

# The restitution of spatial continuities as an urban project for improving territorial efficiency in the Metropolitan Region of Barcelona

Carles Llop<sup>a</sup>, Marta Carrasco<sup>a</sup>, Konstantinos Kourkoutas<sup>b</sup>, Arturo Calderon<sup>a</sup>

## Abstract

The research project from which this article stems, pretends an approach to the concept of territorial efficiency from a projectual perspective, that each territorial actor gives to their problems and their needs in the relation to the resources uses and the respective social, economic and environmental costs. The Metropolitan Region of Barcelona (MRB) is the selected case study, studying the diverse metropolitan projects that have been planted and/or implemented from 1985 till now. With the objective to provide a transverse lecture of the city and the territory, it is suggested that the urban project should be utilized to intervene in order to achieve a greater mutual adaptation between different social and ecological systems, increasing the overall level of organization and thus territorial complexity, and thus setting the foundations for a more sustainable development. In this sense, we analyzed which project strategies permit contribute positively to the territorial efficiency, not only on a local level but on the totality of the region as well. Starting with this diagnostic of the MRB, looking for the concrete territorial

situations that characterize it, and taking into consideration the analyzed projects, a series of project logics are proposed, seen as strategies with a positive potential with regards to urban and territorial efficiency.

Finally, the different examples permit to affirm that this project logic, once applied it can contribute positively to the territorial efficiency of the whole region, especially when considering the multiplicity of scales that a project can entail it aims to achieve an effect greater than the mere establishment of a physical continuity, giving answer to different aspects such as mobility, accessibility, ecological functioning and urban integration, and so on.

## Keywords

Spatial continuity, Urban project, Metropolitan Region of Barcelona, Territorial efficiency, Regional efficiency, Territorial situation, Project logic.

## Introduction

The content of this article poses some of the objectives and questions of the National Research plan with the title “Efficient Cities, Metropolitan territories and urban regions: Strategies and project proposals for the regeneration of the territorial mosaic city, after the urban explosion”<sup>1</sup>. The principal objective of the research is the

evaluation of the Metropolitan Region of Barcelona (MRB) in terms of territorial efficiency, viewed through the analysis of recent metropolitan urban projects, with their respective project logics and strategies. Based on the detected territorial situations encountered within the MRB, and from a multiscale viewpoint, the totality of the MRB was diagnosed in terms of problematics that have arisen in the last decades of intense

<sup>a</sup> Department of Urban and Territorial Planning, ETSAV School of Architecture of the Vallès, Universitat Politècnica de Catalunya - BarcelonaTech, C.Pere Serra, 1-15, 08173 Sant Cugat del Vallès (Barcelona), Spain. E-mail: cllp@coac.net; marta.carrasco@upc.edu; arturo.calderon@upc.edu

<sup>b</sup> CORE Ciutats Intel·ligents i Sostenibles, Escola d'Enginyeria, Universitat Autònoma de Barcelona, Carrer de les Sitges s/n, 08193 Bellaterra. Barcelona. Spain. E-mail: konstantinos.kourkoutas@uab.cat

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urban development, that has been coined with the term “the urban explosion” (Font, Portas, Indovina, 2004)<sup>2</sup>, principally characterized by the different processes and phenomena that go beyond local particularities and are shared by most contemporary urban regions today (Llop, Bosc, 2012).

In this context, the project logics are proposed as project tools capable of inverting determined territorial situations to achieve an improvement both in environmental as well as social, setting the path for a more sustainable development for our territories. These are the logics that we propose as means for the regeneration of contemporary cities, metropolitan territories and urban regions, as demonstrated practical and applied experiences.

For the analysis of the selected projects a methodological guide was developed that in a transverse way, relates and links different concepts to perform a lecture of the reality of each territory and the qualities of each project. This guide was developed over a series of themes that we propose as key concepts for the analysis of the contemporary city and territory. That is, an interpretation of urban and territorial phenomena not solely utilizing morphological criteria, but also considering the contributions that come from other disciplines such as ecology, sociology, etc. The proposed themes are: morphology, metabolism, networks, landscape and time. And the content of each one of them has been developed through attributes compiled from dif-

MORPHOLOGY	STRUCTURE	METABOLISM	NETWORKS	LANDSCAPE	TIME
Types of fabrics	Habitability	Social Metabolism	Ecological, green and blue infrastructures	Character and identity	Velocities and rhythms of the territory
Compactness	- closeness to workplace	Energy management	Types of open spaces	Life quality	Risks and fate
Density	- closeness and accessibility to public transport and public facilities and services	Materials management	Ecological connectivity	Solidarity	Impacts, perturbations and associated cycles
Intensity	- green spaces perception	Biomass management	Topological networks	Landscape banalization	Innovation and creativity
Diversity	- vital space	Pollution	Landscape connectivity	Multiplicity and diversity of landscapes	Climate change
Complexity	- environmental qualities	- Gas emissions	Energetic networks	...	Energy transition
Road and infrastructure routes	- accessibility to natural and public spaces	- Light pollution	Production and exchange of goods and capital		
Barriers and obstacles	- social diversity	- Noise pollution	Mobility and transport infrastructures		
Green system	- housing politics (housing right)	- Soil pollution	Social and cultural		
Porosity	- housing quality	- Water pollution	Information and knowledge		
Permeability	Activity	- Electromagnetic pollution	Organisational		
Public space system	- scales of activity	Resilience	Informational networks		
Canopy and skyline	- diversity of activity		Smart grids		
Limits and borders	- intensity		Governance and organization		
...	- research and knowledge		...		
	Mobility				
	- interconnectivity				
	- accessibility to flows				
	- hierarchy and the scales of mobility				
	- pedestrian streets				
	- cycling paths and bike parking areas				
	- commuting and daily mobility				
	...				

Table 1 – Methodological guideline for the project analysis. Attributes considered for the analysis and diagnose of the selected projects

<sup>2</sup>The concept of “Explosion of the city” was developed during another research led by the Department of Urban and Territorial Planning of the Universitat Politècnica de Catalunya – BarcelonaTech (UPC). The results were published in the following publication: “L'explosió de la ciutat: Transformacions territorials recents en les regions urbanes de l'Europa Meridional”. Antonio Font (ed.). Barcelona: Colegio de Arquitectos de Cataluña. COAC & Forum Universal de la Culturas, 2004. ISBN 84-96185-18-4 (edition languages: catalan and english).

ferent systems of indicators<sup>3</sup> for evaluating city performance from the point of view of different disciplines in terms of efficiency, and the contribution of other specialists.

### ***Territorial efficiency***

In general terms, we understand the concept of efficiency as the relation between the results reached/achieved (based on some pre-established objectives) and the resources utilized to achieve them. From a territorial perspective, various authors have approached the question in different ways. In ecology, the expression of the concept of efficiency is to maximize entropy in terms of information. Efficiency can be explained through the relation between the energy and urban complexity (in terms of organized information) (Rueda, 2012).

From a socio-ecologic point of view, the concept of efficiency is proposed as a means to improve the socioeconomic satisfaction of human needs, while maintaining the ecological quality of the landscapes and conserving the availability of natural resources and the environmental services offered by the biophysical matrix (Marull, Pino, Tello, 2008).

According to Rueda, efficiency is a concept directly related with urban metabolism, that is to say, the flows of material, energy, water that support it's functioning. But the metabolic requirements of a city are also dependent on the sum of material and energy resources necessary to sustain the different aspects of human activity (Wolman, 1965).

Therefore in order to achieve a higher territorial efficiency, from a sustainability perspective, it is necessary that the city and the territory can satisfy the needs of its inhabitants and users, utilizing its own infrastructure and within its given capacity (Rueda, 2012).

From other perspectives, it is evident that we can also talk of energy efficiency, efficiency in terms of mobility, or even in economic terms. But if the principal objective is to achieve a higher efficiency in order to improve the quality of life of the inhabitants of the territory, without risking its future functioning, then we need to consider the question of territorial efficiency with a more holistic/integral perspective. And thus achieving habitability models within a feasible framework of sustainability.

Even more, we assume that the concept of efficiency is specific to the time moment and changing depending on the urban problem (or

territorial situation) and in a position to propose a sustainable development, and a greater mutual adaptation between the different ecosystems, whether urban, rural or natural. As a consequence we propose the territorial efficiency from the project response given to the needs and problems of the different actors related to the used resources and the social, socioeconomic and environmental costs. That is, from a qualitative point of view, a project, whether urban or territorial, permits to increase the territorial efficiency from a multiscale perspective when promotes, with the minimum consume of resources, the integration of the environmental systems and the biophysical matrix; the urban compactness rather than the functional scattering; the social diversity rather than the segregation; the proximity and accessibility to flows (of mobility and public facilities); the permeability rather than the fragmentation, and the mixed uses rather than the specialization. All these issues permit the increase of the efficiency of the different systems, allowing the co-evolution between them as well, in order to lead to a more sustainable development of our territories.

### ***Problem definition: the territorial situations***

The territorial situations are consolidated realities, and are their specific processes that impulse the emergence of these realities. When we talk of territorial situation we refer to the identification of territorial spaces, characteristic in terms of morphology, understood through its phenomenology. That is observing how a space has transformed and why.

- The consolidation of certain urban areas as established centralities;
- The decentralization of the different types of economic activity towards the metropolitan periphery;
- The development of new polarities around new & existing infrastructures;
- A territorial dispersion that implies an extensive and growing consumption of peri-urban land;
- The fragmentation, gradual loss and isolation of natural areas;
- The population loss in metropolitan centres;
- Processes related to the internal restructuring of cities;

<sup>3</sup> UN-Habitat agenda indicators, Urban Audit, Smart Cities - European ranking of medium sized cities, LEED for Neighborhood Development, BREEAM Communities, Banco Público de Indicadores Ambientales (BPIA), Landscape Indicators by Landscape Observatory of Catalonia, Barcelona Urban Ecology Agency, Observatori de Sostenibilitat de les Comarques Gironines, among others.

- The territorial infrastructures and the problems related with the accessibility to the diverse regional mobility flows (of different scales and types).

### ***Project logics and strategies***

When we refer to the project logics in terms of efficiency, we talk about those projects, actions or interventions that when they are applied through the project (urban and/or territorial) and in specific cases or areas, tackle the problematic of the different territorial situations and contribute positively to the efficiency of the whole region.

Principally, the project logics that we propose aim to tackle the problems related to the open spaces and its degradation and regression due to the urban development in extension and the construction of infrastructures that act as barriers; to the habitability of the spaces and the mobility in relation to the accessibility and proximity to the flows; and to issues linked to the regeneration and reprogramming of different fabrics or areas to promote their transformation and reintegration to the territorial matrix in terms of connectivity.

In the research project we propose the following logics or strategies:

- Consolidating the open spaces and the ecological infrastructure;
- Restoring the spatial continuities;
- Reprogramming the deteriorated natural and environmental spaces;
- Designing and planning the borders and promoting the interaction in the ecotones;
- Promoting the territorial waste spaces as opportunity spaces;
- Optimizing the metabolic cycles;
- Reprogramming the degraded specialised areas;
- Integrated the fragmented fabrics into the territorial and urban system;
- Promoting the territorial and urban regeneration;
- Reconsidering and planning new areas of centrality;
- Reconfiguring the metropolitan streets as structural axis;
- Integrating the infrastructures;
- Increasing the multimodality and intermodality in the mobility networks;
- Ensuring the accessibility to the mobility flows;
- Improving and ensuring the habitability of the different fabrics;

### ***Spatial continuities***

Two types of spatial continuities were considered: the ecological ones, that normally occur at various scales and correspond to the functioning of the system of territorial open spaces; and the urban ones, that from a social perspective, we tend to relate with a more local scale (although not necessarily) and questions such as accessibility and mobility of the inhabitants of the MRB.

In ecological studies and “in landscape systems, corridors create connectivity between different habitats. A system of corridors can lace together two distinct ecosystems. *Channelled movements of matter that are spatially differentiated from an adjacent static area may produce or maintain an observable corridor. Here, movement of objects is greater within a strip than in the surroundings.* Corridors in the landscape are “strips that differ from their surroundings; (and they) permeate the land. *They are movement paths for species, for water, for wind, for material of the landscape.* They exist as qualitatively different zones of conduit that connect two ecosystems, end to end. But in addition to connectivity, they also provide distribution as they open up their contiguous surroundings to the stuff that is moving within them, whether species, air, information, or creative practices (Forman, 1995).

Functional corridors may not necessarily be discrete structures. Past research has simulated dispersal and patch colonization on heterogeneous landscapes and identified the regions of the landscape in which flows were funnelled and that, therefore, functioned effectively as corridors. They found that in some cases actual “corridors were diffuse and difficult to identify” (Turner, Gardner, O’Neill, 2001). Reduced contrast between habitat patches and the intervening matrix may enhance connectivity more than would a discrete typical corridor. Evaluating the actual effectiveness of a linear habitat patch as a corridor requires a three-step evaluation of whether organisms can find, select, and successfully move through the patch. Enhancing our understanding of how organisms move through heterogeneous landscapes (along corridors or through the matrix) is a key component of understanding the responses of organisms to spatial pattern (Turner, Gardner, O’Neill, 2001). According again to Dramstadt et al. (1996), the corridors have two basic controls/indicators: width and connectivity. Accordingly, they are attributed five major functions:

- i) habitat,
- ii) conduit,
- iii) filter,
- iv) source and,
- v) sink,

and respectively based on the degree that they fulfil the above functions they can be categorized in two broad categories (Rodá, 2003), in terms of their ecological functioning:

**biological corridors** - a lineal element of the landscape with limited width with the function of canalizing flows (of energy, material, information) adapted to the presence and conditions of the corridor. These corridors are more vulnerable to perturbations that can alter their structure or continuity.

**ecological corridors** - the second concept of the corridor, amplifies that of the earlier category in two important aspects: i) its larger dimensions and ii) its general objective of permitting diverse flows both biotic and abiotic. Thus these corridors provide habitat, and more specifically multi-habitat for diverse species. They constitute landscape elements much more strongly pronounced territorially speaking.

**social corridors** - In the urban environment, one can also observe situations where the different urban fabrics and their functioning (social indicators, social services, habitability, mobility etc.) are seen interrupted by the presence of such types of infrastructural barriers. Related to this, there can also be other types of consequences such as social segregation and isolation, if the barrier effects becomes intensively pronounced. Urban continuity, in this sense, refers to the continuity of the urban fabric in terms of social connectivity and accessibility. While social connectivity refers more to the relational and interchange potential/possibilities between the different fabrics and urban spaces. This connectivity is possible if the space holds the particular qualities and conditions for it to be produced, but at the same time it is also necessary that an adequate access to mobility flows exists or can be established.

*Landscape connectivity* is generally accepted as a highly significant landscape attribute for conservation biology, thus setting up habitat corridors has been a classic approach to landscape connectivity management that has been advocated as a key conservation strategy in human-modified landscapes where urbanization, infrastructure development and other activities frequently sever natural connections (Rodá, 2003). Indeed, connectivity stands out as being one of the most widely used metrics of landscape function. Some authors consider it a single attribute while others tend to distinguish two aspects: *connectance* and *connectivity* (Marull, Pino, Tello, 2008) where the former refers to connection from a structural point of view (based on physical attributes), while the latter describes functional aspects of the connection between landscape elements, such as patterns of organism movement and migration, or the response of organisms to the presence of barriers. For many species, connectance and connectivity are indeed quite distinct (ibidem).

In the case of the Metropolitan Region of Barcelona, chosen as the case study, the open spaces within this area are found in a fragmented state. Observing in detail areas such as the Llobregat river or the Vallès area (figure 1), we can appreciate how the infrastructures act in many cases as barriers, disconnecting the different spaces and invalidating ecological and social functioning of the territory.

The big infrastructures are structured conditioned, to an extent, by the local geomorphology and geology of the territory, taking advantage of

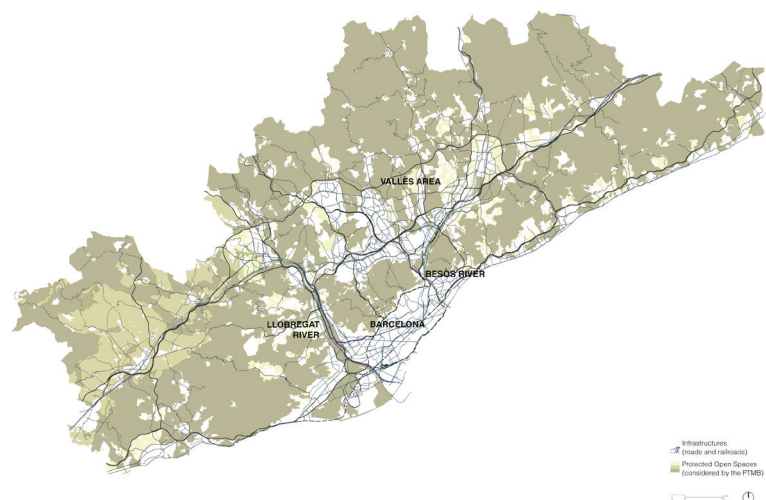


Figure 1- The current fragmentation of the protected territorial open spaces in the Metropolitan Region of Barcelona caused by the infrastructures

Source: Sílvia Mas and Lorena Maristany

the valleys and plains to avoid obstacles. This efficiency in infrastructural terms can have a great impact on other territorial infrastructures and systems, what lately has been coined as green infrastructures of the territory, as a way to interrelate the structure and function of territorial open spaces.

## Methods

### *Data collection and analysis*

The applied methodology is principally based in the identification and study of different metropolitan projects that are analysed posteriorly in more detail. A GIS (Geographic Information System) database of all the detected projects (figura 2) in the metropolitan area was created, projects that impulsed significant operations of urban transformation. Most of these were promoted by public administrations and, for this reason, an extensive analysis of the public databases and information was performed. At this moment, and taking into consideration that this can be considered as an ongoing effort, after the completion of the project, we have identified 800 projects that were developed in the metropolitan area of Barcelona, between the years of 1985 and 2015.

The use of GIS technology has also permitted the development of spatial and network analysis in the metropolitan scale. In this article, a series of the produced cartographies are presented, in relation with the question at hand that is territorial fragmentation and spatial discontinuities.

It is also important to highlight the fact that a great part of the analysed data was complemented with the work and collaboration of architecture students that have performed an extensive survey of the territory, through the course workshop and laboratory.

With respect to the detection of the territorial situations, their identification as exemplary cases was done based on the Atlas of Transformations 1977 - 2014 (*Atlas de las Transformaciones 1977 - 2014*)<sup>4</sup> developed by the team of Prof. Antonio Font (Font, Llop, Vilanova, 1999) and at the same time on the analysis performed with GIS. The superposition of the two types of data, have permitted us to detect those territo-

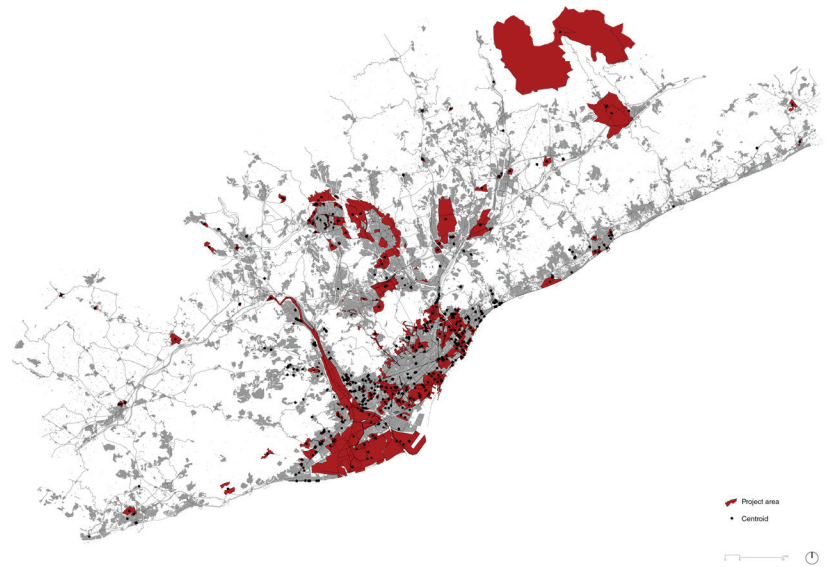


Figure 2- Visualization of the database of the metropolitan projects that we have registered and that have been developed or planned from 1985 to 2014

Source: ICGC (Cartographic and Geological Institute of Catalonia)

rial hotspots where characteristic territorial situations appear. With the further help of aerial photos and other thematic maps, its evolution and transformation can be explained both in physical as well as phenomenological terms.

## Context and territorial situation

### *The territorial disconnection and fragmentation*

The moment of the greater urban expansion in the MRB was produced during the 70s and 80s as a consequence of the growing internal immigration. During this period the important cities of the MRB like l'Hospitalet de Llobregat, Terrassa o Sabadell grew in a rapid way and in an extension that permitted to cover the increasing demands for housing. With the proliferation of the private vehicle and economic industrial development, it was made necessary the construction of a road network that could connect these important cities, on a local and international level. The improvement of the telecommunication technologies during the following decades, also permitted urban development in areas solely accessible by private vehicle, like low density resi-

<sup>4</sup> The Atlas of the Transformations 2004-2012 continues the previous works developed by the Urban Planning Chair of the Dept. of Urban and Territorial Planning (UPC). From the maps of "Uses and forms of building 1977-2000" of the MRB, the research team proposes its updating to the last period 2004 - 2012. The series of maps of "Uses and forms of building" and "Variations of uses and forms of building" show the transformations that the MRB has suffered in each period, and permit concluding the reason why these changes have been. The maps concerning the first period have been published in the book "The construction of the metropolitan territory" (original title: La construcció del territori metropolità, Font, A. (ed.), 1999).

dential areas, industrial and logistics areas along key infrastructures etc. In this historic moment, the priority in terms of efficiency was to facilitate all this incoming population and the construction of new infrastructures that would satisfy these needs.

The key question to consider is how this de-

velopment took place. The big infrastructures were constructed following principally a regional logic, of efficiency in terms of reduction of distances and time, as well as savings in economic resources for their construction. A logic that at the moment did not take into high consideration the biophysical matrix present, as a result having

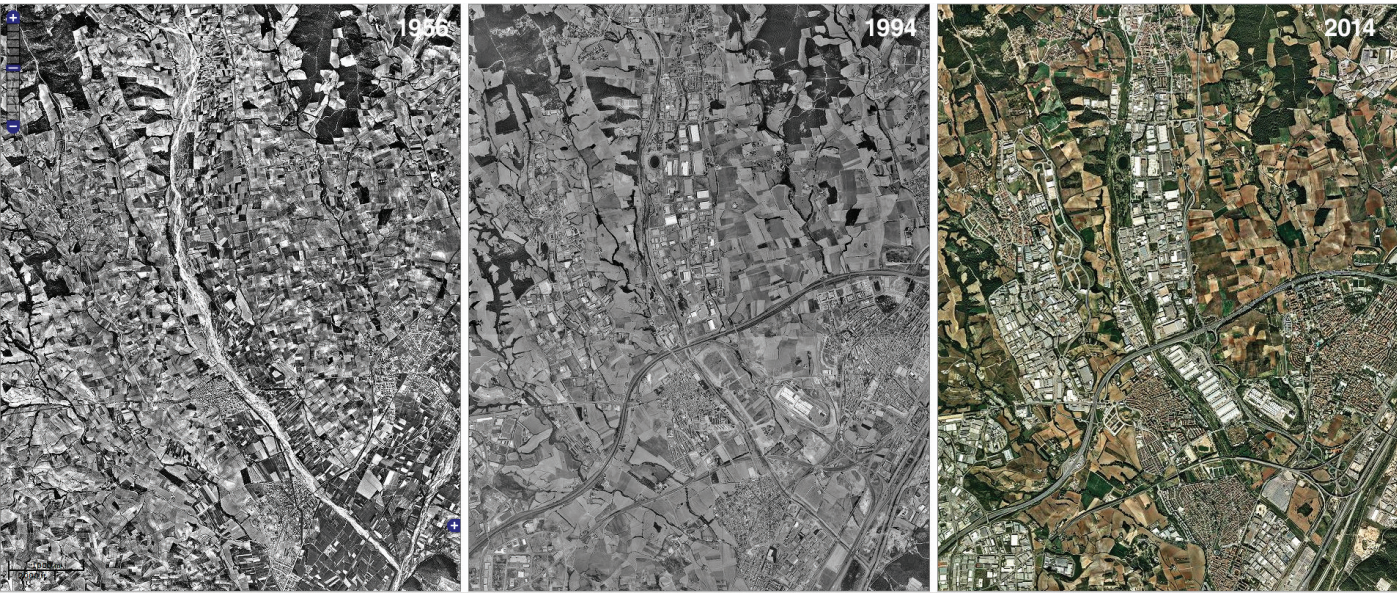


Figure 3- An example of the disconnection between territorial open spaces in the Vallès area

Source: ICGC

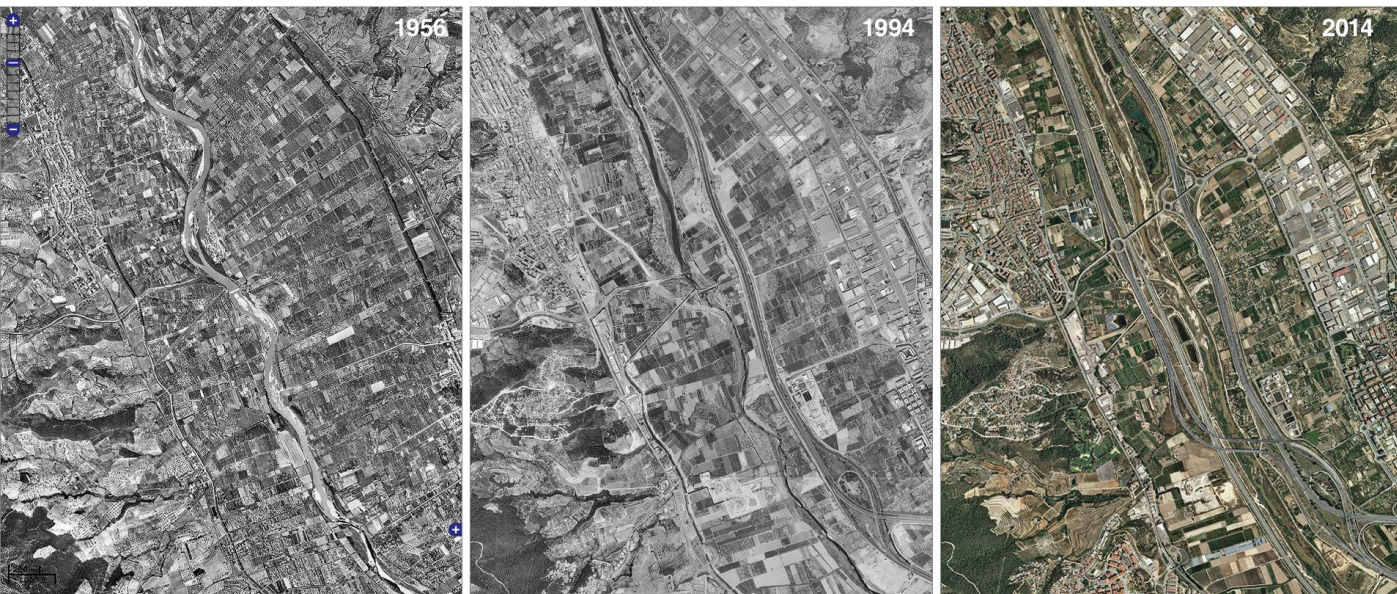


Figure 4- Due to the infrastructural reiteration, the Llobregat river remains disconnected from the other surrounding natural open spaces as well as the surrounding city

Source: ICGC



Figure 5 - The case of Montcada i Reixac. The concentration of infrastructures in the same area cause an impact even bigger since they directly contribute to the isolation and segregation of the different neighbourhoods

Source: Bing Maps

the lack of integration of these infrastructure in the landscape, in functional and aesthetic terms. Rather the contrary, with the majority creating barriers for the continuity of open territorial spaces and contributing to the further spatial fragmentation (figure 3). It is also interesting to highlight how we are often encountered with situations of infrastructural reiteration that further worsen the existing problematic (figure 4).

In the case of urban spaces, the consequences can also be traduced on a social level. During the 90s, and as a result of the urban expansion, many cities reach a point that they exceeded the existing infrastructural limits that on many occasions also formed the formal city limits. As a result, a disconnection between determined areas and neighbourhoods can occur, by the fragmentation of the spaces and corridors that guaranteed the interaction and flows between these areas (figure 5).

In the case of rail infrastructure similar situations can be encountered. In this case, the biggest problems were found inside the consolidat-

ed urban nuclei, where the rail lines constituted a major barrier in functional and structural terms but also on a less tangible level, producing social segregations (figure 6a). Same effect can happen with major highways crossing urban centres, forming corresponding barriers for the inhabitants of the city (figure 6b).



Figure 6.a, 6.b - Examples of road and railroad infrastructures as urban barriers that cross the city

Source: Miguel A. Hernández and Sandra Murcia

### ***The infrastructural barriers in the MRB***

In order to explain the issue of the barriers present in the MRB we elaborated a specific map that crosses the two types of information. On one side the GIS network analysis has provided us with those section along principal infrastructures



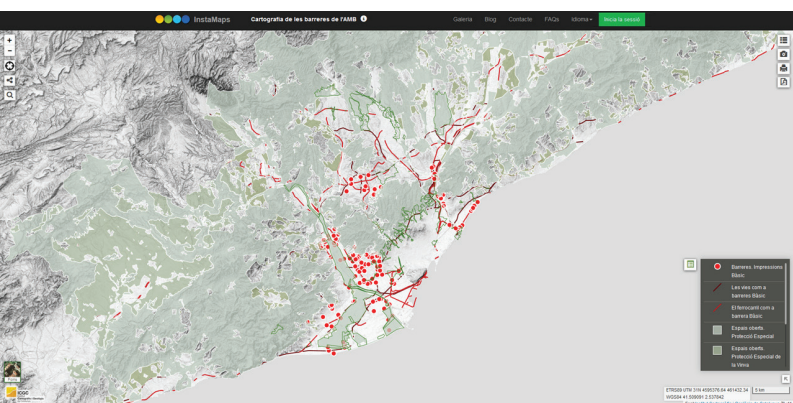


Figure 7 - Interactive map of barriers in the MRB  
Source: <http://www.ciutatmosaicterritorial.com/mapabarreres.html>

(highways and railway) that form barriers to the continuities and connectivity of natural and anthropogenic systems (figure 7). And complementing with the onsite field work with the detection and localization of these situations among the various municipalities of the MRB.

In this way, combining both types of information, it can be observed that the most exemplary cases of barriers are concentrated along and near infrastructures, although not limited to these cases (urban peripheries are also characterized by such phenomena).

## Results and discussion

In this research project more than 800 metropolitan projects and plans were registered for the period between 1985-2014, within the MRB. Based on a qualitative analysis of these projects that apply the project logic in question in this article, the restitution of territorial continuities, is demonstrated the value of the proposed strategies.

The selected projects are presented in continuation, as a *good practice* guide. They do not respond solely to one logic, but the exemplary value lies in the combination of strategies that each one implies. In this sense, we present the specific points of each one in relation with the logic in question.

### ***The restitution of the territorial continuities as project logic***

The principal objective of this logic is the reconnection of territorial and urban spaces, overcoming the infrastructural barriers to achieve

the reintegration of the fragmented spaces to the biophysical matrix. On one side, it implies recovering the ecological functioning, and on the other, the social functioning, such as the accessibility between spaces, the access to different territorial flows, overcome isolation and segregation and in this way recover the latent relation between the city and its natural spaces.

In this case, the question of scale is very important, making a multiscale analysis perspective imperative. This will permit to identify and locate the *passages* (Forman, 1995) that will facilitate and enable communication between the different spaces and permit a reconnection both in physical and practical terms.

In relation to the question of efficiency, this logic promoted the integration and restructuring of the territorial matrix, encouraging the continuity between different spaces, and integration of fragmented patches. At the same time it contributes in the recuperation of the accessibility to the flows, whether ecological, mobility or socio cultural, searching to reinforce these permeabilities that, in a small scale, can have an impact on a larger scale. Small interventions, surgical interventions, can have a much more significant effect and change the relational logic between city and territory. The analysis of the projects was done with these considerations in mind.

So, the logic of the restitution of the spatial continuities can be developed and resolved following different strategies. In continuation we present these strategies in relation to the various selected projects that incorporate them and put in test these types of operations in relation to the idea of the territorial efficiency. It is necessary to have in mind that these projects proposed highlight certain aspects and can respond to more than one project logic. Above all, in the case of the open spaces and the question of territorial fragmentation, it is necessary to think in the question of consolidation as a strategy to reconstruct the ecological corridors and the landscape connectors of the biophysical matrix.

*Reconstruct the ecological corridors and landscape connectors of the biophysical matrix*

Returning to the question of scale, in the case of ecological corridors, it is imperative to consider not only the structure on a local level, but also the potential that it holds for a restructuring on a regional level. For this purpose it is necessary to identify which spaces hold the potential for connectivity in the open spaces system. The Ter-

ritorial Metropolitan Plan of Barcelona (PTMB) (figure 8) was a recent plan that considered these questions. The plan was approved in 2010 and considered three principal axes one of them being the open spaces, and the other two the urban settlements and the infrastructures. In the case of open spaces in was based on the structuring and consolidation of the existing patches/units in order to give them more coherence, robustness and capacity to fulfil with the function they undertake (Generalitat de Catalunya, 2011). As explained in the plan, the resulting structure permits to comply with three objectives: favour the diversity of the territory and maintain its reference and relation to the biophysical matrix; protect the natural spaces; and conserve the landscape as a social value and a territorial asset. The continuity of this structure, formed by a series of patches and ecological corridors also contribute to the braking of the urban expansion, put a limit to the city while permitting at the same time, the conservation of the existing biodiversity of the territory.

This territorial structure and the search for connectivity on a regional level are based on respective consideration on an intermediate and/or local scale. Such examples of recuperation and transformation of ecological corridors are the cases of the fluvial parks of the river Besos and river Llobregat, located respectively on the east and west of the city of Barcelona. In both cases, during many decades the rivers suffered considerable degradation losing great part of the ecological capacity, serving solely as sewage canals for the urban areas. Thus respectively as part of their gradual infrastructuration they both suffered a transformation and a conversion from rivers to canals. During the last decade and due to a change of vision of the MAB (Metropolitan Area of Barcelona) as well of the planning practice in general, a new role has been envisioned for these spaces, with their restoration and update of their function. That is to convert them to lineal parks, facilitating them with increased accessibility has permitted the revalorization of these spaces. On the other hand, and thanks to the distinct interventions aiming at the ecological restoration it has been rendered possible to recuperate to a great extend the natural capacity of the rivers in terms of flows, biodiversity and water quality. To reinstitute the river as a social space, a key element was the construction of new passages/connectors between the fluvial space and the city. Through this initial experience with its successes and mistakes, great lessons were learned on the part of the administration (figure 9).

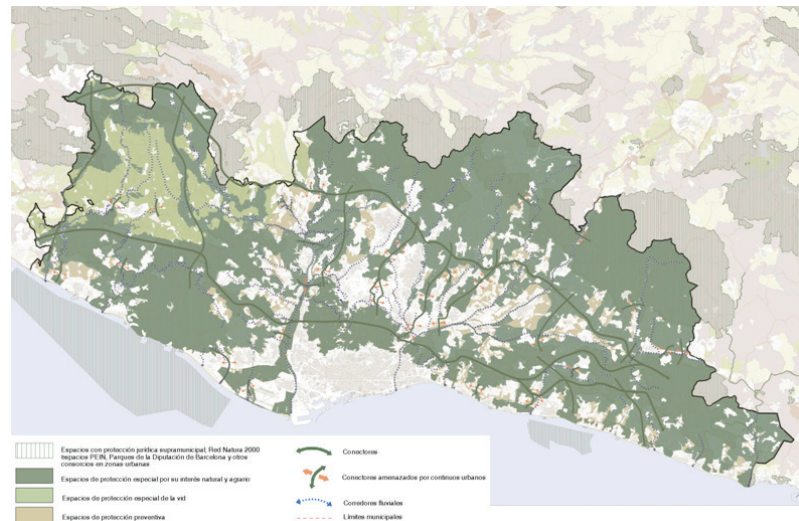


Figure 8 - Proposal of the PTMB concerning the open spaces and the different kinds of protections applied

Source: PTMB, 2010



Figure 9 - The Llobregat River Park and two of the underpasses that connect the river with the urban areas

Source: Bing Maps

*Identify and project new permeabilities that reconnect different fabrics.*

When we talk of permeability we refer, on one hand, to the possibility of crossing or overcoming transversally a barrier, of any type. In the MRB there are many different projects that have realized this type of operation, going after this objective of increasing accessibility and identification of the elements of the territorial matrix.

If we look at the area of the Vallès Occidental, and in particular, the municipalities of Terrassa and Sabadell, two intermediate size cities, located in a territorial space characterized by the fragmentation of the existing open spaces (natural or rural). Both cities during the last decade have developed proposals to tackle the ordinance of their

peri-urban space and take advantage of the landscape possibilities of their immediate surroundings. Examples of such projects are the two green rings projects of the two cities, where in both cases, it is interesting to highlight the focus that these projects put on the question of permeability



Figure 10 - The area of the green corridor while the project of the Directional Center was under construction

Source: Bing Maps

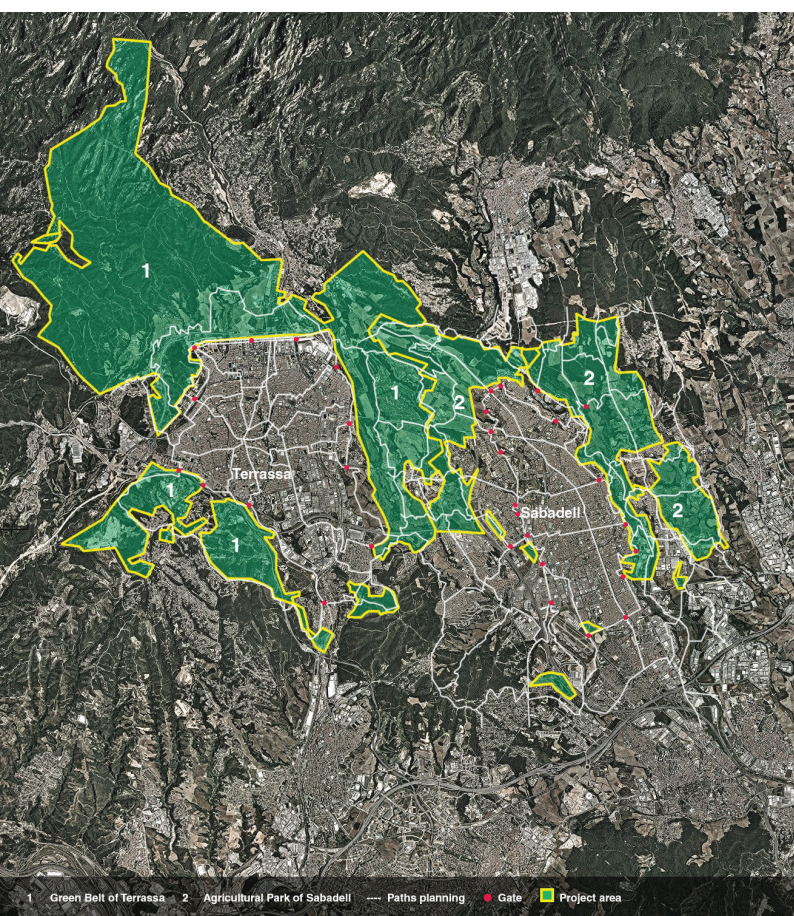


Figure 11 - Project area of the mentioned projects concerning the cities of Terrassa and Sabadell

Source: Bing Maps

and accessibility as well as the continuity between the urban and rural fabrics, in terms of interaction between the two. In this context both cities developed specific proposals focusing on the rural paths as key components and elements of the territorial matrix. Other key elements are the *doors of/to the city*, referring to specific points where this rural-urban interaction takes place. The establishment of these continuities not only caters for the respective social connectivity but also for the recovery of the historic identity of the territory in landscape terms, permitting the integration of the peri-urban space as an asset; landscape, historic and environmental.

Anyway, returning to the regional level, one can observe how these projects adhere to their administrative limits. On one hand, the two proposal confluence along the space of the metropolitan corridor, between the two cities, but each one differentiated from the other (although with similar objectives). And on the other hand, this differentiated treatment (depending on the administrative area/limit) can result in a conflicting situation in terms of continuity of the city rings in their totality. In Figure 11 we can clearly see how both projects pretend to consolidate their respective peri-urban space, but do not bother to integrate within, these spaces that are left out of their municipal reach.

In the case of Barcelona, there is another project that can serve as a good example; the case of the *Doors of Collserola*, that it proposed to work the interaction between the natural space (Park of Collserola) and the urban space of the city of Barcelona. The proposals needed not only contemplate the open spaces but also include an architectural proposal that will contribute towards the reinforcement of the interaction and interchange of flows (social and ecological). Thus, the project proposed eleven Doors, as specific interventions to work towards the general question of permeability and reconnection between the two heterogeneous spaces. And it pretends to change the perspective that the city of Barcelona has had historically with the Park, and at the same time consolidate the park as a metropolitan park, for the whole MRB.

*Construct new complex urban spaces - connectors with the necessary attributes and qualities to overcome the infrastructural barriers with an added value*

In the case of the city, the disconnected spaces and fabrics should be approached starting from the inherent complexity of the city. It is not

sufficient to merely connect two points, or guarantee accessibility, overcoming existing infrastructures. In order for the effect to reach a wider extent, it is necessary to endow the intervention with an added value. A clear example that managed not only to reconnect two neighbourhoods but also generate a new quality public space, is the project of the Parc de la Solidaritat (Park of the Solidarity) (figure 12) in Esplugues de Llobregat. In this case, the B20 highway that divided the city was overcome with the help of a *gran plaza* that hosts a diverse programme of different uses. This square generated a new pedestrian circulation and flows that were impossible before the intervention. This new public space, with areas for relaxation but also of circulation, is able to reconnect the two neighbourhoods and at the same time, improve their specific qualities (habitability, accessibility, and pedestrian/light mobility).

Another example is the project of the plaza of the Sec River and the passage/footbridge of the Farigola in the city of the Cerdanyola del Vallès. Again, the overcoming of the river is not accomplished solely through the construction of passage, but also is complemented with a new public space, a *plaza*, that handles the circulation of flows and at the same time becomes a motivation for a new connectivity between neighbourhoods. This intend to come up with a functional programme that attracts the social flows, provides and additional value to the project, making sure that the effect if the intervention is extended to an area and scale greater than that of the project area.

## Conclusions

From a spatial point of view, it is clear that the restitution of the continuities as project strategy, contributes to the efficiency of the whole metropolitan region, as it was demonstrated that the development of local interventions, can be linked to strategies on a larger scale, looking to maximize the effect in terms of efficiency and spatial coverage. Therefore, the consideration of the multiplicity of scales present in a project is a decisive aspect when contemplating a greater efficiency for the project. In the following plan (figure 13) we can observe the identified project of our database that has tackled the question of the restitution of spatial continuities of metropolitan spaces.

It has been observed that when the projects are considered or constructed in an articulated/coordinated manner, their effect increases exponentially. In this sense, we can talk not only of



Figure 12 - Solidaritat Park in Esplugues de Llobregat.

A park located over an infrastructure to promote the reconnection between two neighbourhoods

Source: Bing Maps

projects, better yet of project or transformation areas. In this context, it is key to consider ways that each project can be integrated in the existing matrix, even improving it in terms of efficiency, resolving those nodes or points where conflict or misconfigurations exist.

In the case of open spaces, and given the constant state of tension that they are found in, it is imperative to have a plan or a regional project that can secure the conservation and functioning of the open spaces system structure at this wider scale. These are in reality really complex spaces, where a tight superposition of flows takes and place, respectively giving birth to a multiplicity of dynamics. For this reason, the restitution of the potential continuities is necessary to be considered in conjunction with the question of territorial fragmentation. So, on one hand it is necessary to apply measures that contribute to the consolidation of these open spaces (providing protective elements against the urban pressure). At the same time, on the other hand, when projecting new infrastructures, they should be projected in an integrated and respectful manner with respect to the territorial structure and function.

Therefore, in order to achieve a more sustainable territorial development, as we mentioned in the beginning, is necessary to promote a mutual adaptation between the different systems present in the territory, whether urban, natural, or rural. In this way contribute in re-establishing relations and scales of proximity, connect neighbourhoods through green spaces, facilitate pedestrian flows as well as the accessibility to urban services, and thus on a long run change the social metabolism of the territory. In consequence, the possibility to increase efficiency arises, by reducing energy dissipation, cutting down on pollution and coming

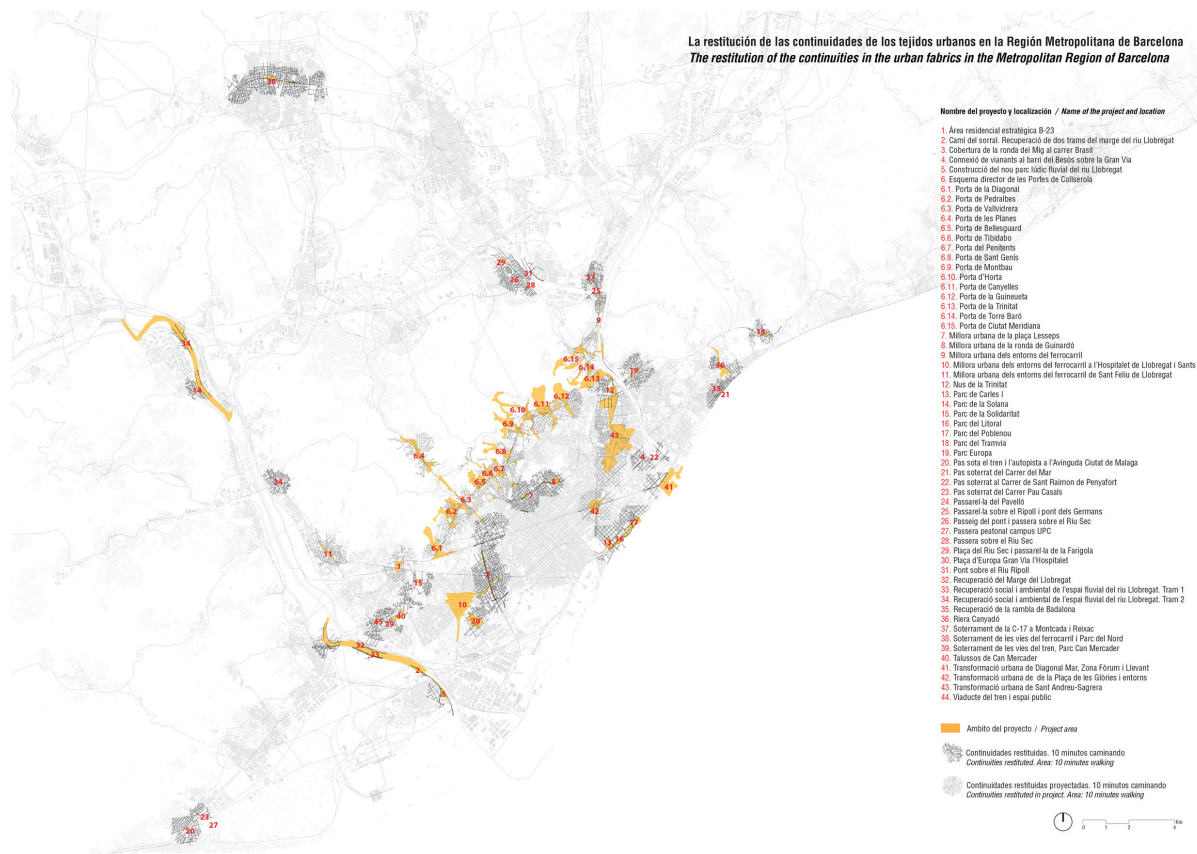


Figure 13 - Map of the projects that contribute to the restitution of spatial continuities in urban areas

up with new systems and approaches that make a more efficient use of energy altogether, while considering a wide range of questions related to the territory (mobility, natural patches size, habitability, natural capacity of the territory). The respective project logics could be thought out as platforms for resolving and improving all the aforementioned questions.

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