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CITY LAB LISBON – EXECUTIVE SUMMARY

APRIL 2016

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1 INTRODUCTION

A European capital with approximately 550.000 inhabitants, Lisbon plays a crucial role not only in Portugal, but also in Europe, due to its role as a gateway to the markets in the southern hemisphere.

Significantly affected by the economic crisis and by demographic changes in previous decades, the city of Lisbon also faces various challenges closer to home. In this context, Lisbon defined the built environment in the historic center, the mobility system, the generation of clean energies and the use of information & communication technologies as key areas of activity for the upcoming years

In order to address the manifold challenges Lisbon is facing today, and to achieve more sustainable urban development, the city has already developed various projects such as the BESOS Project, the Eco Bairro Boavista Ambiente+ or the ClimAdaPT.Local Project. Furthermore, Lisbon launched the Lisbon Europe 2020 Strategy, a plan to promote smart, sustainable and inclusive growth, addressing all relevant sectors within the city and trying to integrate all affected stakeholders (e. g. civil society, research institutes, local businesses).

Nevertheless, Lisbon seeks further support in developing solutions in this context. Therefore, the city applied for the City Lab Challenge and the corresponding City Lab process. The purpose of the City Lab Lisbon 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. It was also intended to identify potential future opportunities, current barriers that need to be overcome and to demonstrate possible paths for a sustainable development of the city.

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 its 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.

2 CITY LAB METHODOLOGY

The in-depth analysis of Lisbon was carried out based on the Morgenstadt assessment framework for sustainable urban development. This framework is structured into three levels of analysis, namely Indicators (measuring the current status quo of urban systems), Action Fields (measuring the degree of intervention in key areas that promote sustainability) and Impact Factors (identifying factors that are unique to the city under analysis). The sum of all three levels allows for an understanding of the current sustainability performance of cities, assisting in the development of coherent strategies and an integrated roadmap for development while at the same time respecting the unique factors of the city that are conditioned by external pressures, sociocultural dynamics, geographic and historic conditions, etc.

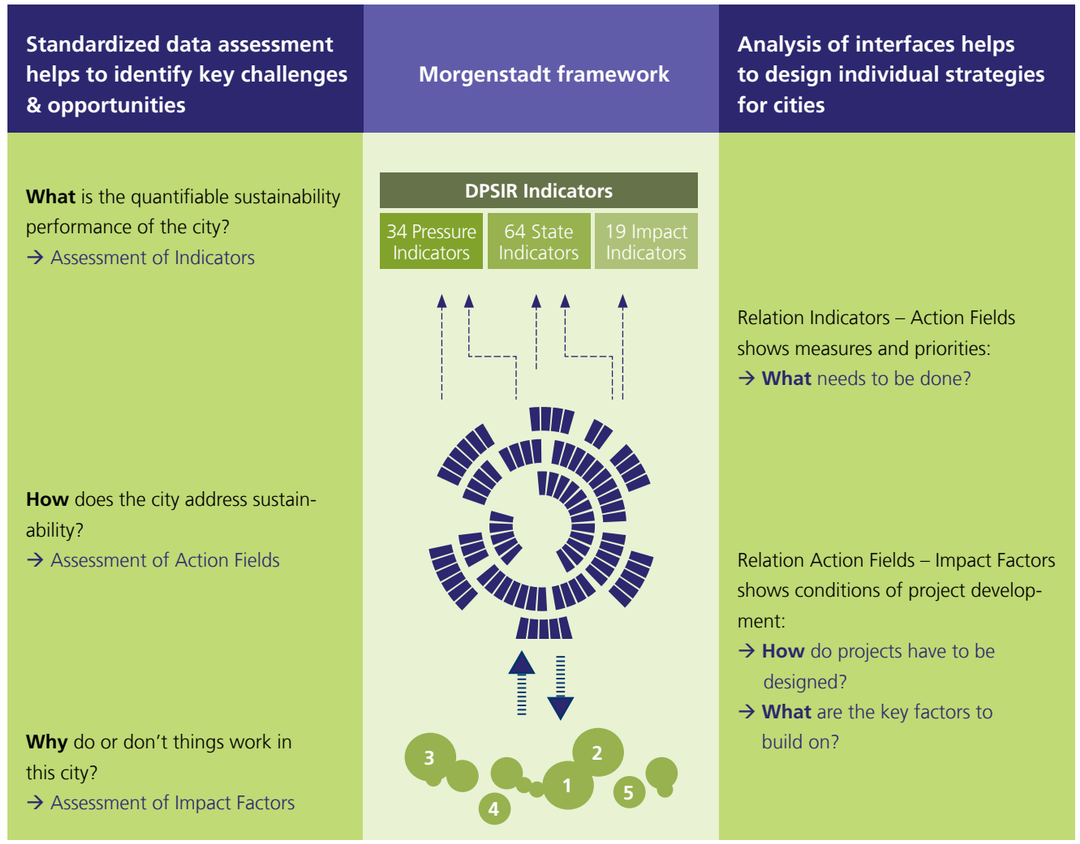

Figure 1: Levels of the m:ci Framework.

Lisbon wins Morgenstadt City Challenge

3 LISBON CITY LAB PROCESS

City Team

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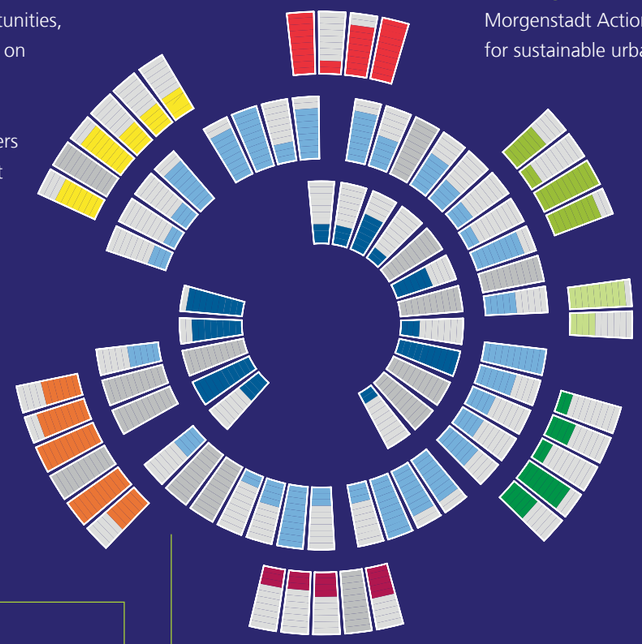
Benchmarking of Lisbon
Comparison of Indicators with Morgenstadt benchmarks

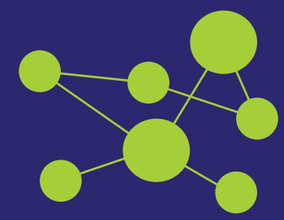
Lisbon Impact Factors
Identification of challenges, opportunities, barriers and ideas for action based on structured Interviews

57 interviews with local stakeholders and experts on the most important city factors



Profiling of Lisbon with the Morgenstadt Action & Response Model for sustainable urban development

Lisbon Roadmap
- Definition of details (costs, timeframe, funding opportunities, stakeholders etc.) for each project
- Integration of measures, projects and actions into a roadmap
- Maximization of synergies among projects



Creation of Lisbon systems models based on most important impact factors

Lisbon Indicators
Assessment of 117 indicators for Lisbon

- Pressures on the city system
- State of the city system
- Impact of the city System

Lisbon Action Fields
Assessment of 86 Action Fields for smart & sustainable development of Lisbon

Measures & Ideas for Action
- Development of 8-12 measures and ideas for action that support and accelerate smart and sustainable development of Lisbon
- Workshops with local stakeholders for working out the measures and initiating first projects
- Involvement of Morgenstadt Partners as experts for technologies, infrastructures and smart city solutions

Final Final Conference: May 13th, 2016
- Presentation & handover of the roadmap
- Kick-off of the first projects

July August September October November December January February March April May

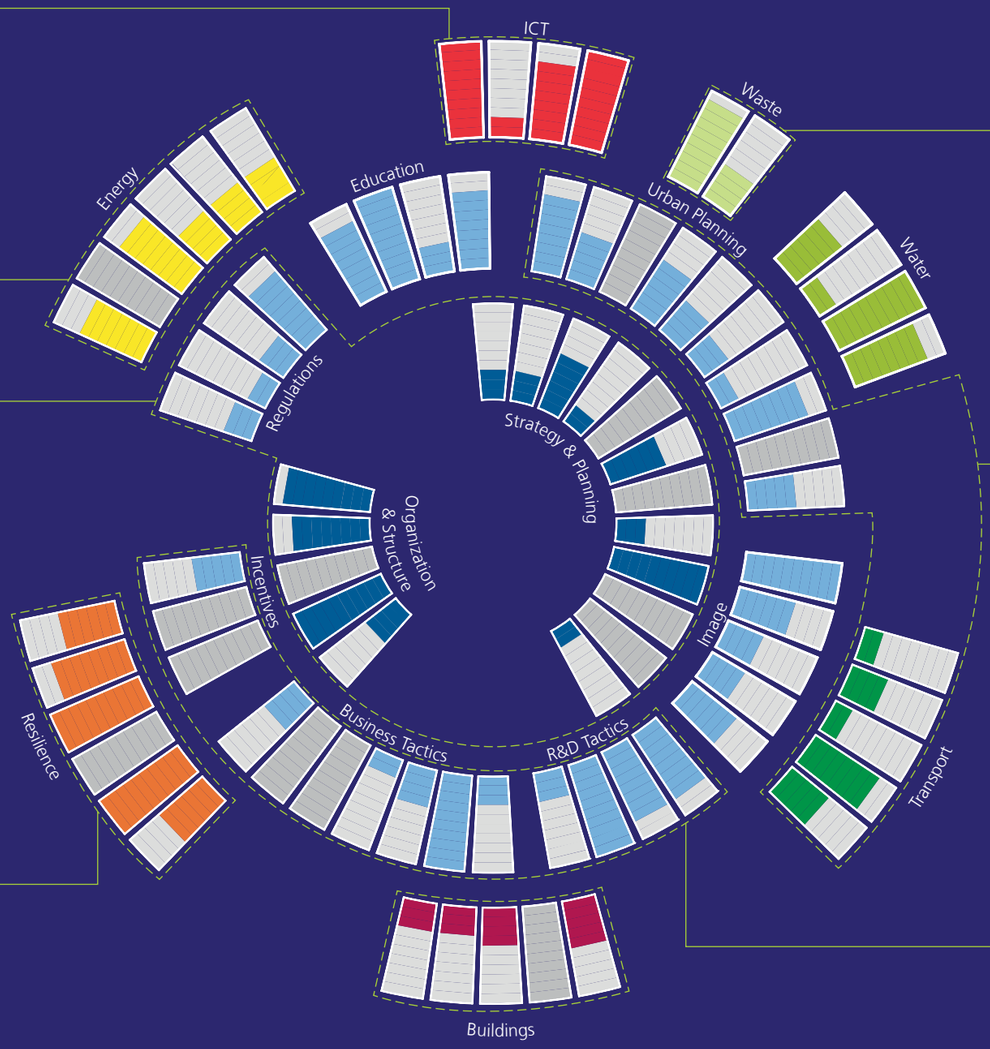
4 CITY PROFILE

ICT
- Comprehensive cross-sectoral solutions are needed
- ICT Strategy in place
- Cooperation between the city, research institutes and society in regard to innovative ICT solutions needs to be intensified

Energy System
- High energy demand
- Potential for renewable energy use, especially solar energy is not well exploited
- Solar energy could be harnessed to reduce the total electricity demand and as an alternative power back-up option.

Governance
- Better coordination in dealing with cross-sectoral issues is needed
- Dependence on the initiative of individual leaders can lead to short-termism
- Lack of coherent development strategy with measurable goals
- Competition between municipalities undermines cooperation
- Lack of clear vision for future-proof urban development

Resilience
- Lisbon is well aware of the risks and vulnerabilities it is facing
- Civil protection actors are participating in many European research projects and networks in order to foster local resilience
- Culture of safety and resilience needs to be established
- Integration of society into crisis management is essential



Waste
- 100 % of households are covered by selective collection service
- The recycling rate is only 22 % as the population is not separating its waste
- The costs of the service could be reduced through the integration of IoT technologies in the system

Space, Planning & Mobility
- Innovative planning approach (PDM)
- Gaps in planning on the metropolitan level
- Riverside development area with great potential
- Mobility acknowledged as a key challenge
- Dominance of cars continues to undermine the emergence of more sustainable mobility forms
- Use of private cars is perceived as more attractive than public transportation despite significant congestion

Economy & Innovation
- Lively innovation landscape
- Good support of business e. g. via micro-entrepreneurship programs
- R&D is performing well
- International students help accelerate economic growth and need to be retained

4.1 Governance System

The city is still feeling the effects of the financial crisis, with high unemployment, especially among youth, as well as austerity measures that limit public spending beyond core needs. Furthermore, demographic changes mean that the city's aging population is going to prove burdensome in terms of effective support through social security in the future. This is not just an issue that is playing out in economic terms but also in terms of the spatial and functional design of the city's urban systems. These represent challenges that have no simple short-term solution but can only be solved through long-term strategic development.

In the context of effectively attracting skilled people and investments, linking mobility, energy and ICT in joint measures and projects, tackling climate change, driving the digital agenda, engaging with civil society or developing data-based decision making systems, all actions require a cross-sectoral and strategic management approach that is able to link the existing hierarchical units of administration not only into joint projects, but also into an integrated management system based on overarching development goals and a strong coordination between all departments. In Lisbon today there is still very limited coordination between actors in terms of dealing with cross-sectoral issues. The organizational system of the city administration is structured hierarchically and cross-departmental decisions are typically based on the voluntary interaction of the heads of departments.

A major issue relates to regional cooperation between municipalities. Whether it is related to gaining access to EU funds or attracting businesses, rather than cooperating to make the region strong, there is significant competition between municipalities. This can also be seen in the lack of a joint and locally anchored metropolitan planning process.

A lack of a clear overarching vision for the future development of Lisbon and the lack of measurable goals is a major barrier to a focused sustainable long-term development of the city. This process requires a collaborative development of a long-term vision for Lisbon, directly linked to cross-sectoral objectives and a means of measuring progress of achieving these objectives.

Many of the sustainability initiatives of the city of Lisbon were attributed specifically to former city leaders, demonstrating the particular importance of the role of the mayor in shifting the direction of development in Lisbon. The ability of leader of a city to drive such initiatives certainly demonstrates strong leadership and good intentions, but a dependence on individual leaders to drive change can lead to short termism, making city development highly susceptible to political cycles. Furthermore, the concentration of responsibility means that unpopular decisions in the short-term that are in the interest of the city's long-term prosperity can be very political damaging. The city would certainly benefit from decentralisation of responsibly of steering urban development. The process of developing a common vision driven by specific goals, as well as evaluation and monitoring mechanisms could be a good starting point to address this issue.

4.2 Economy & Innovation System

Despite the considerable setback as a result of the economic crisis, currently Lisbon demonstrates highly dynamic economic development which has been supported by the active involvement of the Department of Economic Development of the City of Lisbon. The Department envisions Lisbon as one of Europe's most competitive, innovative and creative cities, utilizing the outlined opportunity of a lively innovation landscape. To support the economic development of Lisbon and make use of the city's innovation potential, the City has established a range of programs for supporting businesses and investments.

Lisbon takes pride in its entrepreneurial ecosystem with a highly heterogeneous character bearing a potential of creating a dense network of business incubators, start-up accelerators, support programs, events etc. The City currently demonstrates a significant potential for becoming a new start-up capital of Europe: the low cost of living, affordable rents and a rapidly growing start-up scene are the essential conditions for attracting young creative minds. Moreover, with 106 higher education Institutions with 140,000 students and 30,000 graduates per year, 163 R&D centers, Lisbon has the highest concentration of scientific and technology potential within Portugal and is forming an excellent innovation landscape.

This also makes Lisbon an attractive place for international students. The high amount of international students has shaped the city and the city's image within the past years. Especially within the city center, students have contributed to the transition of a largely vacant area towards a livable and attractive center by renting apartments and using the infrastructure. This development has been actively supported with multiple programs by the municipality, identifying International students as accelerator of the city's economic development. To foster economic growth, one challenge will be to keep the students from leaving after graduation in the future.

4.3 Space, Planning & Mobility

An important legacy that still presents significant difficulties to Lisbon was the process of suburbanization and urban sprawl that began in the 1960s with the effect that the core city lost its population to the suburban areas. The city has acknowledged these on-going processes, leading the city to put emphasis on urban regeneration as a central future development objective. The capital's master plan (PDML) approved in 2012, has been developed as a strategic tool guiding the city's development with the focus on redevelopment, refurbishment and regeneration. The plan has been internationally recognized with the ISOCARP Excellence Award as an effective blueprint for policy adjustments to promote redevelopment in Europe's low-growth cities. Together with a bunch of further urban development programs (e. g. green capital award, strategies for economic development), the rehabilitation and upgrading of the most central areas has been quite successful in its early stages.

Past processes of suburbanization have embedded themselves in the form of artifacts that are present in the city today. This is particularly true in the context of the city's mobility system. The result is a situation where the city has to cater for over one million commuters every weekday, 50 % of which come in personal vehicles, leading to high levels of road congestion and air pollution.

The city has the goal of significantly increasing the portion of soft modes through the development of an Integrated Urban Mobility Plan. However, the potential of these plans will be undermined if there is not coupled with an active effort to deter car use in the city. Furthermore, by easing the stress on road infrastructure, the city would be able to undertake a process of taking space traditionally occupied by cars (car park, lanes etc.) and converting them to promote softer forms (through, for example, protected bike lanes, bus lanes and green areas).

4.4 Buildings

Lisbon´s building stock is characterized by a high share of old and historical buildings, with a vast majority of them requiring refurbishment. However, refurbishment rate is less than 1 % per year, which is very low comparing to the European average of 1,5-2,5 % a year. Building refurbishment in Lisbon should have a holistic approach that considers also the energetic quality of the buildings, the indoor environmental quality and the design of the surrounding public space. Energy efficiency of buildings is of particular importance in the pursuit of international objectives in the area of climate and energy as it is a sector that represents approximately 40 % of total primary energy demand.

In Lisbon, there is a current need for the energetic refurbishment of public buildings. The building situation has been critical due to the lack of energy regulations until the late 1980s, and to the old and historical heritage, which represented much higher refurbishment costs in comparison to new constructions outside the city center. To tackle the problem, the municipality has developed a housing program included in the city Master Plan which sets the course for the needed rehabilitation and requires the application of Lisbon's Energy-Environment Strategy and SEAP (Sustainable Energy Action Plan).

With more than 1100 buildings in the old town, the city council is one of the biggest property owners in Lisbon. Furthermore, the housing department has a clear objective of investing in innovation projects. This situation allows for the implementation of lighthouse projects of public buildings that can have a high visibility. Combined with the right communication strategy and high visitor flow-through, lighthouse refurbishment projects can act as multipliers for further replication.

4.5 Energy System

The total energy use of Lisbon was 3035 GWh in 2013. The city´s total electricity consumption (5.8 MWh/a/cap) is within the European average, but the power use per household is above it (2.1 MWh/a/household), representing a rather strong pressure for the energy system.

Currently, the amount of energy produced locally by a renewable source is insignificant, representing less than 1 % of the total energy consumed. In general, the solar potential within the city and the regional potential for renewable energies are currently not being exploited. Lisbon needs to improve the use of renewable energies and intensify the implementation of smart energy solutions. The great solar potential of the city needs to be harnessed in order to increase the renewable energy share.

The use of photovoltaic and solar thermal systems in social housing complexes, educational installations and swimming pools has long been an important component of the Lisbon's strategy. As part of this, the "solar potential chart" was developed by the local energy agency in 2012 with the objective to allow potential investors to identify the most suitable areas for the installation of solar technologies. However, the use of the tool has been limited so far since it has not been linked to the actual energy demand.

4.6 ICT

Even though the city already has an ICT strategy, is developing an urban data platform and participates in various smart city initiatives, trying to solve various challenges in this field, the City Lab made an additional main challenge evident: a lack of cooperation between the municipality, local ICT-oriented research institutes and society in the context of the development of innovative bottom-up ICT-solutions for the city of Lisbon and its citizens.

By establishing a constant cooperation and knowledge exchange platform between research institutes, other key actors and the citizenship, the city could gain support in regard to the many challenges that require high levels of expertise. At the same time, the city would be supporting innovators working on solutions. An example of this could be the already ongoing development and implementation process of the Lisbon smart data platform (COI) where the city relies on external expertise and technical guidance, which could be offered by local stakeholders.

4.7 Resilience

Lisbon is well aware of its resilience challenges and already participates in a large number of innovative research projects, such as the EU-projects POP-Alert, Alert4All, DRIVER as well as cooperative projects to strengthen the local resilience on the basis of network knowledge and lessons learned (e. g. UNISDR campaign "Making Cities Resilient" or the "100 Resilient Cities" program of the Rockefeller foundation). Furthermore, the civil protection agency runs various projects to actively promote resilience education amongst the citizens, especially focusing on children and adolescents. However, resilience education has not yet become a part of the curriculum in all the schools and a culture of safety and resilience still needs to be established.

Lisbon has not yet integrated the society and particularly local businesses and volunteers in all the crisis management activities. This challenge focuses on the inclusion of these groups and their capacities into crisis management activities in order to improve their own capacities and, in turn, the cities resilience. Therefore, Lisbon can benefit from participation in the ongoing EU-project DRIVER and other projects (POP-ALERT, RESILENS, RESCCUE), which also targets the integration of volunteers into resilience-building processes with a designated work package.

Referring to this multitude of already ongoing projects, Lisbon faces the main challenge of getting an overview over all the existing innovative tools and methods in order to improve the local crisis management practice. Therefore, a tool-catalogue for civil protection solutions and applications has been identified as core demand for the city.

4.8 Water

Water losses caused by leaks, thefts, or metering inaccuracies in Lisbon are very low at only 7 %, which makes it one of the leaders in water sector. This optimization has been achieved by various measures and awareness programs, in particular smart initiatives like the online water management system called "Aquamatrix" designed and used by the water provider company EPAL.

Lisbon needs to structure a back-up plan for water supply for the case of water shortages due to any natural event, such as floods, earthquakes etc., or in case of a disruption in the mid-distance water supply network. Investment in rainwater harvesting is needed for its use at industrial as well as at household level; this will allow for a decrease in the water consumption load from the water supply network.

A "Go Green" mantra could be implemented in the city of Lisbon for new urban developments by designing a building regulation, which promotes sustainable approaches. Provisions of rain-water collection and reusing it for non-drinking purposes could be made mandatory for all new developments with more than 150m2. Already installed smart meters could be used to keep a check on this regulation.

EPAL provides the city of Lisbon, Loures and Mafra with some treated wastewater especially for the air conditioning in commercial venues, street cleaning and garden watering. Their objective is to expand the supply and its reuse in these and other municipalities.

Furthermore, greywater reuse could be made mandatory as a part of building regulation, where non-drinking usages like gardening, car washing, cleaning etc. can be done with treated water.

4.9 Waste Management

The Municipality of Lisbon has implemented multiple solutions for the deposit and collection of solid waste depending on the urban morphology, the producers and the socio-economic characteristics of the specific areas. Since 2003, the city has been expanding the selective collection service which today covers 100 % of the households. However, it has not been possible to achieve the expected selectively collected amounts since the population does not contribute correspondingly with the waste separation. As a consequence the current recycling rate is very low; in 2014 it was only 22 %. Today recycling is not obligatory meaning that service is offered but it is not compulsory to use it.

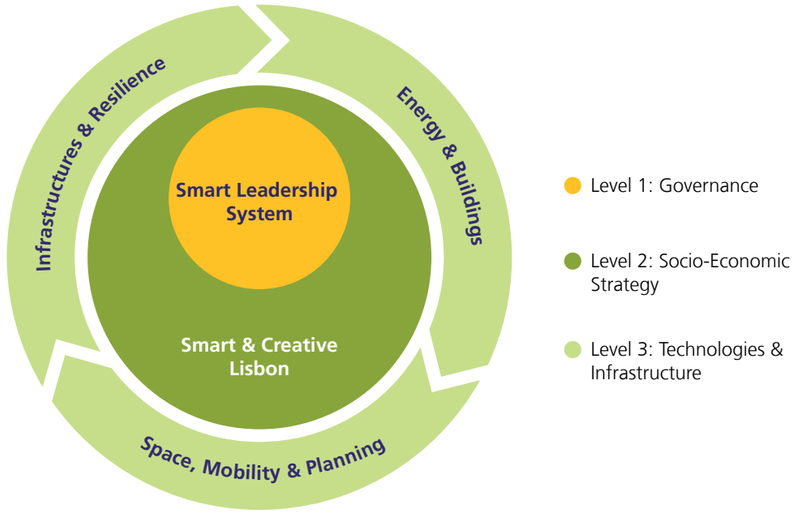
The Municipal goal for 2020 is to increase the share of recycling materials collected in relation to the estimated produced amount to 42 %. In order to reach the goals for 2020, investments in environmental education programs as well as waste prevention campaigns are planned.

Waste management is one of the most expensive services offered by the municipality. The smartification of the system can help to reduce costs and increase efficiency. In this sense, the availability of more extensive and detailed information regarding the waste produced in the different areas provided via sensors would allow the Municipality to rearrange the existing routes and better plan the waste infrastructure.

5 STRATEGY & SUGGESTED MEASURES

Based on the in-depth analysis of 117 indicators and 86 Action Fields, it is suggested to base the strategy for the future smart and sustainable development of Lisbon on three main levels as shown in the figure below.

Figure 2
Levels of action for a sustainable development of Lisbon.



A cross-integration of all levels of analysis of the City Lab Lisbon and a set of discussions and workshops with around 60 stakeholders has produced a list of 12 high-priority measures that are allocated to the three levels of activity.

All measures are interconnected with each other and should be developed and organized in a way that respects the systemic character of the suggested roadmap. There are causal interrelations, but also interrelations based on time, resources, stakeholders, and technologies to be deployed during implementation. The roadmap, as suggested below, should therefore be closely discussed in relation to an overarching strategic management of a sustainable development of Lisbon.

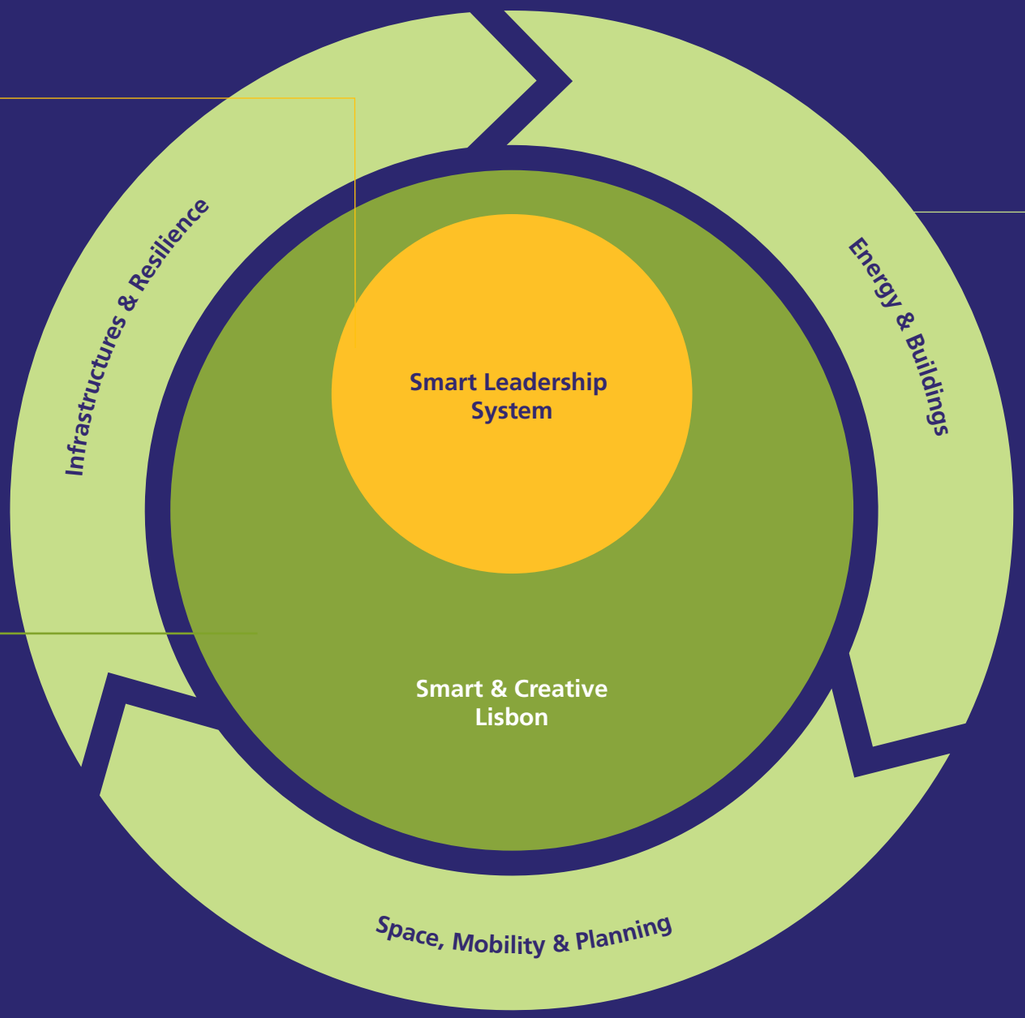
6 SUGGESTED MEASURES

Leadership System & Governance

- Lisbon Sustainability Forum
- Vision and measurable goals for Lisbon
- Neighbourhood sustainability contests

Socio-Economic Strategy

- Smart District Lisbon
- Lisbon Social Innovation Hub
- Research cooperation between city, local research institutions, society & local ICT



Technologies and Infrastructure

- Extended solar potential maps & business model for energy transition
- Closing the urban water cycle
- Smart waste management solutions
- Upgrade of public lighting network with potential for inclusion of sensor network
- Urban Data Platform
- Tool Catalogue for civil protection solutions and applications

6.1 Leadership System & Governance

Lisbon's integrated strategy represents a very promising first step. But based on the findings from the on-site assessment, the process will require some reinforcement to allow effective implementation of the strategy. The first important aspect refers to the limited capacity of the Lisbon 2020 Action Team. A second key finding was the lack of on-going coordination going into the future. A third important finding related to the lack of a measurable vision to help unify actors and guide more sustainable development processes.

Suggested Measures

1. Vision and measurable goals for Lisbon

NEED FOR ACTION
A clear vision for steering the long-term development is lacking, priorities are unclear.

SOLUTION
Definition of clear and measurable development goals.

Lisbon needs clearly defined and integrated vision with measurable goals and a corresponding roadmap for project development, addressing all sectors and stakeholders and following the smart principles in order to unify actors and guide sustainable development processes. A long-term perspective helps focus urban development projects guide the city strategy. Such a vision must be developed in an inclusive and integrated way and be linked to SMART (specific, measurable, achievable, results-focused and time bound) goals, which act as a means of measuring success.

2. Lisbon Sustainability Forum

NEED FOR ACTION
A formalized body to facilitate integrated urban development is needed.

SOLUTION
Lisbon Sustainability Forum

The city is constantly changing and is faced with changing conditions and new challenges. In this context, a more formalized body to facilitate integrated urban development is necessary. Thus, a Sustainability Forum comprised of sustainability representatives from the municipal departments and coordinated by the Lisbon 2020 Action Team is proposed. Depending on the topic in discussion, different actors from within the municipality, universities and research institutes, NGOs, civil society, private sector, innovation hubs, or any other actors deemed relevant for the topic, would be called upon to build topic-specific think tanks. The integration of other representatives from other municipalities or regional organizations could potentially assist with improving regional coordination.

3. Neighborhood sustainability contests

NEED FOR ACTION
Lack of environmental awareness

SOLUTION
Neighborhood sustainability contests

Awareness of sustainability and environmental issues is a major factor influencing human behavior. Lisbon needs sustainability contests at the parish and neighborhood level to increase energy & water efficiency and promote sustainability awareness. The organization of sustainability contests will motivate the participants to change behavior leading to a reduction of energy consumption and waste production, etc. For the implementation, local people will be trained and engaged as sustainability ambassadors to coordinate activities at the local level. This will also assist in conveying the reasons behind policies that aim to improve the sustainability of the city through improved awareness.

6.2 Smart & Creative Lisbon

By addressing its outlined socio-economic challenges and by using the enormous innovation potential, Lisbon could try to focus specifically on social innovations, including non-profit and charity organizations, social enterprises and cooperatives and therefore create a unique selling point (USP) for the fostering of innovations.

Suggested Measures

1. Lisbon Social Innovation Hub

NEED FOR ACTION
Advanced facilities for social innovation, co-working and micro production are needed.

SOLUTION
Social Innovation Hub

There is a need for creating a Social Innovation Hub that focuses on supporting social innovations. The Hub should offer advanced facilities for social innovation, co-working and micro production. The hub could be kick-started in one of the housing communities near the vulnerable historic center. The aim of the Lisbon social innovation hub would be to involve people from all age groups, especially the unemployed youth and elderly and help them explore their potential to create job opportunities for self-employment.

2. Research cooperation between city, research institutes, society & ICT companies

NEED FOR ACTION
Scattered research landscape in the ICT fields with a need of close cooperation of local players.

SOLUTION
Research cooperation

Currently, Lisbon is facing a high demand for bottom-up innovations that help the city achieve the desired level of ICT innovation. At the same time, the city is lacking financial resources to invest into extravagant ICT innovations. For these reasons, Lisbon needs to establish a coherent cooperation strategy between the city administration, local research institutes in the field of ICT, the citizens and local ICT companies, in order to cooperatively develop bottom-up innovations for the city. An example of such a process is the currently being developed Lisbon smart data platform (COI) where the city relies on external expertise and technical guidance.

3. Smart District Lisbon

NEED FOR ACTION
Create a showcase for the smart urban development of Lisbon in the 21st Century.

SOLUTION
Smart District Lisbon

Lisbon needs a lighthouse district that shows the creative, environmental, social, and economic potential of the city in one spot, integrating modern architecture and appealing design. It is therefore suggested to develop a new innovation district which will not only re-integrate working and living, but also make use of innovative and smart urban concepts such as open data, bike and car sharing, smart homes and smart grids, ecosystem services and water recycling.

6.3 Energy and Buildings

Currently, the solar, biological and geothermal potential of Lisbon, and the regional potential for renewable energy use are not being fully exploited.

Suggested Measures

NEED FOR ACTION
Solar potential is not being exploited.

SOLUTION
Lighthouse project with 8 public buildings

Extended solar potential map and business model for energy transition
The existing solar potential map needs to be connected to the energy demand (mainly with the energy profile of the buildings) in order to be a useful tool for decision-making through combining the economical and energy attractiveness of the project. The most suitable buildings for the installation of solar panels can be then identified and used to create a business model and attract new investment. A lighthouse project with eight buildings implemented by the Municipality can be set up as a demonstrator and good example and used to trigger and scale-up the energy transition in Lisbon.

Additionally the installation of solar panels in small infrastructures such as strategic bus stops and kiosks would not only contribute to awareness raising but also as game changer for regulations. For instance, a solar bus stops can have cellphone charging points, advertisement LED boards, LED time display, etc. and even be integrated with PV-based E-Car/E-bike charging stations. Finally solar-powered trash compactor could reduce the necessary trash collections by four times or more and show commitment towards the community and the environment.

6.4 Resilience & Infrastructure

The overall situation with regard to urban infrastructures and resilience in Lisbon is satisfactory. However, the implementation of the following innovative measures in the fields of resilience building, water infrastructure, waste management, public lighting and mobility can help Lisbon on the way to becoming a smart and sustainable lighthouse city.

Suggested Measures

NEED FOR ACTION
Large number of civil protection solutions and applications which are poorly systemized.

SOLUTION
Tool Catalogue

1. Tool Catalogue for civil protection solutions and applications
Since the civil protection department has performed a large number of national and international civil protection research projects, it has access to a large number of solutions and tools to be used within all crisis management phases. Due to the large number of solutions, it is necessary to develop a tool catalogue that gives all crisis management professionals an overview over the existing tools. Furthermore, it is necessary to include a guideline that helps to select the appropriate tools/solutions for the specific situation, especially in time sensitive situations.

NEED FOR ACTION
Unused rainfall potential

SOLUTION
Rain water harvesting and reuse

2. Closing the urban water cycle
The annual rainfall amount in Lisbon holds an immense potential for its use. The city needs to invest in rainwater harvesting systems and reuse it at commercial, and at household levels. Awareness needs to be raised and building regulation needs to be revised in order to enforce reuse of recycled water. Additionally, incentives for the use of recycled water should be provided. Recycled water could also provide a backup water supply in case of emergency.

NEED FOR ACTION
Low recycling rate

SOLUTION
Smart waste management

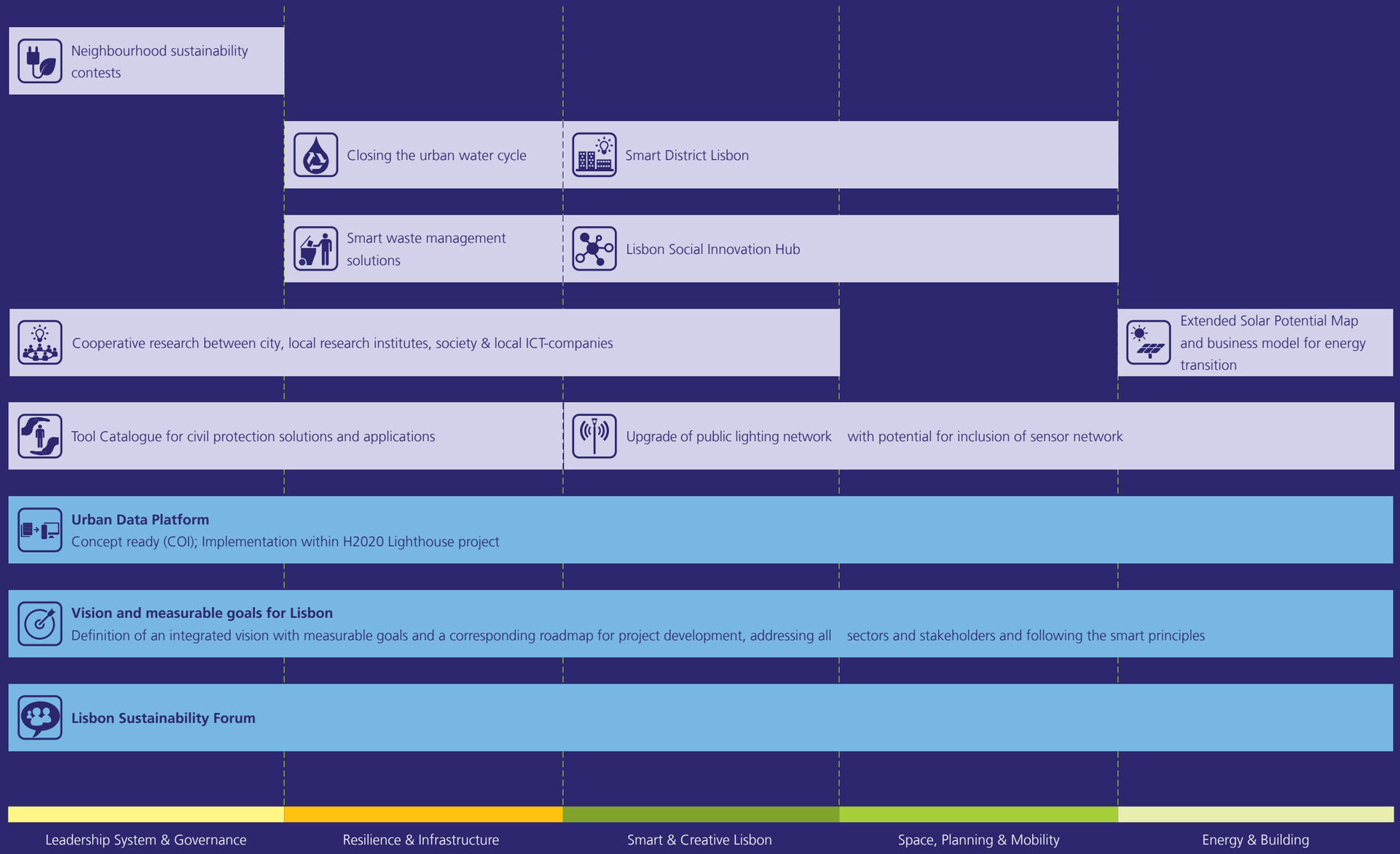
3. Smart waste management solutions
Lisbon needs smart waste management solutions to improve the efficiency in the service offered, reduce costs and optimizing waste collection and increase the recycling rate: GPS sensors & waste bins sensors together with a smart software and waste/recycling app.

NEED FOR ACTION
High energy consumption & high personal vehicle use

SOLUTION
Upgrade of public lighting network

4. Upgrade of public lighting network with potential for inclusion of sensor network
This project aims to address the high energy/electricity consumption of the current public street lighting network. By integrating the development a sensor network into this process, a range of benefits in other sectors can be leveraged. For example, Lisbon's significant mobility-related issues such as high levels of traffic congestion, low cycling rates and low public transport comfort could all be addressed by integrating a sensor network system to support mobility management.

7 ROADMAP: LISBON DEVELOPMENT SYSTEM



8 CONCLUSION

Lisbon presents the necessary preconditions to promote smarter urban development. However, the City Lab process highlighted a range of overarching issues that could not be addressed alone through interventions in specific sectors. Therefore, the key proposed solutions for Lisbon relate to overarching interventions that create a dialogue, encourage cooperation between key actors in different sectors, and set meta-level objectives. Part of this process is the reinforcement of the capacities of the action team to promote inter-sectoral cooperation, the establishment of a forum to create a dialogue between key actors in the city, and the integrated development of a set of clear goals to act as a "guiding star" for future city activities. These transversal interventions need to be complemented by specific projects "on the ground" in the different sectors.

The City Labs process has demonstrated that "smart" urbanism is not just about high-tech solutions, but also means striving for a more holistic understanding, as well as appreciating the complexity of urban systems. Innovative forms of intelligent collaboration, together with a clear vision and strategy, constitute the basis and, at the same time, the precondition for becoming a smart city.

The final report of the City Lab Lisbon contains a full analysis of the city and a detailed description of all proposed measures. It will be made available to the City of Lisbon in May 2016.

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