POCACITO

european post-carbon cities of tomorrow

Lisbon Strategy Paper

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STRATEGY PAPER OF LISBON TOWARDS A POST-CARBON CITY

INTELI – Inteligência Em Inovação, Centro De Inovação, Lisbon, 17 August 2016

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CHALLENGES FACING THE CITY

STAKEHOLDER CONSULTATION WORK

POCACITO methodology integrates the organisation of several workshops with stakeholders with a view to collect their ideas and suggestions, namely: assessment workshops; vision building workshops; backcasting scenarios workshops; and strategic papers workshops.

The vision building and backcasting scenarios workshop in Lisbon was held during May (1-15), 2016. The methodology presented in the POCACITO's deliverable "Case Study Workshop Guidelines" was used in the workshops but there was a need of its adaptation to the context of Lisbon, due to the following factors: economic and financial crisis; uncertain period associated to the change of the City Mayor; difficulty in motivating and mobilizing key stakeholders; parallel organization of similar meetings, workshops and seminars in the scope of Portugal2020 (framework program 2014-2020).

The workshop process was organised through the collection of information and direct interviews with the stakeholders. A final meeting was held to share ideas and summarise the results (List of stakeholders consulted – Annex 1).

The meeting was attended by 5 people. It is worth of notice that the energy sector was highly represented, due to the importance of this area for the Lisbon case study. The transports sector was under represented, which was surpassed by the knowledge of INTELI staff in this area.

Visioning process

The main steps were:

- Presentation of the objective of the meeting;
- Overview of the POCACITO project;
- Brief presentation of the results of the initial assessment;
- Discussion of key challenges for the city;
- Presentation of the context scenario and some urban trends;
- Visioning exercise – Imagine the future of Lisbon in 2050 – Identification and discussion of key messages;

- Selection of one narrative for the vision 2050.

A vision 2050 was defined, and the main sectors were identified.

Backcasting process

The main steps were:

- Presentation of the objective of the meeting;
- Brief presentation and discussion of the vision (desirable “end point”);
- Brief introduction to the “middle of the road” background scenario;
- Discussion on obstacles and opportunities in reaching the end point;
- Definition of interim objectives and milestones;
- Definition of concrete actions that must be taken to get to the end point.

Milestones and actions were defined, having in mind the obstacles and opportunities identified.

KEY CITY CHALLENGES

Through the initial assessment of the city and the organization of stakeholders’ workshops, the key challenges facing Lisbon were identified:

MOBILITY

It is necessary to enhance sustainable mobility in Lisbon. The private car is still the main transport mode used by the population. The results of the assessment exercises are quite disappointing, since the share of sustainable modes, i.e. walking, bus, company or school collective transportation, metro/ underground, train, bicycle and ship, decreased from 59% in 2001 to 51% in 2011. Note that in 2001, the car was responsible for 32% of the modal share and in 2012 it was 34%. Moreover, the lack of synergies between transport modes is also a reality.

Several initiatives have been launched by Lisbon City Council in the area of sustainable mobility (such as electric mobility, car-sharing, bicycle lanes, improvement of public transport, etc.), but with no substantial impact on urban life.

ENERGY

Lisbon needs to both increase its energy efficiency and the use of renewables, and intensify the implementation of smart energy solutions.

The consumption of energy (electricity, fuel and natural gas) in 2008 in Lisbon was 828,751 toe and in 2012 was 927,389 toe, experiencing an increase of 12% during this period. The sector that contributes most to the overall consumption is the transportation sector. Currently the amount of energy produced locally by a renewable source is insignificant, representing less than 1% of the total energy consumed (Fraunhofer, 2016).

Lisbon has a high solar potential that should be explored. It was one of the results of the 'Lisbon Solar Potential Map' project, which evaluated the potential solar installation of solar systems in the built heritage of Lisbon.

RESILIENCE

Lisbon is a coastal city prone to natural disasters, namely floods. It is also located in an earthquake zone, which is a danger to citizens and infrastructures.

The development of preventive and alert systems geared to anticipating these events and making correct decisions is a priority. There are some technology-based emergency management systems that could be used in these situations.

It is worth noting that Lisbon subscribed to 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.

Air quality is also a problem in the city centre. For this reason, Reduced Emissions Areas were launched, which are zones in which the circulation of more pollutant vehicles is forbidden, due to health reasons and compliance with national and European legislation.

BUILDINGS

There are several buildings in Lisbon that need renovation, especially in terms of energy efficiency. However, the refurbishment rate is less than 1% per year, which is very low compared to the European average of 1.5-2.5% a year (Fraunhofer, 2016).

Currently there are nearly 7,000 buildings in Lisbon with an energy certificate, 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. In this context, it makes more sense to intervene in the existing stock or in building renovation.

One interesting example is the project Eco-Neighborhood – Boavista Ambiente + which aimed to reconvert and qualify public space, implement measures to improve the energy performance of buildings and remodel some equipment in the social neighbourhood.

ATRACTIVENESS

Despite the financial crisis, Lisbon demonstrates high economic development, supported by a dynamic entrepreneurial ecosystem.

However, over a span of 30 years, the city has lost more than 200,000 of its residents, shrinking from 800,000 in 1980 to 550,000 today. Most of these people now live in the metropolitan region, reaching 2.8 million residents. Attracting people (students, talents, entrepreneurs, etc.) to live in the city centre is a challenge. Positioning Lisbon in global networks is also an imperative, with a view to attract investment and business.

Lisbon has also a privileged location in the Atlantic Area which should be explored, namely the relations with Portuguese-speaking countries. The city easily allows access to 750 million consumers.

INCLUSION

Both poverty and unemployment are rising in Lisbon. These problems essentially affect young people, elderly people and other disadvantageous segments of the population. Regarding the level of poverty, the figures are very worrying because between 1989 and 2009 this indicator jumped by 80% in the region of Lisboa and Vale do Tejo (NUT II).

The ageing society is a challenge that Lisbon is also facing, in line with European trends.

In order to meet these challenges the City Council needs to develop an integrated management system based on clear development goals and strong coordination between all departments. In Lisbon there is still very limited coordination between actors in terms of dealing with cross-sectoral issues.

These efforts should be based on a strong digital agenda, namely through the development of an urban management platform oriented to support decision- and policy-making processes.

Table 1 summarises the global trends for each Key Performance Indicator (KPI) analysed by the project in the *"Initial Assessment Report"* using statistics for the municipality level.

Table 1: Summary of KPI's global trends - Lisboa

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	Energy-efficient buildings variation rate	2007, 2012	↗

DIMENSION	SUB-DIMENSION	INDICATOR	Year	Trend
ECONOMY	Land Use	Urban building density variation rate	2001, 2011	→
	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	↗

INSIGHTS FROM THE GAP ANALYSIS

POCACITO has developed and compared two scenarios as possible outcomes for Lisbon in 2050 – 'Business as Usual' (BAU) and 'Post-Carbon 2050', which complements the analysis developed under the initial assessment. BAU is essentially based on an examination and extension of current trends for indicators and physical aspects such as population, energy use, GDP, buildings and transport. PC2050 is a projection of the indicators and physical aspects based on an interpretation of the visions, actions and milestones developed in the stakeholder workshops. A summary of some of these is in Annex 2. It is therefore a judgement based on the consistency and robustness of supporting actions to the desired post-carbon state, and a not a quantification of an idealistic state (WP5 Report).

GENERAL TRENDS

ENVIRONMENTAL

It shows that biodiversity-protected areas have recently increased. The Biodiversity Strategy 2020 suggests that there is good potential for this area to be improved in the future, but no additional measures were suggested in PC2050.

In terms of energy the intensity has decreased –probably aided by the increasing contribution of the service sector to GDP and a decrease in the industrial sectors' contribution. With the increased building efficiency and electrification of cars under PC2050, in addition to an improving national energy mix, this is likely to continue improving considerably.

There is a current trend of decreasing carbon intensity, which can be expected to continue in both the BAU and the PC2050 scenario. However, the local renewable energy contribution in Lisbon has only recently risen to around 1 MW of capacity in solar (in 2013) and progress has been slow. Carbon intensity is therefore predicted to increase much more significantly under PC2050 than BAU but there is still room for improvement under PC2050 to facilitate a move to carbon neutrality.

The air quality trend in Lisbon is positive and the number of exceedance days is decreasing. With further measures in the PC scenario the decrease can be expected to continue.

The recent trend in transport has been quite negative with an increase in transport energy and the use of private cars. City authorities have taken measures that might influence the development of

transport, however, neither the BAU scenario nor the PC2050 scenario expects any drastic increase in sustainable transportation.

For waste the current trend shows decreasing waste generation, which can be expected to continue. However, no major additional measures have been suggested, and only minor decreases can be expected in both the BAU and the PC scenario. Surprisingly there has recently been a decrease in waste recovery and no measures have been put forward under PC2050 to improve the situation.

The water loss in Lisbon's distribution system has improved and this can be expected to improve under both scenarios, but water has not been specifically addressed under PC2050.

For buildings the current trend is positive with the number of energy efficient buildings increasing exponentially. In the BAU scenario this increase can be expected to continue. In the PC scenario measures will be taken to reach a target that 100% of all new buildings are "Nearly net zero energy buildings" which, as long as it is reached, will have positive effects.

Urban density in addition to population density appears to be decreasing, the latter of which is an issue for Lisbon's sustainability in general.

ECONOMIC

On the economic front the level of wealth has shown a steady increase and is therefore expected to continue under BAU, while PC2050 is expected to be slightly higher. With the development of the circular economy there is potential for the industry sector to increase under PC2050, with an increase in employment.

There has recently been a high level of indebtedness for Lisbon City Council but this seems to have improved greatly since the financial crisis. This therefore is not seen as a specific concern under either scenario. The R&D intensity was increasing until the financial crisis but was still quite moderate even at its peak of 2.5%.

SOCIAL

For the social indicators one concern is the high level of unemployment particularly for males. There was only national level data available for the poverty level which has increased in the last nine years. Tertiary education has shown a significant decrease for males, which is of concern.

Finally, on a positive note the amount of green space has grown exponentially in the last 5 years and life expectancy continues to grow.

ENERGY QUANTITATIVE ANALYSIS

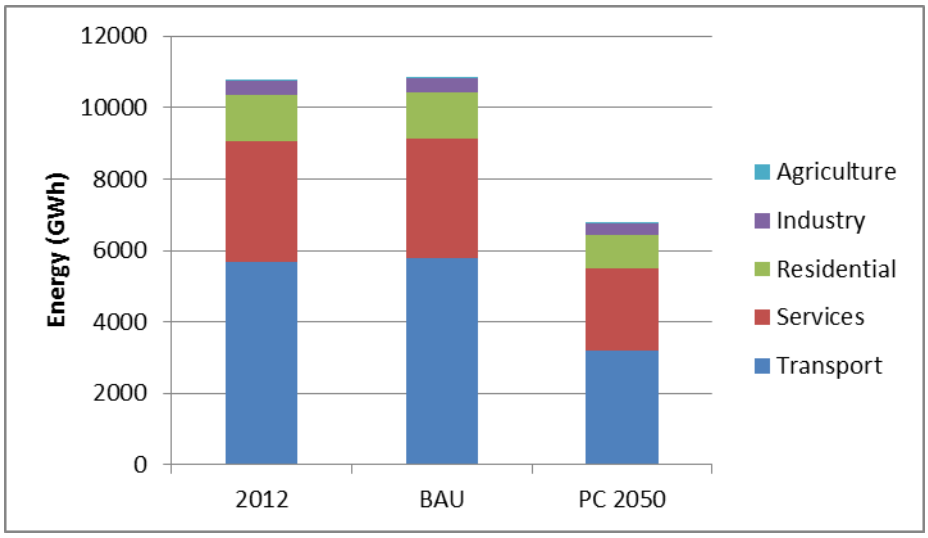
The energy data available for the energy analysis of Lisbon was fairly limited and is based on two main sources: energy data from WP3 and the Sustainable Action Plan for Energy (from the Covenant of Mayors programme (Lisboa E-Nova, 2010). This is supplemented with national data and projections from the EU Energy Trends 2050 report (Capros et al, 2014).

The energy data available for Lisbon, along with the projections for BAU and PC2050, is shown in Table 2. This is further compared in Figure 1 highlighting the decrease in energy use under PC2050 due to improvements in energy efficiency in buildings and transport.

Table 2: Energy by sector for 2008, 2012 and the scenarios

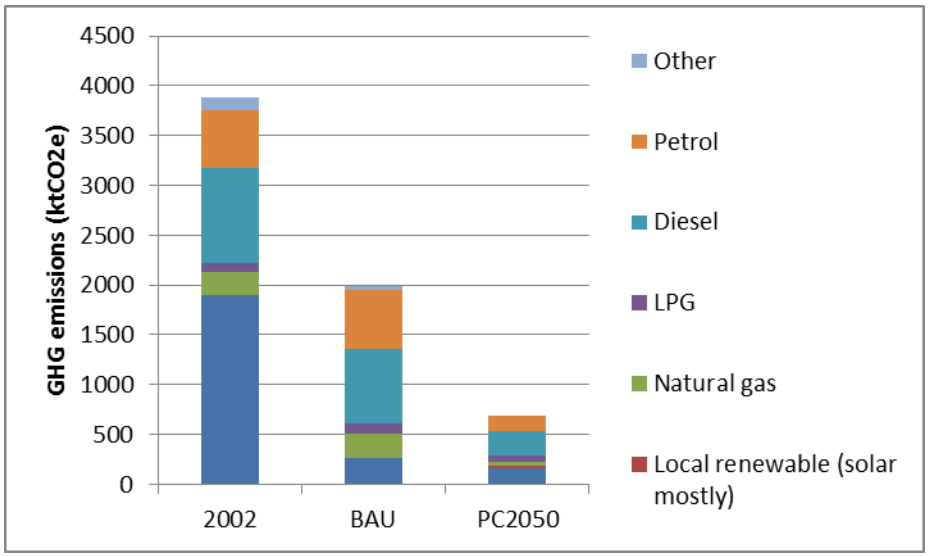
(GWH)	2008	2012	BAU	PC 2050
Transport	4536	5688	5794	3187
Services	3354	3369	3320	2324
Residential	1448	1296	1308	916
Industry	258	377	391	312
Agriculture	43	56	56	56
Total	**9638**	**10786**	**10869**	**6795**

Figure 1: Energy use by sector for 2012, BAU and PC2050



The GHG emissions by energy source for 2002 [from Lisboa E-Nova, (2010)] and the projected emissions for the BAU and PC2050 scenarios are shown in Figure 2. It shows a marked improvement under BAU, but a very significant reduction under PC2050.

Figure 2: GHG emissions by fuel source for Lisbon for 2002, BAU and PC2050



This is primarily due to an increased amount of local renewable energy under PC2050 (from 5.5% under BAU to 41.2% in PC2050) supported by a move to more electric transport. There is also a general electrification of the energy system, with electricity accounting for 70% of the energy. This is highlighted in Figure 3, which compares the energy source profile for 2002, BAU and PC2050. In PC2050 there is a significant drop in the amount of petrol and diesel used for transport. However, fossil fuel transport still accounts for 18.2% of the total energy and this translates into 46% of the total GHG emissions. To further enhance the move to a low carbon city, there is therefore a need for effective policies that further reduce or eradicate the use of fossil-fuelled transport.

The changes in GHG emissions for sectors are shown in Figure 4, emphasising the importance of the transport sector under both BAU and PC2050.

Figure 3: Energy source profile for 2002, BAU and PC2050

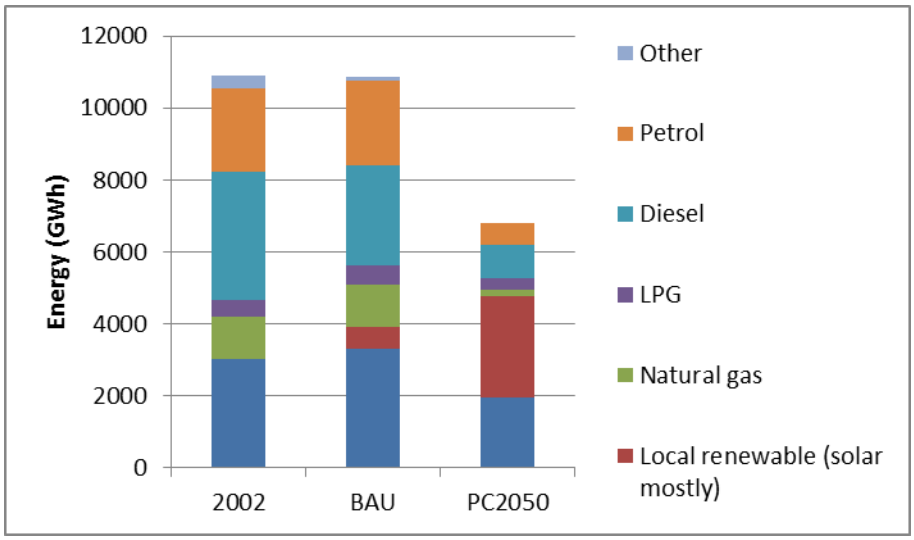
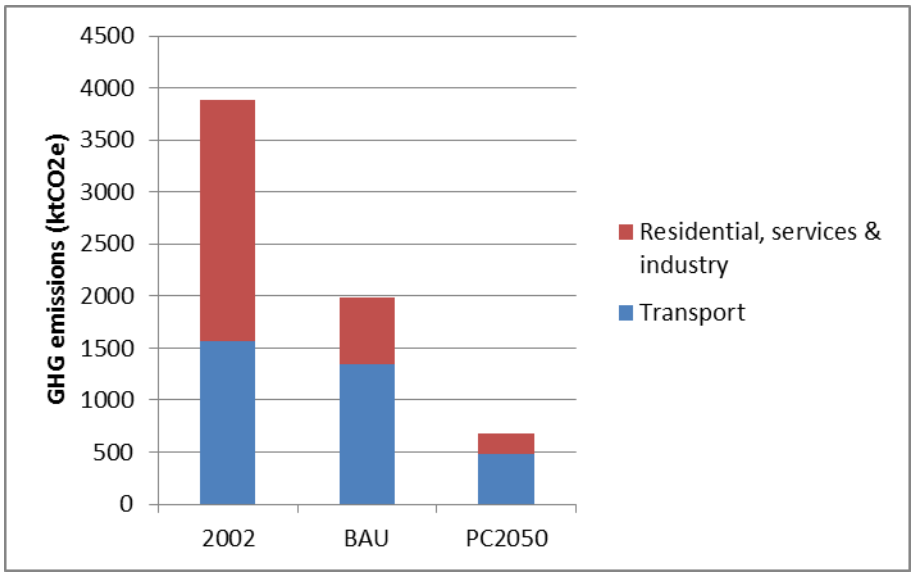


Figure 4: GHG emissions by sector for Lisbon for 2002, BAU and PC2050



A STAKEHOLDER VISION FOR THE CITY

VISION

The 2050 post-carbon vision for Lisbon is:

LISBON. A SMART CITY with more people, more jobs and better quality of life

In line with the key challenges facing the city, the main sectors identified in visioning a future for Lisbon were: **mobility, buildings, energy, resilience, attractiveness, and inclusion**.

MOBILITY – PROMOTING SMART AND SUSTAINABLE MOBILITY

Sustainable transport is the main transport mode in Lisbon (but it was impossible to achieve a share of 100%). Electric mobility is very important for the city, being adopted by the municipality, service operators' and companies' fleets. The use of driverless cars is also a reality (6 million autonomous cars are expected to be in use in Europe in 2030).

The shared mobility model increased exponentially, with the current use of electric car-sharing and bike-sharing systems by the population. Moreover, the biking lane network encourages biking for all citizens, both for work and leisure purposes.

On-demand mobility organises urban transport around user needs and offers new service solutions in the city. Furthermore, electric cargo bikes are facilitating micro-logistics in Lisbon and its surroundings.

Cars have been forbidden in the historic city centre, contributing to reduced carbon emissions and improving air quality, and providing pedestrian areas and shared public spaces to citizens.

Synergies between transport modes have been created, through the adoption of a holistic view of urban mobility including all the cities located in the metropolitan area and considering commuting movements.

A Mobility Operations Centre has been created, providing real-time information on traffic (and other areas such as civil protection) to the city authority, services' operators and citizens. The objective is to support decision-making processes and anticipate urban disasters.

BUILDINGS – PROMOTING SUSTAINABLE URBAN REGENERATION

Several smart and green neighbourhoods have been created in the city centre. The pilot initiative was the rehabilitation of the downtown area supported by the European lighthouse project 'Sharing Cities' 2016-2020 (in partnership with London and Milan). The zone was completely renewed in terms of sustainable mobility, energy efficiency and urban rehabilitation. In this context, urban districts are generating more energy than necessary without additional costs, and new decentralised energy grids have been established.

For new constructions, the share of 100% Nearly-Zero Energy Buildings (NZEB) has been achieved, contributing to promoting energy efficiency and carbon emissions' reduction. Energy management systems are implemented in several buildings, as well as other smart technologies and solutions (integration with electric vehicles, intelligent water and waste management, remote control of basic functions, etc.).

Green roofs are installed in some buildings such as public buildings, industry and retail, supplying residents daily with fresh vegetables and other food. Urban agriculture has increased, as well as small farms and micro-producers.

The involvement of citizens in urban planning has increased. Collaborative urbanism actions are being implemented with a view to transforming public spaces (parklets, public art, etc.).

ENERGY – PROMOTING SUSTAINABLE ENERGY

Almost 100% of the city's energy comes from renewable energy. Thermal and solar PV systems have been installed in buildings all over the city, potential that was identified by the 'Lisbon Solar Potential Map'. Public lighting is totally controlled by intelligent systems and LED.

A smart grids project was implemented in Lisbon allowing a two-way energy flow where many users supply the grid at high demand times through electric cars and renewable energy production.

Urban gardens are increasingly popular in Lisbon, promoting the reduction of city's carbon footprint and enhancing healthy lifestyles.

Lisbon won the European Green Capital Award in 2020, an award given to cities with a consistent record of achieving high environmental standards; committed to ongoing and ambitious goals for further environmental improvement and sustainable development; and showing the ability as a role model to inspire other cities and promote best practices to all other European cities.

RESILIENCE – IMPROVING RESILIENCE

Lisbon is a resilient city. Solutions have been developed to respond to its resilience challenges, namely ageing infrastructure, declining or ageing population, earthquakes, flooding (coastal and rainfall), landslide, and rising sea level and coastal erosion. The strategy 'Resilient Lisbon' is being implemented and a Chief Resilience Officer has been appointed.

Lisbon is member of the '100 Resilient Cities' network, pioneered by the Rockefeller Foundation. The network is dedicated to helping cities around the world become more resilient to the physical, social and economic challenges that are a growing part of the 21st century.

The city has become member of C40, a network to empower cities to connect with each other and share technical expertise on best practices in the area of climate change.

Moreover, public safety is being assured through the use of video surveillance and drones.

Air quality has been improved in Lisbon's city centre, but not as much as desirable. A monitoring centre was installed in order to collect real-time information on air quality and to produce knowledge intended to support decision-making processes.

ATTRACTIVENESS – PROMOTING INNOVATION AND INTERNATIONALISATION

Lisbon is an important economic and financial hub, the services sector being the predominant (about 80%) activity sector and the one that holds the largest share of GVA (Gross Value Added). Key urban clusters are ICT, web and mobile, creative industries, the maritime economy, tourism and health and wellbeing.

It is a city open to the world and a European Atlantic Hub, in close relation with Latin America, Africa and Asia countries and regions. Allowing access to 1 billion consumers from Europe and Portuguese-speaking countries, Lisbon has been attracting companies wishing to manage and prepare its exports or investment ventures in these markets.

The capital has also been the place for the location of Competence and Research Centres of multinational companies and high value shared services centres. In fact, Lisbon can guarantee human resources with availability, qualifications, flexibility, creativity and multilingual skills.

Moreover, Lisbon has been attracting students, talent, entrepreneurs and businesses, due to a strong entrepreneurship policy, namely the creation of incubators, co-working spaces and' fab labs' and launching incentive programs (funding, contests, coaching, etc.). For example, a fab lab is installed in each city neighbourhood.

Lisbon won the European Capital of Innovation (iCapital) award in 2020, due to its holistic vision of innovation related to four areas of urban life: governance, economics, social inclusion, and quality of life.

INCLUSION – PROMOTING QUALITY OF LIFE FOR ALL

Lisbon is promoting itself as a healthy and age-friendly city, providing adequate facilities for elderly people, such as ICT home care and telemedicine. Technology is also used to support emergency management systems and to prevent and fight criminality and natural disasters.

Open governance is a characteristic of Lisbon. Several instruments are at the disposal of citizens to

promote their involvement in the resolution of urban problems and in the definition of the city's future (participatory budgeting, open data, digital platforms, etc.).

Sharing economy is growing in different areas, such as working, housing and transport. Information and communication technologies and social networks are supporting this movement.

The contribution of social economy to GDP and employment is increasing, and social and civic entrepreneurship is being supported by public incentives.

Migrants and refugees are socially integrated into urban daily life; Lisbon is characterised by cultural diversity.

In Lisbon, local government and citizens collaborate intensively in solving urban problems and defining the city's future, under a model of open **governance**. An Urban Sharing Platform has been created in order to collect, analyse and integrate real time data and information to support decision- and policy-making processes.

ACHIEVING THE VISION

The milestones and actions defined to achieve the vision are summarised in the following table. The majority of these measures will be implemented in a pilot district (living lab), and then will be scaled up to the entire city.

OBJECTIVES	ACTIONS & MILESTONES
Promote smart and sustainable mobility (2020-2050)	Creation of more pedestrian areas and shared public spaces
	Awareness campaigns about the benefits of walking and cycling (soft modes)
	Increase and extension of bicycle lanes
	Launch of public incentives to the acquisition of electric vehicles and electric bicycles
	Modernisation of electric vehicles charging points according to European standards and installation of new ones (36 new charging points + 1 fast charging station – Sharing Cities project)
	Launching a bike-sharing system with electric and non-electric modes (at least 30 e-bikes + 2 e-bike stations – Sharing Cities project)
	Integration of electric cars in the car-sharing system
	Acquisition of electric vehicles to the municipal and services' operators fleets (114 new e-vehicles – Sharing Cities project)
	Launch of electric cargo-bikes (micro-logistics)
	Launch of on-demand mobility systems
	Installation of smart parking sensors (30 sensors – Sharing Cities project)
	Launch of free Wi-Fi in public transports
	Creation of an Operations Centre on Mobility
	Imposition of tolls for entering in the city centre (historic centre without cars)

OBJECTIVES	ACTIONS & MILESTONES
	Promoted use of autonomous cars (6 million autonomous cars in Europe in 2030)
	Promoted use of virtual technologies to avoid travel
Promote sustainable urban regeneration (2020-2050)	Launch of a huge urban renewal program centred on promoting energy efficiency in buildings (starting from public buildings and integrating social housing and private buildings)
	Implementation and maintenance of an online interoperable Sustainable Energy Management System (SEMS), a Building Energy Management System (BEMS) and a Home Energy Management System (HEMS)
	Transformation of the historic centre into a smart and sustainable neighbourhood (living lab)
	Creation of green roofs/facades in buildings
	Launch of a program for co-creation of urban furniture with strong citizens' involvement (with the help of 3D printing)
	Supporting participatory urbanism actions (ex.: 'parklets', public art)
	Transformation of the most relevant neighbourhoods into smart and sustainable spaces
	Promote 100% of NZEB – Nearly net zero energy buildings (new constructions)
Promote sustainable energy (2020-2050)	Raising the share of energy consumption produced from renewable sources (100%)
	Installation of thermal and solar PV systems in buildings all over the city
	Creation of 100% intelligent public lighting systems (LED, remote control) (100 light automation sensors – Sharing Cities project)
	Expansion of urban gardens
	Installation of 10 environmental sensors (noise and air quality) – Sharing Cities project
	Adoption of smart grids in the city through the intervention of EDP and City Council
	Launching of Neighbourhood Sustainability Contests (City lab Lisbon project)
	Presentation of the application bid to European Green Capital Award
Improve resilience (2020-2050)	Implementation of the Climate Change Adaptation Plan
	Implementation of the drainage master plan
	Elaboration of 'Resilient Lisbon' strategy and action plan
	Integration of Lisbon in relevant international networks on climate change (C40)
	Launching preventive and alert systems oriented to anticipate natural disasters (technology-based emergency management systems)
	Installation of video surveillance all over the city

OBJECTIVES	ACTIONS & MILESTONES
	Use of drones to ensure public safety
Promote social and cultural inclusion (2020-2050)	Launching a support program for civic entrepreneurship Creation of interactive panels with cultural (and other relevant) information for citizens Expansion of telemedicine Launching of co-housing initiatives Creation of a Social Innovation Hub (City Lab Lisbon project)
Promote attractiveness and economic growth (2020-2050)	Expansion of the Lisbon Network of Incubators and Co-working Spaces Creation of a fab lab in each neighbourhood Emergence of more creative hubs in the city Attraction of two important international Research Centres to Lisbon Presentation of the application bid to European Innovation Capital Award
Supporting Objectives: Governance and ICT (2020-2050)	Installation of 250 wifi sensors (Sharing Cities project) Improvement of the open data portal Creation of an urban sharing platform (Sharing Cities project) Co-creation and co-design of digital services and interfaces by and for citizens and companies Launching of calls for ideas, app contests, acceleration events and mentoring Creation of Lisbon Sustainability Forum (think-tank) (City lab Lisbon project)

It is important to stress the approval of the lighthouse project **'Sharing Cities'** under **Horizon 2020 – 'Smart Cities and Communities'** (2016-20). Lisbon is one of the lighthouse cities in partnership with London and Milan. The follower cities are Bordeaux, Burgas, and Warsaw. The global budget is around €28 million.

Project's vision is of a "more agile and more collaborative smart cities market that dramatically increases the speed and scale at which we implement smart solutions across European cities, engaging society in new ways to cause them to play an active role in the transformation of their communities – delivering more vibrant, liveable, economically active, and resource efficient cities".

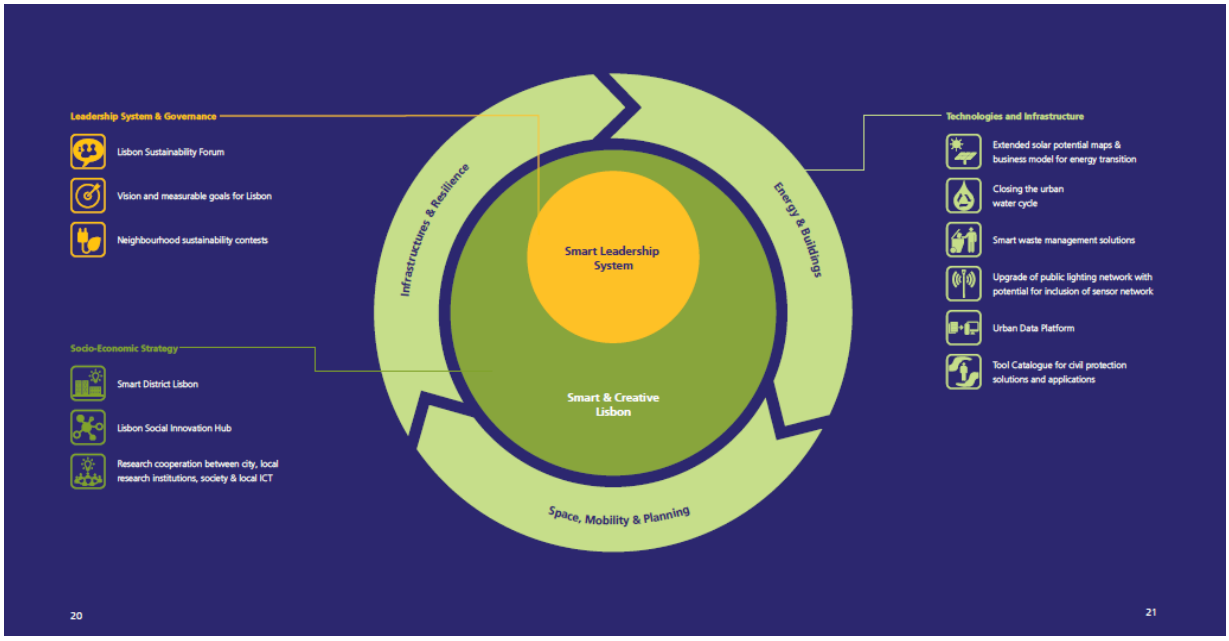
Specific objectives are:

- Aggregate demand and achieve wide scale deployment of smart city solutions;
- Deliver highly relevant common and replicable innovative solutions;
- Attract quantum external investment;
- Make acceleration in uptake of smart city solutions real;

- Deliver 3 role-model low energy efficient districts;
- Shift the thinking irreversibly to decarbonised/ local renewables;
- Shift the thinking irreversibly to new models of eMobility in the districts;
- Make real the notion of citizen participation;
- Exploit 'city data' to genuinely prove its value;
- Strengthen local scale-up businesses in (at least) the 3 cities.

Other relevant project is **'City Lab Lisbon'** developed within the initiative 'Morgenstad – City of the Future' led by Fraunhofer Institute. The purpose of the City Lab was to identify the strengths and weaknesses of the city across several sectors, as well as key areas of intervention for smart and sustainable development.

The results of the City Lab research have led to an integrated set of innovative projects constituting a comprehensive roadmap going into the future. The projects are tailored to Lisbon's unique needs and are meant to support Lisbon in addressing specific challenges. When the proposed projects are combined with the already ongoing activities, Lisbon can further strengthen its position as a southern European lighthouse city.



ASSESSMENT OF NEEDS

Challenges cannot be achieved by actions of the city authorities alone. Many enabling conditions have to be created by national and EU rules and regulations, as well as access to financial tools adapted to their needs. There is also a need to improve stakeholders' participation.

How can we improve the bottom-up approach to stakeholder consultation?

Consultation tools

- Adoption of open digital platforms to enhance the participation of stakeholders in the definition of local roadmaps (crowdsourcing, crowdfunding);

- Creation of Local Support Groups (as proposed by URBACT and INTERREG) and/or Smart City Commissions (ex.: Birmingham) - https://birminghamsmartcity.wordpress.com/;

- Participation of stakeholders in the collection of data and information on environmental issues (through smartphones, self-made sensors, etc.) – for ex. Smart Citizens Lab (Amsterdam) - https://waag.org/en/project/amsterdam-smart-citizens-lab;

- Launching of neighbourhood contests to reduce energy consumption or to improve sustainable mobility (reduce the use of private car);

- Creation of Living Labs as open innovation and co-creation spaces, with a strong user involvement in testing sustainable urban solutions.

Stakeholder groups

- Empowerment of citizens and communities to participate in the decision- and policy-making processes (importance of the neighbourhood level);

- Consideration of a quadruple-helix innovation model (municipalities, companies, universities and knowledge centres, and civil society).

- Consideration of creative and cultural actors, and not only scientific and technological actors in the stakeholder groups.

What should national authorities and the EU do?

Governance

- Reinforcement of local authorities' competencies.

Financing

- Revision of public procurement rules, facilitating the acquisition of sustainable and intelligent solutions by municipalities (pre-commercial public procurement of innovation; green public procurement; etc.);

- Dissemination of funding programs (articulation between national and European funds – ex.: Portugal2020, Horizon2020, Cohesion Fund, JESSICA, etc.) – red tape reduction.

Regulation

- Incentives for the acquisition of electric and green vehicles (ex.: German program – Public incentives for the acquisition of electric vehicles with a discount of €5,000);

- Regulation and harmonization of renewable energy cooperatives framework (legal context, support mechanisms) – ex.: http://www.coopernico.org/ (Portugal);

- Consideration of crowdfunding legal frameworks (national frameworks?; European level policy action?).

Standardisation

- Definition of common standards in the area of smart and sustainable cities (considering the work that is being developed by ITU, ISO, City Protocol, etc.).

Metrics

- Definition of a common set of indicators in the area of sustainability with a geographic level equivalent to 'Municipality' (considering the work that is being developed by WCCD and other organisations);

- Definition and harmonisation of national (and European) monitoring systems to evaluate the level of accomplishment of national and European targets in the area of environment;

- Launching of open data platforms.

Knowledge sharing

- Sharing of good practices and experiences between municipalities.

APPENDIX. SEMI-QUANTITATIVE ASSESSMENT OF KPI'S - BAU AND PC2050

	SUB-DIMENSION	INDICATOR	UNIT/INFO	Quantity	Trend	BAU 2050	PC 2050
ENVIRONMENT	*Biodiversity*	Variation rate of ecosystem protected areas	*Percentage* *Geographical level: Municipality* *Source: Lisbon City Council*	*Calculated to be 0.0% - 1.5% (2003-2012)*	*+1.5 points*	+	+
	Energy	Energy intensity variation rate	*toe/euro* *toe* *Geographical level: NUT III* *Source: INE, DGGE*	*$5.922*10^{-5}$ – $5.334*10^{-5}$ (2003-2012)* *2.339 Mtoe – 2.441 Mtoe (2003-2012)*	*-9.9%* *+4.3%*	+	++
		Variation rate of energy consumption by sectors	*Percentage* *Geographical level: Municipality* *Source: INE; DGGE*	*Industry: +45.8%* *Agriculture: +31.8%* *Services: +0.5%* *Transport: +25.4%* *Residential: -10.5%* *(2008-2012)*	*Increases in three sectors. No change in services, and residential decreased*		
	Climate and Air Quality	Variation rate of carbon emissions intensity	*ton CO_2/euro* *ton CO_2* *Geographical level: NUT III* *Source: INE; APA (www.apambiente.pt/)*	*$151.8*10^{-6}$ – $118.1*10^{-6}$ (2005-2009)* *Greater Lisbon – 7.507.507,70 Ton CO_2 (2005)* *Greater Lisbon – 6.366.261,01 Ton CO_2 (2009)*	*-22,2%* *-15,20%*	+	+
		Carbon intensity per person	*ton CO_2/per capita*	*3,76 Ton CO_2/per capita (2005)*	*-16,76%*	+	+

SUB-DIMENSION	INDICATOR	UNIT/INFO	Quantity	Trend	BAU 2050	PC 2050
		Geographical level: NUT III *Source: INE; APA*	*3,13 Ton CO_2/per capita (2009)*			
	Variation rate of carbon emissions by sector	*ton CO_2*	**No data available**	*No data available*	+	+
	Exceedance rate of air quality limit values	*Nº* *Geographical level: Municipality* *Source: APA*	*O_3: 11.8 – 5.3 (2003-2012)* *PM10: 76.3 – 25.4 (2003-2012)* *Only the pollutants that recorded exceedance rates on air quality limit values were considered in this indicator.* *Other pollutants (NO_2, SO_2 and $PM_{2.5}$) did not registered exceedance rates for air quality limit values.*	*O_3: -55.1% (2003-2012)* *PM_{10}: -66.7% (2003-2012)* *Other pollutants (NO_2, SO_2 and $PM_{2.5}$) remain null values in terms of exceedance rates.*	+	++
Transport and mobility	Variation share of sustainable transportation	*Percentage* *Geographical level: Municipality* *Source: INE, Census,*	**59% - 51% (2001-2011)**	*-8.0%*	*0*	+
Waste	Variation rate of urban waste generation	*kg/person/year* *Geographical level: Municipality* *Source: INE*	*648.6 - 561.4 (2009-2013)*	*-13% (2009-2013)*	+	+
	Variation rate of urban waste recovery	*Percentage* *Geographical level: Municipality*	*92.2 – 72.6 kg (2009-2013)*	*-21% (2009-2013)*	-	-

	SUB-DIMENSION	INDICATOR	UNIT/INFO	Quantity	Trend	BAU 2050	PC 2050
			Source: INE				
	Water	Water losses variation rate	*m^3/person/year* *Geographical level: Municipality* *Source: INE; EPAL*	*27.98 – 15.75 (2009-2013)*	*-43.7% (2009-2013)*	+	*N/a*
	Buildings and Land Use	Energy-efficient buildings variation rate	*Percentage* *Geographical level: Municipality* *Source: ADENE*	*The rate of buildings with A+ and A energy class was null in 2007* *14% (2012)*	*Since the beginning of the certification process (2007), an exponential increase was observed in 2009, even in higher efficiency classes A and A+.* *In evolutive terms between 2007 and 2012, there has been a significant evolution until 2009 and then a slight decrease.*	+	++
		Urban density variation rate	*Nº/km^2* *Geographical level: Municipality* *Source: INE*	*628.08 – 617.82 (2001-2011)*	*-1.63% (2001-2011)*	+	+
ECONOMY	*Sustainable economic growth*	Level of wealth variation rate	*EUR/person* *Geographical level: NUT III* *Source: INE*	*About 18,400 – 19,500 (2004-2012)*	*No clear trend – maximum in 2008 and 2010, reduced since.*	+	+
		Variation rate of GDP by sectors	*Percentage* *Geographical level: NUT III* *Source: INE*	*Agriculture/Industry/Services (2003-2012):* *0.21%/17%/83% - 0.20%/14%/86%*	*Share of services increases somewhat in Greater Lisbon, while industry decreases somewhat.*	+	+

SUB-DIMENSION	INDICATOR	UNIT/INFO	Quantity	Trend	BAU 2050	PC 2050
	Employment by sectors variation rate	*Percentage* *Geographical level: NUT III* *Source: INE*	*Agriculture (2003-2011) – 0.70% - 0.46%* *Industry (2003-2011) – 18.99% - 13.92%* *Services (2003-2011) – 80.32% - 85.61%*	*Agriculture: - 0.24%* *Industry: - 5.07%* *Services: + 5.29%* *Number of people working in services increases, working in industry registered a slight decrease*	+	+
	Business survival variation rate	*Percentage* *Geographical level: NUT III* *Source: INE*	*5.7% – 6.7% (2008-2010)*	*+1 points*	+	+
Public Finances	Budget deficit variation rate	*Percentage of city's GDP* *Geographical level: Municipality* *Source: PORDATA*	*Extremely volatile rates that goes from +200% in 2010 to -96% in 2013, achieving an average of +78% under this period.*	*Significant annual variation – 2012 was an extraordinary year of revenues.*	+	+
	Indebtedness level variation rate	*Percentage of city's GDP* *Geographical level: Municipality* *Source: Management Report 2013, Lisbon City Council*	*79.3% - 4.5% (2010-2013)*	*Significant drop*	+	+
Research & Innovation dynamics	R&D intensity variation rate	*Percentage* *Geographical level: NUT III*	*1.1% - 2.5% (2003-2010)*	*Significant annual variation*	+	+

	SUB-DIMENSION	INDICATOR	UNIT/INFO	Quantity	Trend	BAU 2050	PC 2050
			Source: INE				
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	*Percentage* *Geographical level: NUT II* *Source: INE*	*Male 4% – 10% (2003-2012)* *Female 4% – 7.5% (2003-2012)*	*Increase in unemployment.*	-	*N/a*
		Variation rate of poverty level	*Percentage* *Geographical level: NUT I* *Source: Economic Inequality in Portugal, Carlos Farinha Rodrigues, 2012*	*5.0% - 12.0% (2003-2012)*	*Variation rate only available at national level and with negative fluctuations in 2005, 2007 and 2009.*	+	+
		Variation rate of tertiary education level by gender	*Percentage* *Geographical level: Municipality* *Source: INE, Census*	*About 21% - 32% (2001-2011)* *Male 33.2% - 11.0% (2005-2012)* *Female 10.3% - 9.4% (2005-2012)* *No data available for 2003-2005*	*+ 11% (2001-2011)* *A significant drop on male – 22.2%* *A slight decrease on female – 0.9%*	-	*0*
		Variation rate of average life expectancy	*Average Nº* *Geographical level: NUT III* *Source: INE*	*77.8 – 79.9 (2003-2012)*	*+2.1 years*	+	+
	Public services and Infrastructures	Variation rate of green space availability	*Percentage* *Geographical level: Municipality* *Source: Lisbon City Council*	*+ 27.88% medium rate 2004-2014 (including new or refurbished green spaces, and urban gardens)* *-0.72% medium rate > 2014 (including new or refurbished green spaces, and urban*	*+413% (2004-2008)* *Exponential increase of new and refurbished green spaces in the period 2009-2014*	++	*N/a*

SUB-DIMENSION	INDICATOR	UNIT/INFO	Quantity	Trend	BAU 2050	PC 2050
			gardens)			
	Governance effectiveness	Existence of monitoring system for emissions reductions	*Yes/No* *Description* *Geographical level: Municipality* *Source: Lisbon City Council*	*No*	-	*0*	*0*

Legend	Explanation for scenario projection compared to current situation
++	Likely very positive
+	Likely progress
0	Likely neutral or similar to current situation
-	Likely negative
--	Likely very negative

ANNEX. STAKEHOLDERS: LISBON

WORKSHOP 1, 2

Institution	Name and Surname
Lisbon City Council	Paulo Carvalho
Lisbon City Council	Teresa Almeida
CCDR-LVT – Regional Agency	Eduardo Henriques
Invest Lisboa	Diogo Ivo Cruz
APA – Portuguese Environment Agency	Nuno Lacasta
DGEG – General Direction of Energy and Geology	Carlos Almeida
LNEG - Portuguese National Laboratory for Energy and Geology	Helder Gonçalves
IMT – Institute for Transports and Mobility I.P.	João Carvalho
IN+ Centre for Innovation, Technology and Policy Research	Paulo Ferrão
AMB3E - Portuguese Association for Waste Management	Pedro Nazareth
ADENE - National Energy Agency	Luís Silva
APREN - Portuguese Association for Renewable Energies	Sá da Costa
Energy IN (cluster)	José Paulo Oliveira
Lisboa E-Nova (Municipal Energy Agency)	Miguel Águas
Start-up Lisboa (incubator)	João Vasconcelos

WORKSHOP 3

Institution	Name and Surname
Lisbon City Council	Paulo Carvalho
APA – Portuguese Environment Agency	Nuno Lacasta
DGEG – General Direction of Energy and Geology	Carlos Almeida
LNEG - Portuguese National Laboratory for Energy and Geology	Helder Gonçalves
IMT – Institute for Transports and Mobility I.P.	João Carvalho
AMB3E - Portuguese Association for Waste Management	Pedro Nazareth
ADENE - National Energy Agency	Luís Silva
APREN - Portuguese Association for Renewable Energies	Sá da Costa
Lisboa E-Nova (Municipal Energy Agency)	Miguel Águas