POCACITO

european post-carbon cities of tomorrow

COMPILED INDIVIDUAL ASSESSMENT REPORTS

BARCELONA, ISTANBUL, LISBON, LITOMĚŘICE, MALMÖ, ROSTOCK, ZAGREB, MILAN-TURIN, COPENHAGEN

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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	Strategic 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 Compiled Individual Assessment Reports, integrated in Task 3.2 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, Malmö, Istanbul, Lisbon, Litoměřice, Milan-Turin, Rostock and Zagreb. An important step to achieve the project's goal is to produce an individual assessment of case study cities in order to evaluate the current situation of these cities as an input into the scenario development.

This document includes the Individual Assessment Reports of the following case study cities: Barcelona, Malmö, Istanbul, Lisbon, Litoměřice, Milan-Turin, Copenhagen, Rostock and Zagreb.

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.

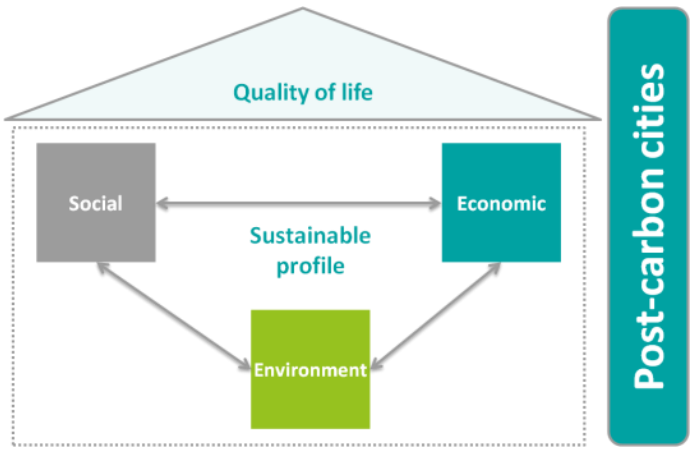


Figure 1 - Conceptual model

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 emissions and its contribution to climate change. Some energy intensive sectors are emphasised, 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.

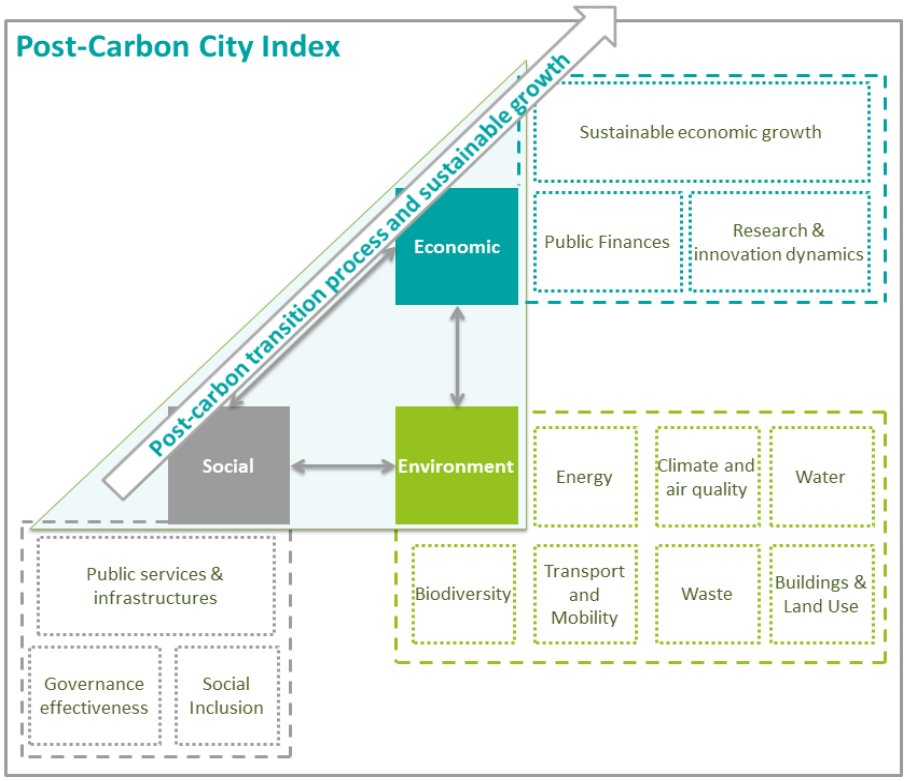


Figure 2 - Dimensions and sub-dimensions of the Post-Carbon City Index

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 privileged 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.

III CASE STUDY CITY BARCELONA

III.I DATA COLLECTION

Gathering data for Barcelona brings a number of difficulties, because the urban area is 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 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

DIM	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	NUT II	2002-2013	IDESCAT, www.idescat.cat
		Variation rate of poverty level	NUT II	2005-2013	Eurostat
		Variation rate of tertiary education level by gender	NUT II	2004-2013	Eurostat
		Variation rate of average life expectancy	NUT II	2004-2012	Eurostat
	Public services and Infrastructures	Variation rate of green space availability	Municipality	2003-2013	IDESCAT, www.idescat.cat
	Governance effectiveness	Existence of monitoring system for emissions reductions	N/A	N/A	N/A

DIM	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas n/a	NUT III AMB	2013	www.parcs.diba.cat
	Energy	Energy intensity variation rate	Municipality	2003-2011	IDESCAT, www.idescat.cat
		Variation rate of energy consumption by sectors	NUT II	2008, 2012	Barcelona energy agency
	Climate and Air Quality	Variation rate of carbon emissions intensity	NUT III	2005, 2009	INE, www.ine.pt; APA, www.apambiente.pt
		Variation rate of carbon emissions by sector	NUT III	2003-2012	IDESCAT, www.idescat.cat
		Exceedance rate of air quality limit values	Municipality	2003, 2012	Generalitat de Catalunya http://mediambient.gencat.cat
	Transport and mobility	Variation share of sustainable transportation	AMB	2008, 2013	EMEF yearly surveys www.IERMB.cat
	Waste	Variation rate of urban waste generation	Municipality	2002-2013	Barcelona municipality, www.bcn.cat
		Variation rate of urban waste recovery	Municipality	2007-2012	Barcelona municipality, www.bcn.cat
	Water	Water losses variation rate n/a	Water utility	2013	Aguas de Barcelona
	Buildings and Land Use	Energy-efficient buildings variation rate n/a	Municipality	2012, 2013	www.icaen.gencat.cat
		Urban building density variation rate	N/A	N/A	N/A
ECONOMY	Sustainable economic growth	Level of wealth variation rate	NUT III	2001-2011	Eurostat
		Variation rate of GDP by sectors	N/A	N/A	N/A
		Employment by sectors variation rate	NUT III	2010-2012	IDESCAT, www.idescat.cat
		Business survival variation rate	NUT III	2008, 2009, 2010	Barcelona municipality, www.bcn.cat
	Public Finances	Budget deficit variation rate	Municipality	2008-2013	SIELOCAL
		Indebtedness level variation rate	Municipality	2008-2013	SIELOCAL

DIM	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
	Research & Innovation dynamics	R&D intensity variation rate	**NUT II**	**2004-2012**	**IDESCAT, www.idescat.cat**

III.II OVERVIEW OF THE CASE STUDY CITY

III.II.I TERRITORY

Barcelona is the second largest city in 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 million 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 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) (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).

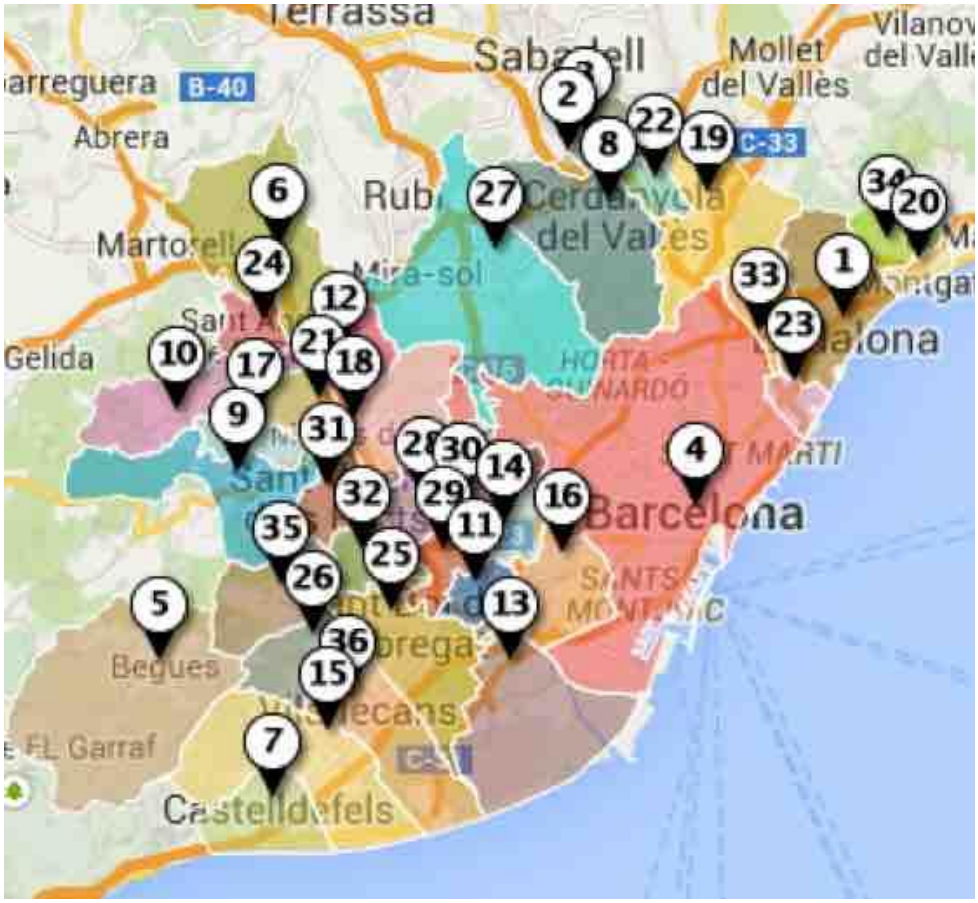


Figure 3 - Barcelona Metropolitan Area, which is comprised by 36 municipalities

Source: 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.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].

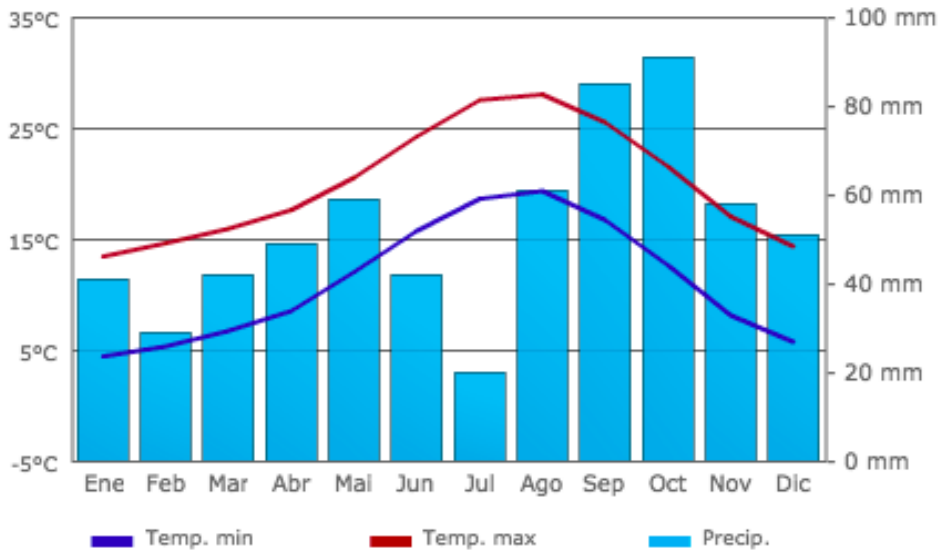


Figure 6 – Barcelona Climate.

Source: www.climatedata.eu

III.II.III POPULATION

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 16,000 inhabitants per km^2 in the Barcelona municipality and 5,500 for the metropolitan area.

[1] Information from Climatedata.eu

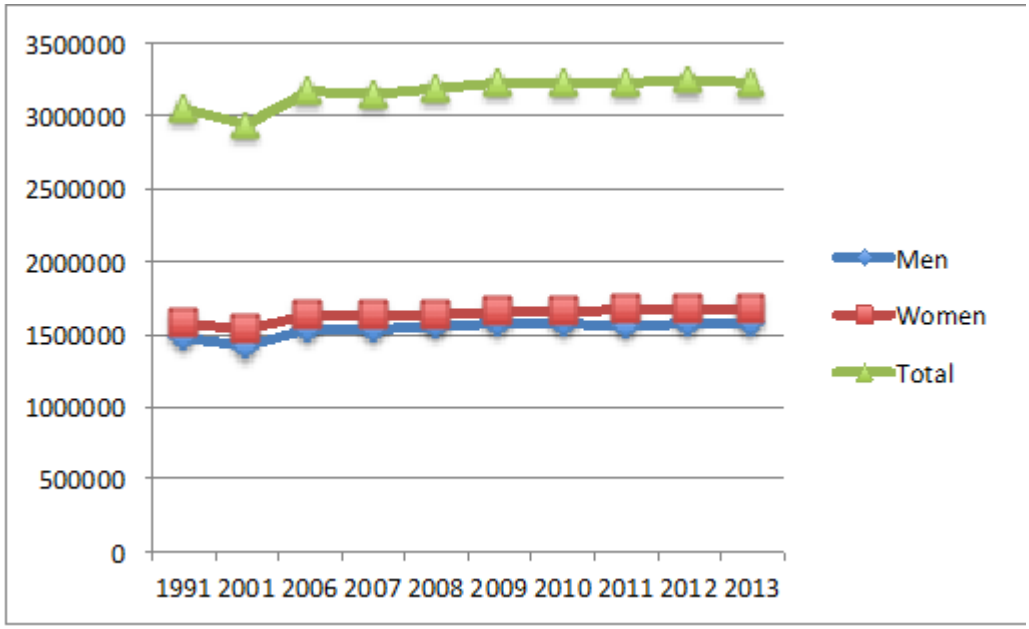


Figure 7 – Population of the metropolitan area of Barcelona.

Source: Idescat

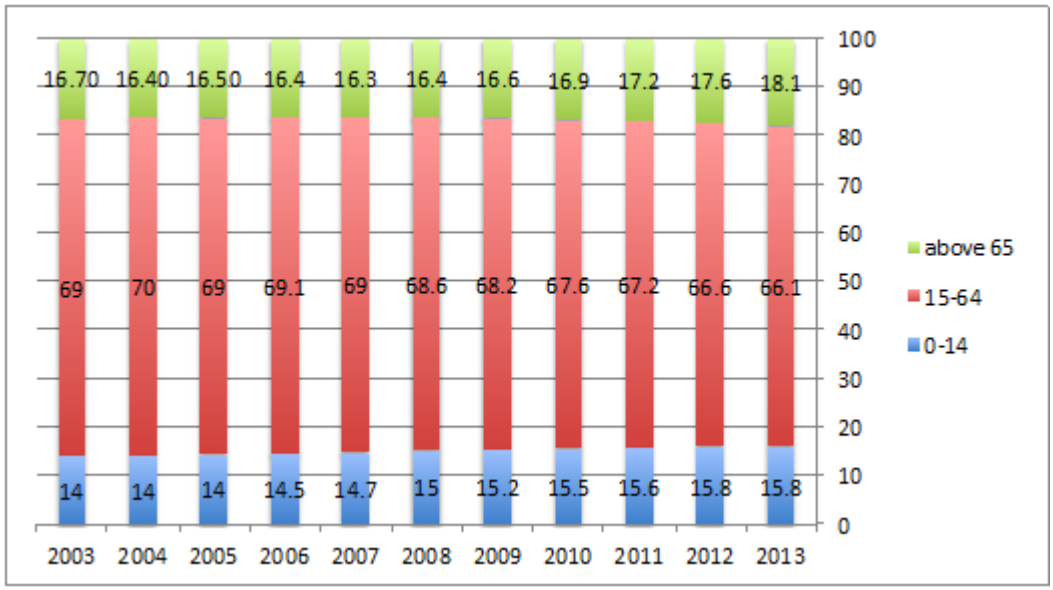


Figure 8 – Evolution of the age structure in the metropolitan area of Barcelona.

Source: Idescat

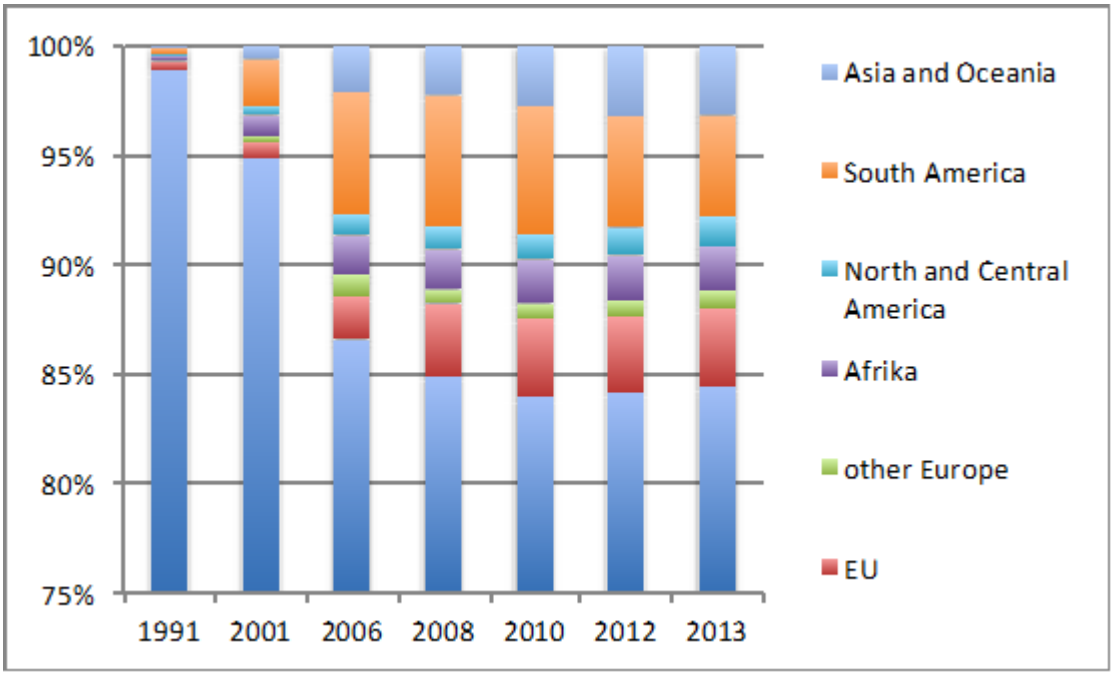


Figure 9 – Evolution of the population by origin metropolitan area of Barcelona.

Source: Idescat

III.IIIKEY STRATEGIES AND PROJECTS

III.III.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 a 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.

III.III.II KEY PROJECTS

Some of the projects of the city are listed below.

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 256 kbps • 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 metro. The 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, etc.)	City of Barcelona
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

PROJECT FACTSHEET 4	
	• 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 5	
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

PROJECT FACTSHEET 5	
	information related to the new system is also being 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 6	
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 7	
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

PROJECT FACTSHEET 7	
	it governs the city, by being an open government: a transparent, inclusive, collaborative government that cooperates with citizens in implementing policies 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 8	
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.

PROJECT FACTSHEET 8	
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 preventive 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 9	
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	Developing 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.

PROJECT FACTSHEET 9	
	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 10	
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 available on the portal includes for example: 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 11	
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 12	
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

PROJECT FACTSHEET 12	
	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 13	
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 14	
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 15	
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

PROJECT FACTSHEET 15	
	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 CO_2 emissions and reduced the use of fossils fuels by 56% in 2010.
Website	www.districlima.com

III.IV CASE STUDY CITY ASSESSMENT

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.

III.IV.I SOCIAL PERFORMANCE

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 by gender shows how, beside the general increase in both rates, the crisis affected more strongly male's employment compared to women's (Table 2Table 2). In 2001 women unemployment rate (12%) was almost the double of the men's rate (6.8%). Over the following 10 years, Figure 10 shows how the trend reversed to the point where, in 2013, male's unemployment (23.7%) was higher than the women's one (22.5%).

Table 2 - Variation rate of unemployment rate. NUT III, 2001-2013

RATE OF UNEMPLOYMENT		
Year	**men**	**women**
2001	6.8%	12%

RATE OF UNEMPLOYMENT		
2012	23.7%	22.5%
2007-2012 variation rate	**+239%**	**+158%**

Source: www.bcn.cat

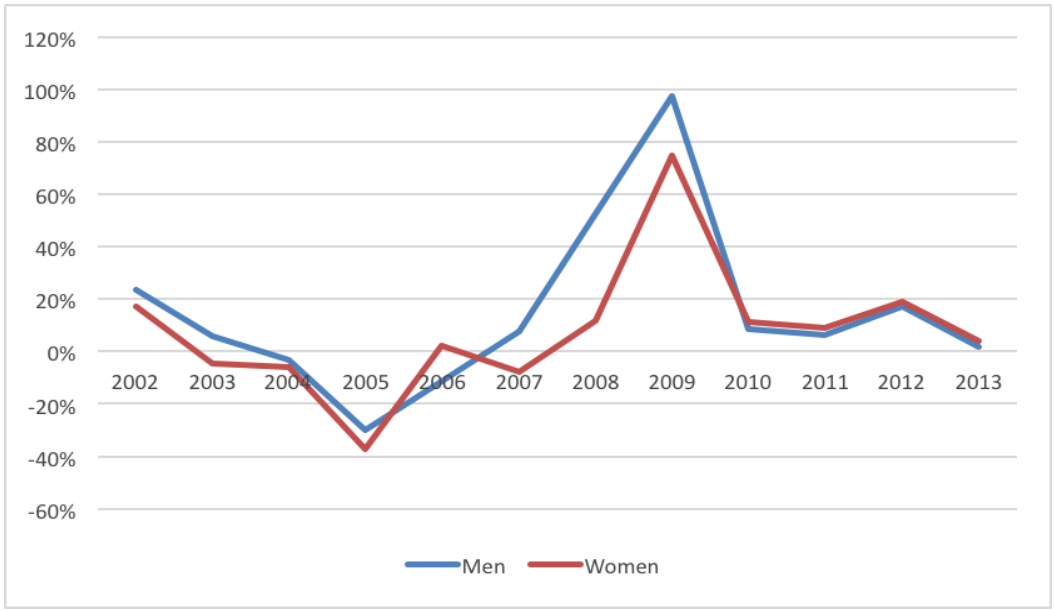


Figure 10 – SOC 01 - Variation rate of unemployment level by gender. NUT III.

Source Idescat

LEVEL OF POVERTY

Between 2004 and 2013 the percentage of the population at poverty risk increased by 2.4% from 17.7% to 20.1%. As can be seen by Figure 8, a sharp increase in the poverty risk rate happened between 2007 and 2011 while an evident reversion of the trend can be appreciated from 2011 onwards.

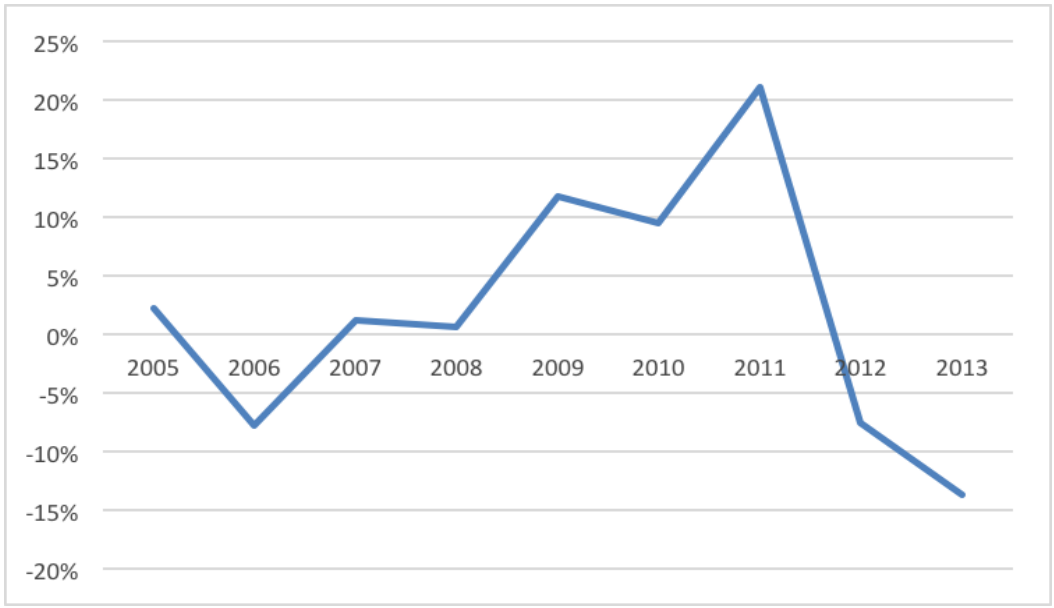


Figure 11 – SOC 02 – Yearly change of share of population at poverty risk. NUT II.

Source Eurostat

EDUCATION LEVEL BY GENDER

Figure 13 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 of 2013 was quite different: the women share of population with tertiary education raised to 37.7% against a men's share of 31.9% (Figure 12); 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.

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

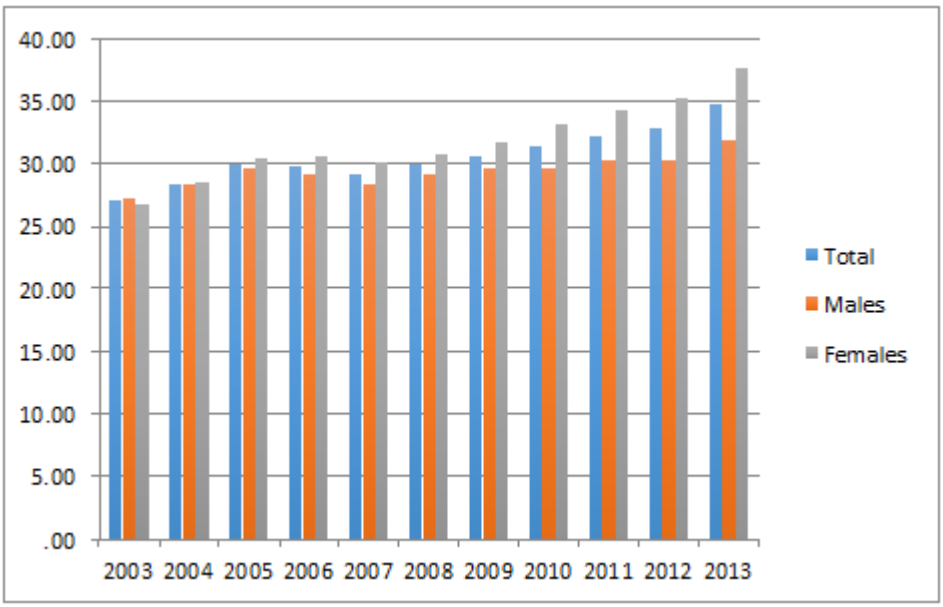


Figure 12 – SOC 03 - Tertiary education level by gender, percentage of population aged 25-64 years. NUT II.

Source Eurostat

Figure 13 – SOC 03 - Variation rate of tertiary education level by gender. Population aged 25-64. NUT II.

Source Eurostat

LIVE EXPECTANCY

Excluding a drop by 0.4% in 2005, average life expectancy (Figure 14) has grown for the whole period 2003-2013. At the end of 2003, average life expectancy at 1 year was 80.0 years; at the end of 2012 it was grown by 2.8 years reaching the level of 82.2 years.

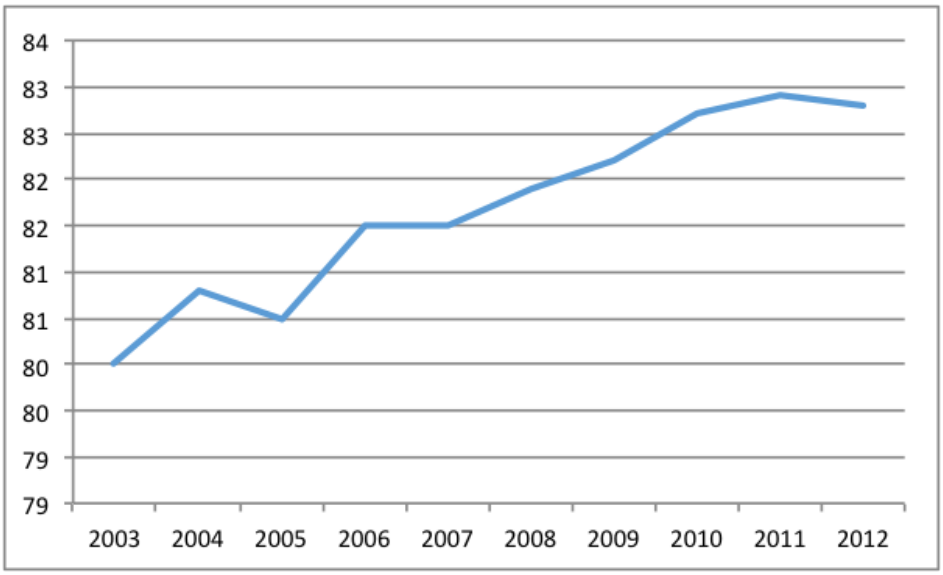


Figure 14 – Average life expectancy, years. NUT II.

Source Eurostat

GREEN SPACE AVAILABILITY

This indicator is on the green surface area of the city (urban forests, parks or green spaces) and their evolution between 2003 and 2013 (Table 3). Green areas (forests, scrubland and other green areas) have not changed substantially in size over the period, in 2013 the share of green areas, forests and green areas was at 58%, farming at 8,5% and urban at 29,2%, the remaining 4,4% are areas with no vegetation. The only noticeable change has been in the farming area, which fell two percentage points between 2003 and 2010. It is important to note that the time series is broken between 2010 and 2011, as the boundaries of the metropolitan area were changed, reducing by 58 ha the area, from 324 ha down to 246 ha. Statistical changes are thus only relevant from 2003 to 2010 and from 2011 to 2013. This is indicated by the line in Figure 15.

Table 3 – Share of green areas and urban areas in the Metropolitan areas of Barcelona (excludes farming and areas without vegetation)

YEARS	GREEN AREA	URBAN AREA
2013	62,1%	29,2%
2012	59,7%	29,5%
2011	59,8%	29,3%
2010	64,4%	25,4%
2009	64,3%	25,4%
2008	64,9%	25,3%
2007	65,1%	25,3%
2006	66,7%	25,2%
2005	67,0%	25,0%
2004	65,8%	25,9%
2003	65,5%	25,8%

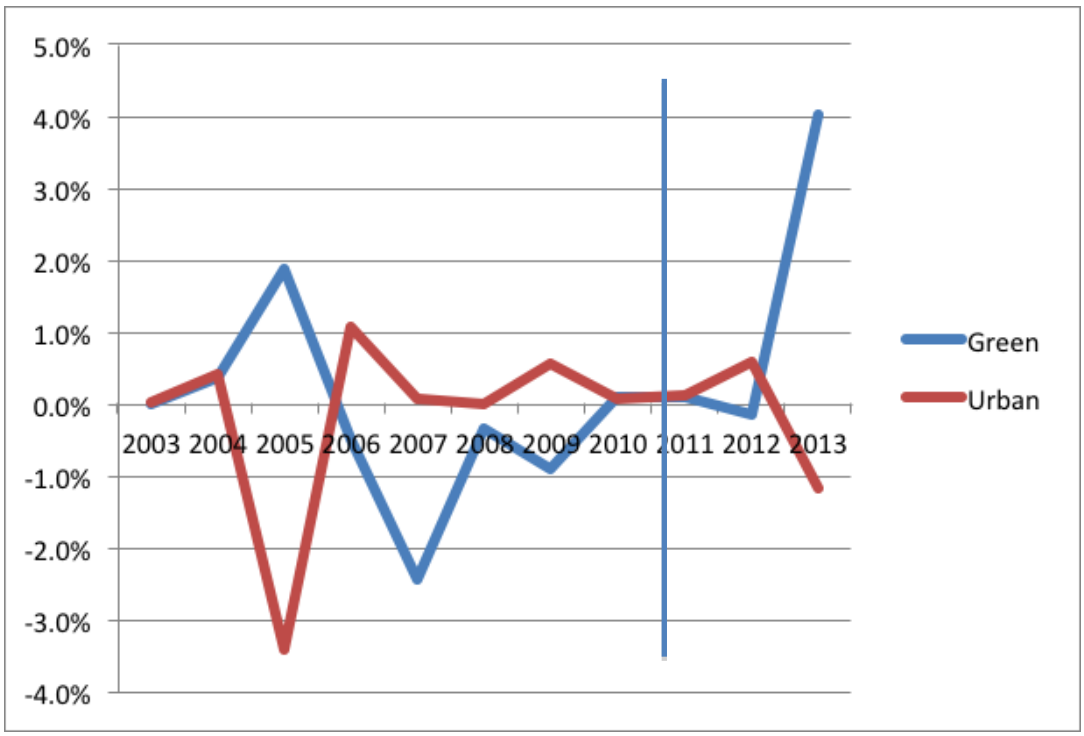


Figure 15 – SOC 05 - Variation rate of average green areas, Barcelona Metropolitan Area.

Line identifies break in data series due to change in territory covered.
Source: Indescat

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].

III.IV.II ECONOMIC PERFORMANCE

WEALTH

As proxy to measure the wealth level of the city we used the Purchasing Power Standard indicator (Figure 16). Data are available only until the end of 2011. The variations of the indicator during the decade between 2001 and 2011 mirror quite closely the global macroeconomic conditions and the 6% drop in 2008 need to be red under this light. Despite the effects of the crisis, in 2011 Barcelona was anyway a wealthier city than the pre-crisis period. In terms of Purchasing Power units, Barcelona grew from 23,400 in 2001 to 28,300 in 2011, peaked at 30,300 in 2007 to then decline to the present level.

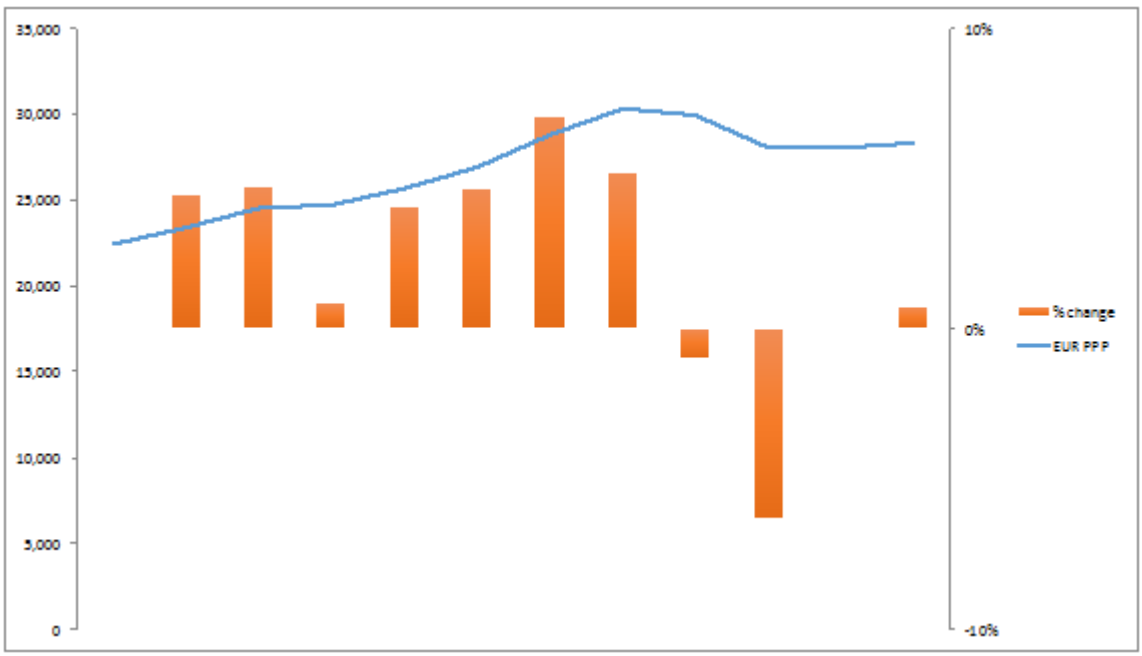


Figure 16 – ECO 01 –Purchasing Power Standard per inhabitant, and % change. NUT III.

Source Eurostat

[3] Diputació de Barcelona (2014), 'Informe de síntesis: Consums energètics i emissions de gasos d'efecte hivernacle a la província de Barcelona', Technical Bureau on Climate Change and Sustainability, July, 2014.

EMPLOYMENT

Figure 17 presents the employment variation rates by sector of Barcelona between 2005 and 2012[4]. The sector that was affected the most by the crisis was the primary sector. It is interesting to note that, despite a drop in employment of 75% between 2006 and 2008, the primary sector was the only sector that managed to regain a positive variation rate by the end of 2012 (+12%). All the other three sectors are showing negative variation rates since 2008.

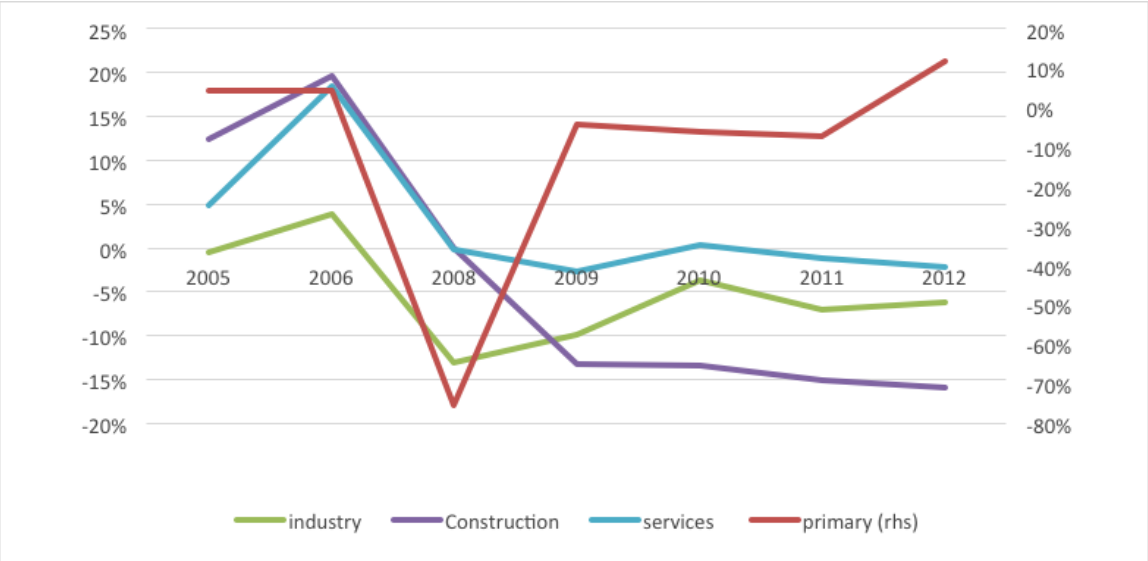


Figure 17 – ECO 03 – Employment by sector variation rate, NUT III. Date for 2007 was missing.

Source: Idescat

BUSINESS SURVIVAL

In Barcelona (municipality), the number of active companies has fallen from 2008 to 2010 due to the hit of the crisis. The number of deaths of companies exceeded the number of births by over 20% (Table 4). The number of new companies that survive after three years has also fallen. If one relates the figures of company births and companies managing to survive over three years, we reach to survival rates of about 90% in 2008 and only 69% in 2010 which seems to be the impact of the crisis. Also, the number of surviving companies in relation to the total companies (which are also falling in number) is decreasing. This also points to the difficulties for companies to establish themselves.

[4] Figures for 2007 are missing.

Table 4 – ECO_04 - Death and births of companies in Barcelona

ECO_04. DEATH AND BIRTHS OF COMPANIES IN BARCELONA			
	2008	**2009**	**2010**
No of active companies	514.548	503.654	496.104
no of deaths	47.787	46.367	
no of births	39.355	37.970	41.377
No of companies surviving from t-3	34.456	31.299	28.622
Ratio of companies that have survived up to three years of total	6,67%	6,21%	5,77%

Data source: Municipal database, www.bcn.cat

PUBLIC FINANCES

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 position 1,297 of Spain 8,116 municipalities. Madrid, at position 129, has three times the Barcelona debt level in per capita terms[5].

The trends have been taken from the 'Systema de transparencia economica' www.sielocal.com website that aggregates and published economic information on debt and public expenditures of different levels of governance. Data trends start in 2008. Figure 18 shows a quick debt jump from 753 m 2009 to 1.1 bn in 2010 as the crisis hits and then a stabilisation until 2013. There is a slight fall, but not significant enough.

In terms of percentage of GDP of the municipality (Table 5), the debt level has increased over the period by 62%, from 1.19% to 1.92% due to the combined fall in GDP and debt increase. Due to a lack of data on GDP after 2010, the 2011 and 2013 figures have not been added.

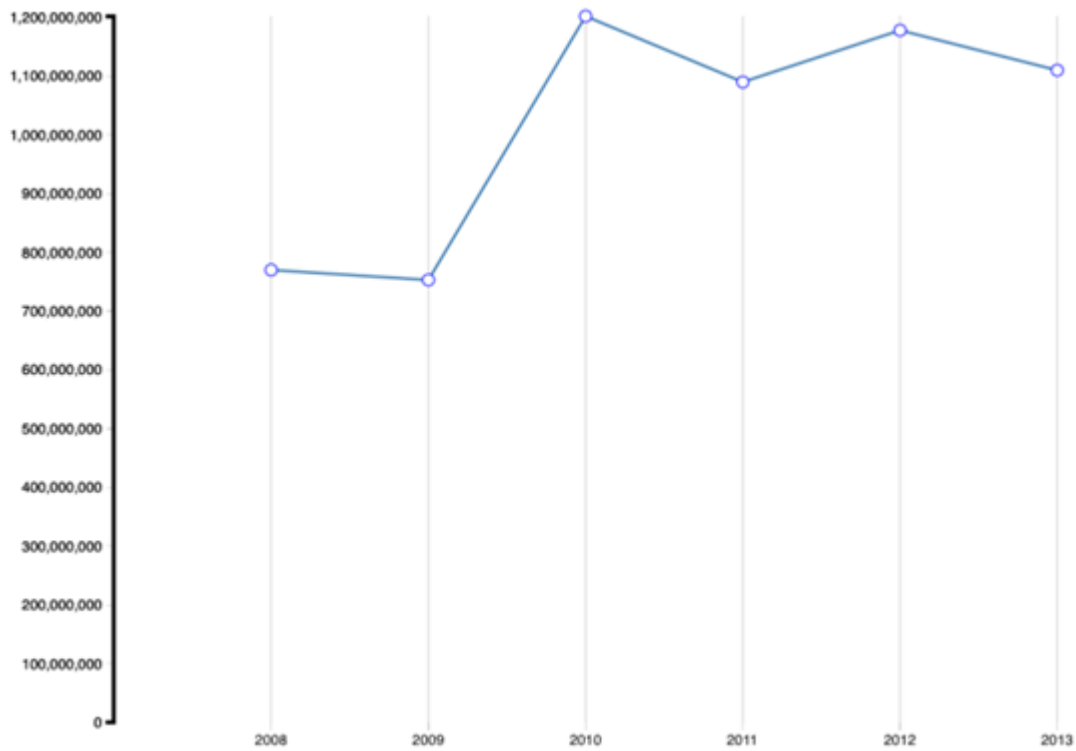
Table 5 – ECO_04 – Debt to GDP developments 2008-2010

YEAR	GDP BN	DEBT BN	DEBT/GDP	CHANGE
2008	64,5213	0,77	1,19	-
2009	61,4905	0,753	1,22	26,12%
2010	61,9152	1,202	1,94	18,92%

Source: www.bcn.cat

[5] Data collected from the Ministry of Finance by Cinco Dias, http://cd00.epimg.net/descargables/2014/05/16/dd32d34ad9121b5bc59b6c52d0817670.pdf

Figure 18 – ECO 04 – Public debt, Barcelona municipality



Source: SIELOCAL

R&D EXPENDITURES AS PERCENTAGE OF GDP

In 2012, Barcelona 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.

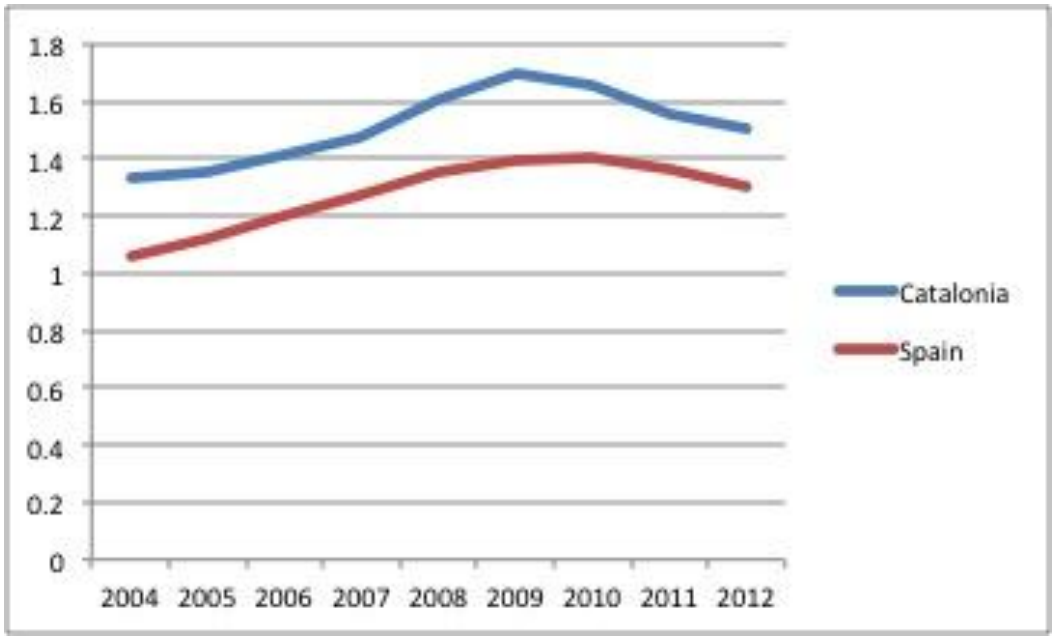


Figure 19 – ECO 07 – Total R&D expenditures as percentage of GDP in Catalonia. NUT II.

Source: Idescat

III.IV.III ENVIROMENTAL PERFORMANCE

BIODIVERSITY

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 wider district of Barcelona has 12 natural protected areas of 102.587 ha or 22% of the territory, three of which surround the city (Figure 20). 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.

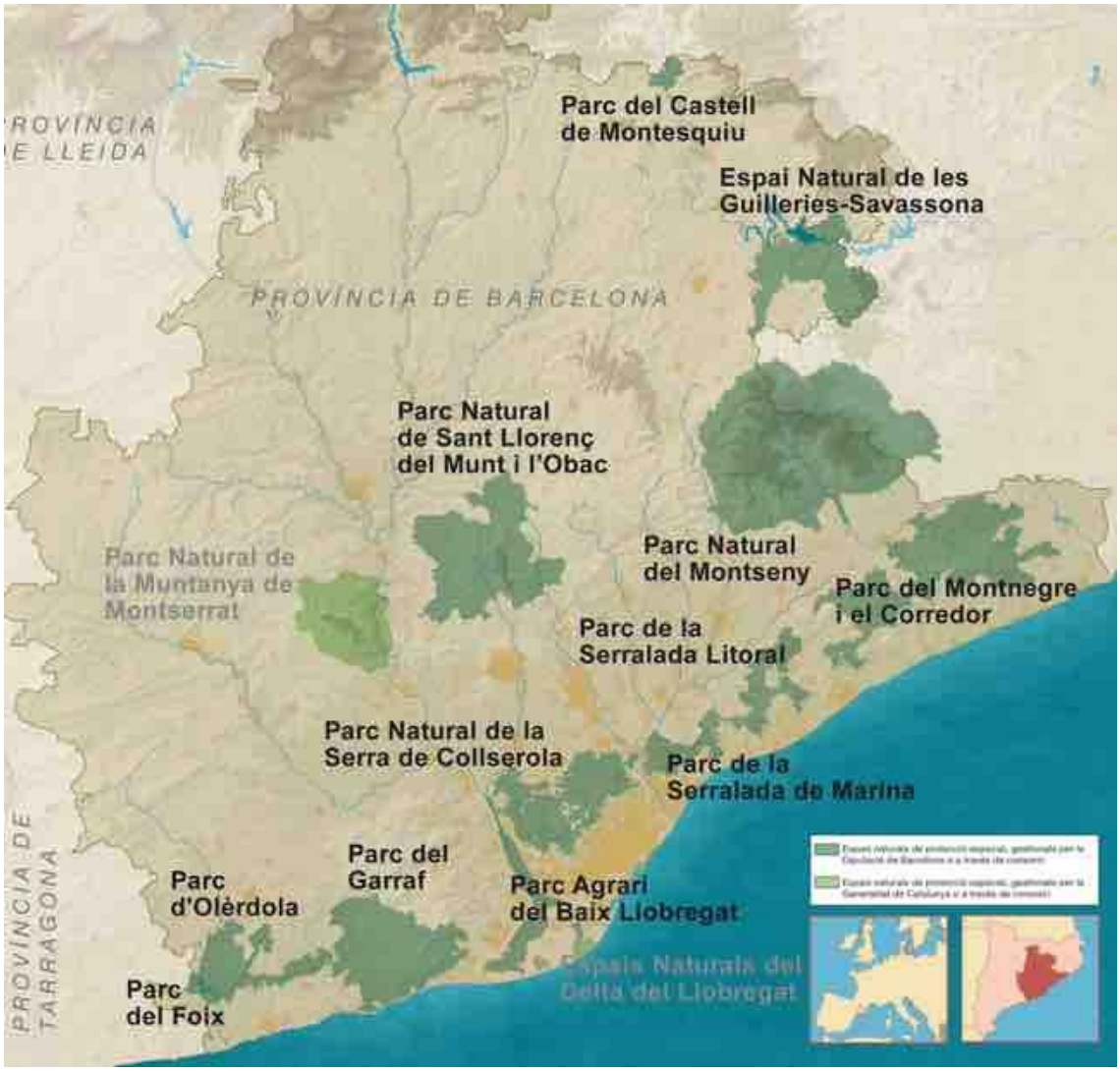


Figure 20 – National Parks of the District of Barcelona (NUTIII)

Source: www.parcs.diba.cat

In the metropolitan area 28% of the territory (69.033 ha) is considered part of the Plan of areas of natural interest (PEIN) and thus protected. The data published is only for 2012 and 2013, thus a variation rate cannot be established.

ENERGY

ENERGY INTENSITY

Barcelona has a strong commitment to reducing the energy consumption in the region, as well as energy intensity, while energy consumption has fallen (Figure 22), energy intensity increased from 2008 to 2010 (Figure 21) 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.

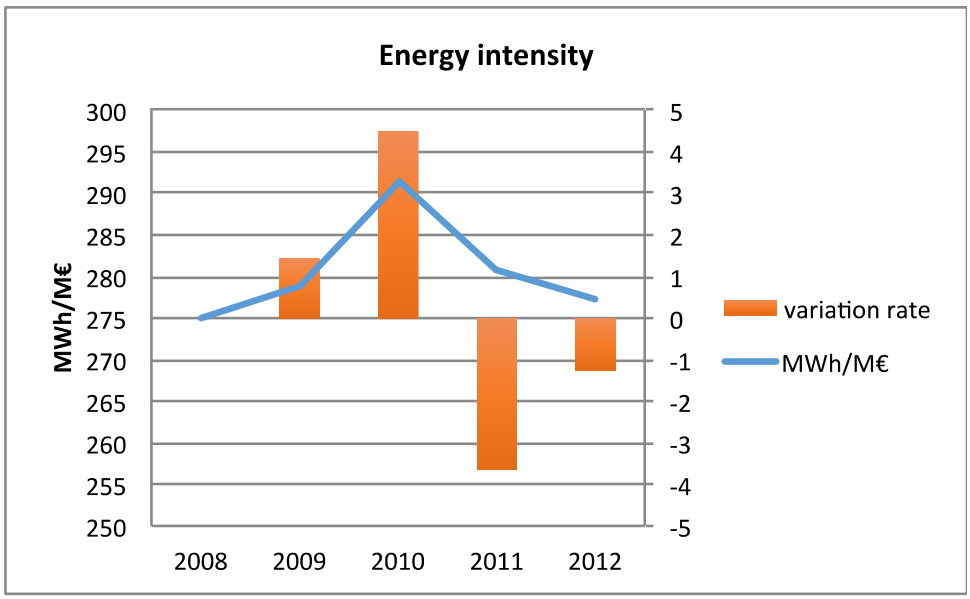


Figure 21 – ECO 02 – Energy intensity MWh/M and variation rate

Source: municipal database, www.bcn.cat

ENERGY DEMAND

The offices of the province of Barcelona (NUT III) published an analysis in July 2014 that shows a fall in energy consumption for the province from 2005 to 2012, based on a study by the Energy Agency of Barcelona[6]. The decrease per capita from 2005 to 2012 has been of 11% from 12.9 MWh/inhabitant to 11.5 MWh/inhabitant. The main reason for this fall in consumption has been a reduction in the energy use in the transport sector.

[6] Diputació de Barcelona (2014), 'Synthesis report: Summary report: Energy consumption and greenhouse gases emissions in the province of Barcelona', Oficina Tècnica de Canvi Climàtic i Sostenibilitat, July 2008

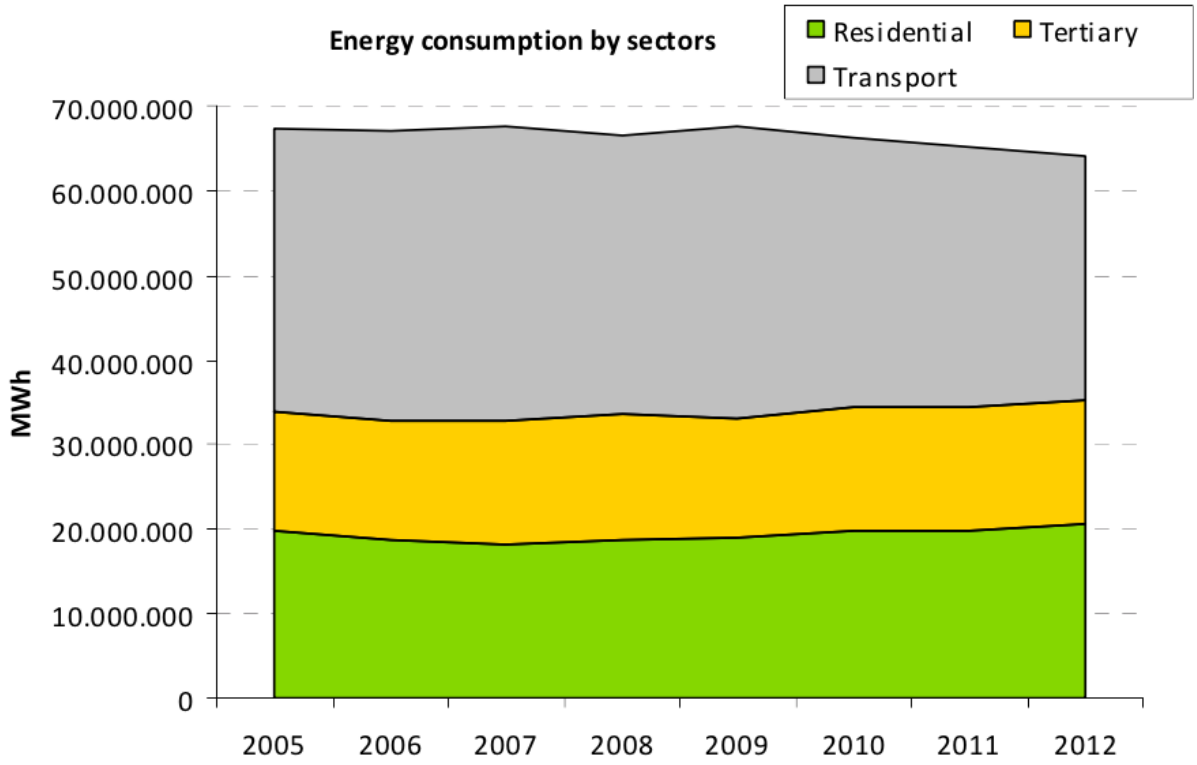


Figure 22 – ECO 03 – Energy consumption by sectors MWh

Source: Energy agency Barcelona

CLIMATE AND AIR QUALITY

GREENHOUSE GAS EMISSIONS INTENSITY

The emission intensity in terms of CO_2 per unit of GDP and by sector is not published for the city, thus the data for the Catalan region is used as a proxy. Given the importance of the capital in the region, this can be seen as a close proxy.

From 2003 the emission intensity per unit of GDP has been falling. Figure 18 shows the intensity in megatons per million Euro of GDP. In total over the period the fall in emissions intensity per unit of GDP has been 30% from 312 Mt to 216 Mt of CO_2 equivalent greenhouse gases (Table 6).

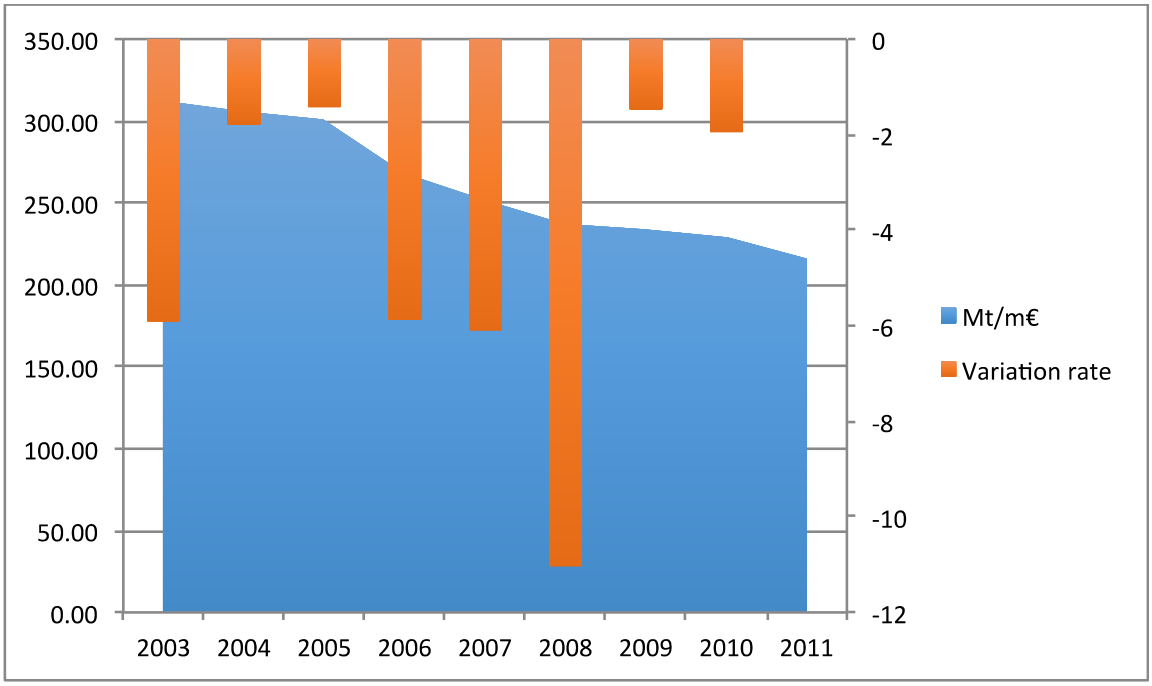


Figure 23 –ENV 04 – carbon emissions intensity for Cataluña (NUT II) between 2003 and 2012.

Source: IDESCAT; calculations: CEPS.

Table 6 – ENV-04 – Variation rate of carbon emissions intensity for Cataluña (NUT II) between 2003 and 2012.

VARIATION RATE OF CARBON EMISSIONS INTENSITY (T/€)	
2003	312.2
2012	216.2
Variation Rate (%) 2003-2012	**-30,8%**

Source: IDESCAT; calculations: CEPS.

The fall in emissions per economic source can be seen in Figure 24. What is interesting in the fall in emissions has started before the financial crisis while GDP was still growing considerably. The data is affected by the fall in demand for energy, which makes it difficult to draw clear conclusions.

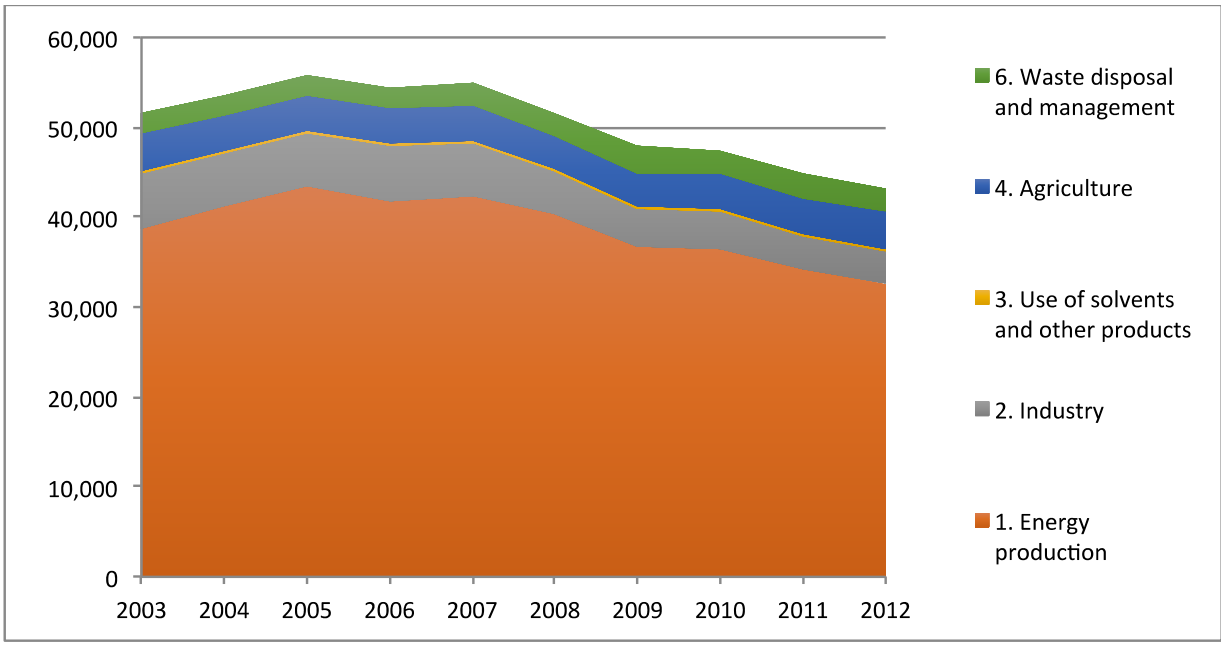


Figure 24 – ENV 05 – Emissions by sector CO2-eq (Gt) by economic activity,

Source: Idescat, www.idescat.cat

AIR QUALITY

Barcelona has an active air quality policy and follows emissions closely and values of pollution exceeding air quality limits have been low. There seems to have been a fall in the number of days where values exceeded the maximum levels triggering an alert. But while a fall has been recorded, the variation rate between 2003 and 2012 cannot be taken as very accurate, as in 2013 the days with excess values increased to 5.

Table 7 – ENV-06 No of alerts due to exceedance air quality limit values between 2003 and 2012

EXCEEDANCE OF AIR QUALITY LIMIT VALUES (DAYS)[7]	
	Days where values were exceeded
2003	19
2012	2
Variation Rate (%)	**-89,5%**

TRANSPORT AND MOBILITY

Figure 25 represents the main modes of transportation used by people living in Barcelona on their working day commuting, based on a yearly survey (EMEF) undertaken by the Institut

[7] The values presented in this table are the days where the city of Barcelona issued an alert.

d'Estudis Regionals i Metropolitans de Barcelona (IERMB). The years 2008 and 2013 are used as comparison, as methodology changed after 2007. The results show a modal shift from private cars to public transport in percentages and a considerable increased share of in walking and biking. The percentages are slightly misleading, because the number of people traveling on public transport has increased, not fallen. The use of private transport has declined, but not as significantly as portrayed in percentages. The real change has been an increase in the pedestrian figures. However, in the absence of a significant population growth and a relatively mild fall in private motorised transport modes used, one has to question the survey.

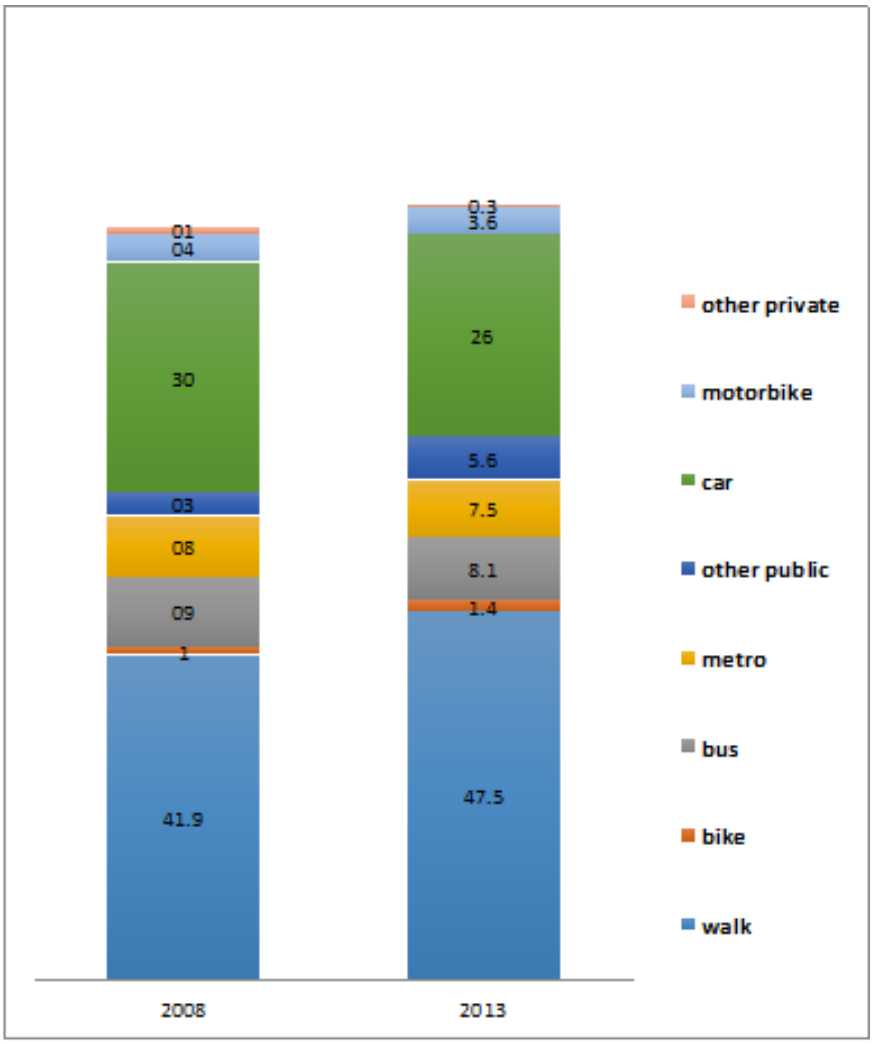


Figure 25 – ENV 07 Modal share on commuting in the metropolitan area.

Source: IERMB, summarised by CEPS

Table 8 shows the change in non-motorized (walking and biking), public and private vehicle transport. We can see in numbers a very sharp increase in recorded walking and biking in commuting, but the numbers in the public and private transport modes are not changing so significantly. The population of the metropolitan area has increased over the same period, but only by a hundred thousand inhabitants.

Table 8 - Variation rate of modal transport 2008 and 2013, metropolitan area

VARIATION RATE OF MODAL TRANSPORT			
	total not motorized	public transport	private vehicle
2008	6.632.089	3.554.434	5.296.110
2013	8.546.785	3.695.323	5.214.040
Variation rate %	28.9%	4.0%	-1.5%

WASTE

WASTE GENERATION PER PERSON

There has been a decreasing trend in the waste generation per person of 20% in the municipality of Barcelona.

Table 9 - Variation rate of waste generation per person year 2007 and 2012 in kg, municipality of Barcelona

WASTE GENERATION PER PERSON YEAR 2007 AND 2012 IN KG	
	KG/PERSON
2003	1.5
2012	1.2
Variation Rate (%)	**-20%**

Source: www.bcn.cat

WASTE RECOVERY

The figures of the urban waste recovery show an increasing share of recycled waste and a very high increase in organic waste collection.

Table 10 - Variation rate of urban waste recovery in the Barcelona municipality between 2007 and 2012.

URBAN WASTE RECOVERY		
Year	% of total waste recycled	Organic waste tons
2007	32	86.914
2012	36.2	122.508
2007-2012 variation rate	**+4.2%**	**+41%**

Data source: www.bcn.cat

WATER

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 4.500 km 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 1.500 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, a 19% fall.

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.

BUILDINGS AND LAND USE

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 region of Catalonia recently became available. 332.586 certificates have been issued from the 28th of May 2013 until the 5th January 2015.

URBAN DENSITY

Due to changes in the area borders, the variation rates for the metropolitan area are not useable. The census of buildings in the municipality had the methodology changed, making the figures also not comparable across years.

III.V FINDINGS AND KEY CHALLENGES

Table 11 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 11 - Summary of KPI's global trends

DIMEN-SION	SUB-DIMENSION	INDICATOR	Year	Trend
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	2002-2013	↗
		Variation rate of poverty level	2005-2013	↗
		Variation rate of tertiary education level by gender	2004-2013	↗
		Variation rate of average life expectancy	2004-2012	↗
	Public services and Infrastructures	Variation rate of green space availability	2003-2013	↗
	Governance effectiveness	Existence of monitoring system for emissions reductions	N/A	yes
ENVIRON-MENT	Biodiversity	Variation rate of ecosystem protected areas	2013	n/a
	Energy	Energy intensity variation rate	2003- 2011	↘
		Variation rate of energy consumption by sectors	2008, 2012	↘
	Climate and Air Quality	Variation rate of carbon emissions intensity	2005, 2009	↘
		Variation rate of carbon emissions by sector	2003-2012	N/A
		Exceedance rate of air quality limit values	2003, 2012	↘
	Transport and mobility	Variation share of sustainable transportation	2008, 2013	↗
	Waste	Variation rate of urban waste generation	2002- 2013	↘
		Variation rate of urban waste recovery	2007- 2012	↘
	Water	Water losses variation rate	2013	↘
	Buildings and Land Use	Energy-efficient buildings variation rate	2012, 2013	↗
		Urban building density variation rate		n/a
ECONOMY	Sustainable economic growth	Level of wealth variation rate	2001-2011	↗
		Variation rate of GDP by sectors	n/a	
		Employment by sectors variation rate	2010-2012	↘

DIMEN-SION	SUB-DIMENSION	INDICATOR	Year	Trend
		Business survival variation rate	**2008, 2009, 2010**	↘
	Public Finances	Budget deficit variation rate	**2008-2010**	↗
		Indebtedness level variation rate		↗
	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.

III.VI 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 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.

IV CASE STUDY CITY ISTANBUL

IV.I DATA COLLECTION

In Turkey, TurkStat is the main data source for statistical documents. For the data collection process of the case study city Istanbul, TurkStat has been mainly used. However, all data are not available at the city level in TurkStat, so additional data sources were needed. The data have been collected in cooperation with Istanbul Metropolitan Municipality Department of Environmental Protection and Istanbul Development Agency. The reports, documents have been useful in this process. Istanbul Environmental Plan Report (2009), Green City Index by Siemens (2009), Istanbul with Numbers by Istanbul Chamber of Commerce (2010), GHG Inventory of Istanbul by Istanbul Metropolitan Municipality (2010), Household Research by Istanbul Metropolitan Municipality (2006) have been the main reports and documents used for data collection. Moreover, Istanbul Water and Sewerage Administration and Ministry of Energy and Natural Resources have been the other institutional data sources.

Table 12: List of key performance indicators

DIMEN-SION	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	NUTS II	2004-2012	TurkStat
		Variation rate of poverty level	NUTS II	2006-2012	TurkStat
		Variation rate of tertiary education level by gender	NUTS II	2008-2012	TurkStat
		Variation rate of average life expectancy	NUTS II	2012, 2013	TurkStat
	Public services and Infrastructures	Variation rate of green space availability	Istanbul Metropolitan Municipality	2004-2012	Istanbul Metropolitan Municipality
	Governance effectiveness	Existence of monitoring system for emissions reductions	Istanbul Metropolitan Municipality	N/A	N/A

DIMEN-SION	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	Istanbul Metropolitan Municipality	2004, 2014	Istanbul Environmental Plan Report, 2009, Istanbul Metropolitan Municipality
	Energy	Energy intensity variation rate	Istanbul Metropolitan Municipality	2008-2012	TurkStat
		Variation rate of energy consumption by sectors	TURKEY	2003, 2008	Ministry of Energy and Natural Resources
	Climate and Air Quality	Variation rate of carbon emissions intensity	Metropolitan Municipality	2006, 2010	Green City Index, Siemens, 2009 GHG Inventory of Istanbul, Istanbul Metropolitan Municipality, 2010
		Variation rate of carbon emissions by sector	Metropolitan Municipality	2010	GHG Inventory of Istanbul, Istanbul Metropolitan Municipality, 2010
		Exceeding rate of air quality limit values	Metropolitan Municipality	2010, 2011, 2012	Istanbul Metropolitan Municipality
	Transport and mobility	Variation share of sustainable transportation	Metropolitan Municipality	2006,2008	Green City Index, Siemens, 2009 Household Research, Istanbul Metropolitan Municipality, 2006

DIMEN-SION	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
	Waste	Variation rate of urban waste generation	Metropolitan Municipality	2005-2012	ISTAC
		Variation rate of urban waste recovery	Metropolitan Municipality	2006-2011	ISTAC
	Water	Water losses variation rate	Metropolitan Municipality	2001-2012	Istanbul Water and Sewerage Administration, 2012
	Buildings and Land Use	Energy-efficient buildings variation rate	Metropolitan Municipality	2009-2014	http://www.usgbc.org/leed
		Urban building density variation rate	Metropolitan Municipality	2009, 2011	Istanbul Environmental Plan Report, 2009, Istanbul Metropolitan Municipality
ECONOMY	Sustainable economic growth	Level of wealth variation rate	NUTS II	2004-2011	TurkStat
		Variation rate of GDP by sectors	NUTS II	2007-2011	TurkStat
		Employment by sectors variation rate	NUTS II	2004-2009	TurkStat
		Business survival variation rate	Metropolitan Municipality	2009, 2010, 2011	TOBB
	Public Finances	Budget deficit variation rate	N/A	N/A	N/A
		Indebtedness level variation rate	Metropolitan Municipality	2006-2012	Istanbul Metropolitan Municipality
	Research & Innovation dynamics	R&D intensity variation rate	NUTS II	2010, 2011	TurkStat

In order to be able to compare data in different years, different sources have been used for different years. While doing so, some problems have been confronted such as; the units are introduced differently in different sources. Another problem is about introducing the data under different categories (for example, the share of sustainable transportation is categorised

differently in different sources). All data in this report have been used as their original form in the sources.

IV.II OVERVIEW OF THE CASE STUDY CITY

IV.II.I TERRITORY

Istanbul is located in the north-west of Turkey, Marmara region. According to Nomenclature of Territorial Units for Statistics Turkey has 12 NUTS 1, 26 NUTS 2, 81 NUTS 3 statistical regions. Within this frame Istanbul is defined as region in those 3 statistical regions as TR1 Istanbul, TR10 Istanbul, TR100 Istanbul. Istanbul extends over two continents; Asia and Europe. Istanbul's two sides are divided with Bosphorus passing through between Asia and Europe sides. Also Bosphorus connects Black Sea and Marmara Sea, separates Asia Continent from Europe Continent. Istanbul has 39 municipal districts. The local government is organised as the Metropolitan Municipality for the entire Istanbul territory and 39 district municipalities responsible for their district territory.

Figure 26: Istanbul's location in Europe

Figure 27: Istanbul's location in Turkey

Figure 28: Maps of Istanbul

Istanbul is one of the world's metropolitan cities with its strategic location; cultural, economic, demographic dynamics; and relation with different countries.

Istanbul is a connection point between the Balkans, Caucasus, Middle East, Middle Asia, North Europe, Black Sea countries and Mediterranean countries with its central geographical location. Europe and Asia is connected in terms of highway and seaway through Istanbul in the shortest way. Moreover, it dominates the sea connection of Black Sea countries to Mediterranean. The 4th Pan European Corridor which is one of the 10 main transportation axes determined by European Union starts from Dresden and ends in Istanbul. The city has two important ports: Haydarpasa and Ambarli, and two airports: Ataturk and Sabiha Gokcen for international transport, export, and import.

Istanbul has both Black Sea and Mediterranean climate characteristics because of its geographic location. Summer is hot and humid, and winter is rainy and cold, sometimes snowy. The felt temperature is hotter in summer, colder in winter because of humidity. The annual average temperature is 13.5°C. The average temperature is 2°C - 9°C in winter, 18°C - 28°C in summer.

IV.II.II POPULATION

The population of Istanbul is 13.854.720 (TurkStat, 2012). It consists 18.3% of Turkey's population which is 75.627.384. Male population is 49.8% (6.897.832) and female population is 50.2% (6.956.908) among the total population. The distribution of the population according to age cohorts is; 23.2% 0-14 age cohort, 71% 15-64 age cohort, 5.7% over 65 age.

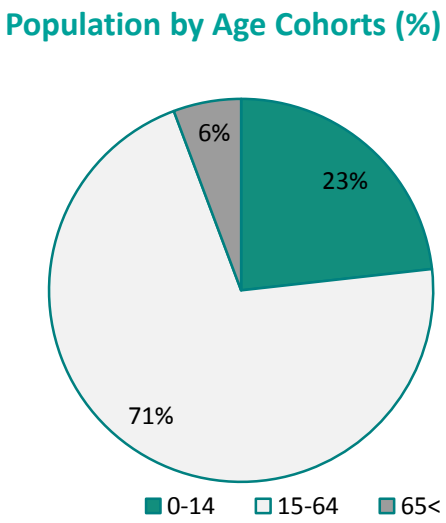


Figure 29: Population of Istanbul by age cohorts (%)

Source: TurkStat, 2012

The urban population is 77.3% in Turkey while it is 99.0% in Istanbul. Istanbul has a relatively small area but large population which causes a high density of population. The population density is 2666 inhabitants/km^2. Turkey's average population density is 98 inhabitants/km^2 which corresponds to 1/27 of Istanbul's population density. The population increase rate is 1.7% and higher than Turkey's average rate of 1.2% (Istanbul Development Agency, 2014).

With its population over 12 million, Istanbul metropolitan region has become a mega-city, ranking 8 out of 78 OECD metropolitan regions in terms of population size and first for population growth since the mid-1990s. Istanbul used to concentrate about 5% of national population in 1950's whereas it is 20% today (OECD, 2008).

Table 13: Population change over years in Istanbul and in Turkey

YEAR	ISTANBUL POPULATION	RATE IN TURKEY POPULATION
1927	806.863	5.91%
1970	3.019.032	8.48%
1990	7.309.190	12.94%
2009	12.915.58	17.8%
2012	13.854.720	18.3%

Source: Turkstat

The population has continuously increased in Istanbul since 1927. The proportion in Turkey's population has already increased. Istanbul gets immigrants from all over Turkey. Especially after 1950's the migration to Istanbul has increased rapidly. The rapid increase of population has caused an extension of urban area without control, the number of illegal settlements and slums has increased, environmental pollution and disruption have emerged, urban services and facilities have become insufficient. In recent years migration impacts on Istanbul population have decreased in comparison to previous years. However, Istanbul still has a dynamic demographic structure with immigrations and emigrations. The population of inhabitants who born in any other city constitutes 1/3 of inhabitants who born in Istanbul (OECD, 2008).

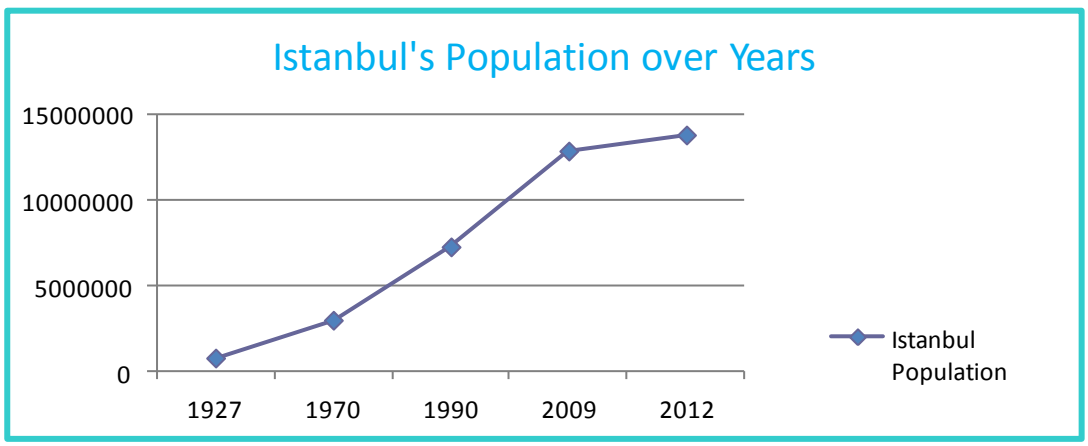


Figure 30: Population of Istanbul over years

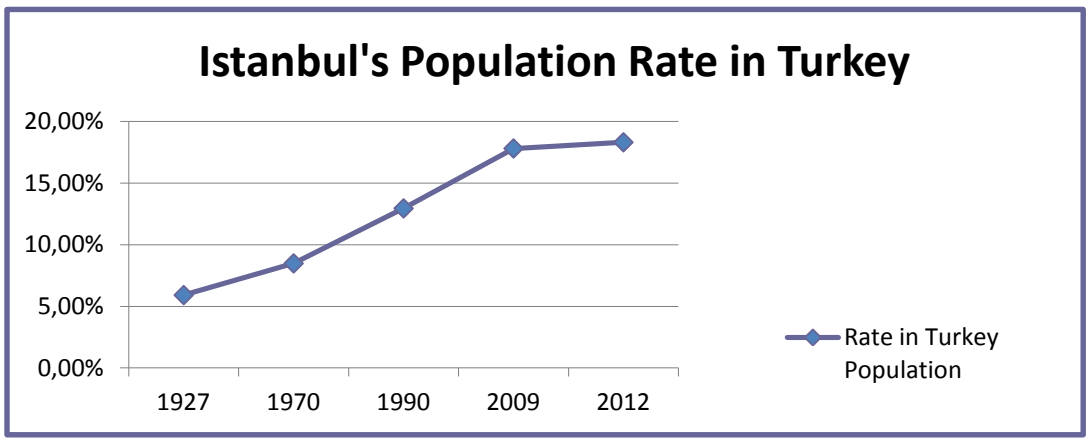


Figure 31: Population of Turkey over years

6% of population is foreign residents. Population with higher education is 12.1%, employment rate is 51.1% and unemployment rate is 11.3% which is higher than Turkey's unemployment rate 9.2%. Unemployed population of Istanbul consists of 22.6% of Turkey's unemployed population.

IV.II.III ECONOMY

Istanbul's GDP was $ 14,591 in 2008 while GDP was $ 9,384 in Turkey. Istanbul's GDP was 8,210 PPS in 2009. According to Green City Index by Siemens, GDP per head in 2009 is 14,615 Euros. Istanbul has also higher export and import per person than the region's and Turkey's average. It produces almost 27% of national GDP, 38% of total industrial output, more than 50% of services, and generates 40% of tax revenues (OECD, 2008). GDP per capita of Istanbul has already exceeded the national average by more than 70%. According to TurkStat data among 44,472 newly established companies and cooperatives, 15,839 were located in Istanbul while among 10,395 closed companies and cooperatives 5,274 were in Istanbul in 2009. Among the total enterprises in Turkey which is 3,474,992 829,119 of them were in Istanbul (Istanbul Development Agency, 2014). The city gets the lion's share of total FDI and generates half of total exports in Turkey (OECD, 2008). In sectorial GDP, services is the dominant sector with 73.1%. It is higher than Turkey's service sector ratio, 64.3%. The industry sector is 26.7% which is under the ratio of Turkey, 27.2%. Agriculture has 8.5% in Turkey while it is 0.2% in Istanbul. Istanbul is the center of industrial and commercial activities because of its geographic location. Parallel to the country's economic trends, the weight of service sector has increased in Istanbul's economy. In this frame the main economic activities that contribute to Istanbul's development are culture, tourism, logistic and finance (Istanbul Development Agency, 2014).

Istanbul faces challenges to become a hub for finance, logistics, culture and tourism in Euro-Asia region as well as its development in general. The labour intense activities are major in Istanbul's economy however there is a change towards an economy that based on knowledge industry. Constraints on human capital development and the informal sector have hindered productivity levels and increased income disparities (OECD, 2008). Over-migration is a challenge for Istanbul's economy, infrastructure, housing, etc.

Istanbul maintains a sizeable low value-added and labour-intensive manufacturing sector, mainly textiles and supply chain. This sector represents 37% of total labour force and 26% of GDP and 80% of total exports (OECD, 2008). As a result of economic growth and the dominance on national economy the city attracts migrants from other parts of Turkey as well as from neighbour countries.

Migration has also encouraged the informal sector of the economy which is 30% of the city's working labour force as economic growth has been insufficient in providing jobs for a large number of newcomers into the labour market (OECD, 2008). Those informal small firms have helped to relieve urban employment problems during the economic crisis.

Table 14: Portion of national GDP for Istanbul by sectors

SECTOR	ISTANBUL GDP RATIO 1987	ISTANBUL GDP RATIO 2000
Agriculture	1.4	0.7
Manufacture	26.8	29.2
Construction	17.8	18.8
Commercial	29.3	27.5
Logistic	21.7	21.7
Finance	43.0	55.2
Personal Services	38.8	39.5
Total Sectors	21.0	22.6

Source: TurkStat

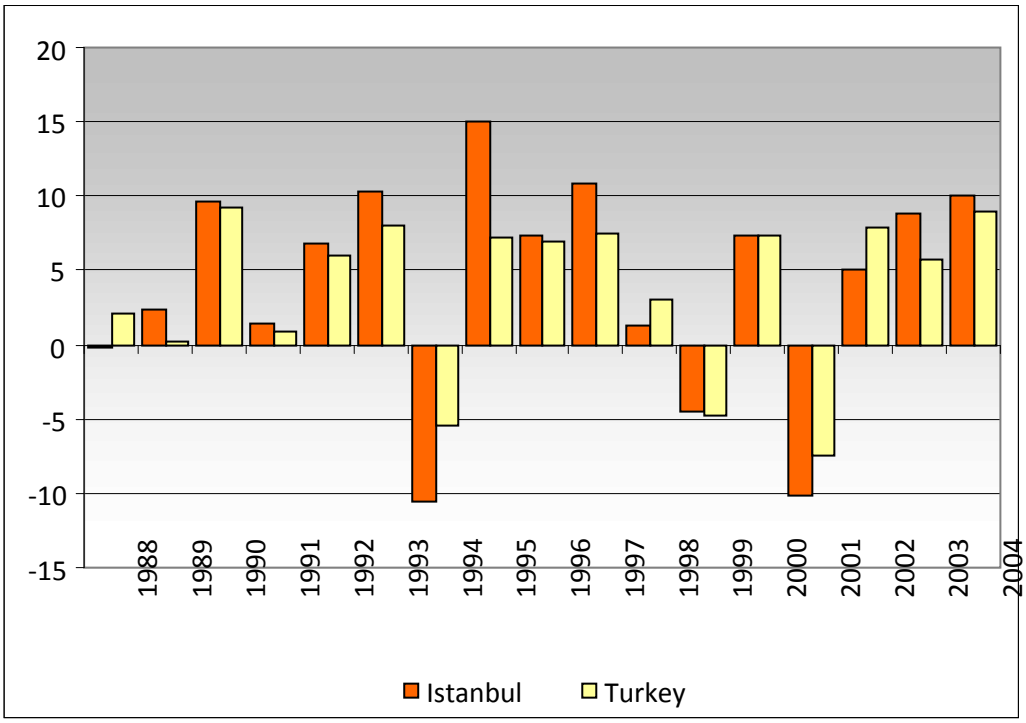


Figure 32: GDP real growth of Turkey and Istanbul (1989-2004)

Source: OECD, 2008

The allocation of the production in Istanbul has caused regional development disparities in the country. Turkey is characterised by the growing gap between East and West. Over the years directives have caused the east getting poorer and migration flows to the west.

Istanbul has developed rapidly in production and efficiency. Between 1987 and 2004 Turkey's growth rate is 3.2% while Istanbul's is 3.7%. According to international standards, Istanbul ranked 12th among the 45 OECD metropolitan regions in terms of economic growth rate for the period 1995-2000.

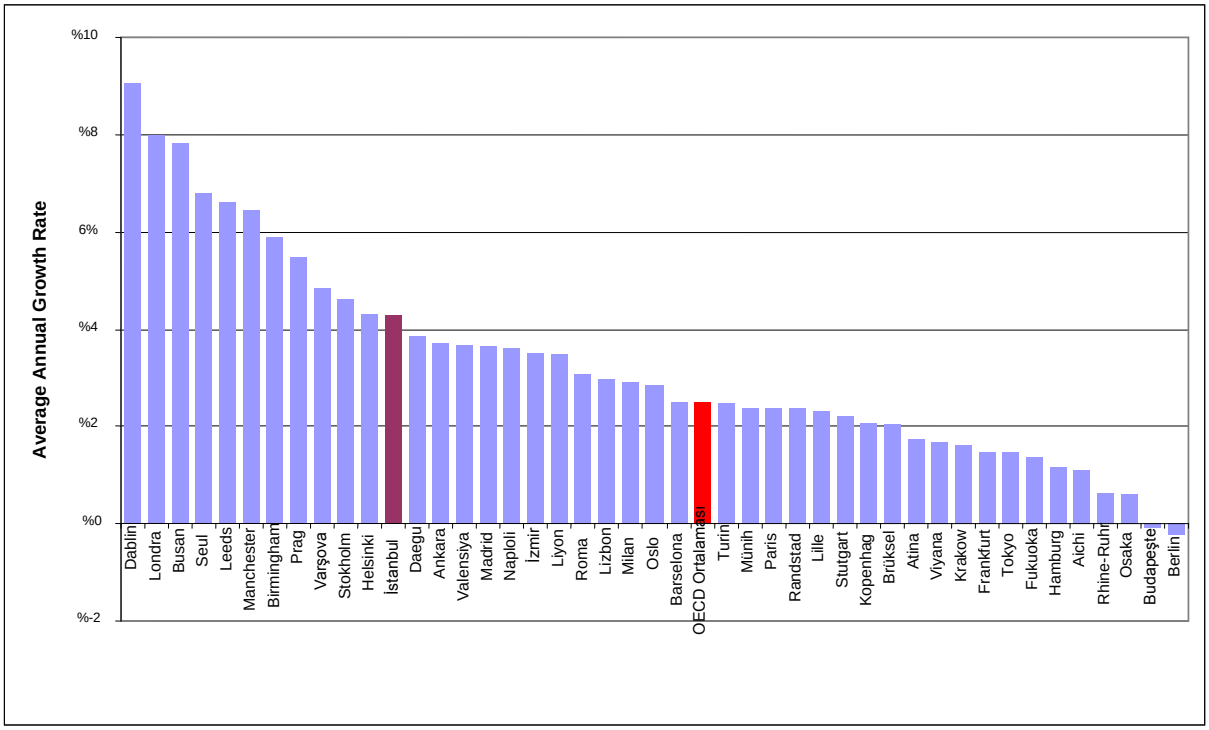


Figure 33: Economic growth in selected OECD metropolitan regions

Source: OECD, 2008

IV.III KEY STRATEGIES AND PROJECTS

IV.III.I STRATEGIES AND ACTION PLANS

STRATEGY/ACTION PLAN FACTSHEET 1	
Title	**Improvement in Public Transport and Popularization of Usage**
Dimension of KPIs	Transport and Mobility
Period	2014-2023
Strategy/Action Plan descriptio	
Objective	Improving public transport infrastructure especially rail transit systems to sustain equal accessibility to citizens. Integrating different and alternative transportation modes. Preventing the dominance of automobile usage as primary transportation mode.
Measures	Constructing new metro lines and railways. Construction of more connection/transit station to integrate different modes. Increasing the capacity of vehicles.
Targets	Increasing the ratio of railway systems in the network. Preparing long-term comprehensive public transportation strategies.
Links and Contacts	
Promoter	Istanbul Metropolitan Municipality

STRATEGY/ACTION PLAN FACTSHEET 1	
Document/website	http://www.ibb.gov.tr/tr-TR/kurumsal/Birimler/ulasimPlanlama/Documents/%C4%B0UAP_Ana_Raporu.pdf
Contact E-mail	-

IV.III.II KEY PROJECTS

PROJECT FACTSHEET 1	
Title	**Airport Carbon Accreditation**
Dimension of KPIs	Transportation and carbon emissions
Area of implementation (city, neighbourhood, etc.)	Istanbul Ataturk International Airport
Implementation period	2009 - n.d.
Project description	
Aims	Reducing carbon emissions in airports
Activities	Energy management, energy efficiency, sustainability
Promoters/Beneficiaries; Partnership	Airports Council International (ACI) Europe, TAV Airports
Financing	TAV Airports
Outcomes and impacts	14% increase in number of passengers, 4.6% decrease in the total carbon emission
Main factors of success	Innovative energy implementations and policies
Reproducibility and transferability	Can be conducted to any other airports
Links and Contacts	
Promoter	Airports Council International (ACI) Europe
Website	http://www.airportcarbonaccreditation.org/
Contact E-mail	-

IV.IV CASE STUDY CITY ASSESSMENT

IV.IV.I ENVIROMENTAL PERFORMANCE

VARIATION RATE OF ECOSYSTEM PROTECTED AREAS

According to Istanbul Environmental Plan Report (2009), the natural protected areas in Istanbul extent 39,497.6 ha for 2004 and according to Istanbul Metropolitan Municipality it is 52,212 ha for 2014. The geographical level of the data is municipality level.

Additionally, Turkey is in process of a new regulation of determining the environmental protection areas. With this new regulation all environmentally protected areas are planned to examine again and to determine the protection level according to identified criteria. This process is not completed yet, therefore the protection levels of those natural areas and the size of them may change over time.

Table 15: Ecosystem protected areas (ha)

YEAR	HA	VARIATION
2004	39,497.6	
2014	52,212	**32.1 %**

Source: Istanbul Metropolitan Municipality
Geographic Level: Municipality

ENERGY INTENSITY VARIATION RATE

Energy intensity is measured at national level in Turkey. Therefore the data is not available at the city level in appropriate form. In order to calculate the energy intensity of Istanbul, we have used total electricity consumption data between 2008 and 2012 and gross added value data for the same time period as input. The source for those data is TurkStat. Energy intensity rate is obtained by dividing the total energy consumption into GVA.

The results show that there is a decrease in energy intensity since 2008 in Istanbul. This means less energy consumption with more GVA which represents more efficient energy management.

Table 16: Energy Intensity (toe/euro GVA)

YEAR	TOE/EURO	VARIATION
2008	0.023	-
2009	0.022	-0.01
2010	0.021	-0.01
2011	0.026	0.05
2012	0.020	-0.06

Source: TurkStat
Geographic Level: Municipality

VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

The data of energy consumption by sectors could not be found at urban (Istanbul) level. Therefore, for this dimension, national level data from Ministry of Energy and Natural Resources has been used. The data is only available for 2003 and 2008. The data for each sector can be seen in Table 6. In the source the data is categorized as; residential and services, transportation, industry, agriculture, and others. Therefore the data has been used as it is in original.

According to data, the most energy consuming sector is residential and services in 2008 while it is industry in 2003 in Turkey. Industry sector is the second one in energy consumption in 2008 in Turkey. The third sector is transportation for both years in Turkey. Agriculture is considerably less energy consuming sector when compared with the other sectors.

The energy consumption for residential and services has increased 12%, transportation has increased 4%, industry has decreased 1%, agriculture has increased 3% and other sectors have decreased 18% from 2003 to 2008 in Turkey.

Table 17: Energy consumption by sectors (%)

YEAR	RESIDENTIAL & SERVICES (%)	TRANSPORTATION (%)	INDUSTRY (%)	AGRICULTURE (%)	OTHERS (%)
2003	24	16	33	4	23
2008	36	20	32	7	5
VARIATION	12	4	-1	3	-18

Source: Ministry of Energy and Natural Resources
Geographic Level: National

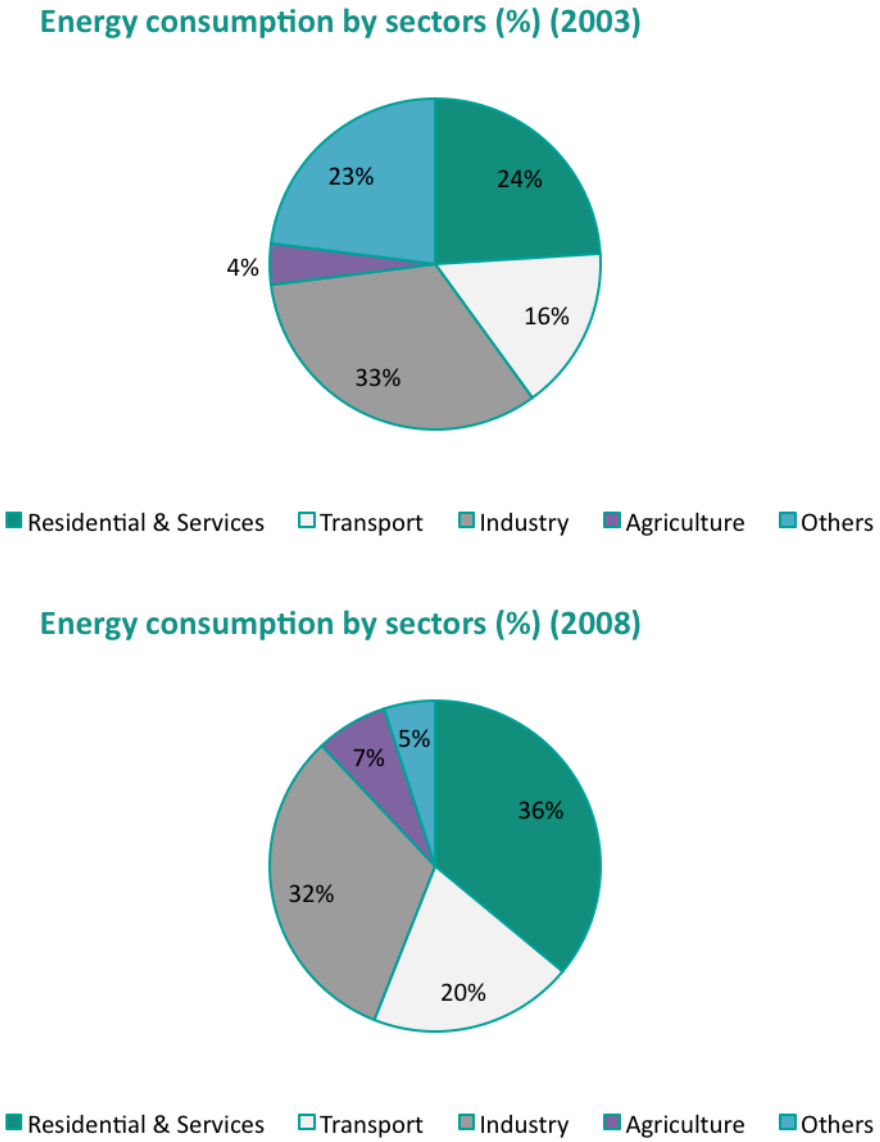


Figure 34: Energy consumption by sectors (%) (2003 and 2008)

VARIATION RATE OF CARBON EMISSIONS INTENSITY

The data for Istanbul's carbon emissions intensity is available in two different sources for two different years. According to Green City Index by Siemens the carbon emission per head is 3.25 tCO_2e in 2006 for Istanbul, at the municipality level. According to 2010 GHG Inventory of Istanbul, the carbon emission per head is 3.31 tCO_2e. In order to calculate the carbon emission intensity, carbon emission per head is divided into GVA dollars per person (since GDP for Istanbul is not available, GVA is used) in relevant year values. In conclusion, carbon emission intensity for 2006 is 0.315 tCO2/1000 dollars and it is 0.246 tCO2/1000 dollars for 2010. When the values compared, carbon intensity decreased 0.069 in 2010 which is relevant to increase in GVA.

Table 18: Carbon emissions intensity

YEAR	CARBON EMISSIONS PER HEAD	GVA	CARBON EMISSION INTENSITY	VARIATION
2006	3.25 tCO_2e	10,314 dollars/person	0.315 tCO2/1000dollars	
2010	3.31 tCO_2e	13,416 dollars/person	0.246 tCO2/1000dollars	- 0.069

Source: GHG Inventory of Istanbul 2010, Green City Index
Geographic Level: Municipality

VARIATION RATE OF CARBON EMISSIONS BY SECTOR

The data is obtained from 2010 GHG Inventory of Istanbul. The data is only available for 2010 and it is at the municipality level. In the source the sectors are listed as: residential, commercial, industrial, transportation, solid waste disposal, incineration and open burning, waste water treatment and discharge. The amount of carbon emissions by sector can be seen in Table 19.

As obviously seen in the table the highest carbon emission created by residential sector and followed by transportation. The urban settlement area and car ownership increase in Istanbul means more carbon emissions by those sectors can be expected in the future. Since data is available only for 2010, variation rate of carbon emissions by sectors could not be presented.

Table 19: Carbon emissions by sectors (tonCO2)

YEAR	RESIDENTIAL (TONCO2)	COMMERCIAL (TONCO2)	INDUSTRIAL (TONCO2)	TRANSPORTATION (TONCO2)	SOLID WASTE DISPOSAL (TONCO2)	INCINERATION & OPEN BURNING (TONCO2)	WASTE WATER TREATMENT & DISCHARGE (TONCO2)
2010	15,282,654	4,872,008	6,626,962	13,309,358	1,598,736	4,357	768,283

Source: GHG Inventory of Istanbul 2010
Geographic Level: Municipality

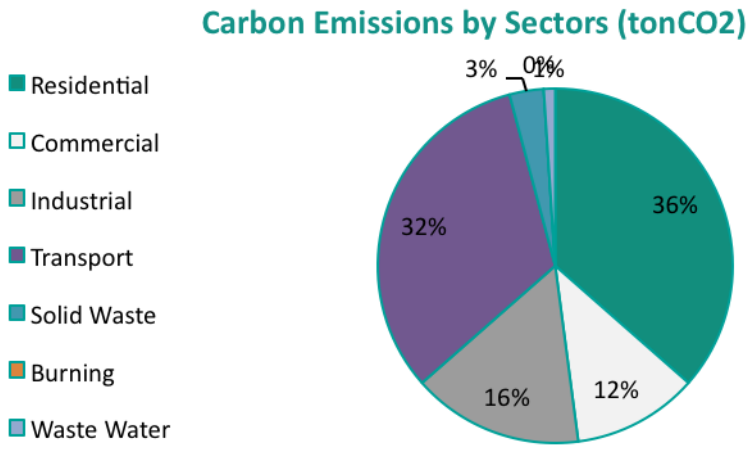


Figure 35: Carbon emissions by sectors (%)

EXCEEDING RATE OF AIR QUALITY LIMITS VALUE

The data is obtained from Istanbul Metropolitan Municipality, Environment Preservation Department for 2010, 2011, 2012. The data is avaliable for SO2, NO2, M10, M2,5. The exceeding rate of air quality limits value can be seen in Table 9 for each year.

Table 20: Exceeding rate of air quality limits value (no of days)

YEAR	SO2	VARIATION	NO2	VARIATION	M10	VARIATION	M2.5	VARIATION
2010	0	-	35	-	157	-	0	-
2011	0	-	2	-33	122	-35	0	-
2012	0	-	0	-2	173	51	0	-

Source: Istanbul Metropolitan Municipality
Geographic Level: Municipality

There is no observed exceeding rate for SO2 and M2.5 for 2010, 2011, 2012. NO2 exceeded the limit values 35 days in 2010 and 2 days in 2011. The variation is -33. M10 exceeded the limit values 157 days in 2010, 122 days in 2011, variation between those two years is -35, for 2012 exceeding was 173 days. The variation rate between 2011 and 2012 is 51.

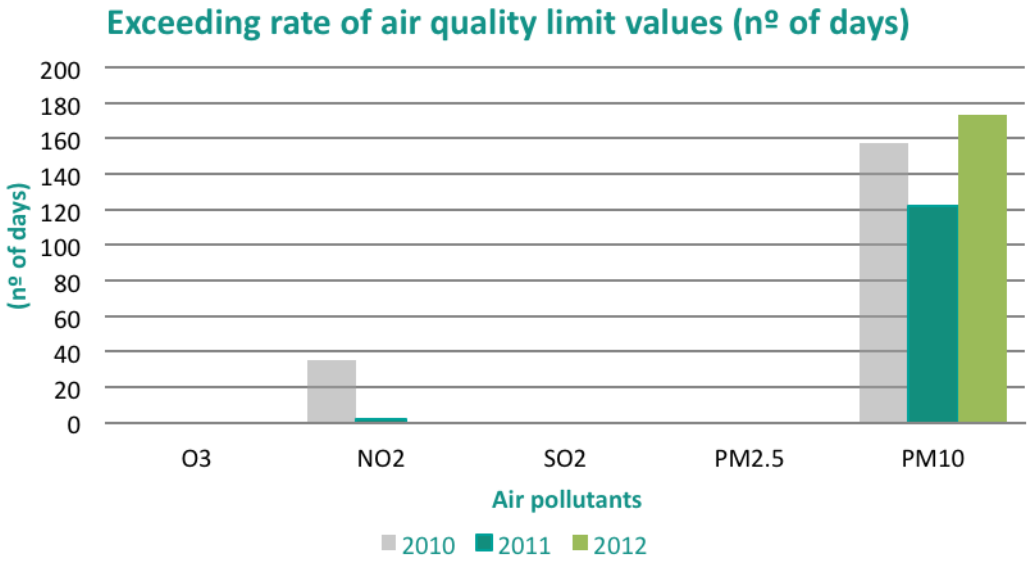


Figure 36: Exceeding rate of air quality limit values (no of days)

VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

Two different sources are used for this data at the municipality level. For 2006, Household Survey has been used while for 2008 Green City Index by Siemens has been used. The data is categorized differently in each resource. Therefore, the comparison is not possible. The data can be seen in Table 10 and Table 11. According to data, the share of public transportation in 2006 was 84% (schools' and companies' staff shuttles are included in the public transportation category) and it was 54.02% in 2008.

Table 21: Share of sustainable transportation (Household survey data)

YEAR	SHUTTLE & BUS (%)	RAILWAY (%)	BOAT (%)	PEDESTRIAN (%)	PRIVATE AUTOMOBILE (%)
2006	32	2	1	49	16

Source: Istanbul Metropolitan Municipality
Geographic Level: Municipality

Table 22: Share of sustainable transportation (Green city index data)

YEAR	PEDESTRIAN+CYCLING+PUBLIC TRANSIT (%)	PRIVATE TRANSPORTATION (%)
2008	54.02	45.98

Source: Green City Index
Geographic Level: Municipality

VARIATION RATE OF URBAN WASTE GENERATION

The data is obtained from ISTAC (Istanbul Environmental Management Industry and Trading Company). The data is available for the years between 2005 and 2012. The variation rate of urban waste generation over years indicates an increasing trend since 2007 for Istanbul.

Table 23: Variation rate of urban waste generation (tone/year)

YEAR	URBAN WASTE GENERATION (TONE/YEAR)	VARIATION
2005	4,668,350	-
2006	5,161,465	10%
2007	4,889,175	-5.5%
2008	5,160,370	5.5%
2009	5,183,000	0.4%
2010	5,295,785	2.1%
2011	5,383,385	1.6%
2012	5,685,605	5.6%

Source: ISTAC
Geographic Level: Municipality

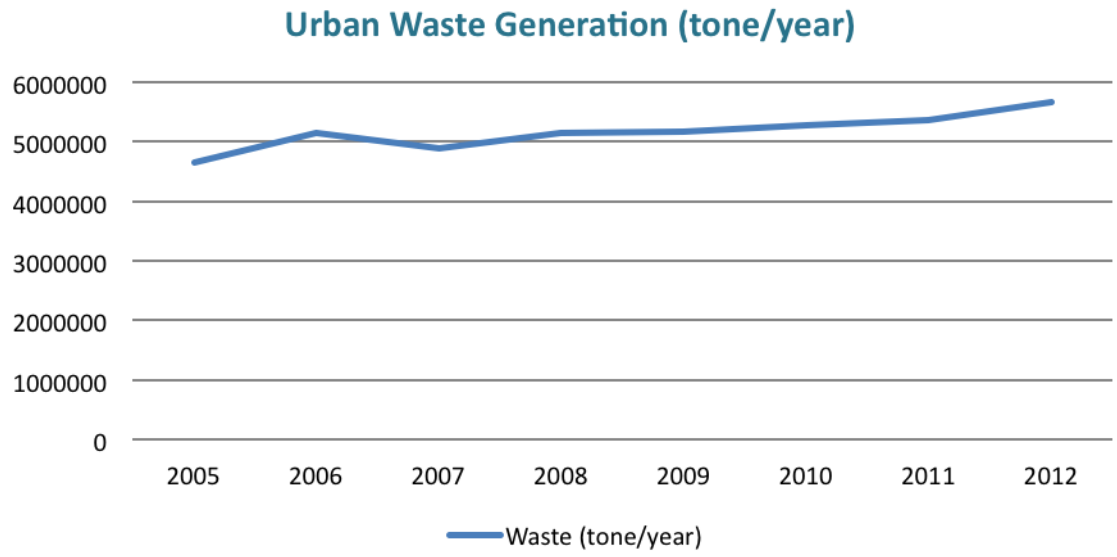


Figure 37: Urban waste generation by years

VARIATION RATE OF URBAN WASTE RECOVERY

For this dimension recycled packing waste and compost production has been used as the source ISTAC, sustained the data. The rate of the recovered waste among the generated waste has been calculated. The data has been obtained from 2006 to 2011. The variation rate of the dimension shows that there is an increasing rate for the waste recovery.

Table 24: Variation rate of urban waste recovery

YEAR	URBAN WASTE RECOVERY	VARIATION
2006	0.48%	-
2007	0.75%	0.27%
2008	0.50%	-0.25%
2009	1.17%	0.67%
2010	2.00%	0.83%
2011	2.62%	0.62%

Source: ISTAC
Geographic Level: Municipality

Figure 38: Urban waste recovery by years (%)

WATER LOSSES VARIATION RATE

The data has been obtained for the years between 2001 and 2012 from ISKI (Istanbul Water and Sewerage Administration). The rate of water losses fluctuates over years however there is a remarkable decrease from 2001 to 2012. As the importance of sustainable water management has been understood, ISKI has taken some measures to decrease the water losses which is effective on decreasing the rate of water losses.

Table 25: Water losses variation rate (%)

YEAR	WATER LOSSES (%)	VARIATION
2001	35.33	-
2002	38.38	3.05
2003	36.14	-2.24
2004	34.65	-1.49
2005	28.43	-6.22
2006	29.44	1.01
2007	27.85	-1.59
2008	24.84	-3.01
2009	24.24	-0.6
2010	28.53	4.29
2011	25.59	-2.94
2012	24.11	-1.48

Source: ISKI; Geographic Level: Municipality

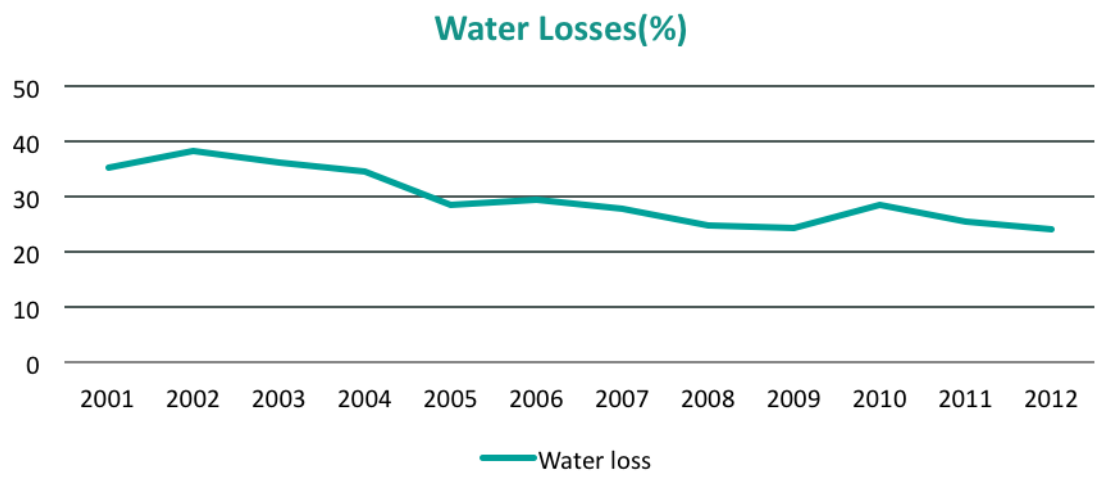


Figure 39: Water losses by years (%)

ENERGY EFFICIENT BUILDINGS VARIATION RATE

For this dimension, there is no available data as the number of energy efficient buildings in the city. Therefore, the number of the buildings which have had the LEED certificate in Istanbul has been considered as energy efficient buildings. The data has been obtained from the web-site of U. S. Green Buildings Council (http://www.usgbc.org/leed) as the certificate awarded at any level of LEED buildings in Istanbul. The first time the buildings awarded in Istanbul was 2009.

The number of LEED certificated buildings in the city has increased since then. Investors give more importance to green and energy efficient buildings. For the time being there are 146 buildings in Istanbul which are candidate for the certification.

Table 26: The number of energy efficient buildings

YEAR	ENERGY EFFICIENT BUILDINGS (NO)	VARIATION
2009	2	-
2010	3	1
2011	13	10
2012	21	8
2013	23	2
2014	40	17

Source: http://www.usgbc.org/leed; Geographic Level: Municipality

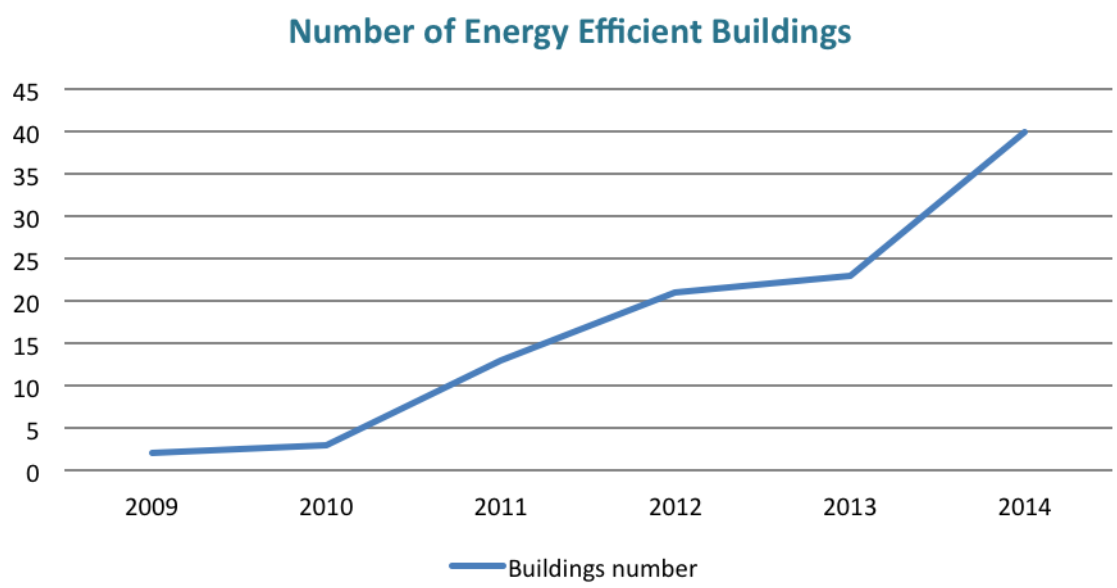


Figure 40: Energy efficient buildings by years

URBAN BUILDING DENSITY VARIATION RATE

According to Istanbul Environmental Plan Report, the building density in Istanbul was 637.93 no/km^2 in 2009. According to Istanbul Metropolitan Municipality, the building density in 2011 was 677.51 no/km^2. The building density has been calculated by dividing the number of

buildings into total surface area of Istanbul. The results show an increase in the density of buildings as expected.

Table 27: Urban building density

YEAR	NO OF BUILDINGS	ISTANBUL SURFACE AREA	BUILDING DENSITY (NO/KM2)
2009	3,483,758	5461 KM2	637.93
2011	3,699,930	5461 KM2	677.51

Source: Istanbul Metropolitan Municipality
Geographic Level: Municipality

IV.IV.II SOCIAL PERFORMANCE

VARIATION RATE OF UNEMPLOYMENT LEVEL BY GENDER

The data has been obtained from TurkStat (Turkish Statistical Institute) for the years from 2004 to 2012 at NUTS 2 (TR1- Istanbul) level. The data before 2004 cannot be found. Unemployment rate for females has been always higher than for males. In the period from 2004 to 2009, unemployment rate decreased for both gender, however in 2009 a sudden increase has been observed. After 2009, it has continued to decrease. The highest level was in 2009 for both gender and the lowest level was in 2007 for males, and in 2005 for females. The data for each year can be seen in Table 17.

Table 28: Variation rate of unemployment level by gender (%)

YEAR	MALE (%)	VARIATION FOR MALE	FEMALE (%)	VARIATION FOR FEMALE
2004	11.7	-	14.9	-
2005	11.0	-0.7	13.2	-1.7
2006	10.6	-0.4	14.0	0.8
2007	9.5	-1.1	13.5	-0.5
2008	10.4	0.9	13.7	0.2
2009	15.8	5.4	19.9	6.2
2010	13.2	-2.6	17.4	-2.5
2011	10.6	-2.6	15.2	-2.2
2012	10.1	-0.5	14.4	-0.8

Source: TurkStat
Geographic Level: NUTS II

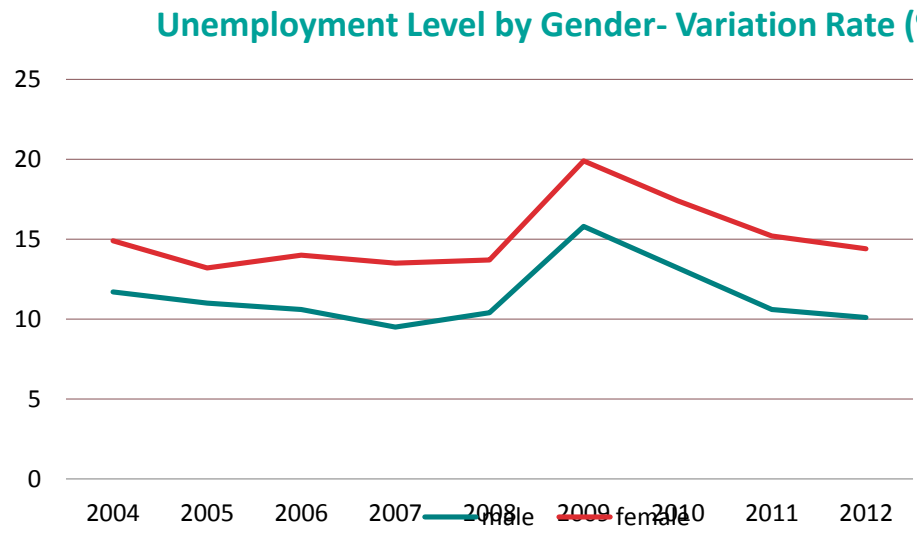


Figure 41: Variation rate of unemployment level by gender (%)

VARIATION RATE OF POVERTY LEVEL

The data has been obtained from TurkStat for the years from 2006 to 2012 at the NUTS 2 (TR1-Istanbul) level. The data before 2006 cannot be reached. The poverty level fluctuates over the years in Istanbul. The highest level was in 2006 with 21% and the lowest level was in 2009 with 14.9 %. The poverty rate is lower than Turkey's average for each year. The data for each year can be seen in Table 18.

Table 29: Variation rate of poverty level (%)

YEAR	POVERTY LEVEL FOR ISTANBUL(%)	VARIATION RATE OF ISTANBUL	POVERTY LEVEL FOR TURKEY (%)	VARIATION RATE OF TURKEY
2006	21.0	-	23.9	-
2007	15.8	-5.2	21.3	-2.6
2008	17.4	1.6	22.2	0.9
2009	14.9	-2.5	22.3	0.1
2010	18.7	3.8	21.2	-1.1
2011	18	-0.7	21.1	-0.1
2012	17.4	-0.6	-	-

Source: TurkStat
Geographic Level: NUTS II

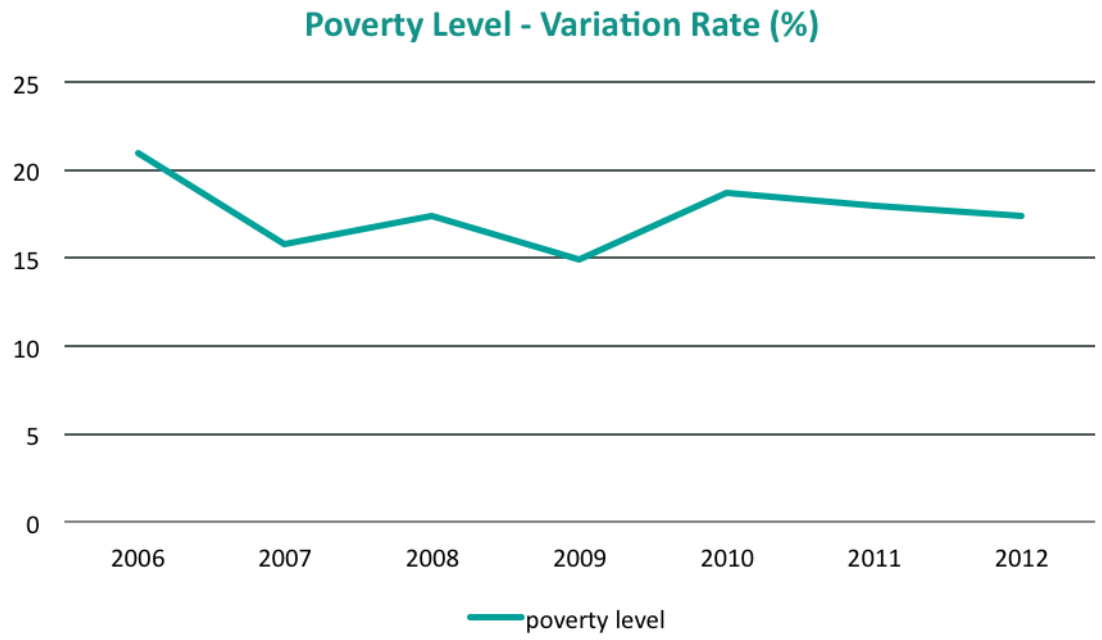


Figure 42: Variation rate of poverty level (%)

VARIATION RATE OF TERTIARY EDUCATION LEVEL BY GENDER

The data has been obtained from TurkStat for the years from 2008 to 2012 at the NUTS 2 (TR1-Istanbul) level. The data before 2008 cannot be found. The data indicates that there is a trend of continuously increase in tertiary education level for both gender. The data for each year can be seen in Table 19.

Table 30: Variation rate of tertiary education by gender (%)

YEAR	MALE (%)	VARIATION FOR MALE	FEMALE (%)	VARIATION FOR FEMALE
2008	3.92	-	3.14	-
2009	4.52	0.6	3.74	0.6
2010	4.73	0.21	3.93	0.19
2011	5.45	0.72	4.63	0.7
2012	5.71	0.26	4.98	0.35

Source: TurkStat
Geographic Level: NUTS II

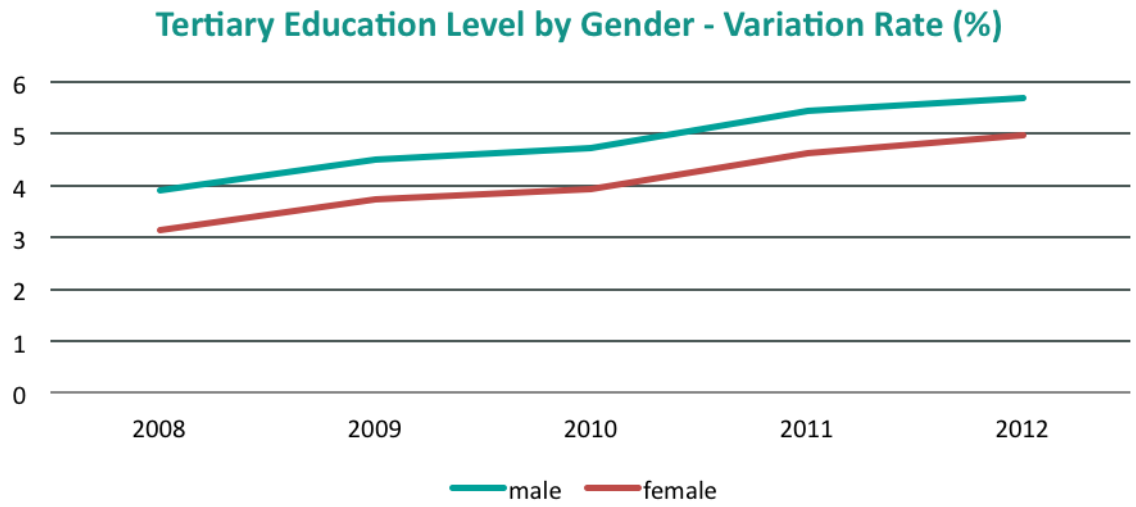


Figure 43: Variation rate of tertiary education level by gender (%)

VARIATION RATE OF AVERAGE LIFE EXPECTANCY

TurkStat formally produced the data in 2012 and 2013 for the first time. The life expectancy at birth for Istanbul was 77.2 in 2013 while it was 76.3 for Turkey. No more information about that dimension can be found. Life expectancy is higher than Turkey's average in Istanbul.

According to the variation rate of the data, the average life expectancy in Istanbul was decreased from 2012 to 2013.

Table 31: Average life expectancy

YEAR	LIFE EXPECTANCY IN ISTANBUL	VARIATION
2012	77.8	-
2013	77.2	-0.6

Source: TurkStat
Geographic Level: NUTS II

VARIATION RATE OF GREEN SPACE AVAILABILITY

The data for this dimension has been obtained from Istanbul Metropolitan Municipality, Department of Parks and Gardens for the period between 2004 and 2012. In Istanbul, green areas are under the management of Istanbul Metropolitan Municipality or District Municipalities. The data contains only the green areas that are under the management of Istanbul Metropolitan Municipality. Because of the absence of a system that collects the green area information from all district municipalities, this data does not contain the amount of green spaces under the management of district municipalities.

The variation rate of green areas indicates a continuous increase in the amount of green areas in Istanbul since 2004. In 2012, the percentage of green areas in Istanbul has reached 9.09% with an increase of 3.44% since 2004.

Table 32: Green space availability (%)

YEAR	GREEN SPACE (KM2)	GREEN SPACE (%)	VARIATION
2004	308.64	5.65	-
2005	343.64	6.29	0.64
2006	384.01	7.03	0.74
2007	459.68	8.41	1.38
2008	479.83	8.78	0.37
2009	482.99	8.84	0.06
2010	483.85	8.86	0.02
2011	486.28	8.90	0.04
2012	496.93	9.09	0.19

Source: Istanbul Metropolitan Municipality
Geographic Level: Municipality

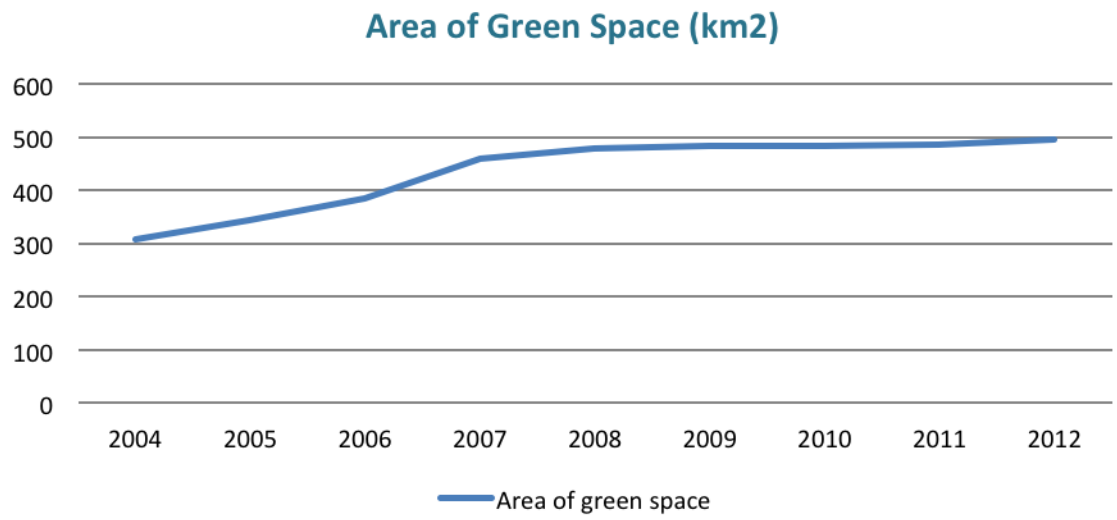


Figure 44: Green space availability by years (km2)

EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

From the interviews with Istanbul Metropolitan Municipality Department of Environment Preservation and conducted researches it is concluded that there exist air pollution monitoring systems however, there is no CO2 emission monitoring system in Istanbul.

IV.IV.III ECONOMIC PERFORMANCE

LEVEL OF WEALTH VARIATION RATE

The data has been obtained from TurkStat for the years from 2004 to 2011. GDP per person is not available at the city level in Turkey, therefore, GVA (Gross Value Added) per person data has been used to describe the level of wealth in Istanbul. The source supplies the data as GVA dollars per person has been used for this dimension as given unit in the source.

The level of wealth has increased since 2004 except the decrease in 2009. The level of wealth for Istanbul which was 7,943 dollars/person in 2004 raised to 13,865 dollars/person in 2011. The variation rate between 2004 and 2012 is 74.5%.

Table 33: Level of wealth variation rate (GVA per person)

YEAR	LEVEL OF WEALTH (GVA PER PERSON)	VARIATION
2004	7,943 dollars/person	-
2005	9,511 dollars/person	19.7%
2006	10,314 dollars/person	8.4%
2007	12,925 dollars/person	25.3%
2008	14,591 dollars/person	12.8%
2009	11,848 dollars/person	-18.7%
2010	13,416 dollars/person	13.2%
2011	13,865 dollars/person	3.3%

Source: TurkStat
Geographic Level: NUTS II

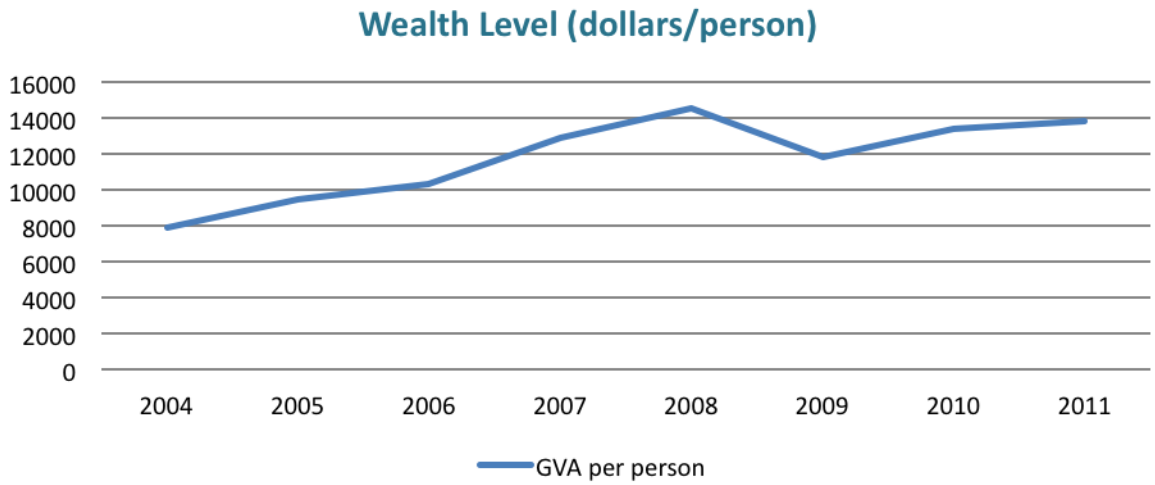


Figure 45: Level of wealth by years (dollars/person)

VARIATION RATE OF GDP BY SECTORS

The data for this dimension is available for the period 2007 - 2011 from TurkStat at NUTS 2 (TR1) level. The data is categorised as agriculture, industry and services. According to data the highest rate is services, industry follows as the second and agriculture has the lowest rate. Over the years small changes can be observed on the rate of each sector's GDP however the dominant sector has not changed. For Istanbul the weighted sector is services in terms of their rate of GDP.

Table 34: GDP by sectors (%)

YEAR	AGRICULTURE (%)	INDUSTRY (%)	SERVICES (%)
2007	0.2	27.5	72.3
2008	0.3	26.7	73.1
2009	0.2	24.9	74.9
2010	0.2	26.3	73.5
2011	0.2	27.4	72.5

Source: TurkStat
Geographic Level: NUTS II

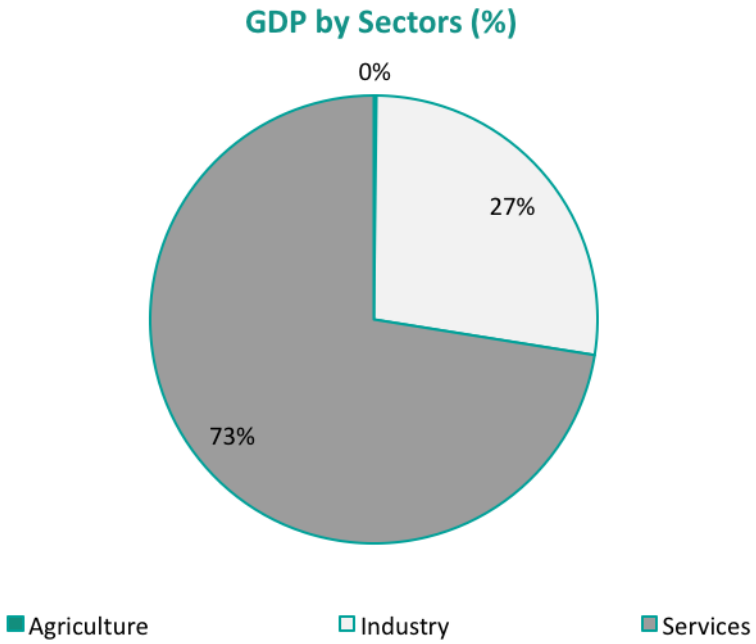


Figure 46: GDP by sectors, 2011 (%)

EMPLOYMENT BY SECTORS VARIATION RATE

The data has been obtained from TurkStat for the years from 2004 to 2009. The sectors are categorised as agriculture, industry and services. When data for those years are compared, it can be observed that the rate of services continuously increases while agriculture and industry decrease. The major sector is services. It can be said that agriculture is very limited in Istanbul. The data for each year can be seen in Table 24.

Table 35: Employment by sectors variation rate (%)

YEAR	AGRICULTURE (%)	INDUSTRY (%)	SERVICES (%)
2004	0.8	42.6	56.7
2005	0.6	43	56.4
2006	0.5	41.9	57.6
2007	0.3	40.3	59.4
2008	0.4	40.1	59.5
2009	0.3	37.9	61.8

Source: TurkStat
Geographic Level: NUTS II

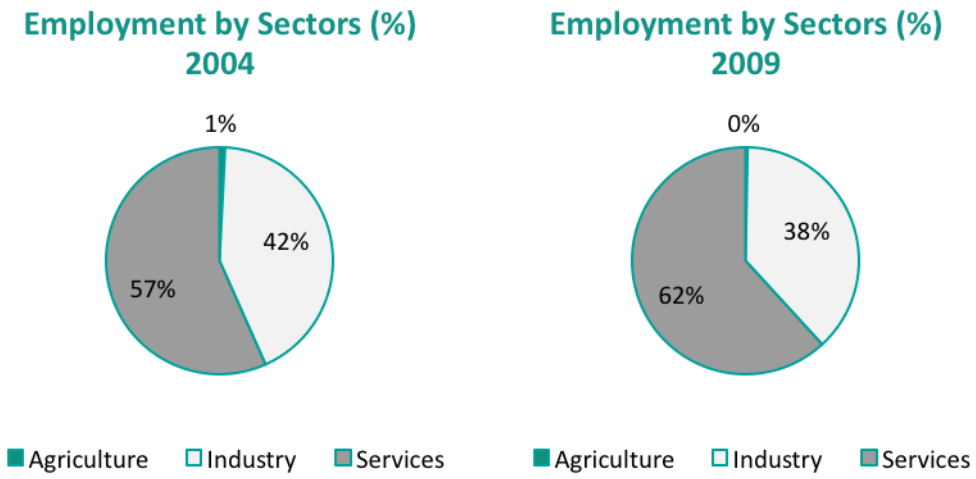


Figure 47: Employment by sectors, 2004, 2009 (%)

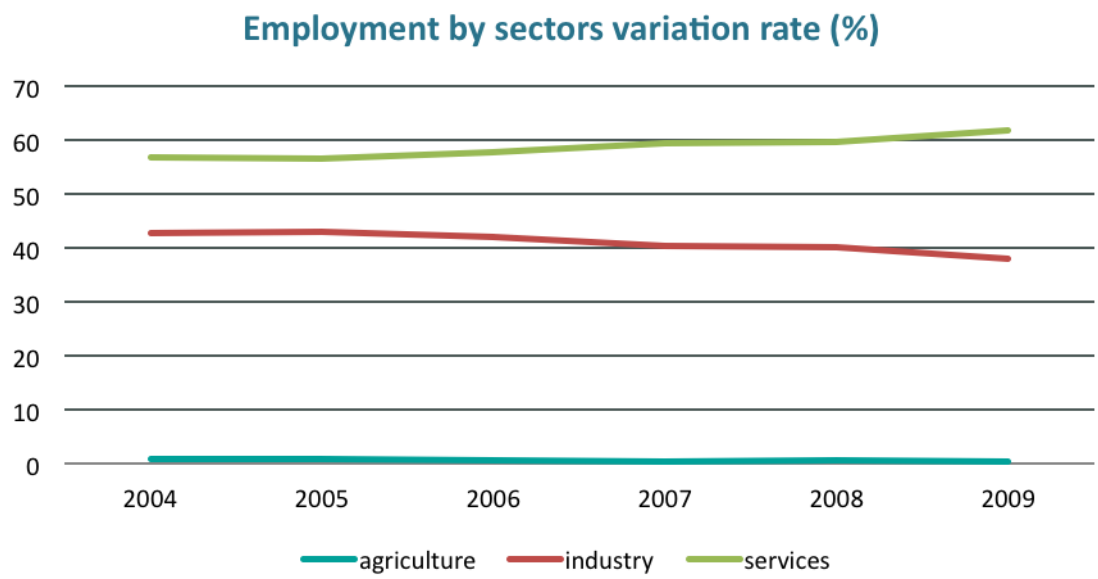


Figure 48: Variation rate of employment by sectors (%)

BUSINESS SURVIVAL VARIATION RATE

The ratio of companies surviving up to three years is not available for Istanbul. TOBB only reveals the number of opening and closing firms/companies by years. Therefore, for this

dimension, the number of opened and closed firms for 2009, 2010 and 2011 is given to make a comparison.

In 2010 18.18% more firms opened in Istanbul comparing with 2009 while 10.37% more firms opened in 2011 comparing with 2010. On the other hand 5.59% more firms closed in 2010 comparing with 2009 and 23.09% more firms closed in 2011 comparing with 2010.

Table 36: Number of opened and closed firms

YEAR	OPENED	VARIATION (%)	CLOSED	VARIATION (%)
2009	31216	-	11513	-
2010	36894	18.18	12157	5.59
2011	40721	10.37	14965	23.09

Source: TOBB
Geographic Level: Municipality

BUDGET DEFICIT VARIATION RATE

There is no data on this dimension. The budget deficit is not determined at the local level in Turkey.

INDEBTEDNESS LEVEL VARIATION RATE

The data has been obtained from Istanbul Metropolitan Municipality for the period 2006-2012. It has been calculated as extracting the income of the municipality from the expenditure of the municipality. The difference is the debt of the municipality for both domestic and foreign.

The level of indebtedness increased from 2006 to 2010 however in 2011 a sudden decrease that continues also in 2012 has been observed. The indebtedness level has increased 1.7% since 2006.

Table 37: Indebtedness level variation rate (%)

YEAR	INDEBTEDNESS (%)	VARIATION
2006	7.8	-
2007	17.9	10.1
2008	18.3	0.4
2009	24.1	5.8
2010	31.7	7.6
2011	13.4	-18.3
2012	9.5	-3.9

Source: Istanbul Metropolitan Municipality
Geographic Level: Municipality

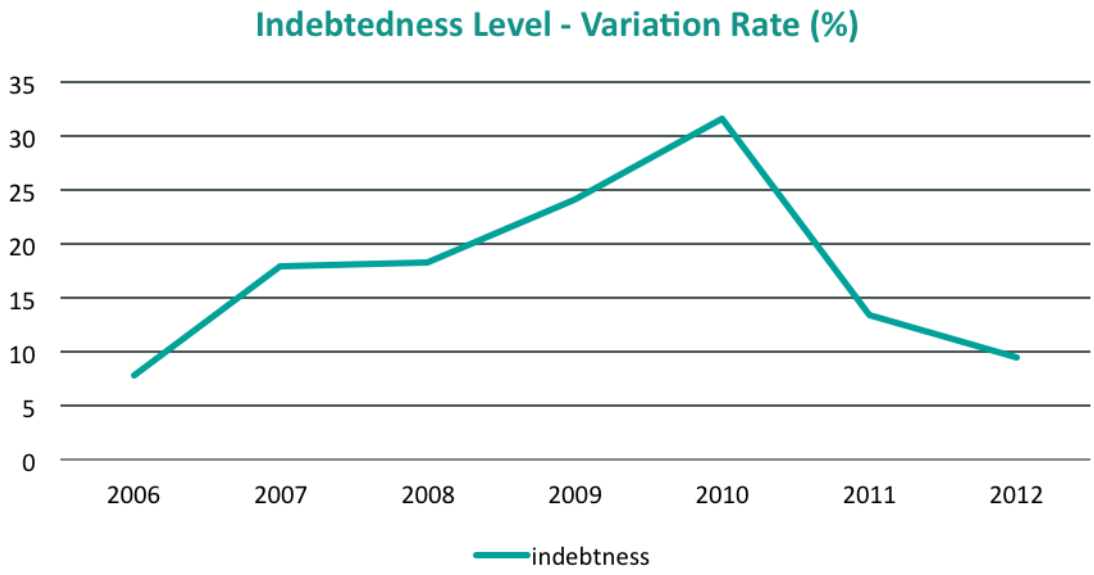


Figure 49: Indebtedness level variation rate (%)

R&D INTENSITY VARIATION RATE

The data has been obtained from TurkStat for 2010 and 2011. A slight change on R&D intensity can be observed from 2010 to 2011.

Table 38: R&D Intensity variation rate

YEAR	R&D INTENSITY (%)	VARIATION
2010	0.6286	-
2011	0.6857	0.05

Source: TurkStat
Geographic Level: NUTS II

IV.V FINDINGS AND KEY CHALLENGES

Istanbul's population has reached 13 million and continues to increase rapidly. The increase in urban population causes sprawl of the city towards peripheries, enlargement of settled and built area. This situation brings some problems such as stress on natural protection areas and forests, long travel time in traffic, air and environment pollution. Population increase is the primary challenge for Istanbul.

Data collection and monitoring for some dimensions are not supplied in Turkey. In the process of data collection that was the main challenge confronted. The system for data collection and publishing is a challenge for Turkey to be developed. Therefore, in this study some dimensions

have data only for one year even some do not have at all. This situation creates problems to find out the trend about dimensions, comparison between past and today and makes factual comments on the dynamics of the city.

Environmental performance data is available for one year in most of dimensions. The reason for this is recently created consideration on environmental issues. The data is obtained from some special studies on Istanbul. The urban sprawl threatens the natural protection areas. The trend of urban sprawl and population increase put the natural protection areas at risk. Increasing population causes also an increase in energy demand.

Public transportation investments are increased by municipality. Istanbul Metropolitan Municipality gives importance to expand the public transportation to all over the city. Transportation Master Plan of Istanbul (2011) focuses on public transportation, integration of different modes and decreasing the share of automobile in the traffic. Increasing the share of public transportation in the city is one of the main targets of the municipality.

Istanbul has improving trends on social performance. Unemployment and poverty levels are decreasing. Although there is no significant decrease and there is a stable situation in recent years, the decrease over the years is obvious. Also, Istanbul is in a better condition when it is compared to Turkey's average data. The education level increases, life expectancy is higher than Turkey's average.

Economic performance data indicates that the wealth level is increasing in Istanbul. The city is the economic center of Turkey that attracts investments, enterprises, co-operations in Istanbul. Therefore, the city has a dynamic and developing structure in its economy. Its geographic location is an advantage for the economic development. The primary sector in Istanbul is the services sector. Services sector has both the highest GDP rate and the highest employment rate. According to economic trends of Istanbul, the rate of services sector is increasing over the years, while the rate of industry and agriculture is decreasing. Istanbul is not an agricultural city with its limited agricultural land.

When social, environmental and economic performance of the city is compared, the weakest dimension is the environmental performance. According to social performance data Istanbul has a positive trend over the years. Economic performance data also indicates a positive trend over the years. However, environmental performance is the most underestimated aspect of the city by local and national governments. The data collecting and monitoring system is not developed by governments. Urban and economic development's impact on environment is not considered. While encouraging economic investments, environmental aspects are underestimated. The importance of environment and protection of nature has recently taken into consideration. Therefore, the environmental performance of Istanbul should be seriously taken into consideration and be improved.

IV.VI RECOMMENDATIONS

Based on the indicators in this report, the following recommendations can be given for Istanbul:

- Istanbul needs an accurate data collection and monitoring system especially on environmental dimensions

- Population increase and urban development should be controlled and developed in a more sustainable way.
- Over-migration causes transportation, infrastructure, housing, risk management problems. The migration problem should be solved by strengthening the local administration, implementing the national strategies and limiting the migration to Istanbul.
- More sustainable approaches to the city should be adopted instead of pure economic concerns.
- Cooperation of public organisations, private institutions, academics, NGOs and citizens should be sustained. The decisions, plans and regulations should be transparent. Participatory approach is necessary for the development process.
- Further environmental measures, legislative regulations can help improving environmental performance.
- Citizens should be enlighthen about future challenges of the city and how they can contribute to the future development.
- Despite the investments on public transportation private car is still main transportation mode in the city. Public transportation should be made more attractive for citizens.
- Urban renewal is in the most active period in Istanbul. Old and risky buildings are rebuilding all over the city. While rebuilding the structures, more energy efficient and sustainable buildings should be constructed.
- Carbon emissions and air quality should be monitored in order to put a target on reducing carbon emission and increasing air quality.
- Urban waste recovery amount should be improved by municipality. Citizens should be educated about recycling, separate collection of waste and using environmentally friendly products.
- The economic potential of Istanbul should be used in a more sustainable way. New solutions should be created to decrease unemployment and poverty while protecting environment.
- At the regional level, actions should aim at strengthening the networks between firms, encouraging links up and down supply chains, and facilitating the insertion of small firms into the wider process of technological and managerial change.
- Without development in other parts of the country Istanbul will continue to face the challenges that it suffers. A national strategy for managing future growth is a necessity.

IV.VII CONCLUSIONS

Istanbul is in the initial stage of post-carbon city development. It has a lot of challenges and advantages as well to organize a more sustainable and post-carbon city. Istanbul's geographic location, economic attraction, natural values, historical and cultural heritages, tourist attractiveness are the main advantages. On the other hand, population increase, immigration, urban sprawl and the pressure on natural areas are the major challenges of the city. Development and protection measures should be considered in a sustainable way and regulations should be made by local and national governments for social, economic and environmental viability of the city.

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V CASE STUDY CITY LISBON

V.I DATA COLLECTION

By default, data for the Lisbon case study city is gathered at municipality level. If the data is not available at this scale, then data is collected at NUT III level. Only for those cases, it is specifically indicated the geographical level.

Table 39 summarizes the geographical level, sources of data and years of data collection for each KPI. Most of them were collected for the municipality or NUT III and through the national official statistics office - INE. The source of energy indicators is Directorate-general for Energy and Geology - DGEG and the source for carbon emissions and air quality is the Portuguese Environment Agency – APA. Some public reports published by the Lisbon City Council have also been used whenever statistics from INE are not available.

Table 39 - Summary of geographical level and data sources for each KPI

DIMENSION	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	NUT II	2003-2012	INE, www.ine.pt
		Variation rate of poverty level	NUT II	1989, 2009	Desigualdade Económica em Portugal, Carlos Farinha Rodrigues, 2012
		Variation rate of tertiary education level by gender	Municipality	1960, 1981, 2001, 2011	INE, Census, censos.ine.pt/
		Variation rate of average life expectancy	NUT III	2003-2012	INE, www.ine.pt
	Public services and Infrastructures	Variation rate of green space availability	Municipality	2004-2008; 2009-2014; >2014	Estratégias locais – boas práticas, Lisboa Smart City, José Sá Fernandes, Lisbon City Council.
	Governance effectiveness	Existence of monitoring system for emissions reductions	Municipality	N/A	N/A
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	Municipality	2003, 2012	Estratégias locais – boas práticas, Lisboa Smart City, José Sá Fernandes, Lisbon City Council.
	Energy	Energy intensity variation rate	NUT III	2003, 2012	INE, www.ine.pt; DGEG, www.dgeg.pt

DIMENSION	SUB-DIMENSION	INDICATOR	GEOG. LEVEL	YEAR	SOURCE
		Variation rate of energy consumption by sectors	Municipality	2008, 2012	INE, www.ine.pt; DGEG, www.dgeg.pt
	Climate and Air Quality	Variation rate of carbon emissions intensity	NUT III	2005, 2009	INE, www.ine.pt; APA, www.apambiente.pt
		Variation rate of carbon emissions by sector	N/A	N/A	N/A
		Exceedance rate of air quality limit values	Municipality	2003,2012	APA, www.apambiente.pt
	Transport and mobility	Variation share of sustainable transportation	Municipality	2001, 2011	INE, Census, censos.ine.pt/
	Waste	Variation rate of urban waste generation	Municipality	2002-2013	INE, www.ine.pt
		Variation rate of urban waste recovery	Municipality	2002-2013	INE, www.ine.pt
	Water	Water losses variation rate	Municipality	2002-2013	INE, www.ine.pt
	Buildings and Land Use	Energy-efficient buildings variation rate	Municipality	2007, 2012	ADENE – Portuguese Energy Agency, www.adene.pt/
		Urban building density variation rate	Municipality	2001, 2011	INE, Census, censos.ine.pt/
ECONOMY	Sustainable economic growth	Level of wealth variation rate	NUT III	2004-2012	INE, www.ine.pt
		Variation rate of GDP by sectors	NUT III	2004-2012	INE, www.ine.pt
		Employment by sectors variation rate	NUT III	2003-2011	INE, www.ine.pt
		Business survival variation rate	NUTIII	2008, 2009, 2010	Eurostat, ec.europa.eu/eurostat
	Public Finances	Budget deficit variation rate	Municipality	2009-2013	Pordata, www.pordata.pt
		Indebtedness level variation rate	Municipality	2010-2013	Relatório de gestão 2013, Lisbon City Council
	Research & Innovation dynamics	R&D intensity variation rate	NUT III	2003-2010	INE, www.ine.pt

As mentioned above, Lisbon Municipality and NUT III are the most used geographical levels. Only the indicators 'variation rate of unemployment level by gender' and 'variation rate of poverty level' was gathered for NUT II region.

Besides the geographical level, the other main limitation of this study is related to the years of available data. Most of indicators are presented for other time periods than the ones indicated in *Report on Key Performance Indicators*, as shown in Table 1.

Some other constrains were found, namely related to carbon emissions indicators. Despite the values of carbon emissions are published by APA at municipality level, the carbon emissions by sector are not known regardless the geographical level. Because GDP is only calculated at NUT III, NUT II or national level, carbon emission intensity had to be computed by summing up the emissions for the municipalities within NUT III. The same procedure was followed for energy intensity.

As far as we could investigate, there is no monitoring system for emissions reduction in Lisbon; therefore, no years or source of data are presented in Table 1 for this indicator. In addition, for the indicators related to exceedance rate of air quality limit values, data is only complete for two pollutants: ozone and PM10.

The two indicators of sub-dimension Public Finances are not presented as a percentage of city' GDP since, as it was mentioned above GDP is not calculated at municipality level.

V.II OVERVIEW OF THE CASE STUDY CITY

V.II.I TERRITORY

Lisbon is the capital of Portugal and the largest city in the country. Briefly, Portugal is located in South-western Europe, on the Iberian Peninsula. It is the westernmost country of mainland Europe and is bordered by the Atlantic Ocean to the west and south and by Spain to the north and east. The area of Portugal is 92,212 km^2 and it has 10.6 million inhabitants. In addition to the continental territory, Portugal includes two autonomous regions of the Atlantic Ocean, the islands of Azores and Madeira.

Regarding Lisbon, it is the westernmost city in continental Europe as well as the westernmost capital city and the only one along the Atlantic coast. Lisbon lies on the north bank of the Tagus Estuary and is located more or less in the centre of the country, approximately 300 km from the Algarve in the south and 400 km from the northern border with Spain.

Lisbon municipality occupies an area of 100.05 km^2; however if one considers a larger area, known generically as Greater Lisbon (NUT III), comprising other cities, namely Amadora, Cascais, Loures, Mafra, Odivelas, Oeiras, Sintra and Vila Franca de Xira, the area is extended up to 1,389.98 km^2, as is shown in Figure 3 - . Each municipality is still divided in several parishes for better administrative purposes, being Lisbon divided in 24 parishes.

Figure 50 - Greater Lisbon Area, which is comprised by 9 municipalities: Amadora, Cascais, Lisboa, Loures, Mafra, Odivelas, Oeiras, Sintra and Vila Franca de Xira

GEOGRAPHICAL POSITION

Lisbon is a city open to the world and wants to become a European Atlantic Hub, in close relation with Latin America, Africa and Asia countries and regions, connected by air and sea and allowing access to 750 million consumers from Europe and Portuguese-speaking countries.

In fact Portuguese is the fifth most spoken language in the world, with over 250 million consumers, and Lisbon is the ideal location for companies wishing to manage and prepare its exports or investment ventures in these markets. The emergent powerhouses Brazil and Angola are at the forefront.

Lisbon is served by several motorways, two bridges which cross the Tagus River, trains and buses that connects Lisbon to the main cities and villages within Portugal. In addition, Lisbon International Airport is located within city limits. Regarding the public transportation, Greater Lisbon offers a reliable network, comprising subway, trains, trams, buses and ferries. In digital terms, Lisbon has the best fibre-optic network in Europe (FTTH, 2011).

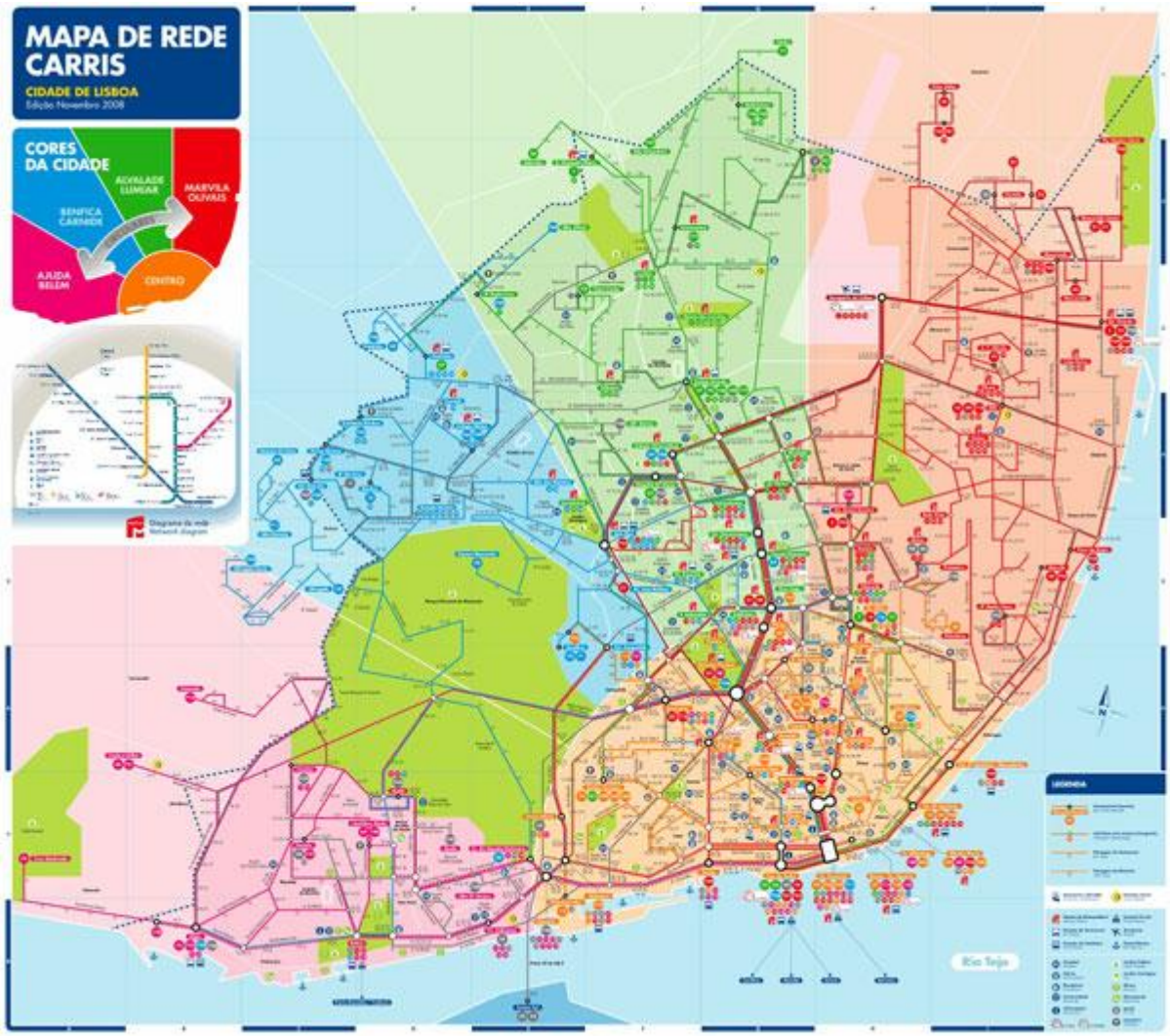


Figure 51 - Public transportation network

CLIMATE

Lisbon exhibits a Subtropical-Mediterranean climate, being considered a pleasant climate throughout the year due to the influence of the Atlantic Ocean, with fairly cold winters and hot summers. The average annual temperature is 21.5 C during the day and 13.5 C at night. Average annual temperature of the sea is 17.5 C. In the coldest days, temperatures can be as low as 3°C at night and in the hotter days the temperature can reach 35°C.

Rain occurs mainly in winter, being the summers generally dry. Sunshine hours are about 2,800 per year, from an average of 4.6 hours of sunshine duration at day in December to an average of 11.4 hours of sunshine duration at day in July.

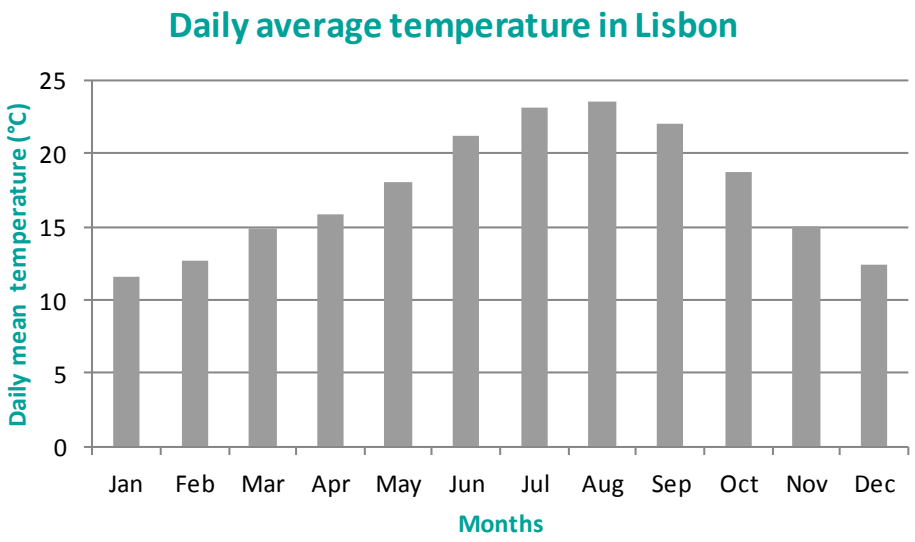


Figure 52 - Daily average temperature in Lisbon.

Source: Instituto de Meteorologia, http://www.ipma.pt/pt/oclima/normais.clima/1981-2010/012/.

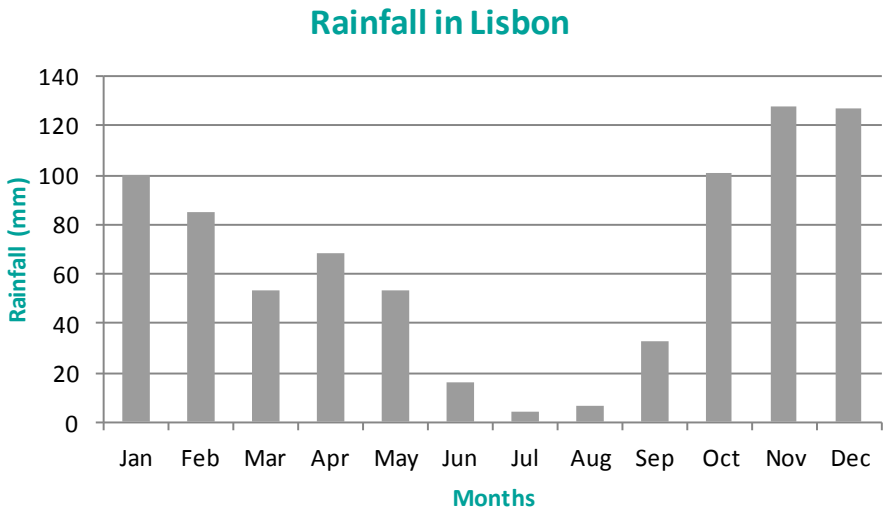


Figure 53 - Rainfall in Lisbon.

Source: Instituto de Meteorologia, http://www.ipma.pt/pt/oclima/normais.clima/1981-2010/012/.

V.II.II POPULATION

Almost 600,000 (547,733 – Census 2011) people live in Lisbon accounting to 5.2% of the total resident population of the country. However, this number rises up to 2 million (2.042.477 – Census 2011) if we include all the population of the Greater Lisbon, thus corresponding to 26.75% of the country's resident population.

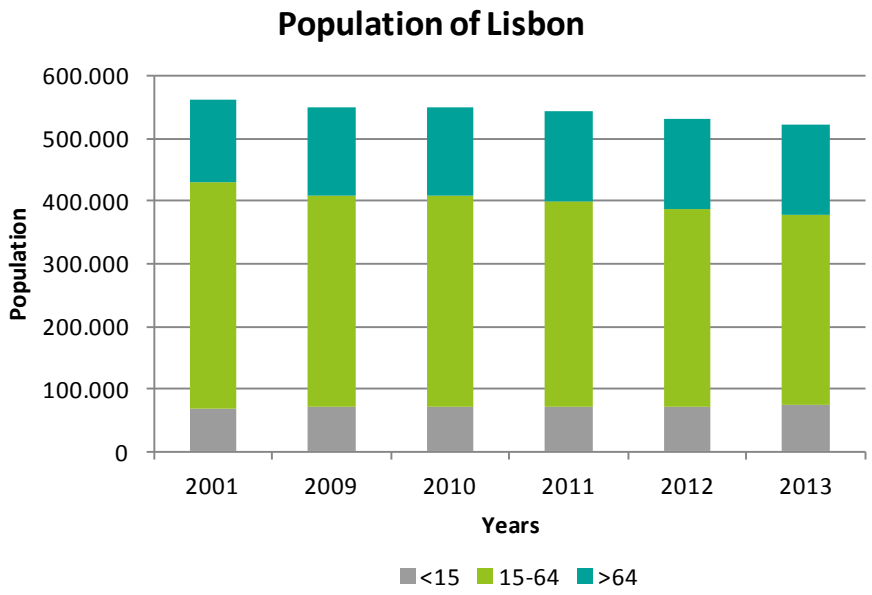


Figure 54 - Population of the municipality of Lisbon.

Source: Pordata

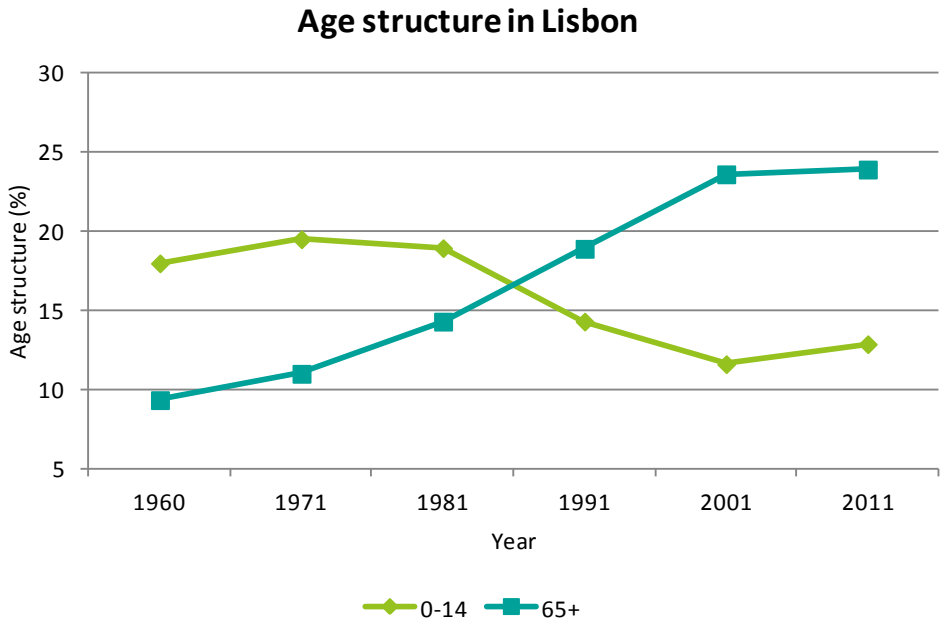


Figure 55 - Evolution of the age structure in Lisbon.

Source: A Economia de Lisboa em Números 2014, Lisbon City Council.

Each day, Lisbon has an influx from 550,000 to more than 900,000 people who come in to work. Notice that commuting movements between the main city and the agglomeration cause a major problem, especially since car travel is predominant. Added to the 160,000 vehicles of

Lisbon residents are 430,000 others. The population density of the municipality of Lisbon is 6,247.5 inhabitants/ km^2.

According to Census 2011 data, 13.5% of the population are under 15 years old and 26.9 % are over 65 years old. The percentage of foreign residents is about 8%. 31.1% of the population hold a higher education degree and the employment rate is approximately 48%.

Lisbon is also a place plenty of universities and research and development centres. There is a critical mass of national and international researchers and public and private higher education institutions and other research organizations (universities, laboratories, foundations, etc.), dedicated to several fields of knowledge. Moreover, international cooperation programs between Universities and R&D Institutes such as MIT, University of Austin-Texas, Carnegie-Mellon University, Fraunhofer Program and the Harvard Medical School, make Lisbon a vibrant environment for the attraction of talents and companies which want to recruit highly skilled human resources. It is worth of notice that Portugal is the 4th OECD country with the most researchers in science and engineering per 1,000 inhabitants (Global Benchmark Report 2010).

V.II.III ECONOMY

Besides being the largest Portuguese city, Lisbon is also the most important centre in terms of economy and financial services in Portugal.

Having a GVA of 47.313,645 Million Euros per capita, services is the sector that contributes the most for the economy, representing 86% of the GVA of the Greater Lisbon. In 2011, Lisbon represented 31% of the national GDP and employed 1,186 thousand persons (24.4% of national employment), reaching an apparent labour productivity 1.3 times higher than the national average.

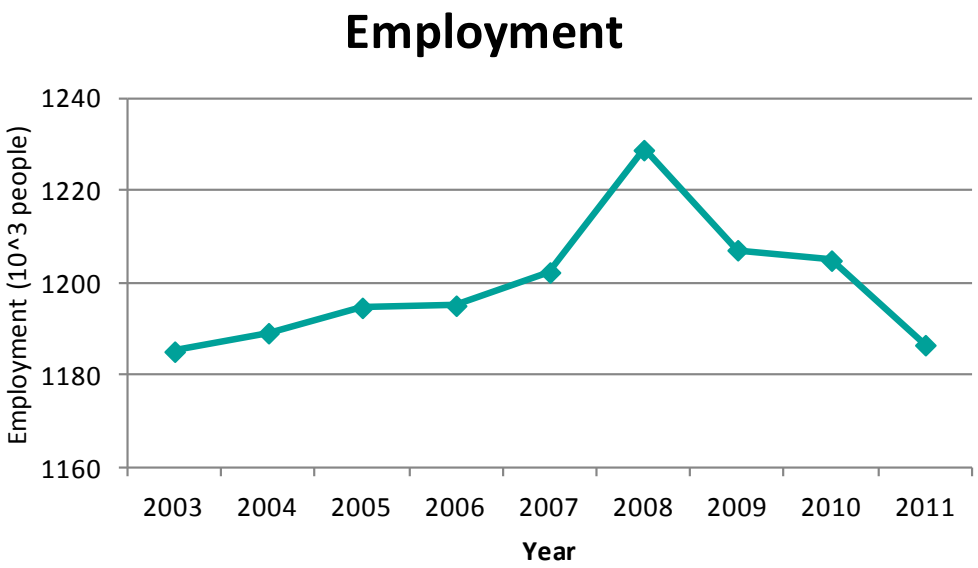


Figure 56 - Employment in Greater Lisbon (NUT III).

Source: INE.

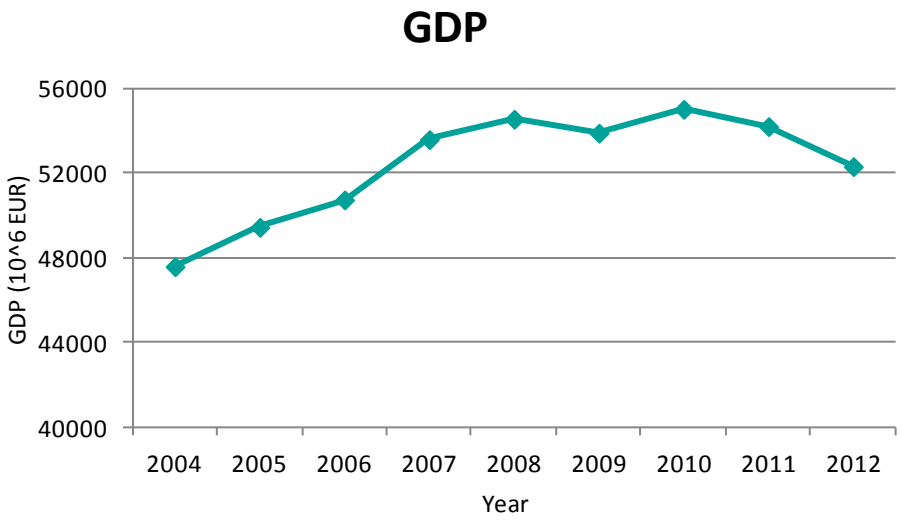


Figure 57 - GDP in Greater Lisbon (NUT III).

Source: INE.

The main city is home to 96,731 companies (8.7% of national share) employing 600,000 people. The importance of Lisbon Region on the international trade is growing up, originating about 16% of national exports. Notice that exports grew more than 100% in the last 5 years. Lisbon is the destination of about 30%of national imports

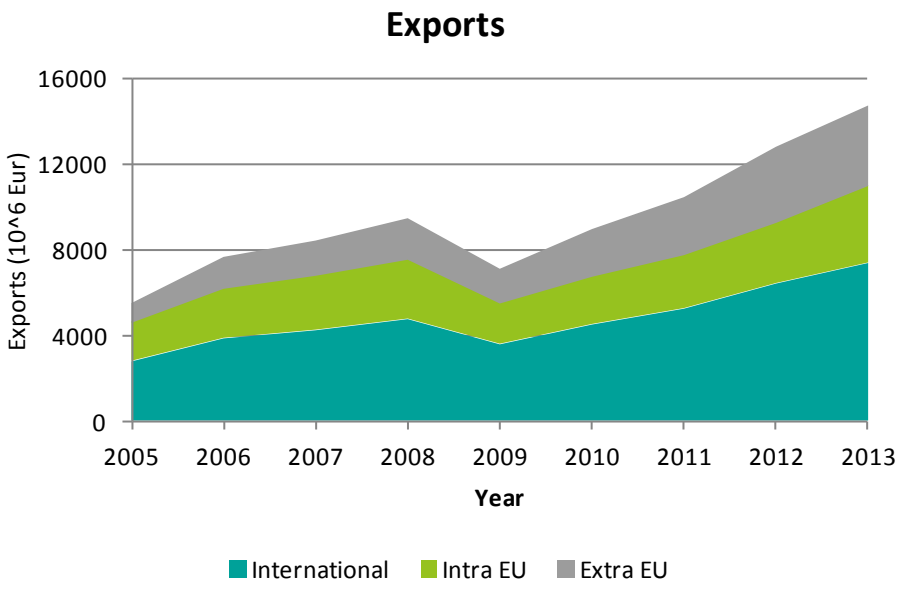


Figure 58 - Exports in Lisbon.

Source: INE.

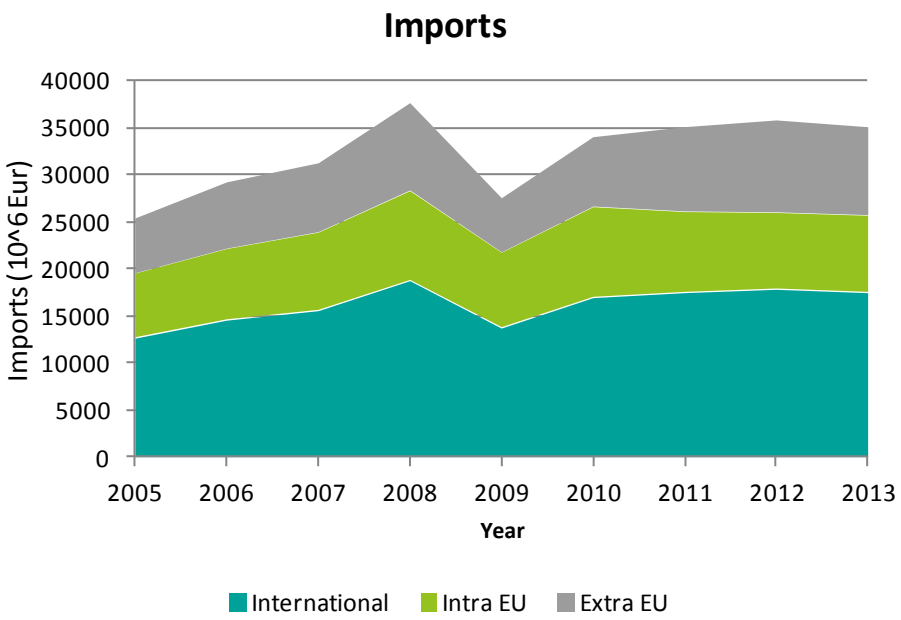


Figure 59 - Imports in Lisbon.

Source: INE.

In terms of knowledge and innovation, the region concentrates more than 50% of national R&D expenditures and the company's share of these expenditures is higher.

Table 40 - R&D indicators for Lisbon Region in 2011 (NUT II).

R&D INDICATORS		
	Lisbon Region	**Portugal**
Expenditures (% of GDP)	21.1%	1.5%
Employment (‰ of active population)	17.7‰	10‰
Researchers (% of active population)	1.6%	0.9%

Source: INE

The region is the destination spot for 6 million tourists, and according to the Travel & Tourism Council´s forecasts these figures should jump by 50% in 2017. The tourism sector creates nearly 80,000 direct jobs and 140,000 indirect jobs, generating a total activity volume of 2.8 billion Euros per year which corresponds to about 5% of the GDP of the region.

The city dynamism has reinforced Lisbon's position in the main cities' world ranking for international meetings, achieving a closer position to the most relevant EU capitals. For several years now, Lisbon has been ranked as one of the European cities of the future by the Financial

Times (European Cities and Regions of the Future 2014/15). This ranking, which lists the top 25 European cities, is based on a comparison of several aspects: economic potential of the area, the quality of human capital, the existence of adapted infrastructure (road, air, rail and maritime hubs) and finally the business friendliness of the cities.

V.II.IV CULTURE

Lisbon is an interesting combination of a historic city marked by a strong heritage and traditions with an innovative city characterised by cosmopolitanism, cultural diversity, creativity and entrepreneurship.

The city has a long history materialised in a strong cultural tangible and intangible heritage. São Jorge Castle, 'Sé de Lisboa' Cathedral, convents and churches, palaces, and the monuments linked to the Discoveries (Belém Tower, Jerónimos Monastery, Padrão dos Descobrimentos) are some of the city attractions. Moreover, traditions, memories, and legends are the foundations of the social-cultural urban identity of its people. The recent election of Fado as Intangible World Heritage by UNESCO is an example of the value of these immaterial assets.

Natural amenities mix with cultural heritage making the city a unique place to live, learn, work, play and visit. Lisbon is a city with a port, being the Tagus River one of the important assets of the town in economic, social and cultural terms. Moreover, the hills, the views, the light, the colours create a unique scenic environment. Lisbon has also several urban natural parks and gardens, such as Monsanto and Eduardo VII parks, which provides the citizens and visitors with places of leisure, sports and culture.

The combination of these elements makes Lisbon a city with quality of life. For these reasons, Lisbon was considered by the Institute of Urbanism as the "European City of the Year 2012".

Figure 60 - Torres de Belém, in Lisbon.

Figure 61 - Mosteiros dos Jerónimos, in Lisbon.

V.III KEY STRATEGIES AND PROJECTS

V.III.I OVERALL STRATEGY

The Municipality of Lisbon has defined a smart city strategy which main goal is "to facilitate creativity, providing citizens, small enterprises, start-ups and civil organisations the tools needed to create, to innovate, to enable social innovation, centring the citizen as a co-producer/partner of the city" [Lisbon City Councillor Graça Fonseca (2009)].

OBJECTIVES

Lisbon's development has been progressively evolving as a global city, namely addressing the following challenges for the future:

- An international hub for world scale companies, benefiting from the bridge Lisbon represents between Europe, Africa and America;
- A pole for creativity and innovation, acknowledging that the creative industry already accounts for 6% of Lisbon's employment and further represents an important asset in Lisbon's economy;
- A city with a prospering atmosphere for entrepreneurs, incubator for new ideas and business models;
- A dynamic city for exhibitions, events and cultural activities, listening and learning from experienced partners the ways to better exploit its resources;
- A centre for excellence in R&D, recognizing the fact that Lisbon is Portugal's biggest university pole;
- A sustainable city, focused on achieving excellence in the efficient use of its resources, bearing in mind the commitments assumed within the Covenant of Mayors and the city's Energy-Environment Strategy that sets ambitious targets for the energy, water and materials consumption;
- An inclusive city for its citizens, fostering a cooperative environment between the local authorities and the population [Fernandes, J.; Gonçalves, F.; Águas, M. (2013)].

STRATEGIC AREAS

The three main axis of this strategy are:

- Citizen participation, promoting open governance and the intervention of civil society in the definition of the city's future and the resolution of urban problems, through projects like the participatory budget, "A Minha Rua" portal, the requalification of Mouraria, and the Lisbon Academy;

- Entrepreneurship and innovation, enhancing the creation of new companies and jobs, triggered by the Lisbon Start-up initiative, the fab lab, the promotion of co-working spaces, and the open data portal;
- Sustainability, focused on energy efficiency, sustainable mobility and renewable energy, through projects such as electric mobility, solar potential map, Mob carsharing, reduced emissions areas, Eco-Neighbourhood - Boavista Ambiente +, etc.

METHODOLOGY

In this context the Municipality decided to create the Lisboa Living Lab (LxULL) which supports the smart city strategy of the city, creating an environment that nurtures co-creation processes oriented by a user-centric approach and involving the relevant stakeholders. LxLL is member of the European Network of Living Labs (ENoLL).

Moreover, the City of Lisbon is a partner in several Living Lab projects developed under the Competitiveness and Innovation Programme of the European Commission. Among these, we can stress the participation in projects such as Apollon, Fireball, Save Energy, City SDK and MyNeighbourhood, where the city had a chance to work closely with a number of existing Living Labs, including Manchester, Forum Virium (Helsinki), and Barcelona.

V.III.II ACTION PLANS

A detailed description of key sectorial action plans is presented below.

ACTION PLAN FACTSHEET 1	
Title	**Sustainable Energy Action Plan – Covenant of Mayors**
Dimension of KPIs	Environment – Energy, Climate and air quality
Period	2010
Strategy/Action Plan description	
Objective	In 2008 the Municipality of Lisbon decided to join the Covenant of Mayors initiative. The Covenant of Mayors is the mainstream European movement involving local and regional authorities in the fight against climate change. It is based on a voluntary commitment by signatories to meet and exceed the EU 20% CO_2 reduction objective through increased energy efficiency and development of renewable energy sources. In June 2010 the Sustainable Energy Action Plan was submitted, in the framework of the Energy-Environmental Strategy of Lisbon. Moreover, Lisbon subscribed the Mayors Adapt initiative in 2013. Adaptation to climate change is the main objective of this platform with a view to adapting infrastructure and policies to climate impacts. Lisbon has also presented a bid to become the European Green Capital in 2017.

ACTION PLAN FACTSHEET 1	
Measures	Several measures are proposed in the Sustainable Energy Action Plan of Lisbon in order to reduce the CO_2 emissions till 2020, such as: - Promotion of energy efficiency in the transport system; - Use of more efficient vehicles; - Increase in energy efficiency in new construction and urban rehabilitation; - Use of more efficient lighting systems; - Use of energy solar systems; - Organisation of energy efficiency awareness campaigns; etc.
Targets	Reduction of the CO_2 emissions in more than 20% till 2020.
Links and Contacts	
Promoter	Municipality of Lisbon, Lisboa E-Nova
Document/website	http://lisboaenova.org/en/projects/energy-environment-strategy/convenant-of-mayors
Contact E-mail	info@lisboaenova.org

ACTION PLAN FACTSHEET 2	
Title	**Creative Economy Blueprint**
Dimension of KPIs	Economy –Sustainable Economic Growth
Period	2013
Strategy/Action Plan description	
Objective	The Creative Economy Blueprint presents a strategic vision for a co-creative Lisbon for the year 2020, and a plan for the development of the creative economy in Lisbon. It intends to make the creative economy an instrument of innovation, skills, entrepreneurship and urban regeneration, and to promote cultural and creative spaces, neighborhoods, factors that are increasingly critical to attracting investment, companies and people, and contributing to the internationalization of the Lisbon "brand".
Measures	The strategic priorities of this plan are: - Internationalisation; - Creative events: anchors of competitiveness; - Creative districts and territories; - Spaces and equipment: new uses and functions; - Creative entrepreneurship; - Workshops for artists and residencies; - Creative talent.
Targets	Promotion of the creative economy in Lisbon with the involvement of the relevant stakeholders.
Links and Contacts	
Promoter	Municipality of Lisbon
Document/website	http://www.cross-innovation.eu/proud-to-present-the-lisbon-creative-economy-book/news/

ACTION PLAN FACTSHEET 2	
Contact E-mail	paulo.s.carvalho@cm-lisboa.pt

ACTION PLAN FACTSHEET 3	
Title	Integrated Urban Renewal Strategy of Lisbon 2011-2024
Dimension of KPIs	Environment, Economic, Social
Period	2011-2024
Strategy/Action Plan description	
Objective	Urban rehabilitation is an area of huge potential of intervention and of great relevance to the city of Lisbon. The Municipality has been launching several programs and specific measures to support urban rehabilitation (including legislation, taxation, financial incentives, new institutional arrangements, etc.), integrating principles of energy and environmental sustainability. In this context, the Integrated Urban Renewal Strategy of Lisbon 2011-2024 was launched.
Measures	The main objectives and measures of this strategy are: - City rehabilitation, enhancement of social cohesion, rejuvenate the center of Lisbon, attract new families, establish businesses and employment; - Repopulate and reuse the existing buildings, increasing the environmental quality and energy efficiency; - Give priority to periodic maintenance of buildings; - Rehabilitate the degraded buildings, given the risk of fire and earthquakes; - Keep the memory of the city, restore the historical, architectural and natural heritage of Lisbon; - Maintain, restore, enhance and upgrade the public space and community facilities; - Regenerate the Priority Intervention Neighbourhoods/Priority Intervention Zones.
Targets	One of the quantitative targets is the urban rehabilitation of 7,000 degraded buildings till 2014.
Links and Contacts	
Promoter	Municipality of Lisbon
Document/website	http://ulisses.cm-lisboa.pt/data/002/004/prospectivos/1/estrategia.pdf
Contact E-mail	Not applicable

ACTION PLAN FACTSHEET 4	
Title	**Biodiversity Strategy 2020**
Dimension of KPIs	Environment – Biodiversity
Period	2010-2020

ACTION PLAN FACTSHEET 4	
Strategy/Action Plan description	
Objective	In March 2010, a Cooperation Protocol was established between Lisboa E-Nova, Lisbon Municipality and the Institute for Nature Conservation and Biodiversity, with the pioneering and ambitious goal of increasing the biodiversity potential of Lisbon city by 20% until 2020. In this Protocol, the parties committed to constitute a Task Force, with representatives of the above entities and invited experts from the Science Faculty of the University of Lisbon, and to prepare, among other reference documents, an Urban Biodiversity Matrix of Indicators. Under this Protocol, an Advisory Committee was also formed, comprising representatives from several institutions or individual experts. In September 2012, the Task Force finalized editing the book "Biodiversity in the City of Lisbon: a Strategy for 2020", which integrated the "Urban Biodiversity Matrix of Indicators", the "Characterization of Biological Diversity in the City of Lisbon" and the "Biodiversity Strategy".
Measures	Several measures are included in this strategy, for example: - Increase in public green spaces area; - Implementation of zones with urban gardens; - Conservation of natural areas such as the Tagus estuary; - Promotion of citizens' awareness in relation to biodiversity.
Targets	To increase the biodiversity potential of Lisbon city by 20% until 2020.
Links and Contacts	
Promoter	Municipality of Lisbon, Institute for Nature Conservation and Biodiversity, Lisboa E-Nova
Document/website	http://lisboaenova.org/en/projects/biodiversity/biodiversity-lisboa-2020;
Contact E-mail	info@lisboaenova.org

V.III.III KEY PROJECTS

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

STRATEGIC AREAS	KEY PROJECTS
Sustainability	Electric Mobility Mob Carsharing Bicycle Lanes Network Lisbon Solar Potential Map ECO-Neighbourhood - Boavista Ambiente + ZER – Reduced Emissions Areas

STRATEGIC AREAS	KEY PROJECTS
Entrepreneurship	Start-up Lisboa Fab Lab Lisboa Co-working Spaces Open Data Portal
Participation	Participatory Budget Requalification of Mouraria Fix My Street ("Na Minha Rua")

V.III.IV SUSTAINABILITY PROJECTS

PROJECT FACTSHEET 1	
Title	**Electric Mobility**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2009-(…)
Project description	
Aims	The objective of the project is to facilitate the introduction of the electric vehicle in the city, through the provision of charging points and an intelligent mobility management system. It is integrated in the Portuguese Electric Mobility Program, launched in 2009 by the national Government. In fact, Portugal was one of the pioneer countries in the implementation of a countrywide EV charging network, which includes more than 1,300 charging points across the country, with Lisbon having the most prominent position with 687 charging points. 

PROJECT FACTSHEET 1	
Content	The main activities of the project were: - Production of the Electric Mobility Plan; - Installation of the EV charging points in the city; - Connection to the Mobility Intelligence Centre: Lisbon and other cities charging points are interconnected within a unique platform with multiple interfaces which presents the location and status of each charging point (energy consumption, tons of CO_2 avoided, clients, etc.); - Awareness actions related with electric mobility. It is worth of notice that the Municipality bought 54 electric vehicles to the municipal fleet.
Promoters/Beneficiaries; Partnership	Municipality of Lisbon; INTELI – Intelligence in Innovation, Innovation Centre; CEIIA – Mobility Intelligent Centre; EDP; Portuguese companies (EFACEC, etc.)
Financing	Mobi.e project (FAI – Innovation Support Fund and FPC – Portuguese Carbon Fund)
Outcomes and impacts and Main factors of success	The main outcomes and impacts are the reduction of GHG emissions, the internationalization of Portuguese companies (ex.: EFACEC is the top worldwide exporter of fast charging points) and the promotion of citizens' quality of life. Main success factors are linked to electric mobility awareness among citizens and the development stage of the EV market. Due to the economic crisis, the sales of electric vehicles were lower than forecasted, which hindered the development of the program.
Reproducibility and transferability	The solutions and technologies related to electric mobility can be transferred to other cities and regions. Besides Lisbon, 24 municipalities are part of the RENER Living Lab – Portuguese Smart Cities Network and have functioned as places for the experimentation of EV charging points.
Links and Contacts	
Promoter	Portuguese Government, Municipality of Lisbon, INTELI
Website	https://www.mobie.pt/en
Contact E-mail	info@mobie.pt

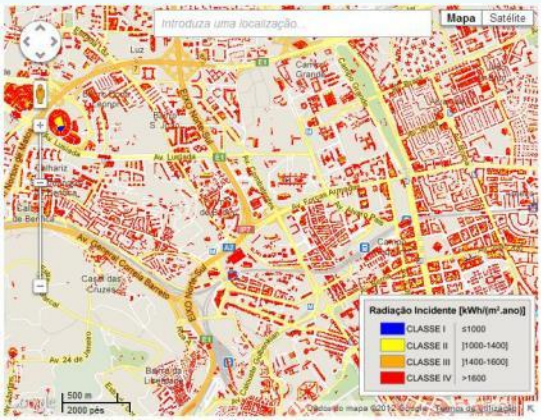
PROJECT FACTSHEET 2	
Title	**Mob Carsharing**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2008-(...)
Project description	

PROJECT FACTSHEET 2	
Aims and Content	Mob Carsharing is a carsharing service provided in the city of Lisbon. It's a short-term car rental with gas and parking included, for members to rent a car by the phone or the internet and have it available in the next minute. The car is reserved during the chosen time. In the end, the car must be returned to its reserved parking location. Lisboa Viva Card is the car key. It's an electronic card, also valid on public transports. Each month, members receive the invoice with detailed information of all reserved cars, duration, driven km, etc. 
Promoters/Beneficiaries; Partnership	Carristur, EMEL, Municipality of Lisbon
Financing	Public-private funding
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: decrease of households' expenses, reduction of GHG emissions, decrease of traffic congestion, pollution reduction, etc. Main success factors are linked to carsharing awareness among companies and citizens.
Reproducibility and transferability	The project can be transferred to other cities and regions. In Portugal, the city of Porto has also available a carsharing service, provided by Citizenn carsharing operator.
Links and Contacts	
Promoter	Carristur
Website	http://mobcarsharing.pt/pt/
Contact E-mail	mobcarsharing@carristur.pt

PROJECT FACTSHEET 3	
Title	**Bicycle Lane Network**
Dimension of KPIs	Environment – Mobility and Transports
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2007-(…)
Project description	

PROJECT FACTSHEET 3	
Aims and Content	In late 2007, the Municipality of Lisbon started to implement a strategy for bicycles. The aim was to build bicycle lanes and overlap them with the city's ecological green structure, creating a friendly bike paths network together with green corridors, connecting fragmented green spaces and covering main parts of the city, including access to important public transport interfaces as well as representative educational and office equipment. The first step resulted on almost 40 km of cycle paths including more than 40 public bike parks and 2 specific bicycle-pedestrian bridges. In 2010 there were around 80 km of cycle paths in Lisbon. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon
Financing	National and European funds; Public-private funding
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: reduction of GHG emissions, decrease of traffic congestion, pollution reduction, and health improvement. Main success factors are linked to the awareness of users of the benefits associated to the use of bicycles as an effective commuting alternative.
Reproducibility and transferability	The project can be easily transferred to other cities and regions, with the needed adjustments.
Links and Contacts	
Promoter	Municipality of Lisbon
Website	http://www.cicloviaslx.com/; http://lisboaciclavel.cm-lisboa.pt/
Contact E-mail	Not applicable

PROJECT FACTSHEET 4	
Title	**Lisbon Solar Potential Map**
Dimension of KPIs	Environment – Energy
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2009-2012
Project description	

PROJECT FACTSHEET 4	
Aims and Content	The Lisbon Solar Potential Map was promoted by Lisboa E-Nova under the European Project POLIS – "Identification and Mobilization of Solar Potentials via Local Strategies". The project aimed at the evaluation of the potential solar installation of solar systems in the built heritage of Lisbon. Lisbon Solar Potential Map, available online via Google Maps application, covers all the buildings in Lisbon. It allows the identification of the preferable areas to invest in solar technologies and represents an efficient awareness tool, both for local authorities, investors and companies and citizens. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon, Lisboa E-Nova (Portugal), Climate Alliance, Polytechnic University of Madrid (Spain), Lund University (Sweden), Skåne Energy Agency (Sweden), HESPUL (France), APUR - Atelier Parisien d'Urbanisme (France), Ecofys Germany GmbH (Germany), Paris, Lyon, Munich, Malmö, Victoria-Gasteiz
Financing	POLIS - Identification and Mobilization of Solar Potentials via Local Strategies – Intelligent Energy Europe Program - EC
Outcomes and impacts and Main factors of success	As a result of the project and cooperation between the various European partners, it was possible to identify measures that contribute to the definition of public policy at the level of development of municipal urban planning regulations, as well as new legal and financial mechanisms to encourage the adoption of solar technologies in the urban environment.
Reproducibility and transferability	The project can be transferred to other cities and regions. In fact, under the POLIS project all partner cities, Lisbon, Paris, Lyon, Munich, Malmö and Victoria, have developed a Solar Plan Action.
Links and Contacts	
Promoter	Lisboa E-Nova
Website	www.lisboaenova.org/cartasolarlisboa
Contact E-mail	info@lisboaenova.org

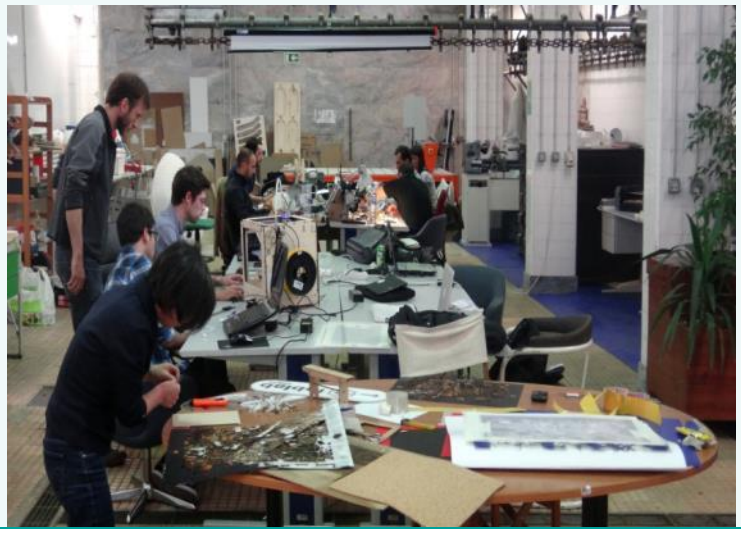
PROJECT FACTSHEET 5	
Title	**ECO-Neighbourhood - Boavista Ambiente +**

PROJECT FACTSHEET 5	
Dimension of KPIs	Environment – Energy
Area of implementation (city, neighbourhood, etc.)	Neighbourhood
Implementation period	2010-(…)
Project description	
Aims and Content	The project aims at the reconversion and qualification of public space, implementation of measures to improve the energy performance of buildings and remodelling of some equipment in the social neighbourhood Boavista, including the municipal swimming pool. Dissemination and awareness actions to the residents of the neighbourhood were also promoted, such as the launching of a challenge posed to 100 families to cooperate in order to enhance domestic savings of electricity, natural gas and water. 
Promoters/Beneficiaries; Partnership	Lisbon Municipality, Lisboa E-Nova, EPUL - Empresa Pública de Urbanização de Lisboa, GEBALIS - Gestão dos Bairros Municipais de Lisboa, Santa Casa da Misericórdia de Lisboa, etc.
Financing	Lisbon POR program in the framework of QREN (Partnerships for Urban Regeneration) - Eco-neighbourhoods program
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: reduction of GHG emissions, energy and water consumption reduction, expansion of public space, social sustainability, etc. Main success factors are linked to community involvement in the project's actions.
Reproducibility and transferability	The project can be replicated in other neighbourhoods. Within the Eco-neighbourhoods program, an additional project is being supported in a neighbourhood in Vila Franca de Xira.
Links and Contacts	
Promoter	Municipality of Lisbon
Website	http://ecobairroboavista.hostname.pt/
Contact E-mail	gabipboavista@cm-lisboa.pt

PROJECT FACTSHEET 6	
Title	**ZER – Reduced Emissions Areas**
Dimension of KPIs	Environment – Climate and air quality
Area of implementation (city, neighbourhood, etc.)	Some areas of the city
Implementation period	2011-(…)
Project description	
Aims and Content	The introduction of Reduced Emissions Areas (ZER) is integrated in the program for the improvement of air quality in the Lisbon Region. Reduced Emissions Areas are zones in which the circulation of more pollutant vehicles is forbidden, due to health reasons and compliance with national and European legislation. The ZER's second phase consists of two areas (Area 1 and Area 2), with the following characteristics: - Time: 7h - 21h | working days - Circulation of vehicles: a) Area 1 (Axis Liberdade/Baixa) – only light and heavy vehicles that comply with the EURO2 emissions norm (light vehicles built after January 1996; heavy vehicles build after October 1996); b) Area 2 – only circulation of vehicles that comply with the EURO1 emissions norm (vehicles built after July 1992). Permitted exceptions: emergency and special vehicles; historic vehicles; Lisbon residents in Area 2 and Area 1. The ZER's third phase with more restrictive limits will enter in force in January 2015.
Promoters/Beneficiaries; Partnership	Lisbon Municipality, CCDR-LVT
Financing	Not applicable
Outcomes and impacts and Main factors of success	The main outcomes and impacts are the reduction of pollutants in 30% in the axis Liberdade/Baixa, and the improvement of air quality in the city of Lisbon.
Reproducibility and transferability	The project can be replicated in other areas of the city, if needed.
Links and Contacts	
Promoter	Lisbon Municipality
Website	http://www.cm-lisboa.pt/perguntas-frequentes/ambiente/zer-zona-de-emissoes-reduzidas
Contact E-mail	Not applicable

V.III.V ENTREPRENEUSHIP PROJECTS

PROJECT FACTSHEET 7	
Title	**Startup Lisboa**
Dimension of KPIs	Economic – Sustainable economic growth
Area of implementation (city, neighbourhood, etc.)	3 buildings
Implementation period	2011-(…)
Project description	
Aims and Content	Start-up Lisboa is an incubator that supports entrepreneurs to deploy their ideas into market viable solutions. It provides entrepreneurs and companies with office space as well as a support structure, to maximize their chances for success. Mentoring, link to strategic partners, access to angel investors, venture capital or loan funds, help with business basics, networking activities, communication and work spaces. They've opened and requalified three buildings in Lisbon's Centre, two for tech and other for commerce and tourism. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon, Montepio Geral Bank, IAPMEI
Financing	Participatory budget; other private funds
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: 186 start-ups supported; 602 jobs created; 46 partnerships. More than 20 start-ups already expanded to international markets. About 30% of foreign entrepreneurs.
Reproducibility and transferability	The project can be replicated in other cities. The Municipality of Lisbon has also launched the Lisbon Incubator Network that includes Startup Lisboa and other incubators and creative spaces located in the city (http://www.incubadoraslisboa.pt/).
Links and Contacts	
Promoter	Municipality of Lisbon
Website	http://startuplisboa.com/
Contact E-mail	geral@startuplisboa.com

PROJECT FACTSHEET 8	
Title	**Fab Lab Lisboa**
Dimension of KPIs	Economic – Sustainable economic growth
Area of implementation (city, neighbourhood, etc.)	Forno do Tijolo old Market - Neighbourhood of Intendente
Implementation period	2013-(…)
Project description	
Aims and Content	Fab Lab Lisboa is located in the central neighbourhood of Intendente in the heart of an old market. It is a municipal initiative driven from the need to create public spaces where innovators and entrepreneurs can benefit from a low cost prototyping environment, having access to peers from different areas of action, joining efforts in the testing of virtual ideas on a small scale approach. These digital manufacturing laboratories are constituted by specific tools, such as digital milling machines, 3D printers, etc. which allow the creation of new products. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon, Amorim Cork Composites, YDreams, ETIC, Iberomoldes, CENTIMFE
Financing	Public-private funding
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: promotion of innovation dynamics, democratisation of innovation, and creation of new products. Main success factors are linked to the awareness of the population towards the DIY ("Do-it-Yourself") trend.
Reproducibility and transferability	The project can be replicated in other cities. In fact, fab labs are connected through the Fab Labs Network (promoted by MIT) that shares information from fab labs at a world wide scale.
Links and Contacts	
Promoter	Municipality of Lisbon
Website	http://fablablisboa.pt/
Contact E-mail	info@fablablisboa.pt

PROJECT FACTSHEET 9	
Title	**Co-working Spaces**
Dimension of KPIs	Economic – Sustainable economic growth
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2010-(…)
Project description	
Aims and Content	The co-working concept is another reality in Lisbon, where independent professionals are invited to share a working space, benefiting from the synergies of using the common infrastructures, both in terms of lower costs and the contacts network. One of the most important co-working spaces in Lisbon is the LX Factory co-working space. LX Factory is a space to house creative industries located in old industrial buildings in Alcantara Docks. A creative island occupied by corporations and professionals of the industry serves also has stage for a diverse set of happenings related to fashion, advertising, communication, fine arts, architecture, music, etc., attracting numerous visitors to rediscover the neighbourhood. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon, Mainside property developer
Financing	Public-private funds
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: promotion of entrepreneurship; development of creative industries; creation of new companies; job creation; etc.
Reproducibility and transferability	The project can be replicated in other cities, with the needed adjustments to the territorial reality. Co-working spaces are also integrated in the Lisbon Incubator Network (http://www.incubadoraslisboa.pt/).
Links and Contacts	
Promoter	Municipality of Lisbon, Mainside property developer

PROJECT FACTSHEET 9	
Website	http://www.lxfactory.com/; http://www.coworklisboa.pt/en/
Contact E-mail	info@coworklisboa.pt

PROJECT FACTSHEET 10	
Title	**Open Data Portal**
Dimension of KPIs	Economic - Sustainable economic growth
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2012-(…)
Project description	
Aims and Content	The objective of the Open Data Portal is to make available sets of data regarding the city of Lisbon in the most diverse areas both collected from public and private entities, allowing citizens and entrepreneurs to consult and create new services and functionalities based on this data, creating projects with an added-value at the local scale. A competition for the development of applications based on this data was also launched - Lisbon Big Apps. The initiative was oriented to hackers and entrepreneurs that understand the real benefit and possible gains in providing added value to those that live, work and visit Lisbon. Moreover, Lisbon is partner of the CitySDK European project. Helping cities to open their data and giving developers the tools they need, the initiative (January 2012–October 2014) aims for a step change in how to deliver services in urban environments. With governments around the world looking at open data as a kick start for their economies, CitySDK provides better and easier ways for the cities throughout Europe to release their data in a format that is easy for the developers to re-use. The project is focused on three pilot domains: Smart Participation, Smart Mobility and Smart Tourism, being Lisbon responsible for the last one. OPEN DATA LX
Promoters/Beneficiaries; Partnership	Municipality of Lisbon
Financing	European funds; other public and private funds
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: development of new products, services and applications to solve urban problems; citizen participation; promotion of entrepreneurship; creation of new companies; etc.
Reproducibility and transferability	The project can be replicated in other cities. In fact, there are several cities around the globe that launched open data portals and apps competitions in order to promote the development of urban innovation applications.
Links and Contacts	
Promoter	Municipality of Lisbon

PROJECT FACTSHEET 10	
Website	http://www.lisboaparticipa.pt/pages/newApps.php; http://lisboa.bigapps.co/; http://www.citysdk.eu/
Contact E-mail	Not applicable

V.III.VI PARTICIPATION PROJECTS

PROJECT FACTSHEET 11	
Title	**Participatory Budget**
Dimension of KPIs	Social - Governance
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2008-(…)
Project description	
Aims and Content	Lisbon's strong tradition in participatory decision-making processes has achieved wide visibility with participatory budgeting, an initiative which allows the population to decide the projects in which the Municipality should invest 5% of the municipal total annual budget. This is an innovative tool for citizen's participation in urban development. With a budget of around € 2.5 million, about ten projects are selected each year by citizens to receive the necessary funding for their completion. At the same time, a vast campaign to raise awareness of this practice was started by the city and the platform of the participatory budget went from 1,000 voters to more than 17,000 in 2013. This practice has already been recognised as a best practice in urban governance by UN-Habitat. Orçamento Participativo '12
Promoters/Beneficiaries; Partnership	Municipality of Lisbon
Financing	Municipal budget
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: increase in citizen participation; open governance; resolution of urban problems; etc.
Reproducibility and transferability	The project can be replicated in other cities. For example, in Portugal there are around 30 cities that have adopted this practice.
Links and Contacts	
Promoter	Municipality of Lisbon

PROJECT FACTSHEET 11	
Website	http://www.lisboaparticipa.pt/pages/orcamentoparticipativo.php/A=711___collection=cml_article
Contact E-mail	municipe@cm-lisboa.pt

PROJECT FACTSHEET 12	
Title	**Requalification of Mouraria**
Dimension of KPIs	Social
Area of implementation (city, neighbourhood, etc.)	Neighbourhood
Implementation period	2010-(…)
Project description	
Aims and Content	Located in the historic centre of Lisbon, Mouraria has a long time been afflicted by a negative image. This multicultural neighbourhood is today at the centre of a vast requalification program, set in motion by the Municipality of Lisbon. The main aim of this program is to rehabilitate this neighbourhood full of old buildings and enhance its image among Lisbon residents without driving out the people living there. The initiative has two intervention domains: the physical restoration of the area, and the implementation of social measures to strengthen cultural identity. Nearly €12 million was spent on the requalification of buildings, redesign of public spaces, and the promotion of the architectural value of historic buildings. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon, several partners
Financing	Lisbon Operational Program - QREN
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: rehabilitation of old buildings; improvement of public space; social capital and participation; enhancement of the neighbourhood's image; strengthen of cultural identity; social cohesion; employment opportunities; etc.
Reproducibility and transferability	The project can be replicated in other cities, with the needed adjustments to the territorial reality.
Links and Contacts	
Promoter	Municipality of Lisbon
Website	http://www.aimouraria.cm-lisboa.pt/pdcm.html
Contact E-mail	pa.mouraria@cm-lisboa.pt

PROJECT FACTSHEET 12	
Title	**Fix My Street ("A Minha Rua")**
Dimension of KPIs	Social
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2008-(…)
Project description	
Aims and Content	Through the "A Minha Rua" portal, citizens can report, view or discuss local problems, asking for their resolution by the Municipality of Lisbon. It is possible to locate the problem on the map of the area. Requests can be related to: public lighting, municipal equipments, housing, public space, etc. 
Promoters/Beneficiaries; Partnership	Municipality of Lisbon
Financing	Public funds
Outcomes and impacts and Main factors of success	The main outcomes and impacts are: increase in citizen participation; resolution of urban problems; open governance; etc.
Reproducibility and transferability	The project can be replicated in other cities. In fact, several cities in Portugal have adopted this practice.
Links and Contacts	
Promoter	Municipality of Lisbon
Website	http://lxi.cm-lisboa.pt/lxi/?application=NaMinhaRua
Contact E-mail	municipe@cm-lisboa.pt

V.IV CASE STUDY CITY ASSESSMENT

V.IV.I ENVIROMENTAL PERFORMANCE

The environmental performance assessment of the city of Lisbon will be based on the KPI identified for this dimension. It is also important to compare some of these values with the targets defined in the action plans and projects presented in the last chapter.

BIODIVERSITY

In spite of being a border ecosystem, Lisbon's municipality has several botanical gardens with exotic and endogenous species. Assuming the importance of the biodiversity and ecosystems preservation, in 2010 the City Council of Lisbon cooperated with the Municipal Agency for Energy and Environment (Lisboa E-Nova), the Institute for Nature Conservation, and Lisbon University, to launch its "Lisbon Biodiversity 2020" strategy. The strategy inventory reveals that near 18% of the city's area is semi-natural. Of its 2,800 plant species, fewer than 10% are native, and at least 148 species of birds can be found in the city, including 14 threatened species.

Additionally, due to the municipality administrative reorganization occurred in 2012, the city acquired an area of 1,50 km^2 of a special and classified protection zone, the Special Protection Zone of Tagus Estuary (Sector Plan Natura 2000 - PTZPE0010) (Table 41). Being now one of the municipalities involved on the Sector Plan Natura 2000, Lisbon Special Protection Zone of Tagus Estuary is under an extensive and restricted set of management guidelines of natural values at national and European level.

Table 41 - Ecosystem protected areas in Lisbon Municipality.

ECOSYSTEM PROTECTED AREAS AVAILABILITY (KM^2)	
2003	0,0
2012	1,5

Source: Lisbon City Council.

ENERGY

The consumption of energy (electricity, fuel and natural gas) in 2008 in Lisbon was 828.751 toe and in 2012 it was 927.389 toe, experiencing an increase of 12% during this period. The sector that contributes the most for the overall consumption is the transportation sector, followed by the services sector, as it is shown in Figure 62 and Figure 63.

In absolute numbers, the energy consumption for all sectors increased during this period with the exception of the residential sector, whose variation rate was -10.5% (Table 42). The industry sector was the one that recorded the highest increase (45.8%) and the services sector exhibits a slight increase of 0.5%.

Table 42 – Variation rate of energy consumption by sector between 2008 and 2012 in Lisbon.

VARIATION RATE OF ENERGY CONSUMPTION BY SECTOR				
Industry	**Agriculture**	**Services**	**Transport**	**Residential**
45.8%	31.8%	0.5%	25.4%	-10.5%

Source: DGEG; Calculations: INTELI.

In more detail, in 2012 the transportation sector was responsible for more than half of the overall energy consumption, increasing from 47% in 2008 to 53% in 2012. Moreover, the services sector decreases its share from 35% to 31%, and the residential sector experienced a decrease from 15% to 12% during the same period.

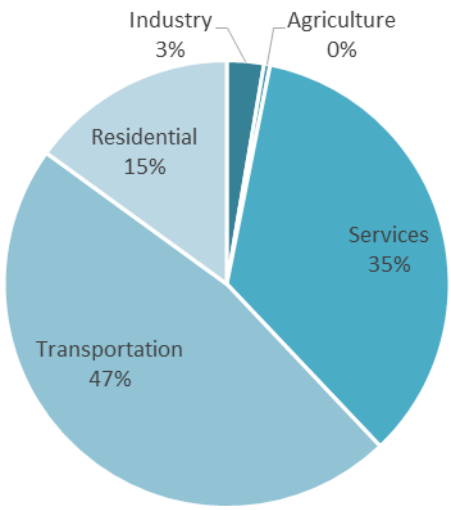


Figure 62 - Energy consumption by sector in 2008.

Source: DGEG.

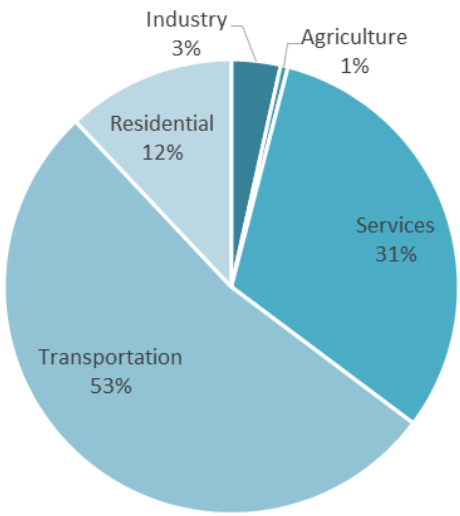


Figure 63 - Energy consumption by sector in 2012.

Source: DGEG.

Despite the energy consumption has increased between 2003 and 1012 in Greater Lisbon from 2.339 kToe to 2.441 kToe, the GVA has also increased, resulting in a decrease of almost 10% of the energy intensity (Table 43), which is a good indicator since the consumption of energy for each unit of a produced good is lower. In other words, it means that to produce the same wealth, it has been used a smaller quantity of energy.

Table 43 – Energy intensity in Greater Lisbon (NUT III).

ENERGY INTENSITY (TOE/ 10^6 €)	
2003	59,22
2012	53,34
Variation Rate (%)	**-9.9%**

Source: INE, DGEG; calculations: INTELI

Energy efficiency

Among several initiatives to reduce the consumption of electricity, bulbs have been replaced by more efficient devices as LEDs.

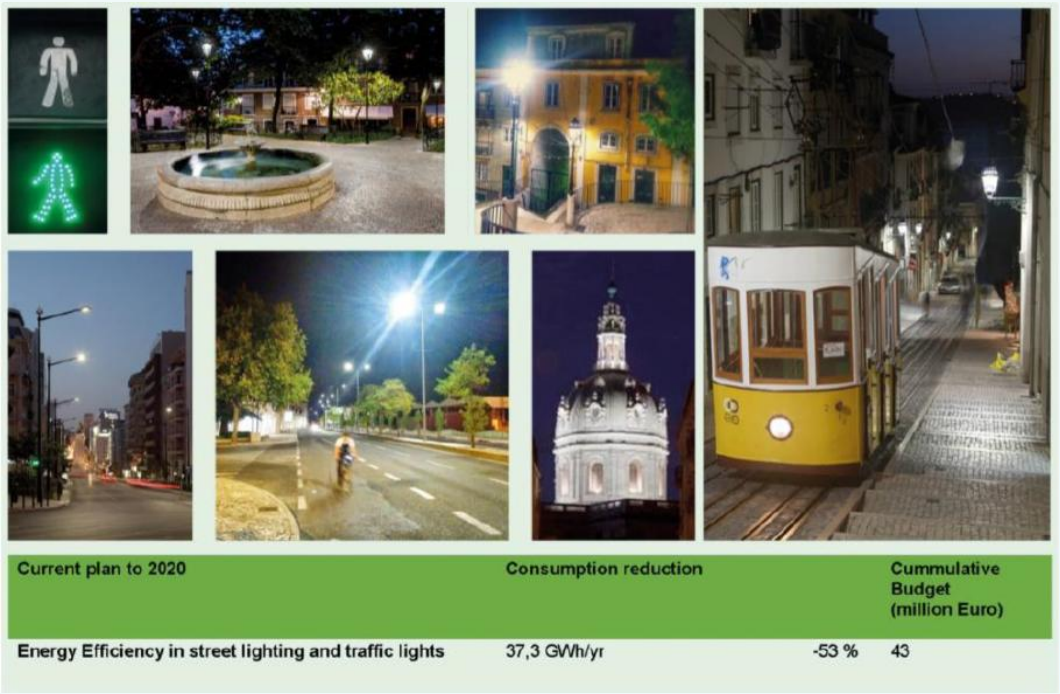


Figure 64 - Energy efficiency in street lighting and traffic lights.

Source: Municipality of Lisbon.

CLIMATE AND AIR QUALITY

Regarding the CO_2 emissions, Lisbon is the municipality of Greater Lisbon which is responsible for the higher CO_2 emission/ km^2, although a slight decrease has been observed between 2005 and 2009.

This number is far above from the average CO_2 emissions/ km^2 taking into account all Portuguese municipalities, which is 3.869 ton CO_2/km^2 in 2012.

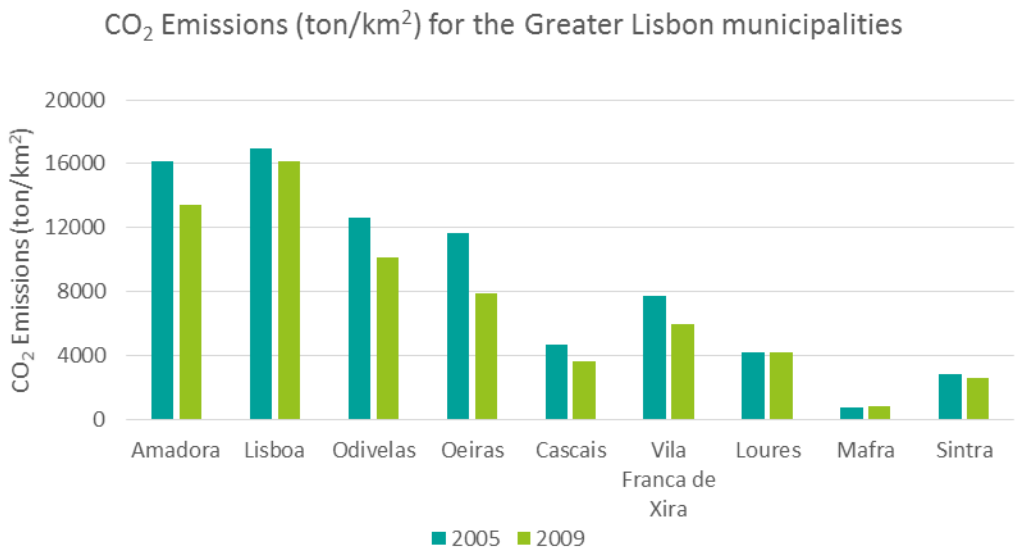


Figure 65 - CO_2 Emissions (ton/km^2) for the Greater Lisbon municipalities (NUTIII).

Source: APA.

Similarly to the energy intensity, the carbon emission intensity also recorded a substantial decrease of about 24% from 2005 to 2009 due to a higher GVA and less carbon emissions in 2009. Therefore, to produce the same amount of wealth, Lisbon has produced less CO_2 emissions, which is an important step towards a post-carbon city.

Table 44 - Variation rate of carbon emissions intensity for Greater Lisbon (NUT III) between 2003 and 2012.

VARIATION RATE OF CARBON EMISSIONS INTENSITY (TON/10^6 €)	
2005	175.6
2009	133.9
Variation Rate (%)	**-23.8%**

Source: INE, APA; calculations: INTELI.

Table 45 -Variation rate of exceedance air quality limit values between 2003 and 2012 in Lisbon municipality.

EXCEEDANCE OF AIR QUALITY LIMIT VALUES (DAYS)[8]		
Pollutants	**O_3**	**PM_{10}**
2003	11,8	76,3
2012	5,3	25,4
Variation Rate (%)	**-55.1%**	**-66.7%**

Source: APA; calculations: INTELI.

IN THE LAST 10 YEARS (AIR QUALITY

Barcelona has an active air quality policy and follows emissions closely and values of pollution exceeding air quality limits have been low. There seems to have been a fall in the number of days where values exceeded the maximum levels triggering an alert. But while a fall has been recorded, the variation rate between 2003 and 2012 cannot be taken as very accurate, as in 2013 the days with excess values increased to 5.

Table 7 – ENV-06) the exceedance levels of limit values for ozone and PM_{10} microns pollutants have recorded a considerable drop (-55.1% and -66.7%) in the number of days that exceed the legally acceptable values imposed by the European and national legislation.

However, and due to all the seven air quality monitoring stations covering the municipality of Lisbon, still occurred disturbing levels of PM_{10} particles in certain areas of the city due to the high concentration of inhalable particles mostly issued by automobile traffic excess, which has been subject to legal sanctions.

TRANSPORT AND MOBILITY

Figure 66 represents the main modes of transportation used by people who lives in Lisbon on their commuting to work or school. The results are quite disappointing since the share of sustainable modes, i.e. walk, bus, company or school collective transportation, metro/ underground, train, bicycle and ship, have decreased from 59% in 2001 to 51% in 2011. Notice that in 2001, the car was responsible for 32% of the model share and in 2012 it was 34%. Likewise, in 2012 less people chose buses as their main mode of transportation (27% in 2001 and 19% in 2011). Moreover, metro/underground was the only public transport that exhibits an increase in the number of passengers for commuting who lives in Lisbon.

[8] The values presented in this table are the average of the values recorded in seven air quality monitoring stations spread around Lisbon.

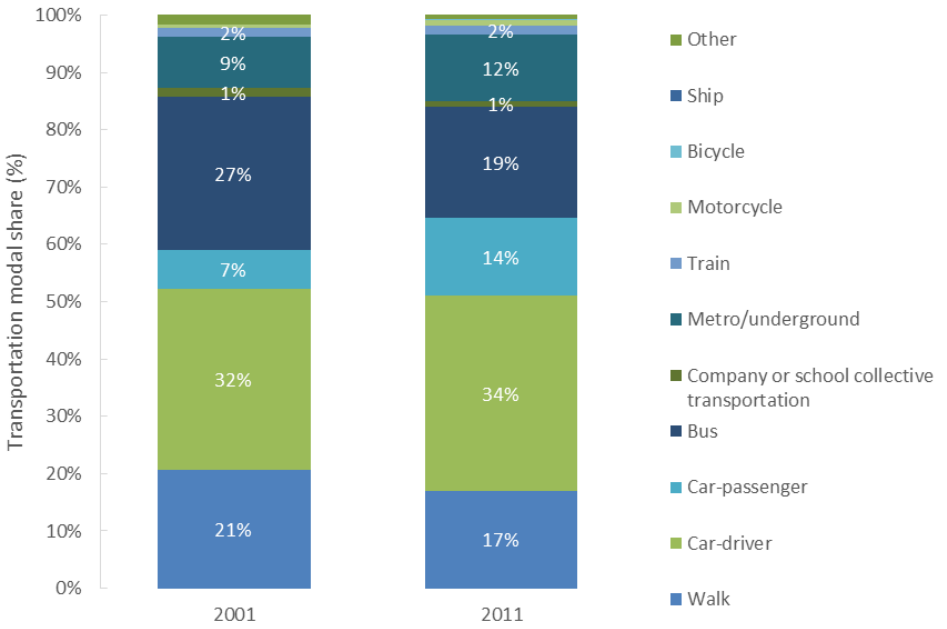


Figure 66 - Modal share on commuting.

Source: INE

Commuting movements

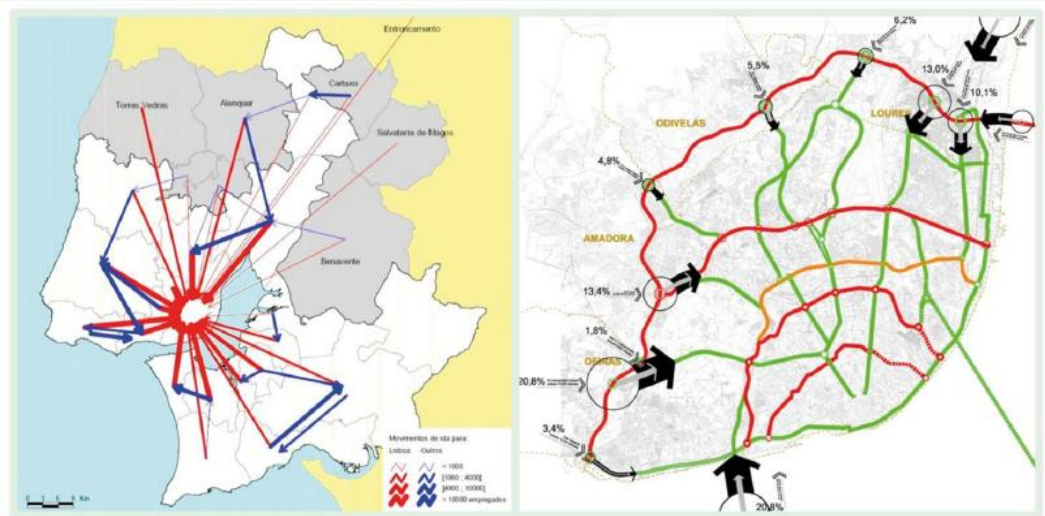


Figure 67 - Diagram of commuting movements from areas from outside of the city.

Source: Municipality of Lisbon

Mobility targets for a better environment

The municipality of Lisbon has launched some actions in order to reduce the number of cars within the city, thereby reducing the pollution and GHG emissions as well as the noise.

- Reduce traffic;
- Promote public transportation;
- Bet on soft modes;
- Improve parking policy;
- ZER – Reduced Emissions Area

EMEL (municipal company for parking and mobility) was the responsible for one of these initiatives. As a result, an online platform was developed to manage the parking in Lisbon (Figure 68). Several zones were created (green, yellow, blue and red) according to specific rules regarding the price and maximum duration allowed for parking. Moreover, parking can be paid using an application for smart phones.

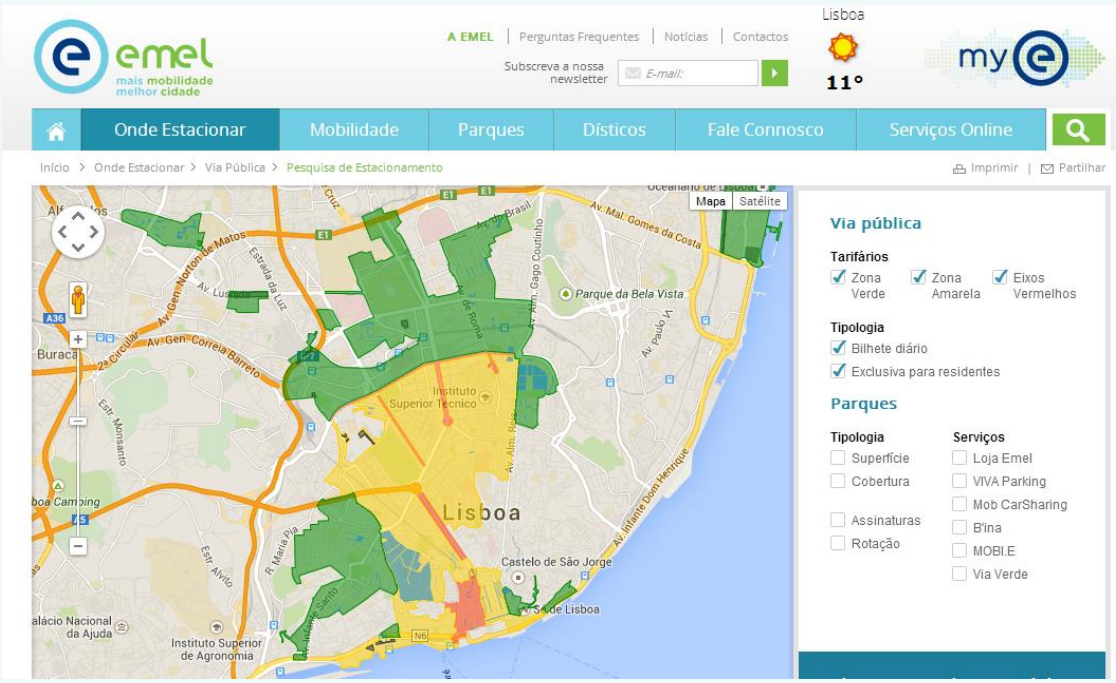


Figure 68 - Online platform created by EMEL for parking management.

Source: EMEL, www.emel.pt

WASTE

Figure 69 shows a decrease of the total urban waste generation (organic and able to selective collection) recorded in the period 2002-2013; however, it is notorious a jump between 2007 and 2008. In terms of recovery waste through all selectively collected waste (after collection),

it has been increasing significantly, from 6% in 2002 to 13% in 2013. Remember that in 2003 the process of selective collection from door to door in specific locations of the city begun, increasing the amount of waste delivered for recycling.

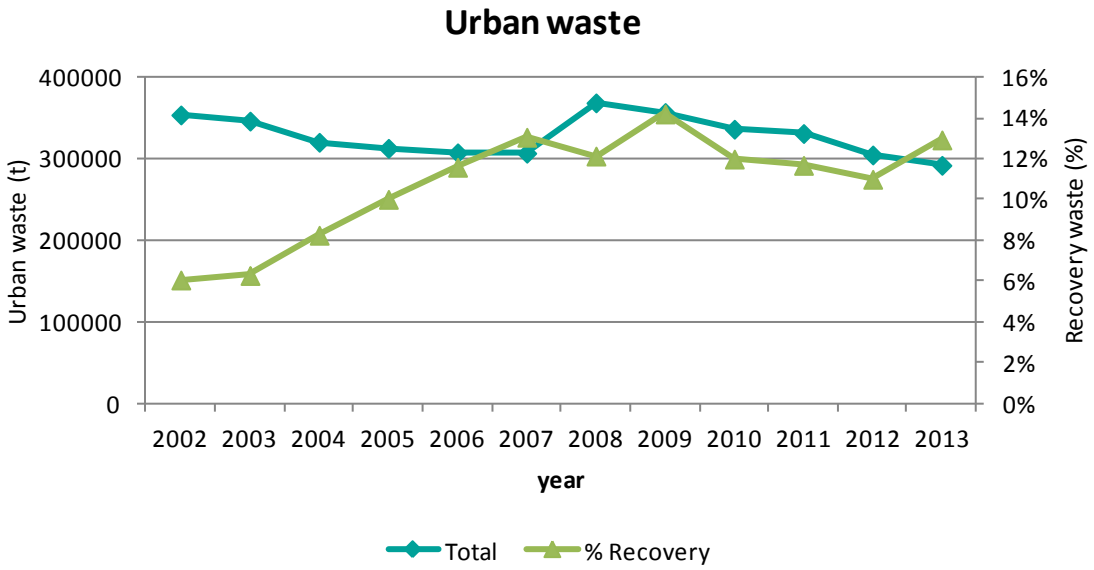


Figure 69 - Urban waste generated in Lisbon.

Source: INE

Table 46 - Variation rate of urban waste generation in Lisbon municipality between 2009 and 2013.

URBAN WASTE GENERATION (T)		
Year	**Total (kg per capita)**	**Variation rate (%)**
2009	648,6	-
2010	612,8	-6%
2011	610,2	0%
2012	574,5	-6%
2013	561,4	-2%
2009-2013		**-13%**

Source: INE. Calculations: INTELI.

Despite the resident population has been decreasing, the waste production per capita has been declining along the total waste generation, which means that the production of waste falls at a higher rate than the population.

Table 47 - Variation rate of urban waste recovery in Lisbon Municipality between 2009 and 2013.

URBAN WASTE RECOVERY		
Year	**Total (kg per capita)**	**Variation rate (%)**
2009	92,2	-
2010	73,5	-20%
2011	71,3	-3%
2012	63,2	-11%
2013	72,6	15%
2009-2013		**-21%**

Source: INE. Calculations: INTELI.

The figures of the urban waste recovery per capita are disappointing since it has been decreasing throughout the years according to Table 47, although in the last years it has recorded a slight improvement. According to the analysis conducted by Lisbon City Council, these results may have been caused by some collateral effects of the recent economic crisis (illegal robbery of recyclable materials).

WATER

A new strategy based on a continuous sectoring and monitoring of the entire water distribution network was the main action adopted by the company EPAL which holds the entire supply and distribution of water in Lisbon.

Through a network segmentation, data monitoring and subsequent analysis and control combined with active control leakage interventions, it has been possible to successfully reduce water losses by 74%, from 32 M m^3 in 2002 to 8.2 M m^3 in 2013.

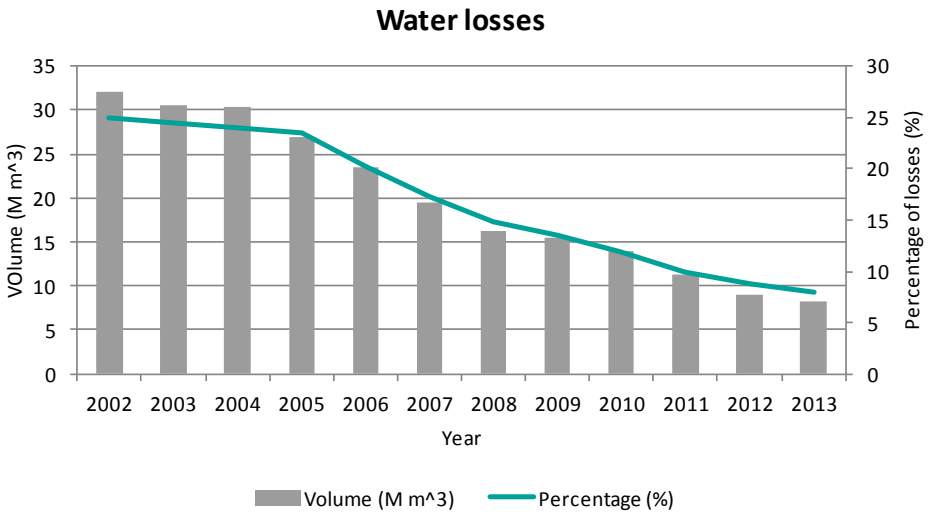


Figure 70 - Water losses in Lisbon.

Source: Lisbon City Council

Table 48 - Variation rate of water losses in Lisbon Municipality between 2009 and 2013.

WATER LOSSES (M M^3)		
Year	**Losses (m^3 per capita)**	**Variation rate (%)**
2009	27,98	-
2010	25,49	-8,9
2011	20,63	-19,1
2012	16,95	-17,8
2013	15,75	-7,1
2009-2013		**-43,7**

Source: EPAL. Calculations: INTELI.

Concerning water losses per capita, it has been decreasing, however at a slower variation rate according to Table 48. Notwithstanding, the reduction of water losses are truly impressive.

Water matrix in Lisbon

The sector that consumes more drinking water is by far the residential, representing about half of all the consumption throughout the years.

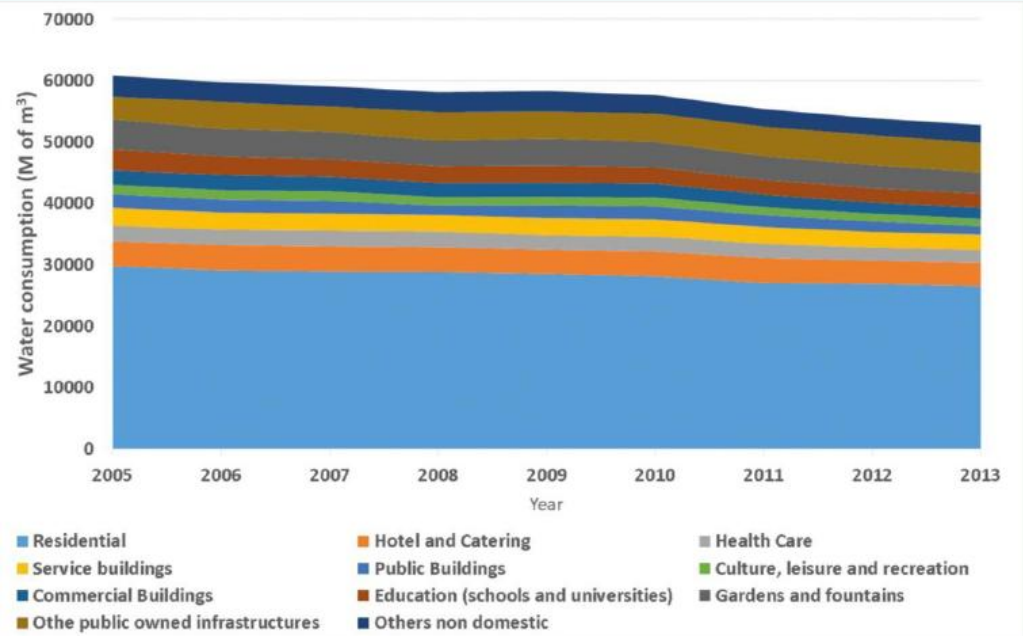


Figure 71 - Consumption of drinking water by activities.

Source: Municipality of Lisbon.

BUILDINGS AND LAND USE

On Table 49 we can see that in 2007 the energy certification for buildings was clearly absent, due to the fact that only since January 2009 the Energy Certification System become mandatory for all buildings (new and existing), thereby justifying the exponential increase (14%) of certificates issued in 2012.

Table 49 - Variation rate of energy-efficient (with A+ and A energy class) buildings in Lisbon municipality between 2003 and 2012.

ENERGY-EFFICIENT (A+ AND A ENERGY CLASS) BUILDINGS			
Year	**No of certificates issued with A+ and A energy class**	**No of total certificates issued**	**Variation rate (%)**
2007	0	4	0%
2012	1,042	7,291	14%

Source: ADENE. Calculations: INTELI.

Table 50 - Variation rate of urban building density in Lisbon municipality between 2001 and 2011.

URBAN BUILDING DENSITY (Nº OF BUILDINGS/KM^2)	
2001	628,08
2011	617,82
Variation Rate (%)	**-1.63%**

Source: INE. Calculations: INTELI.

The low variation rate of urban building density observed in the decade 2001-2011 may have as main causes the demolition of buildings left vacant and/or unused without any legal registration.

V.IV.II SOCIAL PERFORMANCE

The social performance assessment of the city of Lisbon will be based on the KPI identified for this dimension.

SOCIAL INCLUSION

The unemployment level was practicably stable until 2008 at 4%, and then it stated climbing until 10% in the case of men and almost 8% in the case of women, exhibiting annual growth rates up to 40%. Remember that 2008 was the year when the economic crisis began, which has impacted all the Portuguese economy, and being Lisbon an important economic centre, the region has also suffered extensively.

Figure 72 - Unemployment level by gender and its annual variation rate, for the Lisboa and Vale do Tejo (NUTS II) region.

Source: INE.

In 1960 only 2.7% of Lisbon population held a tertiary education degree. At a national level, the picture was even worst, with 0.6% of the population having tertiary education degree. Fortunately nowadays the numbers are not the same and 32.2% of Lisbon residents have attended a tertiary education school against 13.8% at national level. Despite the growth rates have been declining, they are very expressive since between 1960 and 1981 the variation rate was 215% and between 2001 and 2011 the tertiary education level grew 54%.

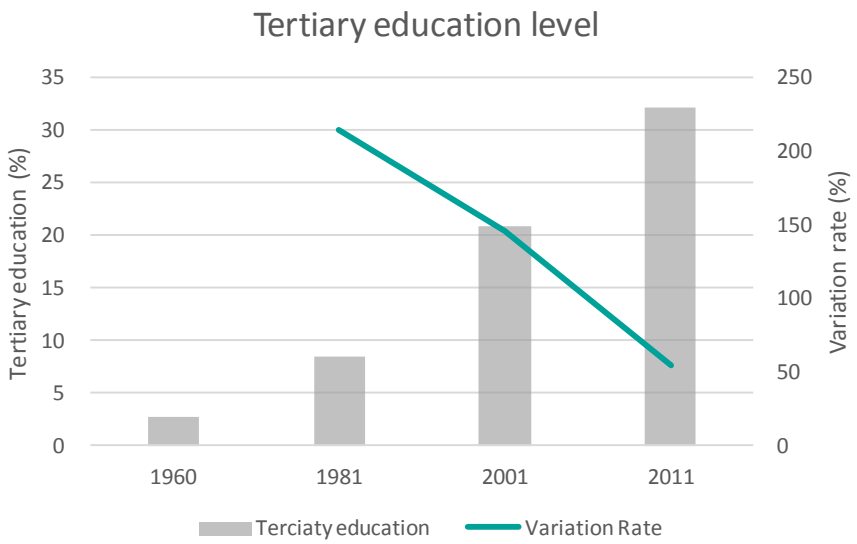


Figure 73 - Tertiary education level for population over 15 years old and its variation rate.

Source: INE

Despite the average life expectancy has been increasing, the annual growth rate has broadly decreased; however the values range is narrow (from about 0.2% to almost 0.7%). Nevertheless, the increase of average life expectancy in a 10 years period from 77.8 to 79.9 is remarkable since, on average, the life expectancy has increased 2.4 months per year.

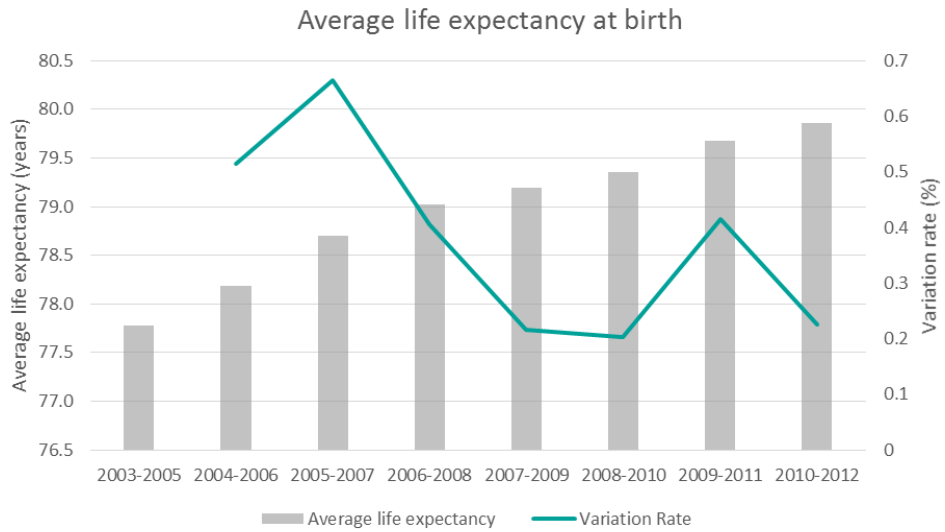


Figure 74 - Average life expectancy at birth and its annual variation rate for Greater Lisbon (NUT III region).

Source: INE.

Regarding the level of poverty, the figures are very worrying because between 1989 and 2009 the level of poverty in the region of Lisboa and Vale do Tejo jumped by 80%. The large urban

concentrations and the unemployment are the main causes of this condition [“Desigualdade Económica em Portugal, Carlos Farinha Rodrigues, 2012]. Nonetheless, at national level, the level of poverty decreased from 22.5% to 17.9% between 1993 and 2009.

PUBLIC SERVICES AND INFRASTRUCTURES

The area of green spaces in Lisbon has been increasing. Between 2009 and 2014, 107.23 ha of green spaces were created and 53.06 ha have suffered improvements.

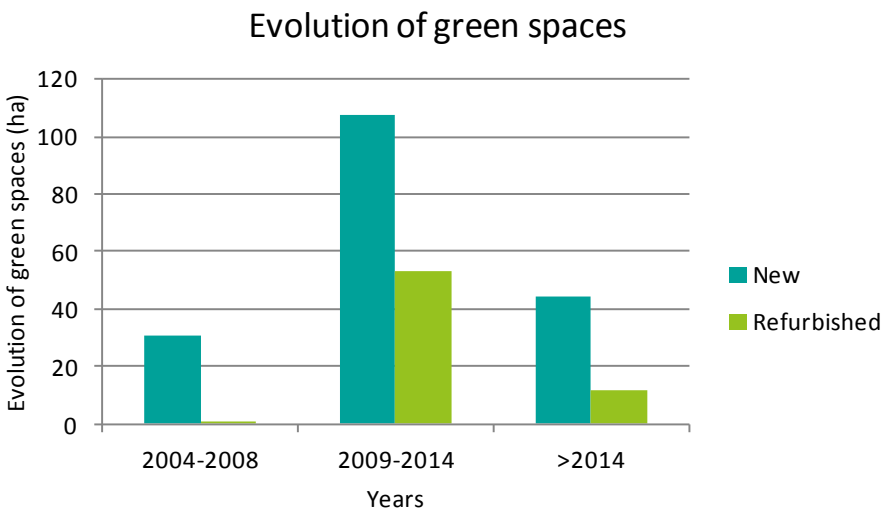


Figure 75 - Evolution of green spaces in Lisbon.

Source: Municipality of Lisbon.

The exponential increase of new green space in Lisbon is clearly demonstrated in the period 2009-2014 through its 413.42% variation rate in comparison with the period 2004-2008.

Evolution of urban gardens in Lisbon

Urban gardens are increasingly popular and Lisbon follows this trend. In 2013-2014, urban gardens rose by 29.9 ha in the city.

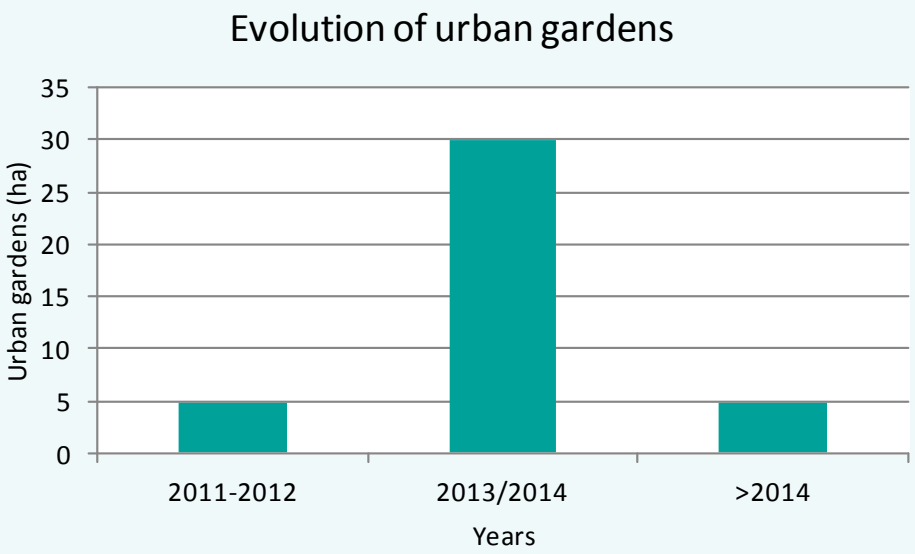


Figure 76 - Evolution of urban gardens in Lisbon.

Source: Municipality of Lisbon

GOVERNANCE EFFECTIVENESS

Lisbon has seven air quality monitoring stations spread around the city and the municipality has joined the Covenant of Mayors. Nevertheless, as far as it could be noticed, there is neither formal monitoring system for emission reductions nor monitoring program launched by Lisboa E-Nova or by City Council. Therefore, the answer for the indicator related to the existence of monitoring system for emissions reductions is negative.

V.IV.III ECONOMIC PERFORMANCE

The economic performance assessment of the city of Lisbon will be based on the KPI identified for this dimension.

SUSTAINABLE ECONOMIC GROWTH

The level of wealth, measured in terms of GDP for the NUTS II region, increased until 2008 (year of the beginning of the economic crisis) on average 2% to 5%. Nevertheless, between 2007 and 2008, the GDP increased 1% only. In 2009 the annual average rate was negative, but in 2010 the GDP raised again to a value closer to the one recorded in 2008. In the last three years, GDP falls continuously, with rates up to 3.5%, as it can be seen in Figure 77.

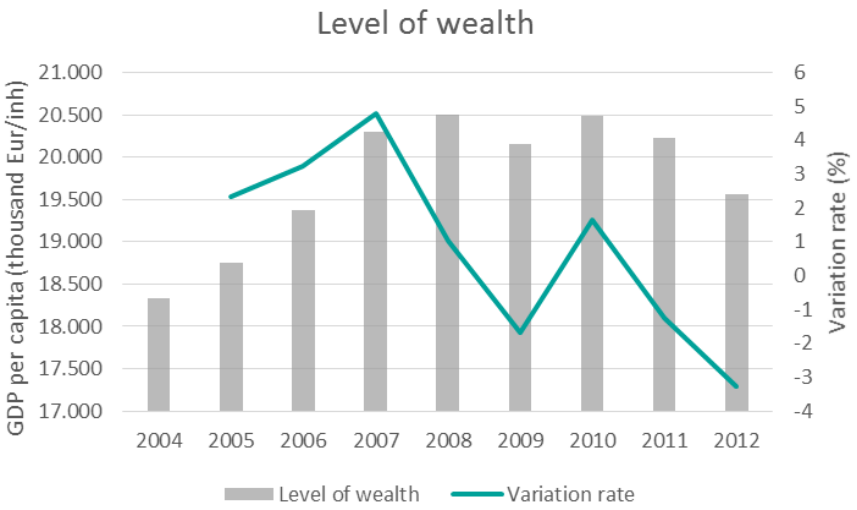


Figure 77 - Level of wealth and its annual variation rate for Greater Lisbon region (NUT III).

Source: INE.

Since GDP are published by sectors for national level only, it was substituted by GVA for the Greater Lisbon region. In fact, there is no data about GVA by municipality, so NUT III was the closest option for the indicator.

Table 51 shows that GVA has been growing up throughout the years mainly due to the growth of the industry sector which offsets the decline of the agricultural sector. Despite this broadly trend, a slight decline of GVA is noticeable in the last two years (2011 and 2012).

Table 51 - GVA by sector for the Greater Lisbon region (NUTIII).

VAB BY SECTORS (10^6EUR)				
Year	**Agriculture**	**Industry**	**Services**	**Total**
2003	84,61	6.728,09	32.678,45	39.491,15
2004	83,09	7.030,04	34.429,61	41.542,74
2005	81,03	7.080,66	35.580,72	42.742,41
2006	94,07	7.034,91	36.509,84	43.638,81
2007	93,52	7.127,14	39.048,78	46.269,44
2008	95,16	7.158,55	40.098,00	47.351,71
2009	91,64	6.739,17	40.713,96	47.544,77
2010	94,79	6.852,34	41.237,40	48.184,53
2011	88,99	6.584,89	40.639,77	47.313,64
2012	90,67	6.218,26	39.454,16	45.763,10

Source: INE.

Figure 78 shows that the share of GVA by sector follows a quite stable pattern throughout the years, since the annual variation rate is small, being the services sector the most

representative sector (about 80%), followed by industry (about 20%) and the contribution of the agriculture sector is negligible.

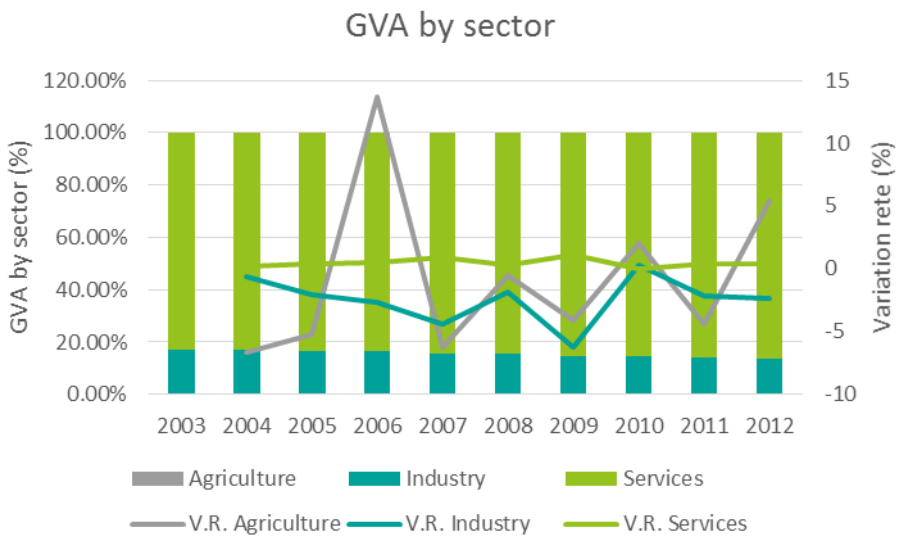


Figure 78 - Share of gross value added by sector and its annual variation rate for the Greater Lisbon region.

Source: INE.

Regarding the employment by sector, which is summarized in Figure 79, it is observed that that the number of employees has been growing up in services, which is in line to the GVA trend of this sector. On the other hand, the number of people working in industry is declining, which is proved by a negative annual variation rate. The sector which has recorded higher annual variation rates is agriculture; however its contribution for the employment is residual. Summing up the contributions of all sectors, the number of people employed increased until 2008 (year of the economic crisis), and then it stated to fall down.

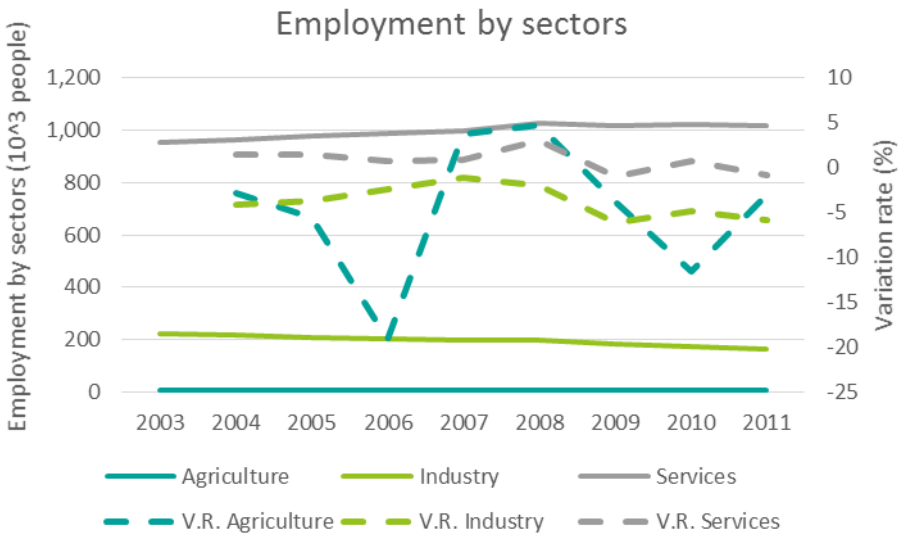


Figure 79 - Employment by sectors for the Greater Lisbon region (NUT III).

Source: INE.

The number of enterprises newly born that has survived in the year of birth and the following 3 years have been rising up at least for the years between 2008 and 2010 according to Table 52. These figures are exciting since the economic crisis stated in 2008. Taking into account the population of active enterprises, the survival rate has increased, whilst the variation rate have the opposite trend by decreasing slightly.

Table 52 - Business survival in Greater Lisbon (NUT III).

BUSINESS SURVIVAL				
Year (t)	**Number of enterprises[9] newly born in t-3 having survived to t**	**Population of active enterprises in t**	**Survival rate**	**Variation rate (%)**
2008	21.361	377.684	5,7%	-
2009	22.409	364.404	6,1%	8,7%
2010	22.763	341.226	6,7%	8,5%

Source: Eurostat.

PUBLIC FINANCES

Globally, the expenditures of Lisbon City Council have been decreasing; however, the revenues are very volatile, thereby the balance varies greatly resulting in extreme variation rates, as it is shown in Table 53.

[9] Industry, construction and services except insurance activities of holding companies.

Table 53 - Budget balance of the Lisbon City Council.

YEAR	EXPENDITURES (10^3 EUR)	REVENUES (10^3 EUR)	BALANCE (10^3 EUR)	BALANCE – VARIATION RATE (%)
2009	593.136,95	556.730,09	-36.406,86	
2010	564.333,03	600.698,24	36.365,21	-200%
2011	486.484,07	536.563,79	50.079,72	38%
2012	488.166,72	823.676,40	335.509,68	570%
2013	474.492,94	487.365,85	12.872,91	-96%

Source: Pordata

Regarding the indebtedness level of the Lisbon City Council, it is notorious the efforts to reduce it. In the last 4 years, it jumped from 79.3% to 4.5%, thereby a variation rate of 94%. Notice that in 2012, the indebtedness level was 0%, increasing slightly in 2013.

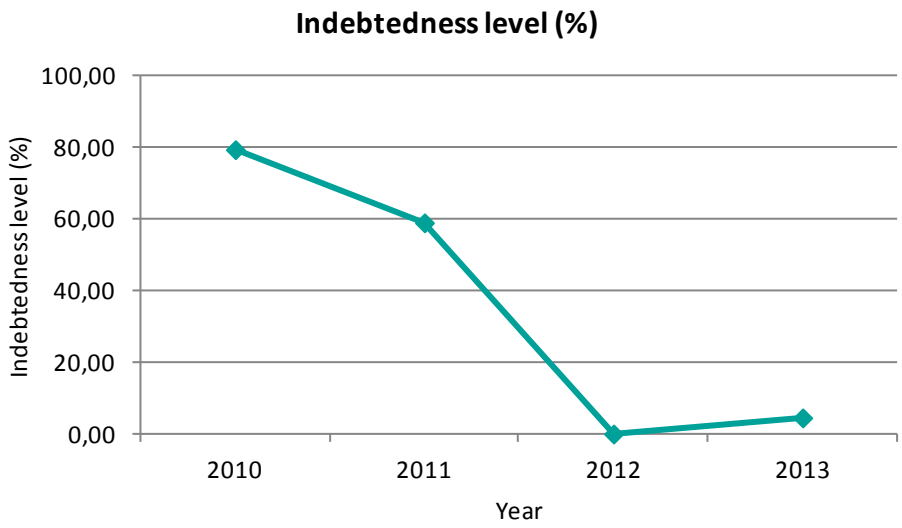


Figure 80 - Indebtedness level of the Lisbon City Council.

Source: Lisbon City Council

RESEARCH & INNOVATION DYNAMICS

Research and development activities merited increasing efforts until 2009, exhibiting significant annual variation rates, especially in 2006 and 2008 with values up to 27%. Despite in 2009 it was recorded the highest contribution for R&D activities, from 2008 onwards the variation rate started to decrease. In 2010 the R&D intensity decreased 5% in relation to 2009, being its value between the ones occurred in 2008 and 2009.

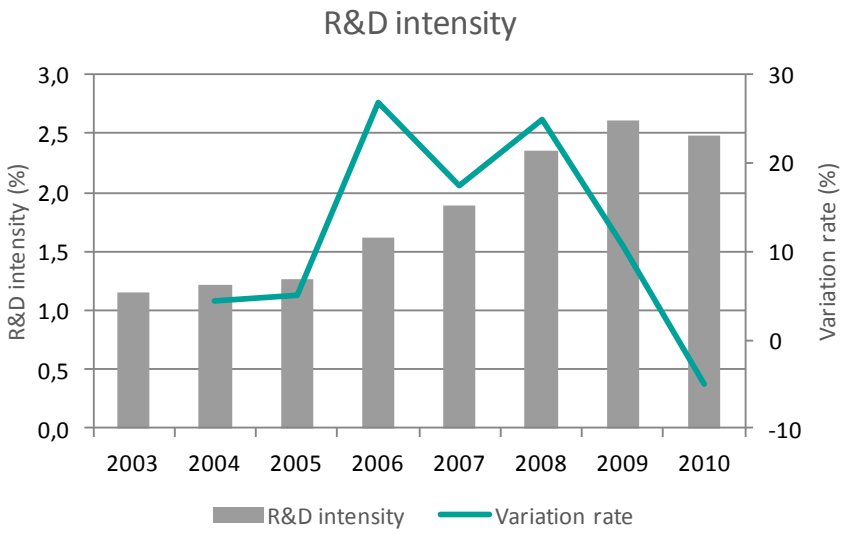


Figure 81 - Proportion of gross expenditure on research and development in GDP (%) and its annual variation rate for the Greater Lisbon region (NUT III).

Source: INE

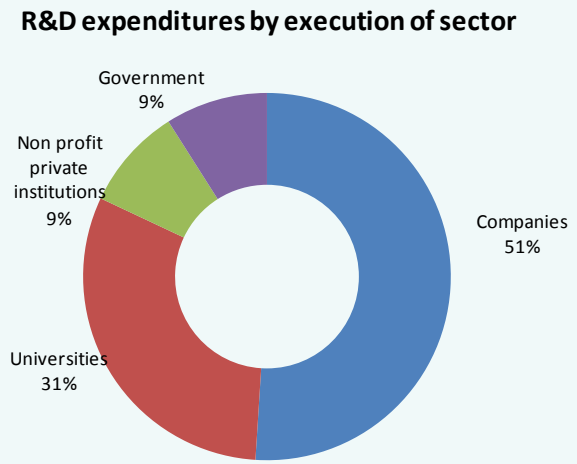


Figure 82 - R&D expenditures by execution sector.

Source: Economia em Números 2014, Lisbon City Council.

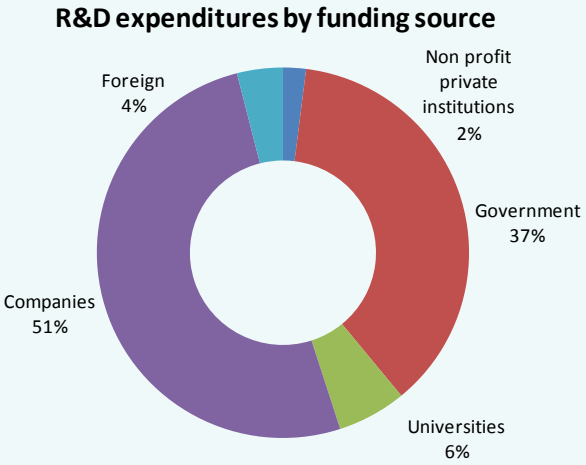


Figure 83 - R&D expenditures by funding source.

Source: Economia em Números 2014, Lisbon City Council.

Knowledge map of Lisbon

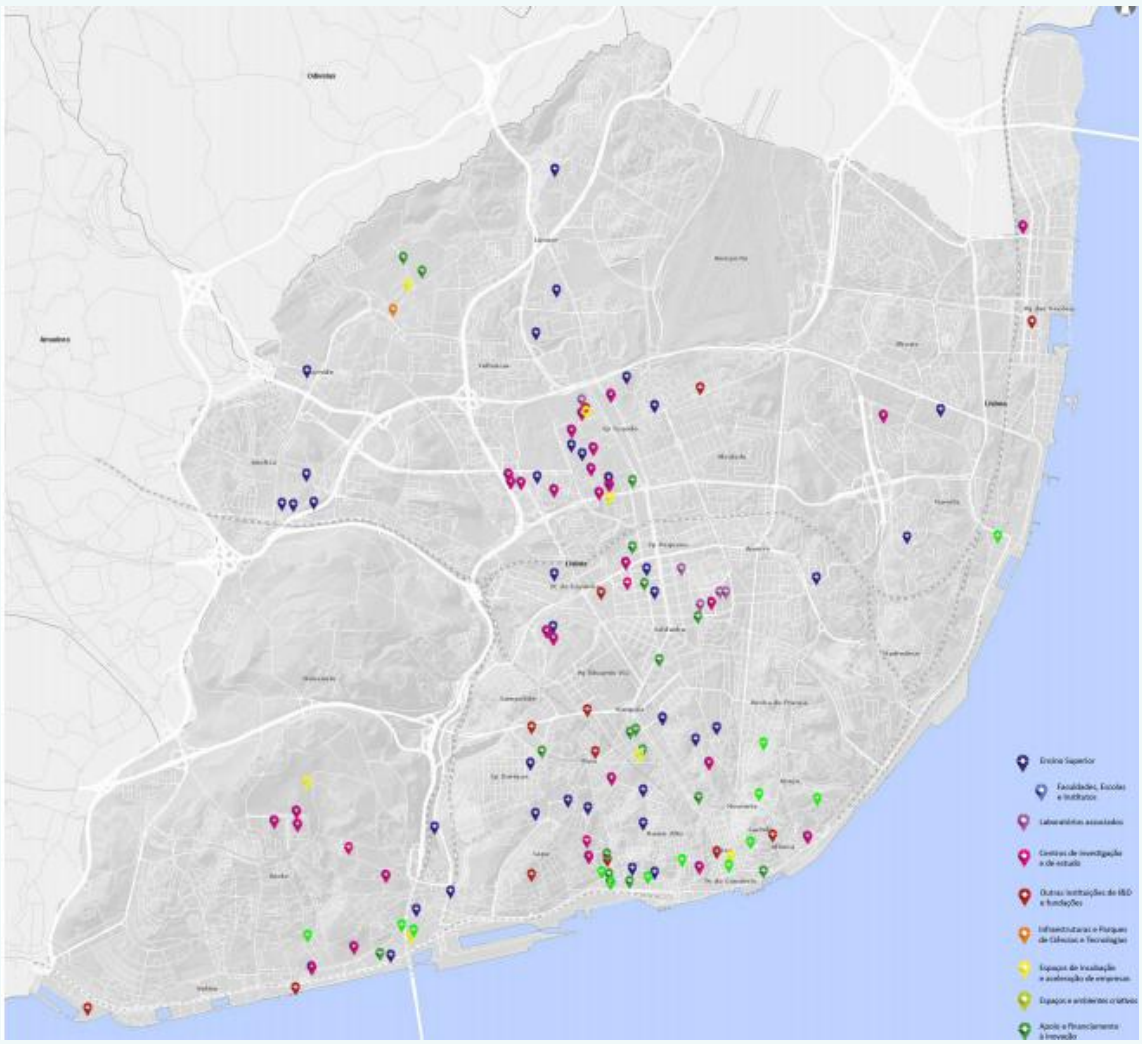


Figure 84 - Knowledge map of Lisbon.

Dark blue: Universities; violet: Laboratories; pink: research centres; red: other R&D institutions and foundations; orange: infrastructures and parks of science and technology; yellow: spaces for incubation and entrepreneurship; green: creative spaces and environments; dark green: support and funding for innovation.
Source: http://lxi.cm-lisboa.pt/lxi

V.V FINDINGS AND KEY CHALLENGES

Table 54 summarises the global trends for each KPI indicator for the Lisbon case study city. In red are the indicators in which Lisbon has records a worst performance; nevertheless Lisbon is moving positively for the majority of the indicators towards a post-carbon city.

Table 54 - Summary of KPI's global trends

DIMENSION	SUB-DIMENSION	INDICATOR	Year	Trend
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	2003-2012	↗
		Variation rate of poverty level	1989, 2009	↗
		Variation rate of tertiary education level by gender	1960, 1981, 2001, 2011	↗
		Variation rate of average life expectancy	2003-2012	↗
	Public services and Infrastructures	Variation rate of green space availability	2004-2008; 2009-2014; >2014	↗
	Governance effectiveness	Existence of monitoring system for emissions reductions	N/A	N/A
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	2003, 2012	↗
	Energy	Energy intensity variation rate	2003, 2012	↘
		Variation rate of energy consumption by sectors	2008, 2012	↗
	Climate and Air Quality	Variation rate of carbon emissions intensity	2005, 2009	↘
		Variation rate of carbon emissions by sector	N/A	N/A
		Exceedance rate of air quality limit values	2003,2012	↘
	Transport and mobility	Variation share of sustainable transportation	2001, 2011	↘
	Waste	Variation rate of urban waste generation	2002-2013	↘
		Variation rate of urban waste recovery	2002-2013	↘
	Water	Water losses variation rate	2002-2013	↘
	Buildings and Land Use	Energy-efficient buildings variation rate	2007, 2012	↗
		Urban building density variation rate	2001, 2011	→

DIMENSION	SUB-DIMENSION	INDICATOR	Year	Trend
ECONOMY	Sustainable economic growth	Level of wealth variation rate	2004-2012	↗
		Variation rate of GDP by sectors	2004-2012	↗
		Employment by sectors variation rate	2003-2011	→
		Business survival variation rate	2008, 2009, 2010	↗
	Public Finances	Budget deficit variation rate	2009-2013	↘
		Indebtedness level variation rate	2010-2013	↘
	R & I dynamics	R&D intensity variation rate	2003-2010	↗

Over a span of 30 years, the Portuguese capital has lost more than 200,000 of its residents, shrinking from 800,000 in 1980 to 550,000 today. Most of those people now live in the metropolitan region, reaching 2.8 million residents. This change of Lisbon demography leads to several problems such as aging people. Another issue is related to commuting. Each day more than 300,000 people come in to Lisbon to work and most of them arrive by car, which has impacts on the quality of the environment, on energy consumption and on quality of life, because people take more time on commuting, causing stress and fatigue and also spend a higher share of their budgets on transportation. Therefore, bringing people back to Lisbon is undoubtedly a key challenge.

In addition to this main issue, KPIs allow us to identify a set of domains in which Lisbon is not doing well on its transition to a post-carbon city. Both poverty level and unemployment are rising up (although the employment rate is quite stable), being the two indicators interconnected somehow since unemployment leads to a reduction of people income.

The use of sustainable modes of transportation has lost enthusiasts despite the public transportation network in Lisbon is extensive and the kilometers of cycling lanes have been improved. The use of car is very popular among Lisbon residents, so it should be developed new ways of using car, including car pooling and car sharing. Actually, some related projects have already been launched such as Mob Carsharing (see page 101), which means that the creation of synergies between transport modes is essential. Public transport alongside cycling and walking should be encouraged as well. Therefore, a holist overview of urban development, including the metropolitan area should be addressed, taking into account the main residential and work areas.

Despite the percentage of urban waste recovery has been increasing, the performance of Lisbon regarding urban waste recovery per capita is getting worse since 2010. Notwithstanding, if one looks to the period of 2002-2013, it can be observed a substantial improvement on recovery waste. Therefore, Lisbon should create new initiatives to revive the population awareness about this question, as well as to adopt intelligent urban waste management solutions.

On the other hand, Lisbon is a nice city to live in, since new green spaces have been created and the carbon emissions were reduced by nearly 5% between 2005 and 2009. In fact, Lisbon

is committed to reduce 20% of its carbon emissions by 2020. Moreover, people are living longer due to the increase of the average life expectancy.

Currently there are nearly 7,000 buildings in Lisbon holding an energy certification, of which about 1,000 are A or A+ energy efficient buildings. Although this number is likely to grow, it is a matter of concern, because 80% of world's energy is consumed by cities and buildings are responsible for 40% of energy use and 23% of GHG emissions. However, we have to become aware that the reduction of energy consumption and GHG emissions cannot be achieved solely through the thermal efficiency of new buildings. In fact, the urban building density in Lisbon is quite stable; thus it makes more sense to intervene in the existing stock or in building renovation. Meritorious examples are the project Eco-Neighborhood – Boavista Ambiente + and Requalification of Mouraria. Thus, Lisbon is also committed with more energy efficiency buildings, which is a flagship area of the European Commission through the ambitious targets of NZEB – Nearly net zero energy buildings.

Concerning the indicators in which the Lisbon City Council can have an active role, it is notorious the improvement of public finances because the indebtedness level has been falling down very significantly and the balance of expenditures/revenues has been positive since 2010. Regarding the environmental policy and initiates such the Reduced Emission Areas (see page 106), the results are encouraging: the pollutants and carbon emissions have been reduced, and it was possible to reduce water losses and new and more pleasant green spaces have been emerged. Lisbon has recorded real world-class values in terms of water losses, mainly due to the projects and solution launched by EPAL, the water operator in the city (for example the Wone system - http://www.epal.pt/EPAL/en/menu/products-and-services/wone).

The wealth of Lisbon, measured in terms of GDP, has been increasing as well as the investments in R&D activities. Thereby it can be found a negative correlation between the level of wealth and both the consumption of energy and carbons emissions. In fact, when cities and countries are richer, they can invest more money on the environmental questions. The business survival records a positive growth, which are really good news given the adverse economic context.

V.VI RECOMMENDATIONS

The main recommendations for the transition of Lisbon towards a post-carbon city, taking in account the KPI analysed are:

- **Sustainable Mobility:** Despite several initiaves have been launched by the Lisbon City Council in the area of sustainable mobility (such as electric mobility, carsharing, bycicle lanes, improvement of public transport, etc.), private car is still the main transport mode used by the population. It is needed a change of mentality, which takes time.
- **Buildings Renovation:** There are several buildings in Lisbon that needs intervention, mainly in the area of energy efficiency. An Urban Renewal Strategy is under development till 2024, which may help to solve this situation.
- **Monitoring Carbon Emissions**: A formal monitoring plan of carbon emissions is needed in order to evaluate the progress towards the 2020 target of 20% reduction. The impact of the ZER (Reduction Emission Areas) needs also to be monitored.
- **Renewable Energy**: According to the Lisbon Solar Potential Map, huge opportunities of production of renewable energy are available and should be improved. Reducing energy consumption through energy efficiency is also a trend that should be reinforced. Public lighting is an important area of intervention, in which some actions have been already launched (LED).
- **Waste management:** Waste management intelligent solutions can be used by the municipality in the framework of the Lisbon smart city strategy, in order to improve urban waste recovery amounts.
- **Economic crisis:** Poverty and unemployment are a result of the national (and European) economic crisis. These problems should also be managed at municipal level. Employment opportunities should be created, and social innovation projects should be launched.

V.VII CONCLUSIONS

It can be concluded that Lisbon is following a sustainable economic growth towards a post-carbon city. Nevertheless, some actions should be improved in the areas of mobility, buildings renovation, renewable energy production, carbon emissions monitoring, and waste management. In economic and social terms, unemployment and poverty should be stroke at municipal level, along with European and national measures.

VI CASE STUDY CITY LITOMĚŘICE

VI.I DATA COLLECTION

The data were collected from following sources:

- National statistics – Czech Statistical Office;
- European statistics – Eurostat;
- Data collected on the city level and provided by the city office.

The data on the city level were obtained from the local authorities as they are not part of publicly available statistical databases. We differentiate four levels of geographical coverage according to the data availability:

- Litoměřice city (NUTS5);
- Litoměřice municipality district (NUTS4);
- Ústecký kraj (NUTS3);
- Severozápad (NUTS2).

The collected data were inserted on an online platform created by the WP3 leader. If the indicator differs in the available variable, it is reported only in this report and not on the online platform, where the variable formats were exactly prescribed.

VI.II OVERVIEW OF THE CASE STUDY CITY

VI.II.I TERRITORY

The city of Litoměřice is situated in the northern part of the Czech Republic, 60 km north of the capital city of Prague, at the confluence of rivers Ohře and Elbe. The territory of the case study covers the area of 17.99 km^2 and encompasses the city Litoměřice with its four city quarters and 24,136 inhabitants. The exercise in WP4 – the vision building and backcasting scenario refer both to the territory of the city.

Figure 85: Litoměřice city (NUTS5 - CZ0423 564567) and its position in municipality district Litoměřice (NUTS4)

Sources:http://cs.wikipedia.org/wiki/Litom%C4%9B%C5%99ice#mediaviewer/File:LT_Litom%C4%9B%C5%99ice.png ; http://cs.wikipedia.org/wiki/Litom%C4%9B%C5%99ice#mediaviewer/File:Litoměřice_LT_CZ.png

However, for the data collection, the city level is not captured in most of the statistical databases and the traditional unit for statistical reporting is the municipality district Litoměřice, which covers much larger territory of 1,032.16 km² with 150 municipalities and 119,250 inhabitants.

Some of the key performance indicators refer to broader territories of NUTS3 CZ042 – Ústecký kraj (indicated in Figure 86) and NUTS2 CZ04 – Severozápad.

Figure 86: NUTS3 - CZ042 - Ústecký kraj

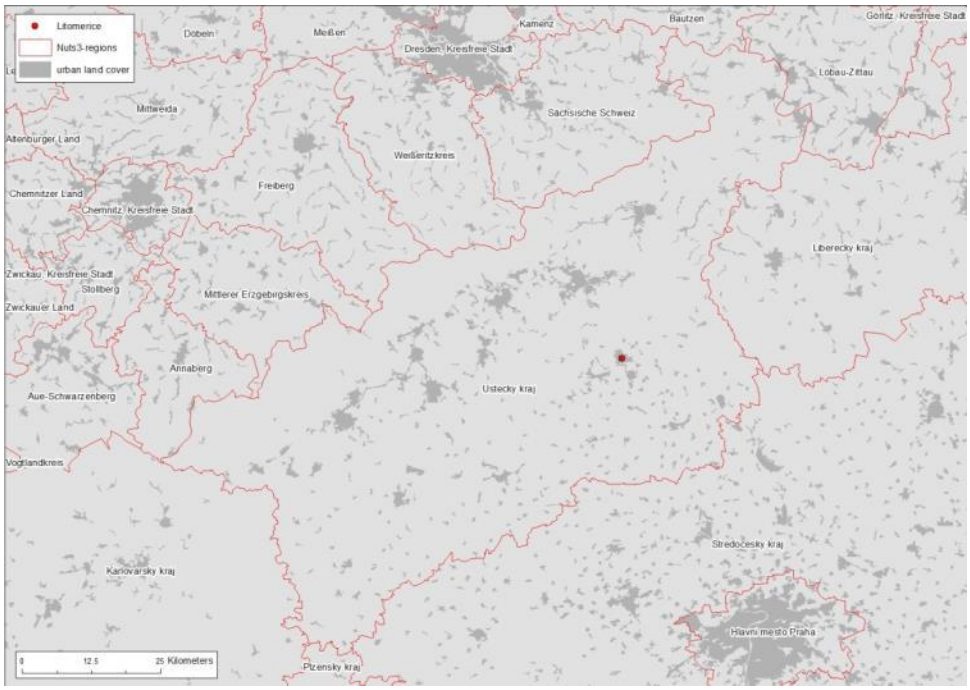
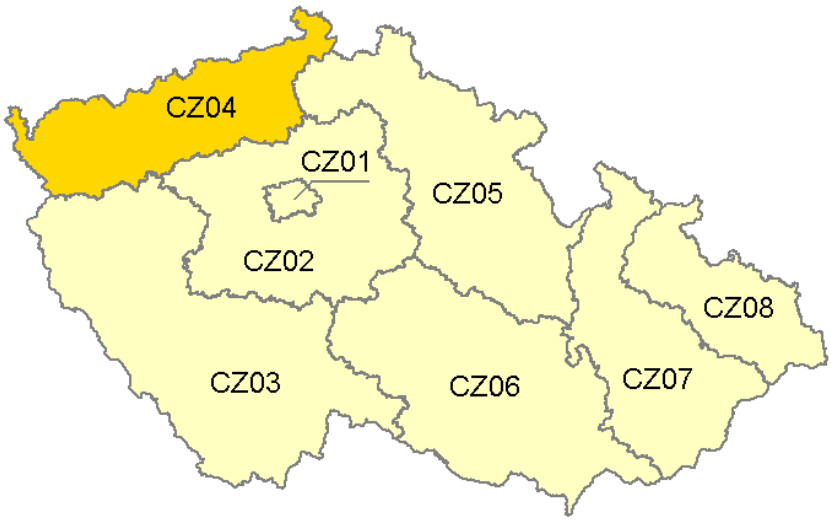


Figure 87: NUTS2 – CZ04 Severozápad and its position in the Czech Republic



Source: http://cs.wikipedia.org/wiki/NUTS_Severoz%C3%A1pad#mediaviewer/File:Cznuts2_04.png

VI.II.II POPULATION

The population of the city is 24,136 (year 2013)[10]. The average age of its inhabitants is 41, with 14% of the population under 15 years and 15.2% of the population over 65 years old. The population density is 1,341.63 inhabitants per 1 km^2. 14% of its inhabitants have completed

[10] Source: Czech Statistical Office

tertiary education. The employment rate is 45% (employed out of all inhabitants) and the unemployment rate in the city is 4% (unemployed out of all inhabitants). 94% of the inhabitants are Czechs, only 4% are foreigners.

VI.II.III ECONOMY

The GDP per capita for the NUTS2 CZ04 equals 11,800 EUR (in 2011). The annual budget of the city is approximately 400 million CZK. In total there are 6,693 enterprises in the city.

Litoměřice is a city with rich history which dates back to 9th century and offers a lot of cultural and natural heritage. The historical city centre is urban conservation area since 1950 and since the 17th century the area is called "the garden of Bohemia" which refers to the rather fertile lowland around the Elbe River. The district area partially overlaps with the protected landscape area České středohoří.

Typical for this administrative district is cultivation of crops, fruit and viticulture, but also chemical and paper industries. Most of the enterprises in the city itself are small companies without employees or micro enterprises with up to 10 employees. Most of the enterprises are active in commerce and services and construction industry.

Table 55: Structure of enterprises in Litoměřice (in 2010)[11]

ACCORDING TO SIZE	
Without employees	4881
1-9 employees - micro enterprises	519
10-49 employees - small enterprises	121
50-249 employees - medium enterprises	30
> 249 employees - large enterprises	4
ACCORDING TO ECONOMIC ACTIVITY	
Commerce and services	3345
Construction industry	1079
Other public, social and personal services	979
Industry	695
Education and health	254
Transport	205
Agriculture, forestry, fisheries	120
Public administration	7

[11] Source: Local sustainable development indicators: http://www.indikatory.eu/ustecky/litomerice/litomerice/eco2-%E2%80%93-stabilita-diverzifikace-mistni-ekonomicke-zakladny-v-obci-litom

VI.III KEY STRATEGIES AND PROJECTS

Litoměřice is member of the National Network of Healthy Towns and of Energy Cities. It has currently an approved Strategy development plan of the city till 2030 and few other sectoral strategies and action plans, most importantly a new energy plan. Carbon footprint of the city was calculated in 2013.

VI.III.I STRATEGIES AND ACTION PLANS

STRATEGY/ACTION PLAN FACTSHEET 1	
Title	Strategic development plan of the city
Dimension of KPIs	All
Period	2012-2030
Strategy/Action Plan description	
Objective	Based on Agenda 21 recommendations, it presents the goals of the city´s development within 5 areas: A) Economy, business and tourism, B)Regional development, transport and housing, C) Social sphere, health, social development, education, D) Energy independent and low emission, E) Quality office and organization of the city.
Measures	Set in corresponding annual action plan.
Targets	A. Economy, business and tourism *(Litoměřice – attractive, picturesque and prosperous city)* B. Regional development, transport and housing *(Litoměřice - city pleasant for living in the heart of the bohemian garden Environment)* C. Social sphere, health, social development, education *(Litoměřice – healthy city, town of culture, sport and education)* D. Energy independent and low emission *(Litoměřice – the city of innovations)* E. Quality office and organization of the city *(Litoměřice - responsible, high quality and efficient urban management)*
Links and Contacts	
Promoter	City of Litoměřice
Document/website	https://www.Litoměřice.cz/images/strategicke-dokumenty/SPRM_2012_FINAL_pro_web-2014.pdf

STRATEGY/ACTION PLAN FACTSHEET 2	
Title	Conception of social inclusion of excluded Roma localities in Litoměřice
Dimension of KPIs	Social
Period	2014-2016
Strategy/Action Plan description	
Objective	Achieve social inclusion of excluded Roma inhabitants

STRATEGY/ACTION PLAN FACTSHEET 2	
Measures	Support in finding appropriate employment, requalification and education, housing.
Targets	n.a.
Links and Contacts	
Promoter	City of Litoměřice
Document/website	n.a.

STRATEGY/ACTION PLAN FACTSHEET 3	
Title	4th Community plan of social services of Litoměřice city
Dimension of KPIs	Social
Period	2014-2017
Strategy/Action Plan description	
Objective	Based on citizens needs current social services are evaluated and suggestions on new developments are made.
Measures	n.a.
Targets	n.a.
Links and Contacts	
Promoter	City of Litoměřice
Document/website	http://komplan.Litoměřice.cz/

STRATEGY/ACTION PLAN FACTSHEET 4	
Title	Conception of family policy in Litoměřice
Dimension of KPIs	Social
Period	2014-2019
Strategy/Action Plan description	
Objective	Improvement of family friendly environment and life conditions in the city
Measures	n.a.
Targets	*n.a.*
Links and Contacts	
Promoter	City of Litoměřice
Document/website	https://www.Litoměřice.cz/images/strategicke-dokumenty/Koncepce_prorodinne_politiky_2014.pdf

STRATEGY/ACTION PLAN FACTSHEET 5	
Title	Marketing and tourism strategy
Dimension of KPIs	Economy
Period	2012+
Strategy/Action Plan description	

STRATEGY/ACTION PLAN FACTSHEET 5	
Objective	The strategy summarizes current city needs in the area of marketing and tourism and suggests 7 areas for marketing and tourism development.
Measures	n.a.
Targets	n.a.
Links and Contacts	
Promoter	*City of Litoměřice*
Document/website	https://www.Litoměřice.cz/images/strategicke-dokumenty/MISTRAL_Strategie_marketingu_a_cestovniho_ruchu_140724.pdf

STRATEGY/ACTION PLAN FACTSHEET 6	
Title	Energy plan of Litoměřice
Dimension of KPIs	Environment
Period	2014-2030
Strategy/Action Plan description	
Objective	The document summarizes the current energy demand of the city and suggests methodology and general framework for the city´s energy management.
Measures	Measures are suggested in the area of heating, public lightening, buildings, renewable energy etc.
Targets	n.a.
Links and Contacts	
Promoter	City of Litoměřice
Document/website	https://www.Litoměřice.cz/images/strategicke-dokumenty/Energeticky_plan_mesta_Litoměřice.pdf

VI.III.II KEY PROJECTS

PROJECT FACTSHEET 1	
Title	Geothermal power plant
Dimension of KPIs	Environment
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2000+
Project description	
Aims	Building new geothermal power plant in the ownership of the city with installation capacity of 20 MWh to cover most of the city´s demand for heat.
Activities	n.a.
Promoters/Beneficiaries; Partnership	City of Litoměřice
Financing	City budget and external resources

PROJECT FACTSHEET 1	
Outcomes and impacts	Substantial increase of energy independency of the city, share of renewable energy, decrease of GHG emissions.
Links and Contacts	
Promoter	City of Litoměřice
Website	http://www.prvnigeotermalni.cz/

VI.IV CASE STUDY CITY ASSESSMENT

This chapter includes details on the actual collected indicators for the case study Litoměřice. We indicate the actual geographical coverage and data source for each indicator. The collected data were inserted on the joint online platform created by the WP3 leader.

VI.IV.I ENVIROMENTAL PERFORMANCE

The indicators on environmental performance were provided by representatives from the city office, especially the Department for Projects and Strategies of Litoměřice City. Most of the data are available only for year 2013, as they were calculated for the purposes of the Energy plan and the Carbon footprint. Most of the required data are not collected or reported regularly. Thus the variation rates of the indicators are not known.

Table 56: Actual collected indicators for environmental dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEO. COVER.	DATA SOURCE
Biodiversity	Ecosystem protected areas	Percentage	20122014	City	City office
Energy	Annual primary energy consumption	Toe	2013	City	City office
	Energy consumption by sectors	Percentage	2013	City	City office
Climate and Air Quality	Carbon emissions	Ton CO2	2013	City	City office
	Variation rate of carbon emissions by sector	Ton CO2	2013	City	City office
	Exceedance rate of air quality limit values	№	2013	City	City office
Transport and mobility	Share of sustainable transportation	Percentage	2013	City	City office
Waste	Urban waste generation	Kg/person	2013 2014	City	City office
	Urban waste recovery	Percentage	2013 2014	City	City office
Water	Water losses variation rate	n.a.	n.a.	n.a.	n.a.
Buildings and Land Use	Share of energy-efficient buildings	Percentage	2013 2014	City	City office

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEO. COVER.	DATA SOURCE
	Urban building density variation rate	n.a.	n.a.	n.a.	n.a.

ENV 01: ECOSYSTEM PROTECTED AREAS

The city of Litoměřice lies on the border of protected landscape area České středohoří and majority of its territory is within the protected landscape area. The data available from the city office are for years 2013 and 2014 and the total surface protected area in both years is 16.58 km2 (out of 17.99 km2), thus covering 92% of the total cadastral area of the city.

Variable: Municipality surface area (km2) covered by Natura 2000 network and/or national protected areas
Geographical coverage: City
Data source: City office

ENV 02: ANNUAL PRIMARY ENERGY CONSUMPTION

The primary energy consumption in 2013 was 22,256 toe. The data for energy consumption is available only for 2013, when the carbon footprint of Litoměřice city was computed. The data for GDP per capita are available only for NUT3 and for 2011. The energy intensity per GDP is thus not computed.

Variable: Primary energy consumption in 2013
Geographical coverage: City
Data source: City office

ENV 03: ENERGY CONSUMPTION BY SECTORS

The data on the consumption by sectors is available only for 2013, when the carbon footprint of Litoměřice city was computed. It was calculated for industry, housing and other.

ENERGY CONSUMPTION BY SECTOR IN 2013	INDUSTRY	HOUSING	OTHER	TOTAL
Toe	8,787	11,029	2,440	22,256
%	39%	50%	11%	100%

Variable: Energy consumption per sectors in 2013
Geographical coverage: City
Data source: City office

ENV 04: CARBON EMISSIONS

The total greenhouse gas emissions in 2013 were 136,427.9 t CO_2e, i.e. 5.652 t CO_2e per inhabitant. The data for GHG emissions is available only for 2013, when the carbon footprint of Litoměřice city was computed. The data for GDP per capita are available only for NUT3 and for 2011. The carbon emissions intensity per GDP is thus not computed.

Variable: Carbon emissions in 2013
Geographical coverage: City
Data source: City office

ENV 04: CARBON EMISSIONS BY SECTORS

The data on the greenhouse gas emissions by sectors is available only for 2013, when the carbon footprint of Litoměřice city was computed. It was calculated for industry, transport, housing and other.

ENERGY CONSUMPTION BY SECTOR IN 2013	INDUSTRY	TRANSPORT	HOUSING	OTHER	TOTAL
Ton CO_2e	39,399	30,604	48,707	14,132	132,830

Variable: Carbon emissions by sectors in 2013
Geographical coverage: City
Data source: City office

ENV 05: EXCEEDANCE RATE OF AIR QUALITY LIMIT VALUES

The data on the exceedance of air quality limit values was provided only for 2013. From the observed pollutants, only the limit for PM_{10} was exceeded on 19 daily measurements. The values for $PM_{2.5}$ are not available.

	O_3	NO_2	SO_2	$PM_{2.5}$	PM_{10}
No. of limit exceedance (24h limit)	0	0	0	n.a.	19

Variable: Number of days of air quality limits values exceedance
Geographical coverage: City
Data source: City office

ENV 06: SHARE OF SUSTAINABLE TRANSPORTATION

The data on the share of transportation modes is available only for 2013, when the carbon footprint of Litoměřice city was computed.

PERCENTAGE OF PEOPLE BY MODAL TYPE	%
Walk	58.9
Car-driver	25.5
Car-passenger	n.a.
Bus	6.4
Company or school collective transportation	n.a.
Metro/underground	not existing
Train	4.4
Motorcycle	0.0

PERCENTAGE OF PEOPLE BY MODAL TYPE	%
Bicycle	4.8
Ship	n.a.

Variable: Share of transportation modes in 2013
Geographical coverage: City
Data source: City office

ENV 07: URBAN WASTE GENERATION

URBAN SOLID WASTE PRODUCTION (KG/PERSON/YEAR)	PAPER	PLASTIC	GLASS	METALS	TEXTILES	ORGANICS
2013	10.2	10.4	8.6	0.0	2.9	61.8
2014	10.7	10.6	9.0	0.3	2.8	62.4

Variable: Total amount of urban solid waste production (kg/person/year) by waste classes
Geographical coverage: City
Data source: City office

ENV 08: URBAN WASTE RECOVERY

% OF RECOVERED/TREATED URBAN SOLID WASTE	MATERIAL RECYCLING	TOTAL INCINERATION	DEPOSIT ONTO OR INTO LAND	COMPOSTING	DIGESTION
2013	34	0	0	64	0
2014	35	0	0	65	0

Variable: Percentage of recovered/treated urban solid waste (%) by categories of final destination
Geographical coverage: City
Data source: City office

ENV 10: SHARE OF ENERGY-EFFICIENT BUILDINGS

The information on energy efficiency standard of buildings is available only for public buildings and for years 2013 and 2014. In 2013 the share of public buildings complying the A and A+ energy classification standard was 2%, whereas in 2014 it was already 10%.

Variable: Share of energy-efficient public buildings
Geographical coverage: City
Data source: City office

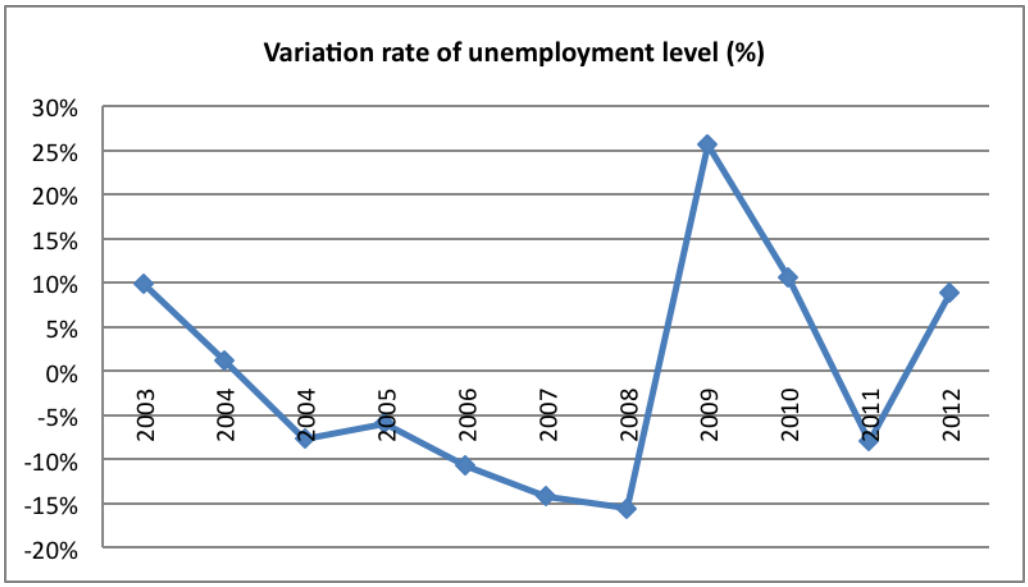
VI.IV.II SOCIAL PERFORMANCE

The overview of actual collected indicators representing the social performance of the city, their geographical coverage and data source is listed in Table 57. Each indicator is shown in more detail below.

Table 57: Actual collected indicators for social dimension

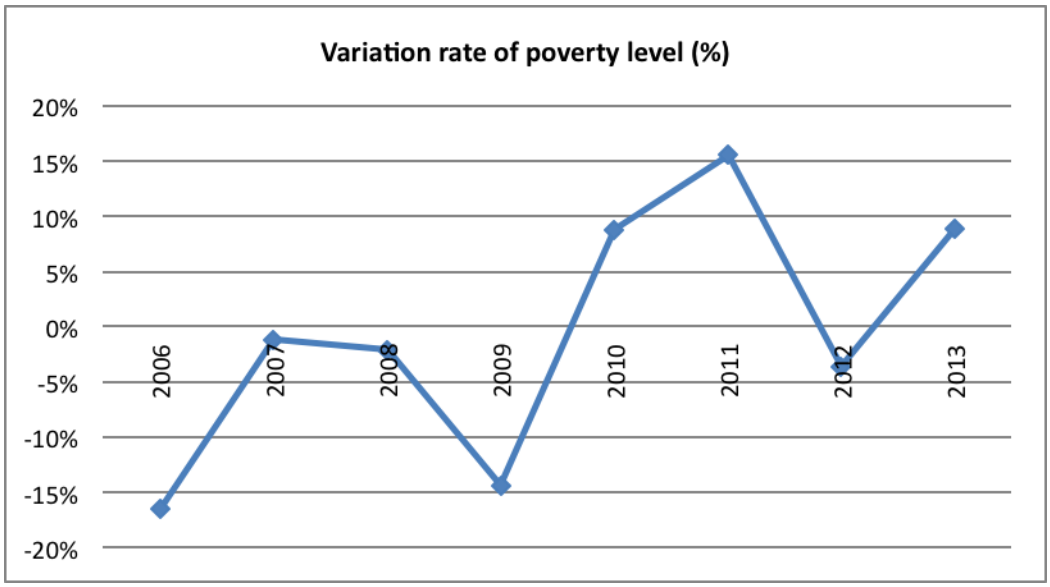
SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.	DATA SOURCE
Social Inclusion	Variation rate of unemployment	Percentage	2003-2012	Municipality district	Czech Ministry of Labour and Social Affairs
	Variation rate of poverty level	Percentage	2006-2013	NUTS2	Eurostat
	Population with tertiary education level by gender and its variation rate	Percentage	2001, 2011	City	Czech Statistical Office
	Average life expectancy and its variation rate	Average Nº, %	2008-2013	Municipality district	Czech Statistical Office
Public services and Infrastructures	Share of urban public green space	%		City	City
Governance effectiveness	Existence of monitoring system for emissions reductions	Yes/No Description	2013	City	City

SOC 01: VARIATION RATE OF UNEMPLOYMENT LEVEL, PERCENTAGE, 2003-2012



Geographical coverage: Municipality district
Data source: Ministry of Labour and Social Affairs, registered unemployment time series: time http://portal.mpsv.cz/sz/stat/nz/casove_rady

SOC 02: VARIATION RATE OF POVERTY LEVEL, PERCENTAGE, 2006-2013

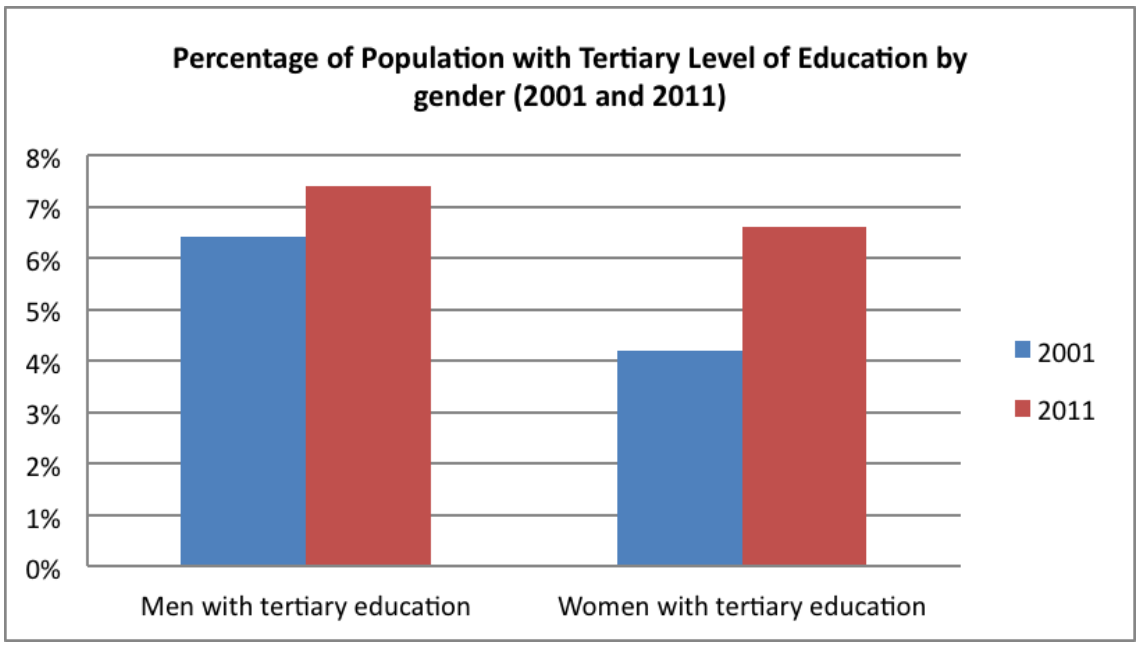


Geographical coverage: NUTS2 - Severozapad
Data source: Eurostat, People at risk of poverty or social exclusion by NUTS 2 regions: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_peps11&lang=en

SOC 03: POPULATION WITH TERTIARY EDUCATION LEVEL BY GENDER AND ITS VARIATION RATE, 2001 AND 2011

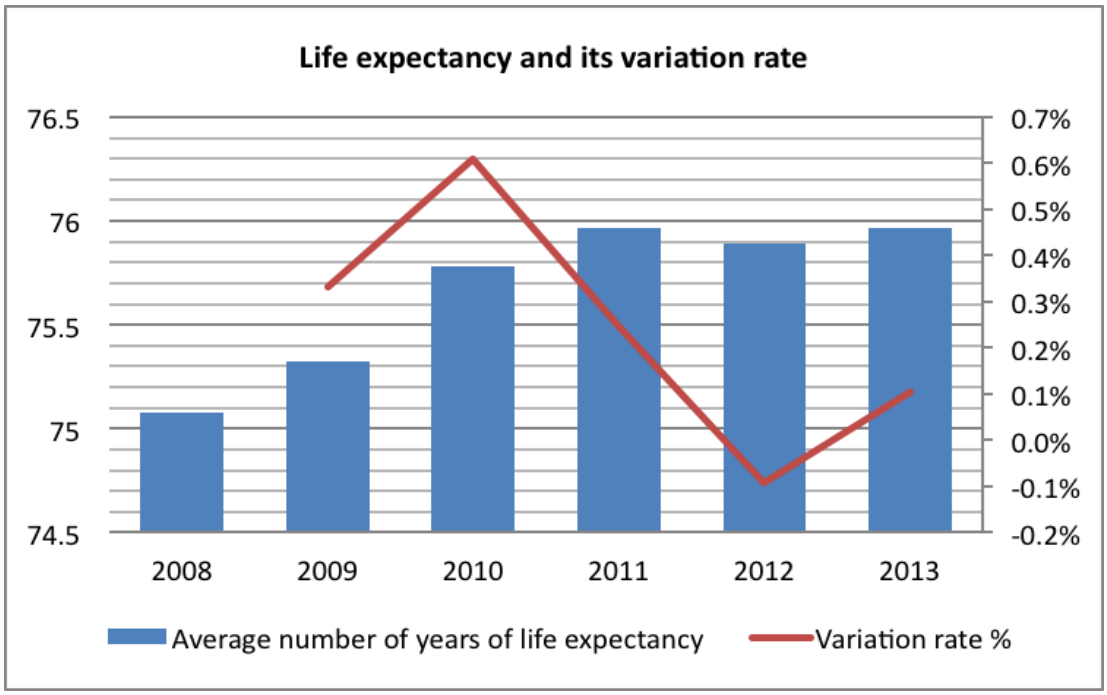
Variation rate:

The share of men with tertiary education within the city´s population increased between 2001 and 2011 by 16%. The share of women with tertiary education within the city´s population increased between 2001 and 2011 by 57%.



Geographical coverage: City
Data source: Czech Statistical Office, Census 2001 and 2011

SOC 04: AVERAGE LIFE EXPECTANCY AND ITS VARIATION RATE, 2008-2013



Geographical coverage: Municipality District
Data source: Czech Statistical Office, Life expectancy in Administrative Districts of Municipalities with Extended Powers: http://www.czso.cz/csu/redakce.nsf/i/umrtnostni_tabulky

SOC 05: SHARE OF URBAN PUBLIC GREEN SPACE

The data available from the city office are for years 2013 and 2014 and the total surface of public green spaces in both years is 1.685 km^2 (out of 17.99 km^2), thus covering 9% of the total cadastral area of the city.

Variable: Share of urban public green space
Geographical coverage: City
Data source: City office

SOC 06: EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

The city of Litoměřice does not have a system for regular monitoring of GHG emissions reduction. Energy conception has been elaborated in 2008 that mapped the CO_2 emissions from the operation of municipality facilities, however a system to ensure regular monitoring is not yet in place. The city is able to monitor emissions of other pollutants thank to national monitoring system of Czech Hydrometeorological Institute.

Geographical coverage: City

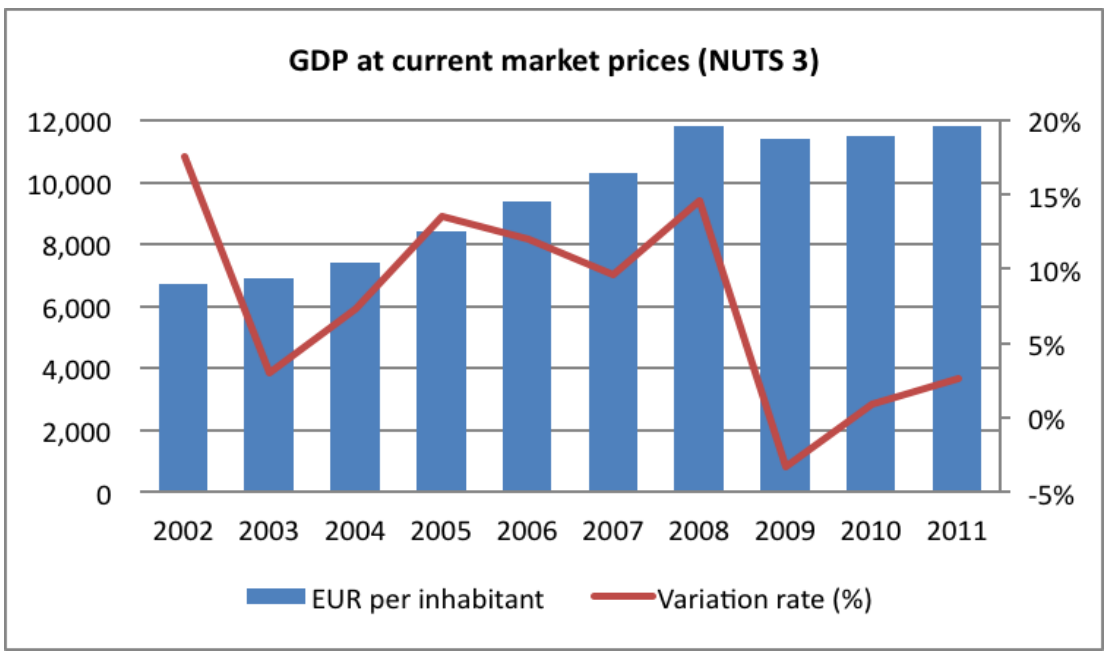
VI.IV.III ECONOMIC PERFORMANCE

The overview of actual collected indicators representing the economic performance of the city, their geographical coverage and data source is listed in Table 58. Each indicator is shown in more detail below.

Table 58: Actual collected indicators for economic dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.	DATA SOURCE
Sustainable economic growth	GDP at current market prices	EUR/ inhabitant	2002-2011	NUTS3	Eurostat
	GDP at current prices by sectors and its Variation rate	Percentage	2003, 2012	NUTS3	Czech Statistical Office
	Employment by sectors and its variation rate	Percentage	2001, 2011	City	Czech Statistical Office
	Business demography	Nº	2010	NUTS3	Eurostat
Public Finances	Annual city budget deficit/surplus by GDP and its variation rate	Percentage	2004-2011	City, NUTS3	City, Eurostat
	Indebtedness level variation rate	n.a.	n.a.	n.a.	n.a.
Research & Innovation dynamics	Share of &D expenditure on GDP and its variation rate	Percentage	2002-2011	NUTS2	Eurostat

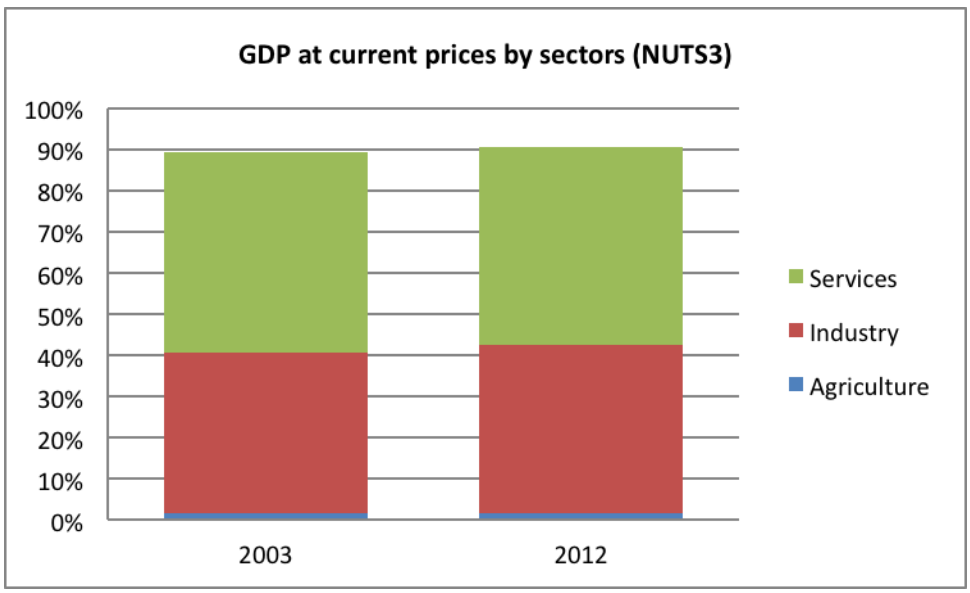
ECO 01: GDP AT CURRENT MARKET PRICES



Geographical coverage: NUTS3 – Ustecky kraj
Data source: Eurostat, Annual GDP per capita:
http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/regional_statistics/data/database

ECO 02: GDP AT CURRENT PRICES BY SECTORS AND ITS VARIATION RATE

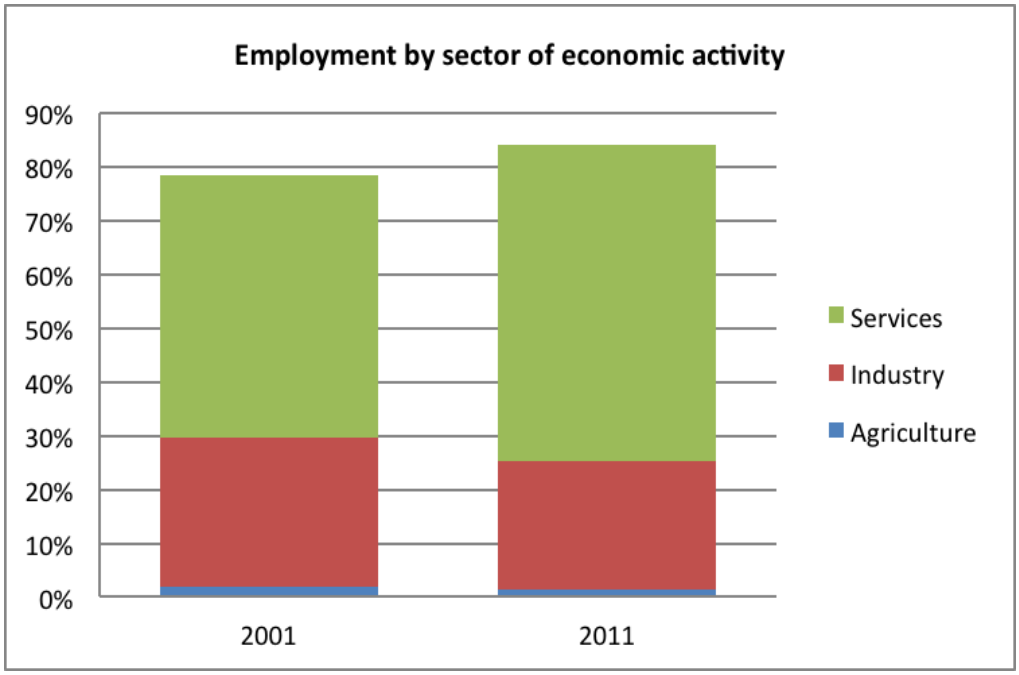
The highest increase in share on GDP between year 2003 and 2012 was in industry. The variation rate between these years equals 4.8%. Also share of agriculture slightly increased between 2003 and 2012 - variation rate equals 3.7%. On the other hand share of services on GDP slightly decreased. The variation rate equals -1.6%.



Geographical coverage: NUTS3 – Ustecky kraj
Data source: Czech Statistical Office, Gross domestic product at current prices by sectors: http://apl.czso.cz/pll/rocenka/rocenka.presmsocas

ECO 03: EMPLOYMENT BY SECTORS AND ITS VARIATION RATE

Most inhabitants of Litoměřice city are employed in services (58.9% in 2011) and least in agriculture (1.4% in 2011). Furthermore, between 2001 and 2011 decrease of employment rate in agriculture can be observed. The variation rate between 2001 and 2011 is -28.9%. Also the employment in industry decreases, the variation rate between 2001 and 2011 equals -13.8%. On the other hand, employment in services increased from 48.9% in 2001 to 58.9% in 2011, the variation rate being 20.5%.



Geographical coverage: City
Data source: Czech Statistical Office, Census 2001 and 2011

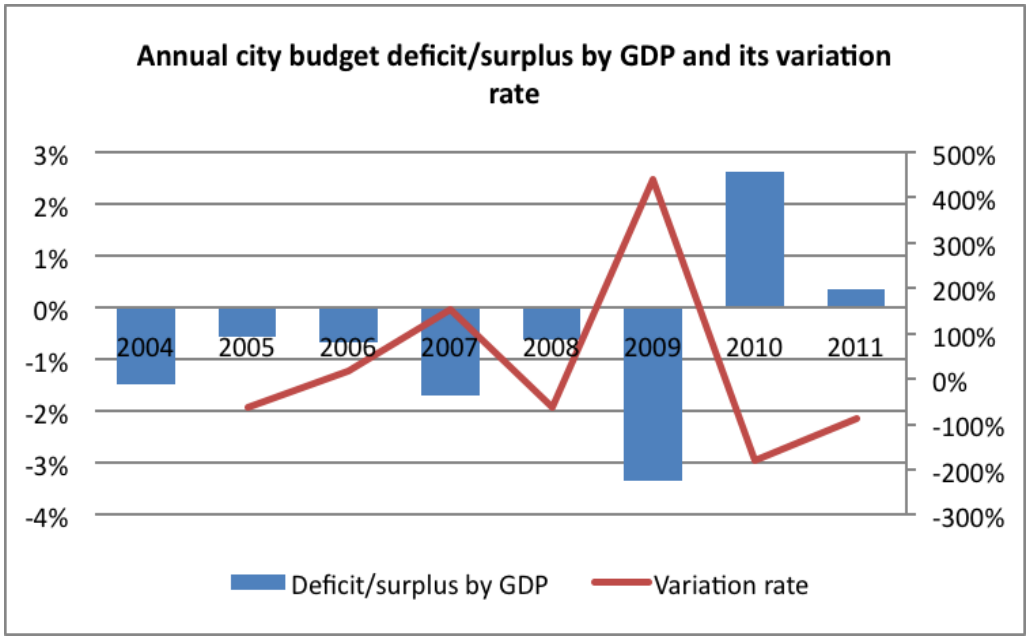
ECO 04: BUSINESS SURVIVAL VARIATION RATE

The data on business survival / demography for the relevant NUTS3 (Ústecký kraj) are available only for year 2010. In this year there were 66,447 active enterprises in the region.

Geographical coverage: NUTS3 – Ustecky kraj
Data source: Eurostat, Business demography by size class and NUTS 3 regions: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd_size_r3&lang=en

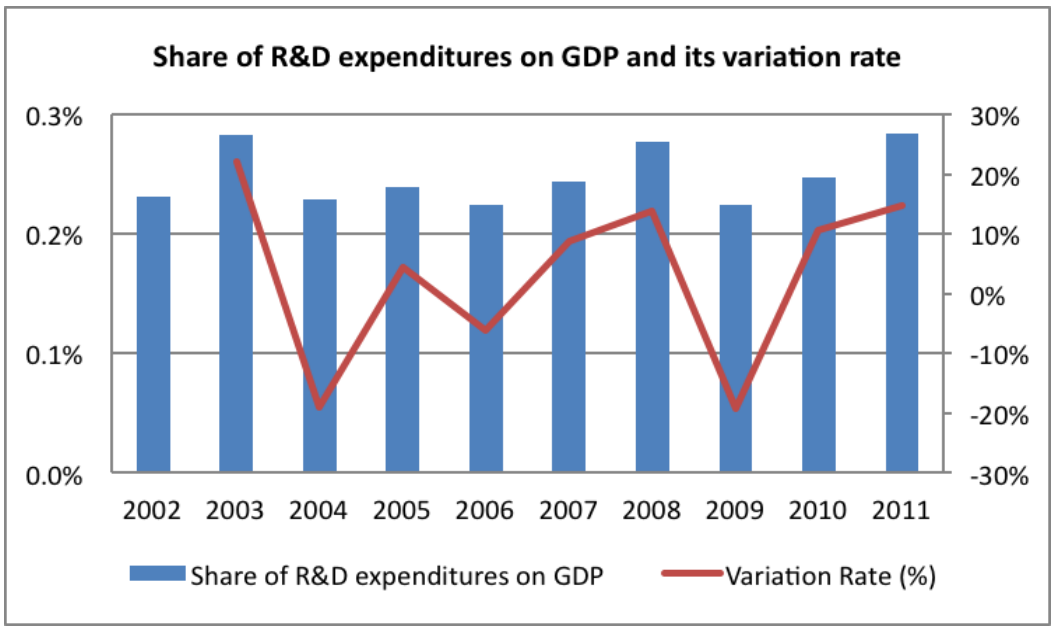
ECO 05: BUDGET DEFICIT/SURPLUS AND ITS VARIATION RATE

The GDP for the city of Litoměřice is not available. The indicator was thus constructed by multiplying the GDP per capita for NUTS3 (indicator ECO 01) by the number of inhabitants of the Litoměřice city.



Geographical coverage: City
Data source: Annual budget of the city, available online on the city website: https://www.Litoměřice.cz/rozpocet-a-hospodareni-mesta; Eurostat, Annual GDP per capita (ECO 01)

ECO 07: SHARE OF R&D EXPENDITURE ON GDP AND ITS VARIATION RATE, 2002-2011



Geographical coverage: NUTS2
Data sources: Eurostat - Science and technology statistics (NUTS2): http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/regional_statistics/data/database

VI.V FINDINGS AND KEY CHALLENGES

Litoměřice is one of the pioneer cities in Czech Republic aiming at energy efficiency and renewable energy production. Its commitment is manifested in the Strategy development plan and the Energy plan of the city. Currently, strong emphasis is given on the energy consumption and production. As member of the National Network of Healthy Towns, it targets a lot of activities as well as planning also to the social sphere and stresses an open communication with its inhabitants and their involvement in the city´s decision making.

The strategy of Litoměřice city is aiming at energy self-sufficiency based mainly on the project of geothermal power plant. The success of its strategy is thus strongly dependent on the availability of external financial resources. Litoměřice is small city that is from large extent influenced by the development of higher territorial units.

VI.VI CONCLUSIONS

Litoměřice is the smallest case study city in the POCACITO project. Some of the data are not available at the city level as they are reported only on the level of higher territorial unit. The relevance of some of the data, e.g. the macroeconomic indicators, is questionable.

VII CASE STUDY CITY MALMÖ

VII.I DATA COLLECTION

The data were collected from following sources:

- National statistics – SCB Statics Sweden;
- European statistics – Eurostat;
- Data collected on the city level by the city office.

The data on the city level were obtained from the local authorities as they are not part of publicly available statistical databases. If not otherwise indicated, the data was collected for the municipality of Malmö.

VII.II OVERVIEW OF THE CASE STUDY CITY

VII.II.I TERRITORY

The city of Malmö is situated in the Skåne region on the southwest coast of Sweden, with direct connection to Denmark via the Öresund bridge. The territory of the case study covers the area of 332.64 km^2, whereof 156.87 km^2 land, and encompasses the municipality of Malmö with its about 313,000 inhabitants (2013).

Figure 88: Malmö municipality in the Skåne region

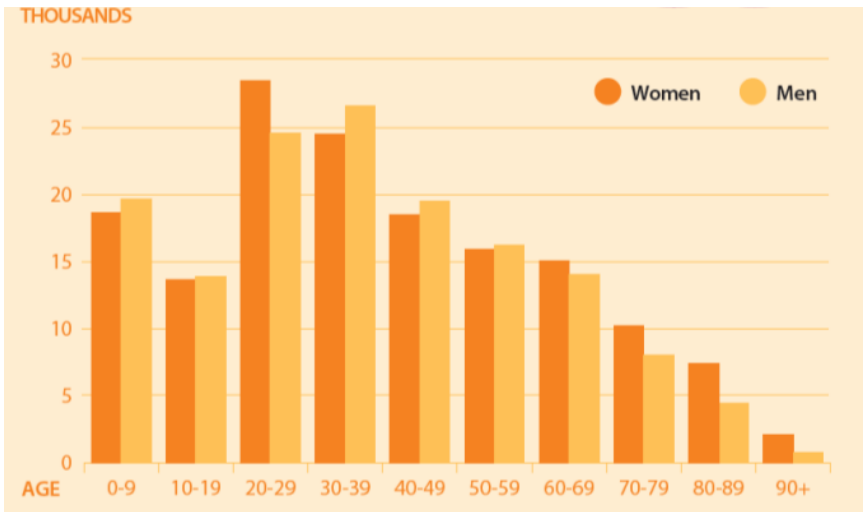
Figure 89: Detailed map of Malmö municipality.

VII.II.II POPULATION

In twenty years, the average inhabitant of Malmö has become three years younger. The most typical resident of Malmö today is a 29-year-old woman or a 30-year-old man. With 312,994 inhabitants, Malmö is Sweden's third largest city (31 Dec. 2013). The population increased by 5,236 people (+1.7%) in 2013. Both net birth and net migration are positive.

Malmö is a young city – almost half of the population is under 35 (49%). 71% of households consist of single parent or single person households (2013). 31% of the city's inhabitants were born abroad – the largest groups were born in Iraq, the former Yugoslavian countries and Denmark. All in all, about 178 countries are represented among the Malmö citizens [10].

Figure 90: The Malmö population by age group and sex in 2013 [10]



VII.II.III ECONOMY

Malmö's gross regional product (GRP) amounted to SEK 123,356 million in 2011 (+55% in ten years). It is mainly service production that has increased. GRP per capita was SEK 410,000. Total disposable income in Malmö was SEK 47,238 million (+53% in ten years). Disposable income per capita was SEK 157,000.

Table 59: Structure of enterprises in Malmö 2013: Number of workplaces by number of employees.

SECTOR	0 EMPL	1-2	3-9	10-49	50-249	250-499	500+	TOT
Agriculture, forestry and fisheries	701	30	12	0	0		0	743
Manufacturing	610	185	189	132	39	3	1	1159
Energy, water, waste	49	18	14	13	9	1	0	104
Construction	1038	384	234	154	39	1	0	1850
Commerce	2423	1017	1123	480	69	3	0	5115
Transport and warehousing	366	324	159	93	21	8	2	973
Hotels and restaurants	385	333	330	143	11		0	1202
Information and communication	1571	427	240	134	37	4	0	2413
Financial and insurance services	478	116	84	42	10		1	731
Real estate activities	2214	421	134	55	7		0	2831
Law, economics, science and technology	4453	1226	518	239	44	2	0	6482
Rental, real estate, travel, support services	803	283	223	142	59	3	3	1516
Public administration, defence etc.	5	11	31	32	39	5	2	125
Education	643	92	174	236	65	3	0	1213
Healthcare, social services	774	305	281	282	52	4	4	1702
Culture, entertainment and recreation	2292	241	102	54	8	1	0	2698
Other services	1718	375	184	66	9		0	2352
Other	77							77
Total	**20600**	**5788**	**4032**	**2297**	**518**	**38**	**13**	**33286**

VII.III KEY STRATEGIES AND PROJECTS

Many of the Malmö strategies and plans focus on the time up to 2020. Below, main plans, strategies and projects for the city are presented.

VII.III.I STRATEGIES AND ACTION PLANS

STRATEGY/ACTION PLAN FACTSHEET 1	
Title	Comprehensive plan for Malmö
Dimension of KPIs	All
Period	2014-…
Strategy/Action Plan description	
Objective	The three areas of sustainability are mutually dependent and intricately linked – neither can be achieved without the others. The goal is to create an attractive and sustainable city with a robust urban structure for a growing population. The overall objectives are: • Social balance and good living conditions • Economic dynamism and sustainability • Resource efficient society and environmental robustness
Measures	Strategies, maps and environmental assessment
Targets	• Close, dense, green mixed-function city Malmö's should mainly grow by inward expansion. This means mainly expanding within the city's outer ring road. Creating a more dense city will lead to a reduced consumption of resources. Walking, cycling and public transport will form the basis of the transport system. • A regional driver of green growth and employment Growth-oriented ventures to further the welfare of the people of Malmö and increasing chances of employment and financial security are of central importance to the development of the city. Furthering regional cooperation is a key priority. Copenhagen-Malmö-Lund are to form a coherent metropolis and generate a vibrant economy in the Öresund region. • The city as a venue for culture and democracy Urban spaces are important for desirable social development, shared venues for human contact and for stimulating democracy and inclusion. Reducing the public health divide within the city has high priority. The city is also socially strengthened by public participation and it is essential that steps are taken to increase participation in the planning processes.
Links and Contacts	
Promoter	City of Malmö

STRATEGY/ACTION PLAN FACTSHEET 1	
Document/website	The comprehensive plan consists of different parts: strategies, maps with planning guidelines and an environmental impact assessment. All parts of the plan can be seen at www.Malmö.se/op English summary: http://Malmö.se/download/18.1256e63814a61a1b34c1b34/1418996678792/OP_english_summary_hemsida.pdf

STRATEGY/ACTION PLAN FACTSHEET 2	
Title	Green plan
Dimension of KPIs	Environmental
Period	2003 - …
Strategy/Action Plan description	
Objective	Sector plan, advisory document for the physical planning
Measures	Green policy, mapping of green areas and their content, strategy
Targets	General goals: • Increase the total green area in Malmö • Protect valuable green areas from exploitation Recreational goals: • Create a variation of parks and nature/recreational areas to fulfil the "green needs" of Malmö citizens • Realize a green network with easy access within the whole municipality Biological targets: • Enrich the number of species and biotopes in the municipality • Strengthen the different landscape types within the municipality and create characteristic areas for each type.
Links and Contacts	
Promoter	City of Malmö (4 offices)
Document/website	http://Malmö.se/download/18.7de6400c149d2490efb90a32/1417528807150/Gr%C3%B6nplanPopwebb.pdf

STRATEGY/ACTION PLAN FACTSHEET 3	
Title	Malmö City environment program
Dimension of KPIs	Environmental/physical
Period	2001 - …
Strategy/Action Plan description	
Objective	A basis for guidelines regarding lighting, paving, small buildings, colouring and more.

STRATEGY/ACTION PLAN FACTSHEET 3	
Measures	Description of the characteristics of Malmö city.
Targets	Protecting and enhancing the city characteristics.
Links and Contacts	
Promoter	City of Malmö
Document/website	http://Malmö.se/download/18.7de6400c149d2490efbfc9/1416578190093/Malm%C3%B6stadsmilj%C3%B6programwebb.pdf

STRATEGY/ACTION PLAN FACTSHEET 4	
Title	Storm water strategy
Dimension of KPIs	Environmental
Period	2008
Strategy/Action Plan description	
Objective	A basis for storm water handling (not including run-off from agricultural soils)
Measures	• Clarification of responsibilities • Rules and recommendations for storm water projects • Classification of storm water and recipients • Preventive measures and activities
Targets	Ensure ground water and recipient quality and prevent flooding.
Links and Contacts	
Promoter	City of Malmö and water stakeholders
Document/website	http://Malmö.se/download/18.7de6400c149d2490efb1062/1416578198402/Dagvattenstrategi_2008.pdf

STRATEGY/ACTION PLAN FACTSHEET 5	
Title	Traffic program
Dimension of KPIs	Economy/Environment
Period	2012-2017
Strategy/Action Plan description	
Objective	Provide strategies and measures for a sustainable traffic system
Measures	• Prioritise pedestrians, biking and public transport • Reduce car traffic shares in the centre of the city through policy measures • Promote clean, efficient and quiet vehicles and transports • Influence long term travel behaviour through communication and marketing • Develop an overall traffic plan for concrete action

STRATEGY/ACTION PLAN FACTSHEET 5	
Targets	Clean transport targets: • Climate emissions reduction by 20% from 1990-2017. • In 2017, nitrogen oxide emissions should be lower than the quality norm value 40 µg/m3in all of Malmö. Long term target is an annual mean of 20 µg/m3. • Particle emissions still in line with quality norms in 2017. Quiet transport targets: • No residents should be exposed to noise more than 5dBA above the levels 30dBA (equivalent level) and 45dBA (maximum level). • Prioritised environments (schools and preschools) should not exceed the targets of 55dBA (equivalent level) and 70dBA (maximum level). • Measures should be taken by prioritised parks and environments. Efficiency target: • Energy use in transport should decrease by 15% during the program period (compared to use 2001-2005). Sustainable transport target: • The share of pedestrian, bike and public transport shall increase so that maximum 30% of all travel and half the commuting into the city is made by car in 2030.
Links and Contacts	
Promoter	City of Malmö
Document/web site	http://Malmö.se/download/18.7de6400c149d2490efb90bb9/1417529640559/trafikmiljopgm_web.pdf

STRATEGY/ACTION PLAN FACTSHEET 6	
Title	Biking plan
Dimension of KPIs	Environment/social
Period	2012-2019
Strategy/Action Plan description	
Objective	Malmö shall be an internationally acknowledged biking city where it is easy and safe to bike. The bike, together with pedestrian and public transport should be the traffic norm in the city.
Measures	Measures in five areas: 1. Strengthening the biking profile of Malmö 2. Operational measures for increased safety and comfort 3. Large scale infrastructure measures 4. Small infrastructure measures 5. Measures for better parking
Targets	Increase the share of biking from 23% in 2008 to 25% in 2013 and 30% in 2018.

STRATEGY/ACTION PLAN FACTSHEET 6	
Links and Contacts	
Promoter	City of Malmö
Document/ website	http://Malmö.se/download/18.3744cbfb13a77097d8748de/1383643894338/Cykelprogram+f%C3%B6r+Malm%C3%B6+stad+2012-2019+2012-10-30.pdf

STRATEGY/ACTION PLAN FACTSHEET 7	
Title	Pedestrian plan
Dimension of KPIs	Environment/social
Period	2012-2018
Strategy/Action Plan description	
Objective	Put focus on pedestrians in urban planning and increase the number of pedestrians.
Measures	The overall measures include: • Walking path plan (including demonstration paths) • Guidelines for handling of walking paths in the planning process • Safety measures around walking paths and bike tunnels • Provide walking paths to public transport stops/stations • Include walking paths in the city travel planning app and city maps • Better signs • Etc.
Targets	Targets of the measures are: • Increase the number of pedestrians • Higher priority of pedestrians in urban planning • Increased health and well being • Enhanced availability and access for pedestrians
Links and Contacts	
Promoter	City of Malmö
Document/website	http://Malmö.se/download/18.d8bc6b31373089f7d9800079234/1383643710678/NV+Fotg%C3%A4ngarprogram+webben.pdf

STRATEGY/ACTION PLAN FACTSHEET 8	
Title	Security program
Dimension of KPIs	Social
Period	2010-
Strategy/Action Plan description	

STRATEGY/ACTION PLAN FACTSHEET 8	
Objectives	• Define the strategy for security work • Suggest measures • Support daily security work
Measures	Strategies and measures cover the areas: • Planning • Traffic and availability • Lighting • Trees and bushes • Littering and vandalism • City orientation and street names • Public life • Citizen dialogue and influence
Targets	Decrease the perceived feeling of insecurity in Malmö public spaces
Links and Contacts	
Promoter	City of Malmö
Document/web site	http://Malmö.se/download/18.7de6400c149d2490efb104c/1416578196928/trygghetsprogram.pdf

STRATEGY/ACTION PLAN FACTSHEET 9	
Title	Energy strategy
Dimension of KPIs	Environment
Period	2009 – (currently being revised)
Strategy/Action Plan description	
Objective	Renewable energy system 2030
Measures	Measures in the areas of energy efficiency (public private and industry), types of energy generation, planning and communication, etc.
Targets	• 20% decrease in energy use 2009 to 2020 (compared to the period 2001-2005). • 50% renewable energy in the common energy mix 2020. • 30% decrease in city companies and administration by 2020. • 100% renewable energy in city companies and administration by 2020.
Links and Contacts	
Promoter	City of Malmö
Document/website	http://Malmö.se/download/18.76105f1c125780a6228800039868/1383647015917/Energistrategi-Kf+2009-12-17.pdf

STRATEGY/ACTION PLAN FACTSHEET 10	
Title	Strategic Development Plan for Anti-Discrimination Work in the City of Malmö
Dimension of KPIs	Social
Period	2012-2019
Strategy/Action Plan description	
Objective	The City of Malmö shall be an open, inclusive city in which equal rights and opportunities for all people are the prevailing norm.
Measures	n.a.
Targets	Impact targets for 2016: Social perspective. By 2016, the City of Malmö has: • active collaboration with civil society, associations and organisations, as well as individual people in the city's development work in the area of human rights and anti-discrimination. Operational perspective. By 2016 the City of Malmö has: • target-oriented work under way for the equal distribution of power and influence for all people, regardless of background and affinity. • based on reviews conducted of its own activities, set up targets and commitments for discrimination (which must be included in operational plans and budgets). • in collaboration with and under the leadership of the Town Planning Office, developed a joint model for norm-critical audits of its own activities. Employers' perspective. By 2016, the city of Malmö has: • active competence development work under way for the municipality's employees in the area of discrimination. • implemented the City of Malmö's Plan for an Equal Opportunity HR Policy. • work under way in accordance with the Municipal Council's target that the proportion of employees with a foreign background at all levels shall match the proportion in the total population.
Links and Contacts	
Promoter	City of Malmö
Document/website	http://Malmö.se/Kommun--politik/Sa-arbetar-vi-med.../Antidiskriminering/Strategisk-utvecklingsplan.html

STRATEGY/ACTION PLAN FACTSHEET 11	
Title	Cultural strategy
Dimension of KPIs	Social
Period	2014-2020
Strategy/Action Plan description	
Objective	In 2020, the Sustainability of Malmö has increased by means of art and culture.
Measures	• Develop an action plan with measures during 2015-2016 • Execute and follow up the action plan during 2016-2020 • Use of five strategies and connected targets
Targets	Five targets connected to the strategies: 1. Easy access to art and culture for all citizens; the most culturally active city in 2020. 2. Art and cultural facilities is a major reason for people move to Malmö, and to stay in the city. 3. Malmö 2020 has the best conditions for cultural actors. 4. The cultural public debate in 2020 is open and visual, and is recognised regionally, nationally and internationally. 5. In 2020, art and culture contributes to learning and education among school children and the general public.
Links and Contacts	
Promoter	City of Malmö
Document/website	http://Malmö.se/download/18.76b7688614bb5ccea096ad6a/1426086846575/Kulturstrategi_2015FINALwebb.pdf

VII.III.II KEY PROJECTS

PROJECT FACTSHEET 1	
Title	'Bo01 - City of Tomorrow' /Western harbour development
Dimension of KPIs	All
Area of implementation (city, neighbourhood, etc.)	Development of a sustainable district in the Western harbour
Implementation period	2001 - ongoing
Project description	
Aims	The aim is for the district to be an internationally leading example of environmental adaptation of a densely built urban environment. It will also be a driving force in Malmö's development towards environmental sustainability.
Activities	Bo01 was the first development stage of Västra Hamnen (The Western harbour) one of Malmö´s growth areas of the future. The area is typical of urban redundant industrial land with contamination and affected environment. The area has, at the same time, many positive aspects in its location by the sea and next to the beach and the city centre. A fundamental ecological approach to planning, building and construction was a key tool in the creation of the district.
Promoters/Beneficiaries; Partnership	n.a.
Financing	Public and private (?)
Outcomes and impacts	Green buildings with smart IT systems for climate, open storm water system, renewable energy, refuse suction system, soil decontamination projects etc…
Links and Contacts	
Promoter	Environmental department, Malmö
Website	http://Malmö.se/English/Sustainable-City-Development/Bo01---Western-Harbour.html
Contact E-mail	miljo@Malmö.se

PROJECT FACTSHEET 2	
Title	Malmö´s path towards a sustainable future – health, welfare and justice
Dimension of KPIs	Social
Area of implementation (city, neighbourhood, etc.)	Social investment policy
Implementation period	2013 -
Project description	
Aims	Deepening the analysis of the causes of the growing health inequities in the population of Malmö. Part of the assignment was to work from scientifically based strategies to reduce health inequities.
Activities	Objectives and actions within the areas: • Everyday conditions for children and young people • Residential environment and urban planning • Education • Income and work • Health care • Changed processes for socially sustainable development
Promoters/Beneficiaries; Partnership	Malmö City executive board appointed an independent commission, cooperating with a number of advisors, academia, city administrations, NGOs and many more stakeholders.
Financing	Public (?)
Outcomes and impacts	Final report with compilation of objectives and actions
Links and Contacts	
Promoter	Commission for a Socially Sustainable Malmö
Website	www.Malmö.se/kommission Final report: http://Malmö.se/download/18.51821d07143bab87ba7c4ac/1392805314379/malm%C3%B6kommisionen_rapport_engelsk_web.pdf

VII.IV CASE STUDY CITY ASSESSMENT

This chapter includes details on the actual collected indicators for the case study Malmö. We indicate the actual geographical coverage and data source for each indicator. The collected data were inserted on the joint online platform created by the WP3 leader.

VII.IV.I ENVIROMENTAL PERFORMANCE

The indicators on environmental performance were provided by representatives from the national and municipal statistics. Detailed sources are listed for each indicator. Most of the data are available only for some years, and not collected or reported regularly. Thus the variation rates of the indicators are not known.

Table 60: Actual collected indicators and their coverage for the environmental dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.
Biodiversity	Variation rate of ecosystem protected areas	**Percentage**	**2007 & 2013**	Municipality
Energy	Energy intensity variation rate	**Toe/euro Toe**	**2003 & 2011**	Municipality
	Variation rate of energy consumption by sectors	Percentage	**2003 &** 2012	Municipality
Climate and Air Quality	Variation rate of carbon emissions intensity	**Ton CO_2/euro Ton CO_2**	**2000 & 2011**	Municipality
	Variation rate of carbon emissions by sector	Ton CO_2	**2000 &** 2012	Municipality
	Exceedance rate of air quality limit values	Nº	**2010 &** 2012	Municipality
Transport and mobility	Variation share of sustainable transportation	**Percentage**	**2003, 2008 & 2013**	Municipality
Waste	Urban solid waste generation	**Kg/person/year**	**2007 & 2012**	Municipality
	Variation rate of urban waste recovery	Percentage	No data	n.a.
Water	Water losses variation rate	**m^3/person/year**	No data	n.a.
Buildings and Land Use	Energy-efficient buildings variation rate	**Percentage**	No data	n.a.
	Urban building density variation rate	Nº/ km^2	2010	Municipality

ECOSYSTEM PROTECTED AREAS

Variation rate of the municipality surface area (km^2) covered by Natura 2000 network and national network of protected areas registered. The data is valid for Malmö municipality [8].

Table 61: Share of ecosystem protected areas.

Year	Proportion Natura 2000 of surface area over total Malmö municipality area (%)
2007	2.1
2013	4.5

ENERGY INTENSITY VARIATION RATE

This indicator presents annual primary energy consumption by GDP for 2003 and 2011. The energy consumption for Malmö municipality per capita is 2.1035 tonne of oil equivalent (toe) and 2.0350 toe in 2003 and 2011 respectively. The GDP for the municipality were 35,440 Euro and 45,400 Euro in 2003 and 2011. The number of inhabitants was 267,171 and 302,835 in 2003 and 2011. Two different indicators were required for the report; primary energy consumption (toe) for Malmö municipality and primary energy in GDP (toe/Euro). The above numbers give:

2003

$$\frac{2.1035\ \frac{\text{toe}}{\text{cap}}}{35440\ \frac{\text{Euro}}{\text{cap}}} = 0.000060\ \frac{\text{toe}}{\text{Euro}}$$

$$2.1035\ \frac{\text{toe}}{\text{cap}} \cdot 267\,171\ \text{cap} = 561\,994\ \text{toe}$$

2011

$$\frac{2.0350\ \frac{\text{toe}}{\text{cap}}}{45400\ \frac{\text{Euro}}{\text{cap}}} = 0.000045\ \frac{\text{toe}}{\text{Euro}}$$

$$2.0350\ \frac{\text{toe}}{\text{cap}} \cdot 302\,835\ \text{cap} = 616\,269\ \text{toe}$$

Table 62: Energy intensity

YEAR	2003	2011	CHANGE
Toe	561 994	616 269	+9.7 %
Toe/Euro	0.000060	0.000045	-25 %

Sources: [9; 10; 11; 12; 13]

VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

Table 63: Variation rate of energy consumption by sector in toe and % of total

PRIMARY ENERGY CONSUMPTION BY SECTORS IN TOE	2003		2012	
Total	571 700	100 %	618 789	100 %
Household	186 672	33 %	188 645	31 %
Building industry	63 816	11 %	71 023	11 %
Agricuture, forestry and fisheries	2 025	0 %	2 035	0 %
Public sector	49 682	9 %	56 327	9 %
Transports	153 729	27 %	170 391	28 %
Other services	115 776	20 %	130 369	21 %

The indicators measure the primary energy consumption by different sectors, identifying the sectors that are more energy intense and therefore need more action towards being more efficient. Data for Malmö municipality [14].

VARIATION RATE OF CARBON EMISSIONS INTENSITY

This indicator assesses the carbon emissions due to energy consumption. It is the ratio between CO2 emissions and local GDP. Data needed this indicator follow. The GDP per capita were 32,120 Euro and 45,400 Euro for 2000 and 2011 respectively. The total carbon dioxide emissions for 2000 and 2011 were 1 318 600 tons and 1 751 530 tons. The population in Malmö was 259,579 and 302,835 in 2000 and 2011. This gives:

2000

$$\frac{1\,381\,600\ \text{ton CO2}}{32\,120\ \frac{\text{Euro}}{\text{cap}} \cdot 259\,579\ \text{cap}} = 0.000166\ \frac{\text{ton CO2}}{\text{Euro}}$$

2011

$$\frac{1\,751\,530\ \text{ton CO2}}{45\,400\ \frac{\text{Euro}}{\text{cap}} \cdot 302\,835\ \text{cap}} = 0.000127\ \frac{\text{ton CO2}}{\text{Euro}}$$

Table 64: Variation rate of carbon emissions intensity

VARIATION RATE OF CARBON EMISSIONS INTENSITY	2000	2011	CHANGE
Ton CO2	1 381 600	1 751 530	+26.8 %
Ton CO2/Euro	0.000166	0.000127	-23.5 %

Data for Malmö municipality [10; 12; 15; 16; 17]

VARIATION RATE OF CARBON EMISSIONS BY SECTOR

This indicator assesses the measurement of CO2 emissions per sector. This indicator helps identify the most inefficient sectors where more actions should take place in order to contribute to a sustainable economic growth.

Table 65: Variation rate of carbon emissions per sector

YEAR	2000	2012
Total (kton CO2)	1318,6	1606,1
Work machines and tools (kton CO2)	50,0	74,0
Industry and energy (kton CO2)	734,0	1158,4
Road transport (kton CO2)	489,0	348,4
Transport, other (kton CO2)	45,6	25,3

Data for Malmö municipality [18]

EXCEEDANCE RATE OF AIR QUALITY LIMIT VALUES

The indicator quantifies the number of annually exceedances registered for the following pollutants: Ozone (O3), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2), and particles with a diameter of 10 microns or less (≤ PM10) and particles with a diameter of 2.5 microns or less (≤ PM2.5).

According to the World Health Organization, the exceedance of air quality limit values considers the following exceeding values:

- O3 threshold Information 100 µg/m3 8-hour mean
- NO2 threshold Alert for 40 µg/m3 measured for annual mean and 200 µg/m3 1-hour mean
- SO2 threshold Alert 20 µg/m3 24-hour mean and 500 µg/m3 10-minute mean
- PM 2.5 threshold Alert 10 µg/m3 annual mean and 25 µg/m3 24-hour mean
- PM 10 threshold Alert 20 µg/m3 annual mean and 50 µg/m3 24-hour mean.

Table 66: Exceedance of air quality limit values

POLLUTANT	CRITERIA	YEAR 2010		YEAR 2012	
		Urban background	Street-scape	Urban background	Street-scape
Ozone	threshold Information 120 µg/m3 8-hour mean (number of days)	1	2	5	1
	Mean value annually (µg/m3)	51.7	44.4	55.5	46.2
Nitrous oxides	threshold Alert for > 36 µg/m3 (number of days)	10	136	5	99
	200 µg/m3 1-hour mean (number of days)	0	0	0	0
Sulphur dioxide	Mean value annually (µg/m3)	2.1	-	1.3	-
	Maximum value hour mean (µg/m3)	40.4	-	11.4	-
PM 2.5	Mean value annually (µg/m3)	13.5	13.7	Not available	12.6
	25 µg/m3 24-hour mean (number of days)	34	33	12	25
PM 10	Mean value annually (µg/m3)	15.9	20.5	16.1	20.7
	50 µg/m3 24-hour mean (number of days)	3	4	3	9

Measuring results from three stations were used for Ozone and Nitrous oxides, two stations measuring the concentrations in the urban background and one in streetscape. The results for the urban background were taken as an average from the two stations for the different pollutants. For PM 2.5 and PM 10 two stations were available, one in streetscape and one for urban background. Only urban background is measured for sulphur dioxide.

The measuring stations was in running 99 % for NO2, 98 % for O3, 99 % for SO2, 93 % for PM 2.5 and 97 % for PM 10, annually. Data for Malmö municipality [19; 20; 21; 22].

VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

This indicator provides details relating to trends for passenger transport in their travels. It measures the number of residents that use sustainable transportation methods such as bus, company or school collective transportation, metro/underground, train, bicycle, ship, walk or other methods in their travels. Data for Malmö municipality [23; 24].

Table 67: Modal share of transportation

TRANSPORT MODE	MODAL SHARE 2003 (%)	MODAL SHARE 2008 (%)	MODAL SHARE 2013 (%)
Car	52	41	40
Bus	10	10	14
Train	3	4	7

TRANSPORT MODE	MODAL SHARE 2003 (%)	MODAL SHARE 2008 (%)	MODAL SHARE 2013 (%)
Bicycle	20	23	22
Walking	14	20	15
Other	1	2	2

URBAN SOLID WASTE GENERATION

Total urban solid waste production in 2007 and 2012 kg/person/year. The indicator is calculated on the total amount of city urban solid waste generated per capita in kilogram.

The categorization of the city urban solid waste will cover the following waste classes: paper, plastic, glass, metals, textiles, and organics.

Table 68: Total urban solid waste

	2007	2012
Total urban solid waste in Malmö (kg/cap/year)	370,2	329,3

Data for Malmö municipality under the assumption that the amount biological waste is the same for 2007 as it was 2012 (although a new reporting system was used then), 13 kg. Textiles are not included [25; 30].

VARIATION RATE OF URBAN WASTE RECOVERY

This indicator has not been collected due to lack of data.

WATER LOSSES VARIATION RATE

This indicator has not been collected due to lack of data.

ENERGY-EFFICIENT BUILDINGS VARIATION RATE

This indicator has not been collected due to lack of data.

URBAN BUILDING DENSITY VARIATION RATE

Table 69: Urban density in 2010

	2010
Registered buildings	49 244
Total surface land area	156,9
Ratio (Number of/km2)	313,9

Data for Malmö municipality. No data available for previous years for this indicator [33; 34].

VII.IV.II SOCIAL PERFORMANCE

The overview of actual collected indicators representing the social performance of the city, their geographical coverage is listed in Table 57. Each indicator is shown in more detail below.

Table 70: Actual collected indicators for the social dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.
Social Inclusion	Variation rate of unemployment level by gender	**Percentage**	**1996-2014**	Municipality
	Variation rate of poverty level	Percentage	2008-2013	Swedish municipalities
	Variation rate of tertiary education level by gender	Percentage	2003-2012	Municipality
	Variation rate of average life expectancy	Average Nº	2003-2011	NUTS 3 (Skåne county)
Public services and Infrastructures	Variation rate of green space availability	**Percentage**	**2000 & 2005**	Malmö urban area
Governance effectiveness	Existence of monitoring system for emissions reductions	**Yes/No Description**	**2013**	Municipality

VARIATION RATE OF UNEMPLOYMENT LEVEL BY GENDER

The target group covers people of the ages 16-64. The figure shows the evolution of the unemployment rate by gender. Both registered unemployed and people in activity support are included. Data for Malmö municipality [1].

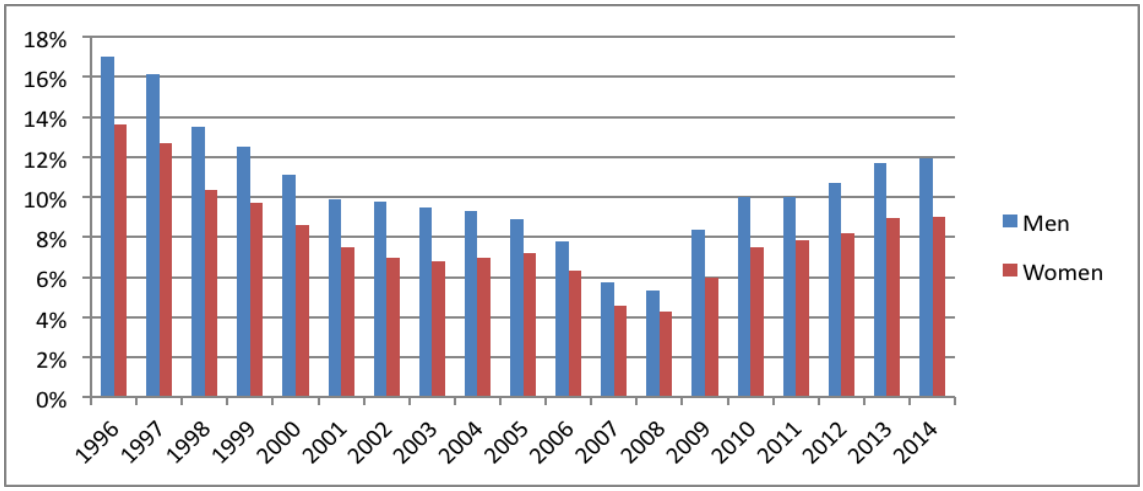


Figure 91: Variation rate of unemployment level by gender

VARIATION RATE OF POVERTY LEVEL

The indicator sums up the number of persons who are at risk of poverty, severely materially deprived or living in households with very low work intensity. The data is not Malmö specific, but there is a small difference between major cities and other municipalities in relation to all Swedish municipalities, why it can be expected that Malmö is in the range between the blue and the red stack. Though, there are no major trends for the time period, 2008-2013 [2].

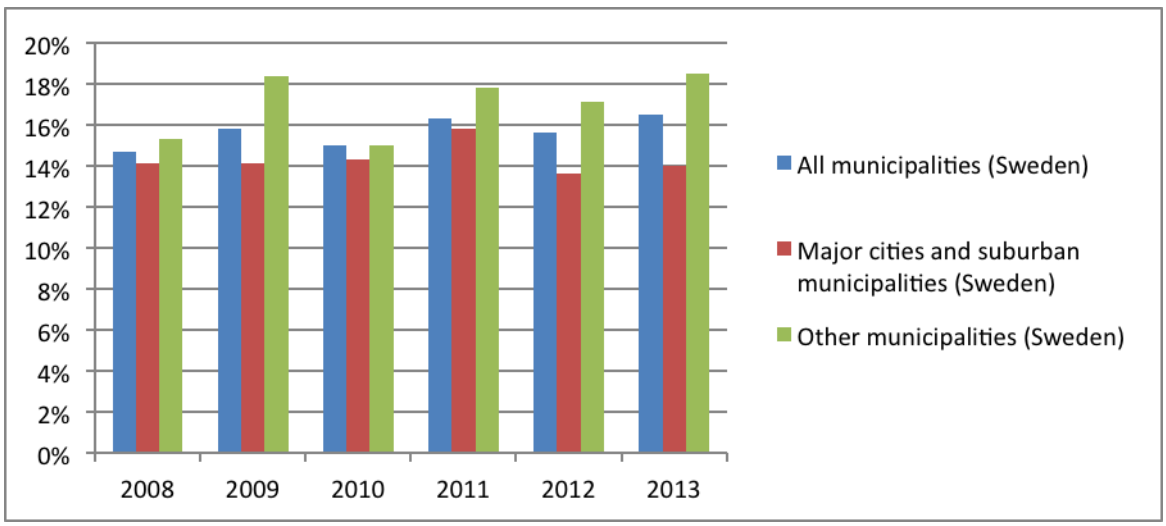


Figure 92: Variation rate of poverty level.

VARIATION RATE OF TERTIARY EDUCATION LEVEL BY GENDER

Based on Malmö municipality, data available for one third of the population which is extrapolated. It is important to notice that the numbers change depending on the definition of a tertiary education. In this case all tertiary education-levels are included. If a minimum of three years of tertiary education is valid, the numbers would drop about 10 percentage points [3].

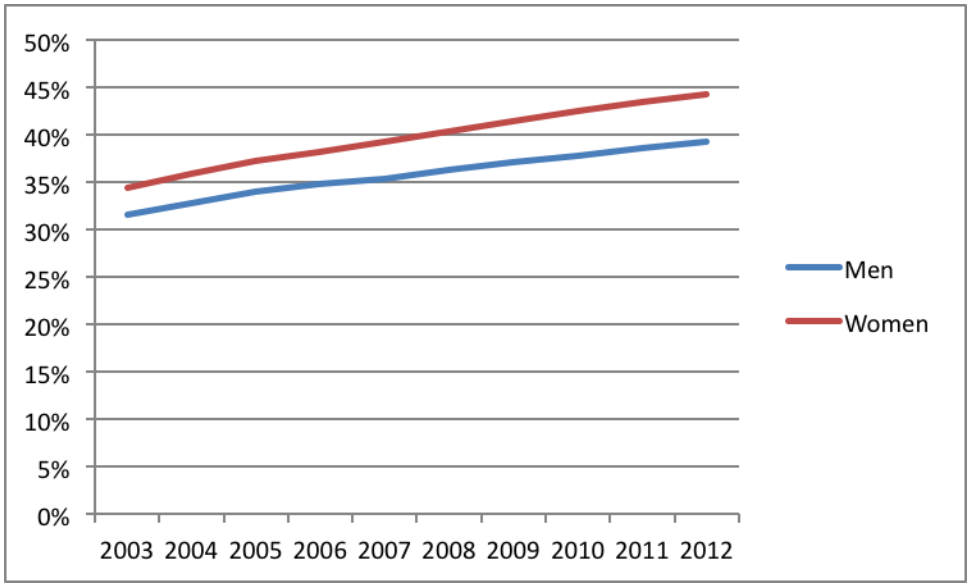


Figure 93: Variation rate of tertiary education level by gender (2003-2012)

VARIATION RATE OF AVERAGE LIFE EXPECTANCY

Evolution of the average number of years of life expectancy. Statistics based on Skåne County (NUTS 3), average of men and women at birth [4].

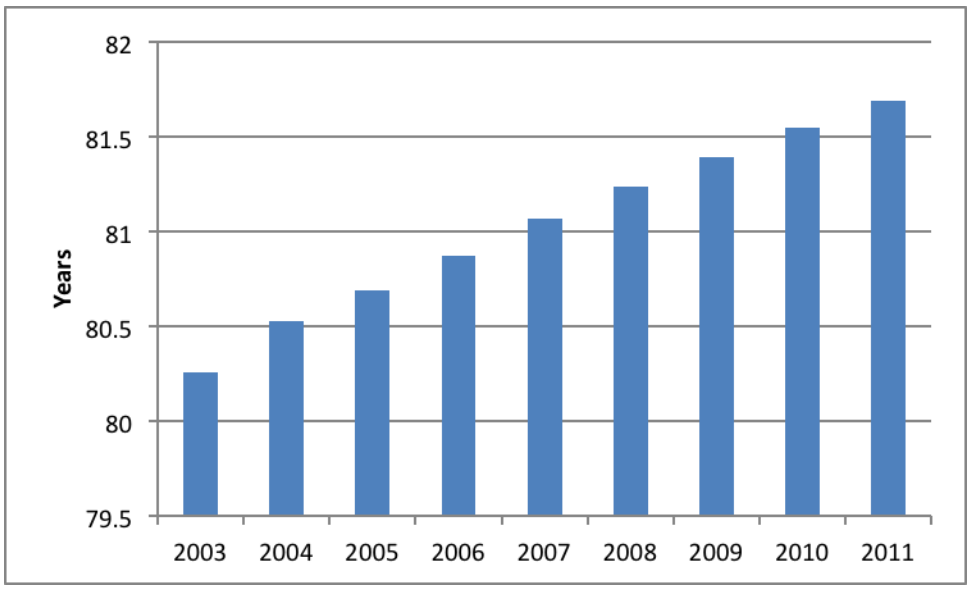


Figure 94: Variation rate of average life expectancy

VARIATION RATE OF GREEN SPACE AVAILABILITY

The indicator aims to assess the variation rate of the surface area (km2) of public green (urban forests, parks or green spaces) space availability. This is based on the Malmö urban area, i.e. not the entire municipality [5; 6].

Table 71: Green area and green area variation rate

YEAR	2000	2005
Total green area (km2)	38,34	39,52
Total land area (km2)	69,62	72,43
Variation rate of green space availability	55 %	55 %

All green space within the urban city limit, such as common parks and open grass areas, impediment, gardens and green spaces between houses and roads are included in green spaces according to SCB.

EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

To become a post-carbon city, cities should define their own targets related to CO2 emissions and put them in place. Thereby, the indicator existence of monitoring system for emissions reductions was introduced and intends to check if cities are complying with the targets they set, evaluating the effectiveness of the policies and strategies implemented to reduce CO2 emissions.

RESULTS:

Yes. Malmö municipality has a target of 40 % emission reduction until 2030 (CO2) compared to 1990. This is monitored and reported on a yearly basis in order to indicate whether the target will be fulfilled by 2030. Today´s forecast is that this target will be difficult to achieve [7].

VII.IV.III ECONOMIC PERFORMANCE

The overview of actual collected indicators representing the economic performance of the city, their geographical coverage and data source is listed in Table 58Table 57. Each indicator is shown in more detail below.

Table 72: Actual collected indicators for economic dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.
Sustainable economic growth	Level of wealth variation rate	**eur/person**	**2003-2011**	Municipality
	Variation rate of GDP by sectors	Percentage	2003-2012	NUTS 2
	Employment by sectors variation rate	Percentage	**2003** 2012	NUTS 2
	Business survival variation rate	Percentage	2008,2009,2010	Municipality
Public Finances	Budget deficit variation rate	**Percentage of city's GDP**	**2003-2011**	Municipality
	Indebtedness level variation rate	Percentage of city's GDP	2003-2011	Municipality
Research & Innovation dynamics	R&D intensity variation rate	**Percentage**	**2003-2013**	National level (one NUTS 3)

LEVEL OF WEALTH VARIATION RATE

Cities with a strong economic activity are most prepared to face the challenges and difficulties of the transition process towards a "post carbon city". They normally have more resilience towards economic changes and uncertainty. Data for Malmö municipality, GDP per capita [10; 13; 17].

Table 73: Level of wealth variation rate

LEVEL OF WEALTH VARIATION RATE	
Years	GDP (€/cap)
2003	35 990
2004	37 650
2005	38 760
2006	40 970
2007	43 190
2008	44 850
2009	44 300
2010	43 190
2011	45 400
Change (2003-2011)	+ 26.1 %

VARIATION RATE OF GDP BY SECTORS

Weight of economic sectors in GDP (%). Results based on Sothern Sweden (NUTS 2) [26].

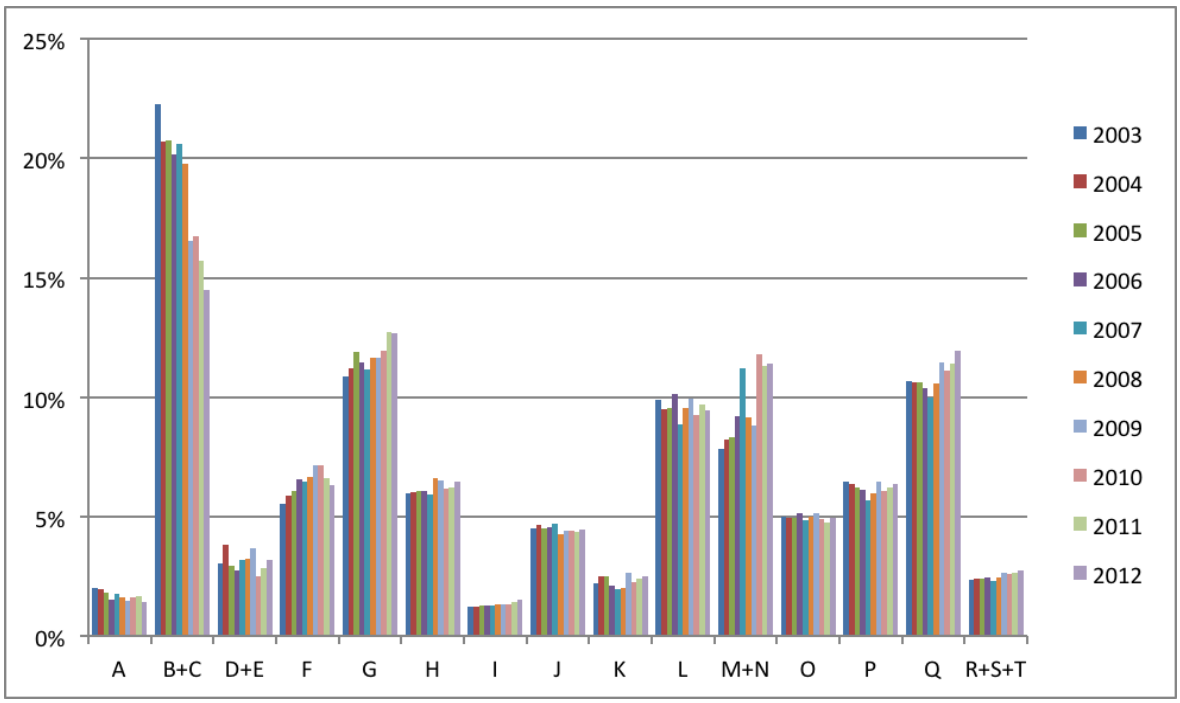


Figure 95: variation rate of GDP by sectors.

LETTER	SECTOR
A	AGRICULTURE, FORESTRY AND FISHING
B	MINING AND QUARRYING
C	MANUFACTURING
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES
F	CONSTRUCTION
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES
H	TRANSPORTATION AND STORAGE
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES
J	INFORMATION AND COMMUNICATION
K	FINANCIAL AND INSURANCE ACTIVITIES
L	REAL ESTATE ACTIVITIES
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES
N	ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY
P	EDUCATION
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES
R	ARTS, ENTERTAINMENT AND RECREATION

LETTER	SECTOR
S	OTHER SERVICE ACTIVITIES
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; U0NDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE
U	ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES

Table 74: List of sectors

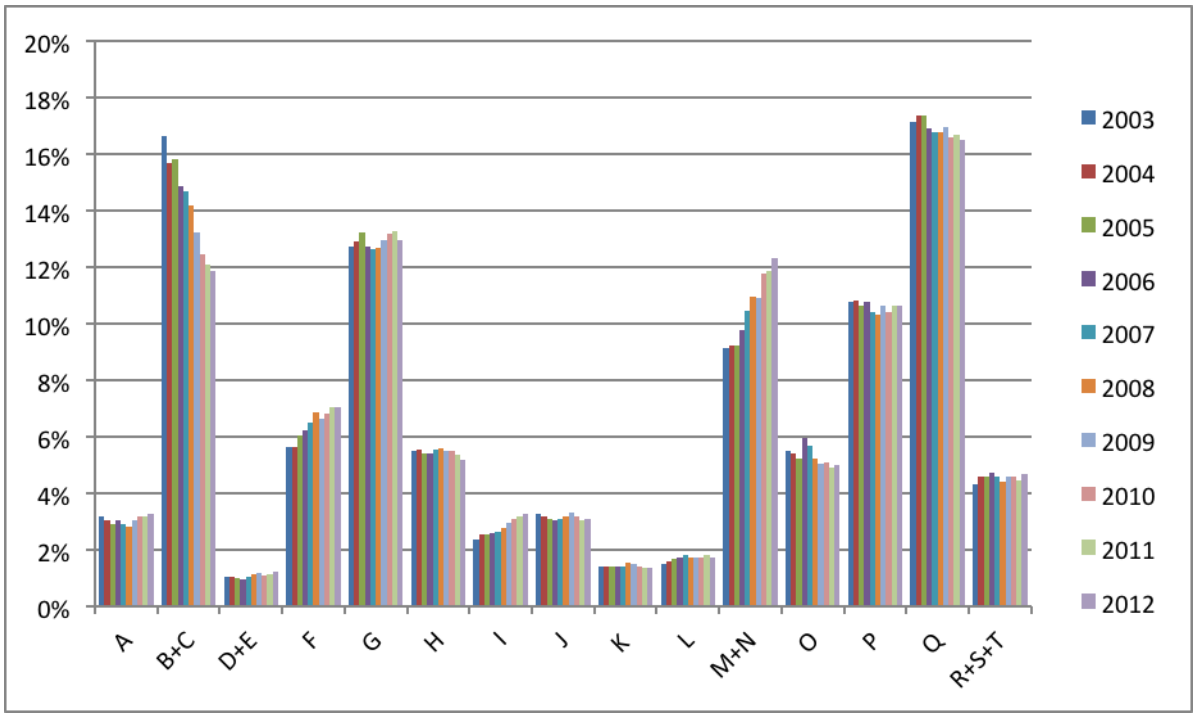
EMPLOYMENT BY SECTORS VARIATION RATE

Employment by economic activity sector (%). Employment ratio by economic activity sectors

This indicator shows the dynamics of the labor market and is an important mechanism to monitor and measure the weight of the different economic sectors in the total of the employed population.

Results based on Sothern Sweden (NUTS 2), and according to the RAMON - Reference and Management of Nomenclatures classification [26].

Figure 96: Employment by sectors variation rate. For sectors, see Table 17 above.



BUSINESS SURVIVAL VARIATION RATE

The business survival variation rate in Malmö is 68 % upon the three years 2008, 2009 and 2010 [27].

BUDGET DEFICIT VARIATION RATE

Percentage of city´s GDP. This indicator shows how the cities generate the necessary revenues to finance their activities, or if they need to seek external financial sources (indebtedness).

Table 75: Budget deficit, GDP and variation

YEAR	BUDGET DEFICIT (€/CAP)	GDP (€/CAP)	RATIO (%)
2003	1001	35 990	2,8
2004	864	37 650	2,3
2005	877	38 760	2,3
2006	779	40 970	1,9
2007	1025	43 190	2,4
2008	1034	44 850	2,3
2009	927	44 300	2,1
2010	1235	43 190	2,9
2011	1287	45 400	2,8

The difference between all costs and benefits in a Swedish municipality is fully or partly financed by the government in tax equalization. In the above table this equalization is not included. Data as valid for Malmö municipality [10; 28].

INDEBTEDNESS LEVEL VARIATION RATE

Annual debt by GDP percentage of city´s GDP. Cities with a lower level of indebtedness are more resilient to challenges in the context of a post-carbon transition process.

Table 76: Indebtedness level, as % of GDP

YEAR	INDEBTEDNESS (€/CAP)	GDP (€/CAP)	RATIO (%)
2003	1 586	35 990	4.4
2004	1 426	37 650	3.8
2005	1 408	38 760	3.6
2006	1 337	40 970	3.3
2007	1 779	43 190	4.1
2008	1 578	44 850	3.5
2009	1 635	44 300	3.7
2010	1 670	43 190	3.9
2011	1 861	45 400	4.1

The indebtedness, GDP per person and the final ratio is presented in the above table. Data is valid for Malmö municipality. This includes both short and long term debts [29].

R&D INTENSITY VARIATION RATE

Total R&D expenditure as a % of GDP. The level of R&D expenditures is normally associated with the level of competitiveness of an economic area (country, region or city); the R&D is the first step towards the innovation as an important element of a post-carbon society. Data available for Sweden from 2003 to 2013 (see below). Data for Blekinge-Skåne region (NUTS 3) was only available for 2011, where the ratio was 4.5 %. This gives the 9th highest ratio of all European regions [30; 31].

Table 77: R&D intensity variation rate

YEAR	R&D INTENSITY VARIATION RATE (%)
2003	3.6
2004	3.4
2005	3.4
2006	3.5
2007	3.3
2008	3.5
2009	3.4
2010	3.2
2011	3.2 (Blekinge/Skåne: 4.5%)
2012	3.3
2013	3.2

VII.V FINDINGS AND KEY CHALLENGES

Malmö is a young, multi-cultural city with high immigration numbers. It is a segregated city, with some recent evidence of social unrest, e.g. in the residential area of Rosengård. This presents a specific social challenge, addressed for example in the Strategic Development Plan for Anti-Discrimination Work.

The current energy strategy sets very ambitious targets for 2020 in terms of energy use and renewable energy. These targets will be difficult to fulfil, and the strategy is currently under revision. Another challenge connected to carbon is that there is no protocol in use to calculate the carbon footprint of the city. Such a tool would be useful, and should also cover the consumption perspective, which is a great challenge. Sustainable transportation is on the right track, with model share of car travels at 40%, aiming for 30% in 2020. Actions are being taken to improve the biking network, but modal share of biking increases quite slowly.

Malmö is an innovative city, with a high level of R&D expenditure compared to other European cities. Economically, the GDP (€ per capita) shows a positive trend, while at the same time unemployment rates have been increasing since 2008, possibly due to the economic crisis in Europe. This presents a challenge related to economic inequity in the city. However, the initial assessment has not provided enough detailed data to investigate this issue in more depth.

VII.VI CONCLUSIONS

The main environmental challenge in Malmö appears to be the dependence on fossil fuels. The top social hotspot is integration, while economically; the city is doing quite well according to our assessment. Malmö have proactive strategies and plans in place to address discrimination and social sustainability, such as the Commission for a Socially Sustainable Malmö that was selected in 2008. Hopefully, this work continues and has an impact beyond reports and suggestions. Social issues and culture were also highlighted by stakeholders in the vision and backcasting workshops, showing that this is a key issue to success for the sustainability of the city.

It remains to be seen what the revision of the energy strategy will bring in terms of new targets and actions to help the city on its path to post carbon. The work has to be a joint effort by energy industry, municipality and citizens, potentially aided by smart IT solutions to reduce energy use in households.

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VIII CASE STUDY CITY ROSTOCK

VIII.I DATA COLLECTION

The data was collected in a bottom-up approach through the local authorities, mainly the environmental agency of Rostock, and a top-down approach through statistical data and other relevant documents. One major data source was the town hall website[12] and the yearbook "Statistisches Jahrbuch Hansestadt Rostock 2013". As Rostock is a master plan commune for 100% climate protection, it has already gathered much relevant data.

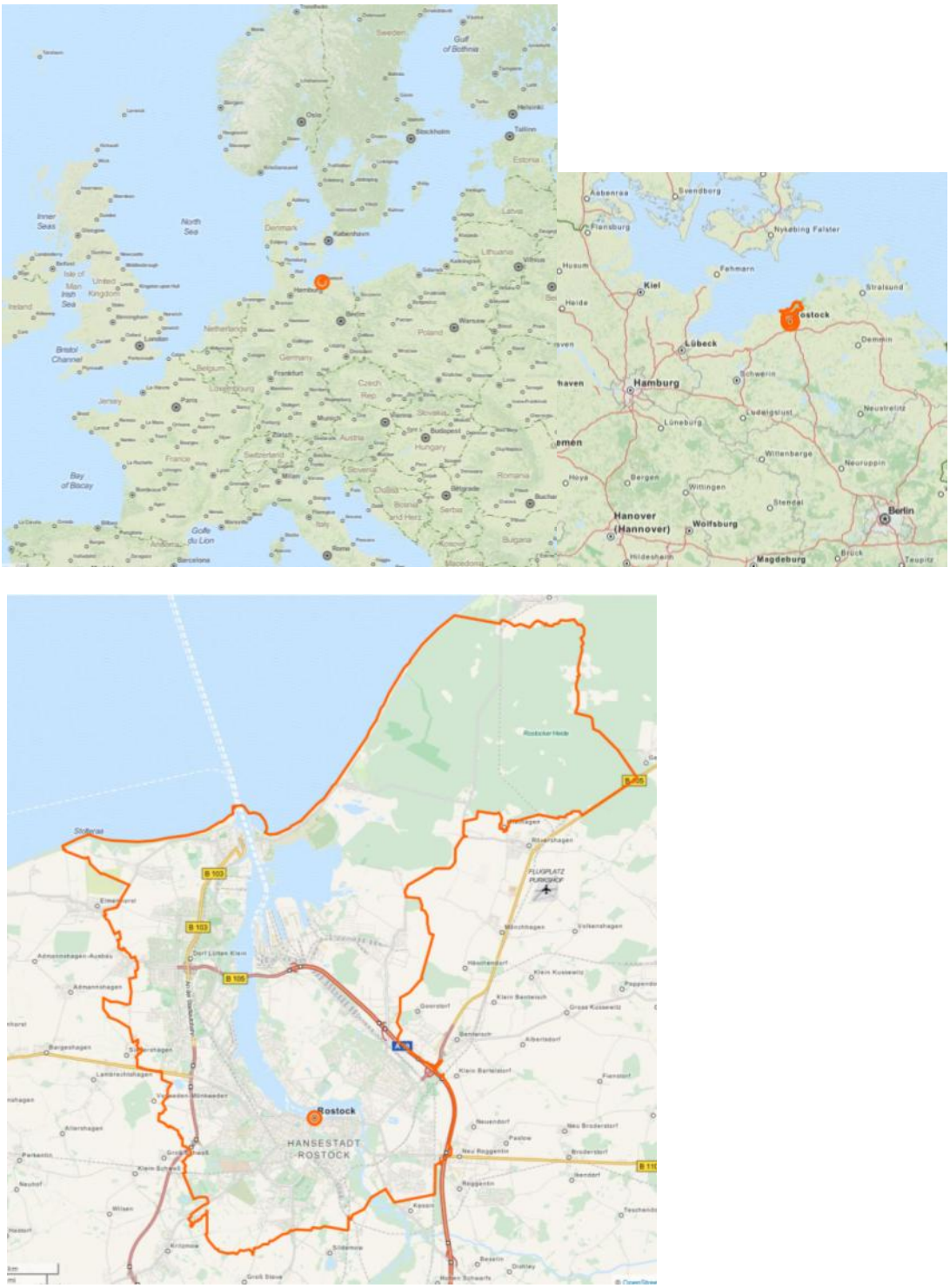
VIII.II OVERVIEW OF THE CASE STUDY CITY

VIII.II.I TERRITORY

Rostock is a medium-sized city on the north-east coast of Germany by the Baltic Sea. The city is located in the state Mecklenburg Western-Pomerania (Eurostat NUTS2 region) within the geographical region Northern Lowland. The climate is temperate with significant rainfall throughout the year. Rostock is situated on the river Warnow, which flows into the Baltic Sea in the northern quarter Warnemünde. Rostock is composed of 31 quarters, although for statistical reasons they are summed up to 21. Rostock can be accessed by highway from Hamburg and Berlin in around 2 hours. Ferry traffic is conducted between Rostock and Gedser (Denmark), Trelleborg (Sweden), Ventspils (Latvia), Helsinki (Finland) and Gdynia (Poland). The military and civil airport Rostock-Laage is situated around 40km from the city. The maps below indicate its location within Europe and its geographical boundaries.

[12] http://rathaus.rostock.de

Figure 97: Map of Rostock in Central Europe, in Germany and close-up



Source: © OpenStreetMap contributors

VIII.II.II POPULATION

Rostock is the largest city in the region with a population of 203,673 inhabitants. With a size of 181 km^2, there are on average 1,123 inhabitants per km^2. While 23% of the population is more than 65 years old, 11% is younger than 15 years. 3.9% of the population are foreigners. Around 1/3 of the inhabitants completed a higher/tertiary education. Rostock's employment rate is at 49.7% and its unemployment rate at 11.5%.

VIII.II.III ECONOMY

GDP per capita in Rostock is at 30,628 EUR with the main economic sectors being Tourism, Services and Technologies. Major employers are the cruise line AIDA, which has its German headquarters in Rostock, several shipping companies and call centres. The University of Rostock is the main public employer. Being located on the Baltic Sea, the beach, harbour and several maritime events are key tourist attractions. Rostock boasts Germany's largest cruise liner harbour as well as a ferry harbour and an international seaport for the maritime transport of goods. Rostock is further allying with the region as a "Regiopole", a major regional city[13].

VIII.III KEY STRATEGIES AND PROJECTS

VIII.III.I STRATEGIES AND ACTION PLANS

STRATEGY/ACTION PLAN FACTSHEET 1	
Title	**Climate Protection Concept (Klimaschutzkonzept)**
Dimension of KPIs	Environmental dimension
Period	Publication 2005, data 2004
Strategy/Action Plan description	
Objective	A framework concept for climate protection.
Targets	50% reduction of CO_2 emissions by 2010 compared to 1987.
Links and Contacts	
Promoter	Environmental Agency Rostock
Document/web site	http://rathaus.rostock.de/sixcms/media.php/144/Klimaschutz%20Rahmenkonzept%20kl%20Kopie.pdf

[13] http://www.regiopolregion-rostock.de.

STRATEGY/ACTION PLAN FACTSHEET 2	
Title	**Communal Master Plan**
Dimension of KPIs	Environmental dimension
Period	May 2012 – April 2016
Strategy/Action Plan description	
Objective	Reduction of energy demand by 50% by 2050 and CO_2 emissions reduction by 95% compared to 1990 levels.
Measures	Measures in the public, private and household domain, e.g., energy concepts for swimming hall, scholar education, and inclusion of businesses to the energy alliance (see Master Plan for more details).
Targets	Various, e.g., 53% of total heating thorough long-distance heating; saving of 30,000l fuel oil per year by the public waste disposal company (see Master Plan for more details).
Links and Contacts	
Promoter	*Environmental Agency Rostock*
Document/website	http://rathaus.rostock.de

VIII.III.II KEY PROJECTS

Key projects in Rostock include:

- Master Plan for 100% climate protection/Masterplan 100% Klimaschutz[14];
- Agenda21-Counsel[15];
- Working Group Energiewende;
- Fair-Trade-City[16];
- Bürgerenergie (citizen energy);
- Future Mobility Plan (Mobilitätsplan Zukunft, work in progress)[17];
- Energy alliance (pre-association launch)[18].

[14] http://rathaus.rostock.de/sixcms/media.php/144/Vortrag%20KSL%20HRO.pdf

[15] http://dotcomdesign.de/pdf/hro/struktur_agenda.pdf

[16] http://rostock.fairtrade-towns.de/das-projekt/

[17] https://rostock-bewegen.de/mitreden

[18] http://rathaus.rostock.de/sixcms/detail.php?template=seite_umweltamt_energiewende_de

VIII.IV CASE STUDY CITY ASSESSMENT

VIII.IV.I ENVIROMENTAL PERFORMANCE

VARIATION RATE OF ECOSYSTEM PROTECTED AREAS

The data available for 2008 are 13 km^2 of protected area in Rostock[19]. For further information also see social performance indicator V.II.5 Variation Rate of Green Space.

ENERGY INTENSITY VARIATION RATE

Table 78: Energy variation 2005 & 2012

YEAR	GDP/ PER PERSON	TOE[20]/ PER PERSON	INHABITANTS	TOE	GDP (MIO €)	TOE/GDP	ENERGY DEMAND PERSON MWH[21]	PER IN
2005	25,288	1.394	199,300	277,100	5,033	0,0000551		16,17
2012	30,628	1.389	203,104	282,040	6,238	0,0000452		16,15

YEAR	TOE/EUR	VARIATION
2005	0,0000551	-
2012	0,0000452	**-18%**

Level: city
Source: Rathaus Rostock[22], Statistisches Amt Mecklenburg-Vorpommern SIS-Online[23]

The energy intensity (tonne of oil equivalent - toe) per GDP (EUR) decreased by 18%, comparing 2005 and 2012 data. (The numbers are based on the available years 2005 and 2012.)

VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

The total energy consumption dropped between 2002 and 2012 by 9.1%. The sectors Industry, Agriculture and Services consumed an aggregate of 57% of the total energy consumed in Rostock in 2012 (Total 4,135 GWh). There is no data on the variation rate on city-level by sectors for 2002 available.

[19] http://rathaus.rostock.de/sixcms/media.php/1074/GV_Flaechenstatistik.pdf

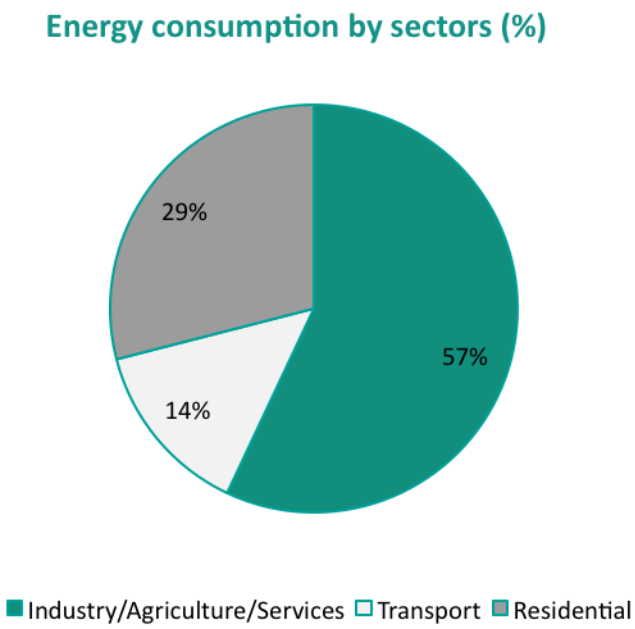
[20] The IEA/OECD define one toe to be equal to 11.63 MWh.

[21] Final energy demand adjusted by weather data

[22] http://rathaus.rostock.de/sixcms/detail.php?id=194&_sid1=rostock_01.c.263.de&_sid2=rostock_01.c.538.de&_sid3=&_sid4=&_sid5=, "Rostock_Bilanztabelle"

[23] http://sisonline.statistik.m-v.de/sachgebiete/P242601K_Bruttoinlandsprodukt_zu_Marktpreisen

Figure 98: Energy consumption by sector, 2012 (%)



Level: city
Source: Hansestadt Rostock, Amt für Umweltschutz

VARIATION RATE OF CARBON EMISSIONS INTENSITY

Carbon emission intensity per GDP (EUR) decreased by 25% between 2002 and 2012 in Rostock.

Table 79: Variation rate of carbon emissions intensity (%)

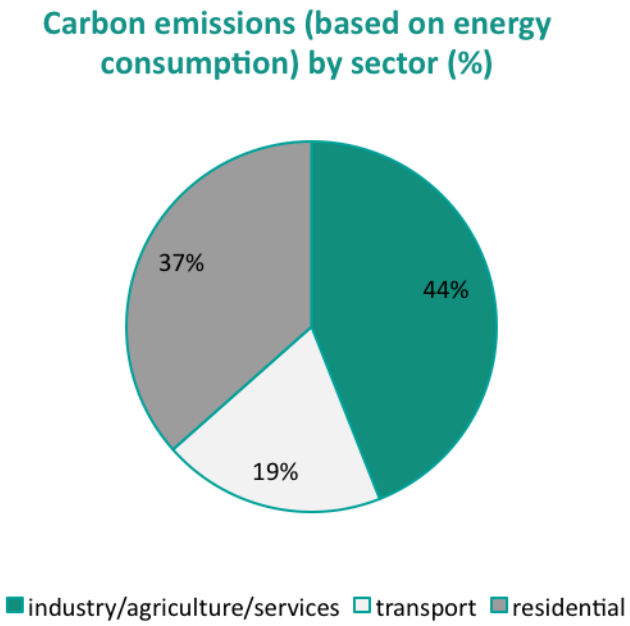
YEAR	KT CO_2	GDP	TCO_2/EUR	$KGCO_2$/EUR	VARIATION
2002	890	5.033.000.000 €	0.000177	0.176833	-
2012	830	6.238.000.000 €	0.000133	0.133055	**-25%**

Level: city
Source: http://rathaus.rostock.de

VARIATION RATE OF CARBON EMISSIONS BY SECTOR

A total of 791kt CO_2 were emitted in 2012 (based solely on energy consumption). The sectors Agriculture, Industry and Services contributed 44%, Residents 37% and Transport 19%.

Figure 99: Carbon emission (based on energy consumption) by sector (%)



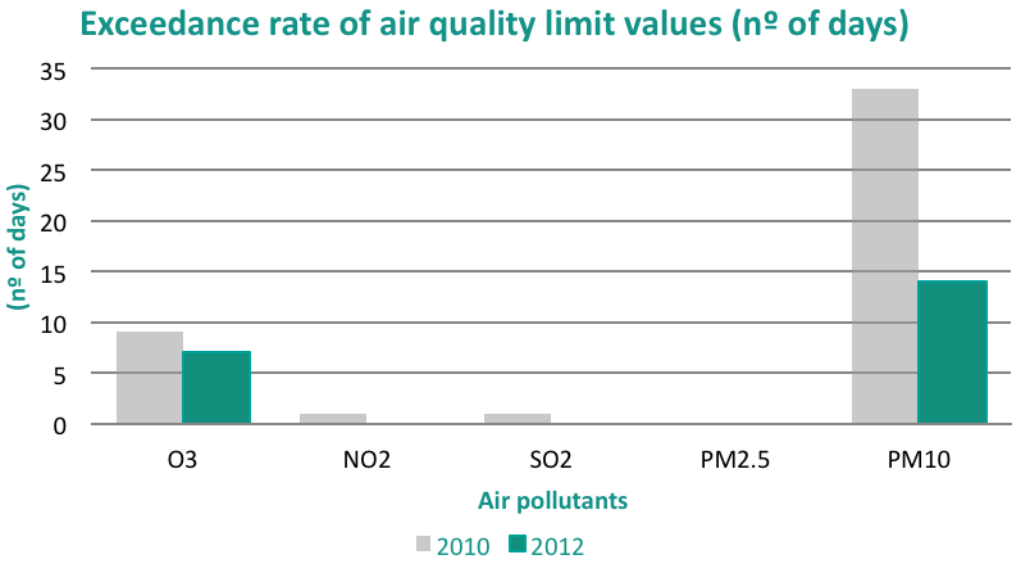
Level: city
Source: Rathaus Rostock Ergebnisbericht[24], p. 51 (data only for CO_2 (Energy) available)

EXCEEDANCE RATE OF AIR QUALITY LIMIT VALUES

In Rostock, the air quality limits were mainly exceeded for the larger particulate matter PM_{10}. The air quality improved with PM_{10} levels being exceed in 2010 on 33 days and in 2012 on 14 days. In 2010, the limit value for SO_2 threshold was at least 1 time higher than the limit value. Data for the O_2-values are based on > 100µg/m^3.

[24] http://rathaus.rostock.de/sixcms/media.php/144/Ergebnisbericht_AP1_20130823.pdf

Figure 100: Air quality limit exceedance (days)



Level: city
Source: Lung[25], Umweltbundesamt[26]

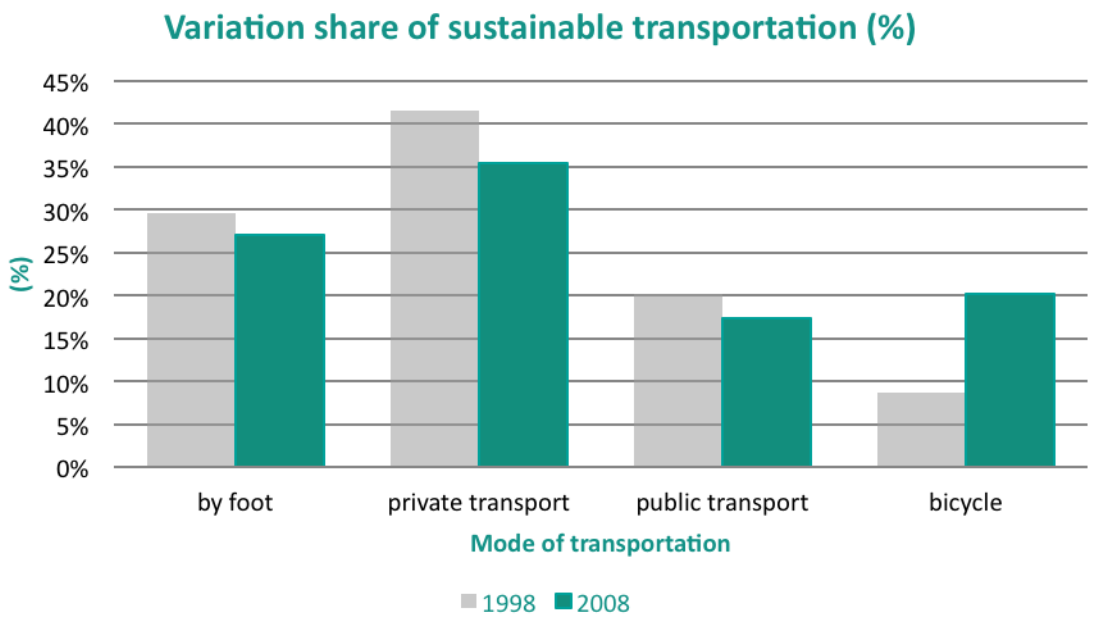
VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

In 2008, 65% of people in Rostock use sustainable transport, which is an increase of 6% compared to 1998. Private transport, which includes car-driving, car-passenger and motorcycles, are used by 35% - a 15% decrease compared to 1998. Public transport, such as bus and train usage as well as walking by foot, slightly decreased. The major increase is seen with the total use of bicycles from 9% to 20%.

[25] http://www.lung.mv-regierung.de/umwelt/luft/http://www.umweltbundesamt.de/sites/default/files/medien/358/dokumente/no2_2012.pdf

[26] https://www.umweltbundesamt.de/sites/default/files/medien/370/dokumente/no2_2010.pdf

Figure 101: Share of mode of transportation (%)



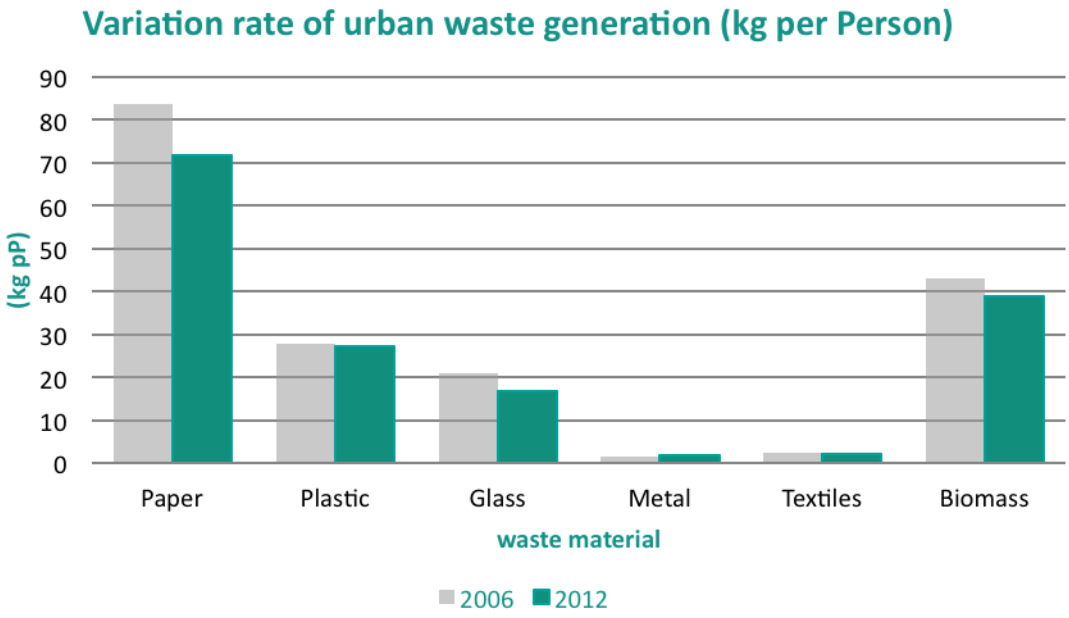
Level: city
Source: Modal Split[27]

VARIATION RATE OF URBAN WASTE GENERATION

Waste generation saw an overall reduction – on average by 9% from 2006 to 2012. The only increase of waste during that time was seen with metal from 1.6 to 1.7 kg per person (8%). Data of the category plastic is substituted by light packaging (no data of plastic available).

[27] http://www.radregion-rostock.de/fileadmin/downloads/abc-Radverkehrskonferenz2014/P08-140516-HolgerMatthaeus.pdf

Figure 102: Variation of urban waste generation (kg per Person)



Level: city
Source: Jahrbuch HRO 2013, p. 177

VARIATION RATE OF URBAN WASTE RECOVERY

Material for recycling increased in Rostock from 53% in 2009 to 54% in 2013. No data for the categories of total incineration (%), deposit onto or into land (%), composting (%) and digestion (%) were available.

Level: city
Sources: Genesis (Statistik der öffentl.-rechtl. Abfallentsorgung)[28], Jahrbuch HRO 2013, p. 177

[28] https://www.regionalstatistik.de/genesis/online/data;jsessionid=1D658C9907433A4F6E6FA8BD6BEE4EA9?operation=abruftabelleBearbeiten&levelindex=2&levelid=1416567021626&auswahloperation=abruftabelleAuspraegungAuswaehlen&auswahlverzeichnis=ordnungsstruktur&auswahlziel=werteabruf&selectionname=503-41-4&auswahltext=%23SHRKRLB-13003&werteabruf=Werteabruf

VARIATION RATE OF WATER LOSSES

Water losses were reduced in Rostock by 44% between 2003 and 2012 levels.

Table 80: Variation of water losses (m^3/person/year)

YEAR	M^3/PERSON /YEAR	VARIATION
2003	14.10	-
2012	7.90	-44%

Level: city
Source: Hansestadt Rostock, Amt für Umweltschutz

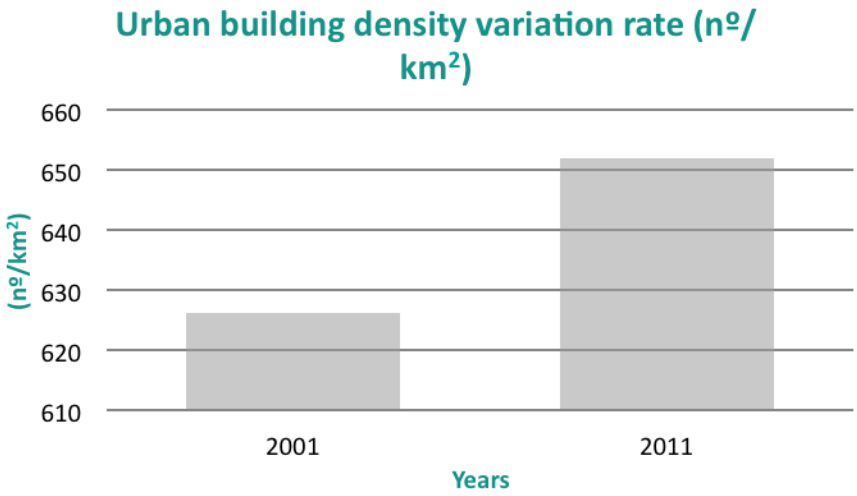
ENERGY - EFFICIENT BUILDINGS VARIATION RATE

No data available.

URBAN BUILDING DENSITY VARIATION RATE

The total area in Rostock is 181.3 km^2. Urban building density increased in Rostock from 626 buildings per km^2 in 2001 to 652 buildings in 2011 (increase of 4.1%).

Figure 103: Urban building density variation rate (nº/km^2)



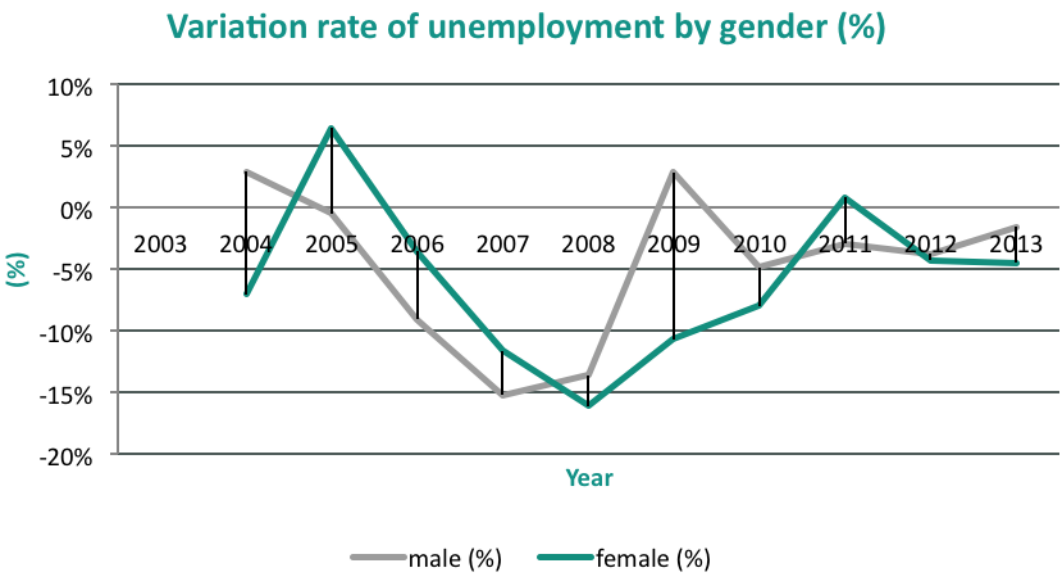
Level: city
Source: Jahrbuch HRO 2013, p. 153

VIII.IV.II SOCIAL PERFORMANCE

VARIATION RATE OF UNEMPLOYMENT LEVEL BY GENDER

In the state Mecklenburg Western-Pomerania, the average unemployment rate between 2003 and 2013 was 15% for females and 16% for males.

Figure 104: Variation rate of unemployment by gender (%)

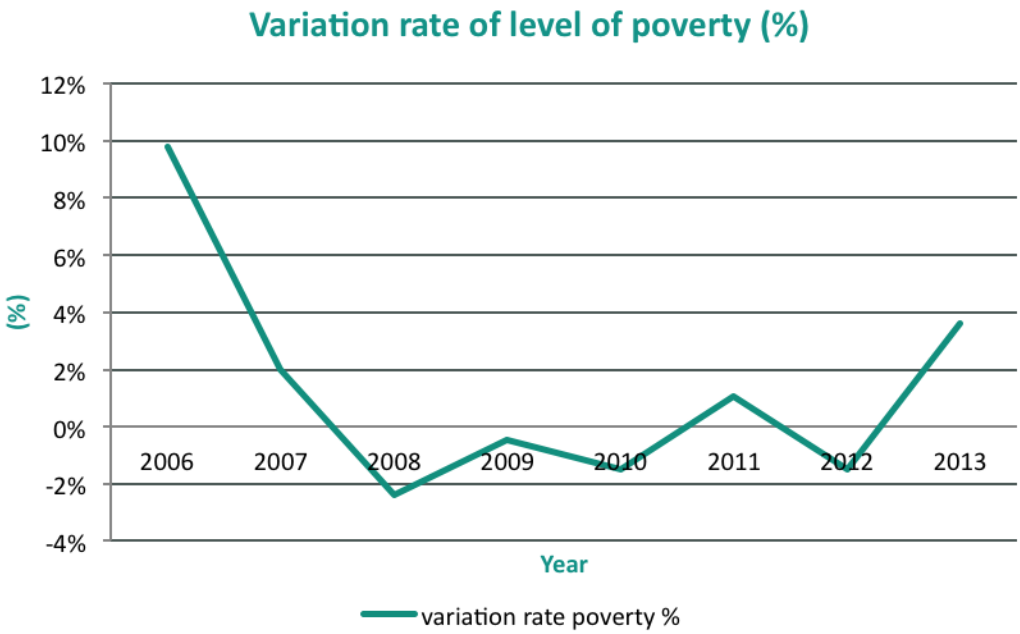


Level: NUTS2 (is the state Mecklenburg-Western Pomerania)
Source: https://www-genesis.destatis.de

VARIATION RATE OF POVERTY LEVEL

Poverty levels in Mecklenburg-Western Pomerania range from 18.4% in 2005 to 20.3% in 2013 and are increasing again in 2013.

Figure 105: Variation rate of level of poverty (%)

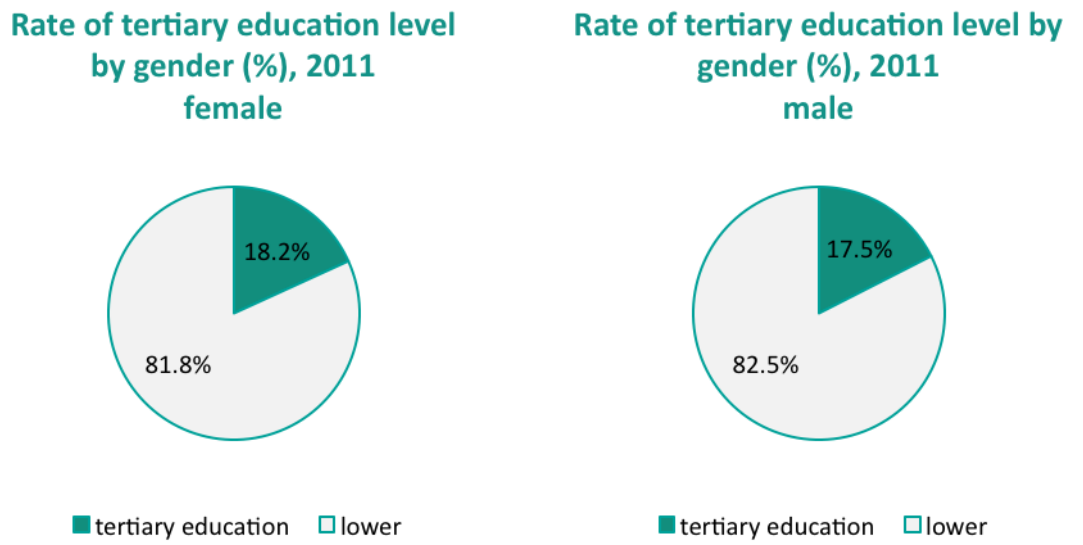


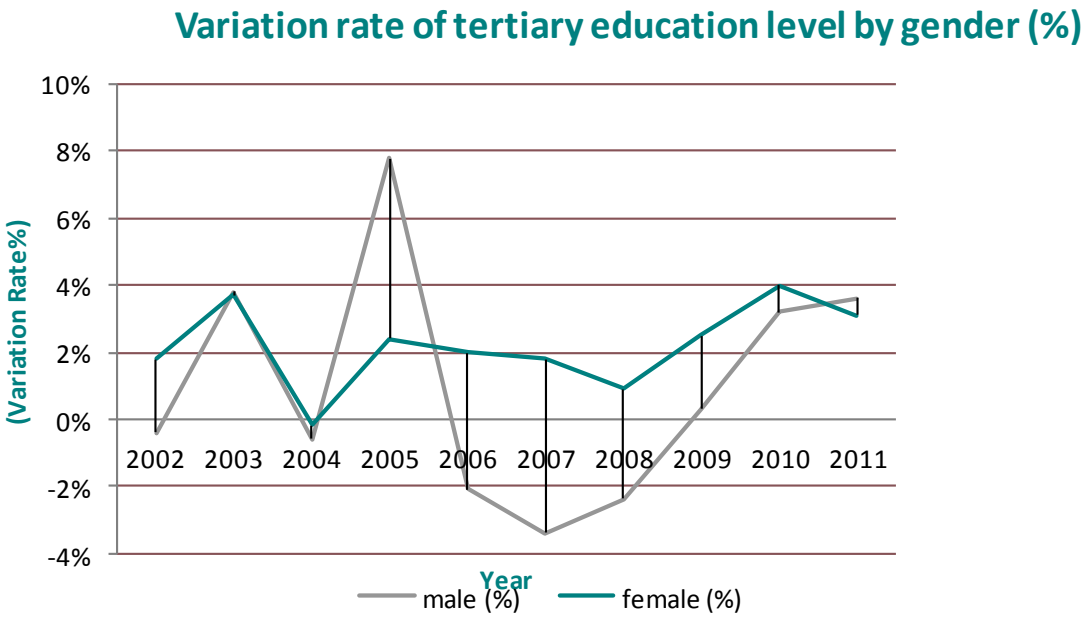
Level: NUTS2 (Mecklenburg-Western Pomerania)
Source: Eurostat

RATE OF TERTIARY EDUCATION LEVEL BY GENDER

The total percentage of the population with higher education in Rostock is 18.2% for women and 17.5% for men in 2011 (Zensus 2011). (Only data for people with higher education working in the city for the other years are available.)

Figure 106: Rate and variation rate of tertiary education level by gender (%)



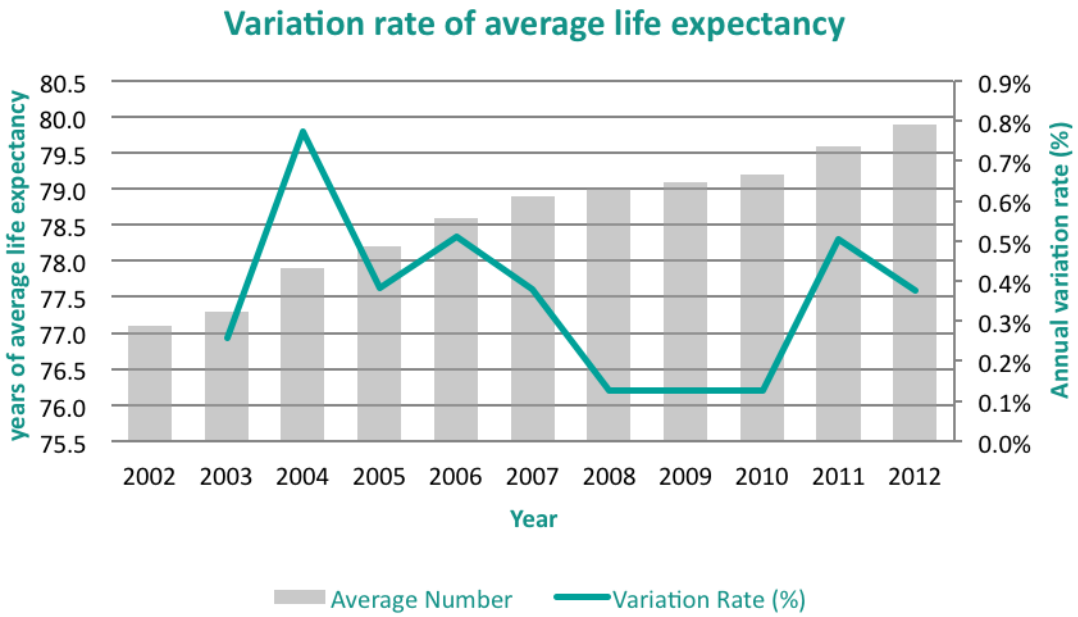


Level: city
Source: Zensus 2011 - www.regionalstatistik.de

VARIATION RATE OF AVERAGE LIFE EXPECTANCY

Life expectancy increased in Rostock from 77 years in 2003 to 80 years in 2012.

Figure 107: Variation rate of average life expectancy (%)



Level: NUTS2 (Mecklenburg-Western Pomerania)
Source: Eurostat

VARIATION RATE OF GREEN SPACE AVAILABILITY

Green space increased in Rostock by 4.6% from 75.2 km^2 in 2003 to 78.66 km^2 in 2012. While garden land decreased by around 70%, recreational land increased by around 34% during this time period.

Table 81: Variation rate of green space availability (%)

YEAR	TOTAL AREA HA	RECREATION-AL AREA HA	FOREST HA	GRASSLAND HA	GARDEN LAND HA	CEMETERY HA	TOTAL GREEN SPACE HA	SHARE
2003	18103	1097	4924	1143	270	83	7517	41.5%
2012	18127	1469	5034	1203	78	82	7866	43.4%
variation	-	33.9%	2.2%	5.2%	-71.1%	-1.2%	4.6%	1.9%

Level: city
Source: Jahrbuch HRO 2013, p. 23 (Hansestadt Rostock, Kataster-, Vermessungs- und Liegenschaftsamt)

EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

Rostock has developed and concluded a carbon neutrality plan "Masterplan 100% Climate Protection" at city level, with the goals to reduce CO_2 emissions by 95% and energy consumption by 50% by 2050. This programme is co-founded by the Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Germany.

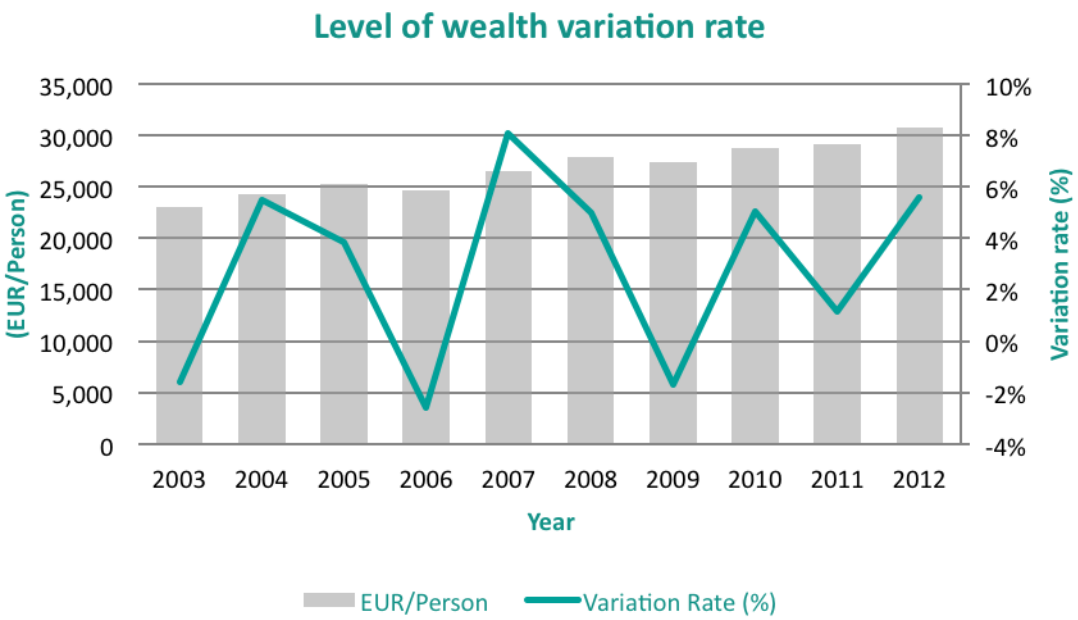
Based on the carbon neutrality plan for Rostock, the climate department of the city (Klimaschutzleitstelle des Umweltamtes) is responsible for monitoring and providing the indicators and data structure for data collection of CO_2 and energy consumption in the future.

VIII.IV.III ECONOMIC PERFORMANCE

LEVEL OF WEALTH VARIATION RATE

The GDP per person increased in Rostock from 23,066 EUR in 2003 to 30,746 EUR in 2012.

Figure 108: Level of wealth variation rate (%)



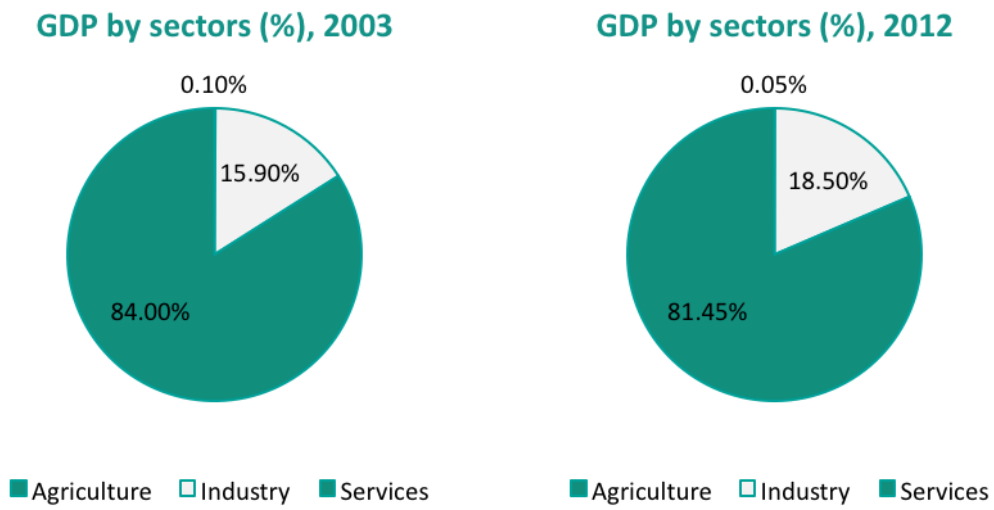
Level: city
Source: Statistisches Amt Mecklenburg-Vorpommern SIS-Online[29], Jahrbuch HRO 2013, p. 33

[29] http://sisonline.statistik.m-v.de/sachgebiete/P242601K_Bruttoinlandsprodukt_zu_Marktpreisen

VARIATION RATE OF GDP BY SECTORS

Services is the main sector of GDP generation in Rostock with 84% in 2003 and around 81% in 2012. The very small amount of agriculture dropped even further by 50% GDP decrease. Industry increased during this period by 16%.

Figure 109: Variation rate of GDP by sector (%)

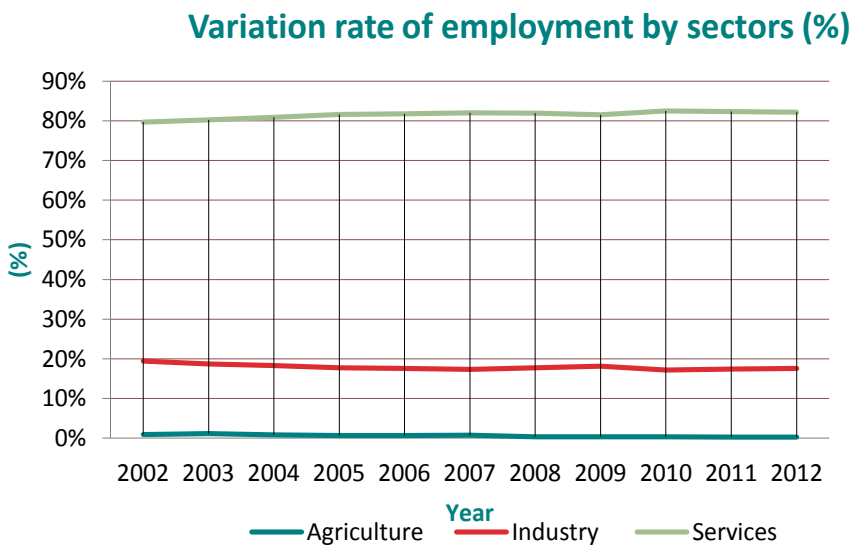


Level: city
Source: Hansestadt Rostock, Amt für Umweltschutz

VARIATION RATE OF EMPLOYMENT BY SECTORS

The highest rate of employment in Rostock is in the Services sector ranging from 79.6% in 2002 to 82.2% in 2012.

Figure 110: Variation rate of employment by sector (%)



Level: city
Source: Statistisches Amt Mecklenburg-Vorpommern SIS-Online[30]

VARIATION RATE OF BUSINESS SURVIVAL

The number of businesses increased in 2008 by 10% compared to the year before. From 2009 to 2010 there was, each year, around 1-2% more businesses in total established in Rostock.

Level: city
Source: Statistisches Amt Mecklenburg-Vorpommern SIS-Online[31]

[30] http://sisonline.statistik.m-v.de/sachgebiete/A625407K_Sozialversicherungspflichtig_Beschaeftigte_Wohnort_nach_Wirtschaftsabschnitten_WZ2008

http://sisonline.statistik.m-v.de/sachgebiete/A625405K_Sozialversicherungspflichtig_Beschaeftigte_Wohnort_nach_Wirtschaftsabschnitten

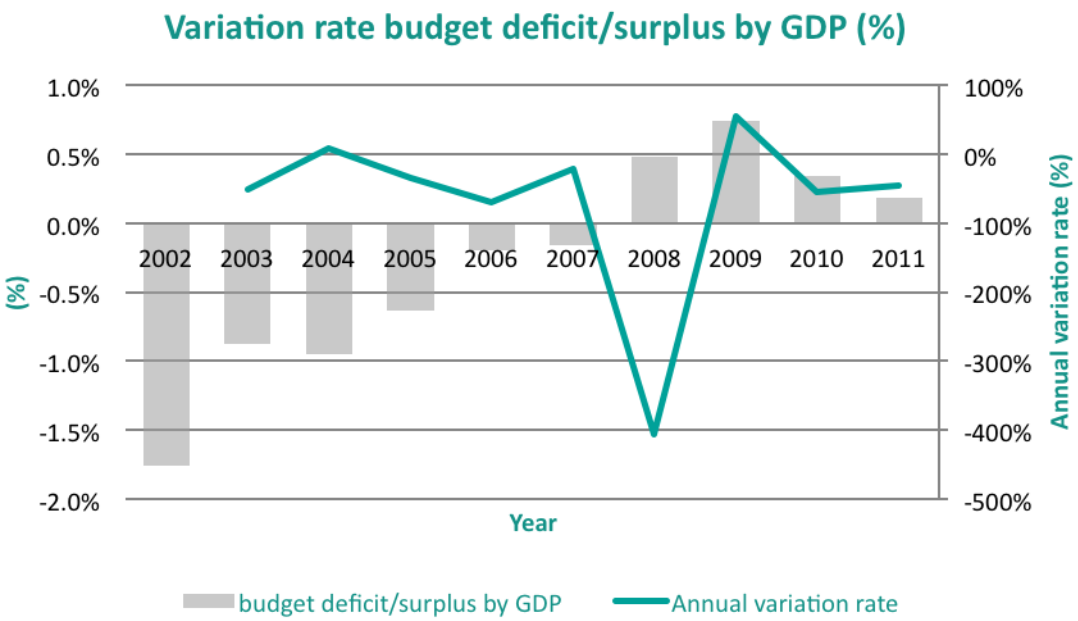
[31] http://sisonline.statistik.m-v.de/sachgebiete/D152106K_Betriebe_nach_Kreisen_und_Wirtschaftsabschnitten

http://sisonline.statistik.m-v.de/sachgebiete/C441101K_Landwirtschaftliche_Betriebe_nach_Groessenklassen_der_landwirtschaftlich_genutzten_Flaeche_Betriebe

VARIATION RATE OF BUDGET DEFICIT

The share of the annual budget deficit/surplus of Rostock by GDP is shown in the grey histogram. It indicates that until 2007 Rostock did not generate the necessary annual revenues to finance all their activities. Between 2007 and 2011, the city ceased adding new annual deficits and generated slight annual surpluses, although with a downwards trend. The annual surplus of Rostock in 2011 by GDP was 0.2%. The variation rate highlights the high fluctuation in 2008.

Figure 111: Variation rate of budget deficit by GDP (%)



Level: city
Sources: Statistisches Amt Mecklenburg-Vorpommern SIS-Online[32]

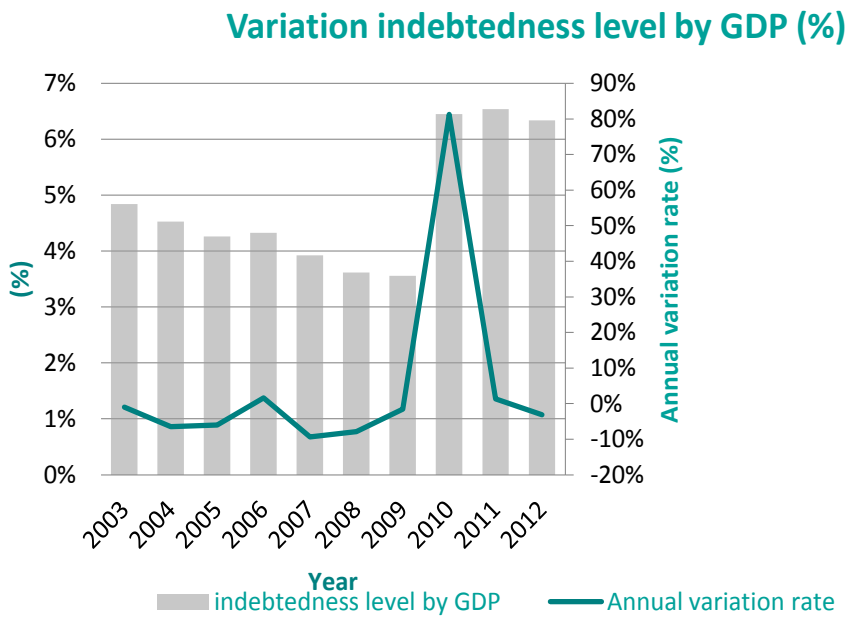
VARIATION RATE INDEBTEDNESS LEVEL

The indebtedness level indicates that Rostock needed to seek external financial sources to finance its activities. Indebtedness levels in relation to (an increasing) GDP have declined until 2009. The variation indebtedness level jumped by +81% in 2010 and decreased from 2011 to 2012 by 3% again. The indebtedness in relation to GDP in Rostock was 6.3% in 2012.

[32] http://sisonline.statistik.m-v.de/sachgebiete/L271101K_Kassenmaessige_Ausgaben_und_Einnahmen_der_Gemeinden_und_Gemeindeverbaende

http://rathaus.rostock.de/sixcms/detail.php?id=194&_sid1=rostock_01.c.261.de&_sid2=rostock_01.c.388.de&_sid3=rostock_01.c.200178.de&_sid4=rostock_01.c.409.de&_sid5=

Figure 112: Variation rate of indebtedness level (%)



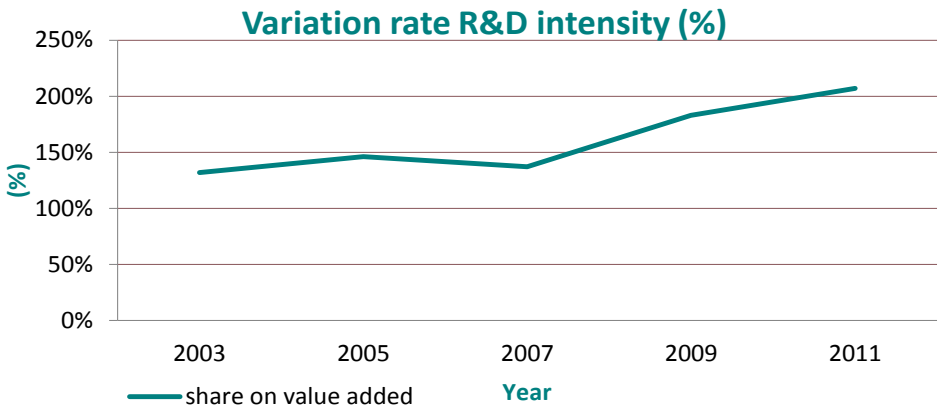
Level: city

Source: Jahrbuch HRO 2013, p. 331

VARIATION RATE R&D INTENSITY

Research and development increased in Mecklenburg-Western Pomerania from 1.32% of value added in 2003 to 2.07% of value added in 2011. The only exception is for 2006 (-6%). The largest increase of 34% was in 2009. Data was available for bi-annual variation.

Figure 113: Variation rate R&D intensity (%)



Level: NUTS2 (Mecklenburg-Western Pomerania)

Source: Eurostat[33]

[33] http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/dataset?p_product_code=TGS00042

VIII.V FINDINGS AND KEY CHALLENGES

The workshop in Rostock on the 4 December 2014 helped to develop a vision for a post-fossil Rostock in 2050 and receive feedback on the initial assessment indicators. Some indicators were criticised for being redundant, as many stakeholders had already gone through similar data and time-intensive discussions during the "Masterplan 100% Klimaschutz" creation. Various datasets were updates with input from stakeholders. The vision-building proved difficult, since stakeholders were already thinking about concrete measures and felt past this process. Hence, some indicators were updated afterwards and other indicators were neglected due to insufficient data.

The environmental indicators show that Rostock has already started important measures to reduce its environmental footprint. Energy intensity and energy consumption by sector decreased from 2002 to 2012. Air quality improved and public transportation as well as cycling increased while private transport decreased. Waste generation decreased slightly and water losses were significantly reduced while urban building density increased.

The social indicators only partly show a picture of Rostock. The data of Mecklenburg-Western Pomerania indicates a weak infrastructure of the region and social challenges regarding unemployment and poverty. However, in Rostock, tertiary education is high, which can be associated to the locally influential university. Life expectancy increased and green spaces grew slightly. Rostock has a large area of green space of more than 7,800 ha. A large share of green space derives from the circa 6,000ha forest of Rostocker Heide (see territory map), which is located on the eastern, less-populated and accessible side of the river. This can be seen in favour of biodiversity, but also decreases the actual urban green area. Furthermore, the indicator for building density does not reflect the high amount of multi-level buildings that are common for the East German region.

Regarding economic indicators, it stands out that services are the main factors for employment and GDP-generation. Financial resilience (budget deficit, indebtedness level) can be further improved. Another positive note is the increased research and development intensity, indicating a focus on Rostock being a location of knowledge generation and innovation. This can be an indicator for high competitiveness of the economic area.

VIII.VI RECOMMENDATIONS

Based on the indicators in this report, the following recommendations can be given for Rostock:

- A variation of sectors in Rostock can lead to a more flexible and vibrant economy, especially with a focus on social entrepreneurship and green economy.
- Financial resilience could be improved by local authorities in order for Rostock to be financially sustainable.
- Further environmental measures in the energy sectors can improve energy intensity and efficiency.

- Incentives or nudges could boost the public transport use and walking by foot to increase sustainable transport.
- Improved green space availability and efficient waste management could also be on the agenda.
- The green space availability indicator could be more insightful when seen in relation to the quarters of high multi-level building density or inhabitants per km^2.
- Furthermore, present experience with renovation, re-design and revaluation of multi-level-housing areas can be combined with eco-technologies and -design for more sustainable housing.
- Strengthening the region around Rostock, e.g., through strengthening regional food networks, should further improve the city's socio-economic challenges.
- Lastly, positive examples, e.g., on large water savings, should be valued and their factors of success better understood.

VIII.VII CONCLUSIONS

Rostock is already on the way to a post-carbon economy with its master plan programme; however, key challenges remain. Being located in an infrastructurally weak region, the city has established itself as a "Regiopole" with connections to Hamburg-Berlin-Scandinavia-Poland and should further expand this strategy. The focus on high quality research, education through the university, and various tourist attractions are major advantages of the location that can be built upon further. Stricter financial planning could improve the city's financial situation while a variation in sectors could further improve the city's economic resilience.

Based on the key performance indicators, the vision-building workshop defined the following areas as essential for the future vision of Rostock 2050:

- Economy/employment,
- Mobility (alternative drives, model split/environmental associations),
- Consumption and waste management,
- Quality of life for everyone,
- Working with demographic change/old-age poverty,
- (Affordable) living space (vs. increased density/green spaces),
- Energy sources/energy efficiency/using the potentials and networking with the region.

IX CASE STUDY CITY ZAGREB

IX.I DATA COLLECTION

The data were collected from following sources:

- Statistical Yearbook of Zagreb;
- National statistics – Croatian Bureau of Statistics;
- European statistics – Eurostat.

There is only one level of geographical coverage for Zagreb as NUT III and the municipality of Zagreb city are the same. The collected data was inserted on an online platform created by the WP3 leader.

IX.II OVERVIEW OF THE CASE STUDY CITY

IX.II.I TERRITORY

Zagreb is the capital and the largest city of the Republic of Croatia. It is located in the northwest of the country, along the Sava river, at the southern slopes of the Medvednica mountain. Zagreb lies at an elevation of approximately 122 m (400ft) above sea level. Its geographic position provides an excellent traffic connection between Central Europe and Adriatic sea.

Zagreb was originally developed in medieval age from two settlements situated on two neighbouring hills: Gradec and Kaptol. In 17th century the town started to spread towards the river, but the first big expansion happened in 19th century when Zagreb became a regional capital within Habsburg Empire. Next important expansion happened after World War II, when people start to leave rural areas to get employment in growing industrial sector of Zagreb. It caused construction of large housing development across the river. The latest large expansion happened after 1990 when Zagreb became a capital of Republic of Croatia. Nowdays, City of Zagreb covers surface of 641 km2, while its surrounding area Zagreb County, which includes towns Velika Gorica, Zaprešic and Samobor, covers around 3,000 km2.

Figure 114: Zagreb area at different levels

IX.II.II POPULATION

In the last official census of 2011 the population of the City of Zagreb was 792,875. Zagreb metropolitan area population is slightly above 1.2 million inhabitants, as it includes the Zagreb County. It is the only metropolitan area in Croatia with a population of over one million.

The majority of its citizens are Croats making up 92% of the city's population (2001 census).

Average density is 1,237 inhabitants per sqkm while urban density is 3,121 inhabitants per sqkm.

Figure 115: Population pyramid

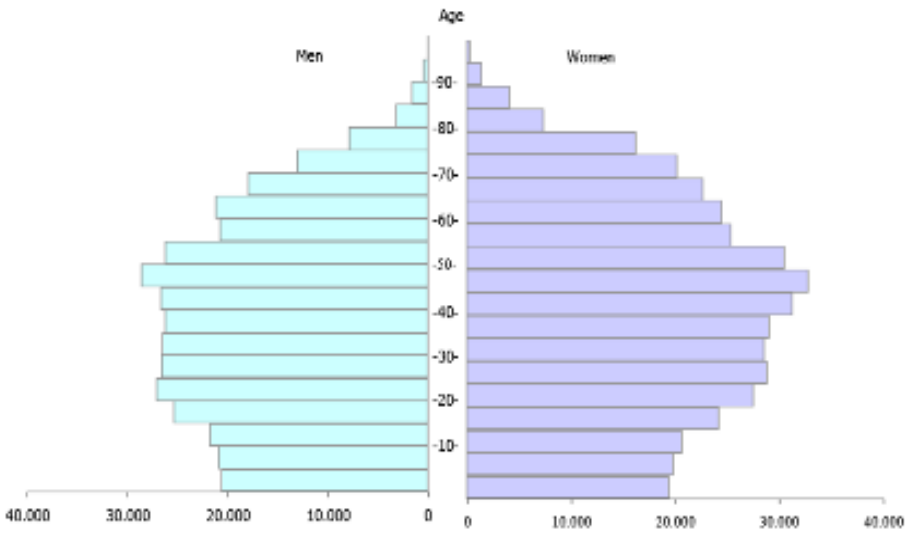
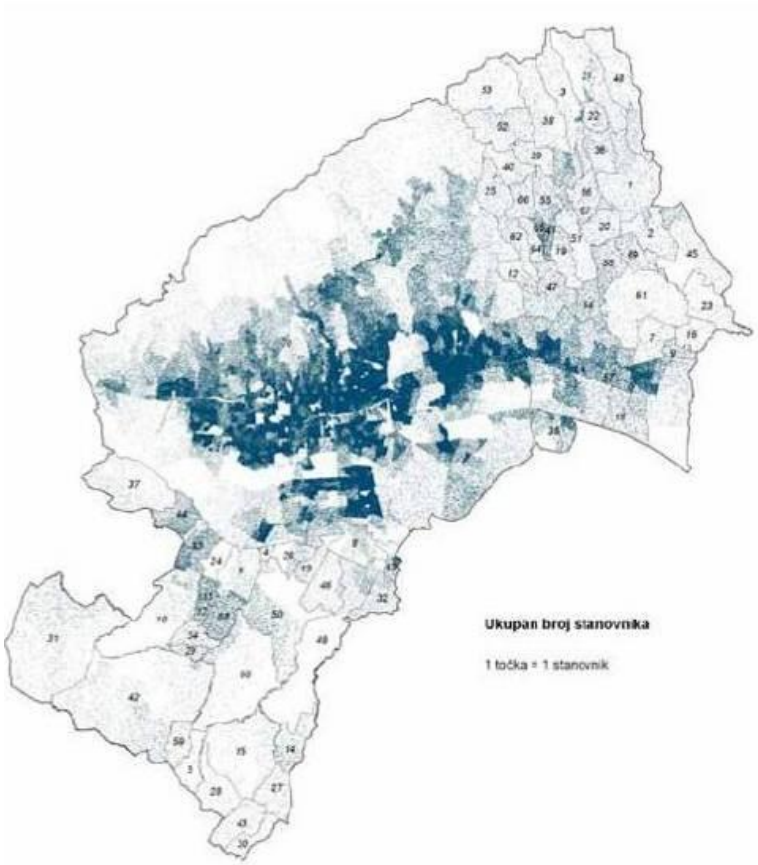


Figure 116: Population distribution



IX.II.III ECONOMY

Most important branches of industry are: production of electric machines and devices, chemical, pharmaceutical, textile, food and drink processing. Zagreb is an international trade and business centre, and an essential transport hub placed at the crossroads of Central Europe, the Mediterranean and the Balkans. Almost all of the largest Croatian as well as Central European companies and conglomerates such as Agrokor, INA, Hrvatski Telekom have their headquarters in the city. According to 2008 data, the city of Zagreb has the highest PPP and nominal gross domestic product per capita in Croatia at $32,185 and $27,271 respectively, compared to the Croatian averages of $18,686 and $15,758. The average net salary about € 900 is above the national average is about € 725. At the end of 2012, the average unemployment rate in Zagreb was around 9.5%. 34% of companies in Croatia have headquarters in Zagreb, and 38.4% of the Croatian workforce works in Zagreb, including almost all banks, utility and public transport companies. Companies in Zagreb create 52% of total turnover and 60% of total profit of Croatia in 2006 as well as 35% of Croatian export and 57% of Croatian import.

IX.III KEY STRATEGIES AND PROJECTS

The key strategic documents are City of Zagreb Development Strategy (2013), City of Zagreb Spatial Plan (2009) and Sustainable Energy Action Plan (2008).

IX.III.I STRATEGIES AND ACTION PLANS

STRATEGY FACTSHEET 1	
Title	City of Zagreb Development Strategy (ZagrebPlan)
Dimensions of KPI	All
Period	2011-2013 and 2014-2020
Strategy description	
Objective	ZagrebPlan is actually a development strategy, which for the desired vision, established long-term goals and priorities, detects measures and activities that should be carried out by the end of 2013. The strategy for the period of 2014-2020 is developed but it is still not adopted.
Measures	Set in corresponding plan
Targets	A. Competitive Economy B. Development of human resources C. Sustainable management of energy and environment D. High quality of city spaces, functions and services E. High quality of living and efficient management of development
Links and Contacts	
Promoter	City of Zagreb
Document/website	http://www.zagreb.hr/UserDocsImages/ZAGREBPLAN_summary_web.pdf

STRATEGY FACTSHEET 2	
Title	City of Zagreb Spatial Plan
Dimension of KPIs	All
Period	2009 - ongoing
Strategy description	
Objective	City of Zagreb Spatial Plan is a document having legal force and is determining main infrastructure corridors, forest land, building areas, requirements for implementation of all buildings and scope of lower level spatial plans.

STRATEGY FACTSHEET 2	
Measures	• Arrangement of main city functions; • Guidelines for conservation of landscape, natural, cultural and historical values; • Building conditions in different areas; • Conditions for environment protection; • Conditions for strategic city projects planning; • Obligations for production of lower level spatial plans and their scopes.
Targets	n.a.
Links and Contacts	
Promoter	City of Zagreb
Document/website	n.a.

ACTION PLAN FACTSHEET 3	
Title	Sustainable Energy Action Plan (SEAP)
Dimension of KPIs	Environment
Period	2008-2020
Action Plan description	
Objective	Zagreb city assembly accepted SEAP as a legitimate document on 11th conference in year 2010. With the adoption of SEAP Zagreb has taken a role as a leader of good practice and the best model for other counties and cities in Croatia. With decisive promotion of energy policy it has become an active participant in preventing global warming and the adverse effects of climate change.
Measures	About 50 measures on how to improve energy efficiency, increase use of renewable energy sources and reduce CO_2 emissions in the city area in public buildings, public lightning and transport sector.
Targets	• Reducing CO_2 emissions and energy consumption by at least 20%, thus increasing the share of energy from renewable sources to more than 20% by year 2020; • Reducing energy consumption in building, transportation and public lighting sectors; • Contributing to security and diversification of energy supply; • Increasing local energy independence and public awareness in the fields of energy and environmental protection; • Implementation of climate and energy targets set by European union and the Covenant of mayors initiative.
Links and Contacts	
Promoter	City of Zagreb

ACTION PLAN FACTSHEET 3	
Document/website	http://www.regea.org/en/key-projects/domestic-projects/sustainable-energy-action-plan-%28seap%29-for-the-city-of-zagreb.html

IX.III.II KEY PROJECTS

1. Railway reconstruction

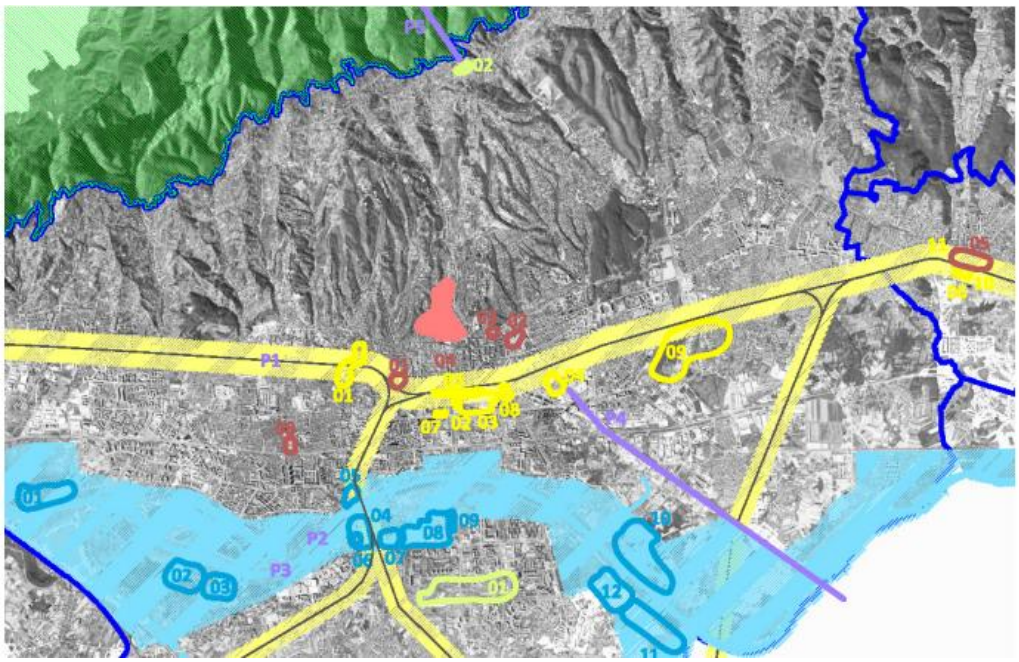
2. Development of spaces along river Sava

3. Urban renewal of old industrial, military and commercial areas

4. Regeneration of urban blocks in city centre

5. Landscape development (park Novi Zagreb and Medvednica)

Figure 117: Map of Zagreb's Strategic City Projects



Project FACTSHEET 1	
Title	Railway Denivelation Project
Dimension of KPIs	Economy, Social
Area of implementation (city, neighbourhood, etc.)	Whole corridor passing through City of Zagreb
Implementation period	n.a.

Project FACTSHEET 1	
Project description	
Aims	The aim of this project is reconstruction of existing railway system, while improving urban, suburban and regional connectivity and denivelation of railway particularly in the Zagreb city centre. By lifting or descending of existing railway valuable spaces would be left for development and better integration of historical (northern) and modern (southern) part of the city would be achieved.
Activities	• Stage 1: - strategic planning - consideration of few solutions - production of cost-benefit analysis
Promoters/Beneficiaries; Partnership	City of Zagreb and expert institutions
Financing	Various funding opportunities are considered.
Outcomes and impacts	Improving urban quality and city functions
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 118: Zagreb railway station

Project FACTSHEET 2	
Title	Zagreb on Sava
Dimension of KPIs	Environment, Economy
Area of implementation (city, neighbourhood, etc.)	Along entire flow of the river Sava in the City of Zagreb
Implementation period	2013 - ongoing

Project FACTSHEET 2	
Project description	
Aims	The concept design developed for the project provides a complete solution for protection, development and utilization of Sava river from Slovenian border to the town of Sisak. The new Sava – Sava canal would have the capacity needed for discharging big water waves around the city of Zagreb, which would enable the city of Zagreb a river flow within the river bed in all conditions. Development potential of Zagreb would be accomplished within the area of about 350 hectares with urban, transportation and recreational facilities along the river and on the river. Installation of hydro power plants with total electricity production capacity of 150 MW would provide 25% of the required capacity for the City of Zagreb. Construction of Zagreb river port near Velika Gorica would unleash the potential of maritime port of Rijeka and speed railway corridor Zagreb – Rijeka, integrating them into the system of Sava and Danube river navigation, all through Zagreb river port.
Activities	n.a.
Promoters/Beneficiaries; Partnership	Government of Republic of Croatia, City of Zagreb, various public agencies and expert institutions
Financing	Various funding opportunities are considered.
Outcomes and impacts	Improving urban quality and city functions; Environmental protection and sustainable management of natural resources and energy.
Links and Contacts	
Promoter	Government of Republic of Croatia, City of Zagreb
Website	http://zagrebnasavi.hr/

Figure 119: River Sava and Zagreb

Project FACTSHEET 3	
Title	Zagreb Fair Ground - Strategic City Project
Dimension of KPIs	Economy
Area of implementation (city, neighbourhood, etc.)	City, Novi Zagreb area
Implementation period	2015 - 2030
Project description	
Aims	Zagreb wishes to transform its fair into an innovative urban area not only to fulfill its need for such space and facilities, but also to honor the tradition of Zagreb Fair which has always been a venue for presenting the modern-day achievements as well as a testimony of the economic strength. The proposed concept of development and transformation of Zagreb Fair is also reflected in the vision of Zagreb as an urban incubator of sustainable concept, entrepreneurship and new values.
Activities	• Stage 1: - preparation - strategic planning Result of the stage 1. is a draft of strategic directives for different time periods (short-term and long-term). • Stage 2: - evaluation - defining strategic directives After stage 2. and completed evaluation which includes internal discussions, round-tables, thematic discussions, exhibitions, public consultations, publications the final strategic directives for succesful project implementation should be defined. • Stage 3: - financing and negotiation - project implementation - project monitoring - project evaluation
Promoters/Beneficiaries; Partnership	City of Zagreb, coordinated by the City Office of Strategic Planning and Development of the City
Financing	After reaching some development stage of the project, the City will search for investors and EU funding opportunities.
Outcomes and impacts	Competitive economy / Improving urban quality and city functions / Improving the development of management system
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 120: Zagreb Fair Ground

Project FACTSHEET 4	
Title	Paromlin
Dimension of KPIs	Economy, Social
Area of implementation (city, neighbourhood, etc.)	City centre
Implementation period	2006 - ongoing
Project description	
Aims	The main aim of this project is to renew and reconstruct one of the Zagreb's most important industrial architecture monuments, placed on the crossroad between historical and modern city developments, by giving it a new public meaning and function.
Activities	• Stage 1: Several architectural competitions conducted in order to rethink existing space and select the best solution for former factory in the city centre.
Promoters/Beneficiaries; Partnership	City of Zagreb, coordinated by the City Office of Strategic Planning and Development of the City
Financing	After reaching some development stage of the project, the City will search for EU funding opportunities.
Outcomes and impacts	Improving urban quality and city functions
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 121: one of selected competition projects for Paromlin

Project FACTSHEET 5	
Title	Green Campus Borongaj
Dimension of KPIs	All
Area of implementation (city, neighbourhood, etc.)	City, Borongaj neighbourhood
Implementation period	2014 - 2020 (postponed)
Project description	
Aims	The project, currently considered as the biggest investment in Croatia, aims to accommodate around 35,000 students within 20 faculties, 15 high technology institutions and 20 agencies in one area, formerly used as barrack. It is imagined as 'University City' in the city build according to the highest sustainability standards and new technologies developed during various university research projects.
Activities	• Stage 1: Conduction of architecture and urban planning competition for Campus Borongaj; • Stage 2: Adoption of Urban Developement Plan for Campus Borongaj; • Stage 3: Production of Feasibility Study; • Stage 4: Construction of campus in 4 phases.
Promoters/Beneficiaries; Partnership	University of Zagreb, City of Zagreb
Financing	The project will be applied for EU Funds.
Outcomes and impacts	Competitive economy / Development of human resources / Improving the quality of living / Environmental protection and sustainable management of natural resources and energy
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 122: Campus Borongaj Project

Project FACTSHEET 6	
Title	Jakuševac Landfill Rehabilitation
Dimension of KPIs	Environment
Area of implementation (city, neighbourhood, etc.)	City, Jakuševac neighbourhood
Implementation period	1998 - 2018
Project description	
Aims	The Zagreb Solid Waste Management Programme comprises the rehabilitation of Jakuševac landfill site situated near the housing neighbourhood and local water supply. The existing landfill is supposed to be totally recovered and closed until 2018, respectively after the city finds another waste treatment solution.
Activities	n.a.
Promoters/Beneficiaries; Partnership	City of Zagreb, Zagreb Holding
Financing	European Bank for Reconstruction and Development
Outcomes and impacts	Environmental protection and sustainable management of natural resources and energy
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 123: Jakuševac Landfill Rehabilitation

Project FACTSHEET 7	
Title	Medvednica cable car reconstruction
Dimension of KPIs	Environment, Social
Area of implementation (city, neighbourhood, etc.)	City, Podsljeme area and Medvednica mountain peak
Implementation period	n.a.
Project description	
Aims	The objective of the project is making Medvednica mountain more accessible and providing new facilities to Podsljeme housing neighbourhoods, by reconstructing old cable car and extending it on the bottom side towards new station planned to be build in Podsljeme neighbourhood.
Activities	n.a.
Promoters/Beneficiaries; Partnership	City of Zagreb
Financing	n.a.
Outcomes and impacts	Improving urban quality and city functions / Improving the quality of living
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 124: Old cable car

Project FACTSHEET 8	
Title	Zagreb Technology Park
Dimension of KPIs	Economy
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	n.a.
Project description	
Aims	The main objective of the project is to enable sustainable regional development and improve regional competitiveness by reinforcing a larger number of new technology-based companies, attracting new investment into the technology park and creating now job positions in accordance with sustainable development.
Activities	• Stage 1: Concept and the basic infrastructure (identification of key innovative companies and analysis of their needs, drawing up a feasibility study, preparation of project documentation for the purpose of building technological infrastructure) • Stage 2: Infrastructural works on a defined location (building and equipping of facilities in line with the prepared documentation from stage 1, setting up of training programs according to entrepreneurs' needs, mapping of institutions, companies and other organizations as potential users of TPZ services) • Stage 3: Production center – intended for medium-size and big businesses (establishing partnership within a wide entrepreneurial zone in Zagreb's environs, continuous work on the preparation of new projects echoing identified needs) • Stage 4: venture capital (VC) accelerator (development of accelerator programs within the infrastructure of the technology park, implementation and utilization of available EU programs for entrepreneurial funding through VC funds)

Project FACTSHEET 8	
Promoters/Beneficiaries; Partnership	City of Zagreb and Zagreb Holding
Financing	The project was applied for and adopted in the Ministry of Regional Development and EU Funds' call for submitting project ideas for the Regional Development Project Preparation subprogram
Outcomes and impacts	Competitive economy / Development of human resources
Links and Contacts	
Promoter	City of Zagreb
Website	http://www.raza.hr/eng/Development-projects/Ongoing-projects/Zagreb-Technology-Park

Project FACTSHEET 9	
Title	Urban Gardens Project
Dimension of KPIs	All
Area of implementation (city, neighbourhood, etc.)	Various city areas outside city centre
Implementation period	2013 - ongoing
Project description	
Aims	The main aim of the project is enabling citizens to temporarily use small cultivable plots in the city for production of food, spices and flowers for their own needs. Beside sustainable use of the land owned by the city, the project will have many positive impacts like improved availability of healthy food, protection of city nature and biodiversity, promotion of healthy lifestyle and creating new relationships between citizens.
Activities	• Stage 1: Production of assessment of potential locations for public urban gardens as a respond to civil iniciatives requesting the space for urban gardening • Stage 2: Providing selected locations with basic infrastructure and facilities • Stage 3: Public call for getting the plot in lease
Promoters/Beneficiaries; Partnership	City of Zagreb, coordinated by the City Office for Agriculture and Forestry
Financing	City of Zagreb
Outcomes and impacts	Improving urban quality and city functions / Improving the quality of living
Links and Contacts	
Promoter	City of Zagreb
Website	n.a.

Figure 125: One of Zagreb's urban gardens

IX.IV CASE STUDY CITY ASSESSMENT

This chapter includes details on the actual collected indicators for the case study Zagreb. We indicate the actual geographical coverage and data source for each indicator. The collected data were inserted on the joint online platform created by the WP3 leader.

IX.IV.I ENVIROMENTAL PERFORMANCE

The indicators on environmental performance are taken from the Sustainable Energy Action Plan (SEAP) and Zagreb Plan strategy.

Table 82: Actual collected indicators for environmental dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR
Biodiversity	Variation rate of ecosystem protected areas	Percentage	2012
Energy	Energy intensity variation rate	Toe/euro	2006
		Toe	2008
	Variation rate of energy consumption by sectors	Percentage	2003
			2012
Climate and Air Quality	Variation rate of carbon emissions intensity	Ton CO2/euro	2003
		Ton CO2	2012
	Variation rate of carbon emissions by sector	Ton CO2	2011
Transport and mobility	Variation share of sustainable transportation	Percentage	2001

SUB-DIMENSION	INDICATOR	UNIT	YEAR
Waste	Variation rate of urban waste generation	Kg/person/year	2007 2011
	Variation rate of urban waste recovery	Percentage	2007 2012
Water	Water losses variation rate	m3/person/year	2003 2012
Buildings and Land Use	Energy-efficient buildings variation rate	Percentage	2007 2012
	Urban building density variation rate	Nº/ km2	2003 2012

ENV 01: VARIATION RATE OF ECOSYSTEM PROTECTED AREAS

	2001	2011
Total (km2)	96,83	85,88
Percentage (%)	15,1	13,4

Geographical coverage: City
Data source: Zagreb Plan

ENV 02: ENERGY INTENSITY VARIATION RATE

	2006	2008
Toe/euro	101,4	79,7

Geographical coverage: City
Data source: Zagreb Plan

ENV 03: VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

	2003	2012
Residential and commercial	53,5%	53,9%
Industry	17,5%	15,1%
Transportation	29%	31%

Geographical coverage: City
Data source: SEAP

ENV 04: VARIATION RATE OF CARBON EMISSIONS INTENSITY

	2006	2008
Ton CO2/euro	0,00024	0,000189
Ton CO2	2.732	2.769

Geographical coverage: City
Data source: SEAP

ENV 05: VARIATION RATE OF CARBON EMISSIONS BY SECTOR

	2008
Buildings [t CO2]	1.007.443,1
Transportation [t CO2]	1.731.927,4
Illumination [t CO2]	29.157,6
Industry [t CO2]	3.555.076,5

Geographical coverage: City
Data source: SEAP

ENV 06: VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

	2001	2011
Public transport	36,8%	35%
Walking	25,4%	25%
Cycling	0,7%	3,0%

Geographical coverage: City
Data source: Zagreb Plan

ENV 07: VARIATION RATE OF URBAN WASTE GENERATION

	2008	2011
Kg/person/year	465	378

Geographical coverage: City
Data source: Statistical Yearbook

ENV 08: VARIATION RATE OF URBAN WASTE RECOVERY

	2008	2011
Recycling	3,3%	5,6%

Geographical coverage: City
Data source: Statistical Yearbook

ENV 09: WATER LOSSES VARIATION RATE

	2003	2012
m3/person/year	67,22	67,64

Geographical coverage: City
Data source: Statistical Yearbook

ENV 10: ENERGY-EFFICIENT BUILDINGS VARIATION RATE

Geographical coverage: City
Data source: N/A

ENV 11: URBAN BUILDING DENSITY VARIATION RATE

	2001	2011
Nº/ km2	1.214	1.228

Geographical coverage: City
Data source: Statistical Yearbook

IX.IV.II SOCIAL PERFORMANCE

The overview of actual collected indicators representing the social performance of the city and data source is listed in Table 57. Each indicator is shown in more detail below. All social indicators are found in Statistical Yearbook.

Table 83: Actual collected indicators for social dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	DATA SOURCE
Social Inclusion	Variation rate of unemployment	Percentage	2003-2012	Statistical Yearbook 2013
	Variation rate of poverty level	Percentage	2006-2013	Eurostat

SUB-DIMENSION	INDICATOR	UNIT	YEAR	DATA SOURCE
	Population with tertiary education level by gender and its variation rate	Percentage	2001, 2011	Statistical Yearbook 2013
	Average life expectancy and its variation rate	Average Nº, %	2008-2013	Statistical Yearbook 2013
Public services and Infrastructures	Variation rate of green space availability	Percentage		Statistical Yearbook 2013
Governance effectiveness	Existence of monitoring system for emissions reductions	Yes/No Description	2013	Zagreb Plan

SOC 01: VARIATION RATE OF UNEMPLOYMENT LEVEL, PERCENTAGE, 2006-2012

	2006	2007	2008	2009	2010	2011	2012
Total unemployment	35.761	28.124	26.184	34.112	39.900	38.900	45.388
Male (%)	3,64	3,12	2,52	3,40	4,08	4,61	4,79
Female (%)	5,56	4,68	3,68	2,90	4,32	4,79	4,71

Geographical coverage: City
Data source: Statistical Yearbook

SOC 02: VARIATION RATE OF POVERTY LEVEL, PERCENTAGE, 2007-2012

	2007	2008	2009	2010	2011	2012
%	19.0	18.9	20.2	20.6	21.1	20.5

Geographical coverage: Croatia
Data source: Statistical Yearbook

SOC 03: POPULATION WITH TERTIARY EDUCATION LEVEL BY GENDER AND ITS VARIATION RATE, 2001 AND 2011

	2001	2011
Total	147.480	195.326
Male (%)	49.0	45.6
Female (%)	51.0	54.4

Geographical coverage: City
Data source: Statistical Yearbook

SOC 04: AVERAGE LIFE EXPECTANCY AND ITS VARIATION RATE, 2003-2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Average	75.6	76.6	76.4	76.9	76.7	77.2	77.2	77.6	78.1	78.8
Male	72.0	73.2	72.9	73.6	73.6	73.7	74.2	74.9	75.0	75.6
Female	78.8	79.5	79.5	79.9	79.8	80.3	79.9	80.0	80.9	81.6

Geographical coverage: City
Data source: Statistical Yearbook

SOC 05: VARIATION RATE OF GREEN SPACE AVAILIBILITY

	2006	2007	2008	2009	2010	2011	2012
Forests (km^2)	168.8	169.1	90.46	88.54	95.73	92.83	92.85
Parcs (km^2)	0.573	0.573	0.592	0.592	0.592	0.592	0.592
Grass surfaces (km^2)	9.334	9.839	9.977	10.108	10.285	10.285	10.319

Geographical coverage: City
Data source: Statistical Yearbook

SOC 06: EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

There are currently 6 monitoring systems in the city territory for tracking emissions and air quality.

Geographical coverage: City
Data source: Zagreb Plan

IX.IV.III ECONOMIC PERFORMANCE

The overview of actual collected indicators representing the economic performance of the city, their geographical coverage and data source is listed in Table 58Table 57. Each indicator is shown in more detail below.

Table 84: Actual collected indicators for economic dimension

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGRAPHICAL COVERAGE	DATA SOURCE
Sustainable economic growth	GDP at current market prices	EUR/inhabitant	2002-2011	City	Statistical Yearbook
	GDP at current prices by sectors and its Variation rate	Percentage	2003, 2012	City	Statistical Yearbook
	Employment by sectors and its variation rate	Percentage	2001, 2011	City	Statistical Yearbook
	Business demography	Nº	2010	City	N/A

ECO 01: GDP AT CURRENT MARKET PRICES

	2003	2004	2005	2006	2007	2008	2009	2010
Total	11,527	12,701	14,216	15,567	16,766	18,554	17,814	18,645

Geographical coverage: City
Data source: Statistical Yearbook

ECO 02: GDP AT CURRENT PRICES BY SECTORS AND ITS VARIATION RATE

	2003	2009
Agriculture, forestry	5,7 %	5,9 %
Industry	18,0 %	16,7 %
Commercial	11,8 %	9,5 %
Tourism	3,6 %	3,9 %
Business sector	17,0 %	21,3 %

Geographical coverage: City
Data source: Statistical Yearbook

ECO 03: EMPLOYMENT BY SECTORS AND ITS VARIATION RATE

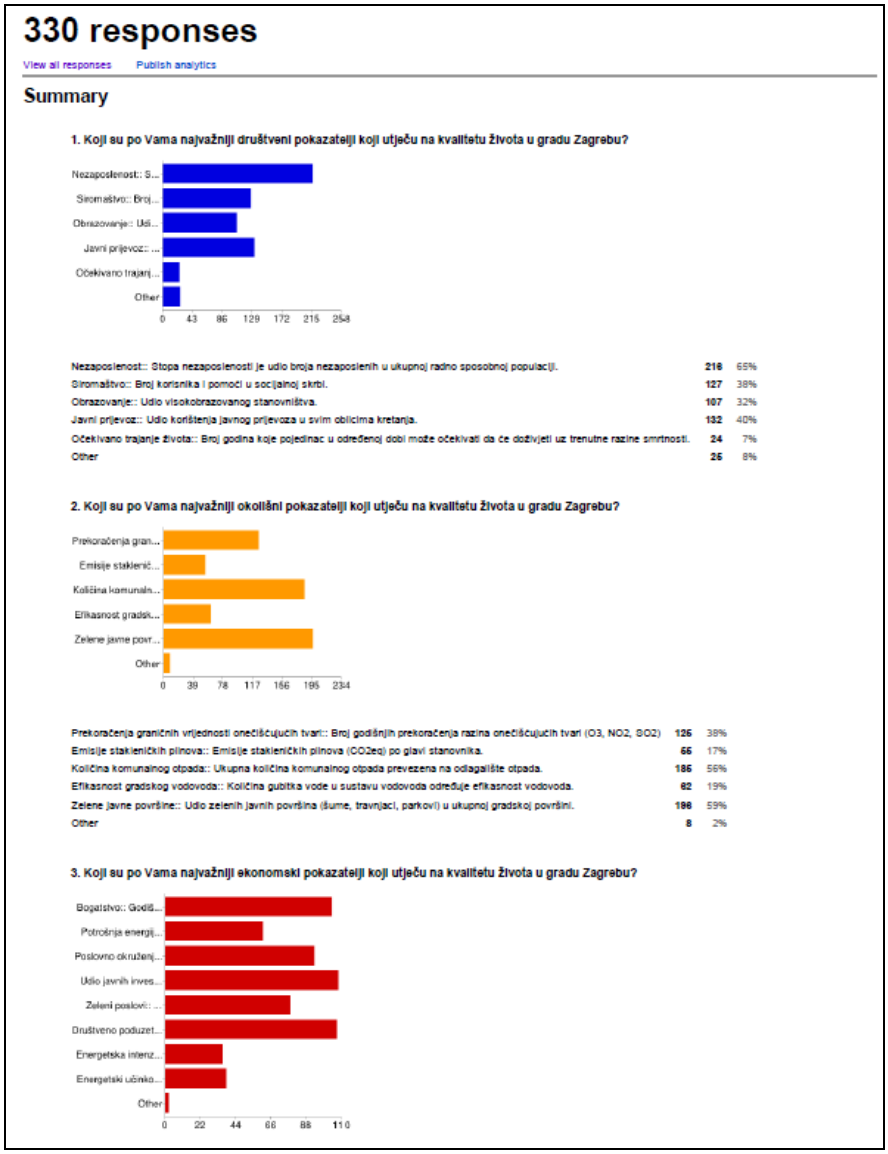
	2009	2010	2011	2012
Services (%)	75,7	77,3	78,5	79,3
Industry (%)	23,8	22,2	21	20,22
Agriculture (%)	0,4	0,39	0,42	0,43

Geographical coverage: City
Data source: Statistical Yearbook

IX.V FINDINGS AND KEY CHALLENGES

KPI were tested during the Initial Assessment Workshop as well as through online survey with citizens with more or less similar answers. The critical social factors in both groups are: level of unemployment, poverty level and share of green areas. The critical environmental factors are: public transportation and municipal waste management. Highlighted economy indicators are level of social entrepreneurship, business survival of start ups, and GDP per capita. It is interesting to note that citizens (and workshop participants) did not recognize CO_2 emissions as the key performance indicator, although each measure they have selected have a direct or indirect impact on CO_2 emission.

Table 85- The results from online survey for citizens on KPI



330 responses

View all responses Publish analytics

Summary

1. Koji su po Vama najvažniji društveni pokazatelji koji utječu na kvalitetu života u gradu Zagrebu?

Nezaposlenost:: Stopa nezaposlenosti je udio broja nezaposlenih u ukupnoj radno sposobnoj populaciji.	216	65%
Siromaštvo:: Broj korisnika i pomoći u socijalnoj skrbi.	127	38%
Obrazovanje:: Udio visokobrazovanog stanovništva.	107	32%
Javni prijevoz:: Udio korištenja javnog prijevoza u svim oblicima kretanja.	132	40%
Očekivano trajanje života:: Broj godina koje pojedinac u određenoj dobi može očekivati da će doživjeti uz trenutne razine smrtnosti.	24	7%
Other	26	8%

2. Koji su po Vama najvažniji okolišni pokazatelji koji utječu na kvalitetu života u gradu Zagrebu?

Prekoračenja graničnih vrijednosti onečišćujućih tvari:: Broj godišnjih prekoračenja razina onečišćujućih tvari (O3, NO2, SO2)	125	38%
Emisije stakleničkih plinova:: Emisije stakleničkih plinova (CO2eq) po glavi stanovnika.	55	17%
Količina komunalnog otpada:: Ukupna količina komunalnog otpada prevezena na odlagalište otpada.	186	56%
Efikasnost gradskog vodovoda:: Količina gubitka vode u sustavu vodovoda određuje efikasnost vodovoda.	62	19%
Zelene javne površine:: Udio zelenih javnih površina (šume, travnjaci, parkovi) u ukupnoj gradskoj površini.	196	59%
Other	8	2%

3. Koji su po Vama najvažniji ekonomski pokazatelji koji utječu na kvalitetu života u gradu Zagrebu?

IX.VI RECOMMENDATIONS

Well succeed transition towards a post-carbon city will not be possible without active participation of citizens and NGOs in shaping city strategic documents, such as post carbon city roadmap. There are growing number of citizens and transition groups in Zagreb paving the way towards the post carbon initiatives that should be taken into account. However, this bottom up approach would not be enough. Although City is participating in major EU and global initiatives that are aiming on CO_2 reduction in urban areas (such as Covenant of Mayors, ICLEI, Energy Cities etc.) it seems to not taking full advantage of such networks and projects in which they took part of. Lastly, City is lacking the strategic planning in general.

IX.VII CONCLUSIONS

Zagreb Plan strategy 2020 that is underway should be targeted place for post carbon city roadmap. This process should be taken in parallel. It will be of a great importance to feed in the Zagreb Plan strategy with the roadmap results. At the same time, there is a need to constantly promote and support citizen-driven post carbon initiatives that are sparsely happening in town but have a potential to raise the awareness among citizens on how to start the transition from individual level.

X CASE STUDY CITIES MILAN-TURIN

X.I DATA COLLECTION

To collect the data for the key performance the following two approaches have been followed:

- 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.

National/regional statistical offices, government departments, environment and energy agencies, research institutes and non-governmental organisations represent the main sources of the data.

All the indicators are collected for various points in time, in order to compare their evolution throughout this period. Ideally all indicators should be collected at the city and municipality levels. However, if an indicator is not available at this geographical level, then it would be collected for the province or for the region. 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.

X.II OVERVIEW OF THE CASE STUDY CITIES

X.II.I TERRITORY

MILAN

Milan is the administrative centre of the Lombardy region in the NUTS 1 area Nord-Ovest. It is Italy's second largest city, ranking after Rome. It is located in the Northern part of Italy, on the Lombard Plain, midway between the Po River and the foothills of the Alps. It is located at 122 meters above sea level. Due to its command of the rich plain of the Po and routes from Italy across the Alps, Milan has been one of the major cities of Europe since ancient times.

Milan displays a humid subtropical climate, with hot, humid summers with little rainfall and cool, winters. The average maximum temperature in July is around 28°C, and in January is 6°C. Snowfalls are relatively common in winter. Mean annual precipitation is around 1000mm. Moderate fog used to affect normal life in Milan. In recent years, however, the removal of rice fields from the southern neighbourhoods, the urban heat-island effect, and the reduction of pollution levels have made this phenomenon less common.

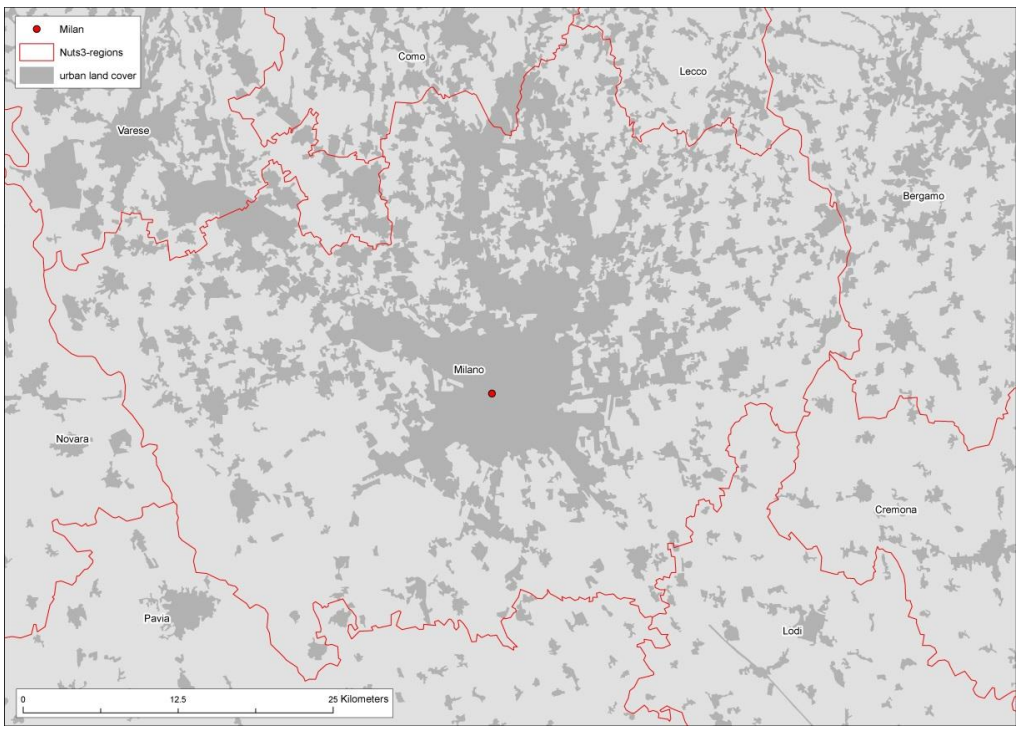
Three rivers, namely the Olona, the Lambro and the Seveso creek run through Milan—with the Olona and Seveso running mostly underground in artificial channels.

Milan is one of the main railway hubs in Italy and is served by numerous expressways. Milan has four subway lines, a rich tramway system with more than 20 lines, and a bus system with nearly 100 lines. Two international airports, Linate and Malpensa, connect Milan with the rest of the world.

Due to difficulties in finding the relevant statistical data, different levels of territorial aggregation had to be used throughout this report. The highest aggregation level is represented by the NUTS 2 Region "Lombardia", which is a relevant unit within the Italian administrative and political system. The Italian Regions have considerable political, legislative and administrative autonomy. For example, they have competencies, inter alia, for urban development, including the urban planning legislation, environmental policies, local/regional transport systems at the level which is relevant for commuting and connectivity within metropolitan areas.

The NUTS 3 level is another level of aggregation used for this report. It corresponds, within the Italian administrative hierarchy, to the Provinces (abolished as to the 31st of December 2015) and substituted, in the case of Milan, by the Milan Metropolitan area, which has the same delimitation as the former Provincia di Milano. In this case data collected corresponds to the "Provincia di Milano". Finally data has been used referring to the municipality of Milan ("Comune di Milano").

For this report, we tried to collect the data at the most disaggregated level, namely, the municipality level. Whenever data was not available at this fine level, we collected data at provincial level. In few cases, when neither municipality nor provincial level data was available, we had recourse to regional data.



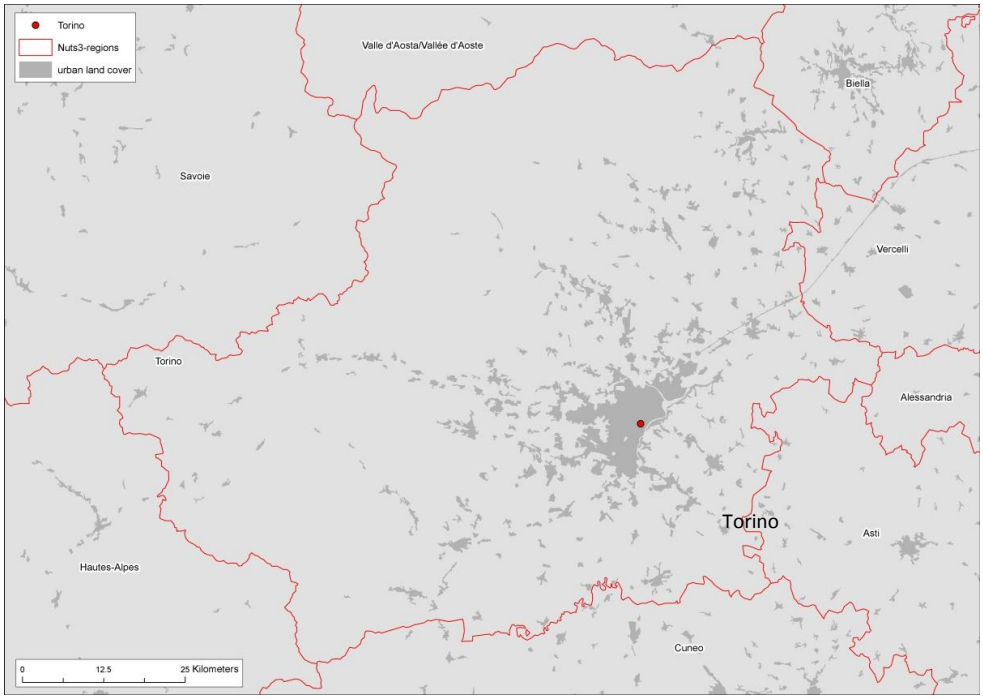


Figure 126: Provinces (NUTS3) level)

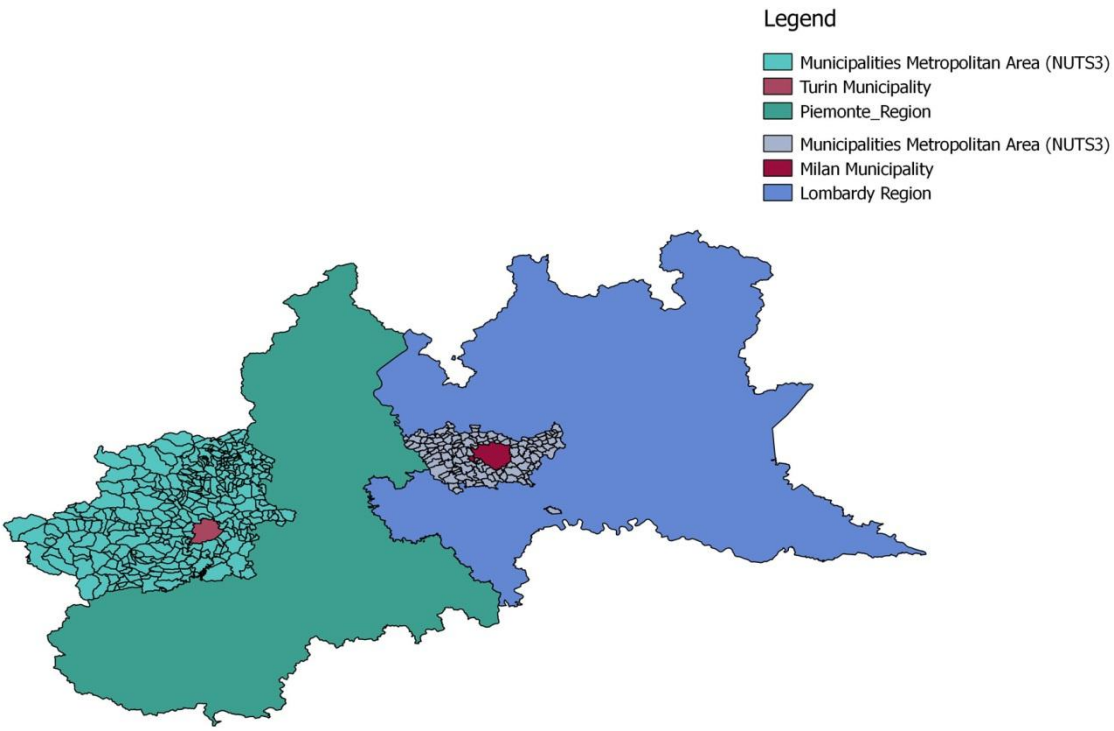


Figure127: Municipalities, Provinces (NUTS3) and Regions (NUTS2)

TURIN

Turin is the administrative centre of the Piedmont region in the NUTS 1 area Nord-Ovest. It is Italy's fourth largest city, ranking after Rome, Milan and Naples. It is located on the Western part of the Po valley, at the foothills of the Alps, at 239 meters above sea level.

Turin displays a humid subtropical climate, with hot, humid summers with little rainfall and cool, winters. The average maximum temperature in July is around 28°C, and in January is 6°C. Snowfalls are relatively common in winter. Mean annual precipitation is around 838mm.

The Po river crosses the city from South to North-East; two other rivers, Dora Riparia and Stura di Lanzo, flow through the territory of Turin into Po.

Turin is connected Eastward to Milan by a high-speed rail line, while Westward a similar infrastructure to Lyon in France is under construction. A metropolitan railway system connects Turin to the main cities of the province; the urban transport system is constituted by an automated subway, 9 tramway lines and about 100 bus lines. The airport of the city is Caselle, which ranks thirteenth in Italy for number of passengers.

The same warnings about statistical data for Milan are true for Turin. In this report data are collected at the municipal level whenever possible, otherwise at the level of Province ("Provincia di Torino", NUT3) or Region (Regione Piemonte, NUTS2).Milano (NUTS3 level)

X.II.II POPULATION

MILAN

The city had a population of 1'324'169 inhabitants in 2013; it covers an area of 182 square Km, with a population density of 7'271 inhabitants per square Km. The province of Milan (NUTS 3) on the contrary hosts 3'176'180 inhabitants in area of 1'580 square Km.

As the rest of Italy, Milan is characterised by an ageing population. In 2013, there were 310'279 inhabitants aged 65 or older, accounting for 23 percent of the city's population. Those aged 15 or less, 187'809 inhabitants, represented 14 percent of the whole population.

As of 2013, the Italian national institute of statistics ISTAT estimated that 194'991 foreign-born immigrants live in the Milan Urban Area (city of Milan), equal to nearly 15 percent of the city's population. The origin countries most represented in the Milan area are the Philippines (17%), Egypt (12&), China (11%), Peru (9%), Sri Lanka (6%), Ecuador (6%) and Romania (5%).

TURIN

The city had a population of 902'137 inhabitants in 2013; it covers an area of 130 square Km; the population density is 6'939 inhabitants per square Km. The province of Turin (NUTS 3) hosts 2'297'917 inhabitants in an area of 6'827 square Km.

In 2013, inhabitants aged 65 or older in the city of Turin were 224'307 (25 percent of the total population); 119'424 inhabitants (13 percent of the whole population) were aged 15 or less.

Foreign-born immigrants in the city of Turin in 2013 were 138'214, equal to 15 percent of the whole population. The origin countries most represented in the Milan area are Romania (39%), Morocco (14%), Peru (7%), China (5%), Albania (4%), Moldavia (4%) and Nigeria (3%).

X.II.III ECONOMY

MILAN

Milan is the main industrial and commercial city in Italy. It hosts the nation's largest stock exchange and represents the country's main banking center. Milan is world-wide known for its fashion and design center, especially for clothing and home furnishings. Manufactured products include textiles, furniture, motor vehicles, power tools, machinery, and chemicals.

According to the Global Metro Monitor, Milan is ranked amongst the richest cities in the world in terms of GDP per capita. Commodities account for 1 percent of Milan's total output. Construction accounts for 5 percent, business and finance 33 percent, manufacturing 21 percent, local non-market 16 percent, trade and tourism 15 percent, transport 6 percent, and utilities 3 percent.

Milan is not only a leading economic centre but also an important artistic and cultural centre. Important architectural and cultural attractions are the "Duomo" cathedral; the world-renowned opera house "Teatro alla Scala"; the "Galleria Vittorio Emanuele II", which is a covered arcade linking the Duomo's piazza with the Teatro alla Scala; and the "Castello Sforzesco" which is a castle built in the 15th century by Francesco Sforza, Duke of Milan. Moreover, Milan hosts many important churches, museums, art and design fairs (Triennale) and exhibitions.

TURIN

The Province of Turin is the third area in Italy in terms of GDP: it contributes to national GDP for 4.3%. According to Eurostat, gross value added is generated by manufacturing for 18%, construction (5%), wholesale and retail trade, transport, accommodation and food service activities (19%), ICT (7%), real estate (14%), financial and insurance activities (6%), professional, scientific and technical activities (10%), public administration, defence, education, human health and social work activities (14%), arts, entertainment and recreation (4%).

Turin is the most specialized area of Italy in industrial activities: it hosts design offices and factories of Fiat (now FCA – Fiat Chrysler Automobiles); other important industrial sectors are mechanics, aerospace, ICT, telecommunications.

Former a typical "one-company town" focused on the automotive sector, in the last twenty years Turin has greatly diversified its economy; it has maintained its industrial specialization, but at the same time it has increased its role as a cultural and touristic attractive pole in Italy. It has host the Winter Olympic Games in 2006, valorized its artistic heritage (in particular baroque monuments, and urban buildings of XIX century when Turin was the first administrative capital of the unified Italian Kingdom), increased its centrality as an

international pole in contemporary arts. It hosts several fairs and events about food, books, and arts.

X.III KEY STRATEGIES AND PROJECTS

X.III.I STRATEGIES AND ACTION PLANS

Table 86: Milan Strategy/Action Plan for Sustainable Energy and Climate

STRATEGY/ACTION PLAN FACTSHEET	
Title	PAES (Action Plan for Sustainable Energy and Climate)
Dimension of KPIs	Environmental, Social, Economic
Period	2009-2020
Strategy/Action Plan description	
Objective	Curb CO2 emissions and increase renewable sources of energy
Measures	Interventions involve public and residential buildings, public lighting, transports, energy production, and waste
Targets	20-20-20 target
Links and Contacts	
Promoter	AMAT, Municipality
Document/website	http://www.amat-mi.it/it/ambiente/cambiamenti-climatici/
Contact E-mail	info@amat-mi.it

Table 87: Milan Strategy/Action Plan for Mobility

STRATEGY/ACTION PLAN FACTSHEET	
Title	Pums (Sustainable Urban Mobility Plan)
Dimension of KPIs	Environment
Period	2012-present
Strategy/Action Plan description	

STRATEGY/ACTION PLAN FACTSHEET	
Objective	Sustainable mobility, make Milan a more liveable city, improve security
Measures	Improve the local public transport in terms of number of lines and service efficiency. Boost the connections between the regional railway system and the city public transport. Direct individuals' means of transport towards public as opposed to private transport. Increase pedestrian, soot free, and low speed areas. Reduce the number of street parking spaces. Extend the cycling path. Improve car sharing. Improve smart technologies. Make parking more efficient. Increase goods transport on railways.
Targets	Less pollution; fewer accidents
Links and Contacts	
Promoter	AMAT, Municipality
Document/website	http://www.amat-mi.it/it/ambiente/cambiamenti-climatici/
Contact E-mail	info@amat-mi.it

Table 88: Turin Strategy/Action Plan for Energy

STRATEGY/ACTION PLAN FACTSHEET	
Title	TAPE – Turin Action Plan for Energy
Dimension of KPIs	Environmental, Social, Economic
Period	2010-present
Strategy/Action Plan description	
Objective	Curb CO2 emissions and increase renewable sources of energy
Measures	Interventions involve public, industrial and residential buildings, public lighting, transports, energy production, and waste
Targets	20-20-20 target
Links and Contacts	
Promoter	Municipality

STRATEGY/ACTION PLAN FACTSHEET	
Document/website	http://www.comune.torino.it/ambiente/patto_sindaci/piano/index.shtml
Contact E-mail	informa.ambiente@comune.torino.it

Table 89: Turin Strategy/Action Plan for Mobility

STRATEGY/ACTION PLAN FACTSHEET	
Title	PUMS (Sustainable Urban Mobility Plan)
Dimension of KPIs	Environment
Period	2010-2020
Strategy/Action Plan description	
Objective	Increase the sustainability of the local mobility system
Measures	Grant and increase the accessibility in the city for people and goods; improve air quality; improve the quality of the urban environment; promote public transport; increase efficiency and safety of the road network; promote ITS; improve the governance in implementing the plan.
Targets	More balanced modal split; less congestion; less pollution; fewer accidents
Links and Contacts	
Promoter	Municipality
Document/website	http://www.comune.torino.it/geoportale/pums/cms/
Contact E-mail	info.viabilitaetrasporti@comune.torino.it

X.IV KEY PROJECTS

Table 90: Milan Project: EXPO

PROJECT FACTSHEET	
Title	EXPO
Dimension of KPIs	Social, Economic
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2015
Project description	
Aims	Under the slogan "Feeding the Planet, Energy for Life": EXPO aims to open up a dialogue between international players to exchange views on the problems of nutrition and the resources of our planet. *It proposes examples for technical and strategic innovation.*
Activities	Projects: WE-Women for Expo; Short Food Movie; Laboratorio Expo; Feeding Knowledge; Childrenshare, children and sharing; School Project; E015 Digital Ecosystem. Thematic areas: Future Food district; Children' s park; Biodiversity Park; Arts and Food
Promoters/Beneficiaries; Partnership	Municipality; Ministero dell'Economia e delle Finanze; Regione Lombardia; Provincia di Milano; Camera di Commercio Milano; Official Participants include 11 Countries; European Union, United Nations; ActionAid, Alliance2015; Caritas; Don Bosco Network; Faitrade International, Fondazione Triulza; Inter Press Service; Lions Clubs International; Oxfam; PlaNet Finance; Save the Children; WWF; WAA-AMIA/CONAF; New Holland Agriculture; KIP International School China; Corporate United Pavilion; Vanke; JooMoo; Accenture; Enel; Fiat Chrysler Automobiles; CNHIndustrial; Intesa San Paolo; Samsung; Selex ES; TIM
Financing	State, region, local funding; chamber of commerce
Outcomes and impacts	The exhibition will provide solutions to guarantee water and food for the entire world population, to increase food security while taking into account biodiversity. It will offer visitors the

PROJECT FACTSHEET	
	tools for finding their own answers to such issues. It will increase awareness and sensibility on nutrition, health and sustainable eating.
Main factors of success	Global audience
Reproducibility and transferability	Innovative solutions aim at replication
Links and Contacts	
Promoter	n.a.
Website	http://www.expo2015.org/en/index.html
Contact E-mail	n.a.

Table 91: Milan Project: Congestion Charge

PROJECT FACTSHEET	
Title	AREA C
Dimension of KPIs	Environment, Social
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2012-present
Project description	
Aims	Low Emission Zone (LEZ)
Activities	Congestion charge for all private vehicles entering the city centre
Promoters/Beneficiaries; Partnership	Municipality
Financing	Local see City of Milan Area C Economics (costs in 2012 € 7'1 million; revenue € 20'3 million Euro, benefits were used for enhancing public transport, bikesharing, biking lanes, etc.)
Outcomes and impacts	Reduce car congestion within the city, make the public transport more efficient, improve sustainable mobility, improve

PROJECT FACTSHEET	
	life quality by reducing the incidence of car accidents, and reduce air and noise pollution.
Main factors of success	Reduction of car traffic in the core zone, increasing use of public transport
Reproducibility and transferability	Yes, relates to similar initiatives in London, Stockholm
Links and Contacts	
Promoter	Municipality
Website	City of Milan, Area C
Contact E-mail	n.a.

Table 92: Turin Project: High Speed Railway

PROJECT FACTSHEET	
Title	Turin-Lyon high-speed railway line
Dimension of KPIs	Environmental, Economic
Area of implementation (city, neighbourhood, etc.)	From the municipal to the international level
Implementation period	2015-2025
Project description	
Aims	Creating a new arch of the TEN-T railway corridor 5 from Lisbon to Kiev, upgrading the present "traditional" railway link Turin-Lyon to a high-speed connection status.
Activities	Building the new railway line through a new tunnel under the Alps
Promoters/Beneficiaries; Partnership	Italian and French State, European Commission, Piedmont and Rhone-Alpes Region, LTF
Financing	European Union, Italy and France: 24 billion euros
Outcomes and impacts	Reductions of journey times between the two cities, increase of the socioeconomic relations for the city of Turin with the

PROJECT FACTSHEET	
	Western European cities
Main factors of success	Deadline in construction, actual budget, interconnection with local rail systems
Reproducibility and transferability	The high-speed rail lines are not new, but the Turin-Lyon case can be adopted as a "best practice" in integrating the new infrastructure in a wide-area strategy for promoting the territories it crosses
Links and Contacts	
Promoter	LTF Lyon-Turin ferroviare
Website	http://www.ltf-sas.com
Contact E-mail	n.a.

Table 93: Turin Project: Metropolitan Railway

PROJECT FACTSHEET	
Title	Metropolitan railway system
Dimension of KPIs	Environment, Social
Area of implementation (city, neighbourhood, etc.)	Metropolitan area
Implementation period	2009-2018
Project description	
Aims	A more balanced modal split in the mobility at the provincial level
Activities	Incrementing the number of trains, activating a regular interval timetable, planning the railways lines as a whole coordinated system
Promoters/Beneficiaries; Partnership	Metropolitan Mobility Agency, Piedmont Region, Trenitalia, GTT
Financing	European Union, Italy and France: 24 billion euros
Outcomes and impacts	An increased weight of rail transport in the passenger mobility

PROJECT FACTSHEET	
	at the provincial level; reduction of pollution and road congestion
Main factors of success	A coherent regional planning according to a TOD (Transit oriented development) can be crucial to the real success of the metropolitan railway system
Reproducibility and transferability	Yes, it relates to similar initiatives in Stockholm, Copenhagen, Munich, etc.
Links and Contacts	
Promoter	Metropolitan Mobility Agency
Website	www.sfmtorino.it/
Contact E-mail	info@mtm.torino.it

X.V CASE STUDY CITY ASSESSMENT

X.V.I ENVIROMENTAL PERFORMANCE

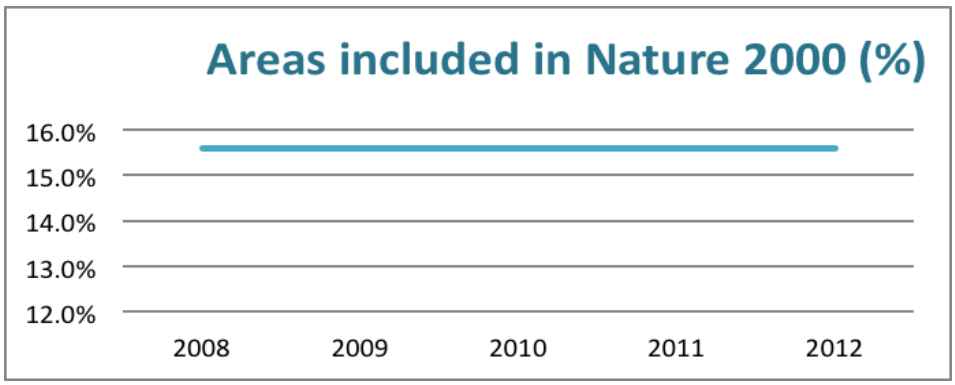


Figure 128: MILAN, Ecosystem protected areas

Source: Italian statistical office, ISTAT. Regional level (NUTS 2)

Nearly 16 percent of the total land area of the Lombardia region is included in protected natural areas of the Rete Natura 2000 network. This figure has held constant from 2008 onward. While Lombardia ranks only 14th among Italian regions for the percentage of territory placed under Rete Natura 2000 protection, it ranks first for the number of individual areas included.

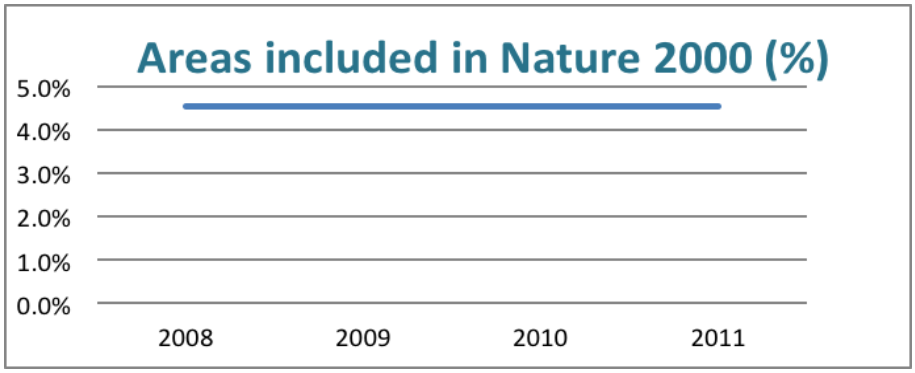


Figure 129: TURIN: Ecosystem protected areas

Source: Piedmont Region. Municipal level

Nearly 5 percent of the total land area of the Municipality of Turin is included in Nature 2000 network: there are one Sites of Community Importance, one Special Protected Area, three natural reserves. This figure has held constant from 2008 onward. At the provincial level, over 15% of the surface is classified as Sites of Community Importance. Piedmont region ranks 16th among the 21 Italian regions in terms of percentage of total surface included in Nature 2000 network.

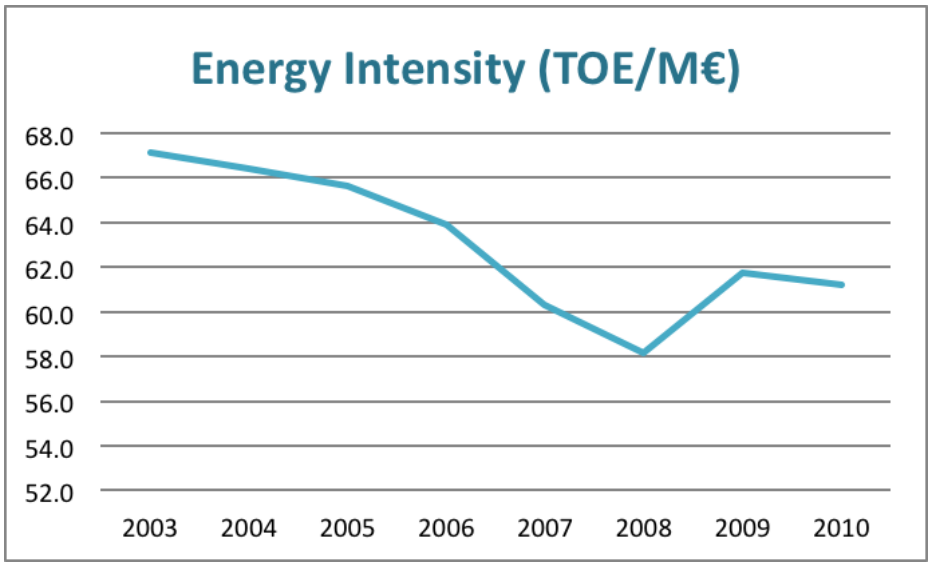


Figure 130: Milan, Energy Intensity

Source: author's calculations based on data from Finlombarda (Sirena), Bank of Italy and Eurostat. Provincial level (NUTS 3)

The energy intensity in the province of Milan declined from 2003 until 2008, grew from 2008 to 2009, and declined from 2009 to 2010. Unfortunately more recent data is not available. The growth of GDP, more than the decline in energy consumption, is responsible for the overall declining trend of the index. The largest reduction in energy intensity occurred between 2006 and 2007, with the 2007 index being six percent lower than the index in 2006. In 2008 the

energy intensity computed for Italy was 108.7, while the index for the Lombardia region (NUTS 2) was 93.8. Only few regions in Italy display lower energy intensity than Lombardia.

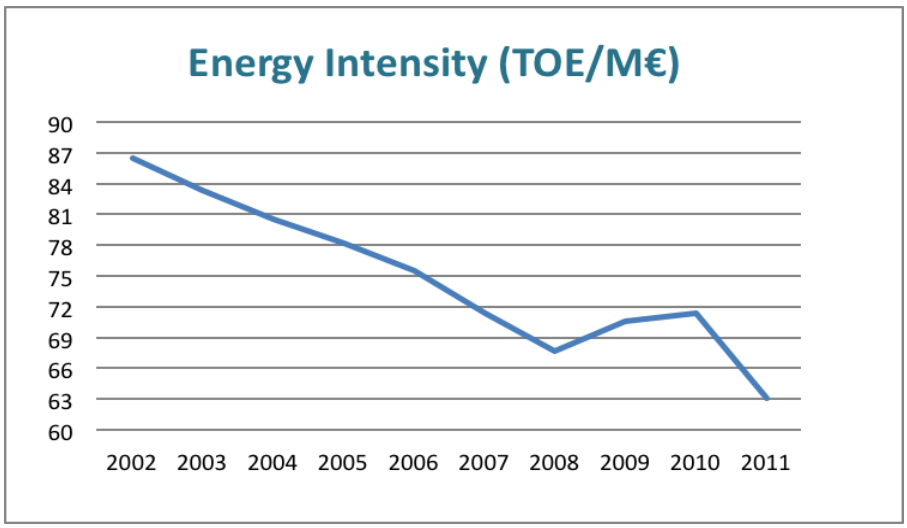


Figure 131: Turin, Energy intensity

Source: author's calculations based on data from Province of Turin. Provincial level (NUTS 3)

The energy intensity in the province of Turin shows a trend similar to Milan: it declined from 2002 until 2008, grew from 2008 to 2010, and declined from 2010 to 2011. More recent data are not available. Between 2002 and 2011, the energy consumption declined by 13%, while GDP increased by 20%. The decreasing weight of the industrial sector in the local economy is probably the main cause of the increasing efficiency in energy consumption.

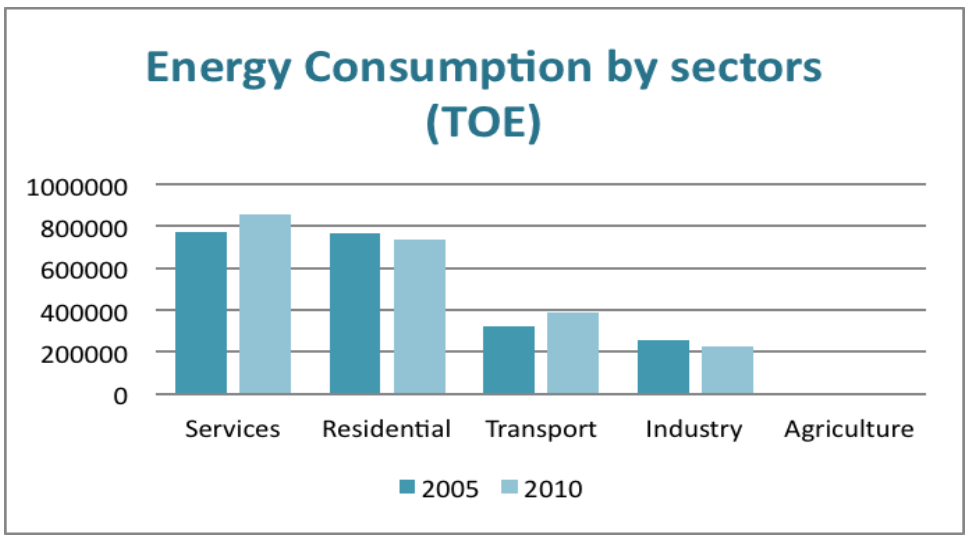


Figure 132: Milan, Energy consumption by sectors

Source: Finlombarda (Sirena). Municipal level

Services and residential are the sectors that contribute the most to the total energy consumption. While the residential sector displayed a reduction in consumption between 2005

and 2010, the energy consumption of the services grew. The transport sector increased consumption between 2005 and 2010, the industry sector slightly decreased, while consumption in the agricultural sector remained constant. Services contributed to 36.6 and 38.9 percent of total energy consumption in 2005 and 2010, respectively. The residential sector contributed 36.1 and 33.3 percent in the two years respectively. Transport contributed 15.2 and 17.5; industry 12 and 10.3 percent. Finally agricultural share was 0.04 percent in both years.

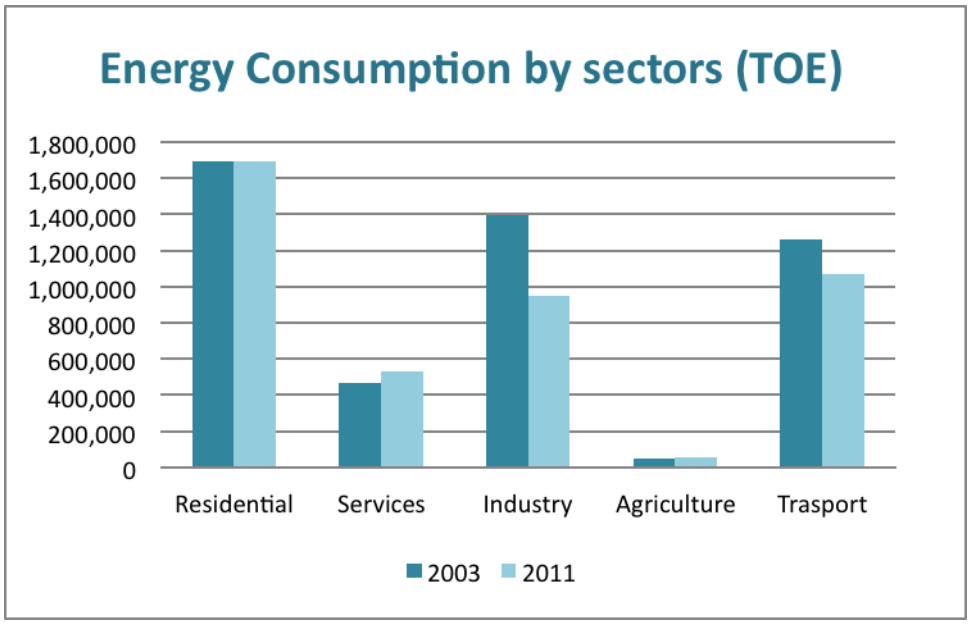


Figure 133: Energy consumption by sectors

Source: Province of Turin. Provincial level (NUTS 3)

Between 2003 and 2011, in the province of Turin energy consumption increased in agriculture (+18%) and in the tertiary sector (+14%), stayed stable for the residential sector and decreased in industry (-32%) and transport (-16%). 39% of the energy is consumed by residences, 25% by transport, 22% by industry, 12% by services, only 1% by agriculture.

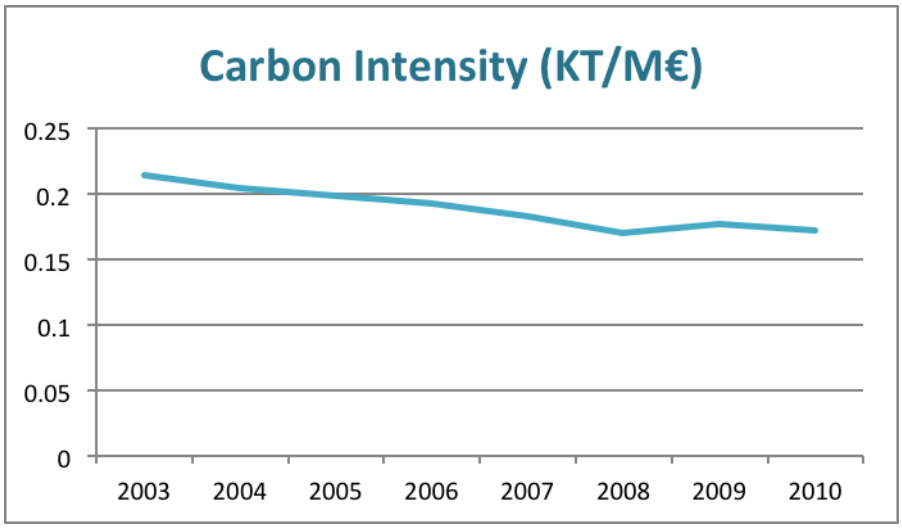


Figure 134: Milan, Carbon emissions intensity

The declining trend in energy intensity is reflected in a declining trend in carbon intensity. The index is computed as the ration of greenhouse gas emissions and GDP. In Lombardia the carbon intensity in 2010 was 0.23, while the average index for Italy was 0.3. Except for the year 2009, when the index displayed an increase compared to the previous year, the index declined every year on average by four percent.

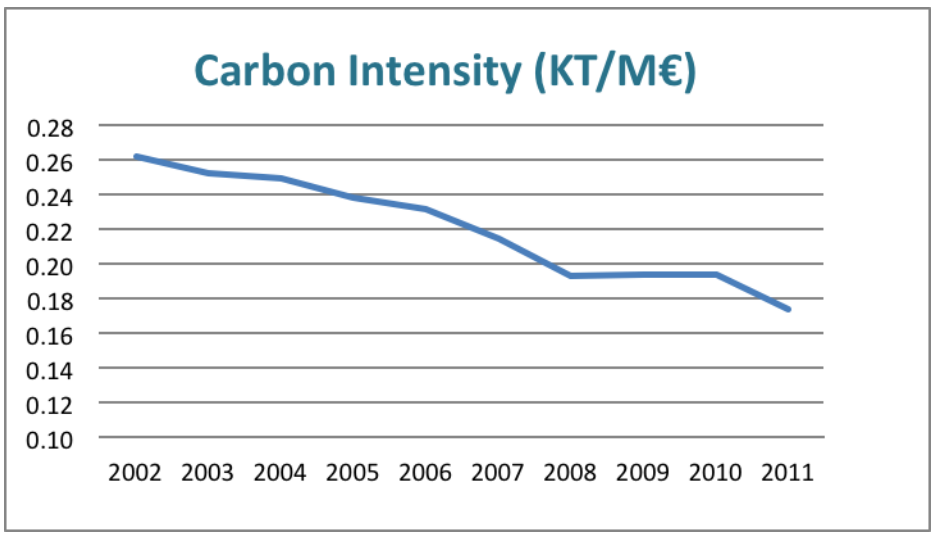


Figure 135: Turin, Carbon emissions intensity

Source: Province of Turin. Provincial level (NUTS 3)

Like Milan, also Turin shows a declining trend in carbon intensity. Between 2002 and 2011, emissions were reduced by 21%; because of the contemporary growth of GDP, carbon intensity in the same years decreased by one third.

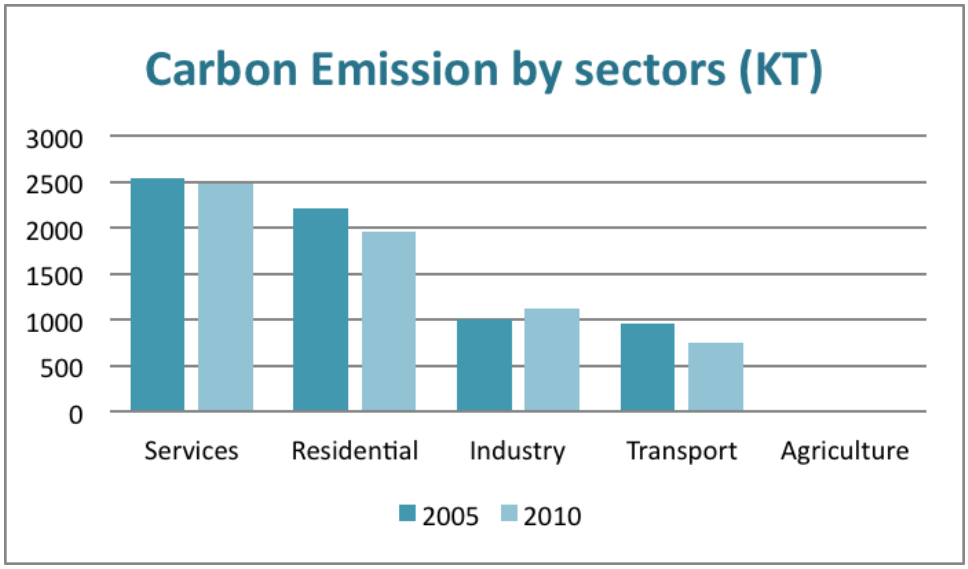


Figure 136: Milan, Carbon emissions by sector

Source: Finlombarda (Sirena). Municipal level

The service sector is the largest emitter of greenhouse gases, followed by the residential, the industry, the transport and the agriculture sectors. All sectors but industry display lower emissions in 2010 compared to 2005.

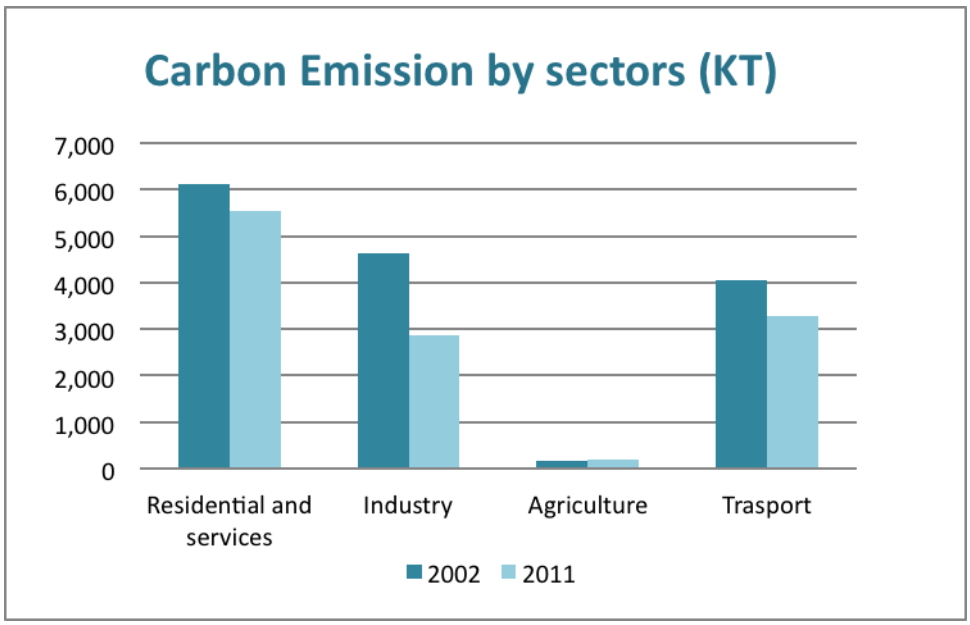


Figure 137: Turin, Carbon emissions by sector

Source: Province of Turin. Provincial level (NUTS 3)

Carbon emissions by sectors reflect the weight of the sector in energy consumption: residences and services contribute to almost 50%, 28% of the emissions is due to industry, 24%

to transport, 1-2% to agriculture. All sectors have reduced their emissions between 2002 and 2011, except agriculture.

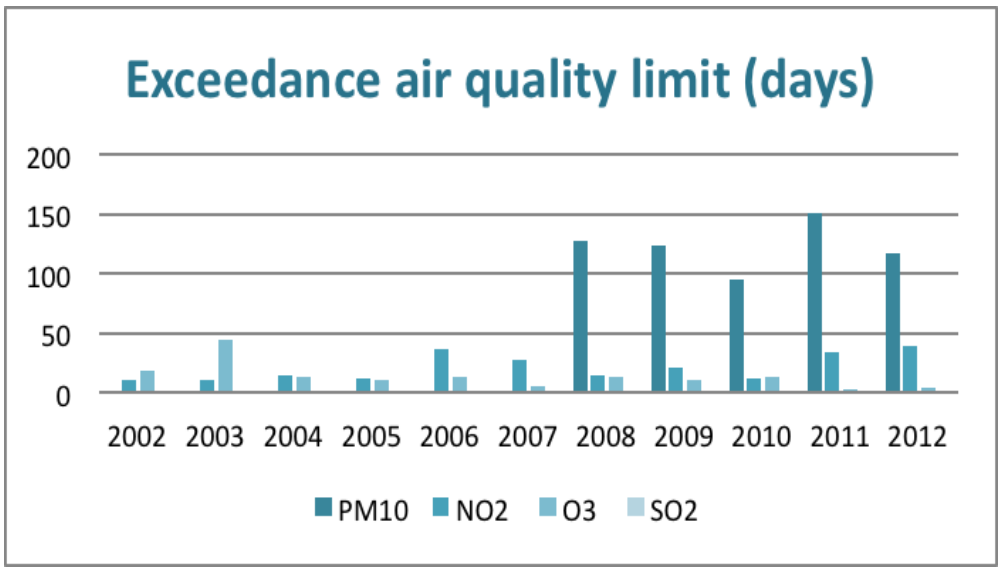


Figure 138: Milan: Exceedance rate of air quality limit values

Source: ARPA Lombardia, Rapporto sullo Stato dell'Ambiente in Lombardia. Municipal level

The air quality in Milan is a critical issue, in particular as the PM10 is concerned. During 2008 127 days were detected in which the concentration of PM10 exceeded the threshold limits established by the Directive 2008/50/CE. The days of exceedance were 123, 95, 151 and 117 in 2009, 2010, 2011, and 2012, respectively. A clear trend does not appear, indicating that much has still to be done to solve this problem in Milan. Exceedance of the threshold limits for both NO2 and O3 were registered in more than one time over the years. But while the peak of exceedance for S02 traces back to 2002, the value for O3 in 2012 is the highest recorded in the previous 10 years.

Milan is among the most polluted cities in Italy. According to the most recent report on environmental quality in Italian cities for 2013, Milan ranks 78 out of 83 cities considered with regards to the concentration of PM 10, and 59 out of 86 cities with regards to the number of days in which the threshold for O3 of 120 ųg/mc is exceeded.[34]

[34] Ambiente Italia (2014) Ecosistema Urbano; XXI Rapporto sulla qualità ambientale dei comuni capoluogo di provincia, pp 29,30

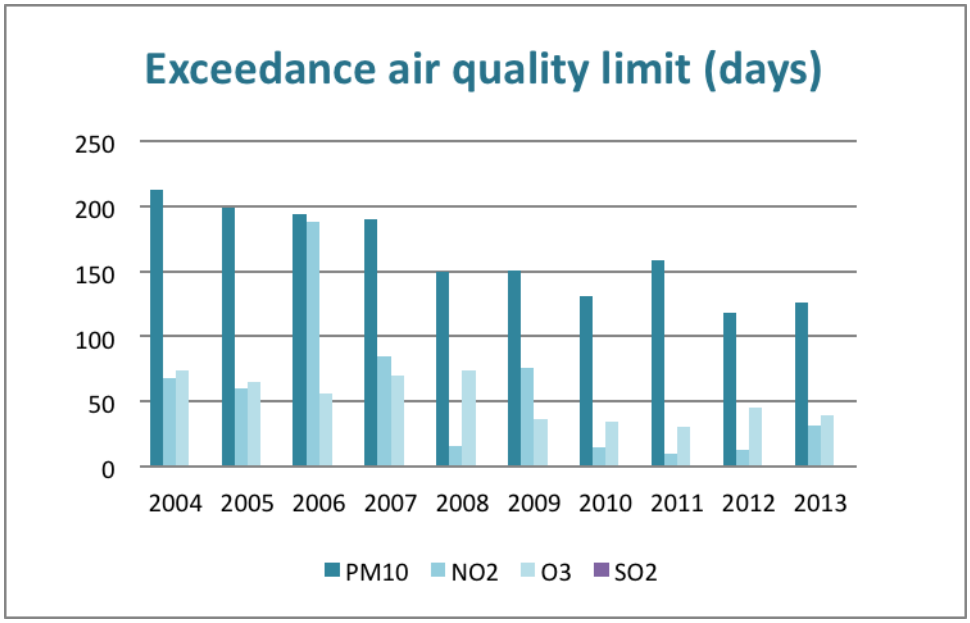


Figure 139:Exceedance rate of air quality limit values

Source: ARPA Piemonte. Municipal level

As for Milan, also for Turin air quality is a critical issue: both cities are in the Po valleys, where air stagnates because of the Alps and pollution concentrates at high level. Air quality is generally improving in Turin, but the situation is still critical: during 2013, 126 days (instead of 35) were detected in which the concentration of PM10 exceeded the threshold limits established by the Directive 2008/50/CE; the days were 31 (instead of 18) for N02 and 38 (instead of 25) for O3 (in this case, calculated as the average of the last three years).

According to the European Airbase, Turin is one of the most polluted great cities in Europe; according to Ecosistema urbano, Turin ranks 81 out of 83 cities considered with regards to the concentration of PM 10, 81 out of 82 for NO2, and 69 out of 86 for O3.

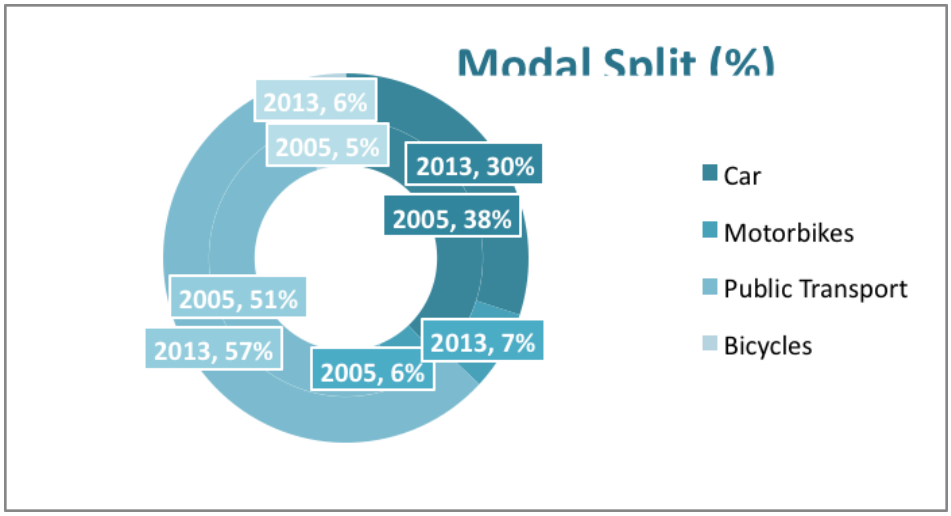


Figure 140: Milan: Share of sustainable transport means

Source: AMAT. Municipal level

Connections within the city are mainly done using the local public transport. Not only is public transport the most important means of connections, but its contribution has increased in the last decade, with the share being 51 percent and 57 percent in 2005 and 2013, respectively. The usage of cars has decreased between 2005 and 2013, while the use of private motorbikes has slightly increased. The use of bikes is still modest in Milan and increased only marginally between 2005 and 2013.

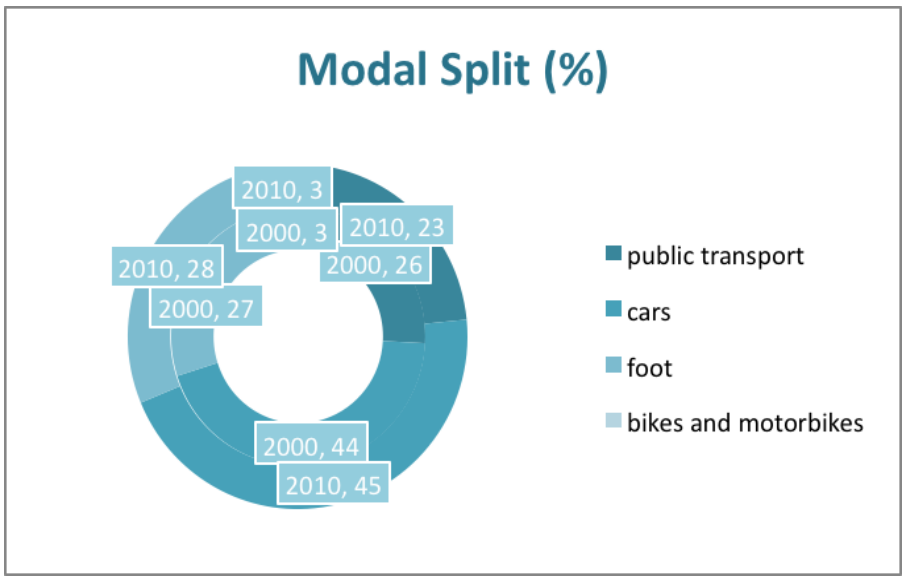


Figure 141: Turin, Share of sustainable transportation

Source: Metropolitan Mobility Agency. Municipal level

Between 2000 and 2010, private motorized mobility nearly accounted for half of the trips within the city of Turin. One fourth of journeys are made by foot, another fourth by public transport. Two-wheels (motorized and not) are nearly negligible.

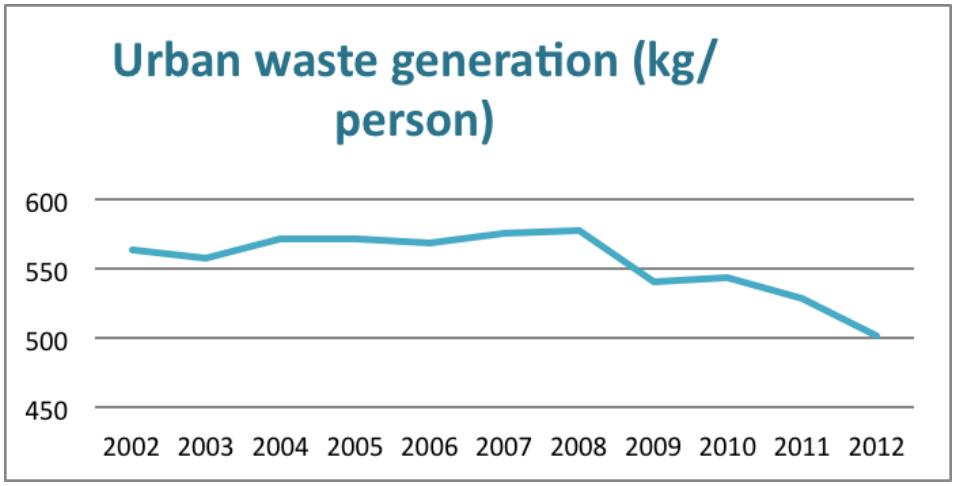


Figure 142: Milan, Urban waste generation

Source: Italian statistical office, ISTAT. Municipal level

Waste generation registered a certain decline in particular between 2008 and 2012. Waste production in 2012 was 11 percent lower than production in 2002.

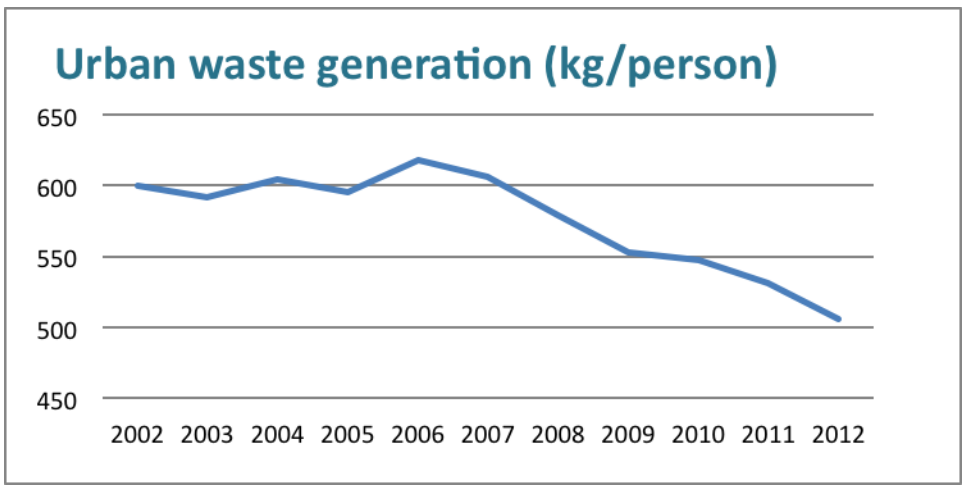


Figure 143: Turin, Urban waste generation

Source: Italian statistical office, ISTAT. Municipal level

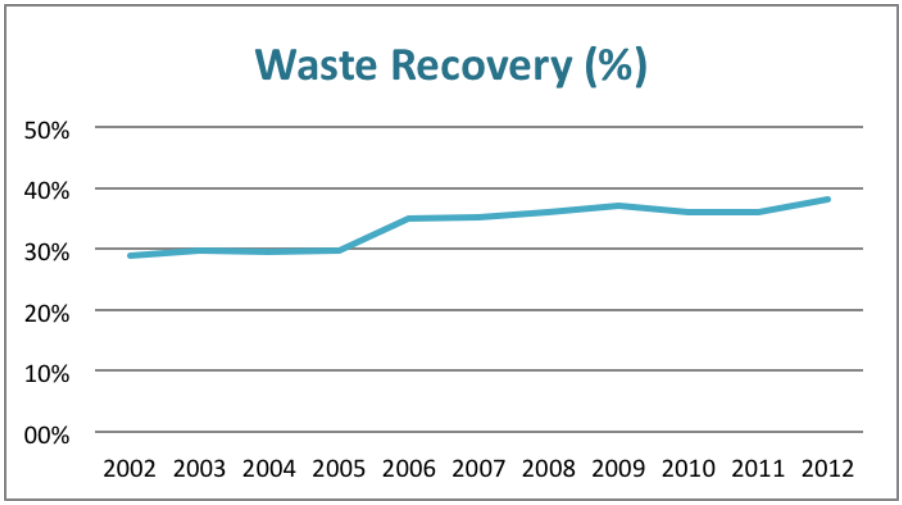


Figure 144: Milan, Urban waste recovery

Source: Italian statistical office, ISTAT. (Municipal level)

Waste recovery increased between 2002 and 2012. While in 2002 only 28 percent of waste was recycled, the share in 2012 reached 38 percent. For Italy overall, in 2012, 35 percent of waste was recovered, making Milan better than average. However, compared to some virtuous cities, such as Pordenone, Verbania, Novara, and Belluno, where more than 70 percent of waste is recovered, Milan lags behind.

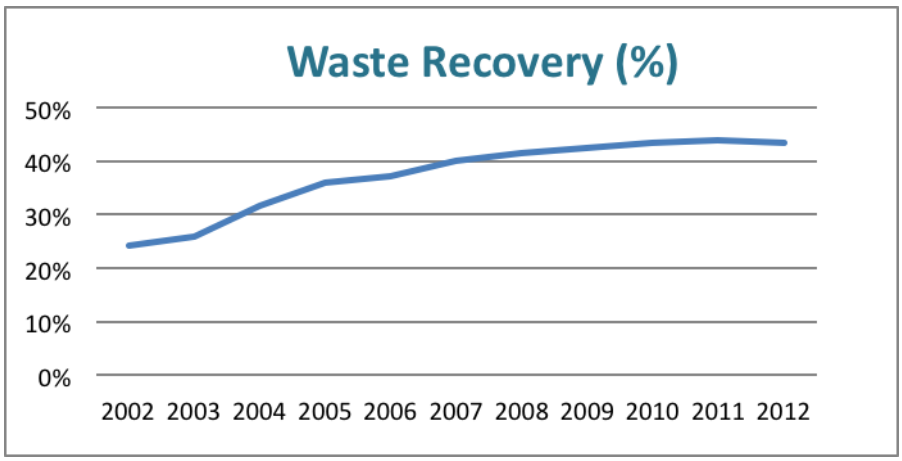


Figure 145: Turin, Urban waste recovery

Source: Italian statistical office, ISTAT. Municipal level

Waste recovery in Turin increased between 2002 and 2012, when it reached 43%, 23 percentage points higher than in 2002.

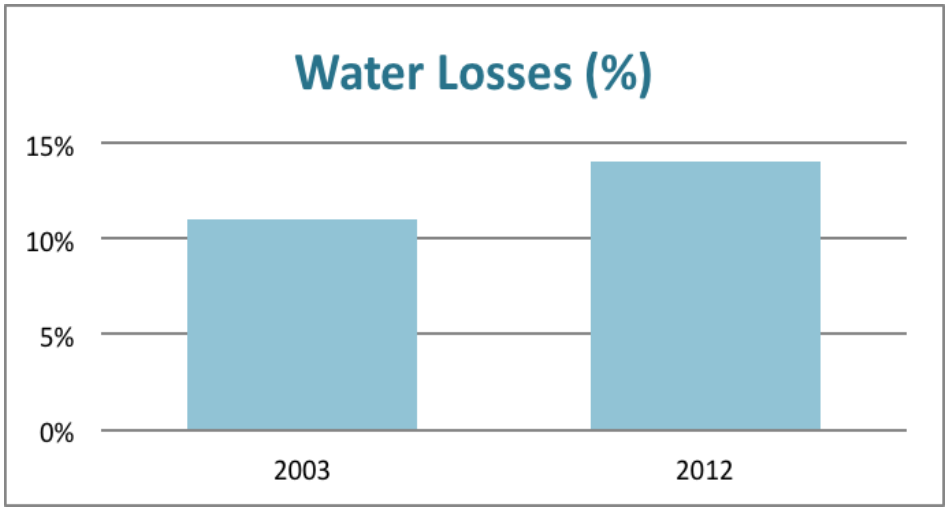


Figure 146: Milan, Water losses rate

Source: Legambiente, Rapporto Ecosistema Urbano. Municipal level

Leaking water is another major issue in Italy. Milan lost 14 percent of water in 2012, but it is among the cities where leaks are more contained. Unfortunately the statistics worsened between 2012 and 2014. There are cities, in particular in the Southern part of Italy, where leaks represent more than 60 percent of total water inflows.

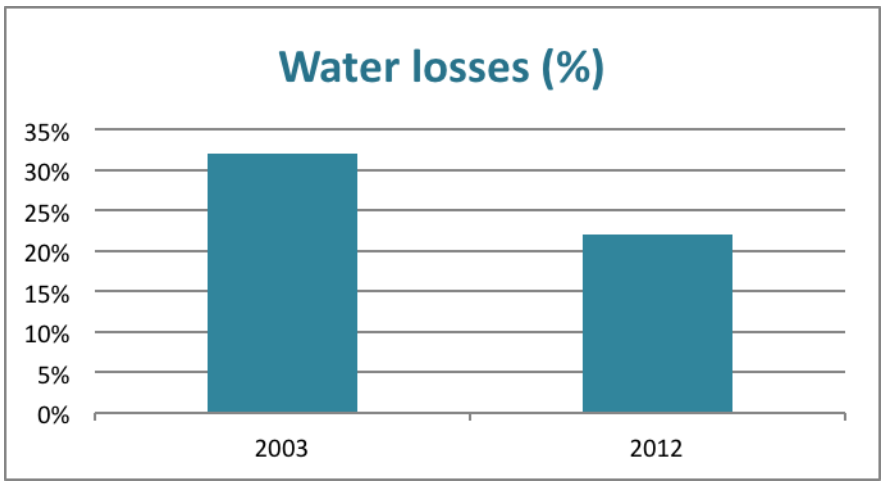


Figure 147: Turin, Water losses rate

Source: Legambiente, Rapporto Ecosistema urbano. Municipal level

Water losses decreased in Turin since 2003, but in 2012 are still much higher than in Milan: leaks represent 22% of total water inflows.

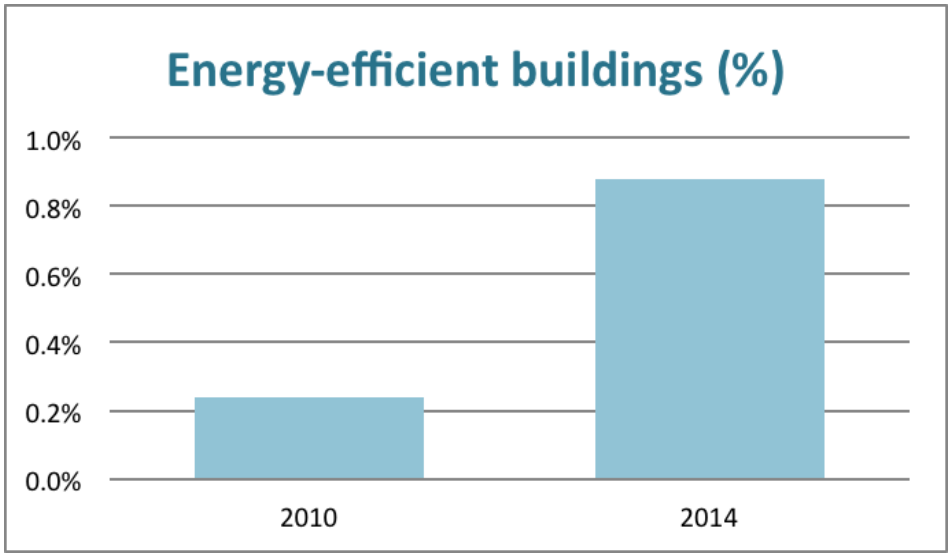


Figure 148: Milan, Energy-e Efficient buildings

Source: author's calculations based on data from Finlombarda (Cened). Municipal level

Despite being only a limited share of total buildings, the number of buildings rated A and A+ increased between 2010 and 2014. In 2010 energy-efficient buildings were only 0.25 percent of total, while in 2014 the percent increased to nearly 0.9.

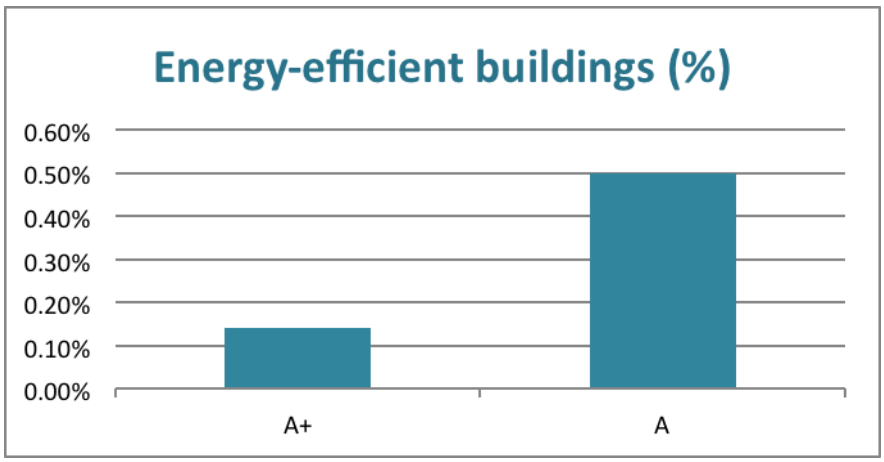


Figure 149: Turin, Energy-efficient buildings

Source: City of Turin. Municipal level

Buildings rated A and A+ represents less of 1% of total buildings in Turin. Data before 2014 are not available.

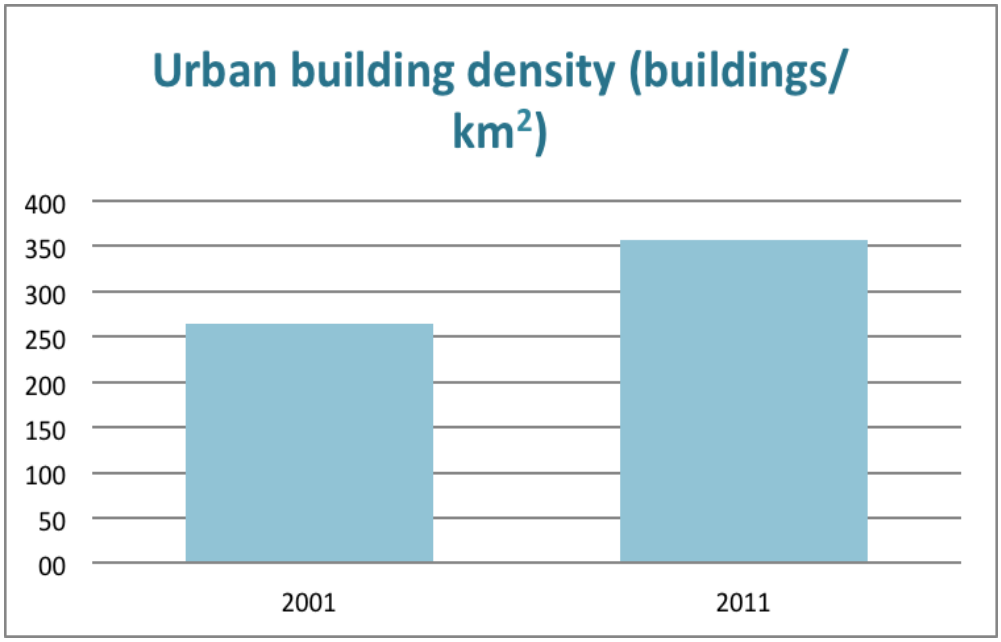


Figure 150: Milan, Urban building density

Source: author's calculations based on data from the Italian statistical office, ISTAT. Municipal level

Milan is a highly dense city as far as urban buildings are concerned, and density increased from 2001 to 2011. In 2001, about 250 buildings per square km were reported in the Census, while in 2011 the number increased to 350.

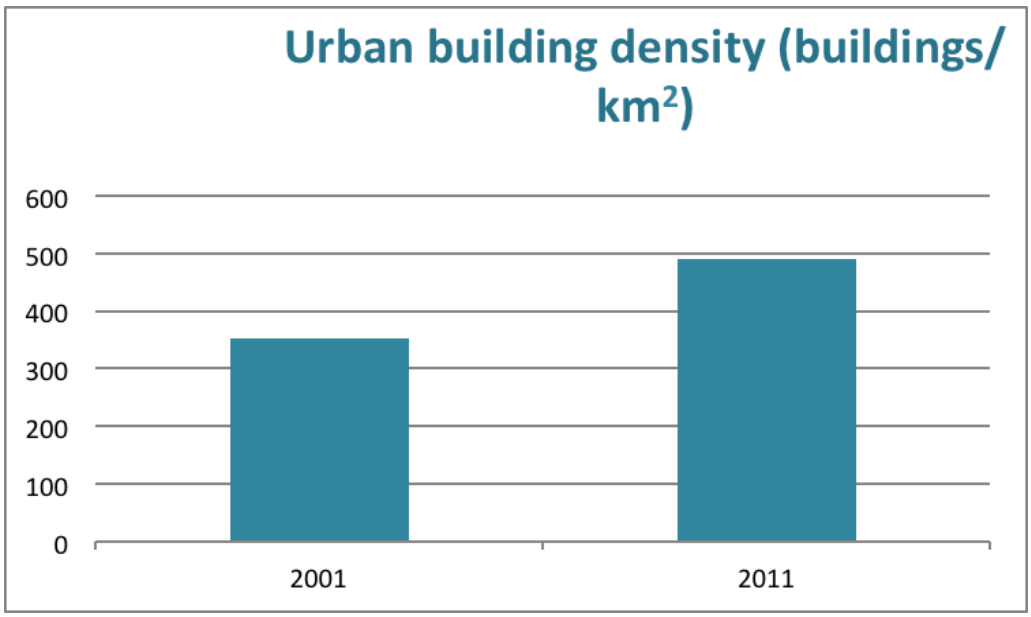


Figure 151: Turin, Urban building density

Source: author's calculations based on data from the Italian statistical office, ISTAT. Municipal level

Turin is even denser than Milan: in 2001, there were 353 buildings per square, in 2011 they increased to 490.

X.V.II SOCIAL PERFORMANCE

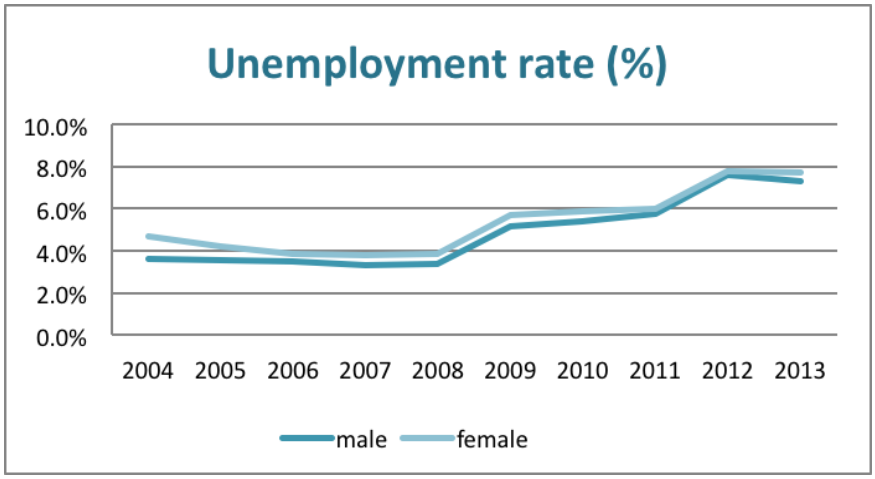


Figure 152: Milan, Unemployment Rate by Gender

Source: Italian statistical office, ISTAT. Provincial level (NUTS 3)

The unemployment rate both for men and women increased gradually from 2004 onward. Males are better off than females even if the gender gap reduced during the period. In 2004, the male unemployment rate was 2.4 percentage points lower than female rate, while in 2012 it was only 0.4 of a percentage point lower. Despite being on a rising trend, the unemployment rate in Milan province is much lower than the average national rate, being 11.5 and 13.1 for males and females respectively in 2013. Only few provinces in Italy have lower unemployment rates.

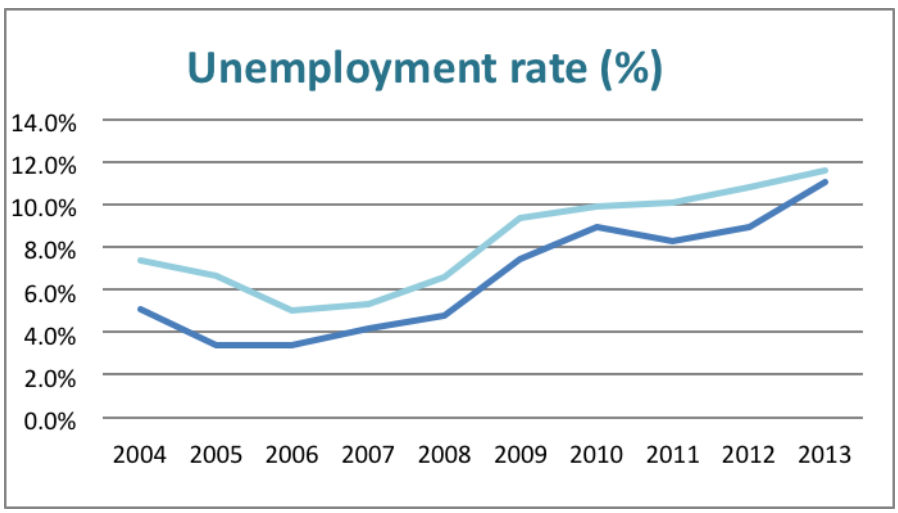


Figure 153: Turin, Unemployment Rate by gender

The unemployment rate in Turin slightly decreased from 2004 to 2006, then gradually increased to 11.1% for males and 11.7% for females: these are very high values, similar to those of most cities in Southern Italy. The gender gap reduced from 2.3 percentage points in 2004 to 0,6 points in 2013.

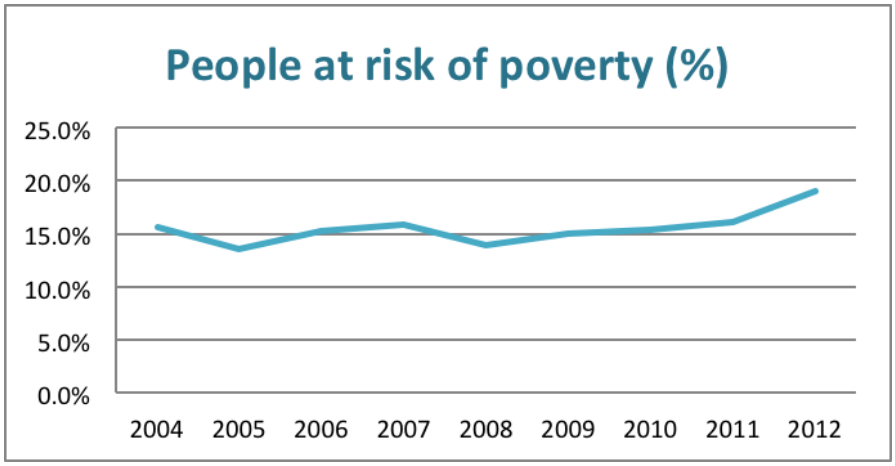


Figure 154: Milan, Level of Poverty

Source: Italian statistical office, ISTAT. Provincial level (NUTS 3)

The level of poverty has gradually increased in the Lombardia region (NUTS2). From 2004 to 2008 the trend was not monotonic, with some years experiencing a growth and some years experiencing a decline in the percentage of people at risk of poverty. From 2008 onward, on the contrary, the rate was on an increasing trend. From 2011 to 2012, the rate displayed the largest positive growth, with the rate in 2012 3 percentage points higher than the rate in 2011. The level of poverty in the Lombardia region is low compared to the rest of Italy. The average national poverty rate was 30 percent in 2012, and only few regions display lower rates than in Lombardia.

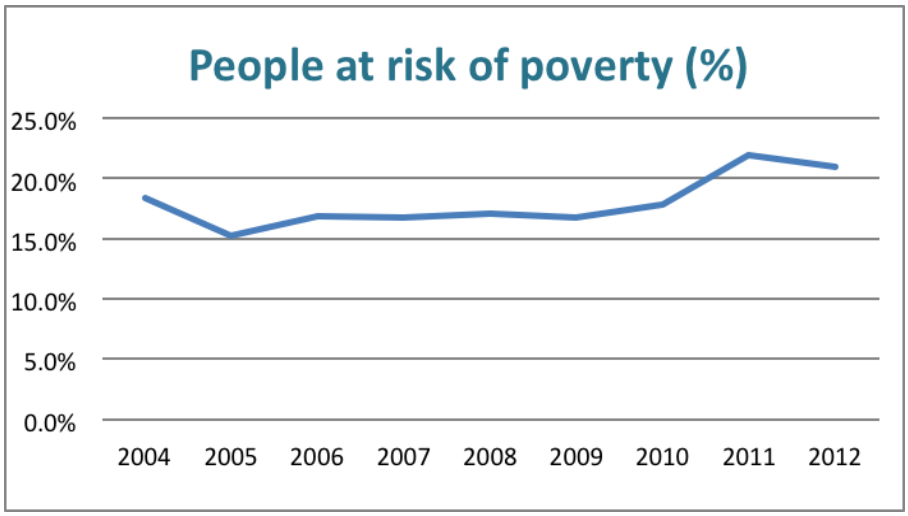


Figure 155: Turin, Level of poverty

The level of poverty in Piedmont was quite stable from 2004 to 2009, then increased over 20% as a consequence of the economic crisis that hit hard this industrial region: in 2012 21% of people was at risk of poverty.

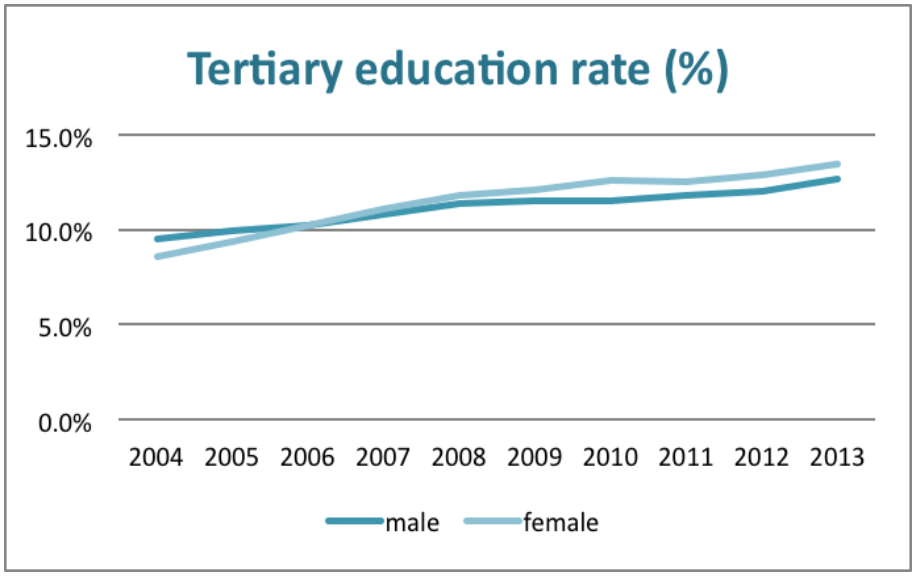


Figure 156: Milan, Tertiary Education by Gender

Source: Italian statistical office, ISTAT. Regional level (NUTS2)

The tertiary education rate increased from 2004 to 2013. Until 2005 the male rate was higher than the female rate while in 2006 the trend crossed and the female rate overcome the male one.

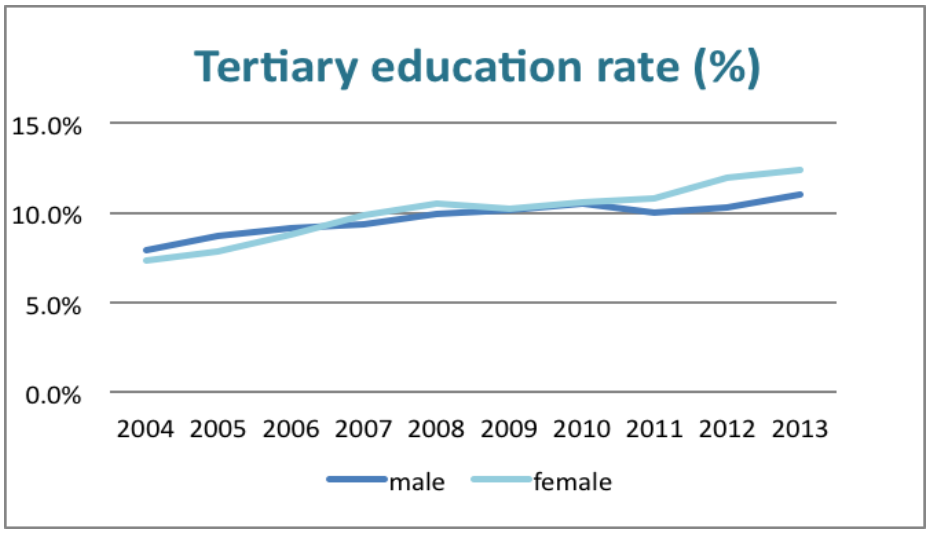


Figure 157: Turin, Tertiary education by gender

Source: Italian statistical office, ISTAT. Regional level (NUTS2)

The tertiary education rate shows in Turin a trend similar to Milan: it increased from 2004 to 2013, and in 2007 the female rate overcame the male one.

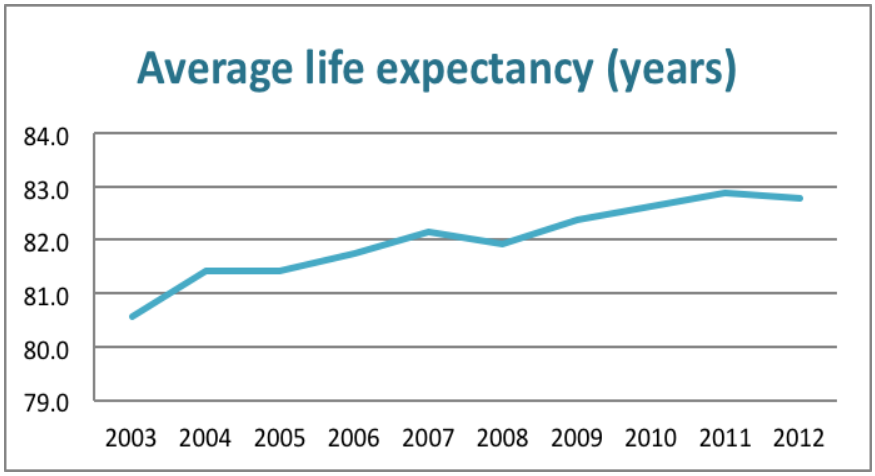


Figure 158: Milan, Average life expectancy (years)

Source: Italian statistical office, ISTAT. Provincial level (NUTS3)

Life expectancy is high and is on a rising trend in the province of Milan.

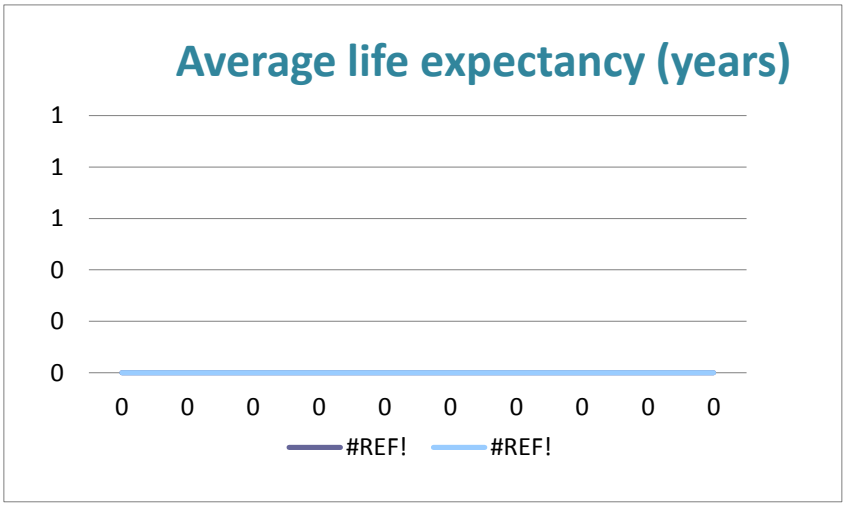


Figure 159: Turin, Average life expectancy

Life expectancy in Turin is a little shorter than in Milan; for females is higher of 4 years than for males.

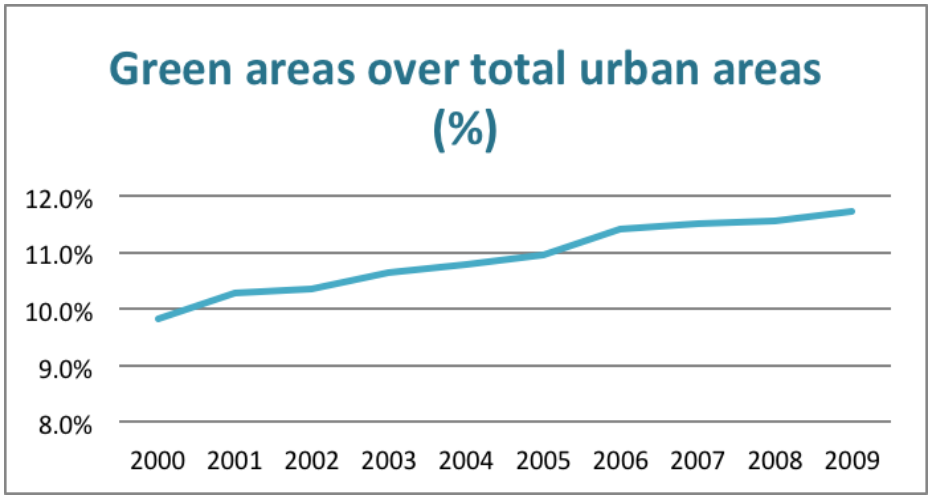


Figure 160: Milan, Green space availability

Source: Italian statistical office, ISTAT. Municipal level

The percentage of green areas within the municipal area increased from 2000 to 2009. In 2009 green areas occupied 9.8 percent of the whole urban area of Milan, while in 2009 the percentage increased to 11.7. Italian cities display huge disparities, as the rates range from 72 percent in Pisa to only 0.001 in Taranto and Olbia in 2009. Although the size of the green areas is limited, Milan is among the cities offering the largest size of green areas.

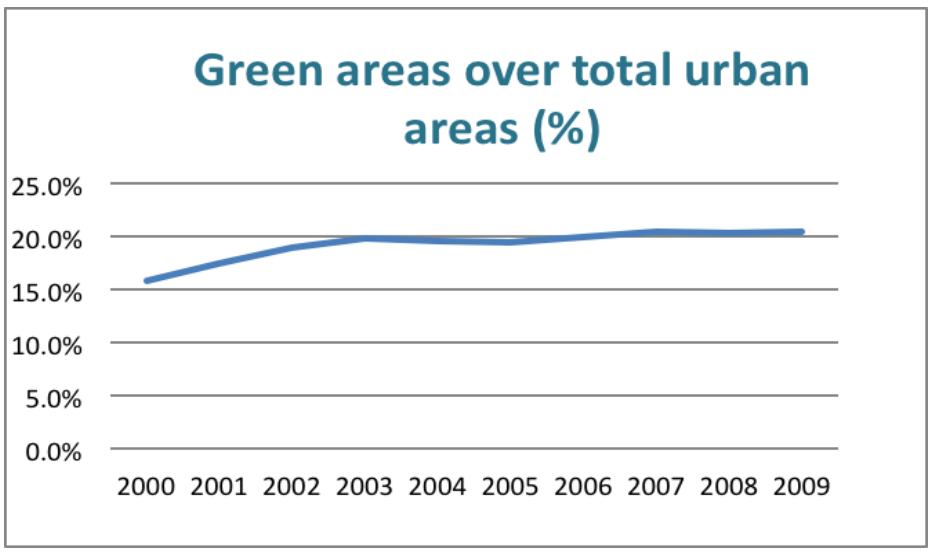


Figure 161: Turin, Green Space Availability

Source: Italian statistical office, ISTAT. Municipal level

The percentage of green areas within the municipal area of Turin increased from 2000 to 2003, then maintained stable. It is quite double than in Milan: Turin is recognized as one of the greenest major cities in Italy.

MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

Since 2005, Milan has owned a monitoring system for emissions reductions. In 2003, an assessment of the environmental situation for Milan was produced, and emissions tracing back to 1998 have been reported. However, a consolidated system of emission monitoring was put in place only after 2005 (Source: AMAT).

In Turin, the monitoring system for emission reduction has been implemented by the Province since 2000, and it has been enhanced since the adoption of PAES in 2010. (Source: Province of Turin, City of Turin.)

X.V.III ECONOMIC PERFORMANCE

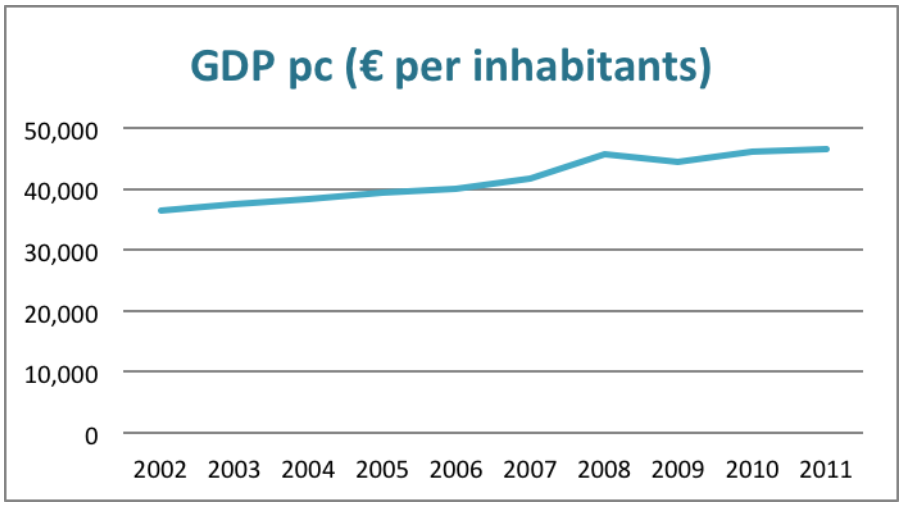


Figure 162: Milan, Level of Wealth

Source: Eurostat. Provincial level (NUTS3)

The province of Milan is among the richest, not only with respect to the rest of Italy, but also compared to other European cities. The GDP per capita expressed in a comparable purchasing power parity (PPP) was 45'600 euros in the province of Milan in 2011, while it was 25'500 for Italy and 25'100 for Europe overall. GDP per capita grew steadily in the province of Milan from 2002 to 2011, even if the rate of growth between 2010 and 2011 was much lower compared to the previous periods.

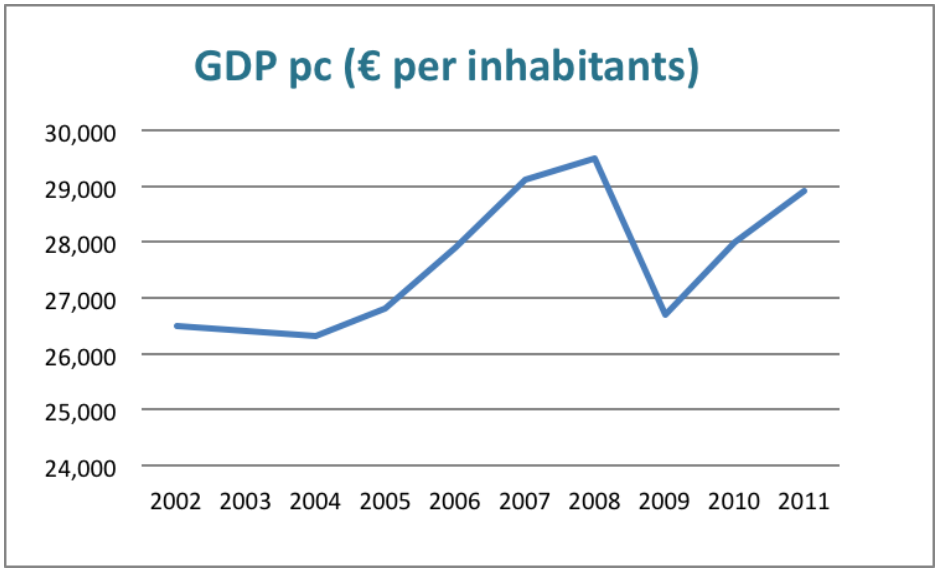


Figure 163: Turin, Level of wealth

The GDP per capita expressed in a comparable purchasing power parity (PPP) in Turin increased till 2008, then because of the global economic crisis decreased of 9% in 2009; afterwards it increased again, but in 2011 it was still under the maximum level reached three years before. In 2011, it is less than two thirds of the GDP in Milan.

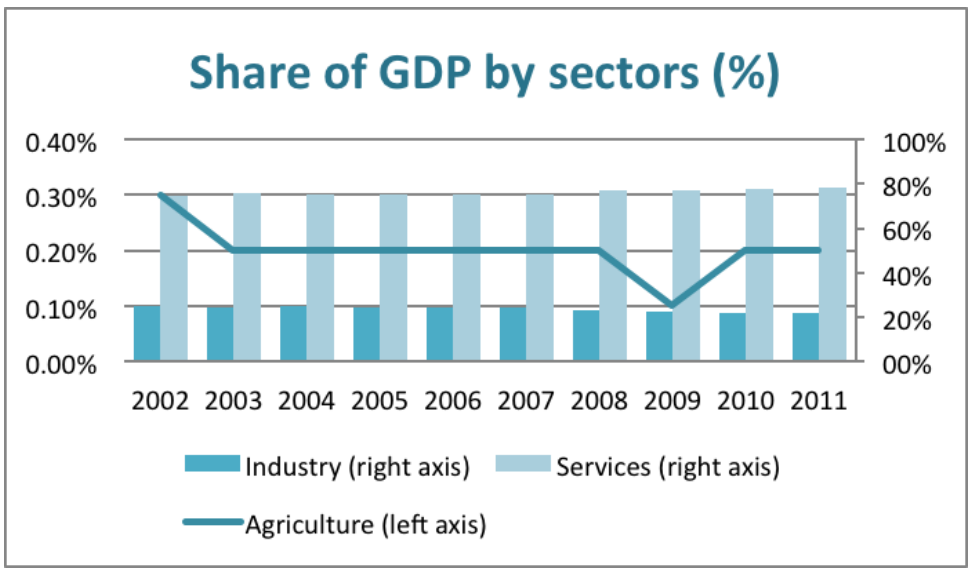


Figure 164: Milan, GDP by Sectors

Source: Eurostat. Provincial level (NUTS3)

In the province of Milan, services make the largest contribution to total GDP. The service sector is responsible for more than 70 percent of GDP, and the percentage has been growing since 2002. Industry is the second largest sector. Its contribution has been slightly declining over time, with 25 percent in 2002 and 22.8 in 2011. The agricultural sector is only marginal, with a share varying around 0.2 percent.

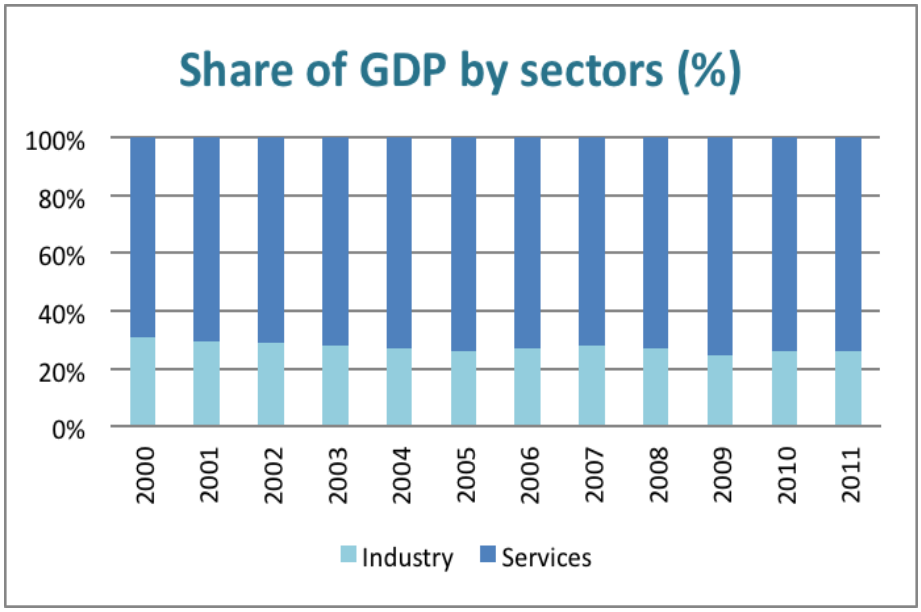


Figure 165: Turin, GDP by Sectors

Source: Eurostat. Provincial level (NUTS3)

In the province of Turin, services are responsible of three quarters of local GDP. The industrial sector contribution decreased between 2000 and 2011 from 30% to 25%, but it is still the most relevant in Italy. Agriculture weights for 0.6%.

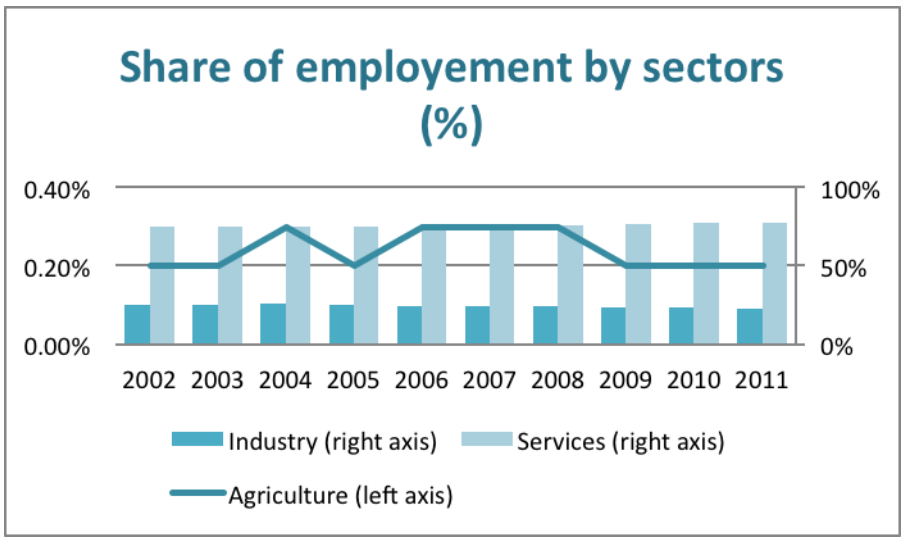


Figure 166: Milan, Employment by sectors

Source: Eurostat. Provincial level (NUTS3)

The different sectoral contribution to GDP is reflected in the allocation of employment among the different sectors. Services in the province of Milan account for more than 70 percent of total employment, industry around 25 percent, and agriculture only 0.2 percent. While the

employment share in the service sectors has been growing, the share in the industry sector has been declining.

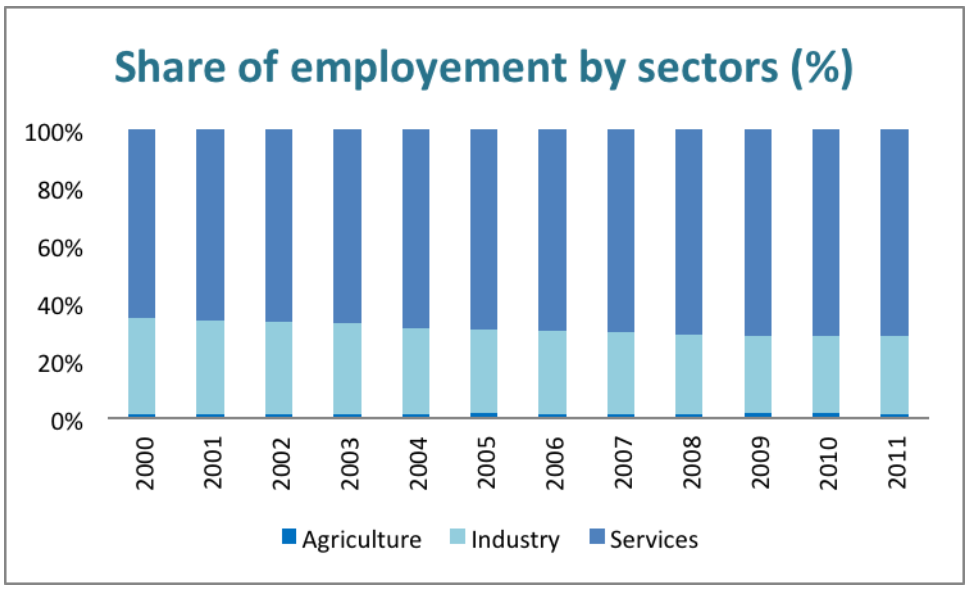


Figure 167: Turin, Employment by Sectors

Source: Eurostat. Provincial level (NUTS3)

Also in the province of Turin, employment reflects the different sectoral contribution to GDP. Services account for 72% of total employment, industry for 27%, and agriculture for 1.5%.

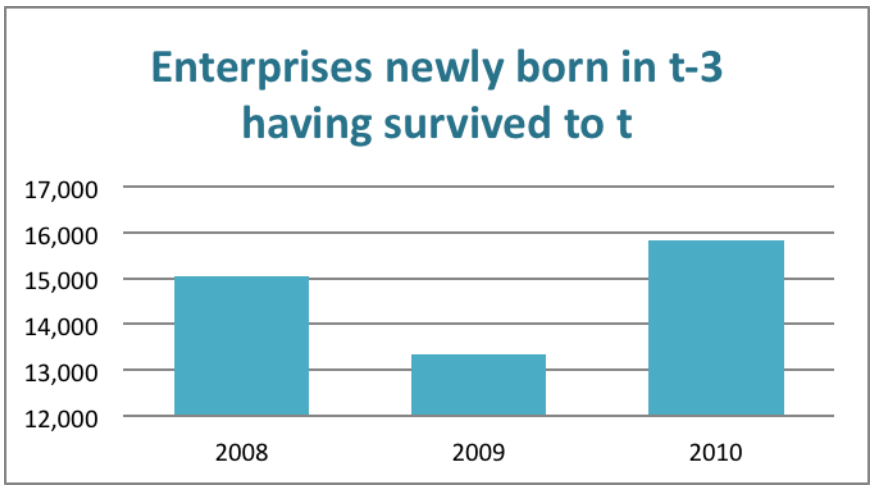


Figure 168: Milan, Business survival

Source: Eurostat. Provincial level (NUTS3)

The survival rate of enterprises in the province of Milan does not show a trend. In 2008, the number of enterprises that survived for at least 3 years was 15'000. The number declined to around 13'000 in 2009 and reached nearly 16'000 in 2010. In Italy, only Rome displays a larger

number than Milan, followed by Naples and Turin. These figures indicate that big cities attract the largest number of (successful) enterprises.

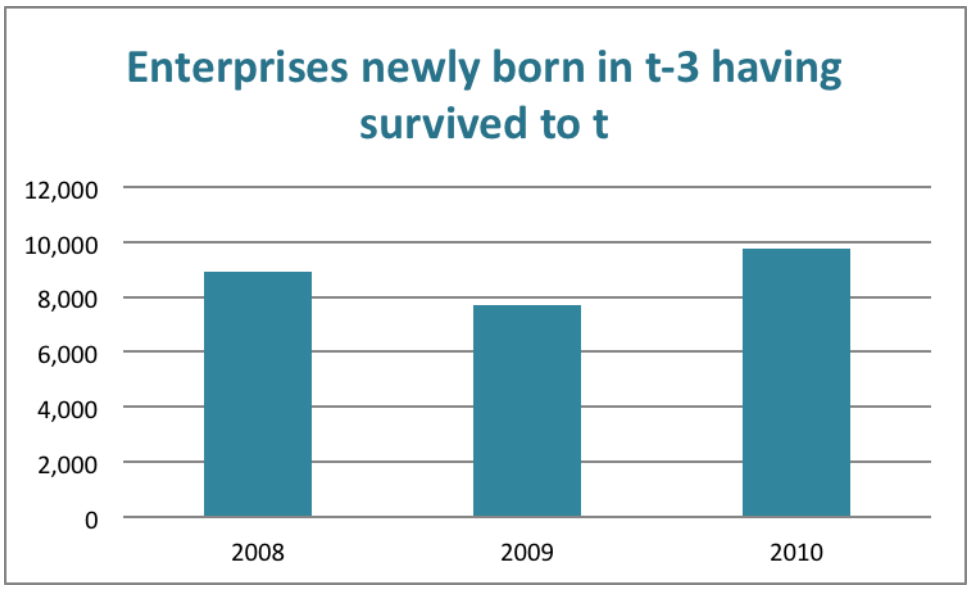


Figure 169: Turin, Business survival

Source: Eurostat. Provincial level (NUTS3)

As in Milan, the survival rate of enterprises in the province of Turin shows a reduction in 2009, but a reprise in 2010. In absolute number, in 2011, the number of enterprises that survived for at least 3 years was nearly 10’000, two thirds of the value in Milan.

MILAN

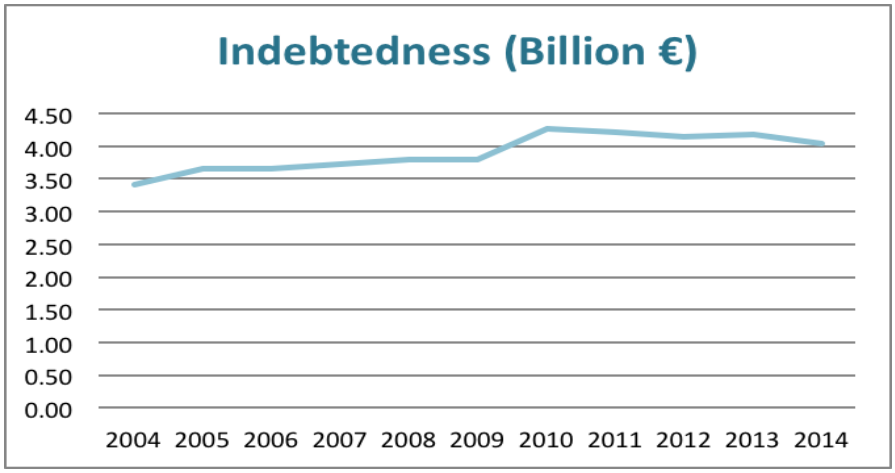


Figure 170: Milan, Indebtedness level

Source: Municipality. Municipal level

The stock of debt of the municipality of Milan has been growing from 2004 onward. In 2004, Milan displayed a debt of 3.4 million euros, and this figure increased to 4 million in 2014. This evolution must be interpreted on the background of recent national austerity policies reducing the flow of funding from the central state to local authorities and redistribution of tax revenues between local authorities and central state.

TURIN

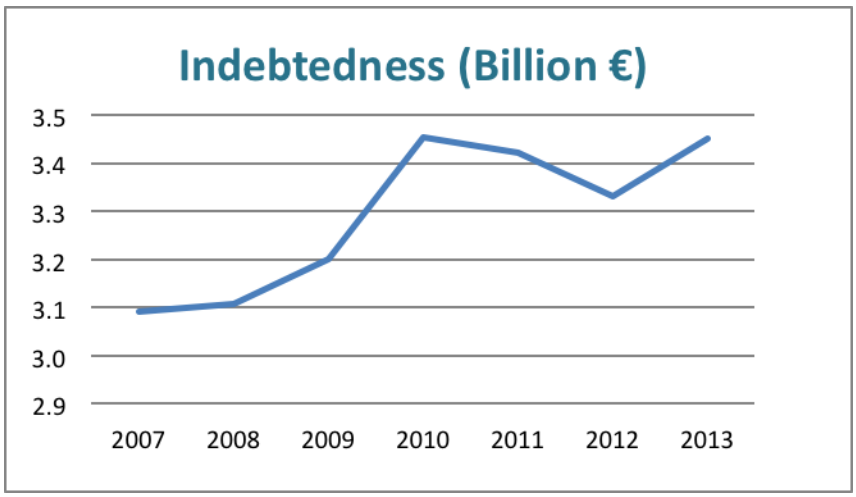


Figure 171: Turin, Indebtedness level

Source: Municipality. Municipal level

The stock of debt of the municipality of Turin is the highest in Italy per person (over 3.500 euros per inhabitant) and the second after Milan in absolute terms: nearly 3.500 million euros.

It increased from 2007 to 2010; then it begun to decrease, but in 2013 this virtuous trend diverted again.

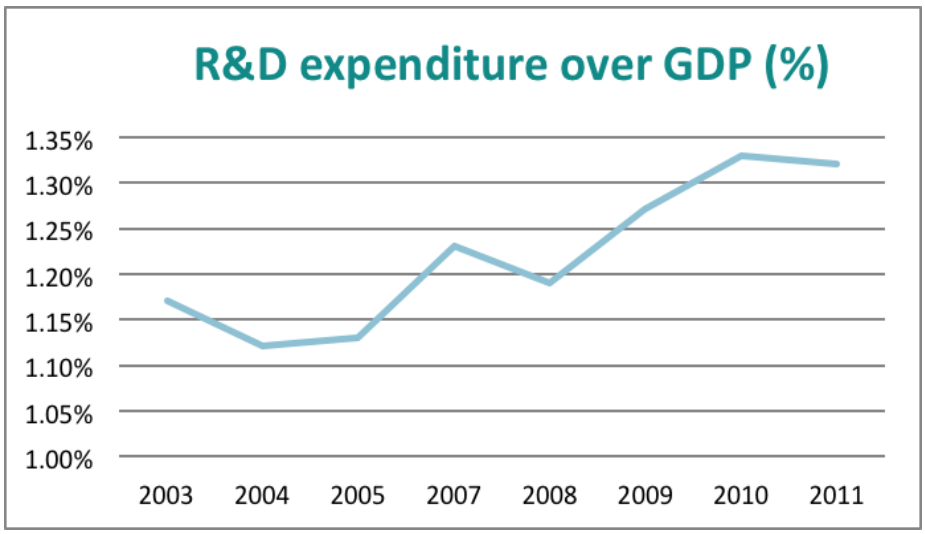


Figure 172: Milan, R&D intensity

Source: Eurostat. Regional level (NUTS2)

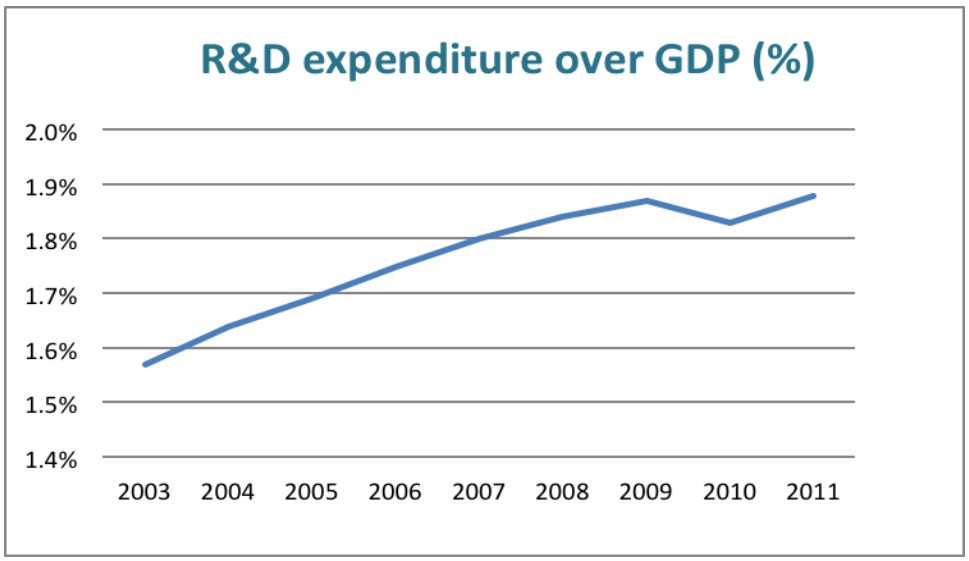


Figure 173: Turin, R&D intensity

Source: Eurostat. Regional level (NUTS2)

Only a marginal share of GDP is used to finance R&D in Italy in general, but also in the Lombardia region, despite Lombardia being the region where the largest number of innovations are made. The percentage is slightly more than 1 percent, with peaks of 1.3 percent in 2010 and 2011. The variation rates were both positive and negative during the period even if a general upward trend can be identified. The average R&D intensity of Italy was 1.25 in 2011. Piemonte is the region with the largest percentage, namely 1.88 in 2011,

followed by Lazio (1.67) and Liguria (1.45). Only few other regions have higher percentages than Lombardia.

X.VI FINDINGS AND KEY CHALLENGES

The analysis shows that Milan is a leading city as far as both innovation and wealth are concerned. In terms of environmental issues and efforts towards post carbon solutions, Milan has an advantage compared to the majority of Italian cities.

If compared to the rest of Europe, Milan can be still considered a leader with regard to social but in particular to economic indicators. However, as for the environmental indicators, not only does Milan lag largely behind the cities in the Northern Europe, but has still much to do to achieve the average European standards in this area. For example, according to the European City Ranking conducted for the "Soot-free for the Climate!" campaign, Milan seems to be at the bottom end of the ranking, together with another Italian city, namely Rome. Nine environmental indicators have been collected and 17 cities located in Western Europe have been considered to define the ranking. The indicators take into consideration the effort put in place by the cities in the last years toward the improvements of the environmental quality. The first indicator measures the success in reducing PM10 and soot concentrations. The second considers the existence and extension of Low Emission Zones and Bans of High Emitters. The third and fourth consider the investments towards clean public transport and clean non road mobile machinery, through retrofitting existing vehicles with diesel particulate filters (DPFs) or furnishing new ones with effective filters or other clean technologies. The fifth measures the use of economic incentives to support the transition of private vehicles towards clean ones or to support new forms of mobility. The sixth looks at the modal split trend, and the seventh considers measures to raise the share of public transport, such as investments for expansion of public transport networks and other tools promoting public transport. The eighth considers measures to promote the use of bikes and legs, through both hard measures such as cycling paths, and soft measures, such as communication campaigns. Finally the ninth indicator looked at the quantity and quality of information which the city made available to the public in order to raise civil awareness and participation.

As regards Turin, the present economic crisis has hit the city and its metropolitan area very hard, mainly because of the persistent strong specialization in the industrial sector: since 2008 GDP has decreased and unemployment has increased; at the same time, Piedmont is the Italian region which invests the larger share of its GDP in R&D. Social inclusion must deal with severe problems: the stock of debt is high (with consequent difficulties in granting services for population), 20 people out of 100 are at risk of poverty, tertiary education is still. From the environmental point of views, the city offer a relevant share of green areas, some of them are natural reserves; on the contrary, air quality is still very poor, and it is improving too slowly, and energetic efficiency of buildings must be enhanced.

X.VII RECOMMENDATIONS AND CONCLUSIONS

Looking at the Milan case, it is clear that economic constraints are not the sole obstacles toward a post carbon model. Milan ranks very high in terms of economic indicators, but it scores poorly when environmental indicators are considered. Efforts to increase civil

awareness, and the ability to shift strategies from a carbon toward a zero-carbon paradigm are crucial.

Technological advancement is another important ingredient for post carbon cities, and Milan is clearly one of the leading cities in Italy, together with Turin, in terms of innovation.

With regards to sectors to which improvements should be targeted, air quality appears as one of the major problems in Milan. Main sectors producing carbon emission are heating and cooling (services and residence), followed by transport. Recent local strategies for traffic limitations have not yet yielded substantial improvements in terms of reduction of PM 2.5 or PM 10; but just limited improvements with regards to the generation of black carbon within the LEZ zone.

Further to extending the efforts for limiting emissions from fuels in the transport sectors, tackling the issue of heating (and cooling) in the residential and services sector appears most promising, considering the share of contributions to the overall emissions. According to expert opinion, some improvements will be possible improving energy efficiency within buildings, although in the extended aged building stock in the city of Milan, these strategies will soon find some limits. A more promising strategy in this sense could be found in introducing renewables and/or increase the efficiency of centralised energy generation, using forms of co-generation and centralizing heating and cooling facilities for both residences and the services sector.

Most of these recommendations can be taken into consideration also for Turin. Transport, residential, tertiary and industrial consumption and emissions should be object of policies for improving efficiency, mainly to deal with the major problem of air pollution. The level of municipal debts makes it difficult for the city to invest in long term environmental policies; as a consequence, it is necessary that private stakeholders, which play a relevant role in regional R&D investments, cooperate with public administrations and local universities in smart city projects. Social innovation is also required to grant inclusion of an important bracket of the population, which is at risk of poverty, digital divide, lack of higher education.

In the first workshops, when the result of this initial assessment were discussed, local stakeholders both in Turin and in Milan could not find significant opportunities of implementing post carbon policies through a collaboration between the two cities. At the moment, the high speed rail line that connects the two cities has mainly reduced journey times, but has not determined new environmental strategies or projects for a common action. Most post carbon policies seem to be effective if implemented at a city or metropolitan level, while an intercity scale does not seem to offer opportunities for increasing the efficiency of these policies. Chances for collaboration are mainly economic, in terms of complementarities between industrial specialization of Turin and services in Milan, between universities and innovation and research centres, between multi-utilities.

XI CASE STUDY CITY COPENHAGEN

XI.I DATA COLLECTION

The data used in this assessment of KPIs covers the municipality that administratively cover the core Copenhagen, due to that this is the most urbanised area of the city and due to the practical constraints that a sample of 20 municipalities would constitute for the assessment of KPIs as well as for the analysis of urban visions and strategies in WP4. The City of Copenhagen, i.e. the municipality that covers the core area of Copenhagen, is thus used as the unit for data collection. The data for the assessment of the KPIs in Copenhagen was collected using the following sources:

- Statistics Denmark
- Statistics and number on Copenhagen
- GIS modelling (conducted by AU)
- Danish national air quality monitoring programme
- Danish nature Conservation Society
- On supplementary basis: Communication with city officials

The City of Copenhagen regularly – almost exclusively on annual or biannual basis – monitors a large quantity of parameters of significance for the city, covering the urban areas of residents, moving patterns, commuting, income, socio-economic status, housing, business and growth, employment, transport, climate and environment, urban life, education, health, safety, and public administration. Most of these statistics are publicly available and has been a valuable source of information for the KPIs included in this assessment.

XI.II OVERVIEW OF THE CASE STUDY CITY

XI.II.I TERRITORY

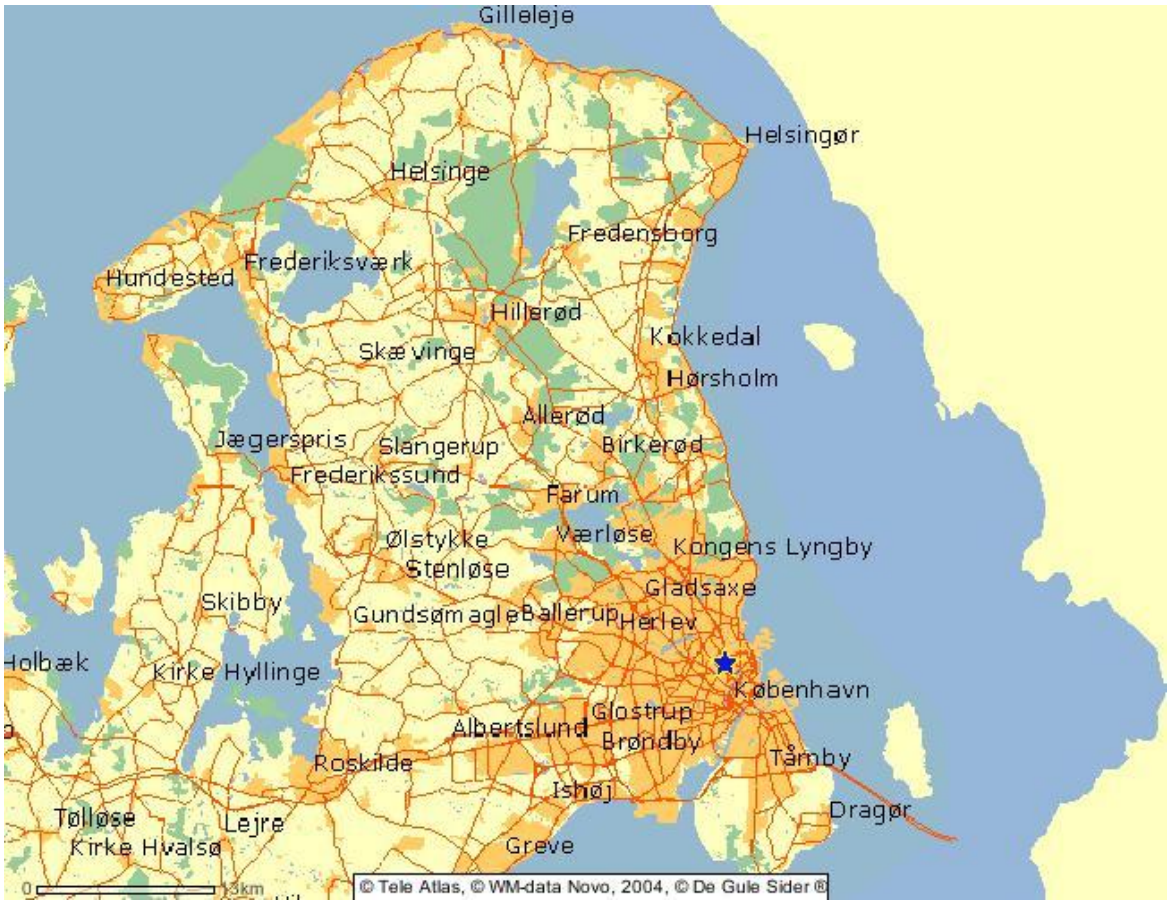
Copenhagen is composed of the core city, administratively covered by the City of Copenhagen, and Copenhagen Capitol Region which covers the effective city region and is administrated also by the adjacent municipalities.

The core city – and the City of Copenhagen – is centred at the harbour area, with intensive development of the northern port area Nordhavn going on. It is composed of 10 urban communities. Due to historic reasons, Municipality of Frederiksberg constitutes an affluent enclave in the City of Copenhagen (an empty area). The City of Copenhagen covers a geographical area of 86 sqkm (Statistics Denmark, 2015).

Figure 174: Map of the City of Copenhagen

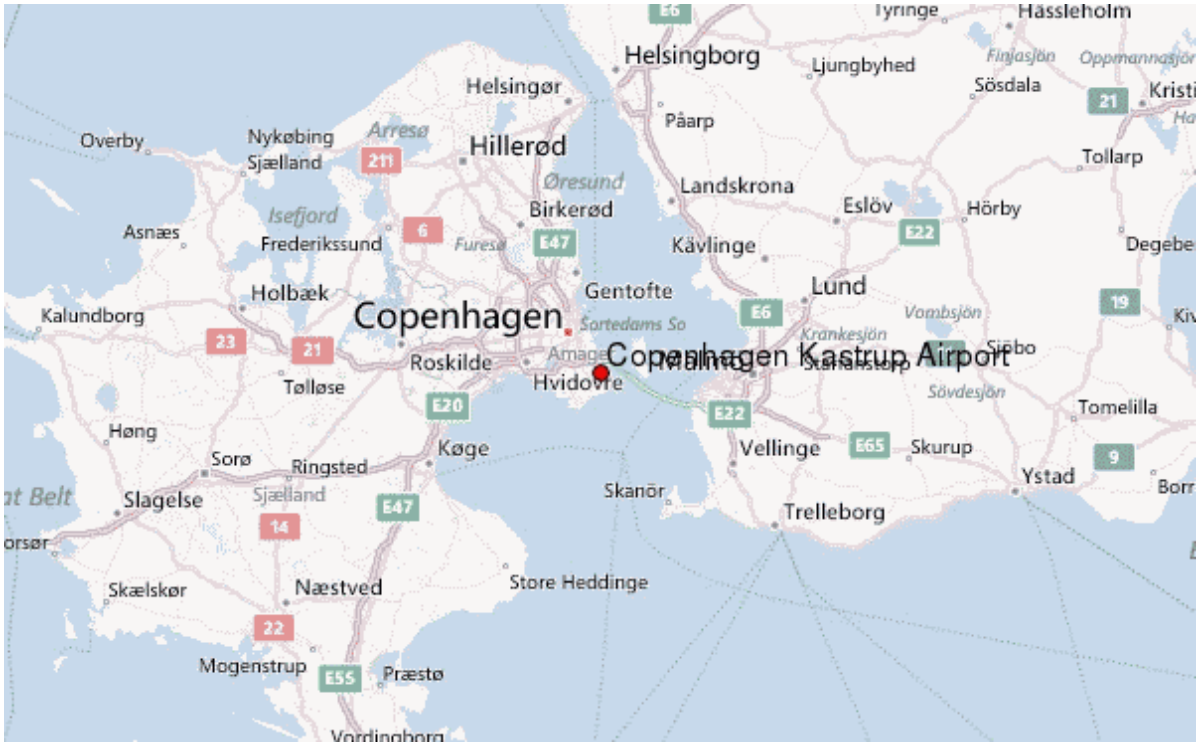
Located by the coast of Øresund, the Copenhagen is situated on the island of Zealand and the small island of Amager in the south-eastern part of Denmark. Copenhagen Capitol Region covers an area of 2,559 sqkm and stretches north and west of Amager and Øresund. The landscape is flat and the south of the city, especially the part located on the southern part of Amager lies below sea level.

Figure 175: Copenhagen in the Copenhagen Capitol Region



Copenhagen International Airport is located on the island of Amager, and from the island the Øresund Bridge connects Copenhagen to Malmø.

Figure 176: Map of Copenhagen in the Øresund Region

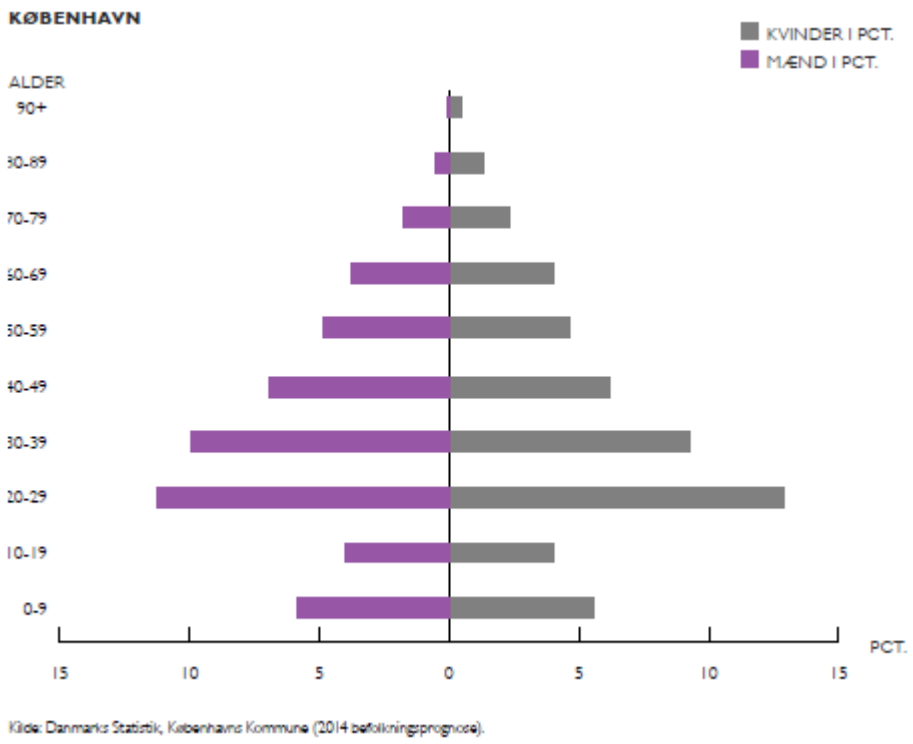


XI.II.II POPULATION

During the past 20 years, the population in the City of Copenhagen has increased 23% from 471,300 inhabitants in 1995 to 581,000 in early 2015 (City of Copenhagen, 2015b). This reflects a present population increase in of app. 800-1000 new citizens per month.

Compared to the average demographic distribution for Denmark, Copenhagen has a young population, with a markedly higher rate of residents between 20-49 years than the national average. The majority of Copenhageners are less than 49 years old, and people moving into the city are young. This pattern is expected to continue, and the increase in population is expected to continue growing, in parallel with the other Scandinavian capitols (City of Copenhagen, 2015b).

Figure 177: The population and demographic distribution in Copenhagen per 1 January 2014



Grey blocs denote the female population, purple blocks denote the male.

XI.II.III ECONOMY

In the period 2003-2013, the Gross Domestic Product (GDP) for the City of Copenhagen (municipal level) increased from EURO 31,705 (DKK 236,201k) to EURO 45,685 (DKK 340,352k) while the increase in GDP for Copenhagen Capitol Region was a little less, EURO 69,508 (DKK 517,833k) in 2003 to EURO 97,809 (DKK 728,678k) in 2013. During the same period of time, the total disposable income rose from EURO 27,146 (DKK 202,240k) to EURO 39,386 (DKK 293,424k) in the City of Copenhagen.

Distributed per capita, City of Copenhagen had in 2013 a GDP per capita of EURO 63 (DKK 471k), while the Capitol had EURO 56 (DKK 419k). Disposable income for the City of Copenhagen was in 2013 EURO 54 (DKK 406k).

Table 94: GDP for Municipality and Copenhagen Capitol Region

	2003 (1000 DKK)	2003 (EURO 1000)	2013 (1000 DKK)	2013 (EURO 1000)
Current prices, (mill. DKK.)				
Copenhagen Capitol Region				
Gross domestic product	517 833	69,508	728 678	97,809
Gross domestic product at factor cost	443 001	59,463	625 020	83,895
City of Copenhagen (Municipality level)				
Gross domestic product	236 201	31,705	340 352	45,685
Gross domestic product at factor cost	202 240	27,146	293 424	39,386
Pr. capita. Current prices, (1000 DKK.)				
Copenhagen Capitol Region				
Gross domestic product	318	43	419	56
Gross domestic product at factor cost	272	37	359	48
City of Copenhagen (Municipality level)				
Gross domestic product	366	49	471	63
Gross domestic product at factor cost	313	42	406	54

Source: Copenhagen Statistical Bank, 2015; Statistics Denmark, 2015

Table 95: Structure of employed per sector with residence in Copenhagen Municipality/other municipality 2013

SECTOR	RECIDENCE IN THE CITY OF COPENHAGEN (Nº EMPL)	RESIDENCE IN OTHER MUNICIPALITIES (Nº EMPL)	TOTAL (Nº EMPL)
1. Agriculture, forestry and fishery	47	234	**281**
2. Industry, resources and forsyningsvirksomhed	4.400	9.467	**13.867**
3. Building and construction	2.829	5.616	**8.445**
4. Trade	19.075	15.470	**34.545**
5. Transport	6.448	7.348	**13.796**

SECTOR	RECIDENCE IN THE CITY OF COPENHAGEN (Nº EMPL)	RESIDENCE IN OTHER MUNICIPALITIES (Nº EMPL)	TOTAL (Nº EMPL)
6. Hotels and restaurants	12.360	3.962	**16.322**
7. Publishing, tv and radio	8.414	1.761	**10.175**
8. Telecommunication	1.793	463	**2.256**
9. Data and information services (ICT)	6.027	3.364	**9.391**
10. Finance and insurance	6.980	4.210	**11.190**
11. Real estate and rent	3.104	1.578	**4.682**
12. consultancy	9.955	5.536	**15.491**
13. RTD	1.709	1.326	**3.035**
14. Advertising and other business services	5.748	1.098	**6.846**
15. Travel agencies, cleaning and other operational services	12.275	4.671	**16.946**
16. Public administration, military and police	12.798	6.134	**18.932**
17. Teaching	15.224	13.412	**28.636**
18. Health	10.602	8.041	**18.643**
19. Social services	23.482	11.992	**35.474**
20. Culture and recreation	5.957	2.696	**8.653**
21. Other services	7.934	2.241	**10.175**
22. Unspecified	1.974	3	**1.977**
Total	**179.135**	**110.623**	**289.758**

Source: Copenhagen Statistical Bank, 2015; Ministry of Economy and Home Affairs, 2015

XI.IIIKEY STRATEGIES AND PROJECTS

In 2007, the City of Copenhagen developed an overall urban vision, *The Eco-Metropolis* (City of Copenhagen, 2008a [2007]) that set a 20 per cent CO_2 reduction target for 2015, and which was updated, specified and extended in the vision *Carbon neutral by 2025 – Climate Plan* Copenhagen Climate (City of Copenhagen, 2009b) that formulated the vision for Copenhagen to be CO_2 neutral by 2025. Many of the following sector plans and strategies reflect and refers to one of these or both, and thus operate within the medium time horizon of 2025. Below, main plans, strategies and projects for Copenhagen are presented.

XI.III.I STRATEGIES AND ACTION PLANS

STRATEGY/ACTION PLAN FACTSHEET 1	
Title	Vision - Eco-Metropolis. Our Vision for Copenhagen 2015
Dimension of KPIs	All, focus on social and environmental
Period	2007-2015
Strategy/Action Plan description	
Objective	To make Copenhagen the most sustainable capital in the world. To reduce CO_2 emissions by 20 per cent relative to 2005 by 2015

Measures	Four areas at the centre that each have specified targets for 2015and each have star initiatives.
	• Best Cycling City in the World:
	  ○ 50 per cent modal char for the bike for study and work related travels
	  ○ 80 per cent of the cyclist feel safe in urban traffic
	  ○ 50 per cent reduction in serious traffic accidents for cyclists, relative to 2007
	• The World Centre for Climate Policy:
	  ○ 20 per cent reduction in CO_2 emission by 2015, reference year 2005
	  ○ Strong position in the world as climate capital
	• A Green and Blue Capital:
	  ○ all Copenhageners should be able to access green/blue spaces within 15 min walk
	  ○ Copenhageners use these twice as much in 2015 than in 2007
	• A Clean and Healthy City:
	  ○ noise levels reduced to below health threatening levels
	  ○ AQ levels that does not harm the health of Copenhageners
	  ○ organic food rate is 20 per cent for Copenhageners and 90 per cent for public institutions

STRATEGY/ACTION PLAN FACTSHEET 1	
Targets	City administration, citizens, business, outside world
Links and Contacts	
Promoter	City of Copenhagen, Technical and Environmental Department
Document/website	http://kk.sites.itera.dk/apps/kk_pub2/pdf/524_vkZwf2uL.pdf

Source: City of Copenhagen, 2008a

STRATEGY/ACTION PLAN FACTSHEET 2	
Title	Vision - Copenhagen as hydrogen city
Dimension of KPIs	Environment, energy
Period	2012-2018
Strategy/Action Plan description	
Objective	To make Copenhagen a leading city in use of hydrogen and fuel cells

Measures	• Greening the energy supply
	  • demonstration project Smart CPH2
	• Green mobility
	  • inclusion of 40 hydrogen cars in City's vehicle fleet;
	  • establishment of 3-5 new hydrogen fuelling stations in the city
	• Green mechanical working equipment in the City
	  • 2-4 sub-projects with public machines fuelled on hydrogen
	• Partnerships and communication
	  • Workshops for potential partners
	  • Regional collaborative network established with Copenhagen Clean-tech Cluster
	  • 2 proposed new projects per annum

Targets	Energy consumers, specifically in the transport sector
Links and Contacts	
Promoter	City of Copenhagen
Document/website	http://www.damvad.com/media/45031/k_benhavn_som_brintby_2012_-_2018.pdf

Source: City of Copenhagen, 2012b

STRATEGY/ACTION PLAN FACTSHEET 3	
Title	Climate Adaptation Plan
Dimension of KPIs	Environmental, climate, urban development
Period	2011 -...
Strategy/Action Plan description	
Objective	To climate proof Copenhagen in situations with extreme weather events
Measures	• Clarification of responsibilities • Rules and recommendations for storm water projects • Classification of storm water and recipients • Reinforcement of dyke • Construction of 3 main city sewege water channels • Participation • Collaboration on funding schemes 3 overall measures: - Larger sewers, reservoirs, pumping stations - Local retention of rain water - To channel inevitable flooding to areas where flooding harm the least
Targets	The grey and green/blue infrastructures in the city; citizens; business
Links and Contacts	
Promoter	Copenhagen Municipality, water companies
Document/website	http://en.klimatilpasning.dk/media/568851/copenhagen_adaption_plan.pdf

Source: City of Copenhagen, 2011a

STRATEGY/ACTION PLAN FACTSHEET 4	
Title	Good, Better, Best. Copenhagen Bicycle Strategy 2011-2025
Dimension of KPIs	Transport, Environment, urban space
Period	2011-2025
Strategy/Action Plan description	
Objective	To make Copenhagen the World's best cycling city by 2025
Measures	Measures in five areas: - Better urban spaces for cycling - Comfort forcyclists - Travel time - Safety Specific measures include: - Monitoring of progress and key statistics - Collaborative networks with adjecent municipalities on establishment of super cycle track - Well connnected cycling network - Cycling/pedestrian bridges where heavy traffic or lack of access prevent smooth cycle mobility - 5 super cycle tracks connecting the City of Copenhagen to the adjacent municipalities - Extension of green cycle track network - Air pumps along cycling lanes - High level of snow clearance - Wider cycle lanes - Green waves in traffic lights adjusted to cycling
Targets	Copenhagen citizens, commuters
Links and Contacts	
Promoter	City of Copenhagen
Document/website	http://kk.sites.itera.dk/apps/kk_pub2/pdf/818_YF8zF5k7Cr.pdf

Source: City of Copenhagen, 2011b

STRATEGY/ACTION PLAN FACTSEET 5	
Title	Carbon neutral by 2025 – Climate Plan Copenhagen
Dimension of KPIs	Environment/social/economic
Period	2015-2025
Strategy/Action Plan description	
Objective	For Copenhagen to become the first CO_2 neutral capital in the world by 2025
Measures	• Reduction of CO_2 emissions with 1.2 mio tonnes • Engagement of Copenhageners – create ownership • Engage business and investors • Engage knowledge insititutions • Green growth • Flexible and adaptive public policy and planning • Experiental urban planning projects, incuding in specified neighbourhoods • Enhance the framework conditions, e.g. legal frameworks and models for funding Specific target areas are: - Energy efficiency in buildings, low energy renovations and low energy new buildings - Solar panesl on public buildings - Public buildings used for demonstration projects - Electricity and heat production based on bio fuels, wind energy, goethermal energy, and waste - Increase cycle mobility - New fuels in the transport sector - Enhance public transport - Implementation of smart transport manangement systems - Smart transport cokmunication systems - The City of Copenhagen as climate company
Targets	Copenhagen citizens, business, global cities
Links and Contacts	
Promoter	City of Copenhagen
Document/website	http://www.energycommunity.org/documents/copenhagen.pdf

Source: City of Copenhagen, 2009b

XI.III.II KEY PROJECTS

This section presents examples of key projects that are on-going, about to start or recently finished. The projects all connect to Copenhagen's vision of becoming carbon neutral by 2025, with 20 per cent CO_2 reductions as mid-term target, or to sectoral visions/strategies/plans that implement the vision (City of Copenhagen, 2008b, 2009a, 2012a, 2012c, 2014b).

Project FACTSHEET 1	
Title	Affordable and green housing
Dimension of KPIs	Buildings and Land-use
Area of implementation (city, neighbourhood, etc.)	Neighbourhood
Implementation period	completed
Project description	
Aims	The aim is to build high-density, industrially manufactured townhouses and to keep operating expenses low.
Activities	Building 83 energy efficient townhouses, which have state-of-the-art insulation and heat exchangers. Exclusion of janitor services
Promoters/Beneficiaries; Partnership	KAB
Financing	KAB
Outcomes and impacts	People like living here, low moving rate among residents, and the estimates of low energy consumption have been accurate. Inspired the establishment of similar projects – 10 in Copenhagen and 1 in Aarhus
Links and Contacts	
Promoter	KAB, Municipality Copenhagen
Website	n.a.

Project FACTSHEET 2	
Title	Nordhavn urban development project
Dimension of KPIs	Transport modal share
Area of implementation (city, neighbourhood, etc.)	Urban area
Implementation period	2005-2025
Project description	
Aims	The aim is to develop the most ambitious, sustaianbel and climate proof urban development plan possible.

Project FACTSHEET 2	
Activities	Nordhavn is a new urban neighbourhood constructed in the old industrial port and on islands erected in the harbour through the use of the soil excavated during the extensive construction of sub-surface metro lines in Copenhagen. Private developers must comply with strict sustainability, energy efficiency and low carbon regulations in housing and urban planning projects. The green transport solution consists of a metro link, cycle super highway and excellent conditions for pedestrians, all integrated in a multimodal network. Buildings meet a bronze standard (aka DGNB; the DGNB standard is a German building standard that has been selected as the standard for sustainable areas and buildings in Denmark) which means that they are more energy efficient. Furthermore, the plan requires integration of climate adaption measures. For example by greening the roofs and by disconnecting rainwater from the sewage system. CPH City & Port Development reports its progress to maintain the certification.
Promoters/Beneficiaries; Partnership	City of Copenhagen, CPH City & Port Development A pilot project is led by the Danish Nature Agency and the Danish Green Building Council (DK-GBC)*
Financing	CPH City & Port Development, private developers, investors
Outcomes and impacts	Obtaining the gold certification for the green transport solutions, the use of rain water and the requirements for energy-efficient buildings.
Links and Contacts	
Promoter	City of Copenhagen, CPH City & Port Development
Website	n.a

Project FACTSHEET 3	
Title	Sustainable school at Dyvekie School Educating the new green generation
Dimension of KPIs	Building and construction. Social cohesion
Area of implementation (city, neighbourhood, etc.)	Building, community
Implementation period	2011-2014
Project description	
Aims	The aim is to create an inspiring learning environment, renovate the learning environment of the school and give Dybeke School a new sustainable profile.

Project FACTSHEET 3	
Activities	The roof and all the windows have been replaced with energy-efficient solutions. Solar cells have been installed on part of the roof. A new management system that controls the heating, ventilation and lighting has been installed to cut down 70 per cent of the energy used before. Electric lights have been changed to LED and integrated with the natural lighting, so areas near windows receive less electric light than the areas away from natural light sources. Furthermore the school handles rainwater locally and the sustainable solutions have been integrated into classroom teaching. e.g. science and math.
Promoters/Beneficiaries; Partnership	The City of Copenhagen in cooperation with KANT design and consulting, Cowi engineers, Kragh & Bergludn landscape designers, Enemærke and Petersen entrepreneurs, Grontmij acoustics consultants and Ulla Kjærvang consultant.
Financing	City of Copenhagen
Outcomes and impacts	Now every classroom in the school consumes less energy. For example, electricity consumption on lighting per room is now less than 1/5 of the electricity used before. Furthermore there is an inspiring learning environment.
Links and Contacts	
Promoter	City of Copenhagen
Website	n.a.

Project FACTSHEET 4	
Title	Wind turbines at Prøvestenen, Copenhagen
Dimension of KPIs	Energy
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2013-ongoing
Project description	
Aims	The aim is for the wind turbines in Copenhagen were the key to a more flexible and CO_2-neutral energy system.
Activities	Three new wind turbines have now been erected on an industrial area less than 5,000 meters from the city centre as a living proof of the future for green energy production in cities. The strategic location of the turbines, the public, companies and organizations in the area have been invited to purchase a 33 percent share in the wind turbines.
Promoters/Beneficiaries; Partnership	City of Copenhagen, HOFOR, CPH City & Port Development (By & Havn) and Copenhagen Malmø Port
Financing	

Project FACTSHEET 4	
Outcomes and impacts	• 13,600 MWh: this is the amount of energy produced by the three wind turbines from end of December 2013 to beginning of November 2014. • 3,400: so many households' energy consumption can be covered by the electricity produced from the turbines so far. • The turbines are part of Copenhagen's goal to install 360 megawatt of the energy from 100 wind turbines by 2025. This makes wind turbines one of the largest contributors to achieving CO_2 neutrality by 2025.
Links and Contacts	
Promoter	City of Copenhagen
Website	n.a.

Project FACTSHEET 5	
Title	Plastic ZERO
Dimension of KPIs	Waste
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	Finalised in August 2014*
Project description	
Aims	The aim is to uncover new ways to get more value from waste plastics.
Activities	There has been focus on design for recycling and Copenhagen engaged major retailers to take part in developing a guideline for plastic packaging. The project also developed guidelines to prevent waste plastics through public procurement. Engage stakeholders in the value chain.
Promoters/Beneficiaries; Partnership	The project was led by the City of Copenhagen and had six European partners: • City of Hamburg (Germany) • City of Malmö (Sweden) • Aalborg University • Amager Resource Center • The Latvian munipal waste company Liepajas RAS Ltd. • The Finnish company Tampere Regional Solid Waste Management Ltd.
Financing	City of Copenhagen, EU Life Programme The total budget of Plastic ZERO was 2 million euro.
Outcomes and impacts	-

Project FACTSHEET 5	
Links and Contacts	
Promoter	City of Copenhagen
Website	n.a.

Project FACTSHEET 6	
Title	The Cycle Serpent
Dimension of KPIs	Transport
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2012-2014
Project description	
Aims	The aim with The Cycle Serpent (Copenhagen's new elevated two-way bike lane) is to connect the road and the harbour bridge. The bridge contributes to Copenhagen's bicycle strategy by improving passability and comfort for cyclists as it leads cyclists away from the pedestrians, traffic and steps. Furthermore, Copenhagen is aiming to be the world's best city to bike in by the year 2025. The goal s are: • 50 percent of all trips to work and study to be by bike. • 90 percent of the cyclists to feel safe in traffic. • 15 percent of the travel time to be cut.
Activities	Construction of an elevated two-way bike lane for cyclist only, connecting the road and the harbour bridge.
Promoters/Beneficiaries; Partnership	DISSING+WEITLING architectures, Rambøll engineering, and MT Højgaard construction.*
Financing	City of Copenhagen Total cost: DKK 38 million (the Danish government has supported the project with DKK 6 million)
Outcomes and impacts	On the connecting bridge, Byggebroen, cycle traffic has increased by 23 percent compared to two years ago. Additionally every cyclist saves one minute using the Serpent instead of the stairs on their ride to work and study. Converted into working hours, this means society will save DKK 5 million a year.
Links and Contacts	
Promoter	City of Copenhagen
Website	n.a.

Project FACTSHEET 7	
Title	Hydrogen cars: Joint Purchase and Fleet Management*
Dimension of KPIs	Transport

Project FACTSHEET 7	
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2011/2012-2025
Project description	
Aims	The aim is to have replaced 85 percent of the City of Copenhagen's small passenger cars with hydrogen or electric cars by 2015, and 100 percent by 2025. Additionally it is the aim to make the transition at the same or even lower costs.
Activities	• Establishing central data collection of the usage of cars in all departments. • Making it easier to use the full potential of the cars. • Other cities have been invited to join the procurement process, and this will ensure lower prices because of the advantage of large-scale purchases. In 2014 there were counted 14 public partners. • Converting all the city's own cars to alternative fuels before 2025. • The city is also investing in infrastructure for its electrical cars.
Promoters/Beneficiaries; Partnership	Contractor: The City of Copenhagen
Financing	City of Copenhagen
Outcomes and impacts	The City of Copenhagen has saved up to 30 percent of the full price through joint procurement of the new hydrogen and electric cars. Furthermore, the number of the city's green cars has more than doubled; from 2012 to 2013, the percentage of green cars increased from 15 percent to 43 percent.
Links and Contacts	
Promoter	City of Copenhagen
Website	n.a.

Project FACTSHEET 8	
Title	Climate proofing Copenhagen
Dimension of KPIs	Climate adaptation
Area of implementation (city, neighbourhood, etc.)	City
Implementation period	2012-2032
Project description	
Aims	The aim is to protect Copenhagen against heavy rainfall in the future.

Project FACTSHEET 8	
Activities	The basis for more than 300 unique climate adaption projects across the capital and all the projects will take about 20 years to implement. A key part of the climate adaption plan is to build tree large pipes to deal with the everyday rainfall as well as storm water. There will also be build roads for storm water, pipes for storm water, roads for delaying rain, spaces for delaying the rain and green roads (these spaces such as parks or green roofs delay and store water locally).
Promoters/Beneficiaries; Partnership	City of Copenhagen
Financing	City of Copenhagen The budget for the project is DKK 9.8 billion
Outcomes and impacts	Reduced risks for flooding
Links and Contacts	
Promoter	City of Copenhagen, Hofor
Website	n.a.

Project FACTSHEET 9	
Title	St. Kjelds Neighbourhood
Dimension of KPIs	Environment
Area of implementation (city, neighbourhood, etc.)	Neighbourhood
Implementation period	2011-2016
Project description	
Aims	The aim is to demonstrate how green areas and public involvement can tackle the problem of increased rainwater and create an attractive urban space.
Activities	Tåsinge Plads, was launched as a symbol of the innovativeness of the climate adaption of the entire St. Kjeld's neighbourhood, and it has been sloped so that the lower part collects rainwater that then seeps into the ground. Solutions at street-level are being, and will continue to be, established to serve as attractive urban environments, which at the same time manage rainwater. Furthermore, St. Kjeld's neighbourhood is involved by the public.*
Promoters/Beneficiaries; Partnership	The City Planning Office, the Integrated Urban Renewal in St. Kjeld's, Greater Copenhagen Utility (HOFOR) and the Environmental Centre Østerbro.
Financing	The cost of the new climate-adapted Tåsinge Plads had a cost of DKK 16 million.

Project FACTSHEET 9	
Outcomes and impacts	Surface water from a total area of about 6,400 sq m can now be managed without being flushed directly into the drains, but instead it is reused or it is allowed to leach into the groundwater or evaporate. Understanding climate adaption processes as combination of bottom-up change management and top-down technical solutions is one of the important lessons learned from this project.
Links and Contacts	
Promoter	City of Copenhagen
Website	n.a.

XI.IV CASE STUDY CITY ASSESSMENT

XI.IV.I ENVIRONMENTAL PERFORMANCE

The indicators on environmental performance were provided by representatives from the national and municipal statistics. Detailed sources are listed for each indicator. Most of the data are available only for some years, and not collected or reported regularly. Thus the variation rates of the indicators are not known.

Table 96: Data collected for the KPIs in the environmental dimension and actual period covered

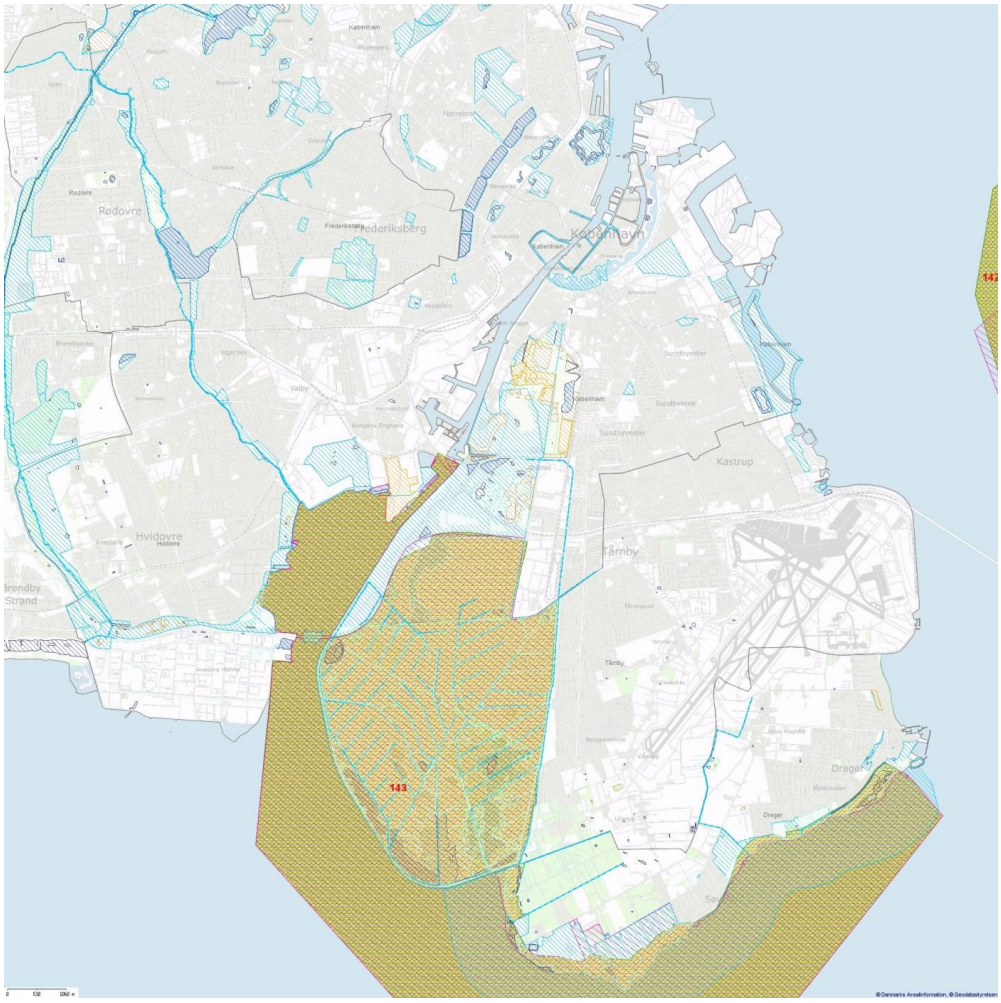
DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	Area	2012
	Energy	Energy intensity variation rate	Toe/euro Toe	-
		Variation rate of energy consumption by sectors	Percentage	2008-2013
	Climate and Air Quality	Variation rate of carbon emissions intensity	Ton CO_2/euro Ton CO_2	2005-2013
		Variation rate of carbon emissions by sector	Ton CO_2	2005-2012
		Exceedance rate of air quality limit values	Nº	2009-2012
	Transport and mobility	Variation share of sustainable transportation	Percentage	2010-2012
	Waste	Variation rate of urban waste generation	Kg/person/year	2007-2010

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
		Variation rate of urban waste recovery	Percentage	2006-2012 2001-2010
	Buildings and Land Use	Energy-efficient buildings variation rate	Percentage	-
		Urban building density variation rate	Nº/ km^2	2010

ECOSYSTEM PROTECTED AREAS

Since 1996, the major parks in Copenhagen have been converted to protected areas (DN, 2014). Furthermore, there is a Habitat 2000 area to the south west of the municipality.

Figure 178: Share of ecosystem protected areas/Natura 2000 in Copenhagen in 2012



Source: Ministry of the Environment, 2015

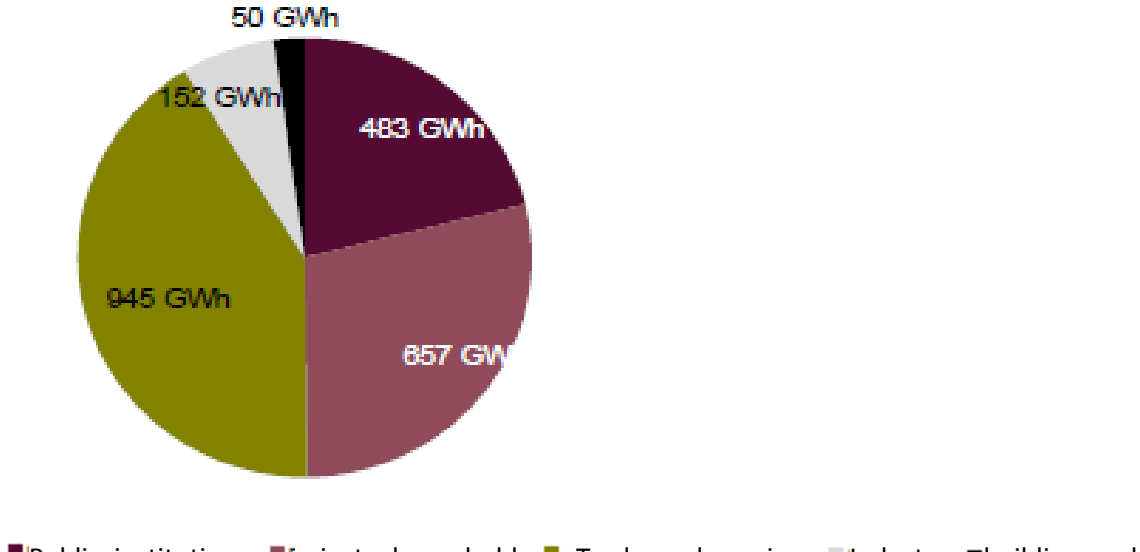
ENERGY INTENSITY VARIATION RATE

Data is not available.

VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

Variation rate for energy consumption indicates sectors where potential significant reductions may be gained. This is reflected by the relative share of electricity consumption and of heating for sectors. Data for earlier years is not accessible.

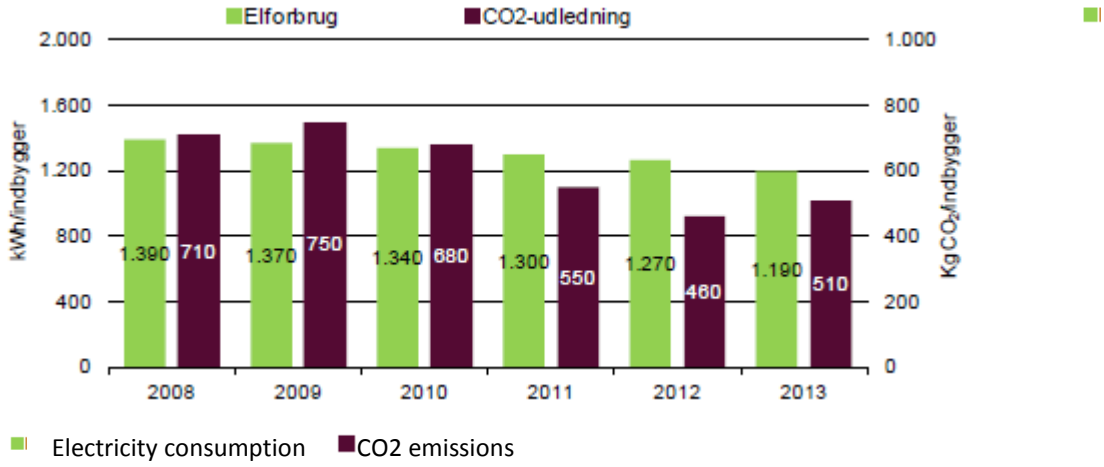
Figure 179: Electricity and heating (GWH) consumption 2013 per sector



Source: City of Copenhagen, 2014c

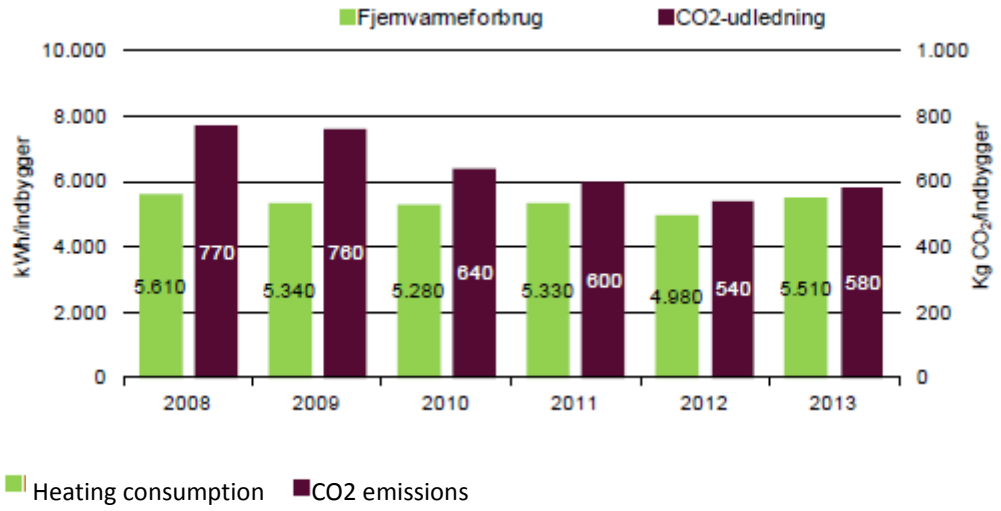
Households make up the majority of consumption of heating, mainly as district heating supplied by city's power plants. Almost no houses are heated by electricity. The variation rate for households' energy consumption thus also indicates the KPI, see figure 7 and 8.

Figure 180: Variation rate of electricity use and carbon emissions for households in Copenhagen 2008-2013



Source: City of Copenhagen, 2014c

Figure 181: Variation rate of heating consumption and carbon emissions in Copenhagen households



Source: City of Copenhagen, 2014c

VARIATION RATE OF CARBON EMISSIONS INTENSITY

The indicator of carbon emission intensity indicate the efficiency of initiatives to reduce the CO_2 stemming from CO_2 emitting urban sectors. In Copenhagen's monitoring programme, CO_2 emissions are measured for categories of electricity production, district heating, transport and other activities. Copenhagen uses 2005 as base year for CO_2 reduction objectives, and the monitoring has been conducted consistently since then. Thus, the time period for this KPI covers 2005-2013.

By 2013, CO_2 emissions were 1.9 tonnes, representing a 20 per cent decrease in emissions relative to 2005. This covers a short period with increasing emissions in 2012, due to poor wind conditions and subsequently more fossil fuels imported for energy production. At the same time, then the 20 percent decrease has taken place concomitantly with a 11.4 per cent increase of the population in Copenhagen, from 502,362 inhabitants in 2005 to 559,440 in 2013. This is reflected in the CO_2 emissions per capita in table 89.

Table 97: Variation rate of carbon emissions intensity

VARIATION RATE OF CARBON EMISSIONS INTENSITY	2005	2013	CHANGE
1,000 tonnes CO2	2,358	1,874	-20 %
Per capita tonnes/cap	4.69	3.35	-29 %

Source: City of Copenhagen, 2014c

VARIATION RATE OF CARBON EMISSIONS BY SECTOR

This KPI of variation rate of carbon emissions by sector indicates the potential for further reductions and may also show which areas that have challenges with respect to meeting reduction targets. Copenhagen monitors the CO_2 emissions as part of achieving its vision of reaching 20 per cent reduction by 2015 and becoming carbon neutral by 2025 and uses 2005 as base year.

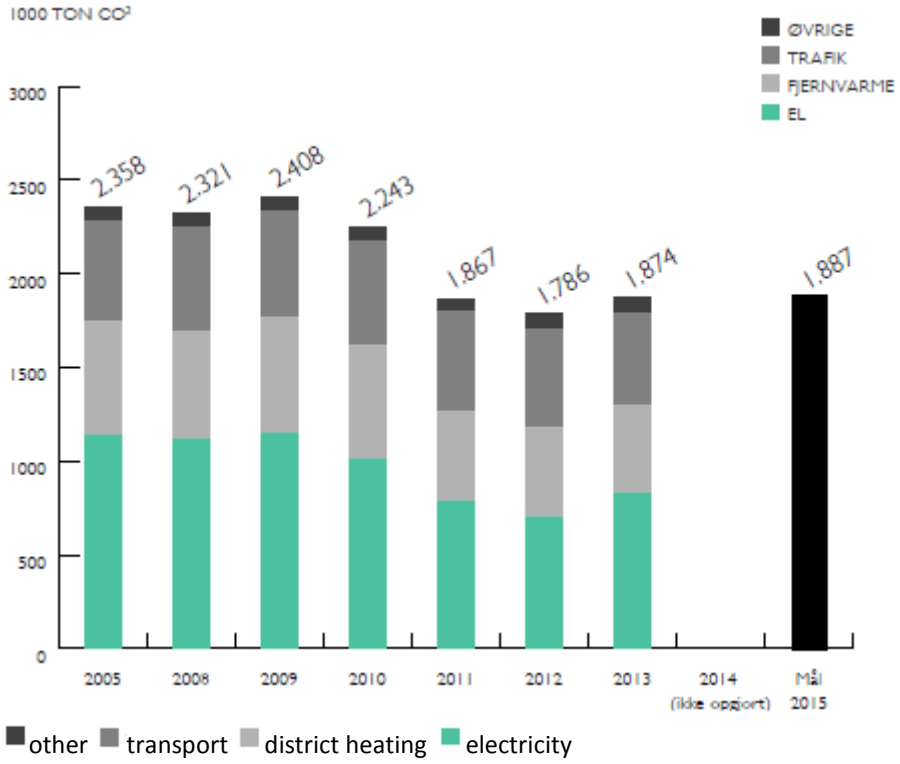
Table 98: Variation rate of carbon emissions per sector in Copenhagen 2005-2012

YEAR	2005	2012
Total (kton CO2)	2,358	1,874
Work machines and tools (kton CO2)	50,0	74,0
Industry and energy (kton CO2)	734,0	1158,4
Road transport (kton CO2)	489,0	348,4
Transport, other (kton CO2)	45,6	25,3

Source: City of Copenhagen, 2014c

The relative distribution of CO2 emissions by activity 2005-2013 is shown in figure 182.

Figure 182: Distribution of CO2 emissions by activity 2005-2013 in Copenhagen



Source: City of Copenhagen, 2015b

EXCEEDANCE RATE OF AIR QUALITY LIMIT VALUES

The indicator shows the variation in annually exceedances registered at street level in Copenhagen for for the following pollutants: Nitrogen Dioxide (NO2) and particles with a diameter of 10 microns or less (≤ PM10) and particles with a diameter of 2.5 microns or less (≤ PM2.5). It should be noted that there are large variation over the year, week and day and according to location within the city (Ellermann et al, 2015).

Table 99: Exceedance of air quality levels in Copenhagen 2009-2012

POLLUTANT	ANNUAL MEAN VALUE (µG/M3)				EU LIMIT VALUES
	2009	2010	2011	2012	
PM 2.5	18	17	19	15	25
PM10	30	28	35	31	40
NO2	50	56	54	55	40

Source: City of Copenhagen, 2015b Ellermann et al, 2015

VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

The shares of different modes of urban transport show the general development in low carbon transport modes such as walking, cycling, hydrogen/electrical cars and busses, electrical trains fuelled by renewable energy. Furthermore, it indicates the extent to which Copenhagen at current is dependent on car transport. However, the statistics do not differ between hydrogen/electrical cars and energy efficient electrical trains, and thus the sustainable transport share only covers walking and cycling.

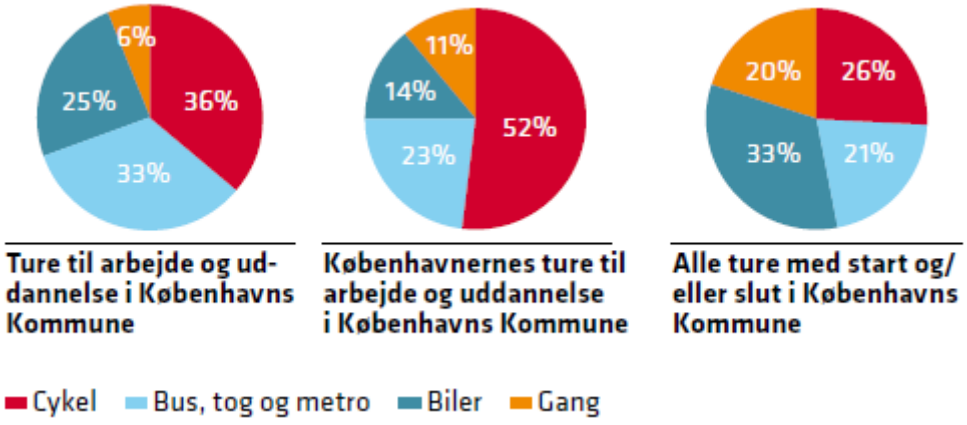
Table 100: Modal share of transportation

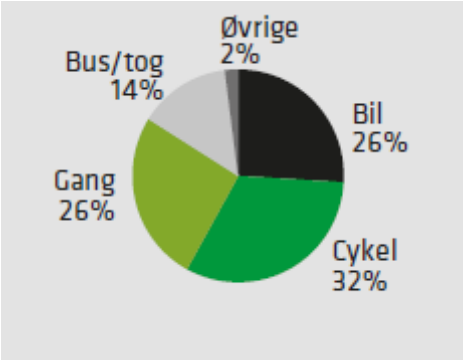
TRANSPORT MODE	MODAL SHARE 2010 STUDY/ WORK TRIPS	MODAL SHARE 2012 STUDY/WORK TRIPS	MODAL SHARE 2012 ALL TRIPS
Cycle	32 %	36 %	26 %
Bus, train, metro	14 %	33 %	21 %
Cars	26 %	25 %	33 %
Walking	26 %	6 %	20 %
Others	2 %	-	-

Source: City of Copenhagen, 2012d, 2011d

The modal share differs for people with residence in Copenhagen and for all who work or study in Copenhagen.

Figure 183: Modal share in 2012 for all study or work related trips, fora Copenhageners' study or work related trips, and for all trips starting or ending in Copenhagen, and modal share for all trips in 2010





Source: City of Copenhagen, 2012d, 2011d

URBAN SOLID WASTE GENERATION

The indicator of variation rate of urban waste generation has been calculated for 2007 and 2010, as numbers for 2013 are unavailable. In 2007, City of Copenhagen had 502,954 inhabitants and generated 890,000 tonnes of waste, and in 2010 it had 527,045 inhabitants and generated 820,000 tonnes of waste. The per capita waste generation is calculated on the basis of this and stated in kg/person/year. The waste generated cover waste from private households, businesses and building and construction. The categorization of Copenhagen's urban solid waste covers the waste classes: paper, plastic, glass, metals, textiles, and organics.

Table 101: Total urban solid waste in Copenhagen and per capita

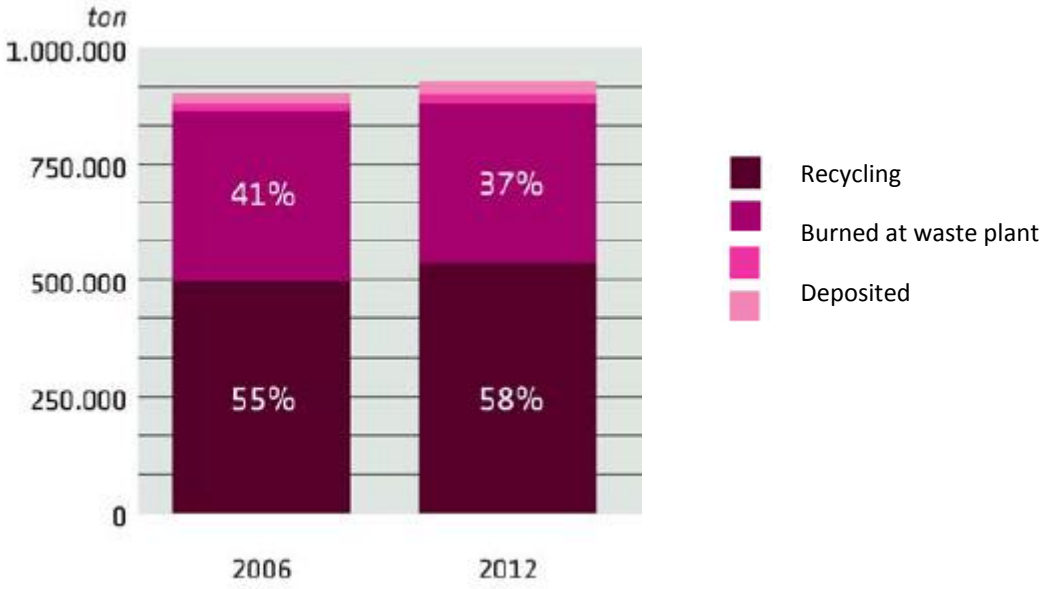
	2007	2010
Total urban solid waste (1000 tonnes)	890	820
Total urban solid waste per capita (kg/capita)	1,770	1,556

Source: City of Copenhagen, 2011c, Statistics Denmark, 2015

VARIATION RATE OF URBAN WASTE RECOVERY

This indicator is represented by the share of waste that was subject to recycling and is shown for 2006-2012 in figure 184 and for 2010 in table 94.

Figure 184: Recycling of waste in percent of total waste in Copenhagen 2006-2012



Source: City of Copenhagen, 2008c

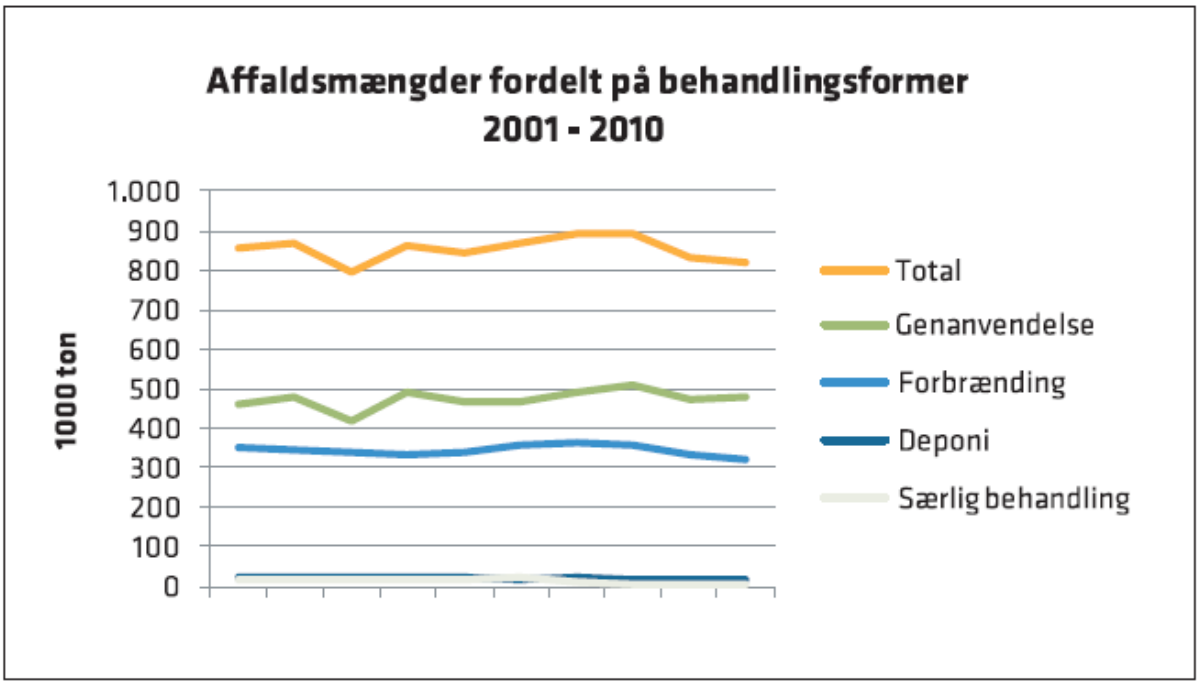
Table 102: Recycling of waste in 1000 kg and as per cent of total urban solid waste in Copenhagen 2010

	2010
Total urban solid waste (1000 tonnes)	820
Total recycled waste (1000 tonnes)	476.6
Per cent recycled	58 %

Source: City of Copenhagen, 2011c; Statistics Denmark, 2015

Numbers for recycling were not available for 2007 while the graph below indicates very little variation in recycling. The green line represents recycling and the yellow total amount of waste.

Figure 185: Recycling of waste 2001-2010



ENERGY-EFFICIENT BUILDINGS VARIATION RATE

This indicator has not been collected due to lack of data.

URBAN BUILDING DENSITY VARIATION RATE

Table 103: Urban density in 2010

	2010
Registrered buildings	49 244
Total surface land area	156,9
Ratio (Number of/km2)	313,9

Source: AU modelling. No data available for previous years for this indicator.

XI.IV.II SOCIAL PERFORMANCE

The overview of actual collected indicators representing the social performance of the city, their geographical coverage is listed below. Each indicator is shown in more detail below.

Table 104: Data collected for indicators in the social dimension with actual period

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.
Social Inclusion	Variation rate of unemployment level by gender	**Percentage**	**2007-2012**	Municipality
	Variation rate of poverty level	Percentage	2000-2010 2012-2014	Municipality
	Variation rate of tertiary education level by gender	Percentage	2006-2012	Municipality
	Variation rate of average life expectancy	Average №	2004-2013	Municipality
Public services and Infrastructures	Variation rate of green space availability	**Percentage**	**2013** **2007-2013**	Municipality
Governance effectiveness	Existence of monitoring system for emissions reductions	**Yes/No** **Description**	**2007-2015**	Municipality

VARIATION RATE OF UNEMPLOYMENT LEVEL BY GENDER

Table 97 shows number of unemployed by gender relative to the labour force and Copenhageners from the age of 16 and older. Data available is for 2007-2012 for the City of Copenhagen and represents number of unemployed in January in 2007-2012 in percentage of the total labour force. The table shows that while in 2007, women with 7.1 % had a higher rate of unemployment than men with 6.5 %, this had changed by 2012 where women with 7.1 % had a lower level of unemployment than men with 7.8 %. Moreover, the numbers cover a

lower unemployment rate for both genders during the period, with 2009 as the year with lowest level of unemployment.

Table 105: Full time unemployed in % of the total labour force (age 16-) 2007-2012 and by gender

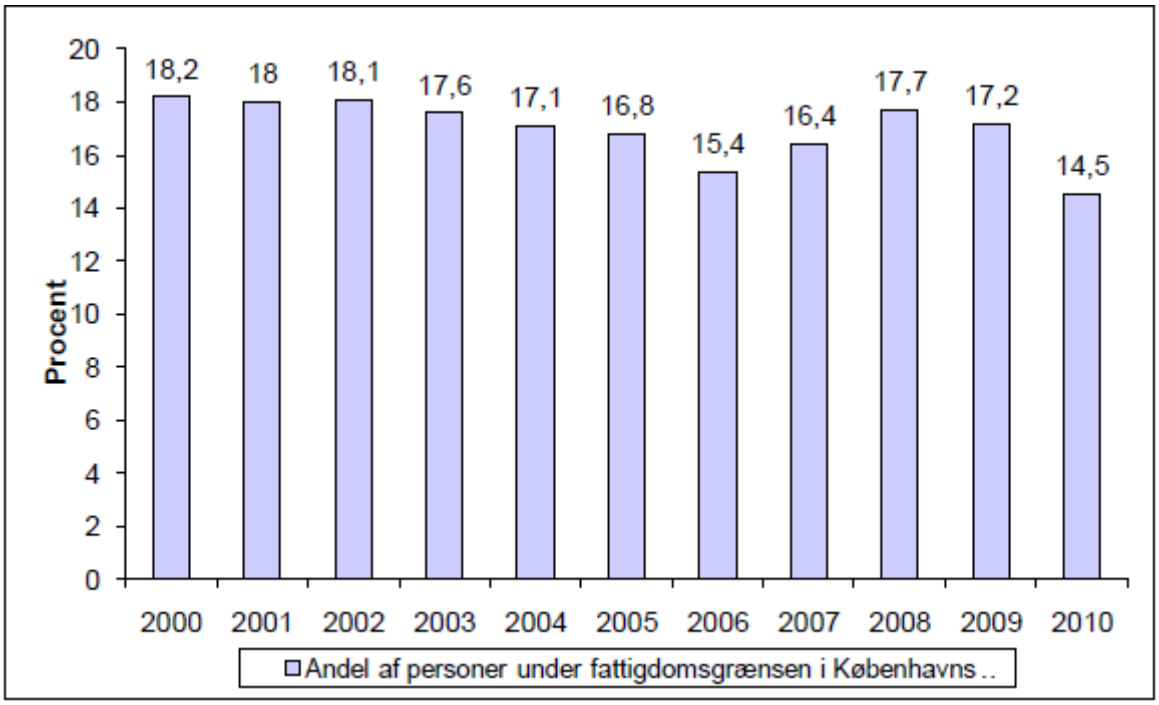
	TOTAL	MEN	WOMEN
2007	6,8	6,5	7,1
2008	5,1	5	5,2
2009	5,1	5,5	4,6
2010	7,5	8,5	6,5
2011	7,8	8,6	7
2012	7,5	7,8	7,1

Source: Statistics Denmark, 2015

VARIATION RATE OF POVERTY LEVEL

The indicator sums up the number of persons who are at risk of poverty, severely materially deprived or living in households with very low income). Denmark does not have an official definition of poverty and the City of Copenhagen bases monitoring of poverty levels on a definition of relative poverty (City of Copenhagen, 2013a). Table 98 shows the development in poverty rates in Copenhagen 2000-2010.

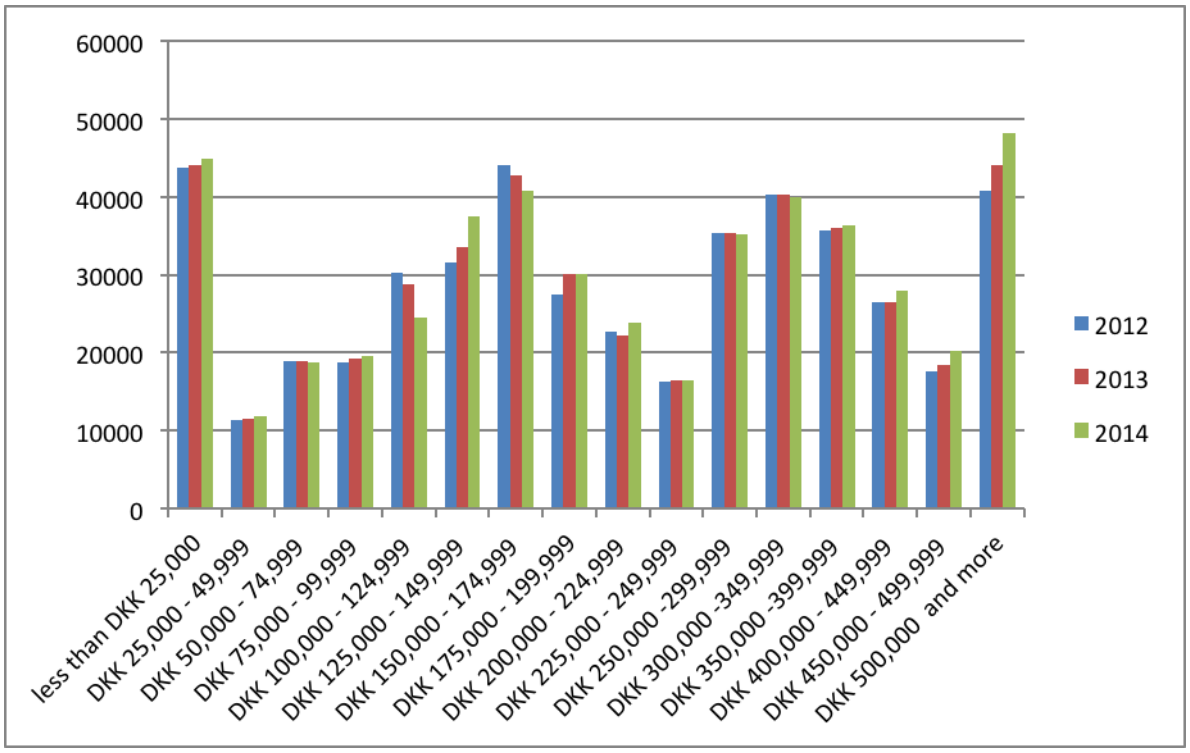
Figure 186: Number of persons living below the poverty threshold in Copenhagen, relative to the population in Copenhagen 2000-2010



Source: City of Copenhagen, 2013a

The poverty level in Copenhagen is also indicated by the size of the income gap in Copenhagen, as shown in table 99. Data for the City of Copenhagen covers 2012-2014 and though it only covers a short period of time, it reflects the general trend of a widening income gap in the city (City of Copenhagen, 2013a) and in Denmark.

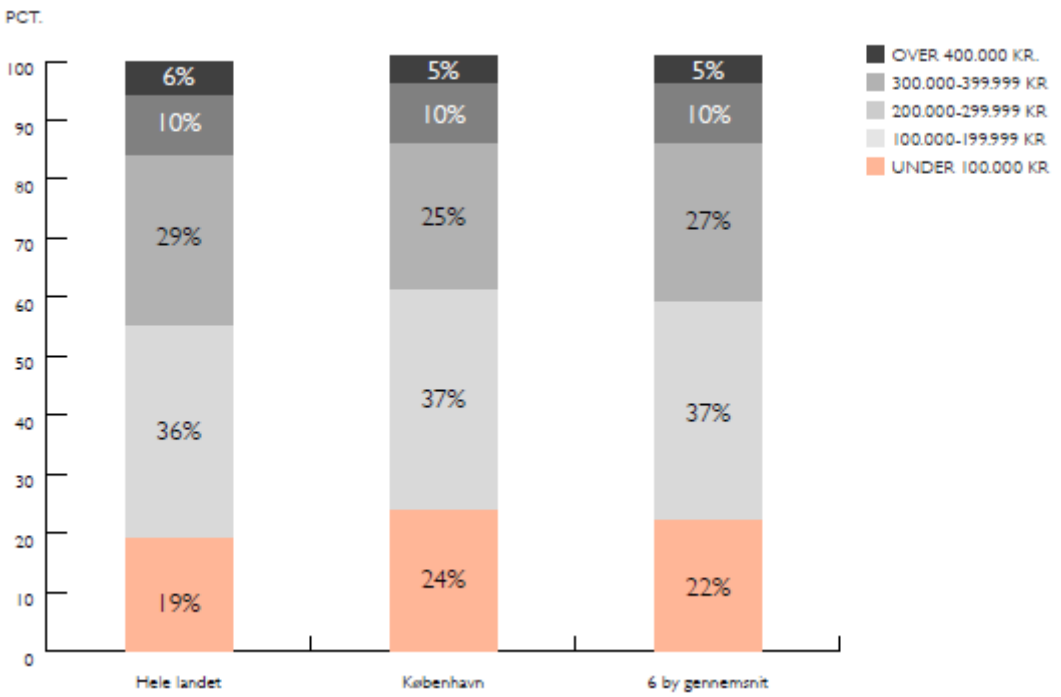
Figure 187: Variation rate of income gap in Copenhagen 2012-2014



Source: Statistics Denmark, 2015

The widening gap is also reflected in the share of the population in the lowest income group, compared to the Danish average. Copenhagen has a relatively high share of the population in the low income group. In the figure, the pink represents the lowest income, a maximum of EURO 13,423/DKK 100,000 per year, and Copenhagen in the middle with national average to the left and the average in the largest Danish cities (minus Copenhagen) to the right.

Figure 188: Distribution of the population according to level of income for national average, Copenhagen and the average of the 6 largest cities (excl. Copenhagen)



Source: City of Copenhagen, 2015b

VARIATION RATE OF TERTIARY EDUCATION LEVEL BY GENDER

In Statistics Denmark, tertiary education covers short and medium tertiary educations, and bachelor, master and PhD educations. These are summarized for women age 16-69 living in Copenhagen and compared to total number of Copenhageners with tertiary education and to women in Copenhagen who have completed any education. Table 100 shows that the total number of women and men with tertiary education has increased from 2006 to 2012, and moreover that the increase is higher for women than men. Women in both years make up the majority of Copenhageners with completed tertiary education than men

Table 106: Variation rate of women in Copenhagen with tertiary education

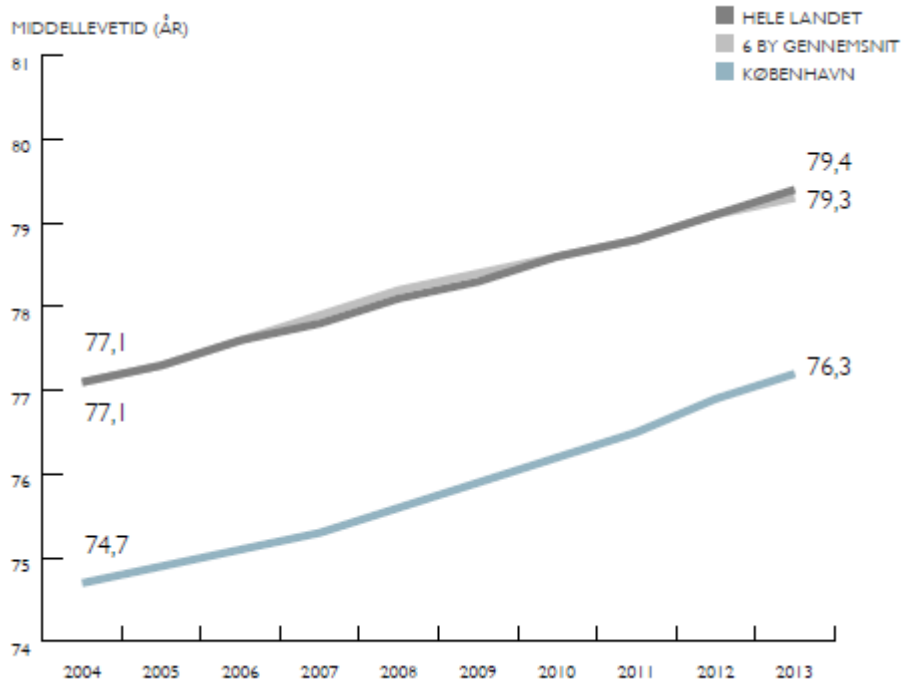
	2006	2012	INCREASE, NO.	INCREASE RATE
Copenhageners with tertiary education	126154	160514	34360	27 %
Women in CPH with tertiary education	67312	87251	19939	30 %
Men in CPH with tertiary education	58842	73263	14421	25 %
Rate of women in CPH with tertiary education of all Copenhageners with high education	53 %	54 %		
Rate of men in CPH with tertiary education of all Copenhageners with high education	47 %	46 %		
Rate of women in CPH with tertiary education of all women in CPH with any education	35 %	41 %		

Source: Statistics Denmark, 2015

VARIATION RATE OF AVERAGE LIFE EXPECTANCY

This KPI indicates the general health conditions and pictures the average length of life in Copenhagen. The graph in figure 187 also shows life expectancy in Copenhagen to be clearly below both the national average (dark grey line) and the 6 largest Danish cities (minus Copenhagen) (the light grey line).

Figure 189: Variation rate of average life expectancy



Source: City of Copenhagen, 2015b

VARIATION RATE OF GREEN SPACE AVAILABILITY

The indicator aims to assess the variation rate of green spaces, i.e. urban parks, forests, pocket parks and other forms of nature relative to total surface area (km2). Since the Second World War, the overall spatial development of Copenhagen and neighbouring areas has been structured according to an urban spatial plan The Finger Plan (Local Plan Office for Greater Copenhagen, 1947) outlining the city along the image of a hand, with the core city at the 'palm', main transport lines (rail, road, cycle paths) along the 'fingers' and green wedges between the 'fingers' stretching into the built urban area towards the core city at 'palm' of the 'hand' (Jensen et al, 2013). These wedges are still to a large extent preserved.

In managing the development of the core city, the City of Copenhagen works with urban green spaces within a range of urban policy areas, including climate adaptation, recreation, health, urban gardening, educational purposes, community building, urban nature and biodiversity (Zandersen et al, 2014). The City of Copenhagen includes a range of urban green spaces, including parks, pocket parks, green roofs, squares with green areas, and court yards with vegetation in public and private housing, and includes additionally blue spaces, i.e. lakes, ponds, streams and the harbour baths, in the approach to green spaces that this is based on (City of Copenhagen, 2009c, 2013d). The area of recreational spaces is thus used as proxy for green spaces. Data is not available for 2003.

Table 107: Ratio of green areas and recreational areas the City of Copenhagen and Copenhagen Capitol Area 2013

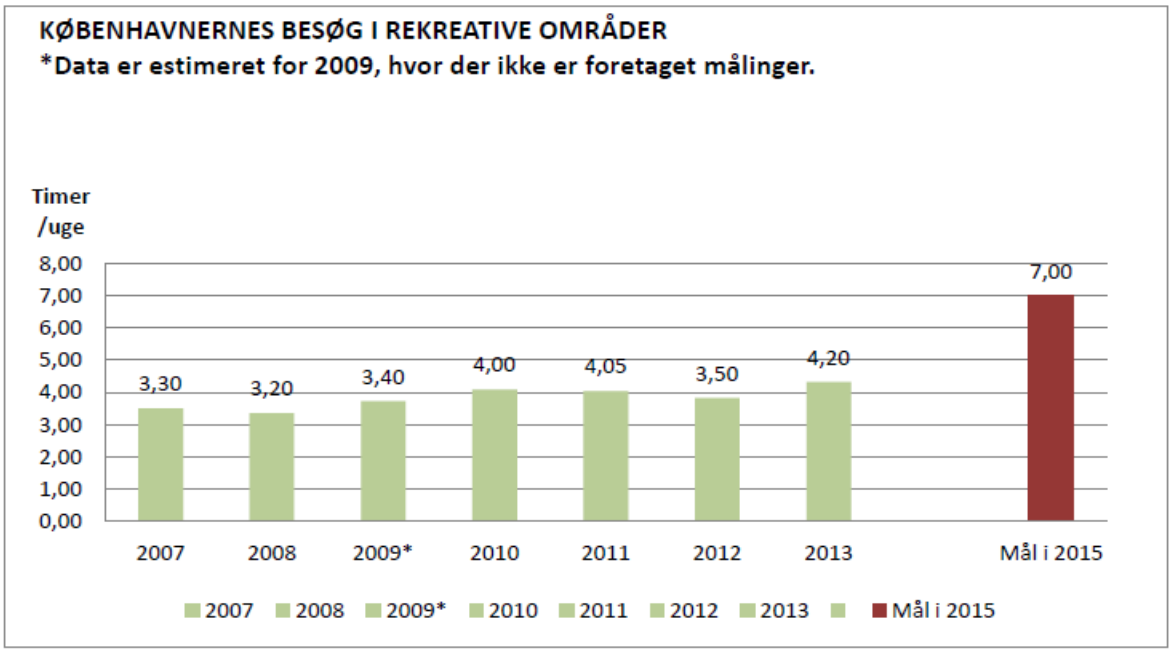
2013	TOTAL AREA	GREAN/BLUE AREA*		RECREATIONAL AREAS**	
	Km2	Km2	Proportion %	Km2	Proportion %
City of Copenhagen	89	20	22.2	15	16.5
Copenhagen Capital Area	2,791	1,020	36.6	532	19.1

* Parks, forests, lakes, nature
** Recreational areas from DØRS

Source: AU modelling 2015

In addition to proportion of total area, accessibility to public urban green spaces also indicates the green space availability. The City of Copenhagen has included the use of green spaces/recreational areas as a priority in the urban visions and urban development plans, measured in terms of average number of hours per week spend in green/recreational space. Recreational areas are almost exclusively mixed with green spaces, e.g. skate tracks in urban parks or public squares with grass and trees, thus recreational areas indicate urban green areas. Use of recreational – green areas is shown in figure 188.

Figure 190: Copenhagener's use of recreational/ green spaces in Copenhagen 2013



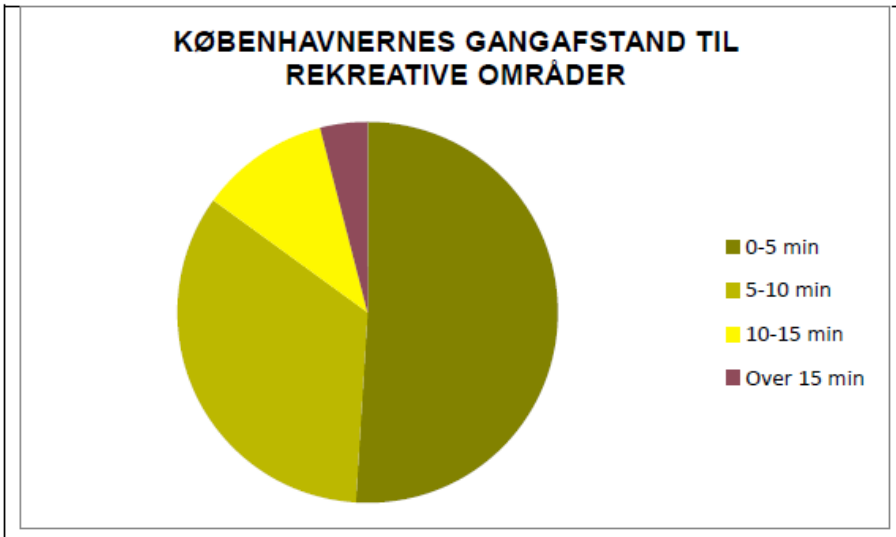
Source: City of Copenhagen, 2015b

In the diagram, the x-axis represents hour spent in recreational spaces per week. The burgundy pillar displays the target set in the 2007 vision *The Eco-Metropolis - Our Vision for Copenhagen*

2015 (City of Copenhagen, 2008a [2007]).

Access and distance from residence to recreational areas constitutes another indicator that informs about green space availability. This is shown in figure 189. Furthermore, the figure illustrates the vast differences that exist within the city.

Figure 191: Distance for Copenhageners from place of residence to recreational area and amount of the area of recreational space per inhabitant 2013



BYDEL	Areal grønne områder (ha)	Indbyggere	m2 grønt pr. indbygger
Indre By	125,61	50.906	24,67
Østerbro	115,28	73.992	15,58
Nørrebro	46,01	76.715	6,00
Vesterbro/Kgs. Enghave	140,59	59.447	23,65
Valby	150,88	50.127	30,10
Vanløse	103,33	38.734	26,68
Brønshøj-Husum	190,81	42.441	44,96
Bispebjerg	153,30	51.764	29,62
Amager Øst	157,13	52.641	29,85
Amager Vest	836,47	62.361	134,13
I alt	2019,40	562.412 (inkl. 3.284 uden for fordeling)	35,91

Source: City of Copenhagen, 2015b

EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

Copenhagen has formulated two overall urban visions and a number of sectoral plans and strategies where visions are also included and linked to the overall urban vision. Each of the visons has been followed by measurable target objectives in key areas and by measures. Annually or bi-annually, the progress (or lack of progress) within the target areas are monitored, and progress is evaluated with respect to achieving the targets of the visions, which includes the development in CO_2 emissions specified for the target objectives. Also projects and measures launched as part of the climate initiatives are monitored and evaluated, though the level of detail in the evaluations varies.

The overall most recent urban vision has set a target of Copenhagen becoming carbon neutral by 2025. Difficulties in especially the transport sector are recognized and monitored extra closely.

Hence, yes, a monitoring system for emissions reductions exists in the City of Copenhagen.

(City of Copenhagen, 2008, 2012, 2013, 2015)

XI.IV.III ECONOMIC PERFORMANCE

The overview of actual collected indicators representing the economic performance of the city, their geographical coverage and data source is listed in102. Each indicator is shown in more detail below.

Table 108: Data collected for indicators of the economic dimension and actual years

SUB-DIMENSION	INDICATOR	UNIT	YEAR	GEOGR. COVER.
Sustainable economic growth	Level of wealth variation rate	**eur/person**	-	-
	Variation rate of GDP by sectors	Percentage	2009-2013	Municipal
	Employment by sectors variation rate	Percentage	2009-2013	Municipal
	Business survival variation rate	Percentage	-	-
Public Finances	Budget deficit variation rate	**Percentage of city's GDP**	**2005-2014**	Municipal
	Indebtedness level variation rate	Percentage of city's GDP	2005-2014	Municipal
Research & Innovation dynamics	R&D intensity variation rate	**Percentage**	-	-

LEVEL OF WEALTH VARIATION RATE

Data not available.

VARIATION RATE OF GDP BY SECTOR

Data not available

EMPLOYMENT BY SECTORS VARIATION RATE

This indicator pictures employment by economic activity sector in per cent. The KPI indicates the movements in the labour market in Copenhagen and is in table 103 pictured in the period 2009-2013 for people in the City of Copenhagen and in other municipalities who work in Copenhagen.

Table 109: Employment by sectors variation rate

SECTOR	2009 COPENHAGENER WITH WORKPLACE IN			2013 COPENHAGENER WITH WORKPLACE IN			VARIATION	
	City of Copenhagen	Other municipalities	TOTAL 2009	City of Copenhagen	Other municipalities	TOTAL 2013	No.	%
Agriculture, forestry, fishery	50	220	**270**	47	234	**281**	+ 11	**+ 4,1**
Industry, resource extraction, resource distribution	4.990	10.216	**15.206**	4.400	9.467	**13.867**	- 1.339	**- 8.8**
Building and construction	3.553	6.369	**9.922**	2.829	5.616	**8.445**	- 1.477	**- 14.9**
Trade	19.754	15.025	**34.779**	19.075	15.470	**34.545**	- 234	**- 0.7**
Transport	8.116	7.760	**15.876**	6.448	7.348	**13.796**	- 2.080	**- 13.1**
Hotels and restaurants	9.866	3.556	**13.422**	12.360	3.962	**16.322**	+ 2.900	**21.6**
Publishing, tv and radio	7.462	2.228	**9.690**	8.414	1.761	**10.175**	+ 485	**+ 5.0**
Tele-communitation	1.937	563	**2.500**	1.793	463	**2.256**	- 244	**- 9.8**
ICT and information services	5.340	3.438	**8.778**	6.027	3.364	**9.391**	+ 613	**+ 7.0**
Finances and insurance	7.144	4.463	**11.607**	6.980	4.210	**11.190**	- 417	**- 3.6**
Real estate	3.395	1.305	**4.700**	3.104	1.578	**4.682**	- 18	**- 0.4**
Consultancy	8.884	5.296	**14.180**	9.955	5.536	**15.491**	+ 1.311	**+ 9.2**

SECTOR	2009 COPENHAGENER WITH WORKPLACE IN		TOTAL 2009	2013 COPENHAGENER WITH WORKPLACE IN		TOTAL 2013	VARIATION	
Research and development	1.740	1.036	**2.776**	1.709	1.326	**3.035**	+ 259	**+ 9.3**
Advertising and other business services	5.685	1.296	**6.981**	5.748	1.098	**6.846**	- 135	**- 1.9**
Travel agencies, cleaning	11.658	4.853	**16.511**	12.275	4.671	**16.946**	+ 435	**+ 2.6**
Public administration, police and defense	13.845	4.769	**18.614**	12.798	6.134	**18.932**	+ 318	**+ 1.7**
Education	13.334	11.898	**25.232**	15.224	13.412	**28.636**	+ 3.404	**+13.5**
Health	9.627	7.179	**16.806**	10.602	8.041	**18.643**	- 163	**- 1.0**
Welfare institutioner	21.271	12.436	**33.707**	23.482	11.992	**35.474**	+ 1.767	**+5.2**
Culture and leisure	6.053	2.500	**8.553**	5.957	2.696	**8.653**	+ 100	**+ 1.2**
Other services	7.651	2.089	**9.740**	7.934	2.241	**10.175**	+ 435	**+ 4.5**
Not specified	2.064	117	**2.181**	1.974	3	**1.977**	- 204	**- 9.4**
Total	**173.419**	**108.612**	**282.031**	**179.135**	**110.623**	**289.758**		

BUSINESS SURVIVAL VARIATION RATE

Data not available.

BUDGET DEFICIT VARIATION RATE

This indicator shows the balance of the budget in Copenhagen and indicates whether Copenhagen generates the necessary revenues to finance their activities, or if the city relies on other financial sources such as loans (indebtedness). Table 104 shows that the City of Copenhagen had a surplus, i.e. negative deficit, in the period from 2005-2014. The surplus on the balance grew from Euro 0.186 bill in 2005 to Euro 1.631 bill in 2014.

Table 110: Budget deficit, GDP and variation

YEAR	BUDGET DEFICIT (BILL EURO)	POPULATION	BUDGET DEFICIT (€/CAP)	GDP* (BILL EURO)	GDP* (1000 EURO/CAP)	RATIO (%)
2005	-0.186	502,362	- 371	30.83 (229.7 dkr)	61.5 (458 dkr)	- 0.6
2014	-1.631	570,171 (2014) 559,050 (2012)	- 2,861	35.13 (261.7 dkr)	63.5 (473 dkr)	- 4.5

* GDP for 2012

Source: City of Copenhagen, 2005, 2006, 2013b, 2013c, 2015a, 2015b

INDEBTEDNESS LEVEL VARIATION RATE

Cities with a lower level of indebtedness are more resilient to challenges in the context of a post-carbon transition process. The indebtedness, GDP per person and the final ratio indicates how strong the economy in Copenhagen. Following the national trend with new public management and privatization of public companies, a range of public services were privatized, with the City of Copenhagen as shareholder, during the 2000s. The level of debts relative to Copenhagen's GDP is shown in table 105.

Table 111: Indebtedness level, as per cent of GDP

YEAR	DEBTS (BILL EURO)	DEBTS INCLUDING SHARES IN PUBLIC-PRIVATE COMPANIES (BILL EURO)	GDP (BILL EURO)	RATIO (%)
2005	1.02 (7.6 dkr)	-	30.83 (229.7 dkr)	3.3
2014	0.32 (2.4 dkr)	4.13 (30.8 dkr)	35.13 (261.7 dkr)	0.9

* GDP for 2012

Source: City of Copenhagen, 2005, 2006, 2012reg, 2013stat, 2015reg, 2015stat

R&D INTENSITY VARIATION RATE

Data is not available.

XI.V FINDINGS AND KEY CHALLENGES

Copenhagen has developed markedly over the past two decades and is as the capital and regional metropolitan area greatly diverse and complex. The population is growing and has been for the past decade, and average income per capita is rising, as is the number of people living in poverty. The city has shown a capacity to establish monitoring systems and a system of connected urban plans under the umbrella of an urban post-carbon vision.

Currently, the urban vision CPH2025 sets the overall and long term target for the city and specifies key urban policy and planning areas of priority and action. Within each of these, specific targets have been set and measures and initiatives are in operation. This includes specifically transport, energy, waste, climate adaptation and buildings, but places also green growth and a liveable city at the core of urban development.

Energy consumption has largely come under control and CO_2 emissions have been reduced with 21 per cent by 2014 (base year 2005). Also the modal share of cycling has increasing, waste not recycled is reduced and the share of renewable energy production has increased. The indicators also suggest the areas where the policy has not been as successful as desired. This concerns specifically transport, air quality and rising income gap and poverty levels.

XI.VI CONCLUSIONS

Copenhagen has over the past decade and a half developed an urban vision that has low/zero carbon futures as a crucial element. The findings in this case study report shows that for a range of the POCACITO KPIs, the city has taken notable steps toward realising the vision, including the establishment of a system of sectoral sub-visions, strategies and action plans. Thus, the report suggests that working with visions can further not only significant CO_2 reductions but also the hard and uncertain transition of urban government towards developing, enabling and implementing transition policies.

The actual transition may however be blocked by identifiable as well as still uncertain challenges. The main challenge in Copenhagen seems to be firstly, to maintain the trend towards reduced CO_2 emissions. This includes efforts to maintain attention to innovate and implement CO_2 reduction measures among the public and stakeholders, as well as across a large range of sections in the city administration. Secondly, for moving closer to realisation of the vision, it may prove to be straining to address the transport sector, as the level of CO_2 emission from road transport does not decrease significantly. Thirdly, the city is challenged by a relatively high rate of low-income citizens and a widening income gap which may constitute challenges for urban policy that demands actions and attention in the future. Furthermore, to realise post-carbon city futures, not only low carbon targets must be met but also social and economic aspects.

Moreover, Copenhagen also runs into the difficulty of having achieved the ‘easy’ reductions, the low hanging fruits, and is now compelled to a large extent to focus on reduction measures that are far more challenging, and e.g. require innovative technological development, e.g. as with the hydrogen cars, long term investments, e.g. in low energy buildings, or a long term change of behaviour, e.g. with transport.

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XII 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
	Buildings and Land Use	Energy-efficient buildings variation rate	Percentage	2007 2012
		Urban building density variation rate	Nº/ km^2	2003 2012
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	Percentage	2003

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
		variation rate		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