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# BARCELONA SMART CITY TOUR

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Ajuntament de Barcelona



Discover why  
Barcelona is  
a Smart City pioneer,  
leading innovative  
and sustainable  
initiatives for a better  
quality of life



The Tour will visit the most dynamic and interesting area of the city of Barcelona: **22@Barcelona, the Innovation District.**

It will cover the following key points of interest:

- 01 Media-TIC (Media-ICT) Building**  
EXAMPLE OF GREEN ARCHITECTURE
- 02 Underground service galleries**  
EASY ACCESS TO SERVICE NETWORK
- 03 FAB LAB Barcelona**  
INNOVATION IN MANUFACTURING AND SUSTAINABLE ARCHITECTURE
- 04 SIUR project**  
INTEGRAL SOLUTIONS FOR URBAN INFRASTRUCTURES
- 05 Sensors for Urban Services**  
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- 06 Biosphere Certification for Barcelona**  
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# TMB CLEAN PUBLIC BUSES

## COMMITMENT TO URBAN SUSTAINABLE MOBILITY

**Transports Metropolitans de Barcelona (TMB)** is the main public transport company in Barcelona and its metropolitan area, and it manages buses and metro.

Currently, TMB has a large number of buses powered by natural gas (33% of its fleet). It is also making a commitment to the technologies of **hybrid vehicles**. This commitment is reflected in both the acquisition of new hybrid vehicles and the conversion of diesel vehicles into hybrid vehicles. TMB plans to produce 80 hybrid vehicles (diesel-electric) before 2010, which will represent a significant reduction of emissions (NOx, particulate matter, CO<sup>2</sup>).

Furthermore, TMB and the company Gas Natural are working together to transform a gas vehicle into a hybrid one.

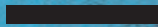
The transport company is also installing filters for particulate matter and NOx in over 500 vehicles. With all these measures by the end of 2012, TMB will have one of the **cleanest surface public transport fleets** in Europe.

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



22@  
BARCELONA,  
THE  
INNOVATION  
DISTRICT



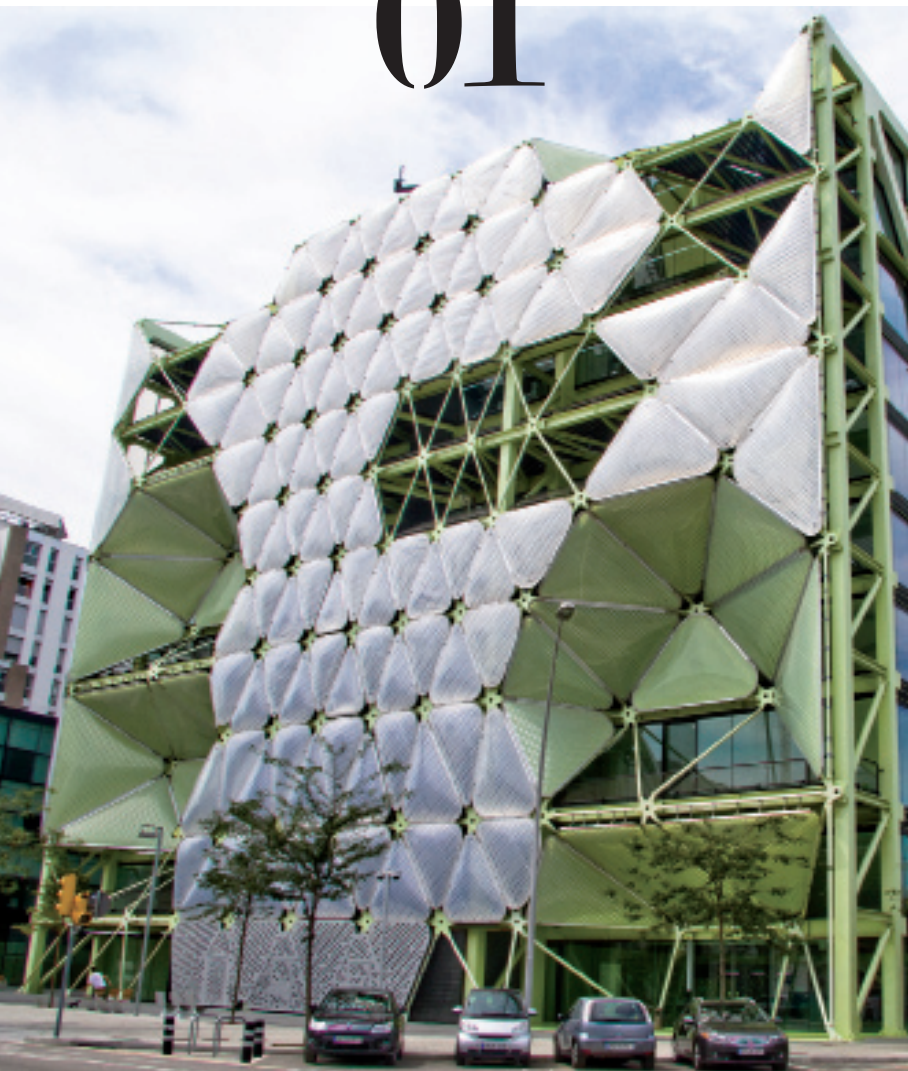
The **22@Barcelona** project transforms two hundred hectares of industrial land into an **innovative district** offering modern spaces for the strategic **concentration of intensive knowledge-based activities**. This initiative is also a project of urban, economic and social refurbishment to create a high-quality environment for working and living. It is the most important project of urban transformation in the city of Barcelona in recent years, and one of the most ambitious in Europe of these characteristics, with a high real estate potential and more than 200 million Euros public investment in the infrastructure plan.

The coexistence of innovative and dynamic companies with those in the local district -shops, small workshops, service providers- configure a rich productive network. The presence of enterprises allows the creation of **cluster areas** in several fields of knowledge in which Barcelona is able to obtain international leadership, by means of the concentration in the area of companies, public institutions and scientific and technologic centres of reference. The **strategic sectors** are: Media, Information and Communication Technologies (ICT), Medical Technologies (MedTech), Design and Energy.

Barcelona has a strong commitment to develop digital infrastructures and to apply technology for a smarter city management, becoming a reference in Europe as a Smart and Innovative City. In this context, the city launched the **22@Urban Lab** project to foster the use of the city as an urban laboratory and a testing ground for innovative solutions for companies implementing tests in any field: urban planning, education, mobility, etc. The aim of the project is to provide companies that are developing innovative projects in the pre-commercialisation stage with the possibility of testing them in the district through pilot trials. Some pilots currently underway are developing new applications for public lighting, traffic or mobility, among others.



01





# MEDIA-TIC BUILDING

## EXAMPLE OF GREEN ARCHITECTURE

The MEDIA-TIC building is a good example of the new **smart and sustainable architecture** in Barcelona, which uses the latest technology.

Officially inaugurated in September 2010, it is designed to be a communications hub and meeting point for businesses, R&D centres and institutions in the field of information and communication technologies (ICTs) as well as for the media and audio-visual sectors. It hosts the following companies and institutions: Barcelona Digital Technological Centre, Cibernarium (a digital training centre for companies and professionals), the Open University of Catalonia (Universitat Oberta de Catalunya), among others.

A highly personal creation of the Cloud-9 architect's office, the MEDIA-TIC building is in the shape of a cube and is formed by large iron beams covered in a **plastic coating of inflatable bubbles**, which offer glimpses of the fluorescent structure of the building. The attractive covering also has a functional utility as a way of **regulating light and temperature**, primarily preventing 114 tons of CO<sup>2</sup> a year from escaping from the building, and offering a 20% saving on climate control.

Every facade of the Media-TIC is different: from the outside, they reveal parts of their interior spaces and give a diverse plasticity, while from the inside they offer spectacular views. The translucent and innovative covering, **ETFE** (Ethylene Tetrafluor Ethylene), recently approved as a construction material, is in itself an innovation in Spanish building: it acts as an external covering and a mobile sunscreen that helps light to penetrate and affords heat savings. The ETFE skin is activated using pneumatic mechanisms thanks to **"luxometer" sensors** that automatically and independently activate the chamber inflation and deflation devices according to how much solar energy there is. These luxometers are energy independent.

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# 02





# UNDERGROUND GALLERIES

## EASY ACCESS TO SERVICE NETWORK

When the 22@Barcelona plan was approved, the infrastructure network in the Poblenou industrial area was clearly insufficient. For this reason, the project created a new **Special Infrastructure Plan** for urban improvements on 37 kms of streets in the 22@Barcelona district with highly competitive utility infrastructures.

The Infrastructure Plan brings investments of more than 200 million euros in a **new model of urbanization and underground infrastructures**: a modern network of energy, telecommunications, district heating and pneumatic waste collection systems. The design of these new networks gives priority to energy efficiency and responsible management of natural resources.

One of the improvements in urban services brought by the new Infrastructure Plan is a **system of underground service galleries** interconnecting the blocks. From the departure points of the system (central stations of the system, such as power stations, pneumatic waste collection plants or stations for heating, ventilation and air conditioning) the core network distributes all these services throughout the district. From there, service galleries cross the core network taking the services to a technical room in each block from where services are distributed to the different buildings in the block.

These underground galleries enable service networks to be repaired or improved without street excavation (saving time, money and annoyances to neighbours) and an easy installation of **fibre-optic telecommunications networks**, electricity network, district heating and pneumatic waste collection systems.

Additionally, the new infrastructures plan also includes a **new electricity network** which guarantees a quality electrical supply with five times more power than the current network, and more powerful and efficient gas and water-service supplies.

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# 03





# FAB LAB BARCELONA

## INNOVATION IN MANUFACTURING AND SUSTAINABLE ARCHITECTURE

The **Fab Lab Barcelona**, one of the leading fabrication laboratories in the world, is part of the **Institute for Advanced Architecture of Catalonia (IAAC)**, a cutting edge **education and research centre** for the development of **architecture** capable of meeting the challenges of habitability in the early 21st century.

A fabrication laboratory (Fab Lab) is a **small scale workshop** equipped with digital fabrication machines and technologies, such as laser cutters, 3D printers, milling machines and a platform for manufacturing electronic boards. Now, there are around 100 labs located in more than 30 countries, connected through the Internet, constructing one of the biggest networks of knowledge in the world. Fab Labs are an outreach project of the Center for Bits and Atoms at the **Massachusetts Institute of Technology (MIT)**.

In 2008 IAAC and Fab Lab Barcelona took part in the official section of the Venice Biennale with the project Hyperhabitat and in 2010 presented the **Fab Lab House** at the Solar Decathlon Europe in Madrid where it won the People's Choice Award. The Fab Lab House is the first **self-sufficient house** made in Barcelona and produced in a Fab Lab in the world.

IAAC and Fab Lab Barcelona are currently developing other projects on self-sufficient and smart cities, through applied research on construction of theoretical and physical models that rises from the scale of devices to the territory, from bits to geography. One of the projects is "the **self-sufficient blocks**", which is in the stage of an interactive model to test the flows of information, energy and resources between buildings and blocks of a city that will be tested in a 1:1 scale block of Barcelona.



[www.iaac.net](http://www.iaac.net)  
<http://fablabben.org>

04





# SIUR PROJECT

## INTEGRAL SOLUTION FOR URBAN INFRASTRUCTURES

The SIUR project (Integral Solution for Urban Infrastructures) is an example of innovative urban living lab, installed in Barcelona thanks to the **Urban Lab Initiative**. The project is coordinated by Barcelona Digital Technology Centre and the consortium is made up of Arelsa, Circutor, E-controls, Prysmian, Santa&Cole, SECE and Semai Lighting.

SIUR project is an innovative integration of **urban infrastructure and services** to manage cities in a more efficient, friendly and intelligent way. The goal is to better satisfy the needs of citizens and institutions, improve energy efficiency and reduce pollution and energy consumption.

The high cost of operation and maintenance of street lighting is not only an economic problem but also an environmental concern. The application of measures such as **control of lighting zones**, regulation of the hours of lighting, improvements in facilities and an electrical analysis of the position of lamps results in costs savings of up to 40%.

Street lamps in the SIUR project are equipped with **LED technology** to reduce cost and pollution. Lamps include **sensors** that process environmental information and detect presence, temperature, humidity, noise and pollution. These lights are connected to a Street Lighting Cabinet that centralizes all communications and services (such as Fibre-optic cabling to the Home, Wi-Fi or Electrical Vehicle recharging stations), and sends the information to a central control centre. This new lighting system is located in **Passatge Mas de Roda**, with two main objectives: to test new more efficient lighting systems and to integrate technological features to develop a real Smart City environment.

SIUR has been **awarded in the Living Labs Global Award 2011**, from among more than 245 proposals, and proposed to develop an intelligent and sustainable lighting solutions in Eindhoven.



[www.bdigital.org](http://www.bdigital.org)  
[www.siiur.com](http://www.siiur.com)



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05



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# SENSORS FOR URBAN SERVICES

## NEW APPLICATIONS FOR A BETTER URBAN QUALITY OF LIFE

Barcelona has been working for the last years in several pilot projects to install **sensors** in the city and to create **platforms** that allow the share of information and give it the proper use to citizens, city managers, businesses and professionals. Furthermore, there are different formats of sensors, databases, new applications and designs generated both by public administration and private firms.

The city had to bring order to the many municipal information systems and to integrate other information systems from the private sector. Moreover, there was an interest to offer the city itself as an **urban lab** for testing and simulating applications developed by innovative start-up companies.

Barcelona is creating an efficient and **smart service delivery platform** for citizens and municipal workers. This platform has a common data warehouse where the different sensors systems store their information. This system has been built through a public-private partnership model, developing a normalized model based on well-known standards.

The deployment of sensors in Barcelona has been coordinated by the City Council and the firms Abertis, Cisco and Indra, with the participation of companies such as Libelium, Urbiotica, Worldsensing or Zolertia, among others. The different pilot projects cover many applications to **improve management of urban services**. Some examples are sensors in solid waste containers (to report loading data to adjust schedules or routes), street sensors (occupancy of parking spaces and loading areas) for environmental control (air and noise pollution), humidity (for irrigation in public parks) and urban metering (of gas, water or power).

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[www.libelium.com](http://www.libelium.com) · [www.urbiotica.com](http://www.urbiotica.com)  
[www.worldsensing.com](http://www.worldsensing.com) · [www.zolertia.com](http://www.zolertia.com)  
[www.smartbarcelona.cat](http://www.smartbarcelona.cat)

# 06



BIOSPHERE  
RESPONSIBLE  
TOURISM

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# BIOSPHERE CERTIFICATION FOR BARCELONA

## INTERNATIONAL SUSTAINABLE TOURIST DESTINATION

Barcelona is **the first city in the world to receive the 'Biosphere World Class Destination' certification**. This certification, awarded by the Responsible Tourism Institute (ITR, affiliated to UNESCO and the World Tourism Organization UNWTO), recognises the city of Barcelona and the Barcelona Tourism Consortium's environmental management and positions the city as a sustainable tourist destination, which proves the city's commitment to economic, social, cultural and environmental values.

This recognition represents the fulfilment of one of the targets of the City of Barcelona **Strategic Tourism Plan 2010-2015** and, together with the implementation of the Responsible Tourism System, helps position Barcelona as a high-quality, innovative and responsible tourist destination. The Biosphere recognition positions the city as a leading tourist destination of quality, innovative in responsibility and sustainability, which translates into specific actions such as corporate social responsibility, quality of service or proper environmental management.

The certification was officially presented during the Global Sustainable Tourism Council (GSTC) Annual Meeting on 29th June 2011. This organisation, a United Nations Foundation, works to promote sustainable tourism.

In line with sustainable tourism, a group of companies and institutions from the Forum Area of the city (hotels, convention centre, shopping centre and foundations) have recently created the **Barcelona Forum District (BFD)** that highlights the social, environmental and cultural commitment of its members and their common values and objectives in these matters.

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[www.biospheretourism.com](http://www.biospheretourism.com)

07





# FORUM SOLAR PHOTOVOLTAIC INSTALLATION

AN ICON OF LOCAL ENVIRONMENTAL  
FRIENDLY POLICIES

The **Forum Solar Photovoltaic Installation** was inaugurated in 2004, on the occasion of the organisation of the Universal Forum of Cultures, an event promoting global dialogue on contemporary human challenges, which involved the urban development of part of the Barcelona's coastal area.

It is installed on the prolongation of the Forum Esplanade, a bit further out towards the sea, at the entrance to the new Marina. The installation provided a good deal of the electrical energy and became a reference element on the Barcelona coastline and a **monument to ecological commitment**.

It is a south-facing, 4,500 m<sup>2</sup> oblique surface mounted on four reinforced concrete pillars; a huge pergola receives the sun's radiation and simultaneously produces energy and shade. The total peak power of the solar panel is 1,100 kWp and it is based on silicon mono-crystalline cells. In the area there is a sailing school also covered with solar panels.

In 2009, the City of Barcelona through its Barcelona Energy Agency assigned the rights for the operation and maintenance of the solar panel to TERSA, among other solar facilities. Currently, the management covers a total of 36 solar installations.

TERSA is a public company specialized in the selection, treatment, control, management and recycling of solid urban waste, with the commitment and assurance of continuous improvement in environmental management activities.



[www.teresa.com](http://www.teresa.com)

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08





# INTEGRAL WASTE MANAGEMENT PLANT

## WASTE TO ENERGY TREATMENT PLANT

This metropolitan facility is managed by the public enterprise Tractament i Selecció de Residus S.A. (TERSA). This company has two public shareholders: Barcelona City Council (58%) and Metropolitan Area of Barcelona (42%).

This integral installation comprises a **Mechanical and Biological Treatment plant** (also called Ecoparc) followed by a **Waste to Energy plant**, with a global capacity of 400,000 tonnes per year. This plant is the main example of the Catalan Model of Waste Treatment and its best practices and technologies.

The installation receives the municipal waste fraction not selected in origin. First of all, it is treated in the mechanical and biological treatment plant. The main goal in this phase is separating recoverable materials such as paper, glass, different plastics, ferrous metals and organic matter.

The rest of this first treatment goes automatically to the Energy Recovery plant, where this municipal waste is burned in three furnaces with a capacity of 15 tonnes per hour. This process generates electrical energy and steam to the cooling and heating network managed by Districlima S.A.

General information about Waste to Energy plant:

- MUNICIPAL SOLID WASTE TREATED: 350,000 t/year
- ELECTRICAL ENERGY PRODUCED: 175,000 MWh/year
- STEAM TO HEATING AND COOLING NETWORK: 15 t/h



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# 09





# DISTRICLIMA

## HEATING AND COOLING SYSTEM

Districtlima was set up in 2002 to implement, for the first time in Spain, a district **heating and cooling network** for use in heating, air conditioning and sanitary hot water. The project was initially located in an urban remodelled area of Barcelona: Forum.

The project encompassed the design, construction and later use, over a 25-year concession, of the Forum's production station and energy distribution network. In 2005, a second stage started with the amplification of the network to the 22@ Innovation District.

Main **environmental advantages** of Districtlima: Residual energy sources are generally used (urban solid waste or others) in high performance energy equipment, thus minimising fossil origin primary energy consumption; reduction of greenhouse effect gas emission as it is a more efficient energy solution; significant reduction of refrigerant losses into the atmosphere compared with conventional systems; Noise and vibration reduction in buildings connected to the system and null visual impact as the system ensures that roofs and facades remain completely unobstructed.

The system also brings **economic advantages** (mostly by savings in bills and maintenance costs), in **safety** (guarantee of safety, continuity of supply, permanent supervision, elimination of risk of legionnaire's disease), and advantages of **use to the customer** (Districtlima is more flexible, reliable, and simple than traditional supply).

Districtlima prevented 10,100t of CO<sup>2</sup> emissions and reduced the use of fossils fuels by 56% in 2010.

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# LIVE BARCELONA PROJECT

## THE ELECTRIC MOBILITY PLAN FOR THE CITY

LIVE Barcelona (**Logistics for the Implementation of the Electric Vehicle**) is an open public-private platform that promotes the use of electric vehicles in the city as an opportunity to position Barcelona as a centre of innovation in electric mobility on a worldwide scale. To achieve these objectives, LIVE Barcelona coordinates the initiatives for the development of electric mobility, it has created an information centre for the public and companies and promotes participation in events and European consortiums.

It is promoted by the Government of Spain, the Government of Catalonia, Barcelona City Council, and the firms ENDESA, SEAT and SIEMENS.

Today the city has more than **240 recharging stations**. The goal is that every citizen has a station accessible within 5 minutes from home. This public network of recharging points is an example of an innovative infrastructure and creates new business opportunities. It responds to an open model: some vendors implement different technologies. The city is developing a pilot project on a large scale where you can test and develop new technologies.

The first **Fast Charge Station** for electric vehicles installed in Spain is located in Carrer Lope de Vega 125 (close to the crossing with Avda. Diagonal). This station is operated by Endesa Cepsa. Pure electric vehicles already in the market, such as Nissan Leaf, can be charged at this station in less than 10 minutes.



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

# 11



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# HOTEL ME, A MOBEC HOTEL

## ELECTRIC MOTORBIKES FOR TOURISTS

A Biosphere Hotel and a Responsible Tourism Establishment, **Hotel ME** was inaugurated in 2008. This tower hotel, reaching 120 metres high, is one of the tallest buildings of the Barcelona skyline. It is the work of French architect Dominique Perrault.

Hotel ME participates in a new initiative, called **Mobec Hotels**, a mobility sharing system for tourists and city visitors with electric motorbikes. The project is led by the Barcelona Hotel Association and Barcelona City Council.

Mobec Hotels is a unique and innovative **electric mobility initiative**. The project links the Mobec Point charging stations (there is one Mobecpoint Smart Motorbike Charging Station in front of the hotel) with green energy and electric mobility. The project consists of the installation of a network of charging stations for six vehicles in front of the hotels of Barcelona participating in the project, which will have six rental two-wheel electric vehicles available for the hotel's guests.

The project brings value added to the clients of the hotels participating in the programme, by offering a cheap, sustainable and efficient transportation system. Furthermore, Mobec Hotels is a good way for the participating hotels to implement environmental and corporate social responsibility policies, bringing benefits for the hotel's image and their environmental concern, reducing pollution and noise in the city.

Joining the Mobec Hotels initiative is very easy for all the hotels interested, as the investment is very low and the return of investment is very fast.

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[www.mobecpoint.com](http://www.mobecpoint.com)  
[www.me-barcelona.com](http://www.me-barcelona.com)

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# 12





# AUTOMATED WASTE COLLECTION SYSTEM

## A CLEAN AND EFFICIENT WASTE COLLECTION

The **pneumatic and selective waste collection system** minimizes noise pollution from the traditional waste collection methods and improves quality of urban spaces as waste containers disappear from the streets.

The first pneumatic waste collection system was installed in Barcelona in 1992, in the Olympic Village District as part of the city's renovation for the 1992 Olympic Games. After this first installation the city developed a Director Plan in 2002 to regulate the deployment of the system and the location of the collection stations, which was later completed in 2006 with a technical planning for future growth. In the 22@Barcelona District, the waste collection system has been operational since 2006.

The system consists of a network of fixed collection points strategically distributed, where the users deposit their waste allowing the separation of waste fractions. The drop-off points (either inside the new buildings or in the streets) collect the three basic waste fractions (organic waste, inorganic waste and paper).

The drop-off points are connected via a **vacuum network** through the pipes installed under the streets and transported to the collection plant, where a hydraulic press compacts the waste to reduce its volume (resulting in less traffic and noise).

The entire network is cabled through a communication network to control the state of the infrastructure and to measure if waste containers are empty or not to optimize collection routes of trucks.





# 13



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# BICING

## BICYCLE SHARING SYSTEM

**Bicing** is the name of a **community bicycle programme** of the city of Barcelona created in March 2007. It aims to make available to citizens bicycles **for commuting within the city**, with an economical and sustainable transportation mode. Its purpose is to facilitate short daily trips but not for tourism or recreational use.

Users must acquire a yearly membership. The system has a network of more than 400 stations to loan and return the bicycles distributed throughout the city. Most stations are situated next to public transport stops or public parking to facilitate and promote intermodality. Since the start, the service has registered more than 50 million uses and has 120,000 registered users.

A number of types of **traffic separators** for **bicycle lanes** have been tested in the 22@ district to find out which of the pilot projects contributed to improved circulation and safety for cyclists while not preventing traffic from running normally. One of the products tested and commercially developed is ZEBRA, a traffic separator for cycle lanes with high reflecting painted strips for increased visibility, and engineered curves and internal structure to ensure mechanical resistance. ZEBRA separator is 100% recycled and recyclable made of the heavy fraction of the electrical wires plastic covers.

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[www.bicing.cat](http://www.bicing.cat)  
<http://en.zicla.com>

# 14





# E-GOVERNMENT

## FOR ENTREPRENEURS, BUSINESSES AND CITIZENS


Barcelona is pioneer in many e-government initiatives, applying new technologies to improve public services, access, efficiency and transparency.

Some of these initiatives are:

**The professional folder:** Barcelona is the first city in Spain to allow professionals to complete online procedures on behalf of their clients (payments, debts, property formalities and fines). Professionals apply for permission through the portal and the system keeps track of the progress of procedures. On the business side, Barcelona Activa (the Local Development Agency) has also several programmes which are accessible online, including support and procedures for incorporation of firms in 48 hours.

**Open Data BCN:** public data owned by the City Council is made accessible to the public in open and standard digital formats in an easy and clear structure. The portal includes more than 300 categories of data in 5 basic areas: territory, population, urban services, economy and administration. The initiative aims to increase the transparency of the City Council, identify information of common interest, support private initiatives that develop public services of interest and support the openness of public data.

**Quiosc PuntBCN:** the city has kiosks for attention to citizens similar to automatic cash dispensing machines. These kiosks improve the attention to citizens from the eleven Oficines d'Atenció Ciutadana (OACs, Offices for public attention) that receive an average of 4,500 daily users. These kiosks are located in different points of the city (shopping centres, libraries, civic centres and at the 11 OACs), and allow citizens to solve most of their administrative procedures, which represent 60% of all enquiries received. This initiative improves the city network for public attention and increases the hours of service. All services and procedures provided from the kiosks are also available online.



[www.bcn.cat/hisenda](http://www.bcn.cat/hisenda) · [www.bcn.cat/opendata](http://www.bcn.cat/opendata)  
[www.bcn.cat](http://www.bcn.cat) (virtual office)



Barcelon**a**ctiva

[bcn.cat/barcelonabusiness](http://bcn.cat/barcelonabusiness)