POCACITO

european post-carbon cities of tomorrow

CASE STUDY ASSESSMENT REPORT

BARCELONA

CEPS – CENTRE FOR EUROPEAN POLICY STUDIES

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

GDP	Gross domestic product
GVA	Gross value added
KPI	Key performance indicator
Gt	Gigatons
Mt	Megatons
MWh	MWh
R&D	Research and Development
SEAPs	Startegic Energy Action Plan
Toe	Tonne of oil equivalent

I INTRODUCTION

In the context of the POCACITO – "Post-carbon Cities of Tomorrow – Foresight for Sustainable Pathways towards liveable, affordable and prospering cities in a world context" project, this document intends to present the Barcelona Case Study Initial Assessment, integrated in Task 2.2. – Initial Assessment of Case Study Cities of WP3 – Initial Assessment.

In fact, the POCACITO project aims to develop a 2050 roadmap to support the transition of cities to a more sustainable or post-carbon future, through a collaborative research and participatory scenario building.

In order to use an evidence-based approach, 10 European case studies were selected: Barcelona, Copenhagen/Malmo, Istanbul, Lisbon, Litoměřice, Milan/Turin, Rostock and Zagreb. An important step to achieve the project's goal is to produce an initial assessment of case study cities in order to evaluate the current situation of these cities as an input into the scenario development.

The document is divided in the following parts: approach and methodology; overview of the Barcelona case study city; key strategies and projects; Barcelona case study city assessment; findings and key challenges; recommendations; and conclusions.

II APPROACH AND METHODOLOGY

The development of the initial assessment of the case study cities is supported by two methodological documents produced within POCACITO: D 1.2 – Report on Key Performance Indicators and D 3.1 – Methodological Guide for the Initial Assessment. In this context, the initial assessment was developed based on a set of pre-defined KPI – Key Performance Indicators integrated in the PCI – Post-Carbon City Index.

II.I MODEL AND CONCEPT

'Post-carbon cities' were defined by the POCACITO team as a rupture in the carbon-dependent urban system, which has led to high levels of anthropogenic greenhouse gases, and the establishment of new types of cities that are low-carbon as well as environmentally, socially and economically sustainable. The term 'post-carbon' emphasises the process of transformation, a shift in paradigm, which is necessary to respond to the multiple challenges of climate change, ecosystem degradation, social equity and economic pressures.

Thus, it is assumed that the core components of post-carbon cities are in line with the three pillars of sustainability, comprising environmental, social and economic dimensions. However, cities are complex, adaptive, social-ecological systems (Ecologic Institute 2014) and cannot be fully understood by examining individual components. For this reason, POCACITO moves away

from analysing the three dimensions of sustainability as silos towards a more comprehensive and holistic approach.

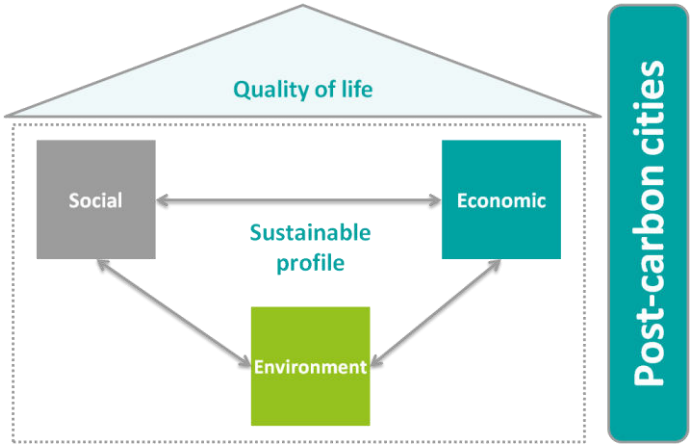


Figure 1 - Conceptual model

The **social dimension** is concerned about equity both in the current generation and between generations during the transition process to post-carbon cities, which is expected to be smooth for all citizens. The benefits for inhabitants that come out of living in a reduced carbon city are highlighted, showing that these cities are places where it is pleasant to live in and the values of equity and social inclusion are present. Special attention has been given to standards of living related to essential aspects such as education and health (for example, life expectancy and wellbeing). Unemployment rates and poverty are also issues to be addressed on the context of post-carbon cities. Public services and infrastructures that are available for citizens are analysed, as well as aspects of governance and civic society, promoting the positive sense of culture and community.

The **environment dimension** investigates the sustainable profile of the cities and assesses not only the current impacts on the environment, but also during the transition processes, evaluating the environmental resilience of the cities. It is important to continuously adapt the strategies to follow in order to mitigate the negative impacts on the environment during the transition process. The environmental dimension covers the energy sector in general in order to promote not only the final energy efficiency but also the resources depletion associated with energy consumption. Post-carbon cities pay special attention to GHG and its contribution to climate change. Some energy intensive sectors are empathised, such as transportation/mobility and the buildings stock. Biodiversity and air quality are critical themes that also belong to this dimension. The concerns regarding waste and water are also evaluated.

The **economic dimension** emphasises the sustainable economic growth based on the wealth of the cities and their inhabitants. It recognises that investments are crucial to promoting post-carbon cities, in particular the ones related to sustainable facilities. The labour market and the life of the companies are taken into account to demonstrate the dynamics of a post-carbon economy in a green economy paradigm. Public finances are also analysed because the cities with a lower level of indebtedness are more prepared to face the challenges during the

transition process towards a post-carbon city. This dimension also includes the R&D expenditure because no city can become a post-carbon city without innovation.

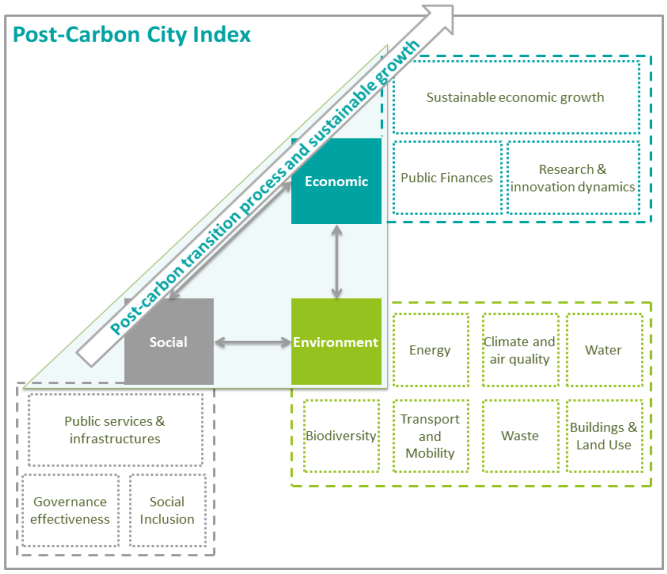


Figure 2 - Dimensions and sub-dimensions of the Post-Carbon City Index

For each sub-dimension, a set of indicators has been selected which allows a uniform collection of data, improves the comparison and supports the identification of best practices in each case study city, covering environmental, social and economic aspects (ANNEX I).

II.II DATA COLLECTION PROCESS

The production of each case study initial assessment report involves data gathering and data analysis, in order to make possible the quantification of the KPI. Data collection has a central role in the initial assessment of the case study cities and it is crucial to ensure the quality of scenarios and the modelling of the impacts. The selected methods for data gathering and collection comprise the following two approaches:

- Top-down approach – completion of the indicators list (Post-Carbon City Index) according to a review of main statistical findings, existing relevant strategic and planning documents, and legislation to assure an accurate quantitative data collection;
- Bottom-up approach – discussions with local authorities and other selected stakeholders should be used to complement the collection of quantitative data and enrich the contents of the case study assessment reports.

In general, most of the required data can be retrieved by national/regional statistical offices, government departments, environment and energy agencies, research institutes and non-governmental organisations. The data collection process depends on the availability of high quality and relevant data.

Moreover, all the indicators should be collected for both years 2003 and 2012 in order to compare their evolution throughout this period (sometimes, mainly for some economic and social indicators, time series were required). Whenever data is not available for those years, one should collect the earliest and the most recent years between 2003 and 2012.

The geographical boundaries of the initial assessment of each case study city should be defined by each case study leader, according to the objectives of the work and the limitations of data availability. All indicators should be collected for this geographical level, being priviledged the city or municipality levels. If an indicator is not available at this geographical level, then it could be collected for NUT III or NUT II. If the data is only available at the national level, it is considered that it is not representative of the city, so it should be discarded.

DATA COLLECTION FOR THE BARCELONA CASE STUDY

Gathering data for Barcelona brings a number of difficulties, because the urban area is far larger than the municipality of Barcelona. An analysis based on the municipality would fail to give a reliable picture of the situation in the city. In fact, the authorities are aware of this and the Area Metropolitana de Barcelona (AMB) bringing together 36 municipalities was created to improve the coordination of services. Data at this level is however not systematically collected causing some difficulties.

To overcome the data problems indicators have been collected on the most appropriate level or where the data is available, municipal (Barcelona centre), in rare cases the intermediate urban level (Barcelonés), the five most urbanised central municipalities, the metropolitan area (metropolitan area of Barcelona) or at the NUTs III province level of Barcelona. The district NUTs III area is also more useful than the data of Barcelona municipality, as municipality is too small in size and population to be representative for the whole city.

The province has 7,733 km^2 and 5,5 million inhabitants, of this the metropolitan area covers 636 km^2 and 3,24 million inhabitants, the Barcelonés area has 2,23 million and 145,8 km^2, the municipality of Barcelona has 1,6 million inhabitants and 101,4 km^2.

Table 1 summarizes the sources of data and years of data collection for each KPI. The data has been mostly collected at the level of the NUT III region and the metropolitan area.

Table 1 - Summary of geographical level and data sources for each KPI

DIMENSION	SUB-DIMENSION	INDICATOR	Geographical level	Year	Source
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	City	2003-2015	Ajuntament de Barcelona, from data of INE
		Variation rate of poverty level	NUT II	2004-2014	Eurostat
		Variation rate of		2003-	Eurostat

DIMENSION	SUB-DIMENSION	INDICATOR	Geographical level	Year	Source
		tertiary education level by gender	NUT II	2013	
		Variation rate of average life expectancy	City	2003-2012	Ajuntament de Barcelona
	Public services and Infrastructures	Variation rate of green space availability	City	2004-2013	Ajuntament de Barcelona
	Governance effectiveness	Existence of monitoring system for emissions reductions	Municipality	N/A	Ajuntament de Barcelona
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas n/a	Municipality	2009 - 2013	Generalitat de Catalunya
	Energy	Energy intensity variation rate	City	2003-2012	Ajuntamet de Barcelona
		Variation rate of energy consumption by sectors	City	2003-2012	Ajuntament de Barcelona
	Climate and Air Quality	Variation rate of carbon emissions intensity	City	2003-2012	Ajuntament de Barcelona
		Variation rate of carbon emissions by sector	City	2003-2012	Ajuntament de Barcelona
		Exceedance rate of air quality limit values	City	2003, 2012	Generalitat de Catalunya
	Transport and mobility	Variation share of sustainable transportation	City	2004-2014	Ajuntament de Barcelona
	Waste	Variation rate of urban waste generation	City	2003-2014	Ajuntament de Barcelona
		Variation rate of urban waste recovery	City	2006-2014	Ajuntament de Barcelona
	Water	Water losses	City	2011-	Aigues de

DIMENSION	SUB-DIMENSION	INDICATOR	Geographical level	Year	Source
		variation rate n/a		2014	Barcelona
	Buildings and Land Use	Energy-efficient buildings variation rate n/a	City	2013	Insitut Catala d'Energia
		Urban building density variation rate	City	2001-2011	Ajuntament de Barcelona
ECONOMY	Sustainable economic growth	Level of wealth variation rate	City	2003–2012	Ajuntament de Barcelona
		Variation rate of GDP by sectors	NUT II	2003–2014	IDESCAT
		Employment by sectors variation rate	City	2003-2014	Generalitat de Catalunya
		Business survival variation rate	City	2009-2014	Ajuntament de Barcelona
	Public Finances	Budget deficit variation rate	City	2003-2015	Budget of Barcelona
		Indebtedness level variation rate	City	2003-2015	Budget of Barcelona
	Research & Innovation dynamics	R&D intensity variation rate	NUT II	2004-2012	IDESCAT

III OVERVIEW OF THE CASE STUDY CITY

III.I TERRITORY

Barcelona is the second largest city and Spain and the regional capital of Catalonia in the North-Eastern part of the country. Spain is located in the South-western Europe, on the Iberian Peninsula. It is bordered by the Atlantic Ocean in the North West, Portugal on the West, the Mediterranean in the East and South and France and Andorra in the North. The area of Spain is 504 km^2 and has 46 m inhabitants.

Barcelona is the capital of the Catalan region, located in the North-Easter area of Spain, bordering France. Barcelona is the second economic centre of Spain after Madrid and had a GDP per capita at 126% of the EU average PPP in 2010, down from 126 before the financial

crisis in 2008. The official languages are Castilian and Catalan. The city is an important port city and one of cultural centres in Europe. It aims to be an innovation and trade hub in Europe and is ranked as one of the most advanced cities in the world and at the forefront on of the smart city development. In 2014 it received the award of European Capital of Innovation in a competition with 58 other European cities.

The city is also an important tourism destination, 10 million tourists visit the city annually and it hosts many international events, such as the annual Smart City World Expo.

The municipality of Barcelona with 1,6 million inhabitants and 101,4 km^2 is only one of the 36 municipalities that make the Barcelona Metropolitan Area (AMB) in Figure 3. Of the metropolitan area, the Barcelonés 'comarca', made out five municipalities represents the economic centre of the metropolitan area (Nos. 1,4,13,23 and 33)

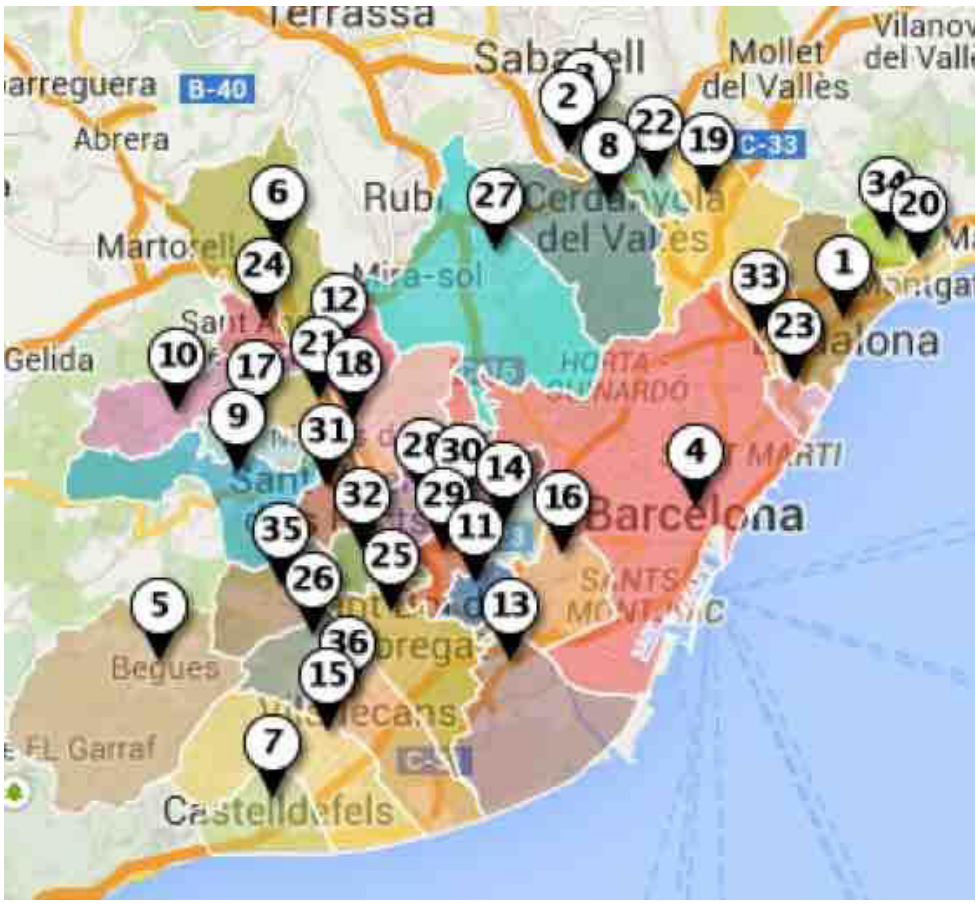


Figure 3 - Barcelona Metropolitan Area, which is comprised by 36 municipalities, http://www.amb.cat/ca/web/area-metropolitana/municipis-metropolitans

Barcelona is served by motorways and fast rail links to the rest of Spain and France, It has a well developed regional rail link and extensive underground system with 11 lines and 165 stations stretching over 123 km, including the stations of the regional rail system (24 of the stations) within the metropolitan area of Barcelona. In addition, Barcelona has a dense public bus system.

Figure 4 - Metro transportation network. Source: Transports Metropolitans de Barcelona

Figure 5 - Public bus transportation network. Source: Transports Metropolitans de Barcelona

III.II CLIMATE

Barcelona exhibits a Mediterranean climate with mild winters and hot summers. The average daily winter temperatures reach in winter a minimum of 4°C and maximum of 13 4°C (January) and in the peak of the summer (July and August) a minimum of 19 4°C and maximum of 28°C.

Rain occurs mainly in late summer and autumn, with very low precipitation in June and July. Sunshine hours are about 2,500 per year, from an average of 4.5 hours of sunshine duration at day in December to an average of 10 hours of sunshine duration at day in July[1].

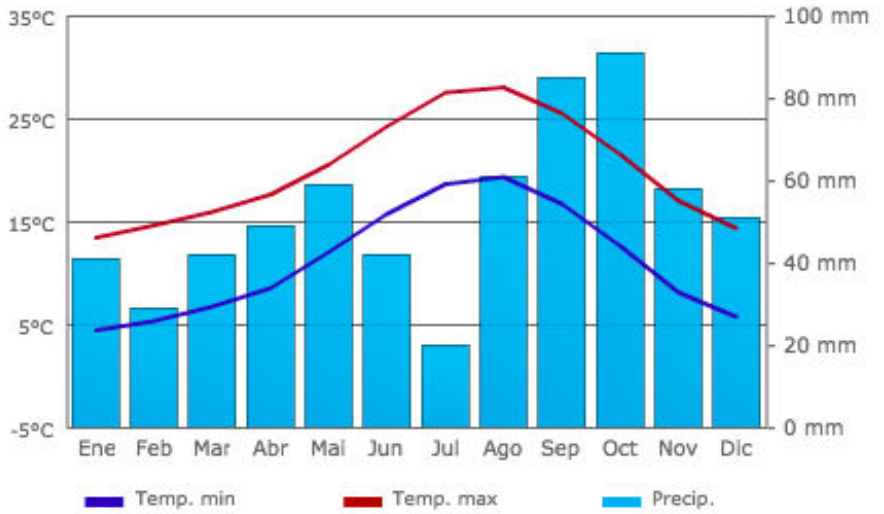


Figure 6 – Barcelona climate. Source: www.climatedata.eu

III.IIIPOPULATION

We can distinguish three levels of population of Barcelona, NUTs III district, the metropolitan area AMB and the municipality. The province has 5,5 million inhabitants, of this the metropolitan area covers 3,24 million inhabitants and the municipality 1,6 million. The Barcelona District has 75% of the population of the region of Catalonia (7,5 million inhabitants) and 12% of Spain. Figure 7 shows the evolution in the metropolitan area.

The age structure in the metropolitan area of Barcelona has seen some ageing, but due to a population increase of the city and immigration the share of young inhabitants has been stable or even slightly increasing (Figure 8), although the population of working age has slightly declined. Immigration has increased the number of foreign residents from 1,2% in 1991 to over 15% in 2013 (Figure 9).

The density of the population of Barcelona is very high with 16000 inhabitants per km^2 in the Barcelona municipality and 5500 for the metropolitan area.

[1] Information from Climatedata.eu

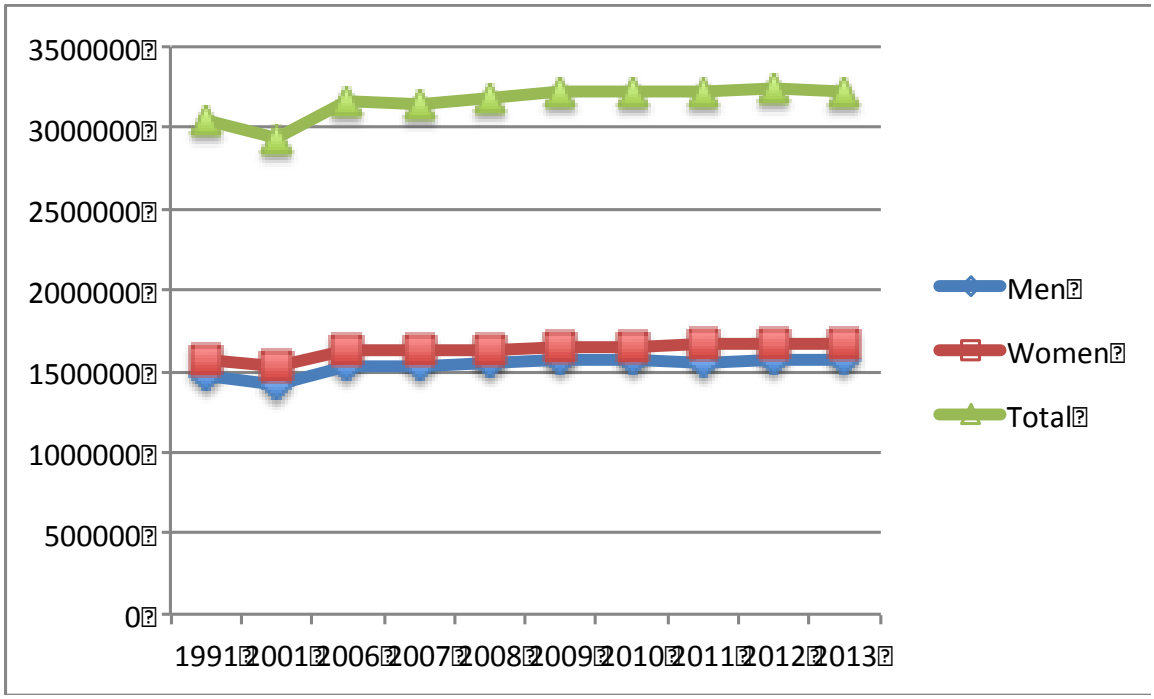


Figure 7 – Population of the metropolitan area of Barcelona. Source: Idescat

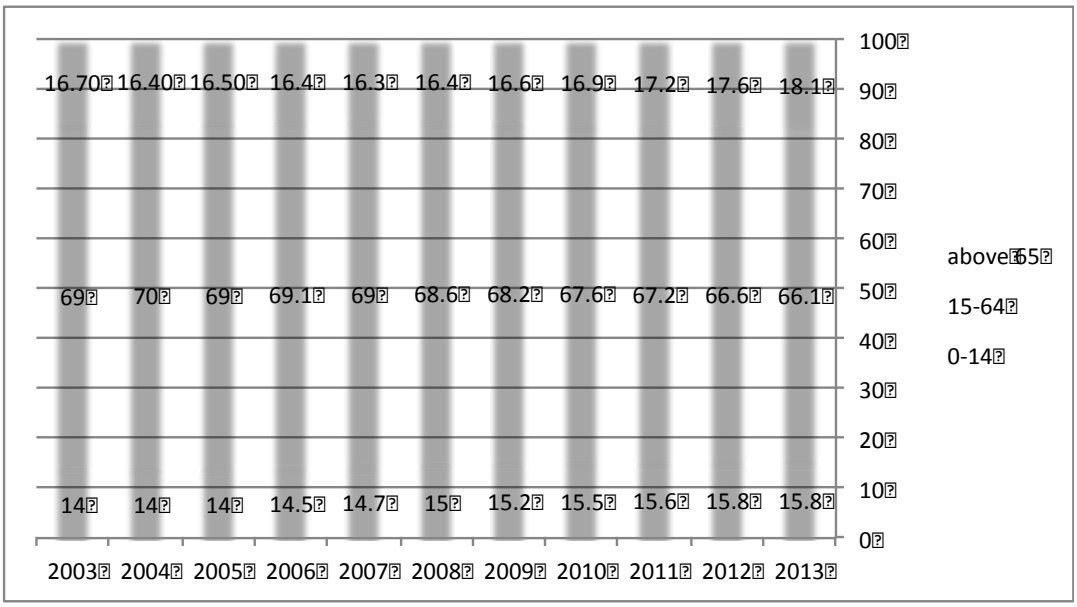


Figure 8 – Evolution of the age structure in the metropolitan area of Barcelona. Source: Idescat.

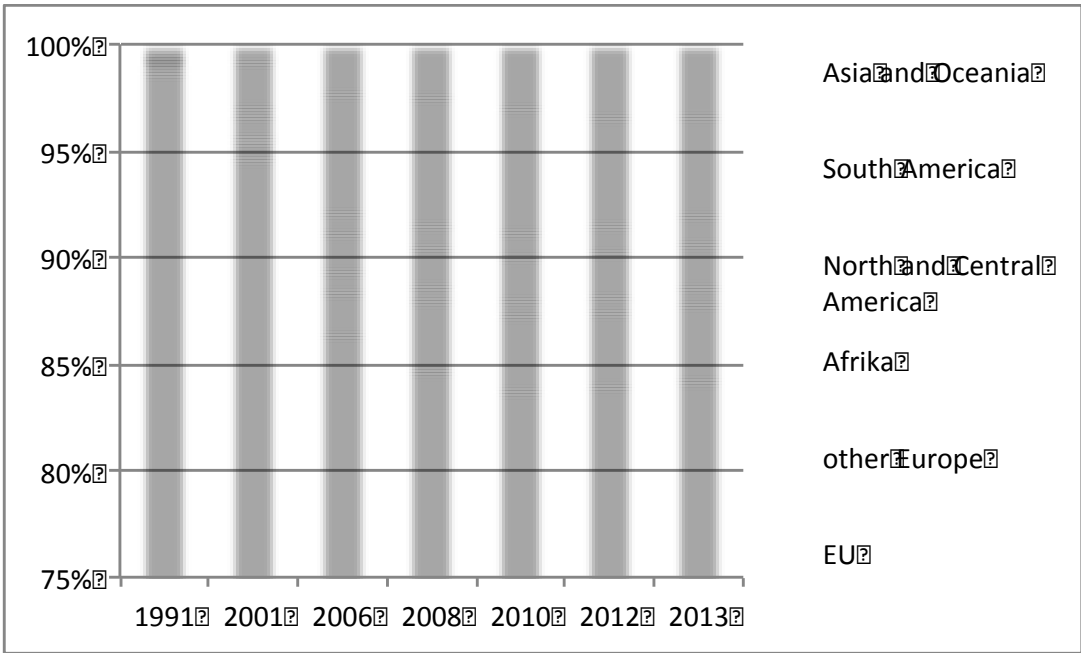


Figure 9 – Evolution of the population by origin metropolitan area of Barcelona. Source: Idescat.

IV KEY STRATEGIES AND PROJECTS

IV.I OVERALL STRATEGY

The AMB has an ambitious strategy, seeking to be at the top of the smart cities worldwide. One of the main pillars of the AMB is the common strategy to reduce CO_2 emissions and the opportunities such strategies may open in parallel, in terms of the quality of living and the economic development of the city.

Barcelona started a plan to reduce CO_2 emissions in 2002, which included guidelines for each district and sector of the AMB. These strategic guidelines had to be followed by all companies and organisations linked to the AMB. A key strategic document of the city of the Barcelona was the Energy improvement Plan of Barcelona. This plan combined energy efficiency and renewable energies to reduce emissions and energy consumption. This plan comprised 59 projects for the city, helping the city to achieve by 2020 CO_2 emission reductions of 20%.

In 2011 a new 'Energy, Climate Change and environmental quality plan' (PECQ) was adopted, while the city in parallel signed the Covenant of Mayors SEAPs.

The plan has an holistic nature involving different sectors of the administration, with a city programme and specific programmes for the municipalities. The progress is monitored by an "Energy Observatory" that publishes the results.

The AMB also has a metropolitan plan for adaptation to protect the city from climate change impacts. It identifies 24 risks and identifies 50 adaptation actions.

The strategy and action plans are supported by information campaigns

Some of the projects of the city are listed below.

IV.II KEY PROJECTS

The key projects in the three strategic areas identified – sustainability, entrepreneurship, and participation - are summarised in the following factsheets. A detailed description of each project is also presented.

PROJECT FACTSHEET 1	
Title	**Electric Mobility**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	Metropolitan Area
Project description	
Aims	The project intends to turn Electric Vehicles into Barcelona's standard mode of public and private transport for individuals and groups.
Content	• **Electric Taxis**: Barcelona will become the leader in the implementation of this type of vehicle in the realm of public transport. • **Electric buses**: Barcelona is a benchmark for this type of service: Barcelona has the cleanest fleet of buses in Europe. All thanks to the introduction of and support for hybrid and compressed natural-gas-powered vehicles, as well as the use installation of anti-pollution filters in diesel vehicles. TMB is also collaborating with the company Siemens on hybridization designs for buses and minibuses, to cover 100% of the bus routes. • **Car Sharing** using electric vehicles: Barcelona is establishing a new rental model for such vehicles, which will also improve the current system, as users will be able to pick up and drop off the vehicles wherever they wish. • **Electric motorbikes**: Barcelona already provides 150 recharge points for these vehicles as well as a newly installed electric motorbike station at the IESE Business School, which is currently functioning at full use.
Website	http://w41.bcn.cat/en/

PROJECT FACTSHEET 2	
Title	**Barcelona Wi-Fi**
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Barcelona City Council is aiming to increase resident's access to the Internet and the use of technology in their daily lives.
Content	• Barcelona Wi-Fi is a service provided by Barcelona City Council that enables you to connect to the Internet from a wide range of the city's streets. Access points are located at 193 municipal facilities and at 276 street sites, making a grand total of 461 access points and thereby creating the largest free-access, public Wi-Fi network in Spain and one of the most important in Europe. • Enables simple browsing the internet, except for those sites with content considered ethically dubious. Not to distort the market in accordance with applicable law, the connection speed is limited to 256kbps . • This project involves the successful bidder for the management of municipal networks (GIX) , Abertis Telecom to meet the growing need for mobile information access of the citizens of Barcelona. The collective public-private partnership allows adding Internet access services offered by the Council for free but with limited speed telecommunications regulations imposed as a complementary payment provided by Abertis Telecom (WI Premium). • Introducing WiFi to municipal parks and gardens: The aim behind this initiative is to extend the Barcelona WiFi service to the city's parks and gardens, and to boost it in children's play areas as well as other points of interest in the parks. This will be done gradually, by first installing the service at 220 parks with WiFi access before the summer of 2015. • Installing WiFi on the city bus network and the metroThe idea here is to install the Barcelona WiFi service on the

	city's buses and at the main metro stations. It will cover the entire bus network and the metro, and it is envisaged that 1,130 buses and 9 metro stations and will have the WiFi service by the end of 2016.
Website	http://www.bcn.cat/barcelonawifi/en/

PROJECT FACTSHEET 3	
Title	**Barcelona Open Data**
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Making city's Public information available to everyone.
Content	Barcelona City Council provides public data so that a range of individuals and entities can access and reuse the data with ease. The main portal provides data in standardised and open, digital format that is clearly structured to make it easily understandable. There is a catalogue of the data, which is classified according to the following categories: • Public Administration • City and services • Economy and business • Population • Region
Website	http://opendata.bcn.cat/opendata/ca

PROJECT FACTSHEET 4	
Title	**Apps4Bcn Portal**
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood,	City of Barcelona

etc.)	
Project description	
Aims	Creating a meeting point for people looking for apps to improve their experience of the city and also for developers, who share their applications on the portal.
Content	Apps4Bcn has created a network of experts who try out and assess apps. These experts come from a range of areas, some are sports experts, some work in the apps industry and others are apps lovers. The portal is organised under the following categories: • Art and culture • Finance • Social media • Business and work • Games • News, opinion, books • Sports • Eating and drinking • Healthcare • Photos, video and tv • Transport and traffic • Education • Music • Shopping • Travel and tourism • Urban life and participation In addition to these categories there are also apps aimed at thematic collections. These are constantly renewed according to the events or campaigns that are held in the city: apps for St George's Day, for the Mobile World Congress, etc. Apps4Bcn is a project that allows citizens to live the mobile experience in Barcelona 365 days a year; a portal that evolves on a daily basis, with as many apps as there are experts and a firm commitment to improve citizens' quality of life and enhance the city's mobile industry.
Website	http://apps4bcn.cat/en/apps/index

PROJECT FACTSHEET 4	
Title	**New Bus Network**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	A smart bus network easy to understand, intuitive, faster and better connected.
Content	Since 2012, Barcelona has introduced on a *New Bus Network* based on vertical, horizontal and diagonal routes. The new network brings on board improvements to technology that ensure that the system is managed more efficiently: "right-of-way" traffic lights, transfer points, in-bus and bus stop information, smart management to improve speed, frequency and service provision across the city, as well as the optimisation of resources based on people's needs. The management of information related to the new system is also be carried out in a smart manner, whereby the impact of changes to public transport on users is reduced, above all on groups such as children and the elderly.
Website	http://www.novaxarxabus.bcn.cat/es/

PROJECT FACTSHEET 5	
Title	**Barcelona Contactless**
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Offering specific and accurate information on the user's current location in the city as well as the activities going on there at that precise moment.
Content	It consists of hundreds of access points distributed throughout the city (NFC or QR codes that can be accessed through mobile,

	tablet, PDA or any other device with an Internet connection): these connect to a mobile website providing information on what is happening at that specific place and time: facilities and services, events calendar, activities, related mobile apps. The facilities and services that make up Barcelona Contactless may be identified thanks to a variety of related symbols presented in a range of formats and media: they operate 24 hours a day and 365 days a year.
Website	http://contactless.barcelona.cat/en

PROJECT FACTSHEET 6	
Title	**Barcelona Open Government**
Dimension of KPIs	SOCIAL – Governance effectiveness
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Barcelona Open Government is promoting a new relationship based on transparency, participation and collaboration between the City Council and citizens. A change in the way of doing politics that is committed to regenerating political life and where the technology applied facilitates this new relationship in order to change from “governing for people” to “governing with people”.
Content	Barcelona City Council has decided to change to the way in which it governs the city, by being an open government: a transparent, inclusive, collaborative government that cooperates with citizens in implementing policies s by providing access to information, fostering participation and creating spaces for dialogue and cooperation. Based on these objectives, it has created: • The website which brings together, orders and disseminates all “open government” initiatives under one heading. • The Joint Innovation Platform: A new Citizen Participation service for proposing solutions and ideas, promoting and discussing ideas and solutions put forward by other citizens. All these ideas and solutions are examined by the

	Council and, if they receive more than 50 supporting votes from other citizens, they will be responded to, studied and, if feasible, implemented by the Council. • The Barcelona Open Government App, which is free for Android and iPhone, allows citizens to communicate with municipal representatives and give their opinions, assess municipal policies and become involved in the different participatory processes established in the city, on any topic that affects it. The app is designed to be easy to use and let people get involved in the city's policies: finding out, giving opinions, assessing and contributing. • A participatory processes offered by the Council have been unified in a clear, visible, orderly manner, in order to promote citizen participation by allowing them to submit their proposals from their computers or tablets, as well as their mobile phones.
Website	• www.bcn.cat/governobert • www.bcn.cat/coinnovaci%C3%B3 • bcn.cat/participació

PROJECT FACTSHEET 7	
Title	**Telecare service**
Dimension of KPIs	SOCIAL – Social Inclusion
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Prompt emergency response service for people who are elderly, with disabilities or dependent on others.
Content	It is a domestic care service that helps to improve the quality of life and independence of people who are elderly, with disabilities and/or dependent on others, who live or spend many hours alone at home. The service is available 24 hours a day, 365 days a year and has a twofold purpose:

	• Offering an appropriate response to users' requests for assistance. • Taking preventative action by maintaining frequent contact with individuals, to prevent unsafe situations, isolation and/or loneliness. Its modus operandi is simple: a device is installed in the individual's home and connected through a (land or mobile) telephone line to a Call Centre, which can be contacted at the simple press of a button. The Call Centre has a team of professionals who attend to requests and mobilise, where necessary, the most appropriate response for the situation: locating family members or designated contacts, sending a Mobile Unit out to the user's home or mobilising other emergency services (doctor, 061 etc.). Barcelona City Council currently provides this service for free to more than 70,000 citizens.
Website	http://w110.bcn.cat/portal/site/GentGran/menuitem.7b0284142327bd0f9d869d86a2ef8a0c/?vgnextoid=85ad84ae4f1fa210VgnVCM10000074fea8c0RCRD&lang=ca_ES

PROJECT FACTSHEET 8	
Title	**Smartquesina - The interactive bus stop**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Developping new smart and sustainable bus stop, equipped with cutting-edge technology to improve user experiences.
Content	The design of the smart bus stop was proposed by SmartCitiesLAB, an ideas laboratory set up by a group of large corporations. It has a WiFi connection, a municipal applications downloading point via Barcelona Contactless (QR and NFC technology), a touchscreen with utility apps for enabling users to travel around the city and get to know it, as well as another screen offering dynamic digital advertising. The digital display that gives information on bus-arrival waiting times is also included in the smartquesina infrastructure. Other benefits available to you include free WiFi hotspots,

	courtesy of the Barcelona WiFi service, and even the possibility of charging your mobile by using any of its USB ports, which you will find integrated into the side of the screen.
Website	Not applicable

PROJECT FACTSHEET 9	
Title	**Procedures portal**
Dimension of KPIs	SOCIAL – Governance Effectiveness
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Make local government more flexible and accessible by making available municipal services online.
Content	The City Council is established itself as an innovative and pro-active local authority that is in touch with people and capable of offering services that help them in their everyday lives, as well as businesses and institutions in their work. The creation of online procedure services has also provided an opportunity for redesigning, simplifying and automating many of these administrative procedures. The procedures portal complies with all legal, privacy and security guarantees required by the Law and municipal byelaws, through such tools as Digital Certificates, Mobile IDs and e-Signatures. Procedural portal bring the latest generation technologies are at the service of Barcelona's citizens. The services availabe on the portal includes: For example, the current range of available procedures includes: Municipal tax direct debits; Application for a Barcelona resident registration certificate; Change of residence in the local population register; Self-assessment for tax on mechanically powered vehicles (IVTM); Self-assessment for tax on the increase in urban land value (capital gain); Application for permits to occupy space on the public highway, for the purposes of taking photographs or shooting films in Barcelona; Obtaining documents confirming payment of tax contributions and fines; Subscribing to text alerts from the Citizen and Businesses and

	Associations files; Application for financial help/grants and subsidies; Staff selection process and associated tax payments; Building work permit and notification procedures; E-notification of traffic fines and consulting them through the Citizen's File and the Businesses and Associations File
Website	https://w30.bcn.cat/APPS/portaltramits/portal/changeLanguage/default.html?&language=es

PROJECT FACTSHEET 10	
Title	**Bicing**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Achieving a safe and efficient means of transport with less impact on the environment.
Content	Bicing was launched in 2007 as a complementary urban transport based on shared bicycle use. Bicing has 420 stations spread round the city and 6,000 bikes. Bicing is complemented by the BicingApp. This is a simple app that gives access to real-time user information such as bicycle availability and stations. Thanks to Barcelona Contactless technology, users can download the app by merely scanning the QR code or drawing your mobile close to the NFC chips placed in every station.
Website	https://www.bicing.cat/es/

PROJECT FACTSHEET 11	
Title	SIIUR project (Integral Solution for Urban Infrastructures)
Dimension of KPIs	Environment – Energy/Climate and Air Quality
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	The goal is to better satisfy the needs of citizens and institutions,

	improve energy efficiency and reduce pollution and energy consumption.
Content	SIIUR project is an innovative integration of urban infrastructure and services to manage cities in a more efficient, friendly and intelligent way. 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 SIIUR 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.
Website	www.siiur.com

PROJECT FACTSHEET 12	
Title	SENSORS FOR URBAN SERVICES
Dimension of KPIs	Social – Governance effectiveness Environment – Energy
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Bring order to the many municipal information systems and to integrate other information systems from the private sector.
Content	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. 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. 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).
Website	www.libelium.com www.urbiotica.com www.worldsensing.com www.zolertia.com

PROJECT FACTSHEET 13	
Title	INTEGRAL WASTE MANAGEMENT PLANT
Dimension of KPIs	Environment – Waste
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Recover waste for energy generation
Content	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. 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. 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.
Website	www.tersa.cat

PROJECT FACTSHEET 14	
Title	DISTRICLIMA
Dimension of KPIs	Environment – Climate and Air Quality
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Minimising fossil origin primary energy consumption
Content	Districlima 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 Districlima: 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 (Districlima is more flexible, reliable, and simple than traditional supply). Districlima prevented 10,100t of CO2 emissions and reduced the use of fossils fuels by 56% in 2010.
Website	www.districlima.com

PROJECT FACTSHEET 15	
Title	**Smart Traffic Lights**
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	*Helping blind people to use pedestrian crossings by e*mitting sound
Content	The system involves a small remote control device that is used on approaching the traffic light to activate the audio mode so that it emits a sound when it turns green. It does so only for a few minutes: long enough for the person to cross the street.
Website	http://smartcity.bcn.cat/en/smart-traffic-lights.html

PROJECT FACTSHEET 16	
Title	**School Routes**
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Programme that encourages school children to go to and from school in an independent and safe manner, as well as get to know the neighbourhood and improve their sense of orientation.
Content	School routes are participatory projects making up the road-safety educational and awareness policies, which opt for a new a new mobility culture that prioritizes quality of life and respect for both the environment and the urban surroundings. They are aimed at school children as well as their families, schools (they will be integrated into curriculum programmes, included within the AMPA [School Parents' Association] the neighbourhood in general (shopkeepers, neighbours, organisations and associations), and other municipal agents

	(local police service, etc.), which means all these groups must take responsibility as educational players. However, the project does not end once improvements have been made to the roads and the routes have been presented to the families, but rather, only when everyone involved continues to work on improving and maintaining them. 117 schools and colleges across all districts are registered on the programme for the 2013 - 2014 academic year.
Website	http://smartcity.bcn.cat/en/school-routes.html

PROJECT FACTSHEET 17	
Title	***ApparkB***
Dimension of KPIs	SOCIAL – Public service and infrastructures
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	*An application that enables drivers to pay for Green-Area and Blue-Zone parking via their mobile telephone without the need for parking meters.*
Content	Using geolocation technology the correct parking tariff is applied, which you confirm and that is enough. This is an optional system and is used in addition to the traditional parking meter system.
Website	http://smartcity.bcn.cat/en/apparkb.html

PROJECT FACTSHEET 18	
Title	**MobileID**
Dimension of KPIs	SOCIAL – Public service and infrastructures - Governance effectiveness
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Aims	This app enables people to complete the City Council's administrative procedures and applications, as well as access its services in a secure manner:
Content	The system mobileID allow to the citizenship identify remotament of certain way through a digital identity that finds to his mobile phone. It bases in a register of mobile digital identities that allow to associate a number of mobile phone to each citizen that want to have of this new modalitat of acreditació digital. Any user that have of a smartphone connected to internet (with line of data or through Wi-Fi) will be able to request and use his digital identity mobileID through an application, available for iPhone and Android. The technical system that backs this identity fulfils the technical and juridical standards national and international of transparent way for the citizens, that only interactuen with the application of his telephone. This system will be able to use to access of certain way to places web, as well as to services loaned through other channels, such as the telephonic or the presencial. Barcelona is the first city that implements a system of this type for his citizens, and puts it into motion to access to the municipal telematic services.
Website	http://smartcity.bcn.cat/en/mobileid.html

PROJECT FACTSHEET 19	
Title	V **FABRICATION LABORATORIES**
Dimension of KPIs	ECONOMY - Research & Innovation dynamics - Employment
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	These are open spaces where you can learn the basics of digital fabrication as well as any other technology or scientific process that can be applied to your day to day life.
Content	Fabrication Laboratories offer the most basic, experimental and entertaining way possible to stimulate anyone's initial level of interest in new scientific and technological models STEM: Science, Technology, Engineering and Mathematics, as well as new forms of informal learning and online organising: co-creation, collaboration, crowdsourcing, crowdfunding, etc. The strategy is primarily focused on three programmes: 1. Educational programme Exerting an influence on the educational system is a determining factor. Teachers who work at Nursery-, primary- and secondary-school levels, as well as those who deliver vocational and university courses, will take a training programme coordinated and certified by the Barcelona Education Consortium. 2. Family programme The family programme aims to engage with the home dimension of children's education. Technology and the new ways of organising and learning need to be understood within children's family environments so that parents and carers can accompany them with the development of their learning at home. Saturday, extracurricular and summer-school activities are being promoted, which will be attended by hybrid parent+child, grandparent+child, whole-family groups etc. By seeking to strengthen the bonds between family members and by offering joint discovery activities everyone can take part and

	learn in an informal, creative and fun way. 3. Social-innovation programme The social-innovation programme is aimed at highlighting the local environment of each Fabrication Centre's area of influence, by raising awareness of the district's hidden talent amongst the neighbourhood's local residents and associations. It promotes public-innovation dynamics, which are applied to the local area to hybridize work groups: they search for diversity or a lack of, in terms of age, sex, origin, training, profession, and they work through communal goals, self-tasking, flexible methodologies, etc.
Website	http://ateneusdefabricacio.barcelona.cat/en/

PROJECT FACTSHEET 20	
Title	**VI MSCHOOLS**
Dimension of KPIs	ECONOMY - Research & Innovation dynamics
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	**VI.I** AN EDUCATIONAL PROGRAMME AIMED AT GETTING SECONDARY-SCHOOL STUDENTS TO UNDERTAKE CLASSROOM STUDY USING MOBILE TECHNOLOGY.
Content	This world-pioneering programme consists of four initiatives: 1. "Let's mobilise computing". This is the title of an optional 4th year course in the compulsory secondary school education system (ESO): it is based on the conceptualisation and design of apps. The aim is for students to work in small groups and develop creative

	concepts in the form of an app that helps to contribute solutions and improve everyday activities. Besides having their teachers' support students are provided with input by some 200 professionals from leading businesses involved in the development of apps or videogames, business incubators, Internet portals and entrepreneur associations. 2. Mobile Learning Awards. These are accolades to the most innovative initiatives in the field of education, for students and teachers alike. The prizes offer a great opportunity for gauging the mood of the educational community and identifying the main trends in using mobile devices in the classroom. 3. Mobile History Map. A project that will enable students to create and develop collective maps by using mobile technology. Students will become active developers by creating itineraries and points of interest (historical, leisure, film etc., routes) in their schools' vicinity, and then creating and editing, using geolocation, descriptive content about their most immediate environment. 4. An impetus for entrepreneurs in the ICT-Education sector. Other programmes have been launched, in parallel to the mSchools programme, which introduce students to mobile technology, such as the organisation of weekly school trips to the Mobile World Centre, the MWCB centre in Plaça Catalunya.
Website	http://smartcity.bcn.cat/en/mschools.html

PROJECT FACTSHEET 21	
Title	**Radars Project**
Dimension of KPIs	Social – Social Inclusion
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	

Aims	This initiative was created to enable people aged over of 75, who live alone or with other elderly people, to continue living in their own homes, but with the support from local community members to ensure their social welfare.
Content	"Radars" are a network of local residents, retailers, volunteers and professionals from associations and services linked to neighbourhood life. They all work together for the common goal of building a more humane and caring neighbourhood and reducing the effects of solitude and the risks of isolation and social exclusion among the elderly. The project calls on these local "radars" to be attentive – keeping a respectful look-out to ensure privacy– to the daily dynamics of the elderly people they know. If they spot some a change in their daily routine, behaviour or aspect, they communicate their observations by phone or email to the Social Services centre. The project includes a search and detection stage called "Door to Door". Volunteers from a third-sector association visit residential buildings with a high elderly population in each neighbourhood, both to disseminate news about the project and engage elderly people as users. The elderly people identified, whether through "Door to Door" or thanks to contact from a "radar", are assessed by Social Service professionals, who then make a response in conjunction with the local neighbourhood network. The process is completed with support from a Telephone Monitoring Platform, a group of volunteers who periodically make a companionship call to elderly people to keep them informed of the neighbourhood's social life (activities, resources, services etc.,) and thereby connect them to their local community.
Website	http://smartcity.bcn.cat/en/radars-project.html

PROJECT FACTSHEET 22	
Title	Sustainable Barcelona Map

Dimension of KPIs	Environment. Economy – R&I Dynamics
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	It's an interactive, virtual map, as well as a social network, which introduces the city's initiatives and places of interest with environmental and social value.
Content	This information can be of use for consulting, for example, the situation of sustainable shops, services and businesses, environmental facilities, fauna and flora wildlife refuges in the city etc. All these initiatives, whether public or private, which add a green-economy value and help to improve the urban environment, in building a fairer and more inclusive social structure and enriching the community and local-neighbourhood fabric. The content of the new map is being created through collaborative workshops. On an individual level, you can consult the Calendar for the coming workshops in your neighbourhood and take part in the new content of the map by proposing points of interest, uploading photographs or writing out your experiences or stories. You can organise new workshops, give a helping hand with the project's coordination or take part as an expert. If you are a school, you can use the map as a teaching resource and promote the student community's participation. What's more, the Map is the city's contribution to the Open GreenMaps international initiative, in which over 850 cities from 65 countries are taking part.
Website	http://smartcity.bcn.cat/en/sustainable-barcelona-map.html

PROJECT FACTSHEET 23	
Title	**Superblocks**

Dimension of KPIs	Social – Public Services and Infrastructures, Governance Effectiveness Environment – Land use, Transport and mobility, Waste
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Superblocks is a project designed by Barcelona City Council in collaboration with the Urban Ecology Agency that aims to foster sustainable mobility, the intensive use of public spaces, biodiversity, social cohesion involving the participation of the general public, a reduced ecological footprint and, in short, which enhances the human dimension of the city. This will all be achieved by promoting a new type of urban organization in five macro-areas specially chosen for the experiment.
Content	This is a territorial unit that is smaller than a neighbourhood but bigger than a residential block, with calm streets where urban planning and environmental activities are held. Compact, efficient areas, that have a positive effect on the life of Barcelona residents and which are also self-sufficient in terms of energy consumption. The aim is to improve the quality of life and conditions for local residents, by rationally managing natural resources and public spaces, through the active participation of everyone involved and by fighting inequality and social exclusion. **What is going on in these superblocks?** 1. More sustainable mobility: by integrating the new Orthogonal Bus Network and Bicing in accordance with Barcelona's Urban Mobility Plan, encouraging journeys on foot and by bicycle and improving the distribution of goods, in order to reduce both noise levels and emissions. 2. Revitalising public areas: by making the streets quieter, increasing the number of recreational areas and promoting new uses for these places. 3. Fostering biodiversity and urban vegetation: by improving the trees in the streets, favouring microhabitats in order to attract birds and increasing the amount of urban vegetation by creating new community areas. 4. Fostering the city's social fabric and promoting cohesion: by guaranteeing appropriate local facilities, encouraging productive activities that create jobs and working for social inclusion. 5. Promoting self-sufficiency in the use of resources: by

	reducing consumption, producing renewable energy, decreasing the demand for drinking water and making better use of greywater and river water. 6. Integrating governance processes: by involving the general public when defining projects and developing actions.
Website	http://smartcity.bcn.cat/en/superblocks.html

PROJECT FACTSHEET 24	
Title	**Telemanaging irrigation**
Dimension of KPIs	Environment – Water
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	The mechanism, now installed and successfully up and running at several of the city's parks, optimises water use from a communications infrastructure built on the current irrigation network which integrates a SCADA (Control Supervisor and Data Acquisition) system tailored made for Barcelona.
Content	This tool enables irrigation to be telemanaged and optimised through the remote control of the electric valves that turn on the water. The data it uses are gathered by a network of sensors that improve the irrigation's efficiency. The process includes Sentilo free-programming technology, an open code platform launched by the City Council. **How does it work?** Barcelona Parks and Gardens staff inspect the state of the plants in these green spaces every day, using a tablet. This gives the gardeners at each of the parks a quick and easy way of seeing how the irrigation system is working and enables them to detect any incidents that may have occurred, so they can repair them quickly. When new species are planted or if they spot some area of the park that needs more water, they can provide extra irrigation manually, though that should be

	the exception. The irrigation telemanaging system quantifies the input and output of a system's water at a specific time, compares them with the plants' water needs and complements all that with data on rainwater and irrigation variables, including water evaporation, transpiration, drainage and percolation. That way it only provides the water that is strictly needed for irrigation, so preventing any waste. In addition to that, the system automatically stops when it rains and adapts to any wind so that the water will not fall outside the irrigation area. Barcelona City Council is adopting this initiative as part of its "smartwater" strategy for managing the city's water resources more efficiently. That includes not just public irrigation and fountains but also ground and underground water. This line of action is designed to improve the perception of the value of water, by using new technologies in planning facilities and a more rational management policy that achieves maximum water performance for the city and we the people who live in it.
Website	http://smartcity.bcn.cat/en/telemanaging-irrigation.html

PROJECT FACTSHEET 25	
Title	**City OS**
Dimension of KPIs	Social – Governance effectiveness
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	A technological platform set up to help Barcelona City Council take decisions in real time, in order to meet the needs of governing the city and improve the quality of life of its citizens.

Content	This platform has the capacity to acquire and process information on the running of the city quickly, effectively, efficiently and in a sustainable manner. It has smart systems that allow it to analyse and relate events so it can produce simulations and anticipate any problem that might affect the city (including emergency situations). **Some of the City OS objectives are to:** 1. Integrate and correlate city data (sensorisation elements, municipal and non-municipal system databases, social media network data) and transform them into information. 1. Guarantee the quality of the information stored and security in accessing it. 2. Enable knowledge of the different services offered by Barcelona to be handled both horizontally (between services) and vertically (to a global supervision centre). 3. Enable the data to be analysed and predictions to be made based on the data stored. 4. Run simulations of potential city situations. 5. Enable event behaviour patterns to be established. 6. Enable the integration of the services and production platforms through technological architecture. 7. Serve as a basis or model for future city platforms.
Website	http://smartcity.bcn.cat/en/city-os.html

PROJECT FACTSHEET 26	
Title	**BUITS Plan**

Dimension of KPIs	Environment – Buildings and Land Use
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Boosting public involvement in the concept and management of sites that are not being used in order to breathe life into them, find a community use for them and stop them from becoming run down.
Content	They are municipally owned sites with no provision for short-term development. The Plan is aimed at public and private non-profit organisations that are allowed to run these vacant sites for a maximum of three years. BUITS therefore enables them to be temporarily used as well as reclaimed, restored and developed as centres of neighbourhood life. Many of the winning projects are for city allotments and some of these are for people at risk of social exclusion.
Website	http://smartcity.bcn.cat/en/buits-plan.html

PROJECT FACTSHEET 27	
Title	**Citizen's Postbox**
Dimension of KPIs	Social – Governance effectiveness
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	An app for sending information on incidents in real time
Content	Barcelona City Councilal ready has several channels (Citizen Adviceand Information Offices, the 010 telephone advice service, the Civic Behaviour telephone service, the City Council website, etc.) through which city residents can make complaints, put forward suggestions or report

	incidents. But the Council continues to look for ways to offer a better service.
Website	http://smartcity.bcn.cat/en/citizens-postbox.html

PROJECT FACTSHEET 28	
Title	**Barcelona Growth**
Dimension of KPIs	Economic – Sustainable economic growth
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Generating discussion and propose initiatives for reflating the city's economy and creating new jobs.
Content	On the ground floor of the Barcelona Growth Centre, the Business Support Office offers businesses mediation, support and customised advice. Led by the local development agency, Barcelona Activa, it aims to provide a comprehensive service to every business in the city, Metropolitan Area and rest of the world that wishes to establish itself here. On top of that, it will help businesses to start up, look for staff, get funding and internationalise, provide information and advice on dealing with municipal procedures, and offer an extensive range of programmes aimed at helping businesses to grow, making them more competitive and establishing the foundations for creating quality employment. With the Business Support Office, Barcelona Activa is closing the circle on citizen care, from the unemployed to entrepreneurs and, now, business people too. It is a benchmark in the Barcelona Metropolitan Area in active employment policies, entrepreneurship and now business support.
Website	http://smartcity.bcn.cat/en/barcelona-growth.html

PROJECT FACTSHEET 29	
Title	**Sentilo**
Dimension of KPIs	Social – Governance effectiveness Economy – R&I Dynamics
Area of implementation (city, neighbourhood, etc.)	City of Barcelona
Project description	
Aims	Barcelona City Council has designed and promoted a platform that enables information generated by sensors distributed round cities to be gathered, used and disseminated.
Content	Sentilo has been developed entirely with open-source software components so that any city can use it directly to interconnect the sensors and actuators that it deploys. Open-source software allows considerable savings in the cost of implementing infrastructures in smart cities, as it is not necessary for each city to develop its own platform when another has already made that investment and shares the solution. The main objective of the Sentilo platform is to provide a functional, open, interoperable, easily expandable platform for any city in the world that requests it, sharing public investment in its development based on open-source software. The open-source software model also means that cities have no need to depend on specific providers in strategic areas such as access to the sensor network and actuators spread round their streets and squares. The Sentilo community aspires to become a meeting point in which cities and companies can work together to improve the platform, provide support and develop business using Sentilo. Some examples of how to use the platform currently being used by Barcelona are energy monitoring in municipal buildings

	obtaining data related to noise pollution levels as part of the Strategic Noise Map and urban laboratory activities, in many cases related to the Mobile World Lab project.
Website	http://smartcity.bcn.cat/en/sentilo.html

VII KEY PERFORMACE INDICATORS – BARCELONA

The analysis of the Key Performance Indicators (KPIs) is developed following the structure and the order presented in the POCACITO guideline documents on KPIs. Due to partial data availability this document does not present the full list of indicators; only those for which data are publicly available will be reported and analysed.

VII.I SOCIO-ECONOMIC INDICATORS

VII.I.I UNEMPLOYMENT

During the last decade Barcelona's unemployment increased substantially, mostly because of the adverse effect of the financial crisis.

The analysis of the evolution of Barcelona's unemployment rate shows how, beside the general increase in both rates, the crisis has not differentiated genders.

Geographical level: City of Barcelona

YEAR	TOTAL	MEN	WOMEN
31-12-2003	6.3	5.3	7.4
31-12-2004	5.8	5.2	6.7
31-12-2005	6.5	5.4	7.7
31-12-2006	6.6	5.4	8
31-12-2007	6.3	5.4	7.4

Source: Ajuntament de Barcelona, from national databases of INEM and EPA

Since 2008, changes in methodology

YEAR	TOTAL	MEN	WOMEN
4th.tr 2008	9.1	8.9	9.3
4th.tr 2009	15	15.7	14.5
4th.tr 2010	15.9	18.7	12.6
4th.tr. 2011	16.8	17.6	15.8
4th.tr. 2012	18.6	21	15.9
4th.tr. 2013	17	16.8	17.3
4th.tr. 2014	16.3	15.7	16.9
2th.tr. 2015	13.7	12.2	15.3

Source: Ajuntament de Barcelona, from data of INE and Departament d'Estadistica de l'Ajuntament de Barcelona

VII.I.II LEVEL OF POVERTY

Between 2004 and 2014 (not available data of 2003) the percentage of the population at poverty risk in Catalunya increased by 25.4% from 12.6% to 15.8%. As can be seen, a sharp increase in the poverty risk rate happened since 2008. Last update: 13.08.2015

Geographical level: NUT 2 Region (Catalunya)

Unit: Percentage of total population

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cat.	12.6	13.2	13.4	13.8	13.4	15.2	14.7	14.2	15.8	13.9	15.8

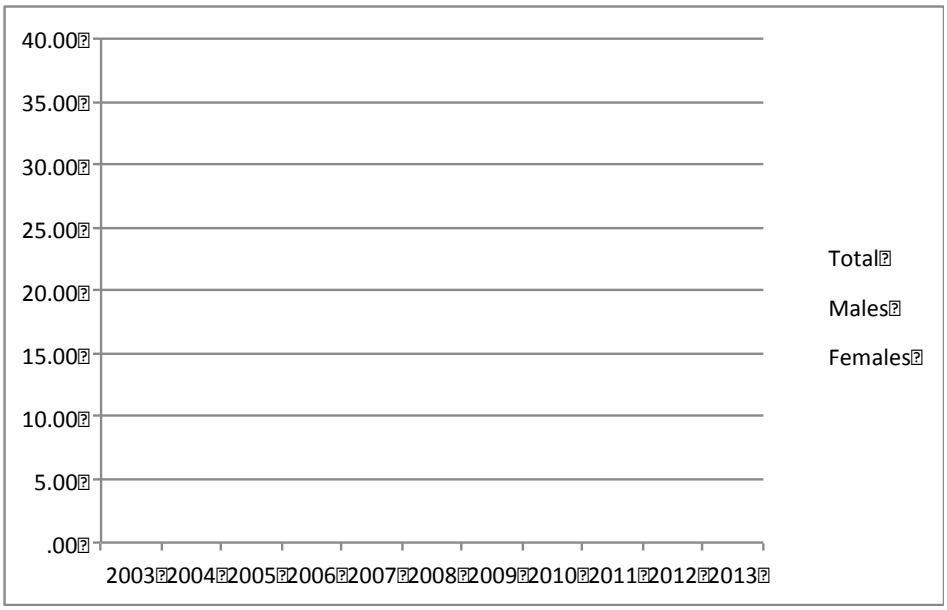
Variation Rate 2004 – 2012: + 25.4%

Source: EUROSTAT

VII.I.III EDUCATION LEVEL BY GENDER

Figure 9 presents the evolution of the variation rate of tertiary education level by gender. Due to lack of compatible statistics[2] for the city of Barcelona, the NUT II regional statistics have been used.

Analogously to the unemployment figures, the trend over the last decade inverted the role between men and women. At the end of 2003, the share of the population with a tertiary education level was respectively 27.2% for men and 26.8% for women. The situation at the end 2013 was quite different: the women share of population with tertiary education raised to 37.7% against a men's share of 31.9%; this was the result of a prolonged positive growth rate (constantly higher than the men's growth in this education level) along the whole decade (10,9% for women and 4,7% for men). The reasons for such a development would need closer analysis, but may be related to a lack of professional opportunities for young women compared to men.



Tertiary education level by gender, percentage of population aged 25-64 years. NUT II. Source Eurostat

[2] Statistics at lower level of governance do not use the same age groups.

Variation rate of tertiary education level by gender. Population aged 25-64. NUT II. Source Eurostat

VII.I.IV LIVE EXPECTANCY

Excluding a drop in 2005, average life expectancy in the city of Barcelona has grown for the whole period 2003-2012. At the end of 2003, average life expectancy at 1 year was 80.3 years, at the end of 2012 it was grown by 2.7 years reaching the level of 83 years.

YEAR	LIVE EXPECTANCY
2003	80.3
2004	81.1
2005	80.6
2006	82.1
2007	82
2008	82.3
2009	82.5
2010	82.8
2011	83.3
2012	83

Source: Departament d'Estadistica. Ajuntament de Barcelona.

VII.I.V GREEN SPACE AVAILABILITY

This indicator is on the green surface area of the city (urban forests, parks or green spaces) and their evolution between 2004 and 2013. Green areas (forests, scrubland and other green areas) have slightly decreased during this period.

Geographical level: City of Barcelona

Year	% rate of green space	m2/100 hab
2004	29.16	1882.6
2005	29.18	1867
2006	29.25	1856.7
2007	29.39	1876.7
2008	29.51	1860.9
2009	29.46	1851.6
2010	29.50	1856.5
2011	29.75	1877
2012	29.76	1870.6
2013	28.56	1805.9

Variation Rate of the surface area 2004 – 2012: + 2.058%

Source: Institut Municipal de Parcs I Jardins. Ajuntament de Barcelona

VII.I.VI MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

The city of Barcelona has been measuring the reduction in emissions. Every municipality in the district of Barcelona calculates the emissions based on a common methodology, based on data from energy consumption in housing, transport and industry. The district of Barcelona has also introduced a further level of emissions monitoring by including emissions dependent on the water cycle and waste management, areas in which municipalities have direct influence[3].

The Plan for Improving Air Quality in Barcelona (2015 – 2018) includes the work being carried out on this issue to improve the city's air quality, as well as future plans and projects.

The plan's main goal is to establish cross-cutting, strategic lines of action on air quality, so as to fully meet the values established by the European Union.

http://habitaturba.bcn.cat/qualitataire/sites/default/files/pdfs/PMQAB_CAT_2014.pdf

Source: Ajuntament de Barcelona.

VII.II ECONOMY

VII.II.I LEVEL OF WEALTH VARIATION RATE

Data are available only until the end of 2012. The variations of the indicator between 2003 and 2012 mirror quite closely the global macroeconomic conditions and the 6% drop in 2009 need to be red under this light. Despite the effects of the crisis, in 2012 the GDP of Barcelona hasn't fallen as much as the GDP of Spain. In terms of asing GDP per capita, Barcelona grew from 35.191 eur in 2003 to 37.347 eur in 2012, peaked at 39.926 in 2008 to then decline to the present level.

Geographical level: City of Barcelona

Year	GDP Barcelona (M eur)	GDP per capita (eur)
2003	55.707,37	35.191
2004	56.944,08	36.063
2005	58.549,9	36.754
2006	60.499,61	37.671
2007	62.051,33	38.903
2008	64.521,3	39.926
2009	61.490,5	37.910
2010	61.915,2	38.242
2011	60.620	37.535
2012	60.540	37.347

Variation rate 2003 – 2012: + 6.12%

Source: Ajuntament de Barcelona

VII.II.II VARIATION RATE OF GDP BY SECTORS

The rate of GDP of agriculture and industry (including building) has been declining steadily since 2003 while the weight of the services sector has increased in this period.

Geographical level: NUTS2. Catalunya.

%GDP by Sectors	2003	2012	2014
Agriculture	1.28%	0.87%	0.93%
Industry (building incl.)	34.4%	25.4%	25.25%
Services	64.32%	73.73%	73.79%

Variation rate 2003 – 2012: Agriculture: - 32 % Industry: - 26.16%

Services: + 14.63%

Source: IDESCAT

VII.II.III EMPLOYMENT BY SECTORS VARIATION RATE

The next table presents the percentage of employment and their variation rates by sector of Barcelona in the years 2003, 2012 and 2014.

Geographical level: City of Barcelona

	2003	2012	2014
Agriculture	0.1%	0.05%	0.041%
Industry	19%	11.60%	11.53%
Services	80.7%	88.35%	89.18%

Variation Rate 2003 – 2012: Agriculture: -50% Industry: - 38.95% Services: + 9.45%

Source: Departament de Treball. Generalitat de Catalunya.

VII.II.IV BUSINESS SURVIVAL

In Barcelona the number of active companies has fallen since 2009 due to the hit of the crisis. The data of previous years is only available at NUTS2 level. And the number of companies created in Barcelona has fallen sharply since 2006.

Geographical level: City of Barcelona

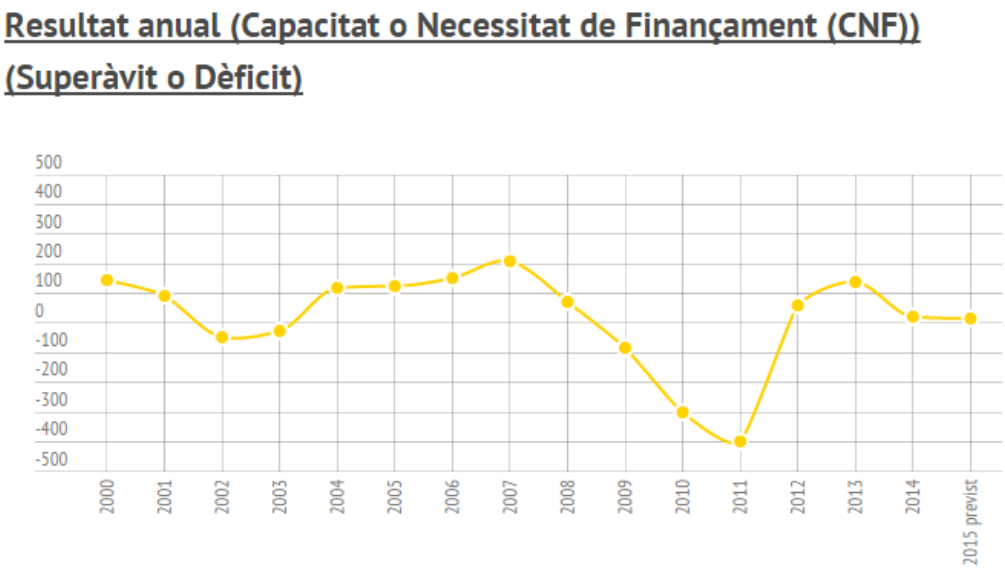
Year	Num. active companies
2009	179.294
2010	176.812
2011	174.926
2012	171.796
2013	169.777
2014	167.439

Year	Num. of companies created
2006	10.193
2007	9.315
2008	7.765
2009	6.223
2010	6.094
2011	6.416
2012	6.733
2013	7.067
2014	7.221

VII.II.V PUBLIC FINANCES

BUDGET DEFICIT VARIATION RATE

Except during the worst years of the crisis, the budget of Barcelona has presented a surplus.



Year	Budget Surplus/Deficit (M eur)	GDP Barcelona (M eur)	Budget S/D %
2003	- 26	55.707,37	- 0.04
2004	119	56.944,08	+ 0.21
2005	125	58.549,9	+ 0.21
2006	152	60.499,61	+ 0.25
2007	209	62.051,33	+ 0.33
2008	72.2	64.521,3	+ 0.11
2009	- 83.3	61.490,5	- 0.13
2010	- 300.2	61.915,2	- 0.48
2011	- 398.3	60.620	- 0.65
2012	60.1	60.540	+ 0.1
2013	139.3		
2014	22.2		
2015 (forecast)	16.1		

*data of GDP since 2013 not available

Source: Budget of Barcelona. http://governobert.bcn.cat/

INDEBTEDNESS LEVEL VARIATION RATE

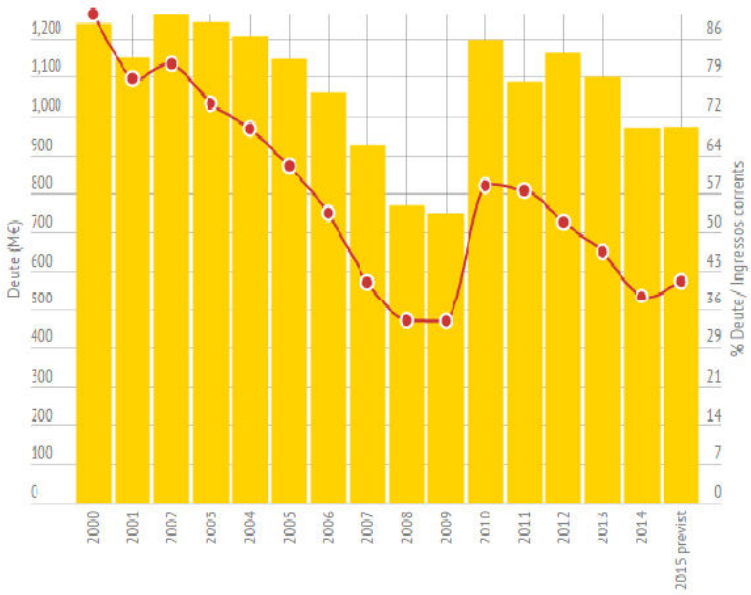
The level of public debt of the municipality of Barcelona was 1.1 bn in December 2013, the second highest after Madrid, which reached 7 bn. In per capita terms the city is in in position 1297 of Spain 8116 municipalities. Madrid at position 129, has three times the Barcelona debt level in per capita terms. The percentage of debt to GDP is low (less than 2%), so we can conclude that Barcelona has healthy public finances.

Geographical level: City of Barcelona

Year	Debt (M eur)	% city GDP
2003	1.244	2,23
2004	1.207	2,12
2005	1.148	1,96
2006	1.061	1,75
2007	928	1,49
2008	770	1,19
2009	750	1,22
2010	1.200	1,94
2011	1.090	1,8
2012	1.165	1,92
2013	1.101	
2014	972	
2015 (forecast)	974	

Variation rate 2003 – 2012: - 13,9%

Debt / Current Income:



Source: Budget of Barcelona. http://governobert.bcn.cat/

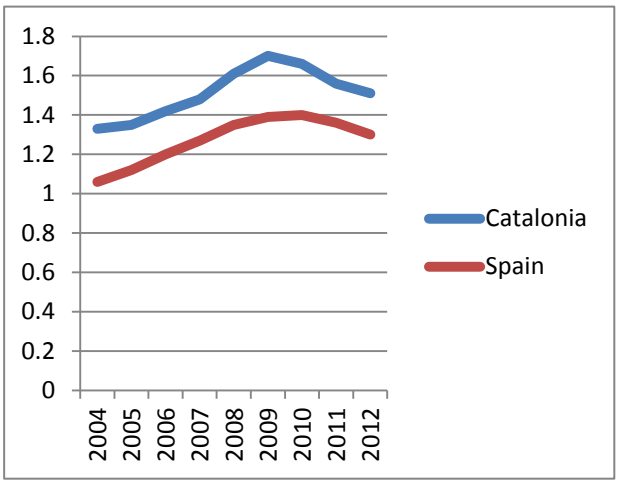
VII.II.VI R&D INTENSITY VARIATION RATE

IN 2012, Catalunya dedicated a higher share of GDP to R&D (1,51%) than Spain (1,35%), but still under the EU 2% average. Expenditure on R&D grew from 2004 to 2009 from 1,33% to 1,7%, but then declined due to the financial crisis. The apparent increase from 2007 to 2009 is misleading, because the level of expenditure did not grow in nominal terms, it is due to a fall in GDP greater than a fall in R&D expenditure. The percentage fall in R&D expenditure is thus a reflection of a greater proportional fall in R&D expenditure than the fall in GDP.

Geographical level: NUTS 2. Catalunya

Year	R&D as % GDP. Catalunya	R&D as % GDP. Spain
2004	1.33	1.06
2005	1.35	1.112
2006	1.42	1.2
2007	1.48	1.27
2008	1.61	1.35

2009	1.7	1.39
2010	1.66	1.4
2011	1.56	1.36
2012	1.51	1.3

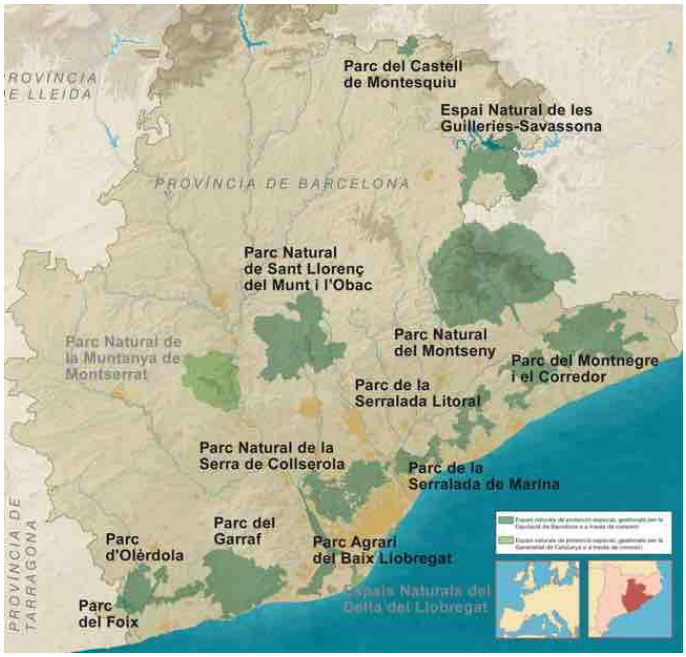


Source: IDESCAT. Institut d'Estadística de Catalunya

VII.III ENVIROMENTAL PERFORMANCE

VII.III.I VARIATION RATE OF ECOSYSTEM PROTECTED AREAS COVERED BY NATURA 2000 NETWORK

Barcelona is one of the most densely populated cities in Europe, surrounded by steep hills, the city has first developed densely before connecting to smaller towns beyond those hills transforming them into part of the urban area. The city of Barcelona has 12 natural protected areas of 1698,1402 ha or 22% of the territory, three of which surround the city. Barcelona has also set up a territorial information system to assess the situation of non-urban areas (SIXTELL). The objective of the information system is to support the administration in improving the functionality of the natural systems to mitigate impacts form socioeconomic changes. Three of the natural parks surround the city.



Area covered by Natura 2000 Network.

2009: 1637,8921 ha

2013: 1698,1402 ha.

Variation rate 2009 – 2013: +3.67%

Source: Servei de Planificació de l'Entorn Natural. Direcció General de Polítiques Ambientals. Departament de Territori i Sostenibilitat. Generalitat de Catalunya

VII.III.II ENERGY

ENERGY INTENSITY VARIATION RATE

Barcelona has a strong commitment to reducing the energy consumption in the region, as well as energy intensity, while energy consumption has fallen energy intensity increased from 2008 to 2010 before falling again. This is likely a result of the crisis and the fall in GDP, which has been proportionally stronger than the rate of emission reductions. In 2011 and 2012 with the end of the GDP fall and slight recovery, the energy intensity has continued falling, which may mean that GDP and emissions are at least partially decoupled. T

Geographical level: City of Barcelona

Year	Final energy consumption (toe)	GDP Barcelona (M eur)	Energy intensity (toe/M eur)
2003	1586285.65356	55.707,37	28,47
2004	1609545.92832	56.944,08	28,26
2005	1656345.72445	58.549,9	28,29
2006	1609219.33740	60.499,61	26,6
2007	1547974.62191	62.051,33	24,94
2008	1515874.99431	64.521,3	23,94
2009	1496811.64194	61.490,5	24,34
2010	1550892.25358	61.915,2	25,04
2011	1463338.53485	60.620	24,14
2012	1442993.26948	60.540	23,83

Energy Intensity, variation 2003 – 2012: - 16.3%

Source: Agencia d'Energia de Barcelona. Ajuntament de Barcelona.

VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

The final energy consumed in the industrial sector and urban transport, this mainly due to more efficient forms of transport, has fallen sharply in the past decade. The only sector in which the final energy consumed has increased slightly in the services sector.

Geographical level: City of Barcelona

Units energy consumption: Toe

Year	Final energy consum. Residential	F. e. c. Services	F. e. c. Industry	F. e. c. Transports
2003	432828.89	410983.66	326441.96	402702.49
2004	459221.84	425264.83	307540.84	402371.45

2005	489257.09	428333.62	325914.87	397254.51
2006	457912.81	436899.39	307010.31	394822.01
2007	428886.11	444578.67	274239.03	388441.96
2008	438698.19	449715.73	238571.79	377018.05
2009	460696.47	445343.93	219137.57	356166.81
2010	477888.22	447238.17	245596.73	365259.67
2011	413052.45	425621.66	269997.93	337704.21
2012	422434.05	419103.18	257051.59	329567.49

Variation F.E.C. residential 2003 – 2012: - 2.4%

Variation F.E.C. services 2003 – 2012: + 1.97%

Variation F.E.C. industry 2003 – 2012: - 21.25%

Variation F.E.C. transports 2003 – 2012: - 18.16%

Source: Agencia d'Energia de Barcelona. Ajuntament de Barcelona.

VARIATION RATE OF CARBON EMISSIONS INTENSITY

The carbon emissions intensity (ton CO2/M eur) has dropped by almost 30% in the city of Barcelona in the last decade.

Geographical level: City of Barcelona

Year	CO2 emissions (ton)	GDP Barcelona (M eur)	Carbon emissions intensity
2003	4.722.334	55.707,37	84,77
2004	4.810.190	56.944,08	84,47
2005	5.003.266	58.549,9	85.45
2006	4.582.807	60.499,61	75,75
2007	4.414.823	62.051,33	71,15

2008	4.200.892	64.521,3	65,11
2009	4.080.249	61.490,5	66,35
2010	4.015.199	61.915,2	64,85
2011	3.813.137	60.620	62,90
2012	3.690.033	60.540	60,95

Variation rate 2003 – 2012: - 28,1%

Source: Agencia d'Energia de Barcelona. Ajuntament de Barcelona.

VARIATION RATE OF CARBON EMISSIONS BY SECTOR

The data of the variation of carbon emissions (tons CO2) by sector mirrors the variation of final energy consumption. But even in the service sector, which has increased in this period and had slightly increased their consumption of energy, reduces carbon emissions.

Geographical level: City of Barcelona

Year	Emissions Residential	Emissions Services	Emissions Industry	Emissions Transports
2003	831.800	649.600	642.210	1.682.470
2004	987.000	829.820	633.710	1.696.030
2005	1.094.930	899.870	692.760	1.689.790
2006	957.780	807.280	630.090	1.679.660
2007	889.860	817.460	553.990	1.663.570
2008	905.370	815.730	515.060	1.617.310
2009	942.210	793.010	470.260	1.477.980
2010	925.420	713.420	505.000	1.491.380
2011	789.060	676.270	556.890	1.417.950
2012	791.410	637.500	534.420	1.379.700

Variation rate 2003 – 2012, Residential: - 4,85%

Variation rate 2003 – 2012, Services: - 1,86%

Variation rate 2003 – 2012, Industry: - 16,78%

Variation rate 2003 – 2012, Transports: - 18%

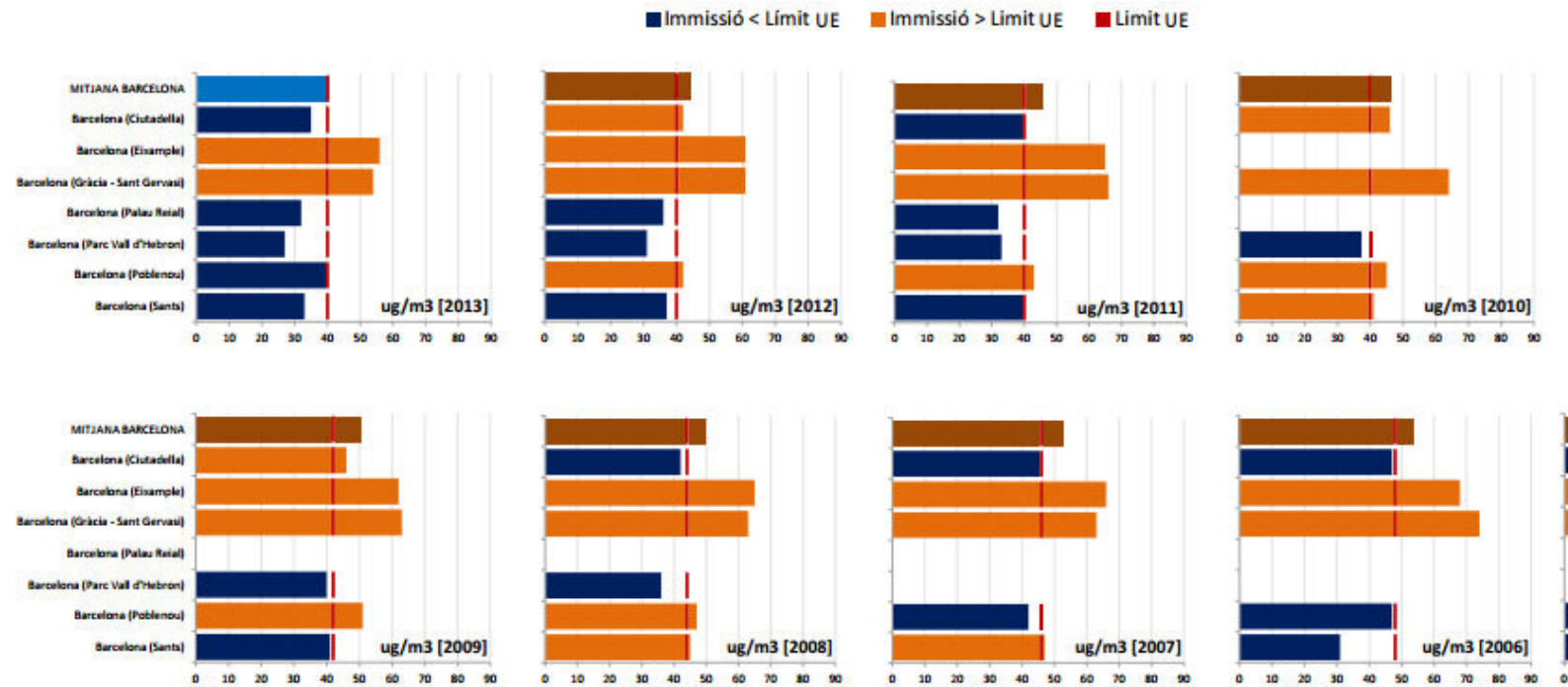
Source: Agencia d'Energia de Barcelona. Ajuntament de Barcelona.

VII.III.III AIR QUALITY

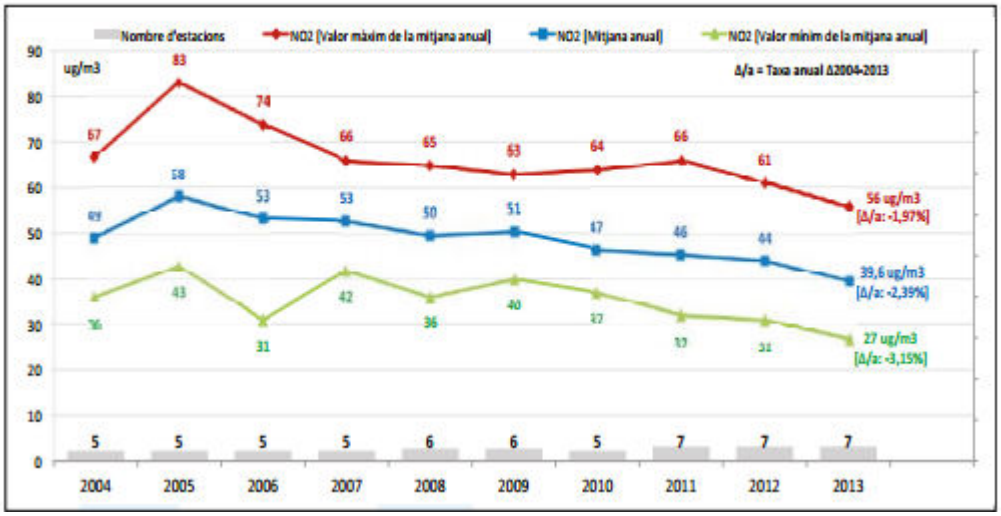
Geographical level: City of Barcelona

The "Pla de millora de la qualitat de l'aire de Barcelona 2015-2018" shows data of air quality in Barcelona collected by its 7 measuring stations, and presents a series of measures to improve the air quality.

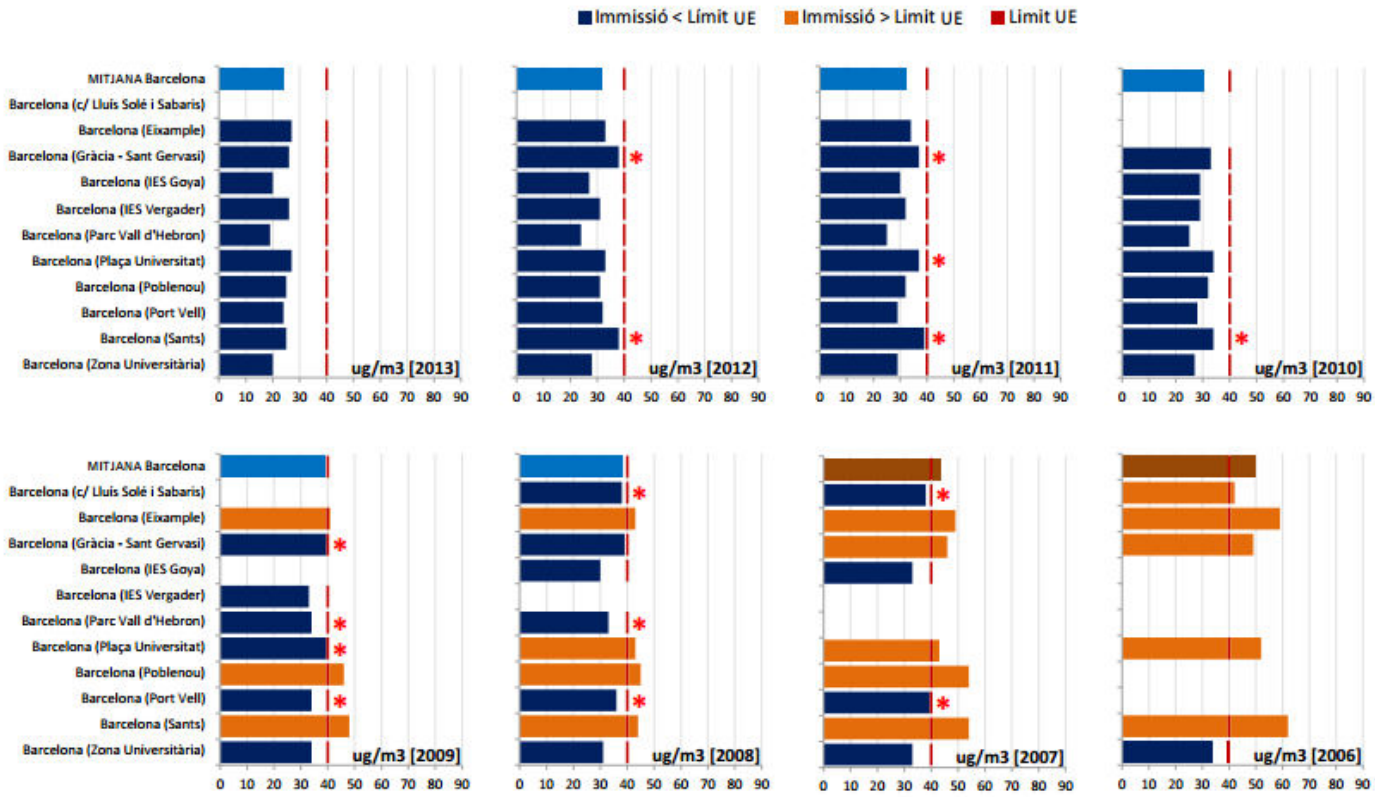
Evolution of the annual average concentration of NO2 in Barcelona, and in its 7 measuring stations, from 2006 to 2013 compared with the limits set by the EU:

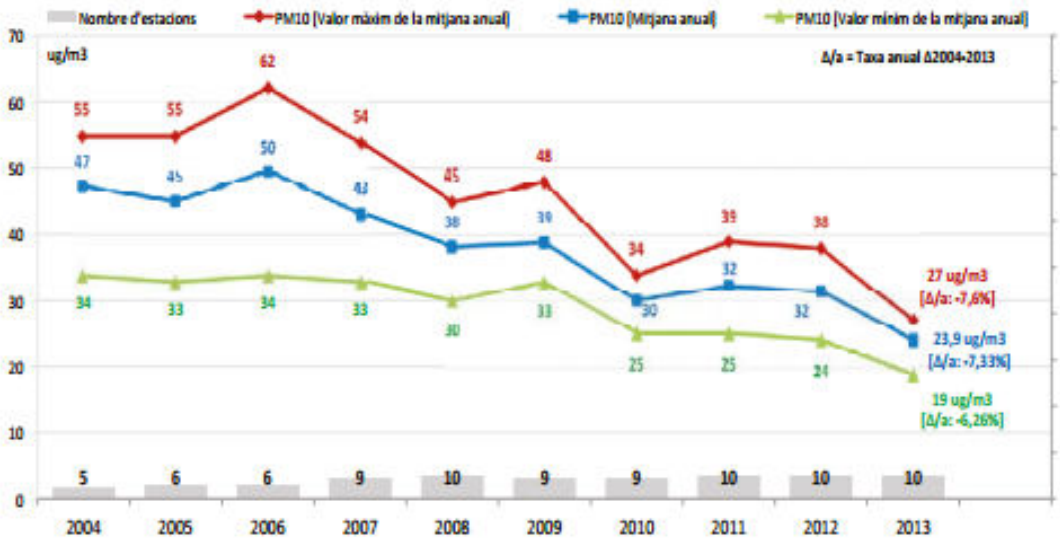


Gràfic 13: Evolució de la immissió d'NO_2 de la mitjana de les estacions de Barcelona.



Evolution of the annual average concentration of PM10 in Barcelona from 2006 to 2013 compared with the limits set by the EU:





Source: Departament de Territori i Sostenibilitat, Generalitat de Catalunya.

Days where the city of Barcelona issued an alert:

Exceedance of air quality limit values (days)[4]	
	Days where values were exceeded
2003	19
2012	2
Variation Rate (%)	**-89,5%**

Source: http://estadistica.bcn.cat/

VII.IV VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

Barcelona's 2013/2018 “Pla de Mobilitat Urbana” is a planning tool defining the lines of action that will govern urban mobility in the coming years, with the strategic mission of continuing to move towards a more sustainable, efficient, equitable, safer and healthier collective mobility model, with the aim to improve the quality of life of the population.

The annual "Dades basiques for Mobility" of Barcelona, shows the number of daily journeys and the method of transport of more than 5 minutes in the city (number in thousands):

Geographical level: City of Barcelona

TOTALS	2004	2005	2006	2007	% 07/06	% mode
Transport públic	2.630	2.687	3.081	3.149	2,19%	39,64%
Transport privat	2.514	2.536	2.259	2.308	2,20%	29,06%
A peu i en bicicleta	2.386	2.399	2.445	2.487	1,70%	31,30%
Total	7.530	7.622	7.785	7.944	2,04%	100,00%

							% mode	
TOTALS*	2011	2012	2013	2014	% 14/13	% 14/11	2014	2011
Transport públic	3.127	3.011	3.012	3.056	1,47%	-2,26%	39,7%	39,9%
Transport privat	2.088	2.057	2.028	2.014	-0,72%	-3,58%	26,2%	26,7%
A peu	2.500	2.518	2.496	2.483	-0,50%	-0,67%	32,3%	31,9%
En bicicleta	118	124	127	136	7,43%	15,48%	1,8%	1,5%
TOTAL	**7.833**	**7.710**	**7.662**	**7.690**	**0,36%**	**-1,84%**	**100,0%**	**100,0%**

The results show that the numbers in the public transport modes are not changing significantly. The use of private transport has declined and there has been an increase in cycling and walking displacements.

Variation of sustainable transportation for all travel 2004 – 2011: + 10.11%

Source: Ajuntament de Barcelona. http://www.bcn.cat/estadistica

VII.V WASTE

VII.V.I VARIATION RATE OF URBAN WASTE GENERATION

Geographical level: City of Barcelona

One of the goals of the "Pla de prevencio de residus 2012 – 2020" of Barcelona is to reduce waste generation per capita 10% by 2018 (as compared to the reference year, 2006). This goal is already achieved.

Year	**kg of waste per person per day**
2003	1.44
2004	1.47
2005	1.48
2006	1.45
2007	1.47
2008	1.51
2009	1.46
2010	1.43
2011	1.37
2012	1.27
2013	1.24
2014	1.26

Variation of solid waste production 2007 – 2012: - 13.6%

Source: Ajuntament de Barcelona. http://www.bcn.cat/estadistica

VII.V.II VARIATION RATE OF URBAN WASTE RECOVERY

The waste generated by the city of Barcelona has dropped since 2006 and the total recycling has remained stable, so the percentage of urban waste recovery has increased.

Geographical level: City of Barcelona

Year	Total Waste (ton)	Total Recovery (ton)	Percentage
2006	879.092	267.273	30,40%
2007	898.453	287.085	31,95%
2008	894.738	289.773	32,86%
2009	864.758	280.148	32,39%
2010	844.140	333.798	39,54%
2011	804.920	304.727	37,85%
2012	753.737	279.433	37,07%
2013	730.285	264.044	36,45%
2014	739.061	266.923	36,11%

Variation rate 2007 – 2012: + 16.02%

Source: Ajuntament de Barcelona. http://www.bcn.cat/estadistica

VII.VI WATER

VII.VI.I WATER LOSSES VARIATION RATE

Barcelona is a water conscious region and has been striving to reduce water consumption and losses in the region. The water distribution of the city of Barcelona is done through the Operational Control Centre of Aiguas de Barcelona. The water distribution system is composed of 4500km of monitored pipes. The control centre is linked to 100 remote stations which allows not only to control the water flows, but also detect anomalies. The metropolitan area has another 1500 km of pipes, but are not managed by the same organisation.

A better management of water has resulted in a fall in consumption per capita in the city from 129.6 litres a day to 105.2 from 2001 to 2013.

From the point of view of water losses the city has published the figures of water that has been measured as reaching the consumer, the efficiency of the water network. In 2013 this was of 82.1%. 17,9% of the water entering the system is unaccounted for and may be due to losses in the system or fraud. Technically speaking this is a high efficiency level and will fall as metering improves.

Geographical level: City of Barcelona

Year	Consumption per capita (l/hab/day)
2001	129.6
2005	120.3
2010	107.1
2013	105.2
2014	101.1

Variation consumption per capita 2005 – 2013: - 12.55%

Source: Aigues de Barcelona, 2015

VII.VII BUILDINGS AND LAND USE

VII.VII.I ENERGY EFFICIENCY CERTIFICATION OF BUILDINGS

The energy efficiency certification of buildings was only introduced in Spain in 2013. Data on certificates has been published for the city of Barcelona recently became available. 279.998 certificates have been issued from the 28th of May 2013 until the 20th April 2015.

Source: Institut Catala d'Energia

VII.VII.II URBAN DENSITY

The number of registered buildings in the city of Barcelona has decreased in the last decade

Number of registred buildings in 2001. 75.932 = 745,162 buildings/km2

Number of registred buildings in 2011. 70.676 = 693,582 buildings / km2

Variation Urban Density 2001 – 2011: - 6,92%

Source: Ajuntament de Barcelona. http://www.bcn.cat/

VIII FINDINGS AND KEY CHALLENGES

Table 2 summarises the global trends for each KPI indicator for the Barcelona case study city. In red are the indicators in which Barcelona records a negative trend; overall Barcelona's trends are all in line with a post-carbon city trend. Negative developments have been caused by external economic shocks rather than a lack of policy action.

Table 2 - Summary of KPI's global trends

DIMENSION	SUB-DIMENSION	INDICATOR	YEAR	TREND
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	2003-2015	↗
		Variation rate of poverty level	2004-2014	↗
		Variation rate of tertiary education level by gender	2003-2013	↗
		Variation rate of average life expectancy	2003-2012	↗
	Public services and Infrastructures	Variation rate of green space availability	2004-2013	↗
	Governance effectiveness	Existence of monitoring system for emissions reductions	N/A	yes
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	2009-2013	n/a

DIMENSION	SUB-DIMENSION	INDICATOR	YEAR	TREND
AND CLIMATE	Energy	Energy intensity variation rate	2003-2012	↘
		Variation rate of energy consumption by sectors	2003-2012	↘
	Climate and Air Quality	Variation rate of carbon emissions intensity	2003-2012	↘
		Variation rate of carbon emissions by sector	2003-2012	↘
		Exceedance rate of air quality limit values	2003, 2012	↘
	Transport and mobility	Variation share of sustainable transportation	2004 – 2014	↗
	Waste	Variation rate of urban waste generation	2003-2014	↘
		Variation rate of urban waste recovery	2006-2014	↘
	Water	Water losses variation rate	2011-2014	↘
	Buildings and Land Use	Energy-efficient buildings variation rate	2013	n/a
		Urban building density variation rate	2001-2011	↘
ECONOMY	Sustainable economic growth	Level of wealth variation rate	2003-2012	↗
		Variation rate of GDP by sectors	2003-2014	
		Employment by sectors variation rate	2003-2014	
		Business survival variation rate	2009-2014	↘
	Public Finances	Budget deficit variation rate	2003-2015	↘
		Indebtedness level variation rate	2003-2015	↘
	R & I dynamics	R&D intensity variation rate	2004-2012	↗

The municipality of Barcelona has seen a slight fall in population from 1970 until the year 2000, from 1.75 million inhabitants to 1.5 million inhabitants. The population has since increased due to the revalorisation of the centre of the town and is today just over 1.6 million. The metropolitan area has increased strongly in population from 2.74 million inhabitants in 1970 to 3.2 million. The province of Barcelona has seen an increase from 3.9 million to 5.5

million inhabitants. The influx of young immigrants from other parts of Spain and abroad has helped Barcelona to diminish the impact of the ageing population.

The creation of the AMB as an entity to help develop the city in an integrated and coherent fashion is helping the city to develop a coherent and efficient transport sector which is reflected in a growing use of public transport. The efforts to facilitate cycling and walking are clearly paying off according to census results.

Barcelona is at the forefront of the Smart City movement and is aiming to retain its position despite the financial crisis and the difficulties this has created for new investment. The city is still vibrant in initiatives and seems poised to regain any lost ground.

Sustainability strategies from transport to green space protection and waste and water management are being implemented.

The city is also trying to find a balance between the need to maintain it as a tourist centre, while keeping its local character. The modernisation of the city has not changed the strategy of the authorities to retain the local markets and the characters of the city districts with their 'town centre'. There will be a need to balance the pressures created by the tourist and expat community, and the protection of the patrimony and local social structures, which in turn make the city attractive to tourists and investors too.

From the point of view of carbon emission, Barcelona has several strategies which seem to be impacting on carbon emissions. Emissions intensity and total emissions have been falling and despite the impact of the financial crisis there seems to be some indication that GDP growth and emissions have been to some extent decoupled as energy intensity was also falling before the crisis hit.

The energy certification of buildings has been introduced only recently and there is this little information that can be extracted from the registration process, except that the energy certification of buildings is taking place rapidly and the database of the municipality has issued 150.000 permits.

The city of Barcelona seems to be solidly anchored on a path to a post carbon city, driven by its objective to remain at the forefront of the smart city movement. This means that Barcelona can be seen as an example on progress. Areas where the city needs to pay particular attention are risk of poverty and social exclusion. Barcelona may recover from the crisis, but some groups is society may well fall in long-term unemployment and poverty.

IX CONCLUSIONS

Barcelona is leading in the path to a sustainable economic growth towards a post-carbon city. Two aspects may require attention by the city authorities. First is the need to address the challenges of an increased share of the population at risk of exclusion and poverty. The city has focused strongly on the tourism and business attractiveness and is at the forefront of actions in the area of technology and environment. The risk may be a class of marginalised citizens not able to benefit from the advanced city features.

Barcelona is crossing the threshold of a testing ground for technologies to one of large-scale application of those. For this a stronger role for the AMB as coordinating body for the city may be needed. The movement is there, the recommendation is to continue ahead.

The growing level of municipal indebtedness of will require the city to explore new financial models for the public procurement and public services, seeking better cost recovery mechanisms, while ensuring affordability for the citizens and positive economic impacts for the city.

ANNEX I

List of key performance indicators

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	Percentage	2003-2012
		Variation rate of poverty level	Percentage	2003-2012
		Variation rate of tertiary education level by gender	Percentage	2003-2012
		Variation rate of average life expectancy	Average Nº	2003-2012
	Public services and Infrastructures	Variation rate of green space availability	Percentage	2003 2012
	Governance effectiveness	Existence of monitoring system for emissions reductions	Yes/No Description	2013
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	Percentage	2003 2012
	Energy	Energy intensity variation rate	Toe/euro Toe	2003 2012
		Variation rate of energy consumption by sectors	Percentage	2003 2012
	Climate and Air Quality	Variation rate of carbon emissions intensity	Ton CO_2/euro Ton CO_2	2003 2012
		Variation rate of carbon emissions by sector	Ton CO_2	2003 2012
		Exceedance rate of air quality limit values	Nº	2010 2012
	Transport and mobility	Variation share of sustainable transportation	Percentage	2001 2011
	Waste	Variation rate of urban waste generation	Kg/person/ year	2007 2012
		Variation rate of urban waste recovery	Percentage	2007 2012
	Water	Water losses variation rate	m^3/person/ year	2003 2012

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
	Buildings and Land Use	Energy-efficient buildings variation rate	Percentage	2007 2012
		Urban building density variation rate	Nº/ km^2	2001, 2011
ECONOMY	Sustainable economic growth	Level of wealth variation rate	eur/person	2003-2012
		Variation rate of GDP by sectors	Percentage	2003-2012
		Employment by sectors variation rate	Percentage	2003 2012
		Business survival variation rate	Percentage	2008, 2009, 2010
	Public Finances	Budget deficit variation rate	Percentage of city's GDP	2003-2012
		Indebtedness level variation rate	Percentage of city's GDP	2003-2012
	Research & Innovation dynamics	R&D intensity variation rate	Percentage	2003-2012