

# **CIRCULAR ECONOMY IN THE BARCELONA METROPOLITAN AREA**

**DREAM**

DIAGNOSI  
REFLEXIÓ  
ESTRATÈGIA  
ACCIONS  
METROPOLITANES

# DREAM COLLECTION

The DREAM collection (its name is an acronym of the Catalan terms for Diagnosis, Reflection, Strategy and Metropolitan Actions) proposes the construction of metropolitan narratives in the Barcelona metropolitan area, based on a shared focus: resilience. The AMB's new strategic lines are thus drawn together in a series of volumes that follow one same methodology. The collection is divided into three major themes which are expressed in three different colours: economy and social rights (yellow), governance (purple) and sustainability (green). The first volume (red) provides a framework for the collection and explains the DREAM methodology that is applied to the other volumes. These are written by diverse specialists, in conjunction with the AMB's Strategic Planning Area, and each volume deals with a determined sector, from analysis and strategic development to the proposal of specific pilot actions in the metropolitan sphere.

## VOLUME

This publication, the result of collaboration between the Strategic Planning Area and the Social and Economic Development Area of the Metropolitan Area of Barcelona, presents the Circular Economy as a strategy for transforming production and consumption patterns whose aims are both the indispensable reduction of the environmental footprint and improved competitiveness for the metropolitan economic fabric. As pointed out by Jaume Collboni in the introduction to this volume, "the circular economy has already taken root in Barcelona's metropolitan area, mainly through initiatives promoted by private or public-private associations and by local authorities. But it still has a long and promising road ahead which this book aims to travel by proposing a series of strategies and actions to be undertaken".





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It is a pleasure for me to introduce this volume of the DREAM collection. Circular Economy in the Barcelona metropolitan area. The DREAM collection aims to analyse the status of various lines of research and management being worked on at the AMB, lines that open up spaces for future metropolitan strategies and that are accompanied by specific proposals for starting to implement them.

This publication is the result of collaboration between the Strategic Planning and the Social and Economic Development areas of the AMB. It presents the circular economy as a strategy for transforming production and consumption patterns whose aims are both the indispensable reduction of the environmental footprint and improved competitiveness for the metropolitan economic fabric. In this sense, it is a question of measures that not only tend to compensate the environmental impact of activities but that, in addition, advocate changes in the production and commercialisation of products that will enable us to moderate the consumption of raw materials and reduce the waste generated in a way that is beneficial for producers and consumers alike.

This change is already underway, as revealed by the diagnosis offered in this volume: the circular economy has already taken root in Barcelona's metropolitan area, mainly through initiatives promoted by private or public-private associations and by local authorities. But it still has a long and promising road ahead which this book aims to travel by proposing a series of strategies and actions to be undertaken.

Therefore, and in the hope that you will find this publication useful, I would like to reiterate the AMB's commitment to a type of economic development that is fairer for people and for the planet. Because, ultimately, that is what the pages that follow are all about.

**Jaume Collboni**  
Vice-president  
Social and Economic Development Area of the AMB



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# DIAGNOSIS

“In the past, reuse and service-life extension were often strategies in situations of scarcity or poverty [...]. Today, they are signs of good resource husbandry and smart management.”

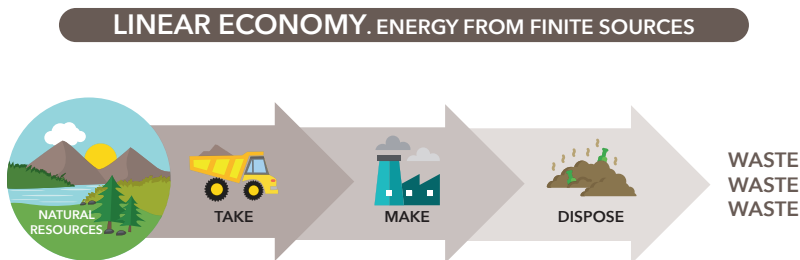
Walter Stahel

## LINEAR ECONOMY VERSUS CIRCULAR ECONOMY

The production system in advanced societies revolves mainly around a **linear economic system** which is based on the extraction of certain resources from the environment which are used to manufacture products that are then consumed and immediately turned into waste, which returns to the environment as a useless and potentially polluting material. This inability to maintain the value of materials at the end of what is known as their “life cycle” would only be sustainable in a world whose resources were infinite. Evidently that is not the case on our planet. Therefore, despite endeavours invested in improving efficiency and reducing consumption to minimise both the extraction of resources and the environmental impact of all kinds of waste, these strategies can do no more than delay the arrival of the inevitable endpoint: the exhaustion of resources and the end of the system. It is necessary, therefore, to change the economic system of production and consumption and make use of the knowledge we have at our disposal and new technologies, not only to minimise the impact caused by our activities but also to generate positive and regenerating impacts on the environment, given that the circular economy theory makes reference to **two classes of materials cycles**.

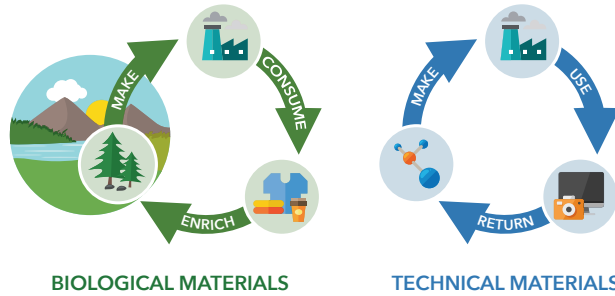
Firstly, the technical materials cycle, which includes all those inorganic materials designed to be able to be deconstructed and their waste efficiently converted into feedstock, minimising the production’s impact on the environment.

Secondly, the biological materials cycle, where materials are recycled using biological processes for the decomposition of organic material (composting, anaerobic digestion, combustion, etc.). This cycle, in contrast, offers opportunities for environmental management and improvement and compensates any adverse or higher-risk production processes that may occur within it.



TECHNICAL AND BIOLOGICAL MATERIALS MIXED UP

## CIRCULAR ECONOMY. ENERGY FROM RENEWABLE SOURCES



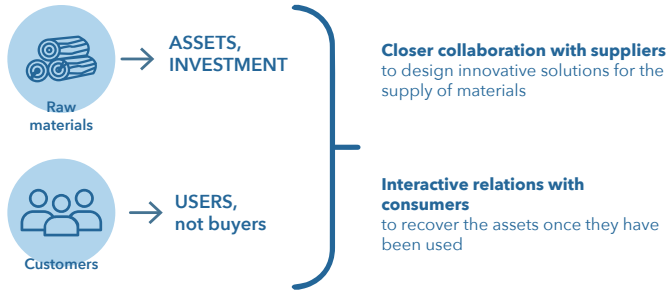
Thus, instead of favouring the linear economy – with its limits in terms of sustainability and resilience, it is necessary to promote, to industry and to society as a whole, the new form of production and consumption proposed by the culture of the **circular economy** and **industrial symbiosis**.

### THE CIRCULAR ECONOMY CONCEPT

The **circular economy** proposes a radical change from the model of *extract, manufacture, use and dispose* to a model with networked, closed or circular value chains, which result in a reduction in the consumption of raw materials and energy as well as in the generation of waste and emissions in the production processes. To achieve this, the circular economy proposes an economic model geared towards the preservation of resources in continuous transformation cycles that conserve their value and where the concept of waste tends to disappear given that the production system is designed in such a way as to avoid its generation. Thus, the goal of the circular economy is to achieve a more efficient and resilient model of production and consumption capable of generating value thanks to continuous and regenerative cycles of a very diverse nature.

This **change of vision** in the way of doing things typical of the circular economy not only manifests itself in the production sphere but also, and in a very relevant way, in how we understand marketing and, in general, the market. In the same way that the materials used in any kind of product should not be considered as *ingredients* but as *assets* in which an investment has been made and that, therefore, it is necessary to recover, the product's customers should not be considered as consumers but as mere users of a design and a set of resources that will return to the production chain.

## CHANGE OF VISION



In terms of production design, this change implies maintaining much closer relationships with various agents to be able to design those solutions that will permit better recovery of the materials. It is necessary to choose the most suitable materials so that they can last longer and be recycled and repaired; and to design products so that they are repairable, dismountable and recyclable.

Materials **flow management** is extremely important for maintaining “balance” and is based on **cascading work cycles**: cycles for preserving the value of products/materials. The smaller these are, the less value lost in the operation. Thus, the obtaining of maximum benefit from a product’s intrinsic value lies in maintenance and repair operations, while the stage where most value is lost is in the destruction of the product and the recycling of the component materials.

The technique for development of the circular economy within the municipal context is based on two main precepts:

Firstly it is necessary to **optimise systems** (rather than optimise components), identify and promote synergies in the “industrial system” on industrial estates, which enables optimised management of stocks and of flows of materials, energy and services and, therefore, development of the municipality (industrial and municipal ecology).

The other main precept lies in differentiating between *consumption* and *use* of the materials. The circular economy backs the **“product-as-a-service” model**, in which the manufacturer or distributor is owner of the product and offers its derived service (what is sold is the use of the product rather than it being a one-time purchase). For example, why purchase a water treatment plant, with all that it involves in terms of facility maintenance, if what we want is treated water? Why not pay for the service instead of investing in the plant? This business model has a positive influence on the efficiency and effectiveness of products/services, as it promotes the development of longer-lasting products, which are easy to maintain, dismountable and recyclable as far as possible (the manufacturer being the owner responsible for all of these tasks...).

**PRINCIPLE 1**

**1**

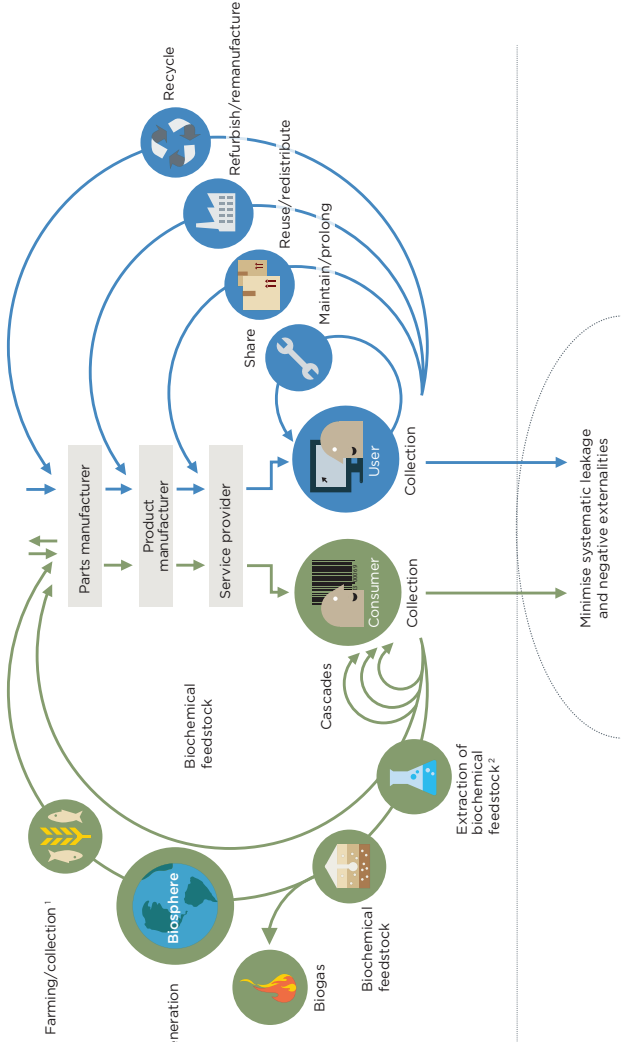
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows. Levers: regenerate, virtualise, exchange.



**PRINCIPLE 2**

**2**

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles. Levers: regenerate, share, optimise, loop.



**PRINCIPLE 3**

**3**

Foster system effectiveness by revealing and designing out negative externalities.

1. Hunting and fishing  
2. Can take both post-harvest and post-consumer waste as an input

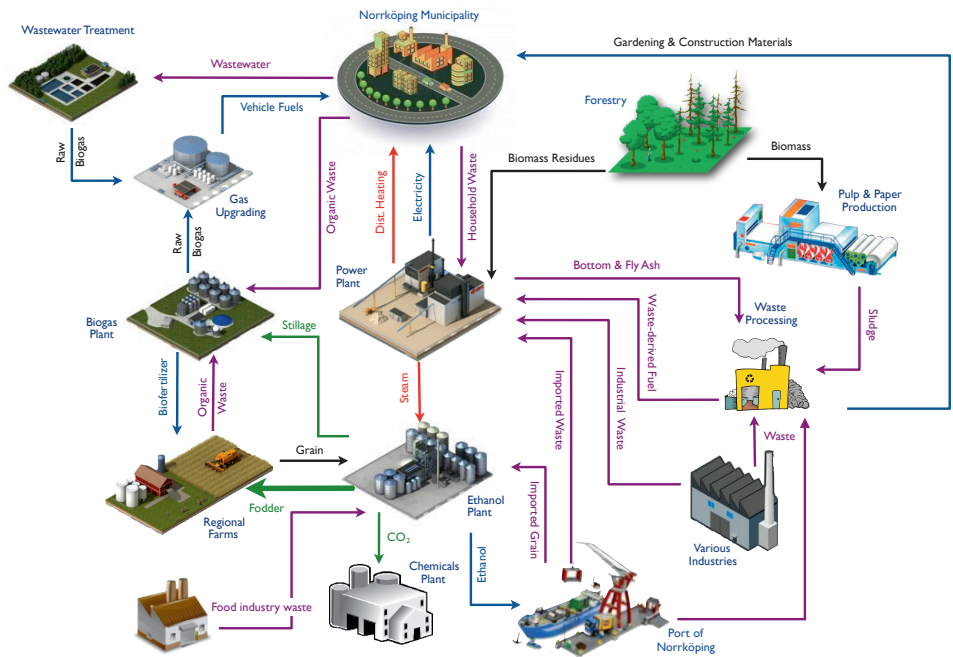
*Outline of a Circular Economy. © Ellen MacArthur Foundation, SUN and McKinsey Center for Business and Environment. Drawing by Braungart & McDonough, Cradle to Cradle (C2C).*

## THE INDUSTRIAL SYMBIOSIS CONCEPT

**Industrial symbiosis** is a business strategy that stimulates collaboration between companies – traditionally separated – to make new **business opportunities** a reality by exploring two main forms of action:

- Adding value to leftover materials.
- Finding solutions for the provision of resources based on the synergy between actors in the production environment.

The aim is to view the whole set of industries as if they were a natural ecosystem where collaboration can be facilitated between industries in different spheres, working to maximise both the use of resources and energy transition towards renewable energies. In a natural ecosystem there is no waste and the energy flows. The more diverse the ecosystem, the richer it is and the more it develops.



*Industrial ecosystem in the region of Norrköping. © Murat Mirata, University of Linköping.*

Despite companies already making an effort to improve their efficiency individually, industrial symbiosis proposes optimization of the use of those resources that companies cannot manage internally. Let's imagine a company that generates polyurethane foam waste that

it would need to recycle in order to reduce the cost of dealing with it as well as reinforce the sustainability strategy that its customers demand. The amount generated, however, might not be sufficient to make it economically viable to set up an internal recycling process, even though this process, above certain quantities of waste, would notably reduce the management costs. It is highly probable that within reach there are one or various companies with the same problem. It could join forces with these to process the waste jointly, in what is clearly a win-win situation.

However, these types of opportunities often do not prosper as solutions because of a lack of appropriate communication channels, guarantees when collaborating or tools to facilitate the establishment of this kind of cooperation. Therefore, local authorities can intervene in industrial symbiosis projects not only by identifying opportunities in the territory, but also as an intermediary and developer of the relations between stakeholders.

Under the current market conditions (linear economy) it is difficult for these projects to be created spontaneously if there has not been a common limiting problem defined, as happened in the emblematic industrial symbiosis project in Kalundborg (Denmark) with water resources. The majority of projects developed around the world respond to initiatives created for specific problems and, of these, a small part are promoted by the companies themselves, while the vast majority have been promoted by local bodies. It is here where local councils can play a relevant role. Municipalities can lead projects, promote them, provide funding, stimulate them, offer a base for experimentation, legislate for change, etc.

The **municipality is the ideal environment** for starting up industrial symbiosis projects because it can take advantage of many additional positive consequences and create the social scenario that gives meaning to industrial ecology projects: besides industries, which are the main target of the projects, in any municipality there is an entire series of resources that may come to create a rich symbiotic network: forests that produce biomass, farmland or livestock farms with a significant generation of organic waste, waste processing plants that can be optimised or expanded, swimming pools and other municipal facilities that consume heat among other things, students who could train as resources managers for the area, for local businesses or for citizens in general, etc.

In the aforementioned city of Kalundborg, the industrial symbiosis project has ultimately led to university qualifications in the field of symbiosis and has fuelled an industrial tourism sector that organises congresses, technical visits, etc. All of this has had a positive effect on the development of the hotel and catering sector. The results of the project have not only led to very important savings in municipal expenditure on energy, but have also attracted industrial investment and have generated jobs and international renown.

Finally, it is important to remember that industrial symbiosis projects are economically profitable because the investments that they require can be covered with the profits that they provide to the companies, but they require a start-up period of approximately a year

and a half on average. In general, they start giving results from the six-month point, but it is not until the end of the first year that they start to record economic profits.

## A NEARBY INDUSTRIAL SYMBIOSIS PROJECT: MANRESA IN SYMBIOSIS

In Catalonia there are industrial symbiosis projects in the process of consolidation: **Manresa in Symbiosis** is a leading project for the implementation of industrial symbiosis, promoted by the Waste Agency of Catalonia and Manresa City Council with the collaboration of the Bages Waste Processing Consortium, Manresa Technology Centre and Barcelona Provincial Council, with the active participation of the Bufalvent Industrial Estate Business Owners Association.

**Objectiu**

El nostre propòsit és implementar a Manresa el primer projecte de simbiosi industrial a Catalunya per a maximitzar l'eficiència en l'ús dels recursos disponibles creant les bases per afavorir les sinèrgies entre empreses/entitats.

**Què és la Simbiosi Industrial?**

És una nova estratègia empresarial que consisteix en unir diverses indústries i entitats —tradicionalment separades— en una sola xarxa on es busquin i es posin en marxa solucions innovadores, dins un mateix territori, per tal de maximitzar l'ús dels recursos: materials, energia, aigua, béns, experiència, logística... per tal d'avançar cap a l'economia circular.

A través de la xarxa s'identifiquen oportunitats de negoci que donen lloc a transaccions comercials rendibles gràcies a:

- Donar valor afegit a recursos sobrants
- Trobar solucions innovadores a la provisió de recursos
- Posar en comú el coneixement...

La cooperació en simbiosi s'enfoca en optimitzar l'ús d'aquells recursos que les empreses per si soles no utilitzen internament. Les empreses fan un esforç per millorar la seva eficiència.

**Impulsen**

Generalitat de Catalunya Departament de Territori i Sostenibilitat | Agència de Residus de Catalunya

**Ajuntament de Manresa**

CONSORCI DEL BAGES PER A LA GESTIÓ DE RESIDUS

**Col·laboren**

Diputació Barcelona | Bufalvent.cat | Ctm

**Implementa**

Simbiosy

Per a més informació: [simbiosy@simbiosy.com](mailto:simbiosy@simbiosy.com)

Projecte pilot de Simbiosi Industrial a Catalunya

**Manresa en simbiosi**

disseny i producció: jordi juanes + 048000701

Leaflet on the Manresa in Symbiosis project.

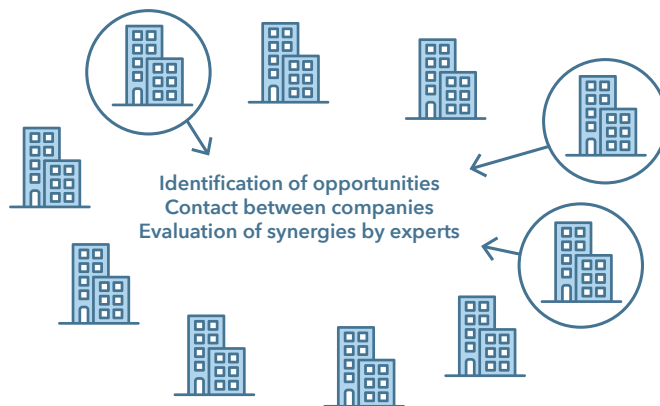
In general lines, the project aims to help companies to learn to take advantage of synergies, strengthen the area's industrial base, drive innovation and create new companies and jobs, as well as to train and raise awareness among technical officers and politicians regarding the opportunities offered by the circular economy and open up pathways for future sustainability and industrial symbiosis projects. The starting point is creating a suitable environment to favour synergies between companies or organisations in order to be able to apply viable economic models for the sale or purchase of leftover materials or resources that are unusable (e.g. waste), lost (e.g. heat), unused (e.g. rainwater), or shareable (e.g. warehouses).

To achieve the creation of this network it is fundamental that the project has political support from the institutions that are promoting it and cooperating with it. Business interest is also essential.

Thus, the first step has to be analysing the data from all companies in the municipality – what do they buy? What do they need? What do they have left over? – in order to identify global opportunities for the whole set of companies in the territory and be able to:

- Identify waste groups that are more numerous or problematic.
- Know how many companies need a certain resource or generate a certain type of waste.
- Geographically position the companies on a map to visualise possible flows of materials and waste products.

This will enable identification of possible groups of synergies between companies that could be managed jointly, and therefore more efficiently and effectively.



*Preliminary analysis of opportunities for synergies among a businesses ecosystem.*

Naturally, this entire process requires intense field work and joint work sessions with business representatives to communicate and demonstrate new forms of managing resources.

Beyond the start-up period, industrial symbiosis projects have to achieve continuity and growth over time: make the synergies detected and implemented greater by involving more companies and identifying new ones, seeking added value in other areas of the municipality (for example education or social welfare). In this regard, the project's continuity is promoted by the Bufalvent Industrial Estate Business Owners Association, which through the Bufalvent Synergies Office takes charge of providing advice and accompaniment services for the implementation of solutions for efficiency in the use of resources to all interested companies in the Bages region. Manresa City Council, the Bages Regional Council, the Waste Processing Consortium

and various business organisations from the area are involved, as is the Catalan Waste Agency and the Provincial Council of Barcelona, to give continuity to and expand this pilot project.



## THE CIRCULAR ECONOMY'S POTENTIAL IN THE BARCELONA METROPOLITAN AREA

For the **Metropolitan Area of Barcelona (AMB)**, the circular economy is an opportunity to improve the use of existing resources and offer a coherent framework to encompass the many initiatives and projects of very diverse types that exist and that fall within its scope, as well as provide a common narrative that paves the way to a more efficient use of these available resources.

This means stimulating collaboration between municipalities, organisations and businesses with common points of interest, with the aim of sharing resources and establishing new forms of relations between economic agents that make the initiatives and projects proposed viable and maximise their added value, both social and environmental.

The liaison and leadership role of the AMB is essential in the transition towards a circular economy in order to ensure a global perspective, considering the entire territory. Therefore, it is necessary to:

- Compile information on what is already being done. Why? With whom? Lessons learned, continuity.
- Identify municipalities' needs, their existing resources and their ways of working.
- Analyse potential opportunities for business and social growth in order to put them into practice.

This document aims to provide a diagnosis of the current state of play, as a starting point towards establishing strategic lines upon which to take action. Thus, to conduct an analysis of the present situation of the metropolitan territory's resources and their use, as well as of new tendencies, systematic compilation of data is necessary to be able to analyse what is happening.

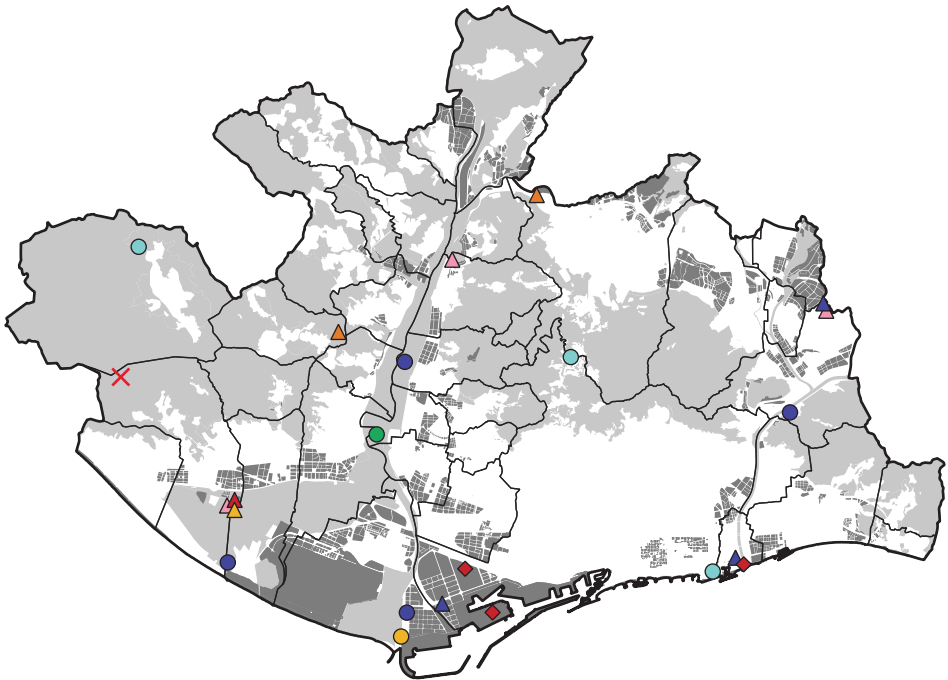
Talking about resources in terms of the circular economy means talking about how to make more efficient use of them and viewing them as the key to a system on a territorial level, for identifying synergies and the business models that will make it possible. And talking about resources means talking about water (runoff, groundwater, regenerated or drinking water), about raw materials and waste, about energy (both electrical and thermal), about facilities and about infrastructures (road, waste processing, treatment plants, etc.) about the spaces and other infrastructures available and about people and teams of professionals.

In order to produce a diagnosis of the current situation of the circular economy in the Barcelona metropolitan area, the metropolitan territory's resources with the greatest potential for the circular economy have been mapped out and information has been compiled on circular economy projects under way in the metropolitan territory and its surrounding areas.

## RESOURCES MAP FOR THE CIRCULAR ECONOMY IN THE BARCELONA METROPOLITAN AREA

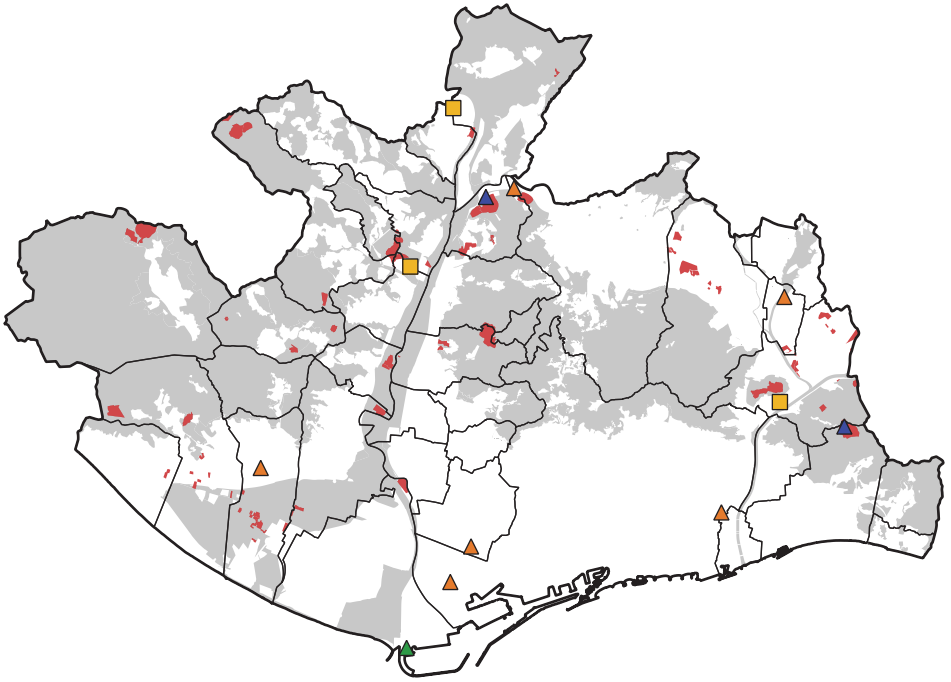
The metropolitan territory's resources maps show the locations of the main municipal processing facilities for waste, water and energy, or the resources of the construction sector (quarries, gravel pits, cement plants, construction waste landfill sites, etc.).

### METROPOLITAN INFRASTRUCTURES



- |  |  |
|--|--|
| ● Drinking water treatment plants                  | ▲ Bulk waste transfer plants                 |
| ● Wastewater treatment plants                      | ▲ Commingled container sorting plants        |
| ● Desalination plant                               | ◆ Fossil fuel power plants                   |
| ● Wastewater plants with tertiary treatment        | ✕ Controlled landfill with biogas generation |
| ▲ Composting plants                                | ■ Industrial estates                         |
| ▲ Organic fraction and non-recyclable waste plants | ■ Natural areas                              |
| ▲ Waste transfer plants                            | □ Municipalities                             |

## CONSTRUCTION SECTOR RESOURCES

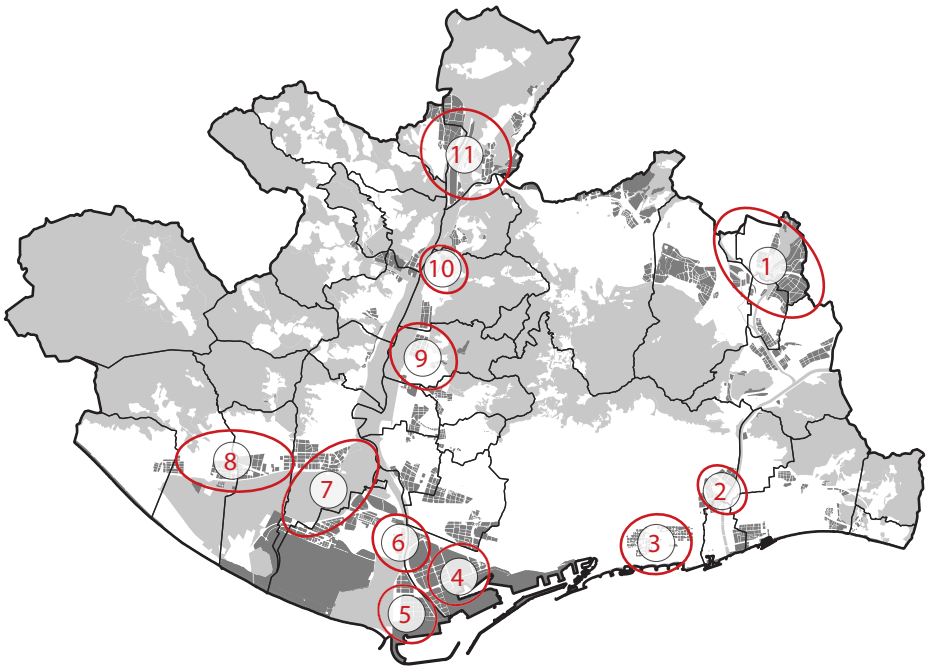


- Cement plants
- ▲ Controlled construction waste landfill
- ▲ Construction waste sorting plants
- ▲ Construction waste recycling plants
- Extractive activities
- Natural areas

## CIRCULAR ECONOMY PROJECTS UNDER WAY IN THE BARCELONA METROPOLITAN AREA AND NEARBY

In the territory of the Metropolitan Area of Barcelona and its surrounding area there are various initiatives and projects devoted to improving the use of resources and the development of collaboration synergies that place the municipalities of the AMB in an advantageous position before the transition towards the circular economy.

The concentration of information and general coordination of the projects are key to maximising the benefits and ensuring rational use of the public resources available.



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2. Bon Pastor and Baró de Viver industrial Estate (p. 26)
3. Districlima (pp. 27-28)
4. Ecoenergíes Barcelona (p. 29)
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8. Ecoindústria (p. 33)
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10. La Granja (p. 35)
11. Simbio (p. 36)

**Other projects in the vicinity of the metropolitan area:**

- Rubí Brilla  
Promotion of energy efficiency and the use of renewable energies in industrial, commercial and domestic environments as a factor for improving competitiveness and environmental enhancement of the territory.
- Eco-Congost  
Energy symbiosis on the El Congost and Jordi Camp industrial estates in Granollers
- Industrial symbiosis in Terrassa
- Vallès Circular  
Business conference on the circular economy in the Vallès Occidental
- Network for the distribution of regenerated water to Sabadell industries
- Manresa in Symbiosis and Bufalvent Synergies Office
- Tub Verd in Mataró  
Heat network using residual energy from the waste processing and wastewater treatment plants
- Circular Economy Berguedà  
Promotion of efficient use of resources in the Berguedà region
- Granollers Enters into Symbiosis  
Industrial symbiosis in Granollers and Montmeló

## INDUSTRIAL SYMBIOSIS



TYPE: project to promote the collaborative economy

MUNICIPALITIES: Sabadell, Barberà del Vallès and Sant Quirze del Vallès

STATUS: started up in 2014

### SUMMARY

A supra-municipal industrial symbiosis project serving companies in the industrial corridor made up of Sabadell, Sant Quirze and Barberà del Vallès to improve efficiency in the use of resources through collaboration between these companies, providing them with advice, training and accompaniment in the implementation of the synergies identified.

### GOALS

- Promote a culture change towards a model of best practices in industrial symbiosis between the participating companies.
- Encourage synergies between the companies in the three municipalities proposing new opportunities for business within a circular economy.
- Provide a mechanism that identifies opportunities and stimulates their materialisation for:
  - **Sharing** knowledge and experiences across the business fabric.
  - **Promoting** synergies between companies from the Economic Activity Estates (PAE).
  - **Detecting** the environmental needs of companies.
  - **Seeking** opportunities to put together a catalogue of best practices in the territory.

### METHODOLOGY

- Application of a bottom-up strategy: working on the company scale based on audits for improvement in technical and environmental solutions.
- Business prospecting to seek opportunities for industrial symbiosis between companies, as well as tasks focusing on specialised technical advice for companies with the potential to develop them.
- Programming of workshops, meetings between companies in the territory and other agents so that they can get to know each other and match up supply and demand.
- Use of existing tools and resources, to develop and stimulate the companies detected with training activities.

### RESULTS

- Two years of supra-municipal collaboration in economic promotion projects. In the year 2015 in Barberà del Vallès and Sabadell. These were joined in 2016 by Sant Quirze del Vallès.
- Supra-municipal collaboration (Barberà del Vallès and Sabadell).
- Public-private collaboration between the local councils and the local production fabric and strengthening of business associations.
- Visualisation of the role of the local authorities for industries.

### CONTACT

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## BON PASTOR AND BARÓ DE VIVER INDUSTRIAL ESTATE



TYPE: promotion of short-circuit distribution of local products

MUNICIPALITY: Barcelona

STATUS: in operation

### SUMMARY

Barcelona City Council Programme for the stimulation of neighbourhoods that promotes and improves the management of the Bon Pastor and Baró de Viver industrial estate through tools to foment the circular economy.

### GOALS

- Reactivate economic activity on the Bon Pastor and Baró de Viver industrial estate as a driving force for development of the territory. Provide tools to improve competitiveness and strengthen the companies based on the industrial estates.
- Attract and encourage the implementation of new activities focusing on innovation through training.
- Host social and cooperative economy initiatives of an industrial nature with special emphasis on activities that promote the circular and green economy.

### METHODOLOGY

- Equip the companies on the industrial estates with a new portfolio of services and consolidate the position of the industrial estates management officer with the mission of achieving:
  - Promotion of business association formation.
  - Business and technological training and guidance.
  - Measures to promote efficiency in the use of resources and energy efficiency through the circular economy to improve business competitiveness.
  - Actions to encourage the use of empty units.

### RESULTS

- Engagement of services to analyse the assets of companies and business representatives available.
- Programme of communication campaigns to connect business representatives.
- Training of municipal technical staff with the aim of ensuring well-trained companies that work in collaboration and where synergies may be produced for the optimisation of resources that will act as a driving force to impel the business fabric towards new business models.

### CONTACT

Barcelona Activa

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## DISTRICLIMA



TYPE: use of residual energy produced by waste processing

MUNICIPALITY: Barcelona

STATUS: in operation

### SUMMARY

Districlima manages a heating and cooling distribution network in the area of the Fòrum and the 22@ Technology District through four pipes with supply temperatures of 5.5°C and 90°C and return temperatures of 14°C and 60°C, making use of the steam originating from the incineration of urban waste.

GIVERS	TAKERS
Waste incineration plant	Companies that use cold and heat (heating, industry, air conditioning ...)
TERSA	Companies in the area of the Fòrum and the 22@ Technology District
	Hospital del Mar



Network of Districlima producer and user points. © Districlima.

### GOALS

- Make use of the excess steam originating from the incineration of municipal solid waste (MSW) at the TERSA waste processing plant.
- Generate heat and cold using renewable energies for the air conditioning and heating systems of the buildings in the Fòrum and 22@ areas.
- Extension of the network to the Hospital del Mar.

## METHODOLOGY

- Creation of a company with public and private stakeholders to achieve the investment necessary (around €55M) to develop this project in a newly built urban area. Stakeholders are: the heat networks specialist investment company **ENGIE** (Suez Group: 50.8%); **TERSA**, metropolitan waste management and energy company (AMB: 20%); **Aigües de Barcelona**, water distribution company (Suez Group 19.2%); the autonomous region's energy authority represented by the **Catalan Energy Institute (ICAEN)** (5%), and the Spanish government-owned **Institute for Energy Diversification and Savings (IDAE)** (5%).
- Construction of two power plants located in the urban environment that, through a piping network, supply thermal energy to areas with offices, residential buildings, hotels, education centres and retail outlets.

## RESULTS

- Construction of two heat production plants:
  - Central Fòrum: production of heating by making use of the steam originating from the incineration of MSW at the TERSA plant (40 MW), and of cooling through electrical equipment refrigerated using sea water (31 MW).
  - Central Tànger: which guarantees the supply in periods of greater demand with natural gas. In a first phase, the production of glycol-water at -7°C (6.7 MW) and of hot water at 90°C (26.8 MW). In a second phase, the expansion is planned, according to demand, of the production of cooling (13.4 MW) and heating (13.4 MW).
- Expansion of a network of pipes measuring 15.6 km which can currently serve 89 buildings with an air-conditioned floor area of 869,000m<sup>2</sup> between the Fòrum and 22@ District areas, achieving an emissions saving of around 18,000 tonnes of CO<sub>2</sub> (2015), with a reduction of 59% in fossil fuel consumption.

## CONTACT

Districlima

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## ECOENERGIES BARCELONA



TYPE: use of waste energy from production processes  
MUNICIPALITIES: Barcelona and L'Hospitalet de Llobregat  
STATUS: in operation

### SUMMARY

Ecoenergies Barcelona manages the cooling and heating network in Zona Franca, Marina del Prat Vermell and L'Hospitalet de Llobregat to provide a thermal supply by making use of the biomass originating from the parks and gardens of Barcelona, forestry biomass, the system of thermal solar panels and the cold generated by the port's regasification process.

GIVERS	TAKERS
Companies that generate residual heat	Companies that use cold and heat (heating, industry, air conditioning, etc.)
AMB Parks and gardens	Mercabarna Zona Franca buildings

### GOALS

- Make available sustainable heating, air conditioning and hot water for buildings in the Zona Franca, Marina del Prat Vermell and L'Hospitalet de Llobregat through biomass originating from the parks and gardens of the AMB.
- Make use of the cold produced in the regasification of liquefied natural gas when it reaches the port of Barcelona to supply it to Mercabarna.
- Develop a model of funding for an investment (not exclusively public) of some €96 M to be supported by the selling of the service.

### METHODOLOGY

- Implementation of an energy project that is pioneering in Europe with a high level of R&D that enables the supply of cooling and heating.
- Offering of the service through a public competition for an energy services company (ESC): Ecoenergies Barcelona.

### RESULTS

- Grouping of givers and takers that implies the use of residual cold obtained in the regasification of liquefied natural gas and waste biomass originating from the maintenance of parks and gardens.
- Public-private funding formula for a new network with the active participation of Barcelona City Council as a shareholder.
- Three power plants integrated into the urban environment (Zona Franca, the Port and La Marina) which, through a network of 24 km of piping, supply thermal energy to residential, industrial and tertiary-sector customers within an area of 15,000,000 m<sup>2</sup>. Using renewable energy from biomass, a saving is achieved of some 27,000 tonnes/year of CO<sub>2</sub>, plus an economic saving of €500,000 per year.

### CONTACT

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## BARCELONA METRO UNDERGROUND NETWORK (TMB)



TYPE: utilisation of unused water

MUNICIPALITIES: Barcelona and L'Hospitalet de Llobregat

STATUS: in operation

### SUMMARY

The pumping wells of the metro of Barcelona collect and pump groundwater that filters into its tunnels to prevent them from flooding. This water represents significant volumes, around 10.2 hm<sup>3</sup>/year, of which the councils of Barcelona and L'Hospitalet make use of 24% for municipal services such as watering parks and gardens, street cleaning and ornamental fountains. It is good-quality groundwater but not potable.

#### GIVERS TAKERS

GIVERS	TAKERS
Companies with access to groundwater	Local councils
Barcelona Metropolitan Transports (TMB)	Barcelona City Council
Catalan Water Agency (ACA)	L'Hospitalet de Llobregat Town Council

### GOALS

- Avoid flooding of the metro's underground facilities.
- Use the water collected for municipal services for purposes such as watering plants.
- Avoid its diversion to the sewage system as this would generate unnecessary costs at wastewater treatment plants due to increased inflows.

### METHODOLOGY

- Collaboration agreements between the TMB, ACA, Barcelona City Council and L'Hospitalet Town Council for water use and management.
- Setting up of a network of 176 groundwater collection wells with 322 pumps to make use of groundwater for purposes suited to its quality: watering of green areas, road cleaning, sewage network cleaning, cleaning of sewage vehicles, ornamental fountains and ponds, watering of sports areas, etc.
- Improvement of waters unused due to excess salinity or unsanitary conditions.

### RESULTS

- In 2016, around 24.43% of this water was used for watering parks and gardens, cleaning or ornamental fountains.
- The percentage of water collected by the Metro with respect to the total consumption of the Barcelonès region is around 6%, so the current usage represents some 1.3% of total consumption.

### CONTACT

TMB

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## ZONA FRANCA CONSORTIUM IN SYMBIOSIS



TYPE: project for the joint management of industrial resources

MUNICIPALITY: Barcelona

STATUS: started up in 2017

### SUMMARY

Implementation of an industrial symbiosis project with the aim of increasing the added value contributed by the Zona Franca Consortium to companies working on its over 12,000,000 m<sup>2</sup> of industrial and urban land. It focuses on joint use of existing resources (owned by the Consortium, by the companies and in the urban territory around them) with the intention of attracting new investments, consolidating clients and converting them into a reference for the eco-management of industrial estates integrated into the urban fabric.

### GOALS

- Promote the international projection of the Zona Franca industrial estate.
- Promote the conversion of the industrial estate into a sector of interest for current and future users of the facilities located there by:
  - **Increasing** the estate's economic and environmental value and that of the companies forming part of it.
  - **Offering** more efficient services and increased production competitiveness, visibility and prestige.

### METHODOLOGY

- Analysis of the resources available but unused or whose use could be improved by using industrial symbiosis criteria and communication of the results to companies.
- Setting up of new services by the Consortium specifically for companies on the estate in order to improve efficiency in the use of these resources.
- Facilitation of collaboration and association formation between companies for the joint analysis of business opportunities identified and putting them into practice.
- Programme of work sessions with business representatives to identify and evaluate together the viability of synergies with shared resources.

### RESULTS

- Map of the resources available and potential opportunities that exist on the Zona Franca industrial estate.
- Creation of the estate's Resources Management Office thanks to the training given to Consortium personnel with the aims of:
  - **Managing and identifying** synergies between resources, residual energy, water, etc.
  - **Offering** improvement services to companies as a way of attracting investment towards the estate.
- Collaborative sessions with business representatives to develop new synergies and agreements that are beneficial for all.

### CONTACT

Zona Franca Consortium

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## ECONOMIC ACTIVITY ESTATE OF THE BAIX LLOBREGAT AGRICULTURAL PARK



TYPE: promotion of the distribution of short-circuit local products

MUNICIPALITY: El Prat de Llobregat

STATUS: in operation

### SUMMARY

The Baix Llobregat Agricultural Park is a protected farming area that leads the short-circuit marketing of local produce and promotes organic products in its working environment, as well as promoting the use of regenerated water for the irrigation of crops, and the use of compost originating from urban organic waste material.

### GOALS

- Provide the maximum number of exchanges possible with the city through economic models that are beneficial, sustainable and environmentally-friendly.
- Establish a connection between the actors in the production cycle that enables maximum usage of resources to be facilitated. This is a key component in the city's circular economy because it enables numerous local exchanges.

### METHODOLOGY

- Activation of local consumer markets in the most populated area in Catalonia
- Promotion of a business estate that can supply fruit and vegetables to some 300,000 inhabitants.
- Improvement of resources for landscaping, ecological connectivity and metropolitan tourism services.

### RESULTS

- Food resource: establishment of short marketing channels to adequately enhance the value of local produce, such as direct sales through farmers' markets, direct farm-to-table sales to restaurants or direct sales through the farmers' directory. Promotion of "Fresh Produce from the Baix Llobregat Agricultural Park".
- Compost resource: collaboration agreements between agricultural producers and the Zona Franca Ecoparc 1 plant, a producer of compost from the organic fraction of municipal waste, through plant protection organisations (PPO) at the Agricultural Park, which enables proper management of this resource on lands with a low level of organic material.
- Water resource: use of wastewater originating from tertiary processing at the wastewater treatment plants in the Llobregat basin in the metropolitan area.

### CONTACT

Baix Llobregat Agricultural Park

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## ECOINDÚSTRIA



TYPE: project to promote industrial symbiosis

MUNICIPALITIES: Viladecans and Gavà

STATUS: started up in 2016

### SUMMARY

The town councils of Gavà and Viladecans are collaborating to set up an industrial symbiosis project in their municipalities with the aim of giving support to companies there. The main objective is to make efficient use of resources by creating a network of connections and facilitating synergies between these networks. The continuation of the project in the year 2018 includes the incorporation of the municipality of El Prat de Llobregat.

### GOALS

- Improve the competitiveness of industrial companies through the reduction of costs and inflow of new revenues based on the use and upgrading of resources.
- Add value to the participating companies by making use of under-utilized waste, energy and fluids, as well as optimising production processes and logistics in order to convert companies into reference points for their customers or consumers.

### METHODOLOGY

- Evaluation of the activities of companies in the territory and their waste and resources, through a system of indicators for products, companies and potential circular economies.
- Mapping of companies and analysis of the industrial ecosystem based on clusters present, resources employed and waste produced.
- Link between the businesses and the Town Council's Business Support Centre, which organises facilitated meetings for companies.
- Establishment of relations between the companies to promote the use of resources that other companies don't use: waste, heat, water, logistics spaces and resources.

### RESULTS

- Around 80 companies have been involved from the Viladecans and Gavà industrial estates in order to gather the maximum information possible.
- The initial meetings with the companies have been organised. These detected the first potential synergies on the basis of:
  - The optimisation of marketing channels to improve the distribution logistics for the products.
  - The design of new business models dedicated to the sale of products as a service.
  - The use of by-products as feedstock.
  - The promotion of new organic/more sustainable products.

### CONTACT

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## CIRCULAR ECONOMY IN SANT FELIU DE LLOBREGAT



TYPE: project to facilitate the circular economy in the municipality

MUNICIPALITY: Sant Feliu de Llobregat

STATUS: in operation

### SUMMARY

Sant Feliu de Llobregat Town Council is promoting circular economy facilitation actions to companies on its industrial estates and is initiating a pilot project proposal for research into methods for the circular economy with the technology centre Cetaqua (owned by AGBAR) through European project applications.

### GOALS

- Promote the circular economy with new services for the municipality's industries and public services.
- Promote public-private collaboration on circular economy and industrial symbiosis projects.
- Set up and develop actions for optimisation of the use of resources: water, energy and waste.

### METHODOLOGY

- Creation of different services for industries through the Sant Feliu Town Council's Economic Promotion Department:
  - Creation of a local administration one-stop system for industries.
  - Promotion of business association formation.
  - Procurement of green energy.
  - Creation of the position of energy manager in the municipality.
- Collaboration between public and private agents on research projects.

### RESULTS

- Services for established resident industries at Sant Feliu de Llobregat Town Council.
- Creation of the joint association of business owners from the El Pla and Les Grases industrial estates.
- Signing of a collaboration agreement for the research project with relevant public and private agents: Baix Llobregat Agricultural Park, Collserola Park, municipal services for the environment, sewage, cleaning, supply of drinking water, gardening and pruning and waste collection, wastewater treatment plant (WWTP), associations of industrial estates and construction, metallurgical and pharmaceutical companies.

### CONTACT

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## LA GRANJA

TYPE: biomass heat distribution network

MUNICIPALITY: Molins de Rei

STATUS: in operation



### SUMMARY

La Granja is a pioneering project for generating heat from biomass from forests and industrial waste, for heating and hot water supplied to 2,200 users at some 700 homes in a neighbourhood of Molins de Rei.

GIVERS	TAKERS
Molins de Rei Town Council Metropolitan Area of Barcelona	Housing in the La Granja neighbourhood
ICAEN	Facilities in Molins de Rei

### GOALS

- To be a pioneer in Catalonia in the construction and installation of district heating networks in a residential area of Molins de Rei.
- To be capable of adapting this new form of heat to the available biomass market, the type of water heaters and the user social fabric.
- To resolve economic deficiencies by promoting a business-based change that makes the operation viable.

### METHODOLOGY

- Creation of Molins Energia by the authorities: a public company formed by Molins de Rei Town Council with 70%, the AMB with 15% and the ICAEN with 15%, with management of the network through licensing to the private company Veolia, which has been guaranteeing the proper functioning of the facilities and the continuity of the service since the year 2015.

### RESULTS

- A 2,350 metre-long heating network with a heating plant supplied by two biomass boilers of 2 MW each (and a reserve boiler using natural gas) and an initial investment of some €2.2 M.
- Reduction of emissions of CO<sub>2</sub> (some 1,700 tonnes/year) as the fuel used is biomass from forestry sources and waste wood from industries.
- Service to 625 domestic customers, in other words, approximately 2,200 residents supplied and five non-domestic customers: CEIP (school), CAP (medical centre), public health centre, shopping centre and sports complex.

### CONTACT

Veolia

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## SIMBIO



TYPE: project for making use of residual heat from metallurgical processes

MUNICIPALITY: Castellbisbal

STATUS: under study

GIVERS	TAKERS
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Metallurgical company	Heat-using companies
CELSA	Castellbisbal Town Council
	BASF

## SUMMARY

Research project led by the universities of Barcelona and Lleida with the collaboration of various companies and that involves the municipality in energy synergy.

## GOALS

- Achieve the development of the proposal for energy symbiosis of the Castellbisbal industrial park through the collaboration of industrial companies, municipal services, commerce, etc.
- Secure funding for the demonstration proposal from the Horizon 2020 programme for the upgrading of residual heat from industrial systems for use, storage and distribution.

## METHODOLOGY

- Definition of the map of sources of heat from the different CELSA facilities and other companies in the industrial park.
- Definition of the possibility of reuse of the heat at CELSA, at the BASF company and at other industrial premises and municipal facilities.
- Work with the heat capture system of the giver companies and with storage based on energy accumulation through materials such as steel, oil or salts.
- Construction of a trial at the Sant Vicenç industrial estate in Castellbisbal.
- Evaluation of the acceptance of the industrial symbiosis concept by the companies.

## RESULTS

- Project led by the Universities of Barcelona and Lleida with the collaboration of the Universities of Ulster and Perugia, Castellbisbal Town Council and the companies CELSA, BASF, Grup Soler and Schneider. It has been produced for the European Horizon 2020 funding programme.

## CONTACT

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## SWOT MATRIX OF THE DIAGNOSIS

### STRENGTHS

Industrial fabrics well established in the metropolitan context.

Industry with a strong tradition of association formation.

Municipalities interested in the maintenance of their industrial fabric.

Presence of cases with a high level of RDI and diversity in the research initiatives.

### WEAKNESSES

Low level of implementation of the circular economy.

Lack of strategic plans for making use of potential resources.

Low level of culture with respect to the circular economy across the business fabric.

### OPPORTUNITIES

Diversification of markets with oligopolistic tendencies.

Constitution of companies with more deliberative and fairer organisational models.

Reduction of consumption in raw materials and energy.

Reduction of waste generation.

Increase in productivity.

Attraction of industrial companies thanks to the complementary services provided by the circular economy.

Increase in industrial competitiveness.

### THREATS

Pressure from real estate speculation generating industrial delocalisation.

Loss of competitiveness.

*SWOT analysis of the circular economy in the Barcelona metropolitan area.*





# REFLECTION

A resilient approach to the territory for good strategic planning means evaluating the risks and outlining the most necessary strategic policies. The metropolitan context is changing: a crisis has developed in housing access that has driven this sector to a position of prime importance among citizens' concerns; recent economic crises reveal the need to improve the economic innovation on offer to ensure activity and there has been consolidation of the concept of fuel poverty, which can be extended to other services. A Catalan law on a basic income for citizens has been created with wide-ranging implications for metropolitan social cohesion, while the Paris Agreement on climate change was signed, requiring not only energy transition but also bringing with it much more demanding environmental standards, and furthermore a new law on transparency has been passed that has led to the creation of the AMB Transparency Agency.

This long list of growing needs also implies an increase in resources which imperatively need to go hand in hand with better efficacy and efficiency in the organisation of the services available in the AMB and a new political strategy in which metropolitan strategic planning is essential.

In this sense it is necessary to highlight the areas with potential and opportunities offered by the AMB Law, explicitly detailed in its Article 14, where alongside more consolidated areas – urban planning, transport, mobility, environmental services – also prominent, among others, are environmental protection, health and biodiversity, as well as measures for combating climate change.

For this reason, the Strategic Planning Area of the AMB has been the starting point for developing the DREAM project which proposes, for each area and service, a Diagnosis (using SWOT methodology), a Reflection, a Strategy and a set of Metropolitan Actions. These have been specified based on the Metropolitan Action Plan (PAM), which is the main reference element relating to metropolitan policies for each mandate.

This new strategic approach seeks to progress from reflection to action and means evolving from a dynamic that tends to produce studies towards a more action-focused approach that generates resilience in the metropolitan territory in the face of external risks and threats. If we want to take a set of metropolitan strategic policies forward in a resilient territory, we must begin with an initial narrative for each of the sectoral areas.

This is the aim of this text: first to pinpoint a DIAGNOSIS structured around the risks, then to establish a REFLECTION on the metropolitan system, considered as an adaptive complex that requires both territorial and governance positioning and, from there, to constitute a STRATEGY to define, subsequently, a set of METROPOLITAN ACTIONS that will need to be implemented. It proposes the creation of a narrative that is based on a resilient diagnosis of the relevant risks and that helps to configure metropolitan strategies based on a series of actions that are already being developed and that will be the basis for defining future strategic policies.

In this phase, one of the central considerations for strategic planning means proposing a series of strategic core areas that, in the near future, will lead us to the definition and territorial distribution of a set of metropolitan policies.

This narrative on the circular economy in the Barcelona metropolitan area is a strategic reflection for the future construction of strategic metropolitan policies in a resilient territory.

In recent years, it has become clear that there is a need to design the urban metabolism of all kinds of urban settlements. Only through analysis of the flows of materials and resources (water and energy) – and their optimisation through adequate design – can we reach a point where we can talk of cities that are truly heading towards horizons of sustainability and resilience. To do this, the governing authorities hold predominant positions in areas such as transport, the water cycle, urban planning and waste management, where their function as managers is important. When we talk of the circular economy and industrial symbiosis, we are talking above all about ways of reorganising and optimising technological cycles and nutrient cycles to preserve the value of resources throughout industrial and agricultural production processes or in the urban metabolism, in order to make the concept of waste disappear. The weight of the authorities in all of these processes would seem to have little relevance, although this in no way means that the public sector's possibilities for promoting this necessary conception of the economy are not important.

Authorities, companies and citizens have the opportunity to contribute decisively to new patterns of production and consumption that will foment sustainability. In the Barcelona metropolitan area, the dense and diverse industrial fabric present in the majority of municipalities, with solid traditions of association-building and of public and private investment in R&D, can be drivers of the implementation of circular economy principles providing that a common and coordinated strategy for authorities and businesses is defined that will optimise both the use of existing resources that are underutilised and the transfer of knowledge and resources between the different economic agents (consumers, companies and authorities). Innovation in products and services that limit as far as possible the demand for resources and the production of waste and that promote durability and efficiency in resource consumption will increase the productivity of the metropolitan economic fabric, favour competitiveness and new job creation and, in the long term, generate new economic opportunities for the metropolitan territory as a whole.

But in addition, local authorities such as municipal councils and the AMB, from their position of proximity to citizens and the territory, can act as facilitators of change, by cooperating, organising and directing the private sector thanks to the implementation of the circular economy as an economically profitable activity and one that makes production processes and urban settlements more resilient.

This volume presents a whole series of examples of such collaboration between public and private agents and also recommends a comprehensive set of actions designed to aid the development of a circular economy in the Barcelona metropolitan area.





# STRATEGY

## POTENTIAL CIRCULAR ECONOMY ACTION SITES IN THE BARCELONA METROPOLITAN AREA

A noteworthy fact relating to the current linear system of resource usage is the minimal or negligible inter-relationship between sectors. The water sector does not have management points in common with that of transport for example, or the food supply sector has no elements in common with the energy sector. Everything is managed in airtight departments which hinder any synergies that might appear. But in a territory like that managed by the AMB it is necessary to coordinate an efficient system of resources use that makes possible a circular system of flexible management where the cross-sectoral strategic vision is a necessary condition.

As a first step towards promoting cross-sectoral relations that permit the transition towards the circular economy and industrial symbiosis, it is proposed to map out the main metropolitan production hubs including resources and experiences that can function as foundations for the consolidation and promotion of these production strategies.

The metropolitan territory managed by the AMB concentrates over 50% of the gross domestic product of Catalonia in 2% of the territory. Therefore, in a very small space, an extremely important consumption of resources takes place and, also, a major production of waste that potentially could be converted again into resources within a circular economy context. In addition, this is a territory divided approximately into equal parts between urban areas, on the one hand, and non-development areas and spaces of natural value on the other. And it is also an ideal territory for establishing economic mechanisms designed to achieve balance between the city and its environment, of vital importance within the context of sustainability and resilience.

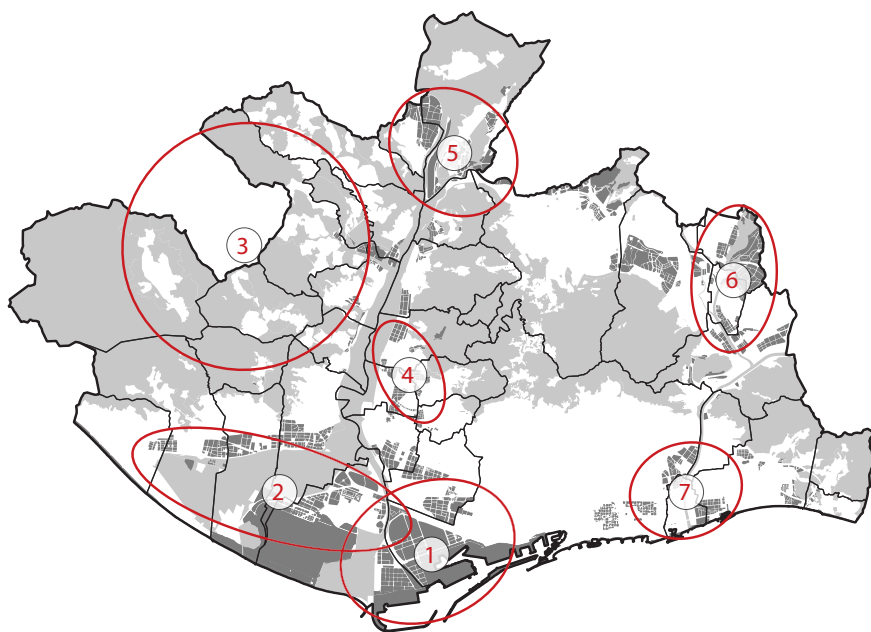
In addition, this territory has resources of great value at its disposal:

- It possesses and jointly manages 1.5 million tons of waste from 33 municipalities with four plants for the processing of the unrecyclable waste fraction, three commingled container sorting plants, three organic fraction composting plants, etc. In addition to rubbish tips and plants for the recovery of paper and glass.
- It manages the water cycle of its municipalities: supply (the Llobregat aquifer, etc.), sanitation, reuse of water, management of sludges.
- It has other natural and agricultural resources of great value: the Natural Park of Collserola, the Baix Llobregat Agricultural Park and the set of parks and gardens in the municipalities.
- There are mountain municipalities with a great ecological value for the environmental balance of big towns and cities forming part of the AMB and these, along with the Agricultural Park, can supply food to almost 10% of the population.
- It has a long tradition of promoting business associations which has materialised in the 250 industrial estates in the municipalities that make up the AMB. These industrial estates are manufacturing production hubs with a major potential for improvement in the efficiency of their processes, both in raw materials and in energy, water, logistics, etc.
- There are pioneering municipalities that are already working on these circular economy concepts, as well as projects, companies and other organisations from which to learn and draw inspiration.

The circular economy can give a coherent framework in the territory of the AMB for maximizing efficiency in the use of all these resources. The idea is to visualise as a system the whole set of resources available and municipalities, with an intersectoral focus, as if dealing with a natural ecosystem.

In a natural ecosystem there is no waste, energy flows and comes from the sun, and the more diverse the ecosystem, the richer it is and the more it develops. So let's consider the municipalities of the AMB as part of an ecosystem, in this case a territorial one, where we stimulate them and facilitate their path towards collaboration in different spheres, working to maximise the use of resources and the transition of energy towards renewable energies.

Taking into account the geographical diversity, the resources available, the needs and the potential of the territories, the human factor and the social repercussions, **seven sites for action on potential circular economy projects** have been identified in the Barcelona metropolitan area:



1. Llobregat Delta (pp. 46-47)
2. Llobregat Plain (pp. 48-49)
3. Mountain Municipalities (pp. 50-51)
4. Lower Llobregat Valley (pp. 52-53)
5. Upper Llobregat (pp. 54-55)
6. Ripoll Valley (pp. 56-57)
7. Besòs Mar Area (pp. 58-59)

## LLOBREGAT DELTA

MUNICIPALITIES: El Prat de Llobregat, L'Hospitalet de Llobregat and Barcelona.

Amassed around the delta of the Llobregat river are a considerable number of companies located on large industrial estates associated with Barcelona's port and airport: the Zona Franca and the logistics activities zones (ZAL). These are major industrial estates.

### RESOURCES, AVAILABLE INFRASTRUCTURES AND RELEVANT STAKEHOLDERS

- Ecoenergies Barcelona heating and cooling network at Zona Franca and the Economic District of L'Hospitalet de Llobregat.
- High quality regenerated water from tertiary treatment at the WWTP in El Prat de Llobregat.
- Groundwater from the Llobregat delta.
- Pilot projects in shared mobility.

### NEEDS DETECTED

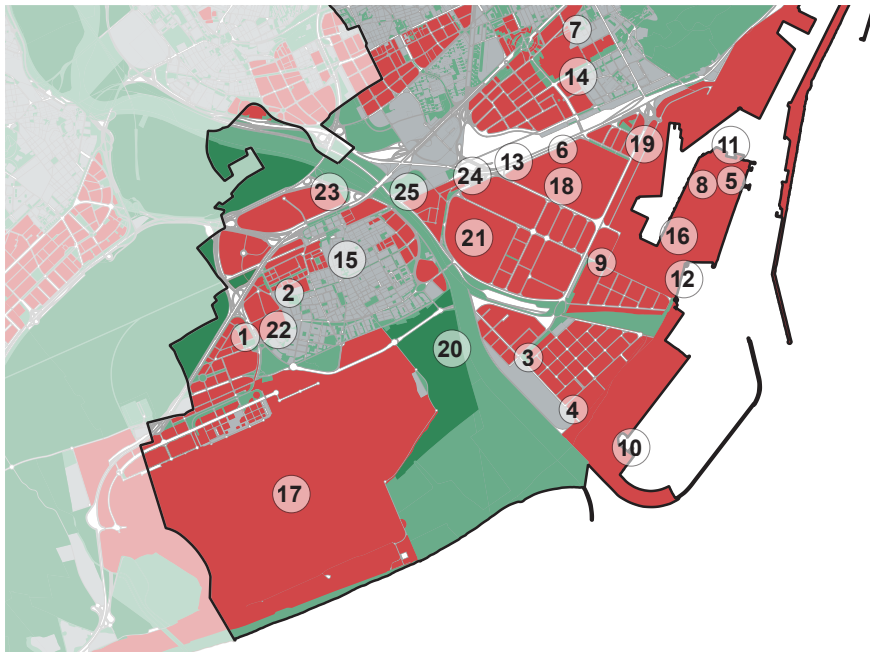
- Mobility: there are major traffic standstills caused by loading and unloading and around the entrance and exit points for workers at the ZAL.
- Water: at present the high quality regenerated water from tertiary treatment at the El Prat de Llobregat WWTP is only used to improve water circulation around the wetlands of the Delta. Part of this water could be used for industries, but a marketing project would be required. It is necessary to find companies that can use this water as well as rationalise the use of regenerated water originating from industrial processes.

### PROPOSALS

- Marketing of the regenerated water from the El Prat de Llobregat WWTP. Regenerated industrial water circuit. Optimisation of the use of groundwater for industrial uses.
- Shared electrical mobility for workers from the companies in the Economic District of L'Hospitalet and at the Zona Franca Consortium.

### EXPECTED RESULTS

- Rationalisation of water resources management with cost savings.
- Improvement in rush-hour traffic and in air pollution. Improved user awareness.



■ Industrial estates  
 ■ Urban  
 ■ Forest and grasslands  
 ■ Agricultural

**WATER INFRASTRUCTURES**

- 1. Mas Blau I drinking water purification plant (El Prat)
- 2. Sagnier drinking water purification plant (el Prat)
- 3. El Prat de Llobregat treatment plant with water regeneration
- 4. El Prat de Llobregat desalination plant

**ENERGY INFRASTRUCTURES**

- 5. Combined cycle power plants Port 1 and Port 2 of Barcelona
- 6. Zona Franca power plant (Ecoenergíes Barcelona)
- 7. La Marina power plant (Ecoenergíes Barcelona)
- 8. Enagás Transport

**WASTE INFRASTRUCTURES**

- 9. Ecoparc 1 Zona Franca
- 10. Barcelona Port construction waste recycling plant
- 11. Tradebe Port Services, SL
- 12. Servicios Flotantes Otto Schwandt

**BUSINESS ORGANISATIONS**

- 13. Barcelona Zona Franca Consortium
- 14. Pedrosa Business Association
- 15. El Prat Business Association

**TRANSPORT COMPANIES**

- 16. Terminales Portuarias, SL
- 17. AENA, SA
- 18. Nissan Motor Ibérica SA
- 19. SEAT

**FOOD COMPANIES**

- 20. Baix Llobregat Agricultural Park
- 21. Mercabarna
- 22. SA Damm
- 23. Carrefour Shopping Centres

**CHEMICALS COMPANIES**

- 24. BASF Española, SL
- 25. Bayer MaterialScience (Covestro)

## LLOBREGAT PLAIN

MUNICIPALITIES: Gavà, Viladecans, El Prat de Llobregat, Castelldefels and Sant Boi de Llobregat.

Gavà and Viladecans have an industrial symbiosis project under way (see page 23), a clear commitment by these municipalities to contribute to the competitiveness of their companies and obtain benefits by implementing new forms of managing waste and providing feedstock. The industrial estates of Gavà and Viladecans form a continuation with the municipality of Sant Boi, which also includes among its Governance Plan's strategic objectives "promoting innovation in the business and commercial sector to improve the local economy and create employment". The continuity of the industrial symbiosis project currently in execution in Gavà and Viladecans requires expansion of the project's scope to the industrial areas of El Prat, Castelldefels and Sant Boi and the involvement of these municipalities in its development.

### RESOURCES, INFRASTRUCTURES AVAILABLE AND RELEVANT STAKEHOLDERS

- Project up and running: "Ecoindustry. Symbiosis in local industry".
- Universe of 1,000 industrial companies across the three municipalities.
- Business associations with a long track record and experience.

### NEEDS DETECTED

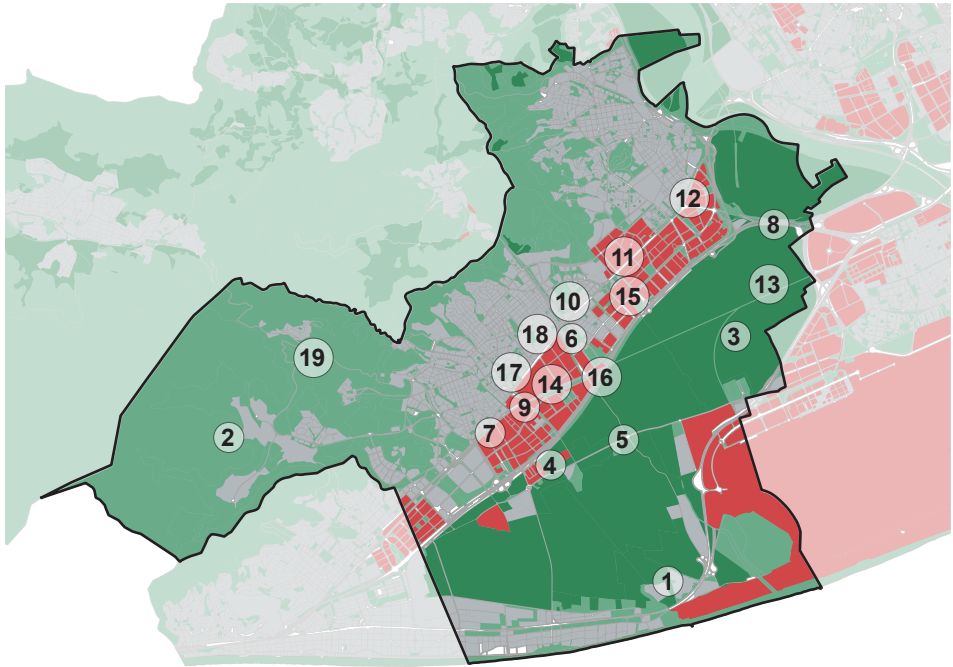
- Business development.
- Occupation of empty industrial units.
- Attraction of investments.

### PROPOSAL

Incorporate the municipalities of El Prat de Llobregat, Castelldefels and Sant Boi de Llobregat into the continuity of the industrial symbiosis project already under way in the municipalities of Gavà and Viladecans "Ecoindustry. Symbiosis in local industry".

### EXPECTED RESULTS

Expansion of the service for the improvement of business competitiveness through participation in an industrial symbiosis project promoted by the municipality in companies based in El Prat de Llobregat, Castelldefels and Sant Boi de Llobregat, transfer of the lessons learned and improvement in services.



■ Industrial estates  
 ■ Urban  
 ■ Forest and grasslands  
 ■ Agricultural

#### WATER INFRASTRUCTURES

1. Gavà-Viladecans purification plant

#### ENERGY INFRASTRUCTURES

2. UTE Biogàs Garraf (landfill site)

#### WASTE INFRASTRUCTURES

- 3. Burés, SA (composting plant)
- 4. Tractament i Selecció de Residus, SA (TERSA – bulk waste)
- 5. Tractament Industrial de Residus Sòlids, SA (TIRSSA - transfer)
- 6. Abicont industrial, SL (recycling of containers)
- 7. Alfredo Mesalles, SA (recycling of tyres)
- 8. Various metal recovery companies

#### BUSINESS ORGANISATIONS

- 9. Gavà Business Park
- 10. Viladecans Business Club
- 11. Can Calderón (Viladecans Business City)
- 12. Sant Boi Business

#### FOOD COMPANIES

- 13. Baix Llobregat Agricultural Park
- 14. Nederland, SA (cocoa)
- 15. Hochland Española, SA (cheese)

#### OTHER COMPANIES

- 16. Desigual (textile)
- 17. Roca Sanitario, SA (ceramics)
- 18. Calbet (distribution)
- 19. Various extractive activities

## MOUNTAIN MUNICIPALITIES

MUNICIPALITIES: Corbera de Llobregat, La Palma de Cervelló, Cervelló, Santa Coloma de Cervelló, Torrelles de Llobregat, Sant Climent de Llobregat and Begues.

The mountain municipalities of the AMB, despite having no strong industry, enjoy great potential because they have access to a valuable natural environment for both local tourism and for contribution to the control of air pollution in the metropolitan area. Quality agriculture and agroindustry are the most important sectors from both an economic and a cultural viewpoint. This is an area where fruit, especially the cherry, is the star product.

## RESOURCES, INFRASTRUCTURES AVAILABLE AND RELEVANT STAKEHOLDERS

- Production of agricultural and forestry products.
- Food products.
- Forests producing biomass.
- Quality compost.
- Farmers.

## NEEDS

Increase in the commercialisation of agroforestry products as a driving force behind an increase in production and economic growth that will lead to an improvement in forest management, reduce fire risks and increase the potential for attracting local tourism. An investment for promoting agroforestry management in these municipalities presents a much greater yield than that of unrecoverable investments for the correction of environmental impacts of possible forest fires in the area.

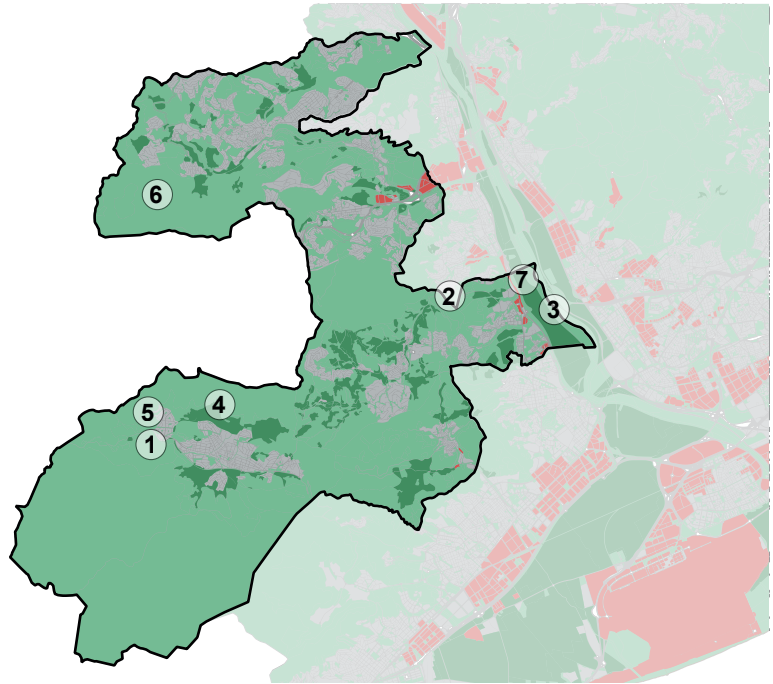
## PROPOSAL

Draw up and implement a plan for the marketing of agroforestry products from the area as a driving force for the local economy. Initiatives to stimulate the local market, create and give prestige to a local quality label (or together with the Agricultural Park), train specialists, promote producers and give them business support fostering innovation, work on a possible CO<sub>2</sub> market and account for the environmental costs associated with the activity.

## EXPECTED RESULTS

Business, economic and social and environmental value growth:

- Improvement of the environmental values of the area's woodlands, prevention of pollution.
- Improvement of the environmental values of protection against fire that agricultural and forest activity requires.
- Improvement of benefits from landscape and tourism assets.
- Maintaining of the agroforestry production culture within the metropolitan context.



■ Industrial estates  
 ■ Urban  
 ■ Forest and grasslands  
 ■ Agricultural

**WATER INFRASTRUCTURES**

- 1. Purification plant at Begues

**WASTE INFRASTRUCTURES**

- 2. Composting plant at Torrelles de Llobregat

**FOOD COMPANIES**

- 3. Baix Llobregat Agricultural Park
- 4. Mountain Agricultural Park

**OTHER COMPANIES**

- 5. Aricemex, SA
- 6. Lafarge Cementos, SA (closed)
- 7. Tratamientos y Acabados por Cataforesis, SA (TRACSA)

## LLOBREGAT LOWER VALLEY

MUNICIPALITIES: Sant Feliu de Llobregat, Sant Joan Despí and Sant Just Desvern.

Sant Feliu de Llobregat, Sant Joan Despí and Sant Just Desvern are municipalities linked by a long track record in collaboration, strongly related with their business fabric. A prominent role is played by the WWTP at Sant Feliu as a major water processing facility. And it is around this important resource, as well as energy and waste, that Sant Feliu is proposing an industrial symbiosis project with the support of European funding. The expansion of this project to Sant Joan Despí and Sant Just Desvern through industrial symbiosis across the entire business ecosystem of the three municipalities seems to be the most coherent form of involving all of them to reinforce the individual project and give it continuity and scale.

### RESOURCES, AVAILABLE INFRASTRUCTURES AND RELEVANT STAKEHOLDERS

- WWTP of Sant Feliu de Llobregat.
- Baix Llobregat Agricultural Park.
- Drinking water purification plant of Sant Joan Despí.
- European research project under study “SFL Circular Economy “.
- Very powerful economic promotion teams.
- Long tradition of local authorities working together with the industrial fabric.
- Collserola Park.
- Single Business Representatives Association in Sant Feliu de Llobregat.
- Facilities available for the marketing of local products (agricultural, manufacturers, etc.).

### NEEDS DETECTED

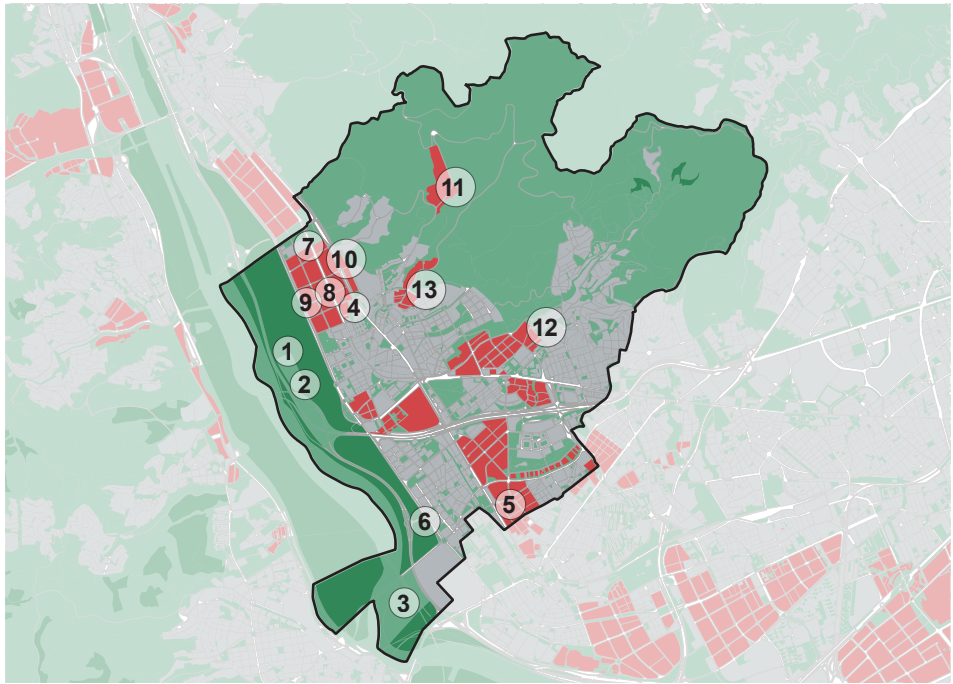
Help to materialise the synergies identified in the European project, foster them and make them extensive to neighbouring municipalities.

### PROPOSAL

Implement a project providing backing for synergies (with special emphasis on water resources) between the three municipalities and that gives support to the European project under development.

### EXPECTED RESULTS

- External help in implementing the synergies.
- Business development.
- Improvement in relations between businesses and the municipality and between the municipal services themselves.
- Accompaniment of industries in the process of adaptation towards a circular economy.



■ Industrial estates  
 ■ Urban  
 ■ Forest and grasslands  
 ■ Agricultural

**WATER INFRASTRUCTURES**

- 1. Sant Feliu de Llobregat treatment plant
- 2. Sant Feliu de Llobregat regenerated water plant
- 3. Drinking water purification plant of Sant Joan Despí-Cornellà

**BUSINESS ORGANISATIONS**

- 4. Business Owners Association of the El Pla and Les Grases Industrial Estates (AEPLA)
- 5. Association of Industries and Business Owners of the Fonsanta Industrial Estate

**FOOD COMPANIES**

- 6. Baix Llobregat Agricultural Park
- 7. Cafè Saula, SA
- 8. Dallant, SA
- 9. Benfumat, SA

**PHARMACEUTICAL COMPANIES**

- 10. Almirall, SA

**OTHER COMPANIES**

- 11. Cemex, SA
- 12. Urgil, SA
- 13. Ferré Recicladors, SL

## UPPER LLOBREGAT

MUNICIPALITIES: Castellbisbal, Sant Andreu de la Barca and Sant Cugat del Vallès.

The municipality of Castellbisbal concentrates a large quantity of industries from very different sectors with potentially high-value resources that are geographically scattered and not optimized (heat from foundry activity, brine ponds, water channels, waste, etc.). The urban centres could take advantage of processes on these large industrial estates with which they could share resources and projects. Improved efficiency in the use of the majority of the resources available in the area, especially linked to thermal energy and water, through business synergies, is a clear point for collaboration between municipalities.

### RESOURCES AND INFRASTRUCTURES AVAILABLE AND RELEVANT STAKEHOLDERS

- Residual heat from the company CELSA.
- Important energy consumption of BASF, among others.
- Metallic waste.
- Piped brine ponds that could be used as heat “stores”.
- Research project under study on heat synergies between the two major companies and other neighbouring companies and the municipality.

### NEEDS DETECTED

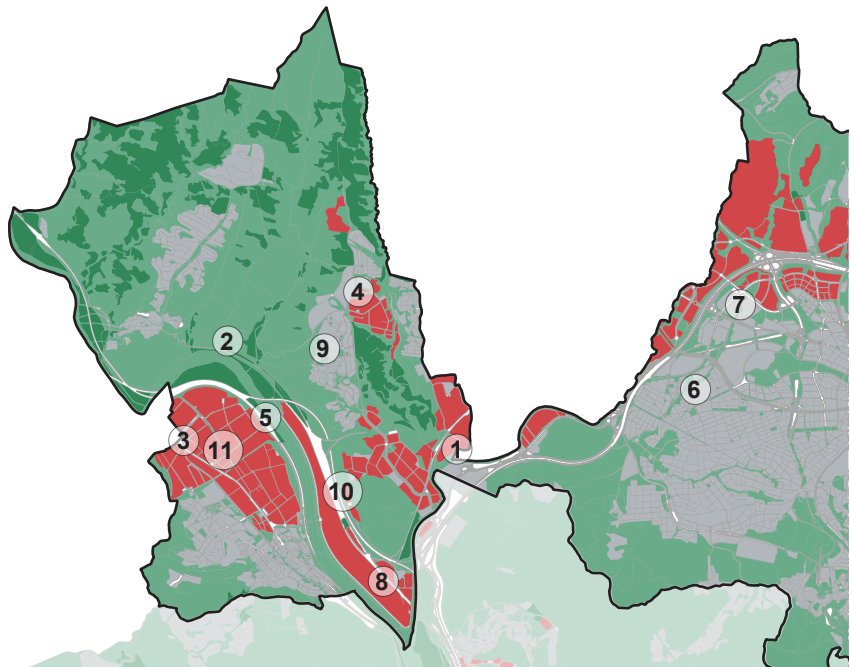
Analysis of the present or potential needs of industries to make use of the resources and facilities existing in the area co-led and coordinated by the local administration to be able to offer solutions for the purpose of rationalising the use of material waste and residual energy resources.

### PROPOSAL

Implement a project with special emphasis on the use/storage of residual heat to give support to the research project under study, participate in it and take better advantage of its conclusions.

### EXPECTED RESULTS

- Increase in business competitiveness.
- Improvement in company-municipality relations.
- Promotion of business association formation.
- Participation in public-private research projects.
- Promotion of business innovation, attraction of energy sector investments.



■ Industrial estates   
 ■ Urban   
 ■ Forest and grasslands   
 ■ Agricultural

#### WATER INFRASTRUCTURES

1. Rubí purification plant
2. Brine ponds reservoir

#### WASTE INFRASTRUCTURES

3. Barcelona Cartonboard, SAU
4. Recuperadora de Vidrio Barcelona, SA (REVIBASA)
5. Stora Enso Barcelona, SA
6. Cespa Gestión de Residuos, SA
7. TMA Gestión Integral de Residuos

#### CHEMICALS COMPANIES

8. BASF Española, SL
9. Química Básica, SA

#### METAL COMPANIES

10. CELSA, SA
11. Clariant Ibérica, SA

## RIPOLL VALLEY

MUNICIPALITIES: Montcada i Reixac, Ripollet and Barberà del Vallès.

These three municipalities in the south of the Vallès Occidental concentrate a very significant proportion of the waste treatment facilities of the Metropolitan Area of Barcelona, which means they present great potential for optimisation through the creation of synergies.

### RESOURCES AND INFRASTRUCTURES AVAILABLE AND RELEVANT STAKEHOLDERS

- ECOPARC 2 in Montcada i Reixac, which includes a container sorting plant, a composting plant and an anaerobic digestion plant with the production of biogas among others.
- WWTP in Montcada i Reixac.
- Drinking water purification plant.
- Lafarge cement company.
- Nearby facilities for the processing of construction waste in Vallensana (Badalona).
- Experience in industrial symbiosis of the economic promotion team of Barberà del Vallès.

### NEEDS DETECTED

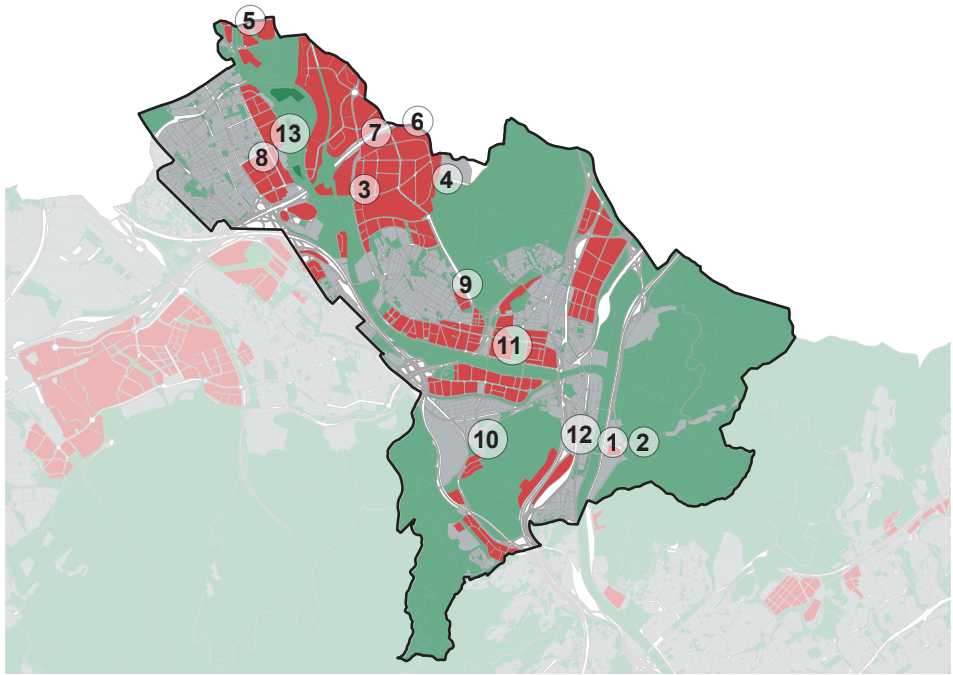
Intensification of the collaboration between public and private waste processing facilities/resources when experience shows that the concentration of resources makes more viable and improves the upgrading and use of waste. Exploring possibilities for synergy between waste facilities to maximise the use of resources is considered necessary.

### PROPOSAL

Apply the concepts of industrial symbiosis to identify synergies between waste processing facilities and explore viable solutions for implementing them.

### EXPECTED RESULTS

- Reduction in the costs of waste processing.
- Rationalisation of the use of the facilities.
- Increase in the quantity and quality of resources recovered.
- Innovation in waste management, etc.



■ Industrial estates  
 ■ Urban  
 ■ Forest and grasslands  
 ■ Agricultural

**WATER INFRASTRUCTURES**

- 1. Wastewater treatment plant in Montcada i Reixac with water regeneration
- 2. Drinking water purification plant in Montcada i Reixac

**WASTE INFRASTRUCTURES**

- 3. Ripollet sorting plant (construction waste)
- 4. Ecoparc 2 in Montcada i Reixac
- 5. FCC Àmbito, SA
- 6. Gestió de Residus Especials de Catalunya, SA (GRECAT)

**BUSINESS ASSOCIATIONS**

- 7. Nodus Barberà
- 8. Business Owners Association of Industrial Estate A in Barberà del Vallès
- 9. Reto a la Esperanza Association
- 10. Engrunes Foundation

**OTHER COMPANIES**

- 11. Española de Electrólisis, SL (FORPEZ)
- 12. Lafarge Cementos, SAU
- 13. Bugaderia Industrial, SL

## BESÒS MAR AREA

MUNICIPALITIES: Badalona, Sant Adrià de Besòs and Barcelona.

The lower part of the Besòs river is one of the most rundown areas of the Barcelona conurbation, but at the same time it is home to an urban area that presents great opportunities with an important industrial tradition. It has a considerable concentration of waste processing plants and a university campus with studies and activities geared towards the circular economy.

### RESOURCES AND INFRASTRUCTURES AVAILABLE AND RELEVANT STAKEHOLDERS

- Besòs WWTP.
- Besòs Ecopark.
- Waste to energy plant.
- Districlima heating and cooling network.
- Besòs Diagonal Campus (UPC).
- A powerful waste recovery sector with the need to learn how to progress from waste manager to provider of recycled materials.
- Project under way for the stimulation of the Bon Pastor and Baró de Viver industrial estate.
- Installers Guild of the Barcelonès Nord (Montigalà).
- Marinas of Sant Adrià de Besòs and Badalona.
- Tram line that reaches Sant Adrià de Besòs.
- Project drawn up by the Waste Agency of Catalonia along these lines.

### NEEDS DETECTED

To be able to close the product life cycles it is necessary to develop a powerful recycling industry capable not only of transforming waste into feedstock but also of knowing how to collaborate with producers and manufacturers to create business models that will make the recycling processes economically viable.

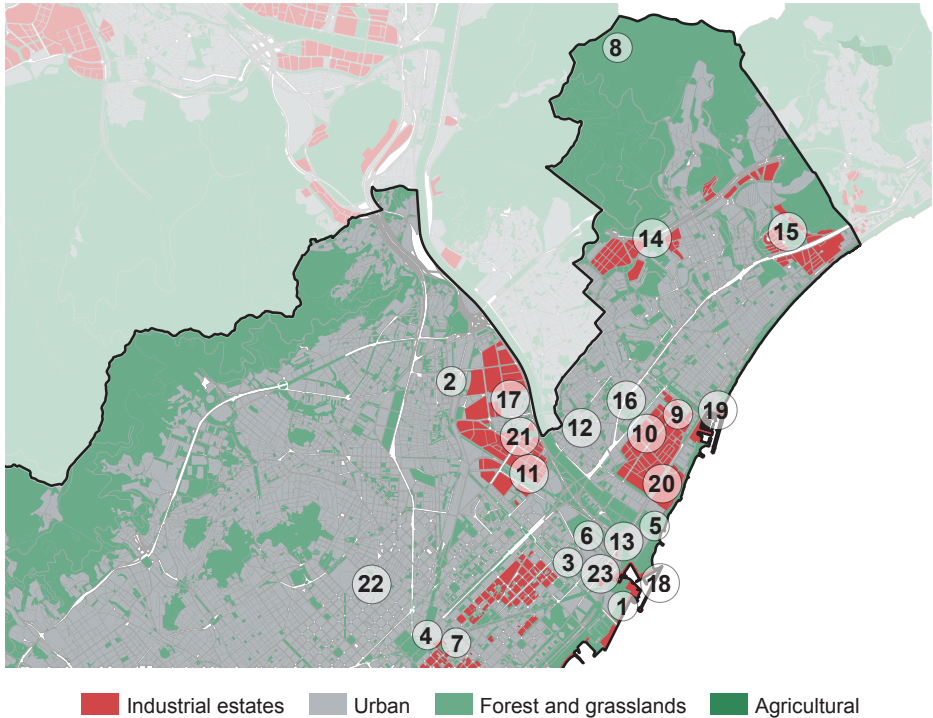
Industries need to find solutions for their waste: places where it is possible to carry out simple tests but on a real scale such as the crushing of containers or of reel cores, the granulation of plastic waste or separation of multilayer materials, as well as find advice to work on solutions and market launches (waste managers with whom to work on the possibility of reuse of materials, manufacturers that consume recycled materials, new products, etc.).

### PROPOSAL

Creation of a leading public-private centre for technological innovation in the field of recycling and innovation in materials around the waste processing facilities and the UPC Campus. A centre at the service of industrial production and of waste managers, offering access to machinery, laboratories and experts, maintained by the companies with the support of the local authorities (space, experts, investments, etc.).

### EXPECTED RESULTS

- Implementation of the technological innovation centre.
- Innovation in waste management.
- Promotion of and increase in competitiveness in the industrial sectors of the entire metropolitan area.



#### WATER INFRASTRUCTURES

1. Besòs purification plant with water regeneration
2. Barcelona drinking water purification plant
3. Tractament Metropolità de Fangs, SL
4. Aquambiente, Servicios para el Sector del Agua, SAU

#### ENERGY INFRASTRUCTURES

5. Combined cycle thermal power plants of the Besòs
6. Besòs power plant (Districlima)
7. Tànger power plant (Districlima)

#### WASTE INFRASTRUCTURES

8. Controlled landfill at Vallensana (construction waste)
9. Saica Natur, SL
10. Recuperaciones Ventura, SL
11. Unión de Traperos para el Reciclaje y Servicios, SL (UTRESA)
12. Metal recovery companies
13. Ecoparc 3 Besòs

#### BUSINESS ASSOCIATIONS

14. Guild of Installers of Barcelonès Nord and Baix Maresme (AEMIFESA)
15. Les Guixeres Business Association
16. Badalona Sud Consortium
17. Bon Pastor Industrial Estate Companies Association

#### TRANSPORT COMPANIES

18. Sant Adrià de Besòs Marina
19. Badalona Marina
20. Sant Adrià de Besòs Tram

#### OTHER COMPANIES

21. Aluminis Giral, SL
22. Merca Ocasiones y Servicios, SCP
23. Besòs University Campus

## GENERAL STRATEGIC LINES FOR PROMOTING THE CIRCULAR ECONOMY IN THE BARCELONA METROPOLITAN AREA

Based on the analysis of these **potential circular economy project hubs** in the Barcelona metropolitan area, three core activities acquire importance for a circular economy strategy in the metropolitan territory:

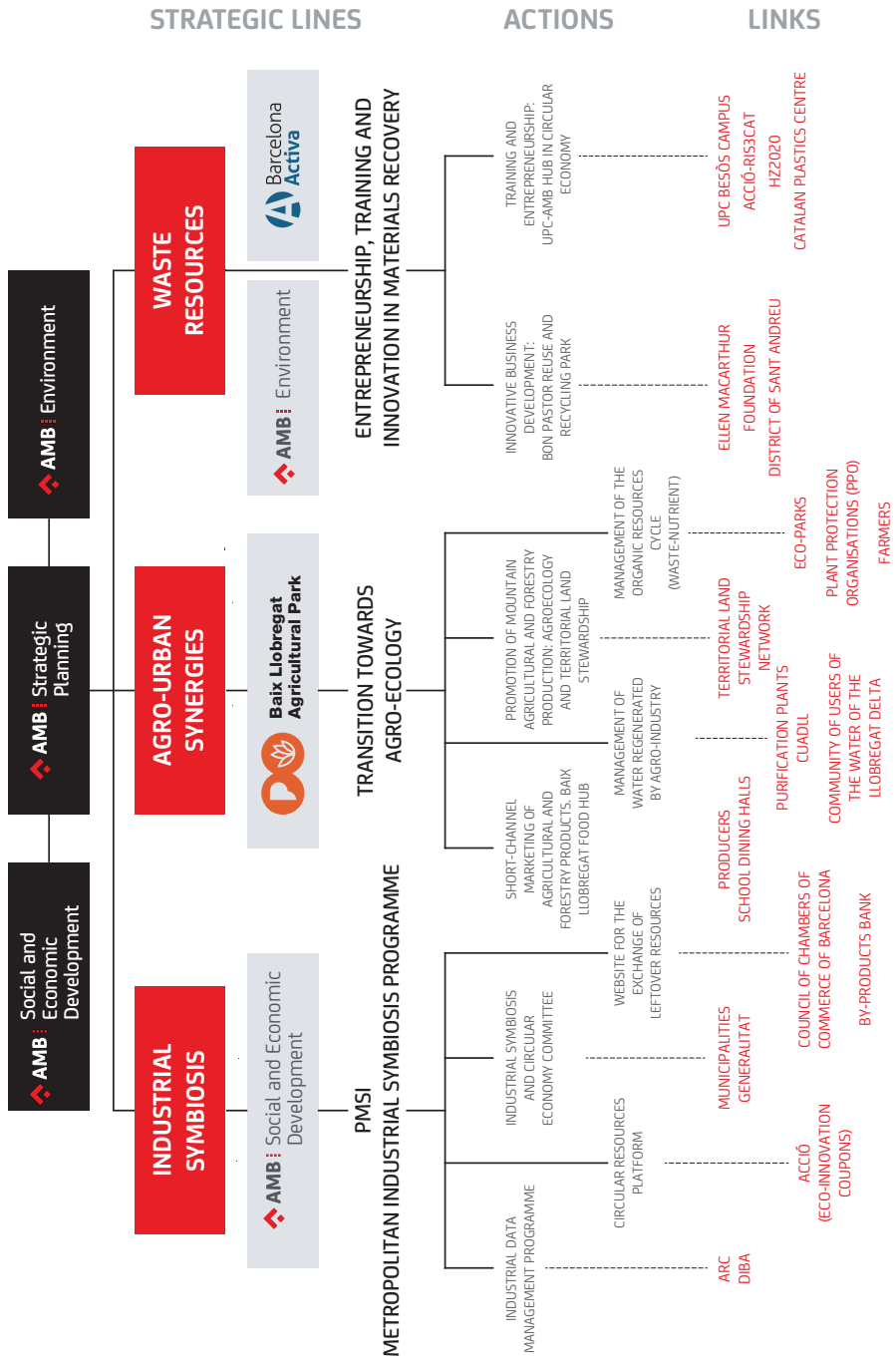
- Agro-urban synergies in the area of the Baix Llobregat Agricultural Park.
- Metropolitan Industrial Symbiosis Programme.
- Promotion of the sector for the transformation of waste into new feedstock in the Besòs area.

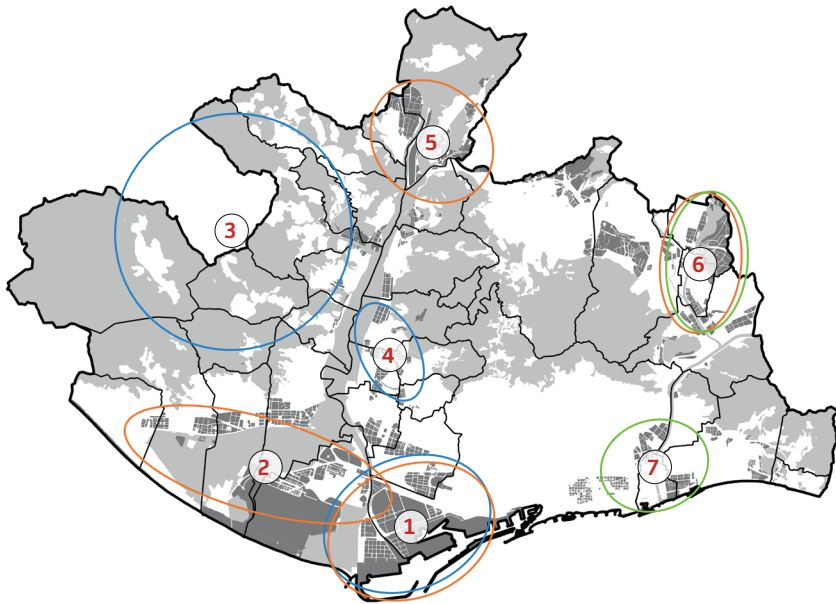
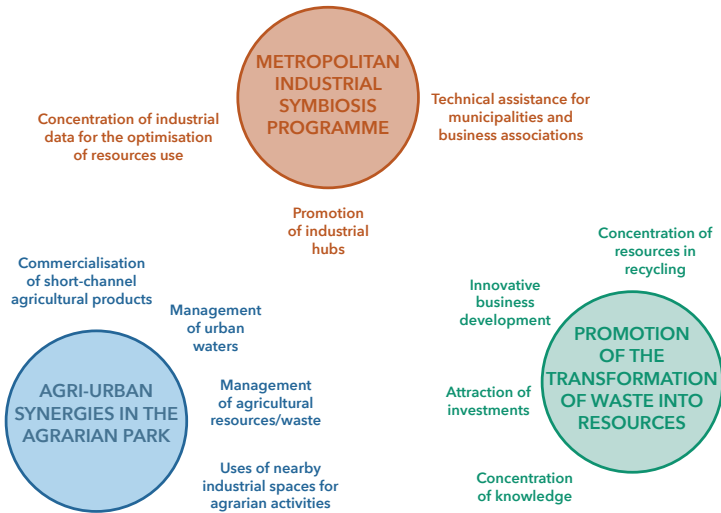
The three core activities listed will promote the use of resources already offered by the territory and that are currently underutilised:

The **agricultural production** of the metropolitan territory, with the products from the Baix Llobregat Agriculture Park at its head, is a local resource that could greatly reduce the dependence on food from outside of the metropolitan territory through improved management. Thus, the promotion of food products originating from local agricultural and forestry activity not only stimulates agricultural and forestry activity indispensable for the maintenance of the metropolitan ecosystem, but it also gives support to the local food industry, both large agroindustrial concerns and small producers and processors, who could form a first-class strategic sector for the metropolitan territory and Catalonia in general.

**Water**, for its part, is an abundant resource in a territory flanked by two rivers and with major water purification facilities that supply a numerous population and large industries. The reuse and smart management of regenerated water will enable optimisation of the use of this, the most fundamental of all resources, and enable advantage to be taken of its implications with different activity sectors.

With regard to **energy**, it is important to highlight the great potential of the sources of industrial heat that are wasted and the high level of research and of successful cases present in the metropolitan sphere. This potential for the generation of electrical energy or use of thermal energy, as well as the joint management of various energy generation sources, must become a clear pathway of transition towards the circular economy.





1. Llobregat Delta (pp. 46-47)
2. Llobregat Plain (pp. 48-49)
3. Mountain Municipalities (pp. 50-51)
4. Lower Llobregat Valley (pp. 52-53)
5. Upper Llobregat (pp. 54-55)
6. Ripoll Valley (pp. 56-57)
7. Besòs Mar Area (pp. 58-59)

## Agro-urban synergies in the area of the Baix Llobregat Agricultural Park

The AMB can play an essential liaison role between the urban, industrial and agricultural structures around the Baix Llobregat Agricultural Park, including the forested environment of the mountain municipalities.

The territory's organisations (Baix Llobregat Regional Council, Barcelona Provincial Council, Baix Llobregat Agricultural Park Consortium) have been working for some time on good initiatives around this agricultural space. The AMB could play a more integratory role to make use of existing urban, industrial and forestry resources and structures and expand the effects of these initiatives which are already under way:

- Forests
- Industrial units on industrial estates around the Agricultural Park.
- Groundwater and WWTP regenerated water.
- Quality compost and facilities for the upgrading of organic waste.
- Local markets, both for direct consumption and for industrial processing.

**The central idea of this strategy** is to use short-channel marketing as a generator of AGRO-URBAN synergies. The short channel, or chain, advocates the simplification of production-consumption cycles and, in some cases, recycling, taking advantage of physical proximity between the production and consumption of a certain product. This strategy therefore proposes consideration of doing without complex channels for the processing and distribution of products and trying to re-establish contact between producers and consumers. The important reduction in costs that this represents could mean a return to profitability for businesses that were being lost and that have positive effects on the environment, favouring a fairer distribution of profits – because the producer does not receive pressure on its prices from large processing, distribution and marketing companies – and, in addition, small-scale processing constitutes an important reduction in waste and promotes markets offering greater quality and added value such as organic and home-grown products. In the field of food products, in opposition to so-called “food security”, short channels propose the alternative model of “food sovereignty” which is based on social justice, ecological production and enhancement of the environment.

Short-channel marketing can thus recover or open new markets with a strong component of socio-environmental improvement in spheres such as:

- Improvement of forest management and reduction of forest fire risks.
- Diversification and occupation of industrial units by small food businesses.
- Maintaining of the touristic interest and cultural value of peri-urban settings.
- The implementation of organic and proximity agricultural models.
- Improvement of the management of the water cycle (groundwater, regenerated water from the WWTP) to strengthen bioremediation for soils and ecosystems in general.

## Metropolitan Industrial Symbiosis Programme (PMSI)

Industrial symbiosis is becoming a powerful tool for applying circular economy concepts within the industrial fabric. Municipalities have a fundamental role to play as they are the promoters necessary for start-up given that, in symbiosis, collaboration never arises spontaneously and needs a small initial investment to be set up.

In addition, for a municipality it is positive and profitable to start up industrial symbiosis projects because:

- In the long term, industrial symbiosis projects are economically sustainable.
- They have important collateral benefits: environmental and social.
- They promote business association formation (relations between companies) and relations with the administration.
- They save costs for companies and for the administration.

In the AMB there are already projects under way or in the planning stages:

Projects under way	Projects in planning stages
Gavà and Viladecans	Sant Feliu de Llobregat
Barberà del Vallès, Sabadell, Sant Quirze del Vallès	Castellbisbal
Zona Franca Consortium	Badalona

All of these projects draw together an important quantity of information on the production fabric, training material and work methodologies, information that needs to be honed down and coordinated in order to:

- Take advantage of synergies beyond local geographical boundaries.
- Avoid duplicating efforts while combining talents.
- Concentrate industrial information accessible to the public (waste statements, invoicing, censuses, etc.).

In short, to take advantage of the lessons learned and make efficient use of the resources available.

**The driving idea of this strategy** is being able to define a role for the AMB as a promoter-coordinator-concentrator of circular economy initiatives applied to the industrial fabric in the territory, one that is complementary to the important roles that DIBA, ARC and ACCIÓ alike are already playing in this field, in other words, giving service to town councils working in symbiosis.

## Boosting the transformation of waste into resources

The great majority of materials that are manufactured, imported and consumed in Catalonia are concentrated around the Barcelona metropolitan area in the form of waste (waste water, construction waste, municipal waste, treatment plant sludges, etc.) As is logical, there is a similar concentration of a large number of facilities for processing this waste as well as a large part of the knowledge and technological potential of an area with a very large potential consumption market that represents over half of the Catalan GDP.

Giving support, coordinating and promoting initiatives designed to transform this waste – which has no value and implies costs – into resources to close materials cycles, reduce dependence on the outside and make a more efficient use of the resources that we have, can contribute to generating economic development in all the municipalities in the territory.

The AMB is one of the leading municipal waste repositories and processors in Catalonia. And it is, also, a focal point for municipalities with a major interest in upgrading municipal waste which means:

- Promoting projects that upgrade the materials that are most problematic for municipal management in the metropolitan area.
- Concentrating materials flows to achieve a working scale that makes investments in new projects profitable.
- Interacting and coordinating with institutions related with the waste sector, principally the Catalan Waste Agency.
- Concentrating information designed for municipalities on new upgrading technologies that are being developed in the Catalan university sector.

**The driving idea behind this strategy** is the great potential of the AMB – as one of the foremost repositories and processors of municipal waste in Catalonia and as a fundamental actor in the coordination of metropolitan municipalities – to give support, together with the Catalan Waste Agency and the Polytechnic University of Catalonia, to the development of a powerful recycling industry with “circular” business models (collaboration with producers and manufacturers to make innovations economically viable).





# ACTIONS

## AGRO-URBAN SYNERGIES IN THE AREA OF BAIX LLOBREGAT AGRICULTURAL PARK

### ACTION 1. Marketing of agricultural and forestry products through short distribution channels: the Baix Llobregat Food-Hub

The creation or promotion of markets for organic products can achieve greater added value and a better price for the farmer and for consumers through short marketing channels:

- Local or farmer's markets.
- Social, school and hospital dining halls.
- Catering sector.
- Others.

Organic and local producers require tools and actors that facilitate the tasks in logistics, production programming, distribution, warehousing and invoicing. In this sense, the metropolitan administration and its local councils can give important administrative support to the new infrastructures that have to be created (centres for procurement-logistics-programming-invoicing), in addition to offering them sufficient consumer markets to make them profitable.

### ACTION 2. Create tools for boosting mountain agricultural and forestry production: land stewardship

Both agricultural and forestry production in the mountain areas of the AMB are on the decline because of the poor profitability of the products that can be obtained: mountain fruits and cereals, grazing or farm livestock, combustible biomass, etc. Incentive measures need to be established to maintain the farmers that remain or for new agriculture with urban schemes or business activation or land stewardship programmes that facilitate long-term access to the land with the aim of incentivising investments in agricultural operations in these mountain areas.

Agricultural activities that have been abandoned in mountain areas have developed an unfarmed, forested mass that increases the risk of forest fires and endangers the buildings scattered around these areas. The activation of boundaries between the urban space and woodland, in the form of agricultural farming operations, is a fundamental measure for guaranteeing the ecosystem through an agricultural mosaic and protection against forest fires.

Urban protection or land stewardship schemes can prevent speculative expectations from keeping lands abandoned meaning new agricultural entrepreneurs have no access to opportunities to find them.

### ACTION 3. Urban water management: regenerated water cycle for industries in the Barcelona metropolitan area

Within the scenario of climate change, efficiency in managing water resources is one of the most important challenges facing the metropolitan area. We have very high water consumption rates and, at the current time, nearly all water is drinking water, even though many manufacturing activities do not need water of such high quality. For this reason it is

necessary to increase the use of regenerated water originating from urban or industrial wastewater treatment plants and to allocate it to industries, even more so considering that at our water treatment facilities we have achieved very high qualities of regenerated water.

Not all industries need the same quality of water, and this also enables different proposals from those currently in operation in water purification and reuse, which could lead to major savings in processing and enormous environmental benefits, including prominently an improvement in the salinity of the Llobregat aquifer thanks to a lower extraction pressure.

The incorporation of renewable energies into the movement and distribution of water can also change certain usage priorities with respect to the current ones.

A comprehensive view covering residential, agricultural, environmental and industrial uses and taking into account which is the most efficient water for each use can establish the criteria necessary for achieving better efficiency in the use of residual water or groundwater existing in the territory and barely used to date.

#### **ACTION 4. Agricultural resources and waste management: nutrients cycle at the Baix Llobregat Agricultural Park**

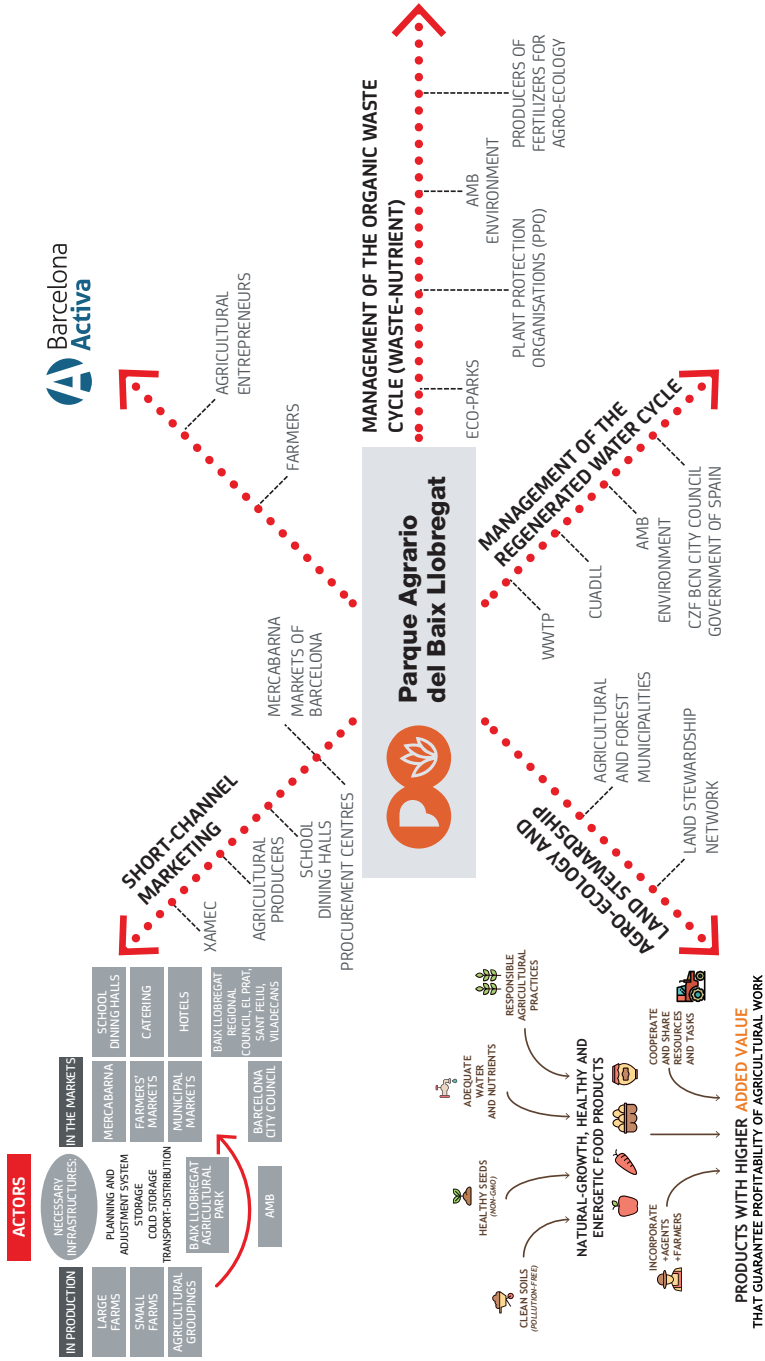
Sustainable production at the Agricultural Park can play an important and long-lasting role in the production of organic crops, which require a change of agricultural fertilization and phytosanitary treatment practices that can have a favourable impact on the health of the soils of the Delta and the Lower Llobregat Valley.

The need for organic fertilizers for these crops offers interesting potential for the adequate management of quality organic waste, which can increase the sustainability of these crops, improve the capacity for water and mineral retention, avoid percolation into the aquifer and reduce salinization. Among other advantages, with this improved soil management, an increase in the uptake of carbon from the atmosphere could be achieved along with, in general, a notable improvement of the self-regeneration capacity of our natural ecosystem.

#### **ACTION 5. Uses of industrial spaces adjacent to agricultural activities**

Markets for the commercialisation of local and organic products have a seasonality that requires strategies so that the local selling period can be prolonged and to reduce the wastage of products with a high nutritional value but of second-rate quality. It is for this reason that transformation into products such as preserves (for example of tomatoes) or the production of creams, soups and jams can help to improve the added value of these productions for the local market.

Urban planning limitations make it unfeasible for food processing buildings to be located on agricultural farms themselves, which means that the nearest industrial spaces would be the most suitable, although the pressure for logistics use in the area close to the park means that the prices that this production sector has to accept are not very feasible.



**CIRCULAR ECONOMY STRATEGIC PLAN**

- AMB Strategic Planning
- AMB Social and Economic Development
- AMB Environment

## **METROPOLITAN INDUSTRIAL SYMBIOSIS PROGRAMME (PMSI)**

### **ACTION 6. Germ of the Metropolitan Industrial Symbiosis Programme (PMSI), an experience that must be replicated. Support services for municipalities working on industrial symbiosis**

The germ of the Metropolitan Industrial Symbiosis Programme aims to establish the bases of a methodology to enable coordination of the different industrial symbiosis/circular economy projects that are developed in the industrial fabric of the AMB, a methodology that means:

- Helping municipalities with their industrial symbiosis/circular economy projects in a way that is complementary to existing forms of aid.
- Compiling and concentrating information and lessons learned on an individual basis into the industrial symbiosis projects in progress in order to make efficient use of the public resources available.

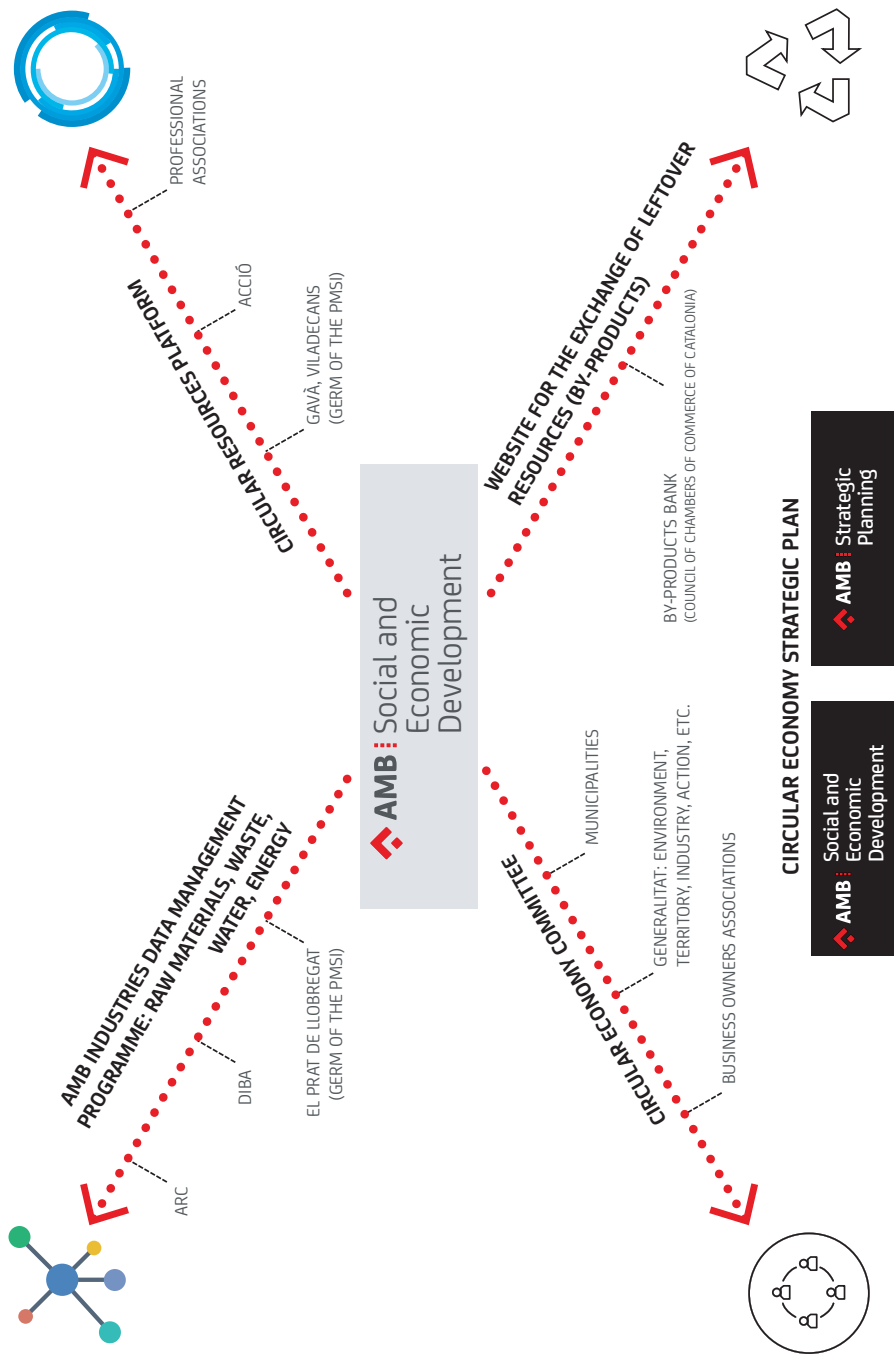
The AMB can play the role of facilitator-coordinator-concentrator of all the initiatives in the territory in order to prevent the loss of data on the industries and their production processes, information, knowledge and opportunities that appear in the different individual projects. Synergies have no frontiers: it makes no sense to duplicate efforts but it does make sense to combine talents, however both of these things must be ensured in a coordinated way.

The AMB can provide the computer programme that municipalities could use to collect and manage data on industries registered in their territory (activity, turnover, waste generated, etc.) and access it in a flexible way that is adapted to their needs.

### **ACTION 7. Technical assistance for municipalities and companies in the territory. Circular resources platform of the Metropolitan Area of Barcelona (AMB)**

Concentrating the knowledge that starts to be generated on circular economy topics in the territory and, in general, any knowledge of interest that is available, can help facilitate the setting up of circular economy initiatives.

A “circular resources platform” aims to be the AMB’s database on the circular economy to give support to local council officers who are working on industrial symbiosis or circular economy projects, but also to companies interested in setting up circular economy strategies, experts who want to make themselves known and participate more actively in projects in their municipality and, in general, citizens who want to look into these fields in greater depth.



The information that this circular economy resources platform could include is: EXPERTS (database of specialists in different fields that appear when implementing projects with companies), BEST PRACTICES (compilation of local and international projects and business examples of circular economy implementation) and REFERENCE DOCUMENTATION (links of interest, videos and books for more in-depth coverage and for catching up on local and international actions already implemented).

### **ACTION 8. Promotion of industrial hubs: Metropolitan Circular Economy Committee**

The sharing of experiences developed by each of the municipalities or metropolitan hubs is one of the functions that is of most interest to municipalities, both those implementing projects and those considering doing so.

The AMB can periodically organise meetings between municipalities implementing industrial symbiosis or circular economy projects and those who are considering implementing them shortly so that they can share experiences, take training and gradually define the services necessary, at both municipal and supra-municipal level.

This committee, furthermore, can take charge of communication, both internally within the group and externally, for the initiatives set up in order to raise the visibility of companies and projects, even in the international sphere, positioning and representing Barcelona and its metropolitan area at circular economy strategies events and proceedings on a worldwide scale.

In summary, the aims of the Circular Economy Committee can be:

- Meeting point, exchange and learning between circular economy initiatives in the territory: sharing experiences.
- Experiences observatory and spokesperson, charged with communicating and disseminating successful cases, whether companies or territorial projects.
- A tool for promoting debate on the most important needs that must be tackled to make a metropolitan transition towards a circular economy and that enables definition of a possible programme of metropolitan circular economy actions based on analysis of the participating projects and initiatives.
- Represent the AMB at national and international events related with the subject such as congresses, workshops, etc.
- Training centre for municipal technical staff responsible for their corresponding circular economy projects: skills.

### **ACTION 9. Website for the exchange of leftover resources**

The AMB could provide a tool for municipalities to be able to visualise the leftover resources that they identify in companies (and organisations): by-products, machine hours, storage spaces... A kind of “Wallapop” for companies.

The by-products bank has a digital tool that, to date, only works with by-products ([www.residuorecurso.com](http://www.residuorecurso.com)), but that could be opened up and give greater visibility to more leftover resources that could be shared. This application has a design that could be personalised for each municipality in line with the desired image, but the data of all of them would be in a single database, so that if an exchange for a certain leftover resource cannot be found in the same municipality, others can be explored.

An agreement could be reached with the By-products Bank and this service offered in those municipalities that request it.

A great opportunity lies in transforming waste into feedstock and the AMB can contribute here by offering the required guarantees to reduce the risk of investment and innovation necessary to attract interested business representatives. Long-term commitments on waste supply could encourage private initiatives to embark on these new business activities.

Competition processes for metropolitan waste processing and by-product management plants do not promote local conversion into secondary feedstock of these by-products. Being able to increase the guarantees of a basic volume of waste can enable these new local investments.

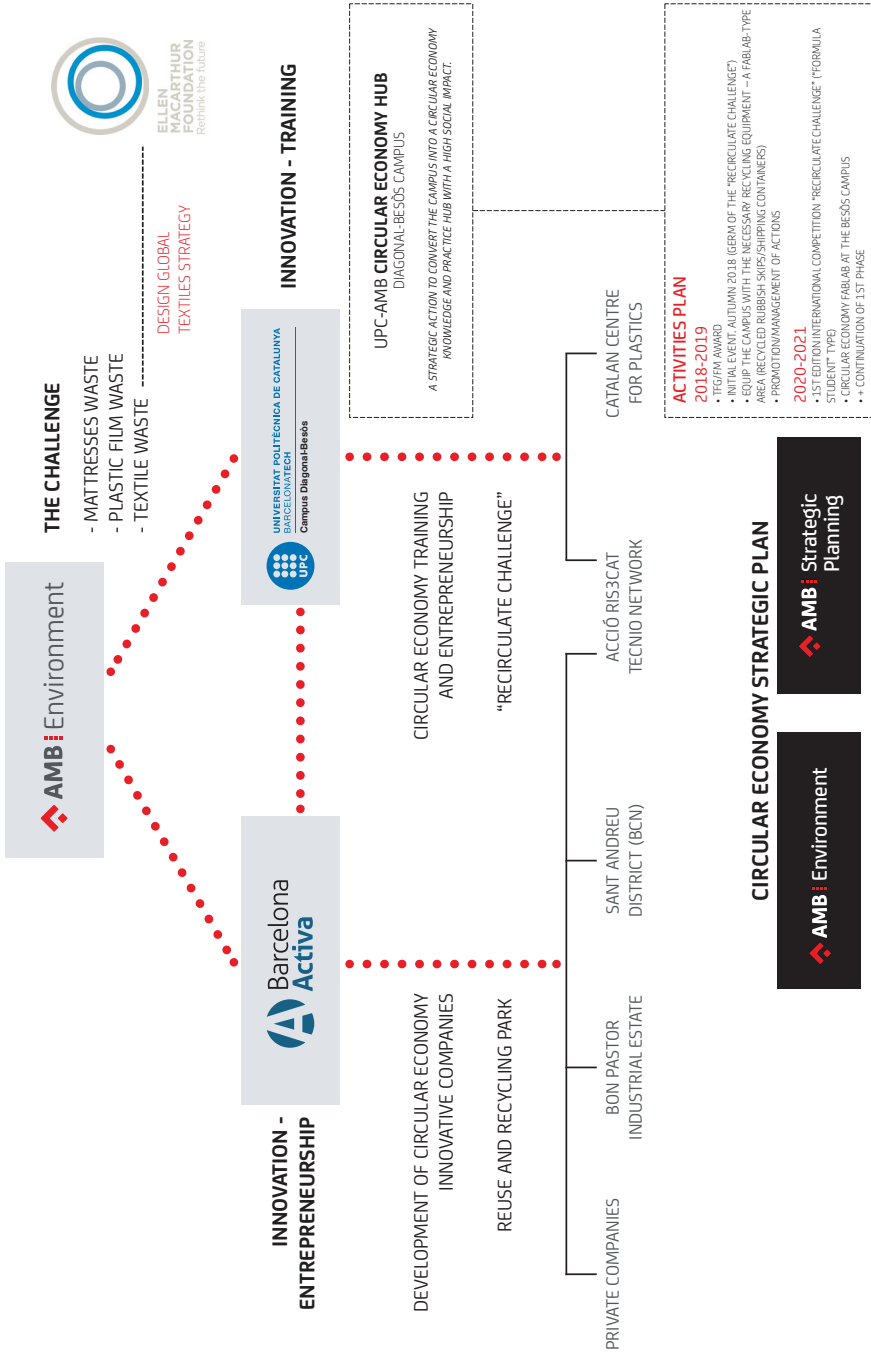
The AMB is considering the possibility of generating proposals for the obtaining of secondary feedstock from problematic waste for which it is difficult to find markets to absorb these by-products and that today fall outside integrated management systems, as in the case of plastic film or mattresses, for example.

## **BOOSTING THE TRANSFORMATION OF WASTE INTO RESOURCES**

### **ACTION 10. Agreement for innovative business development. Bon Pastor Reuse and Recycling Park. Universities, innovation and business development**

On the Bon Pastor industrial estate, a plan is being promoted for the economic reactivation of its industrial units, which are small and compact, and originate from older urban planning policies. In part they have been reconditioned as repair workshops and they could specialise in certain functions necessary for the transformation of waste into secondary feedstock.

The UPC's Besòs Campus and the Catalan Centre for Plastics are very nearby and could function as an "ideas and testing laboratory" strongly linked to business owners/entrepreneurs in the recovery/reuse/recycling sector to encourage innovation and the training of students, with participation of the UPC Lab.



Initiatives such as ideas and projects competitions for students within the framework of the circular economy in the field of waste, linked to entrepreneurship programmes such as Barcelona Activa and to companies already consolidated in the territory, could give rise to a fertile source of ideas and collaborations for their development, where applicable, besides the purely educational aspects, already quite important in themselves.

The Environment Area, through its Waste Prevention and Management Department, can provide the “challenges” (and the materials) that current waste management poses in the AMB and in relation to which it is most interesting to innovate and create wealth. Mattresses, plastic film and textiles are problematic fractions for which a convenient solution needs to be found.

Barcelona City Council, through Barcelona Activa, can offer services relating to entrepreneurship, training and innovation associated with waste in the AMB.

### **ACTION 11. Promotion of the Circular Economy Lab at the Polytechnic University of Catalonia (UPC). Agreement on training in circular economy and municipal initiatives**

The AMB, which acts to bring together new initiatives for local councils and via the UPC-LAB in the circular economy, could articulate training measures for municipal technical personnel and create the training programmes and profiles necessary for these councils. It could also be in continuous contact with them in order to work on developments that may offer a technical solution for challenges that the circular economy raises for municipal managers and for the services to industries that they offer.

## ANNEX

### PEOPLE AND ORGANISATIONS THAT HAVE COLLABORATED ON THIS STUDY

Organisation	Name and surname	Position
Automotive Industry of Catalonia Cluster	Vicenç Aguilera	Chair
	Ferran Verdejo	Manager
Baix Llobregat Agricultural Park	Raimon Roda	Manager
Baix Llobregat Regional Council	Andrés Andrés	Coordinator of the Strategic Development Area
Badalona Town Council	Àlex Mañas Ballesté	Economic Promotion and Environment
	Sònia Benzina	Head of Economic Programming Service
	David Agustín	bTEC Manager
	Francesc Torné	Economic promotion officer
Barcelona City Council- Barcelona Activa	Álvaro Porro	Commissioner for the Social Economy and Local Development and Consumer Affairs
	Jordi Via	Commissioner for the Social and Cooperative Economy
Barcelona Logistics Centre (BCL)	Cristian Bardají	Manager of Infrastructure Studies
Barcelona Provincial Council/ Diputació de Barcelona (DIBA)	Santi Macià	Production Fabric Service of the Economic Development and Employment Area
	Enric Coll	Xarxa en Xarxa (Online Network) facilitator
Castellbisbal Town Council	Joan Playà	Mayor
	Enrico Martinelli	Councillor for the Environment
	Toni Pons	Councillor for Economic Promotion
	Maria Àngels Urbano	Economic Promotion officer
	Aurora Gómez Picó	Circular Economy officer
	Nines Domínguez	Head of the Economic Promotion Area
	Ana Inés Fernández	Associate professor and researcher of the Polytechnic University of Catalonia
	Xavier Bosch	Head of Municipal Engineering
Catalan Waste Agency/ Agència Catalana de Residus (ARC)	Francesc Giró	Deputy Manager
Catalan Water Agency/Agència Catalana de l'Aigua (ACA)	Muntsa Niso	Institutional Area
	Jordi Robusté	Sanitation Area
	Jordi Molist	Manager of the Supply Area
	Elena Pigmateli	Supply Area

Organisation	Name and surname	Position
Comissions obreres (CCOO) trade union	Salva Clarós	Sustainability Area
Gestora de Runes de la Construcció, S.A. (Construction Waste Management)	Ramon Tella	Managing director
L'Hospitalet de Llobregat Town Council	Lluís Traveria	Urban Development Agency of L'Hospitalet de Llobregat
Metropolitan Area of Barcelona (AMB)	Joan Miquel Trullols	Manager of Waste Prevention Services
	Emili Mas	Waste Prevention and Management Services
	Marta Contínente Víctor Ténez	Smart Cities projects Strategic Planning
Mountain municipalities	Ferran Puig	Mayor of Torrelles de Llobregat
	Mercè Esteve	Mayor of Begues
	Isidre Sierra	Mayor of Sant Climent de Llobregat
	Anna Martínez	Mayor of Santa Coloma de Cervelló
El Prat de Llobregat Town Council	Lluís Barba	Coordinator of Urban Planning Services and the Environment
	Alba Bou	Deputy Mayor in the Area of Urban Planning and the Environment
	Marta Mayordomo	Deputy Mayor in the Area of Economic Promotion, Trade and Employment
	Joan Rodríguez	Director of the Area of Economic Promotion and Trade
Sant Adrià de Besòs Town Council	José Antonio Rubio	Mayor's Office technical officer
	Glòria Viladric	Architectural technician
	José Arraval	Head of Infrastructures section
Sant Cugat del Vallès Town Council	Joana Barbany	Economic Promotion
	Sílvia Solanellas	Active Sant Cugat Foundation
Sant Feliu de Llobregat Town Council	Cinta Daudé	Councillor for Economic Activity and Employment and Labour
	Begoña Puges	Economic Promotion officer
Vallès Occidental Regional Council	Teresa Zamora	Economic Promotion officer



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## **Layout and printing**

Ediciones Gráficas Rey, SL

## **Graphic design idea**

Mónica Copaja  
Marta Calvet

## **Acknowledgements**

Ellen MacArthur Foundation  
Murat Mirata, University of Linköping (Sweden)

## **National Book Catalogue Number**

B 30592-2018

## **ISBN**

978-84-87881-31-2

[www.amb.cat](http://www.amb.cat)

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Desenvolupament  
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