METROPOLITAN STRATEGIC REFLECTION FOR A RESILIENT TERRITORY

DREAM

DIAGNOSI
REFLEXIÓ
ESTRATÈGIA
ACCIONS
METROPOLITANES

AMB

DREAM COLLECTION

The DREAM collection (an acronym for the Catalan words for Diagnosis, Reflection, Strategy and Metropolitan Actions) proposes the construction of metropolitan narratives in the Barcelona metropolitan area based on a focus of resilience that implies assessing the risks to establish metropolitan strategies.

The new strategic lines of the AMB are contained, therefore, in a series of volumes that all follow a single methodology. The collection is divided into three main themes that are expressed by three different colours: economy and social rights (yellow), governance (violet) and sustainability (green). The first volume (red) provides the framework for the collection and explains the DREAM methodology applied to the other volumes. These are written by various specialists, together with the AMB's Strategic Planning Area, and each one deals with a sectoral area from diagnosis and reflection to subsequently establish a set of strategies and associated metropolitan actions.

VOLUME

This first volume of the DREAM collection explains an overall vision that is based on social, economic, environmental and lack of governance risks, a focus that enables a set of strategies to be sketched for the future of the Barcelona metropolitan area and that have as their aim the generation of a territory that is resilient to coming changes. Strategies that will be developed with greater detail, and always on a metropolitan scale, in the subsequent titles in the collection. DREAM is the result of close collaboration between the different AMB areas and services.

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The Barcelona metropolitan area is a territorial reality that necessitates a global view that simultaneously draws together all the potential of a joint sum of municipal visions in solidarity. For this reason, it is vital that the Metropolitan Area of Barcelona as an institution does not cease to question itself regarding what we need, and where we are heading in these times of change; times marked by an increase in inequalities, by the energy transition and climate change, and by the transformation in governance formats, with metropolises playing an increasingly paramount role.

Urban resilience refers to the degree to which cities are capable of tolerating change before reorganising around a new set of structures and processes. What matters is the capacity for transformation of the system while recovering, or maintaining, its function or structure.

It is for this reason that I am so pleased to present to you this *Metropolitan Strategic Reflection for a Resilient Territory*, which draws together the efforts made by the AMB's Strategic Planning Area in earmarking pathways for future strategies for the metropolis at a time of social, economic, and environmental changes and risks.

It is increasingly essential to prepare the territories for the changes that are coming, and for the opportunities that will present themselves. For this reason, it is necessary to combine forces to put together an overall proposal, one that encompasses the strategic and action lines of the different AMB management areas.

There can be no doubt that many of the challenges facing us as mayors are of such a nature that it is essential for us to tackle them together. That is why I believe it is so important to bring the metropolitan reality closer to inhabitants, and to fight together against inequalities in all spheres, acting in response to the changes that will come with the energy transition and climate change, and to the challenge represented by building a metropolitan government.

I hope, therefore, that this book that I am presenting to you here, and those that will follow in the DREAM collection, will be of interest to you and can help us to mark out together the course for our metropolitan city.

Ada Colau
President of the AMB

Beyond the everyday implementation of policies and presentation of services, the Metropolitan Area of Barcelona has to work to build metropolitan policies for the future. In this direction and with the creation of the Strategic Planning Area as a Vice-Presidency of the AMB, the aim has been to reinforce the study of the current challenges that demand of us new approaches for the future.

After the passing of the AMB Law in 2010, in the last term of office (2011-2014) a first agenda was created: Metropolitan Strategic Reflection (REM). In this term of office we have wanted to take a step further in the formalisation of metropolitan policies. The DREAM collection aims to be the voice of these proposals for the metropolis that we are promoting from the Strategic Planning Area, in collaboration with the rest of the AMB areas. DREAM is an acronym made from the Catalan words for Diagnosis, Reflection, Strategy, Metropolitan Actions. This is the structure that will be followed by the different volumes of the collection we are starting here. Thus, all the books will start off with the diagnosis of a particular issue, analysing strengths and weaknesses, opportunities and threats in our territory. This enables the development of a reflection on its impact on the metropolis, in order to thus establish innovative strategies for the implementation of the specific metropolitan actions that are proposed.

This first volume of the collection DREAM, Strategic Reflection for a Resilient Territory, has been produced as a joint narrative of all the issues articulated around the risks and opportunities that are posed to the metropolitan territory in social and economic spheres, in those associated with the energy transition and in the fight against climate change, as well as those associated with improved governance. These issues will be covered in detail in subsequent volumes, which we hope will contribute to the discussion regarding where we are heading, and to collaboration in building the metropolitan future.

Janet Sanz
Vice-president of the Strategic Planning Area of the AMB

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PRESENTATION

THE FUTURE OF METROPOLITAN STRATEGIC PLANNING

The future of metropolitan strategic planning requires the understanding and interpretation of the recent past with a view to the future. The origin of the AMB can be found in the Metropolitan Corporation of Barcelona (CMB), founded in 1974 to approve an urban plan (PGMB 1976), which meant that metropolitan services focused on the development and construction of the urban systems of the PGMB (facilities, parks, and urban developments of squares and streets), as well as the management of transport, water, and waste services.

Following the passing of the Law of the AMB (2010), a change in dimension has taken place (from 26 to 36 municipalities). But, in addition, the Law has consolidated a territorial and institutional area where services have been expanded and competences extended to new areas: social, economic and environmental. In fact, currently, within the AMB's organisation there is a certain imbalance between certain strongly reinforced services associated with traditional urban development and a set of social, economic and environmental services that are more limited but increasingly requested. Moreover, and in the case of surface transport management, the concept of sustainable mobility management has evolved, and the area has doubled, from 18 to 36 municipalities

Furthermore, it is necessary to add elements of change external to the metropolitan environment, prominently including the following: a crisis in access to housing has unfolded that has led to this sector taking on a central prevalence among the concerns of citizens; with the recent economic crises, the need can be seen to improve the economic innovation on offer to ensure activity, and the concept of energy poverty has become consolidated and extensible to other services; a Catalan guaranteed income law has been created which has implications for metropolitan urban cohesion. The Paris Agreement on climate change has been approved and, in addition to this leading to an energy transition, it has very demanding environmental implications, and a new Transparency Law has been passed that involves the creation of a Transparency and Good Governance Agency.

This entire list of growing needs also implies an increase in resources that must necessarily be associated with improved efficacy and efficiency in the organisation of the AMB services available, and a redefinition of its fiscal base to be able to offer these new services. All this must be agreed on a collective basis between all the municipalities. The need for this change in the nature of AMB governance, strengthened by the Law of 2010, implies a new policy strategy in which metropolitan strategic planning is essential.

In this sense, it is necessary to highlight the potential and the opportunities offered by the AMB Law, contained explicitly in its Article 14, in which, besides the most consolidated policies – urban planning, transport, mobility and environmental services – clearly prominent are the social and economic policies focusing on land use and housing, on the promotion of social and territorial cohesion, on issues of coexistence between citizens, and on the promo-

tion of innovation in economic activity, the protection of the environment, health and biodiversity, and measures to fight against climate change.

It is for this reason that the AMB's Strategic Planning Area has developed the project DREAM, which proposes for each AMB Area, and each Service, a Diagnosis (using SWOT methodology), a Reflection, a Strategy and a set of Metropolitan Actions. Specific development has been based on the Metropolitan Action Plan (PAM), a reference element for metropolitan policies for each term of office.

This new strategic view proposes to progress from reflection to action, and this implies evolving from a dynamic that tends to produce studies, to a more action-focused view that generates resilience in the metropolitan territory in the face of risks and external threats. For example, in the environmental sphere, where in the previous term of office a whole series of environmental studies were generated, associated with the Environmental Sustainability Plan (PSAMB 2014-2020), with the Climate Change Action Plan (PACC 2015-2020) and with the creation of a Metropolitan Climate Change Observatory (METROBS), the aim is to move on from social, economic, and environmental studies to a set of metropolitan actions in the field of climate change and of social and ecological sustainability. This implies creating self-organised and resilient territories around the third sector, actors in economic activity, and the different actors in public policies (local councils, AMB, Barcelona Provincial Council and the Territorial Services of the Generalitat).

This view of metropolitan actions has to be articulated around the three pillars of the PAM: social rights, sustainable economic development, and territorial cohesion; metabolism, sustainability, and resilience; and government, governance, and democratic quality.

Social and economic risks lead to the need to introduce innovation into the production economy and into the social and solidarity economy, and to the need to generate policies that ensure territorial cohesion and social inclusion. Two further and significant risks have been added to these: the risk of the loss of food sovereignty, and the risk of the impacts on health of man-made actions, prominently represented by air pollution, among others.

The risks associated with climate change and with peak oil imply, on the infrastructural and the services level, the need for a public metropolitan leadership in: implementing renewable energies; the synergic management of water and energy; the consolidation of a sustainable-mobility operator that reduces non-sustainable modes of transport; the consolidation of zero-waste programmes and secure-economy programmes; the management of green infrastructure in order to ensure the conservation of biodiversity; and the management of the coastline in order to tackle the rise in sea levels.

With regard to activities and effects on the population, they mean minimising the repercussions of climate change, especially the increase in temperature and water stress; urban and housing energy renewal; the generation of measures for the preservation of residential, eco-

nomic and transport activities; the creation of measures for the preservation of the population's health; and, lastly, the need to ensure self-organised and articulated territories in the face of all the risks mentioned.

Metropolitan strategies of government, within a resilient strategic perspective, must be focused on transparency and good governance, on the need to ensure technological sovereignty and, principally, on strategic territorial planning.

A strategic territorial view should be centred mainly on the preservation of a more inclusive territory; the reorganisation of a conurbation area with three million inhabitants; a restructuring of territorial accessibility and mobility, focusing on the integration of the first and second concentric zones; the prioritisation of the relationship with the Vallès Occidental and the Vallès Oriental, as territories closely related to the metropolitan region of Barcelona; and a closer relationship of the metabolic cycles with the metropolitan territories on a regional scale.

In this sense, it is necessary to highlight the significant experience of the creation of the Metropolitan Housing Observatory, which has represented a political agreement based on a local-level initiative that has successfully coordinated all the institutions concerned (Barcelona Provincial Council, the Metropolitan Area of Barcelona, Provincial Council of Barcelona and the Generalitat of Catalonia). This is a benchmark model applicable to other sectors: mobility, waste management, circular economy, social services, and economic development.

In parallel, opportunities are opening up, such as that of building a flexible governance of the metropolitan system that implies a reinforcement of intermunicipal cooperation in order to establish metropolitan policies, and the grouping of municipalities through the management of the new AMB territories: Llobregat Delta, Serralada Area, Vall Baixa Llobregat, Llobregat Conurbation, Barcelona, Besòs Conurbation, Vallès-B-30 Area and Municipalities of the Maresme.

This view must be based on self-organised territories, commencing with those that the different institutions are already promoting. Such is the case with the support for initiatives in the Baix Llobregat area, as the AMB's most consolidated pluri-municipal territorial reference; with the support for initiatives in the Besòs territory, articulated around the Besòs Agenda; and with the support for cooperation in the mountain municipalities of the Baix Llobregat: agriculture, forest fires and circular economy.

Moreover, an opportunity has arisen to intensify cooperation between the conurbation's municipalities in different thematic areas: a mobility manager for tackling air pollution and congestion; extension of the district heating and cooling services (heat and cold networks) from the current concessions awarded to DistriClima and Ecoenergies towards the industrial estates of L'Hospitalet, Cornellà and El Prat, the municipality of Barcelona (Bon Pastor and Sagrera) and Badalona and Sant Adrià, in the Besòs conurbation; the cooperation of institutions such as the Barcelona Municipal IT Institute and the CityLab of Cornellà to establish

services in the municipalities, particularly including those that generate open big data and provide guidance in communication to city services based on a metropolitan programme.

In conclusion, it is proposed that the AMB should gradually incorporate strategic planning as a central element for its functioning as an institution and, from a perspective that looks towards the near future, the following instruments are proposed in order to progress in this direction:

- The creation of a set of metropolitan narratives for the establishment of a series of strategies and policies in the near future, associated with the drafting of Metropolitan Narratives based on the Metropolitan Action Plan, already initiated in relation with the DREAM project by the Strategic Planning Area.
- The territorialisation of the PAM through a participatory process, with the outlining of a methodology to define a participatory system that establishes strategic lines for the development of the PAM for coming terms of office.
- Better use of the tool represented by the Council of Mayors, where it would be necessary to establish prior work for metropolitan issues of a strategic nature that are considered by the metropolitan government, or upon the initiative of the Metropolitan Council. A reference for this is the case of the Council of Mayors in the fight against pollution.
- The drawing up of a methodology for the establishment of metropolitan neighbourhoods and the drawing up and application of a methodology for the definition of a set of synthetic indicators for metropolitan neighbourhoods, that in the future permit the application of metropolitan policies that are territorialised and quantified on a metropolitan neighbourhood scale.
- The promotion of a metropolitan management with competitive calls from the AMB based on three layers of territory: metropolitan neighbourhoods, economic activity estates and green infrastructure. This would mean defining an intervention strategy in the urban renewal of metropolitan neighbourhoods based on the experience of the Neighbourhoods Law and the grants for open spaces (PSG). It would further mean defining an intervention strategy in urban renewal of the metropolitan neighbourhoods, based on the experience of the Neighbourhoods Law, and reinforcing and redefining criteria for the Estates Plan and the grants for open spaces (PSG).
- The consolidation of the socio-ecological conflict tables that should permit a dialogue between the city social networks, the municipal authorities, and the metropolitan services, in order to tackle problems at the metropolitan scale.
- The strengthening and accompaniment of the dynamics of self-organised territories, for a more resilient metropolitan territory.

THE DREAM PROJECT

The DREAM project has been developed by the AMB's Strategic Planning Area.

It is a project that proposes, for each area and each service:

DIAGNOSI. (DIAGNOSIS – using SWOT methodology).
REFLEXIÓ. (REFLECTION)
ESTRATÈGIA. (STRATEGY)
ACCIONS METROPOLITANES. (METROPOLITAN ACTIONS)

To materialise this, the starting point has been the Metropolitan Action Plan (PAM) which, for each term of office, is the reference element for metropolitan policies.

This new strategic vision proposes to move forward from reflection to action, which means evolving from a dynamic prone to producing studies towards a more action-centred approach. A vision that generates resilience in the metropolitan territory in the face of external threats and risks.

If we want to push ahead with a set of metropolitan strategic policies in a resilient territory, we must begin with an initial global narrative.

This is the aim behind this document:

- Determining an initial DIAGNOSIS organised around the risks.
- Establishing a REFLECTION on the metropolitan system, considering it as a complex and adaptive system that requires territorial and governance positioning.
- And establishing a STRATEGY to subsequently define a set of METROPOLITAN ACTIONS that will need to be carried out.

This is the procedure configuring the DREAM project, developed based on the different risks and associated challenges.

An open series of metropolitan narratives has been organised which are intended to be the seed of future policies for the metropolis, We propose, therefore, to develop different narratives that are based on a resilient diagnosis, starting with the risks, understood also as challenges, which will help to configure metropolitan strategies, all based on a series of actions that are already being carried out now and that will be the basis for future strategic policies.

One of the central considerations of the strategic planning has involved proposing the pillars that, in the near future, will have to define metropolitan policies and their territorial distribution.

Furthermore, this phase of development of the Metropolitan Urban Master Plan (PDU) essentially requires the prior definition of certain strategic pillars for a metropolitan policy. In the previous term of office, 2011-2014, the focus was on drawing together the strategic positions that emerged from the practice of the different services (*Metropolitan Strategic Reflection*, AMB-Strategic Planning Area, 2015), but in this term of office we wanted to take a step forward in the definition of one of a set of pillars for metropolitan policies, based on the narrative of the Metropolitan Action Plan (PAM) and on the specificities of each territory, which were observed in the participatory process of the PAM itself.

We have at our disposal:

- The studies commissioned, in collaboration with the different areas of the AMB.
- Studies produced by the Metropolitan Regional Studies Institute of Barcelona within the framework of the programme agreement.
- Different forums for reflection in the Strategic Planning Area.
- And also, the AMB's Platform for the participatory process of PAM validation and follow-up 2015-2019.

By arranging the narratives around the scheme of risks/challenges we will be able to establish – and organise – the different actions in the territory. We have defined them based on the strategic lines of the PAM, reorganising them in line with SWOT analysis. This means that it is possible to develop them with greater detail for each thematic area and in common agreement with the metropolitan services affected and the corresponding areas.

The set of the initial list of DREAM narratives is a first strategic reflection for the future construction of metropolitan strategic policies in a resilient territory.


DIAGNOSIS

THE ORIGINS: FROM THE METROPOLITAN CORPORATION OF BARCELONA TO THE METROPOLITAN AREA OF BARCELONA

We find the first metropolitan and territorial vision in the 14th and 15th centuries. These lay in the so called "privileges of *carreratge*", defining municipalities lying outside Barcelona that paid for neighbourhood-status rights and were declared, therefore, "streets of the city". This status protected them and freed them of servitudes and vassalage. This happened in the Vallès Oriental and Vallès Occidental, as well as in the Garraf, the Maresme and, even, the Bages and Anoia areas (Barcelona City Council, 1987b: 171-73) (Tomas, 2017).

In the 15th century, therefore, the reality of Barcelona already stretched beyond its municipal boundaries. Favourable geopolitical periods permitted the port city to gradually adopt more evolved forms. The industrial (steam and railway) revolution, the modernisation of the governmental administration and emergence of the provinces meant that it experienced a boom period. By 1812, the Board of Commerce had become a Provincial Board that developed, in 1848, a Roads Plan that gave it a political space for the metropolitan and regional management of Barcelona.

Fig. 1a. Reform plan and urban extension by Ildefons Cerdà in 1859. *Cerdà Collection, UPC.*

Fig. 1b. Comarcal Region Plan of 1953. *AMB.*

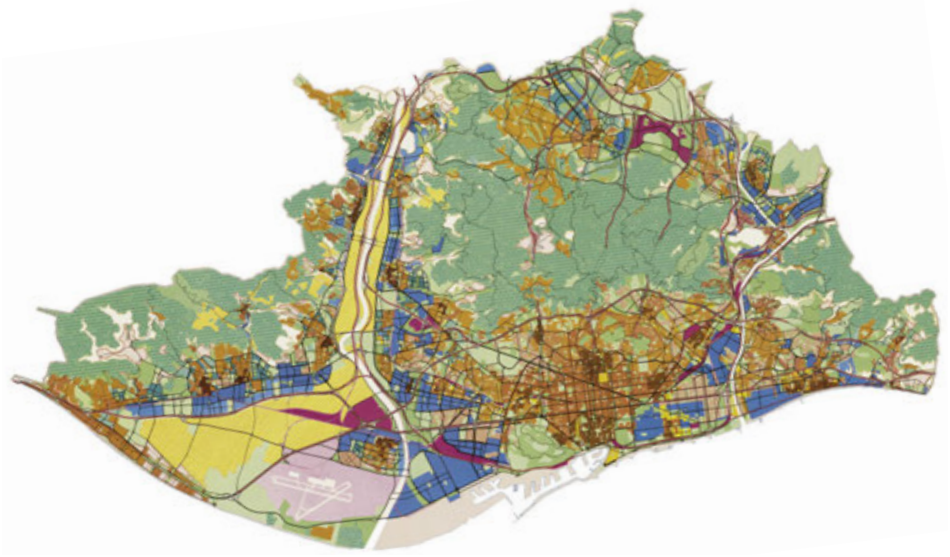

Fig. 1c. General Metropolitan Plan of Barcelona of 1976. *AMB.*

Within this planning environment, the Cerdà Reform Plan and urban extension of 1859 represented the first pluri-municipal planning, as it spanned seven municipalities on the plain of Barcelona: Barcelona, Gràcia, Sants, Les Corts, Horta, Sant Andreu and Sant Martí de Provençals.

Two decades later, Cerdà himself produced a proposal for administrative jurisdictions, linked by a network of roads, that is still valid today and roughly coincides with the AMB area.

Fig. 2. Legal division of the province of Barcelona of 28 December 1872.
Produced by the author based on the Cerdà Collection.

In the period 1875-1897, the gas and water networks and the first tramlines developed the city's growth. Later came electricity and the electric tram that enabled the leap across the comarcal region. This was the moment when the Zona Franca was connected with Sant Cugat, Sabadell, and Terrassa (1912-1918).

Fig. 3. Extension of the electricity network within the sphere of the Cerdà Plan of 1859. *Compiled by the author based on Capel, 1994.*

Fig. 4. Planning proposal for the La Canadenca railway (Barcelona Traction Light & Power) connecting Sabadell and Terrassa with Barcelona. *Capel, 1994.*

The arrival of electricity to the whole of Catalonia led to new planning proposals. The infrastructures drawn up by the Regional Plan of 1932 established, at that time, a new relationship between Barcelona and Catalonia through the "Catalonia-city" model.

The leap from the Plain of Barcelona to the comarcal region scale would need over three decades. First of all came the Comarcal Region Plan of 1953 and, subsequently, the binomial of the Urban Master Plan of Barcelona of 1968 and the General Metropolitan Plan of Barcelona of 1976.

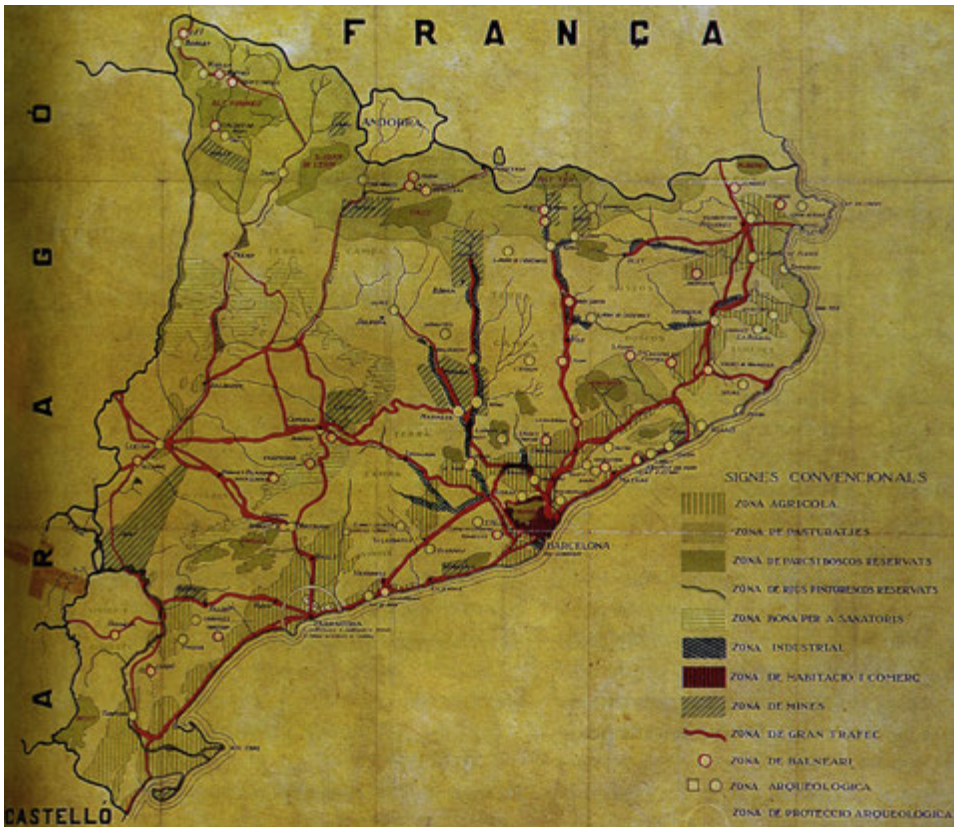

Fig. 5. Regional Plan of 1932. *Department of Territory and Sustainability.*

The drawing-up and approval of the PGMB of 1976 legitimised the creation of the Metropolitan Corporation of Barcelona to manage the PGMB. In fact, there was a former governing body of the organisation, both being created by a law of 1974. It covered 26 municipalities all across the Barcelonès and the Baix Llobregat, a significant part of the Vallès Occidental and a smaller part of the Garraf (Les Botigues, in the municipality of Sitges), and of the Maresme (Tiana and Montgat).

These governing bodies took on responsibility for planning, urban management, and the majority of the infrastructures. As a second-degree representative corporation, they included the Metropolitan Council, or the plenary of mayors or council officials from some interested municipalities, proportional to their size. These mayors and officials chose the president while a manager directed the technical services. The steps that they took feature in the General Metropolitan Zoning Plan and in the Metropolitan Restructuring Plan (1982).

The abolition of the Greater London Authority by Margaret Thatcher's Conservative government, in 1986, was the precedent that gave legitimacy to the autonomous community's authorities to limit the metropolitan authority. In this sense, the Catalan government approved the Territorial Organisation Law (1987) which dissolved the Corporation and transferred all of its services to the Generalitat, especially those relating to urban planning. In parallel, the Generalitat created the Metropolitan Transport Agency and the Metropolitan Water Services and Waste Management Agency. The rest were included in the Association of Municipalities of the Barcelona metropolitan area. This status lasted for over two decades.

In the year 2010, the Parliament of Catalonia approved, unanimously, the creation of the Metropolitan Area of Barcelona which, to a large extent, recovered the spirit of the old CMB, in terms of both actions and competences. With Law 31/2010, passed on 27 July, the AMB was created to replace the three organisations that had been created in 1987.

This period of nearly four decades (1974-2010) has enabled the municipalities to be provided with services and the creation of a stable structure for mobility, the water cycle and waste management.

With the approval of the Metropolitan Territorial Plan of 2010, the phenomenon of a leap forward in planning was repeated once more, this time from the AMB to the Metropolitan Region of Barcelona.

Today the AMB is the public authority for the Barcelona metropolitan area and manages an urban conurbation made up of 36 municipalities, with a population of 3,247,281 inhabitants (data from the municipal censuses of inhabitants of 2017) and covering an extension of 636 square kilometres.

In these last four decades there have been three main schools of governance: that of reform (Metropolitan Corporation of Barcelona), that of rational choice (the period between 1987 and 2003, marked by great institutional fragmentation) and that of new regionalism (between 2003 and 2010), where the Metropolitan Strategic Plan was developed, and the desire shown to institutionalise metropolitan cooperation. These three phases are differentiated by the creation of metropolitan governments, sectorial agencies and voluntary cooperation and also by the conception of the metropolitan territory as a political space, as a market and as a space for cooperation, public and private alike.

It is important to point out that Barcelona is the only Spanish urban agglomeration – and one of the few in Europe – to have a metropolitan government. In fact, the Barcelona case illustrates the debates on territorial limits (metropolitan area or region?), on metropolitan fiscal policy (what are the sources of funding? Should a redistribution component be introduced?), on the model of representation (direct or indirect election of metropolitan representatives?) and on relations (horizontal or vertical?) with the other areas of government (Tomas, 2017).

Over the course of these decades, four principles have been marked out:

- Municipalism and the importance of municipal autonomy.
- The importance of social cohesion on a metropolitan scale.
- The capacity for leadership and for generating synergies on a metropolitan scale.
- The international projection of the city.

During this period, mayor Pasqual Maragall focused on the Costs Plan, the Olympic Games, the Delta Plan and the Besòs.

In the most recent period, and under the government of mayor Ada Colau, three of Maragall's main ideas have been recovered:

- The fight against inequalities on a metropolitan scale:
  -Strengthening social cohesion
  -and creating a metropolitan fiscal system.
- The idea of metropolitan neighbourhoods:
  - Decentralising the city of Barcelona
  - and integrating all the metropolitan neighbourhoods.
- Democratising the metropolitan institution:
  - Direct election of the mayor of the metropolitan city
  - and of its representatives (Tomas, 2017).

The current government defends the need for a "federalism" that is simultaneously respectful and determined, in line with what Pasqual Maragall said when he was elected mayor in 1982: "Mental walls are stronger than physical ones ".

In fact, within the institution, there continue to coexist diverse sensitivities regarding what the AMB should do and what the local autonomies should be.

It is clear, however, that the AMB has a history of a tense – but balanced – relationship between the big city and the municipalities around it, where those that have over 50,000 inhabitants present a clear and evident metropolitan leadership that lends the AMB a multi-polar nature and rebalances the weight of the city centre.

The AMB municipalities position themselves in the world with respect to Barcelona. However, despite there being a metropolitan awareness, the mayors watch over their municipalities and have control over their territory. It should be highlighted, therefore, that there is a need for a metropolitan vision where a more consolidated metropolitan governance can be constructed.

What will be necessary, in short, is good strategic planning in this next period.

THE POTENTIAL OF THE AMB LAW

1. THE AMB'S RAISON-D'ÈTRE

To plan this new phase, we will begin by talking about the AMB Law of 2010, which will be the framework of reference for some years yet, although it is probable that, over time, modifications may be made to it.

The Law's Preamble makes it clear that:

> "The institutionalisation of the Metropolitan Area of Barcelona responds to the desire to improve efficiency and efficacy of the authorities acting in the metropolitan territory, guaranteeing the provision of a high-quality public service, through the configuration of an approachable administration and one capable of increasing the engagement and participation of citizens in a reality of urban continuity, demographic density, and economic and social characteristics that make it necessary."

It makes it clear that it defends the efficiency and efficacy of the authorities. It is a case, therefore, of the services being pertinent (efficacy) and of them working in an adequate way (efficiency). In addition, it demands that the services be of a high quality and it advocates an approachable administration that is capable of increasing engagement and participation.

With the current instruments of this Law, and with good organisation, it is possible to achieve optimum management to be able to mark out the profile of governance from the local level.

Since it was passed, a Metropolitan Strategic Reflection (REM) has been drawn up (AMB-Strategic Planning Area, 2015) to specify metropolitan policies. It is necessary to move forward from Strategic Reflection to the Policies of Metropolitan Resilience (Diagnosis, Reflection, Strategy, Metropolitan Actions: DREAM). To do this, we will work on the basis of the competences that the Law offers us, to establish objectives that will lead us to obtain a set of metropolitan policies that are a comprehensive benchmark for the local sphere.

With the Metropolitan Action Plan 2015-2019 in our hands, we will propose strategic elements to define metropolitan policies within a context of risks/challenges in the social,

economic, environmental and governmental spheres that should enable the AMB to become a benchmark metropolitan reality.

2. THE LAW AS A REFERENCE POINT

In Article 1, the objective and nature of the AMB are defined:

> "The objective of this Law is to create the Metropolitan Area of Barcelona and regulate its organisation, competences and funding."

This means:

> "• the services and governing structure,
>
> • the competences that can conduct a revision of the Law in view of the different governing bodies (Generalitat of Catalonia, Provincial Council of Barcelona, districts, comarcal regional councils and municipal councils),
>
> • funding, its needs and the way of structuring taxation."

We begin with the nature of the AMB. This is defined as:

> "• a local, supra-municipal organisation,
>
> • with a territorial character,
>
> • made up of municipalities from the conurbation of Barcelona
>
> • with which there are economic and social links,
>
> • that make necessary the planning of public policies
>
> • and the implementation of services in a joint manner."

From this one can deduce, as a central element, the nature of a local authority that manages services, and plans public policies, on a pluri-municipal scale.

Moreover, its main general principles of action (see Article 1 of the Law) propose grouping them into three thematic areas that structure the PAM narrative and order them as follows:

- Commitment to rebalancing, inclusion and equity in services:
  "c) Equality of citizens in access to public services.
  d) Solidarity and territorial balance.
  e) Social cohesion.
  j) Equity and redistribution of public actions and the provision of services."

- Commitment to a sustainable, ecological and resilient territory:
  "f) Sustainable development."
- Commitment to a form of local and metropolitan government grounded in the municipalities, with a participatory metropolitan component and with resources that guarantee funding:
  "a) Local autonomy under their responsibility.
  b) Participation of the municipalities in government and management.
  i) Institutional loyalty.
  h) Citizen collaboration in the management and provision of public services.
  g) Financial sufficiency."

3. COMPETENCES OF THE AMB

Management areas

In Article 14 of the Law we see that the competences can be grouped into six areas:

- The management of social and territorial cohesion through policies of positive civic coexistence.
- The management of economic and social development by promoting employment and the creation of businesses, and supporting research and innovation.
- The management of systems (infrastructures, facilities and technical services) of the PGMB.
- The management of rail mobility and public transport.
- The management of water, energy (renewable development), and materials (waste management).
- The management of protection of the environment, health, and biodiversity, as well as the creation of measures against climate change.

Perhaps it is necessary to remember now what the competences of the AMB are as defined in the Law.

Urban development planning

"The competences of the AMB are regulated by section III.

Urban land use is implemented through the Metropolitan Urban Master Plan and the Metropolitan Urban Zoning Plan.

The Metropolitan Urban Zoning Plan can be complemented with municipal or pluri-municipal urban development action programmes."

"ARTICLE 31
COMPETENCES OF THE METROPOLITAN AREA OF BARCELONA IN THE PROCESSING OF URBAN DEVELOPMENT PLANNING

The Metropolitan Area of Barcelona, in addition to the competences established by Articles 25, 27 and 28 with relation to the general urban planning instruments, has the competences of the formulation, initial approval, and provisional approval of the following instruments of derived urban planning:

a) The special urban development plans established by Article 67.1.e of the consolidated text of the Urban Development Planning Law, passed by Legislative Decree 1/2005, if the infrastructures or elements that are to be implemented are of metropolitan interest, they must be executed by the Metropolitan Area of Barcelona and they are not established either by the Metropolitan Urban Master Plan nor by the Metropolitan Urban Zoning Plan.

b) The special urban development plans that it considers necessary to promote with the following purposes:
   One. For the protection of communication routes defined as basic metropolitan roads network in the Metropolitan Urban Zoning Master Plan or by another general urban planning instrument.
   Two. For the improvement of rural environments.
   Three. For the protection and improvement of agricultural and forested areas, river courses, the natural environment and the landscape.
   Four. For the zoning of the underground space.

c) The rest of the derived urban development plans, if they affect more than one municipality within the metropolitan area, and fulfil the following requirements:
   One. That the definitive approval of the Plan corresponds to the Urban Planning Committee of the Metropolitan Area of Barcelona.
   Two. That the municipal councils have not agreed to formulate and process the Plan in a coordinated way.

ARTICLE 32
COMPETENCES OF THE METROPOLITAN AREA OF BARCELONA IN THE PROCESSING AND APPROVAL OF DERIVED URBAN DEVELOPMENT PLANNING

1. The Metropolitan Area of Barcelona has competences for the formulation, initial approval, and definitive approval, of the following urban development planning instruments:

   a) Partial urban development plans and urban improvement plans relating to actions of metropolitan interest defined by the Metropolitan Urban Master Plan and the Metropolitan Urban Zoning Plan, if the Metropolitan Area of Barcelona is the acting authority.

b) The special urban development of plans of urban systems of metropolitan interest envisaged in the Metropolitan Urban Master Plan or the Metropolitan Urban Zoning Plan which must be executed by the Metropolitan Area of Barcelona.

c) [Not in force].

d) Other derived urban development plans if they affect more than one municipality within the metropolitan territorial sphere and fulfil the following requirements:
One. That the definitive approval of the Plan does not correspond to the urban planning bodies of the Generalitat.
Two. That the municipal councils have not agreed to formulate and process the Plan in a coordinated way.

2. In the exercising of the competences to which this Article refers, the participation and prior hearing of the municipalities concerned must always be guaranteed."

Elements associated with systems and their metabolism

"INFRASTRUCTURES OF METROPOLITAN INTEREST

In this area, the AMB is developing, within the framework of its competences and in accordance with the applicable sectoral legislation, those territorial structuring actions necessary for:

- the articulation,
- the connectivity,
- the mobility and
- the functionality of the territory.

These actions refer, basically, to infrastructures and to the management of:

- mobility,
- parks,
- beaches,
- natural areas,
- facilities,
- staff,
- installations and
- technical, environmental or supply services.

TRANSPORT AND MOBILITY

The competences and services under ownership of the AMB in the field of urban transport, which includes the various services that run entirely around the metropolitan area, within the framework established by the applicable sectoral regulations, are as follows:

a) The collective public urban transport of passengers by surface means, except for the tram system which is part of the railway system of Catalonia. The Barcelona metropolitan area is a unitary transport management area, therefore transport is urban if it takes place wholly within it.

b) The provision of the service for the underground public transport of passengers, in line with the applicable sectoral legislation and without prejudice to the competences of the Generalitat.

c) The organisation and administrative intervention of the taxi service.

d) The approval of the Metropolitan Urban Mobility Plan, in line with the applicable sectoral legislation and without prejudice to the competences that this legislation attributes to the territorial mobility authority of the Barcelona Metropolitan Region.
For these purposes, urban mobility is understood as that which affects the unitary management area of the Metropolitan Area of Barcelona as established in letter a).
The definition of the basic metropolitan roads network in the Metropolitan Plan for Urban Mobility involves the participation of the AMB in the programming and management of the traffic within this network, together with the competent department within the government of the Generalitat.

e) The coordination and management, by delegation of the municipal councils, of the complementary mobility services that involve the special or exclusive use of the public roads and the organisation and management of the transport of passengers for cultural and tourism purposes.

f) The promotion of sustainable transport.

WATER

In the area of water, without prejudice to the competences of the Water Authority of Catalonia, and the municipal competences that are not subject to regulation by this Law, and in accordance with the planning approved by the Generalitat and the economic and financial regime established, the Metropolitan Area of Barcelona has the following competences and ownership of services:

a) The distribution to homes of drinking water or the supply of treated water: the direct or indirect management of water; the regulation, following authorisation from the Prices Committee of Catalonia, of the prices of the water tariffs in line with the costs that providing the service requires, which includes the tariff structure and special treatments or discounts, and other functions that correspond to the local agency that owns the service.

b) The public system of wastewater collection and the processing of wastewater, and also the regeneration of these waters for other uses, without prejudice to the competences of the Catalan Water Agency (ACA) to grant the corresponding permits, concession and authorisation for the reuse of regenerated water.

c) The coordination of the municipal wastewater collection systems and, in particular, the integrated management of the evacuation of rainwater, wastewater, and water from the sewage networks.

WASTE

In the waste management area, the Metropolitan Area of Barcelona has the competences and ownership of the following services:

a) The treatment, evaluation and disposal of municipal waste and the rubble originating from minor building works and home repairs.

b) The coordination of the municipal systems for municipal waste collection.

c) The separation and selection of containers, in line with its specific legislation.

d) The municipal rubbish tip service, without prejudice to the effective provision of this service in collaboration with the municipalities.

OTHER COMPETENCES IN THE ENVIRONMENTAL AREA

In the environmental area, the Metropolitan Area of Barcelona exercises the following functions:

a) The coordination and formulation of a Metropolitan Action Plan for the protection of the environment, health, and biodiversity; measures for combating climate change; and the formulation of a metropolitan Agenda 21.

b) Collaboration to produce acoustic capacity maps and strategic noise maps, in line with the sectoral legislation.

c) The issuing of the environmental reports established by the legislation regarding the intervention of the environmental authority in procedures for awarding municipal environmental licences, in accordance with the functions that the sectoral legislation attributes to the supra-municipal organisations.

d) Collaboration with the municipalities to programme environmental organisation policies.

e) The promotion and, where applicable, the management of public and private renewable energies facilities."

Newly incorporated social and economic components

"ECONOMIC AND SOCIAL DEVELOPMENT

The competences of the AMB in the area of economic, social and commercial development are:

a) Fomenting economic activity, promoting employment and the creation of businesses in the fields of industry, commerce, services and tourism resources.

b) Promoting a Metropolitan Strategic Plan that, with the participation of economic, social and institutional agencies, favours modernisation, research and innovation.

SOCIAL AND TERRITORIAL COHESION

In this area, the AMB is responsible for:

a) Promoting the implementation of common public policies in the area of municipal services and fomenting social and territorial cohesion, with the aim of improving living conditions for citizens and the territorial balance of its member municipalities.

b) Participating in the corresponding territory-scale Security Committee to foment public policies in areas of civic coexistence."

The Law's potential

Reading the Law, the unification of competences across the set of municipalities through each of the agencies becomes evident.

It is necessary to establish, after 38 years without the production of another PGMB, a new proposal in the definition of urban planning.

Public policies of social and territorial cohesion, housing policy, and economic development – from a productive and social viewpoint – will be essential components of this new planning.

Also prominent, furthermore, is the metropolitan planning of mobility, which goes beyond the everyday management of the surface public transport service operated by the Metropolitan Transport Agency (ETM). The change to metropolitan management for buses, as well as the change of territorial sphere for 18 out of 36 municipalities, is the most significant part of the new Law.

In a territorial – and increasingly ecological – reading, it will become evident that there is a need for the management of metabolic cycles, beyond the management of water and waste.

It would be very interesting if an energy operator were created that developed renewable energies and generated more synergies between the water cycle and the energy cycle.

Two perspectives would therefore open up:

A new reading of the circular economy and of the materials cycle, as well as the synergy between water and energy with regard to the pumping of regenerated water or cycles of energy and materials in the reuse of sludges and energy, among others.

Also worthy of note is the preponderance of management for the protection of the environment, health, biodiversity, and measures to combat climate change. This change, and the resilience of cities, have become central elements that place in question the very management of metabolic cycles.

In addition, another very relevant question arises: health affected by atmospheric pollution and food.

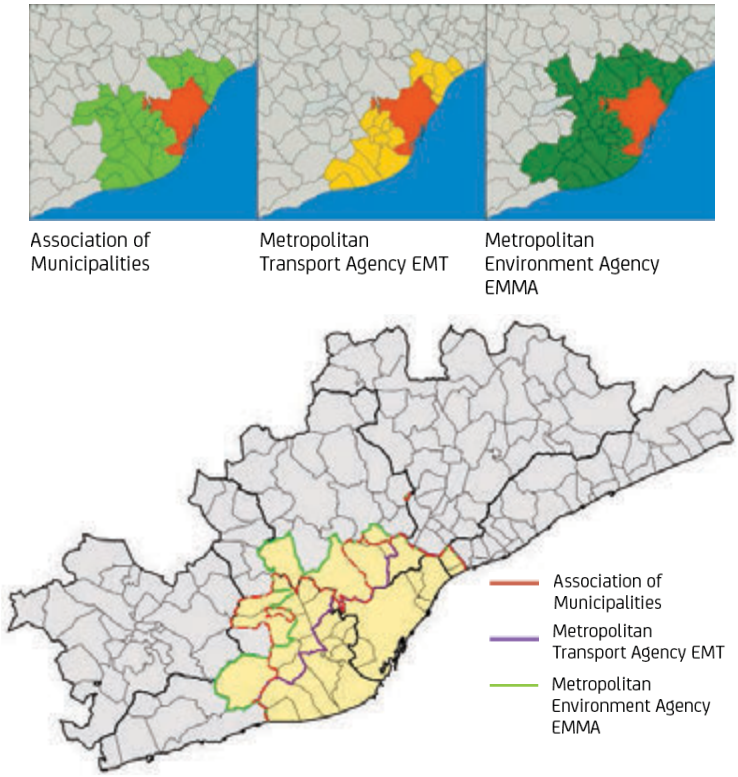

Fig. 6. Areas of the different agencies associated with the origin of the AMB. *AMB.*

4. TAXES THAT GUARANTEE THE FUNDING OF METROPOLITAN POLICIES

The Law establishes a set of resources for implementing the competences:

"ARTICLE 41
SURCHARGE ON PROPERTY TAX

1. The metropolitan surcharge on property tax must not exceed the percentage established by the local tax authority legislation and should be applied to the cadastral value that constitutes the taxable base for this tax.
2. The management of the metropolitan surcharge on the property tax should be carried out jointly with that of the same tax to which it is applied.

ARTICLE 43
TAXATION AND FINANCIAL AUTHORITY

1. The Metropolitan Area of Barcelona has to exercise taxation and financial authority to make effective the solidarity and fiscal balance between the municipalities that are members.
2. The Metropolitan municipal councils can establish mechanisms and formulas for collaboration with the Metropolitan Area of Barcelona for the joint providing of functions such as taxation management, collection, inspection and revision of the municipal taxes and other income for the public purse.

ARTICLE 44
LEGAL BUDGETARY AND FINANCIAL REGIME

The financing, budget, intervention, tax management, tax collection and accounting of the Metropolitan Area of Barcelona are governed by Spanish legislation and that of the Generalitat that regulates local tax authorities.

ARTICLE 45
TARIFFS OF SERVICES PROVIDED BY ORGANISATIONS THAT ACT UNDER THE PRIVATE LAW SYSTEM

1. In accordance with their statutory or contractual system, public business organisations, companies with wholly public capital, public-private ventures, public works and public ser-

vices licensees, and other metropolitan public services contractors, can be paid by tariffs or other fees by users.

2. The tariffs or fees referred to in section 1 are income governed by private law for the company managing the service, without prejudice to its regulation through the rules of the corresponding service or the specific regulations for each tariff.

FOURTH TRANSITIONAL PROVISION

The taxes and diverse resources of the Metropolitan Water Services and Waste Treatment Agency, the Metropolitan Transport Agency, and the Association of Municipalities of the Metropolitan Area of Barcelona, in force on the date of publication of this Law, must be maintained in force until the financing of the Metropolitan Area of Barcelona has been developed."

This represents a great potential amount of resources and taxes in order to finance the new competences, although we find the basis of the resources lies in charging property tax (IBI) and certain other taxes (waste collection, etc.). To be able to increase these, awareness-raising needs to be planned in order to fund the new services. The mayors, always sensitive to these increases, will have to evaluate the metropolitan needs.

Transport management is, undoubtedly, one of the elements that most conditions financial sustainability. As an alternative solution to the lack of resources for improving the service, many administrations have introduced "tolls". In London and Stockholm, it is proposed to fund a new network of quality public transport through tolls for certain routes and territories (for example, the ring roads), or the payment of parking on public streets. Another important resource is the concept of "if you pollute, you pay". Surcharges on the property tax (IBI) are not popular, but it is necessary to point out that they provide a considerable increase in resources.

This is a moment of change that is coinciding with an economic and social crisis. Undoubtedly a new taxation strategy is needed.

Furthermore, the obtaining of loans or other forms of contributing private capital is essential – such as the new housing operator (Habitatge Metròpolis Barcelona) – for the funding of new investments in renewable energies and housing, that subsequently could be recoverable with the management of the services. The funding generated by agreements between mayors will be essential for the future of metropolitan governance.

THE PAM, REFERENCE POINT OF METROPOLITAN POLICY

In the first term of office (2011-2014) following the passing of the Law of 2010, the Metropolitan Action Plan (PAM) was consolidated and a first *Metropolitan Strategic Reflection* (REM 2015) was produced regarding the function of the AMB.

In this second term of office (2015-2019), a strategy has been established and simultaneously, and for the first time, there has been a reading of the prioritisation of strategies of the PAM objectives, by territories.

The PAM defines the major lines that have marked the action of the government of the AMB during this term of office and aims to give a response to the problems being experienced by metropolitan municipalities:

- Social justice,
- sustainability and
- democratic regeneration.

"For a more just, democratic and sustainable metropolitan space."

The strategic lines are organised around three lines of action:

- Line 1. Social rights, sustainable economic development and territorial cohesion.
- Line 2. Metabolism, sustainability and resilience.
- Line 3. Government, governance and democratic quality.

The metropolitan action of the AMB government is, therefore:

LINE 1. SOCIAL RIGHTS, SUSTAINABLE ECONOMIC DEVELOPMENT AND TERRITORIAL COHESION.

- L s1: policies to combat inequalities, for social inclusion and citizen rights.
- L s2: policies for sustainable and inclusive economic development.
- L s3: public space and facilities for reinforcing equal opportunities and quality of life.
- L s4: consolidation of the right to housing.
- L s5: improvements in neighbourhoods and support for the municipal councils.
- L s6: urban planning, a strategic tool for territorial development.

LINE 2. METABOLISM, SUSTAINABILITY AND RESILIENCE

- L m1: fight against climate change and air pollution: the metropolitan city has to be a leader in this area.
- L m2: priority: metropolitan natural and agricultural spaces.
- L m3: water supply, service and treatment in a way that is balanced and fair.
- L m4: advancing towards a circular economy in waste matters.
- L m5: boosting sustainable mobility across the whole metropolitan territory.
- L m6: financed governance of transport and mobility.
- L m7: effective and innovative transport management.
- L m8: infrastructures planning and coordination model for social and territorial cohesion on the metropolitan scale.

LINE 3. GOVERNMENT, GOVERNANCE AND DEMOCRATIC QUALITY

- L g1: promote good governance through the transparency agency.
- L g2: efficient and financially sustainable administration at the service of citizens.
- L g3: coordination between institutions for the management of services.
- L g4: across-the-board coordination in the areas of social, economic, territorial and environmental development of the AMB.
- L g5: systematic approach and guarantee of dissemination of the socioeconomic and spatial data of the metropolitan area and region.
- L g6: governance and participation of all agencies linked to the AMB.
- L g7: metropolitan networks and strengthening of exterior projection.
- L g8: policy of solidarity and progress in cooperation projects.

The PAM, as a guideline for government, proposes, in the first line of action, a focus on social and economic activities whose objectives are sustainable economic development and territorial cohesion that fights against inequalities. And it contributes two new significant instruments for improving neighbourhoods and the public space: a housing policy and an urban renewal policy. It also proposes metabolism management in order to ensure sustainability and resilience.

In the second line it proposes integrated management of the three cycles: the water cycle, the cycle of materials associated with the management, treatment and prevention of waste, and the energy cycle, where it has the authority to develop an energy operator that

could be the basis for introducing renewable energies. In addition, it manages metropolitan mobility.

Moreover, it has the Collserola Natural Park and participates in the Baix Llobregat Agricultural Park, for which reason it proposes that the metropolis be a leader in the fight against climate change and air pollution and that it makes a priority, in short, of protecting natural spaces. Furthermore, it proposes a water policy that provides a balanced and socially just management and a materials policy that introduces the circular economy to convert the AMB into a major manager of metropolitan waste. Within the context of mobility, and its implications for the environment and pollution, it proposes, at the same time, driving the AMB towards sustainable mobility and towards better financial governance.

Finally, with the third line of action, it proposes the reinforcement of a metropolitan government with more democratic quality. A highlight is the creation of a transparency – and good government – agency, and better coordination between the social, economic, environmental and territorial areas with a cross-departmental and strategic perspective. It goes without saying that all of this requires better administration in order to increase financial efficiency. In addition, all of these interventions are proposed within a framework of internationalisation.

It is proposed, therefore, to organise social and economic activities with the ecological systems (water, energy, materials) in order to improve governance and democratic quality. The foundations of this are found in the PAM. All that is needed is to go further than a joint sum of strategic and policy initiatives and a plan of actions that the organisation of the AMB imposes upon itself from the proposals for each service. It is necessary to introduce, therefore, a political and strategic direction with more across-the-board proposals that place the organisation at the service of a metropolitan transition where the AMB must play a more prominent role.

FIRST SWOT FOR THE AMB

1. RISKS OF THE METROPOLITAN SYSTEM FOR PRODUCING A DIAGNOSIS

At the height of a social, economic and environmental crisis it is essential to focus on a resilient metropolitan strategy. A SWOT analysis of the Barcelona metropolitan area should enable us to evaluate the risks and threats affecting it, and should give us a resilient vision of the metropolis of Barcelona.

From the context of the global risks that affect us, we evaluate those whose impact is greater.

Having seen its competences, we will organise the series of risks that can be managed from a metropolitan scale and locate them around the three PAM lines of action:

LINE 1. SOCIAL RIGHTS, SUSTAINABLE ECONOMIC DEVELOPMENT AND TERRITORIAL COHESION

- Social risks.
- Economic risks.
- Risks of loss of food sovereignty.
- Risks to health due to man-made actions and climate change.

LINE 2. METABOLISM, SUSTAINABILITY AND RESILIENCE

- Risks due to the peak oil effect and the impact on energy prices.
- Risks of loss of biodiversity and collapse of the ecosystems.
- Risks of failure with regard to climate change, with a forecast increase of 2ºC in the next 30 years.

This will have evident effects on:

- Water stress,
- Increase in the temperature, with growth in the number of days considered torrid,
- Increase in extreme rainfall,
- in coastal water levels,
- and growth in salinity levels.

LINE 3. GOVERNMENT, GOVERNANCE AND DEMOCRATIC QUALITY

- Risks due to lack of governance on a regional and state level.
- Risks of transparency and good governance.
- Risks of technological sovereignty.
- Risks due to a lack of strategic territorial planning.
- Risks due to a lack of metropolitan government.

For each of these risks we will not only analyse the main threats, but also the weaknesses and strengths of the organisation of the AMB, as well as of the opportunities that present themselves.

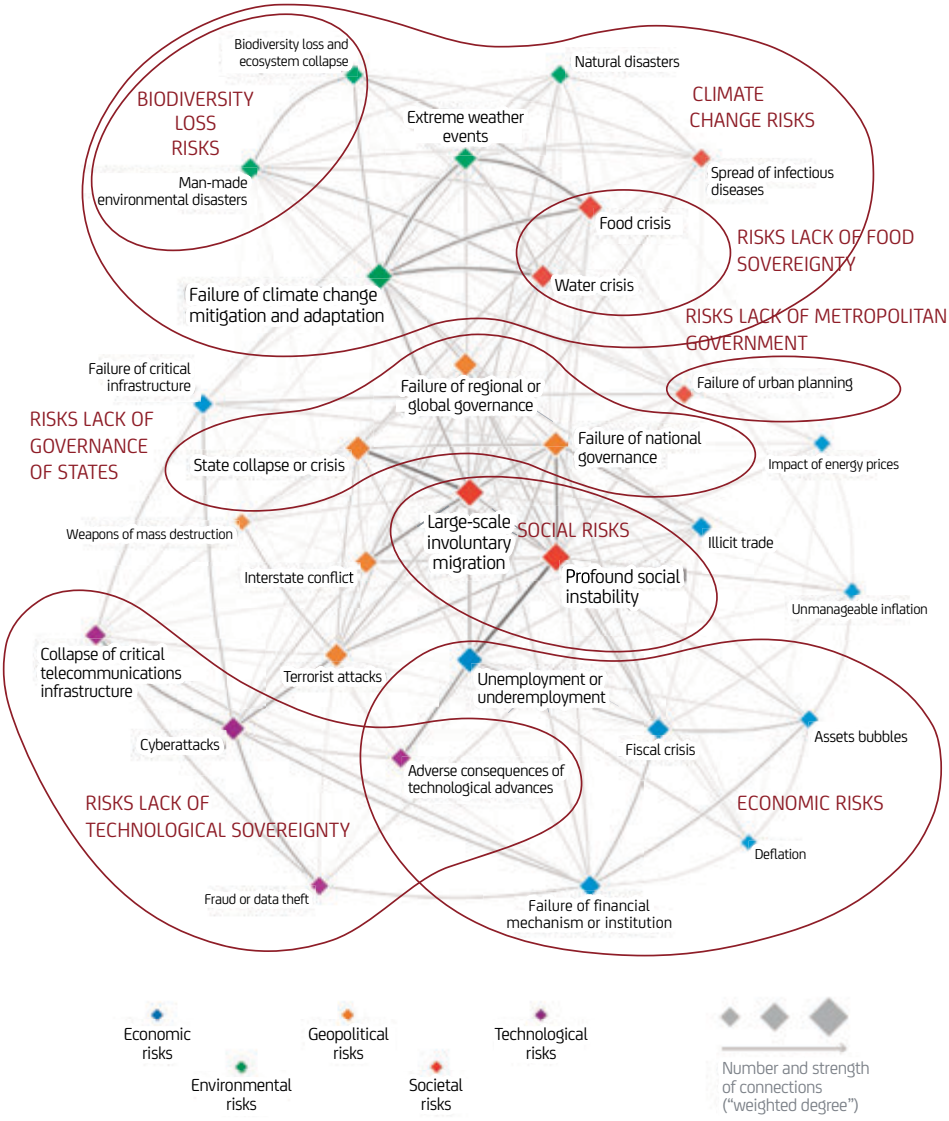

Fig. 7. Typologies of risks and their relationships.

Author reworking based on The Global Risks Report 2018 of the World Economic Forum.

2. WEAKNESSES, THREATS AND STRENGTHS ACCORDING TO THE STRATEGIC LINES OF ACTION

Line 1. Social rights, sustainable economic development and territorial cohesion

SOCIAL RISKS

THREATS

The main risk is the increase in social vulnerability and a lack of cohesion due to the long process of economic crisis that forces into precarity the population without work or with short contracts and without economic benefits, which prevents a response being given to family needs. In some places, the worsening of the situation can even generate a lack of security.

We must add to all this the arrival of speculative capital that increases the price of housing rentals, which the average population is unable to pay.

Furthermore, we must also add to it a lack of a legislation favourable to housing – as a right – and of effective social and educational policies. Moreover, the ageing of the population, and the increase and absorption of immigration are also acquiring increasing importance.

WEAKNESSES

The social protection system is overwhelmed. There are territories with such high unemployment that it gives rise to social segregation of the most impoverished areas and there are educational deficits that coincide with the areas with the highest unemployment levels. Santa Coloma and Sant Adrià, around the Besòs, are the most affected municipalities.

There is also a gap between rental prices and family income, marked by the deficit of housing for rental. This problem is more accentuated in Barcelona, Santa Coloma and L'Hospitalet de Llobregat. There is a lack of renewal of the housing stock.

Finally, it is important to underline the lack of metropolitan services for tackling situations of social exclusion and severe poverty such as homelessness, the increase in needs for tackling mental health or the right to access to decent housing.

STRENGTHS

There is a programme of government defined by the PAM and a set of competent metropolitan services willing to undergo reorganisation. There are also instruments and programmes that are applied to sectors, or in small territorial spheres, that it is necessary to elevate into a systemic vision covering the entire AMB territory.

The strengths are as follows:

- We have a Metropolitan Housing Observatory, with all the instruments for information and analysis, that enables a narrative to be constructed for the needs and challenges in the housing area. In addition, we have a new metropolitan housing operator (HMB) with the capacity to provide capital and management for the construction of publicly subsidised rental housing.
- We have the Directives for Metropolitan Housing Policy 2016-2019.
- Experience in neighbourhood plans.
- Capacity for the production of services, both of the municipalities and the AMB, which it is necessary to reorient towards new needs.
- Experience in co-production of programmes in neighbourhood plans.
- Municipal strategic planning programmes (Badalona) that propose urban transformations with the introduction of innovative industrial projects and employment for young people.
- Start of an educational strategy from the Besòs Consortium.
- Metropolitan training strategy for the car industry at the Comarcal Region Council scale with the Territorial Specialisation and Competitiveness Project (PECT).

ECONOMIC RISKS

THREATS

The main threat comes from the effects of globalisation, which imply precarity for employment and the potential loss of strength of the clusters, especially in the car industry which requires restructuring:

- Transition of the car sales model towards the sale of mobility services.
- Introduction of renewable energies and big data into the transport service.

Moreover, a threat of loss of clusters in the Metropolitan Region and, especially, of those that demand of the industry more upgrades to Industry 4.0.

WEAKNESSES

The Barcelona region's metropolitan economic system is of an industrial nature. The main weakness it presents is the need to reposition itself in the global system to increase the level of RDI in order to achieve better salaries.

STRENGTHS

There is a programme of government defined by the PAM.

In addition, the following exist:

- The Economic Reactivation and Reindustrialization Committee of the AMB.
- A competitive metropolitan economic allocation for industrial estates.
- Experiences in neighbourhood plans with co-production of social economic policies.
- Experience in agro-ecological networks on a metropolitan scale.
- Experience in circular economy policies (Viladecans, Gavà, Barberà, El Prat, among others) that has enabled the creation of a metropolitan programme, of urban innovation in Viladecans (Vilawatt), Barcelona (photovoltaic operator), Santa Coloma de Gramenet (Renovem els Barris – Renovating the Neighbourhoods), Sant Cugat (Energy Efficiency Programme), among others, that can be replicated in the other municipalities.
- Within the framework of the RIS3Cat (Research and Innovation for Smart Specialisation) framework there has been development of training PECTs (Territorial Competitiveness Specialisation Projects) in the automotive sector and pluri-municipal PECTs in different clusters and territories of the Barcelona Metropolitan Region: energy (Rubí, Sant Cugat, Cerdanyola), health (L'Hospitalet, Badalona, Santa Coloma de Gramenet, Baix Llobregat, Terrassa), water and energy (Sant Adrià and Badalona).

RISK OF LOSS OF FOOD SOVEREIGNTY

THREATS

Food shortages due to climate change and energy price increases.

This could worsen in case of the loss of proximity networks that reinforce social, solidarity and care economies.

Moreover, globalised logistics endangers urban agriculture.

WEAKNESSES

There are two prominent factors:

- Loss of agriculture, which does not have a metropolitan food policy.
- There is no metropolitan policy for social and solidarity economies.

STRENGTHS

- Availability of the PAM.
- Availability of grants for open spaces (PSG).
- Availability of local experiences in social and solidarity economy networks. Example of the municipality of El Prat de Llobregat.
- Availability of a network of agents promoting organic agriculture.

HEALTH RISKS DUE TO MAN-MADE ACTIONS AND CLIMATE CHANGE

THREATS

Health is affected, especially:

- The increase in deaths due to environmental contamination and levels of noise and air pollution associated with the circulation of private passenger and goods vehicles.
- Health problems due to the air quality in areas close to cement plants.
- Health problems due to the air quality in areas close to incinerators.
- The threat of poor-quality diets in poorer areas.

WEAKNESSES

Highly concentrated territories with the superposing of the road network on the urban fabric.

Cement plants and incinerators are located at points very close to residential areas.

There are no metropolitan diet programmes.

STRENGTHS

- Availability of the PAM.
- Availability of the PSAMB 2014-2020.
- Availability of the Climate Change Adaptation Plan 2015-2020.
- Availability of the Air Quality Improvement Plan (2015-2018).
- Measures against air pollution (2016).

- Socio-ecological Conflicts Committee.
- Experience in municipal school diet programmes (Molins de Rei).

Line 2. Metabolism, sustainability and resilience

The biggest threat, however, is the lack of effect environmental policies. There are three combined effects that will affect the metropolitan metabolism:

- The disappearance of fossil fuels, which will increase energy prices.
- Climate change, which will increase needs for energy due to the rise in temperature and to water stress.
- The impact of the greenhouse effect and the need for decarbonisation of the metropolitan system.

From a metabolic perspective, a system is needed that promotes sustainability and uses resilience to tackle the risks without any loss of identity.

RISKS OF PEAK OIL AND IMPACT ON ENERGY PRICES

THREATS

The risk of the end of fossil fuels and of peak oil is a real threat.

It is essential to introduce renewable energies and stores of energy (wind, photovoltaic, domestic hot water [ACS], waterfalls), as well as the zero waste model.

Housing is not properly adapted, there is no urban and energy renewal and, therefore, it will suffer the inclemency of the weather due to drought and rising temperatures, with an impact on morbility and mortality.

Transport will become more expensive and this will have an impact on poorer social classes, who will have to take on even more expenses. Added to this will be pollution, i.e., restrictions that the population, especially the poorer section, will have to take on at a considerable social and economic price.

WEAKNESSES

It is necessary to emphasise that we are faced with a predominant fossil fuel energy that is highly polluting and expensive, especially at the peaks (central points of the combined cycle), that prevents a transition towards renewable energies.

Despite the AMB managing water cycles and waste, there is no strategy to counteract the increase in energy prices, especially consumption due to the desalination plant and incinerators.

There is no policy to promote renewable energies in the private sector.

Despite the AMB having the Metropolitan Housing Consortium, there is nothing to counteract the increase in household energy prices, preferably for the most disadvantaged layers of society.

The AMB's mobility manager has not undertaken steps to enable achieving of the CO2 reduction levels that the Paris Agreement makes obligatory.

STRENGTHS

There is a programme of government defined by the PAM.

Furthermore, there exists a whole series of municipal and sector experiences:

- The AMB, which manages the water cycle (wastewater treatment plants, WWTP), has competences, therefore, to create a renewable energy operator. It would be the operator for waste prevention and management which would control an incinerator, potable water treatment plants (PWTP) and eco-parks, rubbish tips and landfill sites, which consume a lot of energy.
- An energy operator in Barcelona that is developing photovoltaic panels: Programme to promote solar energy in Barcelona (2017-2019).
- An extensive urban renewal plan (EU loan anticipated). Passif Haus experiences at schools and experiences in municipalities (Viladecans, Sant Cugat, Sant Boi).
- The implementation of the door-to-door model in some municipalities (Tiana) and areas of Barcelona (Sarrià), as well as the introduction of containers with a magnetic band (El Papiol). There are others that are in development or with alternative technical solutions (Castelldefels, Ripollet).
- The Vilawatt project, in Viladecans, for a culture of energy transition. The Municipal Council of Santa Coloma de Gramenet acts as an operator in urban renewals.
- Experiences in nearby municipalities such as Rubi (Rubí Brilla) and Granollers (Ecocongost), as well as energy efficiency experiences: Viladecans (Vilawatt), Sant Cugat, El Prat de Llobregat and Sant Boi.
- Experience in the implementation of windmills in cooperative form such as, for example, Viure del cel.

The AMB and Barcelona have a metropolitan energy operator, Barcelona Energia.

Potential extension of the neighbourhood plans experience to the whole metropolis in an improved version.

Existence of the PSAMB 2014-2020, of the Climate Change Adaptation Plan 2015-2020 and its updating in the PACC 2018-2030 and of the METROBS Observatory.

In the field of mobility, there are the following sector or municipal policies:

- Promotion of the bicycles network in Barcelona and the AMB.
- The experience of implementation of vignettes to restrict contaminating vehicles on the Barcelona ring roads.
- The experience of the green zones of Barcelona and the effect of the 10% reduction in vehicles in the neighbourhoods where action was taken (2007).
- The experience of the new bus network in Barcelona.
- The experience of intermodality with the European programme BiTiBi.

RISK OF FAILURE AGAINST CLIMATE CHANGE (INCREASE OF 1.5^{0}C) WITH RELATION TO FORESEEABLE AND UNFORESEEABLE ASPECTS

Water stress

THREATS

It is necessary to tackle water stress with a reduction of 18% in resources by 2050 and maintain water consumption. Periods of drought may also increase.

This would also mean:

- Lack of capacity to supply buildings with water.
- Lack of water for domestic consumption due to the available resources being affected.
- Reduction in comfort in the public space due vegetation being affected by water restrictions.
- Lack of water for the needs of the Agricultural Park.

WEAKNESSES

With respect to the increase of 1.5°C, a prominent result is water stress determined by:

- The lack of water resources because of increasingly frequent water stress that will require more efficiency in water uses and new infrastructures such as, for example, a new desalination plant (which requires major energy consumption) and an increase in regenerated water, which will require an increase in the capacity of the treatment plants.
- The structure of the metropolitan area presents a strong change in gradient between the mountain areas and the Delta, with a very gentle slope, making it difficult to manage.
- A large impermeable surface area in open spaces due to a lack of maintenance of woodlands.
- Impermeability of the ground in urban areas.
- Poor quality of water from the Llobregat River basin due to the salinity produced by the saline residues of Iberpotash.
- Lack of rebalancing with the Ter River basin.

STRENGTHS

- Already existing are the AMB Sustainability Plan (PSAMB) 2014-2020, the Climate Change Adaptation Plan 2015-2020, updated in the PACC 2018-2030, the Climate and Energy Plan 2030 and the Metropolitan Observatory for Climate Change (METROBS).
- There is a project for regenerated water at the Llobregat River.
- There are studies for the alternative management of the PWTP in Gavà.
- There is an agreement between the river basins to tackle rebalancing.
- It is necessary to update the Rainwater Master Plan (PDAP) of 2005.
- It is necessary to introduce urban stewardship for agro-forestry operations.
- There is a brine collector, which can be doubled in synergy with the displacement of regenerated water.

Risk of increased sea levels along the coast

THREATS

It is necessary to tackle the increase in sea levels along the coastline, which may lead to the following problems:

- Problems resulting from the regression of the coastline
  - Loss or alternation of beaches due to marine erosion.
  - Closure and/or poor conditions of beaches that prevents their use.
  - Tourism being affected due to the disappearance of beaches.
  - Businesses located close to beaches being affected.
  - Damage to the public space along the seafront due to the impact of storms.
- Energy distribution being affected due to the regression of the coastline at existing installations.
- Problems in untreated water infrastructures and sewage systems, especially interceptor sewers.
- Economic effects on fishing.
- Increase in emergencies due to floods.

WEAKNESSES

The main environmental risk is that associated with the increase in sea levels along the coastline, worsened by the fact that the coasts of the metropolitan region present a negative balance of sediments and an associated danger of the disappearance of beaches. In this territory, prominent are the delta area in recession, to the south, and the fragility of the inceptor sewers, to the north. There is no consolidated pluri-municipal governance and it is an area with marked competence fragmentation.

STRENGTHS

- Already existing are the PSAMB sustainability plan for 2014-2020, the Climate Change Adaptation Plan 2015-2020, updated with the PACC 2018-2030; the Climate and Energy Plan 2030 and the METROBS Observatory.
- Barcelona City Council has begun the drafting of a Strategic Plan for the coastal areas of the city. Consolidated experiences of transporting of sediments and stabilisation of beaches.
- Experience in the construction of collectors in flat areas such as the Delta del Llobregat area.

Risk of saline intrusion

THREATS

Delta in regression and, as a consequence, danger of saline intrusion into deep aquifers.

WEAKNESSES

Problems of salinity. The coasts present a negative sediments balance and an associated danger of the disappearance of beaches.

In this territory there is a prominent delta area in recession towards the south.

STRENGTHS

- Already existing are the PSAMB 2014-2020, the Climate Change Adaptation Plan 2015-2020, updated with the PACC 2018-2030, the Climate and Energy Plan 2030 and the METROBS Observatory.
- There are consolidated experiences of sediments transport and stabilisation of beaches.
- There is a barrier against saline intrusion at El Prat de Llobregat.

Risk of increase in extreme rainfall

THREATS

Cuts affecting the power supply that may affect economic activities.

Torrential rain phenomena or episodes of strong winds, storms and possible cuts affecting the energy and water supplies that would cause damage to infrastructures.

More damage, and lack of capacity for evacuation of water, at transport infrastructures (lack of capacity of treatment plants).

Floods caused by torrential rainfall with a lack of capacity and insufficiency of drainage in the sewage system and storm drains.

Forestry species being affected during periods of drought and an increase in the risk of forest fires.

WEAKNESSES

The Mediterranean climate is characterised by a risk of increased extreme rainfall within an environment of high gradients around a delta-type area. If we add the lack of woodland management, this means an increase in the impermeability of the territory's land and in river levels in extreme rainfall scenarios.

STRENGTHS

- Assets: the PSAMB (sustainability plan) 2014-2020, the Climate Change Adaptation Plan 2015-2020, updated with the PACC 2018-2030, the Climate and Energy Plan 2030 and the METROBS Observatory.
- Experience in the construction of sewers in flat areas such as the River Llobregat delta.
- Experience in forestry operations combined with agricultural farming operations.

Risk of temperature increase

THREATS

Increase in torrid days and expansion of the urban heat island. .

WEAKNESSES

Increase in temperatures that has effects on a housing stock that is not passive and is lacking renewal. The effects are more serious in highly impermeable urban areas that store heat (industrial areas and urban centres).

STRENGTHS

- The PSAMB 2014-2020, the Climate Change Adaptation Plan 2015-2020, updated with the PACC 2018-2030, the Climate and Energy Plan 2030 and the METROBS Observatory.
- Green Infrastructure and Biodiversity Plan of Barcelona (2013-2020).
- Promotion of living terrace roofs and green roofs in Barcelona (2014).
- Eradication of the use of glyphosate in green areas and municipal public thoroughfares in Barcelona (2015).
- Programme to promote the green infrastructure (2017).
- Barcelona Tree Master Plan (2017-2037).
- Continued experience in neighbourhood plans that it is necessary to extend, in an ongoing and improved way, to the entire metropolis.
- Extensive plan for urban renewal with envisaged loan from the EU. Passif Haus experiences at schools and in municipalities (Viladecans, Sant Cugat, Sant Boi).
- Existence of the Baix Llobregat Agricultural Park. Agro-ecology experiences in mountain territories. Metropolitan plan for the use of biomass for boilers in the mountain municipalities of the Baix Llobregat.

RISK OF LOSS OF BIODIVERSITY AND COLLAPSE OF ECOSYSTEMS

THREATS

The loss of biodiversity grows along with climate change.

Among the different problems, prominent are:

- The increase in invasive species.
- The possibility of an increase in forest fires.
- The heat island, which we have already specifically studied, caused by climate change

Globalisation is endangering the non-urban environment because of alteration (new activities that substantially alter the system), the increase of pressure in groundwater and the fragmentation and destruction of habitats.

Agriculture and forestry exploitation are essential for maintaining biodiversity and must enable control of the advance of urban activities (hyper-frequenting of the non-urban environment and worsening of urban environmental conditions) that endanger the biological corridors.

WEAKNESSES

Natural areas are recording growth in invasive species and an increase in the risk of forest fires, which is accentuated by the loss of connectivity of biological corridors and the phenomenon of agricultural shrinkage, affecting the main elements that ensure the biodiversity of natural systems in metropolitan environments.

STRENGTHS

- Availability of the PAM.
- Availability of the PSAMB 2014-2020, the Climate Change Adaptation Plan 2015-2020, updated with the PACC 2018-2030, of the Climate and Energy Plan and of the METROBS Observatory.
- Policy of natural areas (open spaces grants) into which it is necessary to introduce metropolitan biodiversity programmes, preservation of natural areas and the promotion of agriculture, which requires urban stewardship programmes for the Collserola Park and protected natural areas.
- Evaluation of invasive plant species.
- Re-introduction of flocks of sheep to reduce forest undergrowth.

- Exploitation of urban agriculture.
- Re-establishment of the connectivity of the green infrastructure.

Line 3. Government, governance and democratic quality

RISKS OF LACK OF REGIONAL AND STATE GOVERNANCE

THREATS

Greater control of the investment funds and other institutions that are positioned above the traditional authorities.

WEAKNESSES

The AMB can generate proposals that are aimed at consensus or promoting policies of interest for the metropolitan area on behalf of the autonomous and central governments, but does not have the mechanisms necessary to carry them through beyond isolated agreements of the Metropolitan Council as well as other one-off agreements.

STRENGTHS

- The AMB is one of the few governing bodies that goes beyond the municipalities and can put forward proposal for the autonomous and central governments.
- Policies that have established agreements with authorities of the Generalitat and the Provincial Council in housing matters through the Metropolitan Housing Observatory and agreements to combat air pollution.
- The metropolitan areas are increasingly prominent in urban policies that affect citizens. There is a change of scale from national policy to European policy. Continental directives are more determinant, which leads to a crisis of states. The problems are no longer municipal, but metropolitan. Within this geopolitical change, the AMB has to reposition itself.

RISKS DUE TO LACK OF TRANSPARENCY AND GOOD GOVERNMENT

THREATS

Discrediting of politics that places in question the activities of the authorities. It is necessary to establish good governance protocols and instruments of transparency that value the work of the authorities.

Citizens' demands for transparency in the face of socio-ecological conflicts.

Lack of cultural policies and of construction of metropolitan identities.

WEAKNESSES

The AMB has no tradition of dissemination of its work and studies nor of the plans that it develops.

Lack of actions or policies that help citizens to understand the role of the AMB and to create metropolitan identities around common problems and actions.

STRENGTHS

- Transparency Law that obliges municipalities to have a transparency and good governance agency.
- Process to define the menu of services and advise the different dependent authorities.
- Socio-ecological Conflicts Committee already functioning.

RISKS OF A LACK OF TECHNOLOGICAL SOVEREIGNTY

THREATS

Threat of collapse of the critical telecommunications infrastructure, of fraud or theft of data and of cyber-attacks and terrorist attacks.

There are increasingly more administrative services that are offered online and this can create a technological divide according to people's standard of living.

Access to telecommunications is increasingly transforming everyday activities.

WEAKNESSES

The lack of technological sovereignty among the municipalities and the AMB itself is evident.

There is no coordination of services between municipalities and, without a metropolitan policy, it is difficult to improve them.

STRENGTHS

- Metropolitan Action Plan (PAM) and implementation of some first incipient metropolitan policies.
- Experience of Barcelona Digital City and of the Cornellà CitiLab project.

RISKS OF LACK OF ECONOMIC SUSTAINABILITY DUE TO A SHORTAGE OF TAXES AND RATES

THREATS

Reduction of resources originating from the central and autonomous authorities, especially critical for the funding of public transport.

That there is no forecast for needs for rates collection due to the lack of budget restructuring of the TMB, worsened by the reception of new infrastructures (L9 and L10), which would imply budgetary restrictions for the AMB.

There are increasingly more needs to be covered, especially if the aim is to develop the AMB Law to its full potential.

WEAKNESSES

The municipalities are reluctant to increase rates.

There is no common policy to define the contribution of each municipality.

STRENGTHS

- Awareness of need to tackle rates in the face of the threat of the financial collapse of the transport system.
- Policy of defining rates for waste, according to the capacity to recycle at origin.

RISKS DUE TO LACK OF METROPOLITAN GOVERNANCE

THREATS

The regional and central governments do not control the investment fund and other institutions that are positioned above the traditional authorities.

WEAKNESSES

The Barcelona metropolis presents:

- A lack of administrative response on a metropolitan scale in reaction to new housing needs.
- A lack of instruments to tackle new job needs associated with reindustrialisation.

- Progressive loss of agricultural activity.
- A lack of metropolitan public policies of a social, economic and environmental nature that are redistributive and may significantly reduce social segregation.
- A lack of metropolitan policies adapted to the new industrial needs in a globalised world that could give rise to a new territorial and metropolitan crisis.
- An increase in in immigration for economic reasons due to the north-south imbalance.

In general, current metropolitan policies are characterised by a fragmented adding together of municipal policies.

Lack of a strategic policy regarding the general ageing of the metropolitan society, which has implications for associated residential mobility and the creation of new social services located according to the spatial dynamics of future residential mobility.

Secondly, there is a lack of policies associated with the foreseeable technological changes in mobility and the programmed arrival of peak oil:

- Lack of a metropolitan policy for the reduction of commuter journeys.
- Lack of a strategic policy for the transition to sustainable mobility characterised by a fragmented management of public transport operators and a lack of implementation of a centralised operator to coordinate all the sustainable mobility modes and services.

In third place, there is a prominent lack of a strategic policy for resilience with respect to climate change and of achievement of a territory with a balanced metabolism, in which a review is needed of the three cycles: water, energy and materials.

In short, there is conformation of a lack of dynamics associated with resilient thinking to articulate organised territories in the face of potential crises.

STRENGTHS

Metropolitan Action Plan (PAM) and implementation of a series of first incipient metropolitan policies that are characterised by:

- Continued experience in neighbourhood plans that it is necessary to improve and extend to the entire metropolis.
- Experience in plans for economic activity estates (PAEs), which it is also necessary to improve and extend.
- Experience in competitions for grants for open spaces (PSG).

The potential use of the Council of Mayors for issues that need to be channelled by the metropolitan government.

Moreover, and associated with the AMB Law, there are a series of milestones that can increase these policies:

- The AMB Law, which makes an increasingly systemic PAM obligatory.
- The Economic Reactivation and Reindustrialisation Committee. Within the framework of a European programme (RIS3Cat), intermunicipal PECTs of self-organised territories have been created.

RISKS OF A LACK OF TERRITORIAL AND STRATEGIC PLANNING

THREATS

Reductive urban planning tradition. The focus is only on the administrative procedure of individualised demands from municipalities with respect to their needs for facilities and urban systems and not on metropolitan strategic policies. The current administration has not received direct pressure from citizens and, perhaps for this reason, it has relaxed. It is an example of what we call the lack of tax planning with a strategic vision in the face of new needs.

Also lacking are transparency policies and spaces for participation regarding questions on a metropolitan scale, given that the AMB is a second-level organisation. This means, furthermore, a lack of spaces for the generation of metropolitan narratives.

There is a lack of public policies in many sectoral spheres of the higher agencies (infrastructures, sustainable mobility, pollution, health, food sovereignty, technological sovereignty) which without a clear positioning of a metropolitan nature may turn out to be more unfavourable for citizens.

WEAKNESSES

Lack of strategic policies and of evaluation of the territorial and spatial implications represented by, for example, the reserving of spaces for public transport system terminals, for drainage hubs, for water treatment, for housing renewable energy systems and for channelling for flows of water, energy or materials, among others. .These spaces have to coexist with biological corridors.

Threat due to a lack of strategic spatial proposals associated with social inclusion within a scenario of ageing and immigration.

Threat due to a lack of metropolitan governance of housing policies and the reception of economic activities and environmental services that require supra-municipal agreement.

There is no evaluation of the spatial consequences of the evolution of metropolitan dynamics.

STRENGTHS

- Obligation to approve the Urban Development Management Plan (PDU).
- Obligation to approve the PMMAMB.
- Spatial knowledge of the effects of climate change and potential control of the operators of water, energy and materials cycles.
- And more knowledge of the public offering of facilities and of the potential generation of metropolitan facilities.

3. THE COMMISSIONING OF METROPOLITAN POLICIES BY THE AMB LAW AS A SYSTEM OF OPPORTUNITIES

The AMB, by law, is tasked with developing metropolitan policies or plans.
Specifically:

LINE 1. SOCIAL RIGHTS, SUSTAINABLE ECONOMIC DEVELOPMENT AND TERRITORIAL COHESIONS

- Metropolitan land and housing policies.
- Common public policies for municipal services and for promoting social and territorial cohesion.
- Public policies of civic coexistence.
- Metropolitan economic activity policies.

LINE 2. METABOLISM, SUSTAINABILITY AND RESILIENCE

- Metropolitan plan for urban mobility.
- Metropolitan plan for the protection of the environment, health and biodiversity and combating climate change.
- Metropolitan Agenda 21.

LINE 3. GOVERNMENT, GOVERNANCE AND DEMOCRATIC QUALITY

- Urban Development Plan of Barcelona.
- General Metropolitan Plan of Barcelona.

All this has constituted, in this term of office, one of the strengths of the AMB and an entire window of opportunities. The municipalities and their mayors can agree metropolitan policies that give political content to metropolitan strategies. And the law guarantees it.

As we have pointed out, in the midst of a social, economic, environmental and state governance crisis, a series of risks exist that demand a resilient vision of the metropolis. Metropolitan areas in general, and especially local pluri-municipal organisations such as the AMB, must have a more prominent role. The AMB presents a certain metropolitan governance – expressed in the PAM – but it is still possible to look deeper into metropolitan policies with the instruments necessary, among which one could highlight greater use of the Council of Mayors and an increase in the self-organisation of the territories.


REFLECTION

NEED FOR AN EVOLUTIONARY READING OF THE METROPOLITAN SYSTEM FROM A RESILIENCE PERSPECTIVE

1. THEORY OF RESILIENCE AND SOCIO-ECOLOGIC SYSTEMS. APPLICATION TO THE METROPOLITAN SYSTEM

Urban resilience – or the capacity for urban recovery – is the degree to which cities are capable of tolerating change before reorganising themselves around a new set of structures and processes (Alberti *et al*., 2003).

The metropolitan system can be considered complex and adaptive. It follows the evolutionary mechanisms proposed by socio-ecologic systems analysed from the perspective of resilience.

We are referring to complex adaptive systems on the basis of examples typical of natural ecosystems. However, given that our area is the urban environment, we will focus on socio-ecological systems (SES), made up of human beings and natural resources.

The definition of resilience incorporated by socio-ecological systems such as the metropolitan system is defined by the following attributes:

- The capacity for transformation of the system recovering, or maintaining, the function or structure.
- The capacity for self-organisation of the socio-ecological system.
- The opportunity that this system has of constructing and increasing the capacity for learning and adaptation (Carpenter *et al.*, 2001, Berkes *et al.*, 2003 and Walker and Holling, 2002).

A resilient reading enables us to locate processes of change, in crisis and in urban transformation. We are talking about the adaptive cycle in order to incorporate this dynamic and evolving nature to a complex system (Holling, 2001). The theory of this cycle interprets the evolution of ecosystems that suffer a disturbance and explains the change, or the evolution, of a complex system based on four phases (Gunderson & Holling, 2002).

They are the following:

- Ro (r): exploitation and growth, diversity, connectedness and availability of resources.
- Kappa (K): conservation and stability, strong organisation, strength, rigidity and slow changes.
- Omega (·): instability, collapse or creative destruction, constant changes and low interactivity.
- Alfa (α): mobilisation, reorganisation, regeneration, redefinition and flexibility of the system.

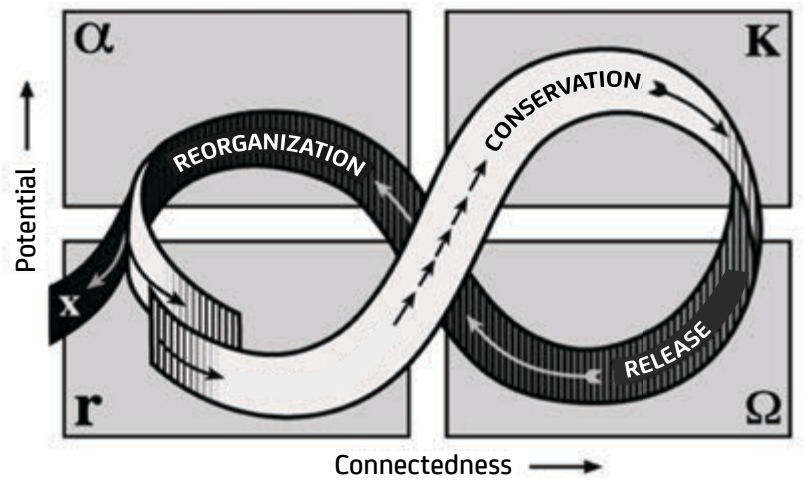

Fig. 8. Phases of evolution of the adaptive cycle. *Walker, 2004.*

2. ADAPTIVE GOVERNANCE IN PERIODS OF CHANGE

The changes in ecosystems, or in society, are usually gradual and follow each other in time. During the phase of constant progress called the front-loop phase (forward or incremental phase that contains the Ro and Kappa phases), the dynamics are continuous and predictable.

In the contrary phase, known as the back-loop phase (backward or decremental phase that contains the Omega (·) and alpha (α) phases, the change is usually disorganised and turbulent. It is difficult to reach consensus. The consequences of actions are ambiguous, and the future dynamic of the system is uncertain and unpredictable (Gunderson and Holling, 2002). This is the phase geared towards renewal, innovation and experimentation.

For the management of resilience of an SES, especially in the turbulent phase, the key characteristics, according to Holling (2001), are:

- Capacity for foresight.
- Capacity for anticipation.
- Intentionality in people's actions (that may considerably reduce the impact of changes on the system).

What aspects of the social system favour this governance for the transformation and adaptability of SESs?

Surprise and crisis usually create spaces for reorganisation, renewal and innovation and facilitate opportunities to generate new pathways for social self-organisation that permit the reinforcement of resilience (Gunderson, Holling, 2002).

Crisis is generated by many causes: the pressure of tourism, external market, floods, changes in property rights, failures in supplies, the existence of rigid paradigms in resources management and new legislation. Or by public policies that do not consider the specific local context (Berkes *et al*., 2003).

An SES with low levels of social memory and social capital would be more vulnerable to changes and could bring us closer, very quickly, to undesired states. In the contrary sense, crises could unleash the mobilisation of capital and of social memory and ultimately generate new types of SES which should contribute to their resilience (Folke *et al*., 2005). A crucial challenge for the adaptive governance of SESs, in periods of rapid change, will be mobilisation of the social memory.

There are environments where cultural experience is assimilated thanks to changes and successful adaptations, to community debates, and to decision-making processes. The social memory is part of the cultural capital of society and is essential for linking past experiences with current and future policies (Berkes and Folke, 1992).

Olsson (2006) defines with greater precision the two typologies of groups of actors who can generate dynamics of governance in the adaptive transformation: shadow networks and transformational leaderships. Shadow networks participate in the quality of self-organised processes by groups and individuals driven by social and environmental crises. It will not be the first time that transformations that led successfully towards governance were preceded by emerging information networks (or shadow networks) that have provided information, have identified hidden information and have created nodes for the construction of knowledge in order to tackle periods of crisis.

To practice an analysis of the successful transformations of SESs towards situations of adaptive governance (Olsson, 2006) requires the following:

- Establishment of the phase of adaptation that they are in.
- Evaluation of experiences that become windows for opportunities.
- Analysis of those conditions that can permit a significant political change.

The behaviour of the actors and the characteristics of the process are completely different. It depends on whether we find ourselves in one phase or another of the adaptive cycle process, for which reason it is essential to take into account two considerations:

- To know what phase of an adaptation cycle the system has reached and identify its thresholds.

- To bear in mind that the retrospective action plan (back loop) is different from the prospective one (front loop). The efficiency in the forward-looking proposal and the resilience in the retrospective one.

Once it has been determined which phase the process is at, and prior to the prospective plan, it is key to locate those projects that represent new windows of opportunity.

These are so-called "resilience" projects and they are characterised by:

- Changing the attitudes of the groups towards a new shared vision. Differences have positive effects. Polarisation has counter-productive ones.
- Creating cooperation and transforming conflicts – accepting their logic, of course – to ensure channels are always open for dissent or disagreement.
- Creating a new strategy for person-to-person, face-to-face, group-to-group or sector-sector communication.
- Encouraging disruptions and recoveries – on a small scale – avoiding the same situations – on a large scale – because of the risk of collapse.
- Designing resilient processes based, for example, on shared discourse or narrative, and favouring collaborations. It is important to avoid rigid structures.
- Evaluating and supervising the results of previous interventions and encouraging reflection subsequent to changes.
- Developing and maintaining a portfolio of projects, while awaiting opportunities to implement them.

Following location of the resilient projects, characteristic of retrospective logic, we must characterise the level of governance. It is necessary to evaluate whether it is possible to make a change in the relations of power, with regard to the new prospective phase. And it is necessary to examine to what degree a real transformation of the urban system has taken place.

To be able to do this, it is essential:

- To verify that progression is towards persistent development, with a leadership integrated through the different scales.
- That the change occurs in a bottom-up way to the top, or the other way around.
- To check the possibility of scaling the different opportunities that exist.
- To try to facilitate governability with flexibility.
- To contrast and evaluate effects it is necessary for at least thirty to fifty years to pass. The restructuring of resilience is a very slow dynamic.

3. APPLICATION OF THE MODEL OF ADAPTATION OF COMPLEX SYSTEMS IN URBAN ENVIRONMENTS

If, in an era of systemic crisis, we want to transfer this methodology of socio-ecological systems to urban social systems, we will have to carry out a transposing of the common ecological good (Costejà, 2009) to the common social good (Subirats, 2011).

In the case of urban systems, it is a question of profiling a dialectic. Firstly, between a preponderant and hegemonic model (which is in decadence due to the stagnation in its governance and seeks renewal through new narratives) and secondly, with the presence of alternative models that seek to transform power relations of the urban system and that defend a cultural heritage associated with the memory of social struggles and community spaces.

In periods of crisis, many adaptive cycles appear, where retrospective logic predominates with bottom-up schemes that enter into dialogue with adaptive cycles which are more hegemonic, with a prospective predominance and with schemes of functioning, therefore, that are top-down.

The capacity for bottom-up transformation is presented as a change in the nature of the urban system that will alter power relations. Meanwhile the contrary, top-down logic, can be associated with a transformation of a Lampedusan nature: everything changes because nothing changes, or with a real urban transformation. This is the central point of the analysis of resilience.

The models of adaptive cycles that have a top-down movement (retrospective) are much faster than the prospective models, which preserve the system more.

In the front-loop case, the social networks follow their own territorial scheme of extension (Dupuy, 1991; Offner, 1993). Times of crisis are characterised by alternative models that usually move in the combined bottom-up to top-down scheme if they are truly transformational with regard to the system.

The question that is posed is whether adaptive cycles – openers of windows of opportunities – generate social innovations and become the element that, without transforming it, gives force to the system or ultimately become the element that transforms it and changes its nature.

The theory of resilience, prospectively, enables us to analyse transformations and, retrospectively, analyse the cycles that it tries to transform. In short, we will know if the system is becoming resilient due to robustness or to transformation (Magrinyà & Balanzó, 2015).

TOWARDS A RESILIENT AND ADAPTIVE METROPOLITAN GOVERNANCE

1. READING OF THE OPPORTUNITIES ASSOCIATED WITH METROPOLITAN TRANSFORMATIONS: BETWEEN MITIGATION AND ADAPTATION

It is evident that the metropolis predominates as a sphere of management and that it needs a body for governance that provides a response to the needs of citizens. And it has to create it.

The AMB is an organisation immersed in quite a complex system of authorities. Its success depends on whether it is capable of equipping itself with a system of governance that satisfies a set of needs that can only be managed, precisely, from the metropolitan scale. The awareness of a metropolitan policy, however, is starting to be glimpsed: the need for housing policies, for equipping ourselves with services to ensure inclusion and social cohesion, food sovereignty, and for taking the health of citizens as an element of reference. Instruments of metropolitan governance are required for socio-ecological conflicts, transparency and good governance, and technological sovereignty.

Managing metropolitan metabolism on a larger scale than the municipal scale is fundamental. Satisfying all these needs is now absolutely essential.

Unfortunately, however, what we are asking for is not prospering at the speed we would all wish. It is necessary to develop more peremptory metropolitan policies, in this new phase, once the AMB has become consolidated following the Law of 2010. Local governance lies with the municipal authorities and the metropolitan authority presents a dual governance phenomenon: the exercising of metropolitan competences focusing on mobility management, water, waste and urban planning services, and the exercising of a consensus with municipal councils in order to reach agreements on delegation or voluntary collaboration between municipalities – all or some of them – and between these and the AMB to make policies and launch projects that are better and more efficient.

We start off from the technical and reformist experience of the Metropolitan Corporation (1976-1987), with top-down proposals that sparked misgivings among the municipalities. With the arrival of democracy, they were determined to build up their own services and their own identities. A second phase of the Association of Municipalities (1987-2010) reinforced the municipalities, but from 2011 onwards, under the effects of the economic crisis of 2008 and before the capacity for revolt, the population ended up making proposals to access the institution and transform it based on different municipal experiences (policy failure).

In this new scenario of crisis, alternative policies have appeared that articulate new demands for a new model of municipal governance, still under construction (policy alternatives), which make a break with the traditional political references (policy plan and policy implementation).

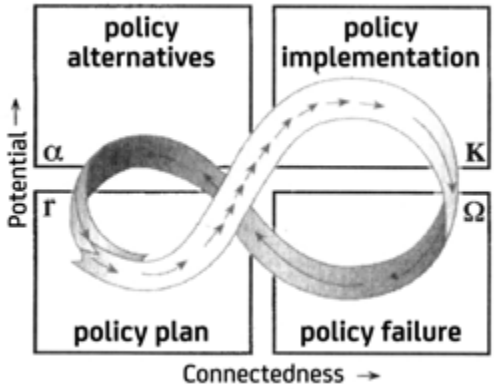

Fig. 9. Cycle applied to resources management policies that establishes four types of policies: Planning, implementation, failure and alternatives characterised by the loop. *Magrinyà & Balanzó, 2009.*

For the construction of governances of transformability of the metropolitan system we are proposing a resilient reading of the metropolis that should enable us to create, in the future, a policy plan that articulates a metropolitan policy endowed with a successful offensive strategy.

It is necessary to analyse, in order to be able to reach this stage, at what position the different strategies that exist are located and, within the framework of risk analysis, establish the most peremptory metropolitan policies.

We classify the different strategies according to SWOT analysis that we have practised previously into:

- Offensive strategies (FO) for success.
- Reorientation strategies (DO) for adaption.
- Defensive strategies (FA) for mitigation.
- Survival strategies (DA) for risk.

The different combination of weaknesses/strengths (internal) and threats/opportunities (external) enable us to establish three scenarios:

- Survival and risk strategies (DA).
- Resilience strategies:
  - Defensive and mitigation (FA).
  - Adaptation and reorientation (DO).
- Offensive and success strategies (FO).

Internal factors External factors	WEAKNESSES (D)	STRENGTHS (F)
THREATS (A)	Survival and risk strategy (DA)	Defensive and mitigation strategy (FA)
OPPORTUNITIES (O)	Adaptation and reorientation strategy (DO)	Offensive and success strategy (FO)

Fig. 10. Correlation between the SWOT analysis organised around the risks and strategies of resilient planning. *Compiled by the author.*

In order to prepare a general framework for strategic planning we will use this reading of resilience, which establishes different types of policies for different types of policy phases:

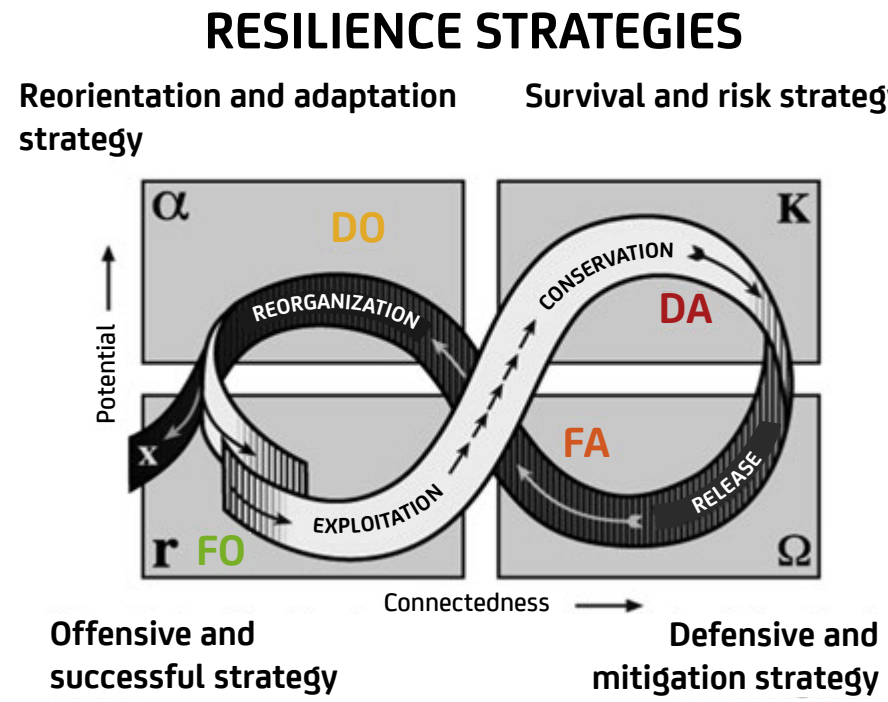

Fig. 11. Typologies of resilient planning strategies linked to the Holling loop. *Compiled by the author.*

2. CURRENT MEASURES FOR MITIGATION AND ADAPTATION AT THE AMB

Drafting of the PSAMB 2014-2020

The AMB equipped itself with PSAMB documents as a reaction to the role it was tasked with by the Law of 2010. On 28 January 2014, the Metropolitan Council approved the PSAMB 2014-2020 (AMB-Environment Area, 2014a), which has as its objective the protection of the environment, health and biodiversity.

In the same way it establishes measures to combat climate change.

Furthermore, in the chapter dealing with this change it underlines adaptation as key for reducing the direct effects on the territory, in addition to the effects on the health of citizens and other socioeconomic aspects.

As a result of the PSAMB, a whole series of actions were developed, nearly all related with studies for gaining knowledge of the environmental sustainability of the AMB territory.

They were organised into the following categories:

- Territory, ecology and biodiversity.
- Energy and climate change.
- Production and consumption resources.
- Environmental health.
- Education for sustainability.

The main strategies, and the sectoral plans and programmes relating to sustainability, were ordered (AMB-Environmental Area, 2014b).

Development of the PACC 2015-2020 and its revision with PACC 2018-2030

In the midst of the fight against climate change, the Parliament of Catalonia passed the Climate Change Law (Law 16/2017, of 1 August), which includes among its aims the reduction of greenhouse gas emissions, and favours the transition towards an emission-neutral economy. With this law, Catalonia has committed to reducing its 2005 emissions of GHGs by 40% by the year 2030, as a contribution to the Paris Agreement (OCCC, 2015).

Within the sphere of the AMB, and under the leadership of the Advisory Council for Sustainable Development (Catalonia), the AMB's PACC 2015-2020 was developed and subsequently revised with the PACC 2018-2030.

Scientific evidence confirms that this change is already taking place, and that the greater part of the warming observed over the last 50 years is due to human activities (IPCC, 2014). Climate change is increasing the probability of extreme weather phenomenon: droughts, floods, heatwaves, changes in average temperature and rainfall. Catalonia, and the entire Mediterranean region in general, is suffering various effects due to warming.

And we will have to adapt.

These effects, however, increase the need to adapt municipal management to a new situation through resources management, planning of infrastructures and urban planning. Tackling climate change is one of the fundamental lines of political action at all levels: global, continental, national, regional and local.

Climate action has to combine two fronts: mitigation and adaptation (for more detail see AMB-Environmental Area, PACC, 2015). As is logical and necessary, most efforts to date have been geared towards climate change mitigation. That is how it should be.

It is necessary to tackle adaptation policies given that some of the effects are already sufficiently patent to tackle them immediately. It is necessary for the territory to be prepared to react in front of the risks posed by climate change.

The mitigation policies must be shared and those of adaptation must be assumed by each territory according to its characteristics, the different risks it faces and the competence structure available to it. The local and supra-local scales are especially relevant here.

And the AMB has a key role to play in all this. Let us make no mistake. The Catalan territory is exposed to climate change. Reports such as that pointing out how climate change is affecting Catalonia (Llebot *et al*. 2005) affirm that there will be less average annual rainfall, more droughts, temperatures will rise, there will be more flooding and more heatwaves... And all this will affect the population as much as economic activities, whether livestock farming, agriculture or tourism.

The planning of the actions that will need to be undertaken can improve the capacity for reaction and help foresee the consequences.

As for adaptation, it has been the subject of attention principally from the state, and recently from Catalonia, with the approval of the Catalan Strategy for Adaptation to Climate Change (ESCACC).

Its objective is the reduction of vulnerability to climate change impacts and, to achieve this, two main general objectives are defined: the generation and transfer of knowledge and an increase in adaptive capacity.

The ESCACC proposes a set of measures for adaptation in accordance with the degree of vulnerability of sectors and systems, as well as the actions that, in matters of adaptation, are being implemented by other states around the world, translated as is natural to the specificity of our territory.

The European Union, for its part, has developed its white paper on adaptation to climate change, where it highlights the role of local action and promotes the implication of local authorities in the adaptation to climate change: the Convenant of Mayors, as it already did with relation to mitigation, is promoting Mayors Adapt.

In addition to taking measures for mitigation, in other words, the action plans for sustainable energy (PAES), we must thus advance towards the resilience of our territory, for which reason, also presented was the *Vilanova Declaration* for the adaptation to the effects of climate change in the territory and along the coastline.

The same day as the presentation of the European initiative, on 18 March 2014, the Network of Cities and Towns for Sustainability presented the *Vilanova Declaration*, which fully embodies the spirit of the initiative Mayors for Adaptation.

The Metropolitan Area of Barcelona is an adherent of some of the initiatives described. Thus, *Mayors Adapt*, for example, aims to extend to local organisations the model of the Covenant of Mayors for Adaptation to Climate Change. It also adhered, in 2013, to the Covenant of Mayors for a Local Sustainable Energy in the function of coordinator, with the aim of offering support and technical and strategic assistance in the metropolitan municipalities that want to form part of the Covenant.

It also signed the *Vilanova Declaration* for adaptation to the effects of climate change in the territory and along the coastline, fundamental areas in ecological dynamics and where the alteration of these will have social and economic repercussions of major transcendence. The AMB also participates in the European CLUE project for districts, cities and regions that are climatically carbon-neutral, with the commitment of becoming pioneers in the process of development, transformation or rehabilitation of urban fabrics. Finally, and more recently, it has adhered to the project ENERGee Watch, an observatory and network for the exchange of experiences between local and regional agencies in matters of energy and emissions of greenhouse gases (GHGs).

Unfortunately, there are specific characteristics of each territory that render insufficient a planning of adaptation and actions on a national scale. Given the diverse impact of climate change in each area, it is necessary to implement adaptation plans of a local nature based on the location, and climatic and geographical characteristics, etc.

In this sense, in the year 2014, the Generalitat approved subsidies for local agencies for the drafting of municipal programmes of adaptation to climate change through Resolution TES/607/2014, of 14 March.

The AMB applied for this call and its proposal was subsidised, which helped to produce the AMB Climate Change Adaptation Plan (hereafter, PACC), in accordance with the operating objectives of the ESCACC:

- Generating and transferring all the knowledge on adaptation to climate change in the specific sphere.
- Increasing the adaptive capacity of sectors and/or systems based on the reinforcement of the capacity for resilience. And, secondly, reducing the exposure of the systems and sectors with premises of social, environmental and economic sustainability.
- Articulating an action plan that enables coordination of policies and plans for adaptation of the 36 metropolitan municipalities.

This Climate Change Adaptation Plan is set within the context of Line 2 on Energy and Climate Change of the AMB Sustainability Plan (PSAMB 2014-2020).

Furthermore, the Metropolitan Programme of Education for Sustainability (PMES 2014-2020) establishes the need to raise awareness and make known the adaptation and resilience of metropolitan society and territory to climate change. And it does so in order to achieve a sustainable social model and one committed to the protection and improvement of the environment.

Among the most significant risks of the PACC are identified those related with droughts, floods, marine storms, saline intrusion, forest fires, evolution of extreme climatic indexes and equally extreme temperatures. From this prior identification, and from the angle of adaptation, a set of actions have been derived designed to fight against climate change.

It is necessary to mention that a series of evaluations of climate change adaptation are being conducted in different municipalities (Viladecans, El Prat, Santa Coloma de Gramenet, Esplugues de Llobregat, Sant Feliu de Llobregat, Sant Just Desvern and Gavà (see http://www.amb.cat/web/medi-ambient/sostenibilitat/canvi-climatic/adaptacio)

Development of the environmental studies associated with the PSAMB 2014-2020, the PACC 2015-2020 and the creation of METROBS

As a result of the implementation of the PSAMB 2014-2020 and of the PACC 2015-2020, the AMB has developed a series of studies relating to the lines of the PSAMB that show great knowledge of the tendential effects of climate change.

Moreover, one of the consequences of the PACC 2015-2020 was the creation of the Metropolitan Climate Change Observatory (METROBS), which emerged from a collaboration agreement between the Group of Experts on Climate Change in Catalonia (GECCC) and the AMB.

The goal of the METROBS is to become a tool for transparent government and communication of the actions carried out in the area of climate change adaptation and mitigation, and to become a benchmark for other metropolitan areas and cities.

In fact, it has already developed seven studies that form part of the knowledge available on the effects of climate change in the area covered by the AMB.

These documents represent the AMB's efforts to raise awareness about fighting climate change.

During the 2015-2019 term of office, the work carried out enabled, as already indicated, the updating of the PACC 2015-2020.

The PACC 2018-2030 forms part of line of action 2 of the PSAMB and its scope is made up of the areas of the whole water cycle, the parks and beaches, as well as municipal waste, with competence as a metropolitan authority. Recently, and within the context of the PSAMB, the AMB has developed the Carbon and Energy Strategy, which incorporates energy through a specific master plan: the roadmap for the energy transition 2030. These three strategies are contained in a single integrating plan, the AMB's Climate and Energy Plan 2030, which constitutes the main metropolitan strategy for fighting climate change and carrying out the energy transition (AMB-Environment Area, 2018).

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AMB measures for climate change mitigation and adaptation

The carbon management strategy, considered one of the main actions in the fight against climate change, has gained increasing importance.

The AMB developed an action plan that by 2015 had achieved a reduction in emissions of 10% with respect to 2011, a percentage established on a global scale across the entire Barcelona metropolitan area, and which in 2014 had achieved a 12% reduction with respect to the baseline year, 2011.

The majority of AMB facilities tackled improved environmental management, but did not only do so with their processes and activities but also as an organisation. In 2015, 31 AMB companies (70%) already had a specific environmental management plan or programme, 11 (25%) an energy management one and seven more (16%) a climate change management plan or programme in the mitigation sphere.

With more or less planning, contractor firms are already working on the optimisation of consumption and the reduction of the environmental impact.

It is important to point out that the AMB has a specific environmental management plan/programme, a certified management system and a verified inventory of greenhouse gases (GHGs). And it must not be overlooked that it has adhered to initiatives for the voluntary reduction of GHG emissions and that it has defined quantified improvement targets for energy or climate management.

Prevented emissions are those that should have been produced at facilities outside of the company but that, thanks to the activities of the AMB facilities, do not do so. Reduced emissions are those that should have been produced at the own facility, but that are not produced either, thanks to activities that reduce energy consumption. Prevented and reduced emissions are not subtracted from the total emissions, but they are not added to them either.

The prevented and reduced emissions results are shown independently for each area. It is observed that prevented emissions only represent 4.2% of the total and reduced emissions 1.4%. In fact, they are a symbolic element with little effectiveness.

The greatest impact is in the waste sector (which represents 69% of total emissions). In other words, it is in this sector where the most has been done at own facilities. In the case of transport and water, the impacts of the measures are symbolic. Actions need to be increased in the transport area, where there is no impact on private vehicles.

Area	Total emissions	Prevented emissions	Reduced emissions	Total emissions (% per sector)	Prevented emissions (% with respect to totals)	Reduced emissions (% with respect to totals)
	(t CO_2eq)	(t CO_2eq)	(t CO_2eq)	(t CO_2eq)	(t CO_2eq)	(t CO_2eq)
Water	90,919	18	7,242	10.3%	0.0%	8.0%
Waste	617.372	36,838	4,714	69.9%	6.0%	0.8%
Transport	165,650	130	-	18.8%	0.1%	-
Territory	8,491	13	-	1.0%	0.2%	-
Offices	468	17	-	0.1%	3.7%	-
TOTAL	**882,900**	**37,017**	**11,956**	**100.0%**	**4.2%**	**1.4%**

Fig. 12. Table of emissions managed, prevented and reduced in the AMB sphere. *AMB, 2018.*

We can affirm, by evaluating these results, that they are not very positive. The experience so far has only been short and there is increasingly less time left to achieve planned results. De-carbonisation is the mitigation measure that the AMB should make its own, given that major cities are the ones that have to make the biggest efforts. A more mature approach is

required, and it does not need to be based on knowledge (despite that seeming to be fundamental) but simply it is essential to move into action.

We propose, therefore, to make deeper inroads into resilient thinking. But we do not want to do this heading towards mitigation, but rather towards adaptation. Whatever we do, the climate will continue getting warmer and this warming will make all of the earth's vital systems suffer alterations. The world of the future will never be the same. We need to adapt. And to adapt vulnerable subsystems. Otherwise, the systems will move on to a different state of equilibrium but not one adapted to humans.

3. EFFECTIVE APPLICATION OF RESILIENT THINKING

As pointed out by Holling (2001), for a system to be resilient it needs:

- Prospective capacity.
- Capacity for anticipation.
- Intentionality in people's actions (which may considerably reduce the impact of changes on any system).

The capacity for anticipation is also called capacity for transformation, understood as the need and the options for introducing changes into the system that improve its resilience. For this reason, it is necessary to explore future scenarios, create or imagine transformational changes (co-design), measure, and evaluate possibilities (ecological, economic and social capital). It is also useful to identify the priorities for action and actions for the medium and long term. In short, it is a prior step to the establishment of policies and the funding of actions.

Prospective work has been carried out for short-term scenarios but, for the moment, there has not been any work done on capacity for anticipation. There have not even been any actions organised to reduce impacts.

For this reason, it is necessary to evaluate the resilience of the system or subsystem for each risk:

- The capacity for transformation of the system, recovering or maintaining its function or structure.
- The degree of self-organisation capacity of the socio-ecological system.
- The opportunities for this system to build and increase its learning and adaptation capacity.

It is necessary, therefore, firstly to understand better the systems of interactions and the most significant variables and to work, through self-organised territories, to build learning and adaptation capacity, both within the AMB as an organisation and within the organised population.

It is in this sense that, from resilient strategic planning, windows of opportunity can be opened, but to do so it is necessary to:

- Phase 1: prepare the system for change.
- Phase 2: open up a window of opportunity.
- Phase 3: navigate towards transition.
- Phase 4: plan a system of governance, for management, in the construction of resilience.

A first narrative must be generated that enables preparation for change. Clearly windows of opportunity appear at times of crisis: tackling peak oil, preparing for a long crisis with solidarity economies, being alert to health vectors, etc.

It is necessary to work on some of these windows first of all.

As we have already seen in the adaptive management process, the social memory acquired by key persons, over the course of the different spatiotemporal scales (panarchy), has an important role in the reorganisation of the change that follows. Social networks, therefore, are a key mechanism for developing the social memory. Above all at critical times, improving the flow of information and collaboration between the different scales (Folke et al., 2005).

The transformations led successfully towards adaptive governance have been preceded by emerging informal networks (or shadow networks) that have provided information, have identified hidden information and created nodes of construction of knowledge to tackle periods of crisis (Olsson, 2006). We are talking of current mayors, or former mayors with years of experience, municipal or AMB technical experts and actors of representative organisations of the territories that have exercised a public control activity for so many years.

Moreover, it is necessary to emphasise the informal networks emerging in solidarity economies (Pam a pam solidarity economy map, XES solidarity economy network, among others) and local consumer cooperatives (the experiences of El Prat de Llobregat).

All this highlights a change in course with regard to the implementation of a series of adaptation measures and the visualisation of windows of opportunity.

To undertake resilient strategic planning, we should adopt a proposal: focus on the actions that foment a territory prepared for crises, evaluating the risks and preparing ourselves to tackle them using action. We should allow ourselves to organise the reading of a first diagnosis, following the SWOT analysis methodology, and from there, propose a prioritisation of future metropolitan policies in the AMB.

Reading the risks, we position ourselves in the hypothesis of a political, social, economic and ecological crisis with a long transition. On the one hand it is fundamental to achieve a terri-

torial cohesion and a set of social, educational, healthcare and cultural services that ensure the inclusive nature of the territory, services in which prominence must be given, above all, to the right to housing.

On the other, and in order to ensure a positioning of the metropolis within a globalised and changing framework, it is fundamental that the proposals for economic development are well situated within the innovation framework. It is fundamental, also, to have socially responsible territories that are capable of self-organisation in response to change.

In summary: the organisation of the productive economy, on a global scale, and of the social and solidarity economies must play a definitive role in the resilient character of the territory.

In parallel, the right to the land and food sovereignty, to health and to technology, will all acquire importance.

Within the framework of the ecological system there is a prominent element: the peak oil risk and the need to tackle an energy transition that, within the metropolitan territory, is especially sensitive. Ours is a territory with great dependence on fossil fuels and with a serious absence of renewable energies. This should be an absolute and peremptory priority of the metropolis. And within this risk scenario, it is fundamental to deal with energy consumption associated with mobility, where the aspect of reduction in the use of private vehicles is a key element.

It is also necessary to make a start with renewable energies. Solar and wind energy – and storage of energy and associated batteries, as well as heating and cooling networks – will be reference points.

And, to be able to do this, a public and metropolitan leadership is necessary.

Every metropolis has to face up to the risk of climate change. It is vital to overcome mitigation proposals with the consideration of forecasting analysis of close and foreseeable futures (front loop). In the case of the AMB, this forecast for the future is auguring water stress (18%), an increase in torrid days (from 10 to 50-80 per year), danger of forest fires and torrential rains and, as there is no sediment balance, an increase in increase in environmentally fragile coastline.

It is necessary to tackle in depth, also, the loss of biodiversity and the increase in associated pests. And we must not leave out the risk of forest fires, a key factor in the loss of biodiversity.

Studies consider that the main changes will take place between 2050 and 2100, with all the unforeseeable implications (back loop), which means it is imperative to propose a resilient thinking, that does not so much foresee the effects (although it has to foresee them too) as the capacity to prepare self-organised territories that are sensitive to unforeseeable changes. Territories responsible for the social and economic effects of climate change and that are self-organised in the face of the changes in the socio-ecologic system.

What are needed, in short, are territorialised proposals.

The Delta plain cannot suffer the same effects as the Besòs basin or the Baix Llobregat mountain. Each territory has its own particularities that make it more sensitive to differentiated variables. The territories need territorialised laboratories for resilience, and experiences of pluri-municipal consensus. We can move between mitigation and adaptation, but we must prepare, urgently, to move forward from mitigation to adaptation.

And from the organisation of the AMB, instruments must be promoted:

- Possibility of introducing innovative mechanisms for governance relating to resilience.
- Creation of a Metropolitan Resilience Lab.
- Design quality teams (QT), working groups for resilient design.
- Develop a Programme of Actions for Metropolitan Resilience (2020-2050-2100) (PARM).
- Promote the creation of teams to drive forward with socially responsible territories.
- Work actively on resilience from the Transparency and Good Governance Agency and from an Agency for the Management of Municipal and AMB databases.

To fund resilience projects, institutional resources can be used (especially from the EU). We propose a strategy of prioritisation of pilot projects to be funded by European programmes. And all this has to be led by the successive PAMs of the governing teams and by the promotion of councils of mayors to deal with each of the issues proposed.

Below, for each of the risks, we will analyse the main priority action strategies.

METROPOLITAN STRATEGIES ACCORDING TO RISKS

1. METROPOLITAN STRATEGIES FOR SOCIAL AND ECONOMIC SYSTEMS: SOCIAL RIGHTS, ECONOMIC DEVELOPMENT AND TERRITORIAL COHESION

Economic risks: need to introduce innovation into the productive economy

The land that exists today in the Barcelona Metropolitan area is one of its most important assets. It is the result of the second industrial revolution, which took place last century, and which was characterised by a production model based on serial production, an energy model based on electricity and later on oil, and a mobility model based on the use of cars.

At a new historical moment, in the midst of the 21st century, the production energy and mobility models are being significantly transformed.

It is necessary to reflect in depth on the new role of metropolitan industrial estates in Barcelona, which have always been fundamental in a territory with such a marked industrial nature as the Barcelona metropolitan region (this section has been developed mainly in the conclusions of the AMB-Social and Economic Development Area, 2017c).

Despite industrial estates still concentrating a significant part of production and of the more innovative companies, other models of territorial distribution of economic activity have been developed – as a result of the changes that we have mentioned – which we currently know as economic activities estates (PAEs). It is for these reasons that the transformation of the current estates into new, more diverse and integrated models is being proposed.

It is necessary to explore new forms of production and activity, of innovation and creativity, of reincorporation into the urban fabric and into the high added value tertiary sector, and especially, connection with the advanced services of RDI.

During the second half of the 20th century, metropolitan industrial estates gradually occupied increasingly broad territories alongside the major communication routes, and they were converted into economic activity areas, dominating the entire metropolitan area. In fact, this space determines the structure of the metropolis today.

The situation described, the result of the second industrial resolution revolution, has lasted up to the present day and explains the current crisis facing industrial estates in our area. The knowledge revolution puts forward new competence conditions and obliges us to think about new spaces of economic activity that respond more effectively to the new conditions.

In the new production system, two major tendencies stand out:

- The role of the new city as a natural space for talent is a main factor in our production system. The new, creative city attracts and establishes people of talent who want to live there to develop their personal lives and their creativity in a setting that is friendly, environmentally sustainable and economically innovative. Talent thus becomes a fundamental factor for competitiveness among companies and among towns and cities that house them. Urban spaces must be created that are capable of attracting and establishing talent. To do this we need a new urban development, new economic strategies, and new social policies.
- The second tendency is related with the transformation of the economic system into global value chains. Today's industrial estates base both their structure and their internal functioning functioning on the logic of sale or rental of a plot. This is a unit of space where a company sets itself up and receives basic services such as water, gas, and electricity, based on the provisions of the urban planning. The structure of the estate, the distribution of the companies on the different plots and the possibility of any relationship between them is purely random. No type of relationship is

planned except for the functional and elementary one of sharing lighting and other basic services.

This situation does not correspond with the requirements of what we have called the second tendency of the new production system. Today, to be competitive on a global scale, companies demand local environment conditions that are not found in the current industrial estates. For this reason, it is necessary to undertake a radical transformation of some estates based on two fundamental requirements:

- Access to advanced services. Companies need broadband services, innovation and research centres that are more or less close to hand.
- Promotion of association-building processes and collaboration. Given the weakness of the current business association-building movement, it needs to be reinforced as a result of promotion processes.

All in all, with regard to the role and necessary transformation of the current industrial estates in the Barcelona metropolitan area, the following three operating conclusions can be drawn:

- The first tendency of the new production system, towards a compact and creative city, results in class A type estates, or urban economic activity areas.
- The second tendency, which situates companies in global value chains, results in the creation of new advanced industrial areas for new industry or class B estates.
- Finally, class C estates are proposed, or industrial and services estates.

We suggest that this new typology of industrial estate be progressively implemented. It is necessary to start with pilot projects that would be distributed around the different corridors as new innovative industrial systems or industrial districts which would structure the new metropolitan production system.

There is a certain correspondence between class A and integrated estates, class B and aggregated estates, and class C and segregated estates (see Fig. 13).

Nowadays, the growing sophistication of production activity focuses attention on innovation, which consists of introducing changes into working and production methods, into production factors used, or into the type of products and services produced by companies.

In order to be competitive, it is necessary to promote this innovation and also the process by which it is reached: research and development (R&D).

The resources allocated to activities that generate innovation vary according to the overall economic system. In a mixed market economy like that of Catalonia, businesses and public

enterprises take decisions with regards to RDI. And they do so in line with factors of an economic and institutional nature.

It is essential to reinforce the intensity and frequency of interactions as well as the generation of value between production fabric and knowledge system. Economic activity spaces (EAE) can be a good place, and a good tool, to develop dynamics and programmes.

In order to optimize the impact and the efficiency of the resources, it is necessary for the municipalities and the economic promotion services to have detailed knowledge of the Catalan system of R&D (public and private) and to avoid the duplicity of services and investments that already exist. With this objective, the map of the ecosystem is drawn.

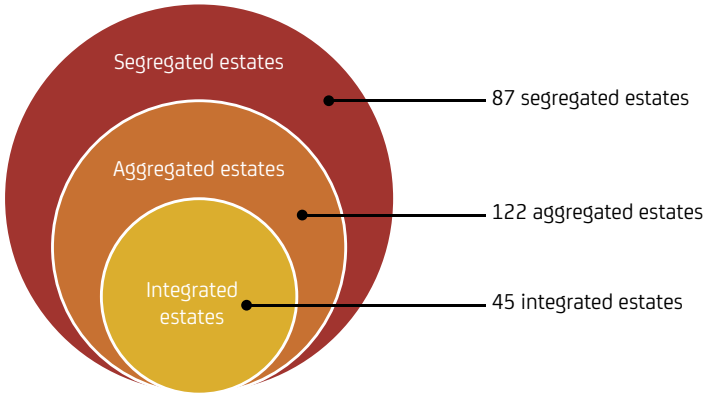


Fig. 13. Distribution of economic activity estates in the Barcelona metropolitan area based on their relationship with the urban centre. *AMB-Economic Development Area, 2017c.*

Different authority levels concentrate competences in the area of research, development, and innovation, as well as private businesses and public and private bodies such as those that we summarise below and that we will subsequently detail more fully:

- Public agents and scientific and technological infrastructure:
  - CERCA, centres promoted by the Generalitat.
  - CSIC, centres dependent on the Spanish government.
  - TECNIO and EURECAT, private centres with support from the Generalitat.
  - Universities.
  - Major scientific and technological infrastructures.
- Companies and other private organisations:
  - R&D of Catalan businesses.
  - Foundations and associations for the promotion of R&D.

- Sector and territorial innovation systems and clusters:
  - Clusters that currently have support and supervision from ACCIÓ.
  - RIS3CAT sectoral specialisation.

The system is relatively rich, but it is necessary for the PAEs and the governments themselves to carry out actions between the agents because this will improve transfer systems. Investment in R&D in Catalonia barely reaches 1.5% of the GDP (a long way from the European goals of 3%) and has an important bias towards the public sector, in comparison with countries that are leaders in innovation, which means that the commitment to R&D and to innovation and, in particular, the strategic attention of all the authorities to promote them, are more necessary than ever.

Fomenting investment in research, development and innovation in Catalan companies is a priority. The authorities must be responsible and take action in their own territories.

Given the challenges of competitiveness and the changes in the production model, which are taking place both in Catalonia and on a global scale, economic activity estates are finding themselves forced to face a new reality that has to lead them to take strategic decisions: prioritise between investments and services, involving strategic public-private consensus; increase collaboration between the businesses that make them up; and innovate, with regard to business models and to the development of technical production processes alike. This way they will become true areas of economic activity of the 21st century.

Thus, we arrive at the following conclusions after tackling the main solutions.

Obsolescence. In the light of this risk, the transformation of the old PAE into new EAE is essential.

It is necessary to consolidate the services and basic actions, such as supplies, the development of a census, promotion or maintenance, ensuring the correct functioning of the industrial space and having access to the necessary bases to be able to innovate and develop technologically. And we will do this by creating new advanced services that enable the improvement of the competitiveness of companies and the promotion of economic growth.

It is vital to connect the EAEs with knowledge institutions, clusters, innovation systems and the main scientific and technological infrastructures in Catalonia, services that we will not necessarily find within the physical space of the PAEs. The importance of being able to innovate through access to talent and specialists, generates a positive synergy between agents, brings universities closer to the production system and opens up new opportunities. And it does so for those people that are training or have just trained at a vocational training centre, a university or a research centre and for business organisations that need to innovate from the PAEs.

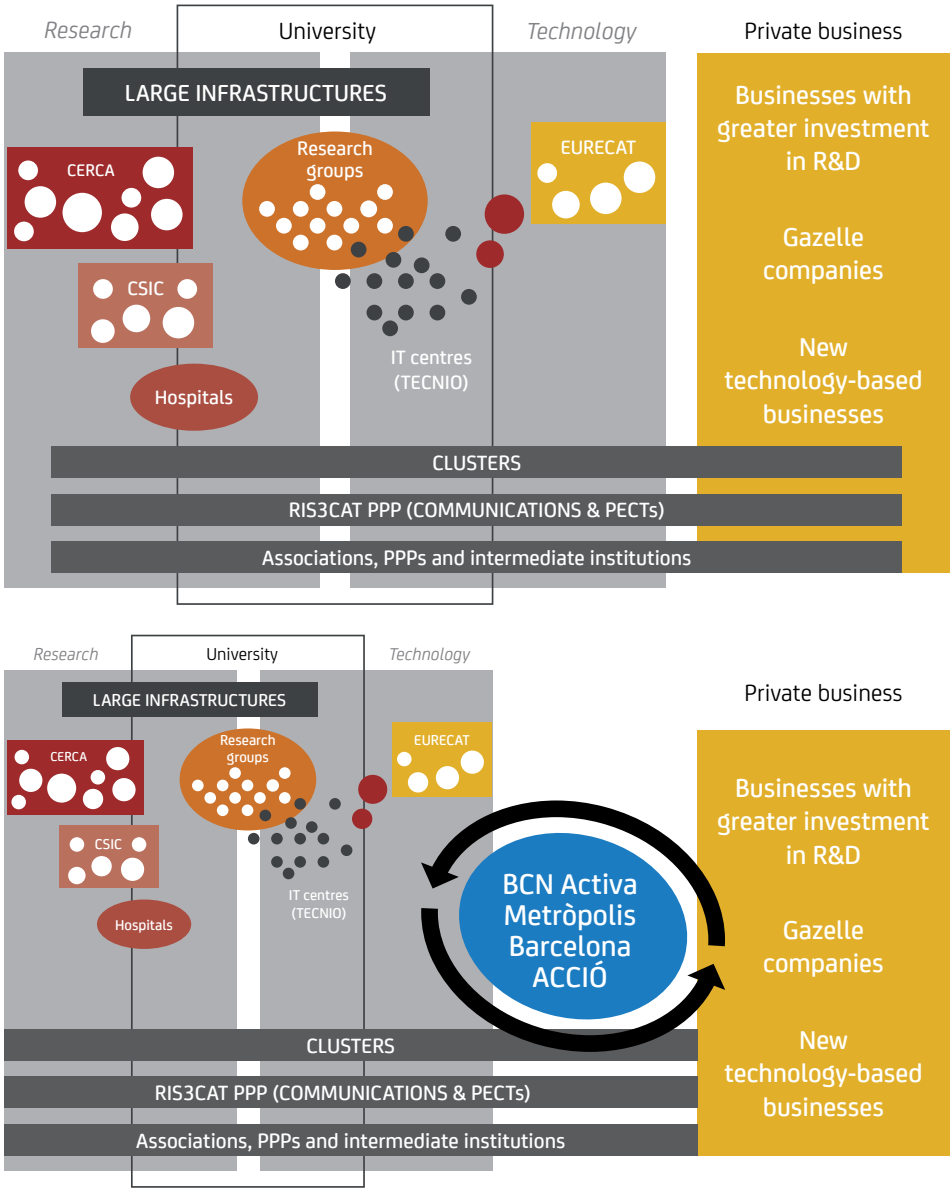


Fig. 14. Desirable evolution of the university, research centres, private enterprise, authority programmes and key role of coordination between Barcelona Activa (Barcelona City Council)-Metròpolis Barcelona (AMB) and ACCIÓ (Generalitat of Catalonia).

Compiled by the author based on AMB-Economic Development Area, 2017c.

We want to highlight, to finish, the importance of the European directives and the intelligent specialisation proposed by the Generalitat of Catalonia with the promotion, precisely, of the European Commission. In addition to identifying emerging economic opportunities, the so-called RIS3CAT strategy (see the proposals in the Barcelona metropolitan region for the last call for proposals in Fig. 15) enables the funding of innovative projects through different instruments and public policies, under the three priorities of the 2020 strategy:

- Sustainable, smart and inclusive growth.
- Orientation of the policy of cohesion towards results and not towards spending.
- Focusing of innovation and efficiency as the main pillars of public policies.

It is necessary to pay special attention, in this scenario, to competitive factors of industry and of territories. The main generic competitive factors of the industrial estates are:

- Administrative regulation and processing times.
- Funding and business fiscality, the cost of energy and other urban services.
- Training and innovative capacity.

It is also necessary to define the metropolitan aspect and the location of subsystems of economic activity. The governance of the entire metropolitan system of economic activity requires a task of territorial delimitation of the diverse subsystems that make it up.

There are five industrial corridors.

Over 40% of the industrial land in the Barcelona metropolitan area is under public ownership. In addition, it is attached to diverse urban systems that do not always serve the aims of industrial competitiveness. The management of these lands can generate more efficient systems at the service of the industrial community, that are also better sized, located, and utilised. It is necessary to focus, however, on relocation and the re-dimensioning of free spaces, facilities under public ownership, and technical services. This sizing adjustment could lead to the appearance of a surplus of land that could be used at the service of the industrial policy within the subsystems of economic activity.

With the aim of improving competitiveness of the overall metropolitan industrial system, the proposal is of own governance for each corridor and district with competences between them. The active participation of municipal councils in the governance will favour more homogeneous knowledge of the overall system and will foment communication and inter-authority collaboration between councils, economic agents and the AMB.

One of the objectives of the economic activity districts – defined as spheres of governance of the industrial subsystems of the Barcelona metropolitan area – will be to constitute themselves as intermediaries for the industrial subsystem and to condense the governance of the industrial estates that they represent overall.

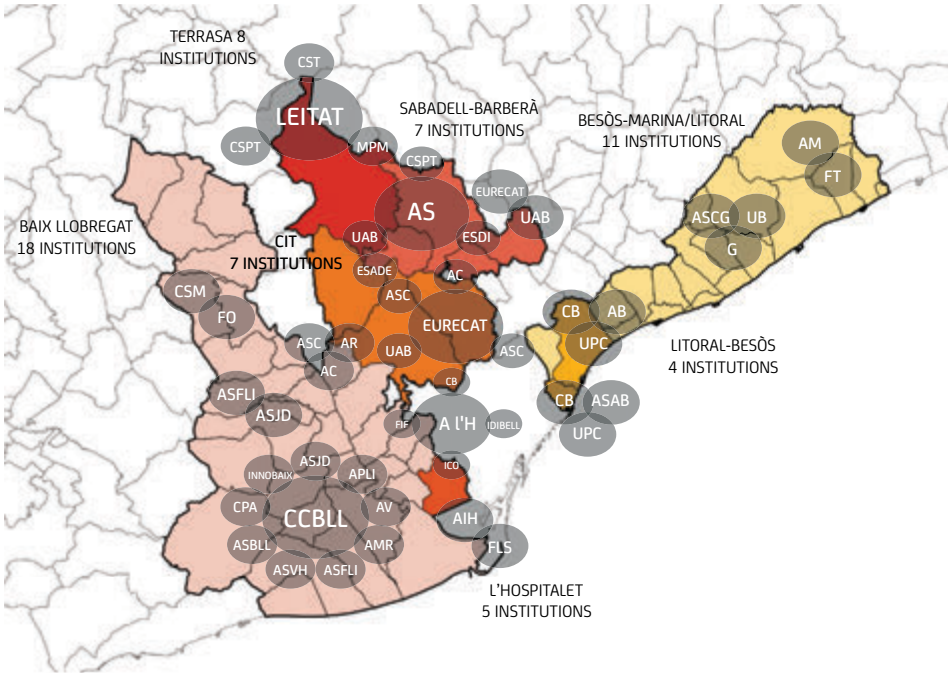


Fig. 15. Prior relations between participating institutions in the PECTs of each territory.
AMB-Strategic Planning Area, 2017d.

It is necessary to consider an entire series of programmes for the resilient adaptation of the territory, which we can specify as the following:

- Programme for the reinforcement of clusters, based on the strengths of the territories, with the collaboration of the Generalitat of Catalonia's ACCIÓ Programme, Barcelona Activa, the municipal economic promotion organisations and the AMB's Economic Development Agency, reforming the PECT programmes already developed (healthcare, food, energy and automotive clusters, among others).
- Reinforcement of the automotive cluster based on the strengths of the Baix Llobregat territory with the collaboration of the Generalitat of Catalonia's ACCIÓ programme, Barcelona Activa, the economic promotion organisations and the AMB's Economic Development Agency, also reforming the PECT programme already developed.
- Metropolitan policy for economic activity estates, which includes the introduction of territories with equalisation of economic activities.
- Circular economy industrial symbiosis programme through an estates plan that considers this pillar and with the strategic support of the Economic Development Agency.

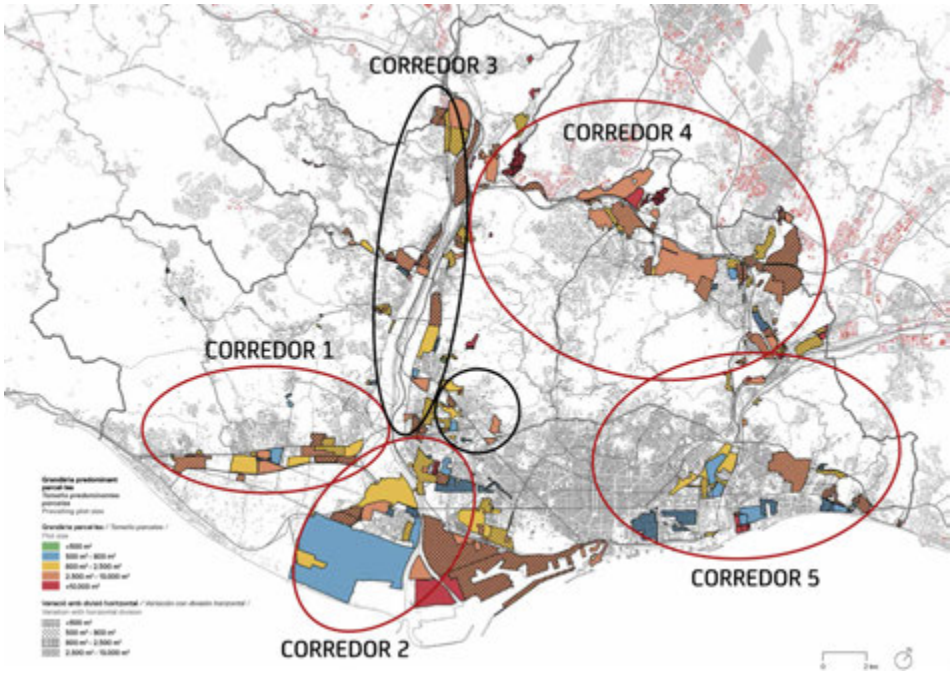


Fig. 16. Corridors of economic activity estates of the AMB. *PDU, Quadern 9.*

- Socially responsible territories programme where, to the co-production of the third sector, it is possible to add the industrial fabric, upgrading it in improved form to the whole of the metropolis. There are municipal strategic planning programmes (Badalona) that propose urban transformations, introducing industrial projects with innovation and employment programmes for young people. Proposal for socially responsible territories (Besòs and Baix Llobregat).
- Reorganisation of programmes of facilities at the service of economic promotion and jobs creation and training on a metropolitan and municipal scale in a coordinated manner.

The essential instrument to be able to develop this policy is the extension of the Economic Development Agency, recently constituted and one of the innovation instruments in the Law of 2010. The bases for this transformation must be developed within the framework of the AMB Economic Reactivation and Reindustrialisation Committee (see AMB-Socioeconomic Development Area, 2018). The committee, formed by 400 participants (elected members, municipal technicians, experts and professionals, social and economic agents from the territory, representatives of universities and technological and research centres), becomes the framework for the relationship with the organised fabric. As a strategy, it has been established to improve the economic activity estates; promote innovation, the transfer of technol-

ogy and knowledge; strengthen sectors with greater industrial potential and added value; boost human resources; develop adequate infrastructures and advanced logistics, define new urban planning instruments; and improve sustainability, while continually fighting against climate change.

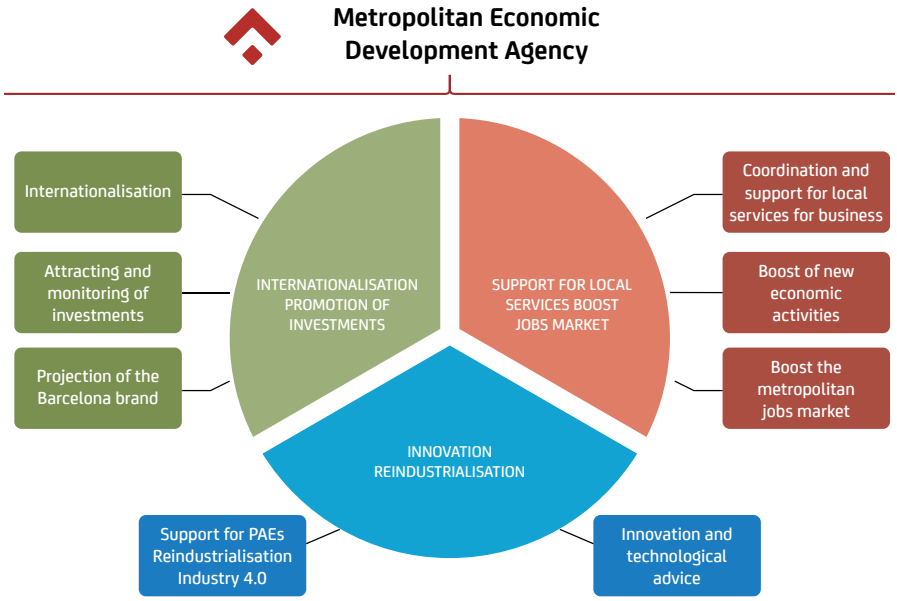


Fig. 17. Structure of the AMB Metropolitan Economic Development Agency.
AMB-Economic Development Area, 2018.

The Agency has been structured around three pillars:

- Support for local services and boosting of the jobs market.
- Innovation and reindustrialisation.
- Internationalisation and promotion of investments.

This structure, within the framework of resilient thinking, exercises a key function in: training and the promotion of quality jobs; the fomenting of innovation in the clusters most adapted to the metropolitan industrial fabric of Barcelona; good connections between companies within the context of globalisation; and the creation of a network of other similar metropolises that permit the learning of best practices and the search for investment capitals interested in the strengthening of the productive economy.

Within this framework, a resilient industrial fabric can be created and adapted to the evolutions of a changing and globalised world.

Economic risks: need to introduce innovation into the social and solidarity economy

Despite representing a small percentage of the economy (around 7% of the municipality of Barcelona), social and solidarity economies constitute a central instrument for self-organised and resilient fabrics in environments of change.

To put these economies into context, it is necessary to confront them with capitalist economies. In this scenario, a dialectic is proposed between the so-called "classical pole" and "holistic pole" (for more detailed development of this section see AMB-Socioeconomic Development Area, 2017c):

- Classical pole: mechanicist and linear paradigm characterised by concentrated and hierarchical power, for partial sustainability and for research into extrinsic motivations. Associated with the capitalist economy.
- Holistic pole: organic and complex paradigm, characterised by distributed and networked power, for comprehensive sustainability and for the research of intrinsic motivations. Associated with the social and solidarity economy.

Within this diagram, four main spheres emerge that make up the current socioeconomic system (see Fig. 19):

- Public (redistributive): socioeconomic sphere formed by the set of activities and economic initiatives promoted by the public authorities.
- Commercial (competitive): socioeconomic sphere formed by the activities promoted by the traditional market economy.
- Financial (speculative): hegemonic socioeconomic sphere, in the sense that it orders the public and commercial spheres through external debt mechanisms and investment funds.
- Social and solidarity (cooperative): socioeconomic sphere formed by the set of activities and initiatives that are differentiated from the dominant framework of the competitive market economy. Geared towards profit.

Within this framework a fundamental point is public leadership that, as far as possible, puts the financial economy at the service of the production economy and not the other way around. In this sense it is very interesting to develop public and cooperative financial institutions that mark out networks in the shadows in order to preserve the resilient nature of the metropolitan productive fabric.

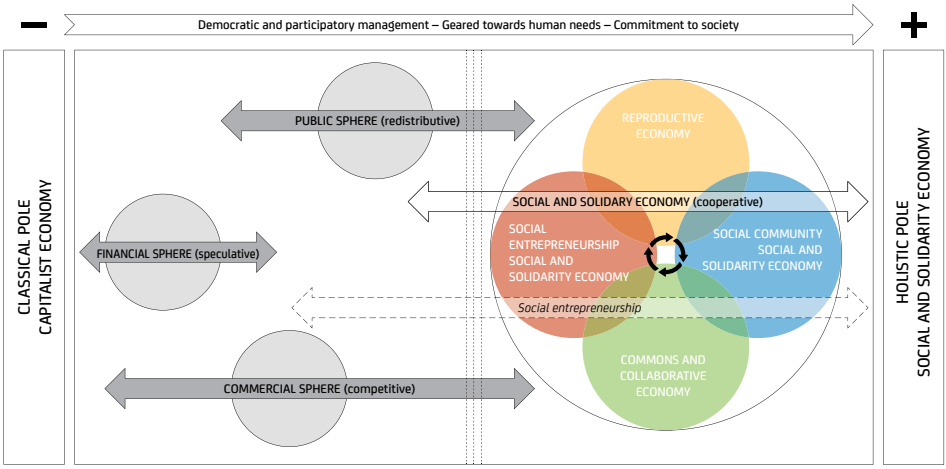


Fig. 18. Global conception of the contemporary socioeconomic model.
AMB-Social and Economic Development Area, 2017d.

The social and solidarity sphere is characterised by three elements that define its character of transformation:

- Democratic and participatory management: it enables movement from concentrated and hierarchical power to distributed and networked power.
- Geared towards human needs: it enables movement from partial sustainability to comprehensive sustainability.
- Commitment to the community: it enables movement from extrinsic motivations (own, individual and materialistic interest) to intrinsic ones (common interest, collective and non-materialistic).

In the first three spheres, development is necessary of the different practices that enable an approach, to a greater or lesser degree, towards the social and solidarity sphere (Fig. 20).

- From the public sphere: responsible public procurement, participatory municipalisation and the municipal enterprise.
- From the commercial sphere: corporate collaborative economy, the commons economy, the circular economy and corporate social responsibility.
- And, from the financial sphere, corporate social responsibility.

In the fourth sphere, the social and solidarity sphere, there are four associated sub-spheres.

It is necessary to take into account the fact that, although the holistic and interdisciplinary vision of this sphere means that the four sub-spheres share common elements (democratic and participatory management, gearing towards human needs and commitment to society), they are based on different logics and origins. The baseline point for the social and solidarity economy (socio-enterprise and socio-community aspect) and of the reproductive economy is the mainstream transformation of models of production, distribution and consumption, while the commons economy is not based on a market logic:

- Social and solidarity economy, in the socio-enterprise aspect: production sub-sphere which includes organisations with certain legal forms (cooperatives, worker-owned companies, social benefits mutuals, third social sector, employment integration companies, ethical finances organisations, etc.).
- In the socio-community aspect: production sub-sphere made up of new formulas for resolving needs through self-organisation, with a high degree of innovation, of participation and without a specific own legal form (community management, responsible consumer groups, fair trade, time banks, community currencies, community vegetable gardens, responsible consumption, ethical finance initiatives, etc.).
- Reproductive economy: reproductive sub-sphere made up of domestic and care work, independently or not of any legal form (time management, feminist economy, care economy, shared childcare groups, etc.).
- Collaborative commons economy: sub-sphere that promotes the cooperativisation of technological platforms (consumer economy, platform cooperativism, etc.), without being based on market logic.

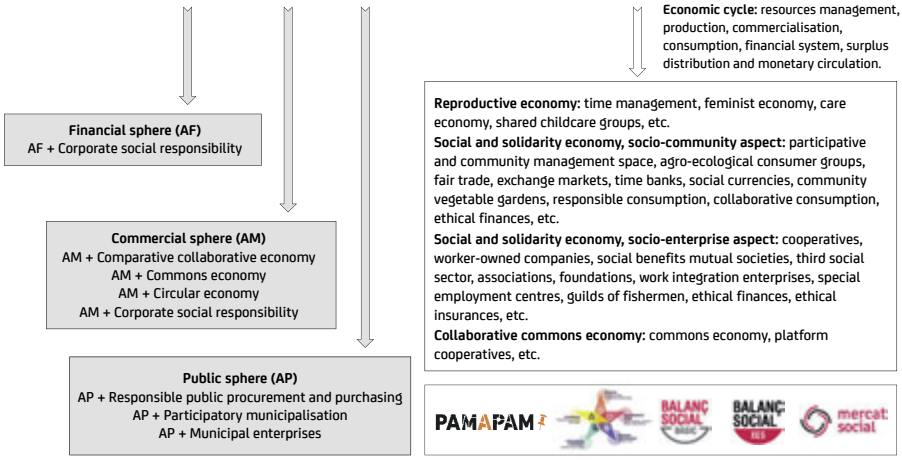


Fig. 19. Examples of the socioeconomic spheres and the social and solidarity sub-spheres. Tools for recording and auditing and social market for inter-cooperation.
AMB-Social and Economic Development Area, 2017d.

The case of social entrepreneurship has to be given a particular treatment within the social and solidarity sphere. It needs and requires clarification with relation to its specific immersion in the classical half of the diagram, according to the implication in terms of democratic and participatory management.

- Individual social entrepreneurship: from the legal forms of the capitalist economy and within the commercial sphere.
- Collective: entrepreneurship from the legal forms of cooperativism, within the social and solidarity sphere and, therefore, committed to democratic and participatory management.

Within the sphere of the AMB, three models existing for carrying out the recording and auditing of the initiatives that exist in this social and solidarity sphere:

- Pam a pam (solidarity economy map), as a model for recording in any of the four subspheres.
- L'Estrella Procomú, as a model for recording in the case of the sub-sphere of the collaborative commons economy.
- The social balance, as an auditing model in any of the four sub-spheres, both in the basic modality (which gives access to the social market) and in the complete one.

Prominent in this territorial sphere are the cooperatives associated with food (21.1%).

Activity sector	
Food	21.1%
Culture and leisure	12.4%
Education and research	11.1%
Spaces and networks	8.4%
Health and care	8.4%
Textiles	7.8%
Advisory	6.4%
Communication	5.8%
Housing and management	4.4%
Industry and other manufactured products	4.0%
Catering	3.5%
Technology and electronics	2.7%
Funding and Social Currency	1.8%
Logistics	1.5%
Supplies	0.7%

Fig. 20. Percentage of initiatives in the Barcelona metropolitan area present on the Pam a pam map, by activity sector. *AMB-Social and Economic Development Area, 2017d.*

Therefore, within a framework of resilience and change, social and solidarity economy networks become a potential reference point in the shadows and emerge as processes of self-organisation by groups and individuals, driven by social and ecological crises.

Many of the transformations carried out successfully towards adaptive government are established by the emerging informal networks in this sector. It is necessary to promote them.

Social risks: policies that ensure the right to housing as a central element of territorial cohesion

Social risks force re-adaptation to new needs, whether because of a prolonged recession, a change in the ages pyramid, prolonged high levels of unemployment with a younger and low-skilled population, a population with long-term unemployment, or alternatively, progressive waves of immigration, that are unpredictable in the future.

Moreover, there needs to be a set of agreed housing policies, above all to guarantee access to housing and in response to the need for this sector to undergo renewal with regard to energy transition.

In this sense it is important to highlight that the metropolitan housing policy is one of the most advanced in its definition during this term of office. See AMB (2017) Metropolitan housing policy guidelines (2016-2019) (https://docs.amb.cat/alfresco/api/-default-/public/alfresco/versions/1/nodes/f73e3554-9672-456e-8377-65afea9de4d9/content/27042017_Politiques_habitatge.pdf?attachment=false&mimeType=application/pdf&sizeInBytes=7877820).

This metropolitan policy consists of:

- The administrative instruments and other resources for action
    - The instruments already available currently and AMB operating staff within these policies (Department of Urban Planning Services, IMPSOL, Metropolitan Housing Consortium) and in close collaboration with the different metropolitan municipal councils and their instrumental resources in public housing matters.
    - The Metropolitan Housing Observatory (OMV) through an AMB agreement with Barcelona City Council, Barcelona Provincial Council and managers of social housing in Catalonia, open to giving service to local governments and their housing policies.
    - The Metropolitan Housing Operator is a mixed company with public-private participation designed to promote major public housing development projects in all metropolitan municipalities, including Barcelona, currently in the preliminary study phase for its constitution.
    - Cooperation with third sector organisations through collaboration agreements in all kinds of projects, whether development or management of affordable public rental housing.

- Urban development and property actions:

  - Rehabilitation of housing and empty or run-down buildings.
  - The promotion of affordable rental housing in different modalities: apartments with communal facilities, assisted living, independent homes, affordable housing, homes for those at risk of exclusion, etc.
  - Complementarily, the development of public housing in a property access scheme, with a limited price and a guarantee of permanency in the affordable housing scheme, in cases where the economic viability of the operation requires this and enabling reinvestment in new projects of public rental housing.
  - Developing new forms of access to housing, such as those based on ceding surface rights, urban tenant housing, shared and temporary ownership, urban co-housing cooperatives, etc.
  - Urban renewal and regeneration, incorporating actions in the urban space, in the housing pool and the social fabric of neighbourhoods and towns.
  - The IMPSOL, as an urban planning operator, to give support to municipal councils on urban planning policy and the generation of land and opportunities for the construction of public housing.
  - Activating the incorporation into the public housing pool of building plots, paralysed property structures and buildings in irregular or loss-making situations, both with respect to their physical state and their lack of occupation or legal situation.

All the above actions will be implemented in an agreed and coordinated way with the councils of the municipalities where the actions are located.

- Political-legislative initiatives

  - Promoting those actions possible and the necessary legislative initiatives to limit speculative increases in the prices of housing rentals in certain urban areas.

Social risks: policies that ensure territorial cohesion and social inclusion

As commented, social risks force re-adaptation to new needs, whether because of a prolonged recession, a change in the ages pyramid, prolonged high levels of unemployment with a younger and low-skilled population, a population with long-term unemployment, or alternatively, progressive waves of immigration, that are unpredictable in the future.

It is necessary to offer the services of the Social and Economic Development Area to satisfy the demands of municipalities that, in this new phase, and once a large part of the social, health and education services have been developed, will need to tackle these needs with an evident lack of resources.

The AMB-Social and Economic Development Area, 2017a study, highlights the fact that there is a great diversity of social services levels that are related with the size of the municipalities and with the implication that may exist between them.

Moreover, there are prominent relevant initiatives that it would be appropriate to replicate in other municipalities.

In a study on benchmarking in leading metropolitan cities (Bilbao, London, Lyon, Stuttgart) (AMB-Social and Economic Development Area, 2016) the following initiatives are noteworthy:

- **Family and children:** the initiatives within this pillar revolve around child adoption and fostering. Also, initiatives are identified geared towards guaranteeing a safe family environment and eradicating any type of violence.
- **Specific groups:** in this pillar there are prominent initiatives aimed at young people (prevention of criminal actions and stimulation of the opinions of this group), the elderly (facilitate the possibility of carrying out physical and intellectual activities), LGTBI (promote integration and reduce social stigma, homeless people (provide a roof and try to improve the conditions of people living on the streets) and immigrants (promote and facilitate integration).
- **Dependencies and disabilities:** these initiatives are aimed at guaranteeing a life as independent as possible for this collective through the practising of activities or the awarding of grants. It is a matter of guaranteeing access for them to housing or assisted-living centres.
- **Gender equality and violence:** this pillar focuses, above all, on comprehensive care, advice, and services provision for victims of gender violence.
- **Education:** initiatives of very varied types are identified, prominently including: services for the dissemination of best practices with the aim of guaranteeing employment success, providing school grants, language courses for immigrants and courses for adults, among others.
- **Health:** many of the initiatives are geared towards the promotion of healthy habits and are focused on dietary habits and the fight against drugs use. Hospital care initiatives are aimed at the mentally ill and early childhood intervention.
- **Transport:** this is focused on the establishment of social fare tariffs aimed at specific groups. Initiatives have been identified geared towards guaranteeing a transport alternative for children to go to school and for people with reduced mobility.
- **Work:** initiatives here are aimed at the promotion of youth employment and use training to ensure that young people can secure employment and grants. Another key point is stimulating the hiring of people from vulnerable groups.
- **Social emergency:** initiatives aimed at guaranteeing access to a healthy diet and grants that guarantee minimum coverage of the basic needs of economically disadvantaged groups.

- **Housing:** initiatives geared towards offering social housing at reduced prices to facilitate access to it. There are also initiatives identified within the context of setting up adapted residential spaces for groups with special needs.
- **Energy poverty:** the majority of initiatives are aimed at ensuring that homes are more efficient from the energy perspective, through services offering technical advice, financial grants and making available tools or resources for upgrading.

The AMB Law enables new services of social and territorial inclusion, that have not been implemented to their potential depth, to be incorporated.

Still awaiting development are a whole series of programmes that the Law enables and even promotes, that require the sharing of best municipal practices and evaluation of needs, to prioritise initiatives on a metropolitan scale that offer support to the municipalities. It is necessary to agree, therefore, the services offered by the municipalities – and according to the different sizes of these – and those services that need metropolitan impetus. This impetus would come through an agreement of the Council of Mayors which, furthermore, would also envisage a format for the monitoring and validation of the policies over the course of time.

It is for this reason that we propose as a main instrument the reorganisation of programmes for facilities in social, healthcare, education and training services on a metropolitan and municipal scale in a coordinated manner.

Risks of loss of food sovereignty

Policies of local agriculture and the introduction of organic agriculture offer the opportunity to move from a model of commercialisation of food to one of right to the land that ensures greater food sovereignty.

The metropolitan territory only covers 3% of the food needs of the Barcelona metropolitan area, but, in the measure that metropolitan agricultural production is channelled, it has clear advantages within the framework of development of short-cycle and local commercialisation.

A metropolitan policy that reinforces food sovereignty is one in which the market demands local products and, where possible, short-cycle products. In other words, that an agreement between producers and consumers ensures both the economic viability of the producers and the quality of the product, leading to an improved diet. As the AMB only produces 3% of its own consumption, agreements need to be established with other nearby territories in order to ensure the resilience of the territory.

Half of the world's population is concentrated into urban and metropolitan areas and, therefore, strategies are needed to achieve sustainable and healthy food systems. Some

160 big cities, including Barcelona, have signed the Milan Urban Food Policy Pact (MUFPP, 2015), an agreement that considers urban and peri-urban agriculture as an instrument that offers different opportunities for the conservation and integration of biodiversity within the urban and regional context and in food systems. In this way, it contributes to the creation of synergies between food and nutrition security and services related with ecosystems and human wellbeing. It proposes a series of actions for the metropolitan sphere, prominently including:

PREPARE A FAVOURABLE CONTEXT FOR EFFECTIVE ACTION IN GOVERNANCE

- Facilitate collaboration between municipal agencies and departments.
- Seek alignment of policies and programmes that impact the food system across multiple sectors and different administrative levels.
- Adopt and mainstream a rights-based approach. The different options include hiring permanent staff in the municipal sphere, reassignment of tasks and procedures, and reallocation of resources.
- Identify, map and evaluate local food experiences and initiatives and civil society food movements, which will help transform best practices into programmes and policies with the support of local research organisations or academic institutions.

PROMOTE SUSTAINABLE DIETS AND NUTRITION

- Promote healthy, safe, culturally appropriate, environmentally sustainable and rights-based diets, through educational, health promotion and communication programmes. With special attention paid to schools, care centres, markets and the media.
- It is recommendable to ensure social and economic equity.
- Redefine the programmes of school dining rooms and other institutional food services in order to offer healthy food, of local or regional origin, that is seasonal and produced sustainably.
- Promote decent employment for all, through equitable economic relations, fair wages and improved labour conditions within the food and agriculture sector, with the full inclusion of women.
- Encourage and support social and solidarity economy initiatives, paying greater attention to food-related activities that favour sustainable livelihoods for marginalized population segments at different levels of the food chain and facilitate access to safe and healthy foods in both urban and rural areas.

- Promote the setting up of networks and give support to grassroots activities (such as community gardens, community food kitchens, social pantries, etc.) designed to create social inclusion and provide food to marginalized sectors.

PROMOTE FOOD PRODUCTION

- Promote and strengthen urban and peri-urban food production and processing based on sustainable approaches and integrate urban and peri-urban agriculture into municipal resilience plans.
- Seek coherence in interactions between municipalities, food production and processing in nearby rural areas. There must be a focus on smallholder producers and family farming enterprises, and more attention paid to women and young people.
- Apply an ecosystem approach to guide holistic and integrated land use planning, with cooperation between urban and rural authorities and other managers of natural resources. To achieve this, it is necessary to combine landscape features with risk-minimising strategies to enhance opportunities for agroecological production, protect the biodiversity of farmland, and adapt it to climate change, tourism, leisure and other ecosystem services.
- Permit and protect land ownership for sustainable food production in urban and peri-urban areas. This must include plots for community gardens and smallholder producers. Perhaps it can be done through land banks or community land trusts. The same access to municipal land for local agricultural production should be provided and integration with land use and urban development plans be promoted.
- Give support to short food chains, producer organisations, producer-to-consumer networks and platforms, as well as to other market systems that make up the social and economic infrastructures to favour an urban food system that links urban and rural areas. This could include civil-society and solidarity-economy initiatives, and alternative market systems.

IMPROVE FOOD SUPPLY AND DISTRIBUTION

- Support improved technologies and infrastructures for food storage, processing, transport and distribution, linking peri-urban and nearby rural areas to ensure seasonal food consumption and reduce food insecurity as well as food and nutrient loss and waste. More attention must be paid, along the value chain, to medium- and small-scale food enterprises that are a source of decent and stable employment.
- Review public policies on procurement and trade, which would facilitate food supply through short chains through the connection between municipalities. It would also

ensure the supply of healthy food, while favouring access to employment and fairer and sustainable production conditions for the most vulnerable producer and consumer segments, using the potential of public procurement to help make effective the right to food for all.

- Develop support policies and programmes for public municipal markets, farmers' markets, informal markets, retail and wholesale, restaurants and all those operating in the food distribution sector. It is important to recognise, however, the differences between cities with respect to the role of public and private components of market systems.

It goes without saying that Barcelona City Council and the AMB have Mercabarna, which is a logistics centre that can favour public policies that lead to an improvement in food sovereignty.

In the case of the AMB, these directives are specified as:

- **Strategy: governance for metropolitan agriculture**
  This means developing instruments for the promotion of a metropolitan agriculture in which the Metropolitan Food Charter, led by the PEMB (2018), would be the reference point. The Charter aims to position food and the food system on the urban agenda, as well as to generate a climate of consensus and collaboration between civil society, the public sector and the private sector for the development of shared food policies. The aim is to reach a consensus document that includes specific shared commitments that are accompanied by specific projects that must be developed.
  Promote principles of inter-territorial solidarity. If the AMB territory only produces 3% of the products needed for food, it is necessary to encourage cooperation networks with other territories outside the Barcelona metropolitan area that can increase that production.
  One measure could be devoting a percentage of the budget to promoting food sovereignty in the Barcelona metropolitan area.
  Products that are consumed at events funded by the AMB should be home-produced and/or from solidarity territories. It is essential, within the AMB framework, to have a Metropolitan Food System Action Plan (2018) that defines the distribution of tasks of each area.
  Strengthen the open spaces call for proposals (PSG) to give support to agroforestry activities and the development of debate and participation tables on conflicts for the maintenance and recovery of metropolitan smallholders promoted by the AMB.
  In addition, it is necessary to develop urban planning for the protection of agriculture and to promote research work and studies to further knowledge of the territory and the building of projects.

- **Strategy: access to land**
  We propose the incorporation of the urban planning discipline to the open spaces of the Barcelona metropolitan area and to endow it with instruments for access to the

land, to increase its agricultural surface, especially with land bank programmes, and with land stewardship as a strategy for the promotion of mountain agriculture.

- **Strategy: renewal of the smallholder sector**
  Renewal of the smallholder sector, today in crisis, is essential. It would be a chance to promote organic agriculture, revitalise metropolitan agriculture and give support to farms working with new agro-forestry products.

- **Strategy: short commercial channel circuits**
  One of the central vectors of the promotion of these supports is giving support to agro-ecological producers for school dining rooms and to the promotion of agro-forestry products. One instrument that must be promoted is the Centre for Local Agrofood Exchange (CIAP).

- **Strategy: consumers of agro-ecological products**
  In any metropolitan region it is essential to promote agro-ecological and local products. Some of the central instruments must be the improvement of school lunches by the AMB and the municipal councils, the fostering of farmers' markets and of the network of markets for organic and local products, and the promotion and support of existing agro-ecological products

- **Strategy: promotion and communication of metropolitan agriculture**
  Lastly, it is fundamental to implement a promotion and communication campaign with leading experiences in metropolitan agriculture.

Risks due to man-made actions which have an impact on health

The wellbeing of the population is one of the essential values of any territory. It is defined by security – basic for life – health and good social relations, elements that are conditioned by the ecosystemic services: provisioning services (food, water, biomass and fuels), regulation services (climate, floods, diseases and air) and cultural services (aesthetic, spiritual educational and recreational).

Security, for its part, is defined by personal security, secure access to resources and security from disasters. The basic material for life is associated with the fact of having adequate communities, with nutritious food, shelter and access to resources.

Health is related with good control and knowledge of the body and with good quality air and water.

Finally, good social relations are determined by social cohesion and the existence of social and solidarity economies.

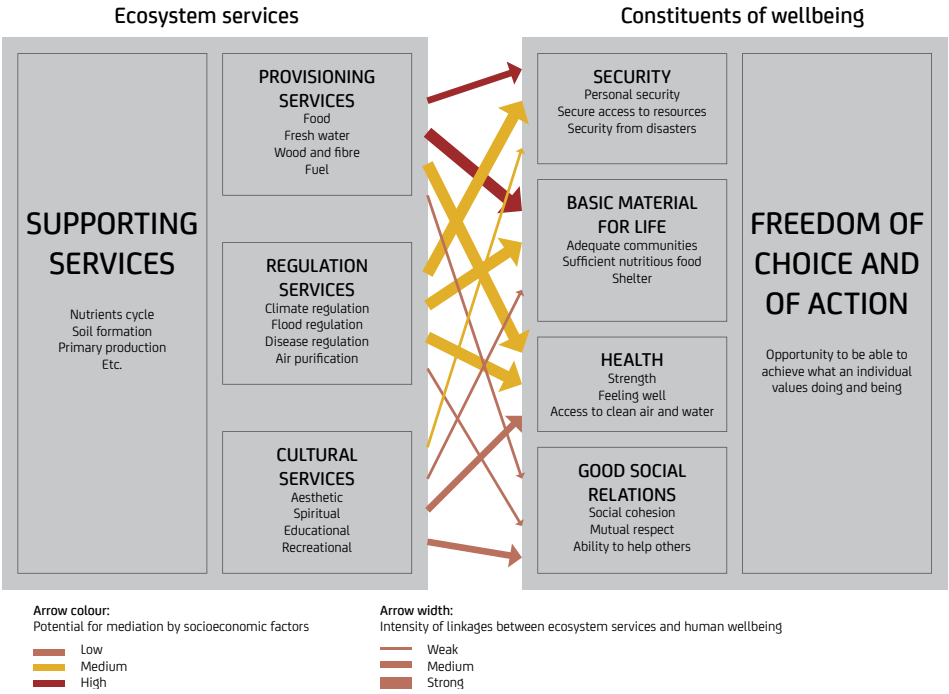


Fig. 21. Relations between ecosystem services and human wellbeing. *Reid, 2005.*

The principles of social cohesion, inclusive communities and security alike are already dealt with in the evaluation of social services and of the function of social and solidarity economies. Social programmes increasingly associated knowledge of the body's needs with the monitoring of those needs within the framework of prevention. Especially with diet. The risk of the loss of food sovereignty has to concern us with relation to the good quality of foods. The evaluation of risks associated with climate change gives us information on security in the face of disasters and access to shelter and resources. What is left, therefore, is evaluation of the good quality of the air and the water.

As fast as it can be said, progress could be made in environmental improvement and in the evaluation of facilities exposed to different levels of air pollution and noise pollution that condition the population's health.

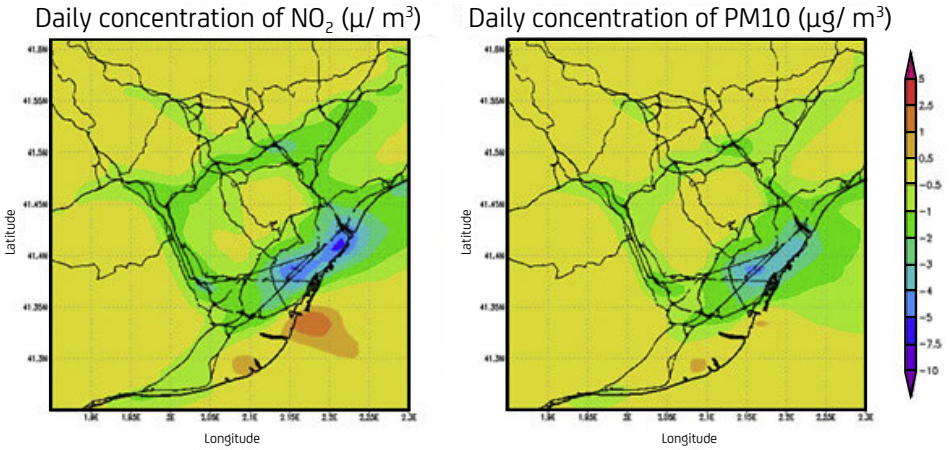


Fig. 22. Map of pollution associated with the main transport routes: B23, A2, C58, AP7 and ring roads. Barcelona Urban Ecology Agency, *2008.*

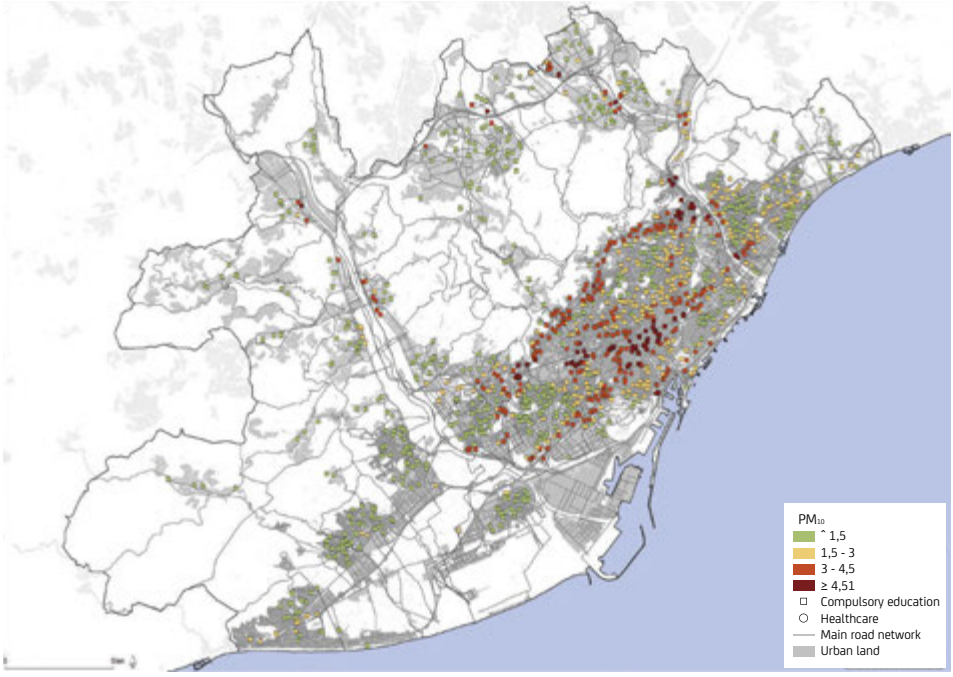


Fig. 23. Vulnerable facilities (healthcare and compulsory education) exposed to different levels of PM10 emissions from road traffic in the Barcelona metropolitan area. *IERMB, 2014.*

Monitoring of the user population of social, healthcare and educational facilities can be a good element for control and becomes strategic, in the same way that monitoring the diet of the school population and the social and healthcare services users population is another fundamental pillar.

Health must be one of the cross-cutting vectors that articulate different programmes. Social, educational, healthcare, economic and environmental.

One of the articulating environmental programmes could be the fight against climate change, which would include the following actions:

- Development of new surveillance systems and information for the analysis of consequences of climate change on human health. This would be done in collaboration with the public health agencies in Catalonia, the Public Health Agency of Barcelona and the municipal public health departments.
- Development of surveillance to detect invasive human diseases vectors.
- Surveillance of the repercussions of working conditions at extreme temperatures on the health of the working population.
- Improvement in the surveillance of air quality and of the tools for evaluation of its effects on health.
- Control of the risks resulting from the increase in temperature on the population's health.
- Control of the pollen composition and of the variation in pollination periods in relation with climate control.

2. METROPOLITAN STRATEGIES OF ECOSYSTEMS: METABOLISM, SUSTAINABILITY AND RESILIENCE

The AMB is committed to achieving sustainability and to fighting climate change. And it does so by heading towards a new socioeconomic and energy model, with a low-carbon economy adapted to climate effects. Its aim is to provide a benchmark model for sustainable development in an environmentally responsible territory that is efficient in its use of resources, with a balance between people, their activity and the environment in which they live, and in line with the AMB government's Strategy for Smart Specialisation and social policies.

All this is also in direct relation with the United Nations Agenda 2030 and the Sustainable Development Goals (SDGs).

By the year 2025, the AMB should have become a metropolitan region with a minimum consumption of fossil fuels and maintain itself as leader, on an international scale, of the

renewable energies sector with a commitment, as a transforming pillar for the territory, to energy efficiency and the management and improvement of natural resources.

Action against climate change is comprehensive and requires a driving dynamic from the AMB Government and the mayors of the municipalities, through the Council of Mayors and the Metropolitan Council, with the aim of adopting coherent and proactive sectoral policies, in a coordinated and collaborative way, between all their areas and services. The mitigation measures operate in key economic and production areas – energy, industry, transport, residential and services, primary sector – and, together with measures of adaptation in the natural, rural and urban environment, water, health, tourism and services, or infrastructures, they affect the whole set of policies: economic, social, environmental and those of territorial organisation.

In passing, they include mainstreaming, from the perspective of gender and of equity. The effects of the climate on human societies, and also the capacity of human beings to mitigate them and adapt to them, are conditioned by social factors such as gender.

It also identifies the most vulnerable sectors, such as elderly people or children without resources, with regard to adaptation to the impacts of climate change. And it takes them into account.

Risks due to the peak oil effect and the impact on energy prices: need for a metropolitan public leadership in the implementation of renewable energies

There is an energy model for the AMB to make the energy transition (see AMB-Strategic Planning Area, 2017a. Energy transition in the AMB), its distinguishing features being:

- Decentralised and distributed: the points where energy is generated and used must be close to each other. The inter-relationship between them must favour an efficient management of demand and present a mesh or network form, in opposition to the centralised model, which is usually radial and has few inter-connected points.
- Balanced and localised: the energy sources and flows must be as linked with the territory as possible, which will help to avoid undesired social and environmental impacts in other places or to establish these sources and flows in common agreement with other territories, where applicable.
- Resilient: it must have the capacity to stand up to adverse periods, resist and adapt easily to the probable technological, environmental, economic, social or pollical changes. And it must do so without modifying the structure and functioning of the metropolitan system.
- Democratic: it must be governed following a management model that studies in depth the democratic structures, functioning, and habits. We understand by *democratic* not only those referred to in the participatory section but also, and above all, to the universality of rights, the redistribution of wellbeing and deliberation in decision-making.

- Low impact: the technology used for the energy supply chain and in all processes related with energy must have a low social and environmental impact.
- Modular and integrated: the model must be based on modules that tend towards self-sustainability and that have all their parts integrated and connected to neighbouring models, thus permitting the strengthening of resilience and the generation of synergic processes.
- With public leadership: the scenario described acquires more importance with leadership from the local public sector. It has a major administrative, economic, adaptive capacity and is deeply aware of the population's needs. It is a guarantee, therefore, for the consideration of energy as a de facto public service and enables it to present great resistance against potential economic swings.

The pillars for the construction of an energy transition must have three fundamental characteristics:

- They must develop the metropolitan energy operator as a central instrument to lead the introduction of renewable energies in the territory.
- They must develop funding mechanisms, understanding that the introduction of renewable energies gives benefits and, therefore, it is fundamental to be able to have access to adequate financing so that they can be introduced into a territory.
- They must permit evaluation of the measures for maximising public resources.

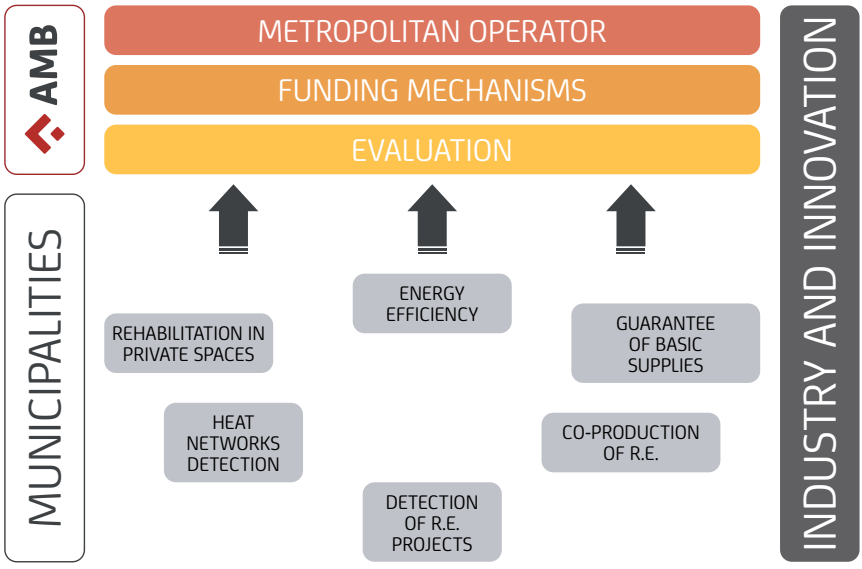


Fig. 24. Strategic pillars for energy transition in the AMB. *AMB-Strategic Planning Area, 2017a.*

CLIMATE PLAN CODE	Measure	Emission savings (t CO_2 eq)	Renewable energy production (MWh)	Energy savings (MWh)	Emissions savings (t CO_2 eq) (%)	Renewable energy production (%)	Energy savings (MWh) (%)	Budget (2018-2021) Climate Plan	Busget (2018-2021) (%) Climate Plan
	Total Mobility			3,372,049	41.6%	0%	78.8%		
	Total Energy		1,647,987	908,307	34.7%	100%	21%	9,886,359 €	100%
	Total Institution AMB				23.6%	0%	0%		
	TOTAL	2,161,820	1,647,987	4,280,356	100%	100%	100%	9,886,359 €	100%
ENER 6-5	Promotion of sustainable and low-emissions mobility in the Barcelona metropolitan area			3,372,049	41.6%		78.8%		
ENER-5-4	Encourage renewable energy generation on the roofs of industrial buildings in industrial estates		585,636		8.2%	35.5%		From 2021	
ENER-5-14	Promote renewable energy production on the roofs of residential buildings		571,250		8.0%	34.7%		1,847,200 €	19%
ENER-6-4	Energy rehabilitation of buildings in neighbourhoods at risk of energy poverty			693,000	6.2%		16.2%	From 2021	
GOV-13-3	Creation of a public electrical energy commercialisation company								
EDU-11-1	Creación de una plataforma de inversión colectiva ciudadana para impulsar proyectos de generación de energía renovable		185,049		2.6%	11.2%		266,000 €	3%
EDU-11-3	Creation of a “Families get active for the climate” campaign			179,917	2%		4.2%	50,000 €	1%
ENER-5-2	Execution of photovoltaic installations in the buildings of public municipal facilities		110,598		1.5%	6.7%		3,034,000 €	31%
ENER-5-3	Strategy to take advantage of forestry biomass in rural municipalities in the Baix Llobregat area and implementation of DHC networks		87,000		1.1%	5.3%		From 2021	

CLIMATE PLAN CODE	Measure	Emission savings (t CO_2 eq)	Renewable energy production (MWh)	Energy savings (MWh)	Emissions savings (t CO_2 eq) (%)	Renewable energy production (%)	Energy savings (MWh) (%)	Budget (2018-2021) Climate Plan	Busget (2018-2021) (%) Climate Plan
ENER-5-6	Pilot project for becoming a 100% Renewable municipality (Baix Llobregat mountain municipalities)		38,000		0.5%	2.3%		From 2021	
ENER-5-7	Promotion and implementation of solar arrays in abandoned agricultural areas in the Barcelona metropolitan area		32,600		0.5%	2.0%		From 2021	
ENER-6-3	Application of the directives of the metropolitan programme for municipal waste management 2017-2025		16,012		0.2%	1.0%			
ENER-5-5	Promote energy production using renewable energies in above-ground car parks		14,100		0.2%	0.9%		204,660 €	2%
ENER-6-10	Creation of energy efficiency schemes for commercial premises			12,865	0.2%			7,500 €	0%
ENER-6-2	Implementation of energy monitoring and remote management systems in public buildings			11,937	0.2%			1,872,900 €	19%
ENER-5-9	Reconvert urban elements into generators of photovoltaic energy and introduction of new urban elements (pergola-type) that incorporate photovoltaic		7,742		0.1%	0.5%		From 2021	
ENER-6-7	Development of Euronet 50/50 projects or similar in public buildings in all the municipalities			6,366	0.1%			15,000 €	0%
ENER-6-1	Investment in energy-oriented reconditioning of public buildings (NZEB)			4,222	0.0%			2,289,099 €	23%
ENER-5-14	Electric vehicle solar charging stations				0.0%	0.00%	0%	300,000 €	3%

Fig. 25. Measures in the AMB Climate and Energy Plan ordered by emissions savings. *Compiled by the author based on the Climate and Energy Plan. AMB, 2018.*

The AMB's starting point is a set of municipal experiences that it is necessary to extend to the whole area, such as the creation of the metropolitan energy operator Barcelona Energia, which is a reference point, the development of the photovoltaic energy operator of Barcelona City Council and the creation of a community of users of renewable energies with metropolitan dimensions.

It is necessary to renew the Districlima and Ecoenergies heating networks in Barcelona and L'Hospitalet. And also, to extend to the private sector the experiences of energy efficiency at public facilities in El Prat de Llobregat, Sant Boi de Llobregat and Sant Cugat del Vallès. Further reference points for the leap from the public sector to the private sector are the rehabilitations in private spaces in Santa Coloma de Gramenet and Viladecans.

The most comprehensive vision is perhaps that featuring a pilot experience being carried out in Viladecans with the European UIA Vilawatt project, the aim of which is to extend a culture of energy transition that begins with the energy renovation of residential buildings. The benefits are paid with a local currency that is distributed to local businesses. In parallel, these businesses also develop an improvement in energy efficiency. For the project it is fundamental to develop a culture that enables energy transition to be extended among all the inhabitants of the town.

It is necessary to propose a similar system, on a metropolitan scale, led by the metropolitan energy operator.

The measures proposed to date for the AMB's Climate and Energy Plan show that there is a great dependency with regard to mobility and reduction of the use of the private vehicle, which represents the most significant impact, of 41.6 %.

If there is no strong policy of restricting private vehicles with toll policies it will not be possible to comply with a reduction of 30% of CO_2 for 2030.

Moreover, the AMB measures are still very concentrated on the efficiency of public facilities (54% of the Plan's committed budget) and only 19% of the budget is allocated to the implementation of renewable energy cover in residential buildings. In contrast, the budget forecasts for the buildings on economic activity estates are a long way from being considered, despite it being envisaged that this will be the sector with the greatest initial incidence.

It is necessary, therefore, to establish public policies that lead the introduction of renewable energies and the metropolitan energy operator will be one of the key instruments.

Following the roadmap for the energy transition 2030 (AMB, 2018), the municipalities of the AMB have signed up to the agreement. The data contributed by the Covenant of Mayors (https://www.eumayors.eu/) point out that the emissions of GHGs in the sphere of the sustainable energy action plans (PAES) represented 57% of the emissions in the Barcelona metropolitan area in the year 2005.

Municipality	Reduc-tion target	Year Plan action	Emissions PAES sphere (2005) (kt CO_2 eq/year)	Estimated GHG saving 2020 (with respect to 2005) - (kt CO_2 eq/year)	GHG saving completed measures (kt CO_2 eq/year)	GHG saving completed measures (%)	GHG saving measures in process (kt CO_2 eq/year)	GHG saving measures in process (%)
Badalona	20%	2011	785.557	159.718	18.975	12%	130.145	81%
Badia del Vallès	21%	2011	47.82	9.885	-	-	-	-
Barbera del Vallès	20%		144.025	28.805	0.000	0%	0.635	2%
Barcelona	20%	2011	3.505.862	710.586	8.951	1%	678.431	95%
Begues	22%	2012	29.59	6.639	-	-	-	-
Castellbisbal	20%	2014	65.63	13.31	1.273	10%	8.945	67%
Castelldefels	24%	2011	234.874	55.964	1.426	3%	23.424	42%
Cerdanyola del Vallès	22%	2010	258.943	57.532	9.650	17%	32.835	57%
Cervelló	22%	2011	37.618	8.276	1.759	21%	3.491	42%
Corbera de Llobregat	22%	2009	51.533	11.524	1.623	14%	9.019	78%
Cornellà de Llobregat	21%	2011	331.543	70.024	0.000	0%	62.886	90%
El Papiol	20%	2011	17.99	3.666	-	-	-	-
El Prat de Llobregat	20%	2011	307.546	60.512	17.958	30%	28.1	46%
Esplugues de Llobregat	21%	2008	185.227	38.020	13.857	36%	24.163	64%
Gavà	22%	2011	182.775	40.384	2.818	7%	8.832	22%
La Palma de Cervelló	22%	2010	10.171	2.234	0.000	0%	0.000	0%
L'Hospitalet de Llobregat	21%	2009	773.783	166.152	14.389	9%	141.788	85%
Molins de Rei	18%	2009	94.663	16.778	0.053	0%	9.792	58%
Montcada i Reixac								
Montgat	20%	2010	36.66	7.332	0.726	10%	6.041	82%
Pallejà	20%	2009	43.75	8.75	4.769	55%	3.825	44%
Ripollet del Vallès	21%	2011	115.07	23.736	-	-	-	-
Sant Adrià del Besòs	21%	2009	135.642	27.854	4.347	16%	21.796	78%
Sant Andreu de la Barca	20%	2011	117.161	23.236	0.708	3%	22.511	97%
Sant Boi de Llobregat	20%	2009	306.268	61.146	7.133	12%	53.775	88%
Sant Climent de Llobregat	22%	2017	14.918	3.282	-	-	-	-
Sant Cugat del Vallès	21%	2009	590.000	121.12	1.446	1%	97.164	80%
Sant Feliu de Llobregat	22%	2015	143.432	31.128	0.000	0%	30.345	97%
Sant Joan Despí	20%	2010	130.519	26.275	9.88	38%	9.265	35%
Sant Just Desvern	22%	2010	73.817	15.963	0.627	4%	11.52	72%
Sant Vicenç dels Horts								
Santa Coloma de Cervelló	31%	2012	29.306	9.014	0.589	7%	3.029	34%
Santa Coloma de Gramanet	40%	2011	338.123	134.857	15.5	11%	119.357	89%
Tiana	33%	2011	27.774	9.034	0.794	9%	7.906	88%
Torrelles de Llobregat								
Viladecans	22%	2011	120.987	26.933	0.858	3%	26.075	97%
TOTAL AMB			**9.288.582**	**1.989.668**	**140.109**	**7%**	**1,575.10**	**79%**

Fig. 26. Impact of the measures in the PAES plans of the municipalities of the AMB.
Compiled by the author based on the Climate and Energy Plan. AMB, 2018.

According to the data provided by the same source, in the year 2015, GHG emissions had been reduced by 7% on average with the actions of the PAES already completed.

However, the plans have left a large part of the measures with an uncertain future. More political leadership, on a metropolitan scale, is needed to undertake a true energy transition.

In the metropolitan area, electrical energy from renewable sources is produced, especially from the waste management facilities. *The Roadmap for Energy Transition 2030* (AMB, 2018) differentiates between facilities managed by the AMB (DWTP, eco-parks), with an installed capacity of 201 MW, and other facilities not managed by the AMB.

In Fig. 27 we show the MWh generated in the year 2014 by the overall set of facilities in the AMB territory and the emissions avoided by the production of renewable energy (RE).

Sphere	Energy production (MWh/ year)	Electric mix (tons CO_2 eq/ MWh)	Emissions avoided (tons CO_2 eq)	Emissions avoided (%)
AMB RE facilities	170,000	0.267	45,390	12%
Other RE facilities	1,270,000	0.267	339,090	88%
TOTAL RE	**1,440,000**	**-**	**384,480**	

Fig. 27. Emissions avoided through renewable energy production in the metropolitan area in the year 2014. *Compiled by the author based on the Roadmap for the Energy Transition 2030. AMB 2018 and the Catalan electric mix.*

In the year 2014, the emissions avoided by own production of energy from renewable sources represented 4% of total emissions.

GHG emissions avoided by RE production	384,480	Tons CO_2 eq/ year
GHG emissions AMB territory	10,334,522	Tons CO_2 eq/ year
Relationship between emissions avoided and emitted	4%	%

Fig. 28. Relationship between the emissions avoided by production of renewable energies and emissions in the metropolitan area in the year 2014. *Compiled by the author based on the Roadmap for Energy Transition 2030. AMB 2018 and Catalan electricity mix.*

To lead an essential and urgent energy transition, it is necessary to drive this process and move on from wishes and proposals that are too optimistic to a constant evaluation of the plans and the way in which they are implemented. A better articulation between the municipalities and the AMB's metropolitan services is vital, and the energy operator must be a fundamental figure.

In this sense, we must use as a starting point experiences that feature:

- The tool for photovoltaic energy management in the public space (the example is Barcelona).
- The instrument for the promotion of photovoltaic and thermal solar energy and heat pumps on industrial estates, as well as circular economies in energy. A public-private company manages the roofs of an industrial estate. The Polígóns Sud in Badalona, the sectors 22@ in Barcelona, the Zona Franca Consortium, the Pla de Sant Feliu i Molins de Rei estate and the industrial estates of Gavà, Viladecans and Sant Boi could be initial implementation experiences.
- The instrument for promotion of photovoltaic, thermal solar energy and heat pumps in residential areas. We have the reference of the l'Illa de l'Eixample, of Badia and of the remodelling of some neighbourhoods of Santa Coloma de Gramenet.
- The instruments of cooperative systems with the local authority as activator: Vilawatt Project in Viladecans.
- The promotion instrument Tub Verd, taking advantage of the needs of industrial estates: EcoCongost, Tub Verd and Castellbisbal (BASF, Celsa and municipal facilities).
- The instrument for public promotion of windmill cooperatives. Viure del Cel is a good example.

These projects must be associated with the neighbourhood plans and the industrial estate plans.

It would be interesting to consider projects on a greater scale that would need public funding or in association with public-private operators such as, for example, with the Metropolitan Housing Operator.

This type of funding could be proposed for projects such as:

- Development of territories with self-consumption that reduce the demand for energy from the centralized network, especially through the figure of energy aggregators which are allowed by the newly approved Royal Decree on urgent measures for Energy Transition and Consumer Protection (Royal Decree Law 15/2018 of October 5).
- Extension of the Districlima projects towards Badalona and those of Ecoenergies towards the L'Hospitalet and Barcelona areas and the potential interconnection of one and the other. It is fundamental to have a public strategy at the time of the renewal of concession licences.
- Wind energy estates, which could be situated outside the AMB area, although cooperation agreements could be established with other territories, especially those with the greatest wind offering: Igualada and Terra Alta. In these cases, we have the opportunity,

with leadership of the AMB, of the municipal councils and the cooperatives network (Som Energia and Coop57).

- Offshore wind energy estates in the marine area that promote development of RDI knowledge in which the metropolitan environment of Barcelona has already made developments and which requires public leadership. AMB-Generalitat of Catalonia collaboration is fundamental, especially when the metropolitan area has demand for renewable energy for the needs of the desalination plant in El Prat de Llobregat and the regenerated water use projects that need impulsion of water.
- Systems of batteries for networks that work in a cooperative way, whether industrial or residential estates.
- Hydraulic energy stores. Feasibility of serving the total electrical energy consumed, beginning with pilot projects with dams at Begues and Collserola.
- Hydrogen energy estates, in synergy with the gas network, such as those in the port area.

All these projects, and their funding, should be associated to already existing demands of the Llobregat Desalination Plant and projects for the pumping of regenerated water envisaged in the Llobregat and Besòs areas, as well as demands for municipal facilities managed on a metropolitan scale. Thus, they could be funded by the EIB, or by other funding institutions, within the framework of the justification of a demand planned jointly with the Catalan Water Agency (ACA, Generalitat de Catalunya), where the AMB also has plays a key leadership role.

In the future, and within the framework of this public leadership, we would have to consider:

- The distribution network project, based on the TMB metro.
- The synergies associated with the interconnected networks that emerge from the nodes of the incinerator, the Desalination Plant, the DWTPs, the eco-parks and the sludge treatment centres.

These nodes must be connected to the points of Red Eléctrica de España (REE) in Viladecans and El Besòs, among others.

From the perspective of planning there are three points that must be considered:

- Reserve spaces around the potential energy transformation nodes (see Fig. 29).
- Establish criteria regarding the prioritisation for use of building roofs, that must be combined and do so in this order:
    - Green roofs for the control of the heat island.

- Productive green roofs.
- Blue roofs for water storage.
- Roofs with solar panels for hot water.
- Roofs of photovoltaic panels (see Fig. 30).

• Reserving of the corridors of the energy transport network that have to connect the new energy generation poles, the energy stores and the connection points for high-tension transport (REE) with the main distribution networks (TMB, Districlima, Ecoenergies, etc.) (see Fig. 31).

The risk of peak oil is, therefore, a window of opportunity for public and metropolitan leadership to head an energy transition policy that should become a clear priority in metropolitan policies. It is clear that it has cross-cutting implications, with a multiplicity of variables (increase in torrid days due to climate change, management of water stress, cost for the more disadvantaged classes, competitiveness of industry, etc.).

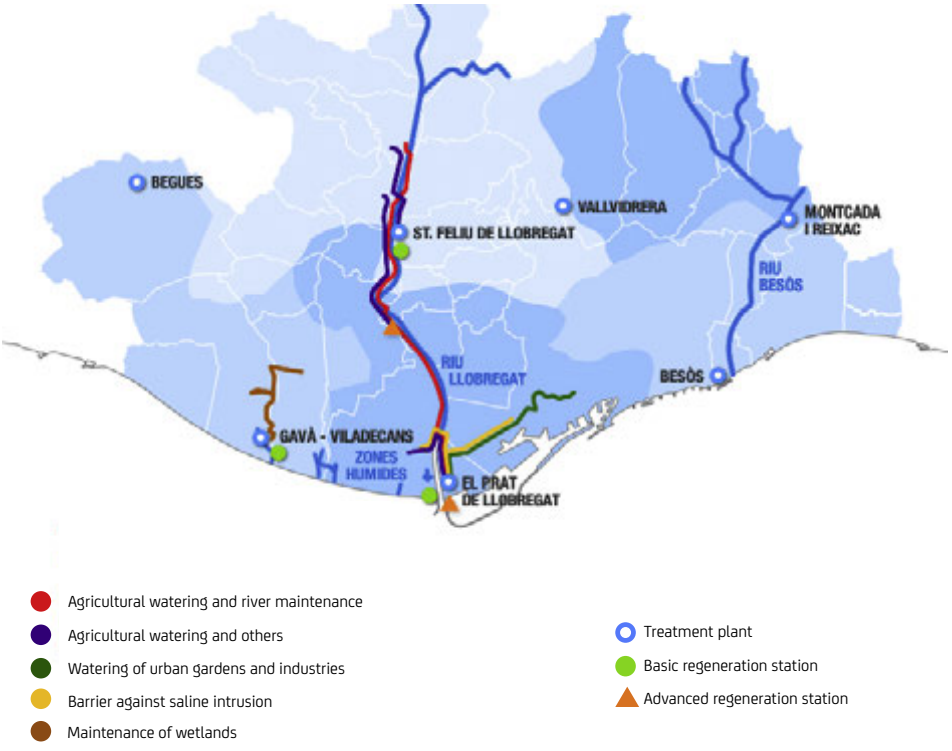


Fig. 29. Potential nodes for energy transformation in the AMB sphere. *AMB.*

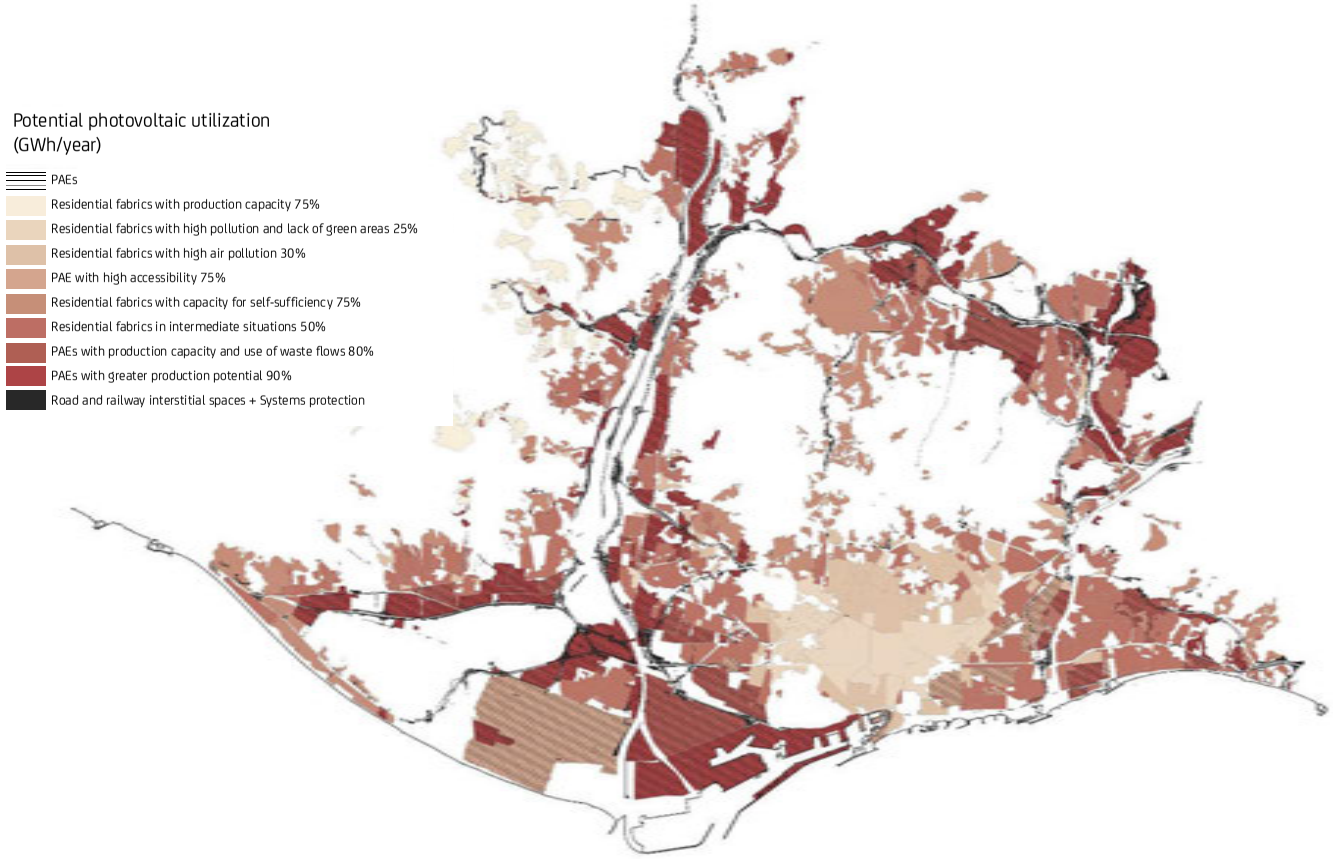


Fig. 30. Potential for photovoltaic usage of the different fabrics of the AMB sphere. *PDU.*

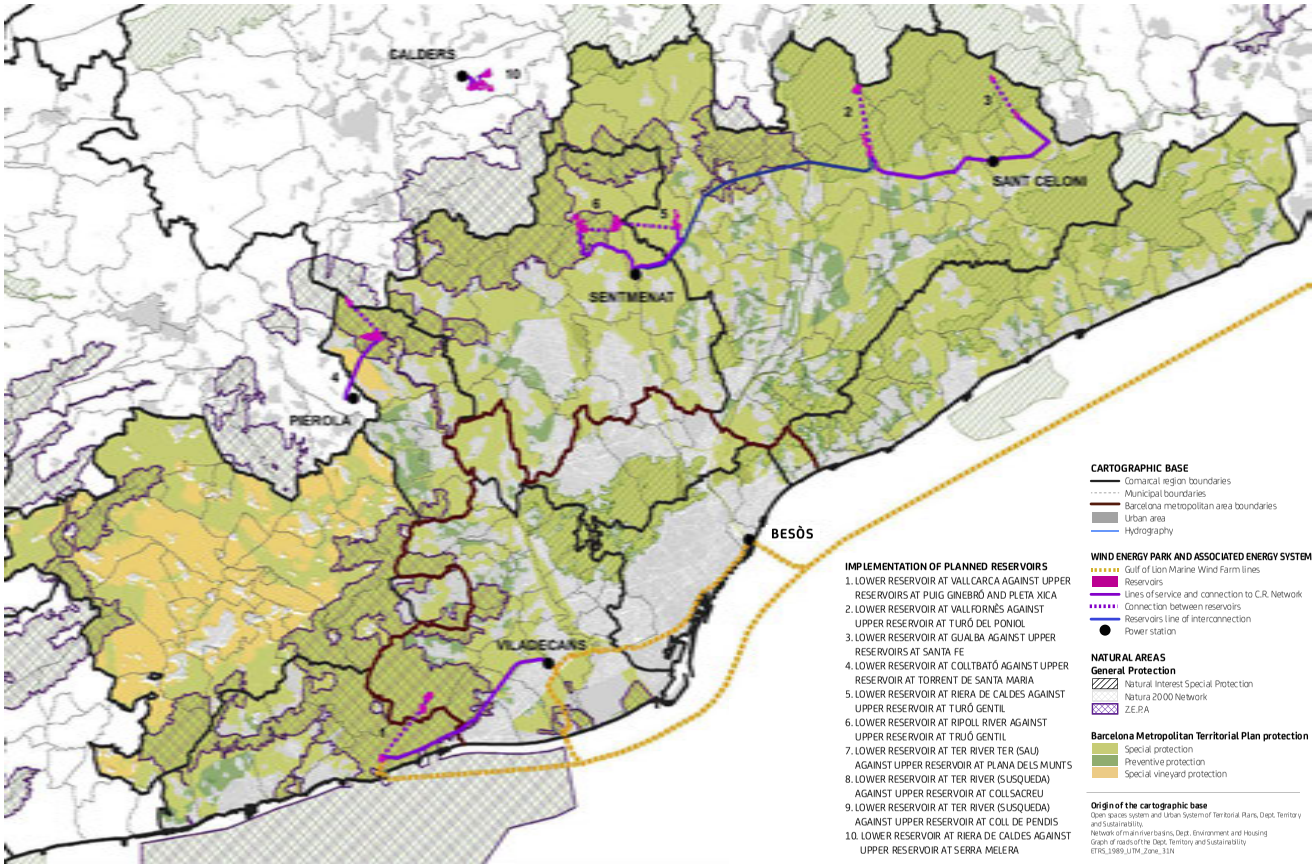


Fig. 31. Report on the feasibility of reversible pumped-storage hydroelectric plants in the Barcelona catchment area. Electricity lines that affect natural areas of the PTMB, 2010. *BCASA, 2015.*

Risks due to the peak oil effect and impact on energy prices: need for a sustainable mobility operator

It has been observed that 41.6% of the reduction in CO2 needs to be done through mobility. Almost the totality of the reduction is focused on private vehicles and, within this context, there is an evident need to develop measures that influence mobility in this way. Results can only be achieved through restricting parking and introducing tolls to prevent congestion and energy consumption.

In the case of the Barcelona metropolitan area, we can confirm that 69% of the mobility crossing the municipality does not go beyond the conurbation (delimited by El Prat de Llobregat, L'Hospitalet de Llobregat, Cornellà, Sant Joan Despí, Sant Feliu de Llobregat, Barcelona, Santa Coloma de Gramenet, Badalona and Sant Adrià del Besòs), which is an area served by rail transport (Rodalies local trains, and trams) and that requires a good above-ground public transport network that guarantees coverage from any point.

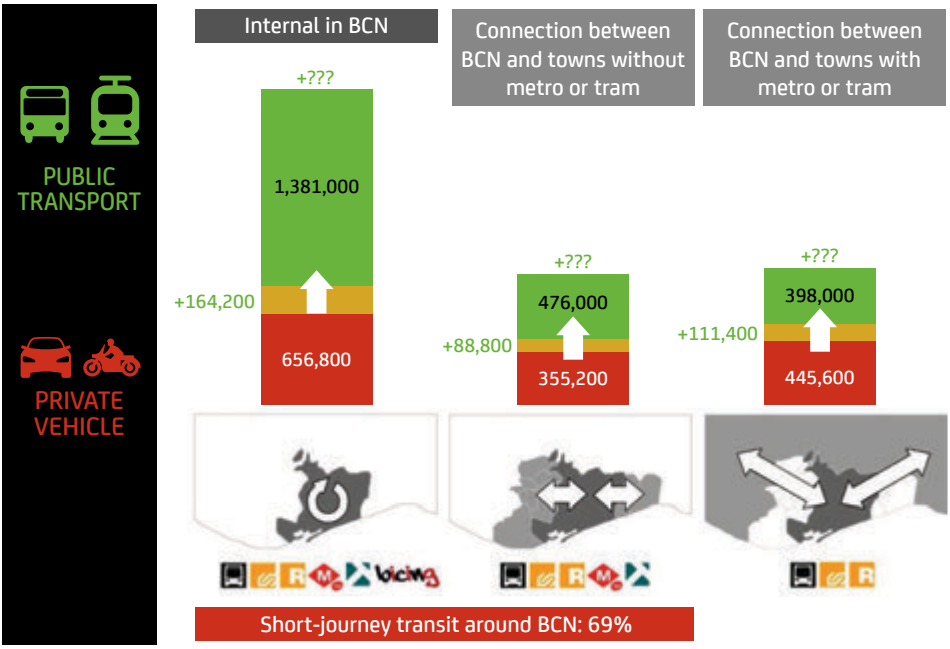


Fig. 32. Scenario of 20% reduction of private vehicles in the conurbation.
AMB-Strategic Planning Area, 2017b.

It is feasible to reduce mobility in private vehicles by 20% via better exploitation of the rail services (increase of 40% in the local trains offering) and the development of an integrated

above-ground transport network in the conurbation (extension of the new bus network (NXB) model implemented in the municipality of Barcelona and extensible to the whole conurbation). Also feasible are good services in the second concentric zone that offer good-quality frequencies (15-20 minutes at peak times and every hour for the rest of the day). In addition to a good intermodal network for economic activity estates and low-density fabrics that integrates bicycles and public transport at the local train stations.

We have this scenario while we await development of the AMB's Metropolitan Mobility Plan (PMM). At present a single fare zone for transport in the AMB has already been created. Now it is necessary to reinforce the metropolitan sustainable mobility operator to manage the strategy for reduction of private vehicles and the offering of an alternative sustainable mobility. This necessarily will involve the development of parking regulations in the metropolitan conurbation and the development of a system of tolls on the ring roads that will reduce metropolitan transport in private vehicles.

The PMM will have to evaluate the different toll scenarios, develop a metropolitan bus network (with BRT corridors) and a metropolitan bicycle network that gives access to municipalities and their economic activity estates, as well as scattered residential areas that can absorb the modal transfer from private vehicle to sustainable modes of transport.

The need to tackle the control of CO_2 emissions, a whole priority window of opportunity for the management of a more sustainable mobility, has to facilitate a more sustainable environment and one that enables the fight against climate change.

Risks due to the peak oil effect and the impact of the materials cycle: introduction of the Zero Waste Programme

The peak oil effect means the obligation to reduce the generation of waste, especially due to the cost of the energy associated with its collection and processing. It is necessary to tackle waste reduction, better known as the Zero Waste Strategy.

The future of the AMB's metropolitan waste prevention policy requires a metropolitan framework of reference to be given to actions for prevention, which must be done through a metropolitan waste prevention plan (PMPR).

This plan must consider the following strategies:

- Improvement in waste prevention.

  It must enable continuity to be given to the actions that have worked and incorporate new proposals in line with the following criteria:

  - They should function by default, i.e., without excess effort by the receiving population.

- They should be aimed at the public in general, not only at those who are already aware or convinced.
- They should be economically viable.
- They should be long-lasting in time and their changes should be permanent.
- That they can be physically measured.
- They should help towards consolidating a change in habits.

All this means reducing food waste, controlling the use of single-use plastic and increasing the useful life of products.

• Extension of selective collection.

This point stands out as the most strategic: promoting systems that facilitate selective and quality selection of organic waste and of the main non-organic fractions. In addition, we need to design a system of collection and monitoring that enables bonuses according to results.

It is also necessary to improve the collection of the minority non-organic fractions, which means promoting a regulatory framework that favours waste prevention, selective collection and the adaptation of the network of rubbish tips to the needs for change of the collection systems.

• Improvement in waste processing.

The proposals for actions are aimed at achieving the best possible processing for the fractions that are processed at the AMB facilities, with the aim of being able to increase the value enhancement index, which means adapting processing plants to new flows and proposing certain actions according to the type of fraction (OFMSW, light containers, NOFMSW, bulky, vegetative fraction and remainder).

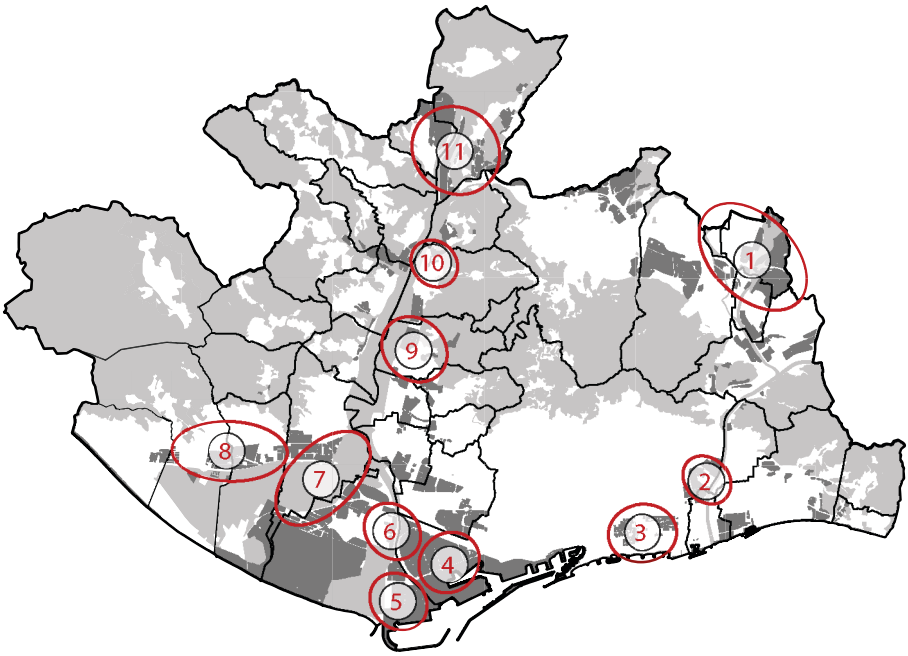
• Improvement in governance.

Carrying out the actions mentioned requires an improvement in governance and special attention must be paid to improving the regulatory framework and to coordinating, giving municipal support and governing the economic area of management, compensating improvements, expanding the responsibility of producers and reinforcing communication.

The benchmark for this metropolitan policy is the Metropolitan Programme for the Prevention and Management of Municipal Resources and Waste 2019-2025 (PREMET 2025), which defines an action strategy based on a new governance that commits to reducing municipal waste, with the aim of achieving 55% in recycling by 2025 and carbon neutrality in the metropolitan waste processing system.

Risks of the peak oil effect and the impact of the materials cycle: introduction of the circular economy

The peak oil effect is obliging us to tackle the materials cycle and develop a circular economy. The AMB and its catchment area have already developed a series of circular economy experiences. However, it is now necessary to extend them in a generalised way thorough a metropolitan circular economy strategy.



1. Industrial Symbiosis
2. Bon Pastor and Baró de Viver industrial Estate
3. Districlima
4. Ecoenergies Barcelona
5. Barcelona Metro underground network (TMB)
6. Zona Franca Consortium in Symbiosis
7. Economic activity estate of the Baix Llobregat Agricultural Park
8. Ecoindústria (p. 33)
9. Circular economy in Sant Feliu de Llobregat
10. La Granja
11. Simbio

Fig. 33. Circular economy reference experiences in the Barcelona metropolitan region. *AMB-Strategic Planning Area, 2017c.*

For a strategy for this circular economy, within this framework of the AMB (see AMB-Strategic Planning Area, 2017c), three pillars are proposed:

- Metropolitan programme of industrial symbiosis.
- Promoting the transformation of waste into resources.
- Agro-urban synergies at the Baix Llobregat Agricultural Park.

With respect to the Metropolitan Programme of Industrial Symbiosis, the idea would be to implement, on a metropolitan scale, the most outstanding municipal initiatives, which have been developed in Gavà-Viladecans and in Barberà del Vallès.

To achieve this, the following are proposed:

- A programme of industrial data management.
- A circular resources platform.
- A website for the exchange of surplus resources.
- An industrial symbiosis and circular economy committee.

To promote the transformation of waste into resources, it is proposed to develop a Waste-Resource Programme, which would be represented by Barcelona City Council's RDI, through Barcelona Activa and in collaboration with the AMB (Environment Area and Economic Development Agency) and the Generalitat of Catalonia (Waste Agency of Catalonia).

This project is an example of synergy between the Barcelona Metropolitan Region, the AMB and Barcelona.

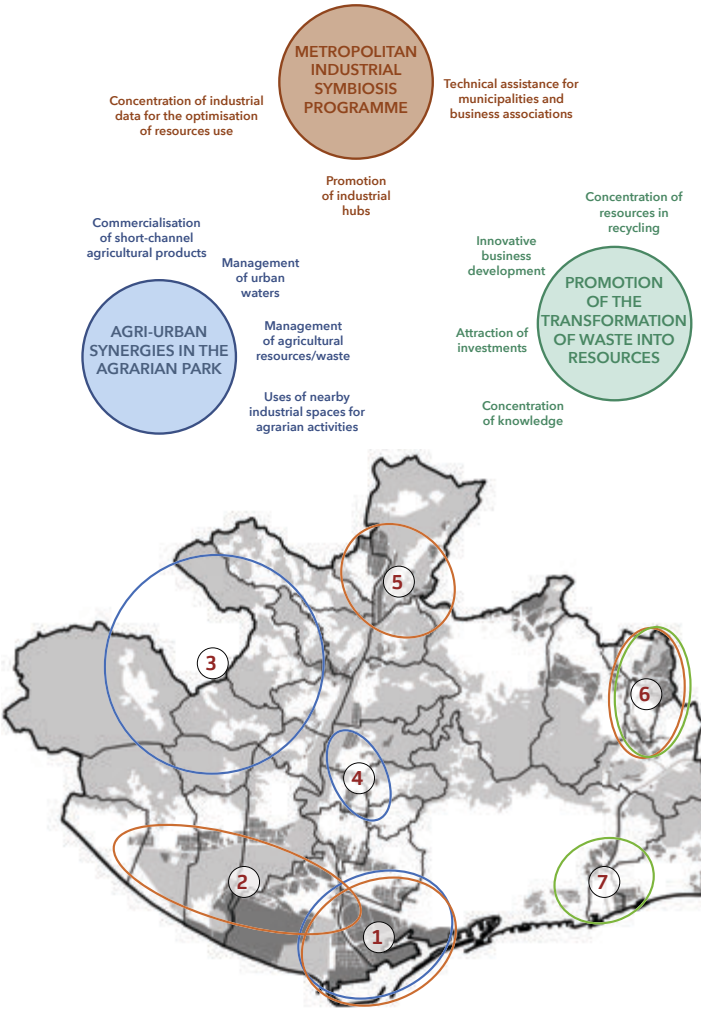
The fourth industrial belt concentrates the largest part of industry in the region. The municipalities of the AMB are developing more advanced symbiosis programmes that can be extended to other municipalities in the region (in coordination with programmes run by the Barcelona Provincial Council and the Generalitat of Catalonia-ARC). The specific waste-resource projects are being developed with the leadership support of the Waste-Resource Programme.

Finally, we are proposing a third pillar, around agro-urban synergies, that acts as a catalyst, among others, for:

- Boosting mountain agro-forestry production, agro-ecology and land stewardship.
- Management of the cycle of regenerated water for agro-industry.
- Management of the organic waste-nutrient resources cycle.
- Commercialisation of short-chain agricultural and forestry products, Food Hub Baix Llobregat.

Risks of loss of biodiversity and collapse of ecosystems: management of the most anthropized and fragile natural areas

The loss of biodiversity is related with the anthropization and urbanisation of the territory and with the impact of climate change.



1. Llobregat Delta
2. Llobregat Plain
3. Mountain Municipalities
4. Lower Llobregat Valley
5. Upper Llobregat
6. Ripoll Valley
7. Besòs Mar Area

Fig. 34. Circular economy strategic plan for the AMB. *AMB-Strategic Planning Area, 2017c.*

As regards diversity, this impact is related with:

- Rising temperatures, which will not cease. There are species that, therefore, whatever we do, will not stand the situation unless we manage to recreate their habitats. The management of the set of wetlands and dunes is fundamental, as is that of the rest of vulnerable habitats. Species will need to move in order to adapt, therefore we have to work on the whole of the "green infrastructure" and not only on the protected natural areas.
- Changing the conditions of habitats will make it much easier for invasive species to occupy and transform the land characteristics.
- In an environment as anthropized as the AMB, the capacity for managing the biodiversity of urban environments cannot be underestimated. A base plan should be developed for the management of Protected Natural Areas (ENP), green areas, trees and the biodiversity of the AMB using criteria of resilience and biophilia. On this basis, each AMB municipality, as Barcelona has done, could "join in" by detailing the most specific issues in its territory.

For owners, the maintenance of the forests presents the problem that, in most cases, it costs more than the income that they could obtain. Often, their only expectation is to convert them into land for development. Many of these areas are awaiting other uses, with the consequent danger of increased risk of fires.

In the case of territories that had formerly been growing areas for agricultural crops, these have become abandoned woodlands.

Metropolitan mountain agriculture needs synergies with other activities and the existence of a commercialisation channel that provides an outlet for its products. Only then will this activity be profitable.

Faced with the conceptual idea that advocates the increase and interconnection of the green land mosaic in order to increase biodiversity, it has been shown that the introduction of mountain agriculture, in coexistence with agroforestry exploitation and the generation of smaller mosaics, favours an increase in biodiversity and, at the same time, is economically feasible (AMB-Strategic Planning Area - IERMB, 2016).

From this dimension it is possible to identify a set of objectives with verifiable and measurable milestones for a strategic period in order to achieve ecological integrity and resilience of the representative elements of biodiversity, mitigate threats, minimise potential impacts, strengthen ecosystem services, human wellbeing and risk management, and to act as soon as the first signs alerting to climate change are seen.

From the perspective of resilience design, and taking into account the dynamic nature of the changes and the uncertainty regarding the effects of climate change, adaptive management is more important than protection. This involves flexible frameworks for the management of protected natural areas (ENP) and coordination with the management plans for green areas, trees and biodiversity of the different AMB municipalities, based on the definition of a basic plan for the overall metropolitan green infrastructure and for its municipalities.

In addition, as a mechanism for resilient management, there is the possibility of implementing the model of land stewardship in protected natural areas and in agriculture, which has two main objectives in the mountain territories:

- Forestry promotion and management (associated with a reduction in fire risk).
- The promotion of urban stewardship as an instrument for the promotion of agro-forestry farming operations.

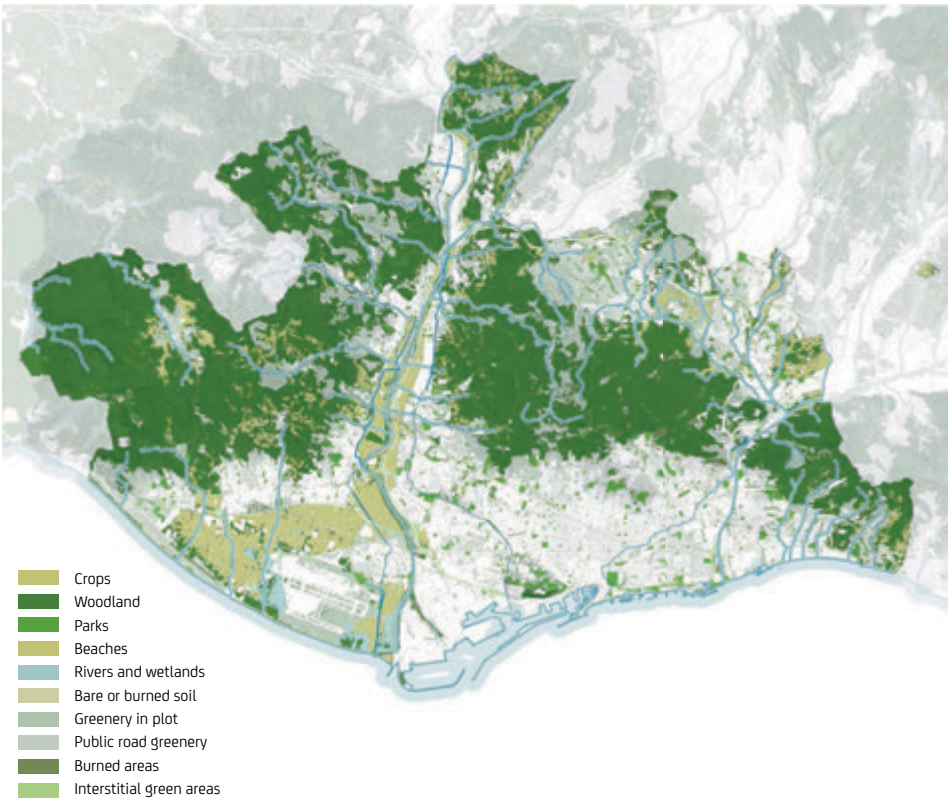


Fig. 35. The components of the green infrastructure of the AMB. *PDU*

Risks due to failure against climate change: need for green infrastructure management

These risks present a window of opportunity for the management of the green infrastructure, given that they enhance the value of ecological services.

The green infrastructure system will have to pay special attention to:

- The system for alerting to emerging pests and diseases.
- Adaptation to emerging animal diseases caused by climate change.
- Man-made interactions with the green infrastructure in a scenario of climate change.
- Environmental adaptation to climate change of plant matter.

It is necessary to have detailed knowledge of the impacts that climate change has on forests and agriculture, impacts that are principally focused around:

- The increase in temperature and variations in rainfall patterns, which affect the forests and agriculture differently.
- The increase in forest fires.

In the case of the latter, it is essential to analyse comprehensive management models in Mediterranean agroforestry systems to increase their ecological value and minimise risks. The AMB, through MedCities, could introduce monitoring programmes and exercise a certain leadership in the Mediterranean metropolises.

The analysis aims to develop planning tools in order to incorporate adaptive management measures for the different types of forests in the face of new needs for evapotranspiration, increased temperatures, new rainfall patterns and changes of species better adapted to climate change. We would add the evaluation of surface run-off for the different types of woodland and the defining of strategies for the promotion of species and for the maintenance of the forests that limit this.

The AMB should establish specific programmes for the Collserola Park, the mountain area of the Baix Llobregat and the Montnegre-Corredor.

In the case of metropolitan agriculture, the first key element must be the regeneration of small-scale farmers with generational change, which will produce, undoubtedly, significant changes in the metropolitan farming population. From a perspective of resilience, it is necessary for the metropolitan agricultural system to adapt to this fundamental change.

The risk of climate change, and also that of food sovereignty, could represent a window of opportunity. The adaptation of agriculture to climate change will be closely linked to water

stress, which will make it obligatory that special attention is paid to water management in the Agricultural Park and the generation of irrigation systems adapted for mountain agriculture.

Moreover, it will be fundamental to optimise the adaptability of agricultural systems to climate change through strategies for the management of land, organic matter, and crops especially adapted to the new climate conditions.

We consider it especially important to establish a lands bank policy to ensure generational change-over in the case of the Agricultural Park, as well as an infrastructure project for the irrigation system that is combined with the introduction of the system for renewable energies and that of regenerated water.

In the case of mountain agriculture, priorities include the project for the reuse of forestry matter for biomass energy projects (boilers for facilities) and the development of profitable agroforestry experiences associated with the maintenance of biodiversity. The land stewardship network will have to emerge as a fundamental instrument for resilience and will have to permit the fight against forest fires through the management of silvopastures, meadows and livestock.

In the climate change scenario, it is necessary to be able to evaluate changes in the productivity of woodlands in order to develop and apply forestry growth models in different situations of climate change. Furthermore, it will be necessary to identify and map the most vulnerable forest territories with the aim of establishing priorities for the selection of seeds of native species adapted to the environment. Territories for special intervention will be Collserola Park, the mountain area of the Baix Llobregat, the Serralada de Marina Park and the Garraf Nature Reserve. It will also be necessary to establish coordination mechanisms with the management of the natural areas of flora within the AMB area, but maintaining a continuity of ecological corridors, especially the Montnegre-Corredor (between the Maresme and the Vallès) and the agroforestry areas of the Vallès.

Risks due to failure against climate change: need for coastline territory management

The coastline territory presents a competence problem where the possibility of resilience is associated with the management of areas that are the under the ownership or competence of the Generalitat of Catalonia or the Spanish Government and where a political lack of action is causing serious effects for the AMB territory.

This lack of (external) coordination makes necessary better “internal” coordination of the coastline municipalities of the AMB to join forces and exploit the possibilities for adaptive management of the effects of climate change along the coast of the Barcelona metropolitan area. These effects are related with erosion, gradual flooding due to rising sea levels, saline intrusion, floods as a result of storms and the effects of floods caused by rainfall.

Phenomena such as coastal erosion and the receding coastline are linked to the management of coastal sediment cells and the defence of the coast. Their area exceeds the municipal and metropolitan boundaries, therefore they must include pluri-municipal beach policies. It is necessary to seriously reconsider new alternatives, prominently including the introduction of mass sediment storage or the establishment of submerged walls with different types of materials that slow down erosion and regression.

The efficacy of these systems must be accompanied by the reinforcement of the dunes, which will reduce erosion due to the action of the wind, the protection of infrastructures (protection of the marine outfalls on the Western coastline) and the Programme to reduce the salinity of the aquifers of the Llobregat Delta, including the Agricultural Park. This would not only achieve a higher capacity for resilience across the set of systems linked to coastline dynamics but, something which is also quite important, an increase in ecosystem benefits for the population.

Resilient coastal management forms part of or, if preferable, must be coordinated with, management of the green infrastructure/biodiversity, climate change and saline intrusion.

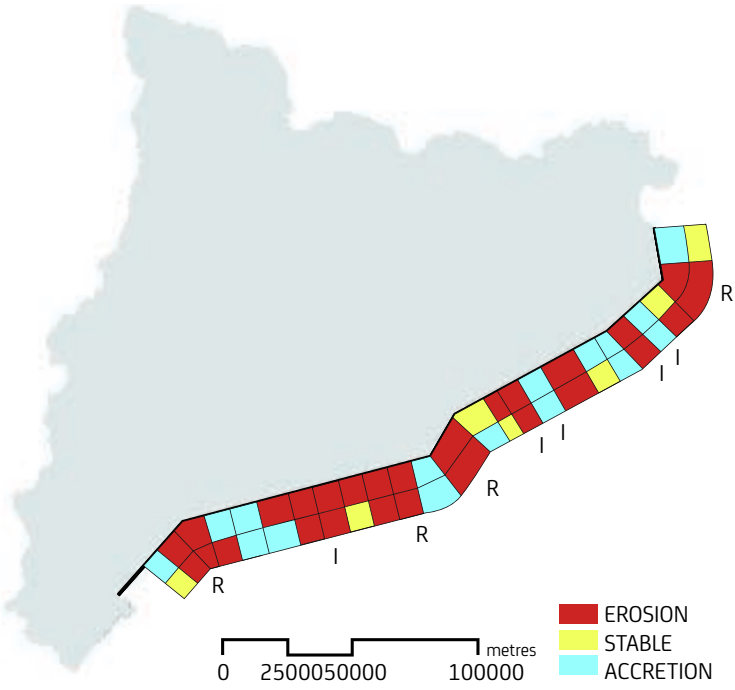


Fig. 36. Behaviour of the coast in the medium term (1958-2001) and within a scenario of climate change (2050). I (intensification): designates coastal sections where the effects of climate change intensify erosion. R (reduction): corresponds to coastal sections where the effect causes a reduction in erosion. *Casas-Prat. M & Sierra, J.P. (2012).*

Risks due to failure against climate change: need for synergic management of water and energy

We need to better manage the river basins and be capable of storing water beyond the current reservoirs. In the same way that there is a management system for water under low pressure to the network, it is possible to generate a parallel system of water under high pressure combined with a water pumping system and consider a double system of potable water and regenerated water.

The following measures are proposed:

- Development of an alert system in the face of possible environmental emergencies occurring at wastewater treatment plants.
- Computerised platform of flood risk notices and generation of automatic alerts.
- Development of a network for monitoring of sewer system overflows (DSS) and diagnosis of the environmental impact that they cause.
- Adaptation of the urban sewer networks through implementation of sustainable drainage systems in urban areas.
- Promotion of self-protection plans for cases of flooding in local organisations.
- Drafting of preliminary projects/projects for the recovery of riverside areas as a strategy for conservation and reduction of the impact of flooding.
- Evaluation of water resources derived from climate change scenarios and the model for exploitation of demand, in the real dimension for the management of a water system which is, at least, that of the Barcelona metropolitan region and the Llobregat River basin.
- Management plan for water demand that takes into account the introduction of regenerated water, the transfer of resources between groundwater, reservoirs and surface waters, and the combination of industrial and agricultural tap water (especially the Agricultural Park), in the real dimension for the management of the water system which is, at least, that of the Barcelona metropolitan region and the Llobregat River basins.
- Expand and consolidate the strategy for the return of water to the River Ter system and progressively reduce the transfer towards the Barcelona metropolitan region.

In all this, special emphasis will be placed on the synergy between water and energy and the introduction of renewable energies associated with them.

Risks due to failure against climate change: minimising its effects on the population

ADAPTATION OF THE GREEN INFRASTRUCTURE

If we want to minimise the effects of climate change on the population in the industrialised area, it is essential to extend greenery in the dense and compact territory, especially in the conurbation. The management of green spaces that the AMB carries out in its metropolitan parks system is notable.

The fight against climate change represents a window of opportunity because the management of the AMB green infrastructure is not restricted to the mere management of parks, but also a management of green infrastructure that re-conquers the urbanised territory. It is necessary, therefore, to increase collaboration between the services of the AMB and municipal services.

Firstly, it is necessary to propose the creation of a mesh of green corridors that goes beyond the ecological corridors and extends a true network of streets that play the role of green corridors, especially in territories with greater transit and less greenery in the metropolitan conurbation (see Fig. 37a and Fig. 37b). Secondly, a Roofs Plan, according to the typology of fabrics and the territorial location, that can help reduce the heat island and mitigate both the effects of the increase in temperature and the adaptation to such an increase. It must also help the creation of productive agricultural spaces that strengthen food sovereignty. Schematically, we could say that the conurbation would have to deploy a Metropolitan Green Plan and that the territories would have to recover and preserve metropolitan agriculture.

As we said previously, this is a Metropolitan Green Infrastructure Resilience Plan combined with an increase in biodiversity that should consist of three coordinated packages:

- Protected Natural Areas (ENP), rural land, agricultural land, woodlands and wetlands.
- Coastline.
- Green Zones (ZV), trees and biodiversity.

We should congratulate the Urban Master Plan (PDU) in terms of its quality as a general strategy. However, how does it match up to this reality? How can we get it to happen? How does it need to be managed?

It is decidedly too great a task for the PDU which, furthermore, would have to undergo revision each year according to the fulfilment of the objectives.

Everything needs to be more dynamic, and this is the type of work that will be done by the AMB's Resilience Lab.

In the case of the green corridors network, the proposal is:

- To create a network of green spaces, formed by parks and green routes, that limits the effects of rising temperatures, especially in more dense and compact fabrics.
- To establish a blue infrastructure network in the same fabrics we have just mentioned.
- To establish a network of green corridors that connects natural spaces: rivers and parks.

It is essential to give priority to the production of green roofs in residential areas and not to photovoltaic panel roofs (see Fig. 30 and 37a).

As we have already indicated, it is necessary to formalise, through planning ordinances (PDU), the establishment of criteria for the use of building roofs, with the following order of priority:

- Green roofs to control the heat island.
- Productive green roofs.
- Blue roofs for holding water.
- Roofs with solar panels for domestic hot water (ACS).
- Roofs with photovoltaic solar panels.

MEASURES FOR THE PRESERVATION OF RESIDENTIAL, ECONOMIC AND TRANSPORT ACTIVITIES

Faced with the risk of climate change and the effects of peak oil, it is essential to prepare the residential fabric and economic activity spaces with constructions that are more passive and less energy-consuming. And the energy needs to be renewable.

In this direction, we propose the following measures:

- A roadmap of innovative management models for adaptation to climate change for private housing based on the experiences of Santa Coloma de Gramenet (Regenerar Barris), Viladecans (UIA Vilawatt) and Barcelona (Neighbourhoods Plan).
- Extend, to the whole of the AMB, the strategies for the adaptation of public facilities to climate change designed by advanced municipalities (El Prat de Llobregat, Sant Boi de Llobregat, Sant Cugat del Vallès).
- A pilot project for energy regeneration in neighbourhoods in urban environments, based on urban renewal policies led by the Metropolitan Housing Consortium.
- Pilot energy regeneration projects in economic activity areas in the PAEs (22@, Zona Franca Consortium, Polígon Sud, Carretera del Mig, Gavà industrial estates, Viladecans and Sant Boi, El Pla de Sant Feliu and Molins de Rei estates).

Having reached this point, we would like to repeat: the restriction of private vehicles will be the fundamental element for reducing GHGs.

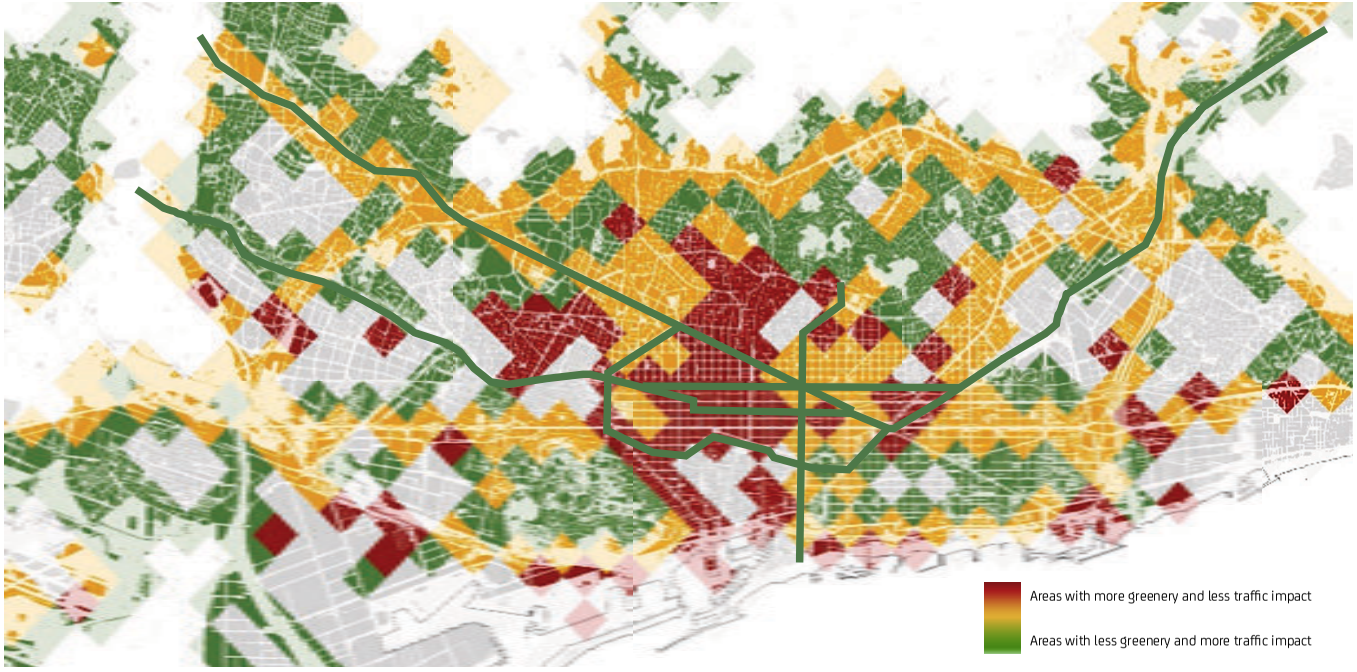


Fig. 37a. Areas with less greenery and greater traffic impact in the Barcelona metropolitan area. *PDU.*

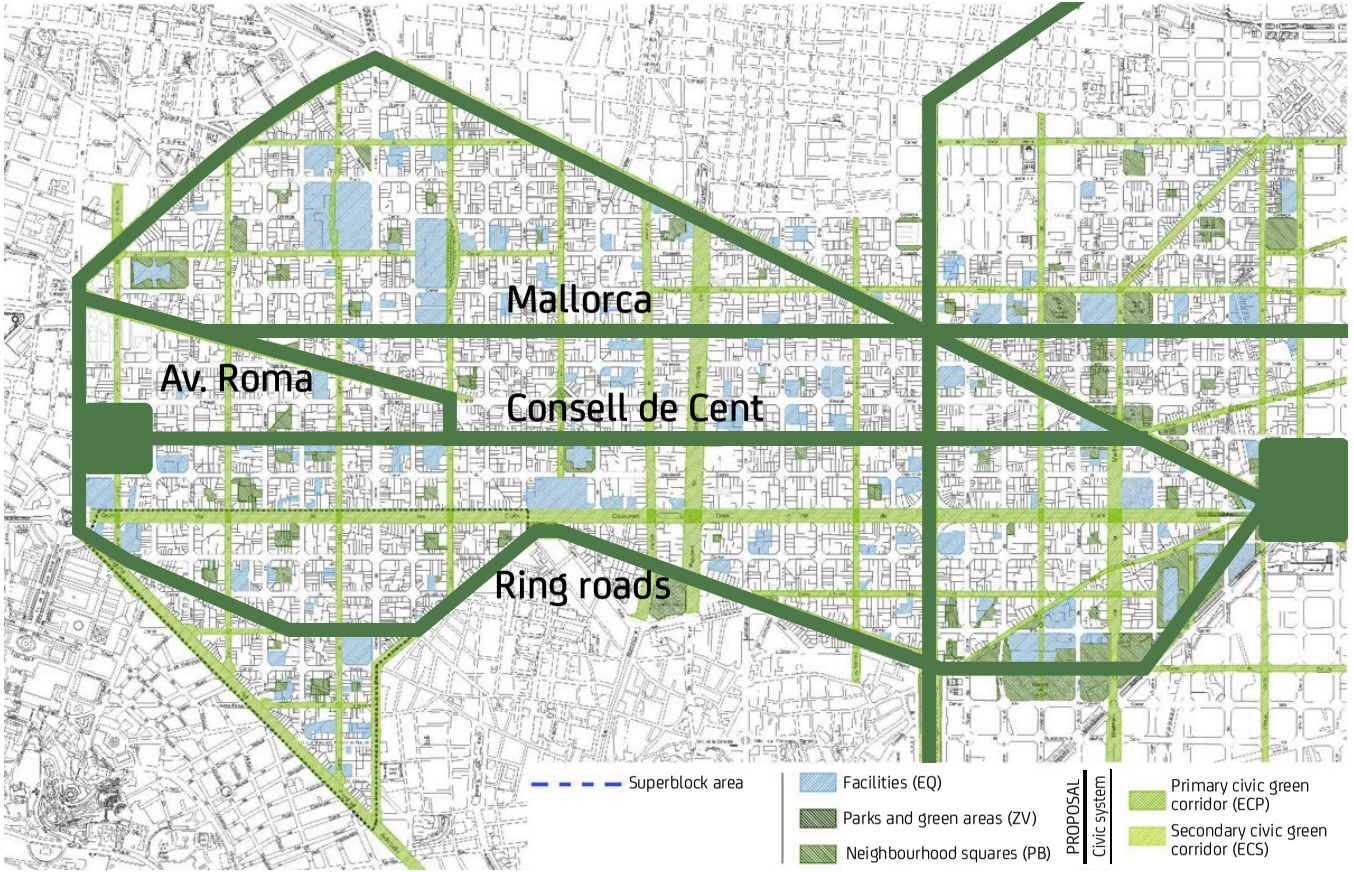


Fig. 37b. Civic green corridors in the Barcelona Eixample district. *Barcelona City Council.*

MEASURES FOR THE PRESERVATION OF THE POPULATION'S HEALTH

For territorial self-organisation with relation to health, as has been defined in section "Risks due to man-made actions which have an impact on health" on page 112, and for everything that affects the impact on the population, these measures must be established:

Develop new monitoring and information systems for the analysis of the consequences of climate change on human health through collaboration between the public health agencies of Catalonia, that of Barcelona and municipal departments.

- Develop, also, the surveillance to detect invasive vectors of human diseases.
- Monitor working conditions in extreme temperatures and the repercussions on the health of the working population.
- Improve monitoring of air quality and of tools for the evaluation of its effects on health.
- Monitor the risks of rising temperatures on the health of the population and establish a network of climate refuges, with measures for prevention, alert and monitoring of the most vulnerable sectors of the population in episodes of extreme heatwaves.
- Monitor the composition of pollen and the variation of pollination periods in relation to climate change.

Risks of failure against climate change: need for self-organised territories

We need to establish a certain perspective – in time and in space – and equip ourselves with new dialectics, tools and processes that are capable of articulating the changes inherent to the territorial system in order to adjust them to local needs, the result of human activity, in the light of their interrelations and unpredictable effects.

Complex adaptive systems share three fundamental characteristics:

- Foresight.
- Capacity for purposeful communication.
- Technological innovation.

Resilient adaptation in response to the effects of climate change and disturbances, is related with the system's capacity to repair itself and recover from upheavals and stress.

It is necessary to know how to learn and change.

Building resilience means, therefore, constructing a methodology for communicative narrative, learning and innovation. It means accepting that systems eventually come to have a capacity for recovery and revitalisation although, inevitably, they are transformed.

And the fact is that beyond recovering following a disturbance, even though it is clearly critical, the interest of resilience – against the interest of protection, mitigation and even adaptation – lies in the achievement of certain capacities that endow the system with foresight and self-organisation. This condition is a creative action with which skills are acquired and transformations generated. Transformations that, in themselves, lead to benefits, even if the disturbance never occurs or is not as it was expected to be.

It is what Judith Rodin, former president of the Rockefeller Foundation, defines as "the resilience dividend".

Managing the uncertainty around climate change represents a methodological transformation in the way of approaching strategic planning and in the design and development of the projects derived from it. This leads to moving from planning and design, as two separate processes, to planning through design as one iterative process. In other words, from planning, as a result of public proposals or scientific analysis, to planning as a tactical and experimental process within a strategic framework. Or alternatively, a political-scientific one. The problem that must be resolved by the planner, faced with the effects of climate change, is uncertain. Unknown. There is no single answer.

If we incorporate research through design, as a tool for the formulation of questions, we will open up new possibilities for strategic planning. The adaptation to climate change represents, therefore, the understanding of strategic planning as a set of experimental actions.

Innovation and technology merge through collaborative design and again reconcile that old separation between research and design, science and humanities. This is how, faced with the effects of climate change, resilience becomes a true driving force for physical and social transformation. This is why future scenarios no longer base themselves on the assumption of technical budgets, contrasted with historical data or trends. This is what happens in the generation of hypotheses, which take on form through projects of new socio-ecological landscapes capable of evolving, learning, self-organising and changing.

The emulation of forms, processes and natural systems has become a tool for creativity and technological innovation. Architects, urban planners, engineers and landscapists, among others, have expanded their fields of operations and their creativity. In light of climate change – and of its effects – they have imagined the city in relation to nature.

There are increasing numbers of projects that incorporate natural processes and strengthen, therefore, the logics of place and renew regional and urban systems.

The construction of generative landscapes based on cycles, processes and flows of nature goes in this direction. The Dutch call it "building with nature", but it is possible to find similar concepts the world over. Concepts that work on the intersection of physics, ecology and governance as mechanisms of adaptation to the effects of climate change:

- Ecological engineering.
- Ecosystem-based management.
- Working with nature.
- Natural-based structures.
- Socio-ecological resilience.

All of them, with their individual nuances, logically, participate in the same philosophy. Everyone is pursuing the construction of landscapes (physical and social) as models of organisation, infrastructure and sources of evolutionary resources between communities and their environment. These exchanges have results, effects and performances that are made manifest through their metabolic services.

When it manages and calibrates these exchanges, design becomes the director of production capacities and the configurer of a legible register of complex and dynamic socio-ecological landscapes.

The risks of climate change and peak oil, as well as the social and economic risks of a long period of social, economic, environmental and governance crisis, make it obligatory to find new forms of governance that go beyond the studies and technocratic measures of different fragmented authorities (municipalities, comarcal regional councils, provincial council, Generalitat Government and the AMB itself).

It is necessary to reinforce, firstly, a better knowledge of the systemic interrelations of the effects of climate change and peak oil, which become windows of opportunity for a new system of metropolitan governance that moves up a level and has the possibility of double movement (top-down and bottom-up). And it is also necessary to incorporate initiatives that reinforce the creation of socially responsible territories so that they can unite in joint action between the administration, the university, the research centres, the business sector, the working world and the social and environmental third sector. It is necessary, in short, that together they design metropolitan policies.

The AMB can play a key role in developing and strengthening territorialised proposals with the political support of its mayors. It currently has access to a set of instruments that have not been much used. It is necessary to develop a participatory process when approving the PAM, which is the main element for the establishment of metropolitan policies. And it must have the support of the Council of Mayors, focused on specific issues, requested by the Metropolitan Council or the metropolitan government. These issues must be discussed and validated in the Councils of Mayors. Everyone must participate in giving real impetus to this new governance.

To prepare for this scenario, from the Strategic Planning Area, a series of metropolitan narratives have been developed, and in parallel, a Programme of Metropolitan Resilience is proposed that will lead to the emergence of metropolitan policies from the risk analysis already proposed previously.

3. METROPOLITAN GOVERNANCE STRATEGIES

Need to organise metropolitan actions based on risks: metropolitan narratives as a strategy

If we want to move ahead with a set of strategic policies in a resilient territory, we have to commence with a first global narrative.

This is the aim of this text, to make an initial and organised DIAGNOSIS around the risks, to establish a REFLECTION on the metropolitan system, considered an as a complex adaptive system that requires territorial and governance positioning and, from there, to establish a STRATEGY to define, subsequently, a set of METROPOLITAN ACTIONS that will need to be carried out.

This procedure is what configures DREAM (acronym from the Catalan words for DIAGNOSIS, REFLECTION, STRATEGY, METROPOLITAN ACTIONS), made up based on the different risks.

An open series of metropolitan narratives has been organised; these are designed to be the seed of future policies for the metropolis.

It is proposed to develop different narratives that are based on a resilient diagnosis of the risks and that help to configure metropolitan strategies based on a series of actions that are already being carried out and that will be the basis for defining future strategic policies.

In this phase, one of the central considerations of the strategic planning aims to propose those strategic pillars that, in the near future, must lead us to the definition and territorial distribution of a set of metropolitan policies. Furthermore, in this phase of development of the metropolitan PDU, a prior definition of some strategic pillars for a metropolitan policy is essential.

We consider that this reflection was limited to the period 1987-2010. In the previous term of office, 2011-2014, the focus was on drawing together the practices of the different services (Metropolitan Strategic Reflection). In this term of office, however, we want to take a step forward in the definition of some pillars of metropolitan policies, based on the narrative of the PAM and the specificities of each territory, which were observed in the participatory process of the PAM.

We have the studies that have been commissioned, in collaboration with different AMB areas, and the studies produced by the IERMB within the framework of the programme contract and the different reflection committees of the Strategic Planning Department. And also of the Platform of the participatory process of validation and monitoring of the AMB's PAM 2015-2019.

Ordering the narratives around the risks diagram we can establish and organise the different actions in the territory. To define them we have started off with the strategic lines of the PAM, reorganising them in line with SWOT analysis and considering the different risks. We develop them in greater detail for each issue, in common agreement with the metropolitan services concerned and the corresponding AMB areas.

The whole of the first list of DREAM narratives is no more than a first strategic reflection for the future construction of metropolitan policies in a resilient territory.

Risks due to lack of transparency and good governance

The AMB is a local, second-line authority, and it can end up hidden if there is no political control and monitoring by mayors, technical officers and essentially, by the organised population. It must have, therefore, easy access to the information generated and ensure good administrative government.

The Transparency Agency has been created, in the new AMB government's term of office, as a service for strengthening transparency and good governance. Its mission is to be an instrument at the service of the Metropolitan Area of Barcelona, and of the linked organisations and service providers, that has to promote transparency and good governance as an integrated process over the course of the management cycle of metropolitan public activity.

Its functions are promoting and coordinating actions to encourage transparency through training, creation and adaptation of internal protocols, construction of new indicators, strengthening of public ethics and cross-cutting work with public and private actors.

The Transparency Agency is aware of the need, as demanded by the legislation, to construct a process itinerary for the implementation of the new transparency culture. It prioritises, or should prioritise, a cross-departmental and participatory methodology that enables collective empowerment. In the same way, it must recognise the value of the contribution of all the public workers to this task.

The Agency bases its actions on a set of principles and values that define good governance and that emerge from the encouragement of personal commitment, first and foremost, and are reflected in the corporate team work ethic.

- Legality: commitment of interest, knowledge and promotion of diligence in compliance with the regulations.
- Responsibility: assuming of obligations and challenges of the application of transparency and good governance, promotion of professionalism and services of quality.
- Integrity: individual actions and services that will be based on values of independence, honesty, loyalty, respect and firmness in actions.
- Accountability: commitment to release information on public management and submit it for evaluation by citizens.
- Right to information: recognition of the legitimacy that corresponds to citizens with regard to being aware of the functioning and activity of public authorities.
- Objectivity: acting with impartiality and motivation of decisions, without personal, subjective or opportunistic considerations.
- Public ethic: service in the public interest and for the common good, applying values and principles that should serve as a guide for the administration.
- Gender equity: fair distribution of rights, benefits, obligations, opportunities and resources between women and men, geared towards equality, on the basis of recognition and respect for differences.

The Transparency Agency is, obviously, a service that works to promote transparency and good governance of the Metropolitan Area of Barcelona, its linked organisations and service providers. It was constituted in compliance with the obligations envisaged in Law 19/2014 on Transparency, right to access to public information and good governance.

Thus, by promoting the culture of transparency and good governance in metropolitan public bodies, the Agency works to favour a new bond of trust and proximity between citizens and the metropolitan sphere.

It is vital to encourage co-responsibility in the public sector and the private sector, especially with regard to the management of services of general interest, mobility and supplies of energy, water and telecommunications.

The services of the Transparency Agency of the Metropolitan Area of Barcelona are:

- Promoting compliance with regulations on transparency, rights of access and good governance and collaborating in a specialised way.
- Coordinating all the actions and initiatives for transparency, rights of access and good governance internally or externally.
- Promoting research and ongoing training in transparency, rights of access and good governance as a metropolitan governance model.

- Guaranteeing constant specialisation in the processing of information on the Transparency Website and producing materials with accessible, easy-to-understand language criteria and maximum information, under the principle of accountability.
- Managing the Transparency Website in coordination with the IT services of the corporate website.
- Proposing protocols and collaborating on the development of protocols and reports for the development of the law and, especially, to guarantee the right of access to information.
- Monitoring compliance with the obligations established by the Transparency Law with relation to groups of interest.

The working groups facilitate participation, consensus and empowerment: horizontal transparency.

In this sense, the following working groups should be set up:

- Regulation of interest groups.
- Code of conduct for senior officials.
- Determination of these posts and of those responsible for the Transparency Law.
- Services of universal general interest.
- Transparency and public procurement.
- Protection of personal data.
- Conflict of interests.

Since it was launched, the Transparency Agency has created the Metropolitan Transparency Advisory Council, has developed the Demèter Programme for transparency in gender equity and has established parameters for monitoring information, active publicity and the transparency of the AMB (MIPAT), among others (see http://transparencia.amb.cat/web/finestres-de-transparencia/avaluacio).

Risks due to lack of technological sovereignty

Technology and the internet are transforming practically all sectors of society and the economy. And they do so in manufacturing, transport, energy, healthcare, etc.

These changes are so rapid that they enable us to find such surprising examples as:

- The biggest taxi company in the world has no taxis (Uber).
- The top provider of accommodation in the world has no properties (Airbnb).

- The biggest telephone company is not the owner of the telecommunications infrastructure (Skype).
- The top retailer in the world has no stocklists (Alibaba).
- The most popular of the mass media owners does not create contents (Facebook).
- The biggest cinema company in the world has no films (Netflix).
- The biggest programming suppliers in the world do not develop apps (Apple and Google) (see Barcelona City Council, 2018).

We are before a historical intersection of two great tendencies: the growth of urban development and the fast evolution of information technology.

The local administration of the AMB sphere is confronted with the urgent need to create urban innovation strategies that promote development of the new economy and that at the same time mean major social benefits. Our institutions, and the social and economic sectors, are also changing. The existing institutions, however, do not seem capable of creating the conditions necessary to tackle the crisis and a lack of trust among citizens is noticeable, along with a crisis of political legitimacy and the growth of Internet values among young people. The social contract between men and women citizens, businesses and governments are suffering a radical change. A whole series of new regulations and models of government and wellbeing are needed.

In this new global environment, the priority of the Barcelona metropolitan area is to go beyond the simple construction of a smart city. In fact, becoming an open, equitable, circular and democratic city, that takes advantage of opportunities for innovation, based on data to improve the city and the lives of citizens. The ambitious and responsible commitment is to focus on the real challenges that these manifest and centre efforts on the providing of updated public services of higher quality, with the impetus for a more sustainable and collaborative economy, and the encouragement of public talent and empowerment of citizens.

The AMB would have to lead a transition towards technological sovereignty. Sovereignty of the government and of citizens that enables priorities to be decided and acted upon, regarding the use of technology in the city. That enables decisions to be made on how it is developed in the towns of the metropolis, that enables recovery of knowledge on the management of the metropolitan city with technological tools. And this knowledge has often been in the hands of a reduced number of companies.

And, finally, we can talk about a sovereignty that enables this knowledge to be left as a legacy for the metropolitan city. In addition to being promoted with open standards, it has to be a tool for the common good. It has to generate a new economy and share knowledge with other metropolises.

From an economic viewpoint, an inclusive public innovation strategy needs to be orchestrated, with a broad-ranging participation of key actors in the city (industry, academia, research centres, citizens, developers, social entrepreneurs, cooperatives, local services providers, etc.) that contribute to the dynamization of the innovative digital ecosystem.

With the most adequate public policies, technology can be the force that enables more equitable and sustainable economic growth, and ensures leadership in urban technological innovation, technology and data sovereignty, democratisation of access and ownership, protecting the rights and privacy of citizens, autonomy and self-determination with regard to information.

The AMB would have to generate a new force and a vision where technology is an instrument for the people and the metropolis.

In a metropolitan city that is truly democratic, citizens must be able to make use of a common knowledge asset – open data and the city's infrastructure of public information – to have better access to public services and, therefore, a better quality of life.

Innovative bottom-up processes have to permit the attraction of talent, active participation of citizens in the resolution of the city's challenges and the empowerment of people for the challenges brought by the new global environment.

Today, cities have more data than ever before (90% of the data they have now did not exist three years ago). This is information that is not organised nor easily accessible. One part is found online, but much of what is not is divided between the numerous departments and companies that make up a town council.

The priority of the metropolitan government should be taking advantage of the power of technology and digital innovation so that it benefits all citizens, improves employment and develops a more sustainable and collaborative economy. It is necessary to create incentives for the urban innovation ecosystem by facilitating access to SME, cooperatives and social entrepreneurs so that innovative solutions can be built. And new jobs.

Looking objectively at professional employment in the technology sectors, we can say that in the year 2015, in Barcelona, 42,437 Social Security affiliates worked in ITC, 13.7% more than in the previous year. And the number of companies was 1,987, some 4.5% more than the fourth quarter of 2014.

However, the creation of jobs, both by these companies, which are truly small in size, and through self-employed people and start-ups, is not homogeneous. According to the European Commission, the number of jobs for highly qualified people will increase by 16 million over the course of 2020. In contrast, the number of jobs occupied by low-qualified workers

will fall to around 12 million. The Commission adds that economic rebalancing can only be achieved by improving digital literacy and education, and promoting the integration of science, technology, engineering, art and mathematics (STEAM).

There is a lack of profiles to cover these needs. And to reinforce training in all these spheres, from the classrooms to the professional sector. In fact, EUROSTAT estimated, in May 2016, that 21 million Europeans were unemployed. In parallel, 40% of European employers stated that they could not find people with the knowledge and the skills adequate for growing and innovating.

Consequently, it is necessary to undertake actions to balance this out. It is evident. Our objective, therefore, must make it clear that if we implement networked technologies, in the urban environment, we will go beyond instrumentalising the city with technology, sensors and actuators. Furthermore, there is another, even more ambitious objective: tackling social urban challenges, in the long term, such as wage inequality, climate change, the scarcity of natural resources and employment. And it must be done by involving the population through participatory, bottom-up processes.

We have to develop a metropolitan agenda that is open, equitable, circular and democratic, that takes advantage of opportunities for innovation – based on data – in order to improve the cities and the lives of their citizens. If digital cities are built without actively involving citizens and communities, failure is assured.

There are two significant projects in the Metropolitan Area of Barcelona: Barcelona Digital City, organised around the Municipal I.T. institute and Barcelona City Council's Technology and Digital Innovation Commission, and the Citilab Centre, led by Cornellà de Llobregat Town Council, which has established stable collaboration relationships with other AMB municipalities.

Barcelona Digital City proposes that technology and digital innovation facilitate a set of public policies that are equitable and efficient, geared towards better covering the needs of citizens and strengthening their capabilities. The intention of Barcelona Digital City is to give shape to public services of greater quality, with an optimum budget allocation and the use of public resources and talent.

It is organised into three core areas:

1. Government and metropolis

Technology for transformation and public innovation. A more open and efficient government must be based on what has been initiated by the AMB municipal councils and seek better coordination.

It is necessary to develop a technology for public transformation and innovation and a more open and efficient government.

The objectives that need to be developed are:

- Guide digital transformation and innovation in the public sector, establishing standards of service focused on users that are "digital by default" and are based on open source and open standards principles, and developed based on flexible methodologies.
- Ensure that the metropolitan city has access to city-scale digital technologies necessary for facilitating the tackling of the main urban challenges: housing, unemployment, social exclusion, energy and mobility.
- Improve services (access to housing, health, energy, mobility, etc.) making a more democratic and accessible use of technology.
- Develop a data infrastructure for a public, open and distributed city. And develop, also, a data strategy that involves citizens, developers, SME, businesses, the third sector, universities, and research centres.

2. Companies and social organisations

The development of the digital socioeconomic fabric and of the local innovation ecosystem is essential.

The objectives that must be developed are:

- Promote and strengthen the ecosystem and the digital and innovative economic fabric.
- Reinforce local cooperation in order to facilitate a plural economy – that includes collaborative economies – and transformation and social return: social and digital innovation.
- Facilitate the access of SME to public procurement.
- Promote the creation of quality employment.

3. Citizenship

The empowerment of people is essential, which must be materialised in:

- Making available a broad offering of digital education and skills training that is personalised for the different collectives (inclusive, professionalising, occupational, city-wide).
- Developing talent with a view to the employment of the future, for the employment of the 21st century, also making use of technology in order to better match employment supply and demand (big data, data mining or business intelligence of the labour mar-

ket, the necessary qualifications and other elements that help to design active employment policies).

- Facilitating an active and participative democracy, encouraging the exchange of talent in communities and public forums.
- Increasing the digital sovereignty of citizens in the metropolitan city of Barcelona, improving their technological awareness and defending their rights and digital liberties.

AND YOU, WHAT DO YOU WANT TO DO?

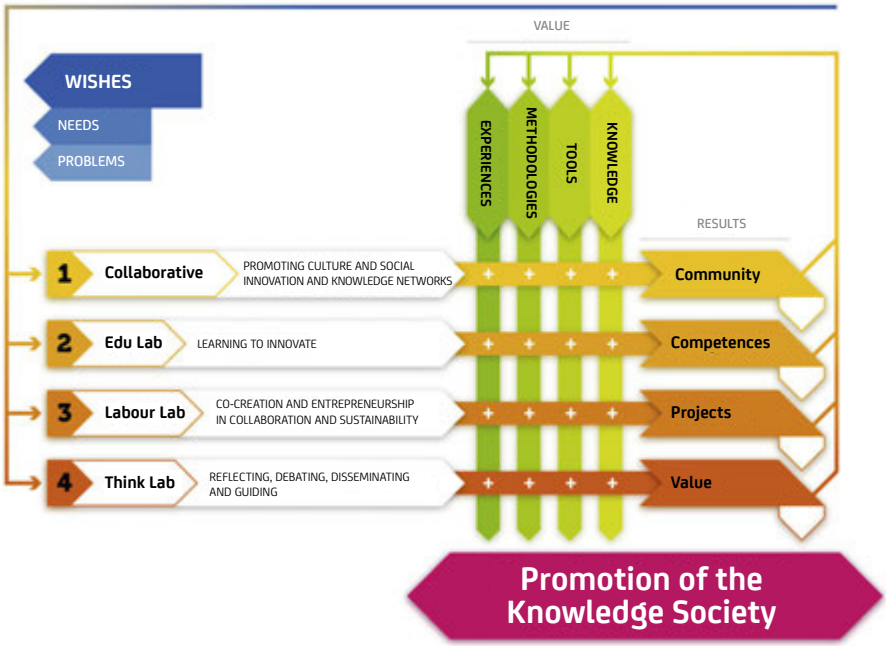


Fig. 38. Citilab organisation diagram. *https://www.citilab.eu/qui-som/laboratori-ciutada/*

Citilab is a citizens' laboratory for social and digital innovation. In Cornellà de Llobregat and Barcelona it explores and disseminates the digital impact on the creative thinking, design, and innovation that come from digital culture. It is a mix of training centre, research centre and incubators of business and social initiatives.

Since the year 1997, and especially since 2007, when a specific facility was inaugurated, Citilab has promoted its activity as a digital centre for innovation for the dissemination and promotion of the knowledge society. Its basic working methods are those of the living lab:

- Design-based thinking.
- Computational thinking.
- User-centred co-creation.

At Citilab, the Internet is considered a means for innovating in the most collaborative and integrating way possible. And it does so by putting the citizen at the centre of the process.

Citilab is a driving force – and benchmark – for a new inclusive and cohesive knowledge society. It encourages technological and social innovation and creates value, knowledge and new networking opportunities.

Its mission focuses on:

- Promoting the knowledge society, disseminating new technologies and new relationships between society, art, science and ICT.
- Informing the public on the latest online technological innovations in all their manifestations.
- Maintaining social cohesion within the digital culture and facilitating democratic access to information.
- Encouraging the use of new technologies.
- Promoting and developing all kinds of training actions.

The risk of the lack of technological sovereignty is a window of opportunity to share these municipal centres and other local area experiences. This could establish a metropolitan governance around digital technology and business and social innovation in the territory.

Risks due to lack of strategic territorial planning

To date, the approach in the development of the Urban Master Plan (PDU) considered it a necessary administrative document that had to remain open in order to include future initiatives and set it in a physical frame.

First, however, in the PDU it is necessary to specify a set of strategic territorial planning options based on which we will frame both the PDU and the future PGMB. From the angle of resilient strategic planning, it is necessary to define in advance an entire series of metropolitan strategic plans for the AMB that condition the urban planning proposals and predefine the PDU.

These plans must consider, among others, the following questions:

- Monitoring of the residential mobility from the Metropolitan Housing Observatory. Development of the PDU and of the PGMB based on strategic metropolitan planning.
- Reinforcement of the dynamics of socially responsible territories at different scales (neighbourhoods, municipalities, AMB sectors, AMB as a whole).
- Reorganisation of the AMB based on strategic planning: economic activity, social inclusion policies, transport, water cycles, energy and materials (waste-resource), open spaces (biodiversity and urban agriculture), governance and internationalisation.
- Introduction of an AMB metropolitan neighbourhoods policy as a metropolitan policy of urban texts. Development of the PDU and of the PGMB based on metropolitan strategic planning of housing.
- Introduction of a metropolitan policy of economic activity estates. Introduction of territories with equalisation of economic activities.
- Introduction of a metropolitan green infrastructure policy. Possibility of implementing the land stewardship model in protected natural areas and agriculture. Adaptation to climate change and preservation of biodiversity.
- Adaptation of the organisation of the EMT, from 18 municipalities to 36, according to the AMB Law. Approval of the PMAMB. Introduction of a metropolitan sustainable mobility operator that will manage a graph, a matrix and the management of strategic studies.
- Monitoring of residential mobility from the Metropolitan Housing Observatory. Development of the PDU and the PGMB based on strategic metropolitan housing planning.

THE NEED FOR A LEAP, BEYOND A MUNICIPAL VIEW OF BARCELONA, TOWARDS THE REORGANISATION OF THE CONURBATION OF 3 MILLION INHABITANTS

Barcelona has leaped over some thresholds on the basis of transport and urban services. The Cerdà Plan represented a leap beyond the walled city.

We have explained that the consolidation of the water, gas and tram services established the union of municipalities in the Plan of Barcelona, which was consolidated with the unification of the municipalities in 1897, and it culminated in 1922 with the joining of Sarrià.

Years later, after the Civil War, and within the perspective of the immigrations of 1950-1970, a comarcal regional leap was proposed with the Comarcal Region Plan of 1953, which would become consolidated with the joining of 26 municipalities around the PGMB of 1976. On this basis, in the 2003-2010 period, a territorial planning based on the services around the districts began. In the case of the Metropolitan Corporation of Barcelona of 1974, with 26 municipalities, the PGMB of 1976 and, subsequently, the AMB Law of 2010 with 36 munic-

Main routes for circulation in horse-drawn carts, stagecoaches and Ripert omnibuses
Railway lines
Railway stations
Ephemeral river courses
Bridges

Urban development in 1860
Urban growth up to 1878

Railway
New underground railway
Animal-drawn trams
Bridges

Urban development in 1878
Urban growth up to 1897

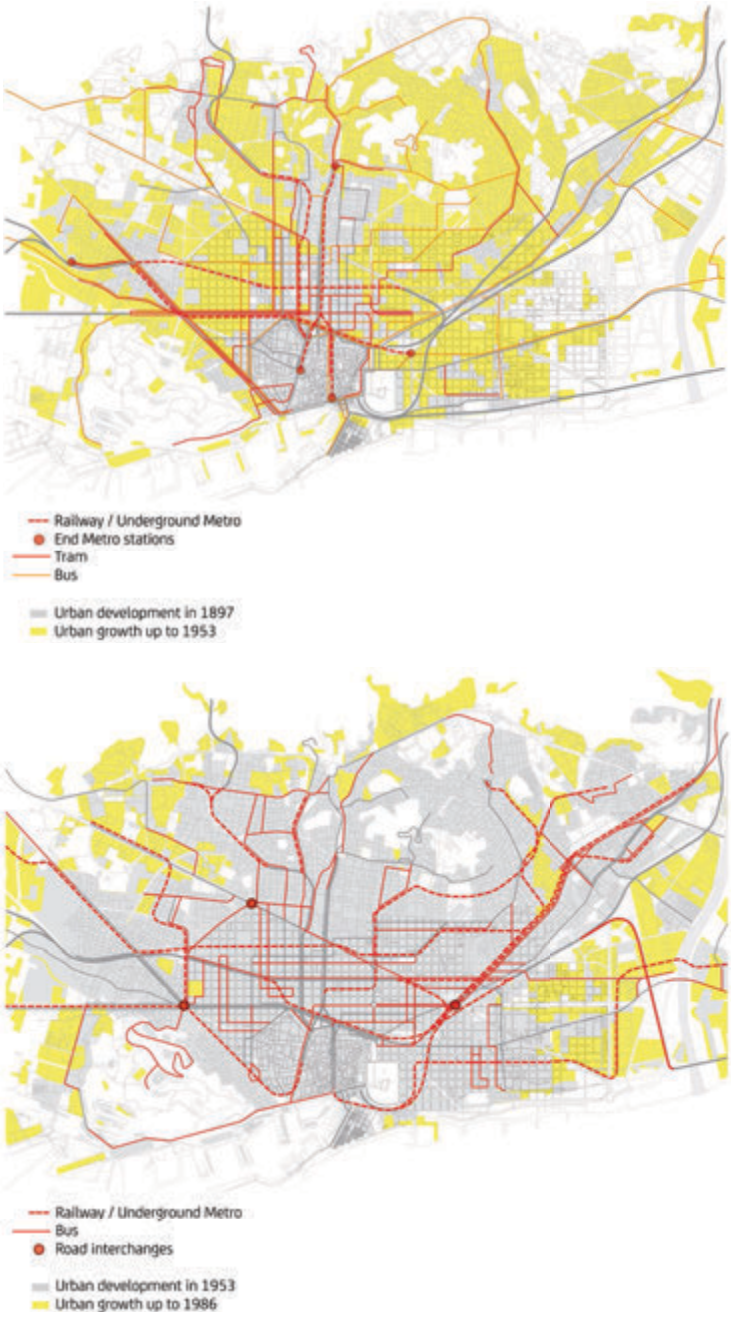


Fig. 39. Periods of transformation in the case of Barcelona. *Magrinyà & Marzà, 2009.*

ipalities, a territory has gradually been configured with increasingly well-equipped municipalities. Similarly, the metropolitan services articulated around water, waste and mobility services have also improved.

In this period, and understanding that every urban system has a centre and a periphery, in the case of the AMB it is articulated around a conurbation and a set of metropolitan corridors. Once the Zona Franca and the Besòs river bed have been developed, the municipality of Barcelona has reached its limit of occupation.

Increasingly one can see more clearly a space that has been structured by the extension of the Metro (L9 and L10) and the tram lines (Tram Baix and Tram Besòs). A territory defined by the municipalities of Barcelona, Sant Adrià, Santa Coloma de Gramenet, Badalona and Montcada (on the Besòs side) and L'Hospitalet de Llobregat, Cornellà de Llobregat, Esplugues de Llobregat, Sant Just, Sant Joan Despí and El Prat de Llobregat (on the other side), define a space well connected with public transport (metro and tram) and with a potential for extension of the new bus network in this area.

It is the new metropolitan centre in a future leap over the threshold (see Fig. 40b and 47).

These conurbation centres have great potential for added-value activities which are currently highly concentrated in the municipality of Barcelona. But it needs to have a new structure, beyond the municipality of Barcelona, that enables it to redistribute the economic and fiscal structure currently concentrated in this municipality, for which reason we propose extending the planning of the new central areas of the municipality of Barcelona, planned in 1986, to the central areas of the Barcelona conurbation.

These nodal points are associated with public rail transport and must enable decentralisation of Barcelona towards the conurbation. We draw six new central areas, consolidated in Barcelona (Sants, Plaça Cerdà-Ciutat Judicial, Diagonal, Glòries, Sagrera and Diagonal Fòrum). In the new scenario, five new central areas would be added in the Baix Llobregat (Sant Feliu de Llobregat, Cornellà de Llobregat, L'Hospitalet-la Torrassa, Bellvitge-Gornal, El Prat de Llobregat) and five new ones in the Besòs (Montcada, Bon Pastor, Sant Adrià de Besòs-Tres Xemeneies and Badalona-Gorg).

They should be centres for metropolitan facilities, and for social and economic activity, with the virtue of minimising private vehicle mobility and, therefore, supporting a more balanced territory.

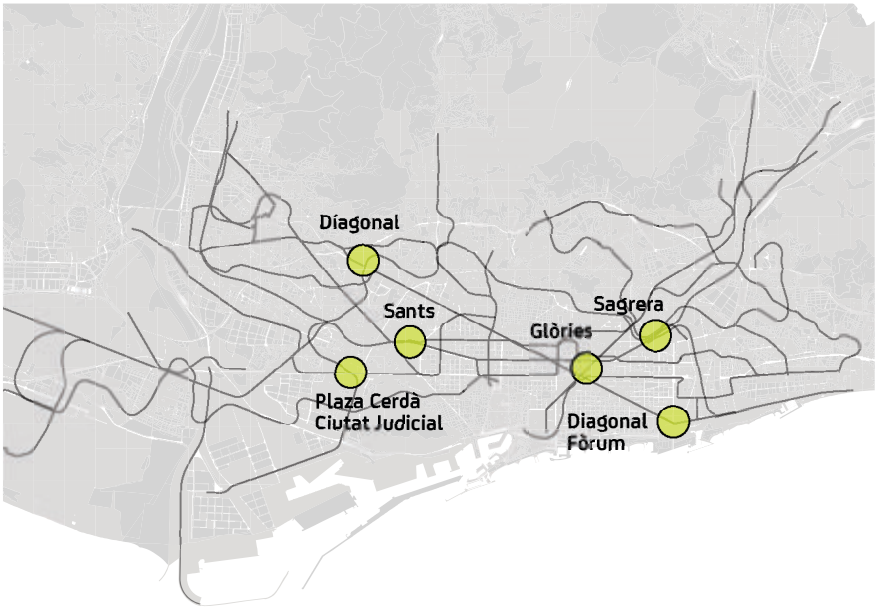


Fig. 40a. New central areas planned in 1986 and now consolidated. *Compiled by the author.*

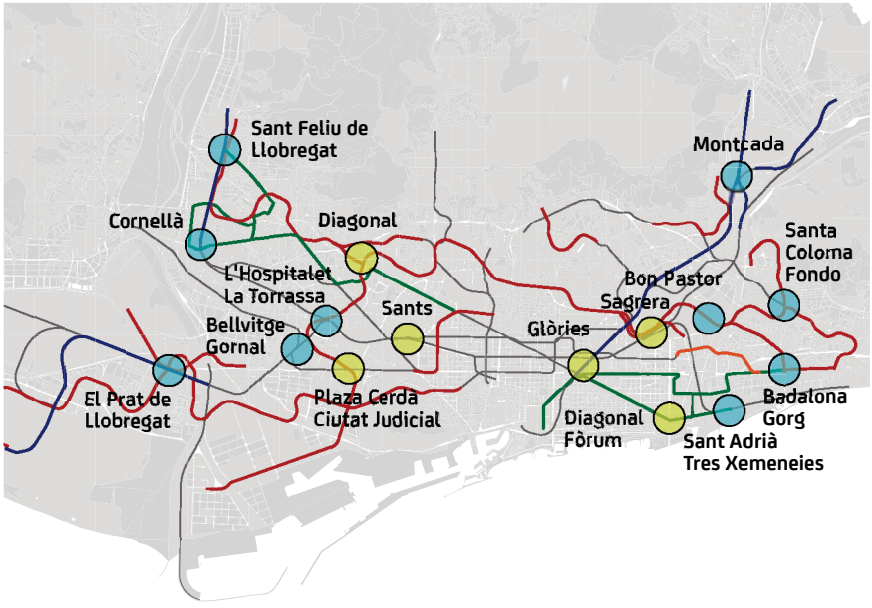


Fig. 40b. Proposal for new central areas for the Barcelona conurbation. *Compiled by the author.*

THE LACK OF A NEW RE-BALANCING BETWEEN THE LLOBREGAT AND THE BESÒS

One of the AMB's key competence areas is social and territorial cohesion policies.

The metropolitan area poverty map is significant and marks out the natural corridors that have not had a good public transport offering. These are:

- The N-150 and R4 corridor (north).
- The northern corridor of the C-31.
- The R4 corridor (south) through L'Hospitalet and Cornellà.
- The C-245 corridor.

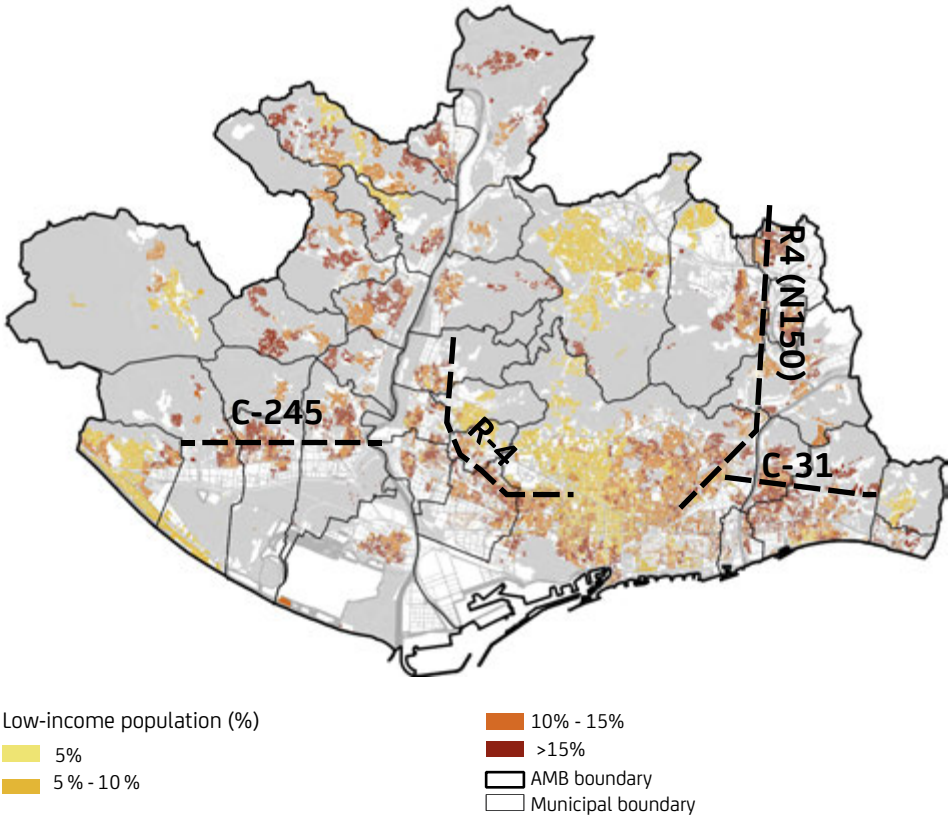


Fig. 41. Map of poverty and most significant corridors.
Compiled by the author based on the census section-scaled estimated income map, IERMB, 2011.

Corridor/Journey type	Female	Male	IA
C-245	**0.07**	**0.07**	**0.07**
Unemployed	0.05	0.05	0.05
Workers	0.04	0.04	0.04
Students	0.15	0.14	0.14
Retired people	0.05	0.05	0.05
Housewives	0.04		0.04
C-31	**0.08**	**0.09**	**0.09**
Unemployed	0.06	0.07	0.06
Workers	0.05	0.05	0.05
Students	0.16	0.17	0.17
Retired people	0.08	0.06	0.07
Housewives	0.07		0.07
N-150	**0.17**	**0.17**	**0.17**
Unemployed	0.18	0.17	0.17
Workers	0.16	0.14	0.15
Students	0.20	0.20	0.20
Retired people	0.18	0.19	0.19
Housewives	0.10	0.02	0.10
R-4	**0.07**	**0.07**	**0.07**
Unemployed	0.05	0.05	0.05
Workers	0.04	0.04	0.04
Students	0.14	0.13	0.14
Retired people	0.05	0.05	0.05
Housewives	0.05	0.01	0.05
TOTAL	**0.09**	**0.09**	**0.09**

Fig. 42. Detector of needs: the inaccessibility index within the poverty corridors of the AMB.
AMB-Strategic Planning Area, 2018a.

A recent study on *Inaccessibility in public transport* (AMB-Strategic Planning Area, 2018a) and the analysis of results that are shown in Fig. 42, concludes that:

- The specific N150 corridor shows a generalised situation of unsatisfied needs and reflects the time restrictions of people who need to carry out their activities, such as caring for other people, studying and work.
- The opposite case is seen in the poverty corridors 4, C-31 and C-245: their unsatisfied mobility needs are related mainly with study purposes and, therefore, with students.
- These results seem to show that in the particular case of all the AMB corridors, students present unsatisfied mobility needs related with their specific study activities.
- As regards transport policies, the AMB has given priority to the C-245 corridor when what is needed is a re-balancing towards the Besòs and, especially, along the N-150 axis.

The diagram of industrial settlements continues the offering that existed in the mid-19th century, an offering that was formed by the corridors of the main roads: firstly the N-2, which runs from Martorell, crossing the Llobregat via the Molins de Rei bridge and following the route Sant Feliu - Cornellà - L'Hospitalet - Ciutat Vella - Sant Martí - Badalona - Montgat; secondly, the N-150, which connects, via the Meridiana trunk road, Sant Andreu - Montcada - Ripollet - Cerdanyola - Barberà - Sabadell - Terrassa and, finally, the C-245 comarcal region route which links Sant Boi - Viladecans - Gavà – Castelldefels.

Fig. 43. Roads built in the 18th and 19th centuries that have structured the metropolis of Barcelona. *AMB, Territory Area, 2009.*

The metropolitan structure of Barcelona was built on this base. In the early 20th century, with the Pearson railways project, the Zona Franca of Barcelona was connected with Sabadell and Terrassa via Collserola and Sant Cugat. Later, the Ferrocarrils Catalans train line enabled urban development on the other side of the Llobregat.

Beyond the modernisation of Barcelona, through the Metro, firstly with L1 and L3, and later with the other lines, during the period between the years 1950-1975, the major metropolitan modernisation was implemented. Firstly, by Ferrocarrils Catalans, clearly reinforcing the Barcelona-Sant Cugat axis and, subsequently, the Rodalies suburban railway, around its lines R1 and R2, parallel to the coastline. And together with above-ground transport, the TMB was created in Barcelona and EMT in the Baix Llobregat and in Barcelonès Nord.

In fact, the approval of the PGMB represents the consolidation of the leap towards the Vallès area.

Improvements in public transport, from the Generalitat, have been proposed between an improvement of the offering of FGC and the extension of the Metro lines L3 to Nou Barris, L1 to Santa Coloma and Badalona and, especially, the two ends of the L9 to Santa Coloma de Gramenet and El Prat de Llobregat.

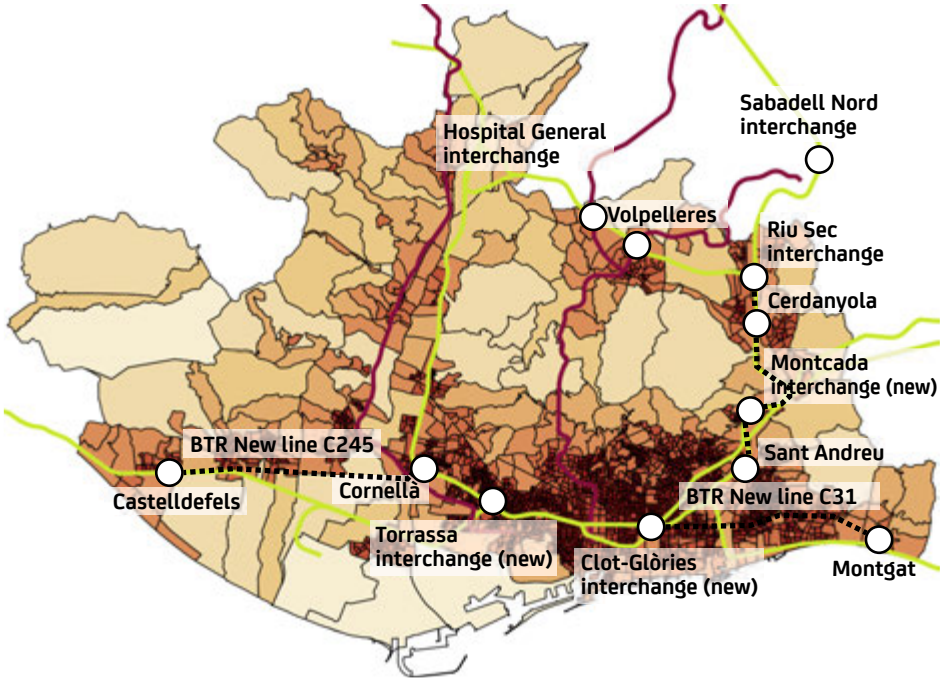


Fig. 44. Network of railway interchanges proposed for territorial rebalancing.
AMB, Strategic Planning Area, 2017b.

This scheme has caused an imbalance between the Llobregat and the Besòs at the cost of the latter. Although Barcelona City Council developed, in the 1990s, a plan for rebalance through the construction of a main station at La Sagrera, as an alternative to that of Sants, and the development of the 22@ district, subsequently the strength of the port and the airport and the predominance of the Baix Llobregat municipalities in the AMB led towards greater growth and accessibility towards the Llobregat.

The commitment to promoting a new re-balancing between the Besòs and Llobregat rivers is based on the introduction of new railway interchanges: Clot-Glòries, with the creation of a station close to El Clot of the line that passes through the Plaça de Catalunya (where there would be stops by the trains of all the local lines, as is the case with Sants), an interchange at Riu Sec- Cerdanyola (which interconnects the B-30 lines with the R4), and two new central stations (Montcada and Torrassa) outside of the municipality of Barcelona where there will also be stops for all the local trains lines.

The introduction of these interchanges creates improvements in accessibility, especially in the Besòs territory, as well as the more peripheral areas of the second concentric zone.

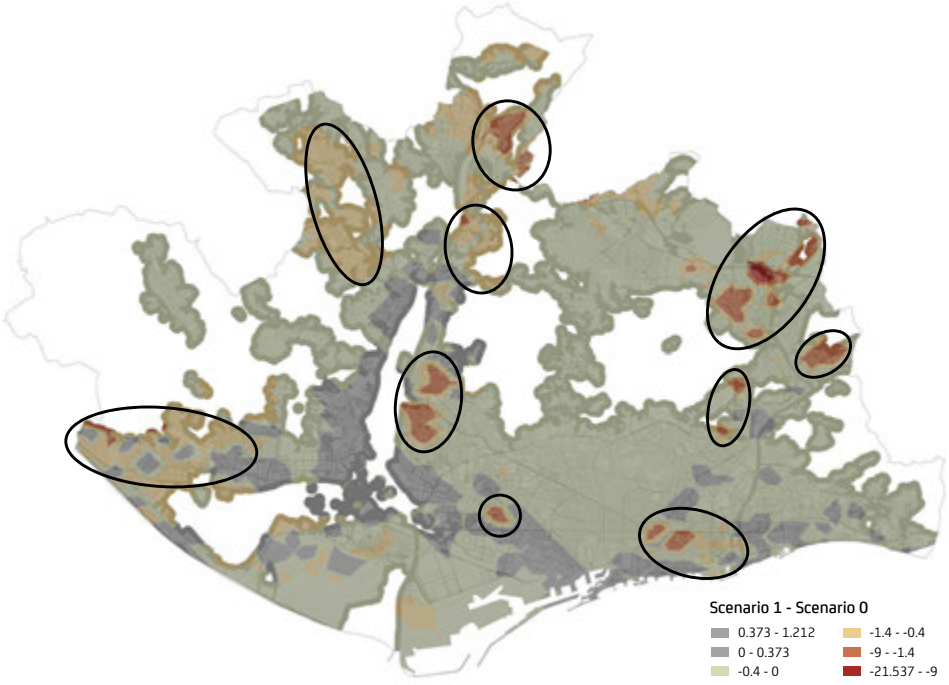


Fig. 45. Improvements in accessibility linked to the introduction of railway interchanges at Clot-Glòries, Montcada Bifurcació, La Torrassa and Cerdanyola-Riu Sec. *AMB-Strategic Planning Area, 2019c.*

If, in addition, we add the introduction of the rapid transit bus (BRT), the prioritisation should be in this order:

- N-150
- C-31
- C-245

In this sense, it is necessary to point out that the BRT that takes the C-58 route does not correspond with the way the territory functions. It is necessary to locate, therefore, a second BRT route on the N-150 with interconnection to the Montcada and Riu Sec-Cerdanyola interchanges.

One fundamental project will be to urbanise the continuity of the Montcada-Ripollet-Cerdanyola-Barberà-Sabadell route, where the stations of Cerdanyola-Riu Sec, Ripollet-Cerdanyola and Montcada Bifurcació must play a central role in the new facilities for this sector. Moreover, on the C-31 the urban project must be built over the current motorway to restructure the urban nature of Sant Adrià and Badalona and permit cross-cutting accessibility. The BRT corridor and a bicycle lane should enable the improvement of metropolitan accessibility in this sector.

In the case of the C-245 corridor, the project for the BRT route and its urban development are quite advanced.

THE LACK OF TERRITORIAL AND RAILWAY RESTRUCTURING AS AN INSTRUMENT FOR INTEGRATION AROUND THE FIRST AND SECOND CONCENTRIC ZONES

The regional diagram of the union of Barcelona with the comarcal regional capitals of Vilanova i la Geltrú, Martorell, Terrassa, Sabadell, Granollers and Mataró proposed by the PTMB 2010 needs, beforehand, the consolidation of the conurbation area associated with the railway stations of El Prat de Llobregat, Sant Feliu de Llobregat, Cerdanyola-Riu Sec, Montcada and Badalona.

The Sants-Sagrera dyad is essential, and a future Glòries-Clot interchange will be added, as well as a new dyad defined by La Torrassa and Montcada that concentrates all the railway movements on a metropolitan scale.

As analysed in a previous study (AMB-Strategic Planning Area, 2017b), if the regional and Rodalies local trains are not stabled at the Estació de França and a new location is sought for them (Sant Andreu, Santa Perpètua-Montcada), the Glòries crossing would be eliminated and the frequency of trains through the two tunnels could be improved by 40%. This improvement is essential and must be done because it would mean a prime qualitative leap for the metropolitan city and would constitute the basis for the future Barcelona metropolitan region.

Moreover, the offering of trains must enable the completion of the railway circular line that, at this moment in time, is only closed on the Besòs side and with reduced frequencies. To facilitate the access of students to the Universitat Autònoma de Barcelona it would be recommendable to create a line that arrives directly from Sants to Riu Sec-Cerdanyola and that connects Cornellà, Sant Feliu, Molins de Rei, Sant Cugat, Rubí and Riu Sec-Cerdanyola (AMB-Strategic Planning Area, 2017e).

These improvements would mean great benefits for accessibility in the Besòs and, secondly, in the corridors of the Lower Llobregat and of the C-245.

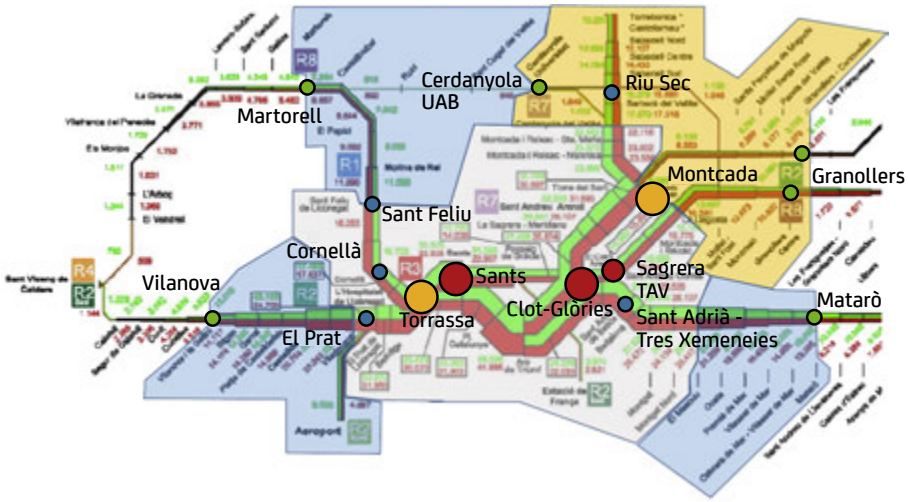


Fig. 46. Passenger transport flows on the Rodalies and RENFE regional trains network.
RENFE Rodalies, 2009.

The improvements of the extension of the new Barcelona bus network towards L'Hospitalet, Cornellà and Esplugues de Llobregat and, also, towards Badalona, Santa Coloma and Montcada on the Besòs side, together with the BRT corridors of the C-31, the C-245 and the improvements in frequencies of the lines in the second concentric zone, should form the base for a new metropolitan unity. On this base it is possible to build a functional space with potential for growth, that is inclusive within the conurbation and that balances out the first and second concentric zones.

This metropolitan leap forward needs impetus from two areas:

- That of the Metropolitan Housing Operator (Habitatge Metròpolis Barcelona) and of the Economic Development Agency, which have to locate and give life to new central areas, that need to be a mix of housing, economic activity, commercial activity and metropolitan services that take advantage of the new metropolitan nodal points.

- That of the Metropolitan Mobility Operator, which has to carry out the work for the preparation and implementation of the new nodal points.

This proposal constitutes a commitment to the construction of affordable housing that could generate in the region of 12,500 free-market housing units, 25,000 subsidised housing units for sale and 22,000 subsidised housing units for rental. Together with the 4,000 units that are planned by the operator at present, they could represent a significant qualitative metropolitan leap forward. Moreover, this would generate around 4,000,000 m2 of space for economic activities (see Fig. 48).

These proposals for new activities and housing should be complemented with those that the municipal councils propose in their respective municipalities. Furthermore, also essential is a mobility policy that proposes a new relationship between private vehicles and public transport, with the proposal of a new area for mobility management of the Barcelona conurbation. We propose a metropolitan mobility operator that, in the style of Stockholm, provides coordinated management of private vehicle, public and bicycle transport on an AMB scale. This operator would develop a policy for a combined public transport offering (train, tram, bus and bicycle) with intermodality that would ensure a modal transfer from private vehicles to sustainable modes of transport.

All this would mean, firstly, the acceptance of concessions within the AMB sphere and, secondly, the reorganisation of the above-ground transport network from a global perspective, agreed between the different actors involved: TMB, AMB (EMT), Generalitat of Catalonia (Surface Transport Department) and ATM.

THE LACK OF GOVERNANCE OF THE PTMB

The definition of the metropolitan and regional framework implies population grouping based on densities and similar population sizes.

The major metropolitan challenge lies in establishing a good articulation between the AMB and what, traditionally, has been called the Metropolitan Region of Barcelona (RMB). This articulation had already been proposed through the districts and corresponding partial territorial plans, developed in the 2003-2010 period, a proposal that aimed to rebalance the potential growth concentrated into the comarcal regional capitals with a minimum of population that, in turn, would rebalance the relationship with Barcelona (Nel·lo, 2005).

In the development of the PTMB, a series of territorial nodes were established in correspondence with an implicit general scheme for Catalonia, associated with other territorial plans (nodes in blue). In fact, that of Barcelona was the last. In this nodal scheme, designed to restore the balance between Barcelona and the rest of the territory, a certain rebalancing was established between the conurbation of Barcelona and the comarcal regional capitals of the Barcelona metropolitan region (in red) (see Fig. 50b).

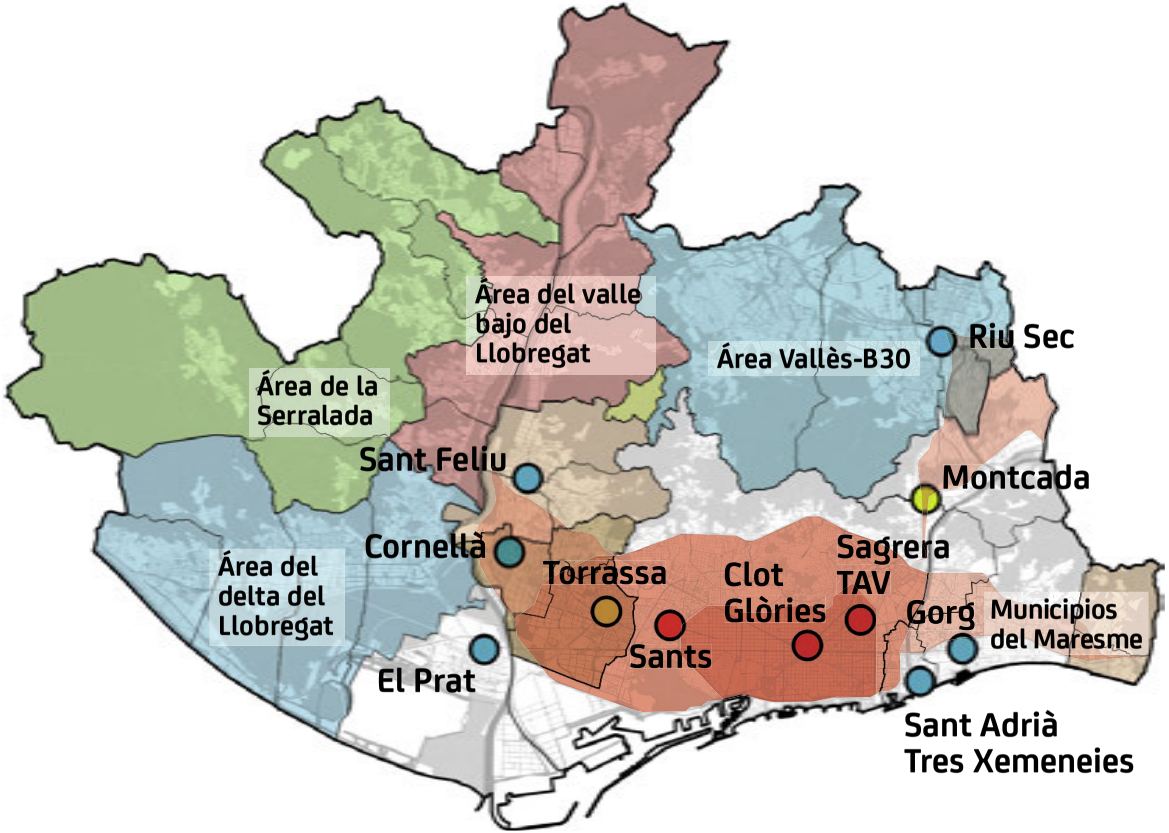


Fig. 47. Sector of the conurbation with proposal for tolls and controlled parking, conurbation sphere, corridor axes (northern leg C-31, southern leg C-31 and C-32, B23-A-1, C-58-C-31) and proposal for new territorial modalities associated with public rail transport. *Compiled by the author.*

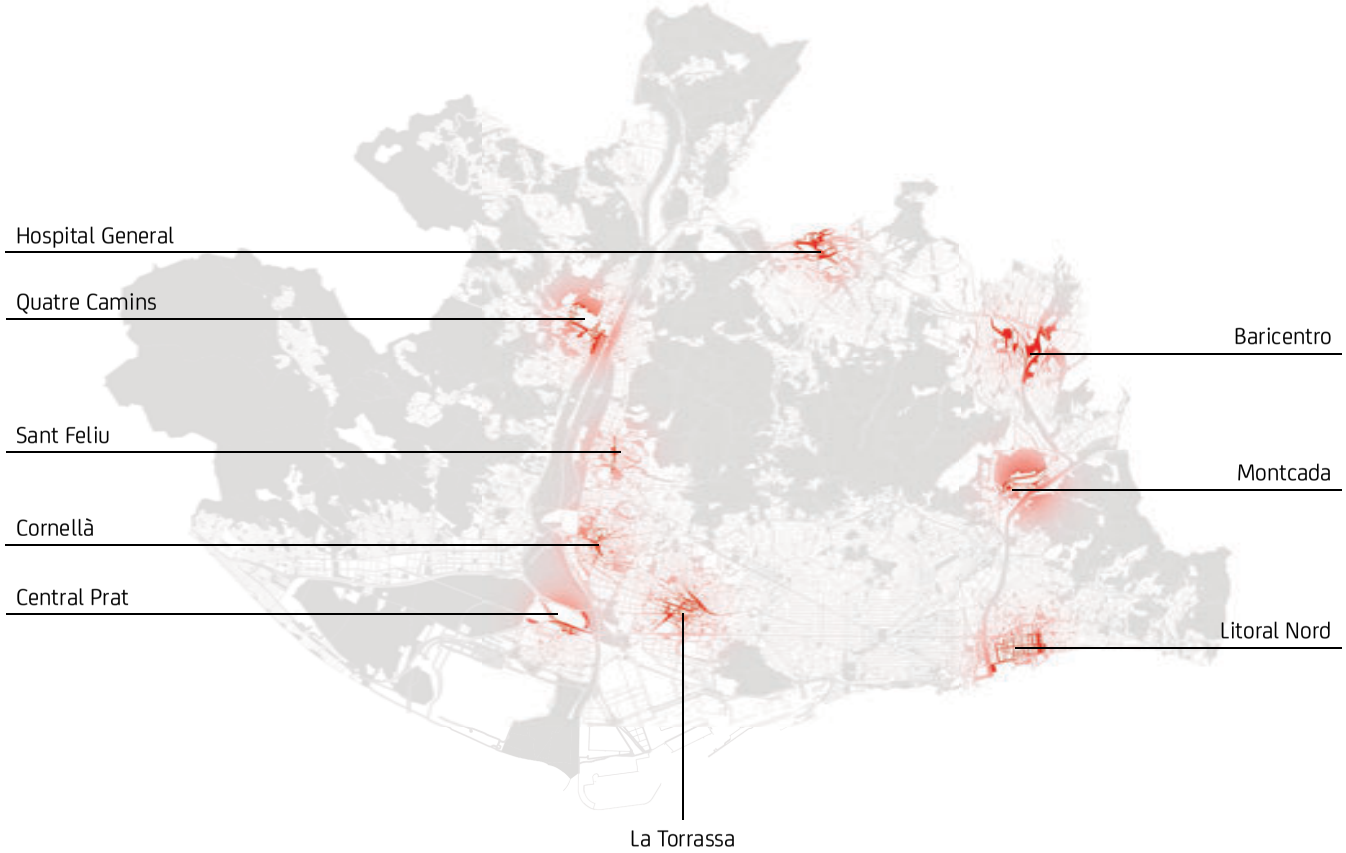


Fig. 48. New territorial nodal points and potential nodal urban development plans. *AMB-Strategic Planning Area, 2018b.*

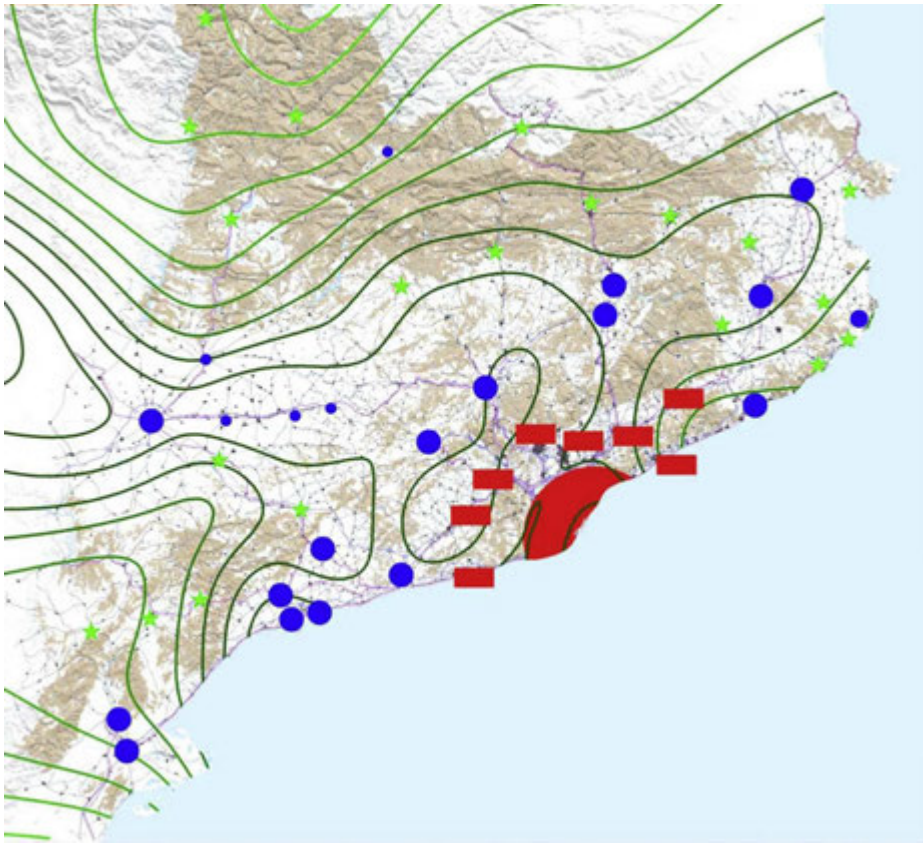


Fig. 49. Structure of territorial nodal points proposed by the PTMB 2010. *PTMB, 2010.*

Although the PTMB is the planning reference for the Barcelona metropolitan region, there is no true instrument for governance. In fact, subsequently, the territorial governance dynamics have gradually modified this territorial organisation. The most significant change is the appearance of the district of Vilafranca, which groups together the comarques of the Garraf and Alt Penedès, which previously belonged to the RMB, and to which are added the comarques of Baix Penedès and Anoia. Therefore, the proposal of a metropolitan region of Barcelona with seven comarques is, at the very least, questioned. In fact, a territory is in the measure of its governance.

The Barcelona metropolitan region was designed, as such, with the Urban Master Plan of 1968 and with the PTMB of 2010, but in neither case has there been a true governance.

Superimposing an analysis carried out by Ildefons Cerdà in 1872, when he was vice-president of the Barcelona Provincial Council, for the definition of municipal jurisdictions based

on mobility and life in the territory (see Fig. 2), and the territorial framework of the RMB in the PTMB (see Fig. 50b), it can be observed that the renowned urban planner mapped, in first place, a central node that coincides approximately with the current Barcelona metropolitan area and that links Barcelona with the Baix Llobregat.

Over this base, the Barcelona metropolitan area is surrounded by the district of Vilafranca, the Vallès Occidental and Vallès Oriental grouping, and the comarques of El Maresme, Osona, El Bages and El Berguedà.

If we observe the nodal points, we will confirm that, unlike the rest of the comarcal regions, the Vallès Occidental and the Vallès Oriental concentrate a large quantity of nodal points. Therefore, if at some stage it is necessary to extend a certain governance beyond the AMB, it will have to encompass the entire Vallès Occidental and Vallès Oriental. In fact, the PTMB already defines the need to conduct a joint mobility study of these two comarcal regions (PTMB environmental assessment).

Also observable, is a return to a regional vision that was proposed by Cerdà in the irradiation law, in which he defined territories with central towns, boundary towns and local populations. With this scheme he proposed that some towns were centres and others, borders.

In the Vilafranca district we observe the capital, Vilafranca del Penedès, as a centre town, and Vilanova i la Geltrú and Igualada as border towns. In the Vallès Occidental and Vallès Oriental comarques, the centre towns of Sabadell and Terrassa – with a certain pre-eminence of Sabadell, converts Martorell, Mollet, and Granollers into frontier towns.

It is clearly observed that, *de facto*, there are three levels: the AMB, the Vallès Occidental and the Vallès Oriental and the comarques that surround this territory; the district of Vilafranca: and the comarques of El Bages, Osona and El Maresme.

It is reaffirmed, therefore, that the metropolitan regional structure of Barcelona is characterised, firstly, by an AMB that has to exercise leadership in the local and pluri-municipal sphere – in coordination with the comarques of the Vallès as principal nodes for priority development – and with an arc of comarcal regional capitals (Vilanova i la Geltrú, Vilafranca del Penedès, Igualada, Manresa, Vic, Mataró) that sustain this central node that links the AMB with the centres of Sabadell, Terrassa, Mollet and Granollers.

If we analyse the isochrones of the metropolis of Barcelona and their evolution over time, we will confirm that, within this central territory, there is an evolutionary gradation of accessibilities.

In Fig. 51 we observe that railway accessibility marks a growth in the territory that can be reached. If we take the limit of 45 minutes average between any two points in the territory, which is a reasonable journey time, we observe that this territory was, in 1972, that of the

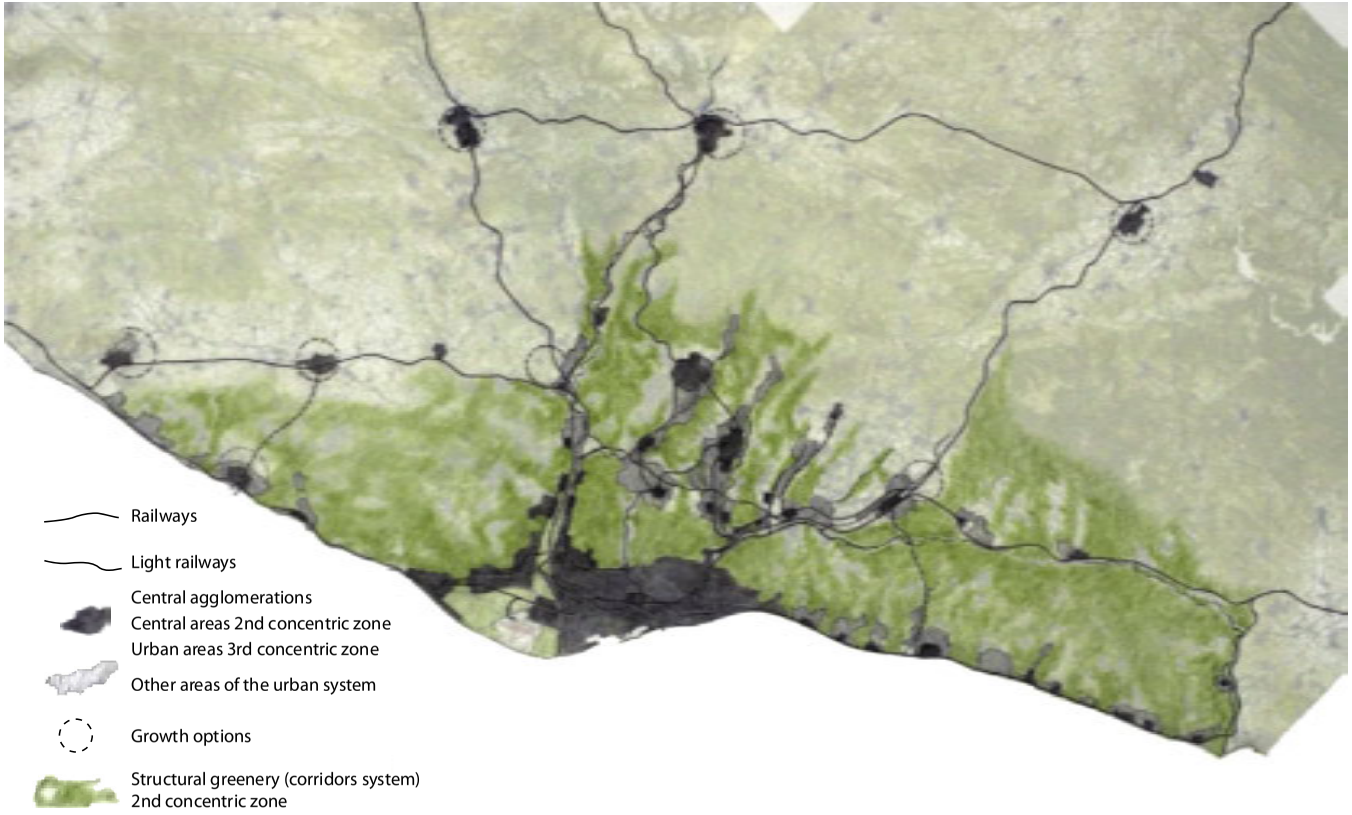


Fig. 50a. Territorial structure proposed by the PTMB. *Esteban, 2011.*

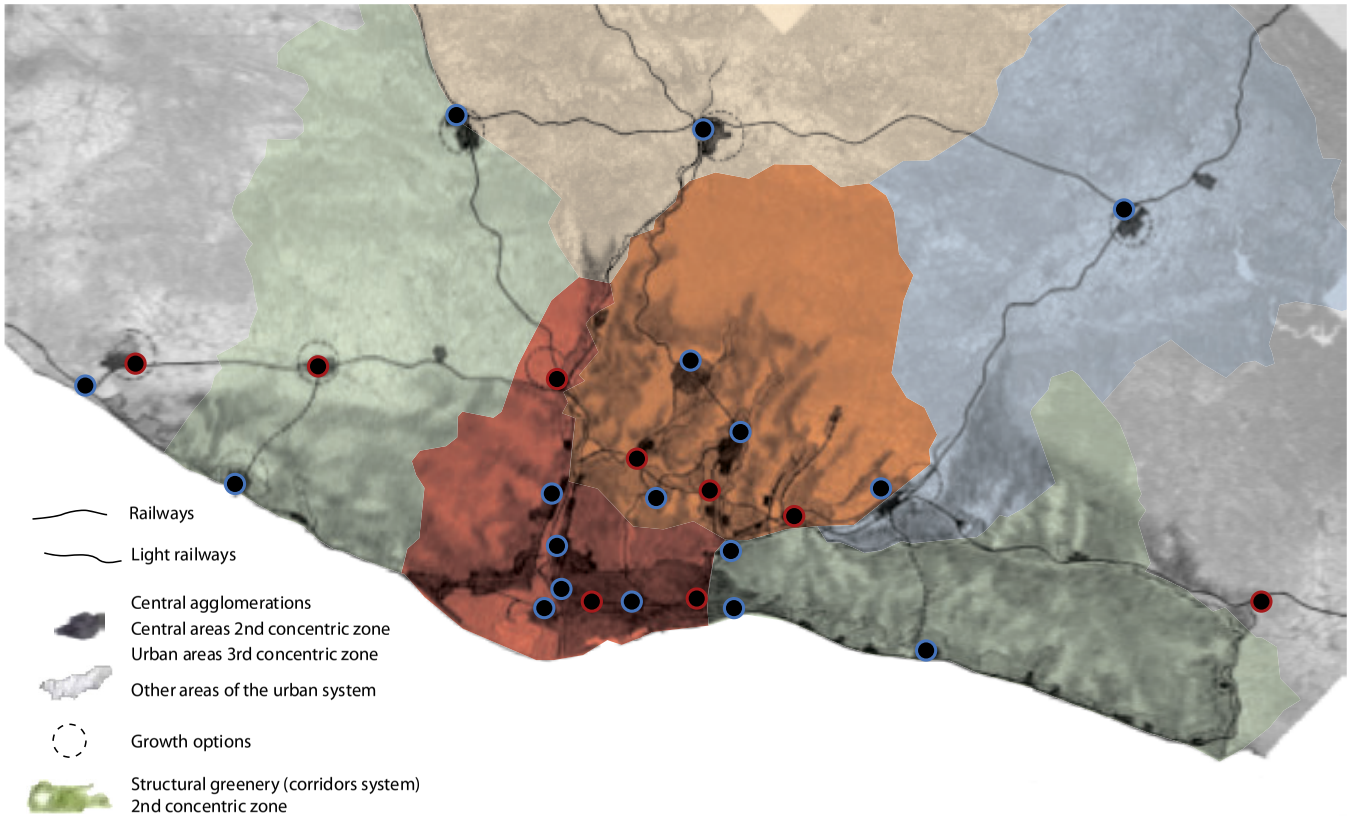


Fig. 50b. Structure of the nodal points proposed on the basis of the territorial jurisdictions of 1876 and the current railway system.
Compiled by the author.

central part of Barcelona's Eixample. In 1985, on the other hand, it had already extended over the railway lines of the Barcelona conurbation. With the proposal of the PDI, in 2001, the metropolitan scenario extended as far as El Prat, Sant Boi, Sant Feliu de Llobregat, Sant Cugat and the territories of Cerdanyola and Mollet. Finally, in the planning of the PTMB, the 45 minutes sphere includes the AMB, Rubí, Sabadell and Mollet, but not Vilanova, Terrassa and Mataró, which lie about 60 minutes away.

This topology defines a space of functional metropolitan accessibility of 45 minutes that includes the Barcelona metropolitan area and the more prosperous part of the Vallès Occidental and the Vallès Oriental. This must be a reference point.

In the future, and speaking of accessibility, analysis will be required of what it might mean to introduce an integrated Rodalies (local train) system that includes, furthermore, a regional high-speed system at the service of this metropolitan system. This has to be the challenge of the coming years.

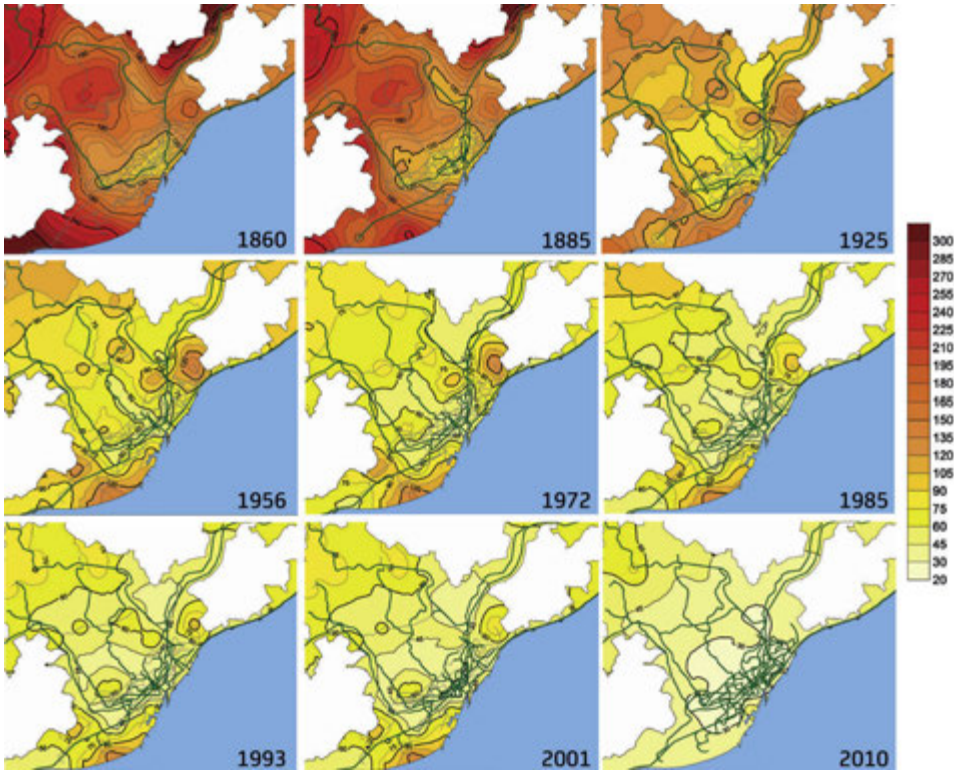


Fig. 51.. Evolution of railway accessibility in the Barcelona metropolis.
Fernández & Magrinyà, 2008.

THE LACK OF A GOOD RELATIONSHIP WITH THE VALLÈS OCCIDENTAL AND THE VALLÈS ORIENTAL

Once the reorganisation of the Barcelona metropolitan area has been defined in its conurbation and corridors, a new re-balancing is established between the Besòs and the Llobregat and once the reorganisation has been hierarchised to a higher scale of the Barcelona metropolitan region that unites the AMB and the comarques of the Vallès Occidental and the Vallès Oriental, and these with the comarques around them, it is necessary to propose a flexible governance of this model of metropolitan reinforcement.

With a governance of the territories as they are lived, we will be able to advance, we will be able to progress beyond the dialectics AMB-Generalitat of Catalonia and of Catalonia-city.

In fact, it is a reality that comarques of the Barcelona metropolitan region, the Bages and the Osona, have gradually been added to the functional metropolitan territory. Their functional relationship with Barcelona through interconnection with the RENFE Rodalies (local) and Regional trains is a central element of this.

Within the framework of the AMB, the first node is the interconnection with the Vallès Occidental and the Vallès Oriental. The AMB, which set out with the management of 18 municipalities of the old EMT, expands its array of municipalities to 36. Prior to this leap, the comarcal region services of the Baix Llobregat and of the Vallès Occidental and the Vallès Oriental are evaluated, and a public transport network is offered that guarantees comarcal region self-containment in a competitive way with private vehicles.

A good service must be offered to the municipalities of the Baix Llobregat that belong to the second concentric zone and a comarcal region proposal established for the self-containment of the Vallès Occidental and the Vallès Oriental. The study of mobility in these two comarques and their interconnection with the AMB is fundamental. On this basis, it is possible to extend the improvement of quality of services in combination with the districts of the RMB, Vilafranca, the central comarques and the comarques of Girona.

For an “extended” metropolitan regional vision of Barcelona, and from a perspective of articulation of the AMB with the surrounding territories, we propose consideration of:

- A first central core, made up of the AMB, the Vallès Occidental and the Vallès Oriental, which make up a territory of 4.3 million inhabitants.
- On this base we consider, second, three groupings that have between 300,000 and 500,000 inhabitants:
  - District of Vilafranca: Garraf, Alt Penedès, Baix Penedès and Anoia, with 460,000 inhabitants.
  - Maresme, with 430,000 inhabitants.
  - Bages and Osona, with 340,000 inhabitants.

The whole of the AMB, plus the Vallès Occidental and Vallès Oriental, plus these three groupings, total some 5.5 million inhabitants, which is what we will call the "extended" RMB.

- If we add the most significant comarques, around the provincial capitals, we obtain a total of 6.7 million inhabitants. This is what we call metropolitan Catalonia.

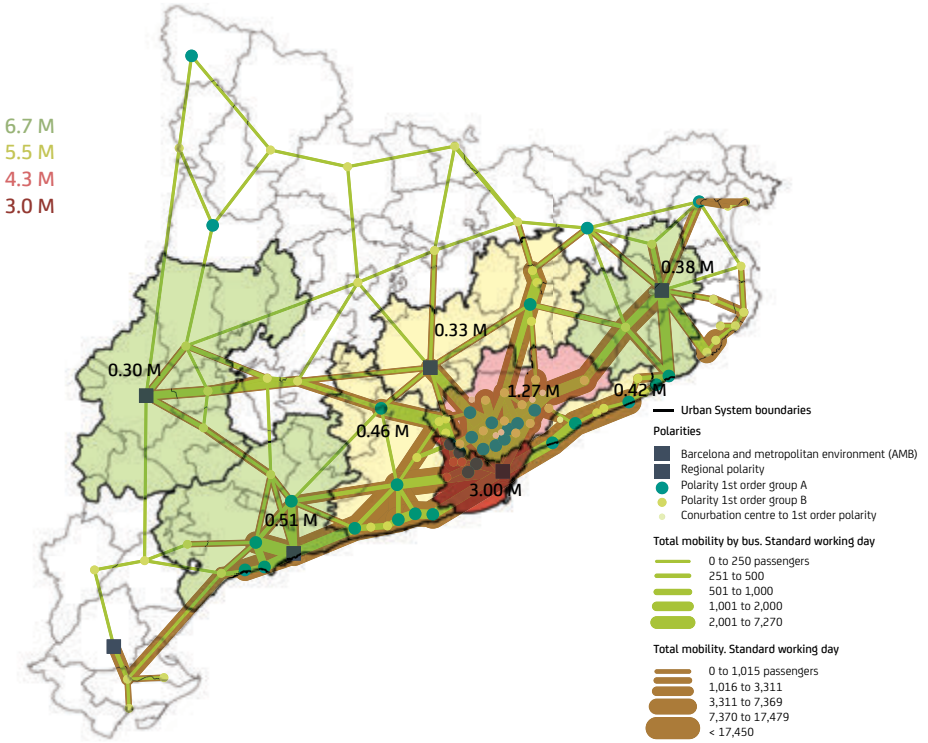


Fig. 52. Superposing of the territories with ATM and the passenger transport network (potential gravity, in brown, and real demand, in green). Extracted from the Passenger Transport Plan of Catalonia 2020. *Compiled by the author.*

The consolidation of a progressive model of territorial organisation must be associated with a joint offering of accessibility in transport that combines the railway system and the inter-municipal bus with assumable services that include regional and long-distance trains (Alvia and TAV), with spheres of the Metropolitan Transport Authority (ATM).

It is necessary to articulate, in short, a territorial system of public transport and associated sustainable mobility, that is led by the AMB. But it should do so in coordination with the surrounding comarques and giving priority to those of the Vallès.

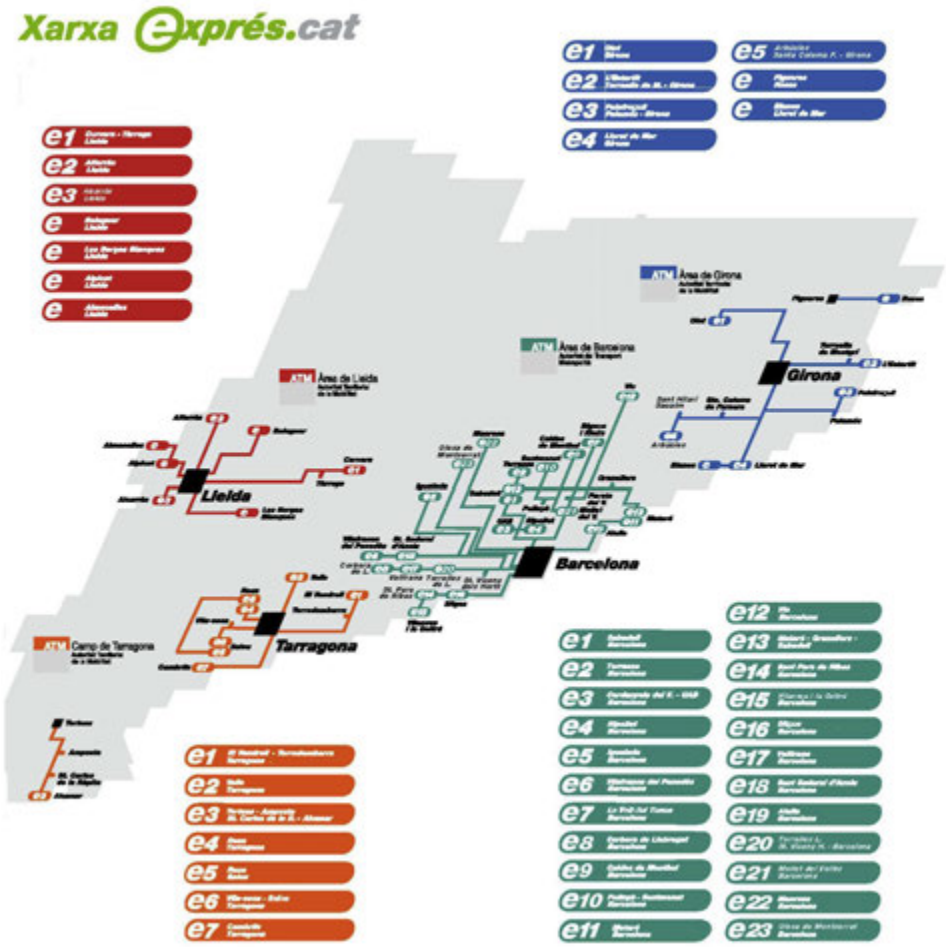


Fig. 53. Network of Generalitat of Catalonia express.cat intermunicipal buses organised according to the ATM model. *Generalitat of Catalonia, 2018.*

One reference, in the case of the Vallès comarques, is the proposal developed by Fem Vallès, which is based on the need to break with the centralised Barcelona vision (see Fig. 54 and 55), where the separation between the comarcal regional relations of the Vallès Occidental and Vallès Oriental are marked, in blue, and relations with Barcelona, in orange). In general, the approach of the RMB's ATM has always been to privilege relations with Barcelona. This comarcal region self-containment provides us with an interurban transport offering that gives service to the relations between the towns of the Vallès with the support, nonetheless, of the railway network.

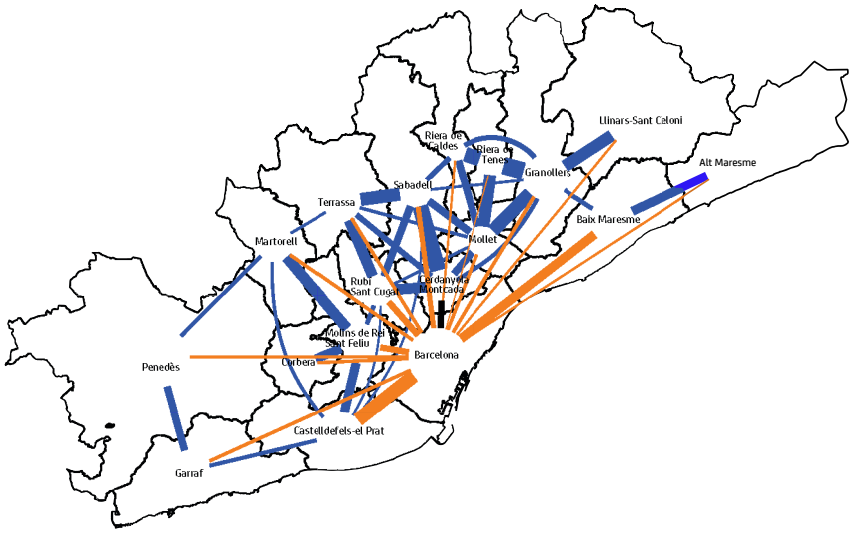


Fig. 54. Map of of passenger transport relations between the main towns of the Vallès Occidental and the Vallès Oriental and their relationship with Barcelona. *Via Vallès, 2018.*

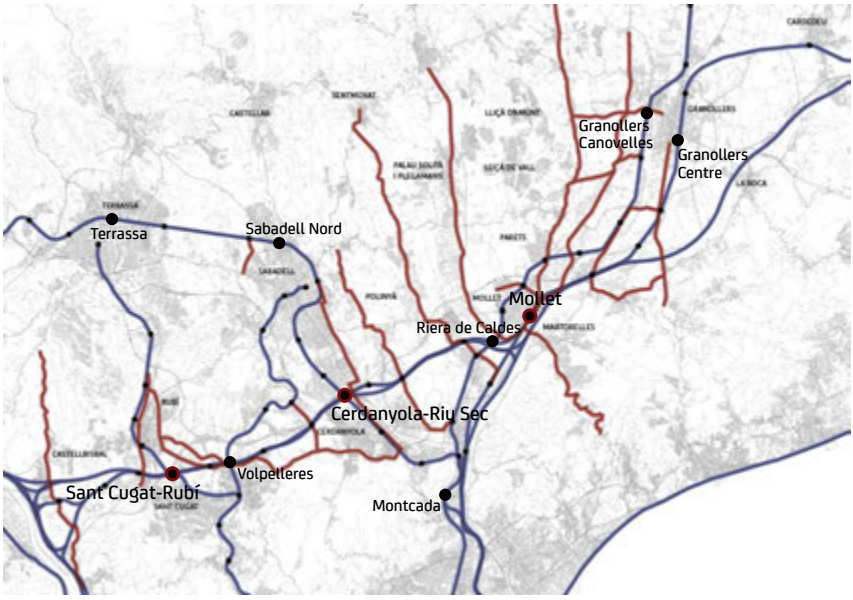


Fig. 55. Proposal for an intermunicipal bus network in the Vallès Occidental and the Vallès Oriental coordinated with the railway network, on which the main railway interchanges are marked. *Compiled by the author based on data from Via Vallès, 2018.*

All of this reflection is pertinent and essential because the organisational unit of the AMB has to position itself within the territorial context of the functional metropolitan region. In this analysis it is observed that it is not possible to perform true governance of the AMB without taking into account the Vallès Occidental, the Vallès Oriental, and the B-30 corridor, as a fundamental corridor for interconnection of the Barcelona metropolitan region, as well as a prior reflection of the relative role that needs to be played by the B-10, the B-20, the B-30, the B-40, the two transverse axes of the Via Augusta and the Catalan transverse arterial road.

In this global consideration it will be fundamental to see when the following are implemented:

- The network of latest-generation regional trains, with metropolitan stops, for regional functioning: Vilafranca, Martorell, Sant Cugat, Cerdanyola, Mollet and Maçanet, which are added to the main Lleida, Camp de Tarragona, Barcelona Sants, Barcelona Sagrera, Girona and Figueres routes.
- The railway orbital network: Vilanova, Vilafranca, Martorell, Terrassa, Sabadell, Mollet, Granollers and Mataró.
- The network of the transverse railway that connects Lleida with Manresa, Vic and Girona.

These networks can construct quite a powerful metropolitan node to be a benchmark on a European scale with the Barcelona-Lyon region.

The AMB has a driving role to play, with the clear aim of securing a structural agreement with the government of the Generalitat. Whatever planning is done, both in the AMB sphere (extended as far as Martorell), and in the Vallès Occidental and the Vallès Oriental, it will be necessary to take into account these future scenarios that will condition any planning.

THE LACK OF ANY RELATIONSHIP BETWEEN METABOLIC CYCLES AND METROPOLITAN TERRITORIES

For the AMB, the capacity for internal leadership and organisation, with metropolitan policies, is a key question. And so is the good integration between local authorities (municipalities, comarcal regional councils, districts and provincial council), on the one hand, and with the Generalitat of Catalonia and the Spanish Government, on the other.

We could focus on three points:

- The AMB has to be characterised by efficacy and efficiency in services and by participation of the citizens that are direct users (AMB) or indirect (RMB or functional metropolitan space that can include Manresa, Vic and Igualada). It is a local authority but capable of giving responses from the globality represented by a metropolis. It does not have

to seek a strong symbolic value with regard to the Catalan government, but it does need to develop leadership that resolves local problems with a metropolitan vision.

- One of the AMB's strong points is the capacity of its services, which have to be coordinated and complemented with the local community, based on enterprising municipal experiences that can be developed on a metropolitan scale.

  It is also confirmed, from time to time, that this availability of resources and services is not put at the service of a true efficacy and efficiency. Obviously, this prevents the policies of all these municipalities being more advanced than they are.

- Moreover, the AMB must be capable of leading metropolitan projects that operate on a Catalan and Spanish scale, but led by the metropolis.

  The AMB does not have to enter into the Barcelona-Catalonia dialectic. It has to provide strong leadership of the local authorities of the metropolis of Barcelona in order to make the regional territory surrounding the metropolis more competitive.

Therefore, a triple movement is required of the AMB:

- Legitimising itself as provider of services to the municipalities with a pluri-municipal perspective.
- Legitimising itself as a reference point for pluri-municipal policies with those institutions that also develop them (Provincial Council of Barcelona and territorial services of the Generalitat).
- Configuring a BCN-AMB-RMB collaboration scheme (with the comarcal regional councils), that leads sectoral processes from a perspective of the local community but with a pluri-municipal vision.

We have two precedents that are apparently quite significant:

- The fight against pollution. It is necessary to design policies for the promotion of public transport and a reduction in the use of private vehicles. This is a need. And it needs to be done with the policy of vignettes and restrictions on the ring roads. This metropolitan leadership project should reach, subsequently, agreements with the different institutions: Barcelona City Council, AMB and Generalitat of Catalonia.
- The creation of a Barcelona Metropolitan Housing Observatory. There is also a need to set up a single public observatory that should represent the benchmark of the housing sector and have the agreement and the participation – in equal parts but led by the AMB – of Barcelona City Council, of the AMB itself, of the Provincial Council and of the Generalitat.

This same model can be used to manage mobility. The AMB metropolis has certain problems with public transport infrastructures that can be considered, in a coordinated manner, between all its municipalities. And they can then raise them before the authorities of the Generalitat and the Spanish Government. The case of the formalisation of certain rail priorities before the Ministry of Public Works is, perhaps, the most prominent (see AMB-Strategic Planning Area, 2017).

In the world of economic activity, the need is raised for articulation of the re-industrialisation activities that began with the Industrial Agreement of the RMB and have led to the agreement for More Industry on a Catalan scale. In this sense, a very interesting framework is the Metropolitan Industrial Agreement of Barcelona, in which it will be necessary to go into greater depth by developing public-private resources or initiatives.

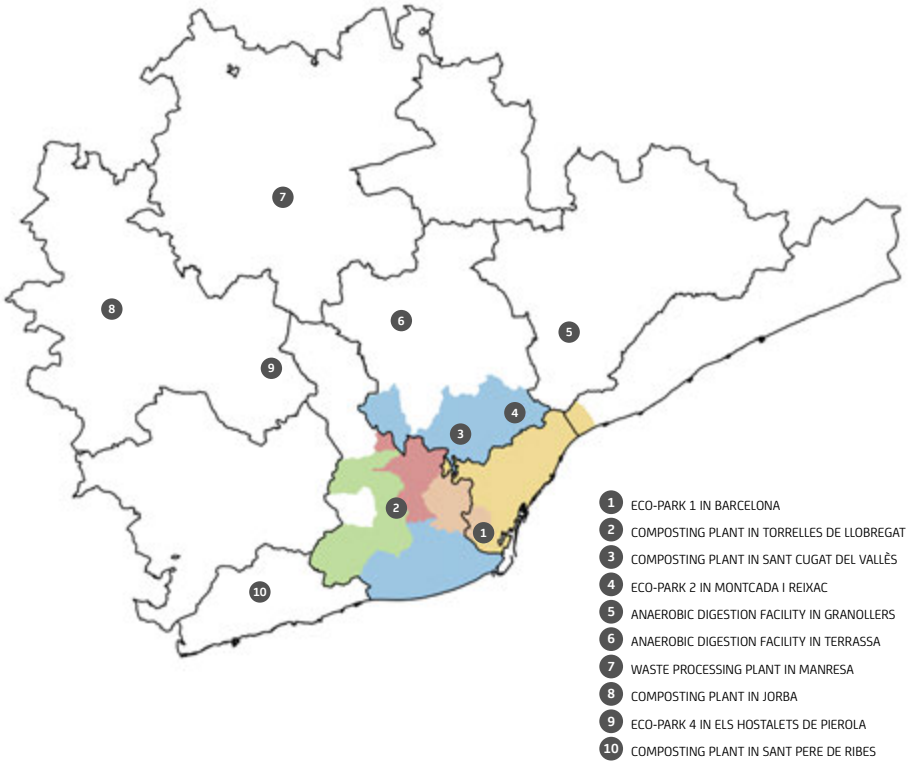


Fig. 56. The AMB and the territorial management catchment area of the Waste Agency of Catalonia. *Compiled by the author based on PINFRECAT 2020.*

Over the course of recent decades, the Barcelona Provincial Council has played an important role in supporting the local community. At the current time, with the AMB achieving strong leadership with regard to its services, it has to establish a stronger agreement with the services of Barcelona Provincial Council and the Government of Catalonia.

Social, economic and environmental policies require good coordination of local services that are promoted by Barcelona Provincial Council, services that will have to be coordinated, as we say, with the metropolitan policies of the AMB.

Good management in the circular economy, innovation, policies for training, economic promotion, resilience, fighting against climate change, biodiversity management, etc., all require coordination of the services with the municipalities, which is, in fact, what the Barcelona Provincial Council, the territorial services of the Generalitat of Catalonia and the AMB itself already do.

Fig. 57. The AMB, the territorial management catchment area of the Catalan Water Agency (ACA) and the basins management system. *Compiled by the author based on ACA data.*

This question is even more evident in the case of the management of metabolic territories: water and waste as reference points. In the case of water, the Catalan Water Agency (ACA) establishes agreements with the AMB and the comarcal regional councils involved (Baix Llobregat, Vallès Occidental and Vallès Oriental, and Maresme), as well as the district of Vilafranca. With respect to waste management, the Waste Agency of Catalonia (ARC), the eco-parks of the AMB and the comarcal regional councils of the Vallès and the Maresme have to coordinate their actions. This is also the case for many other services.

The public management of the water cycle needs a review with regard to the local community, a review that needs to be conducted with a metropolitan vision. The relations between the municipality of Barcelona and the CMB (today AMB), the ATLL and the ACA led to the review of a supply network that soon became metropolitan (Dosrius water supply). It subsequently continued with the use of the surface waters of the Llobregat, later with the supply from the Ter and, finally, with the attempt, which was unsuccessful, of connection with the Ebro.

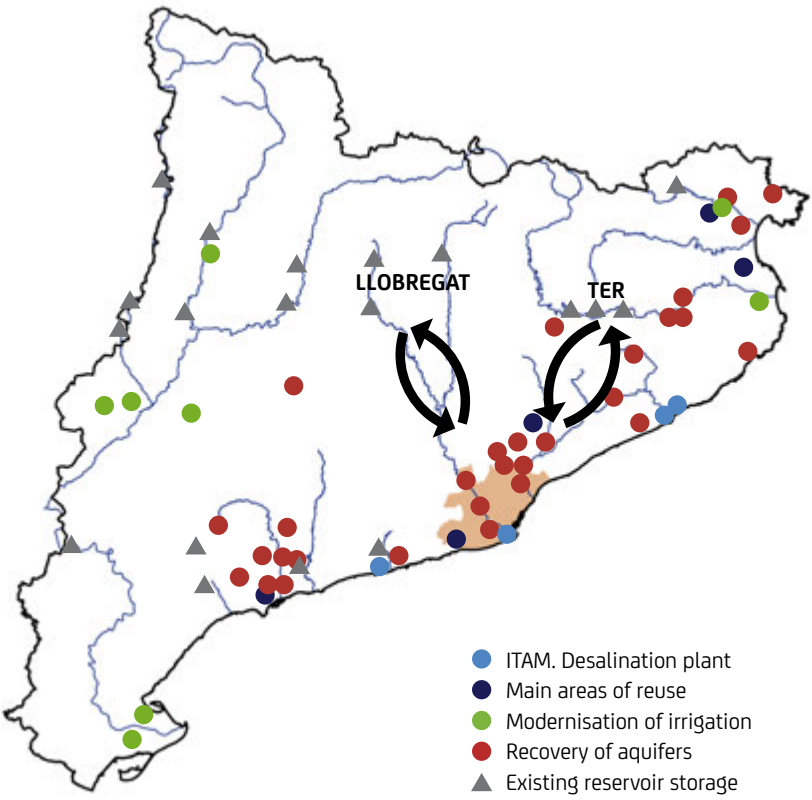


Fig. 58. The AMB, the territorial management catchment area of the Catalan Water Agency (ACA) and the water supply system. *Compiled by the author based on ACA data.*

All these evolutions (1911, 1920, 1925, 1930, 1935, 1966, 1969, 1983, 2001, 2016) were marked by attempts to municipalise the service or, simply, to intervene in the regularisation and control of this service (Gaya, 2014; p. 305).

Projects such as those relating to regenerated water, the relationship with Iberpotash in the Llobregat and Ter river basins, with the added problem of the salinity of the Llobregat, or the reduction in the flow volume of the Ter due to climate change, must lead to new relations being established in a future scenario of water stress.

The water/energy synergy will be fundamental in a scenario of energy transition where it will make increasingly less sense to desalinate using fossil fuels or with projects for the implementation of regenerated water.

Zero waste policies will need coordinated management of the functional metropolitan sphere, as well as generated new mechanisms and circuits for collection (of clothing, for example) or the introduction of alternative collection systems, closer to the circular economy, and with more coordination between the Waste Agency of Catalonia (ARC) and the AMB.

Mobility, water and waste are three examples that show us the need to increase agreements between the institutions of the local sector (AMB, comarcal regional councils and Provincial Council) and those of the general administration (Generalitat and Spanish Government) that should give a response to a series of metropolitan needs on which increasingly, discussions and proposals will be focused.

It is not a case of establishing organisations that are strong and tightly-woven on an institutional scale. The balance between Catalonia and the metropolitan city of Barcelona has always been – and will be – complex. Local governors and the Generalitat alike need to be clear that Catalonia cannot be consolidated without a metropolitan region that, in a functional logic, overflows its borders. Each has to play its role: the Generalitat from a vision of a state authority and the metropolitan city, and its AMB, from a vision of a local and pluri-municipal authority.

THE LACK OF GOVERNANCE ON A EUROREGIONAL SCALE

The Mediterranean Euroregion, which covers the constellation formed by Valencia, Murcia, Zaragoza, Tolosa and Montpellier, should be the reference point of a regional territory with great potential for activity. And Barcelona is its leading metropolis.

Europe has been, to date, the Europe of states. But soon it will tend towards being the Europe of metropolises and their catchment areas. And of their associated Euroregions. The role, therefore, of the structures of the state will lose strength. And it will do so in the face of relations of proximity, following the principle of subsidiarity in the management of services. And, increasingly, the metropolitan city will become stronger. In coming years, the territories will have to reorganise themselves around the influence of the metropolises and of their interrelations and cooperations.

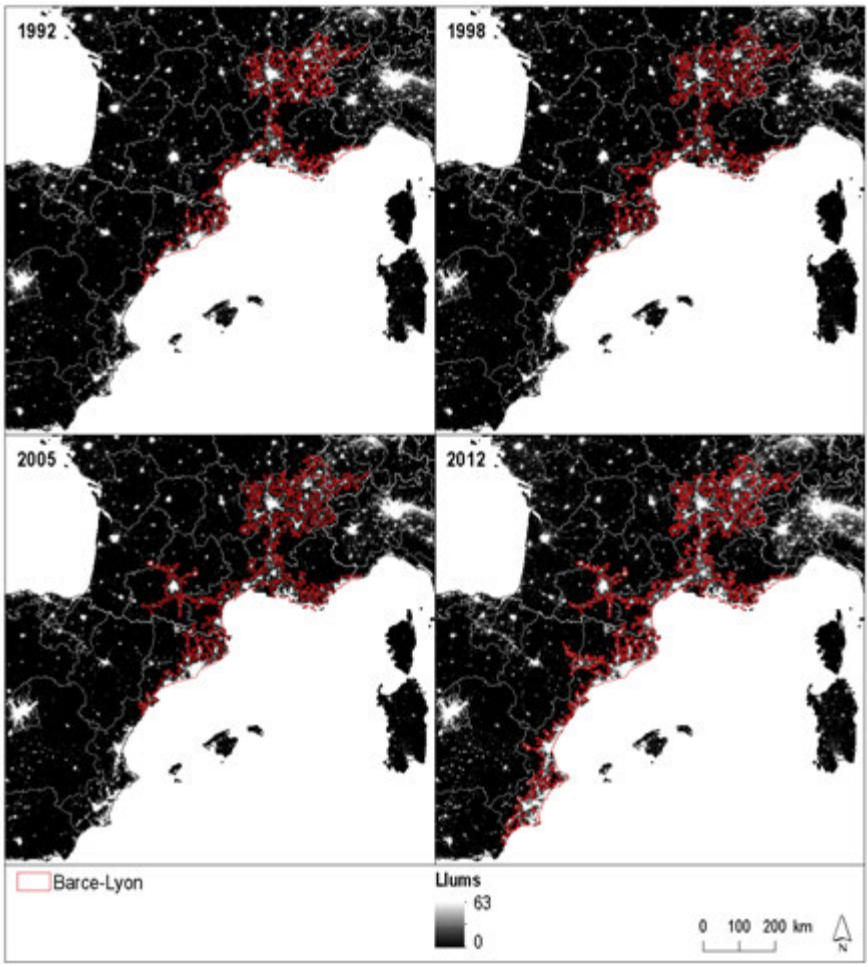


Fig. 59. Periods of transformation of the adaptive cycle in the case of the Barcelona-Lyon Euroregion. *AMB-IERMB, 2016.*

The European rail projects, that show the geopolitics of the European territory, are a good reference framework.

There is an area of networks, of great density, of European cities. The polygonal area that is framed by the space is London, Rotterdam, Hamburg, Copenhagen, Berlin, Prague, Vienna, Ljubljana, Milan, Lyon and Paris. In contrast, Atlantic Europe (London, Paris, Madrid and Lisbon), Southern Europe (Barcelona, Rome, Zagreb and Athens) and Eastern Europe (Helsinki, Kaunas, Warsaw, Katowice, Budapest, Belgrade and Bucharest) have metropolises that are more distanced.

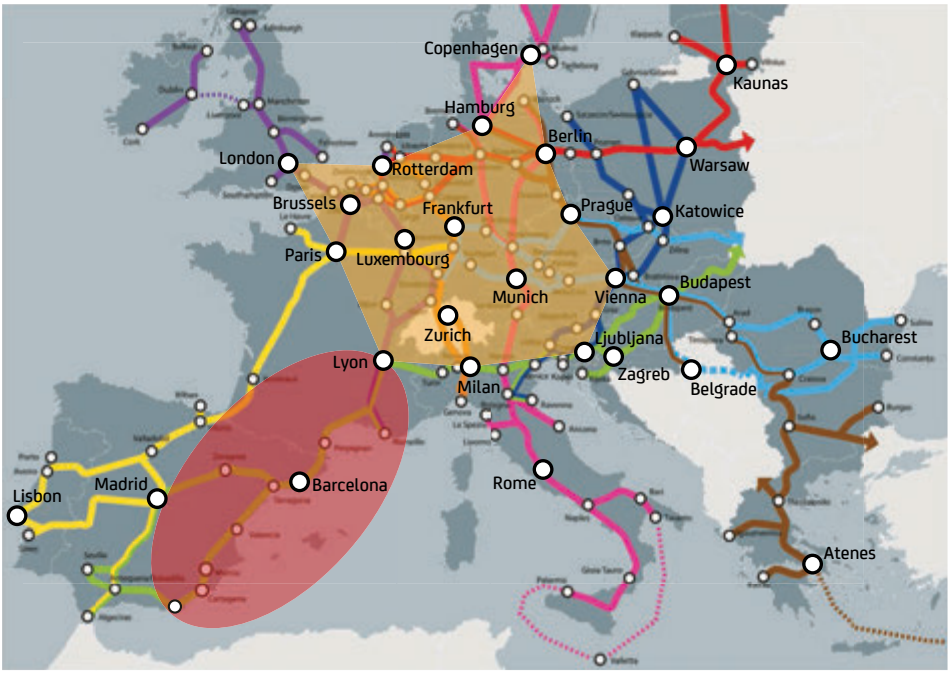


Fig. 60. The European network of corridors, with the Mediterranean corridor in green.
Compiled by the author with data from the European Commission.

The geographical and territorial catchment space of the Barcelona metropolitan area is situated in a central position of the Mediterranean Euroregions. It has a radius of influence of 650 kilometres and stretches from Almeria to Lyon, from south to north and from Bilbao de Marseilles, from east to west. This is the social, economic and cultural territory that the metropolis can develop in cooperation with Valencia, Zaragoza, Murcia, Marseille and Lyon. It is the Pyrenees-Mediterranean Euroregion, associated with the catchment area of Lyon and that configures the relations network known as Barcelona-Lyon.

THE LACK OF ARTICULATION OF THE AMB ON A EUROREGION SCALE

The formalisation of this area, following the principle of Cerdà – who said that the life of a territory is the network of its flows – has to be based on an organised management of the different networks that make it up.

An example is the network of ports, where there should be cooperation with the ports of Barcelona, Valencia, Tarragona, Cartagena and Almeria. And, on a second level, with Marseille, Bordeaux and Bilbao.

It will be essential to establish a series of infrastructure policies. The AMB and its metropolitan municipalities have to propose a leadership with relation to the needs for infrastructures with a global Euroregion perspective. To achieve these objectives, a key point is to establish strategic plans for communications that include passenger transport, terrestrial and maritime goods transport and airport transport. And to implement them it is necessary to establish prior internal debate in the AMB in order to reach a consensus and cohesion of municipal stances before the Government of Catalonia, the Spanish Ministry of Public Works and the European Union.

It is equally necessary to reinforce internationalisation activity on two levels: with the cities that form part of the Euroregion and with the leading cities of the other Euroregions. This has to be one of the central objectives of the AMB's International Area.

THE NEED TO RETHINK INFRASTRUCTURES ON A EUROREGIONAL SCALE

At present, Barcelona airport is leader in the number of passengers transported, but it is too conditioned by the schedules of low-cost connections, which are not competitive schedules for the installation of companies with a high added value.

Airport	City	Travelers 2014
Barcelona - El Prat	Barcelona	37,559,044
Palma de Mallorca	Palma de Mallorca	23,115,499
Alicante - Elche	Elche	10,065,873
Lyon - Saint Exupéry	Lyon	8,467,093
Marseille – Provence	Marseille	8,182,237
Toulouse – Blagnac	Toulouse	7,517,736
Eivissa	Eivissa	6,211,882
Valencia	Valencia	4,592,512
Bordeaux-Mérignac	Bordeaux	4,952,111
Bilbao	Bilbao	4,015,352

Fig. 61. Ranking of airports in the Barcelona-Lyon Euroregion. *Compiled by the author based on https://es.wikipedia.org/wiki/Anexo:Aeropuertos_europeos_por_tráfico_de_pasajeros#Estadísticas.*

It is necessary to start evaluating everyday economic relations (daily, weekly, monthly) of an international nature that structure the relations of globalisation. And this has to be done in terms of both the air passenger transport flights network and the goods transport network.

The percentage of goods originating from the Far East is distributed 24% to the ports of the Mediterranean and 76% to those of northern Europe (Rotterdam and Hamburg, among others). It is necessary to bear in mind that the port of Barcelona is connected with two free zones in Spain (Madrid and Zaragoza) that represent 40% of its goods traffic.

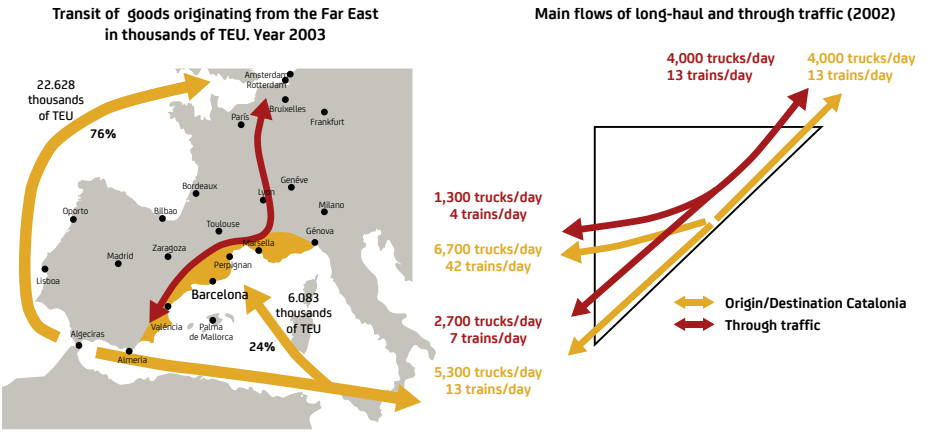


Fig. 62 a. Transit of goods originating from the Far East in thousands of TEU, year 2003. *Port of Barcelona.*
b. Main flows of long-haul and through traffic, year 2002. *SIMCAT-DPTOP, 2003.*

One of the most negative effects, with regard to the environmental impact, in the territory of the Barcelona metropolitan region, is the number of lorries travelling along Catalan motorways and, especially, the B-30. And the fact is that the transport of goods by train only represents 4%, whereas in other countries in northern Europe it reaches 20-30%.

If we analyse the tons transported, we observe that 70% of the journeys are internal. The relationship with the rest of Spain is 18% and with the international sphere is 12%. In contrast, if we analyse the tons per kilometre, we observe that the impact of the journeys between Catalonia and Spain is 43% and that international relations rise to 44%.

The B-30 and B-23 corridor and its connection with the port represents a significant percentage of the movement of goods in the Barcelona metropolitan region (see Fig. 63). And, in fact, the B-30 basically functions on a comarcal regional level.

The AMB will have to make a commitment to a metropolitan and regional model. And it will have to do so with goods transport and passenger transport alike. The global connection system cannot block metropolitan internal functioning. Therefore, achieving this requires reflection on the regional and Catalan communication system that goes beyond the AMB sphere but that conditions, in a vital way, its functioning.

From government, in Catalonia, road transport has been prioritised. Much more than rail transport. The road plans of 1985 and 1995 have been the reference benchmarks, but they have been so without any true territorial planning. The studies were developed during the 1980s,

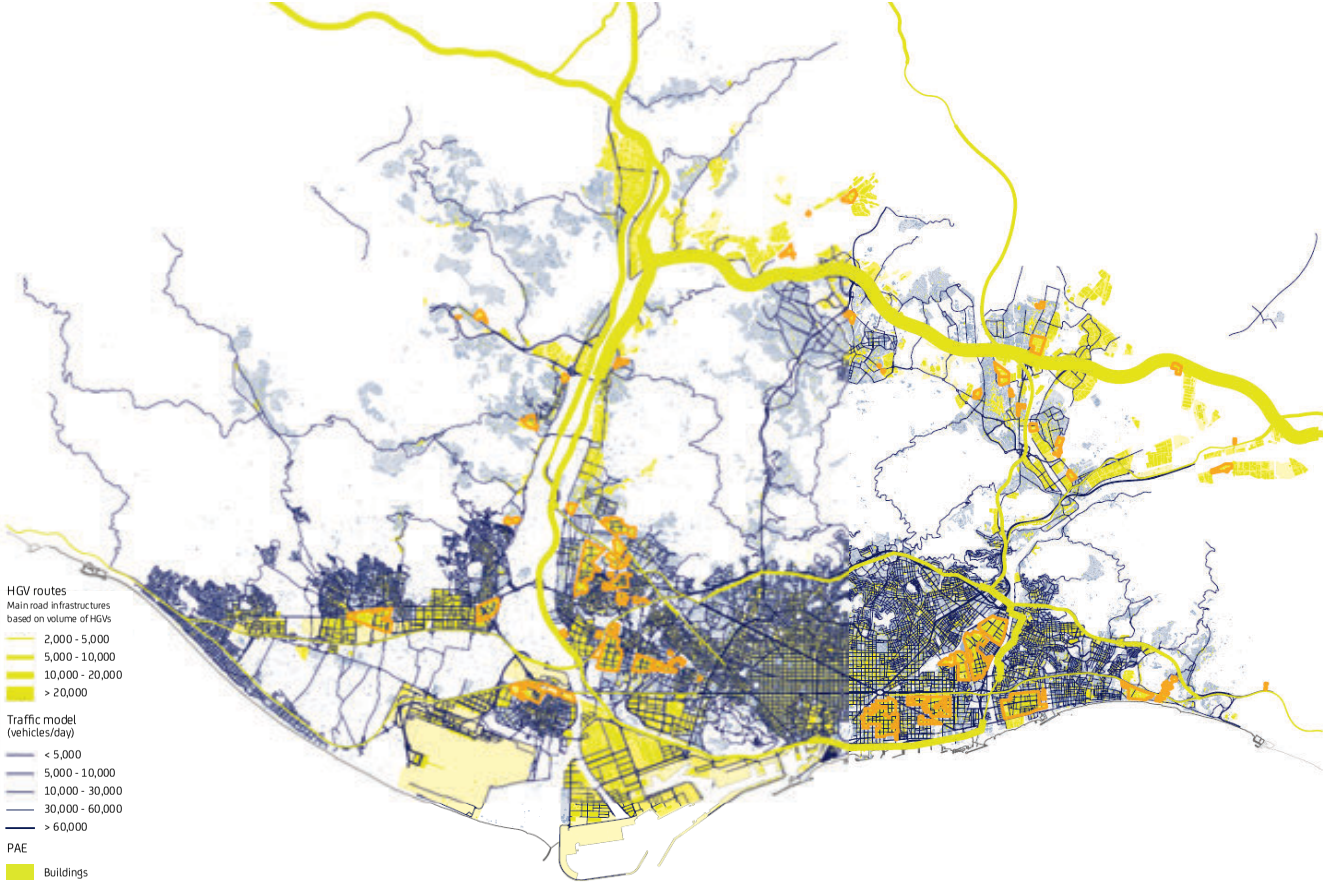


Fig. 63. Private vehicle network and associated industrial estates. *PDU, 2018.*

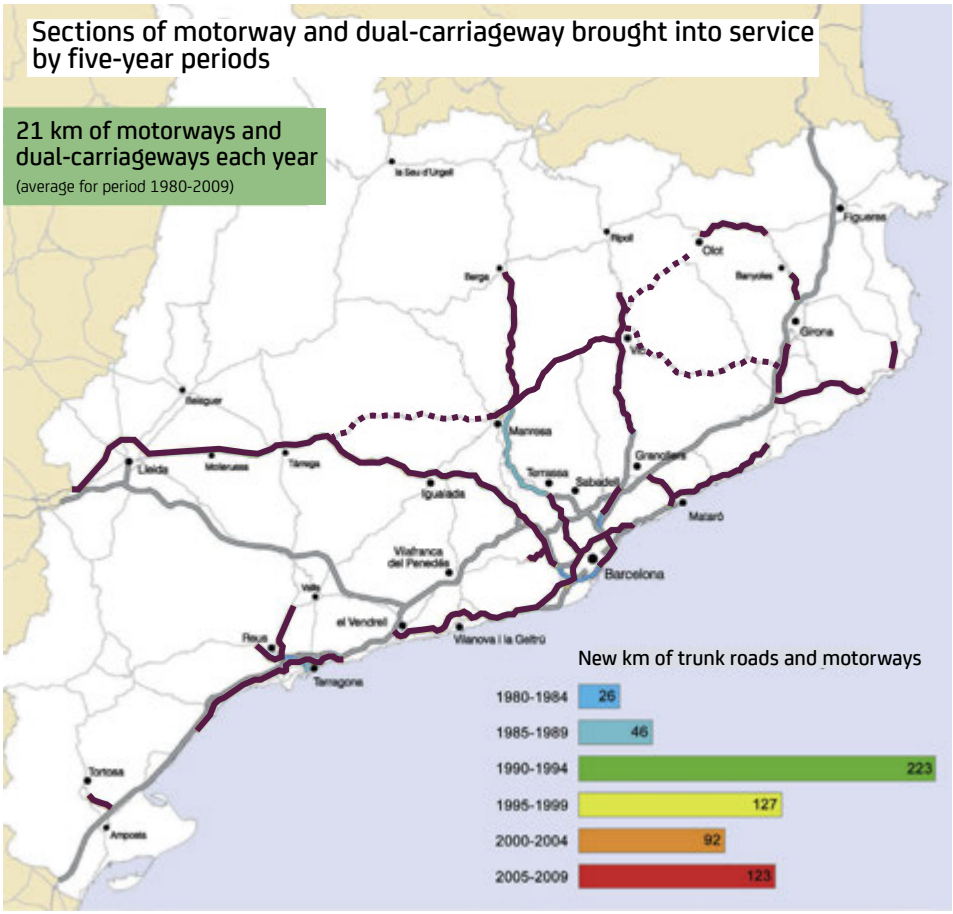


Fig. 64. Construction of the network of motorways and trunk roads in Catalonia in the period 1990-2009 (purple). *Compiled by the author with data from the IET, 2009a.*

but they were not approved until 1996. Subsequently, the Plan for Transport Infrastructures of Catalonia 2006 was approved, which represented formally a balanced compromise between road and rail transport. Unfortunately, during the 1990s, and until the crisis of 2008, there was a commitment to the development of segregated routes (motorways and trunk roads) and high-speed trains (see Fig. 64 and 65), when perhaps, at that time, it was necessary to reinforce metropolitan rail transport (see Fig. 66a).

The most serious rail proposal was that put forward by Pasqual Maragall in the campaign for elections to the Generalitat in 1999, with the construction of the transversal axis railway network.

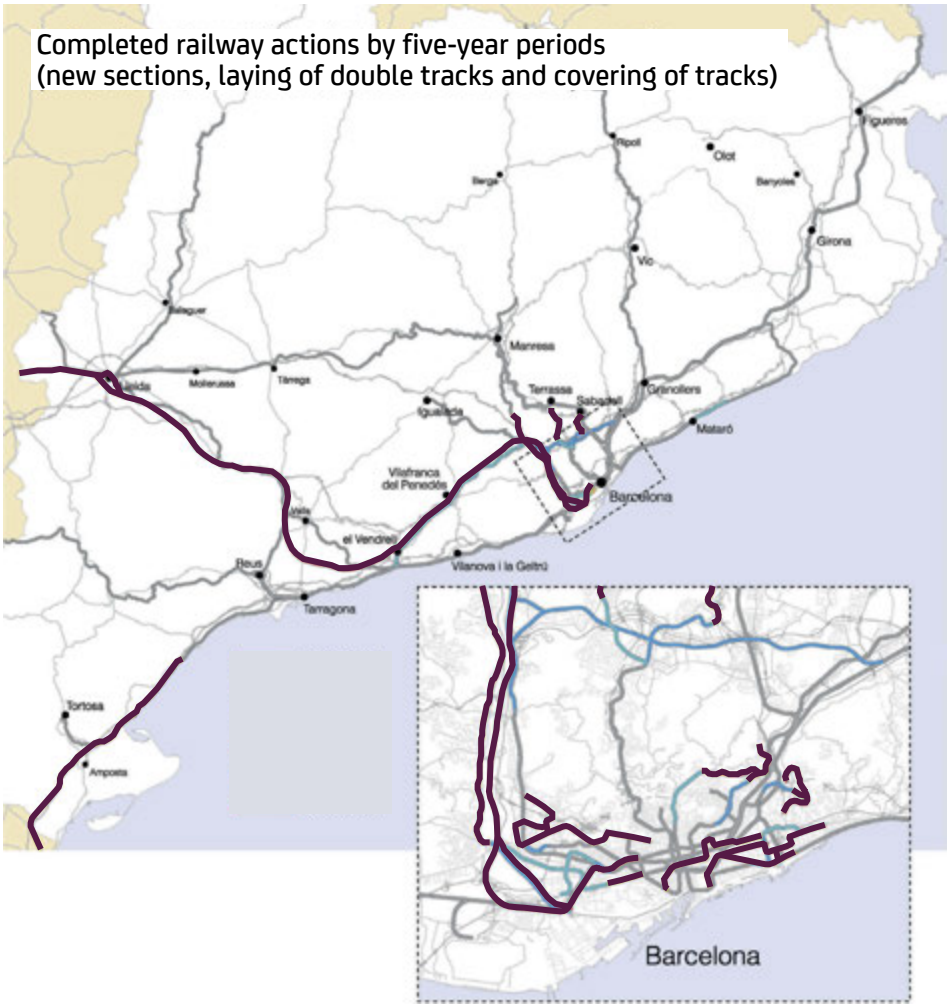


Fig. 65. Construction of the railway network in Catalonia in the period 1990-2009 (purple).
Compiled by the author based on data from the IET, 2009b.

This proposal, together with the orbital rail network of Barcelona, are the only ones that were finally planned. But never built.

The break bulk areas that have to be planned for Arboç-Vilafranca; Martorell, Santa Perpètua-La Llagosta, Hostalric and Figueres indirectly condition the functioning of the AMB.

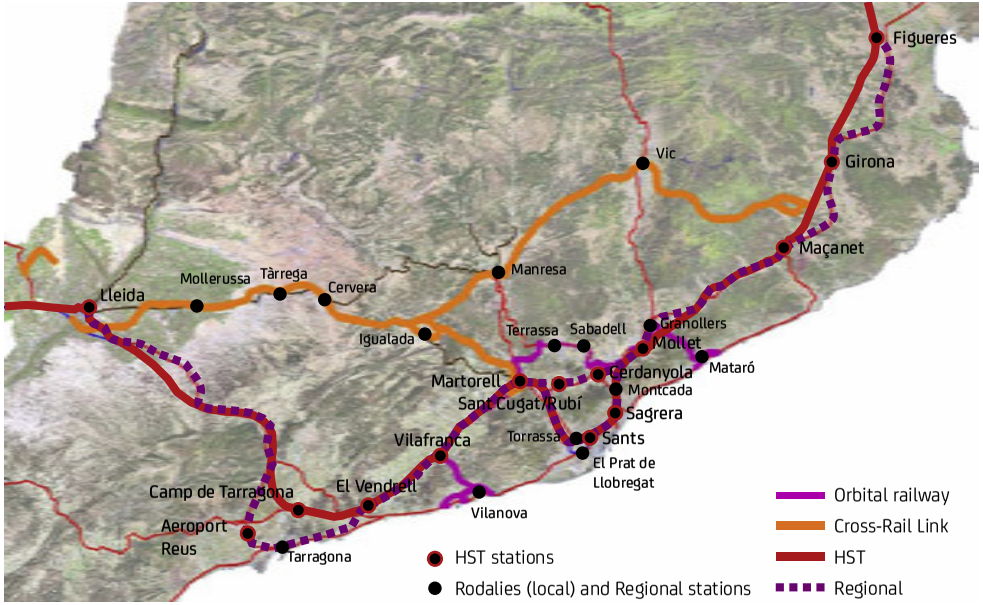


Fig. 66a. Proposal for the structure of territorial nodal points associated with the future metropolitan regional high-speed rail network, orbital railway network and transverse axis rail network. *Compiled by the author.*

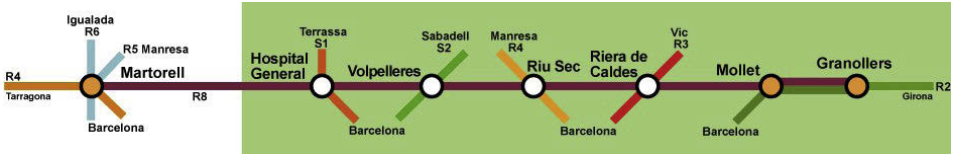


Fig. 66b. Map of the central nodes of the network of stations proposed by Fem Vallès. *Fem Vallès.*

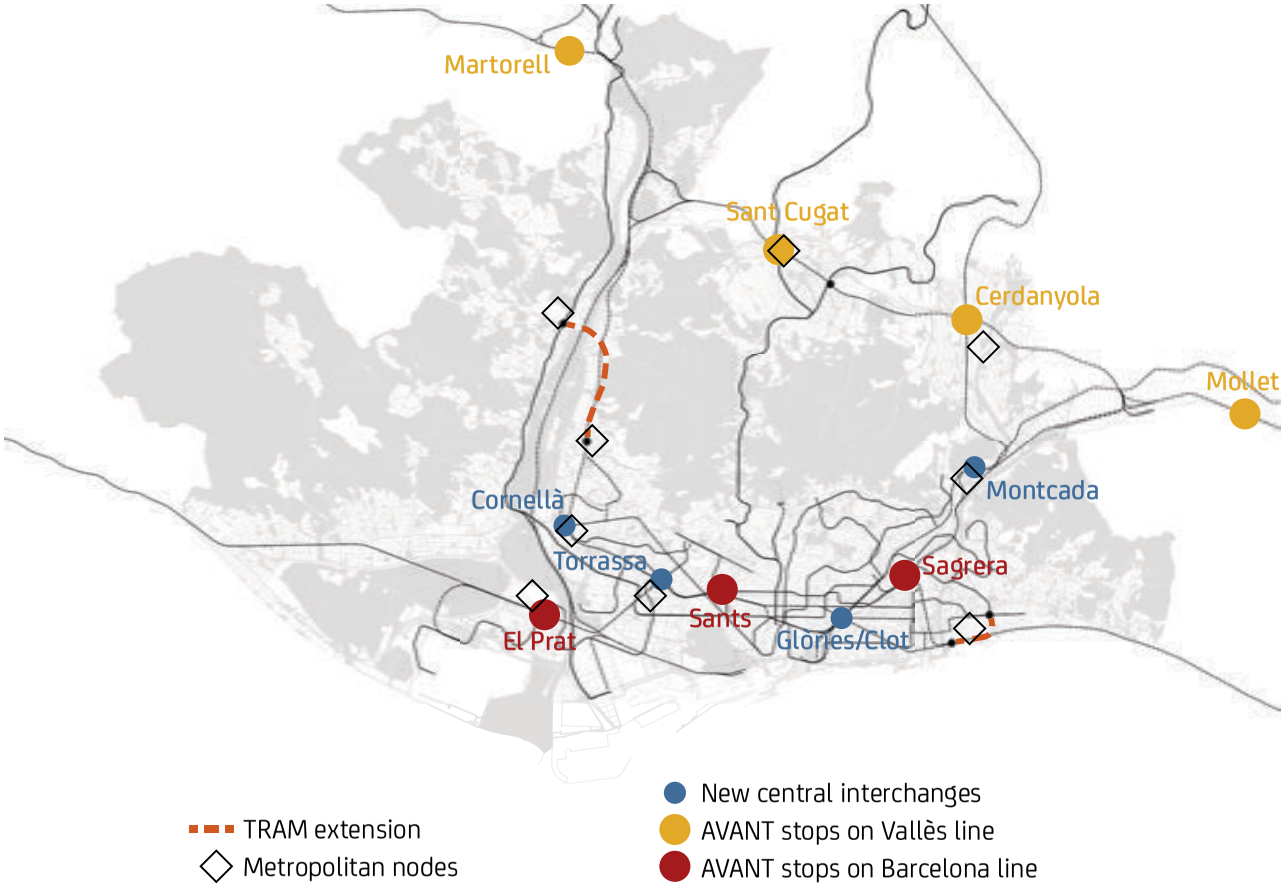


Fig. 66c. Proposal for the structure of AMB territorial nodal points associated with the future rail network. *Compiled by the author.*

A good global connection and internal functioning of the metropolis requires a metropolitan rail and road policy led by the local business community and coordinated from the AMB.

The B-30 should have a much more important role. For the AMB it has not ceased to be, to date, a peripheral corridor. If the AMB is read as a subsystem of the RMB, the B-30 corridor acquires a central role. The consideration of stations that interconnect high-speed, Rodalies and regional trains, for example, with railway stations such as Martorell, Sant Cugat-Rubí, Cerdanyola-Barberà and Mollet-Montmeló, which become new regional central hubs, is fundamental. It is necessary to prioritise them before the construction of the B-40 which, in any case, has to be substituted by the "Ronda Vallès" ring road, understood as a road that is better integrated into the territory, more transparent, closer to the industrial estates and less aggressive with the natural environment and the agroforestry areas of the Vallès.

Therefore, the consolidation of a metropolitan region that enables a new and real leap over the threshold to global positioning needs a clear commitment to rail that involves, firstly, the articulation of a network of regional trains in the Vallès as a central line of support. And added to this, a whole series of metropolitan high-speed stations that are, at the same time, interchanges with the Rodalies and regional network. Secondly, the finishing of the orbital railway project prioritising the tram between Martorell and Mataró. Thirdly, developing the transverse axis railway. And in any event, putting the road network at the service of the rail network in order to establish, also, a modal transfer from private vehicle to rail. And not the other way around.

Along these lines a fundamental project is the laying of double tracks on the Sant Vicenç de Calders-Vilafranca-Martorell and Barcelona-Vic lines and the connection Martorell-Terrassa-Sabadell-Mollet-Granollers, as well as maximising the potential of the Barcelona corridors between Torrassa and Montcada.

Risks due to a lack of flexible governance of the metropolitan system: reinforcement of intermunicipal cooperation

THE GROUPING OF MUNICIPALITIES BY MANAGEMENT: THE NEW AMB TERRITORIES

To improve metropolitan governance, it is fundamental to take the step from a host of individual municipal policies towards a set of pluri-municipal policies.

A first step in this direction would be to establish differentiated policies for the diverse territories of the AMB.

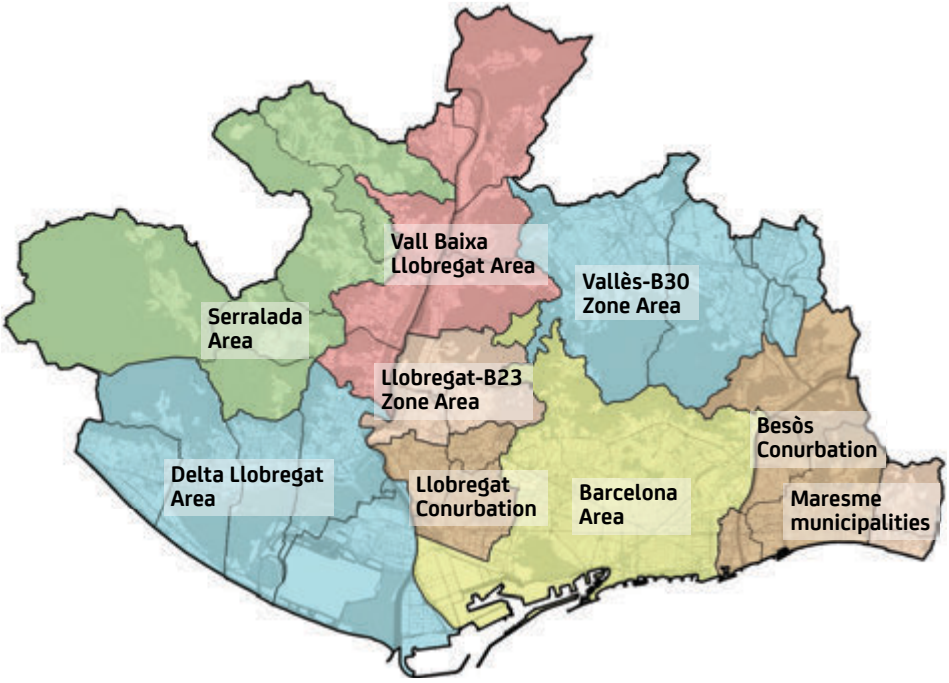


Fig. 67. AMB territorial areas. *AMB-Strategic Planning Area, 2016.*

Municipalities	Inhabitants	Area (km²)	Density (Inhab./km²)
Barcelona	**1,620,343**	**101.4**	**15,980**
L'Hospitalet de Llobregat	261,068	12.4	21,054
Cornellà de Llobregat	87,173	7.0	12,453
Esplugues de Llobregat	46,355	4.6	10,077
Llobregat Conurbation	**394,596**	**24.0**	**16,442**
Sant Boi de Llobregat	82,904	21.5	3,856
Viladecans	66,168	20.0	3,308
El Prat de Llobregat	64,132	31.4	2,042
Castelldefels	66,375	12.9	5,145
Gavà	46,705	30.8	1,516
Delta Llobregat Area	**326,284**	**116.6**	**2,798**
Sant Feliu de Llobregat	44,474	11.8	3,769

Municipalities	Inhabitants	Area (km²)	Density (Inhab./km²)
Sant Joan Despí	34,084	6.2	5,497
Sant Just Desvern	17,494	7.8	2,243
Llobregat B-23 Area	**96,052**	**25.8**	**3,723**
Sant Vicenç dels Horts	27,901	9.1	3,066
Sant Andreu de la Barca	27,332	5.5	4,969
Molins de Rei	25,687	15.9	1,615
Castellbisbal	12,332	31.0	398
Pallejà	11,486	8.3	1,384
El Papiol	4,103	9.0	458
Santa Coloma de Cervelló	8,179	7.5	1,091
Vall Baixa Llobregat Area	**117,020**	**86.26**	**1,357**
Corbera de Llobregat	14,643	18.4	796
Cervelló	8,970	24.1	372
La Palma de Cervelló	2,982	5.5	542
Begues	6,961	50.4	138
Torrelles de Llobregat	5,945	13.6	437
Sant Climent de Llobregat	4,107	10.8	380
Serralada Area	**43,608**	**122.8**	**355**
Badalona	217,741	21.2	10,271
Santa Coloma de Gramenet	118,821	7.0	16,974
Sant Adrià de Besòs	36,669	3.8	9,650
Montcada i Reixac	35,559	23.5	1,513
Besòs Conurbation	**408,790**	**55.5**	**7,366**
Montgat	11,819	2.9	4,076
Tiana	8,709	8.0	1,089
Maresme municipalities	**20,528**	**10.9**	**1,883**
Sant Cugat del Vallès	90,664	48.2	1,881
Cerdanyola del Vallès	57,740	30.6	1,887
Ripollet	38,347	4.3	8,918
Barberà del Vallès	32,839	8.3	3,957
Badia del Vallès	13,417	0.9	14,908
Total Vallès-B30 Zone	**233,007**	**92.3**	**2,524**

Fig. 68. AMB territorial areas. Population, area, and density. *Compiled by the author.*

This qualitative leap demands, at this moment in time, a dual approach. The AMB municipalities need to be regrouped into territories and be activated from the towns that stand out as leaders in these territories or in a coordinated way, if applicable:

- Viladecans and El Prat de Llobregat in the Delta area.
- Badalona and Santa Coloma in the Besòs conurbation.
- L'Hospitalet and Cornellà in the Baix Llobregat conurbation.
- Sant Feliu de Llobregat and Sant Vicenç dels Horts in the lower Llobregat valley
- Sant Cugat and Cerdanyola in the Vallès-B-30 area.
- Torrelles in the mountain municipalities.

There is a territorial implication that emerges as a configurator of policies on a metropolitan scale. Resilient thinking is articulated around specific and self-organised territories.

Self-organised territories could be activated in three of the six territories, around the following issues:

- **Delta del Llobregat,** which would include two issues:
  - Metabolic resilience of the sub-basin of the Llobregat Delta (Gavà-Viladecans), in the face of climate change and the energy crisis.
  - Coastline resilience and adaptation to climate change of the Llobregat southern hemi-delta.
- **Besòs conurbation:** generator of socially responsible territories that would deal with social inclusion, training, social innovation and local-scale economies.
- **Baix Llobregat Mountain and Agricultural Park:** generation of a self-organised territory for the preservation of firebreaks, which will have as instruments the Agricultural Park extended to the agricultural areas of the Baix Llobregat, and the associated environments.

SUPPORT FOR INITIATIVES OF THE BAIX LLOBREGAT COMARCAL REGION AS THE AMB'S MOST CONSOLIDATED PLURI-MUNICIPAL TERRITORIAL REFERENCE

Within the AMB area, the most organised territory is that of the Baix Llobregat Comarcal Region Council. The majority of the Council's municipalities belong to the AMB, which has led to good collaboration relationships being established among a significant part of these municipalities.

Besides services for citizens, municipal councils and organisations already provided by the Region Comarcal Council, in line with those provided by the other comarcal regional councils (psychological support and legal advice for women, Baix Llobregat Women's Council, Consultative Council for the Elderly, school meal grants, school transport, etc.), it is necessary to

highlight the Economic and Social Council (CES) and the development of the Baix Llobregat Agreement for Social Cohesion and Employment, the Action Plan against Unemployment, the creation of the Labour Market Permanent Observatory, expanded and transformed into the Baix Llobregat Comarcal Region Observatory, the Project for the Recovery of the Ecosystem of the Llobregat River, the Baix Llobregat Pro-Employment Services Network (SPOBL), the Baix Llobregat Strategic Plan, the Community Initiatives Operating Programme, the Comprehensive Employment Services, the Baix Llobregat Cooperative Cultural Centre (Ateneu), Innobaix and the Baix Llobregat Innovation and Knowledge Agency.

Everything is geared towards promoting and strengthening, in a not-for-profit way, the innovation capacity of companies and institutions in the Baix Llobregat; the activities associated with the Agricultural Park Consortium (fresh products, farmers' markets, etc.); the activities in the mountain areas of the Baix Llobregat and the Framework Collaboration Agreement for the Protection, Improvement and Comprehensive Development of the Baix Llobregat mountain agro-forestry territory; the Baix Llobregat Tourism Consortium, with initiatives that are committed to the natural and cultural heritage, as well as to the growing creation of new tourism infrastructures; pluri-municipal initiatives such as the Comarcal Region Mobility Forum, which has enabled development of an inventory and a routes map and the promotion of the use of bicycles (Baix Llobregat Comarcal Region Council, http://www.elbaixllobregat.cat/serveis).

A long series of experiences show the pluri-municipal self-organisation capacity that can be developed. And it has to be developed even further. A good perspective of this is given by the Baix Llobregat Under Debate Congress, held recently and organised by the Baix Llobregat Comarcal Region Studies Centre (http://www.baixllobregatadebat.cat/congres/).
The Congress put forward the following conclusions:

- People as subjects of rights:
  - The transformation of services into rights and the guarantee of those rights for citizens.
  - The extension of best practices for welfare policies among the different municipalities.
  - Giving a response to the needs of the municipalities by reinforcing social policies, fundamentally in the smaller municipalities.
- The economy as a factor in development and social cohesion, with the capacity to generate opportunities.
  - Work and knowledge become driving forces of quality employment, with added value.
  - Formal and informal training respond to the demands of businesses and the needs of individuals.
  - Promote and add value to the new social and cooperative economies from the local business community.
- The territory as an area for interaction, relations and coexistence, where economic and social activities are carried out:

- Completion of comarcal regional infrastructures that are pending, and strengthening of an effective, efficient and sustainable management.
- Resolving of mobility deficits, both internally and externally, in some of the comarcal region municipalities and between it and the neighbouring comarques.
- Growth of the neighbourhoods and towns in a harmonious, sustainable and integrating way.
- Good management of the surroundings and of environmental elements in a territory with the complexity, plurality and sometimes servitude presented by the Baix Llobregat.

• The authority as a generator of social rights and manager of public services and policies in the territory:
  - Adaptation of the local authority management models to a model of new governance based on proximity, participation, transparency and innovation.
  - Necessary determination of the authority to find a response to future challenges in a territory as complex as that of the Baix Llobregat.
  - Organise the participation and coexistence of the different authorities established in the territory, respecting the principles of proximity, subsidiarity, equity and equalisation.

It is a good base for organising territorialised experiences of socially responsible and self-organised territories, within the framework of resilient planning that promotes self-organised territories.

SUPPORT FOR INITIATIVES IN THE BESÒS TERRITORY: BESÒS AGENDA

The Besòs River does not exist as a comarcal region organisation. There is a certain organisation around what has been called Barcelonès Nord (a part of the comarcal region without Barcelona), but it does not have the power represented by a majority grouping such as that of the municipalities of the Baix Llobregat comarcal region that belong to the AMB.

The recently-adopted decision on the disappearance of the Barcelonès comarcal region puts a question mark over the need for reorganisation of this territory.

The Besòs Consortium has a significant value as a new organisation. It includes Barcelona, with its districts Nou Barris, Sant Andreu and Sant Martí, plus Badalona, Santa Coloma de Gramenet, Montcada i Reixac and Sant Adrià de Besòs. This territory has decided to define together a strategy for the coming years with a great potential for development around the course of the river and formalised through the Besòs Agenda (see Besòs Consortium. https://consorcibesos.cat/documents-agenda-besos/)

The Agenda situates the river as an element favouring cohesion, over the next 10 years, of 98 neighbourhoods with nearly a million inhabitants. Furthermore, it prioritises actions that reduce vulnerability. Among others, training, right to housing, improved accessibility and connectivity. The five towns have thus brought together their technical and political teams

to define a first agreed document, with over 130 initiatives, which will mark the development of the new action plan.

The Besòs Agenda aims to be a lever in the quest for funding and a new reference point for the definition of all the proposals for the future of the Besòs area in terms of infrastructures, mobility, environmental quality, facilities and services, based on the prioritisation of projects originating from the municipalities and the Consortium. In recent months, in-depth work has been carried out on diagnosis, organised into eight volumes, which has given rise to the first draft of the Agenda and was the subject of one of the main technical work conferences at the UPC.

The Besòs Agenda will lead on to the action plan, which will have to take into account the following strategic priorities:

- Promote a shared identity focusing on the river as a cohesive element for the Besòs neighbourhoods.
- Reinforce social equity to reduce conditions of vulnerability in these neighbourhoods.
- Promote active training policies as a lever for incorporation into the labour market.
- Guarantee the right to housing by promoting policies coordinated with agents in the territory.
- Improve accessibility and connectivity between the neighbourhoods mentioned.
- Compensate negative externalities of the major infrastructures, integrating them into the diverse urban logistics.
- Improve environmental quality by structuring green and blue infrastructures.
- Promote areas of knowledge and metropolitan economic activity, promoting the circular economy.
- Promote revitalisation, networking to build associations, and the strengthening of social innovation practices.
- Strengthen governance in order to jointly manage the territory and promote policies and projects within the metropolitan framework.

SUPPORT FOR COOPERATION OF THE BAIX LLOBREGAT MOUNTAIN MUNICIPALITIES: AGRICULTURE, FOREST FIRES AND CIRCULAR ECONOMY

The mountain territorial area of the Baix Llobregat includes non-development areas of mountain in the Baix Llobregat comarcal region, situated between the Llobregat Delta, the Anoia River and the Garraf Park.

The municipalities concerned are Begues, Castellví de Rosanes, Cervelló, Corbera de Llobregat, Gavà, la Palma de Cervelló, Martorell, Pallejà, Sant Andreu de la Barca, Sant Boi de Llo-

bregat, Sant Climent de Llobregat, Sant Vicenç dels Horts, Santa Coloma de Cervelló, Torrelles de Llobregat, Vallirana and Viladecans.

It has a population of just 42,000 inhabitants but covers an area of 123 km^2, even larger than Barcelona itself (102 km^2).

The demands of these municipalities are very much focused on protection of the natural areas that they cover and on the need to protect themselves from the risk of forest fires, which necessarily means recovering mountain agriculture.

They do have a deficit in terms of sustainable mobility access, which will become more serious with the risk of peak oil and climate change.

For this reason, in the year 2006 and subsequent years, the Comarcal Region Council and the town councils have signed the Framework Collaboration Agreement, for the protection, improvement and integrated management of the mountain agriculture and forestry areas of the Baix Llobregat. This last year, 2018, a new Framework Collaboration Agreement was signed for the protection, improvement and comprehensive development of the mountain agroforestry territory of the Baix Llobregat.

The purposes of this agreement are to:

- Promote the preservation and improvement of the natural, environmental and economic values of the agroforestry environment.
- Develop agricultural, forestry and leisure activities.
- Coordinate the actions of the municipal councils in the agroforestry environment, exchange experiences and tend towards unifying the criteria for intervention among neighbouring municipalities.
- Establish and consolidate coordination and cooperation mechanisms between municipal council and supra-municipal organisations to achieve common goals.
- Establish and promote collaboration and support mechanisms with the private agents in the territory.
- Seek the collaboration of public authorities, scientific institutions and other organisations.
- Disseminate among the population the values and functions of this territory, as well as respect for its natural heritage, the economic activities carried out there and leisure infrastructures and their users.
- Plan and implement actions to achieve the aforementioned goals.

This territory requires a governance framework capable of addressing the risks of climate change and peak oil, which can be reinforced clearly with better pluri-municipal self-organisation in which environmental risks are converted into windows of opportunity.

TOWARDS COOPERATION BETWEEN THE MUNICIPALITIES OF THE VALLÈS WITH THEIR COMARCAL REGIONAL COUNCILS

The Vallès Occidental and Vallès Oriental comarcal regional councils, and especially that of the Vallès Occidental, are key authorities in the development of a metropolitan vision.

The reference point of the Vallès Occidental Reindustrialisation Agreement, constituted in the year 2014, is an experience that must be taken into account in the development of a metropolitan policy of reindustrialisation.

Moreover, any reorganisation of the transport system must include, necessarily, a reorganisation of the sustainable mobility system associated with comarcal region self-containment and resolution with respect to what the roles of the B-30 and the B-23 should be, from a metropolitan region perspective that should combine comarcal region movement and goods through-traffic. Similarly, it is necessary to reorganise the rail system, in which a high-speed line with metropolitan stations (Vilafranca, Martorell, Sant Cugat/Rubí, Cerdanyola-Riu Sec, Mollet) must play a central role.

The Comarcal Region Council has also developed policies such as the Comarcal Region Forestry Biomass Service and the Vallès Forests Project, innovative experiences in forest fire prevention through a new approach to the forestry biomass on a comarcal region scale. This service enables the allocation of public resources, both investments and human resources, to promote the use of biomass from the forests of the comarcal region. Within the framework of this public service, through inter-authority collaboration agreements, the building of two biomass boilers and the Forestry Biomass Logistics Centre have been promoted. All of this gives service to the two boilers mentioned and, in addition, to others that may adhere to the comarcal region service. The mobilisation of wood improves the state of the forests and, consequently, intensifies forest fire prevention.

Until 2013, through the Comarcal Region Plan on forestry management for the prevention of forest fires, an inventory was conducted of 2,123 kilometres of forest roads and tracks and work was carried out to clean up paths and water points, as well as to improve mobile telephone coverage, in addition to important joint work with the Forestry Defence (AF) groups in the area.

It is worth highlighting the Vallès Circular Agreement of 2017, with support from the Generalitat of Catalonia and the Barcelona Provincial Council, which has the aim of working together in order to transform the consumption and production model and which, also, articulates processes of competitive improvement among businesses and social development that generate wellbeing and limit the impact on the environment. The agreement was the result of work that had been initiated by the Organisations Network, created in 2016 in order to promote the circular economy in the Vallès Occidental.

Promotion of the circular economy in the comarcal region is reinforced with the incorporation of the Vallès Circular and Industry initiative into the Reindustrialisation Agreement in the

Vallès Occidental, a cross-cutting and stable framework for cooperation between the authorities and social and economic agents, designed to position the territory as a benchmark reference in the promotion of industrial sector transformation, sharing policies and strategies.

This and other experiences could be mainstream policies for a metropolitan vision, a vision that goes beyond the sphere of the AMB and that constitutes a first set of instruments for the preparation of a leap forward, on an essential scale, for the development of the Barcelona metropolitan region.

TOWARDS COOPERATION WITH MUNICIPALITIES OF THE CONURBATION

Within the context of the reading of a complex adaptive system it is clear that, to take a good leap in scale, it is fundamental to restructure the conurbation based on considerations of mutually agreed cooperation and coordination.

The leap in scale of the walled city on the plain of Barcelona was based on a prior colonisation of the territory by transport (train and tram) and by the water and gas services. The comarcal regional leap, in turn, was able to occur thanks to private vehicles, buses and electricity and telephone systems. As for the regional leap, it required the mass use of private vehicles and the introduction of the new generation of telecommunications.

In this last phase, the leap can be made through a re-adaptation of the economic system, as much of the productive economy as of the social and solidarity economy, a railway infrastructural leap, and management of the restriction of private vehicles in favour of sustainable mobility. And also, a new synergy of water and energy that will require a new system of reuse of regenerated water and the introduction of renewable energies at the water nodes (desalination plant, treatment plants, eco-parks).

However, as we have seen, with each leap there has been a restructuring of the node with increases in scale: walled city and lands with walls, articulation of the central Eixample and the Eixample de Sant Martí, articulation of the ring-road sites and urban development of their surroundings.

Today a restructuring of the conurbation is necessary that unifies the model of areas of new centrality across the entire sphere. A restructuring of the balance between the Besòs and the Llobregat will be essential, and must be based on a series of network operators, which will enable this governance:

- **Ring road mobility regulation operator**

  This operator is legitimised by the AMB Law, which gives it explicit competences for the management of the ring roads. Good management of private vehicle restrictions will

require some type of toll, which should be combined with a metropolitan above-ground parking policy. We already have an initiative associated with vignettes for polluting vehicles, which implies a control of the ring roads applicable in periods of high air pollution levels and will progressively be generalised from 2020 onwards.

It is fundamental that, from the AMB, there is a metropolitan mobility management policy and, especially, in a scenario of change where it is aimed to introduce a generalised vignette. It will be necessary to find a mechanism for congestion management, which in the future will have to be associated with the management of congestion on the B-23 and the B-30.

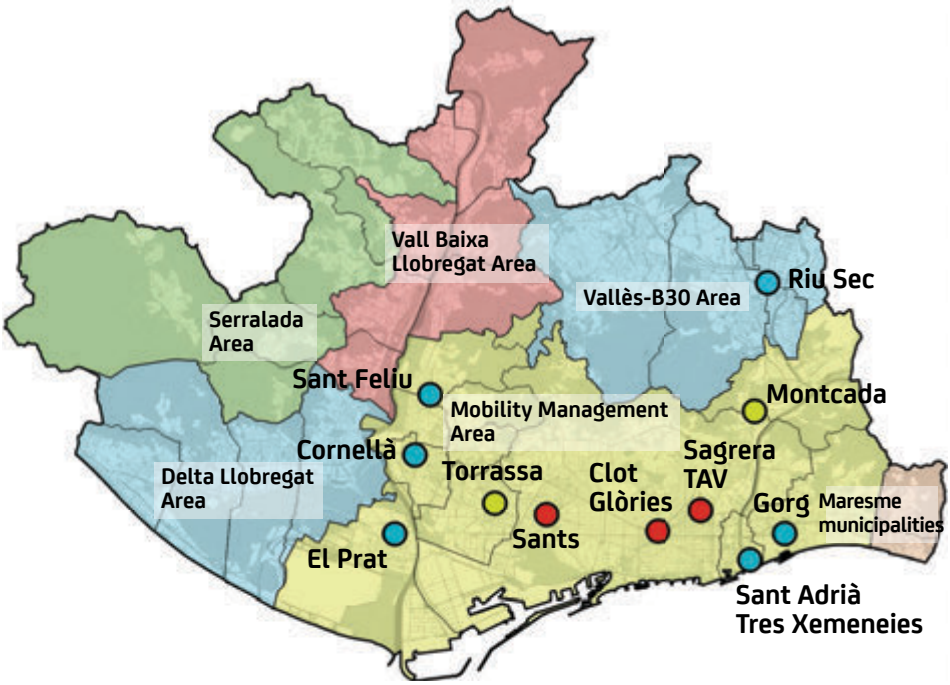


Fig. 69. Proposal for the Barcelona conurbation mobility management area. *Compiled by the author.*

- **Development of a district heating and cooling (DHC) system in the conurbation sphere, led by the Barcelona Metropolitan Energy Operator**

The so-called heating and cooling urban networks are centralised systems that produce and distribute thermal energy (heat and cold) to an entire neighbourhood, district or municipality. The DHC produce energy at one or various power stations and distribute it to buildings or facilities through a network of pipes through which thermal fluid flows.

Centralised production and the use of renewable energy sources, which vary at each type of facility, enable improved efficiency and a reduction in pollutants and greenhouse gases. At present, Barcelona has two DHC networks managed by the companies Districlima, in the Fòrum area, and Ecoenergies Barcelona, in the southern area and L'Hospitalet. It would be very interesting to interconnect them within a conurbation perspective of Barcelona. This would mean a node could be established, with synergies, that would be one of the principal bases of the metropolitan energy operator. Districlima is mainly a generator of heat, whereas Ecoenergies generates cold.

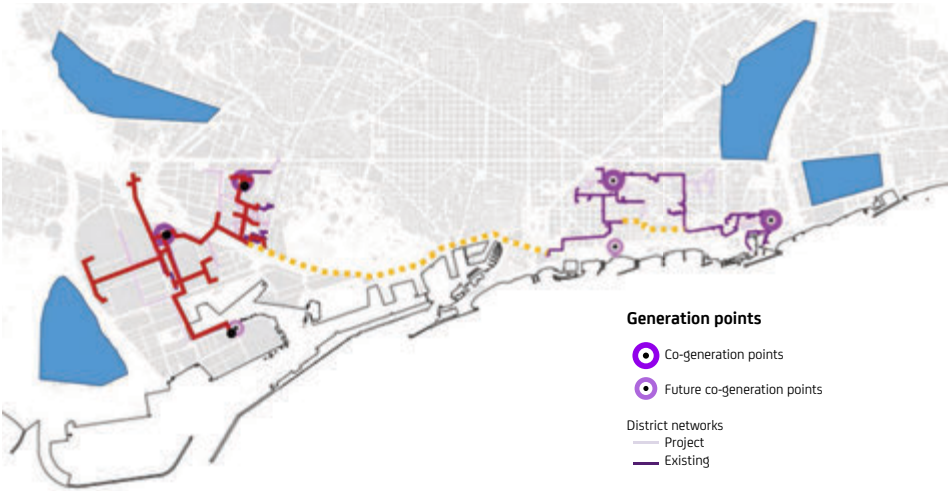


Fig. 70. Current DHC network, forecasts for growth and interconnection proposal for future extension to the industrial estates of the AMB conurbation. *Compiled by the author.*

There is great potential for the extension of economic activity to estates on Carretera del Mig (L'Hospitalet de Llobregat and Cornellà), to the estates of El Prat de Llobregat, of Bon Pastor and of Sant Andreu-Sagrera, in Barcelona, and to Polígon Sud in Badalona and Sant Adrià de Besòs. In addition, of course, to those that already exist at 22@, at the Zona Franca Consortium and at La Fira.

- **A synergy between Barcelona Activa and Metròpolis Barcelona, the AMB's Economic Development Agency**

The economic risks generated by the lack of reinforcement of the productive fabric – especially on economic activity estates within the framework of an economic transition marked by globalisation – requires a public policy that helps position the productive economy potential, training needs and social, cooperative and solidarity economies, which are basic for the territory's resilience.

Within this scenario, an opportunity for adaptation opens up, with a greater synergy between Barcelona Activa, the AMB's Economic Development Agency (Metròpolis Barcelona), created recently, and the organisations originating in the comarcal regional councils, especially those of the Baix Llobregat, Vallès Occidental and Vallès Oriental.

- **From Barcelona Digital City to Barcelona Digital Metropolis**

  Barcelona City Council has the instrument provided to it by the Municipal IT Institute (IMI), and the Barcelona Digital City Project, as well as the experience of the CitiLab of Cornellà de Llobregat.

  These all have a potential for intervention that could be taken advantage of by other municipalities, especially by those of the conurbation, in order to establish collaboration protocols and be able to thus improve services for citizens.

Risks due to lack of flexible governance of the metropolitan system: need for participation and decision mechanisms

INTERACTION OF METROPOLITAN POLICIES THROUGH THE PAM PARTICIPATORY PROCESS

The approval of the PAM represents a key point in the clarification of metropolitan policies for their term of office.

The formal development of the PAM requires it to be validated by a Council of Mayors. In this process it would be increasingly important for it to be validated by the different territories so that these can qualify the different priorities of each.

In the 2015-2019 term of office, a metropolitan participatory process was undertaken on the Metropolitan Action Plan with which we were able to address the differentiated reception of the PAM in all the territories. The strategy presented the lines of action of the three strategic pillars so that participants could prioritise the strategic lines, choose three from the total (around eight for each pillar) and, among those chosen, work on one to evaluate the actions taken. The result of this participatory dynamic enabled the establishment of which strategic lines were prioritised and showed the differentiation between territories.

The debates were carried out in six functional territories:

- In the Vall Baixa del Llobregat area: Sant Vicenç dels Horts, Santa Coloma de Cervelló, Sant Andreu de la Barca, Molins de Rei, Pallejà and El Papiol.

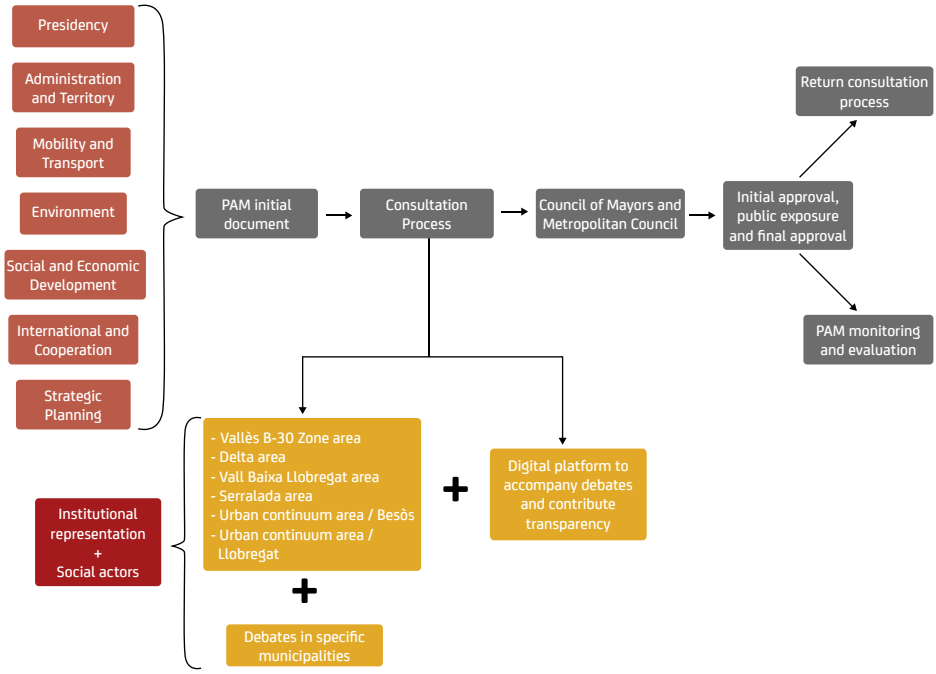


Fig. 71. Participation process for validation of the PAM 2015-2019 in the AMB metropolitan territories. *AMB- Strategic Planning Area, 2016.*

- In the Llobregat Delta area: El Prat de Llobregat, Castelldefels, Sant Boi de Llobregat, Viladecans and Gavà.
- In the Serralada area: Begues, La Palma de Cervelló, Corbera de Llobregat, Sant Climent de Llobregat, Torrelles de Llobregat and Cervelló.
- In the urban continuum area, Besòs sphere: Barcelona, Santa Coloma de Gramenet, Sant Adrià de Besòs, Badalona, Montgat and Tiana.
- In the urban continuum area, Llobregat sphere: Barcelona, L'Hospitalet de Llobregat, Cornellà de Llobregat, Esplugues de Llobregat, Sant Just Desvern, Sant Joan Despí and Sant Feliu de Llobregat.
- In the Vallès-B30 zone area: Castellbisbal, Sant Cugat del Vallès, Cerdanyola del Vallès, Ripollet, Barberà del Vallès, Badia del Vallès and Montcada i Reixac.

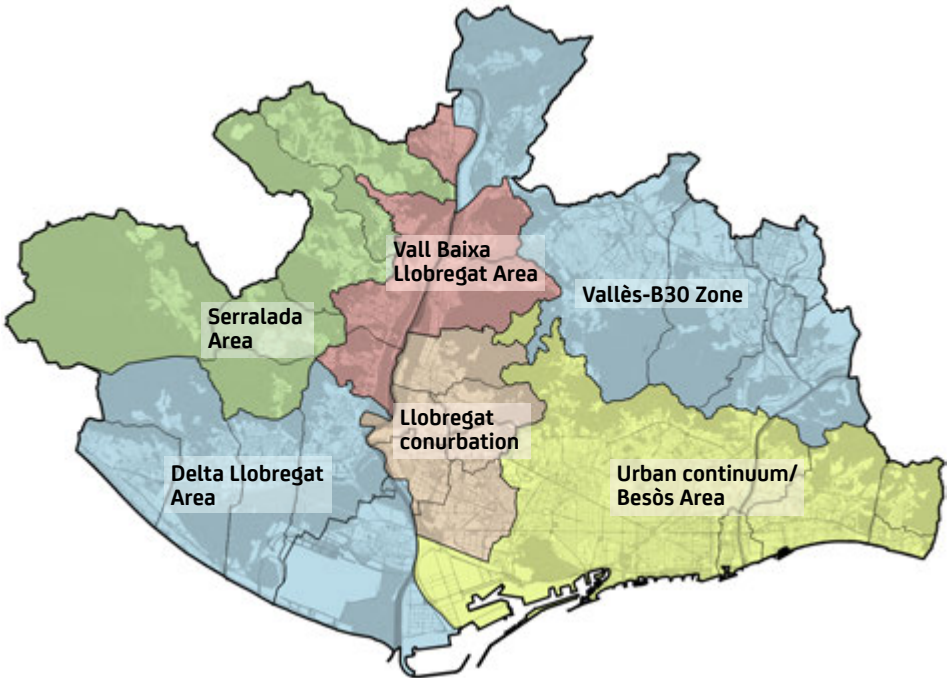


Fig. 72. Territories of the participation process for the validation of the PAM 2015-2019 in the AMB metropolitan territories. *AMB-Strategic Planning Area, 2016.*

The analysis of the strategic lines of the PAM 2015-2019 prioritised by the whole of the sample enabled us to confirm that there is:

- A prioritisation of social and environmental policies. In the case of social policies, they highlight, in top place, those of inclusive and sustainable economic development, those of fighting inequalities of social inclusion, those of citizens' rights and those of consolidation of the right to housing.
- The policies associated with sustainability are centred around the promotion of sustainable mobility in the entire metropolitan territory, the fight against climate change and air pollution and the priority of preserving metropolitan natural and agricultural areas.
- There is a prominent and predominant role for the promotion of good governance and the Transparency Agency, as one of the main instruments of governance.
- There is conformation of the importance given to urban planning as a strategic tool for territorial development.

Strategic lines	Delta	Vall baixa Llobregat	Serralada	Llobregat	Besòs	Vallès	Total
s2: policies for inclusive and sustainable economic development	X	X	X	X	X	X	6
m5: promote sustainable mobility across the whole metropolitan area	X	X	X	X	X	X	6
s1: policies to combat inequalities, for social inclusion and citizens' rights	X	X		X	X	X	5
s4: consolidation of the right to housing	X	X		X	X	X	5
s6: urban planning, strategic tool for territorial development		X	X	X	X	X	5
m1: the metropolitan city leading the fight against climate change and air pollution	X		X	X	X	X	5
g1: promote good governance, with the transparency agency	X	X	X	X		X	5
s3: public space and facilities for reinforcing equal opportunities and quality of life		X	X		X	X	4
m2: metropolitan natural and agricultural spaces as a priority	X	X	X	X			4
m8: deploy a model for the planning and coordination of infrastructures for social and territorial cohesion on a metropolitan scale	X			X	X		3
s5: improvements in neighbourhoods and support for councils				X		X	2
m3: develop the provision, supply and treatment of water in a balanced and socially just way		X			X		2
m4: advance towards a circular economy in the area of waste			X			X	2
g2: an efficient and financially sustainable administration at the service of citizens	X		X				2
g3: inter-institutional coordination for the management of metropolitan services			X		X		2
g4: promote coordination in the spheres of social, economic, territorial and environmental development with a cross-departmental and strategic perspective	X	X					2

Fig. 73. Prioritised strategic lines in the process of participation for the validation of the PAM 2015-2019 in the AMB metropolitan territories. *AMB-Strategic Planning Area, 2016.*

In the differentiated analysis by territories it can be confirmed that:

In the Delta de Llobregat area, the predominant component is that of social and economic development as well as the fight against pollution.

In the Vall Baixa del Llobregat area, predominant are the prioritisation of natural and agricultural areas and the promotion of sustainable mobility.

In the Serralada area, there is combined concern with economic development policies and preoccupation with environmental policies, associated with the prioritisation of metropolitan natural and agricultural areas, as well as the promotion of sustainable mobility.

In the Llobregat urban continuum area they highlight the prioritisation of policies for inclusive and sustainable economic development, the policy to combat inequalities in social inclusion, the policy of citizens' rights and that of consolidation of the right to housing.

In the case of the Besòs urban continuum area they highlight the significant importance of policies for social and economic development and of promoting sustainable mobility. In addition to those prioritised globally by the metropolitan area as a whole.

In the case of the Vallès, a cross-cutting vision is highlighted with the emphasis on measures for improving neighbourhoods and the fight against pollution.

STRENGTHENING OF THE ROLE OF THE COUNCIL OF MAYORS

Once the central role of the PAM is proposed as an instrument for metropolitan policies, it is fundamental to have a series of policies of metropolitan scope, the development of which will need the involvement of mayors in order to establish criteria for participation.

For example, and among others, the following:

- The decision to accept new taxes to be able to move forward with new policies on a metropolitan scale.
- Agree a system of equalisation for the development of a policy of innovative industrial settlements.
- Establish an agreement for the territorial development of an affordable housing for all policy.
- Establish, also, common social policy for the management of the cohesive and inclusive territory.
- Define the investment strategy for a railway transport network agreed by all the municipalities.

Delta		Vall Baixa Llobregat	
Strategic lines	People % total	Strategic lines	People % total
s1: policies to combat inequalities, for social inclusion and citizens' rights	11.7%	m2: metropolitan natural and agricultural spaces as a priority	10.5%
m1: the metropolitan city leading the fight against climate change and air pollution	11.7%	m5: promote sustainable mobility across the whole metropolitan area	10.5%
s2: policies for inclusive and sustainable economic development	10.4%	g1: promote good governance, with the transparency agency	10.5%
s4: consolidation of the right to housing	9.1%	s1: policies to combat inequalities, for social inclusion and citizens' rights	7.9%
g4: promote coordination in the spheres of social, economic, territorial and environmental development with a cross-departmental and strategic perspective	9.1%	s4: consolidation of the right to housing	7.9%
g1: promote good governance, with the transparency agency	7.8%	g4: promote coordination in the spheres of social, economic, territorial and environmental development with a cross-departmental and strategic perspective	7.9%
m2: metropolitan natural and agricultural spaces as a priority	6.5%	s2: policies for inclusive and sustainable economic development	5.3%
m5: promote sustainable mobility across the whole metropolitan area	6.5%	s3: public space and facilities for reinforcing equal opportunities and quality of life	5.3%
m8: deploy a model for the planning and coordination of infrastructures for social and territorial cohesion on a metropolitan scale	5.2%	s6: urban planning, strategic tool for territorial development	5.3%
g2: an efficient and financially sustainable administration at the service of citizens	5.2%	m3: develop the provision, supply and treatment of water in a balanced and socially just way	5.3%

Serralada		Llobregat	
Strategic lines	People % total	Strategic lines	People % total
s2: policies for inclusive and sustainable economic development	13.4%	s2: policies for inclusive and sustainable economic development	18.2%
s6: urban planning, strategic tool for territorial development	13.4%	s1: policies to combat inequalities, for social inclusion and citizens' rights	13.6%
m2: metropolitan natural and agricultural spaces as a priority	13.4%	s4: consolidation of the right to housing	13.6%
m5: promote sustainable mobility across the whole metropolitan area	10.1%	m2: metropolitan natural and agricultural spaces as a priority	9.1%
g2: an efficient and financially sustainable administration at the service of citizens	10.1%	m5: promote sustainable mobility across the whole metropolitan area	9.1%
g3: inter-institutional coordination for the management of metropolitan services	10.1%	s5: improvements in neighbourhoods and support for councils	4.5%
s3: public space and facilities for reinforcing equal opportunities and quality of life	6.7%	s6: urban planning, strategic tool for territorial development	4.5%
m4: advance towards a circular economy in the area of waste	6.7%	m1: the metropolitan city leading the fight against climate change and air pollution	4.5%
g1: promote good governance, with the transparency agency	6.7%	m8: deploy a model for the planning and coordination of infrastructures for social and territorial cohesion on a metropolitan scale	4.5%
m1: the metropolitan city leading the fight against climate change and air pollution	3.4%	g1: promote good governance, with the transparency agency	4.5%

Besòs		Vallès	
Strategic lines	People % total	Strategic lines	People % total
s2: policies for inclusive and sustainable economic development	20.0%	s5: improvements in neighbourhoods and support for councils	24.7%
m5: promote sustainable mobility across the whole metropolitan area	15.0%	m1: the metropolitan city leading the fight against climate change and air pollution	24.7%
s1: policies to combat inequalities, for social inclusion and citizens' rights	10.0%	g1: promote good governance, with the transparency agency	9.4%
s4: consolidation of the right to housing	10.0%	s1: policies to combat inequalities, for social inclusion and citizens' rights	8.2%
s6: urban planning, strategic tool for territorial development	10.0%	s4: consolidation of the right to housing	8.2%
m1: the metropolitan city leading the fight against climate change and air pollution	10.0%	s6: urban planning, strategic tool for territorial development	8.2%
g3: inter-institutional coordination for the management of metropolitan services	10.0%	m4: advance towards a circular economy in the area of waste	8.2%
s3: public space and facilities for reinforcing equal opportunities and quality of life	5.0%	m5: promote sustainable mobility across the whole metropolitan area	8.2%
m3: develop the provision, supply and treatment of water in a balanced and socially just way	5.0%	s2: policies for inclusive and sustainable economic development	0.0%
m8: deploy a model for the planning and coordination of infrastructures for social and territorial cohesion on a metropolitan scale	5.0%	s3: public space and facilities for reinforcing equal opportunities and quality of life	0.0%

Fig. 74. Strategic lines prioritised by each territory in the process of participation for the validation of the PAM 2015-2019 in the AMB metropolitan territories.
AMB-Strategic Planning Area, 2016.

- Define a strategy for renewable energy generation.
- Implement a metropolitan traffic and parking regulation with regulated car parks on a metropolitan scale.
- Potential introduction of congestion charges.
- Definition of a metropolitan resilience strategy that involves pluri-municipal territorial actions.

This entire list, extensible to other initiatives, brings together some of the thematic issues that would need effective Councils of Mayors that enable strategic agreements to be decided for the whole metropolitan territory.

To carry them out, they need to be prepared in advance and the require the leadership of a governing team that should be proposed at the start of each term of office. An example of this practice was the Council of Mayors for Fighting Pollution, which was one of the strategic lines of the PAM. The holding of this council represented political impetus for the pinpointing of policies associated with the management of air pollution in periods of crisis. This is, therefore, a fundamental instrument for channelling metropolitan policies that imply, necessarily and with global agreements, the participation of the 36 mayors.

REDEFINITION OF METROPOLITAN OBJECTIVES FROM A SHARED POLYCENTRIC PERSPECTIVE. INNOVATION AS A VECTOR

Promoting this bottom-up leadership requires the support of the metropolitan leadership of those municipalities with over 45,000 inhabitants, that are capable of conducting a prospective study of their territory and have the technical means to carry it out (due to the size of the population of the municipalities).

One way of establishing this leadership would be that the municipalities that are prominent because of their actions in a particular area would lead, with AMB support, actions on a metropolitan scale.

As a first approach, and without any wish to establish territorialised strategies, which should be by common agreement between the municipalities, the following stand out:

- Business innovation in Sant Cugat.
- Circular economy innovation in Viladecans, Gavà and Barberà.
- The social agreement in innovation in Sant Feliu.
- Innovation in activities estates in Badalona.
- Social economy innovation in Santa Coloma de Gramenet.

- Urban agriculture innovations around the Agricultural Park Consortium.
- Innovation in ICT for innovation matters in Cornellà.
- Innovation in water policies in El Prat de Llobregat.
- The housing operator and the energy operator in Barcelona.
- Innovation in municipal policies for energy transition in Viladecans, Sant Boi and Sant Cugat.

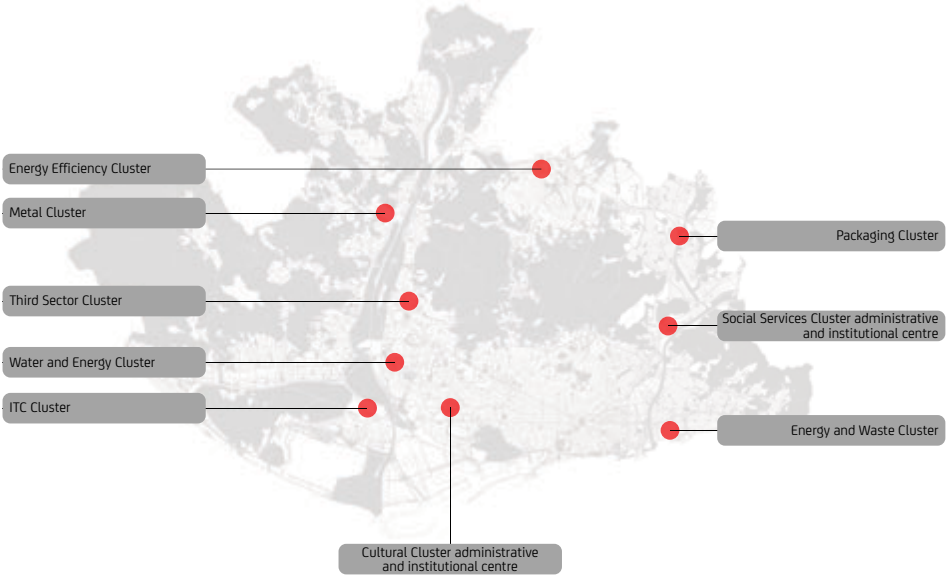


Fig. 75. Sketched proposal for a certain territorial specialisation of the new territorial nodal points. *AMB-Strategic Planning Area, 2018.*

This proposal could find synergies in urban developments at the metropolitan transport nodes that would enable the housing of facilities associated with such leadership, with commitment to an economic management with flexibly managed supra-municipal territories.

TERRITORIAL POLICIES CLOSE TO CITIZENS THROUGH A POLICY ON AN AMB METROPOLITAN NEIGHBOURHOODS SCALE

Proposing metropolitan strategies requires coming down to the neighbourhoods scale and, at the same time, being capable of having indicators that enable assessment of the levels of services and quality of life in each of the neighbourhoods.

We propose, initially, the definition of metropolitan neighbourhoods that represent the grouping of the municipal neighbourhoods recognised by the municipalities.

In a second step, we propose the definition of a series of indicators, not particularly numerous but sufficient to characterise the territories and so underline territorial priorities on a neighbourhoods scale when prioritising metropolitan policies (see AMB-Strategic Planning Area, 2019b). These indicators will be calculated annually by the metropolitan services in collaboration with the municipal services. According to the size of the municipalities, more or less support will be offered for the development of values for the indicators.

Each municipality should know what its neighbourhoods are like. And they should do this from a metropolitan perspective. In this way we will have shared criteria for prioritising policies in the territory. From this knowledge, it is possible to propose a strategy for improving metropolitan neighbourhoods that includes monitoring by indicators, on the scale of metropolitan neighbourhoods, of common public policies in municipal services matters and the promotion of social and territorial cohesion. Furthermore, with this shared strategy it will be easier to secure economic resources from the European institutions.

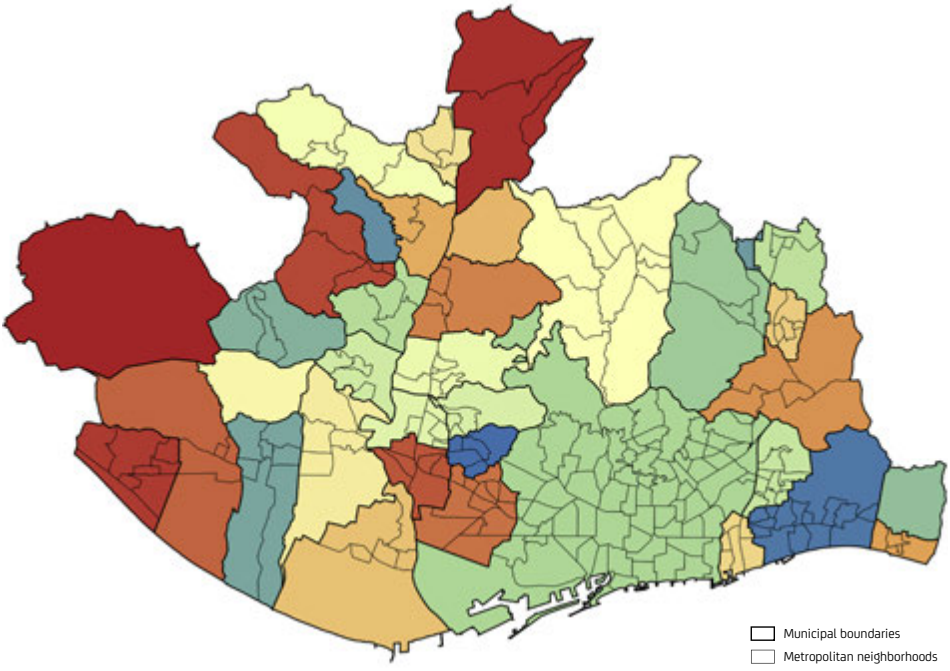


Fig. 76. Preliminary proposal for Metropolitan Neighbourhoods in the metropolitan area.
AMB-Strategic Planning Area, 2019b.

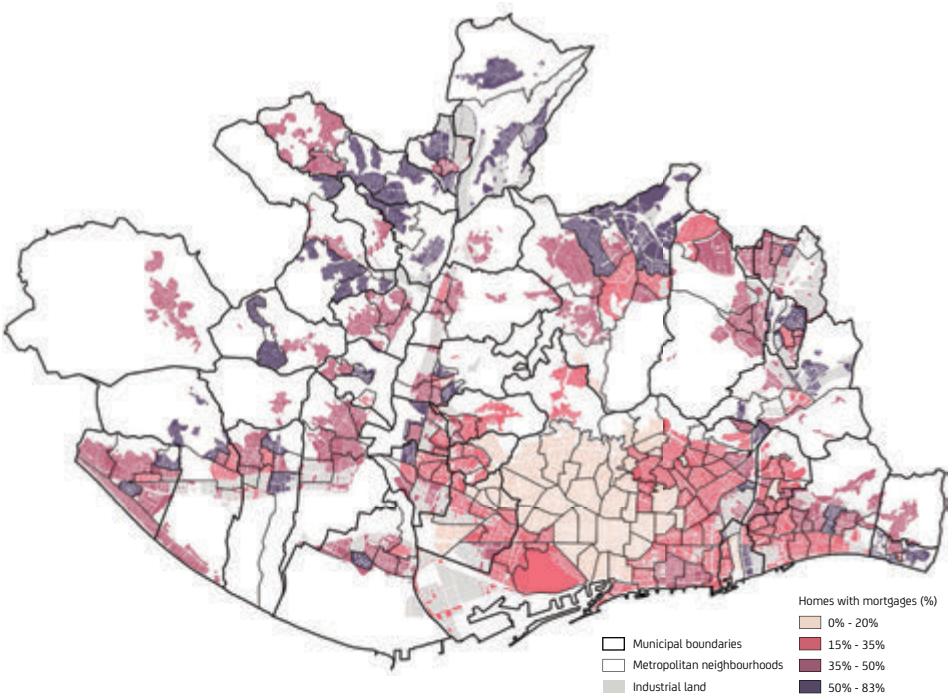


Fig. 77. Percentage of homes owned and with payments pending with respect to the total number of main residences, by metropolitan neighbourhood. *AMB-Strategic Planning Area based on the data of the Census of Homes and Buildings, National Institute of Statistics, 2011.*

TERRITORIAL POLICIES CLOSE TO CITIZENS THROUGH A POLICY ON AN AMB TERRITORIES SCALE

To establish metropolitan policies close to the territories, these need to self-organise and establish their priorities. They have to be capable of defining territorially shared strategies.

It is for this reason that we propose to develop socially responsible territories. To be able to do this, it is necessary to work on territoriality in the spheres of the five municipalities of the Besòs, of the mountain municipalities of the Baix Llobregat, in the territories of the Llobregat Delta, in the municipalities of the Vall Baixa del Llobregat and also in the municipalities of the Vallès.

It is necessary to highlight the Socially Responsible Territory experience initiated in the Besòs area to replicate it in other territories. And also, the networks of social and solidarity

economies need to be developed. It is possible to commence with the social and economic risks, in the case of the Besòs and of the Baix Llobregat conurbation, with the associated networks. And with the ecological risks in the Llobregat Delta territory and the Baix Llobregat mountain territory, both linked to the Agricultural Park network.

FROM THE ADDING TOGETHER OF MUNICIPAL POLICIES TOWARDS SECTORAL CALLS FOR PROPOSALS: HOUSING AND FACILITIES, ECONOMIC ACTIVITY ESTATES (ESTATES PLAN) AND OPEN SPACES (PSG)

Advancing towards a metropolitan policy requires beforehand a set of policies that are raised to a metropolitan scale. Currently, the AMB municipalities especially place value on the economic resources that, with the collection of the property tax (IBI), enable them to implement projects that, in most cases, are associated with facilities and urban development of squares, streets and parks.

If, in fact, the aim is to start establishing metropolitan policies, it is essential for the definition of projects to concentrated around agreed criteria, articulated across three layers of the territory:

- Metropolitan neighbourhood plans with shared policies for social, educational, healthcare and housing access and renovation services.
- Plans for economic activity estates with public policies of innovation and shared management of economic promotion services.
- Environmental matrix plans: with promotion of local agro-ecological and forestry economies, of social and leisure activities and of circular economy and biodiversity promotion.

A supra-municipal leadership is needed that is based on a perspective of the local community and that is at the service of the municipalities, which should materialise as metropolitan policies that take best practices to the metropolitan scale.

In the 2011-2014 term of office, the Estates Plan was introduced and in that of 2015-2019, the Open Spaces Plan (PSG). We must point out that they have modest (€30 M and €17 M, respectively) allocated budgets.

In terms of plans for estates, projects have been subsidised for signposting, clean-up, lighting, security and telecommunications networks.

It is necessary to introduce, in a second stage, the pillars of energy efficiency, renewable energies and sustainable mobility programmes.

In the case of the new open space sectoral plan, in addition to landscape and biodiversity projects, it must also include protected and productive areas. And it must enable good management of forests, fields and crops.

The need to advance towards policies of land stewardship for the forests and natural areas, and at the same time, towards promotion of local and organic agriculture, has to be positioned at the centre of metropolitan policies for open spaces, with a re-reading of natural areas and of the social economy of proximity and of urban culture.

Risks of lack of sustainability due to lack of taxes and rates

The above policies that address the different risks described cannot be undertaken if there is no addressing, at the same time, of the risk of lack of economic sustainability due to a lack of taxes and rates.

Taxes need to be associated with principles such as “if you pollute, you pay”. And we can apply this both to good management of the materials (waste), energy or water cycle, and to the management of mobility, penalising mobility that is not sustainable. The funding of public transport mobility is essential, and is understood as a service to the community that it is fundamental to guarantee, above all for the poorer sectors of the population.

Increases in taxes and rates have to be proposed with a quantification of the benefits that result for the inhabitants of the metropolis. The political cost that it may represent has to be balanced with a pedagogy that shows the benefits of taxes, in order to develop metropolitan policies that ensure the resilience of a territory that is staking its continuity on conditions of urban quality and health for its inhabitants, in an environment where the risks analysed above will become increasingly evident.


STRATEGY

ESTABLISHMENT OF A SET OF METROPOLITAN NARRATIVES FOR THE BUILDING, IN THE NEAR FUTURE, OF METROPOLITAN POLICIES

Various metropolitan narratives will be developed, organised around the risks diagram, which should enable us to establish and organise the different actions in the territory. To define them, the starting point is the strategic lines of the PAM, which have been reorganised based on SWOT analysis ordered according to the different risks.

The list of metropolitan narratives that need to be developed in this first phase is the following:

- DREAM Programme provision for social risks
  - Housing and social rights in the AMB.
  - Housing and urban and energy renewal in the AMB.
  - Facilities, social rights and equity in the AMB.
  - Training and economic activity in the AMB.
  - Public space and social cohesion in the AMB.
- DREAM Programme provision for economic risks
  - Social economy in the AMB.
  - Production activities and innovation in the AMB.
  - Circular economy in the AMB.
  - Tourism in the AMB.
- DREAM Programme provision for peak oil and impact on energy prices
  - Housing and urban and energy renewal in the AMB.
  - Transition to sustainable mobility in the AMB.
  - Sustainable mobility services in the AMB.
  - Waste management in the AMB.
  - Energy transition in the AMB.
- DREAM Programme provision for failure against climate change
  - Water-energy synergy in the AMB.
  - Resilience and climate change in the AMB.

- DREAM Programme provision for loss of biodiversity
  - Natural areas, biodiversity, agriculture and territory stewardship in the AMB.
- DREAM Programme provision for loss of food sovereignty
  - Metropolitan agriculture in the AMB.
- DREAM Programme provision for the impact on health
  - Fight against pollution in the AMB.
- DREAM Programme provision for risks of collapse of governance
  - Metropolitan neighbourhoods and strategic policies in the AMB.
  - Metropolitan taxes and economic sustainability in the AMB.
  - Transparency and good governance in the AMB.
  - Socio-ecologic conflicts and participation in the AMB.

TERRITORIALISATION OF THE PAM THROUGH A PARTICIPATORY PROCESS

At present, the commitment to a metropolitan policy at the AMB is expressed through the Metropolitan Action Plan of the governing team for each term of office. The core pillars, the strategic lines and the action plans express the political commitments made by the governing team.

Reviewing the process for the development of the PAM 2015-2019, it is confirmed that the services of each AMB area predefine a set of actions that have to be carried out.

We propose a more elaborate procedure for the next term of office, in which a first phase is added of reflection on the different services to predefine potential strategic lines, with a more cross-cutting view across the services.

Moreover, it is necessary to define priorities for the different territories.

The political decision-making on the strategic lines that need to be prioritised would be made more prominent with better knowledge of the demands of a metropolitan policy.

Governance would gradually be coordinated as a metropolitan system.

AMB MANAGEMENT BASED ON THREE LAYERS IN THE TERRITORY: METROPOLITAN NEIGHBOURHOODS, ECONOMIC ACTIVITY ESTATES AND GREEN INFRASTRUCTURE

Advancing towards a metropolitan policy requires policies that are raised to a metropolitan scale. Today, the AMB municipalities especially place value on the economic resources that, with the collection of the property tax (IBI), enable them to execute projects that, in most cases, are associated with facilities and urban development of squares, streets and parks.

If the aim is to start to establish metropolitan policies, it is essential that the definition of the projects is concentrated around agreed criteria, articulated across three layers of the territory:

- Metropolitan neighbourhoods plans with shared policies for social, educational, healthcare and housing access and renovation services.
- Plans for economic activity estates with public policies of innovation and shared management of economic promotion services.
- Environmental matrix plans: with promotion of local agro-ecological and forestry economies, of social and leisure activities and of circular economy and biodiversity promotion.

A supra-municipal leadership is necessary that is based on the local community perspective and is at the service of the municipalities, which should materialise in metropolitan policies that raise municipal best practices to the metropolitan scale.

In the 2011-2014 term of office, the Estates Plan was introduced and in that of 2015-2019, the Open Spaces Plan (PSG), although we must point out that they have modest (€30 M and €17 M, respectively) allocated budgets.

In terms of plans for estates, projects have been subsidised for signposting, clean-up, urban development, lighting, security and telecommunications networks. In a second stage it is necessary to introduce the pillars of energy efficiency, renewable energies and sustainable mobility programmes.

In the case of the new open space sectoral plan, in addition to landscape and biodiversity projects, it must also include protected and productive areas. And it must enable good management of forests, fields and crops.

The need to advance towards policies of land stewardship for the forests and natural areas, and at the same time, towards promotion of local and organic agriculture, has to be positioned at the centre of metropolitan policies for open spaces, with a re-reading of natural areas and of the social economy of proximity and of urban culture.

APPLICATION OF TERRITORIALISED METROPOLITAN POLICIES THAT ARE QUANTIFIED ON A METROPOLITAN NEIGHBOURHOOD SCALE

To propose metropolitan strategies it is necessary, at the same time, to go down to the neighbourhoods scale and be capable of having indicators to value the levels of services and quality of life of each of the neighbourhoods.

We propose, in a first phase, the definition of metropolitan neighbourhoods that are the grouping of municipal neighbourhoods recognised by the municipalities, and in a second phase, the definition of a series of not particularly numerous indicators, but sufficient to characterise the territories, in order to establish territorial priorities, on a neighbourhoods scale, when it comes to prioritising metropolitan policies.

These indicators will be calculated annually by the metropolitan services in collaboration with the municipal services. According to the size of the municipalities, more or less support will be offered for the development of values for the indicators.

Each municipality should know what its neighbourhoods are like. And they should do this from a metropolitan perspective in order to prioritise policies in each territory.

From this knowledge, it is possible to propose a strategy for improving metropolitan neighbourhoods that includes monitoring, by indicators, on the scale of metropolitan neighbourhoods, of common public policies in municipal services matters and the promotion of social and territorial cohesion.

Furthermore, with this shared strategy it will be easier to secure economic resources from the European institutions.

CREATION OF INSTRUMENTS FOR A RESILIENT STRATEGIC POLICY

The progressive introduction of resilient thinking requires preparation with instruments that enable it to be implemented and that would be the following:

- Creation of an AMB Metropolitan Resilience Strategies Lab.

  This lab will be attached to the Strategic Planning Area and will establish agreements with the different AMB areas and services.

- General resilience evaluation programme in the area of the Barcelona metropolitan region.

This programme means working with centres of expertise in complex adaptive systems and generating a cross-departmental working team that includes technicians from the different services and, especially, technicians linked to climate change in order to create a reference framework for working in the different territories and sectors.

This programme must be equipped with an IT platform that enables work on a resilient thinking scheme:

- Regarding climate change and peak oil.
- Regarding climate change, pollution and metropolitan mobility.
- Regarding climate change and its effects on health.

• DREAM Dialogues Programme. A support programme for projects by socially responsible territories through co-design and resilient thinking as a mechanism for experimentation and consensus.

The DREAM Dialogues are a governance lab, a framework for reflection/action, participated in by representatives of the authorities, politicians, as well as economic and social agents, and geared towards the definition of metropolitan actions from the perspective of resilient design. In this sense, the idea is to pass from issues to systems of public policies, traditionally implemented by "issues" (in other words, via competences that are generally isolated and constructed on the basis of linear narratives), to the governance of "systems" or territories, understood as socio-ecological systems that behave like complex adaptive systems (open and unpredictable, but at the same time flexible and adaptive). This collective reflection from the strategic and specific perspective, within the framework of public policies in progress, will help to reveal the emerging driving forces in the AMB territories chosen as first case studies.

Socially responsible territories are those where government (municipal councils, AMB and other authorities, as applicable) works together with the third sector, universities and research institutes, and businesses, in order to tackle some of the risks and define public policies.

This programme proposes, furthermore, the reinforcement of socially responsible dynamics at different scales (neighbourhoods, municipalities, AMB sectors and AMB). All these projects will have close links with municipalities and with competitive European projects.

We propose working on some of the more prepared territories and on specific subjects (specific resilience) such as the following:

- Llobregat Delta and Agricultural Park: capacity for adaptation to the effects of climate change associated with water stress and salinity.
- Llobregat Delta and Agricultural Park: capacity for adaptation with regard to peak oil. There is prior experience with the Vilawatt Project in Viladecans and the setting up of the metropolitan energy operator Barcelona Energia.
- Baix Llobregat Mountain areas: capacity for adaptation to the effects of climate change associated with the increase in temperatures, the increase in the probability of forest fires and relations with the agro-forestry sector and food sovereignty.
- Besòs Territory: capacity for adaptation to economic crises, training, social inclusion and energy transition in response to adverse climate scenarios and the increase in temperatures.
- Food sovereignty crisis: territories with open spaces and agriculture in the Agricultural Park and the mountain areas of the Baix Llobregat.

• Socio-ecological conflicts tables

We propose the consolidation of a series of tables for discussion organised around the diverse socio-ecological conflicts present in the AMB, to encourage sharing of the expertise of actors in the social fabric and with the involvement of those participating in the decision-making process.

The participation of the organised social fabric implies more citizens' intervention, which contributes more reflection and openness, with regard to obtaining collective actions with alternative views of social organisation and production and consumption processes.

Various tables have been established, associated with diverse socio-environmental conflicts, and that will have to complete their establishment process:

- Table 1. Common assets linked to the land: rururban spaces in the metropolis.
- Table 2. Common assets linked to everyday life. Man-made urban development: rights and services.
- Table 3. Common assets linked to leisure and health: protection of areas with ecological value in the metropolis.
- Table 4. Common assets of urban metabolism: public management of metabolic cycles.

It is proposed to gradually consolidate these tables based on the development of different thematic cycles for each table. A thematic cycle is a series of meetings between

metropolitan organisations of the organised social fabric, technicians (from the AMB and municipal) and politicians (councillors, mayors) where the conflicts and actions developed by the authorities are presented and it is proposed to reach a consensus in order to advance in the solution of conflicts. These sessions, from four to six, are held fortnightly for two or three months.

In a first phase, three thematic cycles have already been developed corresponding to tables 1, 2 and 3 (http://www.amb.cat/web/amb/govern-metropolita/planificacio-estrategica/taules-de-debat-i-participacio-dels-conflictes-socioecologics).

In a second phase, priority will be given to the following subjects:

- The preservation of metropolitan agriculture (Table 1).
- The preservation of the water network within a scenario of water stress and extreme rainfall events (Table 4).

• Memory project: metropolitan *mnemosyne*.

A resilient territory is a territory with a memory.

It is necessary, therefore, to strengthen the metropolitan memory.

We propose, therefore, the metropolitan *Mnemosyne* project based on a process of research and a series of exhibitions, which will have to be programmed, in the metropolitan territory. The interest and quality of the material discovered to date reaffirm the importance of heightening visibility of images and life stories.

It is urgent that the memory be re-situated within a more cross-cutting metropolitan narrative.

As a result of the desire to continue re-writing the visual memory of the city, in more inclusive and egalitarian ways, each exhibition will respond to the purpose of restoring that part of history that has been undervalued. Stories that it is now necessary to reincorporate to be able to build the city socially without forgetting the history of its photographic and filmed heritage.

If the metropolitan Barcelona narrative has been, to date, excessively partial, the constellations of *Mnemosyne* are an argument in the face of the collective amnesia against which it is only possible to fight as a community.

INTRODUCTION OF ORGANISATION SERVICE QUALITY, RAISED TO THE STRATEGIC PLANNING LEVEL

An organisation that defines itself as such has to have strategic planning, a services charter and a quality control procedure.

The AMB has access to all these elements, with a more formalist than functional approach. In fact, the AMB has an Integrated Quality and Environmental Management System (SIGQMA) and other specific systems with the aim of guaranteeing the provision of services to citizens that is efficient, competent and sustainable.

In addition to the SIGQMA, it also has a quality and environmental management system, specifically for the sewage system and the inspection of wastewater (SSI) and for the laboratory, and another quality system for quality in passenger transport. These management systems are defined, in documentary form, through policies that are governed by common directives and specific procedures and instructions. From bodies that legitimise certain functions to competences that make it obligatory to redefine them.

New planning is necessary.

The AMB has equipped itself with ISO methodologies and quality control, that it is necessary to apply top-down and bottom-up.

The organisation has to function with much clearer metropolitan objectives and in a more effective and more efficient way. We believe that everyone will accept this principle, which goes beyond the political ideologies that will define the priorities. However, in any event, the organisation must be at the service of citizens.

- Objectives:
  - Use the PAM objectives as a starting point along with a revision that must be the framework for the next term of office.
  - Resources are limited and the objectives must be prioritised according to the resources.
  - Redefine the services for the fulfilment of objectives.
- Strategy:
  - Definition of the plans that must enable fulfilment of the objectives. In the case of sustainability, the starting point will be the review of existing and newly formalised plans, within the framework of compliance with European directives and international agreements.
  - Establishment of monitoring bodies, within the framework of AMB strategic planning, and that are linked to the quality control framework and Iso standards.

- Tactics:
  - Monitoring of objectives and actions of the plans that enable them to be fulfilled, with budget and responsibilities.

The ISO methodology must be elevated to a more strategic perspective.

- Plan.
- Act.
- Observe.
- Reflect.

It is necessary to introduce the methodology. We want to observe and reflect in order to plan again and act better. We will develop, therefore, a first programme for the progressive introduction of this methodology and we will define progressive intervention phases.

TOWARDS A PROCESS OF REDEFINING METROPOLITAN SECTORAL PLANS

It is necessary to rethink the different services and adapt them progressively to a defined structure for sectoral plans associated with each of the strategic lines.

We propose, as a first approach, the following structure of metropolitan strategic plans and programmes:

- Metropolitan strategic plan for accessible housing for all.
- Metropolitan strategic plan for social inclusion and equity.
  - Programme for the creation of strong and inclusive communities.
  - Programme for support against unemployment.
  - Metropolitan training programme.
- Metropolitan strategic plan for economic development
  - Metropolitan innovation programme.
  - Metropolitan programme for the promotion of economic activity.
- Metropolitan strategic plan for health.
  - Programme for eating organic and/or associated local products.
  - Programme for monitoring diet and eating in the education and work spheres.
  - Programme for monitoring air pollution and health.
- Metropolitan strategic plan for a better use of the territory, taking advantage of nodal structures and new areas of innovation for the location of residence and economic activity.

- Metropolitan programme for the creation of new jobs and housing around accessible nodes.
- Metropolitan programme for the creation of new jobs around innovation centres.
- Metropolitan programme for the creation of metropolitan services nodes around railway transport nodes.
- Metropolitan programme for the restructuring of the commercial distribution sector: review of nodes and trade offering.

• Metropolitan strategic plan for better management of natural spaces that improve biodiversity.
- Metropolitan programme for the preservation of natural areas.
- Metropolitan programme for the promotion of agriculture and the structure of biodiverse mosaics.

• Strategic plan for the transition to sustainable mobility.
- Programme of railway and above-ground transport (BRT) infrastructures.
- Programme for the management of private vehicle mobility, including management of above-ground parking in the conurbation area and management of the toll on the ring roads.
- Programme for sustainable mobility services.
- Programme for intermodality.

• Metropolitan strategic plan for efficiency of the metropolitan metabolism.
- Water cycle.
- Energy cycle.
- Materials cycle.

This programme should include:
- Metropolitan programme for infrastructures for energy transition.
- Metropolitan programme for the circular economy.
- Metropolitan programme for energy efficiency of the industrial estates.
- Metropolitan programme for energy efficiency of homes, commercial premises and offices.
- Metropolitan programme for Zero Carbon by 2050.

• Metropolitan strategic plan for resilience.
- Programme for the generation and monitoring of socially responsible territories with regard to climate change.

All the above plans are based on responsible and resilient territories and have an integrated focus for the delivery of strategic and local infrastructures that guarantee that the public, private, community and voluntary sectors plan and work together.

We are proposing a methodology for this planning.

This Strategic Plan for resilience reviews and gives coherence to all the previous metropolitan strategic plans and programmes.

METROPOLITAN ACTIONS

ESTABLISHMENT OF A SET OF METROPOLITAN NARRATIVES FOR THE BUILDING, IN THE NEAR FUTURE, OF METROPOLITAN POLICIES

DEVELOPMENT OF METROPOLITAN NARRATIVES BASED ON THE METROPOLITAN ACTION PLAN: DREAM PUBLICATIONS

The proposal is to generate publications for each of the lines.

These publications will all follow the same format and will take the name AMB DREAM, which corresponds to the initials of Catalan words that explain their schematic format.

- D: Diagnosi (Diagnosis)
- R: Reflexió (Reflection)
- E: Estratègia (Strategy)
- AM: Accions Metropolitanes (Metropolitan Actions)

In each book there will be a first diagnosis of the line, a strategy proposal and a series of proposed actions. Each publication will be developed by the Strategic Planning Area in collaboration with the area responsible for implementing the line of action. The publications intend to offer, in a 50-75-page document, a vision of the metropolitan policy to be carried out in the corresponding line of action.

For the development of these publications the starting point is a set of pre-existing studies and documentation produced previously. Thus, each of the lines of action of the PAM and the associated metropolitan policies are formalised and explained in an accessible way and from a strategic planning perspective.

The publications will be grouped into three collections associated with each of the three pillars:

- Pillar 1. Social rights, sustainable economic development and territorial cohesion.
- Pilar 2. Metabolism, sustainability and resilience.
- Pillar 3. Government, governance and democratic quality.

Dream project

PILLAR 1. SOCIAL RIGHTS, SUSTAINABLE ECONOMIC DEVELOPMENT AND TERRITORIAL COHESION

- Social development and equity.

- Facilities, social rights and equity in the AMB.
- Housing and social rights in the AMB.

• Economic development and innovation.
- Social economy in the AMB.
- Circular economy in the AMB.
- Productive activities and innovation in the AMB.
- Training and economic activity in the AMB.

• Urban and territorial renewal.
- Housing and urban and energy renewal in the AMB.
- Tourism in the AMB.

PILLAR 2. METABOLISM, SUSTAINABILITY AND RESILIENCE

• Sustainable transport and mobility.
- Sustainable mobility services in the AMB.
- Transition to sustainable mobility in the AMB.
- Fight against pollution in the AMB.

• Metabolism and urban services: water, energy and materials.
- Energy transition in the AMB.
- Synergy between water and energy in the AMB.
- Waste management in the AMB.

• System of food production and resilience.
- Metropolitan agriculture in the AMB.

• Climate change and resilience.
- Resilience and climate change in the AMB.
- Socioenvironmental landscape in the AMB.

PILLAR 3. GOVERNMENT, GOVERNANCE AND DEMOCRATIC QUALITY

• Metropolitan governance.
- Metropolitan neighbourhoods and strategic policies in the AMB.
- Renewal of economic activity estates in the AMB.
- Natural areas, biodiversity, agriculture and land stewardship in the AMB.

• Metropolitan participation and transparency.
- Transparency and good governance in the AMB.
- Metropolitan taxes and economic sustainability in the AMB.
- Socio-ecologic conflicts and participation in the AMB.
- Cooperation and international relations in the AMB.

TERRITORIALISATION OF THE PAM THROUGH A PARTICIPATORY PROCESS

DEVELOPMENT OF A METHODOLOGY FOR THE DEFINITION OF A PARTICIPATORY SYSTEM THAT ESTABLISHES THE STRATEGIC LINES FOR THE DEVELOPMENT OF THE PAM

The prior studies will be developed in order to give impetus to the participatory process of the PAM, which will consist of the following phases:

- Common participatory process among the management services.
- Development of a methodology for participation for validation of the PAM.
- Preparation of material for validation of the PAM framework by the Council of Mayors.

AMB MANAGEMENT BASED ON THREE LAYERS IN THE TERRITORY: METROPOLITAN NEIGHBOURHOODS, ECONOMIC ACTIVITY ESTATES AND GREEN INFRASTRUCTURE

DEFINITION OF A STRATEGY FOR INTERVENTION IN METROPOLITAN NEIGHBOURHOODS BASED ON THE EXPERIENCE OF THE NEIGHBOURHOODS LAW AND THE OPEN CALL FOR PROPOSALS PROGRAMMES

Definition of a metropolitan strategy for intervention in metropolitan neighbourhoods that is based on indicators, applied to the developed basis of metropolitan neighbourhoods, that enables presentation, in coordination with the AMB municipalities, of candidates for open calls for proposals on a Catalan, Spanish and European scale.

REDEFINITION OF CRITERIA FOR THE CALL FOR PROPOSALS OF THE ESTATES PLAN

Preparation of a document of criteria for the call for proposals for the Estates Plan that enables advances in metropolitan policies for economic activities and that is focused on:

- Energy transition associated with the introduction of renewable energies.
- Energy efficiency of estates.
- Sustainable mobility for accessibility to estates.

REDEFINITION OF CRITERIA FOR THE PSG CALL FOR PROPOSALS

Preparation of a document of criteria for the call for proposals for the Open Spaces Plan (PSG) that enables advances in metropolitan open spaces policies within the framework of biodiversity, the promotion of agriculture and actions with regard to climate change.

APPLICATION OF TERRITORIALISED METROPOLITAN POLICIES THAT ARE QUANTIFIED ON A METROPOLITAN NEIGHBOURHOOD SCALE

DEVELOPMENT OF A METHODOLOGY FOR THE ESTABLISHMENT OF METROPOLITAN NEIGHBOURHOODS

Based on the existing and recognised neighbourhoods in the municipalities, a basis will be proposed for "metropolitan neighbourhoods" which will emerge from the grouping of homogenised municipal neighbourhoods.

This process will need to be validated by the Council of Mayors.

DEVELOPMENT AND APPLICATION OF A METHODOLOGY FOR THE DEFINITION OF SYNTHETIC INDICATORS FOR METROPOLITAN NEIGHBOURHOODS

Based on the different indicators that already exist, produced by municipalities and other organisations (IERMB and others), a series of synthetic indicators will be defined, whose maintenance will be guaranteed by the Strategic Planning Area in collaboration with the different services of the AMB and of the municipalities.

This process will also need to be validated by the Council of Mayors.

CREATION OF INSTRUMENTS FOR A RESILIENT STRATEGIC POLICY

PROGRAMME FOR THE EVALUATION OF RESILIENCE AND OF ADAPTIVE COMPLEX SYSTEMS IN RELATION TO CLIMATE CHANGE AND PEAK OIL IN THE SPHERE OF THE BARCELONA METROPOLITAN REGION

Development of a first HAZUR-AMB model for addressing the fight against climate change.

Development of a first HAZUR-AMB model for addressing the fight against peak oil.

SUPPORT PROGRAMME FOR SOCIALLY RESPONSIBLE TERRITORIES PROJECTS

Creation of a first group of socially responsible territories with respect to:

- Economic crisis, training and social inclusion in the Besòs area.
- Metabolic crisis in relation with water stress associated with the Llobregat Delta and the Agricultural Park.
- Food sovereignty crisis, open spaces territories and agriculture in the Baix Llobregat mountain area.

Creation of a support team for potential groups of socially responsible territories.

SOCIO-ECOLOGICAL CONFLICT TABLES

Development of thematic dialogues associated with socio-ecological conflict tables focusing on the fight against climate change, peak oil and the different risks considered.

MEMORY TABLE. PROJECT OF METROPOLITAN NARRATIVES AROUND THE *MNEMOSYNE* PROJECT

Development of the metropolitan *Mnemosyne* Project.

Development of a programme of exhibitions defined within the framework of the *Mnemosyne* Constellations Programme.

INTRODUCTION OF ORGANISATION SERVICE QUALITY, RAISED TO THE STRATEGIC PLANNING LEVEL

INTRODUCTION TO ISO METHODOLOGY FOR STRATEGIC PLANNING IN THE AMB

Development of a first programme for the progressive introduction of ISO methodology for strategic planning and definition of a series of progressive intervention phases..

TOWARDS A PROCESS OF REDEFINING METROPOLITAN SECTORAL PLANS

DEFINITION OF A BASE DOCUMENT FOR THE DEFINITION OF SECTORAL STRATEGIC PLANS

Development of a working document for the redefinition of the metropolitan sectoral plans, associated with metropolitan risks, for resilient strategic planning.

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