the attention about the ecological issue. In the book's introduction ''Why Ecological Urbanism? Why now?'', Mostafavi presents the reasons about the urgency of the environmental issues (population growth, urbanization phenomenon, exploitation of limited resources, etc.), and he promotes the role of the urban design as the solution in order to find a new balance between humans and nature. In fact, he considers to small the impact of current sustainable architectural practice on the global scale (Gattegno, 2011), and establishes a global and local imperative grounded in design: ''There remains the problem that the moral imperative of sustainability and by implication sustainable design tends to supplant disciplinary contribution. Thus, sustainable design is not always seen as representing design excellence or design innovation'' (Mostafavi, 2010, p.13). The aim of the book should be to provide a framework, with several contributions, among which

Koolhaas, Bhadi, and Kwinter's etc., where ecology and urbanism are conjoined to provide ‘‘the knowledge, methods and clues of what the urban can be in years to come’’ (Mostafavi, 2010, p.13). In fact, Mostafavi highlights the importance of the city scale in the same formulation of the term ‘ecological urbanism’. According to Gattegno (2011), Mostafavi would promote the city as the space of intricate social, political, cultural and economic variables that require an ecological framework for design. It means that Mostafavi with the catalogue of sustainable interventions, would refers not only with architects, but to all the urban planning figures (designers, landscape architecture, urban planning and urban design, etc.) in order to encourage a renovated interest in the sustainable urban design. Additionally, the author continues with a series of ideas that reside more in the realm of provocations than prescriptions (Gattegno, 2011). Through references to Gregory Bateson, Reyner Banham, and Felix Guattari, Mostafavi has promoted ‘‘new forms of creative imagining’’ (Mostafavi, 2010, p.26) and ‘‘openness to unexpected models of urban development’’ (Mostafavi, 2010, p.33). “These ecological design practices do not simply acknowledge the fragility of our surrounding ecosystem and the resource limitations they consider this contemporary state of affairs as the necessary basis for creative design speculation” (Gategno, 2011, p.74).

So, the Ecological Urbanism can be considered as an evolution of the urban approaches defined earlier as “Ecological and Sustainable Design”. It would provide to set a new sensibility that can help enhance the approaches to urban development but as stated by Mostafavi himself “this is not to imply that ecological urbanism is a totally new and singular mode of design practice. Rather, it utilizes a multiplicity of old and new methods, tools, and techniques in a cross disciplinary and collaborative approach toward urbanism developed through the lens of ecology” (Mostafavi, 2010, p.13). Therefore, it's possible to affirm that Mostafavi doesn’t promote any innovation in the knowledge of the sustainable city (renewable energy production, waste treatments, climate change, etc.) but he limits to renovate the debate about sustainable development (what exactly does it mean to be "green", "sustainable", or even "ecological"?) (Turnbull, 2010). In fact, the “book expands the field from landscape urbanism, to embrace issues of environmental and ecological concepts, and to include the expanded disciplinary frameworks that describe the urban condition” (Turnbull, 2010, p.2) but it doesn’t promote any particular innovation for Ecological Urbanism. Mostafavi has worked to merge Ecological Urbanism approach with

the ideas and actions of architecture, landscape architecture, urban design and urban planning for an ecological approach to the design of cities (Spirn, 2013). In fact, sustainability, performance, and green technologies become increasingly central to architecture, but such notions remain considerably less developed within the broader field of urban planning/urban design. The editors offer a sequence of novel postulations suggesting a future that is less dependent on diminishing resources and more focused on socially, economically, and ecologically sensitive interventions (Marinic, 2012). Nevertheless, not all the works produced – written, drawn, or built – qualify themselves as ecological urbanism; they belong to the extent that they embody key concepts and principles.

The idea of Ecological Urbanism presented by Mostafavi didn't find the completely approval by the scientific community, for instance Frederick Steiner thought that Mostafavi and his colleagues draw strongly on landscape urbanism, but pay scant attention to the advances made in urban ecology. If those ecological advances were incorporated, then one might imagine a truly new synthesis: landscape ecological urbanism (Steiner, 2011). In conclusion, this 'new' urban approach remains unclear, it doesn't promote a specific urban ecological strategy. According to Turnbull (2010) the Ecological Urbanism can be defined as a "more cohesive planning model, the kind that would bring together a diverse group as represented by the contributors to this book, from popular innovators to those evoking nostalgic Gaia theories" (Turnbull, 2010, p.2). The author has tried to merge the different disciplines architecture, landscape architecture, planning, and urban design but they maintained the urban design as the main tool of human adaptation to the sustainable city. I think that it is a problem especially when one work on the entire city, and with the ecological idea of a city like an entire system. In fact, it is very difficult to combine at urban scale all the ideas of the urban ecology only with the tool of urban design and without a strong urban policy. The dangers of acting in isolation become especially evident in the extreme conditions of the most densely populated conurbations around the globe, where it is much harder to identify disciplinary boundaries and combine them. A collaborative mode of working among various areas of design expertise is mandatory in thinking about the contemporary and future city, the transdisciplinary approach of ecological urbanism gives a potentially more fertile means of addressing the challenges facing the urban environment (Mostafavi, 2010).

1.2.2. Ecological Urbanism according to Salvador Rueda

The second author that can be considered the initiator of Ecological Urbanism movement is Salvador Rueda. However, he has a completely different academic training than Mostafavi, in fact he is not an architect but a biologist, and he had integrated the studies with a degree in psychology and a diploma in energetic and environmental engineering[11]. The two visions of Ecological Urbanism presented by the authors are very different each other, and the same Rueda in the introduction of his book (*Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, 2014) writes: "Ecological Urbanism was coined by Mostafavi. […] That magnificent book is a compendium of examples and experiences (remnants of reality) found throughout the world in which Ecological Urbanism was defined by extension. The book now in your hands aims to define Ecological Urbanism through understanding" (Rueda, 2014, p.3). Since 2000 Rueda was director of *Agencia de Ecología Urbana de Barcelona*[12], where he has developed and applied his interesting for the city and the ecology. However, already from the 90s he was attracted by environmental issue and in his firsts publications it's possible to see how the ecology studies had influenced him. In fact, the first Rueda's references are H. Odum and W. Margalef, who have influenced him about the role of the nature in the urban system and theory of ecological system (Odum, Energy basis for man in nature, 1980; Margalef, *Teoria de los sistemas ecológicos*, 1991). In 1995 Rueda has published "*Ecologia Urbana: Barcelona i la seva regió metropolitana com a referents*", in 1996 "*Metabolismo y complejidad del sistema urbano a la luz de la Ecología, Ciudades Para Un Futuro Mas Sostenibles*" and in 1999 "*Models and Indicators for Sustainable Cities*", published by European Environment Agency. So, the sustainability has assumed a fundamental role in the Rueda's city vision and according to M. Wackernagel and W. Rees (Our Ecological Footprint, 1995), Rueda has adopted the concept of city like an entire complex ecosystem, where it is necessary the control of the flows of material (water, energy, waste, and also information) (Rueda, 1999). However, the concept of

[11] www.bcnecologia.net/es/equipo/salvador-rueda last seen: 5/10/16

[12] BCNecologia (Urban Ecology Agency of Barcelona) is a public consortium consisting of the City Council of Barcelona, the Municipal Council and Metropolitan Area of Barcelona and the Barcelona Provincial Council. The Agency's goal is to apply a systemic approach to the management of cities in order to encourage a more sustainable model and provide sustainable solutions related to mobility, energy, waste management, water management, urban planning, biodiversity and social cohesion. www.bcnecologia.net, last seen: 13/9/16

sustainability has some points of weakness, and also Rueda showed it in one of his first publication, Ciudades para un Futuro más Sostenible (1997). He criticizes that the lack of results to merely rhetorical use of the term "sustainable" is being prolonged too much, and it is due to an ambiguity of the goals and no effective practical action. The conceptual ambiguity of the term "sustainable" cannot be solved by simple terminology or descriptive definitions, the content of this concept is not the result of explicit definitions, but the system of reasoning apply to approach him. Rueda also presents two aspects of sustainability: “weak sustainability”, which approaches the subject from the perspective own monetary standard economics, and “strong sustainability” the perspective linked to material ecology and natural science. The second one is the one that he develops and that was evolved in the idea of Ecological Urbanism. The first step to approach the “strong sustainability” is to define spatial-temporal reference, because it’s important to clarify if we are talking about a local or a global system. All the existing cities are based on flows requirements that are far above their capabilities and that of course fall back into the external context. So, the global sustainability can’t be ignored and on the local scale the cities need a model able to calculate with the data the effective resources used and control the urban metabolism (Rueda, 1997).

The proposal of Rueda is a new urban model that it is able to increment the habitability of the city (Ramoneda, 2003), and that it’s not based only on the improving efficiency in the use of resources or reducing waste, but also on social and economic factors and environmental and physical-spatial conditions. In this way, the first Rueda’s references were E. Tello (L’economia de la sostenibilitat, 1999) and R.B. Noorgard (Economic indicators of resources scarcity, 1990). When in 2000 Rueda became Director of the Agencia d’Ecologia Urbana of Barcelona he tried immediately to innovate the vision for the city starting from the process of reflection, participation and consensus opened by Agenda 21 movement and the City Council. So, in 2002 the Agencia presented a work that integrated the prospective for the Barcelona of the future: “Barcelona, a compact and complex Mediterranean city. A more sustainable vision for the future”. The new concept for the city was based on the premise that today Barcelona is full and the urban growth should be very limited, focusing its research on a new urban model that meets both ecological challenges and achieves competitiveness through a strategy based on the information rather than consumption of resources (Rueda, 2002). The main role that was defined for

the information is due to the historical period; in fact, it's important to remember how between '900 and 2000 the world was in the middle of "Information age", characterized by the shift from traditional industry that the Industrial Revolution brought through industrialization, to an economy based on information computerization. In particular the city of Barcelona had already adopted the 22@barcelona project that would promote an urban renovation for the old industrial neighbourhood of Poblenau. The plan presented an economic renovation based on five sectors: Energy, ICTs (information and communication technologies), TecMed (Medical technologies), Media (Audio-visual sector) and Design. The aim of these interventions would to realize a physical and social revitalization for the district, increasing the urban density, realizing a mixité of uses and implementing the quality of the neighbourhood (Ajuntament de Barcelona, 2005). Cities need information and knowledge to maintain and implement their structure and organization and Rueda suggests that in parallel to the metabolic flows of a city, like materials, water, energy; there is one more flow: the information flow. These flows are the solution for the implementation of the new model of Barcelona. With information should be possible to achieve compatibility between the terms "development" and "sustainable" (Rueda, 2002). Indeed, the model presented by Agencia de Ecología Urbana was based on the importance of the information and after was structured in four axes, that will become the four axes of Ecological Urbanism: compactness, complexity, efficiency and stability. Compactness is the line that articulates the models of land occupation and new planning, mobility, public space, building types and underground city. Complexity deals with the organization of the city and a new strategy for competing based on information and knowledge and give meaning to the model of the knowledge city. Efficiency is the strategy that proposes the adopting of a new metabolic system that reduces the disturbance of the ecosystems. It manages the flows of water, energy and materials in order to avoiding polluting both the city and the external environment. Stability, deals with social cohesion and also cover co-development, on the understanding that solidarity, equity, and reduction of conflicts for a sustainable development (Rueda, 2002).

Therefore, the Ecological Urbanism approach proposed by Rueda is based on the ideas of urban ecology: the city is viewed like an entire system, where the flows of material need to be controlled and made them more efficient. However, the author has introduced for the first time some technical proposals that should permit to integrate the different approaches

of sustainability (environmental, economic and social) in a holistic vision of the city (Urbanism on three levels and Superblock model). Moreover, Rueda and his team developed an indicators system for the definition of urban habitability, which considers all the possible urban variables (land occupation, public space, mobility, urban complexity, green, urban metabolism, social cohesion) and would become a guide for the calculation of the urban sustainability. In this complex redefinition of the urban sustainable approach the first objective is the restoration of the street's space as real public space, through a new urban mobility system able to ensure the principles of social cohesion, diversity and cultural urban identities. The specific role of the public space in the Rueda's approach find its references in some authors of the last century, D. Appleyard, J. Gehl and J. Jacobs. In fact, even if the director of the Agencia de Ecologia didn't explicit his references it's possible to recognize the attention on the public space promoted by these authors and in particular their arguments about the role of the street's space. In Gehl's perpective, making a city livable means promote life between the buildings. If the administration gives to the citizens the public spaces, the people will always fill this space. So, in 1962 Copenhagen become one of the first city to promote a car-free city suggesting a shift towards bicycles and pedestrian mobility (Beatley, 2009). Appleyard in 1981 coined the movement of "livable streets" emphasizing the role of the street's space as the fabric of social and urban life. Moreover, he has studied the social interactions inside the neighbourhood and the effects upon the lives of local residents generated by the street traffic and correlated by a different manage of the mobility system. Finally, Jacobs has fought for her entire life to defend the role of the neighbourhood, rejecting the modernist urban planning and promoting a local approach to guarantee a urban quality life. In her studies, she has promoted a neighbourhood characterized by: Mixed primary, Short blocks, variety buildings and Density. In this way, it could possible to obtain pedestrian use of the street, neighbourhood contacts, and the urban sense of community that the modernization was cancelling.

2. Theory and practice of Rueda's Ecological Urbanism

In the second chapter I focus on the Ecological Urbanism approach, in order to presents its theoretical framework and the tools promoted for its implementation. First of all, I would show how this urban approach would integrate the two most debated issues of the sustainable city: the efficiency and the habitability (paragraphs 2.1). In fact, the urban system can be considered a living ecosystem, and it's possible to calculate the resources flows that go through it. The Urban Efficiency represents the first restrictor of the Ecological urbanism in order to reduce the ecological footprint and reduce the urban impact on the environment (energy consumption, C02 emission, food production, resources consumption, etc.). Moreover, the Rueda's approach introduces a second main restrictor in order to link the urban space with the best urban conditions, the Urban Habitability. The concept of Urban Habitability has to optimize the urban habitat living conditions and promote a comfortable space for human interaction. In this way, the theoretical approach would suggest a more sustainable city model that presents the following features, (paragraphs 2.2): Urban compactness, Urban Complexity, Metabolic Efficiency, Social Cohesion. Moreover, the Ecological Urbanism approach has presented a validating indicator system in order to ensure the level of sustainability, paragraph 2.3.1. This system is based on a list of 50 indicators that can be used according to the urban area of intervention, and that can help before and after the urban transformation in order to coordinate the possible actions. In addition to this tool, Rueda has proposed two specific tools for the realization of the Ecological Urbanism: Urbanism on three level and the Superblock model. The Superblocks urban model is the solution that has influenced majority the application of the new urban approach, and that provide to restore the entire urban street network, paragraph 2.4.2. Finally, I present in the paragraph 2.5 some cities where the Superblock has been adopted. In these cases, the local administrations have worked in collaboration with the *Agencia de Ecologia Urbana de Barcelona*, as an external actor. The most famous case is the city of Vitoria-Gasteiz that thanks to the Superblock model has won the title of European Green Capital in 2012.

2.1. The theoretical framework of Ecological Urbanism

In 2012, Rueda with the *Agencia de Ecología Urbana de Barcelona* have published a book with the title "*El Urbanismo ecológico. Su aplicación en el diseño de un ecobarrio en Figueres"*. It is a compendium of the several publications realized by Rueda since the last decades of the XX Century that presents the application of the Ecological Urbanism theory in the city of Figueres. The Rueda's book defines a guideline able to understand and develop the concept of Ecological Urbanism in different urban contexts in order to understand how a city works and to have an influence on urban sustainability. On one hand Rueda proposes a conceptual, methodological and instrumental framework for the construction of a more sustainable urban model, and to the other hand he formulates a new strategy for competing based on the information developed by the city of knowledge model. Rueda defines a city or a neighbourhood starting by the urban ecology concept of system: "A system is a set of physical-chemical elements that interact. If there are biological organisms among the elements, the system is called an ecosystem" (Rueda, 2014, p.12). Nevertheless, if all the cities or the neighbourhoods are ecosystem it's necessary to dispose a set of restriction to evaluate them. For Rueda, the main restriction is the context. The idea of a system is all-inclusive and nothing is outside. This holistic vision considers the system and what is around it like the same thing, so it's important to value the landscape relations, metabolic flows, biodiversity interactions of the city. The scale of the context depends from the need of the system and its dimension. In the urban context there are two more restrictions, the Efficiency and the Habitability of the system. Following these two approaches the goal of Rueda is to have an influence on urban sustainability and realize the Ecological Urbanism, "that as the way I see it, the urbanism of smart cities" (Rueda, 2014, p.3).

2.1.1. Efficiency of the urban system

The **efficiency** of a complex ecosystem is the best level of organization that can be reached with an exchange of materials and energy between the system and its context. For the thermodynamic principles, the ecosystems follow the maximization of entropy to increase their stability, which is bound by a reduced consumption of resources. In fact, the urban ecosystem that needs a quantity of resources bigger than the natural ecosystems, can maintain its stability only with a considerable introduction of external resources.

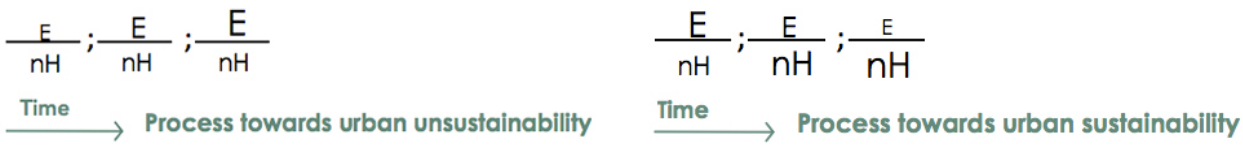
Therefore, the “Urban organization” or the urban complexity, that is the ability to control urban system by flows of materials, energy and also information, permits to organize the exploitation of other ecosystems, simplifying the consumptions of the urban ecosystem and first of all reducing the consumption of resources. If the urban ecosystem will be able to reach self-sufficiency and self-supply of energy, water, materials and food on a local level without overexploiting the support systems, it will reduce uncertainties and increase the resilience capacity. Considering that, the urban ecosystems those are able to increase their organizational complexity and to surge their stability with a less consumption of resources, will able to reach a better sustainable level (Image 2.1.1). Rueda represents this urban ecosystem condition with the following ratio:

Image 2.1.1: Function of urban sustainability

Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.13

In the ratio **E** represents the consumption of energy (as a synthesis of the consumption of resources), **n** represents the number of urban legal entities (business, institutions, infrastructures and associations) and **H** is the value of the diversity of these legal entities which is known as urban complexity (information). The currently unsustainable tendency (left side Image 2.1.2) show an increasing E, due to a continuously growth of resource consumption, significantly higher than the increased rate of organization. The only possibility to realize sustainable city is to change the urban strategy minimizing the consumption of resources and at the same time maintaining or incrementing the urban complexity and the organization of the system (right side of Image. 2.1.2).

Image 2.1.2: From an unsustainable urban ecosystem to a sustainable urban ecosystem



Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.14

Therefore, the aim of Ecological Urbanism is to implement the level of ecosystem's entropy (the organization of the system) in such a way as to reduce the consumption of resources and don't exploit the natural capital. To obtain this goal it is necessary to realize a drastic change in the social and economic culture and thus challenge the contemporary lifestyles based on mass consumer goods acquisition, land use, water consumption and energy. Rueda thinks that the only way to change the actual environmental impact of cities is based on an information and knowledge strategy. In fact, this strategy is the same that is used by the natural complex systems that maximize entropy in terms of information; so, for the urban system it seems necessary to disassociating economic growth from metabolic flows, or rather the dematerialization of the economy. Information in urban systems focus on legal persons: economic activities, institutions and associations, with varying degrees of expertise. Increase urban complexity means increasing the diversity of legal persons and thus the level of accumulated knowledge and a greater number of activities that thrive for the synergies that born when a higher level of complexity is reached. Reduce resource consumption and simultaneously increase information and knowledge are part of the same equation. The following table is a summary of what it means to reduce the E and increase the n and H:

Table 2.1.1: How to reduce E, n and H

Reducing the E means:	***Increasing the n and H means:***
Reducing is the strategy to compete among territories based on the consumption of resources, dematerializing the economy and disassociating growth from consumption.	*Developing the strategy to compete based on information and knowledge. One of the two main challenges of this 21st century*
Reducing the consumption of resources	*Increasing the diversity and the mix of urban uses and functions. This is one key characteristic to increasing economic resilience and stability in the understanding that the stability depends on the degree of complexity on the network of relations and this on the diversity of the urban system*
Increasing the capacity for anticipation and reducing the uncertainties involved in depending on fossil fuels due to their scarcity and/or the increased prices expected because of their extradition.	*Increasing the number of jobs available for citizens of different educational levels and ages. This leads to social stability.*
Reducing greenhouse gas emissions.	*Increase self-containment and self-sufficiency*
Increasing dependency on local resources	*Increasing the economic and social capital*
Getting closer to the self-supply of energy with renewable and local resources.	*Increasing the number of knowledge dense businesses and ICT businesses.*
Getting closer to a territorial rating of carbon	*Increasing productive business with added*

neutral	*value.*
Changing the mobility model	*Increasing creativity, research and innovation.*
Reducing the surface area exposed t inadmissible noise (noise is a manifestation of energy dissipation)	*Building a city in the understanding that a city is built by public arenas and gathering complementary legal entities.*
Committing more to urban rehabilitation and renovation and less on the contraction of new development.	*Creating new areas of centrality and making existing ones more mature.*
Saving on construction processes and building usage and making them efficient.	*Increasing the proximity of uses and functions and accessibility to basic services and infrastructures that offer non –passenger car transport alternatives.*
Reducing soil surface sealing and impermeabilization.	*Increasing the number of citizens of all statues who occupy the public space.*
Saving on public and private services and making them efficient.	*Extending urban life not only during the day but also at night.*
Citizen participation in the attempt to reduce the consumption of resources either through management of the new development, rehabilitation (where appropriate) as well as the use of the resources (this is mandatory) once the new system or rehabilitated system is functioning.	*Increasing public safety*
	Increasing the number of associations comprising civil society
	Creating self-help networks that assist with the growth of civil society.

Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.15

The sustainable city model cannot be achieved without the development of the knowledge of the city, and knowledge city cannot be achieved without the development of sustainable city. The first necessary condition is to increase the efficiency of the urban system, but it isn't sufficient to formulate Ecological Urbanism; this condition is achieved by the maximization of urban habitability for the people and organism that live in the city.

2.1.2. Urban Habitability of the urban system

Urban Habitability is the second main restrictor presented by Rueda and it is linked to the optimization of the urban living conditions of the people and living organism and their capacity to relate each other. Urban Habitability is dived in two aspects, Comfort (the spatial dimension of the city that represents the characteristics of the space) and the Interactions (the dimensions of social conditions of humans and most living beings). The integration of the habitability aspects corresponds to the concept of liveability, defined as the sum of the requirements to obtain the best conditions to live in town.

Comfort – Habitability and public space:

"*The public space and the gathering of complementary legal entities (H) in a limited territory are the two main elements that constitute the essence of a city. Without them, no city exists as such.*" (Rueda, 2014, p.16). Especially the Mediterranean cities are characterized by gathering and meeting place like squares or streets that represent the historical location where city, democracy and politic meet; these are public spaces. The public space is for everyone, and people became citizens when they can use the potential functions of those spaces without any restrictions (games, festivals, economic exchange, residence, sport, etc.). Unfortunately, today the public space is mostly used for motorized mobility (that of course it's one of the multiple possible functions) and citizens stop being citizens and become pedestrian (close in the spaces not at the service of the cars). Therefore, the aim of Ecological Urbanism is to reduce the public space used for the private motorized mobility and gives it back to the potential use of the urban community.

Comfort – Habitability, infrastructure and basic service:

Infrastructures represent one of the basic urban services for the restrictions of Ecological Urbanism. Its characteristics (dimensions, functions, etc.) depend to the features of the entire urban network and the need of the city or of the singular neighbourhood. The infrastructures are realized to serve the citizens, so the degree of habitability for the spaces used by the cars, the public transport, and the bicycles or by foot, is fundamental to calculate the habitability of the entire ecosystem.

Comfort – Habitability and building:

The building (residential building) is with mobility one of the sectors where there is the most consumption of resources. For this reason, Ecological Urbanism wants to develop an urban model able to implement energy efficiency but at the same time able to work for the application of social cohesion. So, the orientation, width of the building, ventilation, use of marginal waters, solar energy etc. are the elements that link the building design to the efficiency but also to the use of spaces by the citizens.

Interaction – Habitability and social cohesion:

In regards to the social cohesion the Ecological Urbanism sees buildings as the first step to achieve social and functional mix of uses. It's very important to realize an urban base for the social cohesion in order to avoid those effects of urban segregation and marginality. The risk is to realize isolated neighbourhood that are not related to the city and that leave

the citizens excluded from the services, commercial activities, facilities, etc. The importance of the coexistence as an expression of social habitability is closely related to the confluence, in relatively small spaces, of people of different conditions. The mix of incomes, ages, ethnic groups or cultures in the "same" urban space, usually provide adequate conditions for living together. Social diversity enhances stability and complexity of the network of relationships.

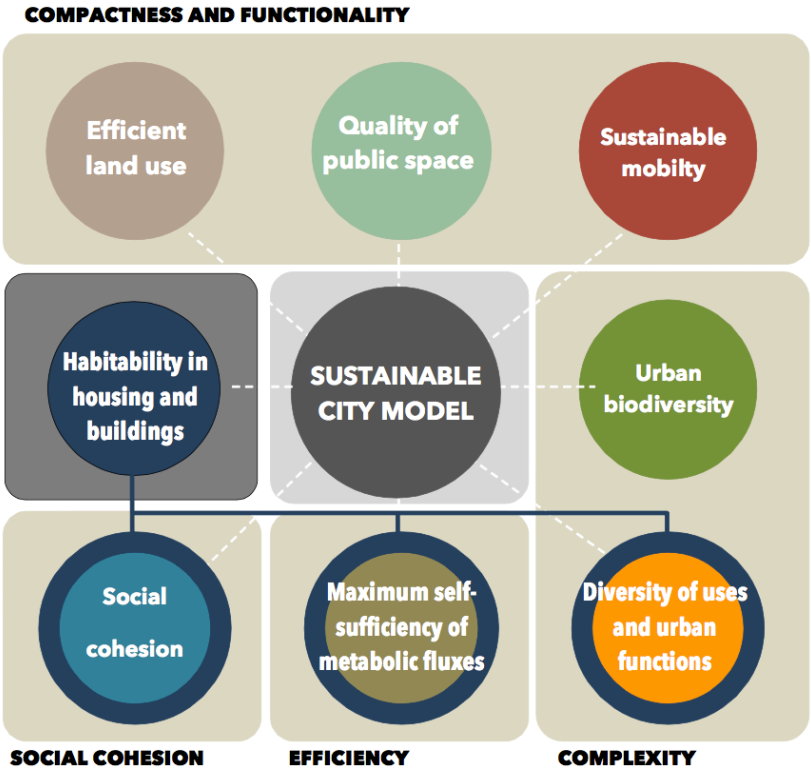
Interaction – Habitability and biodiversity:

Parks, gardens, urban gardens, etc., realize the urban biodiversity of an ecosystem. The functions of these spaces are very important for the entire urban ecosystem, in fact they provide to the citizens an acceptable level of urban habitability implementing the urban quality conditions that would enhance biodiversity and make life thrive.

2.2. The sustainable city model

Rueda promotes the Ecological Urbanism approach starting by an urban model that he considers already one of the most sustainable urban settlement: the Mediterranean city model. This one, according to its preservation and its adaptation to contemporary times, is supported by Rueda as the urban model that can respond better to the challenges of the future. Indeed, he considers in which way the model could respond to the challenges of the regional planning, the danger of sprawl, in the territorial specialization and simplification of tissues, the growth in mono-functional spots involving the destruction of organized urban fabric and the degradation of both urban landscape as territorial. It's a model that can be implemented with solutions to increase the metabolic efficiency and reduce the waste of resources. Moreover, Rueda supports the development of the social cohesion process, that it is one of the main characteristics of the Mediterranean cities, against the social segregation and isolation of citizens into the peripheries, increasingly extensive. Starting by the Mediterranean city model, Rueda suggests a new sustainable urban model. It is structured into seven areas (Efficient land use; Quality of public space;

Image 2.2.1: Sustainable city model



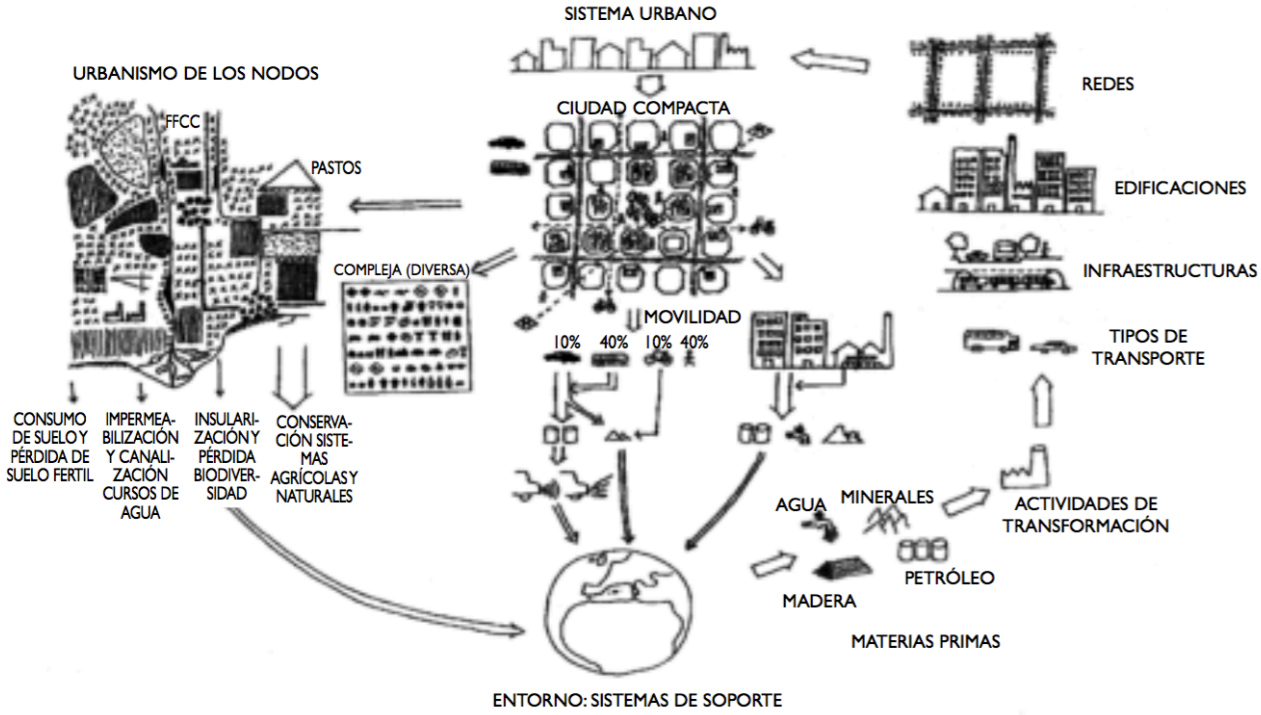
Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Urban Ecology Agency of Barcelona, Barcelona, 2014, pag.21

Sustainable mobility; Urban biodiversity; Diversity of uses and urban functions; Maximum self-sufficiency of metabolic fluxes; Social cohesion) plus one (Habitability in housing and buildings) that are part of the four features of the sustainable city: Compactness and functionality, Complexity, Efficiency and Social Cohesion (Image 2.2.1).

2.2.1. Urban compactness

"Compactness is the theme that has to do with the physical reality of the territory and, therefore, the formal solution adopted: the building density, the distribution of spatial uses, the percentage of green space or road space" (Rueda, 2014, p.18). The compactness expresses the idea of proximity of the different activities of the city, the urban uses, and functions in a limited space. The aim of compactness is to facilitate the contact, exchange and communication that are the essence of the city. Rueda shows how it is more profitable a compact system than a dispersal system (Image 2.2.2). First of all, the presence of public space (square, stress, parks, etc.) is mixed in a compact city, and can be used from everyone without difficulties, because it became aggregation space and its functions go beyond mobility and include many other activities as markets, leisure and festivals, etc. In a dispersal system, public space became more rarely and the streets play the role of

Image 2.2.2: Compact city



Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.18

mainly space, because this type of system need more infrastructure to allow the people to move inside it. The compact city at the same time is useful also for the implementation of Public Transport System. In a compact city, the proximity permit to have uses and urban function in a limited space, so a bus/metro/tram system became more efficient. About the efficiency consumption of the city a compact settlement results more sustainable because the potential contact per unit of energy are greater than in the dispersal city. The last but not least strength of the compact city is the social mix. In fact, the social condition in a compact system can be easily implemented. The separation between persons with different incomes in a compact city is less than that imposed in the diffuse city.

However, compactness presents also a danger. The development of an excessive compactness arising from speculation or poorly applied policies in relation to this concept. The current tendency of city development is for an urban speculation of free space, with a vertical growth of the central area that is mainly filled by tertiary activities. The proportion between buildings and public space is in favour of the former that limit considerably the urban quality and the quality of life. Therefore, the urban compactness must be regulated because excess can generate a malfunction in the urban ecosystem. The balance between built spaces and open (public) spaces, is defined by Rueda into 50%. Cerdà had already expressed this dichotomy, because it represents perfectly the dichotomy of human life, half personal and half public. Finally, the 50% of the public space should be valuated carefully because today that space it's used for the 65-70% for mobility (moving space, parking and loading and unloading areas). So, it is necessary to rethink about the division of public space in a more equal separation of the urban functions. "The public space is a structural element of a more sustainable city model. It is the space for citizen coexistence and, along with the infrastructure, green space and residence system, forms the main focus of social life and relation. The quality of this space is not only an indicator related to the concept of compactness but also an indicator of stability" (Rueda, 2014, p.18).

2.2.2. Urban complexity

The urban complexity represents the degree of mix in the uses and the functions implemented in a certain territory. In fact, all the interactions derive between legal entities: businesses, urban association, infrastructure, utilities, institutions and everything that is organised and that adapts to the set of strategic objectives of the city. As I have mentioned

earlier, Rueda has defined the Mediterranean cities as one of the most sustainable urban models, because the Mediterranean cities of southern Europe had for long treasured their characteristic mix of uses and functions. Many buildings house have several uses and each neighbourhood has a lot of everything. In the Cerdà's project of expansion for Barcelona each neighbourhood presented homes but also services as the market, the church, the shops, etc. All these services were close to the citizens and most of the city results in a high level of urban complexity. However today the danger of speculation and gentrification is a risk that can be generated by the research of the urban complexity due to a tertiarization of the city and a displacement of the populations weaker. This phenomenon has generated the development of residential neighbourhood in the urban suburbs that, far from every type of service, are completely deprived by a sustainable quality of life. The strategy proposed by Rueda is to reduce the current competitive system based a massive consumption of resources in favour of a strategy based on information. In this way, it will be possible to increase the urban competitiveness and efficiency reducing the ecological footprint of the urban system on the support ecosystems, according to the idea of sustainability. He suggests to increase the complexity of the urban system according to the principle of Margalef, which postulate that "the maintenance and/or the increase in complexity of a space occupied by a system, develops at the expense of reducing and simplify other spaces. There is a net flow of materials, energy and information from the less mature (less complex) space to the more mature (more complex) space. In this case the complexity (the organised information) would be the force and the flow would be formed by the traffic of matter, energy and information from a less mature ecosystem to a more complex one" (Rueda, 2014, p.37). The organised information (complexity) is the objective of the future planning of our city for these reasons:

- The increase of complexity in the city involves the mixture of urban uses and functions, which allows unrestricted access to the city.
- The increase of complexity in a limited space involves an increase in the trajectories of relation between the various information carriers, which allows an increase in synergies of all types, including the economies of agglomeration and of urban development.
- The proximity between complementary elements (companies, research centres, training centres, administrative offices, non-governmental organisations, etc.) allows the human,

technological and financial resources to have a greater probability of bilateral encounter and integral and multiple encounter.

- The increase in the probabilities of contact between diverse elements provides one of the basic characteristics of complex cities: creativity.
- The increase of complexity in a city means to promote an implementation of diversity in the natural systems of the urban region.

This is a strategy that marks a possible path in the competition between urban systems, which in this case would involve the factor of entropy.

2.2.3. Metabolic efficiency

The environmental sustainability of the city is a theme that is treated by the compactness and the complexity, but it belongs mostly to the third theme, the Metabolic Efficiency. Rueda, since his scientific background, remembers us that the earth is a big system, opened in energy flows and almost closed for material flows, but the systems that are inside it is opened both for energy both for materials. So, efficiency is a concept related to the urban metabolism, and it is associated with flows of materials, water, waste and energy. Usually organism needs to degrade energy and use materials to evolve and maintain their life, but a degeneration of this cycle of life can create uncertainly for the future. Therefore, an urban system that would to reach the highest level of stability in a sustainable way, need to manage in the best way possible the consumption of resources in order to cause the minimal disturbance on the supporting ecosystems. Regarding the energy consumed in the city Ecological Urbanism suggests that the neighbourhoods shall go beyond their status as energy consumers and, in parallel with a policy of energy saving, they could become the first generators of renewable energy and try to reach a condition of self-sufficiency. Rueda thinks that the actual energy policy needs a reassessment because if until now the focus was on a reduction of greenhouse gasses, today we have to change the energetic regime. It's important to develop a overall culture of energy, production, distribution and consumption.

Concerning the cycle of materials and the waste model the idea of sustainability is based on the level of pressure that the actions of the cities exert on the other support systems. Therefore, it's necessary to work on the flow of material that the urban ecosystem need and the flows of wastes that the cities produce. Reduce the consumption is the first step,

followed by the reuse the materials, the reduction of the emission and dumping in landfill sites and increase the flow of organic and inorganic waste collected selectively. The water is another resource that in the future will be very important, so it's necessary to work immediately to define a policy for the conservation and management of it. The aim of water conservation programmes is to reduce the demand of water, improve the efficiency of use and avoid the deterioration of water resources. It's necessary to work both on a local scale both on a basin scale, trying to integrate the management of resources and realizing solution for the self-sufficiency. It is essential to tie urban development to the water cycle as expressed locally: capture of rainwater and reuse marginal water. Finally, also the urban production of food needs to be included in Metabolic Efficiency. In fact, the food consumed by the citizens is a resource like energy or water, and also it has a relevant impact on the urban footprint. So, it's important to develop in the people a culture against the waste, and at the same time implement a urban food policy. Recently some case studies have showed clearly as urban vegetables garden can be an intelligent solution to reuse the empty urban spaces, realize a food self-sufficiency and help the economy of the neighbourhoods with bottom-up actions.

2.2.4. Social Cohesion

Social cohesion is the fourth theme and it is about the citizens and social relations in the urban system. The social mixture is the first parameter and necessity for a neighbourhood; mix of cultures, ages, incomes, and professions. It has a stabilizing effect on the urban system since it represents a balance between the different actors of a city and it helps for the integration of people from different cultures. Furthermore, it is necessary to work against social segregation that is present especially in the big cities, because these situations, which can degenerate in situations of urban informality, produce problems such as insecurity, instability and marginalization. In these areas, the mixité is so limited and there is often homogeneity of income, among other aspects, which negatively affects the idea of diversity and social cohesion. The social cohesion should promote especially policies and immaterial action to support the citizens, but it can be improved also with a design approach of the city. In fact, a successful planning allows city users of different status to appropriate of the public spaces and facilitate interaction and integration between them. This tends to a general reduction of social conflicts, which can be used like an

indicator to determine the stability or the maturity of an urban system. “The key towards social inclusion and social mixture is to minimize the exclusion of any social group by ensuring that the basic needs of housing, employment, education, culture, etc., are fulfilled. Action must include physical proximity between facilities and housing, mixture of different types of housing for different social groups, integration of slums to strategic urban locations and attraction poles, prioritization of pedestrian connections and accessibility to all urban space categories for people with reduced mobility” (Rueda, 2014, p.20).

2.3. Validating ecological urbanism: The indicator system

After the definition of the theoretical framework for Ecological Urbanism and the main axes for the Sustainable city model, Rueda and the *Agencia de Ecología Urbana de Barcelona* have defined a panel of indicators in order to calculate the sustainability of the Ecological Urbanism. The calculation of the indicators about consolidated settlements lets know the state of art of urban system, but it can be applied also to the new city developments. In both the cases the aim of the set of indicators is to apply the concepts of Ecological Urbanism to the contemporary city and adjust the planning to the model of a city compact, complex efficient and socially cohesive; all-complying with the restrictions of context, efficiency and urban habitability. The set of indicators is organized into seven groups under the four themes for a total of 50 indicators:

THEME.1 Compactness and Functionally
- **Area_1: Land occupation;**
- **Area_2: Public space;**
- **Area_3: Mobility;**

THEME.2 Complexity
- **Area_4: Diversity of uses and urban functions;**
- **Area_5: Biodiversity;**

THEME.3 Efficiency
- **Area_6: Metabolism;**

THEME.4 Social cohesion
- **Area_7: Social cohesion.**

The indicators are very different each other and they are singularly developed in different ways, but it's important to know that the first restriction, the Context, is the basic premise for approaching all the urban issues. It is clear that the use of the indicators is not something mechanical but it's necessary to contextualize the parameters before use them. Moreover, the possibility to use the fifty indicators depends by the data availability, the project phase, and the planning process. "This is why the indicators assess, among other factors, the aspects that have to do with the consumption of resources; the parameters that are related to the organized information or the derivatives of habitability" (Rueda, 2014, p.22).

The indicators presented by Rueda were developed along his career, and published in different works: 1999, *Modelos e Indicadores para ciudades más sostenibles*, Agencia Europea de Medio Ambiente; 2002, *Barcelona, ciutat mediterrània, compacta i complexa. Una visió de futur més sostenible*, Urban Ecology Agency of Barcelona; 2012, *Ecological*

Urbanism, Its application to the design of an eco-neighbourhood in Figueres, Urban Ecology Agency of Barcelona. In this thesis, I purpose the last publication of the Urban sustainability indicators, reporting the values used by Rueda and Urban Ecology Agency of Barcelona. It is necessary to remember that the parameters were applied to the Spanish regulatory system and should be different for another context.

2.3.1. Area_1: Land occupation

The first area of indicator is about the theme of compactness and functionality, and it is specifically about the urban morphology and the urban factory. The aim of these indicators is to implement the level of urban proximity, the mix of urban uses and functions that can involve the quality of life for the citizens. First of all the two indicators follow the idea of a compact urban model presented by Ecological Urbanism, reducing land consumption and seek the greatest of efficiency in the use of natural resources. Moreover, with a compact occupation system is possible to give integration and connectivity to different scales, into the neighbourhood and the city, producing an efficient flow of communication and information. In a dense and compact urban system, the basic building types are collective housing and this solution gives two types of advantages; on one hand, new social and communicative relationships between the citizens and to the other hand a facility distribution of services. Finally, the mobility system is more efficient in a compact environment and can be involved with sustainable solution since it is very simplified by the proximity of urban uses, public spaces, private buildings.

#1 HOUSING DENSITY – Number of homes per hectare.
The density range defined by the indicator is between 220/350 inhabitants/ha which means a more or less variable number of home based on the average occupancy of the area. In case the density should be less of the indicator the urban system couldn't take advantage of positive externality (isolation and consumption of resources), and to the other hand if the density should be greater it could cause congestion problems (less public spaces or service per capita).

Calculation parameters:	Assessment parameters:
Number of homes/total surface area of action	Minimum objectives: > 80 homes/ha
Calculation unit: homes/ha	Desirable objectives: > 100 homes/ha

#2 ABSOLUTE COMPACTNESS - The relationship between the built volume and the surface area.

The compactness has a relevant role in the shaping of urban fabric, with its implementation is facilitated the organization of urban uses, mobility network and the free spaces. The absolute compactness reports the building intensity in a specific urban fabric. It relates the built volume over the analysis surface area and the results equals the average building height out of the total area.

Calculation parameters:	Assessment parameters:
Built volume/territorial unit of reference*	Minimum objectives: > 5 meters
*(200x200m reference grid)	For a minimum of 50% of the study area
Calculation unit: meters	Desirable objectives: > 5 meters
	For a minimum of 75% of the study area

2.3.2. Area_2: Public spaces and habitability

Today it often happens that the public space is considered like the space of result after private spaces and mobility spaces, so consequently there isn't enough public areas for the citizens. In this way come less the same essence of city and it's necessary to find a balance between the areas dedicated to functionality and the areas oriented towards the people. Therefore, Ecological Urbanism establishes parameters related to the organization of the space and the minimum urban comfort levels. The second challenge of Ecological Urbanism about the public spaces is the habitability; in fact, the presence of free space is not sufficient if it is not attractive for the citizens. So, the indicators would implement also the quality of these spaces calculating some parameters like the accessibility, comfort, attractiveness, and security. The solutions proposed by Rueda to implement the urban public spaces and their habitability, find their application in the Superblock concept that I will explain longer in the next paragraph. Now it's important highlight that this urban solution promotes a new idea of the neighbourhood changing the percentage of public spaces divided between cars and citizens (pedestrian).

#3 ADJUSTED COMPACTNESS – The ratio between the built-up volume and the living space.

This indicator wants relate the built-up volume of the city with the public living space, its aim is to find a balance that could guarantee to the citizens the presence of free spaces useful like "*urban stress decompression spaces*". The public living spaces are considered like areas, which due to their location, the morphology and functions, permit interaction between city users.

Calculation parameters:	Assessment parameters:
Built-up volume/public living space*	Minimum objectives: 10-50 meters
	For a minimum of 50% of the surface area*

*(200x200m reference grid)	*(in the area of action)
Calculation unit: meters	Desirable objectives: 10-50 meters For a minimum of 80% of the surface area* *(in the area of action)

#4 LIVING SPACE PER INHABITANT – The surface of the living space in relation to the inhabitants

The living space is one of the main factors used to define the quality of life of the citizen, and this indicator want to preserve a minimal living space per inhabitant. Only with a good balance of walkways, boulevard, parks, squares, etc. and the built city it's possible to contribute to the physical, emotional and relational wellbeing of the citizens.

Calculation parameters:	Assessment parameters:
Surface area of the living space/total population (For areas of action > 50ha, the indicator is calculated over a 200x200m reference grid)	Minimum objectives: > 10 m^2/inhabitant In areas of action > 50 ha, compliance in more than 50% of the surface area
Calculation unit: m^2/inhabitants	Desirable objectives: > 15 m^2/inhabitant In areas of action > 50 ha, compliance in more than 75% of the surface area

#5 AIR QUALITY – The percentage of population and stretches of street (linear meters) exposed to different levels of PM10 and NO2 contaminating emissions.

The quality of a city and its sustainability level is defined also by the quality of air. The quality scale is calculated by the impact of pollution on the human health, so it's necessary to evaluate the exposure of people to the contaminants present in the air. In this case Rueda considers PM10 and NO2 with the limits imposed by Spanish law.

Calculation parameters:	Assessment parameters:
[Population exposed to NO2 and PM10 emissions levels lower than 40ug/m3/total population]x100 Calculation unit: %	Minimum and desirable objectives: < 40ug/m3 For 100% of the stretches of street/population in the area of action

#6 ACOUSTIC COMFORT – The percentage of stretches of the street (linear meters) and population exposed to a sound level less than dB(A).

The goal of this indicator is to limit the acoustic impact deriving from urban activities. The sources considered are the urban traffic and the circulation of public transportation. The acoustic impact is calculated by means of a noise simulation. The number of citizen affected for each noise level is defined by means an analysis of the most unfavourable case.

Calculation parameters:	Assessment parameters:
[Population with a daily sound impact that is lower than 65 dB(A)/total population]x100	Minimum objectives: daily sound impact < 65 dB(A) for a minimum of 60% of the population in the area of action

Calculation unit: %	Desirable objectives: daily sound impact < 65 dB(A) for a minimum of 75% of the population in the area of action

#7 THERMAL COMFORT – The percentage of net daily hours a street offers the adequate thermal comfort conditions for a person.

The objective is to respond to the climatic aspects of the urban system (to the different seasons) and to create a strategy for improvement or mitigate the best thermal situation. The indicator refers between 8 a.m. to 10 p.m. where a street offers the adequate thermal conditions for a walker. Values of climate, morphology of the street, materials of pavements and facades, and the presence of vegetation are used to calculate the thermal comfort.

Calculation parameters:	Assessment parameters:
[Surface area of the road space with a summer comfort potential of more than 50% (more than 7.5 hours a day)/total road surface area]x100 Calculation unit: %	Minimum objectives: > 50% of the net hours of thermal comfort (>7.5 hours a day) in the public space. For a minimum of 50% of stretches of the street Desirable objectives: > 80% of the net hours of thermal comfort (>12 hours a day) in the public space. For a minimum of 50% of stretches of the street

#8 MECHANICAL WIND INFLUENCE – The percentage of surface area of the public space exposed to a comfort level as per the wind speed.

The indicator wants to calculate the pressure of the wind (m/s) on the people's comfort. The indicator is simulated using the UrbaWind program that evaluates the average wind speed and the frequency of the time (% when the threshold comfort speeds, 3.6 m/s, is exceeded) in a certain space.

Calculation parameters:	Assessment parameters:
[Surface area of the public space (as per the type) with comfort levels/total public space surface area]x100 The comfort level is measured in terms of how often the speed is over 3.6 m/s Choose the most unfavourable season of the year Calculation unit: % surface area	Minimum objectives: Living space (sedentary activities) F(v>3.6)<5% Living space (recreational activities) F(v>3.6)<10% Pedestrian road (pedestrian transit) F(v>3.6)<20% For a minimum of 75% of the study surface area as per the type of public space. Desirable objectives: The same frequencies as the minimum objective for a minimum of 90% of the study surface area as per type of public space

#9 ROAD ACCESSIBILITY – The degree of accessibility of the streets based on the width of the sidewalks (right and left) and the slope of the stretch.

The indicator wants to implement the accessibility of the city for those people with reduced mobility. The criteria of assessment are those elements that reduce the urban mobility: slopes and sidewalks widths. They are organized in this scale for the valuation of the accessibility:

Degree of accessibility	Sidewalk (left or right)	Sidewalks (left and right)	Slope (max longitudinal)
Ideal accessibility	≥ 3.7 m	≥ 3.7 m	(y) <6%
Good accessibility	≥ 3.7 m	≥ 2.5 to 3.7 m	(y) <6%
Sufficient accessibility	≥ 2.5 m	≥ 1.8 to 3.7 m	(y) <6%
Insufficient accessibility	≥ 1.8 m	≥ 1.8 to 3.7 m	(y/o) <6%
Very insufficient acc.	≤ 1.8 m	≤ 1.8 m	(y/o) >

Calculation parameters:

[Stretches of the street (linear meters) with sufficient, good or excellent accessibility/total stretches of the street (linear meters)]x100
Calculation unit: % linear meters

Assessment parameters:

Minimum objectives: > 90% of the street stretches with sufficient accessibility
Desirable objectives: > 90% of the street stretches with the ideal accessibility

#10 ROAD SPACE RESERVED FOR PEDESTRIAN (BY STRETCH OF STREET) – The percentage of road space reserved for pedestrians in relation to the width of the street.

Ecological urbanism promotes the pedestrian mobility, so this indicator wants to calculate the availability of space reserved for the pedestrian movements without any frictions with the motor vehicle traffic.

Calculation parameters:

[Pedestrian road spaces (sidewalks or single section pedestrian street)/pedestrian road + vehicular road space] x 100
Calculation unit: %

Assessment parameters:

Minimum objectives: >60% of the road space reserved for pedestrians. In more than 50% of the streets (road surface area)
Desirable objectives: >75% of the road space reserved for pedestrians. In more than 50% of the streets (road surface area)

#11 STREET PROPORTION – The percentage of road space in line with the h/d proportion (average buildings height/average distance between facades).

The presence of sun and light in the city it a fundamental parameter for a quality urban system, so this indicator want to calculate the proportion between the width of the street and the height of the buildings. Classification of the stretches of the street based on the proportion (h/d):

- Excellent street proportion: h/d in the stretch < 0.5
- Good street proportion: h/d in the stretch = 0.5 - 1
- Balanced street proportion: h/d in the stretch = 1 - 2
- Insufficient street proportion: h/d in the stretch = 2 - 3.5
- Very insufficient street proportion: h/d in the stretch ≥ 3.5

Calculation parameters:

Assessment parameters:

[Stretches of the street (linear meters) with an h/d ratio of less than 2/total length of the road (linear meters)] x 100 Calculation unit: %	Minimum objectives: h/d < 2 For a minimum of 50% of the streets Desirable objectives: h/d < 1 For a minimum of 50% of the streets

#12 SPATIAL PERCEPTION OF THE URBAN GREEN SPACE – The percentage of green volume in relation to the visual field of a person in the street.

The indicator is used to assess the type of species and/or size of the trees in relation to the width of the streets from the visual of a pedestrian. Trees are classified in three groups: small size (7 m^3 on average), medium size (28 m^3 on average) and large size (50 m^3 on average).

Calculation parameters:	Assessment parameters:
[E volume of the tree tops/visual volume of the street] x 100]* *(per stretch of the street) Where: Volume of the tops: =4/3*π*r3 Visual volume = [length of the stretch x street width x 8m height] Calculation unit: %	Minimum objectives: > 10% green volume For a minimum of 50% of the streets. Desirable objectives: > 10% green volume For a minimum of 75% of the streets.

2.3.3. Area_3: Mobility and Services

Ecological Urbanism promotes a relevant intervention on the mobility system in order to change the car centric vision of the contemporary city supporting transport alternatives. The goal is to realize a sustainable city were the private vehicles don't exceed the 10% of all the travel, and the percentage of street occupation by motorized vehicles doesn't exceed 25%, so the rest of the space (75%) is destined to pedestrian traffic. This solution want to promote a the functionality of the system with minimal energy consumption and air and noise pollution, increasing safety and reducing traffic accidents for a best quality of the infrastructures system. To reach this objective is important to obtain high values of self-containment and self-sufficiency of the urban services, so that the distances for the citizens are less long and the urban life can be developed around the neighbourhood dimension without the need of use car. The future model of neighbourhood presented by Rueda is defined "Superblock", has an approximate dimension of 400x400m and it is created around the basic perimeter roads of the traffic. Inside it the "local" streets assume new uses and function that I will explain in next chapter.

#13 THE PEOPLE'S MEANS MOVEMENT.

The Ecological Urbanism wants to reduce the car dependence and to implement alternative transportation (pedestrian, bicycle and public transport). This indicator shows the distribution of displacement modes among population using the percentage of trips done by private car versus the total number of displacements.

Calculation parameters:	Assessment parameters:
[Private car displacements/total displacement] x 100	Minimum objectives: < 25% of displacements by private vehicle of area's internal displacements.
Calculation unit: %	Desirable objectives: < 15% of displacements by private vehicle of area's internal displacements.

#14 SIMULTANEOUS PROXIMITY TO ALTERNATIVE TRANSPORTATION SYSTEM – The percentage of the population covered by public transportation stops and a bicycle path.

The possibility of an easily movement inside the city and especially the access to the city centre with the public transport or with bicycle, it's fundamental for the development of a sustainable and democratic transport system. The indicator values these availabilities to implement a private movement, free by the use of cars. The distance considered:

- Bus stops: 300m
- Tram: 500m
- Bicycle network: 300m
- Pedestrian streets and walkways: 300m

Calculation parameters:	Assessment parameters:
[Population covered by alternative transportation system/total population] x 100	Minimum objectives: bike path and PTL stop < 300 meters away. For a minimum of 80% of the population in the study area.
Calculation unit: %	Desirable objectives: bike path and PTL stop < 300 meters away. For 100% of the population in the study area.

#15 ROAD SPACE WITH ACCESS RESTRICTED FROM PASS-THROUGH VEHICLES – The percentage of road surface area used for pedestrian transit with access restricted from pass-through vehicles in relation to the total road system.

The aim of the new network system is to transform the streets inside the neighbourhoods in a place of new urbanity, where it is possible to realize new activities for co-existence, recreation, exercise, exchange and more. The pedestrians and the cars can coexist only if these local streets aren't used by the pass-through vehicles.

Calculation parameters:	Assessment parameters:
[Road surface area reserved for pedestrian/total road surface area] x 100	Minimum objectives: > 60% of the road space with access restricted from pass-through vehicles.
Calculation unit: %	Desirable objectives: > 75% of the road space with access restricted from pass-through vehicles.

#16 BICYCLE PARKING – The percentage of population covered by bicycle parking less than 100 meters away. Space reserved inside the buildings.

The sustainable mobility promoted by Ecological Urbanism need to be supported by the adequate service and infrastructures. So, the number of bikes parking is on of the indicator that defines the intention to promote an alternative mobility. The lack of these spaces is a strong deterrent for the people that would use the bicycle.

Calculation parameters:	Assessment parameters:
[Population covered by bicycle parking/total population] x 100	Minimum objectives: (1) Parking spot for a bicycle < 100m (2) Area reserved in the buildings • Residential use: 2 spot/100m2 • Tertiary use: 1 spot/100m2
Calculation unit: %	Desirable objectives: > 75% (1) Parking spot in the buildings (2) Compliance with the specified reservations.

#17 OFF ROAD VEHICLE PARKING – The percentage of vehicle parking spots located off the road.

The parking spot located around the superblock, are defined as a city service for the citizens of the area, and the allocation of the number of spots and the number of parking are defined by the urban standards in the individual municipality. The indicator reports the ratio between the parking capacity in the public space and the parking of the public roads (public/private parking).

Calculation parameters:	Assessment parameters:
[Number of off-road spots/total number of spots] x 100 Calculation unit: %	Minimum and desirable objectives: (1) A parking spot for private vehicles less than 300m away (residential demand) (2) Reserved space off the road. Ratio:1 spot/home

#18 COVERAGE OF THE DEMAND FOR VEHICLE PARKING.

The theoretical infrastructure-parking deficit shows the difference between demand for parking and supply by off-street parking lots. When the parking lots don't cover the demand the difference between demand and offer is positive; when the difference is zero, the demand match the offer; and when there is a surplus of off-street parking lots the difference is negative. The demand is calculated from a census of the number of cars.

Calculation parameters:	Assessment parameters:
[Nr. Cars demand – supply of off-street parking lots / Nr. Cars demand] x 100	Minimum objectives: < 25% parking lot deficit
Calculation unit: %	Desirable objectives: < 10% parking lot deficit

#19 SPACE RESERVED FOR GOOD DISTRIBUTION – Conditioning factor: the consideration or not in the zoning report of space reserved off the road for good distribution.

The process of loading and unloading of economic activities inside the neighbourhood produce a conflict with the traffic and have a relevant impact on the use of public spaces. So, to ensure the spaces for these operations, the Ecological Urbanism proposes to reserved areas for the goods distribution and to realize “Urban Distribution Centres”. CDU are logistics districts platforms useful not only for the goods transhipment but also for centralization and storage of large volumes of goods that can be later redistribute by sustainable vehicles (last mile transportation).

Calculation parameters:	Assessment parameters:
[Pallets generated on CDU / total pallets generated (CDU and road)] x 100 Calculation unit: %	Minimum objectives: > 80% of CDU operations For consolidated urban fabrics: > 5% Desirable objectives: 100% of CDU operations For consolidated urban fabrics depends on the presence or absence of CDU.

#20 SPACE RESERVED FOR SERVICE GALLERIES – Conditioning factor: the consideration or not in the zoning report of space reserved for utilities networks in service galleries.

The Ecological Urbanism vision proposes to use also the underground system for a better urban organization. Therefore the construction of service galleries could provide for the rationalization of the use of the sub-soil, and it could help for an efficient use of the ground level. For Rueda the economic profitability of service galleries is becoming greater as they allow for preventive maintenance that is much less costly than traditional facilities despite the initial higher cost.

Calculation parameters: N.D.	Assessment parameters:
	Minimum and desirable objectives: space reserved for service galleries and backbone distribution network.

2.3.4. Area_4: Urban complexity

Ecological Urbanism promotes to abandon the old zooning strategy of the last century and develop an urban system approach characterized by a diversity of urban functions, able to balance between business and residence. The proximity patterns between home/work, home/leisure and home/services, will give the possibility to the inhabitants to find whatever they need at a human distance by the residence. The use of cars will be reduced and the role of the neighbourhood will increase producing new centralities and relations. Another important issue is the reduction of resource consumption associated with the increase of organizational networks. In fact an advanced level of society, with high level of organization permits to develop strategies based on information and knowledge, decreasing the pressure on material resources.

#21 URBAN DIVERSITY – Bits of information per individual (organized information) in a certain area. Shannon-Wiener diversity index (H).

The information is essential for the development of a sustainable system, and urban diversity index is a part of information theory that calculates the quantity of information in a message. The indicator is calculated by the Shannon formula, used in ecological literature. *H* is the diversity and unity is the bit of information per individual (species); *Pi* is the probability of occurrence, in other words, the proportion of the species *i* in comparison to the total number of individuals. Thus, the index takes the number of species present in the study area (wealth) and the relative number of individuals of each species (abundance). In the urban system, the individuals are legal persons, economic activities, associations, facilities, etc. The values range from 0 to 6-7, where 7 is the highest value and corresponds to one of the fabrics with the greatest complexity.

Calculation parameters:

$[- \sum_{i=1}^{n} Pi \, Log_2 \, Pi \, *]$

*200x200m reference grid

Calculation unit: Bits of information

Assessment parameters:

Minimum objectives: > 4.5 bits of information (average value in sectors < 50ha)

Desirable objectives: > 5 bits of information (average value in sectors < 50ha)

#22 BUSINESS AND RESIDENCE BALANCE – Non-residential surface area (retail/tertiary/productive surface area) in relation to the total number of homes or in relation to the total built-up surface.

This indicator wants promote an urban system non-specialized with different urban functions and uses. The idea is to realize a co-existence of homes, offices and shop, to balance between residential and business spaces and to permit a self-containment of mobility. This solution mitigates the big affluence of certain places and foster an equilibrate 24h occupation of the space.

Calculation parameters:

[Built surface area of tertiary – productive us (GSM)] x 100

For areas of action>20ha, the indicator is calculated using a 200x200m reference grid

Calculation unit: %

Assessment parameters:

Minimum and desirable objectives: > 20%

In areas of action > 50ha, compliance in more than 50% of the area of action.

#23 PROXIMITY TO SHOP OF DAILY NEED.

The daily needs are those type of activities classified in the sectors of food, books and newspapers and chemicals and pharmaceuticals. The presence of local activities in a neighbourhood scale it's important for the city life and permits to the citizen to avoid unnecessary travel by motorized vehicle. The indicator calculated for each unit parcel, the simultaneous coverage of the different types of activity nearby. The distance considered for each activity is 300 meters (5 minutes). Local activities: (1) bread (2) fish (3) meat, (4) fruit-vegetables (5) a variety of products in supermarket, (6) products varied in small business, (7) pharmaceuticals and (8) press.

Calculation parameters:

Assessment parameters:

[Population with simultaneous coverage to 6 (of 8) different activities/total pop.] x 100 Calculation unit: %	Minimum objectives: ≥ 6 kind of different activity Simultaneous coverage for at least 75% of the population Desirable objectives: access to all activity Simultaneous coverage for at least 75% of the population

#24 KNOWLEDGE DENSE BUSINESSES.

Ecological Urbanism wants to realize a model where knowledge is a significant part of the social and productive structure. The @ activities, that enhance research, innovation and creativity are classified into:

. Activities related to the field of Information and Communication Technologies.
. Productive activities of advanced services.
. Research centres, cultural centres and artistic creation, development and higher education.

Calculation parameters: [Number of @activities / Total legal entities*] x 100 *Reference mesh of 200x200 meters Calculation unit: %	Assessment parameters: Minimum objectives: > 10% For a least 50% of consolidated urban land Desirable objectives: > 20% For a least 50% of consolidated urban land

#25 SPATIAL AND FUNCTIONAL CONTINUITY OF THE STREET – The percentage of streets with degree of intersection based on the number of ground floor activities and the proportion of pedestrian roads, high or very high.

The Ecological Urbanism want to realize streets more interesting for the people and that are able to attract the community. So, the indicator calculates the attractiveness of the street to pedestrian on the base of these three level of interaction:

- Very high interaction: Pedestrian priority (>75%) and business density (> 10 every 100m)
- High interaction: Not pedestrian priority (>75%) and business density (> 10 every 100m)
- Average/low interaction/very low interaction: business density (5/10 every 100m – average interaction); (2/5 every 100m – low interaction), (<2 every 100m – very low interaction).

Calculation parameters: [Stretches of the street (linear meters) with a high or very high interaction level/total stretches of the street (linear meters)]x100* *by stretch of the street Calculation unit: %	Assessment parameters: Minimum objectives: High or very high interaction in more than 25% of the stretches if street. Desirable objectives: High or very high interaction in more than 50% of the stretches if street.

2.3.5. Area_5: Green Spaces and Biodiversity

The environmental issue represents one of the fundamental aspects of Ecological Urbanism, so also the indicator system contains indexes to preserve and implement the green urban spaces and biodiversity. The presence of natural areas must be guaranteed per resident ($10m^2$/inhabitant) and articulated in an urban network. This network should connect parks, gardens, courtyards, interstitial spaces of the block and superblock interior streets, trying to preserve the existence natural green areas and avoid their fragmentation. With this global solution is possible to implement also the urban biodiversity, regulate the hydrological cycle and improve environmental comfort. However, the parks are not the only green solutions, in fact Ecological Urbanism want to promote every type of permeable soils and pavements as possible to compensate for urbanization effects. Green spaces are projected also in height, where enough space should be left for green roofs and walls. The benefits are: a better building thermal and acoustic insulation, a reduction of human-activity produced heat (heat island effect), an increase in the vegetation associated to urban fauna, and mitigation of climate change though CO_2 retention capacity.

#26 SOIL PERMEABILITY – The percentage of functionally significant soil for the development of plant life and the retention of rainwater.

The proportion of permeable soil it's very important for a city, it guarantees the continuity of the green surfaces and a good water cycle. The biotic index indicates the ratio between the functionally surface and the total surface with these soil degrees:

- Soil with permeable surface (1). It is in a natural state without compacting;
- Soil with semi-permeable surface (0.5). Soil which partially maintains its functions although not in a natural state;
- Soil on a green roof (0.3). Topsoil added to building rooftops (extensive or intensive type);
- Impermeable soil (0). There isn't associated natural structure or function.

Calculation parameters:	Assessment parameters:
[∑(Soil permeability factor surface (ai))/surface area of the territorial unit (Ai)]x100 Calculation unit: %	Minimum and desirable objectives: > 20%

#27 GREEN SPACE PER INHABITAT – Green surface area per inhabitant.

The green spaces are essential in the urban model proposed by Ecological Urbanism. The index is defined as the surface area of parks and gardens and other public spaces with vegetation cover (>50% of the surface area) in relation to the inhabitants. The World Health Organization recommends a minimum of $10m^2$ yet and allocation of $15m^2$ per inhabitant is best.

Calculation parameters:	Assessment parameters:
[Green surface area/number of inhabitants]	Minimum objectives: > 10m^2/inhabitant
Calculation unit: m^2/inhabitant	Desirable objectives: 15m^2/inhabitant

#28 SIMULTANEOUS PROXIMITY TO GREEN SPACES - The percentage of population simultaneously covered by the different green spaces considered based on the surface area and walking distance.

The citizens have to be connected with green spaces in order to meet recreational needs. The articulation of the green areas should realize a green network in the urban system that it is able to cover the entire city from little green spaces to big parks.

- Landscaped areas as squares and living areas: green spaces > 500m^2 at a distance < 200m away;
- Open air living and recreational areas: green spaces > 5.000m^2 at a distance < 750m away;
- Urban park and historical natural areas: green spaces > 1ha at a distance < 2km away;
- Urban forest and natural environment integrated: green spaces > 10ha at a distance < 4 km away.

Calculation parameters:	Assessment parameters:
[Population simultaneously covered by the 4 types of green space/total population]x100	Minimum objectives: Proximity to a minimum of 3 of the 4 types of space. For 100% of the population
Calculation unit: %	Desirable objectives: Proximity to the 4 types of green spaces. For 100% of the population

#29 TREE DENSITY PER STRETCH OF STREET – The number of trees (street-lining trees) per linear meter of the stretch of street.

The presence of trees in the urban fabric can be a straight to improve the green corridors and the urban ecosystem connectivity. The indicator defines the size of the tree as in the following table, and valuates the density in a range between 0 and 1, with 0 corresponds to no trees and 1 identifies streets with one tree per meter.

SIZE	AVERAGE DIAMETER OF THE TOP (m)	DISTANCE BETWEEN TREES	NUMBER OF TREES / 100m	IDEAL DENSITY (double alignment)
Small	4	4	25	0.50
Medium	6	8	12.5	0.26
Large	8	10	10	0.20

Calculation parameters:	Assessment parameters:
(100 x number of trees)/length of the stretch	Minimum objectives: ≥ 0.2 trees/m of street For a minimum of 50% of the stretches of street
Calculation unit: trees/meter	Desirable objectives: ≥ 0.2 trees/m of street For a minimum of 75% of the stretches of street

#30 GREEN ROOFS – The percentage of green roof surface area in relation to the total rooftops that may be used for town planning actions.

The green roofs are one of the Ecological Urbanism solutions to implement the urban sustainability. Green roofs produce benefits for the constructions (thermal and acoustic insulation), for the urban metabolism (mitigation of the urban heat island effect, runoff control, filtration of CO_2), and for the organisms (urban biodiversity, green areas closer to the citizens, food production, etc.).

Calculation parameters:	Assessment parameters:
[Green roof surface area (m^2)/total surface area available on the rooftops] x 100 Calculation unit: %	Minimum objectives: Green roof > 10% of the available rooftops surface area Desirable objectives: Green roof > 15% of the available rooftops surface area

2.3.6. Area_6: Urban metabolism

The city, like all the natural system, has an ecological metabolism (Energy, Water, Food, Waste and Air), and it's important to implement its efficiency in order to reduce its impact on the support systems. The aim of Ecological Urbanism is to reach the maximum level of self-sufficiency and metabolic function of urban ecosystem. The energy management is valuated from the demand to the consumption, in fact the approach firstly seeks to reduce the request of energy analysing the different uses (residence, service and infrastructure, and public space) and secondly propose renewable energy sources. In fact, it is the same urban system that can produce energy, solar thermal, photovoltaic, biomass waste, geothermal, winds, etc. The water cycle is basically subject to two aspects: firstly, the optimization of the domestic/non-residential water; secondly, the shift of part of the drinking water supply from the centralized infrastructure to local water installations. About the waste management the Ecological Urbanism promotes a reduction and a closing (maximum possible) of the cycle of materials. To reach this goal it is necessary prevent the production and promote the reuse of raw materials.

#31 ENERGY DEMAND: RESIDENCE - Residential energy demand as per the use (heating, cooling, DHW and electrical uses) and net built surface area of the home.
The residential use of energy is one of the biggest cause of energy consumption; in fact the building type, its orientation, the passive elements and the number of residents or users are factors that impact in the energy demand. The objective of this indicator is to implement energy saving and efficiency to reach a sustainable urban system.

Calculation parameters:	Assessment parameters:
[Residential energy demand/built net surface area of the homes]	Minimum objectives: < 80 kWh/m^2

Calculation unit: kWh/m^2	Desirable objectives: < 65 kWh/m^2

#32 ENERGY DEMAND: SERVICES AND PUBLIC INFRASTRUCTURES – The energy demand from services and public infrastructures as per the use (heating, cooling, DHW and electrical uses) and the energy efficiency.

The services and facilities analysed are for tertiary and commercial uses, the demand for parking (technical buildings) and local public facilities. This indicator wants to promote the foster of energy saving and efficiency reducing the energy dependence.

Calculation parameters:	Assessment parameters:
[Energy demand from services and public infrastructures/built surface area of the services and infrastructures]	Minimum objectives: < 225 kWh/m^2 (services) < 110 kWh/m^2 (infrastructures)
Calculation unit: kWh/m^2	Desirable objectives: < 210 kWh/m^2 (services) < 90 kWh/m^2 (infrastructures)

#33 ENERGY DEMAND: PUBLIC SPACE – The energy demand from the public space as per the total surface area of the public space.

The indicator shows the energy need for lighting in order to guarantee the lighting levels set out by the International Commission on Illumination (ICI) with the maximum energy efficiency and saving criteria and in line with the functionally of each type of space.

Calculation parameters:	Assessment parameters:
[Energy demand from services and public infrastructures/built surface area of the services and infrastructures]	Minimum objectives: < 225 kWh/m^2 (services) < 110 kWh/m^2 (infrastructures)
Calculation unit: kWh/m^2	Desirable objectives: < 210 kWh/m^2 (services) < 90 kWh/m^2 (infrastructures)

#34 LOCAL PRODUCTION OF RENEWABLE ENERGY – The local energy production with renewable energy (RE).

Renewable energy is an unlimited resource and it is very important in the reduction of the greenhouse gasses emissions. If a urban system should be able to implement the self-production of energy through renewable resources It can reach a good level of sustainability. The energy potential is variable based on the characteristics of the site and climate conditions.

Calculation parameters:	Assessment parameters:
[Energy produced/total surface area of the area of action]	Minimum objectives: > 20 kWh/m^2
Calculation unit: kWh/m^2	Desirable objectives: > 40 kWh/m^2

#35 ENERGY CONSUMPTION – The average energy consumption in relation to the built surface area of the study area.

The indicator has the objective to reduce the energy consumption and the CO_2 emissions. In fact the solution to reach a better level of sustainability pass necessary through a more use of electricity produced by sustainable resources, but the first step should be a complex reduction of the energy request. Consumption can be omitted for demands lower than 10

kWh/m^2 as standard comfort parameters can be achieved with cross ventilation or mechanical fans.

Calculation parameters:	Assessment parameters:
[Energy consumption (total and by uses)/total built surface area]	Minimum objectives: < 100 kWh/m^2 (includes solar production)
Calculation unit: kWh/m^2	Desirable objectives: < 80 kWh/m^2 (includes solar production)

#36 EQUIVALENT CO_2 EMISSION - The equivalent CO_2 emissions deriving from energy consumption per unit of built surface area (thermal and electrical consumption).

The climate change can be contrasted only if we reduce the greenhouse gasses. Emission factors are applied based on the energy consumption to calculate the emission. Natural gas is considered to be used as the fuel for the thermal consumption. The emission factors used are: 0.2028 Kg CO_2/kWh (natural gas) and 0.3805 Kg CO_2/kWh (electricity).

Calculation parameters:	Assessment parameters:
[Equivalent CO2 emissions/total built surface area]	Minimum objectives: < 30 kg CO_2/m^2
Calculation unit: kg CO_2/m^2	Desirable objectives: < 20 kg CO_2/m^2

#37 ENERGY SELF-PRODUCTION WITH RENEWABLE ENERGY - The percentage of energy consumed produced within the very system (scope of action) and by renewable energy sources.

The urban system need to self-produce energy as much as possible in order to reduce its footprint and reach the highest level of sustainability. This index calculates the production of renewable energy produced on the total energy consumed.

Calculation parameters:	Assessment parameters:
[Energy produced using renewable energy / (Energy consumed + Energy produced)]x100	Minimum objectives: > 35%
Calculation unit: %	Desirable objectives: > 50%

#38 WATER DEMAND – The quantity of water consumed (total and by consumption segments in litres per person and day).

The water demand is an important indicator of the future sustainable city. The efficiency of the water manage follows two aspects: Optimization of the demand of water with the application of saving measures, and substitution of part of the total demand for non-drinking water with rainwater, grey water and groundwater.

Calculation parameters:	Assessment parameters:
[Water consumption (domestic, public, commercial) from the municipal supply mains billed annually/total population/365 days]	Minimum objectives: <100 lpd (drinking water demand
Calculation unit: liter/person and day (lpd)	Desirable objectives: <70 lpd (drinking water demand

#39 WATER SUFFICIENCY IN THE NON-DRINKING WATER DEMAND – The percentage of fulfilment of the non-drinking water and total water demand.

The urban system should provide to minimize the water demand recycling the water from marginal activities. The minimum and desirables objectives reflect the will to meet the potential non-drinking water demand, which Is estimated at 18 lpd for residential use, 14 lpd for public uses, and 4 lpd for commercial uses.

Calculation parameters:	Assessment parameters:
[Potential availability of usable marginal and pre-potable water/gross non-drinking water and total demand] x 100 Calculation unit: %	Minimum and desirable objectives: 100% sufficiency in non-drinking water and 35% total water sufficiency.

#40 NET SELECTIVE COLLECTION.

This indicator determines the capture of the total net quantity and fraction of separated waste at source by the generators and provided a separate collection systems of the municipality with respect to the total generation of each fraction. Thus, this indicator shows what level of total catch and by fraction collection system of the municipality. The fractions considered are: organic matter, paper and cardboard, glass, light packaging, bulky, textiles and dangerous.

Calculation parameters:

[Fraction of captured (gross) in separate collection system – improper fraction t) / t total fraction generated] x 100
Calculation unit: %

Assessment parameters:

	Organic matter	Paper board	Glass	Plastic	Metal	Bulky	Textile	Hazardous
Minimum objective:	55%	75%	75%	50%	50%	50%	50%	45%
Desirable objective:	80%	80%	90%	60%	60%	60%	60%	60%

#41 PROXIMITY TO WASTE COLLECTION POINTS – The percentage of the population simultaneously covered by collection points for the different waste fractions considered.

The proximity of the refuse fraction collection points means that citizens are encouraged to do recycling and also it is less probably to find waste abandoned in the public roads. The fractions considered by the indicator are: paper and cardboard, glass, light packaging, organic matter and general refuse.

Calculation parameters:	Assessment parameters:
[Population with simultaneous access to the selective fraction and refuse collection points/total population] x 100 Calculation unit: %	Minimum objectives: > 80% of the population is simultaneously covered by the collection points which are less than 150m away. Desirable objectives: > 100% of the population is simultaneously covered by the collection points which are less than 150m away.

#42 PROXIMITY TO RECYCLING CENTERS – The percentage of the population covered by a recycling centre less than 600 meters away.

The presence of a recycle centre for each neighbourhood can fosters the citizens to recycle that wastes that have not ordinary collection. The indicator proposes a recycle

centre close to the residents, no more than 10 minute walk (approximately 600m on foot), and the access must allow both the entrance of vehicle and pedestrian (located on the outer block streets).

Calculation parameters:	Assessment parameters:
[Population with access to a recycling centre/total population] x 100 Calculation unit: %	Minimum objectives: > 80% of the population covered by a recycle centre, less than 600m away. Desirable objectives: > 100% of the population covered by a recycle centre, less than 600m away.

#43 THE END OF THE ORGANIC MATTER (OC) CYCLE – The percentage of organic matter that is generated and later absorbed locally or in the study area.
Self-composing or community composing are practice that foster the citizen to close the organic matter cycle. The compost obtained can be used as a fertilizer in green areas, reusing waste materials and at the same time preventing the introduction of inorganic fertilizers.

Calculation parameters:	Assessment parameters:
[Organic matter generated in households and absorbed in green areas (urban gardens, parks, growing table, etc.)/total organic matter generated] x 100 Calculation unit: %	Minimum objectives: > 25% of the cycle closed Desirable objectives: > 100% of the cycle closed

#44 LOCAL PRODUCTION OF BASIC FOODS – The percentage of basic food produced locally.
The objective of Ecological Urbanism is to foster citizens to self-produce basic food. In fact, urban garden and also little green spaces in the city can permit to produce more or less 10% for each food group. These urban solutions permit to reuse free spaces, realizing micro-market and incrementing the urban biodiversity.

Calculation parameters:	Assessment parameters:
[Local production/Demand for basic food (fruit and vegetables)] x 100 Calculation unit: %	Minimum and desirable objectives: > 4% of the local fruit and vegetable demand covered

2.3.7. Area_7: Social Cohesion

The idea of urban sustainability proposed by Ecological Urbanism exceeds the strictly environmental scope; in fact social cohesion in a urban system refers to the ideas of co-existence among groups of people with different incomes, cultures, ages, and occupations. The concept of social cohesion is closely to the ideas of diversity and mixité of urban system that can be developed in a complex and compact model. However, diversity and mixité are conditions necessary but not sufficient to reach the social

cohesion, and also the socio-economic aspect, the housing policy, the presence of public facilities etc. are fundamental circumstances that have to be considered. The physical aspects of the neighbourhood like the proximity to infrastructure or the connection with the city centre are some indicators that should be valuated, but at the same time Ecological Urbanism proposes also immaterial aspect to implement the social cohesion. Furthermore, the Ecological Urbanism works for the social cohesion in three areas into which a city can be divided based on the degree of privacy: public, semi-public and private spaces. They have different potentials to establish social relations and different contacts, but the citizens remain the core focus of the spaces.

#45 POPULATION AGEING.

The index calculates the relationship between the elderly and the youngest citizens in a determined territory. It wants shows the aging process of the contemporary city and investigates if there are neighbourhood older than others or if the city presents a homogeneous distribution. The index is bounded between 0 and 1, which correspond to an equal distribution and a distribution of aging segregation.

Calculation parameters:

Ageing index:

[Population aged 65/population aged<15] x 100

Segregation index:

$$\frac{1}{2}\sum_{i=1}^{n}\left|\frac{x_i}{X}-\frac{t_i-x_i}{T-X}\right|$$

n = Number of territorial units for which the index is calculated, in this case, neighborhoods

T = Municipality's total population

t_i = Population in the *i* territorial unit

X = Population group to study in the municipality

x_i = Population of X group in the *i* territorial unit

Calculation unit: %

Assessment parameters:

Minimum objectives:

< 200 ageing index

< 30 segregation index

Desirable objectives:

100 ageing index

0 segregation index

#46 FOREING POPULATION.

The indicator calculates the relative weight of the foreign population in relation to the total population of a district or city. In this way, it is possible to understand if some parts of the city present segregation situations, and how they are distributed in the space. The index is bounded between 0 and 1, values which correspond to an exactly equal distribution and a distribution of maximum segregation.

Calculation parameters:

[Foreign population / total population] x 100

Segregation index:

The same of indicator #45

Calculation unit: %

Assessment parameters:

Minimum objectives: < 30 segregation index of foreign population range

Desirable objectives: with no spatial segregation

#47 POPULATION WITH HIGHER DEGREES

The index represents the relationship between citizens with higher education and the total citizens. This relationship permits to identify the neighbourhood with a level of inequality of this group of individuals. The index is bounded between 0 and 1, values which correspond to an exactly equal distribution and a distribution of maximum segregation.

Calculation parameters:	Assessment parameters:
[Post graduated inhabitants/Total population] x 100	Minimum objectives: < 30 segregation index of post-graduate inhabitants
Segregation index: The same of indicator #45	Desirable objectives: with no spatial segregation
Calculation unit: %	

#48 ALLOCATION OF SOCIAL HOUSING – The percentage of government-price or rent-controlled housing out of the total.

The objective is to reach a housing composition that doesn't exclude any type of citizens and that achieve a mixité in order to mitigate social segregation and incorporate the new type of families. A government price or a rent controlled housing offers a good base for the realization of a social cohesion city.

Calculation parameters:	Assessment parameters:
[Government-price or rent-controlled housing/Total housing] x 100	Minimum objectives: > 40%
Calculation unit: %	Desirable objectives: Variable depending on the context

#49 ALLOCATION OF BASIC PUBLIC FACILITY INFRASTRUCTURE – The quantitative adjustment of the allocation of public facilities with respect to the ideal standards.

The aim of this index is to ensure to the citizens the proximity to the different public services able to cover different cultural needs like education, health, sport, culture and social welfare. To reach a good level of urban quality is necessary that the simultaneous proximity is measured for all the different types of equipment. The equipment considered are the following:

CULTURE	**Distance (m)**
Community centres and associations	< 300
Local library / district	< 300
One-purpose small cultural centre	< 300
SPORT	**Distance (m)**
Outdoor sports court	< 300
Small complex indoor/outdoor	< 300
Sport Centre	< 600
Extensive sports playground	< 600
EDUCATION	**Distance (m)**
Kindergarten / Primary school	< 300
Junior High school	< 600
Senior High school + Professional training centre	< 600
HEALTH	**Distance (m)**
Health centres / emergency	< 600

Specialized health centres without detention	< 600
SOCIAL WELFARE	**Distance (m)**
Social service centres	< 300
Elderly residences	< 300

Calculation parameters:
[Allocation (m^2s/inhab) by type of facility/ideal allocation (m^2s/inhab)] x100
Calculation unit: %

Assessment parameters:
Minimum objectives: > 75% of the ideal allocation by type.
Desirable objectives: 100% of the ideal allocation by type.

#50 SIMULTANEOUS PROXIMITY TO BASIC PUBLIC FACILITY INFRASTUCTURE – The percentage of population close to several types of facilities at the same time.

In a city with a high level of urban compactness and urban functions there is also a good distribution of urban facilities. An equitable distribution reduces motorized mobility and provides an incentive for the presence of public service. So the basic facilities can meet the most daily needs of the population constituting the first level of service.

Calculation parameters:
[Population simultaneously covered by the 4 types of facilities/Total population] x100
Calculation unit: %

Assessment parameters:
Minimum objectives: Proximity to 4 (out of 5) of the types for 100% of the population.
Desirable objectives: Proximity to r (out of 5) of the types for 100% of the population.

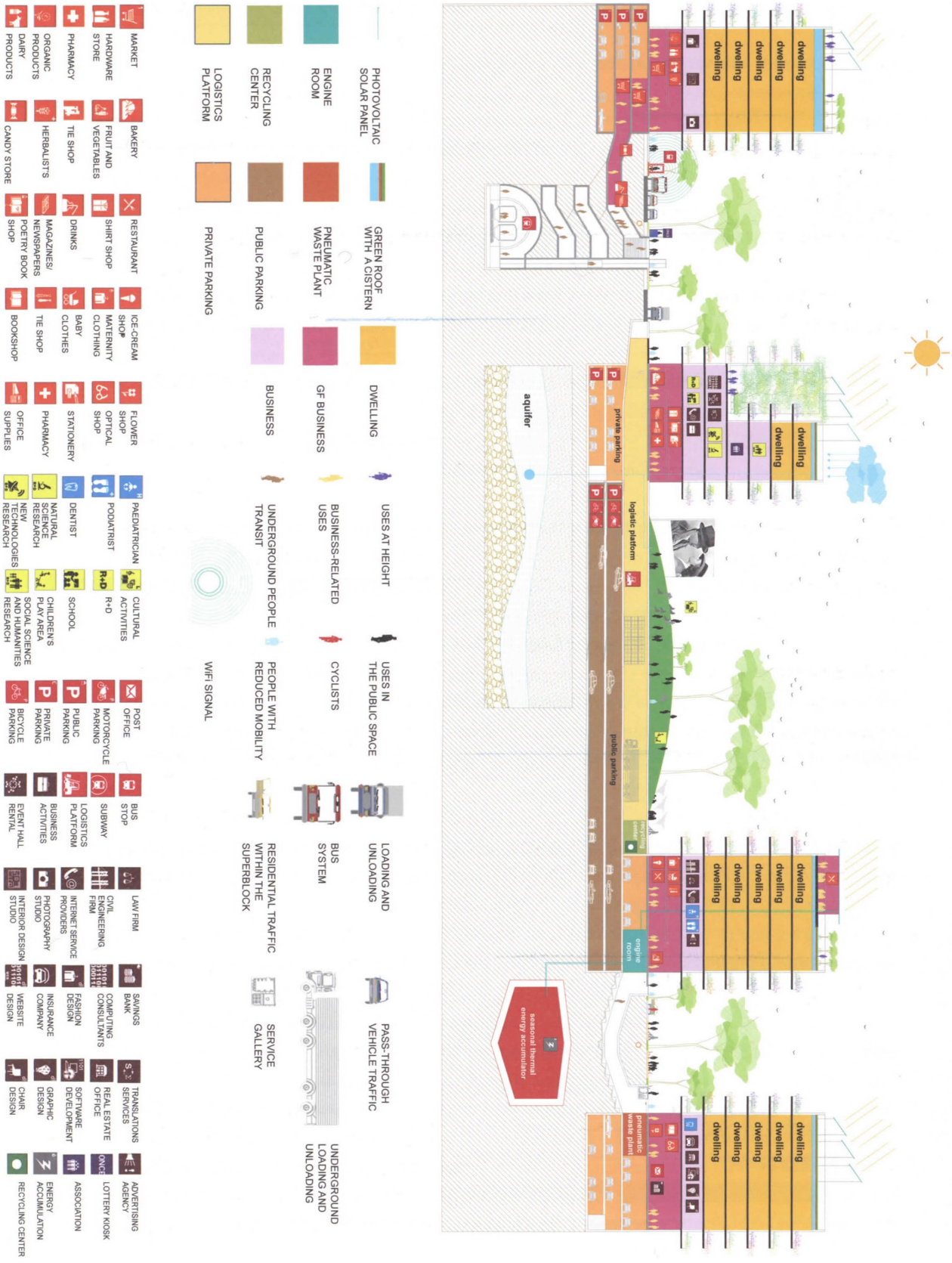
2.4. Ecological urbanism planning tools

Rueda and the Urban Ecology Agency of Barcelona have defined two urban planning tools in order to realize the Ecological Urbanism approach: “Urbanism on three levels” and “Superblock”. The aim of these two tools is to conclude the conceptual scheme of Ecological Urbanism approach and to find a practical realization to the concepts of Efficiency and Habitability. They want to increment urban organization and information in order to implement the function of urban sustainability, and at the same time reduce the consumption of resources. Therefore, urban design solutions will be adopted to change the contemporary urban fabric in order to reach those Rueda’s prerequisites that realize the sustainable city model: Urban Compactness, Complexity, Efficiency and Social Cohesion. Furthermore, as I have previously reported, Rueda used the Mediterranean urban model like the main reference for his project of Ecological Urbanism, so the “Urbanism on three levels” and the “Superblock” want to repeat the best characteristics of this model in order to find a replicable scheme. This scheme, that fulfil to the concepts of Ecological Urbanism should became a guide for the urban transformation, that could be used both for the existent city both for the new settlements. Of course, it needs to value the context and the available resources that are different from each case, but it could represent a good plan of actions for the development of the future cities.

2.4.1. Three levels of ecological urbanism

The three levels of ecological urbanism is the first tool for the realization of Ecological Urbanism model. Rueda starts to present this solution from the critique to the contemporary urban strategies. He defines it, too focused on “two-dimensional plan with zero elevation”, and without a real connection between the planning instruments that design the urban shape and that tools that manage energetic, water, waste policies and all the aforementioned urban variables. Therefore, his idea is to improve the holistic vision of Ecological Urbanism, which would realize an urban system completely connected and organized. The challenge is to pass from a planning system based on zoned areas to a new urbanism that drafts a unique horizontal layer that is divided on three vertical plans. Every plan need to be designed with the same level of details in an urban scale and not in an architectural scale of the single building or project. The three layers are height level, ground level and underground level (Image 2.4.1), and they are able to link the metabolic

Image 2.4.1: Urbanism on three



Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.50

flow to the urban efficiency, coming close to self-sufficiency through the use of renewable resources (rain and aquifers for water, sun for energy and recovered materials for construction, etc.). Their development will provide to implement the urban integration in a vertical and horizontal direction, trying to mix and combine the urban functions and uses. Residences, public space, business activities will be mixed in the renovated idea of a sustainable city. The uses of the city will not change from a neighbourhood to another but from the different spaces of the same urban area.

The three level of urban planning presented by Ecological Urbanism can be useful to face the following challenges:

a) Biodiversity and preservation of geographic and natural values:

A new layer of biodiversity is developed on the top level. Ecological Urbanism wants to connect the height level with the ground level, partially returning the biological capacity that urban development has taken away from it. They could be connected with solutions like large trees, climbing plants, green walls, etc. and implemented with programs to increment the biodiversity as, insectivorous birds; self-composting program for residual domestic organic matter; vegetable garden; etc. The underground level is important for the maintenance of the soil and to obtain the right habitability for the basically tree vegetation. Therefore, the Ecological Urbanism is a tool that seeks to adapt urban design to a site's natural conditions in order to maximize what nature has to offer. The city need to become resilient to the future climate changes, and only with a strong implementation of the nature in the urbanized environment it will be possible to reduce the negative effects.

b) Urban metabolism:

The idea that the city is a system, supposes that it has a metabolism. So the Ecological Urbanism promotes the highest-level possible, integrating all the urban material flows and minimizing the consumption of resources. Self-sufficiency should be the goal both for the private spaces both for the public spaces, reaching by an implementation of information shared and a use of the new technologies. For instance, solar panel, micro wind turbine or geothermal plant are solution that can be adopted for the energy production on the high level or to the ground level of public and private buildings. Moreover, the storage (by means of underground seasonal deposits, for example), as well as the passive system devices installed for energy saving and efficiency are to be considered as part of the

solution; water tanks on upper decks, green terrace roofs and facades and bioclimatic architecture designs can contribute to reach water self-sufficiency. Finally, Ecological Urbanism focuses also on the recycling process and the waste management (3-R: reduce, reuse, recycle) during the entire life cycle.

c) Service and urban logistic:

This is one of the biggest innovation solutions proposed by Ecological Urbanism: like water, gas, electricity and telecommunications service are arranged in galleries, also urban distribution can be arranged by an underground system of distribution. The idea is to centralized the urban distribution in logistics platforms in order to free the public space from this activity and reduce the current frictions that double and triple row of parked vehicles involve. The platform should be located in relation to the business density, and for the service of an amount of activities in order to ensure profitability. The interest of such an underground infrastructure is mainly the great amount of surface space it sets free for the benefit of civil usage. Furthermore, its passageways can coexist with underground parking areas, that way enabling quiet night-time delivery (using silent machinery and vehicles) without disturbing residential or public space activities during daytime.

d) Mobility and functionality:

The revolutionary idea of Ecological Urbanism for the reorganization of the urban fabric is the definition of urban cells: Superblocks. This solution would define a new urban network in order to modify the mobility system, which establishes individual lines for each means of transport, reducing the private space for the private transport and implementing the public transport. With this solution at the ground level the space for parking will be reduced to ta minimum in favour of public space. Superblock project is the second tools and I will explain it better in the next paragraph.

e) Public space:

Urban quality and the habitability of the city are some of main goals of Ecological Urbanism, which should be raised with the implementation of the urban public space. In particular the project would multiply the ground level destined to uses and functions of the inhabitants with the aim to move them from the status of pedestrian to citizens. In fact, today the cities are characterized by a public space that is divided to a lot of space for cars and little space for citizen; the objective of Superblock is to give back that space to

the people. With the development of Superblocks, the public surface area can be freed up by 75%. Moreover, a new aspect that Ecological Urbanism wants implement in the public space is the quality. In fact, the new urbanism proposes to control the environment variables: thermal comfort, noise, air pollution, safety, accessibility, etc.

f) Urban complexity and the knowledge society:

The aim of Ecological Urbanism is to realize a compact, complex, efficient and socially cohesive city, where the proximity between uses and functions can realize an urban system like the Mediterranean city model. The idea is to realize more areas of centrality that can sprawl the services in the city and increase the organized information of neighbourhoods. Furthermore, the division of the urbanism on three levels can prioritize the most attractive activities on the surface, avoiding that effect of “desert” long the streets. The higher levels will use for residential activities and the underground levels for support activities. With a more urban complexity and a reduction of the zooning urban division the information and knowledge society will be amplify. New individuals and legal entities will be attracted from the new opportunities and the entire city will receive a benefit from the urban diversity.

2.4.2. The Block and the Superblock

The Superblock is the second but probably the most important tool of Ecological Urbanism. In fact, Ecological Urbanism, considering the theoretical framework, the indicator system, and the concept of urbanism on three levels, requires a new urban basic unit of organization in order to reach the objectives of efficiency and habitability and realize the sustainable city model. The basic unite presented by Rueda to realize the regulatory framework are called: Block and Superblock. These urban cells will realize a plan more complex but at the same time more flexible and adaptable to the needs of living sustainable city. For each of the levels, or management layers (underground, street and upper level), new classical planning parameters are established and replaced with other parameters in the form of block characteristic sheets. “The characteristic sheets allow for more flexible and open planning in order to fit with the new models of housing and buildings and also establish the parameters and reservations that must be met with the new models of mobility and public space, urban metabolism and social cohesion” (Rueda, 2014, p.53). For example, the new urbanism specifies the occupation of roofs for each

energy collector, water collector or plant strata; or it can specify the bicycle parking, the accumulation deposit for the transfer of thermal solar energy or storage rooms for selective waste fractions, etc.

The '**Block**' is the small cell unit, and it is defined like the part of built space and the free interstitial spaces between the three levels of planning. It represents the minimum unit for determining the urban specifications of the new Ecological Urbanism. The block is composed also by the external space that is destined for the pedestrian accessibility.

The '**Superblock**' is the definition for that urban space realized by the union of smaller cells, and that space included between the blocks. This interstitial part of the city is composed by the public space: mobility networks, infrastructure, services network, green network, equipment and basic services network, community social relations, environment, etc. Rueda defines the public space as "the limit of the idea of city. Where there is no public space, one can talk of urbanization but not really a city" (Rueda, 2014, p.54).

The critique presented by Rueda is that today in Spain (and in most cities of the world) the public space is divided in unequal measure between automobiles and all the other uses. In fact, the idea of the public space is that it can be used for every type of activities like games, festivals, living space, commercial exchange, foot/cycle mobility etc., but now, more than 60% of it is used (directly or indirectly) for cars, realizing an unacceptable environmental condition. The results are, an excess of congestion, noise, air pollution, traffic accidents, visual intrusion and a consequent reduction of urban quality and space dedicated to pedestrian or the other modes of transport. In particular the inhabitants desisted to live the public space, reducing the time passed in the common area for the private spaces, and so they can't be considered citizen but only pedestrian (the rest of the space for cars). The proposal of Superblock tries to reverse this trend and give back the public space to the citizens. In fact, the streets have been developed in origin for the movement of people by foot, creating an urban system that presented several facades with a mix of uses, residential and business activities. The interstitial spaces between the blocks constituted the public space, a space that interacts with the ground floor businesses and which capture the street's flow and releases a network of citizens dynamic. When the motor vehicles arrived to the city, they were free to go everywhere, and consequently they occupied all the public spaces, not only of the streets but also the square or that spaces that until some years earlier were occupied by people. The problem

was that a motor vehicle, which can run quickly from one point of the city to another, collides with the structure of the city where every 100 meters there is a stop. Therefore, to solve the interruptions in the flow traffic, many public administrations have realized urban highways, where the cars could go at the highest velocity. Of course, the problem wasn't solved and with a growth of the number of cars the cities were completely submerged by motor vehicles. The urban factory was modified and while before the introduction of cars the dimension of block was more or less 100 meters, with the necessity of high speed streets the blocks became longer, reducing the block crossing and discouraging the number of businesses on the front facade. The urban landscape has been impoverished discouraging pedestrian movements.

The solution proposed by Rueda would find the right dimension of the urban factory, in order to give back public space for the citizens and permit a better walkability of the city, and at the same time realize a motor vehicle network that could permit an easier movement. Starting from the Cerdà Grid, that had the minimum dimension of 100m, Rueda has compared the pedestrian and motor vehicles speeds to define the right dimension of the Superblock. In fact, the average speed of vehicle in the city is 15/20 km/h, that is quadruple of the human average velocity 4/5 km/h. Therefore, if 100m is the right measure for a pedestrian block, allowing decision-making of a person to two alternative paths have a "burden" like temporary in both cases, the quadruple is the right measure for a motorized vehicle, a Superblock with a dimension of approximately 400x400m (Image 2.4.2). Inside the Superblock the roads space will be freed up by the pass-through vehicle traffic, and it will be the new connection between the blocks, returning the 60-70% of the street's space to public space for the citizens. The only vehicles that can pass inside the Superblock are resident, loading and unloading and emergency vehicles, so the inner roads function exactly as it does today with the exception of pass-through vehicle traffic, the objective that is incompatible with the rest of the uses and functions. Rueda proposed the section of the streets in the superblocks as a single platform where pedestrian, cyclist and car drivers share the same space. The single platform is a solution also to reduce the speed of any moving object, adjusting it to the pedestrian speed, which means accessibility for all people, also with physical handicaps. This speed it is 10 km/h. The space for the parking on ground level is reduced with off-road parking that should meet the needs of the residents and all others may park parking

spots that will position on border of the Superblock for an easy accessibility by the basic roads. Outside the superblock the basic roads would be used for pass-through vehicle traffic, the surface level public transport (buses, taxis, tramways, etc.) and in some cases, the main bike lane path. The concatenation of superblocks results in a network of basic ways, defining a sort of orthogonal grid, that will be interrupted only every 400 metres, reducing the number of left and right turn and with the possibility of making a U-turn every Superblock. The advantage for the vehicles is that the semaphore green wave is made more efficient and they will lose less speed, in case for the public transport could be realized also a priority system.

“Superblocks are the basic cell for organizing mobility networks and the public space of infrastructure and service system, the structure of the green networks, the system of facilities and basic services and the neighbourly and communication relationships with the environment in the three levels of planning” (Rueda, 2014, p.57).

Image 2.4.2: Superblock model

Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.56

2.5. Ecological Urbanism case studies

The Ecological Urbanism approachwas appreciated to the local level as well to the national level, and it started to have a direct influence in the Spanish urban policies. In 2006 the *Ministry of environment and of networks of sustainable local development* published the Urban Environmental Strategy, proposed a new model of mobility that restricts the circulation of the vehicle to a network of basic roads. The publication defines the Superblocks model as a good solution for the renovation of the urban mobility and the implementation of urban functionality. The following year the *Ministry of Agriculture, Food and Environment*in collaboration with Salvador Rueda and the *Agencia de Ecología Urbana de Barcelona*, published *Libro Verde de Sostenibilidad Urbana y Local en la Era de la Información*; the book was republished in English in 2012: *The Green Book on Urban and Local Sustainability in the Information Age*. This book starts with a critique of the regulation systems of urban growth in Europe, because they are often old zoning schemes, which defines a structure or an urban form, using patterns, defining a road network and areas of special interest (natural, historic, scenic). The procedure is based on the definition of a final image, that represents the desired result and that sets limits without any control over the process. Therefore, the *Libro Verde* suggests a new concept of urban planning, and a set of regulatory constraints in development plans, incorporating sustainability and knowledge society variables (Rueda et. Al., 2007). The will of this thesis isn't to discuss the Spanish or European planning regulatory systems but I think it's important to stress how the theory of Ecological Urbanism can be related with the planning tools. It's important to comprehend where there is the fusion between the normative level and the executive level; where the lines of action are transformed into real practices. At the moment in Spain there aren't new tools for the application of the Ecological Urbanism theory, but the *Libro Verde* suggested the following lines of action (Rueda et *Al.*, 2012, pp.50-51):

- *Developing big scale planning tools to ensure the minimum environmental and social conditions;*
- *Linking development plans with other existing strategic instruments in the same area;*
- *Including in city plans a Special Sustainability Indicators Plan and condition that frames and places conditions on the Urban Development Plan;*

- *Rehearsing for new urban development criteria and evaluation systems for Ecological Urban Planning, the New Three levels Urban Planning;*
- *Incorporating an effective participation of all urban actors in the discussion on the conditions of development of all types of planning;*
- *Redefining urban instruments to integrate planning, control and monitoring of short and long term tools, so that they could allow regulations on development pressure and land prices.*

Analysing in particular the possibility to achievement of the Superblocks model, the *Libro Verde* mentions that for the functionality of the urban system (the whole neighbourhoods), it is not necessary to devote to car traffic over 25% of public roads space. Therefore, the 75% of the public space obtained by making the streets car free could be given back to the citizens with a consequent improvement of urban quality and quality of life (noise, air pollution and accidents will be reduced to a minimum). The *Libro Verde* suggests two possible line of action about the possibility to include this type of transformation in the planning tools (Rueda et *Al.*, 2012, p.68)

- *Definition of special plans for sustainability indicators as part of the urban development plans include, among others, percentages of public road for car traffic not exceeding 25%;*
- *Development of mobility and public space plans, ensuring the functionality of the system, allowing multiple use of public space.*

Today Barcelona is the biggest city that is trying to increase the sustainability level of its urban system adopting the solutions proposed by Rueda and the Agencia de Ecología Urbana de Barcelona. Nevertheless, in addition to the capital of Catalonia there are some other Spanish cities that have already considered to develop this project, these cities are: A Coruña, Bilbao, Ferrol, Figueres, Lugo and Vitoria-Gasteiz. Before to present the Barcelona project in the next paragraphs, I would present briefly the others case studies; in order to have an overview of the specific characters of the cities where the Ecological Urbanism and the Superblock model were involved and where they are in phase of realization. I show these cases reporting how the idea of Ecological Urbanism was approached to reality and considering the difficulties to realize this project. The aim is to show how the different administrations have articulated the lines of Ecological Urbanism and if there is a common line between the different cases.

2.5.1. A Coruña

A Coruña is one of the most important cities of Galicia region; it is located on the Atlantic coast in north-west of Spain. In 2011 the local administration approved the Sustainable Urban Mobility Plans (SUMP) of the city, with the aim to increase the degree of urban habitability. The Plan works on the management of mobility and the consolidation of a diverse, compact, efficient and socially cohesive public space model. One of the main objectives of the administration was the management of the public space, because A Coruña, due to its size and configuration has a relevant problem of traffic congestion. From the metropolitan area of the city almost the 90% of the citizens' displacements are effectuated by car, so the city centre that is a little peninsula, presents a difficult accessibility. For this reason, the administration would to stop the present tendencies of mobility and, at the same time, deepens the effort in favour of a quality public space. The Plan approved in 2011 doesn't quote the term of "Superblocks", but it presented a zooning of the neighbourhoods where to realize a traffic limitation with the implementation of Zone 20 (mph).

During the 2016 the local government of A Coruña has ordered to the *Agencia de Ecología Urbana de Barcelona* a plan for the implementation of the Superblocks in the city centre (Image 2.5.1). The neighbourhoods of Pescadería, Ciudad Vieja and San Andrés would be the firsts to test the model of mobility based on Superblocks. The Sustainable Urban Mobility Plan has already identified these neighbourhoods because they are the most in need of recovery of public space, as well as they present better

Image 2.5.1: A Coruña Superblocks scheme

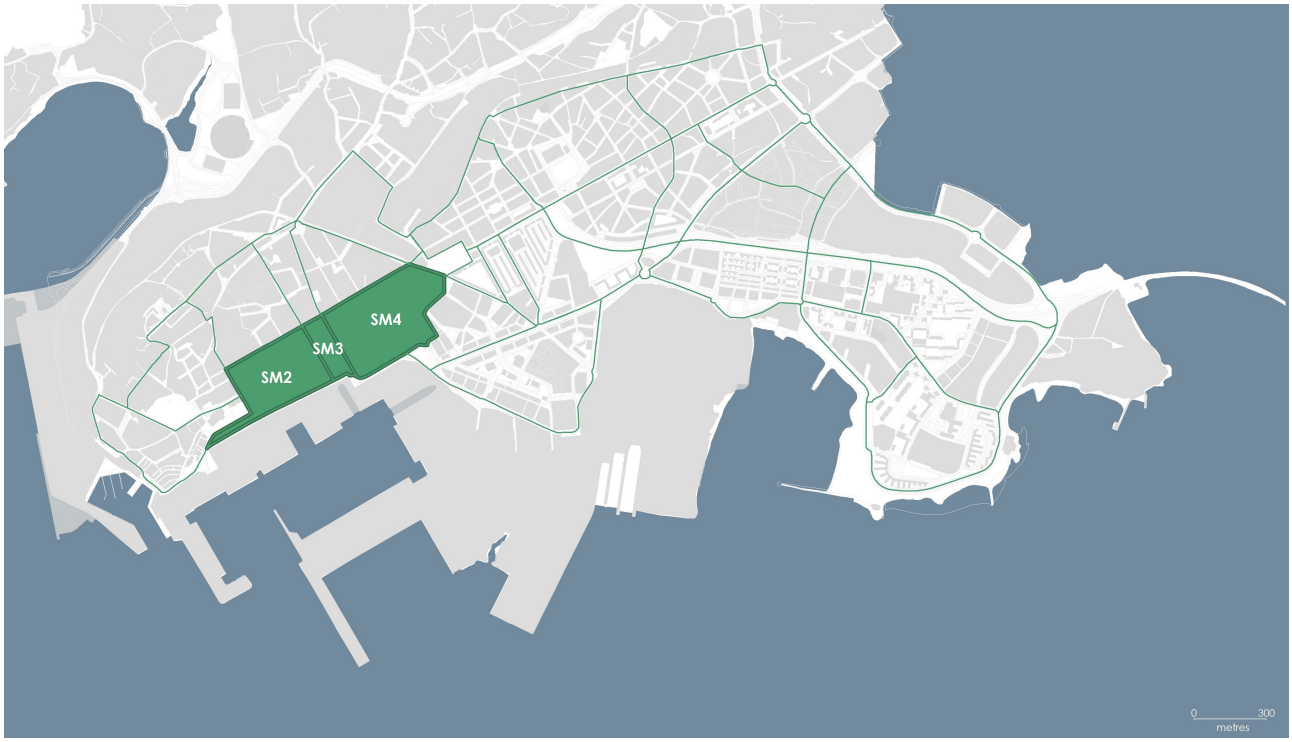
Source: Mobility and public space plan in the city of a coruña. Available at www.bcnecologia.net. Accessed 25 November 2016.

possibilities for the implementation of this system. Therefore, the project would improve the superblocks system closing the local streets of the neighbourhoods to the vehicular traffic and increasing the public spaces. The re-organization of the mobility system should start in 2017 even if there isn't a specific date for the beginning of the works. The Coruña Mayor, Xulio Ferreiro, has announced that the first steps will be the new Public Transport network, subsequently could be implemented the Superblocks model to the whole city. Rueda has suggested that A Coruña could be divided in 40 Superblock, which give back to the citizens the 70% of the pubic space actually used by cars.

2.5.2. Ferrol

Ferrol is a city in the Province of A Coruña in Galicia, located on the Atlantic coast in north-west of Spain. In 2009 the Administration of Ferrol approved the Plan for Mobility and Public Space Plan Sustainable that cover the entire city. It was realized in coordination between the administration and the *Agencia de Ecología Urbana de Barcelona*, and it refers about mobility and the habitability of the public space, starting with an analysis of the current situation. The Plan proposes different scenarios, taking into account the

Image 2.5.2: Superblock model proposed in Ferrol. Magdalena neighbourhood



Source: Ferrol Administration and Agencia de Ecología Urbana de Barcelona, *Supermanzanas Bario A Magdalena, Propuesta de implantación*, 2013

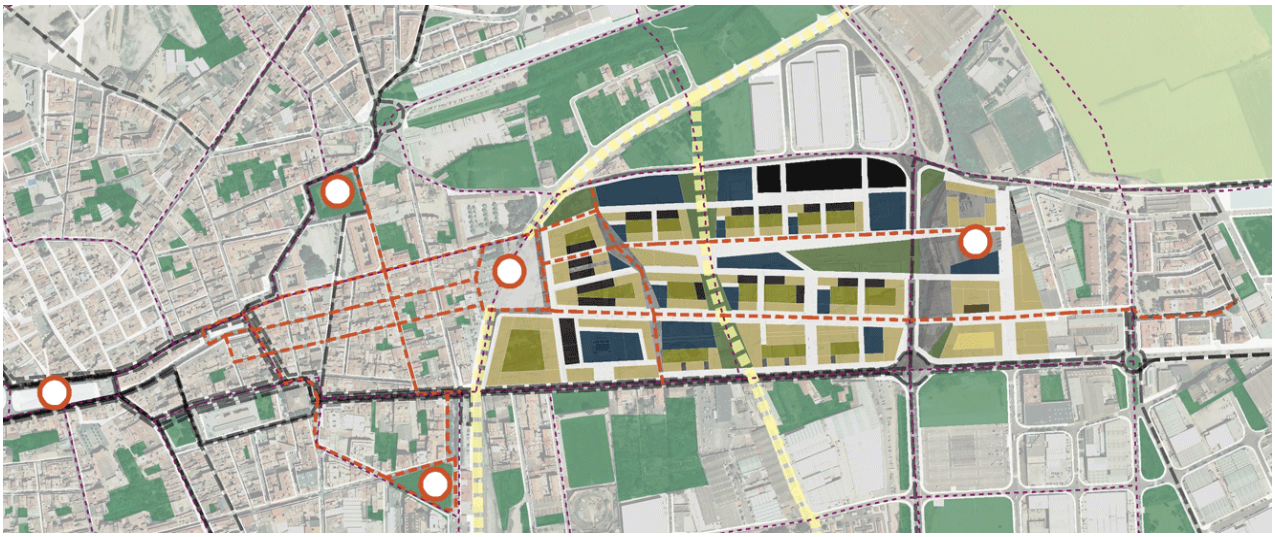
projection of future of the city and it establishes a more sustainable urban mobility model and a more liveable space for Ferrol (reorganization of mobility networks, the impact on the atmosphere, the displacement of people, the occupation of public space, activities and the degree of comfort). Furthermore, it defines also a lower consumption of resources and energy and the quality indicators necessary to increase the value of the public space of the city. The idea to implement the Superblocks model was designed by the Plan for Mobility and Public Space Plan of Ferrol (2009), and a pilot project was structured for the neighbourhood of A Magdalena (Ferrol Administration and *Agencia de Ecología Urbana de Barcelona, Supermanzanas Bario A Magdalena, Propuesta de implantación*, 2013). This study looks at the proposal for the implementation of three Superblocks located in the historic centre of Ferrol (Image 2.5.2). It deals with a compact urban fabric with narrow streets and in some cases hills with grades greater than 6%. The proposals include a new design for bus and bicycle networks, the reorganization and urban distribution of parking is addressed as well. The Superblock project of Magdalena neighbourhood is under the scope of project URBAN (financed by the EU), which takes into consideration its own planned and completed actions in the creation of strategically relevant proposals. After three years from the adoption of the proposal for the implantation of the Superblock, the administration hasn't realized the project yet. The only solutions adopted are a set of traffic lights to regulate retractable bollards in Magdalena district that were later removed. Now the plan expects the creation of three new underground car parks in the municipality, new pedestrian areas, the implementation of the ORA area of payment, public transport reform and new kilometres of bike path.

2.5.3. Figueres

Figueres is a city of medium dimension, with a population of almost 50.000 inhabitants, located in the province of Gerona, Spain. The main actor of the case study of Figueres was the *Agencia de Ecología Urbana de Barcelona* that in collaboration with the local government projected one of the most important cases for the application of the Ecological Urbanism theory. In fact, after this project Rueda published the book "Ecological Urbanism, its application to the design of an eco-neighbourhood in Figueres" (2012), where he tried to offer a guide for a *"new conceptual, methodological and instrumental framework for the construction of more sustainable urban models"* (Rueda et Al., 2012).

The publication shows clearly the comparison between the theory of Ecological Urbanism and the practice of the Superblock model and the indicator sustainability system. It tries to serve as a reference for other similar operations. The implementation of the project was focused on the *Llevant Sector of Figueres*. This neighbourhood presents the typical symptoms of semi-urban fabrics that have grown backwards to the city, without urban planning. It is characterized by problems of social marginalization, and its new management will be responsible for achieving a satisfactory integration, and to do so in a sustainable and balanced manner (Image 2.5.3). The project provides sustainable responses on a double scale: to solve the specific problems of the neighbourhood and at the same time to meet challenges and needs at the municipal level. The project deals with issues such as the soil occupation, the importance of public space or the organization of mobility in Superblocks; it proposes innovative solutions to reduce water and energy consumption and self-supply with own resources, more efficient management of waste, and valorisation of local biodiversity. The indicators adopted would implement an adequate provision of equipment and social housing, sustainable construction patterns, and fosters social cohesion and territorial balance in activities and services.

Image 2.5.3: The Llevant Superblock and the connection with the city centre



Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.155.

The second reason why this project is very important is because it is supported by the CAT-MED (Change Mediterranean Metropolises Around Time) project. The main objective of this European project is to fight the climate change in the Mediterranean with urban strategies. Under this scope, cities are understood as key place for their ability to offer

sustainable alternatives both from a perspective of their responsibility as well as for their potential as Mediterranean cities with traditional lifestyles (Rueda et Al., 2012). The CAT-MED project was cooperation between different cities (Athens, Thessalonica, Rome, Geneva, Turin, Aix-en-Provence, Marseille, Valencia, Seville and Malaga); each partner had to based their ideas on an indicators system and they were responsible for a planning of a Green block (Superblock). In other words, the project had the scope to realize an eco-neighbourhood. The difference between this project and the others Spanish cases is the absence of a Sustainable Urban Mobility Plans (SUMP), or another plan that take in consideration all the urban system. This particularity is probably due to the origin of the project, which was part of a European project and was not integrated with the urban vision.

2.5.4. Vitoria-Gasteiz

Vitoria-Gasteiz in northern part of Spain is the seat of government and the capital city of the Basque Autonomous Community and of the province of Álava. This case is very important because the city won the title of European Green Capital in 2012. The European Commission for Environment decided to give this prize to Vitoria for the process of transformation of the city towards a new condition of sustainability. In this process of transformation Vitoria-Gasteiz has chosen to try to be a leader in sustainable urban mobility, developing a real offensive strategy based on two main focal points: Integration of mobility into urban planning and realization of a strong participatory process.

In 2006 the City Administration organized a civic call in order to involve the citizens and the different stakeholders in a public discussion for the future of the city: *Foro Ciudadano por la Movilidad Sostenible de Vitoria-Gasteiz.* Different actors like the political parties, the social organizations, the neighbourhood associations, etc. composed this Mobility Forum, and it had in total a participation of over 2.000 citizens. The forum had the role to concentrate the public evaluation about the mobility strategies, and to create a basic framework of public consensus. During the first meeting the actors of the Forum defined the future vision for the urban mobility policies approving it in the spring of 2007 with the signature of the "*Pacto Ciudadano por la Movilidad Sostenibl*". This document represents the roadmap from which to work for a more sustainable urban mobility. The first step was the realization of the Plan for the Sustainable Mobility and Public Space (*PMSEP, Plan de Movilidad Sostenible y Espacio Público*, 2008) that was written in collaboration with the

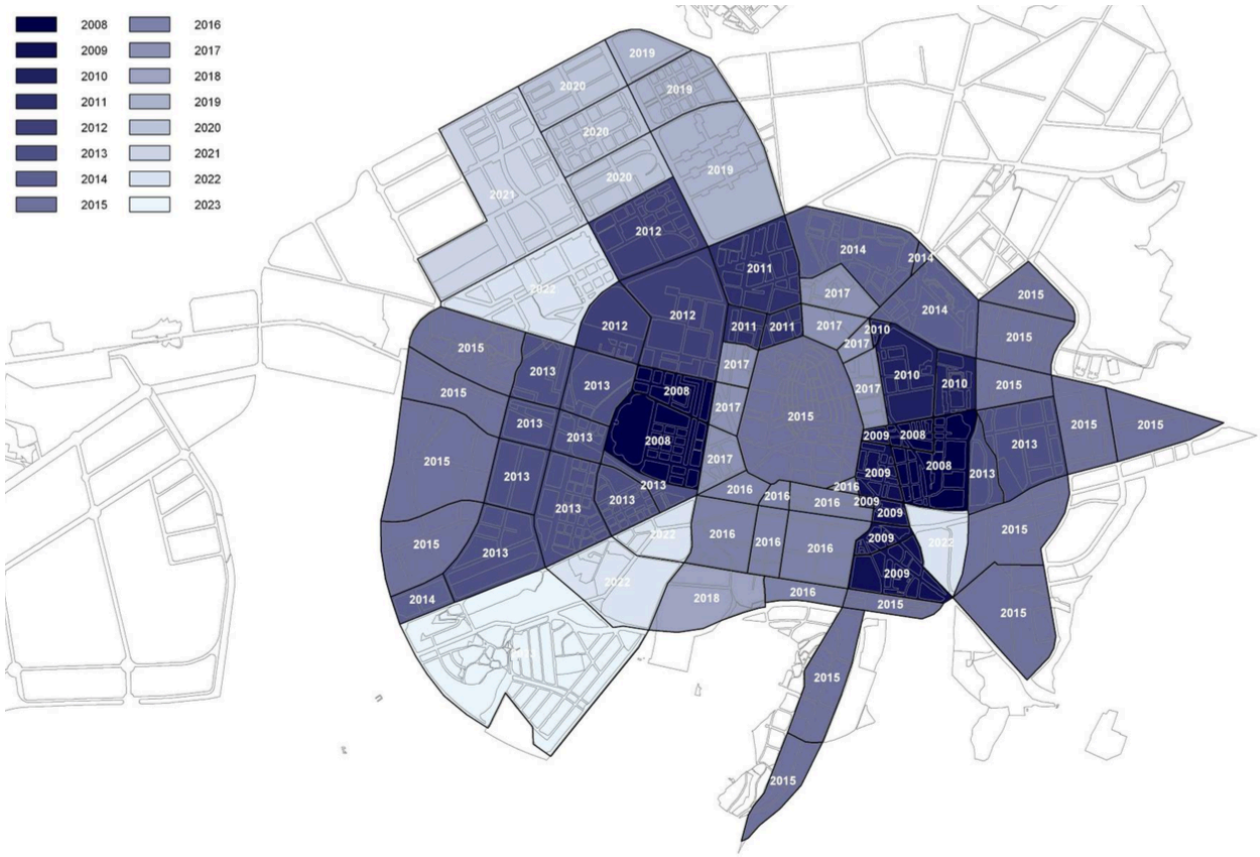
Urban Ecology Agency of Barcelona, and it was the base for the following sustainable implementation of the urban ecosystem. The Plan was based for the period 2008-2012 and it had these main objectives:

1. Reverse the trend of modal split, reducing car and implementing TPL and bicycle;
2. Reduce the number of trips to satisfy the daily needs;
3. Create functional networks for pedestrian and cyclist mobility;
4. Give more value to the public space as a place for citizen coexistence.

The most innovative element of the Plan for the Sustainable Mobility and Public Space was its character of holistic vision. It approached mobility from an integral perspective, considering together the mobility and the public space, and in this new conception of the city the public space has a greater value of space for the social interaction and not only for the displacements. Starting from this interpretation of the public space, it was adopted the new urban tool called Superblocks. How I have explained in the theory of Ecological Urbanism, this urban solution defines a hierarchy in the streets network, identifying two levels of roads, the basic roads (outside the superblocks) and the local roads (inside the superblocks). The distribution of the public space showed that the 70% of all the streets was reserved for car uses. With the implantation of the new model (in project there are 70 Superblocks for the whole city) the majority of local roads can be re-used for the citizens uses, realizing a public space of great quality, without noise, without pollution, safe, attractive and that enhances contact and coexistence between people of any age and social status. The implementation of the Superblocks followed the schedule in the Image 2.5.4, but it is always changing and today only 17 Superblocks were realized (Juan Pablo Escudero 2016). The final goal is to transform the 80-85% of the roads in public spaces, where the inhabitants will be not only pedestrian but where they can be citizens. The way to reach this goal passes through a series of others plans that derive from the Mobility and Public Space Plan. The most notable projects are the new Bus network, the Bicycle Routes Master Plan, and the Parking Master Plan. These plans were realized always in coordination with the Mobility Forum, which ensures the shared approval of the citizenship. The preparatory works were more than two years long and they involved more than one thousand of volunteers that explained to the citizenry the future changes. It was realized in only one night, 30 October 2009: the number of bus lines was changed from 17 to 9; the bus stops were moved and the price of the car parking increased three times. This

revolution of the mobility system permitted to produce new solutions. A new tram system was realised in the city, the buses were more efficient and they have lanes dedicated, and 91 kilometres of bike lanes were built until 2010. Moreover, a peculiarity in the *PMSEP* of Vitoria-Gasteiz is that the Plan has not prioritized in a decisive way the use of electric vehicles. In fact, the aim of the *PMSEP* is to recover the function of the public space discouraging the use of the private car and not only changing the used energy.

Image 2.5.4: Plan de implementation of Superblock model for years



Source: Plan de Movilidad Sostenible y Espacio Público, Avance del Plan Director de Movilidad y Espacio Público (diciembre 2007)

In the Vitoria-Gasteiz strategy the participatory and consensual implementation had a key role, and the *Foro Ciudadano por la Movilidad Sostenible* has permitted to maintain a general direction for the interventions, so that the time schedule is not so important. The most relevant thing is to maintain always the same direction. The objectives of the *PMSEP* for 2020 or 2050 are very ambitious, especially about the climate change problem, but it's already possible to see some results. From 2006 the percentage of urban trips In Vitoria has changed as show in Table 2.5.1:

Table 2.5.1: Modal distribution of transport of the Vitoria-Gasteiz inhabitants (percentage)

Transport	2006	2011
Car	36,2	28,3
Walking	49	53,6
Bycicle	3,4	6,9
Public Transport	7,9	8,3

Source: Barrencua, I. Gandariasbeitia, *Movilidad sostenibleen Vitoria-Gasteiz*, Agencia Vasca de la Innovación, Innobasque, 2014, pag.22

Finally, one of the most relevant issues of Vitoria-Gasteiz projects is the elevated cost for the implementation of the plans. In fact, in the five years corresponding to the first phase for the execution of the *PMSEP* the amount of the total costs was 30-35 million of euro. In particular 25 million come from by *Plan E*[13], and the remaining 10 million by European CIVITAS project[14], the Basque government allocations and the municipal budget. The opportunity to access to all those finance founds was due to the fact that the City Hall had a well-defined plan for the implementation of the projects, so there wasn't wastefulness. At the beginning the financing was destined to the participation process, and to the information campaigns. Afterwards the first pilot projects were realized to show to the citizens the functionality of the Superblock model. They were realized with basic solutions like painting or changing streets direction, and only when the project was approved and shared by the *Foro Ciudadano*, structural and most expensive solutions were implemented. Today in the second phase of implementation the Administration has developed two lines of actions, one cheaper made by basic solutions, and one more expensive that provides the structural interventions like urban renovations of the streets inside the superblocks. In this way, when there will be the possibility to invest more money the plan is ready, but for the moment the *PMSEP* will never stop completely, and it will continue with urban solutions at low budget.

[13] The *Plan Español para el Estímulo de la Economía y el Empleo* or *Plan E*, was a set of more than a hundred measures of economic policy raised by the Government of Zapatero In November 2008. Its objective was to increase the country's economic activity by mobilizing large amounts of public money to cope with the economic crisis. *Plan E* was inspired by the guidelines of the Keynesian economics. (www.plane.gob.es)

[14] CIVITAS - CIty-VITAlity-Sustainability - is a network of cities for cities dedicated to cleaner, better transport in Europe and beyond. The European Commission launched it in 2002 with the aim to support administrations to implement new urban transport solutions. (www.civitas.eu)

2.5.5. Lugo and Bilbao

In addition to A Coruña, Ferrol, Figueres and Vitoria-Gasteiz, there are two more cities where the implementation of the Superblock model was considered: Lugo and Bilbao. Lugo had realized the Mobility Plan in 2009, based on the application of the superblocks model, proposing a new network for buses, bicycles and pedestrians. Nevertheless, it was updated in 2014 in order to facilitate its adoption according to the law 2/2011, 4th March, of sustainable economy, and now the process is at work. In the case of Bilbao, the administration has requested to the *Agencia de Ecología Urbana de Barcelona* a study to develop a program of implementation of superblocks and to identify the urban areas with the highest potential for the implement of the model. This evaluation has been organized with two filters. The first constraint has been focused on the urban structure (physical condition) and critical mass (dynamics of population and activity) of each district, defining the feasibility in the implementation of Superblocks. The second constraint studies the neighbourhoods that have properly fulfilled the first filter, and analyses the opportunities (favourable conditions) and needs (critical condition) of each unit of study. Nevertheless, at the moment the Superblocks project was stopped because there is an internal conflict between the departments of the administration. In fact, the research was requested by the town planning department but the responsibility and the decision maker is the transport department, which belongs to another councillor of a different political party and that is contrary to the project.

The six cities presented are very different each other, there are medium and big dimension cities, but they have started the same process of urban renovation. It's clear how the *Agencia de Ecología Urbana de Barcelona* plays a key role in the sprawling of the Ecological Urbanism theory and in the diffusion of the Superblocks knowledge, helping the local governments to improve the urban quality of life. The several administrations have started the reorganization of the urban system working on two lines of action: the Mobility and the Public Spaces. The innovation is the new awareness that the roads are like public spaces and that the public spaces are not only the residual spaces of the streets network. So, the two themes are considered together and together should be considered in the same urban Plan. Since a specific tool doesn't exist the local administrations have found different solutions to involve in a common project streets and public spaces. Firstly, the

administrations (Ferrol and Vitoria) have realized a Plan for the Sustainable Mobility and Public Space, that is an evolution of the Sustainable Urban Mobility Plans (SUMP), transposing in it the idea proposed by the Spanish Green Book of the Superblocks model as the new urban model. The Plan begins with an assessment of the current state of mobility but also of the liveability of the city. Then it analyses the different future scenarios, taking into account the prospects of the urban system, establishing a model of sustainable urban mobility to make the public space more liveable, and that requires a lower consumption of resources and energy. All the proposals are based on reorganization of the urban fabric into Superblocks model, which will be the new scheme for the transformation of the city. Moreover, the participation process is one of the most important aspects to take into consideration, since for the good result of holistic approach to the urban system is fundamental the transversal consensus of all the stakeholders. About the concrete actions implemented in the phase of urban transformation, the transport system results like the one most important for the achievement of the results expected by the plan. These actions ensure an increasing accessibility to public spaces, a balance in the urban morphology and a better urban quality. In fact, if the Superblock model aspires to change the mobility behaviours of the citizens, it's important to offer valid alternatives sustainable before implement structural solutions to the urban fabric.

Table 2.5.2: Characters of the cities that would realize the Superblocks model.

	A Coruña	Bilbao	Ferrol	Figueres	Lugo	Vitoria	**Barcelona**
Location	Galicia	Basque Country	Galicia	Catalunya	Galicia	Basque Country	Catalunya
Total inhabitants	244.810	349.356	70.389	43.330	98.560	238.247	1.604.555
Urban density (ab./km²)	6.471,32	8.594,24	851,65	2.243,92	296,87	860,72	15.686,6
Year SUMP Year Project	2013 -	2015 -	2009 2013	- 2014	2014 -	2007 -	2013 2014-16
Recipient	City of A Coruña	City of Bilbao	City of Ferrol	City of Figueres	City of Lugo	City of Victoria	City of Barcelona
Project	(UEAB)	(UEAB)	(UEAB) URBACT	(UEAB) CATMED	(UEAB)	(UEAB)	(UEAB)
Status	Ongoing	Rejected	Ongoing	Ongoing	Waiting	Ongoing	Ongoing

Source: personal elaboration

3. The Superblock urban model in the case study of Barcelona

Barcelona is the biggest and most important city that is trying to apply the theory of Ecological Urbanism in a real application, in order to increase its sustainable urban level and become one of the most of sustainable city in the world. Therefore, in the third chapter I present the case study of Barcelona, starting by the history of the city's urban fabric, paragraph 3.1.1. In fact, in 1857 the engineer Ildefons Cerdà has won the commission for the new city expansion, promoting an orthogonal street network that will be the main Barcelona's characteristic, identifying even now the city in the world. The particular space management and the neighbourhood organization promoted by Cerdà have been modified a lot during the years but his urban vision has been unchanged, and the Superblock model find a lot of references in the original application. Almost 15 years ago the *Agencia de Ecologia Urbana de Barcelona* has proposed the idea of a Superblock project – *Supermanzana* or *Superilla* in Spanish - in order to renovate the street network. Anyway, except for some pilot projects, the Administration was not able to implement a choral project to the entire city, paragraph 3.1.2. Only in 2016, the political party "*Barcelona en Comù*" has started the new Superblock program "*Omplim de vidas els carres*" in order to realize finally the innovative urban model and fulfilling the Sustainable Mobility Plan adopted in May of 2015, paragraph 3.1.3. The first Superblock pilot project, Poblenou in the *Sant Martì* district, has completed its first functional phase just in December 2016, producing positive and negative reactions. I analyse the implementation process, combining two dimensions of analyses: the first one at the urban scale, in order to present the main principle of the Ecological Urbanism, paragraph 3.2.1; and the second one at the Superblock scale, so as to show the local transformation of the city, 3.2.2. In both the visions I consider who are the actors, what are the tools, what is the time schedule and what are the resources interested for the project implementation. I would understand what is the methodology structured by the Barcelona government in order to renovate the Cerdà grid, and at the same time to reach the four features of the new urban model (Compactness and functionality, Complexity, Efficiency and Social Cohesion) theorized by the Ecological Urbanism. In conclusion, I report a valuation about the Ecological Urbanism in order to define what could be the strengths and the weaknesses of this urban approach, and the opportunities and threats for the urban system, paragraphs 3.3.

3.1. Overview of Barcelona case study

In the third chapter I study the project of the *Agencia de Ecología Urbana de Barcelona* that is in phase of implementation in the capitol city of Catalonia, for several reasons. In the previous paragraph, I have showed how in smaller realities, like Vitoria-Gasteiz, the Superblock project has demonstrated that it could work, of course with strengths and weaknesses, but it has produced encouraging results. So, I think that now, if the Ecological Urbanism would face a real sustainable change in the urban system, it should confront itself in a city at a different size. Over the 50% of the global population lives today in the urban systems and for this reason the cities with millions of inhabitants should challenge the adaptation to a new urbanized society, to the new life styles of the next millennium and, obviously to the big challenge of the climate change. Barcelona is the right city for this challenge. It is the biggest and most complex city where the ideas of Ecological Urbanism are on going of realisation, and consequently they could show a bigger result. The metropolitan dimension is thirteen times the dimension of Vitoria-Gasteiz, without considering the Barcelona Region, which still has a relevant influence on the city. Rueda thinks that the Ecological Urbanism is a theory especially useful for the historical city, equipped by public spaces and characterized by a lifestyle typical of Mediterranean cities. However, if this methodology, or parts of it could be applied to all the cities, it will open a new approach to the urban planning, and it will be an example not only for the Mediterranean cities. In fact, I think that at the moment the Barcelona Superblock model is demonstrating a change of mentality in the urban planning approach. This model promotes the work at an urban scale, with a holistic vision of the urban environment that was lost in the last decades, in favour of an urbanism for projects and single interventions. Ecological Urbanism is trying to change the way to think to the city, promoting a choral work for the realization of a sustainable city, that take care of all the three aspects of the sustainability: Environmental, Economy and Social aspects. Finally, Barcelona is one of the most important cities in the world, with a relevant role in the global economy, in the international tourism, and with a long history in the field of architecture and urban planning. In fact, the last but not list remarkable reason so I have decided to study this project is exactly the city where the project is on going. Barcelona is permeated by an urban culture that has changed it through the centuries, making it one of the most discussed and renowned cases not only for its ancient history but also for its recent changes about urban

renewal policies. It is today one of the most discussed case study to a global level for its capacity to don't stop the urban growth and changing according to the time. So, I think it's important to have a historical and physical overview of the City before to present the project of the city administration for the implementation of the Ecological Urbanism theory. In fact, by the analysis of the historical urban fabric and the projects that were adopted in Barcelona during the last two centuries it's possible to understand and comprehend the origin of the new Superblock approach proposed by Ecological Urbanism.

3.1.1. Urban history of Barcelona

Barcelona is the capital city of Cataluña region and today it's the second-largest city in Spain with a population 1.604.555 inhabitant. The number of inhabitants had reached its peak in 1975, about one million and 750 thousand units, but later it began to decrease and in 2001, the inhabitants were only 1 million 500 thousand. Today the Barcelona population is increasing again and this demographic compensation is explainable with the high level of immigration. In fact, while during the last decades of the XX° century the Spanish citizens started a migration towards the metropolitan area, looking for a higher quality of space and a house out of the crowded city centre, an increasing number of European and extra European citizens were attracted by the development of Barcelona. In this way, the substitution of the citizens (Table 3.1.1) is achieving a new mixed and heterogeneous population, and the sprawling of the Spanish citizens out of the administrative boundaries has created one of the biggest metropolitan areas in Europe. The metropolitan area can be distinguished in: *Area Metropolitana* (36 municipalities around Barcelona, with a total population of 3.239.337 inhabitants), and the *Àmbit metropolità de Barcelona* (one of the seven districts of Catalonia, with a total population of 5.012.961 inhabitants) which is the largest urbanized area on the Mediterranean Sea and one of the most populous urban area in the European Union after Paris, London, Madrid and Milan.

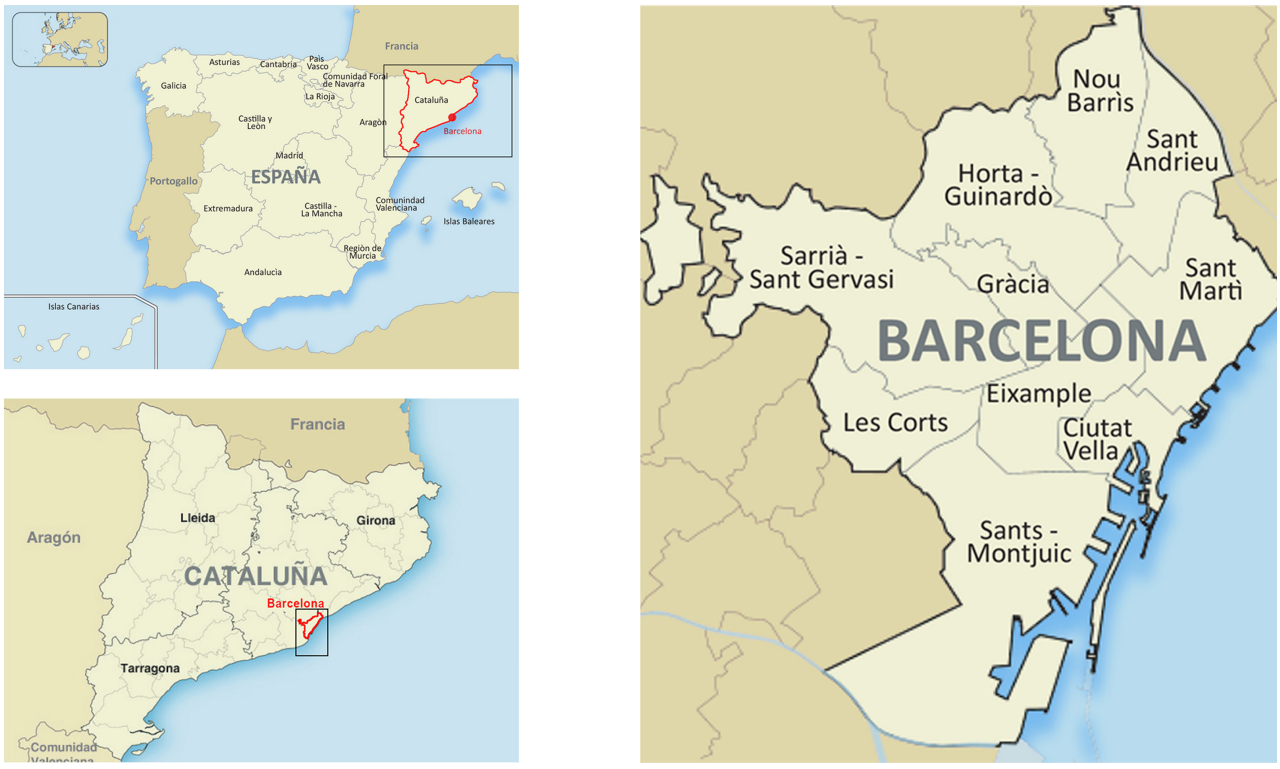
Table 3.1.1: Evolution of the population of Barcelona. 1975-2011

	1975	**1991**	**1996**	**2001**	**2011**
Total	1.750.000	1.643.542	1.508.805	1.503.884	1.601.933
Spanish	-	1.619.822 (98,65%)	1.479.746 (98,07%)	1.408.528 (93,66%)	1.332.124 (83,16%)
Foreign	-	23.720 (1,44%)	29.059 (1,93%)	95.356 (6,34%)	269.809 (16,84%)

Source: www.bcn.cat

Furthermore, the city of Barcelona has a small administrative area (102,2 Km^2), so it presents the highest average population density of Europe, 15.706 ab/Km^2, which can be also higher in some specific neighbourhoods. For instance, the district of *Eixample* has a population density of 35.252 people per square kilometre as well as the district of Gràcia has a population density 28.766 people per square kilometre[15]. The city is divided in 10 districts (Image 3.1.1) that were settlements separated by Barcelona and which were incorporated by the expansion of City during the last decades of XIX century. Today there is a city administration for the government of Barcelona but each one of these districts have maintained their personal representation as such they can preserve a direct contact with the territory and the population.

Image 3.1.1: Map of Spain; Map of Catalonia; Map of Barcelona.



Source: personal elaboration

As I said before Barcelona has a long and important urban history that plays today a big influence into the actual project of urban restoring. The city was one of the firsts conurbations that during the XIX century that faced the urban issue at a municipal scale with the plan of expansion realized by the engineer Ildefons Cerdà in 1857. A geometric

[15] Data of 2015 www.bcn.cat. Accessed 27 October 2016.

shape characterized the *Proyecto de reforma interior y ensanche De Barcelona* and it had to realize a new Barcelona more healthy and hygienic in which to develop new housing, trade and industry. The scheme was composed by blocks (113m x 113m) and by an infrastructural network of streets with width between 20m and 60m. The realization of the project was supported by the strong industrial expansion of the last decades of XIX century and it was consolidated in the first half of the last century. The completion of the plan has covered all the Barcelona plain, connecting the historical settlement with the villages around Barcelona, and designing the new administrative boundaries and the metropolitan area of the contemporary city. Nevertheless, if the project of Ildefons Cerdà was extraordinary, it was less than its execution. In more than one century his Plan was realized with a lot of changes, it was denser and without all the public spaces that supposed to characterize the Cerdà blocks. In fact, the executors of the plan that can be identified as the local government and the middle classes didn't fabricate those public services and infrastructures necessary to ensure a sufficient urban quality level. During the first half of the last century the speculative urbanization has invaded those open spaces projected by Cerdà that should have to be the structure of the city, and subsequently it directed to the suburbs of Barcelona, realizing during the '60s and '70s those neighbourhoods that will be called "*poligonos*" with the same characteristic of lack of services. This urban debit in terms of services and public spaces was the cause of bigger problems of social inequalities, which determined during the following decades the beginning of several urban social movements. At the end of the '80s a trial process, defined "New Renaissance" of Barcelona, has involved the entire community to re-think and re-project the city. The strategy was based on the renovation of the city starting by the restoration of the public and open spaces, and implementing those public services that were not developed in the Cerdà project. The public space became the central component of the new idea of city, ensuring the availability to open spaces for all the citizens and developing an urban network. The administration invested several economic, cultural and political resources to pursue its strategy, but the interventions were concentrated in specific projects, working on streets, squares, parks, in order to give immediately solution to those problems of social and economic iniquities. Furthermore, the urban policies took advantage of the big events to carry the resources, and at the same time promote a change in the idea of the city, realizing a new plan of urban marketing. In 1992 Barcelona

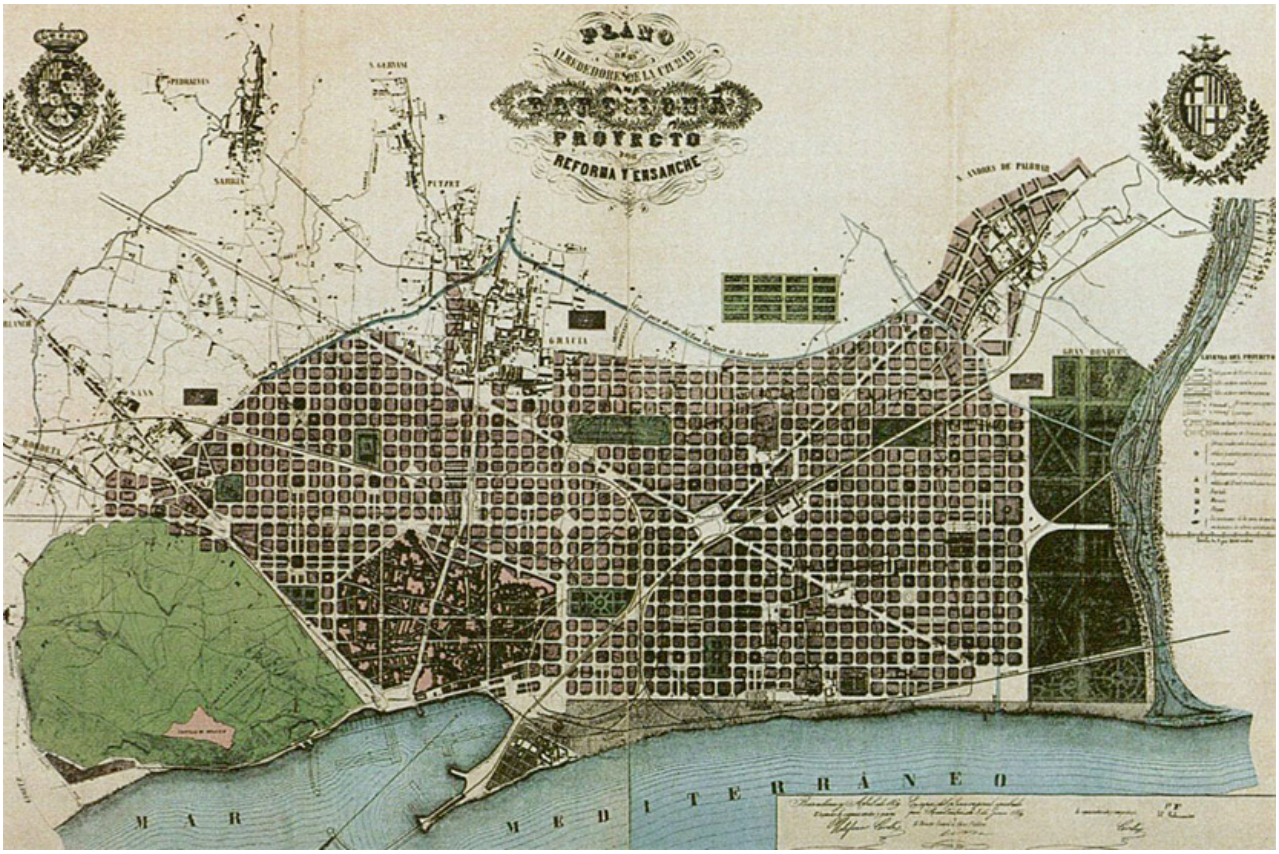
hosted the XXV° edition of the Summer Olympic games, and the Administration has used this event to redevelop the neighbourhoods along the coast, specially in the district of Sant Martì, and to recover the urban beaches. In 2000 the City Hall adopted the 22@bcn Plan to convert the neighbourhood of Poblenou into the city's technological and innovation district, as well as to increase leisure and residential spaces. In 2004 the zone Diagonal-Besos characterized by old industrial plants (incinerator, water treatment plant, and power plants) was transformed for the organization of the Universal Forum of Cultures. So, the urban renewal's strategy has re-proposed the overall vision of the city, and the importance of the public spaces in the realization of the city, with a innovated approach to the reality, that is to go beyond the holistic vision of the city and a comprehensive conception of the urban planning. The new urban approach was the one to think the city starting from his connective tissue, but implementing it without a general plan and through specific projects (Mazzoleni, 2009).

3.1.2. The evolution of Cerdà's grid

The Cerdà project is one aspect that has completely influenced the modern history of Barcelona, so I believe necessary focus the attention on it in order to comprehend how the urban grid, projected by an engineer more than one hundred and fifty years ago, is still a valid tool for the urban planning and moreover, it's the core for a new urban sustainable model. In fact, the Rueda's Superblock idea is not innovative, because a renovation or a redesign of the historical project was already proposed more times during the last century. At the middle of XIX° century the Administration of Barcelona announced a call for the project of demolition of the city's walls and the expansion of the historical centre. The winner was the *Proyecto de reforma interior y ensanche de Barcelona (*Project of interior reform and expansion of Barcelona) proposed by the engineer Ildefons Cerdà, which was approved in 1859 with the support of the national government. Cerdà had a territorial conception of the urban planning that promoted the development of the entire Barcelona's plain till the near settlements, so that the last territories expected by the plan were built more than fifty years after by its approval. The innovative aspect of the Cerdà proposal was the scientific organization of the modern city, deriving by a structural analysis of the elements and relations that compose the urban system (Mazzoleni, 2009). Moreover, he has written also the "rules" for the right implementation of the plan and for the best

management of the city while he was studying the urban system in a depth way. In this work, he considered the modernity aspects and the technical and scientific discoveries as the solutions to urban ills and the base to reach the civilization of the urbanity. In particular Cerdà has divided the new spaces of the city in two parts: the space for the mobility (streets) and the space for the rest (blocks). The new settlement had to be made for all the citizens, without any social or economic distinctions. Therefore, the idea of a regular urban grid, in opposition with the concentric development, was the perfect solution for the implementation of a homogenous and isotropic system in order to fulfil the instance of social equality. So, the *Proyecto de reforma* has promoted the planning of a grid that connected the historical settlement of Barcelona with the others villages around it, dividing the space of the plain in two parts, the streets and the blocks. This partition of the future city was nothing else that the result of the Cerdà deduction of the primary needs by the human nature, the rest and the movement, and that were applied to the urban reality in a strongly geometric way (Image 3.1.2). The streets presented the same space for every

Image 3.1.2: Cerda's original Eixample Master Plan for Barcelona

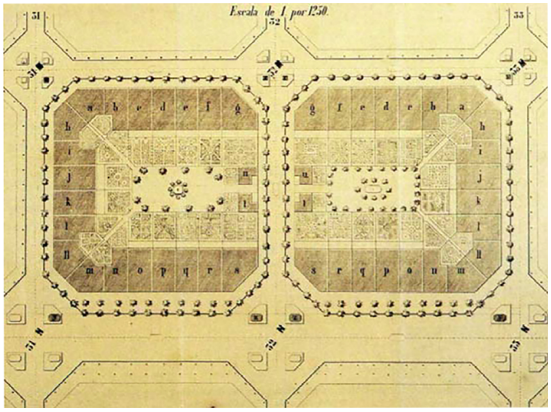


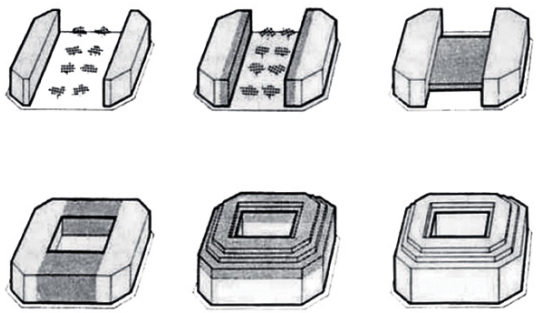
Source: C. Mazzoleni, *La costruzione dello spazio urbano: l'esperienza di Barcellona*, Milano, Franco Angeli, 2009.

user, a width of 20 metres for both the cars directions, and 5 meters of sidewalk on each side to ensure the space for the pedestrian movement. The orientation of the buildings, their height, and their ration with the street's width, were specifically designed in order to guarantee the same amount of light and air to the housings. Moreover, the particular design of the buildings inside the blocks (2 or 3 sides built) gave different values to the streets, that in some cases represented a direct attachment of the constructions, and that could be consider public space inside the neighbourhoods (Image 3.1.3). In the Cerdà Plan there are three more streets that are out of the schematic grid and that are Avin*guda Meridiana, Avinguda Paralel* and *Avinguda Diagonal*. They had the principal function of space for mobility and to connect Barcelona with the historical settlements around it. The block or manzana is the core of Cerda's plan. The length of each side would measure 113,3 metres with a precise area of 12.370m2 and originally, each manzana was to be built up on only 2 or 3 sides, with a depth of 20 metres and a height of 16 metres, for a surface not over the 50% of the block. This solution had to avoid the creation of the "corridor streets" and the inner courtyard in order to ensure the best hygienic standards. In fact, between the built-up sides Cerdà had projected a recreational green space able to allow a maximum amount of sunlight and ventilation to penetrate every unit in the manzana. Moreover, Cerdà would guarantee an easy accessibility to the urban facilities and services implementing for every district or a part of it, the specific amenities: 25 blocks composed a district and it had to contain the church and the social centre, and there was a market every 4 blocks and a hospital every 16 blocks. However, the *Proyecto de reforma* was very innovative for that period and the proposals had a lot of difficulties to be approved and accepted by the Barcelona municipality, which moreover saw in it the imposition of the national government. For this reason, the City Hall and the bourgeoisie power have tried to change and modify the Cerdà's plan during the decades, so that the result was very different by the original idea. By the beginning the Barcelona administration would implemented a plan designed by the architect Rovira y Trias (1858), based on a concentric development of the new city. It presented a clear hierarchical division of the urban space, indicative for a social division, which represented the old conservatism of a next industrial bourgeoisie. Subsequently, the same critiques and instances were proposed again at the end of the XIX° century, even if the Cerdà's Plan had been approved and its implementation had started in the following decades,

supported by the urban need of spaces and the increasing of the industrial sector. In fact, the architect Leon Jaussely was the winner of the international competition for the urban plan that would have to design the connection between the Eixample of Cerdà and the historical settlements. His plan rejected again the isotropic idea of Cerdà, and it presented a distinction of the city based on the functions, with a green system connected by radial axes. At the end this Plan, supported also by the Catalan administration, wasn't realized maintaining the guidelines of Cerdà's project. At the beginning of the new century Barcelona was going through a huge phase of expansion, and it became a big economic centre in European market with ambitious plans of growth that attracted a lot of immigrants by the rest of the Spain. In the firsts three decades of '900 the city population has doubled, and a lot of urban problem have emerged. The Municipality supplied the high request of residences with the construction of social housing that showed in the following years a bad quality construction and often they have presented a lack of urban services. During this historical phase, the urban shape proposed by Cerdà was modified in a relevant way, in fact, the process of urban speculation promoted a densification of the urban blocks that has changed completely the physical aspects and the urban principles promoted by the *Proyecto de reforma*. The blocks have started to be built on the all the four sides, realizing closed and inaccessible units, and at the same time the height of the building was increased, influencing the crossing of wind and sunlight (Image 3.1.4). Also, due to this problematic situation at the beginning of the thirties a new draft plan started to rethink the

Image 3.1.3 (left): Three-sided manzanas with a central public green space as originally drawn by Cerda
Image 3.1.4 (right): Development of the Manzana-Block

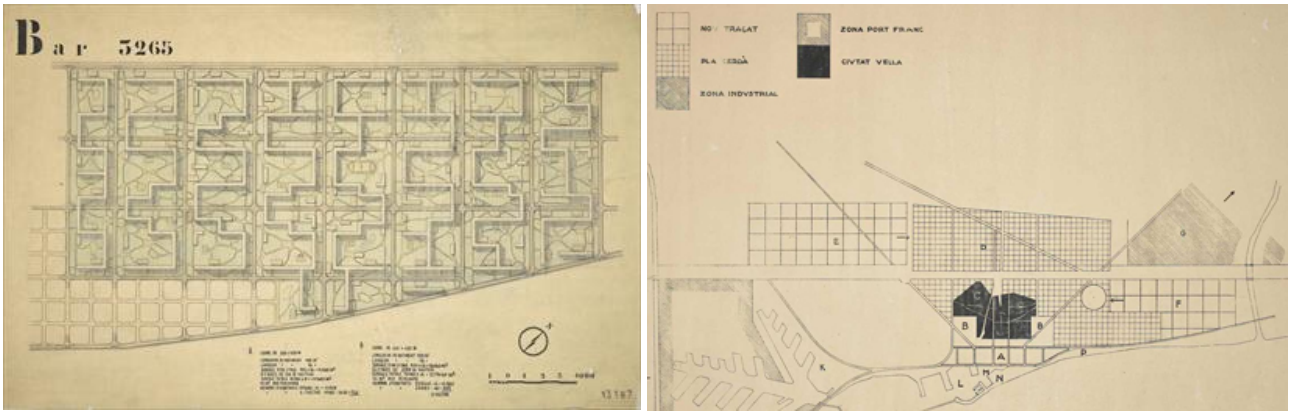




Source 3.1.3: C. Mazzoleni, *La costruzione dello spazio urbano: l'esperienza di Barcellona*, Milano, Franco Angeli, 2009.
Source 3.1.4: Doerr, *Behind Four Walls: Barcelona's Lost Utopia*. At www.failedarchitecture.com. Accessed January 2017.

Cerdà's grid, it was the Plan *Macià* (1932-1935). The project for the new Barcelona was the result of the work of *Gatcpac* (*Grup d'Artistes i Tecnics Catalans par al Progrès de l'Arquitectura Contemporànea*), the Catalan group of the modern artists and architects, that represented the Spain at the Ciam (*Congres Internationeaux d'Architecture Moderne*) and that established a strong connection with Le Corbusier. The Plan *Macià* represents the synthesis of the process of functionalization of the city, and it was designed on the four concepts of the modern city proposed in the Athens Chart (1933): living, working, recreation and circulation. In the case of Barcelona, the plan had confirmed the utopian conception of the city proposed by Cerdà, with a new industrial push due to the great confidence in the technical progress, but it had reinterpreted the urban morphology blocks, while maintaining the geometric ordering scheme of the original project. In fact, in this plan there was the first proposal of application of the Superblock model, that was designed a new urban module (400x400 metres) replacing the scheme made by singles blocks (Image 3.1.5). The union of several blocks in one Superblock could permit to realize modern buildings, surrounded by green spaces, and equipped by all the public services. Moreover, the new streets organization could solve the problem of traffic congestion, and simplify the urban mobility between the spaces for residence and the working places. This is the breaking point with the Cerdà's Theory: the streets became a mere tool for the citizens to move from one part to another of the city, and they have lost their social value of community space. Even if the plan *Macià* will not be realized in a structural way, the idea of a city divided in functional areas will change the traditional city, causing the failing of the daily dimension and the social cohesion aspect of the neighbourhood.

Image 3.1.5: Pan Macià (1932-1935)



Source: C. Mazzoleni, *La costruzione dello spazio urbano: l'esperienza di Barcellona*, Milano, Franco Angeli, 2009.

In the 1942 the Congestive Ordinance (1942-1975) has adjusted the rule that permitted to modify the buildings in the Cerdà grid; the admitted height became 24,4 metres and the patio could be implemented up to 5,5 metres with the possibility of new ziggurat levels on the top. With this ordinance, not only there was a change in the urban skyline but also there was an increase in the process of densification of the city, eliminating inner green areas and producing many dysfunctions. During the seventies, the several problems of social inequalities have generated an attention on the urban government, and at the end of the Franco's dictatorship a new ordinance was adopted in order to reverse the process of densification. The ordinance of the General Metropolitan Plan (1976) has reduced the height of the buildings to 20.75 meters, and to 4,5 meters for the buildings in the patio. Nevertheless, the density of homes was already four times higher than estimated by the Cerdà's Plan and the urban green spaces didn't exist. It can be affirmed that the period from 1944 to 2000 has given rise to an expansion with a provided minimum of public space, which privileges the real estate business and the economic activity instead the quality and the urban balance (Rueda, 2016). In the early 2000s a modification of the PGM was approved in order to restore some of Cerdà's original ideas, and in particular an ordinance was accepted that seeks to return the green public spaces inside the blocks. Moreover, in order to support this ordinance a joint venture between the city of Barcelona and various Catalan banks created the "Pro Eixample" foundation. It would recover and convert the enclosed inner courtyard of the blocks of the Eixample district into a public accessible space, usable as the green space projected in origin. In total, Pro Eixample attempted to recover more than 50 block interiors (100,000m2 of space), which should be 1 in every 9 blocks. After 16 years, the project has recovered almost all the inner garden but its incidence on the urban system is very limited because the high level of density that was reached during last century requires a more drastic intervention.

So, the "new" idea of the Superblock model proposed by the *Agencia de Ecologia Urbana de Barcelona*, is nothing else than a synthesis of the Barcelona urban history. In fact, it repeats the modern definition of a Superblock (3x3 *manzanas*), but avoiding to consider the urban functions proposed by the CIAM, and adopting the organic vision of the urban system stimulated by Ildefons Cerdà. Furthermore, the urban history of Barcelona can be considered like the history of the urban density problem, so the *Agencia*, considering that it's impossible to work inside the blocks, has decided to work out of the blocks. In order to

find that public space that was consumed by an exaggerated housing policy, it will adopt the same approach of the *Proyecto de reforma* to the road space. The streets will be considered like a real public space, an attachment of the private space destined not only for the cars mobility but also all the community activities of the neighbourhood. A new Superblock model, as one of the instruments of the Ecological Urbanism, allows to apply the set of principles that this urbanism proposes. Each Superblock stands in a small "city" (Rueda, 2016).

3.2. Strategy for the realization of a sustainable Barcelona

The new Barcelona's urban vision is going towards the sustainable city concept, which should be able to connect the environmental, the economic and the social aspects of sustainability. How I have presented in the second chapter, the Rueda's proposal 'Ecological Urbanism' wants to implement an urban process able to work with the three concepts together, without any differences. Nowadays it's clear that the urban systems have the biggest impact on the environment, and several agreements were adopted at any scale in order to implement the environmental sustainability. However, just as many solutions about the other two features of sustainability have not been adopted. In this sense, the Barcelona Administration has decided to turn its urban policies so as to invert this tendency and convert Barcelona in a sustainable city from all points of view. The local government has completely adopted Ecological Urbanism approach presented by the *Agencia de Ecologia Urbana de Barcelona*, and in collaboration with the district governments, it will adopt the previously explained indicator system of urban sustainability. In this paragraph, I stress the Barcelona case study so as to understand what is the Administration's urban vision and which strategy will be implemented. I divide the research in the following four questions: Who are the actors involved; What are the planning tools used; What are the resources considered and how long the project will be probably realized. Moreover, I have assessed the four questions on two different scales of action: the urban scale, and the single superblock scale. In this way, I present the history of the Ecological Urbanism implementation until now and in particular the last and most important project adopted by the Administration "*Omplim de vidas els carres"*, showing the strengths and weaknesses at the different levels, exposing the critical issues that I encountered.

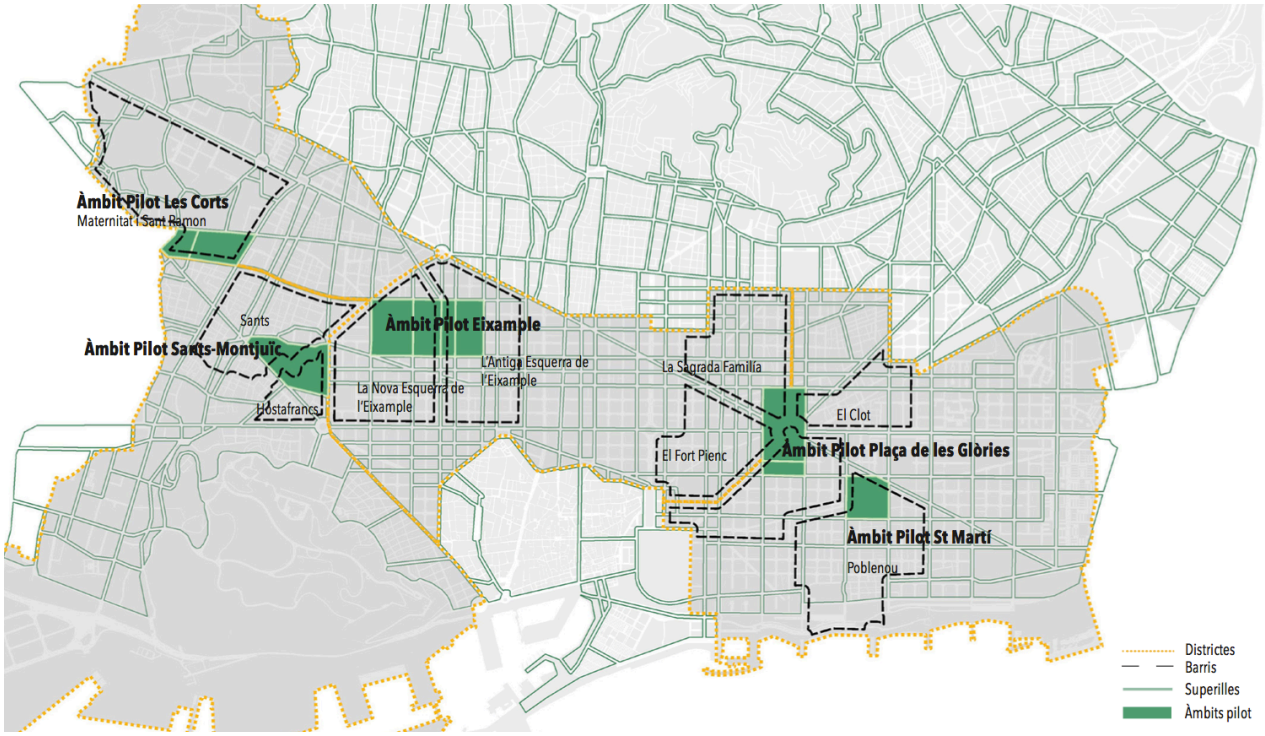
3.2.1. Previously Superblock programs in Barcelona

Before to present the four questions I think it's important to make a brief historical introduction to the Superblock programs implemented in the Barcelona. In fact, how I have presented in the second chapter, Rueda and the *Agencia de Ecologia Urbana de Barcelona* have been studying the Superblock urban model already from the beginning of the 2000s, and the Administration of Barcelona in order to implement the Ecological Urbanism theories, had already started some pilot projects for the realization of Superblocks in the districts of *Gracia* and *Ciutat Vella*. The urban transformation

implemented in the historical centre has started in the *Barri El Born*, and subsequently was enlarged to the *Barri El Raval*, *El Gotic* and *La Barceloneta*. It has promoted several functional interventions, as the parking reduction or the streets direction change, in order to reduce the number of the cars and to release the little streets of the mediaeval urban fabric. The project had the goal to increase the urban quality of the most dense and touristic district, so as to encourage the pedestrian traffic and to facilitate the use of the city from all types of city users (Salvador Rueda, 2016). The second superblock project took place in 2003 in the Gràcia district as part of the "*Pla de Mobilitat del Districte de Gràcia*". This plan can be considered the preliminary test for the application of the Ecological Urbanism theory, because it had experimented the suggestions for a more sustainable city and analysed the neighbourhood with the indicators system proposed by the *Agencia de Ecologia Urbana de Barcelona*. The superblock experience was restricted to a part of the district and it had identified those basic streets necessary to direct the vehicular traffic and public transport, moreover it had changed the road directions and placed physical obstacles to prevent the access to the free areas. Nevertheless, both the projects raised several critics and discussions, because the citizens understood these interventions like a merely action to reduce the private mobility, and after two years of protests and manifestations the projects were abandoned. So, the desirability to implement the Superblock model at the whole city was temporary stopped but the two districts maintained most the mobility solutions already adopted, and in some cases, they implemented with the structural interventions (Salvador Rueda, 2016). One of the reasons why the two projects were not accepted is probably because they were not part of a bigger scheme, but just like an urban project, and the urban holistic vision of the remained out off the popular knowledge. Nevertheless, even if the projects were not concluded and the *Gracia* and *Ciutat Vella* districts became a sort of zones 30, the result increased considerably the urban quality. In fact, so much so that in 2011 the *Gracia* project was awarded for its originality and innovation with the *Premio Iniciativa BMW* in 2011, and today *Gracia* is one of the most attractive districts and the real estate market values increased greatly. So, this project can be considered without any doubt like the turning point for the application of sustainable urban solution and the base for the first urban program for the implementation of the Superblock model at the city scale, "*Programa Superilles 2011-2015*". The program was realized in parallel with the redaction of some other urban plans, first of all the *Plan de*

Mobilitat Urbana de Barcelona 2013-2018, in order to present a comprehensive view of the city and to integrate the pilot projects in a general superblock scheme. The City Council has adopted the program with the name "*Barris a velocitat humana. Programa d'impuls de 5 Superilles Pilot a Barcelona*" the 28th February 2014, with the guidelines to realize five Superblocks. According to the Ecological Urbanism Theory each set of blocks is a combination of open spaces and private spaces, scheduled on a basic network that manage the entire city and can help to connect and implement the natural biodiversity. Moreover, the program would promote a comprehensive transformation of public space that fosters inclusion, reduce the ecological footprint and become landmarks to promote the use of public space. Technically it was based on a first phase of ecological diagnostic and it would involve gradually all public and private stakeholders so as to define a shared roadmap improving their ownership and responsibility in the transformation of the neighbourhoods.

Image 3.2.1: Program "*Barris a velocitat humana. Programa d'impuls de 5 Superilles Pilot a Barcelona*"



Source: Ajuntamento de barcelona, *Barris a velocitat humana Programa d'impuls de 5 Superilles Pilot a Barcelona*, Barcelona, 28 February 2014

The Image 3.2.1 presents the five superblocks included in the first program "*Barris a velocitat humana*" that are:

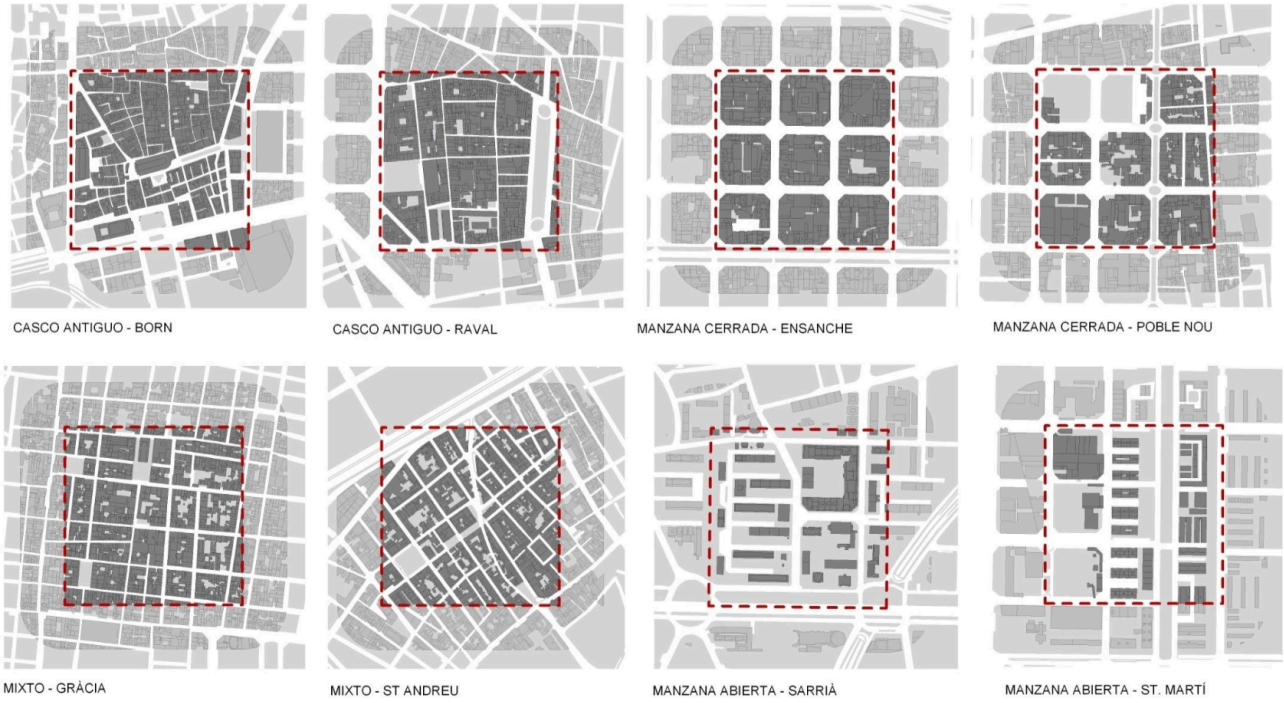
- *Barri de La Maternitat i Sant Ramon,* District *de Les Cortes;*

- *Barri de Sants Montjuic,* District *Sants Montjuic;*
- *Barri de la Nova e l'Antigua Esquierra de l'Eixample,* District *de l'Eixample;*
- *Barri de Poblenou,* District *de Sant Martì;*
- *Plaça de les Glòries*.

In the pilot areas, except for *Plaça de les Glòries* that became a separated project for its huge dimension and the strategic role, the program scheduled a participation process that took action between the second half of 2014 and the first months of 2015. This process should have been the fundamental step to realize a shared "Action Plan", so as to avoid the participation problems incurred during the previous Superblock tests proposed in *Gracia* and *Ciutat Vella*. Several meetings were realized to define what specific actions should have been performed to achieve the desirable future of the Superblocks, what were the priorities and who could have supported them. During these seminars, the main four themes of the groups were: Mobility - Public space - Energy, Water, Waste, Biodiversity, Urban green - Cohesion, Social inclusion, Participation and Self-management. However, only two "Action Plan" were realized, *Les Cortes* and *Sants Montjuic*, and like in the previous program, they weren't realized completely; implementing in the urban fabric only some structural interventions about the Mobility, streets directions, access points to the districts, speed enforcement, etc. and realizing a 30 Zone. The lack of implementation of the program was probably to be due to the absence of the *Plan de Mobilitat Urbana*, that will be adopted the 27th March 2015, and the simultaneous political change that was taking place in Barcelona in the following months, *Barcelona in Comù* was elected and Ada Colau became the new mayor two months later, June 2015. So, due to this variable political situation, in the local government and districts level, the pilot projects didn't have the sufficient support to be implemented in a strong way but despite that, they have obtained good results especially in the districts where the urban fabric simplified the realization of the superblock model (Image 3.2.2). In fact, the interventions to reduce the traffic in the historical city (District of *Gracia* and *Ciutat Vella*, *Barri El Born, Barri El Raval, Barri de La Maternitat i Sant Ramon, Barri de Sants Montjuic*), are more comprehensible to the citizens, because the urban fabric is already physically limited and the car mobility is obstructed in a natural way. Conversely, in those districts characterized by the Cerdà grid (District of *Eixample* and *Sant Martì*, *Barri Poblenou*) the street space is plentiful and it's more difficult to convince the people to leave the car mobility. So, like it was happened in

Gracia with the previous project, the implementation of solutions to reduce the car traffic obtained a tangible improvement in the urban quality of life (Laila Torres Sagrsità, 2016).

Image 3.2.2: Original urban fabric of the pilot areas



Source: Cynthia Echave, *Superblocks Compact city, public space and revitalization*, Barcelona, 2015

In this sense, the new Administration has realized the second program "*Omplim de vidas els carres*", to transform Barcelona in a more efficient urban system not only for spots but working in a holistic urban vision. In fact, as I have stressed deeply in the following paragraph, the new plan that was adopted in May 2016, represents an evolution of the previously strategies, developing in addition to the earlier pilot projects, some other intervention areas so as to present at least one Superblock for each district. However, now I would present the four topics that combine the Administrations' strategy for each Superblocks program:

1) Who are the actors involved;
2) What are the planning tools implemented;
3) How long the project will be probably realized;
4) What are the costs expected.

3.2.2. Who are the actors involved

I have analysed all the Superblock programs realized until now in order to understand whom are the actors involved and what's their influence in the implementation's process.

So, It's possible to divide the actor in four categories: The *Agencia de Ecologia Urbana de Barcelona*; the Administration (City and districts); the Policy and the others stakeholders.

The *Agencia de Ecologia Urbana de Barcelona*

The *BCNecologia* (Urban Ecology Agency of Barcelona) is a public consortium consisting of the City Council of Barcelona, the Municipal Council and Metropolitan Area of Barcelona and the Barcelona Provincial Council. It applies a systemic approach to the management of cities to encourage a more sustainable model. In order to achieve this, the agency provides sustainable solutions related to mobility, energy, waste management, water management, urban planning, biodiversity and social cohesion. The *Agencia* and in particular its director, Salvador Rueda, have the main role for the implementation of the Superblocks because they are trying to promote to the Barcelona's government the idea of Ecological Urbanism since 2000. Moreover, the *BCNecologia* has done projects for various public institutions, foundations, organizations and companies, both nationally and internationally. In each project they work together with their beneficiaries, in order to identify problems and their causes, make proposals, analyse the technical feasibility, quantify the results and provide administrative support in managing and implementing projects. In the case of Barcelona the Administration has commissioned to the *BCNecologia* the strategic programs and the diagnostic plans, so as to analyse the sustainability level of the city and suggest to the technical department the possible solutions to increase the urban sustainability. Nevertheless the *Agencia* is not the leader of the project and it hasn't the possibility to realize any interventions, functional or structural, on the urban fabric (Laila Torres Sagrsistà, 2016).

City and Districts Administration

The urban Department of Ecology, Urban Planning and Mobility (*Ecologia, Urbanisme i Mobilitat*) is the responsible in all development and urban transformation policies: local urban planning, sustainable mobility, the maintenance and management of urban services linked to these matters (water, green areas, waste, energy). The Department is divided in three subdivisions (Ecology, Urban Planning and Mobility), and in addition there are two more transversal sectors: Urban Model and Communication and Participation (Laila Torres Sagristà, 2016). These two sectors represent the transition between the Ecological Urbanism theories to the practice; they try to find concrete application for the Superblock model clashing with the problems of reality (Ton Salvadò, 2016). Moreover, every district

has a representative office that is the connection between the big scale of the city and the local dimension of the neighbourhood. It works together with both the Department of Ecology, Urban Planning and Mobility and both to the *BCNecologia*, in order to adapt the urban strategies to the neighbourhood's needs. The district's office is divided in three sectors (Urban work, Economy aspects and People) and it works mainly for the management of the urban spaces (public lighting, public spaces, etc.). In the process for the implementation of the Superblocks project it has a role of support and correction (Rosa Saiz, 2016). Therefore, the districts work in close contact with the other institutional actors so to help them in the redaction of the district's executive plan. The implementation of this plan should be left to the district's responsibility (Laila Torres Sagristà, 2016).

The Policy

The urban transformation proposed by the Ecological Urbanism is first of all a politic goal, and subsequently a technical tool. So, the role of the policy is fundamental for the implementation of an important project like the Superblock model, and it's essential the support of the majority of political parties so as to reach a good result. As I have said in the previous paragraph Barcelona was characterized by more political change during the last elections. In fact, Barcelona was governed until the 2011 by the PSOE (*Partido Socialista Obrero Español*), since 2011 by the CiU (*Convergència i Unió*[16]), and then by *Barcelona en Comú*[17]. This new party won the 2015's election and now Ada Colau is the current Mayor of Barcelona, in coalition with some others left parties. Nevertheless, the political changes, all the governments have supported the proposal of the *Agencia de Ecologia Urbana*. Especially the Ada Colau's government has adopted the Superblock program "*Omplim de vidas els carres"* as one key point for her mandate, in order to defend social justice, promote participatory democracy and develop a new model of tourism for Barcelona. Now, despite the ideas of Ecological Urbanism have been adopted by all the previous governments, the Colau's administration is passing through a political crisis, due to the implementation of the first Superblock in the Cerdà grid. In fact, the realization of a new pilot project in Poblenou, which I have explained in the chapter 3.1.5, has raised up a

[16] CiU is a Catalan nationalist electoral alliance constituted by two main parties, the CDC (Democratic Convergence of Catalonia) and the UDC (Democratic Union of Catalonia).
[17] Barcelona en *Comú* is a political party that was born in 2014, in parallel to the explosion of the Spanish indignados movement.

lot of critiques, increasing a civil and politic conflict that is not finished yet (Laila Torres Sagristà, 2016).

The other stakeholders

There is an amount of other actors that are important for the execution of the Superblocks project, even if they are not technically involved in the process, first of all the citizens. In fact, during the implementation of the firsts pilots projects, due to the people's critiques and manifestations the projects were abandoned. So, the civil participation is the key to obtain the citizens support and to reach a shared result. Moreover, there are some other institutional actors like the Catalan govern, the *Area Metropolitana de Barcelona* and the *Autoritat Metropolitana del Transport*, that are involved in the implementation process for their influence on the city. In fact, even if the Superblock project will be adopted only inside the administrative boundaries, it will generate relevant effects also on the entire metropolitan area. So, it is necessary to realize a deep assessment of the future consequences especially for the effects generated by those city users that live out of Barcelona and every day come to work in the capital of Catalonia.

3.2.3. What are the planning tools implemented

The holistic vision of the urban system is one of the main principles of the Ecological Urbanism, so it's important to work at a big scale and subsequently go down to the specific district or Superblock, in order to have always a concrete reference at the urban scale (Salvador Rueda, 2016). So, due to the absence of a general urban tools, the first Superblocks projects and the first Superblocks program have not been able to obtain their goals, because they were connected in the same urban vision only in the ideas of the *Agencia de Ecologia Urbana*, but in the reality, they were completely separated, limiting their implementation to mobility interventions. Finally, the holistic vision proposed by the Ecological Urbanism was obtained with the approval of five main plans: *Compromís Ciutadà per la Sostenibilitat*, *Pla del Verd i la Biodiversitat*, *Pla de mobilitat Urbana, Pla de millora de la qualitat de l'aire* and *Pla d'actuació municipal.* These five programs were studied and prepared between the 2010 and 2015 and they were adopted before the political change in the Barcelona administration. Now they are the key reference for the new program "*Omplim de vidas els carres"*.

Compromís Ciutadà per la Sostenibilitat 2012-2022[18]

The *Compromis* is a strategic document written and adopted in 2012 that focuses its attentions on the environment challenge. It presents 10 goals, each one with 10 lines of action, on the horizon of 2022, which works for a more equitable, prosperous and self-sufficient Barcelona. The program involves the different economic and social groups, governments, companies and social organizations and the citizens so that, each one to the extent of its possibilities, promotes the climate change mitigation and resilience of our city. The *Compromis* promotes the sustainable city like a "smart" city, but considering the "smart" much more than "automatic" and even more than just "tech"; *The "Smart systems" are not a delegation of responsibility in the automatism, but a tool to make more efficient the responsible acts*[19]*.* In this scheme, the Superblocks model is presented in the second goal "Public space and mobility"; in order to establish a street network that could generate local centralities, where the neighbourhoods (Superblocks) assume a human speed, increasing the *mixité* and reducing the mobility.

El Pla del Verd i de la Biodiversitat de Barcelona 2020[20]

The urban density is one of the oldest and biggest problems of Barcelona, and the green public spaces are not sufficient for Barcelona. For this reason, the City Council has adopted in 2013 the Green and Biodiversity Plan, so as to preserve and improve the ecological infrastructure. The urban green spaces provide an ecological control that is essential for the urban system, such as for the water cycle, the flow of food, waste and energy and the air. Furthermore, they are essential to guarantee the natural biodiversity and complexity, and the social values, such as health, welfare, beauty, and social relations. The Green and Biodiversity Plan encouraged the green solutions presented by

[18] Ajuntament de Barcelona, *Compromís Ciutadà per la Sostenibilitat 2012-2022,* Barcelona, 2012, Ajuntament de Barcelona. The text present ten objectives for the city of Barcelona: (1) Biodiversity; (2) Public space and mobility; (3) Environmental quality and health; (4) Efficient city, zero emission; (5) Rational use of resources (6) Good government and social responsibility; (7) Wellbeing; (8) Progress and development; (9) Education and citizen action; (10) Resilience and planetary responsibility.

[19] Ajuntament de Barcelona, *Compromís Ciutadà per la Sostenibilitat 2012-2022,* Barcelona, 2012, Ajuntament de Barcelona, pag.7.

[20] Ajuntament de Barcelona, Medi Ambient i Serveis Urbans - Hàbitat Urbà, *Pla del verd i de la biodiversitat de Barcelona 2020*, Barcelona, 2013, Ajuntament de Barcelona. The objectives of this plan are: (1) Preserve and enhance the natural heritage of the city and prevent the loss of species and habitats; (2) Achieve maximum allowance of green area and its connectivity; (3) Obtain the highest environmental and social services of green and biodiversity; (4) Make the city more resilient against emerging challenges such as climate change.

the Superblock model and the Urbanism on three levels, where the buildings, the streets and all the urban spaces will be part of an integrated ecological system. In this sense, the government is working to transform the main streets (Plaza de les Glòries, Avinguda Diagonal, Pere IV, etc.) into green corridors, able to connect the outlying natural areas with the city centre. Moreover, the structural transformation of the superblocks can intercept the green flow, spreading the positive effects of the nature for each block and covering the entire city.

El Pla de Mobilitat Urbana (PMU) 2013-2018[21]

The Urban Mobility Plan is the key tool for the implementation of the Ecological Urbanism Theory. In fact, this type of plan is the only one that can work effectively to implement the new urban model proposed by the *Agencia de Ecologia Urbana*. The idea of a sustainable city proposed by the Urban Mobility Plan (compact, complex, efficient and socially cohesive) goes through a rethinking the intensive use of motor vehicles and a reduction of the resulting social, economic and environmental externalities (accidents, air pollution, noise, visual intrusion, congestion, functional appropriation of public space, etc.). So, the plan presents the restoration of the street network (Image 3.2.3), considering the street in two level: basic street and inner street. These one will be considered like a real public space that overturns the concept of a zone destined only for the mobility and car traffic, defining it like a shared space for all types of city users. It would give back to the citizens the streets like a place where is possible to walk, meet, dialogue, play, etc., and where the concept of city can be restored and the people can move without any restrictions. In fact, the Plan identifies not only the modal shift as the solution to the urban mobility problems, but also the application of measures to contain and restrict the car use in order to increase the urban quality of life. The Plan presented four strategic goals: Safe mobility; Sustainable mobility; Equal mobility and Efficient mobility, that are developed in 66 actions for all the mobility systems (Walk, Bicycle, Public Transport, Car mobility and private vehicle parking, and Distribution of goods). The implementation of these actions has

[21] Ajuntament de Barcelona, *El Pla de Mobilitat Urbana (PMU) 2013-2018,* 2015, Barcelona, Ajuntament de Barcelona. The plan would reach a safe, sustainable, efficient and equal mobility, and it follows eight strategic axes: (1) Organization of the city in Superblocks; (2) New bus network; (3) Development of cycle path; (4) Maintenance of the actual traffic level; (5) Compliance of parameters of environmental quality; (6) Promotion of high number of people per car; (7) Revision of the parking system; (8) Implementation of loading/unloading system.

predicted for the 2018 a modal split in these terms[22]: Walkability 35,1% (+10%); Bicycle 2,5% (+67%); Public transport 41,3% (+3,5%); Private car 21,1% (-21%). All the actions are organized on the new urban network (basic and inner streets) that is the result of the Superblocks system (Image 3.1.7). The *Agencia de Ecologia Urbana* has designed these solutions, so as to promote sustainable mobility but at the same time in order to democratize the roads public spaces and increase the urban quality level.

Image 3.2.3: Proposta Superilles PMU 2013-2018

Source: Ajuntament de Barcelona, *El Pla de Mobilitat Urbana (PMU) 2013-2018,* 2015, Barcelona, Ajuntament de Barcelona

In 2015, at the middle of the application period of the Pla de Mobilitat, it was analysed the current modal split situation, and it have been resulted that the objective of a sustainable mobility was still so far to be reach. The modal split was: Walkability 32,48% (+1,75%); Bicycle 1,84% (+21,8%); Public transport 39,59% (-0,8%); Private car 26,09% (-2,1%). Almost all the mobility systems had a limited progression, and the Public transport is even worst compared to the 2011 as reference year. These bad results are probably due to the slow progression of the Superblocks model that should had to start in 2014 with the Superblock program “Barris a velocitat humana” and instead started fluently only two years

[22] The percentage change is referred to the 2011.

later, with the second program “Oplim de vida el carrer”. Furthermore, regarding the Public transport system, it’s necessary consider that it was going on full renovation, and it has not helped to increase the number of users.

Pla de millora de la qualitat de l’aire de Barcelona 2015-2018[23]

The air pollution is one of the biggest problem in Barcelona, in fact it’s estimated that there are 3.000/3.500 premature deaths annually linked to the pollution problem (Oriol Nello, 2016). So, the *“Pla de millora de la qualitat de l’aire”* works to find a common strategy able to increase the air quality of Barcelona, with a transversal participation of the different sectors of the public administration and with the contribution of the private actors. The goal for the 2018 is to limit the pollution emission according to the EU restriction about NO_2 and PM_{10}, in the whole city, because the current situation oversteps the restrictions in almost all the district. At 2013 the distribution of emission (NO_2 and PM_{10}), was divided mainly between the Port (46% NO_2 and 52% PM_{10}) and the Mobility (33% NO_2 and 37% PM_{10}). So, in order to attend the future goals and reduce the air pollution, the restoration of the urban mobility is one of the main line of actions. In particular the Plan promotes a new hierarchy of the urban network, implementing the reduction destined for the free car mobility and promoting traffic solution as zone 30, pedestrian zones, Superblocks, etc.

Pla d’actuació municipal 2016-2019[24]

Finally, the Barcelona Administration is working to develop also the social aspects of the sustainable city, in order to realize a common project for a collective city, which must include all the actors of civil society in equal conditions, and where no one is left behind. The *Pla d’actuació municipal 2016-2019* is the new urban strategy at a medium/long term, that define the guidelines to face those challenges (culture, technological innovation, human equality, pollution and climate change) that can’t be solved with urgent measures. Its aim is to design a more equitable and inclusive city, where everyone can live with dignity, and where everyone can feel protagonist. In this program, the Superblock model

[23] Ajuntament de Barcelona, Hàbitat Urbà - Medi Ambient i Serveis Urbans, *Pla de millora de la qualitat de l’aire de Barcelona 2015-2018*, 2015, Barcelona, Ajuntament de Barcelona. The guidelines of the Plan are divided in 7 axes: (1) Solutions for the urban services; (2) Measures for communication and enviroment education; (3) Measures defined by the PAMQA; (4) PMU de Barcelona 2013-2018; (5) Self sufficiency energy strategy of Barcelona 2015-2024; (6) Barcelona Port; (7) Barcelona Airport.

[24] Ajuntament de Barcelona, *Pla d’actuació municipal 2016-2019,* 2016, Barcelona, Ajuntament de Barcelona. The Plan would reach five urban aspects, *Una Barcelona*: (1) diversa que asseguri el bon viure; (2) amb empenta per a una economia plural; (3) més humana i en transició ecològica; (4) participativa que garanteixi el bon govern; (5) oberta i compromesa amb el món.

represents one of the actions of the third axes of the Plan "*Una Barcelona més humana i en transició ecològica*", that fosters the importance of a high urban quality level for the future city. In fact, it's necessary to develop a city with a low level of pollution, traffic and noise, so as to facilitate the social relation and the citizen's life. Furthermore, the *Pla* relates the double urban scales of Barcelona - the metropolitan area and the district realities - demonstrating the importance of the local level to avoid territorial fractures and ensure the social involvement. In this vision, the public spaces are fundamental to combine the two complementary dimensions of the urban system, so as to build a global city at a human scale.

The five Plans represent the strategic vision for the city, so that the implementation of the new Superblocks pilot projects can have a solid base at urban scale. After that, in order to realize the Superblocks, the Department of Ecology, Urban Planning and Mobility, edits a specific tool for each neighbourhood in collaboration with the districts' administration. This type of instrument, according with the five general plans and the Superblocks city program (*Barris a velocitat humana or Oplim de vida el carrer*), adopts the urban strategies, and the guidelines for the transformation of each district with the Superblock model. The following tools have been adopted for each one of the Superblock program:

- ***Urban Mobility Plan***[25] (*Gracia district* project)

  The *Agencia de Ecologia Urbana* has realized for the *Gracia* district a specific Mobility Plan, in order to test the Ecological Urbanism theory and implement the Superblock model. The Plan was realized on the diagnosis presented by the provisional document[26] and it promoted the guidelines for the realization of the new urban scheme. In fact, the Plan was not limited to the reorganization of the inner streets of the districts, but it has also promoted alternative solutions for the mobility systems and for the use of the public spaces.

- ***Dossier diagnostic*** (*Barris a velocitat humana* program - *Oplim de vida el carrer* program)

[25] Ajuntament de Barcelona, Agencia de Ecologia Urbana de Barcelona, *Pla de Mobilitat del Districte de Gracia, Supermancana de la Vila de Gracia*, Barcelona, 2006

[26] Ajuntament de Barcelona, Agencia de Ecologia Urbana de Barcelona, *Espai public, mobilitat I accessibilitat al Districte de Gracia*, Barcelona, 2003

When the Administration has decided to implement the Superblocks model to the whole city the *Agencia de Ecologia Urbana* was appointed to realize a Dossier diagnostic for every ambit of the Superblock pilot projects. This urban analysis represents the application of the indicator system developed by the *Agencia*, in order to show the state of the art of the urban sustainability. So, the depth knowledge of each urban area allows to define carefully the priorities and possible actions to increase the sustainability of the district.

- ***Action Plan*** (*Barris a velocitat humana* program)

The *Action Plan* is the tool realized in collaboration between the Department of Ecology, Urban Planning and Mobility and the districts government, in order to define the guidelines for the functional and structural transformation of the urban fabric and the Superblock model. This plan should contain the district's strategy in compliance with the urban general plans, characterized by urban specificities of the district, and adapting the superblocks model on the special needs (Laila Torres Sagristà, 2016). Moreover, in this plan it should be started the application of the indicator system with the analysis of the sustainability state of art.

- ***INFORME. Pla d'Espai Públic i Mobilitat***[27] (*Oplim de vida el carrer* program)

The *Pla d'Espai Públic i Mobilitat* is the evolution of the Action Plan, and it represents for the new program *Oplim de vida el carrer*, the transition tool for the implementation of the superblock model in each district. The document gathers the diagnosis and proposed actions for each of mobility networks (private car, public transport, cycling and pedestrian) and for the services related to the urban system (green spaces, parking and urban distribution of goods). At the moment, it was approved only for San Martì district.

3.2.4. How long the project will be realized

It's not possible to know exactly the time for the realization of the Superblock program, neither at urban level nor at local level. In fact, due to its extremely complexity, none Superblock programs were realized yet and at the moment, according to the Department of Ecology, Urban Planning and Mobility, it's not possible to predict a reliable time for the implementation of the new program *Oplim de vida el carrer* (Laila Torres Sagristà, 2016).

[27] Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí, Barcelona, 2016.*

Instead, Salvador Rueda affirms that it could be possible to implement the Superblock model in a basic way on the whole city in only four years (Salvador Rueda, 2016). The basic or functional way represents the first step for the Superblock implementation, and it can be reached changing the mobility functionality through vertical and horizontal road signs, traffic direction, and prohibitions to type of vehicles, etc. Subsequently the *Agencia de Ecologia Urbana* expects two more implementation steps, a tactic level and a structural level, that will involve a physical urban restoration with new streets sections and green spaces. So, it's not possible to define an exactly schedule for the execution of structural interventions, also because after the adoption of the structural plan by the districts (Action Plan or INFORME. *Pla d'Espai Públic i Mobilitat*), it's the same district administration responsible for its implementation without any restriction (Laila Torres Sagristà, 2016).

In regard to the single Superblock execution it can be realized in a short time. In fact, a new pilot project was implemented in Poblenou district and the basic transformation took only two weeks. However there is one more phase to consider in the Superblock implementation and it's the participatory activity. During the first Superblock program (Barris a velocitat humana program) the Department of Ecology, Urban Planning and Mobility according to the singular districts' administration have implemented a participation process that was long between 3 and 8 months.

3.2.5. What are the costs expected

Since no one Superblock project was completely implemented, there isn't an exactly assessment for the execution of the new urban model. Therefore, it's possible to define the financial perspective by the hypothesis of the *Agencia de Ecologia Urbana de Barcelona*. In fact, according to the *Agencia* the cost for the realization of a single Superblock is between the 50.000 to 100.000 euros, depending on the dimension, the structure and the state of art of each Superblock. Then, since Rueda forecasts the implementation of 500 Superblocks on the whole Barcelona, the cost for the transformation of the entire city with the new urban model should be around the 50 millions euro, but for sure the cost will be less than 100 million euro.

Regarding the total cost for the implementation of the Supeblocks, the financial perspective of the two Superblocks programs it's very similar. In fact the first program, *Barris a velocitat humana*, predicted a total cost of 10 million euro for the implementation

of the five pilot projects. Instead, the actual program, *Oplim de vida el carrer*, forecasts a general expense of 11 million, considering the previous projects and the new pilot areas. Until now, the Administration has financed the first Superblock project (*Gracia District*) with 12.196.594 euro (2005-2009), and the first Superblocks program (*Barris a velocitat humana*) with two million euro.

3.3. Superblocks Program "*Omplim de vidas els carres*"

Ada Colau and *Barcelona en Comù* have always supported the necessity to change the city management in order to renovate Barcelona and transform it in a more sustainable city. In fact, in 2015 they have set the political campaign on the climate challenge and the necessity to improve the urban quality level. So, the Program "*Omplim de vidas els carres*. *La implantacio de les Superilles a Barcelona*" represents a government measure that enacts their new urban model for Barcelona. In this way, Ada Colau has linked the chance of success of the Program with her political mandate (2015-2019); generating now a public debate around the project not only for its technical features, but also for the political aspects. However, the Administration is not willing to change its position and it remarks with this Program that now is the time to take action, and improve the urban quality of life making the city more liveable and healthier, while reducing the impact of human activity and ensure the integrity of the environment in the short and long term (Ajuntament de Barcelona, 2016).

The Program *Omplim de vidas els carres*, promotes the reconsideration of the streets' function in order to solves the urban problems that afflicts Barcelona according to the urban history of the city. In fact, unlike to the previous Superblock Program (*Barris a velocitat humana*), the new one emphasizes the importance of the public spaces for the urban system, redefining the streets as a real public space: a living space, community spaces, extension of the private housing, and a space for the game, green, and local life of the neighbourhoods. Moreover, the Program defines the pedestrian as the centre of the urban planning and of the sustainable mobility; and it promotes the implementation of the Superblock model on the whole city. Therefore, since the new model implies a structural modification of the urban mobility and the resulting citizens' change of habits, it is crucial the participation of the citizens and of the different actors involved during the various stages of the model implementation. This second program want give a big relevance to the public participation all along the process, from the diagnosis to the design and realization of the proposals. In fact, the participation was the key of the political victory for *Barcelona en Comú*, and it should be implemented also in this program, through meetings and activities on several levels and different times. The Program "Omplim de vidas els carres. La implantació de les Superilles a Barcelona" defines the **strategic objectives**, the **methodology of implementation** and the **assessment tools** for the application of the

Superblocks model in Barcelona. In this paragraph, I analyse these three points so as to understand better the renovation urban strategy of the Superblocks program. Nevertheless, it's important to remark that this proposal can count on a central coordination created by the five urban plans previously presented (*Compromís Ciutadà per la Sostenibilitat, Pla del Verd i la Biodiversitat, Pla de mobilitat Urbana, Pla de millora de la qualitat de l'aire and Pla d'actuació municipal*) unlike to the previously Superblocks projects and the first Superblocks program.

3.3.1. Strategic objectives and general guidelines

There are four strategic objectives that characterize the Program "*Omplim de vidas els carres*" summarized in the following points, with the corresponding implementation measures:

1. **Improving the habitability of public space**:

   Support the use of public spaces, recovering the streets for the citizens. The new free space can be used for activities like walk, meet, dialogue, play, game of children, relaxing, etc. The actions should focus:

   - Increase the space pacified with pedestrian priority;
   - Promote new public space to reinforce the urban connections;
   - Improved the habitability (attraction and comfort).

2. **Realize a more sustainable mobility**:

   Implement a mobility model healthy and low-carbon, is the priority in order to reach a better quality of urban life. The main lines of action to improve the environmental quality are:

   - Simplify the transfer towards a more efficient transport systems;
   - Reduce the use of the vehicle, introducing new mobility management;
   - Promote alternative energy vehicles.

3. **Increase and improve urban green spaces and biodiversity**:

   Increase the green spaces and the green infrastructure in order to ensure the presence of sufficient urban vegetation, a high biodiversity level and its contribution to environmental and social services. The actions should focus:

   - Improve the streets' conditions so as to increment the vegetation quantity and to create a favourable microhabitat of birds and other species;

- Ensure the presence of all strata of vegetation (trees, shrubs, vines and creepers);
- Make permeable the soil to ensure water for vegetation in the public spaces;
- Promote new green spaces with a communitarian management and the participation of citizens for the maintenance of green public areas.

4. **Promote the participation and citizenship responsibility**:
   Working together with the public the design, implementation and evaluation of the program superblock.
   - Encourage maximum openness of the process and make sure to include the associations involved;
   - Combine the urban vision of the city, with the territory point of view; and work simultaneously at two scales.

In addition to the four key concepts the Superblocks Program defines also the general guidelines that will guide the process of implementation:

- Maximum **participation** in the diagnosis, in the proposals and execution;
- Priority to the **functional changes** that to the physical changes: "*Urbanisme tàctic*";
- Implementation of the Superblocks model in the whole city, giving priority to the **Cerdà grid** (*Eixample*, *Gracia* and *Sant Martin*);
- Maximum **transversality of the themes**, and completely integration of the urban visions;
- Implementation of the project with **different speeds**, depending on the flexibility and complexity of each district;
- **Two scales of intervention**, the actions can have an impact both on the entire city level and both to the local level (District or Superblock);
- Establishment of **measurable indicators** to check the evolution of sustainability level;
- Improvement of **public space**, according to the criteria of habitability, urban green/biodiversity, and mobility.

3.3.2. Methodology of implementation

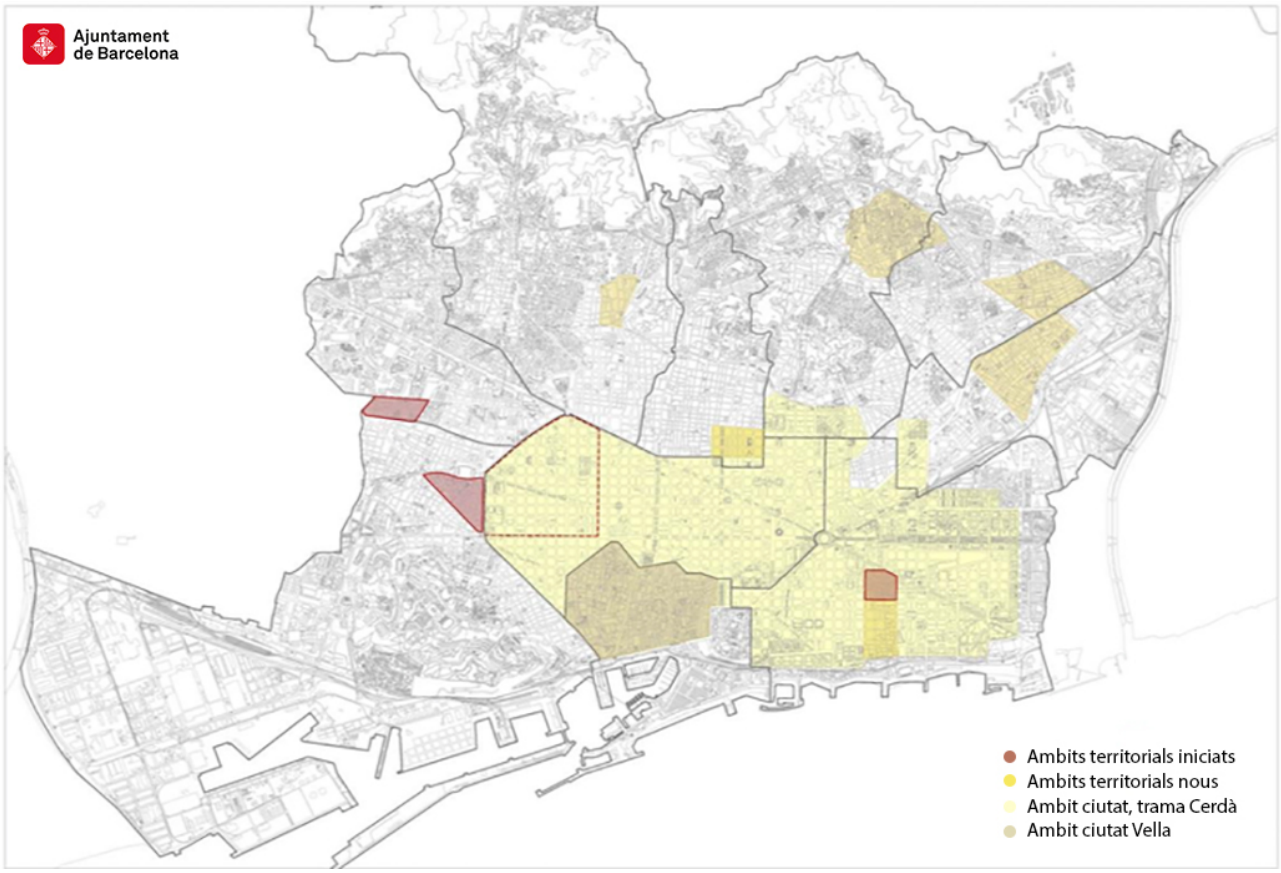
The methodology for the implementation of the Superblocks Program includes four specific sections that sketch an outline of the passage by the general strategic objectives to the real application in the urban dimension:

a. Where will be implemented the Superblocks?
b. Who will support the process?
c. What features will have the proposed actions?
d. How will be structured the process of defining of actions?

a) Where will be implemented the Superblocks?

The Program "*Omplim de vidas els carres*" has defined differently pilot projects in order to use them like examples to dissipate doubts and convince the citizens that the Superblock model can be implemented throughout the city. The Program presents three areas of intervention (Image 3.3.1).

Image 3.3.1: Map of the pilot project of the Program "*Omplim els carrer*".



Source: Ajuntament de Barcelona, Comissiò d'Ecologia, Urbanisme I Mobilitat, *Omplim els carrer. La implantaciò de les Superilles a Barcelona*, Barcelona, 2016.

1. **Cerdà grid**.

Since the features of this unique urban fabric, it's not possible implement the program without an overall planning of the entire districts. So, the Program gives the priority to the

Cerdà grid also for its relevance and its urban significance, implementing the mobility networks and defining the areas where to begin to start the first actions.

- The entire *Districte de Eixample,* but in particular in the following Superblocks:
  - *Barri de l'Antiga i la Nova Esquerra de l'Eixample*;
  - *Barri Fort Pienc;*
  - *Barri Sagrada Familia;*
  - *Barri Sant Antonì.*
- In the *Districte de San Martin:*
  - *Barri del Poblenou*;
- In the *Districte de Gracia*:
  - *Barri Camp d'en Grassot I Gracia Nova*

2. **Pilot projects of previously Superblock Program "*Barris a velocitat humana".***

As said before, the Program "*Omplim de vidas els carres*" represents an evolution of the previous Superblocks program. So, the new Program incorporates the pilot projects already designed, and it will resume the participation process, studying its feasibility according to budget availability.

- In the *Districte de Eixample*:
  - *Barri de l'Antiga i la Nova Esquerra de l'Eixample*;
- In the *Districte de Sants-Montjuïc*:
  - *Barri de Sants i Hostafrancs*;
- In the *Districte de Les Cortes*:
  - *Barri de Maternitat i Sant Ramon*;
- In the *Districte de Sant Martì*:
  - *Barri del Poblenou*;

3. **New pilot projects.**

Finally, the Program has selected other four neighbourhoods where to implement a Superblock, in order to expand the deployment of the program to other areas of the city and to involve the citizens of the districts out of the city centre. The new pilot projects were chosen in some cases for ease of implementation, and others cases, for their relevance. In fact, the Program wants implement a pilot project for each districts of Barcelona, so as to involve the maximum number of people.

- In the *Districte de Sarria-Sant Gervasi*:
  - *Barri de Sant Gervasi*;
- In the *Districte de Horta-Guinardó*:
  - *Barri de El casc antic d'Horta*;
- In the *Districte de Nou Barris*:
  - *Barri de Prosperitat*;
- In the *Districte de Sant Andreu*:
  - *Barri de Sant Andreu*;

b) Who will accompany the process?

The implementation of the Program "*Omplim de vidas els carres"* requires the compulsory interaction and coordination of different urban actors. The participation process needs to start from the beginning of the program, involving the institutional and not institutional agents, in order to promote in the people that sense of co-responsibility and belonging to the project. The following actors are the figures that should participate during the whole process:

- **Residents, neighbours, organizations and territorial association**: who lives in the area of superblocks and that can provide the own contextual knowledge (problems, needs, demands, etc.);
- **Department of Ecology, Urban and Mobility**: provides specific knowledge for the execution of the Superblocks (urban planning, infrastructure an mobility projecting and management of public spaces);
- **Districts**: the district where the Superblock will be implemented provides the comprehensive knowledge of the territory, physical and social;
- **Agencies of the city**: this is the technical part that provides the specialized knowledge on issues related to the superblocks (sustainable mobility, green and public space), for instance the main actor is the *Agencia de Ecologia Urbana de Barcelona*;
- **External experts**: they provide research, innovation and comparison with other experiences worldwide.

- **Technical Secretariat of the Superblocks Programme**: supports the process and it is composed by representatives of the Department of Urban Ecology of Barcelona City Council.

c) What features will have the proposed actions?

Even if *Barcelona en Comù* has imposed the implementation of the Superblocks model in the whole city, the urban space is not homogeneous and each neighbourhood have its morphology and specific features. Therefore, each area of the Program will be determined previously and studied in order to define the best solutions for the achievement of sustainability objectives, taking into account that the implementation of the superblocks is a continuous process of improvement of the public space. Moreover, the actions and proposals of the Program have been set to be flexible, low budget, and in some cases reversible, providing different levels of transformation before the final implementation of the Superblocks model. In this way, it will be easier for the Administration manage the implementation process and, at the same time it will be easier for the citizens know and get used to the new urban model. The Program "*Omplim de vidas els carres"* supposes three implementation phases and three actions typologies corresponding.

- **Functional/Basic level**: It is considered the first phase of the Superblock implementation, and during this phase it's possible to change the mobility structure of the neighbourhood;
- **Tactic level**: It is considered a medium level of the Superblock, when it is possible to program actions in order to improve the urban habitability and increase the public spaces;
- **Structural level**: in the final phase the Superblock will be restored in a structural way, implementing a physical transformation in order to implement the habitability, the biodiversity and the accessibility of the green and public spaces in the entire area.

According to the three implementation phases in the public space, the program provides for three actions typologies:

- **Functional/Basic actions**: this type of actions has to change the functionality of the streets, concentrating mainly on the hierarchy of the traffic and modifying the urban mobility inside the Superblock. The principal solutions adopted are: vertical and

horizontal road signs, change of the traffic directions, prohibitions according to the type of vehicle, streamlining of the parking and the regulation of the distribution of goods. The basic actions have to change the people's way to think and use the roads, currently based on the usage of narrow sidewalks and driveways.

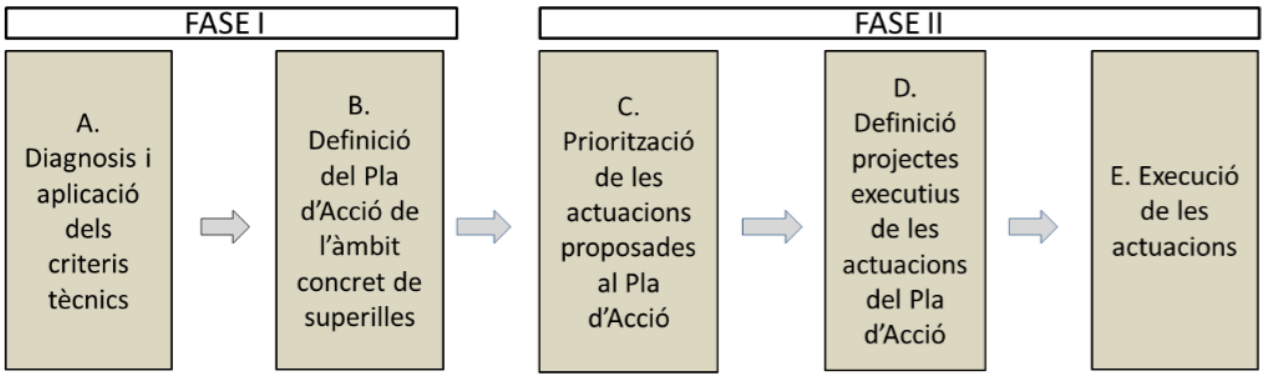
- **Tactic actions**: At the beginning the physical changes of the Superblock are unnecessary, because it is important to change the people's habits and the personal behaviours. In this sense, the tactical actions are activities with a great potential to transform the uses of public space without the need to execute major projects. For instance, they consist in transformation projects through management measures, street furniture and streets painting. These actions have a key role in the urban transformation process, because they are cheap, easy to implement and temporary, so reversible without any problems. The low budget is an incentive to encourage the administration to start urban experimentations. Moreover, the easy implementation of the tactics actions permits to modify and improve the solutions working during construction, enabling the involvement and participation of the citizens concerning the changes that can occur even after the beginning of the experiment. Finally, the possible reversibility of the solutions adopted, allows to overcome the initial hostilities of the citizens against the Superblocks project.
- **Structural actions**: The structural actions represent the last step for the implementation of the Superblock model. They are characterized by the redevelopment of public spaces through a strong physical transformation, but they are not essential to achieve the objectives of the program in the firsts phase, also because they are very expensive and hardly reversible. Anyway, they can be contemplated because expected from other plans and programs, or because they are exceptionally considered necessary within the Superblock. The great challenge of these interventions is the large amount of potentially available urban space. In fact, the urban space occupied by vehicles today, tomorrow it will be new free space, and so it's very important to urbanize with a high urban quality.

d) How it will be structured the process of defining of actions?

The process to define the actions for the implementation of the Superblock has five steps, which in turn are divided into two main phases, Image 3.3.2. The first one, for the definition

and the drafting of the plan (PHASE I. The diagnose the Plan action) and a second one, for the implementation of the project (PHASE II. Projects and executions):

Image 3.3.2: Phases of the implementation process



Source: Ajuntament de Barcelona, Comissiò d'Ecologia, Urbanisme I Mobilitat, *Omplim els carrer. La implantaciò de les Superilles a Barcelona*, Barcelona, 2016.

PHASE I

A) Diagnosis and application of technical criteria

The first step represents the analysis of the area selected for the implementation of the Superblock. The diagnosis helps to know in detail the current features of the public spaces in order to find the best solutions and produce the best influence on the urban life. The diagnosis is divided in three parts:

- Description of public space of the pilot area;
- Calculation of sustainability indicators in the current situation;
- General assessment of the current indicators.

The Superblock analysis will take place on three axes of action and depending on the type of public space: Habitability, Green and Biodiversity, Mobility. In this regard, the process has already begun with the creation of a steering groups, the preparation of a stakeholders maps, information sessions and workshops, and a first collaborative activity to identify a map of the ways and places of interest in the superblocks and its surroundings.

B) Action plan of the area

The second phase of implementation forecasts the redaction of an "Action Plan"; the document represents for each district the guide route for the implementation of the Superblock model. The Action Plan supports all the actions proposed during the diagnosis phase and the participatory process, and it prioritizes the solutions proposed according to their technical availability, the economic resources and temporal parameters. Moreover,

the Action Plan has to take into account the double level of implementation (city and district) and consider the double level of the impacts (urban or local).

PHASE II

C) Prioritization of actions proposed in the action plan

In the third step the proposed actions are assessed based on their needs, their influence, their model, their social benefits, available investments, etc. This phase is realized in parallel with the citizens in a participatory process so as to have consensus in the implementation and scheduling of actions.

D) Definition of executive projects of priority actions

In this step it's forecasted the development of the executive projects and the prioritized proposals, divided into: basic actions, tactic actions and structural actions. The projects are independent each other, and they have different development processes, but in order to realize a shared program they have to be designed and implemented with the participation of residents directly affected.

E) Execution

The execution of the projects presented in the Action Plan is the last step. It depends in particular by the budget availability and the scheduling of the District and the City Council. Moreover, there isn't a deadline for the implementation of the projects but each district can work individually and with its times, according to its priorities.

3.3.3. Assessment tools

An urban program like "*Omplim de vidas els carres*" can be evaluated in several ways. For instance, it is possible to take in consideration the times and the costs initially schedule, in order to evaluate the implementation process. Moreover, the participatory processes are another useful tools to try out the relevance of the projects, and to understand the real effects of the program to the urban system. Finally, a specific indicator system was adopted to evaluate the urban sustainability level.

a) Times and costs schedule
b) Sustainability indicator system
c) Participatory process

a) Times and costs schedule

As already said, the Program "*Omplim de vidas els carres*" would define the planning of Superblock model and develop a new balanced system in the whole Barcelona. However, the priority is to work on the Superblocks of the Cerdà grid, where the implementation of the program can have a greater impact and visibility. To carry out these objectives, the program will be developed in two temporary phases, but also the speed of each territory.

(PHASE I)

2016 - Diagnosis of neighbourhoods; Definition of design criteria; Definitions of the Plan of Action.

(PHASE II)

2016-2018 - Prioritization of actions and drafting of executive projects scheduled

2017-2019 - Execution of the projects and evaluation of the results.

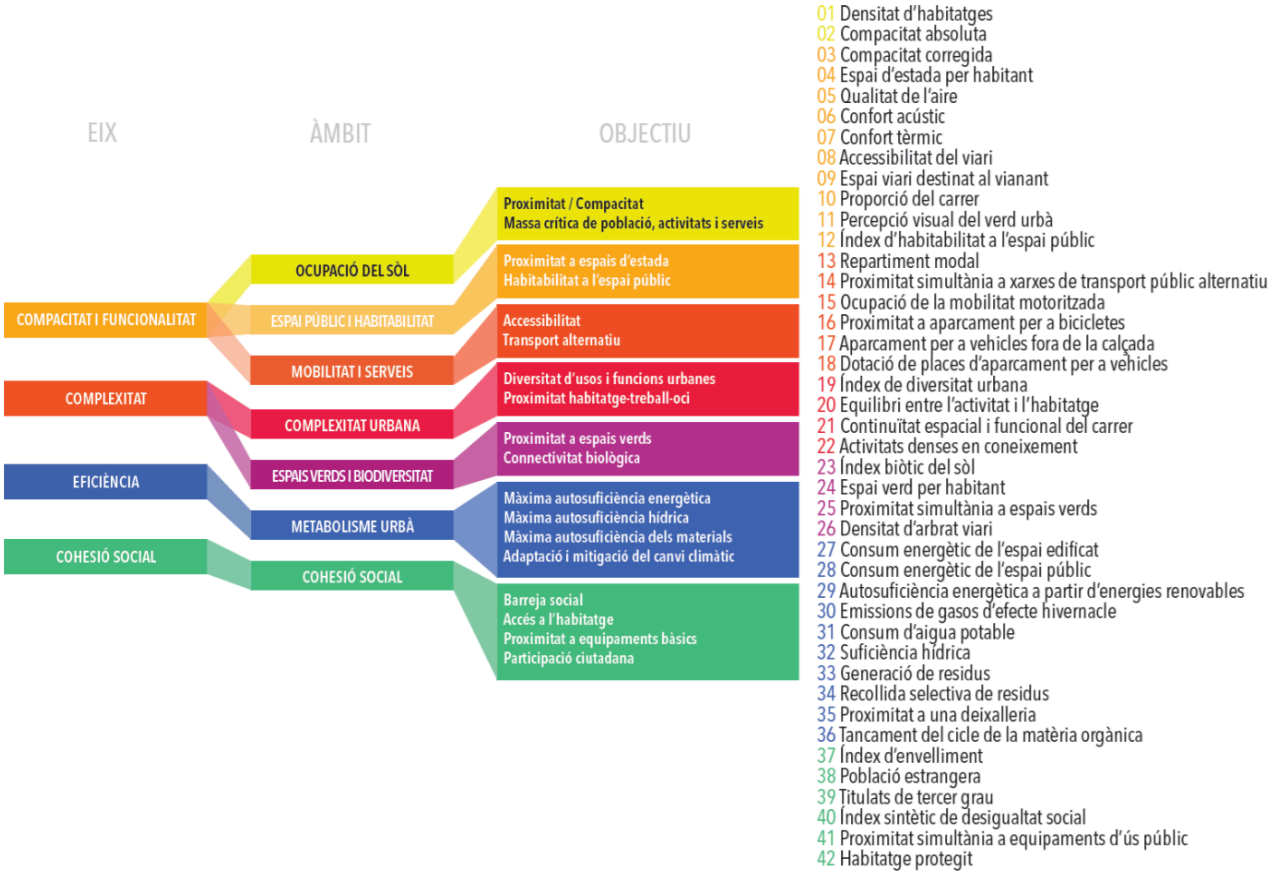
Regarding the expected cost, the "*Omplim de vidas els carres*" is a starter program so it has its own budget of around 11 million euros. This provision is expected to give a boost to the first urban projects, in order to demonstrate that it's possible to change the currently urban model. However, the Ecological Urbanism would be the urban model of the future and the Superblock solution haven't to be implemented as the extraordinary project but it should appear like the normality.

b) Sustainability indicator system

The Superblock implementation program, "*Omplim de vidas els carres*", was realized on the idea of Ecological Urbanism proposed by Rueda, and for this reason, one of the fundamental guidelines is to adopt the sustainability evaluation system. As I have showed in previous chapter, the *Agencia de Ecologia Urbana* has presented a list of 50 indicators for the evaluation of the urban system, and in the Barcelona's case the administration has selected 42 of them. One of the goals of the diagnosis phase is exactly the application of this indicator system so as to know the current situation of the city and register a benchmarking of the sustainability level. In this way the evaluation of the sustainability level before and after the Superblock implementation, will allow an assessment of the new urban model. Furthermore, the overall view of the current situation helps the guide actors to lead the process for the redaction of the Action Plan, and to make improvements according to the different features of the Superblocks. This indicators system, as a whole, must constitute accreditation (can be assimilated to a certification for urban sustainability) to ensure the compliance with the sustainability criteria in the cities. Everything works

through an indicators system, and they will serve to minimize the economic impacts on trade, the price of housing, etc. In the following Image 3.3.3, it's reported the indicator system for the assessment of sustainability adopted by the Administration of Barcelona. It's possible to find the same axes and areas defined by the Ecological Urbanism, nevertheless in the Program "*Omplim de vidas els carres*" were selected 42 indicators due to some of them, which were not measurable in the case of Barcelona.

Image 3.3.3: Indicator system of sustainability



Source: Ajuntament de Barcelona, Comissiò d'Ecologia, Urbanisme I Mobilitat, *Omplim els carrer. La implantaciò de les Superilles a Barcelona*, Barcelona, 2016, pag.11.

c) Participatory process

The promotion of the participation and citizens' responsibility is the fourth strategic objective of the Program, so the challenge is to involve organizations and neighbourhoods' residents in the phases of Superblocks implementation. The participatory process will be present throughout the Program in different stages of work, from the diagnosis, determining the critiques of each superblock and collecting the local knowledge, to the implementation actions, making them part of the project. Moreover, the participation

process supported by the Program has to respect the following technical criteria, adapting to the characteristics of each districts. Participation's criteria:

- **Local view and urban view**:

The superblock model requires double work's scale, at local level and at urban level. So, the participation process has to work in the same double urban dimensions. In fact, it's important to know the social needs and aspirations of each neighbourhoods, and at the same time it's necessary to consider the superblocks in relation with the rest of the district and the city, because it will have impacts both at the local scale that at global scale.

- **Openness and inclusion**:

The participatory process must be completely open and inclusive, promoting the involvement of groups, associations, individual people, and every type of city users involved in each district: the residents, the workers, the elderly, children and youth, traders, etc.

- **Monitoring and accountability**:

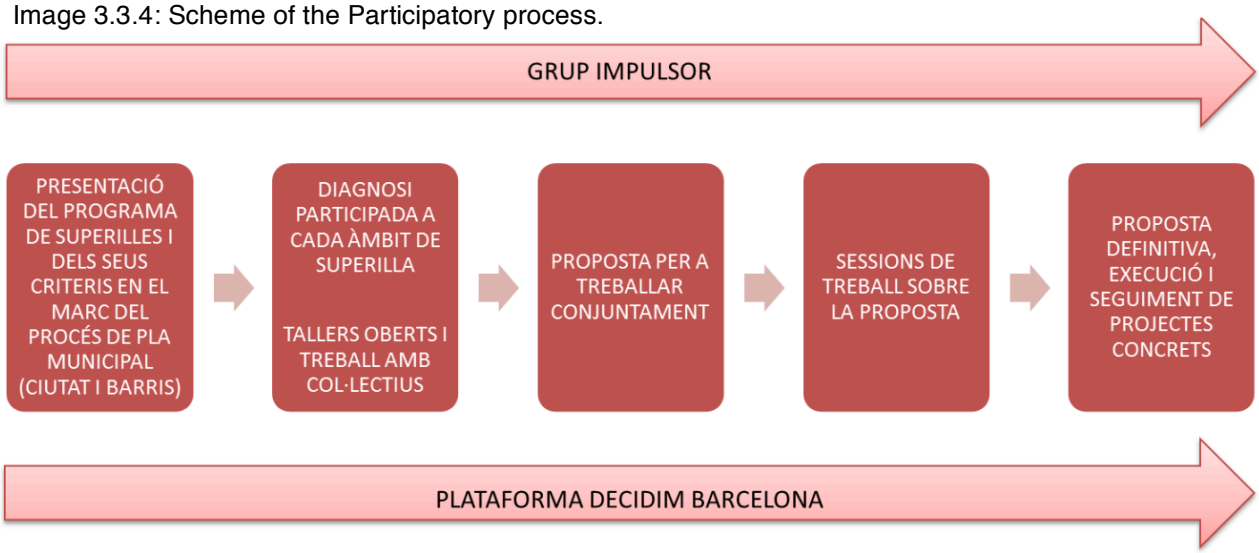
The Program proposes the creation of a steering group in each district, composed by a group of people and/or organizations representing that territory, which will be involved in a special project from the design to the evaluation of the Superblock. The steering group will link the technical team to the neighbourhood program so as to track and validate the various stages; this group will help to define the participatory phases and the results of the participatory workshops and technical works.

- **Transparency and traceability**:

A participatory process on the website (www.ajuntament.barcelona.cat/superilles) and a specific online platform, will ensure the digital participation for the entire program. They will allow the openness of the project to all citizens, reaching those residents who may not participate during the formal activities and permitting them to contribute during each phase.

Finally, the Program has defined a general participation structure that is divided in a preliminary stage for the development of the program and subsequently in two more phases that correspond to the implementation process and the equivalent five steps, Image 3.3.4.

Image 3.3.4: Scheme of the Participatory process.



Source: Ajuntament de Barcelona, Comissiò d'Ecologia, Urbanisme I Mobilitat, *Omplim els carrer. La implantaciò de les Superilles a Barcelona*, Barcelona, 2016.

Phase 0. Presentation of the program to the city and the district;

The Phase 0 determines the first approach of the local residents, organizations and all the interested to the Superblocks project. It consists in conferences, activities and workshops with city institutions, experts and organizations in the territory, in order to present, enrich and validate the objectives and criteria of the program. Furthermore, the promotion of a participatory process was also included in the Strategic lines of PAM[28] (Municipal Action Plan), in particular in the third axis "A Barcelona more human and in ecological transition", and in the Municipal Districts Action Plan.

Phase 1. Definition and drafting of the Action Plan;

The aim of the Phase 1 is to collect all the suggestions, actions and interventions, based on the people's knowledge and neighbourhood's diagnosis, which can define the future of the Superblock. The Phase 1 is divided in turn into two more parts:

Information and diagnosis. The maximum information and analysis on the district's features will be assembled in order to present a completely overview. After that, the Technical Secretariat of the Superblocks Programme will prepare an initial proposal of actions for the district (Action Plan), collecting the explicit requirements of the participatory workshops and crossing them with the territorial diagnosis.

[28] Ajuntament de Barcelona, 73 Barris, una Barcelona, Programa d'Actuaciò Municipal 2016-2019, 2016, Barcelona, Ajuntament de Barcelona

Concrete proposals. The draft of the Action Plan will be presented to the citizens in the following participatory workshops where they will work together to the proposed actions. With the information obtained in this last step it will be developed and improved the final proposal of the Action Plan, which will be the framework to develop the future projects and the specific actions. It will be presented to the public once agreed with the Promoter groups, the District and the Technical Secretariat of the Superblocks Programme.

Phase 2. Executions and implementation of the projects selected by the Action Plan.

The last Phase aims to explore the final proposal, defining in detail the priority actions and making their execution. Depending on the type of operations a specific participatory process can be performed, so as to define in details the projects their development. The steering group and information through digital platform accompany always the process.

3.4. From theory to practice – Application at urban scale

In these paragraphs, I report the urban interventions proposed by the City Administration for the implementation of the Superblock model, in order to present the application of the theory to the practice. Some of them are currently underway, and others are still theoretic projects. The several city's plans previously presented, propose a new urban vision that will be implemented over time and that for the moment represent only a possible future scenario. In this scenario, the Superblocks Program "*Omplim de vidas els carres*" confirms that the *Pla de Mobilitat Urbana de Barcelona* is the main tool for the implementation of the new urban vision. In fact, the *Pla de Mobilitat* and the Superblocks Program are working in coordination each other on the new streets network for the implementation of the sustainable mobility and the realization of the firsts Superblocks. They are working on the theories of Ecological Urbanism, in order to realize a Sustainable City and to impart to the citizens a new ecological life style. Nevertheless, the Program "*Omplim de vidas els carres*" is late on the schedule, and it has started only the functional implementation of some pilot Superblocks.

In my research of the Superblocks model application I emphasize the double level of action provided by the Superblock Program and the Urban Plans, analysing in this paragraph the urban level, and in the paragraph 3.5 the application to the local level. In this sense, I would to show how the city and the neighbourhood would change by the current situation firstly implementing functional interventions and subsequently with structural interventions. I have subdivided the possible interventions in seven points that are the main themes considered also in the *Pla d'Espai Públic i Mobilitat del Districte de Sant Martí* District. The examples that I reporte are not strictly connected to a Superblocks program or a specific project, but they can be part of different cases. Anyway, they are now part of the same big program "*Omplim de vidas els carres*" that would transform Barcelona in a more sustainable city. The seven axes of interventions are:

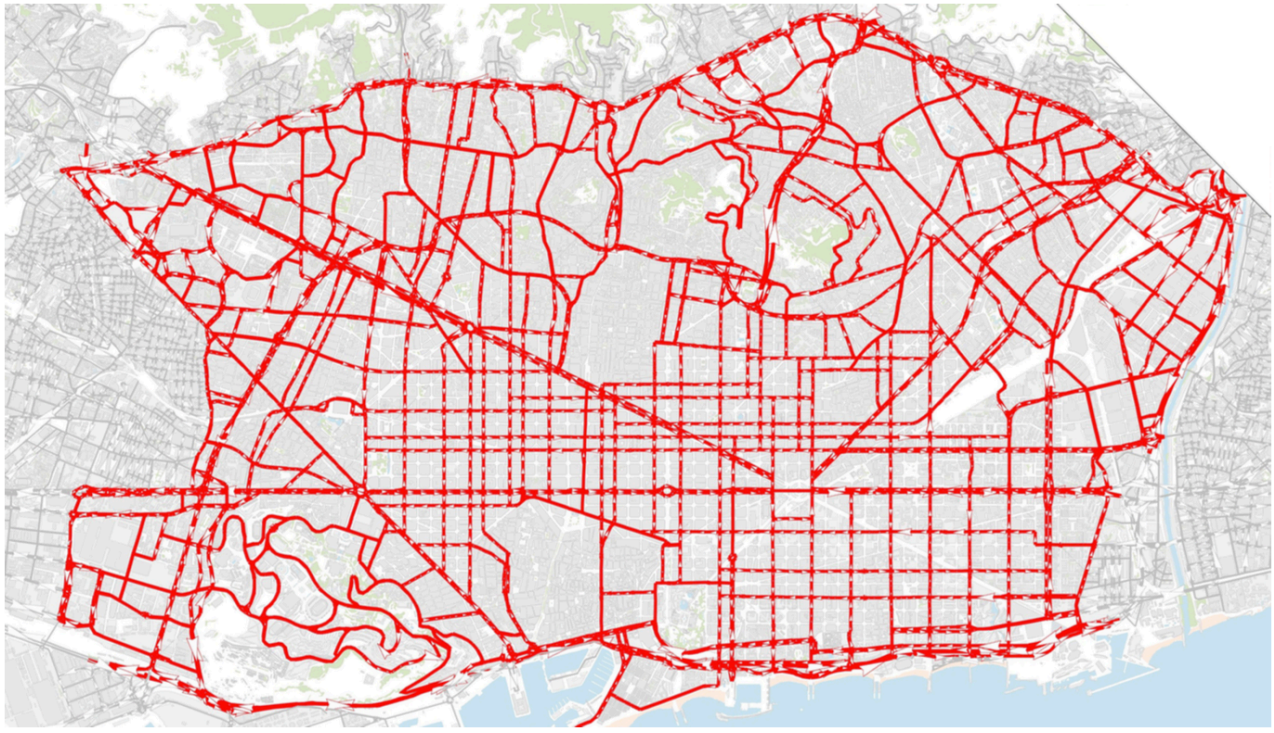
- Motorization Private Network
- Parking
- Public Transport
- Bicycle mobility
- Pedestrian network and public space

- Green network
- Urban good distribution

3.4.1. Motorization Private Network

The *Pla de Mobilitat Urbana de Barcelona* has suggested a new orthogonal infrastructure network in order to reduce the number of urban displacements of the private mobility that represents the 26,7% of displacements (2011). The system will be based on two streets' levels: the basic streets and the inner streets. The basic network (Image 3.4.1) is a sort of Super-grid that has intersections about every 400 meters, and it will permit the free circulation of the motorized transports (public transport and private vehicles). Instead, the streets inside each Superblocks compose the local network that is the result of the Superblock model implementation in the whole city. In the inner streets, the road space must be shared between all the streets users, respecting the slow mobility and giving the priority to the pedestrians.

Image 3.4.1: Basic roads proposal

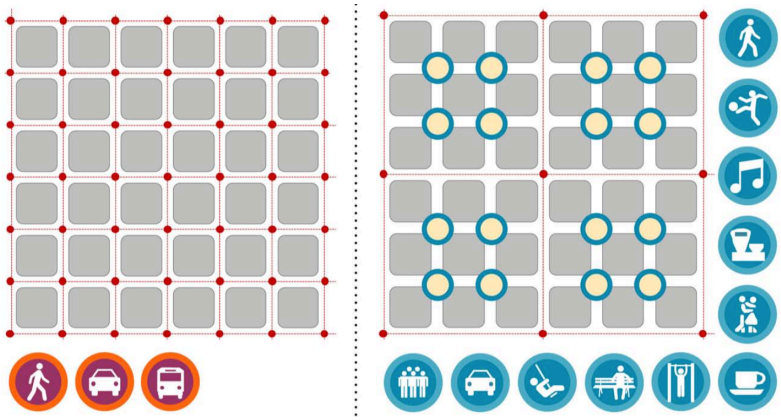


Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag34.

Conversely to the actual system, the free circulation will be organized around the idea of Superblocks (3x3 blocks), Image 3.4.2, inside which the through traffic is not permitted.

The Supergrid doesn't prevent completely the car traffic, however it encourages to use the basic network for long distance journeys, preventing an increase of the local traffic and avoiding to the people to use the car inside the city for short journeys. At the same time, it must ensure the criteria of functionality to the urban traffic flow, therefore the streets' direction is alternated, increasing the network effect of the system, with constant speed between 30 and 50 km/h, depending on the street. Moreover, each basic roadway includes one reserved lane for public transport and one for the bicycles. The maximum speed permitted in the basic network is 50 km/h, while in the inner streets it will be in the functional phase, 30 km/h, and in the structural phase, 10 km/h.

Image 3.4.2: Current system and Superblocks system.



Source: Ajuntament de Barcelona, Presentation *Plan de Movilidad Urbana de Barcelona, PMU 2013-18*, October 2014.

This new urban mobility structure gives the opportunity to reduce environmental pressure of the transport sector, that is the first greenhouse gases producer in Barcelona, and to reorganize the distribution of the streets public space used for each mobility mode, in order to decrease the space for the cars. The Supergrid network will be the base for the implementation of several transport systems (Pedestrian, Bicycle, TPL, Private vehicles) therefore, it will be possible to limit the congestion, the air and noise pollution, the accidents, and to increasing the urban quality level. In addition, the amount of new freed space inside the Superblocks will be available for new public uses, it can be used for leisure time, to walk, meet, dialogue, play, etc. (Image 3.4.2).

According to the *Pla de Mobilitat Urbana* the implementation of the basic streets network provides to reduce the car modal share since the 26.7% to 24,1% in 2018 (- 2,6%).

3.4.2. Parking

During the second half of the twentieth century the cars' market had a rapid expansion, increasing the production and decreasing the prices, defining so the car as a good available for everyone. Subsequently the cities have adapted themselves to necessities of

the new mobility system, not only regarding the request of new streets and space for the circulation, but especially for the parking spaces. Therefore, in the urban system it has been lost a lot of public space, by the streets or by the sidewalks, for the construction of car parking, in order to absolve the rapid expansion of the car market. Nowadays the trend of growth has declined, but the on-street and off-street parking still represent a big portion of urban public space.

In the Barcelona case the on-street parking places have increased from 167.000 in 1980 to 189.000 in 2004, and they decreased to 150.000 in 2010. The off-street parking places have more than doubled from 250.000 places in 1980 (579.000 in 2004) to 640,000 places in 2010. Today the Administration, with the *Pla de Mobilitat Urbana de Barcelona*, wants to design a new parking program in order to swap the current tendency and modify the parking system for cars, motor vehicles and bicycles. The new parking system should be the tool for the regulation of the private mobility, so as to coordinate the interaction between the different traffic modes. In this sense, the parking management is central in the process of Superblock implementation, in order to reduce the use of the private vehicles and increase the use of the other transport systems, public transports, bicycles and walk. Moreover, it will be possible to reduce the number of cars and release urban space available for new uses, minimizing the number of parking. Therefore the *Pla de Mobilitat Urbana* suggests to ensure the parking for the residents, reducing their parking costs, and to limit the number of parking for the city users, increasing their parking costs. In this sense the Administration wants to convince the citizens to leave their car at home, implementing the complexity of the Urban System and limiting the use of the car to the essential displacements.

All these interventions can produce a relevant result to change the current modal share. In fact, the *Pla de Mobilitat Urbana de Barcelona* has calculated that the percentage of the private vehicles displacements could be reduced since the 26.7% to 24.0% (-2.7 points).

3.4.3. Public transport

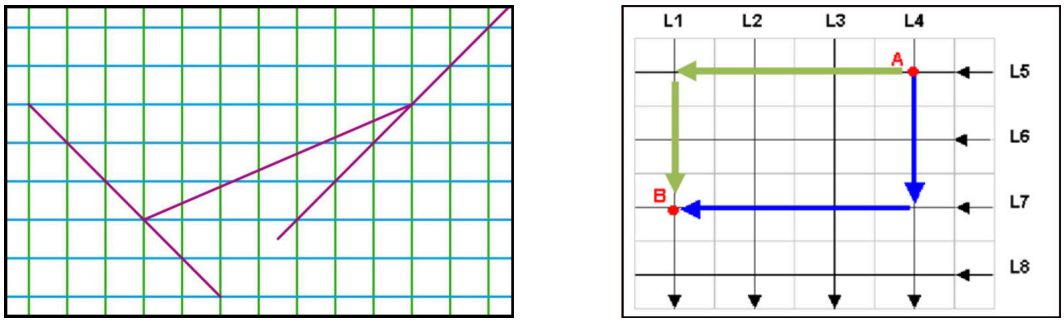
In parallel with the implementation of the Superblocks model the *Pla de Mobilitat Urbana de Barcelona* wants to improve the Transport Public service, in order to promote an efficient and sustainable alternative to the use of the private car. It was calculated that the public transport represents the 39,9% of the modal share during a weekday (7.8 million

trips to Barcelona. 5 were inner connection and 2 were connection with the outside). Moreover, the distribution of the urban travels on public transport in Barcelona is divided between Metro (44%) the Bus (34%) and the rest: tram, taxi train (22%).

Therefore, the Plan has defined several urban solutions for all the transport services, metro, tram, taxi, train, but in particular it has decided to improve the bus system developing a specific restoration project. In fact, the Barcelona's Administration in collaboration with the *Àrea Metropolitana de Barcelona* (AMB) and the *Autoritat del Transport Metropolità* (ATM), have developed a new bus network the *NXB - Nova Xarxa de Bus*, in order to cover the entire city and realize an high quality public transport service. The main features of the *Nova Xarxa de Bus* are:

- **28 lines of new network**: 8 horizontal, 17 vertical and 3 Diagonals, Image 3.4.4. The new bus network will work on the basic streets defined by the *Pla de Mobilitat Urbana* and so it will present infinite combinations of efficient journeys with just a single exchange that before were not possible before.
- The new orthogonal bus network is easier to understand and to use by everyone, with a greater **versatility** and **legibility**. Each bus stop has only one direction, ensuring the 95% of possibility to reach every destination point with only a single exchange (Image 3.4.4).

Image 3.4.4: Map *NXB - Nova Xarxa de Bus*



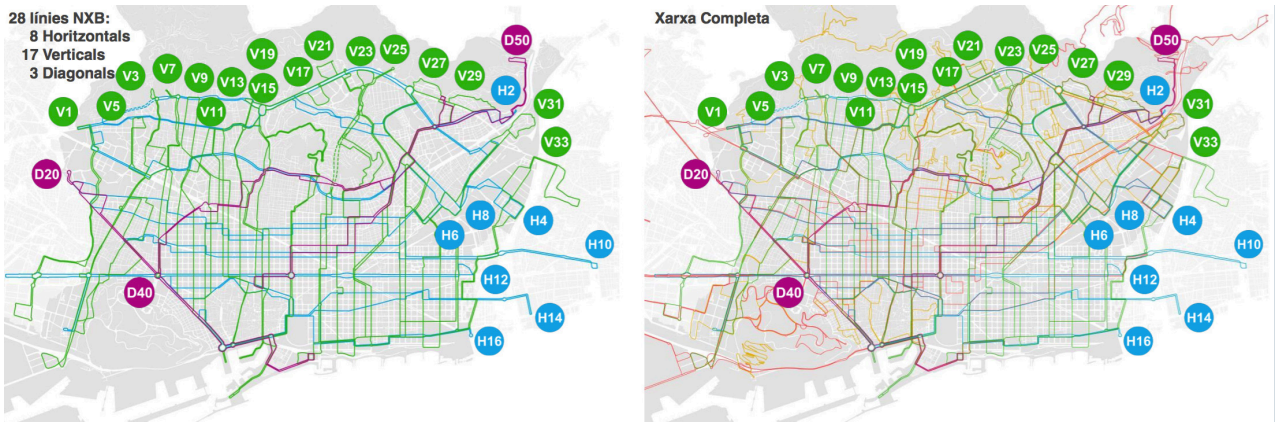
Source: Ajuntament de Barcelona (2017), TMB, *Fase Vde la Nova Xarxa de Bus*, Barcelona, pag.51

- The *Nova Xarxa* promotes the **intermodality** with the other transport systems (conventional bus network, neighbourhood bus, metro, tram, train, taxi, *bicing*, etc) in order to ease the people's movement.
- A high **commercial speed** and a **high frequency** of the bus. The *Nova Xarxa* would minimize the waiting time and the time travel, regulating and ensuring the service in the same way in the city centre as in the suburbs. With the new orthogonal network, it

will be possible to reach an average commercial speed of 12.5 km/h, that allows to increase the frequencies of the buses every 5 to 8 minutes on weekdays and 10 to 15 minutes in the holiday days.

- The *Nova Xarxa* promotes **specific interventions** to the basic roadway in order to increase the efficiency of the bus: bus lane, traffic light prioritization, and bus right of way.
- The new network will ensure almost completely the **territorial coverage**, the 67% of the city, and the 95% of the urban population. The *Nova Xarxa* will run only on the basic streets, so the Superblocks will be free by the bus crossing, ensuring at the same time a bus stop at maximum 200 meters, Image 3.4.5. Moreover, in addition to the Nova Xarxa de Bus there are two more bus network that complete the Bus transport system, the Conventional lines that is constituted by 38 intercity and some internal lines, and the Local bus, composed by 22 bus lines of the neighbourhoods.

Image 3.4.5: Map *NXB - Nova Xarxa de Bus*



Source: Ajuntament de Barcelona (2017), TMB, *Fase V de la Nova Xarxa de Bus*, Barcelona, pag 51.

The implementation works for the Nova Xarxa started at the middle of 2012 and it was divided in 5 phases. Up to now 16 new lines have been implemented and currently the last step is on going. The end of the works is estimated for the next year with the execution of the last 12 lines and the costs incurred until now are more than 1.300.000 euro. During the implementation of the firsts phases for the implementation of the Nova Xarxa the number of the users decreased from 656.134 pax/day in 2010, to a minimum of 616.588 pax/day in 2012. Today, even if the project is not completed, the number of bus displacements has increased to 674.299 pax/day in 2016, and it is estimated to reach the 704.225 pax/day during 2018. Moreover, the Pla de Mobilitat has calculated that the implementation of the

new bus network will influence also to the private vehicle system reducing the modal share of private vehicles since 26.7% to 26.4% in 2018 (-0.3 points). Therefore, the new urban Bus Network plays a fundamental role in the implementation on the public transport of Barcelona and its synchronization with the other systems (metro, train, tram, taxi, bicing) will increase the displacements by public transport. In fact, the Pla de Mobilitat Urbana has estimated a 3,5% increase of the public services in the modal share (from 39,9% in 2011 to 41,3% in 2018), representing 109.000 new displacements (70.000 by the bus and the rest by the other public transport systems).

3.4.4. Bicycle mobility

The bicycle is the best vehicle to move in the city according to all the principles of sustainability. It doesn't pollute, it's economic and, it is one of the best solutions to increase the social cohesion. It has been demonstrated that the bike is the fastest vehicle for the urban displacements under a distance of 5 km[29], but at the moment it corresponds with the only 2% of the modal share. Therefore, the Barcelona's Administration is working to increase the number of urban cyclist and legitimizes the bike as a valid mode of transport. So, it is necessary to create a mobility model able to integrate cycle management with the other transport systems in the same urban space. In this regard, the Civic Commission of the Bicycle and Pedestrian Barcelona have approved in 2004 the *Strategic Plan Bicicleta* that marked the guidelines for cycle mobility safer, more comfortable and more attractive. According to these guidelines, the *Pla de Mobilitat* Urbana has defined the following strategic actions to increase the bike modal share.

- *Bicycle networks*

According to the Superblocks model, the Pla de Mobilitat Urbana has designed two different urban spaces for the bicycle mobility in order to increase the cycling network in a large part of urban areas, and to ensure a greater street safety. The first one, it is composed by a dedicated network for the cycling mobility that will run on the basic streets, and the second one corresponds to the entirety of the Superblocks' inner streets, Image 3.4.6. In 2013 there were 138 kilometres of bicycle lane in Barcelona, and the Plan has supposed to increment them of the 154% for 2018, realizing more than 200 Km that will be

[29] Ajuntament de Barcelona, Presentation *Plan de Movilidad Urbana de Barcelona, PMU 2013-2018*, October 2014, pag.102.

part of the new basic network. Its implementation will cover the entire city, ensuring to the 95% of the population the presence of a basic bike lane to a maximum of 300m by the residence, and to 86% at a distance of 200m. Moreover, in addition to the main network, the secondary network can be considered as the totality of the superblocks' inner streets, which reach a entirety of 737 km suitable for bicycle traffic in coexistence with other uses. Therefore, when the Superblock model will be implemented in the whole city, the two bicycle networks together will reach that 72.6% of the total length of streets, realizing a space completely safe for the bicycles movement.

Image 3.4.6: Map of the bicycle networks proposal

Source: Rueda S. (2016) *La Supermanzana, nueva celula urbana para la construccion de un nuevo modelo funcional y urbanistico de Barcelona*. Available at www.bcnecologia.net. Accessed 21 December 2016, pag.24

- *Electric bicycle*

Barcelona's territory is not completely flat, and so the implementation of the bicycle networks could present slopes too high for the daily cyclists. The Pla has calculated that the bicycle network will present the 68% of the bike lane with a slope less than the 2°; the 19% between the 2° and the 4°; the 7% between the 4° and the 6°; the 3% between the 6° and the 8°; and the 3% more than the 8°. Therefore, the Administration is working to publicize the use of electric bicycle in order to make accessible to the bicycle the entire city. In fact, the electric bike allows travelling for long distances and sloped streets with less effort, increasing the range of potential users, and offering an economic and sustainable alternative to the car or the motor scooter, with the same advantages. Moreover, these vehicles can be used without any restriction inside the Superblocks, and it doesn't present accessibility problems to enter in pedestrian's zones both for the personal mobility and urban distribution of goods.

- *Bicycle parking*

The Pla de Mobilitat Urbana proposes to increment the number of the bicycle parking in order to promote the cycling mobility. In fact, the regular use of the bicycle as a transport mode requires the reservation of safe spaces for parking in the points of origin and destination of the trips. Moreover, the presence of bicycle parking helps to maintain the public space orderly and to reduce obstruction that could cause by the bicycles fixed to the street furniture. Therefore, the Administration has proposed the realization of an integrated coverage parking system “24h automatic access”, able to integrate with one subscription more parking (home, work place, etc.).

- *Intermodality*

The combination of bicycle and public transport is the most sustainable way to travel for medium and long distances. So, the Plan want to increase the intermodality of the bicycle and public transport systems especially for the commuters that everyday come to Barcelona with bus or trains. Therefore, it’s necessary to adapt firstly the public transport vehicles, realizing specific spaces in the trains or buses for the bicycles, and furthermore it’s essential improve the infrastructures and the accessibility to the stations with slopes, elevators or safe parking.

- *Urban policies for cycling*

The *Pla de Mobilitat Urbana* has also defined some policies in order to increase the bicycle modal share. For instance, it would promote public campaigns in order to change the perception of the bicycle, not only as a vehicle of leisure and sport, and it would increase the attentions to the safety of cyclists, creating of a cultural framework favourable to the cycling mobility. Moreover, some other actions for the development of the bicycle are the consolidation of the bicycle sharing service Bicing, and the Bicycle Registration and Marking System.

Finally, the *Pla de Mobilitat Urbana* has calculated that the implementation of the actions for the cycling mobility and at the same time the interventions to reduce the private mobility, can generate in 2018 an increase of the 67% of the bicycle modal share compared to 2011. So, it will be possible to increase the bicycle modal share by 1,5% to 2,5%, that correspond to an increase of 80.000 displacement/day (since 118.151 in 2011, to 197.312 in 2018).

3.4.5. Pedestrian network and public space

Finally, the Ecological Urbanism considers also the pedestrian mobility as the most important mobility mode. In fact, it has a lot of advantages, for instance it's sustainable, healthy, it improves the quality of urban life and social integration, it is an engine of local economic activities and it improves the safety of the streets increasing the presence of people. So, the *Pla de Mobilitat Urbana* wants to promote the role of the pedestrian in the city, because everyone before to be a driver, rider or passenger, is a pedestrian. Moreover, the implementation of the Superblocks model in the whole city works to restore the figure of the people at the centre of the urban space, not only as a pedestrian in the streets but as citizens in the public space. According to Rueda, we can consider the urban settlement like a city only when there are public spaces, because they are the "home of all", the meeting place for exchanges, entertainment, culture, expression, democracy and also the mobility. So, the new urban model promotes the Superblocks' inner spaces not only as a safer place for the pedestrian mobility, but it supports the citizens to get back that public space stolen by the cars mobility and creates a new urban quality space.

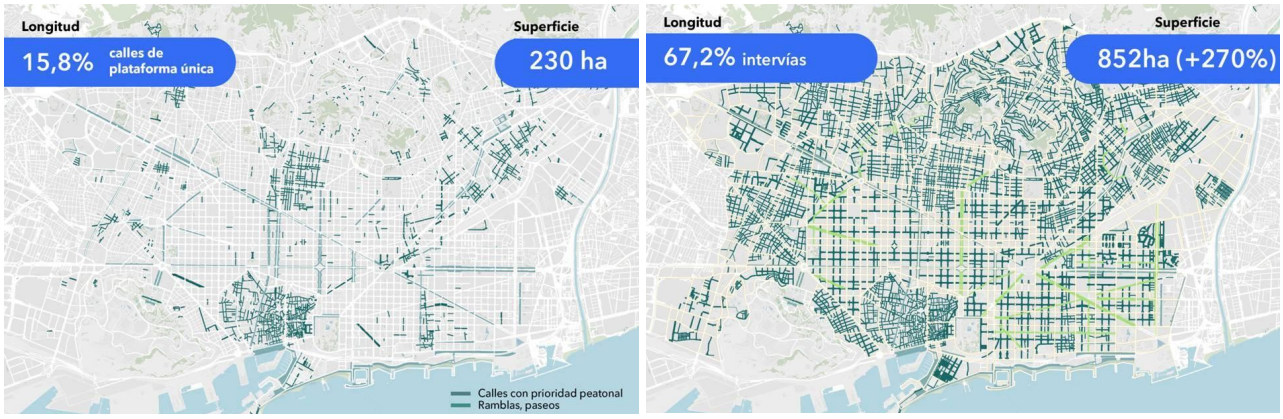
Therefore, the Superblocks model has defined the basic streets in order to canalise the vehicular traffic, identifying the rest of the city's streets like a big common platform where the pedestrians, so the citizens, will be the main actors. The Plan has projected a first functional phase realizing Zone 30 in correspondence of the future Superblocks, in order to reduce the traffic, the congestion, and to limit the local speed (30/20/10 Km/h, depending to the neighbourhood). In the second phase the neighbourhoods will be transformed in a structural way, with a unique street platform, different patterns and the possibility to realize new green spaces. In this way, the Plan has defined the next steps to increase the pedestrian mobility:

- Implementation of the Zone 30;
- Realize safe pedestrian crossing for the basic streets;
- Ensure a safe, continuity and accessible tracks to the schools;
- Reduce the architectural obstacles;
- Promote the figure of the pedestrian: review of regulations and ordinances;
- Reduce the accidentally and create a public space for the pedestrian.

Currently in Barcelona the streets with a unique platform, where the pedestrian and cyclist have the precedence on the car vehicles, represents the 15,8% of the mobility public

space, corresponding to 230 ha. With the implementation of the Superblock model the totality of the inner streets release by the traffic will increase to 852 ha (+622ha; +270%), defining a unique platform that will be the 67,2% of the total streets, Image 3.4.7. The *Pla de Mobilitat Urbana* has calculated that the implementation of the Superblock model and at the creation of new public spaces, can generate in 2018 an increase of the 10% of the pedestrian mobility, passing from the 31,9% to 35,1% of the modal share.

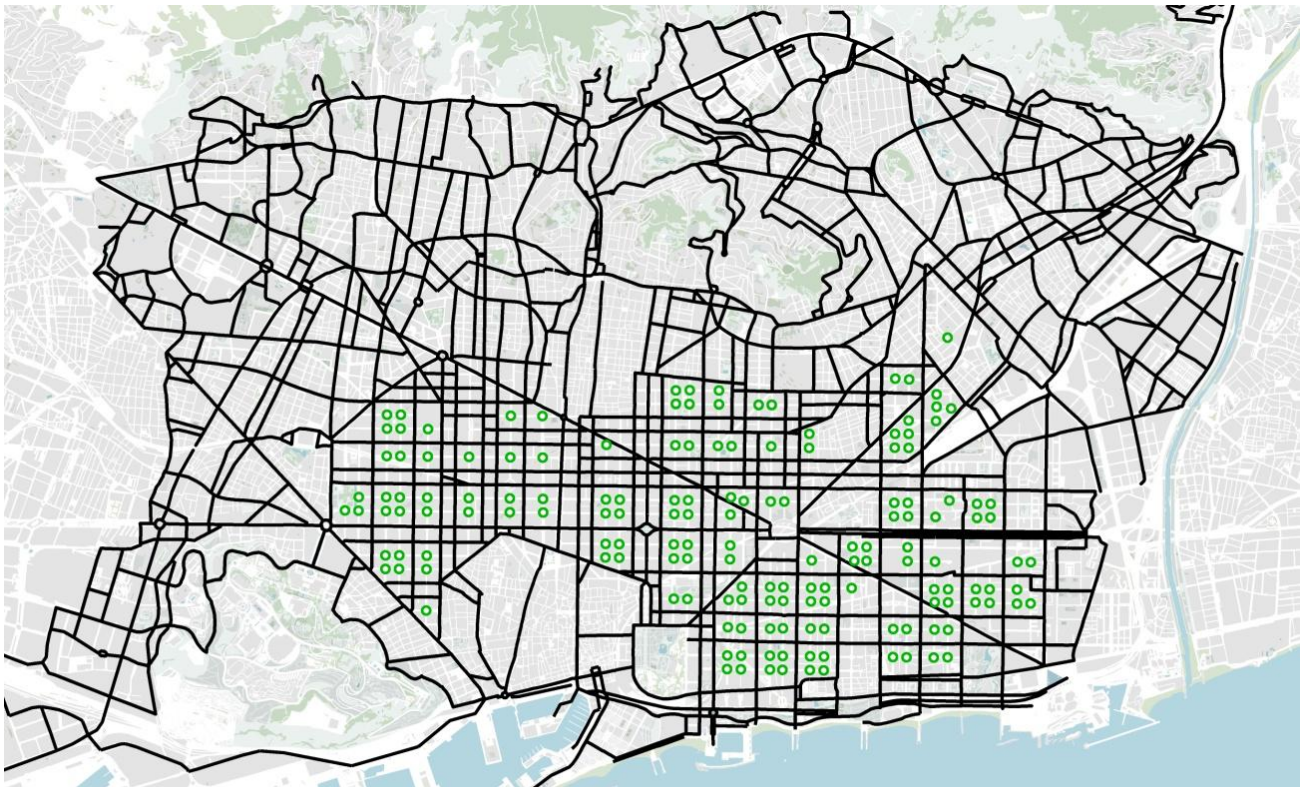
Image 3.4.7: Public space with pedestrian priority. Current status and future scenario.



Source: Rueda S. (2016), *La Supermanzana, nueva celula urbana para la construccion de un nuevo modelo funcional y urbanistico de Barcelona*. Available at www.bcnecologia.net. Accessed 21 December 2016, pag. 25

As already said in the introduction, the Ecological urbanism promotes a car network that occupies only the 30% of the total streets public space, destining the rest to the public life. The street must become a place of preference for pedestrians, removing the diversities between the transport's modes and encouraging the presence and coexistence with cyclists, taxis, service vehicles, emergency vehicles and residents. Moreover, in Barcelona, the implementation of pedestrian streets in the Eixample will produce an important number of pedestrian intersections inside the new urban model. In fact, every Superblocks present four nodes that will be completely free by the traffic and that can be considered like four new squares for the public life. The number of nodes that will become full squares (1900 m^2) is 136, which is about 27.2 ha, and the number of new squares with an area of about 2/3 of the total is 21, which sum 2.8 ha more. Furthermore, the new potential 157 squares would add a public area of about 30 ha, Image 3.4.8.

Image 3.4.8: Superblocks model and pedestrian intersections.

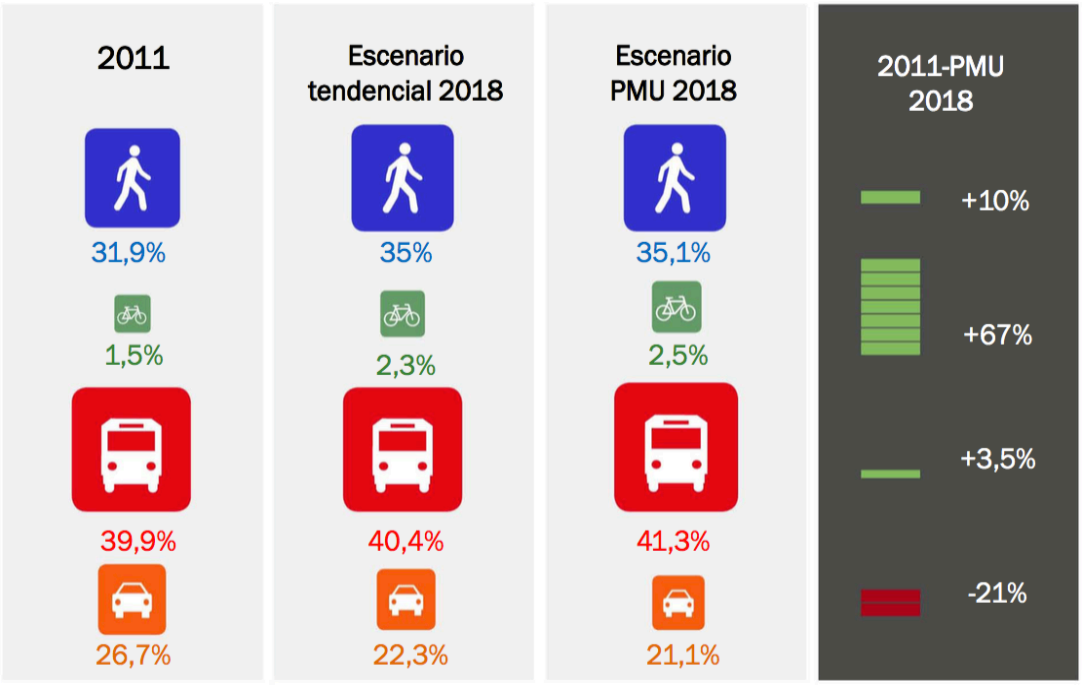


Source: Rueda S. (2016), *La Supermanzana, nueva celula urbana para la construccion de un nuevo modelo funcional y urbanistico de Barcelona*. Available at www.bcnecologia.net. Accessed 21 December 2016, pag.30

Finally, regarding the four main mobility model the *Pla de Mobilitat Urbana* provides this scenario for the transport modal share at 2018. Thanks to the implementation of the *Pla de Mobilitat* and the Superblock model the pedestrian mobility should increase to the 35,1% (+10%), the bicycle mobility to the 2,5% (+67%), and the bus system to the 41,3% (+3,5%). At the same time, the coordinated implementation of the Supergrid model (-2,6), of the new parking policies (-2,7) and of the public transport system (-0,3), reduces the influence of the private vehicle on the urban transport modal share (-5,6), Image 3.4.9. The car modal share will decrease by 26.7% in 2011 to 21.1% in 2018, for a reduction of the 21%, corresponding to a reduction of 438.553 average daily displacements (since from 2,088,348 to 1,649,795), and to a reduction of around 350.842 vehicles. This prediction results very important in order to support the basic street network and the reduction of the flow streets with the implementation the Superblocks model. In fact, the antagonists to the Superblock model support the idea that the new urban model will increase a traffic congestion problem, causing the opposition between streets free by cars (inner streets)

and streets full of vehicles (basic streets). Nevertheless, the *Agencia de Ecologia Urbana* has calculated that it's necessary to reduce the traffic just of 13%, in order to maintain the current traffic level with the new Superblocks model. So, it's clear that if the technical previsions are right, the traffic level not only will be the same of today but it will be also less than today, with new inner streets freed by cars and available for the public life.

Image 3.4.9: Urban transport allocation



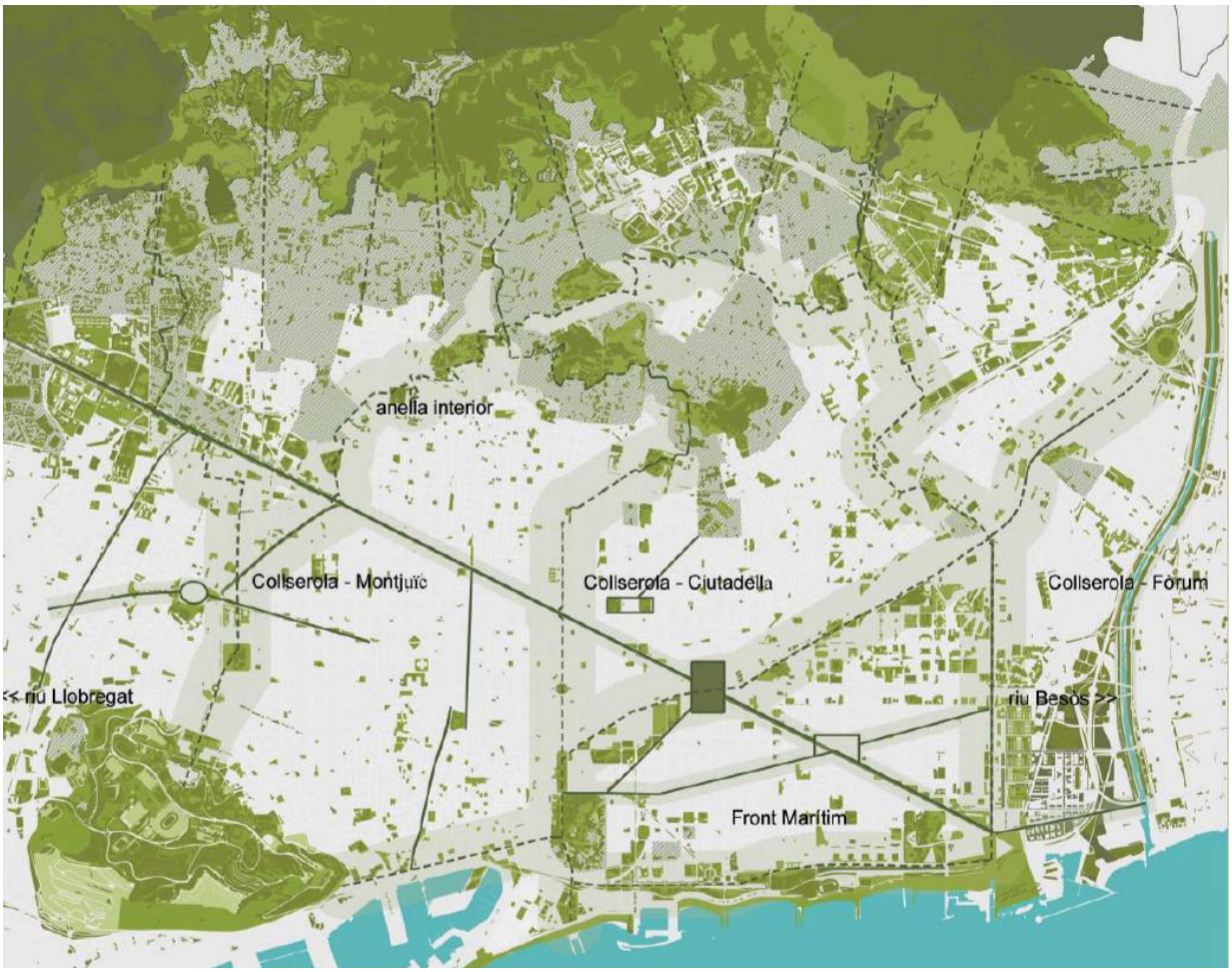
Source: Ajuntament de Barcelona, TMB, *Pla de Movilidad Urbana de Barcelona PMU 2013-2018*, 2014

3.4.6. Green network

The Barcelona Administration has adopted the *Pla del Verd i de la Biodiversitat* de Barcelona 2020 in order to oppose the urban density and re-naturalize the urban system. The *Pla del Verd* want to increase the green spaces and to improve the biodiversity level, increment the permeability index and introducing nature in all the possible apertures of the urban fabric. To achieve this result, it would realize a green network that connect the urban green spaces with the suburban natural areas, through green corridors that can make more permeable the urban system to the naturals and animals flows. In this sense, the Superblock model is the perfect solution to increase the interconnection between the several green spaces: the urban corridors, the public parks, the interstitial spaces, the interior courtyards, the green roofs and the vertical green solution promoted by the

Ecological Urbanism. The basic green corridors are green strips of vegetation where the pedestrians and cyclists have the mobility priority; they must ensure a better urban quality and create attractive habitats for wildlife, increasing the environmental and social benefits. The new green corridors proposed are Pere IV, Avinguda Diagonal, Cristobal de Moura, Ramon Turro, Espronceda, where the 30% of the surface must be permeable, Imagine 3.4.10.

Image 3.4.10: Basic Green network



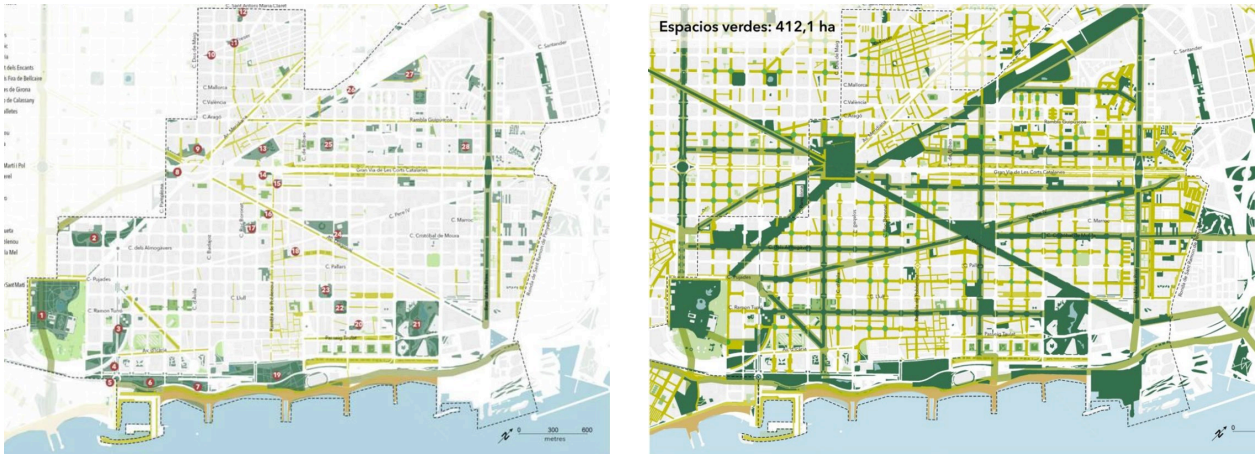
Source: Ajuntament de Barcelona, Medi Ambient i Serveis Urbans - Hàbitat Urbà, Pla del verd i de la biodiversitat de Barcelona 2020, Barcelona, 2013, Ajuntament de Barcelona, pag.65.

Furthermore, the Superblocks' urban cells and the orthogonal streets allow to integrate the mobility and the green networks, composing the second level of the green local corridors. The Pla del Verd defines the trees' density according to the street's hierarchy and the trees' size. For instance, the average number of trees every 100 meters in the basic streets will be 16 big trees, 24 medium and 32 small or 48 in three lines; while in the local streets 16 big trees, 24 medium or 36 in three line, and 32 small, 48 in three lines or 64 in

four lines. Since the trees along the basic and local streets corresponds already to the most relevant natural presence in the city, the Pla del Verd has suggested to increase further the urban green with the implementation of the Superblock model, overcoming the tree lines solution and using the new inner spaces. The inner streets that will be freed by the car mobility, can be transform in park or green areas so as to increment the permeamble area. Moreover, the Pla del Verd i de la Biodiversitat suggests also to increase the green urban surface promoting architectural solutions on the vertical level: green roofs, walls, terraces, etc. These types of solutions can obtain ecological benefits (the improvement of the urban landscape, thermal insulation, reducing of air pollution levels, creation of new habitats for wildlife, water tank, etc) and social benefits (recreation area, seating, space for activities, social cohesion, etc). In this sense, the Pla would implement the 30% of the roofs with natural solutions, nevertheless, the buildings are generally private, so the Administration is working to realize examples on the public edifices so as to encourage the urban transformation. In addition, the Local Government has started several projects to recycle the urban voids and realize urban community garden so as to encourage the citizens into this urban transformation. The main initiative is called BUITS Plan (Urban Voids with Territorial and Social Involvement) and it would involve civil society in defining, installing and managing unused spaces across all districts. The city council provides temporary use for public entities or non-profit associations to develop temporary uses and activities (from one to three renewable years) in order to promote social activism and coexistence in the neighbourhood.

The District of San Martì is a good example for the implementation of the *Pla del Verd i de la Biodiversitat*, because it has a strategic position to connect the city centre with the north area; between the coastal corridor and the river Besos corridor. So, it has developed a plan for the implementation of the urban green network composed by fifteen basic green corridors: five vertical, five horizontal and five diagonals. The main corridors will be the connection axis between the urban natural area (Parc de la Ciutadel, Parc de les Glories, the beaches) and the out natural spaces. In this main framework, the implementation of superblocks frees up much of the space now occupied by private vehicles with potential green urban spaces. The integration between the basic green network and the potential natural extension to the Superblocks' inner streets can realize a new green area close to two million and a half square meters, Image 3.4.11.

Image 3.4.11: Sant Martì Green network



Source: S. Rueda, 2016. *La Supermanzana, nueva celula urbana para la construccion de un nuevo modelo funcional y urbanistico de Barcelona*. Available at www.bcnecologia.net. Accessed 21 December 2016, pag.28

3.4.7. Urban goods distribution

The distribution of goods is one of the urban activities that contribute mainly to generate traffic congestion. In fact, the distribution system generates an urban vehicular traffic estimated to 21.4% of total motorized traffic in the city (in 2011 were 447.815 trips vehicles compared 2.088.348 of journeys by private car). Moreover, the loading/unloading operations are illegal for 35% of the cases, because they are realized out of the designated spaces, stopping trucks in the middle of the street, in double row parking or on the sidewalks, generating circulation problems. However, this phenomenon is mainly due to the demand for L/U door to door, rather than the lack of supply of regulated places.

Therefore, the Pla de Mobilitat Urbana de Barcelona has proposed to renovate the urban goods distribution system, realizing a decentralized system through logistics platforms. It will be modified according to the Superblocks urban model proposed by the Agencia de Ecologia Urbana de Barcelona, considering the double street level of basic and inner streets, and counting the relevant increase of public spaces. It should improve the efficiency reducing the possible frictions with other urban uses, in particular with the public spaces. Moreover, it would reduce the number of illegal parking, locating the L/U spaces as close as possible to the door of the establishment, and decreasing the pressure of the vehicular traffic. Before to take action, it will be necessary analyse each neighbourhood depending on the most relevant aspects regarding the urban goods distribution such as the number of shops and activities, the shops' typology, the average time of

loading/unloading, the density of operations, etc. However, the new distribution system doesn't provide the same solution for the entire urban fabric, but it promotes a range of different solutions depending on the most appropriate operation for each context. The Agencia de Ecologia Urbana has suggested the following solutions:

- Defined slot times

The Urban Goods Distribution will be allowed into the inner streets only during certain hours of the day in order to minimize the negative externalities to the public space. These slot times will be defined according to the characteristics and needs of each superblock, considering the daily moments (school times, game time, lunch, etc) and trying to minimize the coexistence with them.

- Àrees de Proximitat (Neighbourhood platform)

The "*Arees de Proximitat*" are urban transhipment platform dedicated to the loading/unloading operations, which are realized for the urban goods distribution and for the last mile distribution. At the moment, the L/U operations have specific parking spots in all the streets, but the *Pla Urba* intends to redistribute the L/U platform on the intersections of the basic street network, so as to remove the traffic by the inner streets and reduce the noise and pollution. Nevertheless, at the moment some L/U platform will be maintained inside the Superblocks to serve mainly those establishments that use perishable goods, such as supermarkets, bars and restaurants, shops, frozen food, etc. Subsequently, the *Aree de Proximitat* will be equipped with information panels, application for smartphones, presence control of vehicles and a body manager in order to coordinate the operations and the rotation of seats.

- Centres de Distribució Urbana (Urban Distribution Centre)

The Urban Distribution Centres are logistics platforms designed by the Agencia de Ecologia Urbana not only for the goods transhipment but also to centralize and storage large volumes of goods for a Superblock or for more "Aree de Proximitat". They should be located on the basic street network so as to receive goods 24 hours/day, and it is proposed to use the first floor of the underground parking so as to have available more space for the storage. The location and the dimension of the CDU depend by the area that has to serve, by the number and the typology of activities, and by the existence of off-street infrastructure. The CDU should support the function of L/U platforms regarding the volume of goods to handle, especially when it comes to supply medium-sized or large

businesses that do not have unloading docks, and contribute to improving the degree of organization of mobility networks.

- Sustainable last mile distribution

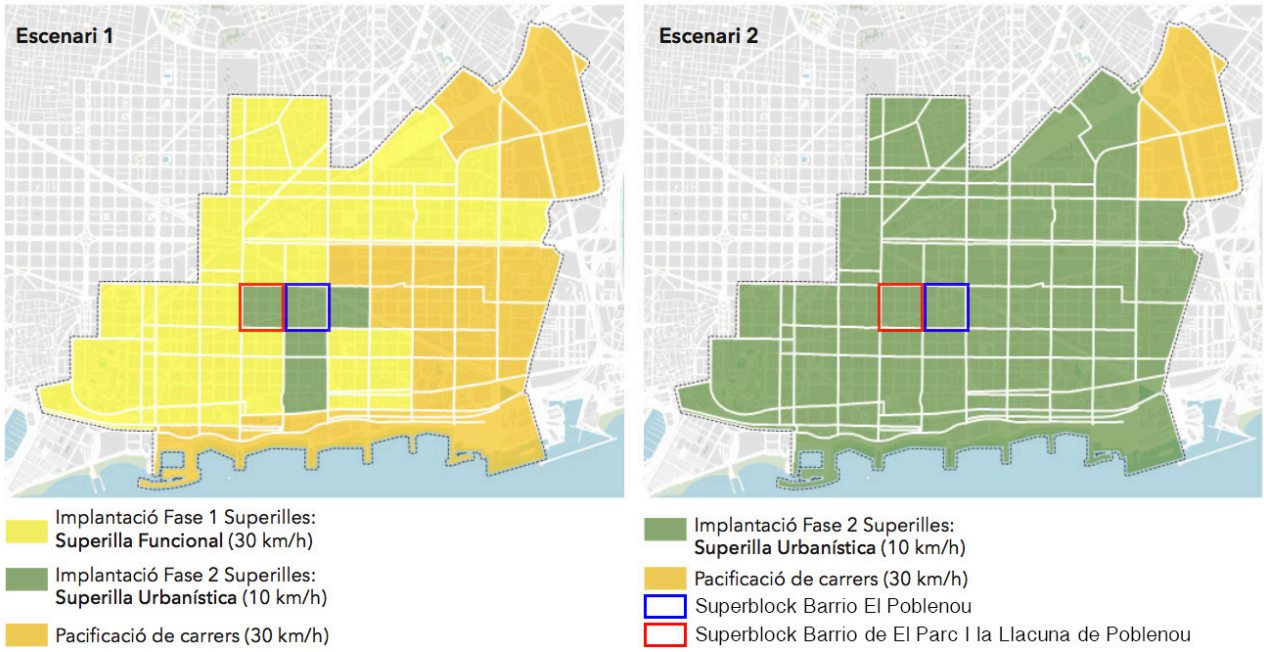
The Pla de Mobilitat Urbana promotes the introduction of low impact vehicles for the last mile distribution, from the Arees de Proximitat and the Urban Distribution Centres to the interior pacified Superblock. In fact, the use of vehicles like electric van, electric bike, cargo tricycle, could permit a goods distribution by the transhipment platforms to the local activities without any type of negative externalities on the public space. These solutions are not polluting, they do not produce noise and they are not invasive.

3.5. From theory to practice – Application at Superblock level

After the presentation of the urban scale, I analyse the Superblock dimension, in order to show the functional and structural solutions adopted, or ongoing of adoption, at the minimum urban scale for the implementation of the Superblock model. In fact, the urban Rueda's theory should be studied to be realize in the whole urban fabric, as a copy-paste model; nevertheless, the practice is very different by the theory and it's very important to study every single case, so as to implement the best solutions encouraging the citizen to develop a sustainable life style. So, the Department of Ecology, Urban Planning and Mobility is working to transport to the reality the theoretical proposals of the Ecological Urbanism, adopting alternative urban strategies depending on the different neighbourhoods. In my report, I describe the features of the Superblocks model as already used in the previously paragraph for the urban scale, in order to maintain the double vision: urban and district dimension. The urban solutions showed, don't belong to a singular Superblock but they correspond to the several Superblocks implemented by the different neighbourhoods' programs. In fact, the Superblock model was adopted for the first time in the historical city centre (*Barrio El Raval and Barrio El El Gotic*), in the Gracia District and in some historical neighbourhoods (*Barrio Maternitat I Sant Ramon and Barrio de Sants I Hostafranc*). The last pilot project started in 2016, and for the first time it was applied to the Cerdà Grid in the Sant Martì District, "*Barrio de El Parc I la Llacuna de Poblenou"*. Therefore, in my research I have analysed in particular this project, which represents the last and biggest challenge for the Administration, but I maintaine a continuously comparison between the different projects. Moreover, thanks to the survey on Barcelona I have reported with photos the current situation in order to demonstrate in a visual way the difference between the theory and the practice.

Before to present the Superblock's features, it is necessary to explain the history of the new Poblenou pilot project, because it had an implementation process completely independently by the urban program "*Omplim de vida els carrers*". In fact, with the first Superblocks program "*Barris a velocitat humana*" the Department has chosen the Superblock "*Barrio el Poblenou*" (also called *Rambla del Poblenou*) like the pilot area for the Sant Martì District, Image 3.2.1. However, it was only partially realized and it was introduced again in the following Superblocks program "*Oplim de vida els Carrer*", proposing two more superblocks under it, Image 3.3.1.

Image 3.5.1: Scenario for the implementation of the Superblocks in the *Sant Martì* District



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag 28.

Subsequently, with the redaction of the Action plan of the Sant Martì District "*INFORME. Pla d'Espai Públic i Mobilitat*" the District has proposed a new extended pilot area with five Superblocks, creating a "T" that should be implemented in a structural way before the 2019, Image 3.5.1. It was supposed that in this new "T" scheme the Superblock "*Barrio el Poblenou"* had to be the first Superblock to be concluded, because it was the oldest project and the participatory process was already done. Nevertheless, it didn't work and the close Superblock "*Barrio de El Parc I la Llacuna de Poblenou*" was the first Superblock to be implemented. The *Agencia de Ecologia Urbana* was the main actor of the implementation process that was presented as a Pop-Up project. It was organized a workshop in collaboration with the *Universidad Internacional de Catalunia* (UIC), since 5 to 12 of September, where 200 architecture students had to study the Superblock model proposed by Rueda in order to suggest how to reuse of the new free space. They have occupied the space of the four intersections, using waste material and creating new temporary street furniture in order to make known the potential uses of the structural implementation of the Superblock (Salvatodor Rueda, 2016). The workshop hadn't civil oppositions due to its temporary nature, and there was a lot of participation during the two testing weeks. However, the decision to extend the pilot period until the end of the year

has generated a lot of problems (Rosa Saiz, 2016). Firstly, for the city's technicians that haven't a sufficient preparation for a long process, neither on the technical aspect neither on the social aspects, and secondly for the citizens that have been advised just for a workshop of two weeks and not for a four months process. Therefore, a project that was thought with a short life became a permanent project, forcing the Department of Ecology, Urban Planning and Mobility to work in process in order to find a solution to the problems emerging. Moreover, the participation process realized before the two weeks workshop was not sufficient for the long period, so it was necessary implementing it with new meetings and public discussions in order to involve the citizens in the Superblock project (Laila Torres Sagrsità, 2016). Anyway, the workshop was very useful to the citizens because it has permitted to see with their own eyes the Superblock model that the Administration would implement in the whole city. Nevertheless, the workshop's proposal had a start and a conclusion, with a precisely deadline of two weeks, and so the decision to extend the pilot period has generated a lot of confusion in the citizens. The public opinion was divided in favour and against the Superblock project. It was born a *Col-lectiu* that supports the implementation of the Superblock; they criticize the lack of participation occurred by the Administration in the adoption phase of the model, however promoting the new urban model with some modifications. At the opposite side, there is the group *NO Superilla* that is organizing a referendum to stop the pilot project "*Barrio de El Parc I la Llacuna de Poblenou*" and the entire project of the Superblocks in Barcelona. The particularity of these groups is that the first one is mainly composed by people who live inside the Superblock; while the group *NO Superilla* is composed by residents out of the Superblock (Silvia Casorràn, 2016).

Despite the public objections at the end of 2016 the pilot project was confirmed and now it's very difficult that the Administration could come back and restore the previously mobility system. Of course, there will be some changes in the application of the Rueda's model, in order to adapt the theory to the reality. However, the Superblock model will be probably extended in the functional way during the next years, and it will be gradually transformed in the structural way depending on the economic and social possibilities. Currently the Superblock "*Barrio de El Parc I la Llacuna de Poblenou"* is the only one Superblock implemented in the Cerdà grid, and after the first pilot phase the Department of Ecology has activated the second functional phase. Starting since February 2017, for a

period of four months, the Superblock will be modified in order to find the best urban solution, introducing new functional application (temporary trees, street furniture, etc.) useful to increase the people participation to the project. Finally, the Superblock will be transformed in the structural way only when the different actors involved in the project, mainly the Administration and the District, believe that it will be the time to finalize the urban transformation.

3.5.1. Motorization Private Network

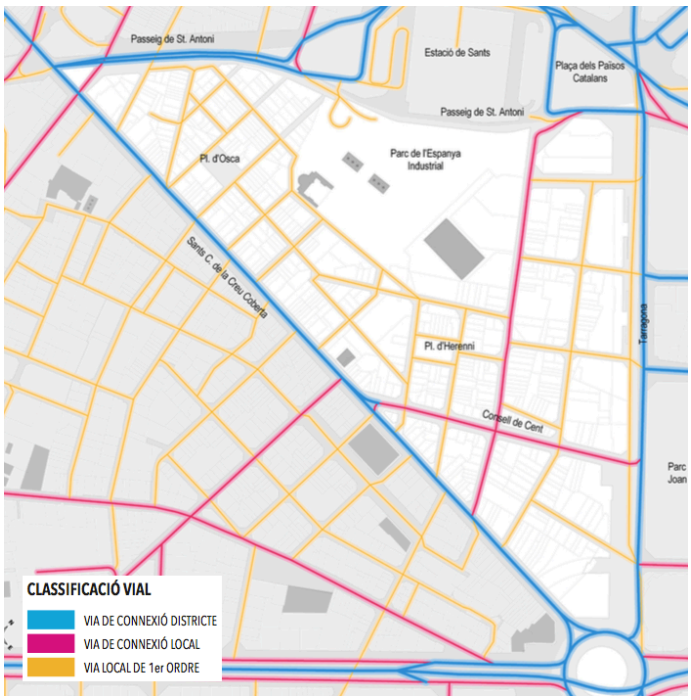
The reduction of the traffic is one of the main goals for the Barcelona Administration in order to implement a city more healthy and liveable. Therefore, already from the first Superblock projects the urban Department of Ecology, Urban Planning and Mobility has implemented new urban solutions, so as to reduce the traffic speed and discourage the car mobility. The firsts interventions were realized in the historical city centre (*Barrio El Raval and Barrio El Gotic*), in order to reduce the presence of motorized vehicles and realize pedestrian zones. The streets were closed by several structural interventions, for instance with retractable or "rising" bollards, video security systems and realizing limited traffic zone. Moreover, all the street parks were removed placing street bollards to avoid also the temporary parking. In this way it was possible to confer the priority to the pedestrians, ensuring the passage of the resident's vehicles and of the service vehicles. The adopted solutions were very useful to increment the urban quality, removing almost completely the traffic by the inner streets and implementing the liveability of the oldest neighbourhoods, Photo 3.5.1. Subsequently, it's possible to recognize street interventions for the modification of the motorized private network realized in the District of Gracia and during the first Superblock program "*Barris a velocitat humana*" (*Barrio Maternitat I Sant Ramon* and *Barrio de Sants I Hostafranc*). In both the cases the pilot projects were part of a Superblock program that wasn't implemented completely due to the relevant protests of the people that have obstructed the projects. Nevertheless, the neighbourhoods were considered as big Superblocks and the structural interventions applied on the inner roadway are sufficient to identify the Superblock's ideas for the motorized private network. The neighbourhoods became zones 30, presenting road sign on the ground at the access points, but without any types of restrictions. However, even if the entrance is possible to everyone, the hierarchy of the inner streets was modified in order to discourage the and

Photo 3.5.1:Inner streets District Ciutat Vella, Barrio Gotic and El Rava

Source: Personal photo, 22 November 2016

permits only to those who really need to pass, Image 3.5.2. In this way it was possible to reduce the traffic and release the streets by the cars. The Superblock/Zone30 realized on the bases of the existent neighbourhoods are bigger than the Superblocks promoted for the Cerdà grid (400x400 meters). Therefore, it was possible to implement three streets' levels inside them:

Image 3.5.2: Road hierarchy Superblock *Barrio de Sants I Hostafranc,* Distric Sants-Montjuïc.



Source: Ajuntament de Barcelona, *Àmbit Pilot de Superilles, Districte de Sants-Montjuïc*, Barcelona, 2016, pag.39

- 30 km/h streets, Photo 3.5.2: Since the neighbourhoods are bigger than the Superblock implemented in the Eixample (3x3 blocks), it's necessary to maintain some flow streets. These roads have been modified structurally in order to reduce the car lane and increase the sidewalks, however maintaining a levels' separation for the streets users. Moreover, they are usually one-way traffic so as to reducing the risk of accident and so as to direct the traffic.
- 10 km/h streets, Photo 3.5.2: The second level represents the local streets, as they will appear also in the new Superblock. One street level, where the space is shared between cars, cyclists, and pedestrian, but in which the slow mobility has the priority. The streets were modified using different asphalts and applying street bollard, in order to characterize the streets and to remove the car parking so as to encourage the citizens to repossess of these new public spaces.
- Pedestrian streets, Photo 3.5.2: The third level represents the streets or the squares that were completely closed to the car traffic and that became pedestrian areas.

The modification of the private network didn't obtain the expected support by the citizens, and the participation process activated weren't sufficient to involve the population in a common process. Nevertheless, the interventions implemented during the years have increased considerably the urban quality and today these neighbourhoods, especially

Photo 3.5.2: Inner streets (30km/h; 10km/h; pedestrian) Barrio de Sants I Hostafranc

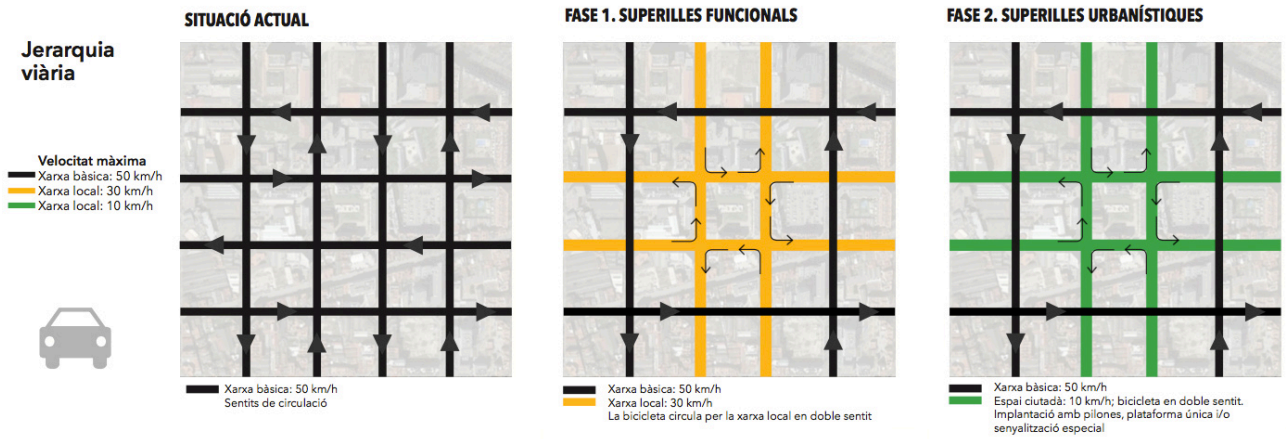
Source: Personal photo, 15 December 2016

Gracia, are examples to follow for the urban restoration program "*Oplime de vida els*". In fact, during my research several citizens have affirmed positive opinions in regard to the urban solutions adopted in the District of *Les Corts* or *Sant Montjuc*, supporting the advantages and the benefits generated on the urban quality. Moreover, this result is reinforced also by the real estate market's data, which has demonstrated a growth in the housing price of the neighbourhoods and a relevant interest by the economic activities. However, the success of the interventions was mainly due to the original urban fabric, in fact the small dimension of the inner streets and the shape of the ancient villages have permitted to influence considerably the urban perception of the streets, the people life styles and to change the mobility habits that are actually too much limited by the use of the car.

The implementation of the new street network (Image 3.4.1) is a big challenge for the Administration because a lot of people consider irrational to limit the circulation where the streets are so wide than seem to be built exactly for the car traffic. Nevertheless, the new Superblocks Program has adopted the urban solution designed by the *Agencia de Ecologia Urbana* in order to pedestrianize the local streets and transform the inner Superblocks. The first pilot project was implemented in the *Barrio El Parc I la llacuna de Poblenou*, District de San Martì, in September 2016 with a temporary intervention in order to modify the functions of the streets. The inner streets of the Superblocks haven't been closed but the car lane was made smaller and it was interrupted the orthogonality of the Cerdà grid creating four rings (*boucles*), that have to force the cars to turn at the first intersection describing a loop input-output back to the basic road network (Image 3.5.3). Therefore, even if there isn't any type of restriction at the entrance of the Superblocks, the inner structure should prevent the crossing traffic, directing it on the basic network. This particular solution would recreate the same situation present in the old neighbourhoods, enforcing the car in small lane and leaving the public space to the citizens. In the first implementation phase the speed limit is 30 km/h, so as to permit a transition period for the adaptation of the citizens to the new urban structure. Subsequently the inner streets can be modified in a structural way and the speed limit will be decrease to 10 km/h. In this way, the inner Superblocks streets will be a unique space at the same road level, which freed by the excessive traffic will permit a more efficient use of the public space by the residents, economic activities and all the city users. This solution is useful to generate a risk

perception on the car drivers, able to keep alert them in favour to the other street's users. When the new urban model will be adopted completely it will be possible to modify the streets in a strong way, implementing structural intervention able to modify the shape and the function of the new public space. At this moment, there aren't concrete projects for the streets' renovation but the technicians of the Urban Department don't exclude intervention to remove asphalt and reintroduce permeable soil.

Image 3.5.3: New Superblock's streets structure and implementation phases.



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag35.

As I have showed in the second chapter, the Ecological Urbanism promotes a Sustainability Indicator System in order to validate the interventions implemented to the urban habitat. Therefore, the Barcelona Administration has adopted part of these indicators so as to assess to the urban transformation currently underway. In regard to the new motorized network, it can be valuated with the indicator 15th "*Road space with access restricted from pass-through vehicles"*. This indicator calculates the percentage of road surface used for pedestrian transit with restricted from pass-through vehicles in relation to the total road system (Minimum objective: >60% with access restricted; Desirable objective: >75% with access restricted).

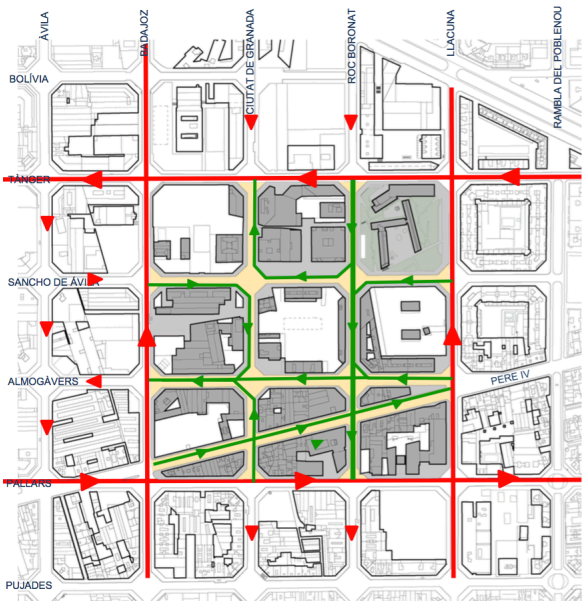
At the moment of my survey to the pilot Superblock, between November and December 2016, the implementation of the first functional phase was already done, and the new road structure was perfectly as the Superblock model proposed by the *Agencia de Ecologia Urbana*, Photo 3.5.3. In fact, it was emerged that the Rueada's scheme is too strict for the case of "*Barrio de El Parc I la Llacuna de Poblenou*" and it is not adaptable to the

particularities of the neighbourhood. In particular two problems appeared about the streets network generating a big debate on its functionality:

- The totally lack of choice for the car driver. While the Superblock in the Gracia or Les Cortes Districts presents a inner roads hierarchy, which permits at least two choice for the drivers, in the Eixample the smaller dimension of the Superblock and the boucles system don't permit any choice. It was proposed to modify the loops system and promote two alternative routes.
- The basic streets directions. Implementing the Supergrid network it was emerged that the two basic streets around the Superblock have the same direction, south - north. So, it was proposed to leave open the street Roc Boronat, in order to preserve the connection north - south.

So, the Administration, the District, and the Urban Department according to the citizens' proposals have defined an alternative solution, Image 3.5.4. The result has modified strongly the boucle system, giving more flexibility, and continuity to the directions of movement (*Roc Boronat* and *Almogàversthe*) but reintroducing the possibility to pass through the Superblock. Anyway, in March the road structure was changed again, and in the currently situation not all the inner streets are crossed by a car lane; so the pilot project is still being tested, Photo 3.5.4.

Image 3.5.4: New Superblock's inner streets



Source: Ajuntament de Barcelona, Oplim de vida els carer, 2016

Photo 3.5.3: Inner streets District Poblenou, Barrio de El Parc I la Llacuna de Poblenou (2016)

Source: Personal photo, 15 December 2016

Photo 3.5.4: Inner streets District Poblenou, Barrio de El Parc I la Llacuna de Poblenou (2017)

Source: Photo by Alessandro Laspia, 31 March 2017

3.5.2. Parking

The parking policy represents one of the most relevant interventions of the new *Plan de Movilidad Urbana de Barcelona*, in order to reduce the car traffic and encourage the people to use sustainable mobility systems. Therefore, the Barcelona's Administration has decided from several years to reduce the number of the on-street parking, freeing street's public space and encouraging people to avoid the car for the short urban journey. Moreover, the Administration has adopted a differentiated on-street parking system for the different users, starting from the first Superblock programs in the historical city centre and in the Gracia district.

ON-Street parking, Photo 3.5.5:

- *Blue area*: these places can be used by everyone but the parking time is limited and they are pay and display parking (the average fee is 2,25 €/hour);
- *Mixed green area*: in these parking the residents of the area concerned can park paying a fewer fee (the average fee is 0,20 €/day), whereas the other users have a higher price (the average fee is 3,00 €/hour);
- *Green area residents*: in these areas the vehicle's residents have the exclusive priority;
- *Reserved*: these places can be used only by specific vehicles (emergency's vehicles);
- *Disabled*: these places are reserved specifically for people with reduced mobility;
- *Loading and unloading*: these parking spaces are destined for those vehicles that necessity to load/unload goods for economic activities in the area. This function is reserved to a specific time slot, from 8 pm to 20 pm and the time of stay per vehicle is limited to 30 minutes.
- *Free parking*: these places are not regulated.

Due to the reduction of the on-street parking, it's very important to cover the demand for residential parking with the off-street parking. So, the public and the private actors work to maintain a balance between supply and demand with the presence of big off-street parking. These types of parking are usually underground, built under the new construction or located on the ground and first floor of the old buildings. Moreover can be considered off-street parking also the parking in the urban voids or in space not used, that become a public space for the parking.

OFF-Street parking, Photo 3.5.?:

Photo 3.5.5: OFF-Street parking

ON-street parking: Green area and Reserved

OFF-street parking: Private residential parking

ON-street parking: Green area residents

OFF-street parking: Public parking

ON-street parking: Blue and L/U area

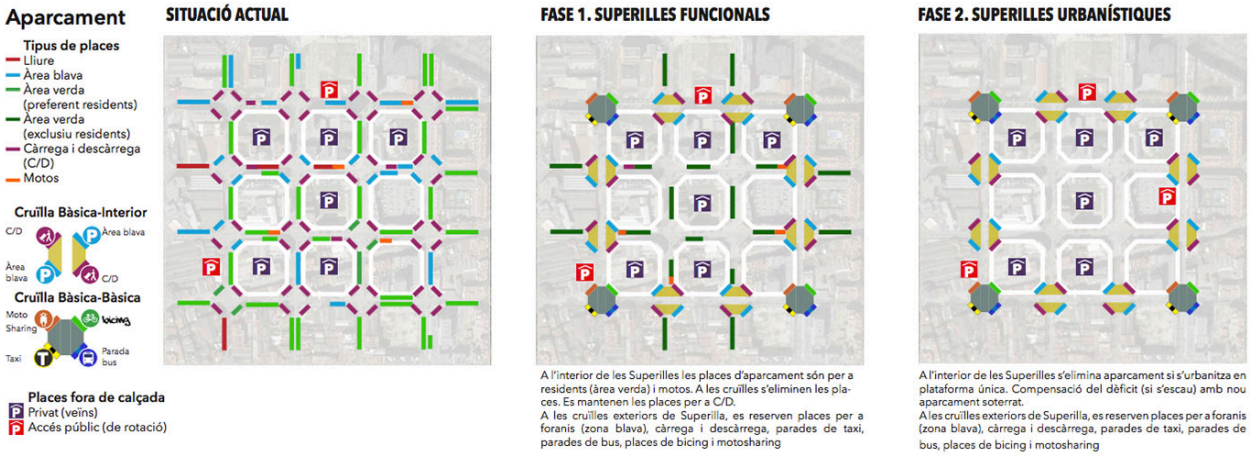
OFF-street parking: Public parking

Source: Personal photo, Barcelona, December 2016

- *Private parking*: these parking are usually underground, directly connect to the residences and accessible only by the residents that have their own car park.
- *Public parking*: these parking are managed by public or private actors but in both the cases are accessible by everyone. Their condition of parking time and fees depends by the single parking.

Regarding the parking policy into the Superblock the Administration has adopted a strong strategy. In fact, according to the *Ecological Urbanism* and the *Plan de Movilidad Urbana*, the Urban Department has designed a Superblock model for the Example without parking spaces in the inner streets. The aim is to change completely the use of the streets, discouraging the crossing traffic through and removing almost completely the on-street parking spaces (Image 3.5.5). In the first phase of the Superblock implementation the elimination of seats will be more or less extensive depending on the existing deficit and the possibility or not to build new underground parking. The not-resident drivers will be forced to use the parking located long the basic streets at the nodes between inners street and the basic street, where there will be free parking spaces (Blue area), while it will be possible for the residents to parking inside the Superblock (Green area residents).

Image 3.5.5: Implementation of the on-street and off-street parking system.



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag140.

As a result of the elimination of on-streets parking, it becomes necessary to build new off-street parking, so as to compensate the loss of car places and to balance the parking deficit. During the second phase, it needs to provide new car places in order to supply both the demand of residents and non-residents. For the resident, it's possible to integrate

the parking space to the residences, but for the not-residents, it would be desirable to locate the car parks on the Superblocks' edges, in order to facilitate the accessibility by the basic network and avoid the possible movement of vehicles within the area pacified. Moreover, the Mobility Plan has defined also the reorganization of motorcycle parking so as to eliminate the places located in the inner sections, creating specific parking at the basic intersections.

The sustainable indicator system has two specific indicators in order to calculate if the parking policies adopted follow the Ecological Urbanism theory. The indicators are the 17th "*Off road vehicle parking"* and the 18th *"Coverage of the demand for vehicle parking".* The first one reports the percentage of vehicle parking spots located off-road (Minimum objective: 1 space/home and >80% off-road parking; Desirable objective: 1 space/home and >90%). The second indicator measures the difference between demand of parking and supply by off-street parking lots (Minimum objective: < 25% parking lot deficit; Desirable objective: < 10% parking lot deficit).

During of my survey in Barcelona the first functional phase was already implemented, and the parking system was completely changed. In the inner streets, almost all the *Blue area* parking have been removed in order to create new public spaces, and it has been preserved only one parking line for each of the inner streets, transforming it in *Green area residents* parking. At the same time the Administration has increased the parking fee for the *Blue area* so as to discourage the private car mobility. Moreover, the Urban department was implementing also the transformation of the basic road intersections; they will present places for the private parking and L/U operations in the basic-local street intersection, and places for the motor vehicles, taxi, bike sharing and bus stop in the basic-basic street intersection, Photo 3.5.6.

Photo 3.5.6: Parking area District Poblenou, Barrio de El Parc I la Llacuna de Poblenou (2016)

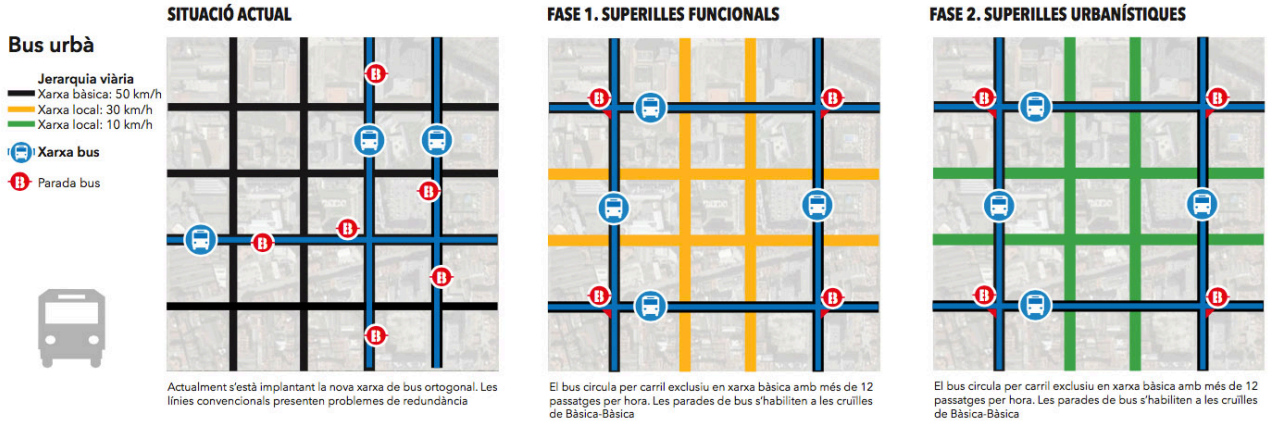
Source: Personal photo, December 2016

3.5.3. Public transport

The new bus network "*Xarxa de Bus*" of Barcelona is the most relevant intervention promoted by the *Plan de Movilidad Urbana* in order to increase the use of the public transport services. It is on going of renovation since 2013, when the Administration has started a restoration of the overall mobility system, implementing the Superblock model and subdividing the road network in basic streets and inner streets. The bus network was adapted to the Supergrid and the bus lines have been moved on the basic streets, so as to realize a new orthogonal system able to cover the entire city more efficiently. In this way the Administration free the inner streets by the vehicles of the public transport, concentrating all the motorized traffic on the basic roads. In those Superblocks that are not part of the Cerdà grid the new *Xarxa de Bus* has been adapted to the streets' hierarchy, because they are usually too big to remove completely the inner bus lines. So, according to the motorized local network there are some bus lines that pass through these Superblocks, like in the Superblocks of *Sants Hostafrancs* and *Gracia* district, so as to ensure a minimum distance to the bus stops for all the citizens, Photos 3.5.7.

The bus network is almost completed and also the Superblocks into the Cerdà's grid have been absorbed by the new bus tracks. The implementation phase is easier than the other issues because it is not necessary any structural transformations. In fact, the bus line will be moved on the basic streets and the bus stops will be locate on the intersection between the main roads in order to facilitate transfers with the other mobility systems, Image 3.5.6.

Image 3.5.6: Implementation of the bus network.



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag77.

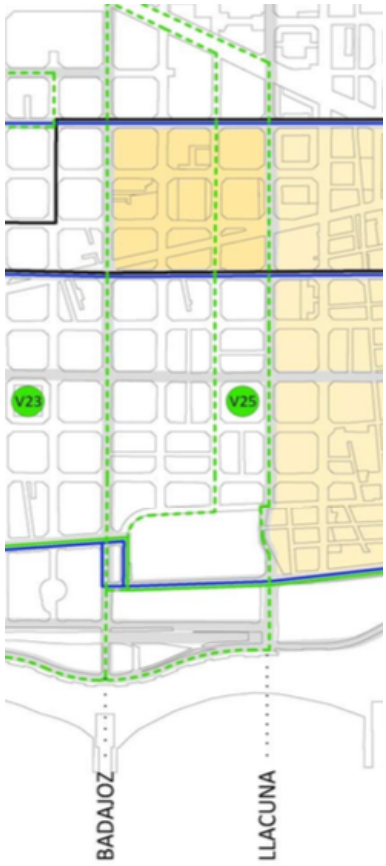
Photo 3.5.7: *Xarxa de Bus*, Gracia and Poblenou District (2016)

Source: Personal photo, December 2016

The new shape of the bus system has been implemented to reduce the travel times, increase the number of daily passenger and simplify the use of the public service. However, also the *Xarxa de Bus* has been analysed by the Sustainable indicator system and in particular by the indicator 14th *Simultaneous proximity to transport network alternatives to private vehicle"*. This indicator calculates the proximity to the bus network (Minimum objective: bus stop <300 meters away for a minimum of 80% of the population; Desirable objective: bus stop <300 meters away for the 100% of the population).

Regarding the Superblock "*Barrio de El Parc I la Llacuna de Poblenou"*, the old bus network didn't pass in these streets so the implementation of the new bus grid will not generate structural changes. However, it has emerged during the implementation of the Supergrid that the basic streets (*Badajoz* and *Llacuna)* around the Superblock have the same way, from south to north. Therefore, the Urban Department has supposed to open the street *Roc Boronat*, Image 3.5.7, inside the Superblock, in order to preserve the double direction. In this way, the new bus network will be adapted to this solution and the bus line V25 will pass through to the Superblock.

Image 3.5.7: New bus network



Source: Ajuntament de Barcelona, Oplim de vida els carer, 2016

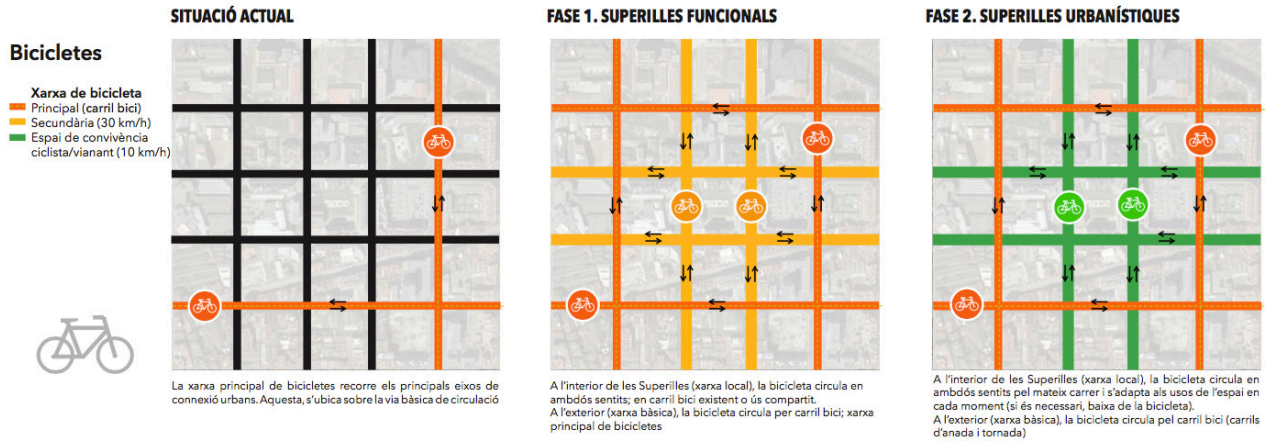
3.5.4. Bicycle mobility

The bicycle is the best vehicle for the urban movements. It provides a high degree of autonomy and mobility, it is healthy and quiet, it is easy to park, it can be combined with other transport's systems, and it is the most energy efficient urban transport. So, during the previously Superblock projects the Administration has already proposed functional and structural interventions in order to simplify the cycling mobility and encourage the citizens to approach this sustainable mobility. In the case of Gracia Superblock the Urban Department has suggest to renovate the bicycle network of the district, defining two spaces for the cycle mobility. Firstly, the local bicycle network has been related with the urban grid, introducing some cycle paths that cross the entire district, independent by the

road section and able to ensure a greater safety for cyclists. Secondly, the Urban Department has defined the inner streets of the district as a common space for all the streets users, introducing a co-existence and co-responsibility system between the people. The road section has been unified simplifying the mobility movements and increasing the accessibility to the cyclists.

As I have already explained, the *Pla de Mobilitat Urbana* has proposed again for the new urban model the double cycling network at the urban scale: the Basic network and the Superblocks' inner streets. In this way the implementation of the two networks in the Superblock model can be realized separately, ensuring in short time all the necessities for the urban cycling mobility. The basic level is an exclusive bicycle lane completely integrated with the new Barcelona's Supergrid, which will run along the basic roads, so as to permit higher speeds and more street safety for the long urban journeys. It can be realized without structural interventions just limiting the road space for the cars and increasing the kilometres of bicycle path. Conversely, the implementation process of the second cycle level is divided in two phases, Image 3.5.8. It is strictly related to the

Image 3.5.8: Implementation of the cycling networks.



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag92.

functional transformation of the inner road spaces of the Superblock, so as to depend by the modification of the motorized private network. So, as previously presented, during the first phase the inner streets become a sort of 30 zone, interrupting the linearity of the Cerdà grid for the car mobility but allowing the completely freedom to the bicycles that can move in both the directions. The bicycle can use the entire road space, sharing the car lane with other vehicles and the public space with the pedestrians. Nevertheless, due to

the pedestrian has the priority in the new inner streets the bycicles have to reduce their speed, so in the second phase the speed limit will be reduced to 10 km/h, ensuring a safety situation and a mutual respect by all the street users. Moreover, the Administration, according to the Ecological Urbanism's theory, has defined some interventions for each Superblocks in order to foster the bicycle mobility. First of all, it would be guaranteed a minimum bicycle parking with these quantities: Residence_2 places/100m2; Work place_1 places/100m2; Facilities_5 places/100m2; Train and bus stations_1/0,5 places/30 places for circulations. The parking spaces for bicycles on-street should be at least 10% of places available for cars that could be increased with the creation of new parking in the ground floor of the building that are currently unused. Moreover, the Administration want promote the diffusion of the bike sharing system "Bicing" and the intermodality bicycle-public transport. So, it has been designed to add new Bicing stations at the basic nodes, in correspondence of the new bus stops and of the basic bicycle network, in order to facilitate the transfer between public transport and urban cycle network.

In regard to the bicycle mobility the Sustainable indicator system provided by the Ecological Urbanism has identified two criteria of analysis: the 14th *Simultaneous proximity to transport network alternatives to private vehicle*, and the 16th *Bicycle parking*. The first one want calculates the proximity to the basic bicycle network (Minimum objective: bike path < 300 meters away for a minimum of 80% of the population; Desirable objective: bike path < 300 meters away for the 100% of the population). Despite, the second indicator analyses the number of bikes parking (Minimum objective: bike coverage parking <100 meters away for more than the 80% of the population; Desirable objective: bike coverage parking <100 meters away for the 100% of the population).

According to the basic bicycle network proposed by the *Agencia de Ecologia Urbana de Barcelona* (Image 3.4.6). the main cycle path would have to pass around the Superblock "*Barrio de El Parc I la Llacuna de Poblenou"*. Nevertheless, the Supergrid proposed didn't consider the existing bicycle path that herepass through the Superblock, Image 3.5.9 (Sancho de Avilla and Ciutat de Granada). So, at the moment, it's possible to detect the tracks reserved to the bicycle by the red asphalt, until the Superblock where they disappear and start again at the end of the Superblock. Over time, the basic bicycle network will be moved on the future Supergid and the bicycle lane on the left side, the bus lane on the right side, and the car lane in the middle will share the street section.

Photo 3.5.8: Bicycle network Poblenou District (2016)

Basic bicycle path: basic street network

Local bicycle network: Superblock's inner road

Basic bicycle path: node basic street network

Local bicycle network: Superblock's node

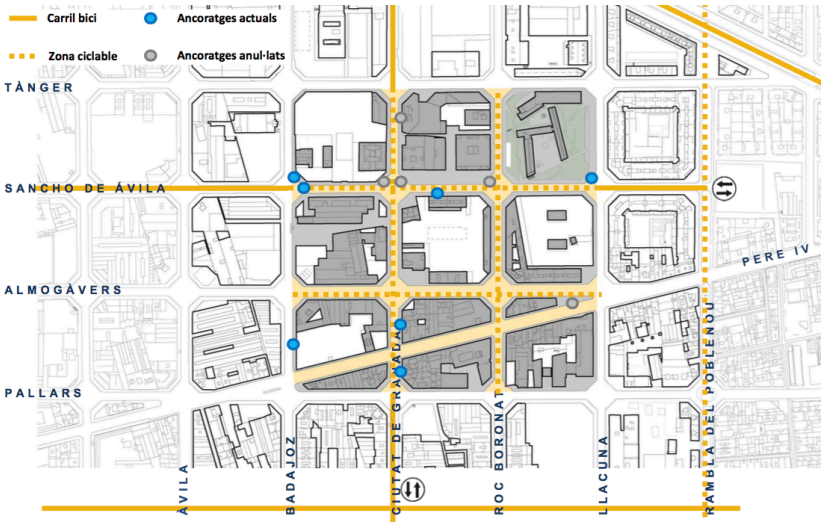
Basic bicycle path: basic street network

Local bicycle network: local street

Source: Personal photo, Barcelona, December 2016

Regarding the local bicycle network, it has been implemented in a functional way, reducing the dimension of the car lane and designing on it horizontal road signs in order to remember the cycle priority. Therefore, the bicycles can move in both directions, but they don't have a dedicated lane because all the streets users, pedestrians, cyclists and car drivers, must share the new space configuration. In this sense, the Department wants to implement a natural speed reduction, prioritizing the slow mobility and to demonstrate how the bicycle could become the private vehicle most useful and convenient, Photo 3.5.8.

Image 3.5.9: Cycling networks in the Poblenou Superblock



Source: Ajuntament de Barcelona, Oplim de vida els carer, 2016

3.5.5. Pedestrian network and public space

The main goal of the Superblocks' model is to restore the Cerdà's concept of the street's space, considering the inner streets not only like a mobility space but rather as a public space able to increase the urban complexity, the human coexistence and the social cohesion. The administration with this new urban model would to remove space for cars mobility and give it back to the citizens, creating a new habitable surface road, safer and more attractive where the pedestrians have the priority.

During the previously Superblock programs the Administration has already started the pedestrianization of the inner streets in the pilot areas. However, due to the bigger dimension of the Superblocks the Urban Department managed the local streets in some different ways. In some case the streets were completely closed to the vehicular traffic, while in other cases the streets have been left opened to the residential traffic. For instance, during the firsts pilot project in the district of Ciutat Vella, the little streets of the historical city centre were completely closed to the traffic in order to simplify the pedestrian mobility of tourists and city users, that move daily to the Catalonia capital. Conversely in the Gracia district the streets have been left opened to the traffic, but it was possible to

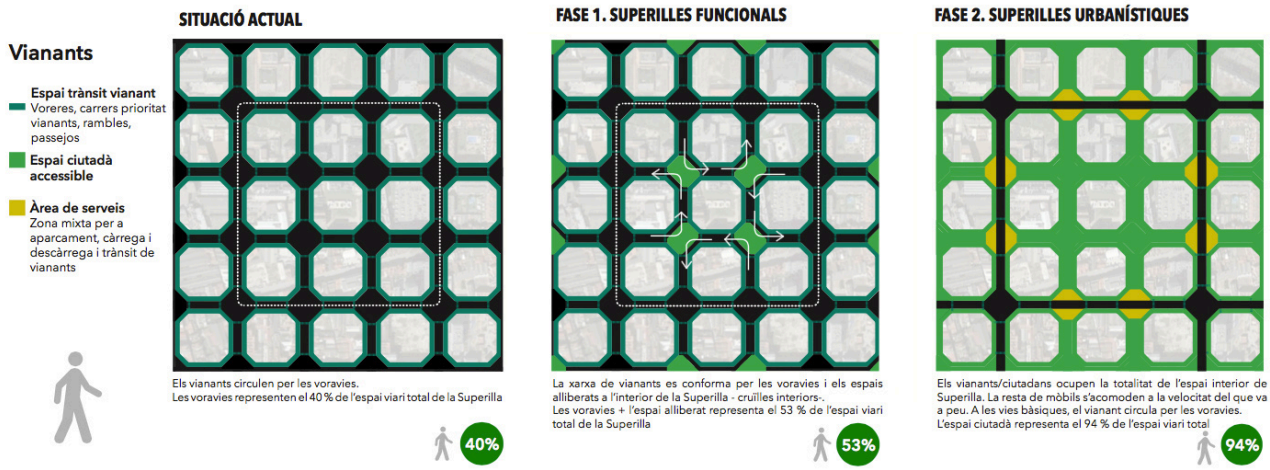
Photo 3.5.9: Pedestrian network and public space in Ciutat Vella and Gracia District (2016)

Source: Personal photos, December 2016

realize a unique street platform for the pedestrian network introducing structural transformations on the road level, in order to remove any step between the sidewalks and the roadway. For instance, it was introduced a different pavement material in order to distinguish the car lane; they were introduced street furniture so to discourage the on-street parking; they were introduced new green elements. These interventions were able to discourage the vehicular traffic, increasing the space for pedestrian/cyclists, growth the pedestrian accessibility, remove the physical barriers, and create a higher urban quality, Photos 3.5.9.

Regarding to the Superblock proposed in the Cerdà grid, the Administration would implement the same model of the old projects, realizing a unique space network in the whole inner streets in order to encourage the pedestrian mobility, Image 3.5.10. Now, the amount of space for the pedestrian mobility in a Superblock corresponds to the 40%, and the streets have generally a speed limit of 50Km/h. The Urban Department has planned a first functional phase in order to simplify the passage for the citizens to the structural transformation. In the first step, it is expected to transform each Superblock in a 30 zone, introducing the "U" loops, and creating spaces for staying at crossroads. In this phase, the street section remains the same, with a structural gap between sidewalk and roadway, but

Image 3.5.10: Increased space for pedestrians in the interiors of the superblock in the Cerdà Grid



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag60.

introducing changes in the horizontal and vertical signage. The new inner space, along with the sidewalks, represents the 53% of the road space of the superblock. Moreover, the Urban Department proposes to restrict the speed in the inner streets to 30 km/h on

weekdays and 10 km/h on holidays. During the second phase, it will be implemented the physical transformation of the entire interior streets platform. This ensures total accessibility to the road section and priority for pedestrian mobility, representing the 94% of total Superblock road space. In this way, it will be completed the main goal of the Ecological Urbanism, that would ensure the street space to the public life. The car speed has to be reduced compulsory to the 10 Km/h.

The pedestrian interventions proposed for the Cerdà grid are calculated by two indicators of the sustainable system proposed by the *Agencia de Ecologismo Urbano*: the 9th *The road accessibility* and the 10th *The road space reserved for pedestrian*. The first one calculates the accessibility of the streets, calculating the width of the sidewalks and the slope of the stretch (Minimum objective: >90% of the streets with sufficient accessibility, sidewalk ≥2.5m and slope <6%). The second one ensures the presence of pedestrian routs without any friction with the motor vehicles traffic (Minimum objective: >60% of the road space reserved for pedestrian mobility).

Regarding the Poblenou pilot project, the first functional phase is currently on going of implementation. As already said, the project started with a two weeks workshop organized by the Agencia de Eologia Urbana de Barcelona, during which it was started the functional transformation of the inner streets. The streets have been coloured in those new spaces destined to the pedestrian mobility, in order to simplify the appropriation of the road and to highlight the new car lanes. The four inner intersections have become four squares able to connect the pedestrian sidewalk around the single blocks and they have been equipped with street furniture in order to host meeting and public events, Photos 3.5.10. During my survey on Barcelona, the Poblenou pilot project was ending the testing period for the functional interventions, so it was possible for me to see how the inner streets have been transformed and to understand what doubts have been raised about its effective functionality. In fact, the population was divided in two opinions, pro and against the project. Who thinks that the project could be a great solution is usually someone who lives inside the Superblock, and that underline the drastic traffic reduction in favour to a better urban quality life, in spite of the streets don't represent yet a real public space (Silvia Casorràn, 2016). On the other hand, who live outside the Superblock considers this solution controversial because it limits the car space in favour of a public space that, expect for the weekend, is always empty and unused (Ana, 2016). The lack of

Photo 3.5.10: Local streets District Poblenou, Barrio de El Parc I la Llacuna de Poblenou (2016)

Source: Personal photos, December 2016

Photo 3.5.11: Local streets District Poblenou, Barrio de El Parc I la Llacuna de Poblenou (2017)

Source: Photos by Alessandro Laspia, 31 March 2017

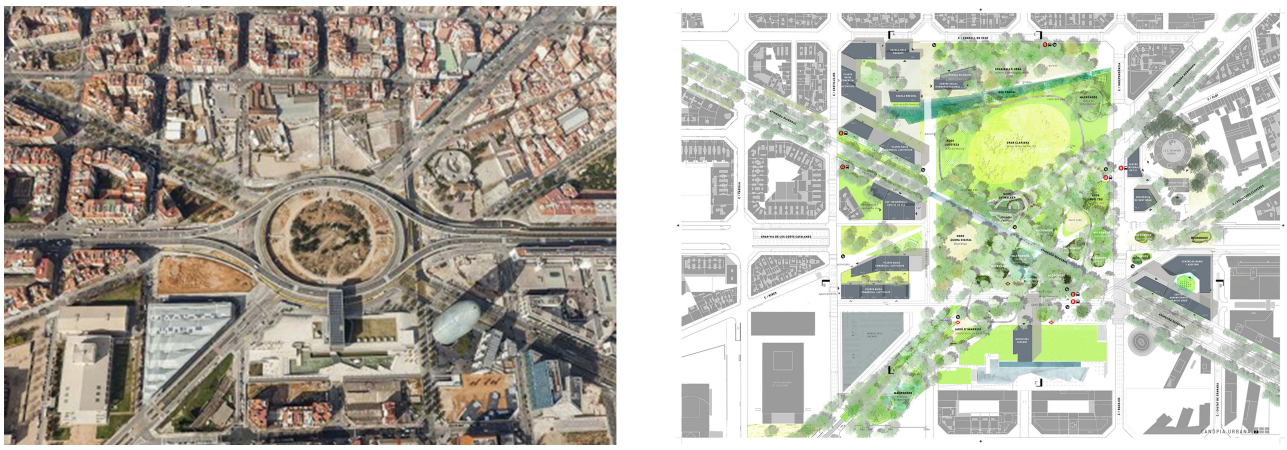
attractiveness by the new pedestrian spaces was probably due to the rapidly evolution of the project, that have not permitted a stronger appropriation of the spaces. Therefore, the administration has started a second functional phase in order to increase the street furniture (benches, temporary trees and street art interventions), and promoting events and activities so as to “Omplim de vida els carrers”, fill the streets with life, Photos 3.5.11.

3.5.6. Green network

The presence of urban green areas is fundamental not only for a better aesthetic of the city but it’s very important in order to improve the urban environment and the human habitat. In fact, they have a significant role both for the environmental sustainability (maintenance of an urban biodiversity; mitigation of the heat island effect and urban temperature; reduction of the air pollution; etc.), both for the social sustainability (creation of public spaces; implementation of the urban comfort and habitability; etc.). Therefore, the Barcelona Administration has adopted the "*Pla del verd i de la biodiversitat*" in order to contrast the huge problem of the urban density promoting the re-naturalization of the city.
Nevertheless, starting with the Gracia Superblock project the Administration has worked in order to increase the connection between the urban areas and the natural zones through green corridors and to create an integrate natural urban system. So, according to the streets' dimensions of the Superblocks they were planted trees along the inner spaces able to maintain a natural continuity. Moreover, due to the compact urban fabric typical of the historical settlements, it was projected to use the balcony and the empty facades in order to take advantage of all the possible surfaces and to increase the green perspective inside the little streets. The second type of intervention realized by the Barcelona Administration regards the big scale project, in particular Plaça de les Glòries Catalanes. Currently it serves largely as a roundabout of elevated highways, however, the Administration has started its renovation in 2007 incorporating the project in the first Superblock program “Barris a velocitat humana”. The project designs a new urban park that will be the central intersection of the main green corridor Avinguda Diagonal, Avinguda Meridiana and Gran Via de les Corts Catalanes, and that will be destined for the leisure time of the citizens and the city users, Image 3.5.11. Finally, the City Administration is working to involve civil society in defining, installing and managing unused spaces across all districts of the city to create new Green spots. One of the most important

programs is the BUITS Plan (Urban Voids with Territorial and Social Involvement) that aims to reuse the abandoned spaces in order to create vegetable gardens. For instance, in Plaça de les Glòries, Ciutat Vella and Les Cortes District the citizens have adopted not used space to create a community garden, Photos 3.5.12.

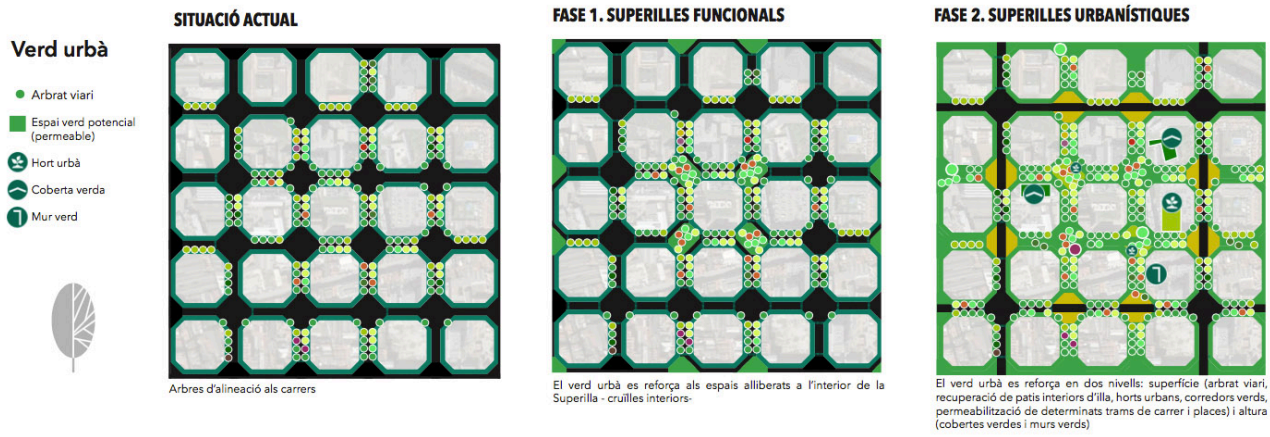
Image 3.5.11: Plaça de les Glòries Catalanes (2014) and the project Canòpia Urbana



Source: Ajuntament de Barcelona, Available at www.ajuntament.barcelona.cat.

The different approaches promoted during the firsts pilot project have been proposed again in the last Superblock program "*Omplim de vidas els carrers*". Nevertheless, the implementation of the Superblocks model in the Cerdà grid will allow to use a bigger quantity of street space, due to more than two-thirds of the roadway will be pedestrianized, Image 3.5.12. In the first implementation phase the Superblocks' inner streets will be

Image 3.5.12: Implementation of the green network in the Cerdà Grid.



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de SantMartí,* Barcelona, 2016, pag116.

closed to the car traffic, realizing a 30 zone, and the new public spaces can be modified with provisional solutions. In particular the four intersections of each Superblock, corresponding to almost 5.825 m2, can be modified implementing temporary urban

Photo 3.5.12:Green sport of BUITS Plan. Placa de les Glories, Ciutat Vella and LesCortes Districts

Source: Personal photos, December 2016

furniture and green intervention in order to explain the new urban model to the citizens. Subsequently, in the second phase the entire urban surface inside the Superblock (almost 25.000 m2) will be equalized realizing a common pedestrian platform. So, it will be potentially transformable with structural green intervention in order to increase the urban permeability and equipping Barcelona with new green public areas. Moreover, the *Pla del Verd i de la Biodiversitat* according with the Ecological Urbanism, suggests to increase the green urban surface promoting architectural solutions on a second vertical level: green roofs, walls, terraces, etc. These types of solutions can obtain ecological benefits (the improvement of the urban landscape, thermal insulation, reducing of air pollution levels, creation of new habitats for wildlife, water tank) and social benefits (recreation area, seating, space for activities, social cohesion).

The presence of natural elements in the urban habitat represents one of the main axes proposed by the Agencia de Ecologia Urbana, and so in the Sustainability Indicator System ther is a particular Area (A5) in order to assess the urban green networks. Each Superblocks has not only to ensure a minimum amount of green space per inhabitant, but also guarantee a minimum level of soil permeability and present a visual perception of green volume. The six indicators involved are:

- 12th *Visual perception of green volume* (Min. objective: >10% green volume, >50% street surface area; Des. objective: >10% green volume, >75% street surface area);
- 26th *Soil permeability* (Min. objective: >20% in areas >50ha);
- 27th *Green spaces per inhabitant* (Min. objective: >10m^2/inh; Des. objective: >15m^2/inh);
- 28th *Simultaneous proximity to green spaces* (Min. objective: 3 (out of 4) green spaces 100% of the population; Des. objective: All green spaces 100% of the population);
- 29th *Tree density per stretch of street* (Min. objective: 0,2 trees/meter >50% of the street length; Des. objective: 0,2 trees/meter >75% of the street length);
- 30th *Green roofs* (Min. objective: >10% of the roof surface area available);

During the functional phase, from September to December 2016, the Urban department has decided to arrange the new public space in the Poblenou pilot project with some temporary trees installations. In particular one of the four inner intersections was organized in order to figure like a park, with trees and benches available for the community, Photos 3.5.13. Subsequently, starting from February, the Urban Department has begun the second step for the implementation of the functional phase and the entire Superblocks

Photo 3.5.13:Green elements District Poblenou, Barrio de El Parc I la Llacuna de Poblenou First implementation phase (Novemb 2016) and Second implementation phase (March 2017)

Source: Personal photos and Alessandro Laspia photos. December 2016 – March 2016

was provided with street furniture, in order to increase the attractiveness of the public space and to engage the citizens in the repossess of the road public spaces, Photos 3.5.13. At the moment, the Urban department haven't realized structural interventions yet, however, there are some drafts and hypothesis that present a possible streets reorganization with new natural area and permeable zones. Finally, regarding the "three levels of Ecological Urbanism", in the pilot Superblock it's present also an example of surface reuse, Image 3.5.13. For instance, an empty façade was reused implementing photovoltaic panels and climbing plants, so as to take advantage of all the urban unused spaces and creating a vertical urban landscape useful to increase the urban biodiversity and the energy sustainability.

Image 3.5.13: Examples of green networks, "Three levels of Ecological Urbanism".

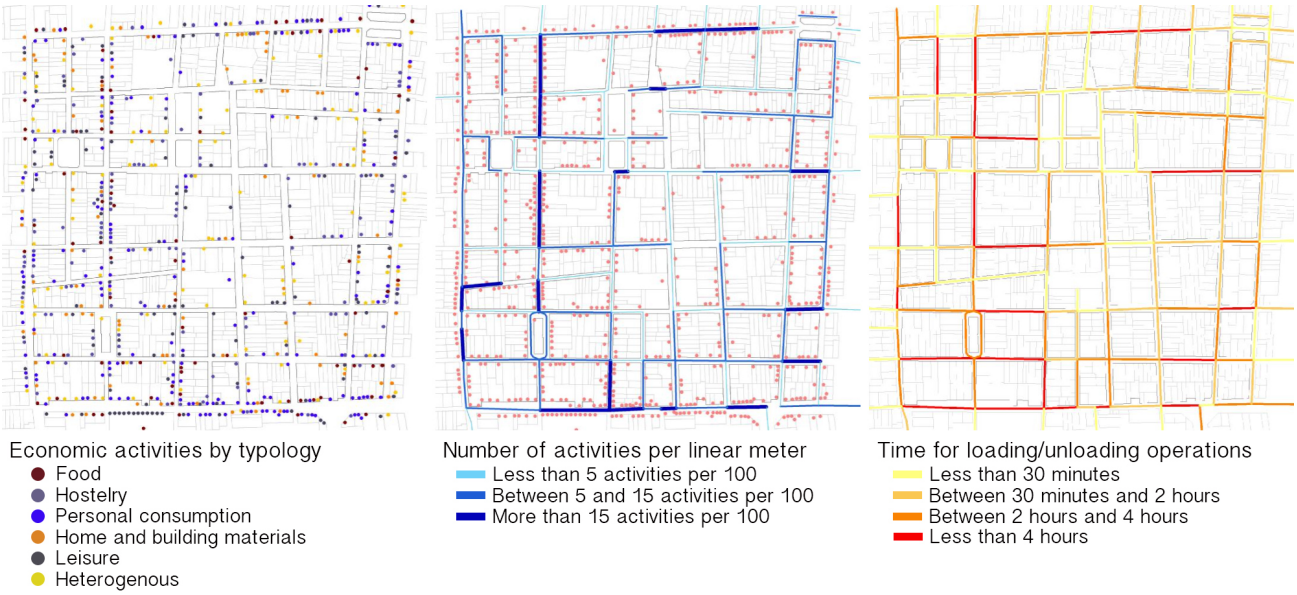
Source: Ajuntament de Barcelona, Medi Ambient i Serveis Urbans - Hàbitat Urbà, Pla del verd i de la biodiversitat de Barcelona 2020, Barcelona, 2013, pag.71-73.

3.5.7. Urban goods distribution

The urban goods distribution represents for Barcelona one of the main causes of the traffic congestion, air pollution and noise pollution, so the Administration has decided to implement the new distribution system proposed by the *Agencia de Ecologia Urbana de Barcelona*. The new urban goods distribution system works on a decentralized network of local Loading/Unloading platforms (*Arees de Proximitat*), and it's aim is to minimize all the possible frictions between the vehicular and pedestrian traffic inside the Superblocks. Moreover, the new generation of underground platforms (Urban Distribution Centres, CDU) will be located close to the basic street network, maybe at the first floor of underground parking, and it will ensure sufficient surface area for loading and unloading operations and the goods' storage. In this way, it will be possible to transform the currently L/U platforms inside the Superblock in new public space.

The Barcelona's Administration, according to the Urban Department and the *Agencia de Ecologia Urbana*, has already tried to develop the new Urban Goods Distribution system during the previously Superblock pilot projects. The *Pla de Mobilitat del Districte de Gracia* has designed the most important project during the implementation of the pilot Superblock in 2006. In fact, the Superblock has been analysed in order to know the types of economic activities, the density of the shops, the number of the weekly loading/unloading operations and the average time used for them, Image 3.5.14. It emerged that there were 1.620 daily operations, corresponding to a total minute for loading and unloading of 18.700 minutes/day. After this survey, the Pla has proposed to reduce the time for the L/U operations to only four hours (240 min/day), implementing the disposition of loading and unloading places so that it was possible to cover the entire superblock with a radius of 50 meters/platform.

Image 3.5.14: Examples of green networks, "Three levels of Ecological Urbanism".



Source: Ajuntament de Barcelona, Agencia de Ecologia Urbana de Barcelona, *Pla de Mobilitat del Districte de Gracia, Supermancana de la Vila de Gracia*, Barcelona, 2006.

Another Urban Goods Distribution pilot project was realized in the Ciutat Vella district at the end of 2013. Here, it was implemented for six months a micro-distribution platform that was the base for the goods transhipment and the local distribution, realized free via electric tricycles. The pilot project would to reach 120 daily operations, conducted by the electric tricycles with an average distance of 16.8 km/day each one, which would save 5.3% of truck's journeys. In practice, this reduction of 5.3% is the equivalent to 225 km travelled by truck and consequently the corresponding savings of air and noise pollution.

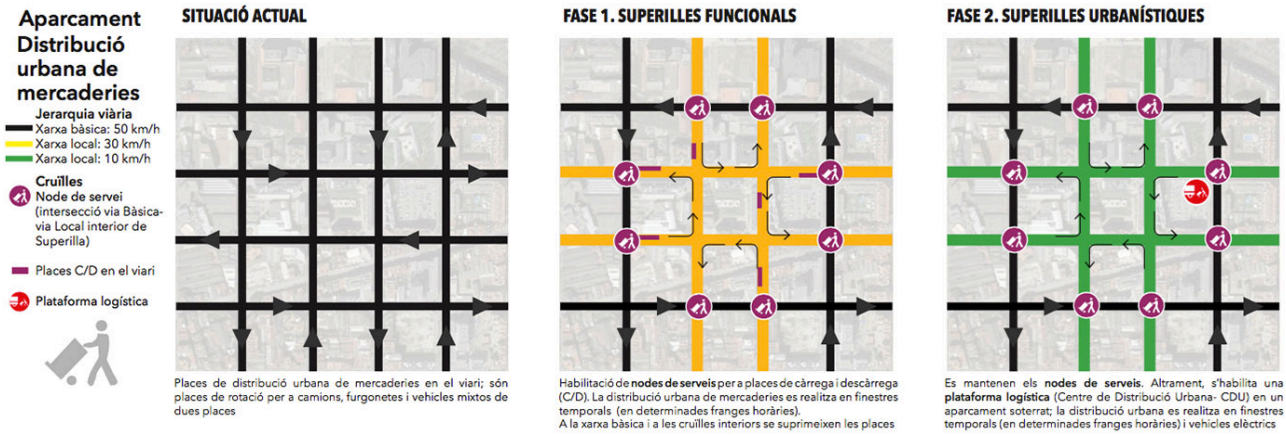
Regarding the implementation of Urban Distribution Centres, the Administration has projected to transform the underground level of the Abaceria market, in order to built the first logistic platform for the Gracia District. As already said in the previously paragraph, the implementation of a CDU will induce a traffic and pollution reduction inside the Superblock, using electric and sustainable vehicles for internal distribution of products and doing it during specific time slots. Technically, in the first stage, and in relation to the number of pallets produced according to the types of activities, it will require a total of 622 m2 of shelves for storage of goods, and a total dimension of 1,850 m2. The second scenario requires 910 m2 of shelves for storage and a total size of 2,700 m2. The activation costs of the CDU vary between 744.750€ of the first scenario to the 1.165.250€ of the second scenario. Instead, the total annual cost of maintenance varies between 196.828€ to 312.123€, and that can be simplified in this way:

- Cost of the rent of the premises: 4.000 € / month per 1,000 m2 premises.
- Cost of additional services (cups, energy, insurance, etc.): € 45 / m2 per year.
- Cost of maintenance of mobile equipment (carts) 10% of the capital per year.
- Cost of maintenance of stationary equipment (shelving): 1% of capital per year.
- Cost of personnel CDU: between 634.600€ to 929.600€.

The implementation of the urban goods distribution system to the Superblock model will be scheduled according to the realization of the Supergrid network, defining a first functional phase and a second structural step, Image 3.5.15. In the first implementation phase the Urban department promotes the coexistence between the actually L/U platform and the new “Àrees de Proximitat” (Node de servei) that will be located at the intersections between the basic street with the inner roads. The distribution of goods will be done during certain time slots so as to don’t overlap with the peak hour, like the enter/exit school hours. The second phase forecasts the maintenance of the L/U platform inside the Superblock only where it’s necessary, enforcing the use of the “Node de servei” for the service of the entire neighbourhood. If the Superblock presents a high request for the Urban Good distribution, the Àrees de Proximitat can be supported by the realization of Urban Distribution Centre. This logistic platform is projected not only for the goods transhipment but it has to centralize and storage large volumes of goods for the Superblock. According to the necessities of each Superblock it could be realized in an underground car park, or in specific new underground infrastructures. As a result of this local urban network the last

mile distribution will take place in a easier way and creating less congestion problems. Finally, the "last mile distribution", from the Urban Distribution Centres to the Superblocks' activities, will be realized whenever possible during the night hours or not coinciding with school hours, with transport units silent and non-polluting, reducing as much as possible the negative externalities of the urban goods distribution.

Image 3.1.36: Distribution of goods. Reorganization of operations for loading and unloading



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de SantMartí*, Barcelona, 2016, pag166.

At the moment, the Barcelona's Administration has decided to adopt only a part of the Sustainable Indicator System realized by the *Agencia de Ecologia Urbana de Barcelona*, and the indicator useful to calculate the sustainability of the Urban goods distribution system is not considered yet.

In the Superblock "*Barrio de El Parc I la Llacuna de Poblenou*" the Urban Department has already implemented the urban solutions proposed for the realization for the first functional phase of the new Urban Goods' Distribution System. In fact, the Loading/Unloading places have been removed by all the inner streets and they have been moved on the eights intersection around the Superblock, between the inner streets and the basic streets. Here the nodes have been implemented with specific spaces, characterized by yellow lines, for the Loading/Unloading operations. So

Photo 3.5.14:Luading/Unloading parking spot

Source: Personal photos, December 2016

now the couriers need a telematics validation to park there and they have a parking time of maximum 30 minutes, Photos 3.5.14. From these spots, they can deliver the goods in the Superblocks using manual trolleys or motorized carts. At the moment, the local government has not implemented any Urban Distribution Centres, nevertheless, it has already supposed to build over time a CDU and 35 micro platforms for the service of the entire district. It will be located on the underground floor of a currently off-street parking, and it is estimated area required for this facility is 3400 m2 with approximately 1000 m2 shelves, Photos 3.5.15.

Photo 3.5.15: Loading/Unloading parking spots. District Poblenou, Barrio de El Parc I la Llacuna de Poblenou

Source: Personal photo. December 2016

3.6. Valuation of Rueda model

The Ecological Urbanism approach proposed by Rueda and the *Agencia de Ecologia Urbana de Barcelona* suggests how the urban shape could influence the compactness, complexity, efficiency and social cohesion of the urban habitat. In particular, it emphasises in which way a renovated management of the public spaces and a different urban design of the streets, could have a central role in the construction of a new sustainable urban model. The crux of the Superblocks project is the restoration of the streets as a real public space, destined not only to the mobility system but also for the daily uses of leisure and social relations. In fact, currently over the 60% of the public street spaces are occupied by motor vehicles mobility (almost the 70% considering also parking places and loading and unloading areas), causing such impacts on public health and environment (pollution, noise, accidents, etc.). So, the Superblock model would concentrate the private vehicular traffic on a basic streets network and create a car free zone in the local/inner streets. Nevertheless, after the presentation of the Barcelona case study, it's clear how the urban design solution couldn't be the only intervention on the urban system. In fact, all the urban policies like, mobility, green, energy, environmental issues, need to be consider in unique urban vision, so as to realize the Sustainable City promoted by the Ecological Urbanism. Therefore, the *Agencia de Ecologia Urbana* and the Barcelona's Urban Department of Ecology, Urban Planning and Mobility are working in close contact to promote at the same time a physical intervention (Superblock model) and the best urban policies in order to support it (*El Pla del Verd; El Pla de Mobilitat; Pla de milioria de la qualitat de l'aire; Pla de actuacio municipal*). In this way, the Barcelona's Administration is working to reaffirm the main role of the public space inside the urban system, and so, the Citizens' rights to the city.

3.6.1. Citizens' rights to the city and the Urban Habitability

The Superblock model designed by Rueda has been inspired by Cerdà's Plan for the Barcelona expansion, projected during the second half of the nineteenth century and realized with several modifications in the following decades. This huge plan had included the creation of an orthogonal grid with urban blocks, partly occupied by buildings and partly destined to maintain open spaces, so as to ensure the best hygienic standards and guarantee the presence of public spaces. Here, the streets spaces were not destined only

for mobility, but in some cases represented a direct attachment of the buildings, and the passage between the private space and the public space of the neighbourhood. However, due to the densification of the urban fabric and the industrialisation process of the city, Barcelona has lost the majority of public and green spaces and the private vehicles has been spread for the urban mobility. It has reduced considerably the area destined to the socialization and transforming the streets in spaces for the exclusive use of motorized vehicles. This process, according to the French philosopher Lefebvre (1970), has generated a violent urbanization process, which has broken any relation between the citizens and the sense of belonging to the traditional city. It had on one hand a social correspondence to the sentimental separation between the community and the generative process of the city, and on the other a progressive movement of physical expulsion of specific sections of the population from the heart of the city with the emergence of class segregation phenomena (Chiodelli, 2009). Enri Lefebvre has introduced the concept of *Rights to the city*, “understood as a (universal) right to take part in urban life in its fullness, to become fully part of a collective process of civilization” (Chiodelli, 2009). This process of civilization must permit to the citizens a social and civil growth, but at the same time it needs a correspondence in the spatial transformation of the city: “Rights to the city means then the constitution or reconstruction of a space-time unity, of a reconciliation to unity rather than a fragmentation" (Chiodelli, 2009). So, according on Lefebvre suggestions the physical shape of the urban system works a relevant role both on the spatial organization and both on the social aspects. In fact, it could be excluded from the city by the physical distance (relegated to the periphery), but also by a sentimental distance (empathic contact). In this sense, Lefebvre had a relevant influence on Rueda and on his idea of a new urban model. The application of the Superblock urban shape should be equal and uniform in the whole, realizing a democratic project able to handle in the same way the neighbourhoods of the city centre and the neighbourhoods of the peripheries. The crux of the project is to reverse the urban car dominance, so the Barcelona Administration is working to gather nine Cerda’s blocks realising inner streets completely free by crossing traffic and giving it back to the citizens. In this way, the public spaces that have been designed by Cerdà inside the blocks will be restored out of the blocks. The Superblocks inner streets, with the declared aims to renovate the citizens’ rights to the city, will become those public area that have been constricted by the growing of the private city. In fact, it

will be increased the surface destined to citizens, providing them different types of public space (pavement, squares, parks, etc.) and urban furniture. Moreover, according to the Ecological Urbanism principles, the public spaces have to guarantee the best environmental conditions (noise, pollution, thermal comfort, etc.) to allow diversification of uses and functions. Only in this way, it will be possible to allow the effective exercise of those urban rights generating social cohesion and forming people not only like pedestrians but citizens. The *Agencia de Ecologia Urbana*, in order to guarantee the right to the city suggested by Lefebvre, has identified five specific urban rights, Image 3.3.1, (Ajuntament de Barcelona, 2016):

- **Right to exchange**

This right refers to the possibilities to establish an interaction between people in a public space, including the transfer of a commodity or service. This exchange may be formal or informal and can be fixed or temporary. The actions that make up the right to exchange can be classified into the following types:

  - Products: Food, books, ice cream, flowers, newspapers, crafts, clothes, roses, etc.
  - Services: Bicycle repair service, dog sitting service, etc.

- **Right of expression and participation**

This right refers to the freedom of thought, speech and expression, in addition to the freedom of manifestation. The actions that make up the right to expression and participation can be classified into the following types:

  - Claiming social rights, beliefs, feelings: manifestation, demonstration, etc.
  - Public act of propaganda: Political meeting, products advertisement, etc.
  - Citizens participation: public debate.

- **Leisure and right to use the public spaces**

This right refers to the possibility of every citizen to occupy public space for activities related to leisure time. The right would ensure the opportunity to occupy and use the public space in order to relax, read, talk, walk, etc. The actions that make up this right can be classified into the following types:

  - Sports activities: jogging, skating, swimming, ball games, gymnastics, fishing, etc.
  - Activities for the physical and mental development: Tai Chi, yoga, meditation, etc.
  - Recreation and entertainment: playground, culinary activities, areas for dogs, etc.
  - Development of hobbies: Urban gardens (growing), possession of animals, etc.

- Consumption activities: drink/food in spaces reserved.
- Activities rest: sunbathing (beach), sit on a bench, etc.

- **Right to the culture and knowledge:**

This right represents the activities realized in order to satisfy the cultural interests, information, education and entertainment of citizens. The actions that make up this right can be classified into the following types:

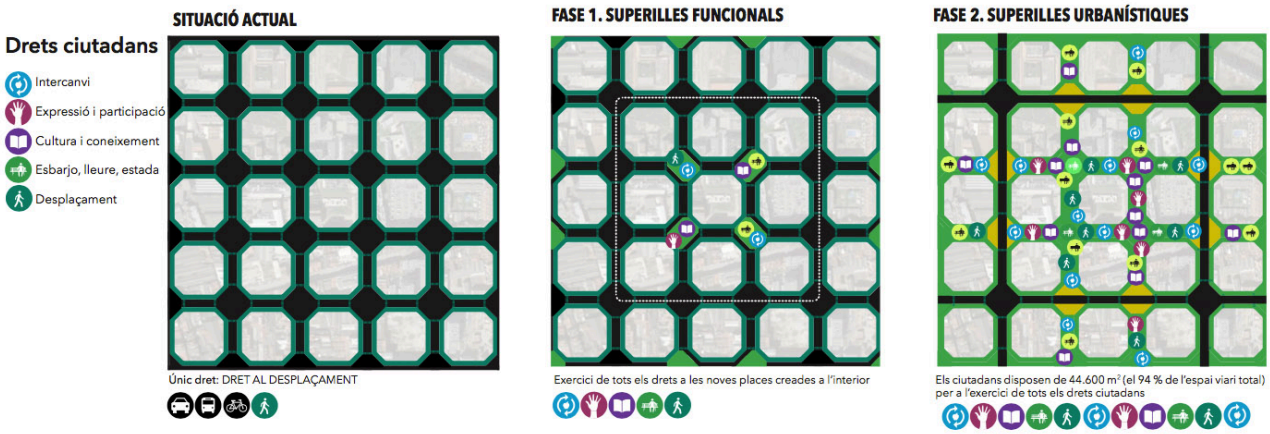
- Information: tourist information, municipal information, etc.
- Knowledge: public lectures, environmental education activities, etc.
- Public shows: Cinema, music, theatre, broadcast television and radio programming
- Exhibition: photography, artworks, antiques, trade show, livestock show, etc.
- Popular culture association: historical commemoration, processions, etc.
- Cultural service: reading books or other graphic material, etc.

- **Right of way in the public space:**

The right of way in the public space refers to the right that people have to move from one place to another with a fixed target. The actions that make up this right can be classified into the following types:

- Walk: school routes, tourist routes, touristic routs, etc.
- Non-motorized vehicles: bicycles, scooter, electric vehicles, etc.
- motorized vehicles: cars, buses, motorcycles, taxis, etc.

Image 3.6.1: Public space distribution and right to the city



Source: Ajuntament de Barcelona, Districte de Sant Martí de Barcelona, Agencia de Ecologia Urbana de Barcelona, *INFORME. Pla d'Espai Públic i Mobilitat del Districte de Sant Martí,* Barcelona, 2016, pag166.

Therefore, the main goal of *Agencia de Ecologia Urbana de Barcelona* is to recover the lost public spaces, which however represent a necessary but not sufficient condition in order to guarantee the minimum level of social cohesion. In fact, the urban Agency underlines how the rights to the city, need a minimum condition of urban habitability in addition to the physical urban space, in order to improve the level of occupancy of public space. The Urban Habitability, as I have presented in the chapter 2.1.2, represents one of the two major sets of restrictions for the Ecological Urbanism, and the Barcelona administration has used three variables in order to describe and valuate the level of welfare or public space occupancy: ergonomics, physical attraction and comfort. All three groups of variables respond to the requirements that relate to the planning and design of public space from the perspective of a person on the street. This means that the rate of occupancy is proposed as a methodology with a clear intention to assess the public from a vision at a human scale.

Ergonomic degree

The ergonomics degree refers to the physical characteristics that impact on people movements in the public spaces, especially on people with reduced mobility. It is calculated on the proportion of space for pedestrians compared to cars, and the proportion of space compared to the buildings, are part of the morphological perception of public space.

- Accessibility: the space which pedestrians must have to ensure appropriate conditions of comfort and safety. It is calculated by the width of the sidewalks and the street's slope.
- Space for pedestrians: Currently, cities are characterized by a ratio of 70% (aimed at car) and 30% (intended for pedestrian). It's necessary to reverse this relationship.
- Proportion of street: It refers to the relationship between building height and the distance between the buildings of a street. This variable can evaluate the degree of perception of the urban compactness. It's considered that a street has provided an index between 1 and 2.

Physical attraction degree

It is a group of psychological variables that refers to the influence of the urban habitat have on the people. These variables can be controlled by the management and planning of

public space and take into account firstly the diversity of outdoor activities; the density of activities on the ground floor and, the presence of vegetation on the street.

- Urban diversity: it indicates the number of bits of information per individual (degree of organized information) in a given area. It's calculated on the number of legal entities (economic activities, associations, organizations and facilities) present in the urban systems.
- Density of activities: the presence of activities near to the public space generate physical attraction, contributing to reduce the feeling of insecurity and the desertification of the streets. This value measures the number of ground activities per linear meter stretch.
- Visual perception of urban green: it calculates the urban green volume (trees, shrubs and flower beds) by the pedestrians' point of view.

Comfort degree

The comfort level refers to the need that the emission, acoustic and thermal comfort does not damage the health of people. Therefore, the Superblocks would reduce drastically the presence of motorized vehicles in the inner streets and modify their terms of use (speed and movements) through the prioritization of public use of public space on that.

- Air quality: The inner streets and the pedestrian zones should not exceed 40 μgr/m^3 concentration levels in surface nitrogen dioxide (NO2) and particulate matter (PM10).
- Acoustic comfort: the superblocks' model work directly to reduce the acoustic noise removing the vehicular traffic by the inner streets. It is considered a comfortable limit of 65 dBA noise levels during the day and 55 dBA at night.
- Thermal comfort: it's important to work on the streets' layout so as to ensure the best micro-climatic conditions. The indicator is calculated from the time that a potential street maintains adequate levels of comfort to stay (8:00-22:00) with levels ranging between 50 and -50 W/m2.

In conclusion, the "Citizens' rights to the city" and the "Urban habitability" represents another way to emphasize the importance of the public space in order to realize a sustainable urban model. They encourage the importance of the physical urban space so as to face the three different sustainability point of view (economic, environmental and social) at the same way. Moreover, it's evident how they support the restoration of the

active role of the people inside the urban habitat, encouraging the use of the public space for the public activity, and discouraging the privatization of the city. In other words, it's looking to restore the Latin sense of *civitas*, where the citizens are the community, and where they are not only users of the city.

At this stage, it's not easy to say if the Ecological Urbanism represent an innovative solution in order to realize a sustainable city. The approach suggested by Rueda would face a lot of urban aspects (energy, waste, food, etc.) that are not only connected to the urban fabric and streets design, and that should be supported by specific urban policies. In this sense, the sustainability indicator system has summarized all the restrictors supposed by the Ecological Urbanism and that are not strictly connected to the application of the Superblock model. So, following to the Rueda's approach, and its application to the Barcelona case study, I show in the Table 3.3.1 what are the objectives supposed by the indicators system and what are the possible results. There are in black the indicators adopted by the Barcelona Administration, and in grey those one that haven't been adopted due to a lack of data or the impossibility to adoption in the Catalonia's capital. In total, 42 out of 50 indicators have been adopted, that represent the four themes of the sustainable urban model (Compactness; Complexity; Efficiency and Social Cohesion) and the seven areas of intervention proposed by Ecological Urbanism (Land occupation; Public space; Mobility; Diversity of uses and urban functions; Biodiversity; Metabolism and Social cohesion). Checking the theory and the practice of the Ecological Urbanism, I show on one hand the "Desirable objectives" promoted by the Sustainable indicator system and on the other hand the current situation and the expected (or already achieved) outcomes, from the Administration's programs. Moreover, the current situation and the result expected are divided on the double level of analysis: urban level and Superblock level; even if not all the data are present for both the urban dimensions. In fact, the table doesn't present data in all the cells data because there is not yet a general report about the sustainability stat of art in Barcelona, and I have used the collection information by different plans and program. About the urban level I have recouped the data by the five urban plans presented at chapter 3.2.3 (*Compromis Ciutadà per la Sostenibilitat 2012-2022; El Pla del Verd; El Pla de Mobilitat; Pla de milioria de la qualitat de l'aire; Pla de actuacio municipal*). While, regarding the data at Superblock level, due to it's not possible to present average values of the totality Superblocks, I report the analysis of the "*Dossier*

diagnostic of the Barri del Poblenou". I have decided to take this one because it's the most similar Superblock with the one that has been transformed (*Barrio de El Parc I la Llacuna de Poblenou*). Finally, in the last column I report the seven axes of interventions exposed in chapter 3.4 and 3.5, in order to connect each indicator with the mainly actions started by the Administration. In this way, it is possible to see how much any areas of intervention could have an influence on the urban sustainability level about each single indicator:

- Motorization Private Network (Mn)
- Parking (Pa)
- Public Transport (Pt)
- Bicycle mobility (Bm)
- Pedestrian network and public space (Ps)
- Green network (Gn)
- Urban good distribution (Ud)

Table 3.6.1: Sustainability indicator system Barcelona *Barri del Poblenou*

Indicator	Current situation	Desirable objectives Sustainable indicator system	Results expected	Restrictors
THEME 1 – Compactness and Functionality				
Area A1. Land Occupation				
1. Home density	Urban level: n/a Superblock: 152 homes/ha	> 100 homes/ha	Urban level: n/a Superblock: a*chieved*	Ps
2. Absolute compactness	Urban level: n/a Superblock: 55%	> 5 meters for a minimum of 75% of the study area	Urban level: n/a Superblock: n/a	Ps
Area A2. Public Space and Habitability				
3. Corrected compactness	Urban level: n/a Superblock: 89,3%	10-50 meters for a minimum of 75% of the surface area	Urban level: n/a Superblock: ??%	Ps
4. Living space per inhabitant	Urban level: n/a Superblock: 8m^2/inh.	> 15m^2/in in areas of action >50ha, compliance in more than 75% of the surface area	Urban level: n/a Superblock: n/a	Ps
5. Air quality	Urban level: 56,2% pop. Superblock: 32% pop.	< 40ug/m3 for 100% of the stretches of street/population	Urban level: 93,9% pop. Superblock: n/a.	Mn Pa Pt Bm Ps Gn Ud
6. Acoustic comfort	Urban level: 45,4% pop. Superblock: 26% pop.	<65dB(A) for a minimum of 75% of the population	Urban level: 67,1% pop. Superblock: n/a	Mn Pa Pt Bm Ps Gn Ud
7. Thermal comfort	Urban level: 45,4% pop. Superblock: 47,8% streets.	>80% of the net hours of thermal comfort for a minimum of 50% of stretches of the street	Urban level: 45,4% pop. Superblock: n/a	Mn Pa Pt Bm Ps Gn
8. Mechanical wind influence	n/a	Living space F(v>3.6)<5% Living space F(v>3.6)<10% Pedestrian road F(v>3.6)<20% For a minimum of 90% of the study surface area	n/a	Ps
9. Road accessibility	Urban level: n/a Superblock: 98,9% pop.	> 90% of the street stretches with the ideal accessibility. Sidewalk ≥2.5m and slope <6%.	Urban level: n/a Superblock: 99% pop.	Mn Pa Bm Ps
10. Road space for pedestrian	Urban level: 15,8% (230ha) Superblock: 42,5%	>75% of the road space reserved for pedestrians. In more than 50% of the streets.	Urban level: 67,2% (852ha) Superblock: 94%	Mn Pa Pt Bm Ps Gn Ud
11. Street proportion	Urban level: n/a Superblock: 98,8%	h/d < 1 for a minimum of 50% of the streets	Urban level: n/a Superblock: n/a	Ps
12. Visual perception of green volume	Urban level: n/a Superblock: 84,4% streets	>10% green volume for a minimum of 75% of the streets	Urban level: n/a Superblock: n/a	Ps Gn
Area A3. Mobility and Service				
XX. Habitability index for public space	Urban level: n/a Superblock: 43,2% streets	> 75% of the streets sections (m2) with acceptable score (IHEP> 30 points out of 45).	Urban level: n/a Superblock: n/a	Mn Pa Pt Bm Ps Gn
13. The people's means of movements	n/a	<15% of displacements by private vehicle of area's internal displacements	n/a	Mn Pa Pt Bm Ps
14. Proximity to transport network alternatives to private vehicle	Urban level: n/a Superblock: 100%	bike path and PTL stop < 300 meters away for 100% of the population	Urban level: 95% Superblock: 100%	Mn Pa Pt Bm Ps
15. Passing-through vehicles restricted road space	Urban level: n/a Superblock: 49,5%	>75% of the road space with access restricted from pass-through vehicles	Urban level: n/a Superblock: n/a	Mn Ps
16. Bicycles parking	Urban level: 32% pop. Superblock: 96,6% pop.	<100m ; >80% population. Allocation: 2 spaces/home	Urban level: n/a Superblock: n/a	Mn Bm Ps
17. Off-road vehicle parking	Urban level: n/a Superblock: 89,9% places	1 space/home; 90% off-road spaces	Urban level: n/a Superblock: 89,9% places	Mn Pa Ps
18. Coverage of the demand for vehicle parking	Urban level: n/a Superblock: 124% places	<10% of space infrastructure deficit (off-road)	Urban level: n/a Superblock: n/a	Mn Pa Ps
19. Reserved space for good distribution	n/a	Reserved space (off-road) for logistic platform (variable size)	n/a	Mn Ps Ud
20. Reserved space for service infrastructures	n/a	Reserved space (underground9 for service galleries	n/a	Mn Ps Ud
THEME 2 – Complexity				
Area A4. Urban Complexity				
21. Urban diversity	Urban level: n/a Superblock: 55,1%	>5 bits of information (average value in area <50ha) in more than 75% of the area	Urban level: n/a Superblock: n/a	Mn Pa Pt Bm Ps Ud
22. Balance between business and residences	Urban level: n/a Superblock: 22,4%	>20m^2 roof businesses (tertiary/productive)/housing (or total built surface area)	Urban level: n/a Superblock: n/a	Mn Pa Pt Bm Ps Ud
23. Proximity to shop of daily need	n/a	All businesses 100% of the population	n/a	Mn Ps Ud
24. business/infrastructure @	Urban level: n/a Superblock: 8,5%	>15m2 total non-residential roofs; >50% of the surface area;	Urban level: n/a Superblock: n/a	Ps Ud
25. Spatial and functional continuity of the street	Urban level: n/a Superblock: 14,8%	High/very high interaction >50% street length	Urban level: n/a Superblock: n/a	Mn Ps Ud

Area A5. Green space and biodiversity				
26. Soil permeability	Urban level: n/a Superblock: 6,9%	>20% in areas >50ha; compliance in the >50% of the surface area	Urban level: n/a Superblock: n/a	Ps Gn
27. Green space per inhabitant	Urban level: n/a Superblock: 0,4m^2/inh	>15m^2/in	Urban level: n/a Superblock: n/a	Mn Ps Gn
28. Simultaneous proximity to green spaces	Urban level: n/a Superblock: 100% pop.	Proximity of the 100% of the population to the three types green spaces	Urban level: n/a Superblock: n/a	Mn Ps Gn
29. Tree density per stretch of street	Urban level: n/a Superblock: 69,1% streets	0,2 trees/m >75% of the street length	Urban level: n/a Superblock: n/a	Mn Ps Gn
30. Green roofs	n/a	>10% of the roof surface area available	n/a	Ps Gn
THEME 3 – Efficiency **Area A6. Urban Metabolism**				
31. Energy demand: residence	Urban level: n/a Superblock: 87,1 kWh/m2	<65 kWh/m^2	Urban level: n/a Superblock: n/a	
32. Energy demand: service and infrastructures	n/a	<190 kWh/m^2 (service) + <90 kWh/m^2 (infrastructure)	n/a	Mn Pa Pt Bm Ps Gn
33. Energy demand: public space	Urban level: n/a Superblock: n/a	Variable depending on the type of public space	Urban level: n/a Superblock: n/a	Mn Pa Pt Bm Ps Gn
34. Local production of renewable energy	Urban level: n/a Superblock: n/a	>40 kWh/m^2 surface area	Urban level: n/a Superblock: n/a	Ps
35. Energy consumption	n/a	<80kWh/m^2 built surface area	n/a	Ps
36. CO2 and equivalent emissions	Urban level: n/a Superblock: n/a	<20kg CO_2/m^2 built surface area	Urban level: n/a Superblock: n/a	Ps
37. Energy self-production	n/a	>50% (by means of renewable energy)	n/a	Ps
38. Water demand (by quality and total)	Urban level: n/a Superblock: n/a	<70 ldp drinking water; <105 ldp total demand	Urban level: n/a Superblock: n/a	Ps Gn
39. Non-drinking water demand sufficiency	Urban level: n/a Superblock: n/a	100% (by means of the collection of rainwater, regenerated grey water, ground water, ecc)	Urban level: n/a Superblock: n/a	Ps Gn
40. Net selective collection	Urban level: n/a Superblock: n/a	Variable depending on the fraction: organic matter (55-80%) paper and cardboard (75-80%), glass (75-90%), containers (50-60%), metal (50-60%).	Urban level: n/a Superblock: n/a	Ps Gn
41. Proximity to waste collection points	Urban level: n/a Superblock: n/a	<150 m for the 100% of the population	Urban level: n/a Superblock: n/a	Ps
42. Proximity to recycling centres	Urban level: n/a Superblock: 95,6% pop.	<600m for the 100% of the population	Urban level: n/a Superblock: n/a	Mn
43. The end of the organic matter (OM) cycle.	Urban level: n/a Superblock: n/a	>50% OM. Transformation into compost for the local use	Urban level: n/a Superblock: n/a	Mn Ps Gn
44. Local production of basic foods.	n/a	Variable depending on potential. >50% homes with community garden	n/a	Mn Ps Gn
THEME 4 – Social Cohesion **Area A7. Social Cohesion**				
45. Population ageing	Urban level: n/a Superblock: n/a	±100% ageing index <10% segregation index	Urban level: n/a Superblock: n/a	Ps Gn
46. Foreign population	Urban level: n/a Superblock: n/a	<10% segregation index	Urban level: n/a Superblock: n/a	Ps Gn
47. Population with higher degrees	Urban level: n/a Superblock: n/a	<10% segregation index	Urban level: n/a Superblock: n/a	Ps Gn
48. Allocation of social housing	Urban level: n/a Superblock: 0,2%	≥30% of total houses	Urban level: n/a Superblock: 0,2%	Mn Ps Gn
49. Allocation of basic infrastructures	n/a	100% ideal referential allocation (by type)	n/a	Mn Ps Gn
50. Simultaneous proximity to basic infrastructures	Urban level: n/a Superblock: 100% pop.	5 (out of 5) types 100 population	Urban level: n/a Superblock: n/a	Mn Ps Gn

Source: personal elaboration

3.6.2. Critique to Ecological Urbanism approach

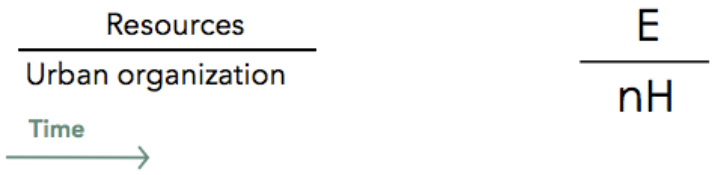
The realization of the Barcelona Superblocks program is the last step of more than twenty years of Rueda's studies regarding the Ecological Urbanism approach and a new sustainable city model. He has started to suppose this ecological approach since the middle of the nineties, and during the following decades through the *Agencia de Ecologia Urbana de Barcelona* he worked in coordination with the Catalan Administration to implement his project. During these years it was possible to apply and evaluate how the project worked on smaller cases, Ferrol, Figueres, Vitoria-Gasteiz, etc. Moreover, the same city of Barcelona was a test bed for the introduction of the Superblocks model in some specific neighbourhoods (District of Ciutat Vella, District of Gracia, neighbourhood of Les Corts, etc.), but actually the Poblenou project is the last pilot project of the trial period. The project that started more than 20 years ago in Rueda's mind seems to has found a guideline and Barcelona could be the first city to adopt on the whole municipality the Superblocks model. Nevertheless, this is nothing else than another starting point, because even if the Superblocks project has been adopted by the Administration and it will be very difficult to stop and reverse, now it must to be followed by the right urban policies in order to develop it as well as possible. In fact, the sustainable urban level supposed by the Ecological Urbanism can't be reached only by a transformation of the urban fabric, but it will be necessary to implement specific policies (Housing, Environmental, Energy, Waste, Transport, etc.) according to the four main axes of Ecological Urbanism: Compactness, Complexity, Efficiency, and Social Cohesion.

In view of Ecological Urbanism theory and its preliminary application to the Barcelona case study, I would present now a critique analysis about the new Rueda's urban approach and the proposed sustainable urban model. In this way, I have stressed what are the controversial themes of the theory model, the strengths and weaknesses of the Poblenou project and the possibility to transfer the Ecological Urbanism on other cities. First of all, it's important to underline the role of the Agencia de Ecologia Urbana that was fundamental for the Superblocks implementation in Barcelona as well as in the other cities where the project has been adopted. The Agencia has the credit to encourage the municipal governments to look the city by a different point of view, analysing and considering the urban system with a holistic vision. The several urban plans that have been structured for the urban regeneration, work together in the same direction with a

unique urban vision. This urban approach renovates the urbanism made by projects that was encouraged in the last decades in particularly in Barcelona, and which promoted an urban development transforming specific urban sectors in a top-down vision. It was related especially to the big events, as the Olympic Game in 1992, the 22@Barcelona in 2000, or the Universal Forum of Cultures in 2004, and it has encouraged the collaboration between the public and the private sectors, increasing the relevance of the private lobbies in the management of the city (Josep maria Montaner). So, the new urban vision promoted by the Agencia de Ecologia Urbana according to the Municipality is working on a city scale in order to recover that "all-inclusive" approach implemented by Ildefons Cerdà in the nineteenth century. Moreover, this approach is now characterized by the relevance of the sustainability aspects (environmental, economic and social) that would consider the people as the crux of the process.

Regarding the theory of Ecological Urbanism there are some points that are presented too easily by Rueda and that don't explain fully how their application could be really helpful to reach the urban sustainability. First of all, the "**function of urban sustainability**" (Image 3.6.2) that is based on two assumptions: on one hand the reduction of E (resources), and on the other hand the increasing of n (urban legal entities) or H (organized information). Rueda considers the flow of information essential for the development of the "knowledge city" but he doesn't explain deeply how to do that. So, the suggestions recommended by Rueda are limited to: "increasing creativity, research, innovation"; "increasing the economic and social capital"; "developing the strategy to compete based on information and knowledge"; etc. (Table 2.1.1).

Image 3.6.2: Function of urban sustainability

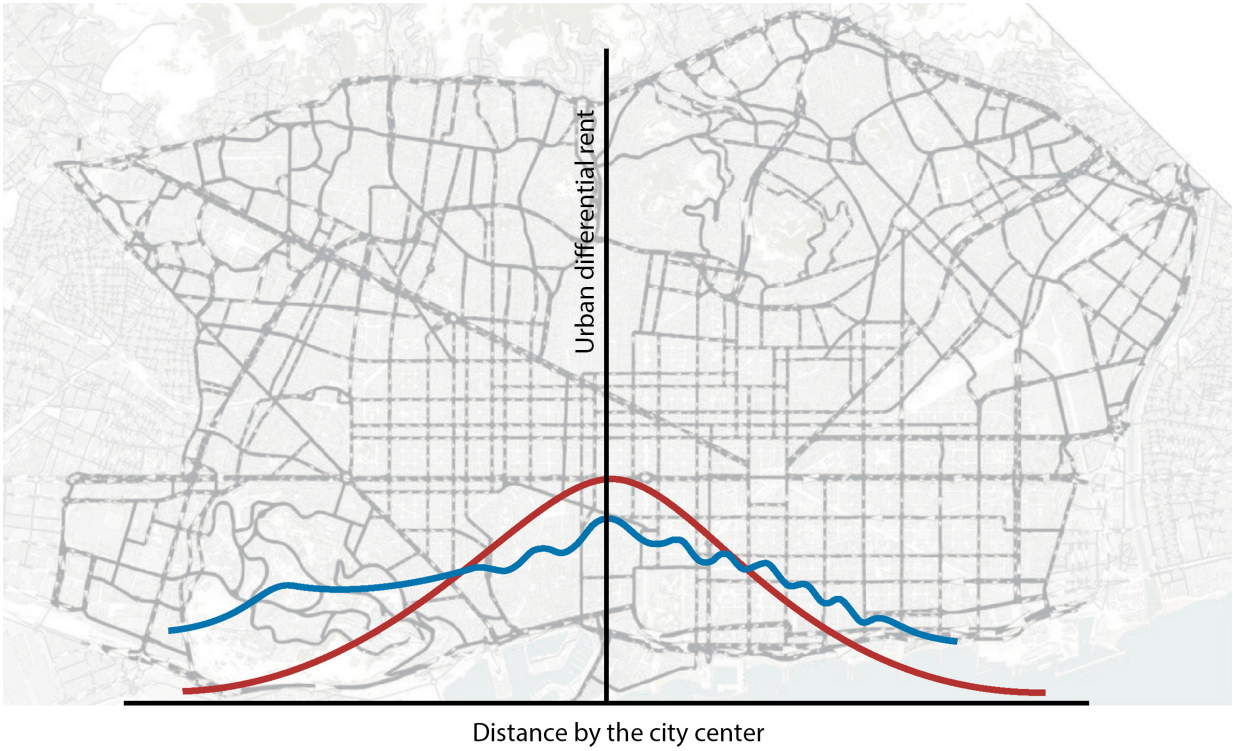


Source: S. Rueda, *Ecological Urbanism, Its application to the design of an eco-neighbourhood in Figueres*, Barcelona, Urban Ecology Agency of Barcelona, 2014, pag.13

The second controversial is the definition and description of the first Ecological Urbanism Planning tool: the "**three level of Ecological Urbanism**". Rueda critiques the today's urbanism due to "a two-dimensional plan with zero elevation" supposing an urbanism

where “there are three plans that give rise to urbanism in height, urbanism on the ground and urbanism underground” (Rueda, 2014, p.49). However, it doesn’t find an appropriate specification neither on the theory nor on the practice. Even through my Barcelona survey, I have not been able to clarify this aspect of Ecological Urbanism. It seems to be relegated to a theoretical aspect and completely aimed at a possible new urban development rather than the management of the existing city. Afterwards, in view of the application of Ecological Urbanism approach on the Spanish case studies I have stressed some considerations. First of all, the **streets public space** and the **mobility model** represents the key role of the entire projects. In fact, the Ecological Urbanism is based mainly on the realization of the Superblock model in order to reverse the car-occupacy of the public spaces (from 75% to 25%) and free the local streets for the public uses. So the city has to realize a streets transformation (Supergrid, with basic streets and inner streets) and a new mobility system in order to maintain (or increase) the currently mobility efficiency. According to the holistic vision of the Ecological Urbanism, the plan should be applied all over the city, in order to uniform the districts, from the city centre to the peripheries. This proposal would increase the **democracy level of the urban system**. In fact, the same management of the urban services and facilities in the entire city would prevent the creation of social and economic inequalities and reduce the gentrification processes. That is confirmed by professor Oriol Nel-lo (2016) which says how the Superblocks model could contribute to reduce the urban differential rent making uniform the city. In the Image 3.6.4, it’s showed the Alonso curve (Red) that represents the currently urban differential rent has a pick in correspondence of the Barcelona’s city centre, while the values decrease going away. This effect is due to the presence of services (shop, activities, etc.) and facilities (public spaces, pedestrian zones, etc.) that make more relevant the city centre on the rest of the city. Applying the Ecological Urbanism theory and the Superblock model the Alonso curve could be theoretically reduced (Blue), maintaining a central pick in city centre but levelling the general value, and generating little picks in corresponded of the Superblocks (Oriol Nel-lo, 2016). In fact, the proposal to remove the vehicular traffic by the inner street will increase considerably the public spaces, reducing the air and noise pollution and increasing the general **urban quality life**.

Image 3.6.4: Supposed urban differential rent with the Superblock model (blue) and without (red)



Source: Personal elaboration

Conversely, the definition of a Supergrid could generate a disparity between who live inside the Superblock and who live on the basic streets: **Winner vs Loser**. Even if the *Agencia* ensures that with the adoption of the new *Pla de Mobilitat Urbana* the traffic level on the basic streets will be reduced than the current level.

During the application of the Superblock model in all Spanish cases the **lack of a regulatory framework** of reference has been presented as one of the main problem encountered by the *Agencia*. Actually, the Superblock model works to change the mobility system, even if it gives the priority to the public space that are not consider by the traditional Urban Mobility Plan. So, in the cases of A Coruna, Ferrol, Figueres and Vitoria-Gasteiz, the *Agencia* worked with the Municipality through the Sustainability Urban Mobility Plan, while in Barcelona it was designed a specific program for the adoption of the Superblock model. However, it is only a tool in order to coordinate the process at urban level, while subsequently it was necessary to introduce other instruments for the real urban transformation at district scale. Here there was the most relevant innovation, because the Barcelona Administration has introduced the '**Mobility and public space plan**', for instance, "*Espai public, mobilitat I accessibilitat*" in Gracia District in 2006 and "*INFORME*

Pla d'Espai Public I Mobilitat" in Sant Martì District in 2016. This type of plan has not been made official by the Spanish law but it has a great opportunity for the future urban development to define how to manage the amount of new public spaces. In Barcelona, it is forecasts that the implementation of the Superblock model on the whole city will realized 622ha of new public area, that correspond like almost two Central Park, spread on the entire city. Therefore, it will be necessary to decide before its realization who will care about it and how it will be regulated in order to avoid the abandoned of it. The last but not least consideration about the implementation of the Superblock model is the **coordination of the all actors involved** in the project. As already said the *Agencia* plays a key role in the project but it's necessary the maximum coordination between all the political and technical groups, at district, urban and metropolitan level. In the case of Barcelona, the Superblock program has been delayed because the different parties didn't work in the same direction obstructing each other and causing several problems. Due to this misunderstanding between the *Agencia* and the Administration, the Poblenou pilot project has suffered complications that have damaged principally the citizens. Conversely, a good practice of participation process has been realized in Victoria-Gasteiz, where in addition to the main city's stakeholders also the citizens had a key role in the decision process. The Administration has organized a Mobility Forum in order to concentrate the public evaluation about the mobility strategies, and to create a basic framework of public consensus. The Forum has defined the future vision for the urban mobility policies approving a roadmap "*Pacto Ciudadano por la Movilidad Sostenibl*" for the implementation of the sustainability urban level.

Finally, I expos some considerations about the specific application of the Superblock model to the Poblenou pilot project through a SWOT analysis system. These valuations represent the outcomes of my theoretically research on the Superblocks model, but also the opinions and the suggestions expressed by the citizens or technicians that I have met during my survey in Barcelona.

Strengths:

- The Superblock has produced a great reduction of the vehicular traffic. It means a **reduced level of air and noise pollution** and a greater **road safety**.
- The new organization of the inner streets designed by the Superblock model provides **public spaces** that are absent in Barcelona.
- The **public transport system**, in particular the new bus network simplifies the urban movements and permit to live in Barcelona without a private car.
- The reduction of the traffic has a relevant influence on the **health** level.
- The Superblock model encourages the people to **live the streets' public spaces**, transforming them by pedestrian to citizens.
- The 'new' streets' public space permit to realize a connection between the private space and the traditional public spaces (squares or park). It realizes a **public network** on the entire city.
- The **functional implementations actions** that have been adopted on the Poblenou pilot project have permitted to change easily the urban design of the Superblock according to the emerged problems.
- The Superblock approach encourage a **reuse of the empty spaces** through community projects, (urban garden or playground) managed by neighbourhood associations.

Weakness:

- The **pilot project has suffered a bad general organization**. The Agencia de Ecologia has collaborated with an Architecture university, organizing two weeks workshop for the implementation of the pilot project. The workshop was not coordinated with the administration's technical offices that were not ready to start the implementation process, generating several problems in the implementation process.
- The **implementation period was wrong**. It was implemented in September after the summer holiday when a lot of people were out of the city, causing a lack of information and frustrating the participatory process.
- The public **information and the participatory process were too short**. It has been organized a participatory process so as to support the two weeks pilot project, and it has been reveal insufficient when the *Agencia* has decided to continue the Superblock test.
- Due to the short implementation time, **the sustainable indicator system was not adopted**. Poblenou pilot project is the only Superblock that was "functionally" completed and that is without a preliminary sustainability analysis.
- The people that live on the **basic streets have observed a traffic increase** and a deterioration of the urban quality.
- The **Rueda's scheme is too strict**. It has been copy/pasted on the reality by the theory without considering the particularity of the neighbourhood (street directions, TPL routs, public services and facilities).

- The rapidly implementation of the Superblock has generated a **parking problem**. It was not considered the number of parking required to satisfy the demand of residents and workers in the short period.
- The **bicycle paths must be integrated to the Supergrid** before the implementation of the inner streets, because the public space with the streets furniture doesn't guarantee an easy and fast cycling route.
- **Create empty and abandoned streets' public space**. Before to start the application of the Superblock model it's necessary to define an action plan in order to decide how the new pedestrian streets will be managed how to involve the citizens.

Opportunity:

- The Barcelona administration is working to **coordinate five different urban plans** (*Compromís Ciutadà per la Sostenibilitat, Pla del Verd i la Biodiversitat, Pla de mobilitat Urbana, Pla de millora de la qualitat de l'aire and Pla d'actuació municipal)* in one Superblock program. This program would integrate energy, mobility, social and environmental policies in order to generate a sustainable city.

Threats:

- The **lack of a regulatory framework** is one of the main problems for the implementation of the Superblock. In fact, at the moment any Spanish regulation define the streets as public spaces, so the Agencia de Ecologia Urbana has developed the Superblocks model mainly through the Sustainable Urban Mobility Plans.
- The Superblock program has been designed for the City of Barcelona (1.6 million people). However, the metropolitan region around Barcelona (5 million people) has not been considered in the Superblock model risking to **create a separated metropolitan system**.
- The **functional division of the city** imposed by the modernistic architectural movements has generated separated urban areas. This vision is opposite to the complexity idea suggested by Rueda's model and discourages the sustainable idea of an economic and social urban mix.

Conclusion

In this thesis, I have faced the theme of the 'urban sustainable development' that nowadays represent one of the most debated issue at global level. In fact, the urbanization process has reached a critical point to understand that cities can be the source of solutions to, rather than the cause of, the challenges that our world is facing today. Therefore, over the last decades several planning approaches have been adopted to promote an urban methodology able to satisfy the three aspects of sustainability (Ecological, Economic and Social) and reduce the human impact on the earth. I have selected one of these approaches that has been developed at the begin of the new millennium, and I have studied its theoretical framework, so as to compare it with the earlier urban approaches, defining what are its features, and if it is able to produce real sustainable outcomes on the urban system. The specific urban approach that I have studied is called Ecological Urbanism, and it has been formalized in 2012 by a Spanish biologist, Salvador Rueda, which is the director of *Agencia de Ecología Urbana de Barcelona*.

This urban methodology can be considered as an evolution of the planning approaches born during the '90s on a particular ecology awareness. However, the Ecological Urbanism is not a totally new and singular urban approach, but rather it promotes a multiplicity of old and new methods, tools, and techniques in order to realize the sustainable city. In fact, it promotes several interventions that can be connected to the previous urban approaches (reduce the resources' consumption; produce energy by renewable sources; food self-sufficiency; increase a better water management; preserve existing ecosystems and biodiversity; sustainable mobility; etc.). Moreover, Rueda promotes the urban compactness as the first character for the sustainable city and an indicators system in order to evaluate all the urban interventions. In addition to these methods, the Ecological Urbanism want to differentiate itself from previous planning approaches promoting a new idea for the sustainable city, the Urban Habitability. The Rueda's goal is to bring back the citizens' value at centre of the cities, so the Urban Habitability is the link to optimize the urban living conditions of the people and living organism and their capacity to relate each other. Rueda recognizes into the public space the solution to reinforce the role of the citizens, because the public spaces are the backbone of the city, which without them

would not exist. Therefore, the first innovation of the Ecological Urbanism is the importance given to the public spaces, considering it not only the squares or the parks, but rather all the living space, including the streets and infrastructures. Furthermore, the second novelty introduced by Rueda is the holistic approach promoted for the urban system. In fact, he doesn't limit the idea of Urban Habitability to a specific part of the city, or for new urban areas, but he encourages a new urban vision for the restoration of the entire urban territory also in consolidated cities.

So, Rueda and the Agencia de Ecologia Urbana de Barcelona, have developed a particular tool in order to create the Urban Habitability, this tool is the Superblock. The Superblock – *Supermanzana* or *Superilla* in Spanish – is a new urban dimension, between the buildings' block and the district. Inside it, the inner street will be closed to the crossing traffic and the road platform will become an entire public space for the daily uses of all the citizens. In this way, the Superblock will be the physical base for specific urban policies that should encourage an increase of the ecological, social and economic urban sustainability. The several Administrations where the Superblock model has been realized, in cooperation with *Agencia de Ecologia Urbana*, have promoted two implementation phases: functional and structural. In this way, thanks to the low cost, easy to implement and temporary, so reversibility, the public administrations are encouraged to start urban experimentations. Moreover, its simple urban scheme and the easy implementation should permit to reproduce the Superblock in a 'copy-paste' method and modify the solutions working also during construction, enabling the involvement and participation of the citizens. The aim of the *Agencia de Ecologia* is to replicate the Superblock scheme on the whole urban city, realizing as a result an orthogonal streets' network that will be divided in two roads' levels, basic streets and inner streets, creating an urban isotropic space, as in the Cerdà's vision. The Superblock model would promotes the complexity of the urban system, going beyond the functional division of the city imposed by the modernistic architectural movement. It would encourage a democratization of the urban space, applying the idea of Urban habitability in the same way to all the neighborhoods, so as to avoid disparities within the same system. Moreover, it wants change the conviction that the private car could be the most useful and efficient mobility system for urban movements, in favor of more sustainable mobility.

So, the crux of the Rueda's approach is the focus on the new value of the streets, which should represent the key in order to deal the issue of urban sustainability, legitimizing an urban system not anymore car based. To achieve the desired level of sustainability (ecological, economic and social), it is crucial to consider urban streets again such public spaces for which they were born and were used before the mass customization of the car. In fact, the streets in the Cerdà's vision represented an attachment of the private space destined not only for the cars mobility but also for all the community activities of the neighbourhood. It was a space for civic life, which is loaned to the passage of the cars and the mobility transports, but which it is not the private space of the cars and the mobility transports. However, we live today in a car-oriented society, and it is not possible to think addressing the streets' public space issue, considering only the urban design solution. It must necessary promote urban policies in order to involve all the urban actors, public and private, political and technical, and it is inevitably that the renewal of the mobility system is the key of the entire project of urban renovation. It involves several actors by different sectors of the City administration and it works at different scales (district, urban and regional scale), but the focus point is always the mobility management.

At the moment, in the specific case study of Barcelona, this urban renovation has taken place only thanks some pilot projects. The final goal of the Barcelona's Administration is to overturn the contemporary concept that the street is "a place of the cars", into "a place also for the cars". In this sense, the Superblock model seems like a merely tool to manage the vehicular traffic, and in a strictly vision it is, but there is something more. It is the bearing structure of the Ecological Urbanism application, it will change the people's rights to the city, making accessible to everyone the public spaces and turning 'pedestrians' in 'citizens' (Rueda, 2016). Nevertheless, the new urban model is not sufficient to realize the Ecological Urbanism approach. Indeed, even if Rueda has defined the Superblock like the functional tool in order to reach the sustainability goals, the only application of urban traffic policies will not be sufficient. It is necessary to merge several urban policies, so as to implement the compactness, the complexity, the efficiency and the social cohesion and guarantee the social and economic sustainability other than the ecological one. The Administration has to work simultaneously on several sides, using the Superblock model like basic frame of application followed by the useful urban policies. In the specific case of Barcelona, the Administration has adopted a Superblock program in order to coordinate

the main urban policies for a more sustainable city. The five main plans that work together are: *Compromís Ciutadà per la Sostenibilitat, Pla del Verd i la Biodiversitat, Pla de mobilitat Urbana, Pla de millora de la qualitat de l'aire and Pla d'actuació municipal*. These five programs were studied and prepared between the 2010 and 2015 and they were adopted before the political change in the Barcelona administration. Now they are the key reference for the Superbock program "*Omplim de vidas els carres*", and according to the new urban model are working for a sustainable urban development. For instance, it should be implemented the quantities of green areas in the city; the urban pollution will be monitored and reduced so as to improve the health level; they will be implemented policies to raise awareness to a critical consumption of energy, water and all the resources consumed in the urban ecosystem.

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