

Urban morphology and sustainability. Towards a shared design methodology

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Abstract. *The information revolution is radically transforming the very foundation of the 'fossil city'. A 'virtual' macro-urbanism will intersect with an 'actual' micro-urbanism, physical and concrete, determining the form of the new urban environment. Within the binomial of macro- and micro- urbanism, urban morphology identifies an interesting socio-building scale that can serve as the basic strategy for sustainable city planning in the twenty-first century. Morphology thus becomes the necessary 'plug-in' for registering the different 'networks' that characterize the contemporary city – from IT and 'smart' devices to energy and environmental systems - translating these networks into building practices, into 'fabrics', for the physical city. At this purpose an Urban Design methodology has been developed in order to combine the Urban Morphology tools with those of Sustainability giving particular attention to the topics of the comfort outdoor and the passive environmental control systems. The methodology has then been applied in the Sant Adrià de Besos Waterfront Regeneration Project in Barcelona. Neighbourhood's size, complexity and localization, between the sea and a large area of brown fields at the northern gateway of the Catalan capital, has set up an interesting testing bench. A sequence of consecutive steps characterizes the methodology in which morphology, architecture and sustainability intersect one another within a single design process.*

Keywords: Urban Morphology, Sustainability, Urban Design, Methodology, Barcelona

Introduction

For several years now, morphology has acquired a globally recognized role among disciplines involved in urban analysis, by developing effective tools for reading cities and territories. Their application to urban design and landscape has however remained at the margins of such disciplines and only recently, with the irruption of sustainability issues, has become a proper field of research. Moreover the information revolution is radically transforming the very foundations of the “fossil city”. On the one hand it exponentially increases the opportunities for exchange in the new global society, on the other, it progressively reduces the daily movement range creating a sort of “virtual”

macro-urbanism intersecting with an “actual” micro-urbanism, physical and concrete, to which the form of the new urban environment is enrolled. Within this binomial of macro and micro urbanism, urban morphology identifies an interesting socio-building scale that can serve as the basic strategy for sustainable city planning in the XXI century. A strategy that involves, on the one hand, a scalar sequence of physical forms related to aggregation and spatial organization (from houses all the way up to districts); on the other, a complementary sequence of forms related to association and civil organization (from families to urban communities). Sequences that find in the concept of “social neighbourhood building” the lowest common denominator of

sustainability: the sustainable unit, on which urban strategies of environmental control on a larger scale can be based. Morphology thus becomes the necessary plug-in for registering all the different “networks” that characterize the contemporary city - from IT and ‘smart’ devices to energy and environmental systems - in order to translate them into building practices for the physical city, that is to translate them into “fabrics” on which planning of sustainable cities will be based.

Methodology

Polarities, Routes, Fabrics

All urban organisms can be viewed fundamentally as anthropic settlements on the territory. Yet settlements, starting with the choice of location, require some experience of the environment they become part of envisaging a rudimentary system of land division, a network of land ownership and so on. This structure even in the rural settlements of the most primitive sedentary civilizations, is always an expression of a similar, albeit elementary, social structure, characterized by all those polarities and hierarchies of communal spaces that identify a community. These spaces will gradually multiply, differentiate, be arranged by hierarchy as society expands, becomes richer and develops a complex civic structure, accurately mirrored in its system of polarizations, routes and fabrics. Since the appearance of the first permanent primitive settlements then three key concepts emerge characterizing all human settlements up to the XX century: the concept of polarity, the concept of route, and the concept of fabric.

“A city is a system in which all life, including daily life, reveals a tendency to polarize, to unfold in terms of social aggregates which are either public or private. The more strongly the polarization is exerted and the closer the interchange between the public and private spheres, and the more ‘urban’ the life of an urban aggregate is from the sociological viewpoint” (Bahrdt, 1966). It is no coincidence that through history a vast urban iconography presents the city as an object well enclosed by

walls, enhanced by towers and domes on the inside and distinctly opposed to the “outside”. Such view generally tended to discern the essence of the location, fixing its special features in a “characteristic image”, where those towers, walls, steeples, domes, minarets, and so on, stand out from urban polarities as recognizable and identifiable elements within the social and architectural city’s fabric. Their task is to coordinate the urban fabric, their role is to identify the different urban communities in order to grant all citizens a sense of belonging to one civic individuality. Hence, polarities can have a centralizing or a delimiting role within an urban body. In particular, the most representative buildings, from a social and civic point of view, were generally located in the heart of the city or of specific neighbourhoods (the cathedral church, the parish, the Lord’s Palace). Conversely, buildings of a specialized nature (city walls, lazarettos, monasteries, barracks, etc.), due to their greater dimensions and functions were usually placed at the edge of town, occupying the urban fringe belts. But if in small-sized towns the relation between fabric and collective themes is clearly perceivable, since such themes have substantial visibility and presence, in cities of greater size, on the contrary, the perception of the relation is more difficult. The organic value of the city will thus be entrusted to local themes embodied in its fabric (parish churches, “town halls” etc.) whose task will be to reveal their connection to the wider urban system. Moreover in situations of high polycentricity, where various urban communities coexist in the same district, even the simple non-residential - usually commercial - specialization of a square or a street can take on a local polar value. Hence, two key elements emerge when studying the concept of urban polarity. The first is the dynamic relation that is established between polarities. It is thanks to the relation between polarities that urban structures can actually survive and change. The second is the relation that develops between polarities and urban fabric. The relation is reciprocal: the fabric indicates the various potentials for polarization, however only through the physical construction of polarities that the potential can materialize and the fabric can be realised. We can therefore see how urban

phenomena can be read according to a complex dialectic of systems which vary in their degree of collaboration, each with its own hierarchy of relations between center and periphery, polarity and anti-polarity: dialectical systems concerning urban areas that are relatively self-sufficient but that remain complementary to the wider urban organism.

The more a context is anthropized, the more the rationale of route formation is accurate and concise. In general, a distinction can be made between planned systems and spontaneous systems. We will focus on the latter where few 'basic' route typologies generally found in all spontaneous building fabrics, from medieval towns to contemporary informal cities, can be noticed. Hence, given any two nodal points (urban or territorial), the route linking them in the most direct possible way will be termed a matrix route. It is deeply connected and influenced by the morphology of the fabric it fits into - be it natural or urban; it often takes on a distinct curvilinear outline, to achieve the required mediation between the geo-morphological conditions of the context and the rectilinear continuity of a path. But in order to develop urban sociality it is indeed necessary, as already stated, to have collective areas where the civitas can gather and share a common identity "recognition": building will therefore center around such nodal points. Yet when the linear distance from these nodal points becomes considerably greater than the depth of the areas located behind the pertinent strip, then building routes will appear, thus called because conceived from the very beginning as planned routes for building, likely to form a fabric. Once again, however, the construction of a route does not continue indefinitely, beyond a certain distance the tendency will be to form a system of connecting routes (between building routes). Going further a progressive hierarchy of roads will then follow in order to answer to the different levels of sociality characterising the city.

Finally, a city is an organism made of "fabrics": social, economic, cultural and environmental fabrics on which the very functioning of any urban structure depends. The more such fabrics are interrelated and efficient, the more the organism will be dynamic,

versatile and capable of meeting the demands of its citizens. The modes of interaction between fabrics in fact express how citizens inhabit their city, express how citizens transform the city through their daily actions. Understanding such logic or, better still, understanding the logical basis of such relations and discerning their role in the definition of urban fabrics can be considerably interesting and useful.

Hierarchies

A concept runs through the issues discussed so far and strongly influences them: the concept of hierarchy. Hierarchy, in actual fact, means assigning priorities. It might be long or short-lived, but it is never static, on the contrary it is essentially dynamic in nature. Day-to-day and long-term priorities, priorities that are planned and spontaneous, private and collective: they all contribute to the definition of an ever-changing system of hierarchies. Hierarchies, therefore, are the "geo-reference points" on the map of our dwelling, they provide us with a scale of values, both individual and collective, on which to base the critical reading of a city. In urban morphology, routes are what condition and determine, more than any other factor, the assignment of hierarchies. Routes are the main vehicles of city life and the fundamental instrument for reading and transforming the territory. This is particularly true in the case of polarities. Not all of them have the same relevance within an urban organism. The role of priorities depends on their location within the fabric but also (and especially) on the quantity and quality of the routes converging in that point. Two "internal" polarities may have a strong hierarchal relation, and from such hierarchization a number of developments might follow: the persistence of one polarity at the expense of another, the transformation of one polarity depending on another, the layout of new road axes, the disruption of entire building fabrics, and so on. The same applies for the various open spaces (public and semi-public) that characterize a city. In this case as well, the quantity and quality of routes converging in a given location determine the degree of "nodality" of a public space, establishing a dynamic hierarchical system that is parallel to

the formation process of an urban organism. It is exclusively because of their varying degree of nodality that these open spaces are perceived as 'full' civic spaces and not "empty" spaces to be occupied. This is confirmed when we look at fabrics as a whole. The process of spontaneous formation of urban fabrics takes place according to a nodality-anti-nodality dialectic where this state of nodality will be followed by a greater fabric specialization, which will regularly decrease as the distance from the nodality increases finally reaching the opposite condition of "anti-nodality". In other words, the degree of specialization acquired by a building over time depends on the level of hierarchy of the route it belongs to. Routes, therefore, are what determine the various levels of nodality within a fabric and the "weight" of urban polarities. But what determines the hierarchy of routes? We might answer: the hierarchization of the society that built them in a constant and continuous interaction. It is actually true that what gives routes "priority" is the quality and quantity of the polarities they connect, but also the different specialization level of the buildings that define them: a route joining two major polarities (urban or territorial) will typically be occupied by highly specialized buildings, even to the complete exclusion of private residences. Building routes originating from said route are most likely to exhibit a good mix of both specialized and residential functions, while the degree of specialization will decrease gradually arriving at a predominance of residences as the route assumes a more anti-nodal quality. The same applies, at least partially, to the height of buildings, which increases when closer to the nodality; it should not be forgotten, however, that the terms "center" and "periphery", "nodality" and "anti-nodality" are not geometric: it is therefore possible to find nodes and anti-nodes in the very center of a city while, conversely, tall buildings can be found along main routes and, just a few meters away, buildings with only a few stories can rise on connecting roads or in congested pertinent strips. Thus, polarities, routes and fabrics, when viewed within the unstable dynamics of their hierarchal relations, are key concepts. For centuries the transformation of cities has

been based on them and morphology relies on them to read urban phenomena. They also are, as a consequence, the thematic framework for a methodology aimed at planning the smart, sustainable, liveable city of the XXI century.

The neighbourhood-building unit

There is a system of built structures whose essential task is to mediate the transition between the citizen's (or family's) individual, sociological dimension and the city's public dimension. The more complex the public dimension is, the more important is the role played by this structures in the functioning of an urban organism. Such structures, at the same time physical and social, can be defined as "social-building neighbourhoods". The neighbourhood, in fact, although it represents the indispensable link between families (small-scale) and communities (large scale), is generally non-institutionalized, and essentially recognizable only in a building context. Perhaps the most considerable historic example is that of Venice, where between the XIV and the XVIII century the Republic or other public institutions built a number of social housing units, generally centered around neighbourhood spaces: the courts. But other significant examples, which appeared thanks to private enterprise, are the London squares and mews with their common areas well enclosed by the walls of houses (often serial and therefore unitary in their "collective" image) and polarized at the center by a collective service: the garden. Actually mews were traditionally linked to squares and terraced houses but when, in the 1970s, they lost their pre-existing specialized role and turned residential they became perfect, if small, neighbourhood units, complete with entrance gates and a central collective space: a sort of "neighbourhood within the neighbourhood", confirming the great popularity this type of structure enjoys in contemporary London. Neighbourhood is in fact responsible for creating a collective dimension of space that acts as a fundamental area of mediation between urban public spaces and private pertinent spaces: a semi-public space of great relevance for urban identity, functionality, and sustainability. Especially

in polycentric cities, the transition from the individual (a person or a family) to the civitas is far from obvious and often requires an intermediate stage for collective identification, which is exactly what the neighbourhood is. It is, so to speak, an “everyday belonging need” that is not always sufficiently satisfied by the district; activities and functions that cannot be carried out easily at home, and even less so in the street, are therefore entrusted to the collective neighbourhood space. A space to carry out all those co-housing activities that have now become indispensable in a contemporary metropolis: nurseries, workspaces, laundries, sport facilities and more. Social-building neighbourhoods represent, moreover, the sustainable urban unit of contemporary cities. Their nature, both collective and unitary, allows for the implementation of a first strategic level of sustainability, which downscaled to individual buildings would not be very effective. Rainwater and grey water collection, centralized heating systems with clean energy production, “neighbourhood” based and meticulous collection of waste, are just some of the needs the construction of a neighbourhood unit can meet. The value of social-building neighbourhood therefore lies in its intermediate position, both from a social and urban point of view, between citizens and civitas, public and private spheres, communal and individual rights, between the utmost open and permeable urban space and the utmost closed space, focused on its pertinent features. Social-building neighbourhood is, we could say, capable of bringing together the plurality of elements typical of urban fabrics and the demand for unity typical of living spaces: a sort of “unity in plurality” that we believe can play an interesting role in planning the sustainable city of the XXI century.

The Morphological Map and The Nodality Survey

All the issues addressed so far serve for devising an analytical tool we shall call a Morphological Map. A map offering complementary ‘levels’ of reading, each to be analysed individually or collectively, based on a relation of reciprocity. Each reading is the manifestation of a particular

aspect of an urban context’s morphological structure and it is open to a great number of sub-levels, in order to better define its qualities according to needs. But, on closer inspection, it should be noted that a structural knowledge of an urban environment allows to “structurally” plan its transformation. In other words, the same elements used to analyse a given urban context can become valuable design tools. It will hence be possible to draw up an analytical and a design Morphological Map to put as the basis for urban design. The advantages of such a system is evident. On the one hand, it makes planning by stages possible allowing at any time the transition from smaller to larger scales (and vice versa), on the other hand, it makes it possible to correct, edit, sharp the project without having to start all over again every time. Moreover, it is always possible, when focusing on a specific layer, to scale down what is being worked on without ever losing sight of the overall picture. In other words, if for instance we are working a single block we will always know what “type” of block it is, what “type” of routes it rests on and what this involves in terms of fabric whether the condition is one of nodality or of anti-nodality and so on: a sort of “compass” for morphologically informed choices, no matter how specific and particular the intervention may be.

An important tool of the Morphological Map is the Nodality Survey. The analysis of the different levels of nodality within an urban fabric is, as previously observed, the main instrument through which to attribute the morphological hierarchies. The whole sequence of factors previously treated (paths, polarities, tissue) depends, we could say, from their own level of morphological nodality. To analyse these levels accurately is not easy. The strong dynamism that characterizes them, their being a direct expression of the way in which men experience the city makes it a theme rather fluid. But this is also the strength and usefulness of the nodality survey in its ability to return, from time to time, an effective and dynamic socio-urban framework, able to understand the main morphological levels of hierarchy and to adapt itself (in real time) to its temporal changes. For this purpose two values of nodality have been identified, a quantitative

one (scientifically measurable) and a qualitative one (subject to partial interpretation). The first we called Grade of nodality, the second Level of nodality. The Grade of nodality depends on the number of paths that converges in a given point of the fabric. Its minimum value (Grade.2) is obtained by the convergence of only two paths in a point and so on until Grade.4. From the latter, in fact, it is assumed the occurrence of a dilatation of the public space (square, courtyard etc.) to accommodate a higher number of routes. Alternatively, or in the presence of a particularly high number of convergent paths along the same road, we can hypothesized to be in the presence of a “linear nodality”. The Level of nodality is otherwise a typical qualitative matter and depends on the type of converging paths in a single location. These levels are calculated starting from a minimum (Level 1) up to a maximum (Level 10) of specialization of the paths where Level 1 is given by the intersection of a local with a fabric route and Level 10 is the result of the convergence of two matrix route. This distinction allows to calculate not only the level of nodality of a given urban context but also its dimensional scaling. So levels up to the third are related to a more local dimension of urban living while those from the fourth to the eighth belong more to the scale of the neighborhood and those from nine to ten are obvious urban nodality. A Node is thus given by the sum of Grades + Levels (G + L) where, however, levels are always hierarchically more important than the formers. On an equal Grade, in fact, two nodes can differ in the type of level: the one having the higher Level will also have a greater value of nodality.

$$\text{NODE} = L + G \quad L > G \quad \text{es: } L3 + G2 = 5 = N \\ L2 + G3 = 5 = N$$

If then a node has a value greater than or equal to ten we are probably in the presence of one polarity. A polarity that will be at the city scale (urban) or at the neighborhood one (fabric) depending on the value attributed to its level of nodality (fabric: L4-L8, urban: L9-L10). The subject does not change if we are in the presence of nodes of degree > 2. In all these cases, in fact, the level to be taken into consideration for the calculation is always the upper one.

es: $G4 = 2 \text{ fabric routes} + 2 \text{ building paths} \rightarrow L8 (2 \text{ building paths});$

$G3 = 2 \text{ fabric routes} + 1 \text{ building path} \rightarrow L6 (1 \text{ fabric} + 1 \text{ building}).$

Finally, one last important aspect has to be considered. If a node was in a condition for which the grade (G) is greater than the level (L) there are two possible alternatives: we are in the presence of a manifest error of analysis, namely an initial error in the attribution of the type of routes insisting in that given place (eg. building instead of fabric route etc.), or we are facing the possibility of a clear upgrade of the node: a node whose changed urban conditions encourage an increase in size, function and of specialization of paths converging in it. The calculation for this chance is possible thanks to the introduction of a correction coefficient (α) given by the subtraction of G - L whose value is added to that of level (L) in order to equate it to that of Grade (G). What is obtained is a new nodality value incremented of that minimum value of L congruent with the morphology of the context. In other words, the coefficient α indicates the minimum level of modifiability of a place in respect of its morphological congruence.

The α coefficient allows, on the one hand, to correct any errors of analysis made upstream of the nodality survey, on the other, to identify conditions subject to increase. Conditions for which it is possible an intervention of urban regeneration aimed at enhancing the characteristics of a given place through changes and functional increments, spatial increases and so on. Changes morphologically congruent and thus realistically feasible (and desirable) with minimal risk. The morphology is, in fact, expression of all those “tissues” that create a city: social, economic, cultural fabrics finding in the physical “form” of the tissues the place where to play those endless possibilities of relationship which are, in fact, the life of a city. The morphological congruence appears, therefore, a useful factor to “scientifically” establish any urban regeneration project and for this purpose, the calculation of nodality values through the nodality survey becomes a very important instrument.

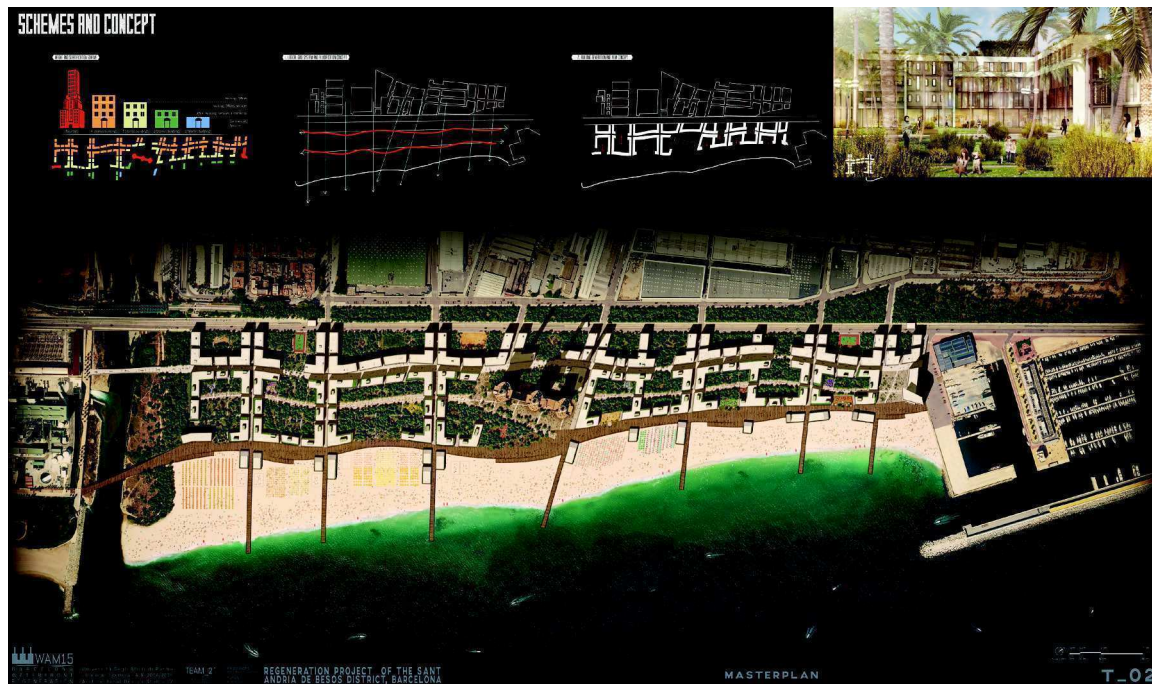


Figure 1.
Project one.

Aim of the project is to create an urban edge to the district of Sant Andria de Besos. This margin is thought to accommodate the main context lines as they approach the sea until they become new pedestrian routes crossing the project and, finally, wooden piers over the sea. Functional hinge of the new system is the coastal road with the new fast tramway. It is intentionally left empty of building in order to don't conflict with the transverse direction of context streets. So the large green courtyards are open upwards to enhance the functional nature of the coastal axis and semi-open to the waterfront as collective courts with facilities for citizens. The system is then crossed by three major axes. The first, the most relevant at the urban level, creates a sort of long "road-square", entirely pedestrian, designed to connect the Forum 2004 area with the northern Marina. It is the heart of the new district, where the main commercial and tertiary activities are located. Continuous building walls highlight its mainly polar character. The second path is the long waterfront. It is the place intended for major recreational activities, sports, and small commercial. A third level of route is the promenade. It slightly sets back from the coastline crossing the large green collective courtyards. It is the ideal place for relaxing activities, for children and families, away from the summer heat and definitely more dynamic waterfront activities. These three paths converge to the center in the garden square dominated by the imposing presence of the three chimneys of Sant Andria de Besos Power Plant, now disused, whose structures have been maintained and transformed into cultural activities. A careful study of the main environmental components (sunshine, prevailing winds, albedo values etc.) within the urban courtyards led the architectural design, guided the casing choices and allowed the selection of materials in order to ensure a truly sustainable urban project.

The Topic: Barcelona. Sant Adrià De Besos Waterfront Regeneration Project

The area of Sant Adria de Besos is at the edge of the northern outskirts of Barcelona. Its location is of considerable territorial importance being to act as a hinge between the compact tissue of the Catalan capital and the continuous system of coastal settlements that characterize this part of Catalonia. On the one hand, it is

standing just beyond the Besòs River, natural border of the Barcelona urban sedime and a few hundred meters from the Forum 2004, on the other hand being at the arrival point of the Avenida Diagonal and the Gran Via de Les Corts Catalanes, it stands out immediately as a spontaneous "northern gateway" to the Catalan capital. Moreover, the coastline, traditionally neglected by all the settlements of the west of Spain, lying along the ancient Roman road

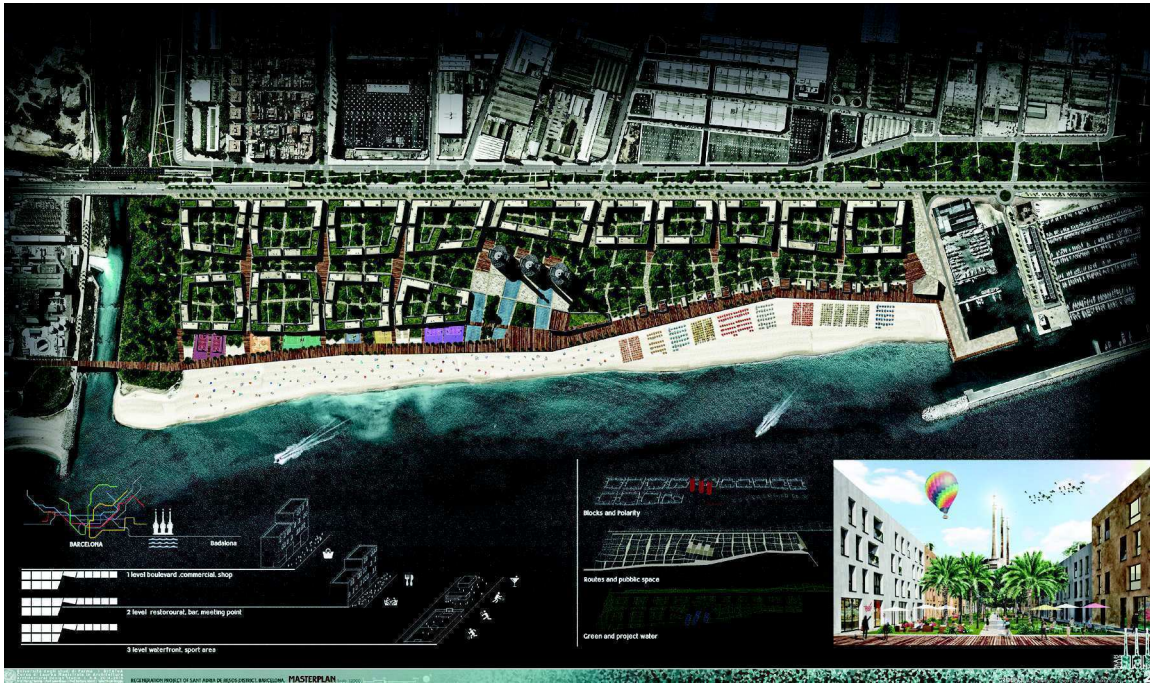


Figure 2.
Project two.

The project moves from the decision to create a real urban boulevard balancing the new district with the rest of Sant Adria de Besos. All major paths are vertical penetration toward the waterfront which is strongly hierarchical thanks to the exclusive use of the wood for the flooring and the location of all major sports and recreational activities. The major commercial activities are planned along the boulevard where all the infrastructural facilities are located. A second settling situation, at a more local character, focuses on the grafting of the pedestrian vertical penetration systems through the dilation of routes in small squares. A third and last hierarchical level is given, finally, from green courtyards system, the neighbourhood unit, which determine the building fabric and that innervate, through a hierarchical grid, the entire project area. At this level, in addition to make entirely pedestrian the new district, the main environmental control choices are given. The latter, as mentioned above, are aimed at a conscious design of outdoor spaces and at the congruent choice of the opening levels of the buildings facades. A final element relates to the identification of the disused Great Plant as a new urban polarity to be devoted to culture whose square recovers the general urban design by the introduction of materials and textures able to specialize the urban fabric without interrupting its continuity.

and set back from the current sea front, now plays a key role in defining their identity. Since the major initiatives of Barcelona '92, the waterfront is, in fact, the starting point of any urban renewal strategy for this part of Catalonia and it is therefore the main subject of this project experience. Finally a major element for which the physical and functional recovery is required, is the large power station, now abandoned, which with its three imposing chimney dominates the entire coastal area for several kilometres: a real territorial landmark that play a fundamental role in the process of urban regeneration of Sant Adria de Besos.

The Urban Projects

Projects presented in this paper are based on a common methodology for urban analysis and basic urban design. All projects are characterized then by taking some common elements derived from the urban analysis, certain common concepts at the basis of the methodology itself (such as urban sustainability, liveability, mixité etc.), but offering a wide variety of design solutions to the issue. So all projects provide a localisation of new urban polarities with the aim of creating a system, within the existing one, on which to base the new morphological structure. Their function and sometimes their

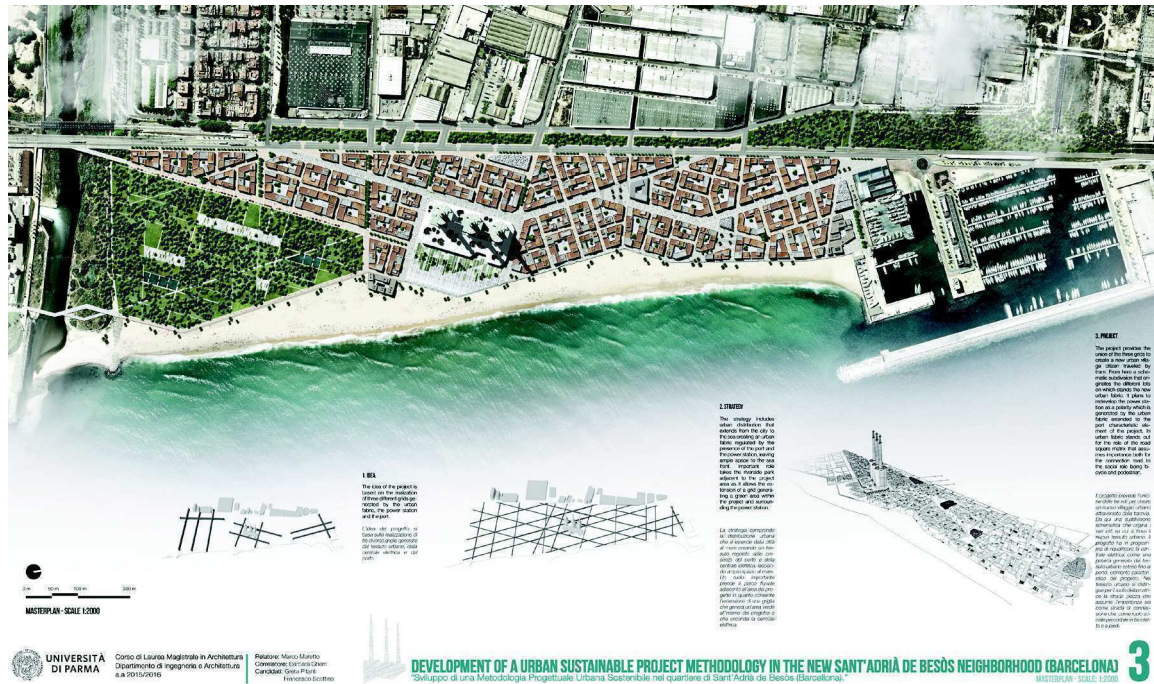


Figure 3.
Project three.

The project is very different from the previous for two substantial reasons. To the one hand it restores the urban boulevard through a compact front opened to the new building tissue and to the routes penetrating the existing fabric. Accesses to these paths, when fitted with a certain value of nodality, are always identified by the presence of a small special building, a square and the stop of the new fast tramway. On the other hand the new district takes on the characteristics of a independent “barrio” with its own hierarchies, its own relational ratios and a settlement strategies dialoguing more with the Mediterranean world in general than with that part of Barcelona in particular. A central axis cuts the settlement putting in connection its major nodalities with the big disused heating Plant in the middle. To the latter we entrust the task of identifying the new neighbourhood within the waterfront of Barcelona. A further set of small “local” squares contributes to hierarchize the urban fabric, while an interesting collective courtyards system generates a network of protected paths from winter winds and excessive summer sunshine. All this to deliver a variety of hierarchical public spaces greatly contributing, in our opinion, to the dynamic unfolding of the different “levels” of life and sociability that characterize an urban organism. To complete the project, to the south, a large urban park is connected with the Besos River Park up to get into the heart of the project while, to the east, a new fish market connects the neighbourhood to the Marina. Even in this project a careful environmental analysis has guided the design choices at the building scale helping to draw the collective courtyards and to design the open spaces system.

own morphological role can change depending on the interpretation that designers have given to the Morphological Map. Yet location of these new polarities, although very similar, does not necessarily coincide from one case to another: it is the design of the new tissue that defines the real urban coordinates, even the relationship with the sea changes according to the different idea of waterfront developed by projects. Sometimes it is fringed, jagged, open, backing up the sea line in the new district; in other cases it is well marked by the

presence of a path which is an ideal location for all major sports and recreational activities, and so on. The same goes for public spaces. In some cases, few important squares sum up in themselves all the civic values of the new settlement, in others, few large spaces, usually themed by an urban polarity, are a counterpoint to a system of small squares, courtyards and gardens for everyday life.

The first step has been then to analyse the context from a morphological point of view focusing on the system of routes, polarities

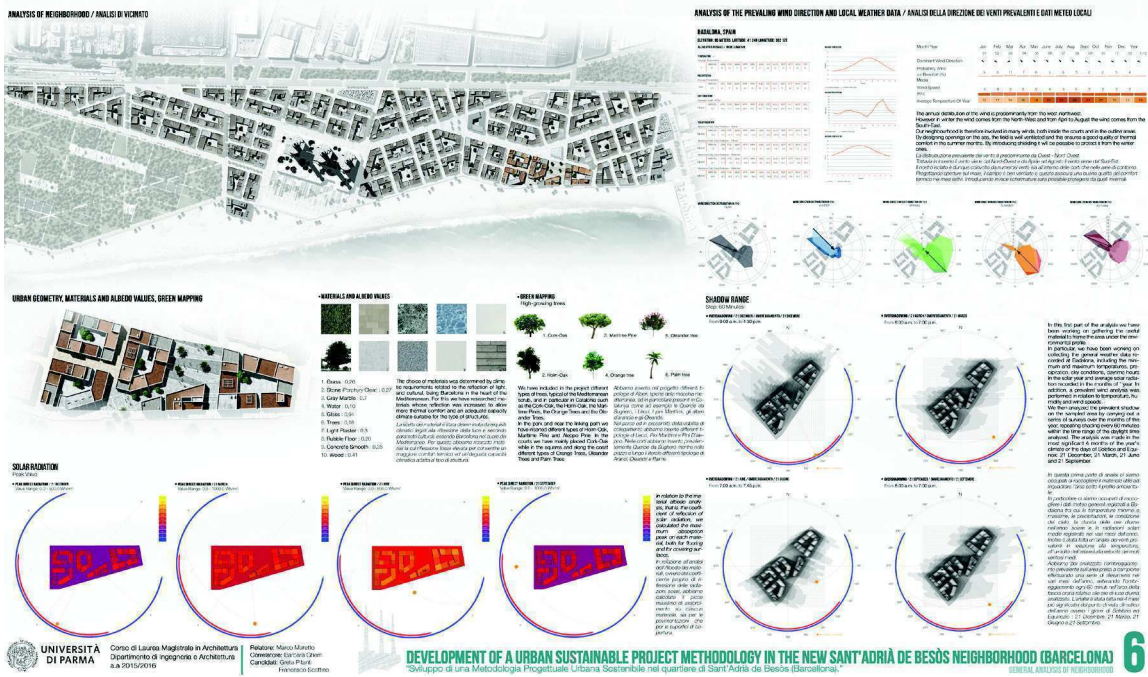


Figure 4. Project three. Environmental analysis: General data.

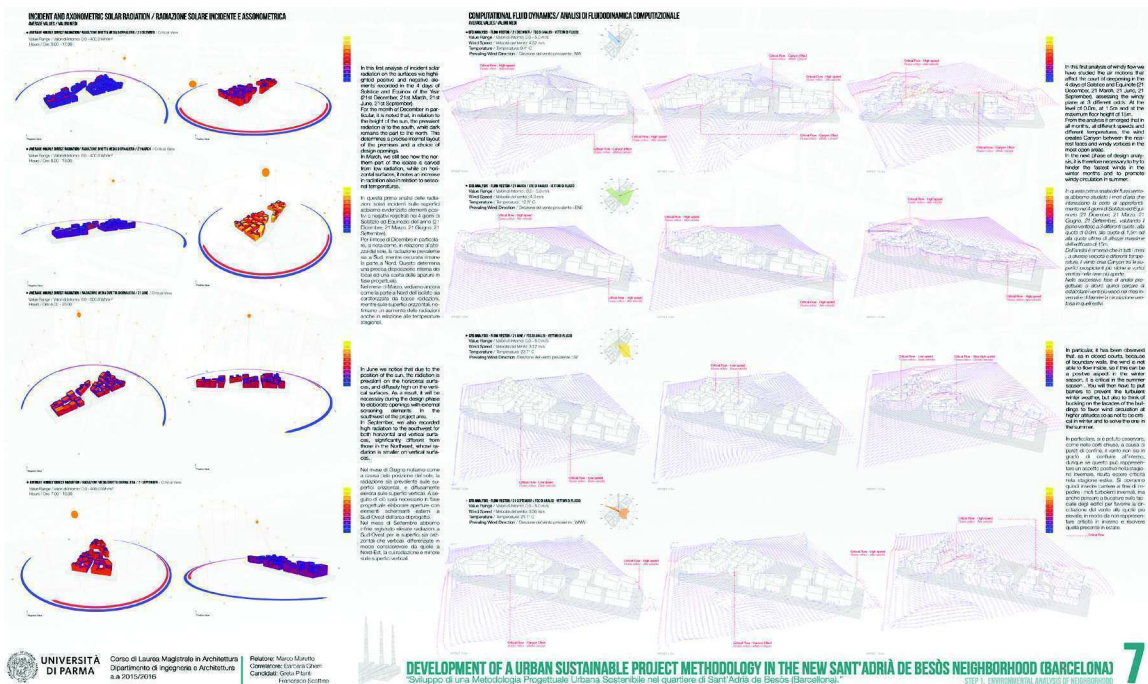


Figure 5. Project three. Environmental analysis: Highlighting criticality of a block-type.

and types of urban tissue in the area. As for the first, it was decided to intervene, first of all, on three topics: the extension of the Gran Via as a fast axis of urban connection; the design of the new waterfront (as an extension

of the Passeig Maritim); the transformation of Carrer d'Eduard Maristany, now split in two by the railway, in a real urban axis capable of gathering together, visually and functionally, all coastal settlements until Girona. For this

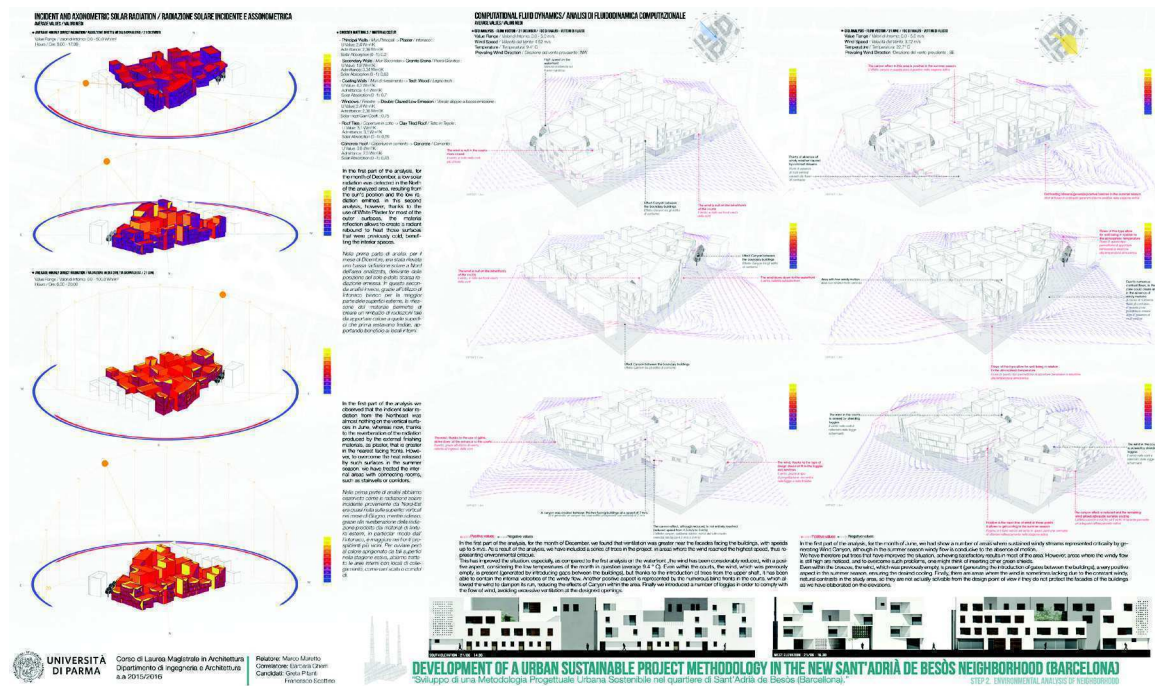


Figure 6.

Project three. Environmental analysis: Design solution of the criticality identified in the block-type.

purpose, the obvious choice has been to provide for the burying of the coastal railway line as strongly required by all the municipalities of the territory envisaging the realization of a fast tramway able to effectively serve the coastal area. On this routes system grafted then all the others, creating the basic conditions for the urban regeneration. As for the second, it was then to identify the presence of urban polarities in the area. Analysis highlighted a substantial lack of “inner” polarities in favour of some important “outer” ones, however, it was noted that the now dismissed Power Plant, with its three large chimneys, could well be that “inner” polarity to identify and organize the new neighbourhood’s tissues: a large urban landmark able to make system with the other two towers dotting the waterfront of Barcelona. As for the urban fabrics, the vast majority of settlements in the area are made up of multi-family houses built along the route (the block is hierarchical from the road) and a few line houses (the road is hierarchical than the block). These two typologies were then chosen as the starting point for the design of the new building fabrics. One specific issue was then the design of open spaces and green as a fundamental connective-morphological element of the urban project. The design of

public spaces follows then, in all projects, the same social and urban hierarchies provided for the new fabric, from large to small scale, adopting the so called neighbourhood building unit as minimum intervention area. Finally sustainability. That of the environmental design has been, since the beginning and for the whole duration of the design experience, the main urban design tool. It is the instrument that guides the formal definition of urban design, it is the tool that defines the design of public spaces, it is the palimpsest for the architectural design. Morphology and Sustainability are then the two main design tools of our methodology and the basis of this experience.

Conclusion

Urban morphology can be on the basis of the sustainable design of contemporary cities precisely because it addresses the very substance of urban fabrics, the rationale that determined their transformation over time, and uses such rationale as a flexible, dynamic, concrete planning tool. An informed plan, where all the different scales of dwelling are held together, where the social, economic and cultural aspects of a city are linked to its

physical, environmental and technological features. Without ever losing sight of its ultimate objective: planning the smart, sustainable, liveable city of the XXI century.

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