

BUILDING SMART CITIES TOGETHER

SHARINGCITIES

SMART CITY BASELINE REPORT LISBON



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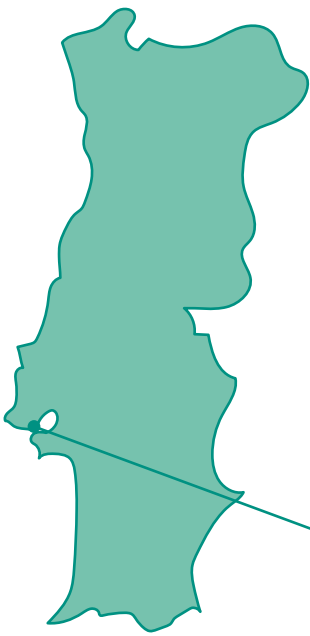
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1.

CITY CONTEXT



Inhabitants

residents: 550,000
daily visitors: 400,000
tourists per year: 10 million

Size (km²)

area: 6,458 km²
population density: 958 km²



City size and role

Lisbon is the capital and largest city of Portugal.

Geography

‘The city of seven hills’, on the right bank of the River Targus, has both the highest number of sunshine hours and the greatest risk of seismic activity in a European city.

Economic features and key activities

Lisbon boasts the highest levels of labour force productivity and enterprise density (114.7/km²) in the country. The national average is 12/km². Low presence of primary and manufacturing activities: tertiary sector 83.4%, secondary sector 16.2% and 0.4% from the primary sector. In the first quarter of 2014, the unemployment rate in the region reached 16.4% (the national average was 15.1%), nationally the third highest rate.

Which ‘lighthouse’ city/cities has similarities and in which areas: Lisbon is similar to London in terms of our urban mobility related challenges, and to Milan in terms of our building retrofit and energy efficiency measures.

2.

SHARING CITIES DEMONSTRATION AREA

Lisbon's demonstration area (10 km² and 100,000 inhabitants) is a strategic location, stretching from the riverfront to the centre of the city, and including the main tourist and historic districts (second place in the Best European Destination 2015 contest). It has several specific challenges, ranging from its particular geography to the historic nature of its buildings, many of which date from the 18th-19th centuries, while others are more recent (built in the 1990s). The area also has an ageing population.

For the building sector, Lisbon's south western geographic location presents great opportunities but also challenges, especially since its energy needs differ from those of other European regions. Cooling is very much in demand, therefore natural gas is used mainly for cooking and producing domestic hot water (DHW) rather than heating. The renovation status of the city's building stock has been critical due mainly to the absence of energy ordinances up until the late 1980s, and also to the overall age of the buildings. These increased the refurbishment costs, in comparison to new constructions outside the city centre (which characterised the past decades). By now, refurbishment has moved to the forefront of priorities, and significant headway has been made in the demonstration area. The city of Lisbon has offered financial and tax incentives to support these activities.

Regarding mobility, the demonstration area has been defined by the municipality as a low emission zone, and regulations have recently been adopted to promote improvements in air quality, and the adoption of electric vehicles (EVs) and the use of public transportation by citizens. The area at issue is being crossed by thousands of people each day, either commuters or tourists visiting the historic areas.

In defining the scope of the demonstration area, the following factors were taken into consideration: ongoing projects sponsored by the municipality, such as the low emission zone (ZER); installation of urban sensors; public access WiFi; availability of resources, such as EV charging points; chart showing the solar energy potential of downtown buildings; potential to reach and engage citizens; existence of buildings and associated infrastructure owned by the municipality or by local private project partners fit for the implementation of the proposed measures; availability of infrastructure, such as public squares, where large numbers of citizens can congregate (for demonstration and engagement purposes).

Downtown in numbers

- Inhabitants: 100,000
- Jobs: 160,000 approx.
- Area: 10km²

District functions (estimates in %)

- Living: 25
- Working: 40
- Leisure: 35

District smart city development focus

- Mobility: a low emission zone, air quality; adoption of EVs and public transportation
- Data monitoring and Internet of Things: network of district monitoring sensors and a district monitoring data platform
- Building retrofit: incentives for refurbishment, work on buildings to improve energy efficiency

*For full information on the demonstration area see Annex 1 'Smart City Solutions'



3.

GENERAL SMART CITY VISION AND AMBITION

The approach the city has taken to become smarter, whether it has a smart city strategy or not, which are the general priority areas in the city and which are specific to the Sharing Cities programme.

SMART CITY STRATEGY/APPROACH

Our ambitious Lisbon-Europe 2020 Strategic Plan focuses on the creation of a large scale open innovation ecosystem, in line with the Sustainable Energy Action Plan (SEAP) drafted within the framework of the Covenant of Mayors. The 2012 Municipal Master Plan provides for the SEAP's implementation by fostering the adoption of best practices to promote a more sustainable performance of city neighbourhoods, based on sustainable plan assessments: improved energy efficiency in public infrastructure; street lighting; and integration of renewable energy technologies. In 2015, Lisbon strengthened its political commitment by being the first capital city to join the Covenant of Mayors for Climate & Energy, adopting an integrated approach to mitigating and adapting to climate change. The Lisbon Atlantic Capital of Europe project was distinguished with the ISOCARP Award for Excellence in Planning.

Lisbon's smart city strategy focuses on the citizens and their needs. Technology is only a means to an end - to achieve a sustainable, competitive, participative, creative, and innovative citizen-centric smart city.

Lisbon has defined a strategy for its development over the next decades, based on a strong investment commitment from the municipality. The main goals that the city wants to achieve are:

- More people: Lisbon wants to attract more inhabitants by promoting housing, smart living, and smart ageing. It aims to attract researchers as well as highly skilled professionals and entrepreneurs by investing in R&D activities and in higher education.
- More employment: the city wants to stimulate the local economy by building human capital, promoting innovation and the knowledge economy, and exploring the full potential of the available resources in a sustainable manner.
- A better city: improving the quality of life in the city; energy efficiency; mobility; social cohesion and inclusiveness; regenerating buildings and neighbourhoods in a poor state of repair; optimising the city's systems and services and interconnecting them in a citizen-centric, participative way.

Priority areas

In general:

- Mobility: a low emission zone, air quality; EV and public transportation adoption by citizens.
- Data monitoring and Internet of Things (IoT): network of district monitoring sensors and a district monitoring data platform building retrofit: incentives for refurbishment of buildings to increase energy efficiency.
- Climate resilient city fostering water resilience and inclusive urban regeneration.

Within Sharing Cities

- Citizen engagement
- Sustainable energy management systems (SEMS)
- Building retrofit
- Shared e-mobility
- Smart lamp posts
- Urban sharing platform

LATEST SMART CITY RELATED ACTIONS AND OTHER PROJECTS



Citizen engagement



My Neighbourhood project

The My Neighbourhood project has received funding from the EU's Seventh Framework Programme.

Sustainable Energy Management System (SEMS)



InovGrid

InovGrid was an innovative project aiming to create smart homes with reduced investment for consumers, and to improve the national electricity grid by developing an active and intelligent management system. Framed around the concept of 'intelligent electricity grids of the future', it has been successful in the adaptation of the electricity distribution system to the new requirements of the market by allowing access for microgeneration projects. The most visible result of InovGrid was the Energy Box, a smart meter that allows remote assistance and monitoring of energy consumption. During the project, more than 50,000 smart meters were installed,

all connected to a central customer information system. The Energy Box also aimed to address the growth of electricity market liberalisation and flexible tariffs, by also allowing officials to change tariffs remotely. Thus, the system eliminates reading errors (These reading errors occur because of the need of a manual reading of electricity consumption in the houses/buildings, while with smart meter technology the reading is directly channelled through an information system platform), contributes to more efficient management and promotes more rational, smart, efficient, competitive and responsible energy consumption.



BESOS

The Building Energy Decision Support Systems for Smart Cities (BESOS) was an EU Research and Development project funded by the EC in the context of the Seventh Framework Programme. Its strategic goal was to develop an advanced, integrated management system which enables energy efficiency in smart cities from a holistic perspective. The energy management is approached as a whole and not a collection of parts. To that end, the Energy Management Systems were deployed in a typical district, where energy production and consumption would normally have been measured with isolated IT solutions. These systems could then share data and services among themselves and with external third party applications using an open and trustworthy platform. This has enabled the design and development of higher level applications, able to process real time data and generate valuable analysis to affect the business, monitoring and control strategies that operate in a smart city. The project had targeted two main stakeholders: the owners of the infrastructure – municipalities – and its operators – Energy Service Companies (ESCOs). The former was provided with a Business Balance Score Card to audit the Service Level Agreements (SLAs) established with the ESCOs against a number of Key Performance Indicators (KPIs). The latter have made use of the same tool to analyse new business models, monitor and control information from the infrastructure and establish coordinated energy efficiency strategies. The solutions developed were tested in two cities: Lisbon and Barcelona. In the two cities, the assets available for the trials included: 150,000 lights in public spaces, 150 public buildings, 250 residential buildings, 55 photovoltaic micro-generation systems (solar panels), 250 wind turbines, smart heating, cogeneration, EV charging points, and 40,000 traffic lights.



inteGRIDy

inteGRIDy aims to integrate cutting- edge technologies, solutions and mechanisms in a scalable cross-functional platform connecting energy networks with diverse stakeholders, facilitating optimal and dynamic operation of the distribution grid (DG), fostering the stability and coordination of distributed energy resources and enabling collaborative storage schemes with an increasing share of renewables. In Lisbon an energy management system (EMS) is being developed for Campo Grande

25, a five block building, where most administrative parts of the municipality work are performed. It has around 2,000 people working every day and many others visit the building, as it hosts some important public services. The building has a total area of 55,000 m², and is supplied with medium voltage, having an average yearly consumption of 3.2 GWh. In addition, a fleet of about 60 EVs is charged in two charging stations available in the building. Today the charging process has its own EMS, able to identify sources of savings and monitor the evolution of consumption. This pilot intends to analyse and evaluate the impact of the installation of photovoltaic solar panels, EV charging, and storage of energy in ice tanks. It will integrate them into an intelligent virtual system, allowing for more efficient energy management.

The remote management project

In Lisbon's municipal buildings and buildings belonging to Lisboa E-Nova associated members, Lisboa E-Nova promotes the remote management project. The objective of this project is to monitor the electricity consumption patterns of buildings electrically supplied in medium voltage, analyse the energy consumption profiles and discuss the results with the building manager in order to identify intervention opportunities. Remote management promotes better management of the building and the accuracy of electricity tariffs.

Solar Potential Map

In 2014, Lisboa E-Nova identified the solar energy production potential for all roofs available in the city. Through a systematic approach, the result has been compiled in the current Solar Potential Map. In this map, the buildings are characterized by type of coverage (concrete, tile, fibre, cement, etc.), ownership and type of use. Energy efficiency diagnostics and solar field sizing were also carried out for production oriented to self-consumption in 82 of Lisbon's buildings, covering an area of 339,222 m² and an estimated photovoltaic module power of 49 MW. It is possible to identify up to 500 buildings in the city that present a potential solar energy production greater than 2,000 m² (Class III and IV).



Building retrofit



Rehabilita

Rehabilita aims to provide solutions to the challenge of identifying and using successful financial tools, to break the investment barrier for energy renovation of private housing and public buildings. The project seeks to support energy renovation financing through the mobilisation of European investment funds, technical assistance and training. As specific objectives Rehabilita aims to: offer a permanent support service to policies for energy renovation in the SUDOE (urban areas of south western Europe) space, promote the implementation of innovative financing tools in

policies for energy renovation and prove the technical viability of energy renovation projects using innovative financial tools. Aimed at public administrations, enterprises, the financial sector and general end users, the project is developing: five ex-ante studies and an IFs (innovative financing tools) structure, a SUDOE methodology for the design of innovative IFs, seven pilot actions to improve energy efficiency in buildings with IFs, four transnational forums for the study and exchange of good practices and experiences, 2 technical visits to discover in situ success stories, and national workshops and seminars.

Boavista

The ECO-neighbourhood - boavista ambiente + project, launched by Lisbon municipality, aims for an integrated model for sustainable innovation. This project is developed under the Lisbon financing programme named POR and the framework for financial support, the National Strategic Reference Framework (QREN), dedicated to the specific regulation of the Policy Cities Partnerships for Urban Regeneration. The main activities have involved the reconversion and urban renewal/upgrading of public spaces, implementation of measures to improve the energy performance of buildings and remodelling of some equipment in the neighbourhood, including the municipal swimming pool.

Sustainable Refurbishment for Lisbon

The project Sustainable Refurbishment for Lisbon aims to promote good practices in the refurbishment of buildings, through the identification of intervention opportunities, capable of improving the energy/environmental performance of those buildings to be refurbished in Lisbon. In this context, one of the project goals is to promote the implementation of the national legislation on buildings' energy and air quality performance. Considering four different types of buildings, dynamic simulation processes have been used to analyse energy/environmental performance. The work has been developed in direct partnership with external entities and strategic stakeholders, so that the relevant know-how is shared in the working meetings (strategic and technical). These meetings will involve all the relevant stakeholders operating in the construction sector - local authorities, entities with a role in legalisation procedures, private construction companies and building material suppliers - all having the main goal of achieving sustainable refurbishment guidelines designed by the institutions that oversee the licensing procedures. The opportunities and specific measures that constitute good practices will be presented in four Good Practices in Buildings Refurbishment manuals. The success of this initiative has allowed Lisbon and all the relevant actors in the construction sector, to explore market opportunities, demonstrating good practices in the real estate market, motivating other real estate promoters to adopt and to replicate the disseminated measures, contributing to the overall improvement of Lisbon's built patrimony.

REQUEST

The goal of the REQUEST project was to increase the uptake of low carbon renovation measures in residential properties across Europe for all ownership tenures. Working as an EU consortium (of national energy agencies and building research institutes of 11 member states), we focused on addressing one of the key barriers to action for property owners, namely easy access to a reliable quality installer or, in the case of major renovation, a range of professionals, referred to for the purpose of this project as the supply chain. The project regarded Energy Performance Certificates (EPCs) as a starting point for a chain of quality renovation actions and aimed to enforce the role of EPCs in this perspective. EPCs need to contain qualitative and comprehensible recommendations, motivating homeowners and tenants to commission a joined up renovation product where they can trust the quality of the delivered renovation. The REQUEST project provided national and regional agencies across the EU with a set of tried and tested tools and techniques which they can use to promote:

- An integrated customer journey leading dwelling owners or tenants from EPC information to low carbon action;
- An integrated supply chain for professionals involved in renovation processes, with mutual recognition of the roles of the various trades involved enhancing quality, professionalism, ease of use and confidence in the outcome for the dwelling owner/tenant.

These objectives were met through collaboration and interaction with key actors from the 4 different target groups involved:

- Demand side - individual householders and the multi-residential building owners/managers;
- Supply side - building professionals and trading organisations;
- Intermediary – EPC advisors, architects;
- Regulators and facilitators - government agencies, experts in low carbon renovation.



Shared e-mobility



FREVIEW

This project has received funding from the EU's Seventh Framework Programme. The 2013 Urban Mobility Package identifies FREVIEW as a European Commission flagship project to support the introduction of electric freight vehicles (EFVs) by demonstrating and evaluating innovative urban logistics solutions. FREVIEW established demonstrations in eight of Europe's largest cities, including six capitals: Amsterdam (Netherlands), Lisbon (Portugal), London (United Kingdom), Madrid

(Spain), Milan (Italy), Oslo (Norway), Rotterdam (Netherlands), Stockholm (Sweden). These cities provide a diverse political and regulatory setting in which EFVs are being introduced. Moreover, each of the FREVUE demonstrations also comprises a unique package of measures which are being implemented thanks to the close cooperation of local authorities, industry and research partners. By exposing over 70 EFVs to the day to day rigours of the urban logistics environment, FREVUE aims to prove that the current generation of electric vans and trucks can offer a viable alternative to diesel vehicles, particularly when combined with state of the art urban logistics applications, innovative logistics management software, and with well designed (local) policy.

Bike-to-work

By means of a partnership composed of the Lisbon Municipality, Lisboa E-Nova and the Portuguese Cycling Federation and Bicycle Users (FPCUB), 'Bike-to-work', aimed to challenge companies/institutions based in or with facilities in the Lisbon to mobilise their employees to travel by bicycle to their work place, sensitising them to the need to reduce the environmental impacts of urban mobility, and promoting smooth means of mobility. In 2011, the initiative was launched experimentally, targeting only the workers of the Lisbon City Council. In 2012, due to the interest shown by the business community, it was decided to extend to companies/institutions headquartered or with facilities in the municipality of Lisbon. The number of entities participating in these editions has increased significantly during the last years.

DEMOCRITOS

The DEMOCRITOS (Developing the Mobility Credits Integrated Platform Enabling Travellers to Improve Urban Transport Sustainability) project introduced the 'Mobility credits model' as a transport specific platform that enables travellers, mobility providers, technology providers and transport planners to understand the implications of climate policy and increasing prices for greenhouse gas emissions and to identify new opportunities in urban mobility first and in extra-urban mobility later. The concept of the mobility credits was originally developed by the Italian firms Evidenze and RightStrategy with the support of Fondazione Italiana Accenture (owner of the trademark 'Crediti di Mobilità') and was further developed through the collaboration with the municipality of Genova. The rationale of the mobility credits model is based on setting as a quantitative target the 'sustainable load of GHG (Greenhouse Gases)' of the study area. Subsequently the GHG load was converted into a 'total amount of mobility credits' distributed to all the travellers of the area. Based on their mobility behaviours, individuals 'consume' their initial endowment of mobility credits. In addition, depending on their mobility habits, people could have needs higher or lower than the mobility budget assigned: as a reaction, exchange mechanisms develop in the system, regulated through a sort of bank where credits are bought by the individuals or returned with monetary benefit in case they have

been unused. Capturing the requirements of the topic “to enable travellers to understand and reduce greenhouse emissions related to mobility and consumption choices”, we noticed that providing information is not enough. That would leave travellers without a compelling proposition to adjust their behaviours and choices. It could create understanding, but not reductions. On the contrary, we believed it was necessary to create a behavioural context where the travellers can experience the effects of changing attitudes and choices in mobility. The mobility credits model allowed the creation of this context within a range of possible implementations, from a pedagogic tool to a mandatory demand management scheme. The mechanism of this context was to set a quantitative target (e.g. an allowable threshold of CO₂ production), to make the approach path to the target measurable (how much CO₂ was not produced on account of a different mobility behaviour) and to apply a driving force (incentive or obligation) from the current status to the target. Then, the goal of the DEMOCRITOS project was to establish an exhaustive framework of the platform aiming at:

- Further enhancing the theoretical framework addressing medium and long-term effects (relocation of industrial, commercial and residential activities, inflation in prices of goods and services, local competitiveness, effect on tourism, ...);
- Exploring different ways to implement the pillars: theoretical schemes to define the charge area and to measure the sustainable load; load/credits ratio; alternative policies to an even distribution of credits; rules; exchange models;
- Exploring how the model could spur innovation in individual transport means through a positive selective pressure to induce the use of low pollution, low consumption and small vehicles;
- Assessing the implications of different technology scenarios (automotive, other transport means, electronics, sensors, and mobile communications) and how they can fit into the model;
- Assessing the social awareness and concerns in applying such pervasive monitoring (tradeoff with security and environmental benefits?).



Smart lamp posts

Smart lamp posts

The goal of this project was to improve the efficiency of energy use in public lighting. To achieve this goal, continuous monitoring, more efficient management and control systems, as well as replacements with more efficient equipment were all considered. Without jeopardising the security and comfort criteria, priority was given to solar light potential and adjustment of colour and light intensity to the lighting purposes

and requirements. Technologically, electronic ballasts with controlled flux reduction have been installed, replacing the ferromagnetic ballasts of 250 W (in high pressure sodium vapor lamps) with electronic ballasts, creating energy savings of around 50%. The investment payback took between 3-5 years. In addition, 625 lamp posts were programmed to be controlled remotely. Both solutions deserve replication, although in areas with different characteristics – e.g. a solution with a ballast without remote control can be used in residential areas and the solution with control point to point should be used in certain areas of the city. In addition, the city has also conducted an intervention in public lightning of monuments with improved lighting quality and reduced light pollution. As a pilot, this project replaced the existing exterior lighting of the Basilica da Estrela, various kinds of lamps, including incandescent, with more efficient lamps focussed on particular elements of the façade. An energy and financial saving higher than 50% has been achieved.

LED lights

The goal of this project, supported by national funds, was the replacement of the traditional incandescent light bulbs used in traffic lights with LED (light emitting diodes). This has a great range of advantages: road traffic safety, lower costs in energy consumption and maintenance, and higher sustainability. LED lamps use only 6-15 Watts, in contrast to an incandescent lamp's 100 W, representing a saving of over 80%. Moreover, while a 12 W LED bulb lasts for around 11 years, traditional incandescent light bulbs last for only 0.23 years. In addition to the lower energy consumption, longer lifespan and lower temperature during operation, the LED lighting allows the equipment to continue operating until the elimination of 20% of the whole group of bulbs, without lowering the quality of the light emitted by the traffic light. Another advantage is the elimination of the ghost effect, the reflection of solar light is half that produced by conventional technology. This project has consisted in the replacement of 1,500 incandescent bulbs with LED in traffic lights in the 1st phase (downtown area) and 2,500 in the 2nd phase (important roads in the city centre). These actions represent considerable energy savings (about 90%), maintenance cost reduction, and an increase of road safety in the affected areas.



Urban Sharing Platform (USP)

The CitySDK APIs project has received funding from the EU's Seventh Framework Programme.

NATIONAL AND EUROPEAN FRAMEWORK

ICT, energy, mobility and climate change are key priorities at European level, addressed in several Strategies (Europe 2020, Digital Single Market Strategy, Covenant of Mayors for Climate & Energy, etc.), directives and other legislative measures binding for EU member states.

Cities and their management entities are key actors in making smart cities a reality, putting in place practical solutions that create an impact in the citizens' daily lives.



Lisbon was the first capital to join the Covenant of Mayors for Climate and Energy on 29 June 2016. This initiative was set up by the European Commission to engage cities in taking action to adapt to climate change. Lisbon has committed to the Covenant objectives of reducing its CO₂ emissions by at least 40% by 2030, increasing resilience to climate change and also strengthening its efforts to provide secure, sustainable and affordable energy to its citizens.

In July 2017, the Municipal Adaptation Climate Change Strategy was approved by the City Council. This integrates the initiatives and measures to be implemented within the city's strategy.

Regarding mobility, the Action Plan for Sustainable Urban Mobility in Lisbon Metropolitan Area will allow to a broader perspective concerning mobility within Lisbon and the surrounding districts.

Examples of relevant regulations

EU directives

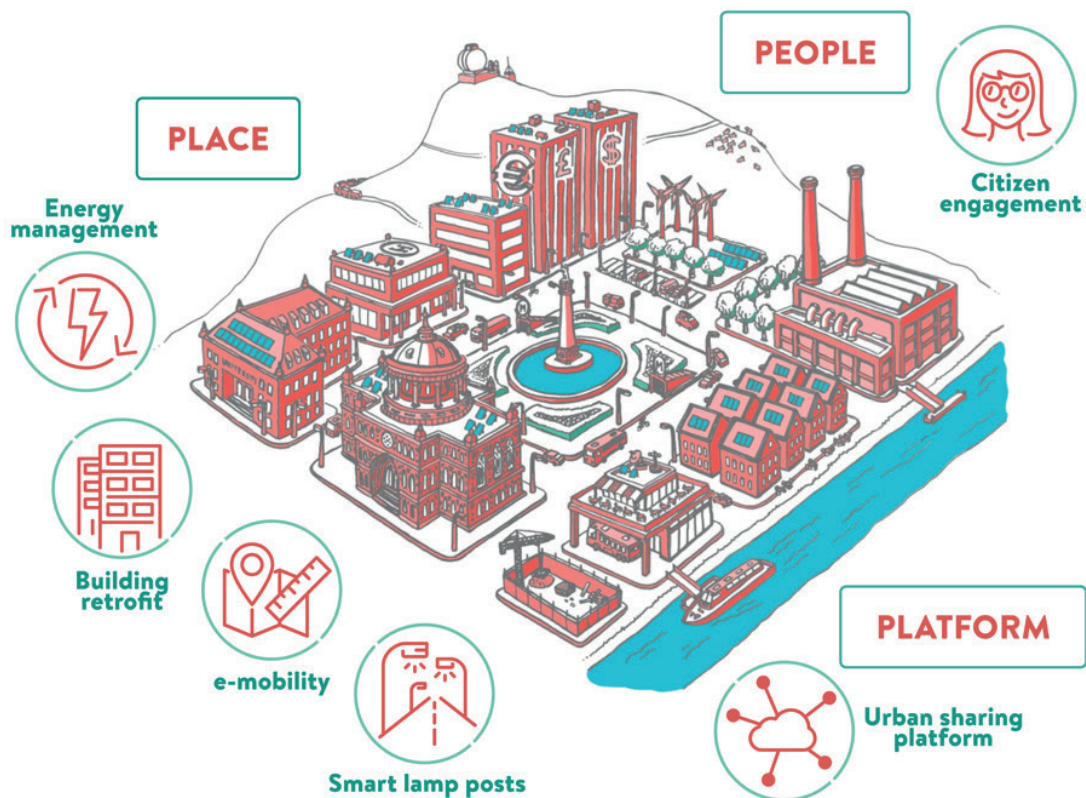
- 2009/28/EC - Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
- 2009/72/EC - Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC
- 2012/27/EU - Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC
- 2010/31/EU- Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings
- 2002/91/ EC- Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

EU regulations

- 347/2013 - Regulation (EU) No 347/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009
- 1316/2013 - Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010 Text with EEA relevance

4.

SHARING CITIES SMART CITY SOLUTIONS AND MEASURES



Within the Sharing Cities programme several smart city solutions are being developed.

For each measure there is a description about how the city has prioritised it, what kind of related challenges had been identified and other relevant information.



CITIZEN ENGAGEMENT

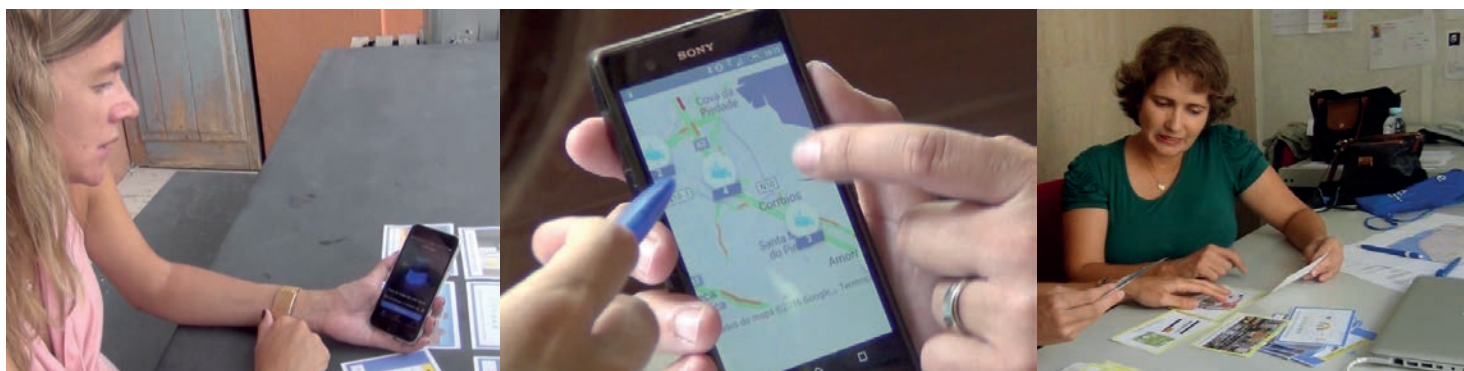
This measure envisages citizen focused activities, in particular user research, citizen engagement, the development and implementation of a Digital Social Market which will incentivise the uptake of services and behavioural change via incentive mechanisms and the development of a service layer.

Information about priority area

In 2008, Lisbon was the first European capital to adopt a participatory budgeting (PB) process. Since then, the city has become a reference in the field of citizen engagement. Participatory budgeting has been refined and reinforced edition after edition to make it more inclusive and to further encourage citizen participation.

CHALLENGES

One of the challenges is to continuously maintain and build trust and involve the citizens in creating effective e-participation tools, and also to respond effectively to citizen participation initiatives. Furthermore, digital inclusion and the digital divide are also considered to be issues related to citizen engagement.



Strategic approach towards becoming a smart city

Lisbon has a strong tradition in participatory processes, based on its participatory budget. Since 2008, numerous such proposals have been tabled and votes and participatory assemblies held.

Through the participatory budgeting process, decisions on the allocation of €2.5 million are made with the involvement of the citizens.

Since 2008, 5,208 proposals have been presented by the citizens. A total of 1,647 projects have been put to the vote (180,000 votes cast), and 88 of these are now in the implementation phase. Over the past eight years, investment in the selected proposals reached €26 million. The challenges include the ageing population and the digital divide, as well as the need to build and maintain the trust of citizens in the participatory processes. The latter task has significant financial implications. Another challenge is the complexity of maintaining an effective link between the municipality and the local associations and institutions that promote civic engagement.



Organisational structure

Local Development Division (DDL);
Social Development Department (DDS);
Participation and organisational innovation
Division

Key stakeholders

Universidade Nova de Lisboa – Nova
IMS, Centro de Estudos Sociais (CES),
Associação IN-LoCo, Agência para a
Modernização Administrativa (AMA)



SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

This measure involves the development of an advanced, data-rich, management system which gains maximum benefits from the retrofitted buildings, sharing energy data through the open platform enabling energy services to be provided that reduce energy use and bills. This will enable the design and roll out of higher level applications for citizens and authorities, taking advantage of the sensing layers and actuators installed.

Information about priority area

Lisbon's vision of a smart city rests on an integrated approach to all its energy consuming and producing infrastructure. This approach includes applied innovation; better planning; more participation; higher energy efficiency; better transport solutions; and intelligent use of information and communication technologies. Lisbon has initiated the BESOS (Building Energy Decision Support Systems for Smart Cities) project, working in partnership with Barcelona to develop an advanced, integrated management system, which enables energy efficiency in smart cities in a holistic way.

CHALLENGES

The challenge is to deploy and implement an integrated energy management system which enables coordinated energy monitoring and control of the infrastructure and equipment, which consume and produce energy. In relation to this, the key issue is the data and device integration in energy management platforms.

Strategic approach towards becoming a smart city

In the field of energy management, the municipality works closely with the local energy agency Lisboa E-Nova, on several projects aimed at promoting energy efficiency in buildings and efficient energy use by citizens.

The main challenges include: reducing CO₂ emissions; lowering the municipality's energy bill (public buildings and facilities); as well as integrating energy consumption and production data and making it available to public managers and to the public at large in open and reusable formats.

Organisational structure

Operations Department (DO); Municipal Direction of Green Infrastructure Environment and Energy (DMEVAE)

Key stakeholders

Lisboa E-Nova, Agência para a Energia (ADENE), EDP





BUILDING RETROFIT

This measure aims to apply deep-retrofit measures to public and private residential properties affecting 15,000 citizens across the six cities and integrating the properties with low carbon energy sources (solar PV, water source heat pump) and electric vehicle charging, all wrapped together by a digital first digitally driven sustainable energy management systems wrapping it all together.

Information about priority area

Lisbon's Strategy Chart 2010-2024 includes: action plans for a refurbished and reinhabited city; a major awareness raising campaign; Programme RE9 technical support for small interventions in buildings; Re-Inhabit Lisbon and Refurbish First and Pay After for old private buildings; a funding programme for energy efficiency measures in condominiums; and the Community Support Framework 2014-2020 refurbishment financing programme to increase energy efficiency.

Regarding the interventions in social housing districts (multicultural and vulnerable communities), the city is an example of a truly integrated model for sustainable innovation due to the building refurbishments performed in recent years. Through the cooperation of various stakeholders with the local housing organisation and the local community associations, energy performance has been improved and behaviour change achieved. The so-called BIP/ZIP 2020 programme is one of the initiatives promoted by Lisbon Municipality.

CHALLENGES

On one hand, the challenge is to have a cost efficient energy retrofit of building infrastructure. On the other hand, it is to promote low architectural impact and high technological solutions for local energy production in the historical area, which nowadays faces the opposition of the Directorate General for Cultural Heritage (DGPC) (This national institution aims to preserve the historic buildings and panoramic views in the city historic centre). The opportunity which is also a challenge is to develop projects under the umbrella 'Lisbon: solar capital of Europe'.

Strategic approach towards becoming a smart city

Lisbon's Strategy Chart 2010-2024 includes: action plans for a refurbished and reinhabited city; a major awareness raising campaign; Programme RE9 technical support for small interventions in buildings; Re-Inhabit Lisbon and Refurbish First and Pay After for old private buildings; a funding programme for energy efficiency measures in condominiums; and the Community Support Framework 2014-2020 refurbishment financing programme to increase energy efficiency.

Regarding the interventions in social housing districts (multicultural and vulnerable communities), the city is an example of a truly integrated model for sustainable innovation, due to the building refurbishments performed in recent years.



Organisational structure

Housing and Maintenance of Municipal Buildings (DHMEM) Shared e-mobility: Traffic Management Division (DGT); Fleet Management Division (DGF) Smart lamp posts: Operations Department (DO)

Key stakeholders

Laboratório Nacional de Engenharia Civil (LNEC), Instituto Superior Técnico (IST), Instituto da Habitação e da Reabilitação Urbana (IHRU)



MOBILITY

The mobility measures include:

- e-car share: delivering bold ambitions in districts consistent with growing city-wide ambitions for real scale reduction in traditional car ownership and use; learning from different city contexts – user behaviour/ownership and commercial offers from suppliers; and to support EU-wide relevant market take-up of EVs through sharing business models and the clean power for transport package.
- e-bikes: building on existing human power bike sharing schemes with introduction of e-bikes, to support shift from cars and other modes to e-bikes for those longer journeys, senior citizens, mobility impaired; integrate with EV car sharing services and charging points and local renewable energy generation.
- e-vehicles charge: installing a network of EV charge points, and integrate infrastructure with the other place-based measure and the urban shared platform: building retrofit; solar PV; humble but smart lamp posts; sustainable energy management system; to enable shift to e-mobility and achieve an advanced level of ‘digital first’ and ‘infrastructure next’ integration.
- Smart parking: implementing smart parking technologies, including evaluation of sensor type implementation (potentially different sensor types and business models), testing and capture of operational experience to incentivise e-mobility.
- e-logistics: countering the growth in conventional (particularly diesel) freight delivery vans caused by growth in on-line commerce, local deliveries and small businesses through implementing electric logistics to prove the business cases for new ways of urban logistics, and package learning for EU cities replication.

Information about priority area

Portugal was the first country in the world to have set up a nationwide interoperable and integrated public network for charging EVs (MOBI.E), creating the conditions for a business oriented EV ecosystem. Lisbon currently has 540 charging stations, operated by four different service providers but managed via a single platform – MOBI.ME. MOBI.ME is a fully interoperable and integrated nationwide

network of EV charging stations. This network, managed by the mobi.me system, has been operating since 2010, and is capable of producing aggregated information on the quantity and quality (mix) of the energy used by the network at 15-minute intervals. The city aims to lead by example. Accordingly, it will demonstrate EV technology and create the conditions for EVs to be positively perceived by the population. The tools to be used include: the Transporlis platform (Transporlis is a multimodal information system of the Lisbon Metropolitan Area); and a public portal and a smartphone app for public transport information on schedules, fares, and routes.

CHALLENGES

On the mobility area first of all the promotion of ‘sharing culture’ among citizens is the main challenge. This also includes the promotion of new eco-friendly services focusing in the mobility of locals and visitors. The change of mindset needs to be accompanied with the change of individual ownership habits and car use habits.

Strategic approach towards becoming a smart city

The city plans to upgrade its municipal fleet by introducing an e-car sharing system. The Sharing Cities project is the perfect platform to reach that goal.

The municipality already has more than 100 EVs, and around 3,000 of its employees hold permits to drive municipal vehicles, so it is important for this scheme to be up and running as soon as possible.

Other e-mobility solutions

e-car sharing:

Lisbon has two car sharing service operators: Mobiag (private company) and CityDrive (private company). None of them operate EVs.

e-bike sharing:

EMEL (EMEL is a municipal parking and mobility company) is launching ‘GIRA Bicicletas de Lisboa’ a bike share which provides a new eco-friendly service focusing on the mobility of locals and visitors. The shared bicycle network will comprise 1410 bikes (940 e-bikes and 470 conventional bikes) spread across 140 stations. All bikes will be associated with a mobile app which is required to use the network.

Key stakeholders

Centro de Engenharia para Inovação da Indústria Automóvel (CEiA), Instituto da Mobilidade e dos Transportes (IMT), Transportes de Lisboa, Associação Portuguesa do Veículo Elétrico (APVE)

The EVs public charging points network has been managed by MOBI.E since 2010. The MOBI.E framework is openaccess, inclusive, user focused and lets partners develop different business models allowing energy suppliers to operate the charging points. The MOBI.E model grants universal access to any car and battery manufacturer, Electricity Retailer for Electric Mobility, or Recharging Network Operator. Since 2010, the network has constantly been expanding. By the end of 2017, all the Portuguese's municipalities will be equipped with at least one charging point and the charging service will begin to be paid.

In Lisbon, 150 charging points currently exist, with almost 1,400 users, allowing a CO₂ saving of almost 2 tonnes. The following graph shows the constant improvement of energy consumption from EV charging in Lisbon.

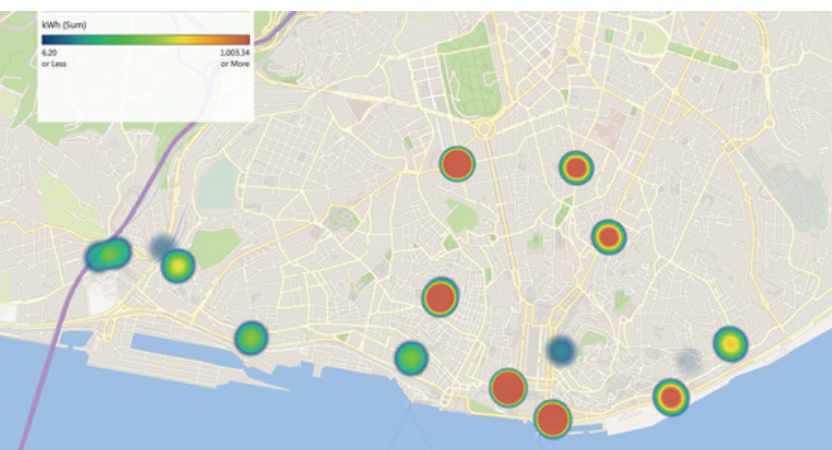
Smart parking:

To optimise parking space usage, improve the efficiency of parking operations and help traffic in Lisbon, EMEL are looking to implement smart parking in the city. There is a search for offers for parking sensors using wireless technology like LoRa.

This solution offers considerable advantages to all parties involved:

- For residents: real time availability of spaces, check in, navigation, timer
- For controllers: occupancy and infringement handling
- For retailers: becoming involved in attracting shoppers even without ownership of adjacent parking spaces
- For the municipality: usage pattern information enabling daily records for further uses

EV charging:



Lisbon has a widespread public EV charging network.

The EVs public charging points network in managed by the MOBI.E since 2010. In Lisbon, currently exist 150 charging points and almost 1400 users, allowing a CO₂ saving of almost 2 tons. The following graph shows the constant increment of energy consumption from EV charging in Lisbon.

In the Lisbon' demonstration area currently there are 35 charging points represented in the heatmap to the left.

e-logistics:

The Lisbon Municipality operates a fleet of over 100 EVs, including ones that serve e-logistics needs. EMEL and Correios de Portugal (CTT, the national postal company) also use e-logistics vehicles.



SMART LAMP POSTS

Smart lamp post presents a very visible ‘quick win’ for smart cities; and the well-proven lighting and maintenance savings offer an attractive bankable initiative. The smart approach is to consider how to develop business models and funding mechanisms that incentivise implementation of ‘smart’ measures (WiFi, air quality, parking, EV charging, etc) alongside lighting exploiting what is typically a considerable network of existing assets – in other words to multi-purpose the ‘humble’ lamp post.

Information about priority area

The municipality of Lisbon owns the street lighting infrastructure and is responsible for its management. In some of the pilot areas, specific projects have been developed jointly with the energy agency Lisboa E-Nova to implement a central management system and install sensors. A plan to replace conventional light bulbs with LED lamps is also on the table.

CHALLENGES

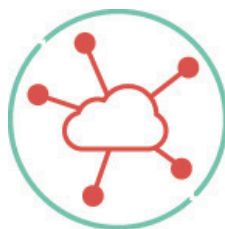
Besides the cost of maintenance of smart lamp post infrastructure itself, some of the key challenges are related to power supply, to assuring 24 hour power to the street lighting. The operation and management costs of public network would also decrease, a positive which nonetheless requires the formulation of new management strategies. There are also legal and data privacy/surveillance issues.

Strategic approach towards becoming a smart city

The municipality owns Lisbon’s lamp posts and their management system. In some of the city’s pilot areas, the municipality has joined forces with energy agency Lisboa E-Nova to install central management systems and sensors. Lisbon’s 64,000 street lights have a combined annual energy consumption of around 60 GWh. Around 10% of the street lights, 6,800 street lights have LED technologies.

Key stakeholders

Lisboa E-Nova, EDP



URBAN SHARING PLATFORM (USP)

An Urban Sharing Platform (USP) is a logical collection of technical components, capabilities and processes which provides functions and services that enable a smart city. Its purpose is to aggregate data and control functions from a wide variety of devices and sensors, store, process, correlate the data and present information to the city and citizens which enables better use of the city resources and may provide support for innovative service verticals.

Information about priority area

Lisbon's municipal Integrated Operations Centre (COI) will allow for the intelligent management of the city by gathering all the data and knowledge from the relevant data sources and data capturing devices.

The public procurement process for building and deploying the COI is currently underway. The next few months will see the start of development, with deployment expected in 2017.

A new open data portal for the city, integrating data from external city stakeholders, was inaugurated in September 2016, and agreements on granting open access to data have been signed with more than 20 municipal institutions, including the transport authority, utility companies, universities, and research centres.

CHALLENGES

In relation to the platform, some of the key issues are related to the data integration and the lack of application programming interfaces (APIs) and web services to access relevant data, or the old legacy systems from the municipality. Others are around the lack of standards in certain areas.

Strategic approach towards becoming a smart city

The municipality has set up a team dedicated to planning and managing the implementation of the City Integrated Operations Centre (COI). The international public procurement process for the centre's IT platform and associated services is in its final stages.

The COI platform will aggregate, manage, and display relevant data gleaned from the municipality's information systems and from 20-odd other public and private institutions.

The city has also launched a new open data portal and has appointed a chief open data officer. Its aim is to promote the opening of relevant city data by and for all relevant stakeholders.

The institutions that will supply data to the COI have also signed agreements to make at least part of that data available via the city's open data portal. More than 300 datasets are already available freely and openly via this CKAN. CKAN is a data management system that makes data accessible by providing tools to streamline publishing, sharing, finding and using data. The data providers include the municipality and seven other institutions.

A network of IoT enabled devices is also being deployed through the city to provide the COI with real time data, and to enable control over the smart city IoT enabled devices.

Organisational structure

Informations Systems Departement (DSI);
Mission team for the installation of the Integrated Centre of Operations of Lisbon
Equipa de (EM-COIL)

Key stakeholders

Associação para a Promoção e desenvolvimento da Sociedade de Informação (APDSI), Beta-I, Start Up Lisboa, Instituto Superior de Engenharia de Lisboa (ISEL), Universidade Nova de Lisboa – Nova IMS, PT Inovação

OTHER

Information about priority area

The municipality has also promoted the launch of a new open data and open innovation initiative called Smart Open Lisboa (SOL). Some of the local partners in the Sharing Cities project, along with more than 200 teams/startups applied for the contest in 2016.

Organisational structure

Brand and Communication Department;
Municipal Direction of Economy and
Innovation; Start Up Lisboa

Key stakeholders

Fraunhofer Institute, TM Forum



5.

GOVERNANCE

The internal organisation and modes of governance in relation to external stakeholders are essential parts of the cities' transition to becoming smarter. The Sharing Cities programme gives opportunity to the city to rethink the way of working. The cross-departmental (internal) and focus groups (with external stakeholders) are presented.

INTERNAL ORGANISATION, GOVERNANCE

The Lisbon City Council is the executive body of the municipality. Its mission is to define and execute policies that may promote the development of Lisbon in different areas.

The City Council comprises 17 elected councillors, representing the different political forces. One of these councillors holds the post of mayor. Each councillor manages one or more specific areas of the city's governance.

The City Council's work is supported by 16 thematic directorates, which oversee 40 municipal departments and 100 divisions. These latter manage the following areas: public works; waste; green areas; IT; civil protection; public space management; traffic and mobility; sports; education; culture; social assistance and local development; housing; human resources and finance; participation; economy and innovation; and central coordination of the parishes/boroughs.

At local level, 24 parishes/boroughs define, together with the City Hall, the local management policy line. They are autonomous and have their own independent budget.

Cross-departmental working groups (WG) and focus groups

There are several working groups in Lisbon.

Examples:

- Sharing Cities H2020 working group for the bid/EU funds proposal
- several cross-departmental working groups for other bids/ EC funds proposals working groups for open data and open innovation projects

The working groups (WGs) include:

- the Sharing Cities H2020 working group for the bid/EC funds proposal
- several cross-departmental working groups for other bids/EC funds proposals working groups for open data and open innovation projects

The WGs have existed since 2015.

The WGs were created to promote cross-departmental cooperation and working within the municipality's departments, and incorporating external stakeholders and partners to achieve the successful implementation of the projects and funding proposals.

The areas covered are:

- urban platform for smart city development; open data;
- open innovation and interoperability projects; e-mobility;
- building retrofit; citizen engagement;
- communication.

The particular challenges faced were: the sharing mindset of WGs' members (Sometimes the municipal workers are not used to working in cross-departmental groups and instead create silos of knowledge), and the hierarchical and administrative procedures within the municipality.

The frequency of the meetings depends on the subjects and the workload/deliverables, but meetings take place at least once a month. Each WG has a clear mandate, and the representatives of the different stakeholders and municipal services are nominated in an official document.

Sharing Cities working groups (WG) and focus groups

The WG set up for the Sharing Cities bid has become the core of the project's management structure. Subsequently several WGs have been created to manage the different work packages of the project. Each group is responsible for a Sharing Cities work package. These WGs have more members than the ones set up before the launch of the project, because they incorporate external stakeholders. Their objectives and deliverables are also more specific.

Once the municipality received confirmation that the consortium's bid was a winner, it set up a project team. Its members were nominated by the councilman responsible for the project. The project team then began mobilising the different departments and local stakeholders in thematic workgroups. The WGs were up and running one month after the project's launch.

The Sharing Cities WGs meet on a regular basis, depending on their workload. Their role is to prepare the deliverables as required, and to align the investment needs and other measures with those of the municipality's other projects.

The focus groups are not yet in place, but we expect to set them up, drawing on the results of citizens engagement's user research and the experiences of its volunteers.



ANNEX 1 - SMART CITY SOLUTIONS

CITY DESCRIPTION IN A SMART CITY CONTEXT

Lisbon, Portugal

Citizens and their needs are at the heart of Lisbon's strategy to become a smart city. Technology is seen as means to an end, which is to nurture Lisbon into a sustainable, competitive, participative, creative, innovative, and citizen-centric smart city.

Lisbon has adopted its urban development strategy for the next decades, and has secured a significant financial investment along with a strong commitment from the municipality. The main goals are: more people; more jobs; and a better city.

The city's commitment to build upon a truly innovative smart city was agreed in a participative process, taking into consideration the views of all stakeholders.



Lisbon in numbers

Number of inhabitants	550,000
Number of e-cars	Approx. 880
Number of jobs	1,386,000
Area	958 km ²

District: Downtown

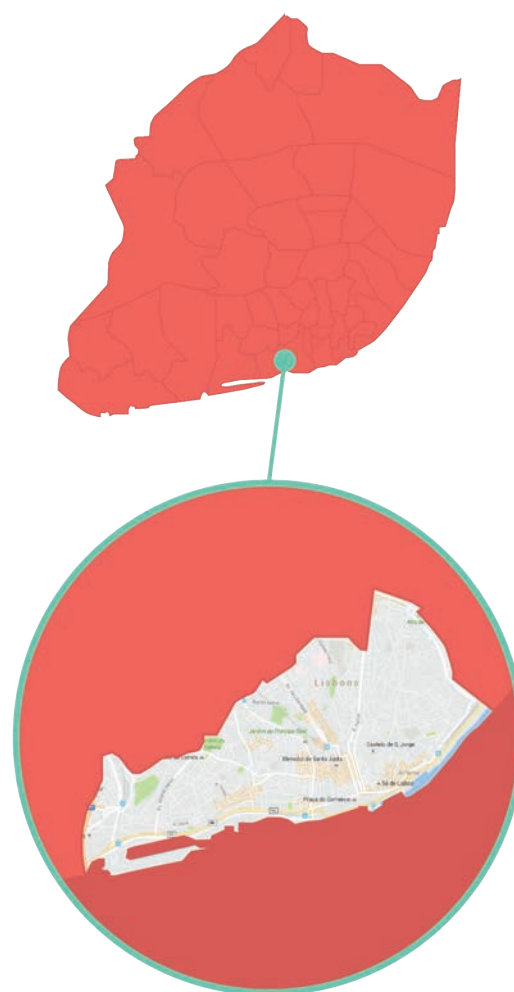
Lisbon's demonstrator area is a strategic location, stretching between the riverfront and the centre of the city, and including the main tourist and historic districts. It poses several challenges, including a particular orography; the historic nature of its buildings; and an ageing population.

District's smart city development focus

- Mobility: a low-emission zone, air quality; adoption of e-vehicles and public transportation by citizens
- Data monitoring and Internet of Things: network of district monitoring sensors and district monitoring data platform
- Building retrofit: incentives for refurbishment, work in buildings to improve energy efficiency

Impact

- Reduce CO₂ emission
- Better air quality
- Savings through lowering energy consumption in the district
- Retrofit of 20,000 m² of private and public buildings
- Deployment of about 200 new shared electric vehicles



Downtown in numbers

Number of inhabitants	100,000
Number of jobs	Approx 160,000
Area	10 km ²

District's functions (estimates)

Living (%)	25
Working (%)	40
Leisure (%)	35



BUILDING RETROFIT

The main objective is to reduce energy consumption and at the same time increase the energy efficiency and comfort of the buildings' occupants. The selected buildings are of different types: public offices, social houses, and private homes. During the retrofitting process, the specific needs of the affected buildings will be recognised and respected, even if the same measures will be applied. The process will include the installation of smart meters, which are expected to help improve the use of data in the future.

Measures foreseen:

- social housing: replacement of windows (single glazed with double glazed, aluminium with PVC), reinforcement of existent insulation (roof and facades), replacement of incandescent light bulbs with LED lighting in public areas, installation of smart meters in all apartments;
- private housing: replacement of windows (single glazed with double glazed, aluminium with PVC), installation or replacement of roof insulation, and replacement of incandescent light bulbs with LED lighting in public areas;
- public office buildings: replacement of windows (single glazed with double glazed - filled with argon gas, aluminium with wood), installation of roof insulation, replacement of incandescent light bulbs with LED lighting (all buildings), installation of photovoltaic (PV) tiles and PV panels on the roof and replacement of the existing air conditioners with more efficient units.

These measures will reduce the energy consumption in offices and private homes. In social housing units, they will also increase living comfort by reducing the inhabitants' energy bills. The smart meters will serve data management purposes only.

Sectors

Main: Building and living

Other: Energy

Benefits

Resources & energy

- increased energy efficiency
- reduction of energy bill

Business & innovation

- improved data availability

Security & liveability

- increased comfort

Stakeholders

Owner: municipality, building owners

User(s): social housing tenants, city council and private owners

Local factors / reasons for implementing

- Increase energy efficiency
- Reduce fuel poverty and increase residents' thermal comfort
- Awareness about energy and environmental behaviours



SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

A sustainable energy management system (SEMS) integrates and optimises energy flows (e.g. demand and supply balancing) from all sources in the districts (interfacing with city-wide energy systems); promotes awareness among user groups; and incentivises them to consume energy more efficiently.

Lisbon's SEMS will optimise the energy consumption of buildings (including e-vehicle charging and flexible loads within buildings, such as garages) to better match micro-generation PV panels through two main actions:

- tests in service buildings to explore new business models that promote the integrated consumerproducer paradigm. This will be done at two levels:
 - within buildings, smart meters with power limitation capabilities and equipment control plugs will be installed to enable better management by the owners through an online control system – building energy management system (BEMS);
 - a system will be developed to match electricity produced by fixed PV panels in one building with electricity consumed at other locations (e.g. through EV charging) by consumers;
- from a holistic point of view, we will create a consumption and production map with the help of smart meters; the instrumentation of electricity distribution points; and the use of the Lisboa E-Nova solar potential chart – SEMS.

Local factors / reasons for implementing

- To integrate and optimise the consumption, demand and supply of energy from different sources in the city, and provide means to support users being more energy efficient.

Sectors

Main: Energy

Other:

- Building and living
- IT and technical interfaces

Benefits

Resources & energy

- increased energy efficiency
- reduction of energy bill
- peak load sharing
- reduction of carbon emissions

Business & innovation

- improved data availability

Stakeholders

Owner: municipality, building owners

User(s): municipality, building owners, citizens



SHARED E-MOBILITY

Lisbon's e-mobility initiatives focus on the development of new clean energy solutions, ranging from the creation of a mobility hub to the introduction of shared connected cars for public and municipal use.

The solutions include:

- leveraging a public e-bike sharing scheme to offer dynamic incentives for citizens to switch to e-bikes (e.g. to reduce pollution);
- public and private mixed use e-vehicle fleets for maintenance, cash collection, deliveries, garbage collection, street monitoring;
- adapting the existing e-vehicle fleet for smart connected shared use by municipal workers along the Campo Grande-Praça do Município axis;
- installing parking sensors in delivery bays, disabled bays and charging stations;
- installing mobility hubs, including e-vehicle fast chargers, and private smart chargers in powerconstrained locations.

Local factors / reasons for implementing

- Strong political support for e-mobility
- Widespread public e-vehicle charging network in Lisbon (more than 500 charging stations)
- Substantial municipal e-vehicle fleet with more than 100 vehicles



- Local expertise in e-mobility and related technologies

Sectors

Main: Mobility

Other

- Parking
- Logistics
- Energy
- Governance and planning

Benefits

Resources & energy

- increased energy efficiency
- reduction of carbon emissions

Security & livability

- traffic reduction

Stakeholders

Owner: CML (municipality of Lisbon)

Technology Provider(s): CEIIA

Operator: EMEL, EDP

Other Actors: Lisboa E-Nova

Users: public



SMART LAMP POSTS

More and more cities have started adopting energy efficient LED street lighting, which offers substantial (up to 50%) savings on energy consumption. Lisbon is no exception. The Portuguese project aims to use this transition to explore other potential functions for lamp posts, such as WiFi repeaters; air quality monitors; traffic and parking sensors; security camera mounts; etc.

Short-term objective is to develop the first two pilots: one in a multimodal transport hub and another in a residential area. These pilots will help us create maps of preferred walking paths, and will also provide information on air quality and mobility.

Long-term objectives are to integrate the data gathered by sensors on the urban platform, which would allow us to improve our energy saving strategy and would also help us maximise the social benefits of offering free WiFi to citizens.

Local factors / reasons for implementing

- To provide data to support planning decision making
- Integration with other smart city measures through sensors

Sectors

Main: IT and technical interfaces

Other

- Mobility
- Parking
- Energy

Stakeholders

Owner: CML (municipality of Lisbon)

Technology provider(s): TBD

Users: public, city authorities

Benefits

Resources & energy

- increased resource efficiency
- reduction of energy bill

Governance & planning

- more efficient delivery of city services

Business & innovation

- improved data availability
- new business opportunities

Security & livability

- social integration
- behavioral change



URBAN SHARING PLATFORM (USP)

Each lighthouse city develops its urban sharing platform through co-creation. This process supports the integration of all relevant municipal data; the implementation of best practices; and future exploitation by other cities.

The USP will accommodate and integrate several solutions in the fields of energy, mobility, building retrofit, and logistics, and will enable the fast-paced development of integrated solutions that cross the boundaries of each affected area, creating an ecosystem larger than the sum of its parts. This enables economies of scale for IT solutions (both physical and logical), and generates larger benefits due to the added value of all possible correlations between said measures.

To achieve genuine replication, the USP will be based on open standard reference architecture and, whenever possible, will use open source components.

Sectors

Main: IT and technical interfaces

Other

- Mobility
- Parking
- Logistics
- Building and living
- Energy
- Governance and planning

Benefits

Governance & planning

- better management of service providers
- better (evidence-based) planning

Business & innovation

- improved data availability

Security & livability

- behavioral change

Stakeholders

Owners: Sharing Cities project

Technology providers:
ALTICE LABS / CEiIA

User(s): CML – municipality of Lisbon



SMART LAMP POSTS

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- Integration with other smart city measures through sensors

Sectors

Main: IT and technical interfaces

Other

- Mobility
- Parking
- Energy

Stakeholders

Owner: CML (municipality of Lisbon)

Technology provider(s): TBD

Users: public, city authorities

Benefits

Resources & energy

- increased resource efficiency
- reduction of energy bill

Governance & planning

- more efficient delivery of city services

Business & innovation

- improved data availability
- new business opportunities

Security & livability

- social integration
- behavioral change

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City

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www.sharingcities.eu



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BUILDING SMART CITIES TOGETHER

SHARINGCITIES

SMART CITY BASELINE REPORT

LONDON - ROYAL BOROUGH OF GREENWICH



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Duration of the project: 60 months

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1.

CITY CONTEXT



City size and role

The Royal Borough of Greenwich is one of 32 London boroughs, located in the south-east of the city. London is the capital and most populous city of England and the United Kingdom; it is one of just a handful of truly global cities.

The Greater London Authority is a regional, top-tier administrative body. It has powers over transport, policing, economic development, and fire and emergency planning, and strategic integration and cooperation between the London Boroughs.

London borough councils such as the Royal Borough of Greenwich provide the majority of day-to-day services for their local residents, including education, housing, social services, environmental services, local planning and many arts and leisure services.

In contrast, the Mayor of London sets an overall vision for London. The Mayor has a duty to develop strategies on air quality, biodiversity, culture and tourism, economic development, transport, waste and spatial development.

Inhabitants

Greenwich residents: 254,557
tourists yearly: 9 million
expected growth (2014-2041): 76,000
London residents: 8.5 million
daily visitors (work or study): 1.1 million
tourists in 2014: 16.8 million

Size (km²)

Greenwich: 15.5km²
Greenwich population density: 5,700/km²
London: 1,579km²
London population density: 5,177/km²

Geography

The Royal Borough of Greenwich lies on the south bank of the River Thames, and has the longest river frontage of any London Borough. It also features a UNESCO World Heritage Site, and is the home of the Prime Meridian.

Economic features and key activities

The Greenwich economy has a strong tourism sector, which currently contributes £1.2 billion to the local area, with growth of 28% expected by 2018. The sectors that contribute most to the Greenwich economy are Construction, IT and Communications, Water Supply and Waste. The sectors with the most employees, however, are Health and Social Work, Education, and Retail.

London as a whole is one of the world's largest financial centres, a centre of international trade, and is home to the head offices of more than 100 of Europe's 500 largest companies. In 2011, London's GDP was €48,600 per inhabitant, well above the UK average of €28,200, and GDP was €394.76 billion, 22.3% of that of the UK (Eurostat 2014). London has the largest city GDP in Europe.



2.

SHARING CITIES DEMONSTRATION AREA

The Greenwich demonstration area is one of the most strategic locations in London. It stretches along the riverfront – from the UNESCO World Heritage Site to the Greenwich Peninsula – with an area of 516 hectares. The site combines visitor attractions (e.g. the O2 entertainment arena); a new business start-up district; existing and new residential sites; and considerable water frontage.

In defining the scope of the demonstrator area, the following factors have been taken into consideration:

- complex urban challenges linked to significant economic and population growth, where solutions are scalable and transferable
- a rich and varied urban landscape, including well established residential communities and businesses alongside major new redevelopment schemes; and a significant inward and outward movement of employees and visitors
- strategic assets for low-carbon transformation in the Horizon 2020 timeframe; its community; the emerging digital cluster in the Peninsula with expertise in security, data integration and visualisation; a mix of housing/retail/commercial buildings; major visitor destinations; and multimodal transport - ferries, tube, rail, bus)
- key transformation projects/plans currently being implemented or scheduled for the near future (e.g. the redevelopment of the Peninsula and the transport interchange at North Greenwich; the new London City Cruise Port to be constructed at Enderby Wharf in 2017; the testing of autonomous vehicles)
- existing infrastructure assets (in particular the Blackwall Tunnel, one of the capital's most used roads; emissions in the area; and the sites/venues attracting millions of visitors every year, such as the Greenwich Heritage site - the second most visited attraction in London - and the O2 Centre - the largest European entertainment arena with the most concentrated footfall in London)

District smart city development focus

The Royal Borough of Greenwich's Smart City Strategy has four key areas of focus:

- Smart neighbourhoods and communities
- Infrastructure for change
- An innovative and smart council
- Economic growth and higher value jobs

3.

GENERAL SMART CITY VISION AND AMBITION

The approach the city has taken to become smarter, whether it has a smart city strategy or not, which are the general priority areas in the city and which are specific to the Sharing Cities programme.

SMART CITY STRATEGY/APPROACH

The Royal Borough of Greenwich was the first London Borough to introduce a Smart City Strategy¹. Launched in October 2015, it has four key components: transforming neighbourhoods and communities; transforming infrastructure; transforming public services; and transforming the Greenwich economy. Citizen engagement is a further priority across all four themes.

The Greater London Authority coordinate the Smart London Plan², which covers London as a whole and reflects its different role to London's Boroughs. Its main goals are citizen centred actions, including: digital inclusion plan; increasing the number of digital apprenticeships; open access to data, including working with EU cities to create a common data platform; investing in ultrafast broadband for SMEs; Smart London Export Programme; Smart London Network; working with Future Cities and Connected Digital Economy Catapults; smart grids; traffic management; new data markets and understanding infrastructure demand; data sharing and analytics; smart planning systems; and monetising efficiencies.

Priority areas

In general:

The Royal Borough of Greenwich's Smart City Strategy has four key areas of focus:

- Smart neighbourhoods and communities
- Infrastructure for change
- An innovative and smart council
- Economic growth and higher value jobs

Within Sharing Cities

- Energy management
- Building retrofit
- e-mobility (EV charging, e-bike, e-car sharing, e-logistics)
- Smart parking
- Smart lamp posts
- Urban sharing platform (USP)
- Citizen engagement

1. <http://www.digitalgreenwich.com/wp-content/uploads/2014/06/Greenwich-Smart-City-Strategy1.pdf>

2. https://www.london.gov.uk/sites/default/files/smart_london_plan.pdf

LATEST SMART CITY RELATED ACTIONS AND OTHER PROJECTS



Citizen engagement

The Royal Borough of Greenwich places utmost importance on the engagement of residents when delivering its services. It does this in a number of ways, for example its Better Together meetings³, and Greenwich Info magazine.⁴ Sharing Cities will be able to draw on these resources: for example the excellent links the Royal Borough's Community Participation and Diversity team have with tenants, as well as innovative ways of engagement such as Commonplace,⁵ an online engagement platform trialled in the Gateway driverless car project.



Sustainable Energy Management System (SEMS)

The Royal Borough of Greenwich has been continuously adding to its energy infrastructure over the last few years; installing over 350kWp of photovoltaic solar panels and 18 electric vehicle charging points. In addition, battery storage technology is being trialled in the demonstrator area as part of Sharing Cities and will provide additional energy assets for the SEMS control strategy. SEMS will ensure that this expanding network of energy assets such as solar panels are connected, balanced and optimised to provide the most efficient and effective energy systems to where they are needed, when they are needed.

3. http://www.royalgreenwich.gov.uk/info/200024/consultations/1846/public_local_area_meetings

4. http://www.royalgreenwich.gov.uk/info/359/council_-_news_and_information_releases/703/greenwich_info

5. <http://www.commonplace.is/>



Building retrofit

In 2014, the Royal Borough of Greenwich adopted the ‘Greenwich Homes Standard’⁶. This is a new way of planning major housing estate improvements, which encourages a ‘whole estate approach’ to ensure that Royal Borough owned homes are of a high standard, whilst reducing the need for repeat visits and keeping disruption to a minimum. Improvements made as part of this standard include fitting insulation, and replacing or upgrading roofs, lifts, lighting, windows, heating, kitchens and bathrooms. The intention is to reduce energy bills, improve tenant comfort and control, building management and maintenance. Outside of Sharing Cities, the approach has been successfully piloted at the Barnfield Estate and is also being applied to John Wilson Street. Works being undertaken at the Barnfield Estate included external wall insulation, window and roof replacement where needed, and emergency and communal lighting upgrades. The estimated lifetime CO₂ savings from these works is 11,000 tonnes. Works at John Wilson Street will include: the replacement of the oil fired heating system with a new efficient gas system; external wall insulation; window replacement; and the installation of solar panels onto the roof.



Shared e-mobility

The Royal Borough of Greenwich was awarded funding from the Mayor of London for the creation of a Low Emission Neighbourhood⁷ in the demonstration area. This will utilise smart technology, for example an electric vehicle car club and charging infrastructure, smart parking management, and app-based smart incentives; and more traditional methods such as car-free days and personalised travel planning which encourages active travel.

Greenwich is also the host of the Gateway⁸ Driverless Car trial. Funded by Innovate UK and industry and led by the Transport Research Laboratory, the project seeks to research and test development criteria that enable industry, government and society to gain critical knowledge, safely accelerate innovation and deliver smart city integration. More information on this and on Digital Greenwich’s three other driverless car projects can be found on page.

6. <http://bit.ly/2fEMS0u>

7. http://www.royalgreenwich.gov.uk/news/article/726/low_emission_neighbourhood_to_be_created_in_greenwich

8. <https://www.gateway-project.org.uk/>



Smart lamp posts

The Royal Borough of Greenwich has recently upgraded lamp posts in Eltham High Street to LEDs. Sharing Cities will draw on this experience, as well as trialling different Central Management Systems, to evaluate the most effective use of smart lighting solutions such as LED and CMS to optimise the operation of this infrastructure.



Urban Sharing Platform (USP)

The Royal Borough of Greenwich has partnered with NEC⁹ to collaborate on the use of big data analytics and visualisation to improve public and commercial services for local residents across the council, as part of Greenwich Smart City Strategy. Platform approaches have already begun to be applied to proof of concepts outside of Sharing Cities such as in Adult Social Care and Fleet Management. The development of a Greenwich Urban Sharing Platform as part of the Sharing Cities programme will be another example of this platform approach, ingesting, analysing and visualising data from the programme and offering insights on energy and transport systems.

NATIONAL AND EUROPEAN FRAMEWORK

Digital Greenwich is committed to using the British Standard Institute's PAS181 'The Smart City Framework'¹⁰ in its operations in this field.

Other related frameworks include PAS 182, Smart city concept model – Guide to Establishing a Model for Data Interoperability; PAS 183, Smart cities – Guide to establishing a decision-making framework for sharing data and information services; PAS 184, Smart cities – Guide to developing project proposals for delivering smart city solutions.

The Director of Digital Greenwich previously chaired the BSI standards group working on Smart Cities, and was also in the technical drafting group. He is also currently the co-chair of the City Standards Institute.

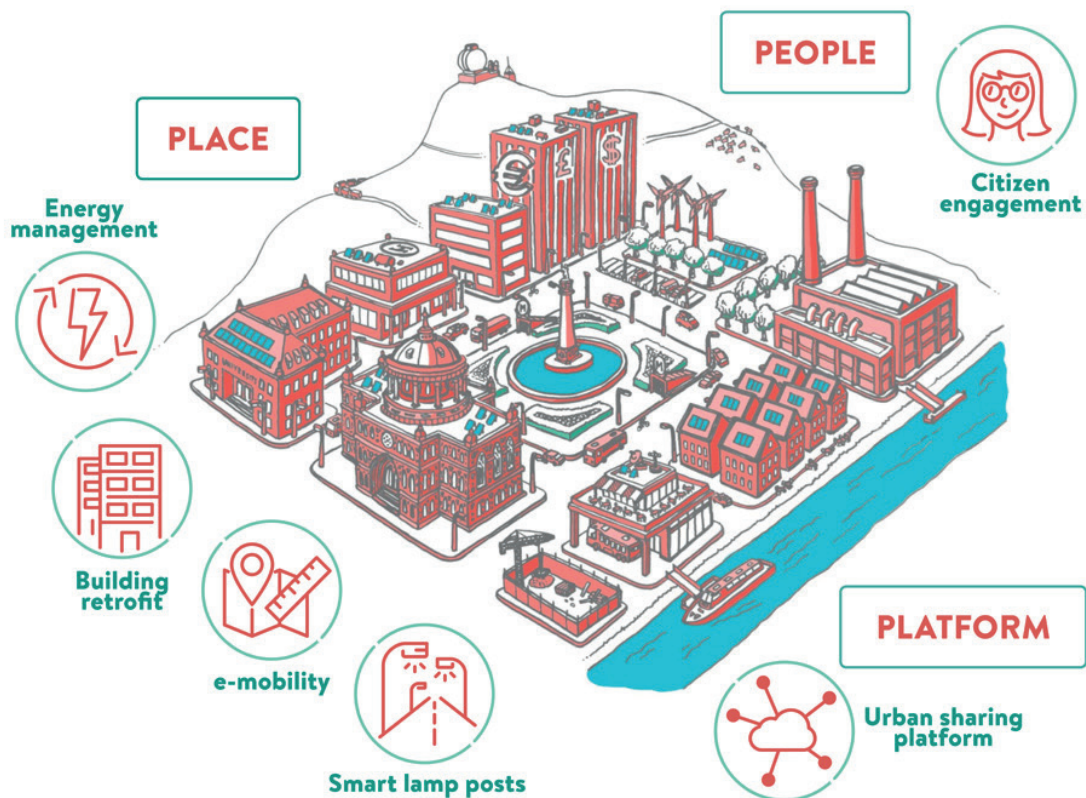
Digital Greenwich is further a founding member of the ETSI City Digital Profile Group, which will help accelerate the delivery of integrated citizen services and provide a technology road map for city leaders who will benefit from standardized solutions from their suppliers.

9. http://uk.nec.com/en_GB/press/201510/20151022_01.html

10. http://shop.bsigroup.com/upload/Smart_cities/BSI-PAS-181-executive-summary-UK-EN.pdf

4.

SHARING CITIES SMART CITY SOLUTIONS AND MEASURES



Within the Sharing Cities programme several smart city solutions are being developed.

For each measure there is a description about how the city has prioritised it, what kind of related challenges had been identified and other relevant information.



CITIZEN ENGAGEMENT

This measure envisages citizen focused activities, in particular user research, citizen engagement, the development and implementation of a Digital Social Market which will incentivise the uptake of services and behavioural change via incentive mechanisms and the development of a service layer.

Strategic approach towards becoming a smart city

The Greenwich Smart City Strategy recognises that communities are at the core of cities and need to be at the core of a smart city strategy. The strategy is, first and foremost, about people, with technology acting as the enabler of change. Above all, a smart Greenwich is one that is able to deliver resource-efficient, low-carbon, healthy and liveable neighbourhoods within the borough, where citizens enjoy improved social and economic opportunities, while feeling part of the community and part of the decision-making processes affecting the environments and communities they live in, and where services are delivered efficiently and reflect the needs and aspirations of citizens. Most important is that Greenwich is a desirable and vibrant place to live, work or visit.

CHALLENGES

One of the important challenges is the need to align the timelines of different activities and measures in order to ensure that the results of the user research are part of the design of 'Place' activities - to be most effective, user research should take place as quickly as possible after the start of a project, to ensure it can be used in the design of measures. It is also necessary that engagement activities reach a diverse and representative range of residents across the programme. A 'digital-first' approach must be balanced with meeting the needs of the non-digitally enabled, for example ensuring that the online engagement platform does not exclude the non-digitally enabled by also providing paper-based forms on request, and attending relevant events with a tablet to help residents to give their feedback.

The Strategy is further based on the following principles:

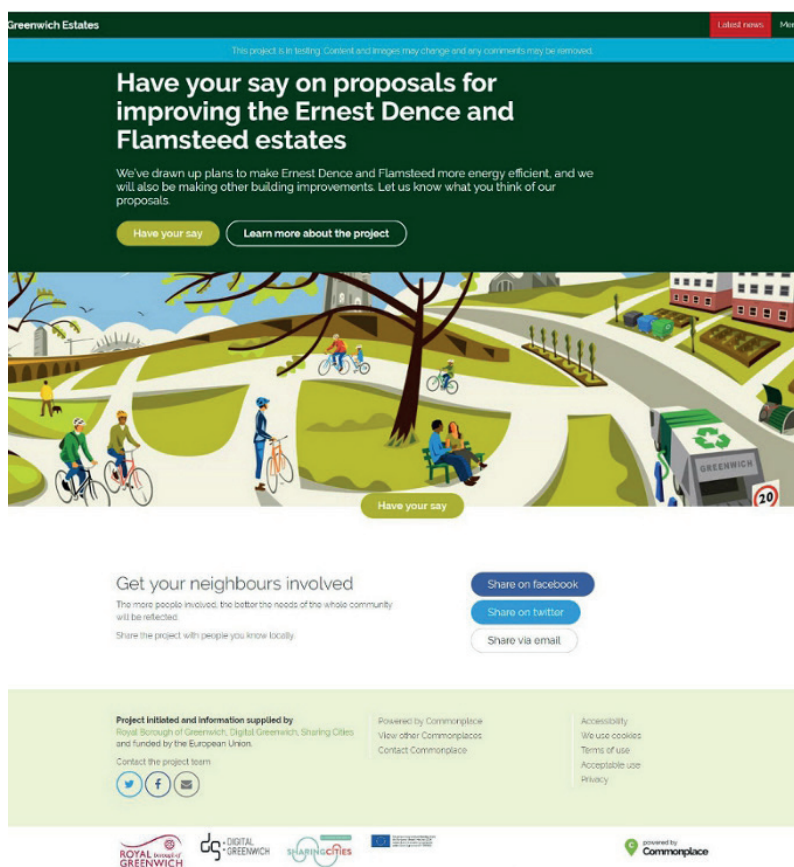
- **inclusivity:** a strategy aimed to benefit all citizens, communities and neighbourhoods;
- **citizen centric:** we aim to transform citizen engagement in the borough to ensure our policies put citizens at the forefront of our policy development and meet their needs;
- **transparency:** citizens will be informed of change and its outcomes, and information will be made accessible for the benefit of our citizens.

Organisational structure

This area of the programme is led by Digital Greenwich

Key stakeholders

Primarily residents of the demonstration area , as well as local businesses, and commuters.





SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

This measure involves the development of an advanced, data-rich, management system which gains maximum benefits from the retrofitted buildings, sharing energy data through the open platform enabling energy services to be provided that reduce energy use and bills. This will enable the design and roll out of higher level applications for citizens and authorities, taking advantage of the sensing layers and actuators installed.

Strategic approach towards becoming a smart city

The SEMS contributes to the Greenwich Smart City Strategy by supporting the theme of 'Infrastructure for Change'. It recognises how the use of sensors and Internet of Things technology can promote energy efficiency, sustainability, and smart neighbourhoods.

CHALLENGES

Initial work on the SEMS has involved considerable discussion on defining the SEMS itself; its role in our city; and how it sits and interacts with the USP.

Producing a technical specification has been the main focus of initial investigations of the feasibility of a water source heat pump in the demonstrator area. This process has spanned a few months, and it has proven useful to involve someone with technical expertise in the field.

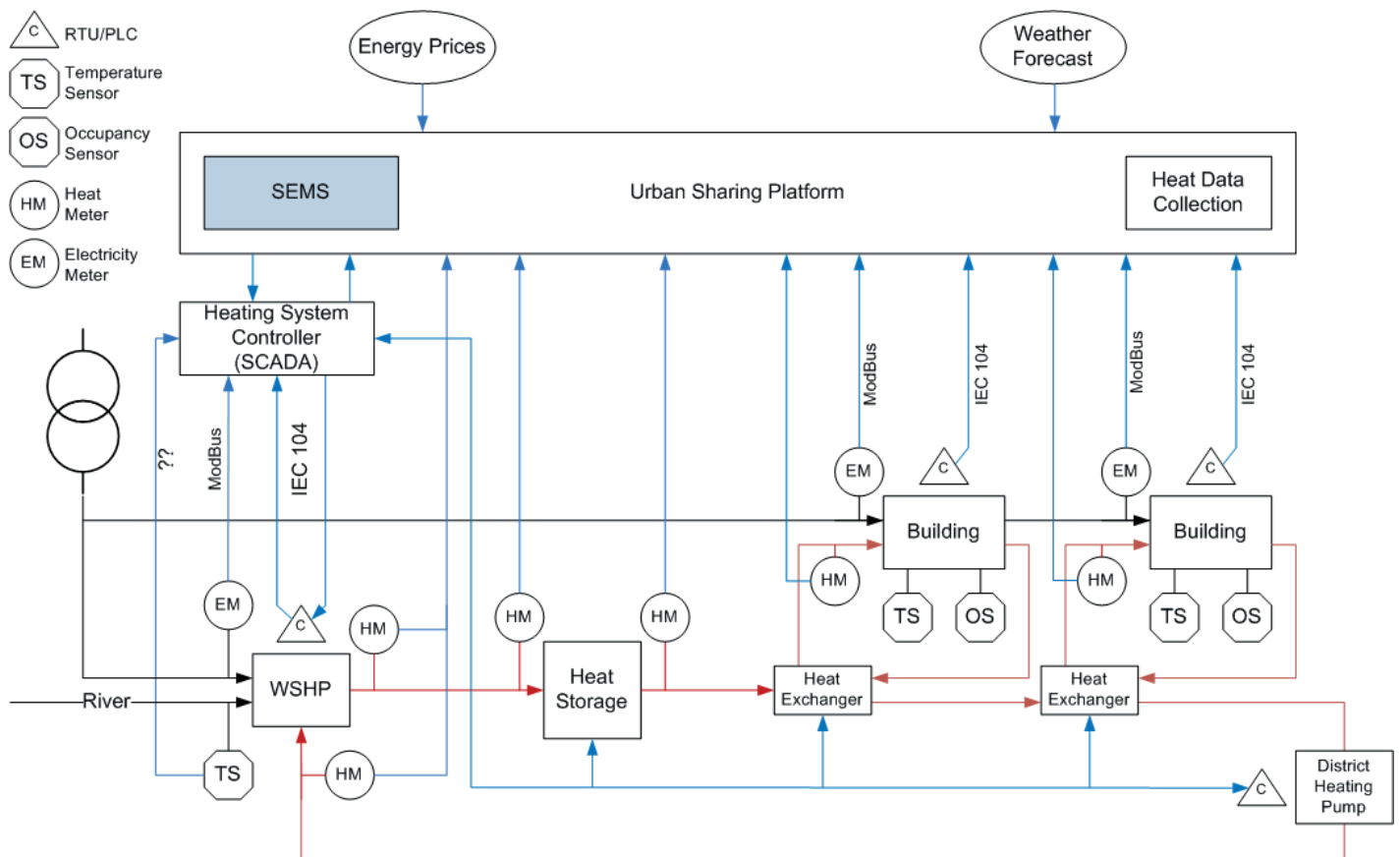
Decarbonisation of heating and cooling systems will be a key component of reaching the UK's target of reducing greenhouse gas emissions by at least 80% of 1990 levels by 2050. One of the mechanisms for achieving this is anticipated to be the widespread deployment of electric heat pumps; however, research has indicated that the increase in electricity demand could require a doubling of the existing electricity infrastructure, at a cost of up to £30 billion. A key challenge is to facilitate the transition to an electrified heating/cooling network in a cost-effective way.

Organisational structure

The Sustainability team lead on the SEMS. This team is part of the Department for Regeneration, Enterprise and Skills.

Key stakeholders

Tenants' and Residents' Associations for the social housing blocks that will be part of the District Heat Network. An additional key stakeholder is the Department for Business, Energy and Industrial Strategy of the UK government, which gave a grant for some of the feasibility work.





BUILDING RETROFIT

This measure aims to apply deep-retrofit measures to public and private residential properties affecting 15,000 citizens across the six cities and integrating the properties with low carbon energy sources (solar PV, water source heat pump) and electric vehicle charging, all wrapped together by a digital first digitally driven sustainable energy management systems wrapping it all together.

Strategic approach towards becoming a smart city

Building retrofit supports the Greenwich Smart City Strategy by supporting the theme of 'Infrastructure for Change'. It recognises how the use of sensors and Internet of Things technology can promote energy efficiency, sustainability, and smart neighbourhoods.

CHALLENGES

It was important that the project included an evaluation process for feasibility, costing, and implementation of the retrofit works on particular blocks. This process is still ongoing. This may mean that any early deployment or piloting of metering may become obsolete later on in the project.

The monitoring and evaluation framework and the initial approach encourage reviewing monitoring options on a technology or application specific basis (i.e. considering technical requirements of each sensor/meter/measurement indicator separately) rather than a systems-based approach. The deployment of a system in which we receive various measurements simultaneously, which operate in sync with one another, is of far more importance and is critical to a successful metering strategy and delivery. An individual approach increases costs by necessitating more sensors, data transfer equipment, and licenses, which in turn increases the amount of space required to fit the equipment (if all the data transfer equipment has to be located in an enclosed space, for example near the boiler, the heat interface unit (HIU), or near the modem/phone line, universal deployment may not be possible, and even if so, resident uptake is likely to be lower). This would require multiple contractual and data protection agreements and more work (person/months) from partners working on integration.

Organisational structure

The Sustainability team lead on the SEMS. The team is part of the Department for Regeneration, Enterprise and Skills. The Asset Management and Tenancy teams are closely involved in Building Retrofit.

Key stakeholders

Tenants' and Residents' Associations for the housing blocks that will be retrofitted.





MOBILITY

The mobility measures include:

- e-car share: delivering bold ambitions in districts consistent with growing city-wide ambitions for real scale reduction in traditional car ownership and use; learning from different city contexts – user behaviour/ownership and commercial offers from suppliers; and to support EU-wide relevant market take-up of EVs through sharing business models and the clean power for transport package.
- e-bikes: building on existing human power bike sharing schemes with introduction of e-bikes, to support shift from cars and other modes to e-bikes for those longer journeys, senior citizens, mobility impaired; integrate with EV car sharing services and charging points and local renewable energy generation.
- e-vehicles charge: installing a network of EV charge points, and integrate infrastructure with the other place-based measure and the urban shared platform: building retrofit; solar PV; humble but smart lamp posts; sustainable energy management system; to enable shift to e-mobility and achieve an advanced level of ‘digital first’ and ‘infrastructure next’ integration.
- Smart parking: implementing smart parking technologies, including evaluation of sensor type implementation (potentially different sensor types and business models), testing and capture of operational experience to incentivise e-mobility.
- e-logistics: countering the growth in conventional (particularly diesel) freight delivery vans caused by growth in on-line commerce, local deliveries and small businesses through implementing electric logistics to prove the business cases for new ways of urban logistics, and package learning for EU cities replication.

Strategic approach towards becoming a smart city

e-mobility measures of the Sharing Cities programme address the Greenwich Smart City Strategy’s theme of ‘Smart Neighbourhoods and Communities’. This recognises the opportunity to shape how neighbourhoods evolve, and address concerns such as road safety, mobility, use of natural resources, and air quality. The need is identified for modal shift towards more sustainable mobility systems – walking, cycling and electric vehicle sharing schemes.

As well as the measures under the Sharing Cities programme, the Royal Borough of Greenwich's strategic approach to transport involves trials of autonomous vehicle technology.

The development of technology related to autonomous vehicles is a long-term objective for Digital Greenwich. The borough aims to be an urban test bed, and to host an autonomous vehicle corridor. The borough is working with experts in the field to test the technology, so that this objective can be achieved.

Challenges to this ambition include the speed with which primary legislation can be changed for real world trials, and public acceptance of autonomous vehicles. Many of Digital Greenwich's projects are addressing such challenges.

In a further project complementary to Sharing Cities' e-mobility measures, the Royal Borough of Greenwich has received funding from Innovate UK to run an innovative trial to develop 26 tonne electric refuse truck technology with other partners including Magtec. A diesel refuse truck will be retrofitted to operate the engine, drivetrain and compressors with electricity, and therefore have zero emissions. It will be the first refuse vehicle of this size operated solely by electricity.

CHALLENGES

Rapid Electric Vehicle charging points (EVCs): it is challenging to get a charge unit, which is appropriate and small enough for residential areas, particularly as most of the demonstrator area in Greenwich is a conservation area. If a new unit is not developed as part of this scheme to address the issue, the placing of rapid charging points is limited to the Peninsula area. Placement of the rapid charging point is also limited by appropriate and affordable access to a three phase power source.

EV charging points: the pressure from electric vehicle charging on the local energy network is a key consideration. This issue is being considered in collaboration with the Sustainable Energy Management System workstream.

E-bikes: currently e-bikes are prohibitively expensive for the mass market with prices of £1,000 and upwards. Many potential users may be put off by the high initial investment involved.

Organisational structure

The Transport team lead on shared e-mobility. The team is part of the Department for Regeneration, Enterprise and Skills.

Digital Greenwich and DG Cities, however, lead on AVs.

Key stakeholders

Residents and local businesses in the demonstrator area.



SMART LAMP POSTS

Smart lamp post presents a very visible ‘quick win’ for smart cities; and the well-proven lighting and maintenance savings offer an attractive bankable initiative. The smart approach is to consider how to develop business models and funding mechanisms that incentivise implementation of ‘smart’ measures (WiFi, air quality, parking, EV charging, etc) alongside lighting exploiting what is typically a considerable network of existing assets – in other words to multi-purpose the ‘humble’ lamp post.

Strategic approach towards becoming a smart city

Smart lamp posts contribute to the Greenwich Smart City Strategy by supporting the theme of ‘Infrastructure for Change’. This recognises how the use of sensors and Internet of Things technology can promote energy efficiency, sustainability, and smart neighbourhoods.

CHALLENGES

There are a lot of options, without much past demonstration. There is not one smart lamp post to fit all purposes.

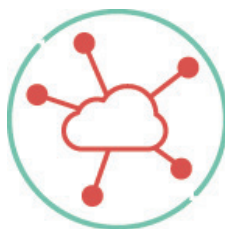
We must determine the applicability of any sensors, and answer the questions ‘what are we sensing’ and ‘why does this provide value or use’ so that a realistic list of the ‘smart’ aspects of the lamp posts can be produced.

Organisational structure

The Smart Lamp Post project is led by Digital Greenwich. Staff from across the council support in the delivery of the project - for example the Street Lighting team are closely involved in the Smart Lamp Post work package.

Key stakeholders

Other council departments, notably Street Lighting and Transport.



URBAN SHARING PLATFORM (USP)

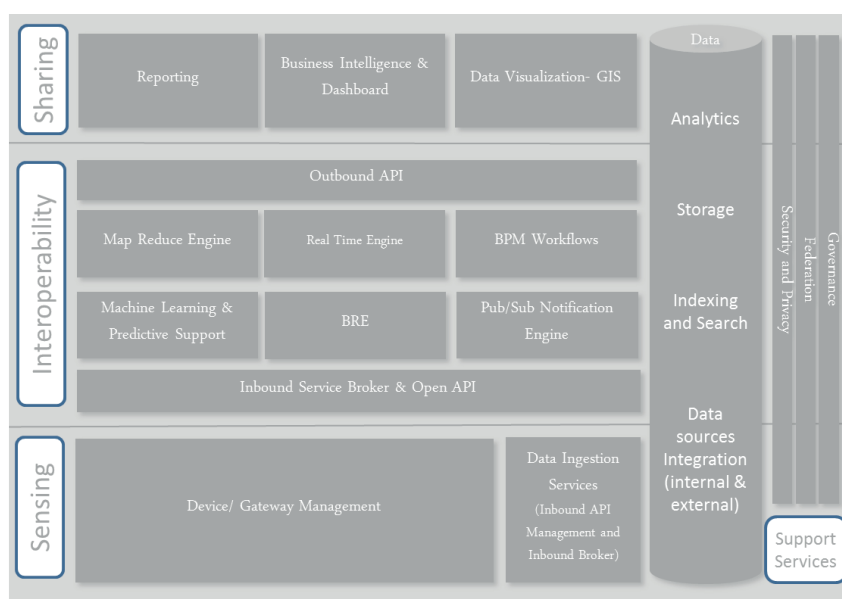
An Urban Sharing Platform (USP) is a logical collection of technical components, capabilities and processes which provides functions and services that enable a smart city. Its purpose is to aggregate data and control functions from a wide variety of devices and sensors, store, process, correlate the data and present information to the city and citizens which enables better use of the city resources and may provide support for innovative service verticals.

Strategic approach towards becoming a smart city

The Urban Sharing Platform contributes to the Greenwich Smart City Strategy by supporting the theme of 'A Smart and Innovative Council'. It will enable the effective use of operational data, and open up new innovative opportunities, based on new insights obtained from the data.

In Greenwich, the USP will be connected to a larger city platform, which the borough has committed to jointly developing with NEC.

This is a large transformation project for the council, and has many associated challenges. These include the complex nature of the local authority and the associated data that it holds; how to collect data and ensure privacy; and how to present the data in a way that is useful and understandable for the council and its residents.



CHALLENGES

Defining the SEMS and USP boundaries, their roles and their integration was a significant challenge at the start of the project in Greenwich. This key interdependency has needed and will need on-going discussions between work packages and partners, and updates to the design of architecture as the project progresses and more parameters and technologies are defined. The interdependence between the work package on the urban sharing platform (USP) and technical measures deployment is a key challenge, with the USP heavily dependent on the progress of technical measures. For example, the urban sharing platform needs to know the specifications of technical measures (e.g. mobility, SEMS) related sensors and smart devices to complete technical details of the platform and ensure data can be ingested smoothly. In addition, the testing and re-adjustment (when needed) of the platform, will require that all sensors and smart devices are installed and running (generating data).

The integration/alignment of the USP with the Greenwich City Platform which has been developed with NEC and has already explored proof of concept in areas outside of Sharing Cities is a challenge and opportunity. It offers the opportunity to share and learn from technical solutions deployed, and learn about the institutional processes necessary to deploy a platform solution using data from a municipality.

Organisational structure

Digital Greenwich leads on the Urban Sharing Platform.

Key stakeholders

Other council departments who can use the data platform to generate insights, such as Sustainability, Asset Management, Transport and Street Lighting.

5.

GOVERNANCE

The internal organisation and modes of governance in relation to external stakeholders are essential parts of the cities' transition to becoming smarter. The Sharing Cities programme gives opportunity to the city to rethink the way of working. The cross-departmental (internal) and focus groups (with external stakeholders) are presented.

INTERNAL ORGANISATION, GOVERNANCE

The Royal Borough of Greenwich is a local authority with 51 elected councillors, and a cabinet and leader model. Cllr Sizwe James is the Cabinet member responsible for Transport, Economy and Smart Cities.

The Royal Borough of Greenwich has six departments: Children's Services; Community Engagement and Environment; Housing and Safer Communities; Finance, Health and Adult Services; and Regeneration, Enterprise and Skills.

Digital Greenwich was set up as a department within the council that would lead on smart city innovation and related transformation projects across the council. Reporting directly to the Chief Executive, the small team of experts in their relevant fields leads on all themes in the smart city field, working closely with other council departments with their associated expertise.

The Royal Borough of Greenwich has also recently set up a limited company, DG Cities Ltd, which is wholly owned by the Borough. As the commercial arm of Digital Greenwich, it enables the organisation to work flexibly with external partners in research consortia, local government, consultancy and other new business opportunities related to smart city development.

Cross-departmental working groups (WG) and focus groups

There are no working groups connected to the Smart City agenda. Instead, there is a dedicated team that reports directly to the Chief Executive.

Work progresses through the council's Senior Management Team meetings, which are chaired by the Chief Executive and attended by Directors. Regular reports and recommendations are released by this forum.

The team attends Directorate Management Team meetings, and in this way the Smart City Strategy is embedded within the council's existing structures, without the need for a working group.

This is supplemented by regular meetings with relevant officers in the council. These deal with issues related to digital infrastructure and innovation in core service areas, and address key themes and initiatives, such as autonomous vehicles.

Sharing Cities working groups (WG) and focus groups



The Sharing Cities: London City Board brings together representatives from the Royal Borough with the other partners in London responsible for the delivery of the programme to discuss updates, interdependencies, risks and issues.

The London partners of the Sharing Cities programme are: Imperial College London, Transport for London, Mastodon C, Danfoss, KiwiPower, Siemens, and the Greater London Authority in their role in the Urban Sharing Platform and development of the London Datastore.

ANNEX 1 - SMART CITY SOLUTIONS

CITY DESCRIPTION IN A SMART CITY CONTEXT

Royal Borough of Greenwich

The Royal Borough of Greenwich was the first London Borough to introduce a Smart City Strategy. Launched in October 2015, it has four key components: transforming neighbourhoods and communities; transforming infrastructure; transforming public services; and transforming the Greenwich economy. Citizen engagement is a further priority across all four themes.

The Smart London Plan covers London as a whole. Its main goals are citizen centred actions, including: digital inclusion plan; increasing the number of digital apprenticeships; open access to data, including working with EU cities to create a common data platform; investing in ultrafast broadband for SMEs; Smart London Export programme, Smart London Network; working with Future Cities and Connected Digital Economy Catapults; smart grids; traffic management; new data markets and understanding infrastructure demand; data sharing and analytics; smart planning systems; and monetising efficiencies.

District: Greenwich

The Greenwich demonstrator area is one of the most strategic locations in London. It stretches along the Thames riverfront – from the UNESCO World Heritage Site to the Greenwich Peninsula – and occupies 1,579 km². The site combines visitor attractions (e.g. the O2 entertainment arena); a new business start-up district; existing and new residential sites; and considerable water frontage.

The Royal Borough of Greenwich is one of London's six 'growth boroughs', with many new developments. Population is expected to increase by 28% between 2014 and 2041.

Greenwich in numbers

Number of inhabitants	275,878 (2016)
Number of jobs	94,700 (2014)
Area	15.5km ²
Living (%)	Approx 33% (2005)
Working (%)	Approx 5% (2005)
Leisure (%)	Green spaces 30%

District's smart city development focus

- Smart neighbourhoods and communities
- Infrastructure for change
- An innovative and smart council
- Economic growth and higher value jobs

Impact

Smart neighbourhoods and communities

- A resource-efficient, low carbon, healthy and liveable neighbourhoods, where citizens enjoy improved social and economic opportunities
- Services delivered efficiently and reflect the needs and desires of citizens

Infrastructure for change

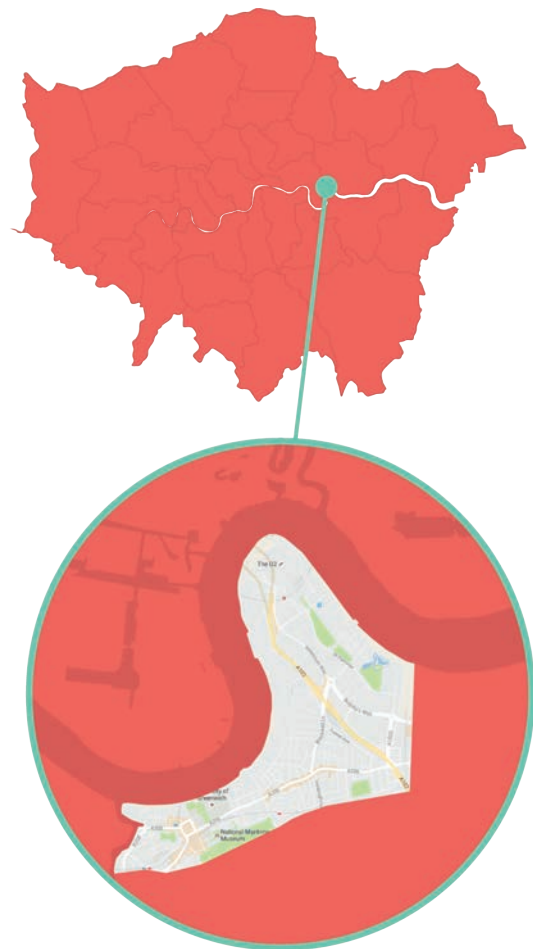
- Fast and affordable digital infrastructure, e.g. pervasive public Wi-Fi services and being at the forefront of the 5G rollout.
- Sophisticated application of digital technologies for delivering public services, e.g. enabling those in need to be cared for in the home, or the ability to balance supply and demand of renewable energy sources

An innovative and smart council

- Committing further to smart data- ensuring that appropriate data is available in real time to enable integration and optimisation of city resources, and building a partnership of other data suppliers across Greenwich to further this goal
- Empowering the Greenwich community to drive service transformation, delivering one-stop citizen-centric services, and digital services for all

Economic growth and higher value jobs

- Prioritising our efforts around the key elements of the digital economy, where the opportunity for innovation by SMEs is greatest
- Improving the resilience of established businesses to digitalization
- Capitalising on our Higher Education Institutions (HEIs) and training our young people to seize the opportunities of the digital age



CITIZEN ENGAGEMENT

Ensuring that Sharing Cities measures are designed with users in mind, to ensure increased take-up of measures and long lasting behaviour change.

The citizen engagement and behaviour change programme has a number of aims:

- To understand engagement on energy efficiency, sustainable mobility, and digital services, in order to influence the design of the measures that will be implemented.
- Ensure that residents are able to give their feedback on both proposals and implementation of measures. In Greenwich, an online engagement platform will be provided by Commonplace - this will enable a digital first approach to engagement, promoting openness and transparency in the programme. It will be supported by offline engagement such as paper copies of the feedback modules available on request, and officers will attend relevant events with a tablet in order to support residents to give their opinions online.
- Awareness-raising initiatives to involve citizens in the development, execution, uptake, and evaluation of the Place measures. These may be organised around each measure (for example events at the social housing blocks that are being retrofitted), or officers may attend other relevant events to raise awareness of the programme.
- A digital social market, that supports both behaviour change and sustainable operation. In Greenwich, the first use case will be trialled with KiwiPower on demand side response in residential blocks - residents will be incentivised to turn off appliances when there is high demand on the power grid.

Local factors / reasons for implementing

- To involve local citizens in the design of measures
- To increase take-up of the measures
- To support long-term behaviour change towards more sustainable practices
- To explore and capture the value of digital first engagement
- To explore and capture how the use of smart and sustainable behaviours and measures (such as energy efficiency) may be effectively incentivized.

Sectors

All

Benefits

Governance & planning
- more efficient delivery of city services

Security & livability
- behavioral change

Stakeholders

Technology provider(s): Kiwi Power, Commonplace

User(s): public

BUILDING RETROFIT

Building retrofit will deliver improved energy performance, comfort, air quality, control and management to the Royal Borough's social housing.

Improvements that will be made to social housing blocks include:

- Installing building fabric improvements, improved heating systems, energy efficient lighting
- Installing renewable energy sources such as solar panels or heat from the River Thames to provide locally generated energy with less emissions and greater energy security.
- Installing devices which can track energy use, temperature and humidity in the home, to inform residents and the Royal Borough on energy use, and target energy-saving measures and improvements.

These works are being conducted in partnership with the Royal Borough of Greenwich's Asset Management team, meaning that other improvements will be made at the same time.

The works will improve the comfort of over 250 dwellings.

Sectors

Main: Building and living

Other:

- Energy
- IT and technical interfaces
- Governance and planning

Benefits

Resources & energy

- increased energy efficiency
- reduction of energy bill
- reduction of carbon emissions

Security & livability

- increased comfort

Stakeholders

Owner: RBG

User(s): tenants, RBG

Investor: H2020, Royal Borough's Housing Improvement Funds

SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

Sustainable Energy Management System (SEMS) is an overarching advanced control strategy and data system focusing on energy system integration and optimisation.

It receives data from devices on the ground via the Urban Sharing Platform, and applies algorithms and analysis to optimise energy systems. In Greenwich this optimisation will take place at three levels or use cases:

- District heat network optimisation
- Demand side response in residential markets
- Energy demand and electricity loads at district level.

SEMS:

Integrates proprietary device and system controls:

- Building Energy Management System (BEMS)
- Lamp post control
- e-vehicle charger

Energy production:

- Heat pump operation, district heating pumping, residential home heating applications.
- Photovoltaics (PV)
- Outputs to Urban Sharing Platform (USP)
- Receives (environmental, market, etc.) inputs from USP in formulating and implementing optimised control strategies.

Provides:

- Predictive control (system), and
- Information via USP (behaviour), including user set-point control.

Sectors

Main: Energy

Other:

- Building and living
- IT and technical interfaces

Benefits

Resources & energy

- increased resource efficiency
- increased energy efficiency

Business & Innovation

- improved data availability

Financial

- reduced household energy costs
- avoided cost of electricity network upgrades to national infrastructure

Local factors / reasons for implementing

- Tackling fuel poverty by lowering energy costs for end users through optimised control and reduced demand
- Lowering the carbon and environmental impact of energy systems
- To consider the integration and optimisation (e.g. demand and supply balancing) of energy from all sources in the district, including renewable generation and electric charging to increase energy security and reduce the risk of brownouts or blackouts
- Provide a means to become more informed, and remotely informed on energy consumption and use, and the status of energy systems at estate and district level, with this feeding into better management and decision making; and supporting resident engagement on energy efficiency

Stakeholders

Delivery partners: Siemens, Kiwi Power, Imperial College London

Technology provider(s): Siemens

User(s): public, local government

Investor: H2020,

Energy producers and distributors (e.g. National Grid)



E-BIKES

The introduction of e-bikes builds on existing human power bike sharing schemes, to support a viable shift from and replacement of private cars. e-bikes provide an engaging technology that attracts people to cycling as a means of transport by reducing barriers to entry.

Residents in the demonstrator area apply to borrow an e-bike for £10 for four weeks.

Aim: To give residents the opportunity to try an e-bike for a one month loan period to activate a direct mode shift from private vehicles such as cars and vans towards active travel through bicycles and e-bikes.

Objectives

- A high quality service provided
- 150 users per year
- Journeys swapped from car to bike are quantified in the monitoring data as 'miles swapped'
- Use GPS data to better understand the journey types and routes to inform future decisions on cycling

Local factors / reasons for implementing

- To encourage modal shift away from private motor vehicles towards more sustainable transport methods such as cycling
- To reduce congestion and emissions in the demonstrator area

Sectors

Main: Mobility

Benefits

Resources & energy
- reduction of carbon emissions

Security & livability
- behavioral change
- traffic reduction

Stakeholders

Owner: Royal Borough of Greenwich

Operator: London Cycling Campaign

User(s): residents - primarily car owners

Investor: H2020 and the Mayor of London

E-LOGISTICS

The cycle logistics measure aligns with the aim to develop a low emission e-mobility district, countering the growth in conventional (particularly diesel) freight delivery vans through implementing electric logistics to prove the business cases for a new wave of urban logistics.

Establishing an e-cargo bike logistics service to complete ‘last mile delivery’ to residents and businesses within the demonstrator area would serve the dual purpose of reducing the output of pollutants and particulates as well as providing a less imposing, safer means of completing deliveries.

The Royal Borough of Greenwich, through the Low Emission Neighbourhood scheme, gave a grant of £10,000 towards the start-up costs of the scheme, as well as support in finding premises and business development.

Local factors / reasons for implementing

Deliveries and logistics movements contribute a high proportion of pollutants and particulates in the demonstrator area.

Complaints have been received concerning delivery vehicles that block the cycle lane in the morning peak and block visibility at junctions when they are delivering goods, causing excess pollution and compromising the safety of road users.

This project will complement the simplifying of loading/delivery restrictions on a key route and provide a substitute delivery method for smaller businesses and residents in the area.

Sectors

Main: Mobility

Other:

- Logistics
- IT and technical interfaces

Benefits

Governance & planning

- more efficient delivery of city services

Security & livability

- behavioral change

Stakeholders

Operator: Recharge Cargo

User(s): Residents and businesses

Investor: Mayor of London (Low Emission Neighbourhood scheme) and Recharge Cargo



ELECTRIC VEHICLE CAR CLUB

The EVCC will help reduce emissions in the study area by providing a low emission alternative to private car ownership for residents and businesses.

This scheme will introduce between six and ten electric car club vehicles for use by the public and business.

The scheme will operate on similar terms to a traditional car club in that users will pay a membership fee and an hourly rate in order to gain access to the cars.

The cars will be parked on street in dedicated EV car club bays, with each bay furnished with a charging post. The charging infrastructure will be procured by the council, and will operate as a private network for the car club.

Local factors / reasons for implementing

The scheme will improve air quality through trip reduction – a car club vehicle typically removes up to 20 private vehicles from the road – and through providing a low emission alternative to conventional vehicles.

An additional aim is to introduce the idea and experience of driving electric vehicles to residents/businesses through a car club format, to encourage the private purchase/uptake of EVs amongst those groups.

Sectors

Main: Mobility

Other: Energy

Benefits

Resources & energy
- reduction of carbon emissions

Security & livability
- behavioral change

- traffic reduction

Stakeholders

Operator: TBC

User(s): residents
and businesses in the
demonstrator area

Investor: H2020 and Mayor
of London

ELECTRIC VEHICLE CHARGING POINTS

This project aims to significantly increase the availability of Electric Vehicle Charging Points (EVCPs) in the area to stimulate the uptake of electric vehicles amongst local residents, visitors and workers.

The programme will install 15-20 chargers in the demonstrator area.

The EVCPs would be available to drivers either on a membership or Pay As You Go basis.

Complementing the conventional EVCPs will be a trial of a lamp post socket style charging facility. This type of charger connects to a socket which is retro-fitted to lamp posts power is drawn from the lighting network and billed directly to the user via a smart meter.

Local factors / reasons for implementing

- Increase availability of charging points to increase uptake of electric vehicles
- To support the electric vehicle car club
- To reduce emissions from diesel/petrol vehicles

Sectors

Main: Mobility

Other: Energy

Benefits

Resources & energy
- reduction of carbon emissions

Stakeholders

Technology provider(s): TBC

User(s): residents, visitors and businesses

Investor: H2020 and Mayor of London (Low Emission Neighbourhood)

SMART PARKING

The EVCC will help reduce emissions in the study area by providing a low emission alternative to private car ownership for residents and businesses.

In Greenwich, three use cases are being developed:

- Installing sensors in coach parks, to reduce the pollution emitted from coaches idling or circling the area looking for a parking space
- Installing sensors on lamp post electric vehicle chargers to assist in the maximising the usage, as well as monitoring and evaluation, of such a scheme

Local factors / reasons for implementing

- To increase the data available to city officials, in order to make more evidence-based decisions
- To reduce emissions from vehicles idling when looking for a parking space
- To support the electric lamp post charging use case

Sectors

Main: Parking

Benefits

Resources & energy
- reduction of carbon emissions

Governance & planning
- better (evidence-based) planning

Security & livability
- traffic reduction

Stakeholders

Technology provider(s): TBC

User(s): coach drivers, city officials

Investor: H2020 and Mayor of London (Low Emission Neighbourhood)

AUTONOMOUS VEHICLES

Digital Greenwich is participating in a number of projects aimed at the development of systems to support the introduction of autonomous vehicles. The lessons learned will feed into the smart mobility plans of the Sharing Cities programme.

ATLAS: identifying the navigation and mapping requirements for autonomous vehicles to operate reliably and safely anytime, anywhere.

Gateway: development of research and testing of public acceptance that enables industry, government and society to safely accelerate innovation and deliver smart city integration. Three use cases are being tested: last-mile shuttle delivery, deliveries/logistics, and valet parking.

Move UK: development of novel solutions for validating autonomous driving systems.

MAVEN: development of trajectory prediction and manoeuvre planning algorithms to support dynamic platooning of highly automated passenger and freight vehicles through urban corridors and signalised junctions.

Stakeholders

Technology provider(s): several partners in different projects from transport and logistics background.

User(s): public

Investor: (depending on the project) Innovate UK, HM Government - Centre for Connected & Autonomous Vehicles, Horizon 2020

Other actors: several partners in different projects, such as other European Cities, academia, and citizen engagement specialists.

Sectors

Main: Mobility

Other:

- Logistics
- Energy
- Governance and planning

Benefits

Resources & energy

- increased resource efficiency
- reduction of energy bill

Governance & planning

- more efficient delivery of city services

Business & innovation

- new business opportunities

Security & livability

- traffic reduction

URBAN SHARING PLATFORM (USP)

An urban sharing platform is a collection of technical components, capabilities, and processes, which provides services that enable a smart city. It aggregates data from a wide variety of devices and sensors on the ground, as well as existing and external data sets; it stores, processes and analyses this data, and presents information to the city and its citizens. Its purpose is to enable the better use of the city's resources, and the monitoring of Sharing Cities systems, through the harnessing of information and insights from data, its analysis and visualization.

In Greenwich, the USP will be connected to a larger city platform, which the borough has committed to jointly developing with NEC.

The USP is a complex solution, which uses ICT and leverages data capabilities to support the 'digital first' principle of Sharing Cities.

Local factors / reasons for implementing

- Generate value from city data, both direct and indirect
- Increase the efficiency of city infrastructure
- Provide advanced support to the municipality's decision makers

Supportive and determining factors

- Potential resource optimisation, value from city data, and improved decision making
- Enabler for other smart city projects, connection of siloed vertical smart projects
- Proof of the value of smart city projects

Sectors

Main: Governance and planning

Other: IT and technical interfaces

Benefits

Governance & planning
 - better (evidence-based) planning
 - more efficient delivery of city services
 - greater transparency on urban processes

Stakeholders

Technology provider(s):
 NEC

User(s): Royal Borough of Greenwich (council and citizens)

Investor: H2020

SMART LAMP POSTS

Greenwich, like Lisbon and Milan is exploring how a range of sensors and services can be added to lamp posts to transform them into a smart infrastructure for the city; demonstrating how smart technology can add value to people's lives. To explore this, Greenwich will equip lamp posts in the demonstration area with different sensors and services, providing an exemplar and case which can inform Borough wide lamp post and lighting upgrade.

Greenwich's trial seeks to evaluate the potential of smart additions to lamp post infrastructure in a number of areas:

- Changes in the lighting itself, including LED replacement and the trialing of different CMS systems
- Air pollution (nitrogen dioxide, PM10, PM2.5 concentration), considering the accuracy and use of small scale air quality monitoring devices affixed to lamp posts
- Parking - exploring how lamp posts may act as a data collection infrastructure for information on free and empty parking spaces, to improve the ease of using electric vehicle charging infrastructure
- Electric vehicle charging - exploring the use of lamp posts for digital connectivity

A multi-purpose 'humble' lamp post equipped with different sensors and functions will reduce the council's energy bill and will also feed information to the borough and its citizens.

Local factors / reasons for implementing

- To provide lighting to the city more efficiently
- To integrate with other smart city measures through sensors

Supportive and determining factors

- Energy saving- the need to improve energy efficiency and carbon impact of public assets
- Pollution - benefits from additional data sources and more granular level data on air quality
- Parking - to increase the ease of using electric vehicle charging infrastructure

Sectors

Main: IT and technical interfaces

Other:

- Mobility
- Parking
- Energy

Benefits

Resources & energy

- increased resource efficiency
- reduction of energy bill

Governance & planning

- better (evidence-based) planning

Security & livability

- traffic reduction

Stakeholders

Technology provider(s):
TBD

User(s): public and city officials

DISTRICT HEAT NETWORK

A heat network to supply social housing units with low cost and low carbon energy.

A water source heat pump would take thermal (heat) energy from the River Thames basin. The temperature is increased by using electrical energy in the form of compressors and a heat exchanger, which can then provide residents with serviceable heat for hot water and space heating. This would be the first example of a river source heat pump being used to provide heat to social housing in the UK.

Local factors / reasons for implementing

- Low-cost energy supply will reduce fuel poverty and increase residents' thermal comfort
- The low-carbon supply will also reduce emissions and the reliance on fossil fuels
- Through link to SEMS - a smarter and more efficient heating system provided for residents

Sectors

Main: Energy

Other: Building and living

Benefits

Resources & energy

- autonomy of fossil fuels and security of supply
- reduction of energy bill
- reduction of carbon emissions

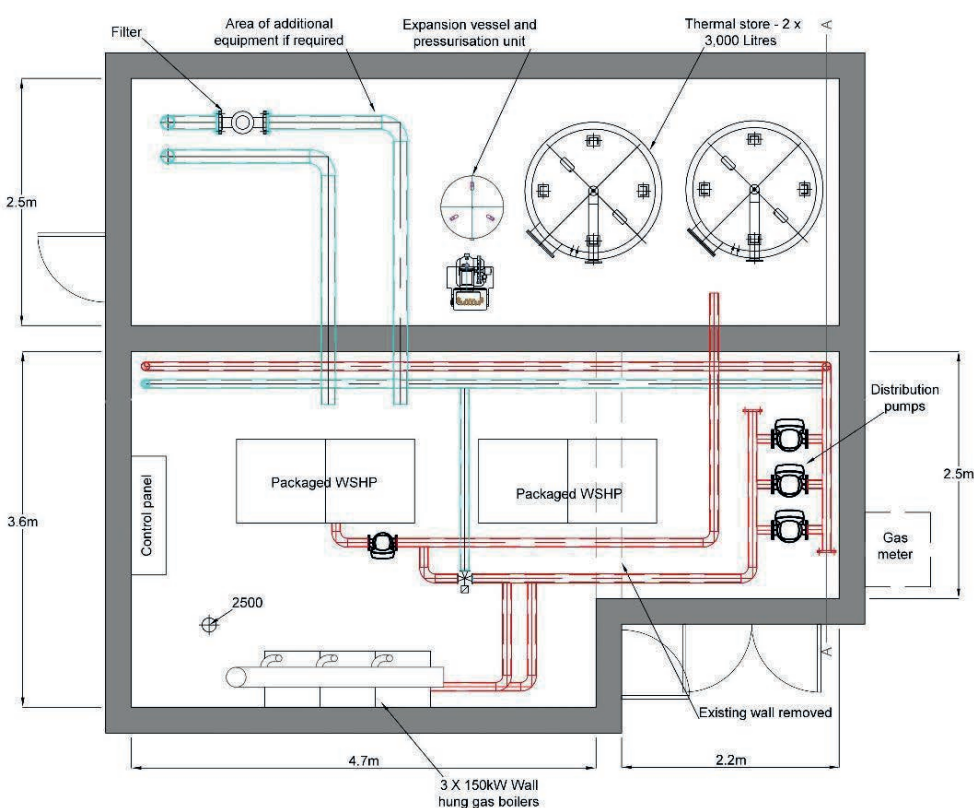
Security & livability - increased comfort

Stakeholders

Delivery partner: Danfoss

Technology provider(s): TBD

User(s): social housing tenants



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USEFUL LINKS

- DG Cities Ltd: <http://www.digitalgreenwich.com/about/>
- Royal Borough of Greenwich Website: <http://www.royalgreenwich.gov.uk/site/>
- Digital Greenwich Projects: <http://www.digitalgreenwich.com/smartcity/projects/>
- DG Cities Projects: <http://www.digitalgreenwich.com/projects-2/>
- Air Quality Action Plan: http://www.royalgreenwich.gov.uk/downloads/download/183/air_quality_reports

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www.sharingcities.eu



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BUILDING SMART CITIES TOGETHER

SHARINGCITIES

SMART CITY BASELINE REPORT

MILAN



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Duration of the project: 60 months

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1.

CITY CONTEXT



Inhabitants

metropolitan level: 3,218,201
city level: 1,351,562
tourist per year: 5,600,000
population density (city): 7,424/km²

Size (km²)

metropolitan area: 1575.65 km²
city area: 181.67 km²

City size and role

Milan, Italy's second most populated city, is the capital of the Lombardy region.

Geography

The city is located in the plains of Lombardy, midway between the River Po and the foothills of the Alps, about 480 km north-west of Rome.

Economic features and key activities

Milan is Italy's most vibrant, rich, dynamic and innovative city and the first Italian Smart City. Milan is also one of the international capitals for fashion, design, food, quality of life and entertainment.

According to 'Osservatorio Milano 2017', Milan emerges as a strong city, a metropolitan area with robust and highly diversified economic infrastructure (with industry, retail, services, finance), that develops balancing capital, services, people and industry.



Generating around 12% of Italy's national GDP (highest individual GDP in Italy), this megacity represents 8% of the Italian workforce, the metropolitan area is home to almost 300,000 businesses, 3,209 multinationals and 926 innovative start-ups (14% of Italy's total), excelling in the area of healthcare, sustainability and social innovation. According to the data monitored in the last 4 years, 570 start-ups were born in Milan thanks to financial support of the municipality, employing 5,500 people. This included the creation of new business incubators, the development of 'makers spaces', the promotion of fab labs as well as the registration and certification of co-working spaces and the publication of the sharing economy operators register.

Among the main assets one undoubtedly counts the academic system, with its 11 prestigious universities which are one of the main national and international attractors. Two first-class institutions such as Politecnico di Milano and Bocconi provide faculties that rank among the best 30 in the world.

In 2015, Milan hosted the Universal Expo. The six-month event attracted over 20 million visitors and left an important legacy related to food policy and based on business growth, innovation and international networks for the sharing economy, social innovation and inclusion.

Milan invests heavily in renovation and development projects and experiments with new and innovative energy technologies. It aims to raise awareness of energy efficiency and improve zero-emission and energy efficiency standards in urban planning and mobility. Milan is a global pioneer in bio-waste recycling and a leader in bike and car sharing services. The city has recently received the OECD's Transport Achievement Award for having introduced a congestion charging scheme known as 'Area C'.

Milan is a member of the C40 Cities Climate Leadership Group, the network of the world's megacities. It is also a founding member of EUROCITIES. Milan's representatives have recently been elected to its executive committee and are active participants in the Knowledge Society Forum of EUROCITIES and the smart cities working group. Milan is also a member of the City Protocol Society and the Smart City National Observatory. It has recently entered the 100 Resilient Cities network.

2.

SHARING CITIES DEMONSTRATION AREA

The Porta Romana/Vettabbia demonstration area is under complete redevelopment. The project will connect the historic centre of the city to Milan's agricultural belt by 'stitching together' two areas that are currently geographically, economically, and socially separated.



- Porta Romana is a brownfield on a 216,614 m² former railway yard in the north of the city owned by Sistemi Urbani S.p.A. Porta Romana is part of the important Railway Yards project, starting in 2018, that aims to convert the abandoned urban railway yards into new city areas. Following its recovery, this area will include a functional mix of private and social housing units; the multimodal integration of transportation systems around a new station; and a large park of 187,226 m².
- Beni Stabili SIIQ and Sviluppo Ripamonti S.r.l. (both LEED certified) are carrying out the redevelopment of lots in the 100,000 m² demonstration centre of recovered, but not yet functional, industrial areas.
- The need to retransform the Via Ripamonti urban axis into an 'urban quality road' is highlighted in the city's sustainable urban mobility plan (SUMP).

The demonstration area is involved in important projects of urban conversion both private and public:

OpenAgri, an innovative UIA project on periurban agriculture; Smart City Lab, the first smart city technology incubator financed with national funds (realisation foreseen by the end of 2018); EU-GUGLE, FP7 project on buildings retrofit; Fondazione Prada, a new contemporary art and cultural institution; Symbiosis project, carried out by Beni Stabili SIIQ and Sviluppo Ripamonti S.r.l. (both LEED certified) and consisting of the redevelopment of lots in the 100,000 m² demonstration centre of recovered, but not yet functional, industrial areas; Fastweb new headquarter (under construction) and the renewal of two farmsteads for co-housing purpose.

The majority of the city's shared ownership residential buildings are located in this area.

- Crossed by the Vettabbia Canal, the southern area is a transition zone where urban and rural uses mix. A large park is under construction to connect the urban part to the rural area around the 12th century Chiaravalle Abbey. This area is notable for its integrated infrastructure. The Nosedo waste heat recovery plant operated by Milano Depur S.p.A. is one of the largest in Europe. This highly replicable and scalable plant meets the specifications of the city's sustainable energy action plan (SEAP). In 2014, it received Legambiente's best eco-friendly innovation award.

District smart city development focus

- Building retrofit
- Shared e-mobility (e-cars, e-bikes, e-logistic vehicles, charging points, smart parking)
- Sustainable energy management service
- Urban sharing platform
- Smart lamp posts
- Co-design - citizen engagement in co-developing innovative services and incentivising positive behaviour change
- Digital Social Market - reward system for citizens' positive behaviours and choices in the domains of housing, energy and mobility



3.

GENERAL SMART CITY VISION AND AMBITION

The approach the city has taken to become smarter, whether it has a smart city strategy or not, which are the general priority areas in the city and which are specific to the Sharing Cities programme.

SMART CITY STRATEGY/APPROACH

In the context of urban, economic and identity transformation, the strategic challenges for Milan include: inclusion and cohesion; sustainability; innovation; cultural economic development; and internationalisation. Sustainable innovation during a harsh and prolonged economic crisis requires radical changes in the way people live, move, and work, and also in the municipality's level of involvement and engagement with citizens. Between 2012 and 2014, Milan's municipal leaders adopted a series of plans and strategic policy frameworks on urban development; sustainable mobility; energy efficiency; the sharing economy; and smart cities.

By 2020, the city aims to improve accessibility; further promote inclusion; support efforts toward sustainability; foster green growth and efficiency; and establish public-private schemes to encourage long-term investment in business, research, and innovation.

Priority areas

In general:

Milan's Smart City Guidelines focus on:

- economic development
- social inclusion and diversity
- urban wellbeing
- sustainable urban mobility
- environmental and energy policies
- citizen engagement: Milan considers the smart city to be centred on its citizens rather than technology-driven. It is one of the first European cities to have adopted a framework to support the local sharing economy. The city's aim is to promote new forms of collaboration between

the public administration, private companies, civil society organisations and citizens, where the different actors are not only stakeholders, but also solution holders capable of co-producing, co-developing, and co-designing services, goods, practices, and policies.

Within Sharing Cities

- Energy management
- Building retrofit
- e-mobility (EV charging, e-bike, e-car sharing, e-logistics)
- Smart parking
- Smart lamp posts
- Urban sharing platform (USP)
- Citizen engagement

LATEST SMART CITY RELATED ACTIONS AND OTHER PROJECTS



Citizen engagement

My Neighbourhood-My City (CIP programme)

My Neighbourhood-My City¹ is an EU co-funded project (ICT call) aimed at strengthening social cohesion and the spirit of solidarity within deprived neighbourhoods through innovation and ICT. My Neighbourhood is a solution, an online social platform that combines new digital technologies and techniques, such as social gaming principles (gamification), with the Living Lab methodology to empower

1. Market Place of the European Innovation Partnership on Smart Cities and Communities. 2016. *Co-creating Smart Cities: Use Cases Analysis- My neighborhood*. <https://eu-smartcities.eu/sites/all/files/use%20cases%20analysis-MyNeighbourhood.pdf>

Market Place of the European Innovation Partnership on Smart Cities and Communities. 2016. *My Neighborhood, the 2nd Use Case Analysed by the Citizen City Initiative is Online*. <https://eu-smartcities.eu/content/my-neighbourhood-2nd-use-case-analysed-citizen-city-initiative-online>

neighbourhoods and enhance city sustainability and to help strengthen existing ties and resolve communal issues in the real, day-to-day world of the neighbourhood, aiming to: 1) rebuild neighbourhoods, 2) empower neighbourhoods, 3) scale neighbourhood value in a manner that reconnects people, recreate communities and, ultimately, make cities smarter.

The ultimate aim of My Neighbourhood pilots is to kick-start a viral effect wherein neighbours and friends (within cities and across Europe) use the My Neighbourhood site to reconnect with one another, share new ideas, create new ways of interacting and help make their lives better. The Milan pilot experiment takes place in the Quarto Oggiaro neighbourhood, located in the north-west area of Milan. This pilot examined aspects of co-design of young and elderly people sharing their wishes, interests and needs, and aimed to recreate urban communities and motivate them to address problems of social inclusion.



OpenCare (H2020 project)

OpenCare² is the first ever online, community driven project that addresses the social dimensions of public healthcare. It is based on three main elements:

- Progress in collective intelligence research; facilitating coherent and concise online debates
- Evolution in hardware technology; permitting reduced costs and more user-friendly devices
- The rise of a global hacker community; willing and able to look for solutions that concern health-care problems
- This bottom-up, open-to-all knowledge approach to healthcare is at the heart of OpenCare. Participants are recruited from already existing, online innovative communities (hackers, artists, activists, designers, etc.). Such a variety of participants ensures a complete design cycle for each problem and solution. The project enables people and patients to become active agents. It benefits from their skills and expertise to make or hack the articles they need instead of passively buying them from corporate organisations.

2. <http://opencare.cc/>

Civic crowdfunding³ (local initiative)

The City of Milan is the first municipality in Italy that promoted a crowdfunding platform dedicated to projects with high social impact in the city. A new way for a Public Administration to fund projects of public and social interest and at the same time engage citizenship that can directly support projects. The objectives of the whole project can be summarised as follows:

- To experiment with innovative ways to finance projects of public interest;
- To encourage the pooling of public and private resources;
- To support projects with high social impact on Milan's territory, with possible effects on the metropolitan dimension;
- To support alternative means of access to credit and, indirectly, to provide a lever for economic development;
- To contribute to the spread of new fundraising models for the Third Sector;
- To promote a direct intervention of citizens in decisions to be taken by public administration.

Synthesis of the achieved results:

- The total raised by the four crowdfunding campaigns was €333,136
- The contribution from the city was €323,413
- The potential investment in the territory was €656,549
- The project that has collected the largest amount of donations is the CINEWALL project with €50,147
- The highest donation was collected from the 'Il cantiere dell'Ortica' project, with € 6,000
- The total number of donors was 1,308

**Sustainable Energy Management System (SEMS)****Smart Spaces (CIP project)**

The SMARTSPACES⁴ service enables public authorities in Europe to significantly improve their management of energy in the buildings they occupy. The implementation of operational services includes 11 pilot sites with more than 550

3. <https://www.eppela.com/it/news/61-crowdfunding-civico-del-comune-di-milano-ci-siamo>

4. <http://www.smartspaces.eu/home.html>

buildings in 8 countries (United Kingdom, France, Germany, Italy, Spain, Netherlands, Turkey, Serbia) with almost 20,000 professionals and staff users and reaching more than 6,000,000 visitors annually. The SMARTSPACES energy optimisation service is a comprehensive approach to exploiting the potential of ICT including smart metering for significant energy saving in public buildings. With its aim of reducing the energy consumption of the public sector by a very significant amount to meet overall emission reduction targets, the project builds on existing services to develop a comprehensive SMARTSPACES service providing feedback on energy consumption and checking changes in usage.



CASCADE⁵ (IEE project)

The project involved 18 partners from 11 EU member states. It provided a framework for exchanging best practices and smarter and sustainable energy solutions. The CASCADE project has showed (in study sites in Portugal, Spain, Italy, Crete and Cyprus) that cost effective and efficient management of vulnerable ecosystems has benefitted from long-term field experiments to improve understanding of non-linear ecosystem dynamics and early warning signals. The complexity of soil and plant ecosystems is highlighted particularly in areas prone to forest fires, overgrazing and land abandonment. New incentives and strategies to prevent land abandonment are required, including social, cultural and economic considerations. Policy makers rely on scientists for information to inform decision-making. Better knowledge sharing is essential, e.g. on the UNCCD's knowledge hub, to make research results more accessible to national governments.



Building retrofit

EU-GUGLE (FP7 project)

The EU-GUGLE⁶ project aims to demonstrate the feasibility of nearly-zero energy building renovation models with a view to triggering large-scale, Europewide replication in smart cities and communities by 2020. Taking on the challenge of sustainable renovation in urban areas, the cities of Vienna (AT), Aachen (DE), Milan (IT), Sestao (ES), Tampere (FI) and Bratislava (SK) have committed to renovating a total of 226,000m² of living space during the 5 years of the project, with the objective of achieving 40 to 80% primary energy savings per pilot district while increasing the share of renewable energy sources by 25% by 2018.

5. <https://www.cascade-project.eu/>

6. <http://eu-gugle.eu/>

**Shared e-mobility****FREVUE (FP7 project)**

FREVUE⁷ - Freight Electric Vehicles in Urban Europe - provides evidence on how innovative solutions using electric freight vehicles can help to achieve emission free city logistics. By exposing over 80 Electric Freight Vehicles (EFVs) to the day to day rigours of the urban logistics environment, FREVIEW aims to prove that the current generation of electric vans and trucks can offer a viable alternative to diesel vehicles, particularly when combined with state of the art urban logistics applications, innovative logistics management software, and with well designed (local) policy. FREVIEW established demonstrators in eight of Europe's largest cities. The overall objective of FREVIEW is to create an evidence base on European best practice, which will underpin future uptake of EVs by private logistics operators and justify policy interventions to promote the use of EVs for urban deliveries.

**CityMobil (FP7 project)**

CityMobil2⁸ has successfully demonstrated automated road transport systems in 7 European cities carrying more than 60,000 passengers on fully automated road vehicles sharing the infrastructure with other road users. By demonstrating the technical feasibility of automated last mile transport, CityMobil2 has fostered the adoption of such new transport systems and cities have even started to install them. The main project achievements, besides having the vehicles operational and the passengers transported, are to have defined the 'safe way' to integrate automated transport in urban streets; not relying on the vehicle technology only but relying on a continuous cooperation with the infrastructure.

**TIDE (FP7 project)**

The mission of the TIDE project⁹ is to enhance the broad transfer and take-up of 15 innovative urban transport and mobility measures throughout Europe and to make a visible contribution to establish them as mainstream measures. TIDE focuses on 15 innovative measures in five thematic clusters: financing models and pricing measures, non-motorised transport, network and traffic management to support traveller information, electric vehicles and public transport organisation. Sustainable Urban Mobility Plan is a horizontal topic which integrates the cluster activities.

7. <https://freview.eu/>

8. <http://www.citymobil2.eu/en/>

9. <http://www.tide-innovation.eu/en/>



Smart lamp posts

LED street lighting

In 2015 for the Universal EXPO Milan event, more than 135,000 LED lights been installed around Milan, in what is said to be the largest LED road lighting upgrade in Italy. The new lighting consumes less than half the power of the previous installation. The upgrade will cut costs associated with road lighting by 31% – Milan's city hall will save €10 million on energy in the first year alone. With the new road lighting, Milan will be responsible for 23,650 fewer tonnes of CO₂ emissions a year. The upgrade will also reduce the burden of lamp recycling, with an estimated 60,000 fewer lamps needing to be disposed of. Led street lighting was completed with the replacement of all the lights in the cities of Lombardy. These new lamps use LED technology, and number 135,000 in Milan, 42,000 in Brescia and 15,000 in Bergamo.



Urban Sharing Platform (USP)



30 'digital islands'

The 30 'digital islands'¹⁰ located all around Milan, offer a set of different services: Free WiFi ; recharging for private electric devices; info on tourism, culture urban mobility; recharging for private electric vehicles; smart lighting; territory surveillance station .



E015 digital ecosystem (national initiative)

An open, cooperative and competitive digital environment enabling API economy and application mashup¹¹. The E015 Digital Ecosystem since 2013 has provided members (membership is free) with a 'common language' to digitally interoperate with other members; the Lombardy Region has recently extended the E015 Digital Ecosystem to 2021. E015 is part of the Urban Sharing Platform of the City of Milan, built in the Sharing Cities H2020 project. Publish E015 APIs: members can expose part of their own information assets in the ecosystem through APIs, so that other members can ask for them in order to build integrated solutions for end-users. Build E015 end-user applications: members can develop Web sites, mobile apps, information kiosks, etc. providing end-users with value added contents and functionalities by leveraging data and features provided in real-time by the E015 APIs.

10. Comune Milano <https://www.comune.milano.it/dseserver/isoledigitali/index.htm>

11. Regione Lombardia <http://www.e015.regione.lombardia.it/PE015/>

NATIONAL AND EUROPEAN FRAMEWORK

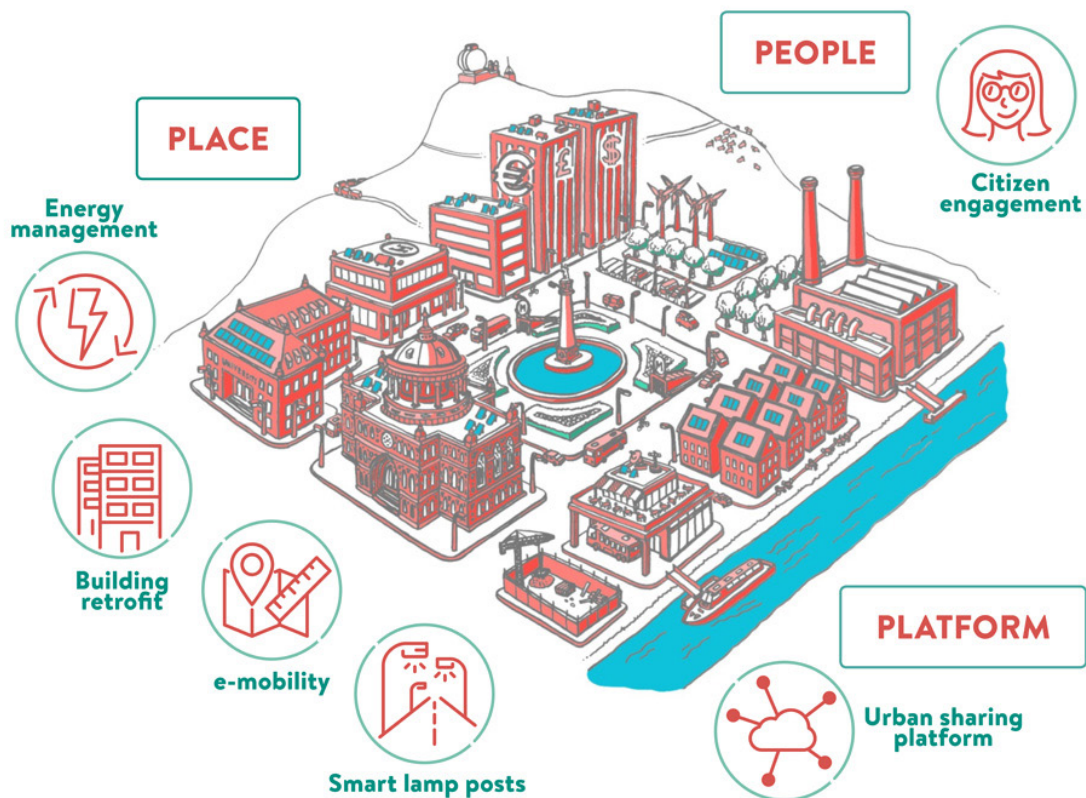
Energy, mobility, and the integration of infrastructure and ICT are key priorities at European level, addressed in strategies (Europe 2020, Digital single market strategy, European strategy for low emission mobility etc.), directives and other legislative measures binding for EU member states. At the same time cities are key actors in delivering and implementing innovative and integrated smart city solutions for energy efficiency, a low carbon society and in general for the transition to a sustainable economy and society of growth. The city is a member of the C40 network's steering committee, gathering major world cities and providing a range of services in support of their climate change efforts. It is also one of the six founding members of EUROCITIES and still a very active member of the network in several forums.

Milan has been a signatory of the Covenant of Mayors for Climate and Energy since 2008. As from October 2015 Covenant signatories commit to adopting an integrated approach to climate change mitigation and adaptation. They are required to develop Sustainable Energy and Climate Action Plans with the aim of cutting CO₂ emissions by at least 40% by 2030 and increasing resilience to climate change within the first two years of adhesion.



4.

SHARING CITIES SMART CITY SOLUTIONS AND MEASURES



Within the Sharing Cities programme several smart city solutions are being developed.

For each measure there is a description about how the city has prioritised it, what kind of related challenges had been identified and other relevant information.



CITIZEN ENGAGEMENT

This measure envisages citizen focused activities, in particular user research, citizen engagement, the development and implementation of a Digital Social Market which will incentivise the uptake of services and behavioural change via incentive mechanisms and the development of a service layer.

Information about priority area

During the last months of 2016 and the beginning of 2017, the following activities were at the heart of the work related to citizen engagement:

Citizen Recruitment

- Local information events to present the project to residents took place within the demonstration area in March, May and July in order to engage as many residents as possible in the project and in particular in the building retrofitting proposal. These events were useful to create the database of people and champions living in the area. Informational material was created and distributed for these events in Milan.
- Community action days took place in the demonstration area on 23 September 2016 and 25 September 2016, involving local schools and the wider community respectively. The goal was to raise awareness about the Sharing Cities challenges and about the importance of taking care together of the places in which communities share their time. The event was organised and managed with local organisations active in the district. Informational material was created and distributed for these events (Milan).
- A thematic seminar 'Apertivi di Sharing Cities/Condominio Ecologico' was hosted within the demonstration area on 20 October 2016, with materials distributed after the event. The seminar aimed to deepen some of the topics of the project in an informal way. The focus was on ecological and energy efficient lifestyles.
- Meetings with active stakeholders in the project area with the aim of creating a synergy with the actors which are already working in the area and with the community that we want to reach and involve in the project.
- Articles in local newspapers with a wide local distribution in the Sharing Cities district aimed at involving citizens in the project and in particular in the retrofitting of buildings.

Co-design activities

Sharing Cities is open to listening to and actively engaging all the stakeholders, stimulating co-design processes, i.e. participatory and collaborative design. The 'People' working group involves the citizens of the pilot area and other actors (e.g. employees, companies, associations) interested to envisioning a series of new shared municipal services that meet the needs of the district's community in key areas of everyday life, such as mobility, energy and community. Participatory and collaborative design methods and tools facilitate the interaction between researchers, citizens and stakeholders at multiple levels, from what people think and say to also what people feel and dream.



Such interaction in Milan is set through a co-design process for envisioning novel urban services, which engages both local citizens and stakeholders in the development of sharing based initiatives and concepts which enable their daily routines around mobility, food, community and energy. Within the project, several activities were organised:

- Three co-design workshops with 30+ citizens were organised with the aim of: (1) mapping local community needs and knowledge about initiatives and services related to sharing in the city (2) identifying and evaluating existing sharing based services which may fit in daily routines, through the use of co-design tools such as cards (3) assessing and implementing the concept of a sharing city eco-system and digital platform for gathering existing and new services (Workshop 3 held on the 20th of June 2017)¹
- Six roundtables with 40+ stakeholders, including developers of sharing oriented platforms and apps, local associations and companies, were held on five thematic tables (i.e. mobility, food and food waste, energy and environment, community and vulnerable people, and condominiums) with the aim of collecting the expert view on main benefits and problems which may arise from the spreading of sharing based initiatives.

Eight reports (in Italian) on each step of the co-design process above were delivered and published on the local Sharing Cities project website.

1. Sharing Cities 2017 <http://sharingcities.wixsite.com/milano/single-post/2017/06/16/20062017-WORKSHOP-DI-CO-DESIGN-CON-CITTADINI-E-STAKEHOLDER>

Future activities of the project

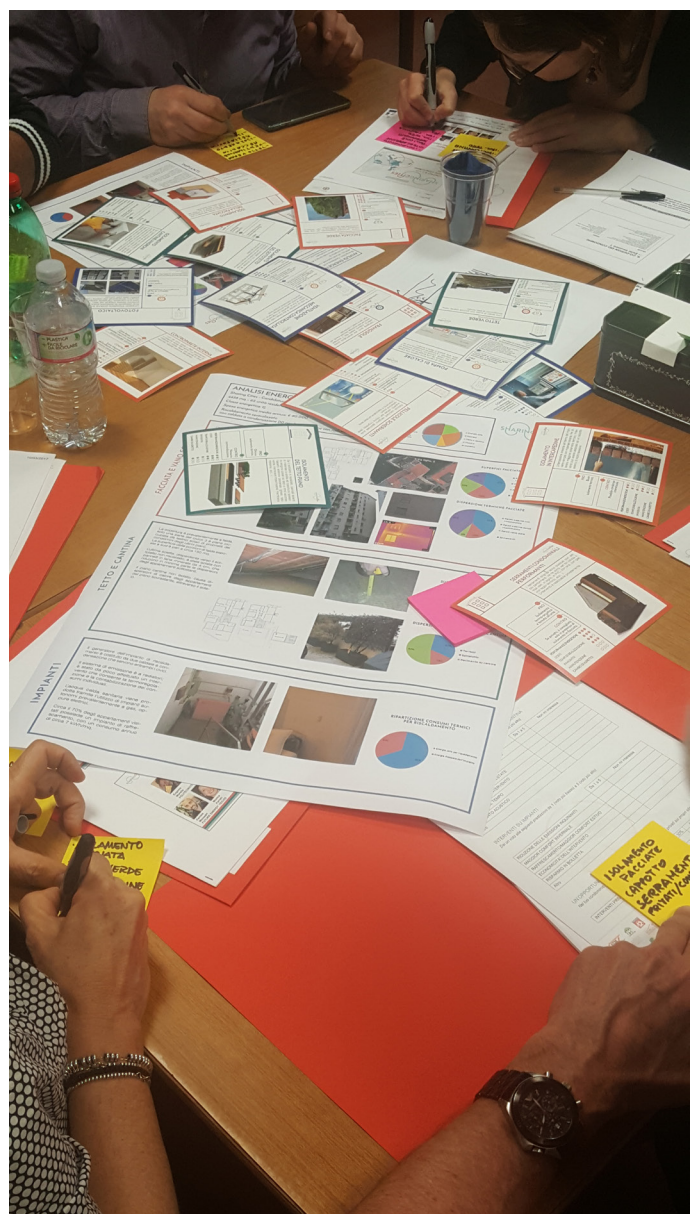
Citizens Recruitment

- Around ten informal meetings (Extra-meetings) take place in the buildings that have been participating in the co-design of the retrofitting measures. The aim is to engage people who haven't participated in any of the co-design workshops and give them all the information they need to vote during the assemblies for the redevelopment of their buildings. These meetings are an occasion to explain and motivate the scenario derived from the co-design workshops and the advantages of building retrofitting in terms of quality of life, economic benefits and positive effects on the environment. The fact of being in the concerned buildings helps to get an informal and convivial way of working with people, to adapt energy requalification to their needs and desires, and give them the opportunity to ask questions and dissolve their doubts and curiosities.
- An event about the vision of a city with electric mobility organised during the European mobility week, in order to capitalise on the work and progress of other initiatives.
- Articles in local newspapers with a wide local distribution in the Sharing Cities district aimed at involving citizens in the project and in particular in the retrofitting of buildings.
- Educational activities in some of the schools of the district. These activities focus on the positive behaviours related to the measures of Sharing Cities and are tailored to the needs and desires of each school. The aim is to raise awareness of some topics of the project and to spread knowledge about Sharing Cities.

Co-design activities

The last step of the co-design process intends to validate the concept of the Smart City urban ecosystem and platform in order to assess the benefits and identify weak points. Some activities organised by the city have been planned such as:

- the conceptualisation of novel urban services which may emerge thanks to the Sharing Cities platform, together with master's students in urban studies (PoliMi)
- the conceptualisation of sharing oriented scenarios for novel urban services addressing climate change at major events such as the Climathon 2017



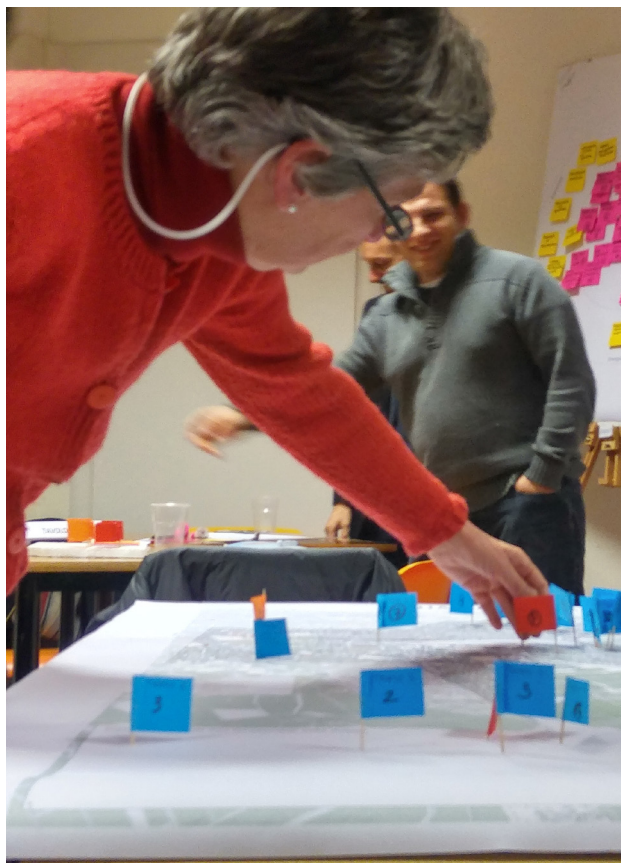
- supporting local initiatives led by citizens, partners, stakeholders and related to sharing oriented services organised at a small scale trial of the urban services platform concept.

Strategic approach towards becoming a smart city

Present situation

In order to develop its smart city strategy, the city of Milan has reviewed the way it is working by analysing existing incentive mechanisms, carrying out interviews to assess the attitude of people toward participation and engagement tools. It also organised workshops to gain insight into citizen's behaviour, assessing the feasibility of community engagement hubs and made a catalogue of efficient practices. It then developed a social market strategy aimed at designing and testing prototypes of bond schemes, and designing protocols, business incentives and operating models.

In order to set everything into motion, the city works in close cooperation with local partners in the project, such as Poliedra, Legambiente, DASTu, that help on the ongoing facilitation, iteration and dissemination (customisation of service; recruitment; training; discussions in local neighbourhood; awareness raising; engagement of different stakeholders; dissemination through local and national media):



Objectives

All the partners working with Milan for citizen engagement are strongly involved in specific tasks of the project. Their tasks include conducting interviews; analysing diaries; editing questionnaires; collecting data; drafting strategies for developing new urban services; planning engagement events; and designing the digital social market architecture.

Specificity

Building refurbishment in Milan is of interest mainly to private owners, which makes the process longer and rather uncertain as it requires strong commitment from all members of the local partnership.

The district bond scheme is likely to have a common architecture, as the co-design scheme has to take the cities' specific contexts into account.



SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

This measure involves the development of an advanced, data-rich, management system which gains maximum benefits from the retrofitted buildings, sharing energy data through the open platform enabling energy services to be provided that reduce energy use and bills. This will enable the design and roll out of higher level applications for citizens and authorities, taking advantage of the sensing layers and actuators installed.

Strategic approach towards becoming a smart city

Present situation

For these activities, the city of Milan is working in close cooperation with Siemens Italy, based in Milan and partner in the project. Siemens works on different use cases and the concept of SEMS. The city of Milan has worked with the city of London and Lisbon to prepare a document describing the SEMS functionalities and their relation to the urban sharing platform which will eventually be developed in the city.

The city shares the Monet platform's standards and API interfaces with the partners of the project responsible for the urban sharing platform developments. The use cases and the concept developed help in specifying the interaction between the Urban sharing platform (USP) and the SEMS. A device protocol is also planned which will be a driver to import specifications and building data.

CHALLENGES

The devices and sensors to be used in the project have yet to be defined. The definition of drivers had to be postponed until the final choice is made.

Data privacy could also be an issue and the municipality is therefore working on this.

Objectives

Short term

Use cases and concept to obtain detailed definition of interaction between SEMS and the USP platforms.

Obtain a definition of public building views on the Monet system and the related dashboard.

Thanks to the device protocol:

- Implementation of import driver for data related to specific apartments of public buildings
- Driver import specification and implementation for thermal data related to public buildings
- Driver import specification and implementation for LoRaWan Connection

In the longer term, after the installation of a production system, Milan will start monitoring the buildings with figures from pre-and post-retrofit work. The device protocol will provide specification and implementation of driver for data on mobility energy, lamp post energy and the environment of the buildings. The SEMS evolution will bring a definition of energy reporting data, the implementation of an algorithm for modulation and the implementation of an urban sharing platform connection.

Specificity

The Monet platform allows the configuration of different views (geographical, technical, and electric) of the project area, enabling easy navigation inside the area.

The LoRaWan protocol used in Milan for connecting certain devices could enable the city to experiment with a different way of managing its sensors. It represents an innovation compared to simple WiFi connection of other cities.

The Monet system, as an algorithm engine, can support load management. It will serve charging points in the Milan Porta Romana area, each equipped with a photovoltaic panel (AC or DC).



BUILDING RETROFIT

This measure aims to apply deep-retrofit measures to public and private residential properties affecting 15,000 citizens across the six cities and integrating the properties with low carbon energy sources (solar PV, water source heat pump) and electric vehicle charging, all wrapped together by a digital first digitally driven sustainable energy management systems wrapping it all together.

Strategic approach towards becoming a smart city - Private building

One of the aims of the project is the deep retrofitting work for 300 private apartments, exploiting the existing extensive and proactive resident and owner outreach network, which informs and supports energy saving and wise retrofit choices.

In the end, the owners will have to bear most of the costs. For this reason, the owners are actively participating in some parts of the project, mapping the energy behaviour, needs, and performance of their home. Energy audits and 'digital first' monitoring of energy consumption and temperature comfort conditions inform owners on the design of retrofit activities to be undertaken during the project.

The first objective is to bring the owners to consider their flat as a part of the urban infrastructure; the building retrofit project is developed at the same time as the overall regeneration programme of the district, and shares the same principles of energy efficiency and digital first approach. The building owners participate at the same time in co-design sessions both for the regeneration project and for the building retrofit process.

On the other side, the aim is to develop new monitoring tools connected to an energy management system at urban level, which allows increased knowledge of personal energy consumption. This will allow flat owners to know their energy consumption and to compare it with other similar flats or families.

This tailored energy efficiency package eventually upgrades the building performances addressing the building specific characteristics and the owner's expectations.

The activity started in March 2016 and the city worked on 52 buildings, trying out a new approach based on ICT technologies for information and engagement of owners' communities to save up to 60% of actual energy consumption.

More in details, these are the steps of building selection and flat owners' cooperation:

- Through a public call launched by AMAT, a third part of Municipality of Milan, 50 buildings presented their nomination to take part of the project. The call was presented in different meetings and events in the district.
- The buildings were evaluated by a preliminary survey of decay and energy performances, considering the real interest of the owners and the building manager.
- 24 of them were considered to be eligible for the project, and the opportunity of taking part in Sharing cities was presented to be approved by the flat owners' assemblies.
- 20 of them approved the proposal. The energy audit and the monitoring system planning then started. At the same time, the co-design process, designed in collaboration with responsible partners for citizen engagement, was developed.

CHALLENGES

Many issues had to be considered: privacy issues, data availability and storage, connection with different systems (e.g. Coster-Siemens), sensor costs and availability, communication protocol availability (e.g. LoRaWAN) or even constraints imposed by the placement of the system inside private flats and the costs.

The energy audit was undertaken with specific tools to have a complete knowledge of the energy performances of the different constructive elements of each building. At the same time, surveys were submitted to the flat owners in order to have data of flat occupation and energy use habits. On the other side, a specific monitoring system connected to the urban sharing platform was designed, with four objectives:

- Provide specific knowledge on personal energy consumption, which can be used in the awareness strategy;
- Provide specific knowledge on personal comfort;
- Provide energy consumption data to the Urban Platform;
- Validate the real energy savings after the retrofit works.

The system will be installed on 20 buildings. Fuel consumption will be monitored through smart meters which give consumption information every hour. An external meteorology station will help with data interpretation.

Equally, the electricity consumption at building level will be recorded through a smart meter which gives consumption information every 15 minutes. In every flat, electricity consumption will be measured with the same technology.

At the same time, in a significant number of apartments, for each block, some sensors will be installed to monitor temperature, humidity and CO₂ level. All sensors are wireless and require very low maintenance.

All data collected by smart meters is recorded by the utility company (A2A) and transferred to the City Energy Management System Monet, operated by Siemens. The data collected by other sensors is recorded through Lorawan technologies, and directed to the Energy Management System Monet.

In the first two buildings the expected works were: building envelope insulation (facades, roof, basement or pilots), installation of photovoltaic solar panels and LED lamps.

Objectives

The objective was the deep energy retrofitting of 21,000 m² of private buildings but also 4,000 m² public residential properties including:

- integration of low-carbon energy sources
- physical modernisation
- digital controls
- Comfort monitoring
- Interventions aim to save until 60-70% energy consumption and improve comfort inside dwellings. Results will be defined thanks to specific monitoring systems.



Strategic approach towards becoming a smart city - Public building

The deep retrofit process for the 4,000 m² public building has started and focused on improving building occupant indoor environmental quality through an innovative monitoring system. The executive design defined includes intervention specifications for energy retrofit and the monitoring system specification (technology, sensor selection, data flow, etc.) and installation.



MOBILITY

The mobility measures include:

- e-car share: delivering bold ambitions in districts consistent with growing city-wide ambitions for real scale reduction in traditional car ownership and use; learning from different city contexts – user behaviour/ownership and commercial offers from suppliers: and to support EU-wide relevant market take-up of EVs through sharing business models and the clean power for transport package.
- e-bikes: building on existing human power bike sharing schemes with introduction of e-bikes, to support shift from cars and other modes to e-bikes for those longer journeys, senior citizens, mobility impaired; integrate with EV car sharing services and charging points and local renewable energy generation.
- e-vehicles charge: installing a network of EV charge points, and integrate infrastructure with the other place-based measure and the urban shared platform: building retrofit; solar PV; humble but smart lamp posts; sustainable energy management system; to enable shift to e-mobility and achieve an advanced level of ‘digital first’ and ‘infrastructure next’ integration.
- Smart parking: implementing smart parking technologies, including evaluation of sensor type implementation (potentially different sensor types and business models), testing and capture of operational experience to incentivise e-mobility.
- e-logistics: countering the growth in conventional (particularly diesel) freight delivery vans caused by growth in on-line commerce, local deliveries and small businesses through implementing electric logistics to prove the business cases for new ways of urban logistics, and package learning for EU cities replication.

Strategic approach towards becoming a smart city

The identification process and the related selection of 10 mobility areas was achieved in 2017. A deeper view of the different measures can be summarised as follows.



E-car sharing

The main achievements reached at Milan level are:

- The selection and definition of ten mobility areas for public e-car sharing, identified through technical examinations;
- The preliminary evaluation of candidate condominiums for private e-car sharing;
- The meetings with potential operators for condominium car-sharing implementation.

E-vehicle charging

- For the e-vehicle charging system, the integration of fast and normal charging networks in ten mobility areas

E-bike sharing

- Seven new bike sharing stations have been identified through technical examinations and 4 bike sharing stations out of 7 locations were already installed and setup.

Smart parking

- Preliminary studies and evaluation for integration of sensors onto the city LoRaWAN Network are currently implemented in Milan.

E-logistics

- This is under current development, with the feasibility of integration into the mobility area being assessed.

Plans for the future within the project

E-car sharing

The expectations regarding the e-car sharing measure are related to:

- The deployment of 60 e-cars by e-car sharing operators
- The planning of a car reallocation system
- The condominium selection for the trial
- The plan and co-design for the condominium car sharing service
- Testing the service with at least 2 vehicles for 3 years

E-bike sharing

- Install the remaining three new bike sharing stations and deploy the 150 e-bikes
- Introduce a reservation system that ensures the availability of a bicycle at any time of the day
- Planning of a bike reallocation system.



Smart parking

- Plan and co-design innovative services related to smart parking
- Identify and install 125 sensors for monitoring and parking control

E-logistics

- Develop a logistics platform with 9 electric vans (with OBU) and 2 e-bikes
- Plan and co-design innovative logistics services

E-vehicle charging

- Implement ten mobility areas with Fast and Normal Charging Networks
- Install 60 charging points for electric car sharing (6 points for each area) of which 20 will be rapid chargers.



SMART LAMP POSTS

Smart lamp post presents a very visible ‘quick win’ for smart cities; and the well-proven lighting and maintenance savings offer an attractive bankable initiative. The smart approach is to consider how to develop business models and funding mechanisms that incentivise implementation of ‘smart’ measures (WiFi, air quality, parking, EV charging, etc) alongside lighting exploiting what is typically a considerable network of existing assets – in other words to multi-purpose the ‘humble’ lamp post.

Strategic approach towards becoming a smart city

Milan planned the implementation of IOT infrastructure to enable smart city services. By installing data concentrators for collecting data from field sensors and interfacing the same concentrators to the network server, cities have a network for new services. People and things can communicate with data concentrators, installed on streetlights, so they can always be connected.

In Milan the lamp post will not only be devoted to illuminating the street or sidewalk where it is installed but will become a key node for network infrastructure that transforms and improves community services. Smart lamp posts can help to monitor indicators related to environment, security, smart mobility and parking thanks to applications from both citizens and municipalities.

The city can also communicate through the streetlights by exploiting their capillary location on the land.

Present situation and achievements (10 March 2017)

In Milan, several actions were put in place resulting in many achievements:

- LED upgrade: the transition of all street lights to LED technology was completed;
- Use cases considering area, residents, and other partners led to focussing on environmental monitoring services, public engagement using lamp posts, transport & mobility services;
- ‘Symbol’: four sensors were installed for measuring temperature and atmospheric pressure;
- LORA: LoRa coverage was verified in specific project areas.



The city of Milan still has plans to further develop the work done with smart lamp posts and expects to:

- Enter into more and specific details for the use cases with location and data plans
- Build common specifications on new DIN standard
- Align procurement activities
- Complete the LoRa coverage
- Expand the connectivity services
- Insert gateway and sensor



URBAN SHARING PLATFORM (USP)

An Urban Sharing Platform (USP) is a logical collection of technical components, capabilities and processes which provides functions and services that enable a smart city. Its purpose is to aggregate data and control functions from a wide variety of devices and sensors, store, process, correlate the data and present information to the city and citizens which enables better use of the city resources and may provide support for innovative service verticals.

Strategic approach towards becoming a smart city

The Urban Sharing Platform (USP), as defined and built in the Sharing Cities project, is an overarching collection of technical components, capabilities, standards, guidelines and processes, which provides functions and services that enable a Smart City, e.g.:

- Support real-time data collection from field sensors and devices
- Provide IT components for data storage and business intelligence
- Provide API-based access to all data and functionalities managed by the platform
- Support seamless integration of third-party open data and APIs
- Support engagement, by enabling the development of dashboards and applications for end-users (e.g., citizens, city managers) to exploit data collected through the USP
- Support proper governance processes
- Enable federation between different instances of the USP

Milan's version of the Sharing Cities USP has been built according to the reference model which is the result of the joint expertise and effort of the three lighthouse cities. It also takes into account the feedback of project partners as well as indications and results of various related state-of-the-art projects and initiatives.

In particular, the Milan USP aims to give value to local existing infrastructures and investments planned in the short, medium and long term, and to enable their evolution and enhancement so that improvements can be continuous and sustainable over time.

The Milan USP is based on the following solutions and principles:

- The Monet EMS solution, by Siemens IT
- The Interoperability Platform of the Municipality of Milan
- The E015 Digital Ecosystem, an institutional initiative operating since 2013
- The federation mechanisms that enable interoperability between different USP instances
- The open approach based on APIs and microservices (API Economy)

The result is an evolving, integrated, modular, open digital ecosystem, inclusive and shared, already operating to support the implementation of local project interventions. The Milan USP enables interoperability between different entities through common guidelines, technologies, standards etc. thus fostering participation of stakeholders from both the private and the public sector. Special focus is being put on federated governance processes, involving particular departments of the city administration, and on adoption and replicability of the proposed model by other cities, extending their existing strengths and capabilities, as well as on sustainability over time that, by design, targets horizons well beyond the duration of the Sharing Cities project.

During the last months of 2016 and 2017, the following activities have been the focus of the work done in Milan regarding the Urban Sharing Platform:

- Creation and integration of new USP components based on open source solutions: Identity Server and Message Broker.
- Proof of conceptual design of the USP components for supporting city use cases: ingestion of data already available from the 'field', including non-real-time electrical energy consumption data of a subset of building inhabitants, elaboration of such data, and simple data visualization in the form of basic dashboards.
- Collaboration with the national Digital Transformation Team Evaluation – Data & Analytics Framework (DTT-DAF): The Municipality of Milan is working with the national DTT-DAF group on the design, configuration, and testing of data storage and data analytics/correlation solutions that are being developed centrally in order to be shared with local public authorities. Such components can then enhance the Milan's USP.
- Investigation of sharing opportunities of Milan's platform solutions with the other lighthouse cities.
- Support to several cross-task and cross-city activities involving the USP (e.g. description of city use cases and related data, description of interactions between the data sources and the USP).

Future activities on the USP include:

- Realisation, configuration, and testing of new components of Milan's USP, as well as fine tuning of existing components, as needed to fully support city use cases being developed by the other work packages.
- Identification of solutions for supporting data visualisation (e.g., dashboards) and data analytics needs, based on existing resources and capabilities, as well as the municipality's needs.
- Definition of integration mechanisms of project APIs and related data with the E015 Digital Ecosystem.
- Definition of federation mechanisms between the Milan USP and the versions run by the other lighthouse cities.

5.

GOVERNANCE

The internal organisation and modes of governance in relation to external stakeholders are essential parts of the cities' transition to becoming smarter. The Sharing Cities programme gives opportunity to the city to rethink the way of working. The cross-departmental (internal) and focus groups (with external stakeholders) are presented.

INTERNAL ORGANISATION, GOVERNANCE

The municipality of Milan is responsible for the Project Management Organisation at local level.

The Smart City Service (under the Urban Economy Directorate) is the PMO Coordination Unit. An ad hoc working team has been mobilized for project activity implementation. The team is supervised by the Head of the Smart City Unit – Clara Maddalena Callegaris, and is composed of a project manager, a project officer and a project administrator.

Several Milan Municipality departments are involved in the implementation processes through regular update meetings. The following directorates are particularly actively involved:

- Mayor's cabinet (communication and international relations units)
- Organisation and human resources (privacy unit)
- Department for mobility, transport, environment and energy
- Department for information systems and digital agenda
- Department for facility management (housing and planning unit)

Milan PMO is also responsible for the linked third parties' involvement: ATM¹ and AMAT². A consolidated daily interaction allows a direct and proactive involvement with a constant updated and feedback about the activities under their responsibility.

The internal performance system (part of the Milan Municipality Quality Control Plan) is also applied to monitor, perform and evaluate the activities and results promoted under the Sharing City project.

1. ATM: www.atm.it/

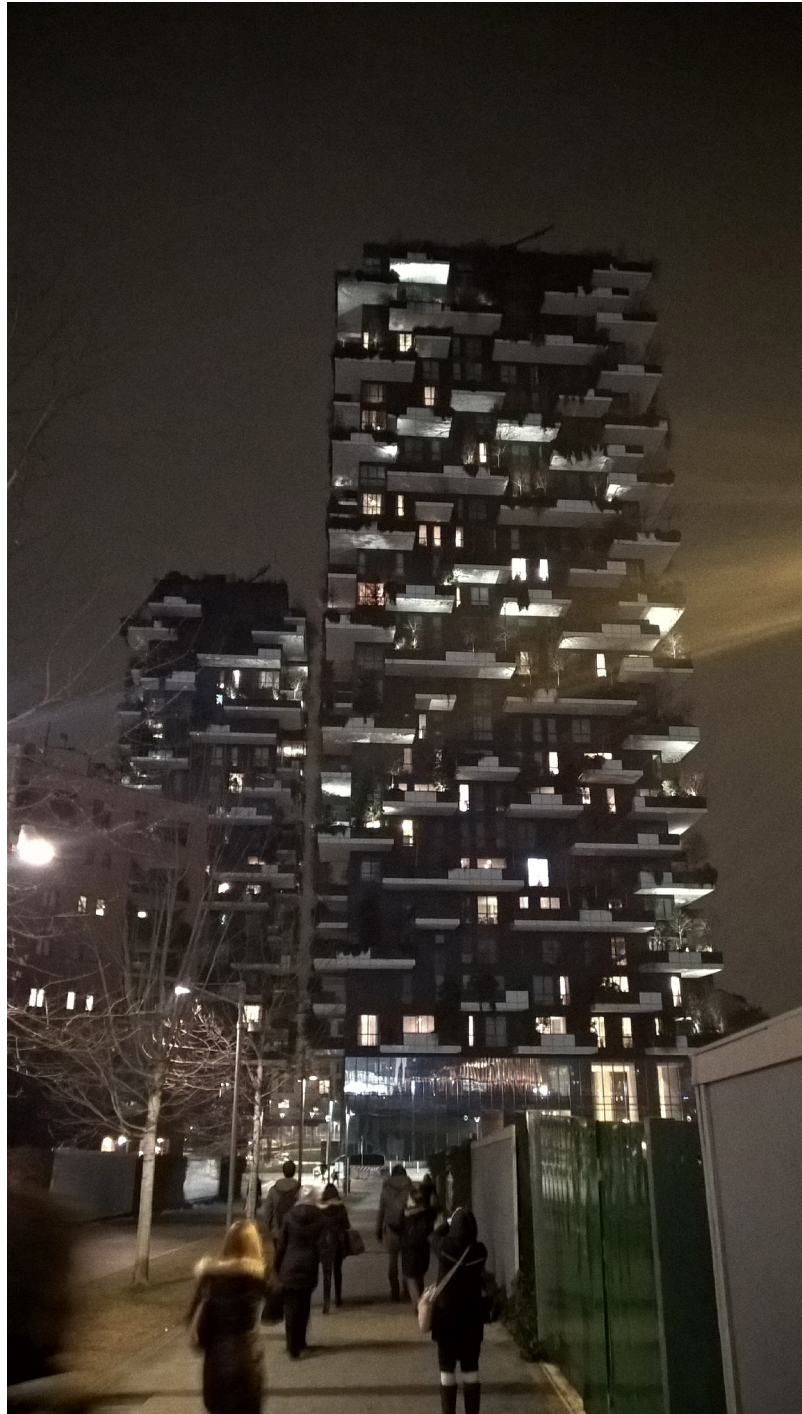
2. <https://www.amat-mi.it/it/>

At the political level, the Local Government responsibility and accountability is assured by the councillors' engagement at Sharing Cities public events and through the alignment of the Sharing Cities actions with the programmatic guidelines declared in the Milan Smart City Plan. The following political departments are involved:

- Department for labour policies, productive activities, trade and human resource - Councillor Cristina Tajani
- Department of education - Deputy Mayor Anna Scavuzzo
- Department for digital transformation and civic services - Councillor Roberta Coco
- Department for mobility and environment - Councillor Marco Granelli
- Department for urban planning, green spaces and agriculture - Councillor Pier Francesco Maran
- Department for public works and housing - Councillor Gabriele Rabaiotti

In order to accelerate and systematise the Sharing Cities results, Milan PMO promotes cross-fertilisation between the EU projects in which Milan Municipality is involved as beneficiary. Among others EU-GUGLE, Open-Agri, Open-Care, BoostInno, Icarus, Zeus, and Synchronicity.

At external level, Milan local PMO leads the Local Consortium represented by the 16 local partners. Meetings are organised every 6 months.



A specific working group has been established in order to have clear and constant updates on the different work packages of the project' activities and to ensure a fruitful intra-work packages coordination. The working group includes the local work package leaders for all activities: meetings are organised with the support of Fondazione Politecnico, every two/three weeks updating on the progress of activities, listing the next steps and discussing critical aspects of the project. Milan PMO replicates at local level the coordination promoted at global consortium level, identifying POLIEDRA as local facilitator for reporting on those activities related to concrete physical developments in the project.

Milan local PMO updates the Local Consortium about the results during the Programme Board discussion. Milan local PMO is also responsible for organising meetings with the local scientific board, these meetings are scheduled every four months.

Regarding dissemination activity at local level, Milan PMO is responsible for the communication plan and the related tools. To this end, a local website has been set up as a dissemination instrument, management tools have been developed, and a repository facilitator has been put in place for the Co-design activity.

The Private sector is involved in the project thanks to an open door approach promoted by the Smart City Unit. The interested local stakeholder can ask for business-to-business meetings with the Milan PMO in order to be updated about Sharing Cities activities, be part of a living database and attend public events. In this regard Milan local PMO acts as a Sharing Cities National Contact Point.

The Milan PMO, also acts as a filter for information and communications between the global PMO in London and the local partnership, ensuring efficiency of information and coordinated responses.

Cross departmental working groups (WG) and focus groups

The municipality, as city lead, facilitates an integrated approach among different tasks and work packages. This approach is spread among all the activities as a collaborative management method.

A proof of this is the creation of dedicated working groups at Milan's municipality level on:

- Privacy
- Communication
- Public buildings
- Use cases
- Monitoring

ANNEX 1 - SMART CITY SOLUTIONS

CITY DESCRIPTION IN A SMART CITY CONTEXT

Milan - Italy

Milan is a metropolitan area with a robust and highly diversified economic infrastructure (with industry, retail, services, finance), that develops balancing capital, services, people and industry. Milan is a vibrant, rich, dynamic and innovative city. Hence, it is also the first Italian Smart City. Since 2012, Milan has developed and adopted a range of plans across the following policy areas: urban development, sustainable mobility, energy efficiency, the sharing economy and smart cities. It is one of the first European cities to have adopted a framework in order to support the local sharing economy.

The city's aim is to promote new forms of collaboration between the public administration, the private companies, civil society organisations, and the citizens. Milan presumes that the smart city needs to be focused on its citizens rather than technology-driven. For Milan, the concept of 'smart city' entails smart mobility, smart environment, as well as smart inclusion and citizenship.

District: Porta Romana/Vettabbia

The Porta Romana/Vettabbia demonstration area is under complete redevelopment. The project will connect the historic centre of the city to Milan's agricultural belt by 'stitching together' two areas that are currently geographically, economically, and socially separated. Porta Romana is a brownfield on a 216,000 m² former railway yard in the north of the city. Following its recovery, this area will include a functional mix of private and social housing units; the multimodal integration of transportation systems around a new station; and a large park of at least 74,000 m². The plans also involve the retrofit of a 100,000 m² former industrial lot and the renewal of the Pompeo Leoni area, which will host Italy's first smart city technology incubator (Smart City Lab). In the southern part of the demonstration area an exhaust heat recovery plant is to be built, using state-of-the-art technology. Highly replicable and scalable, in 2014 this project was recognised with the best eco-friendly innovation award by the Italian environmentalist organisation Legambiente.

Milan in numbers

Number of inhabitants: 1,361,920 (city area)

Area: 181,67 km² (city area)

Regeneration of the demographic structure 2009-2014:

200,000 new residents

5% of the growth is concentrated on the 25-34 age cluster

Forecast 2015-2024:

41,000 more new residents

7.5% of the growth is concentrated on the 25-34 age cluster

Milan is one of the top-10 World Economic Centres

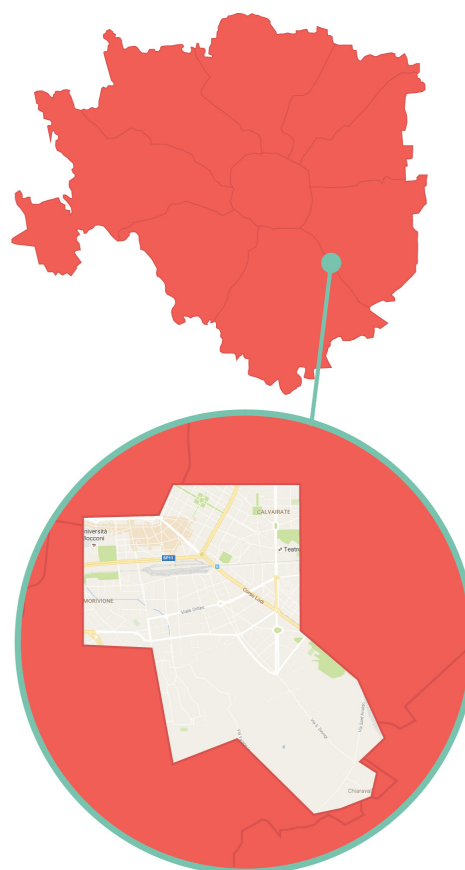
- 25% of Italian bank headquarters are in Milan
- Headquarters of major media operators (broadcasting, newspaper and publishing companies)
- Main pole of attraction for high-tech companies
- More than 9,000 financial companies (8.5% of Italy's total)

Milan is Italy's start-up capital

- 926 innovative start-ups :
- 14% of Italy's total
- €62m turnover (partial data for 2015)

District smart city development focus

- Co-design - citizen engagement in co-developing innovative services and incentivising positive behaviour change
- Building retrofit
- Shared e-mobility (e-cars, e-bikes, e-logistic vehicles, charging points, smart parking)
- Sustainable energy management service
- Urban sharing platform
- Smart lamp posts



Downtown in numbers

Number of 144,110 inhabitants

Number of jobs 34,997

Area 14 km²



BUILDING RETROFIT

Milan will address deep energy retrofit of the residential building stock, both public and private, saving the 60% of energy consumption through tailored technology packages, including: integration of low-carbon energy sources; physical modernisation; digital controls; comfort monitoring. New approaches as co-design process and citizen engagement paths, will be developed through the digital availability of consumption and environmental data, collected by innovatives monitoring systems. Interventions aim to save until 60-70% energy consumption and improve comfort inside dwellings.

Public building

Social housing deep retrofit (4,000m²): the technical solutions defined in the FP7 – EU-GUGLE project will be implemented; a specific monitoring system will be installed to have a complete knowledge of internal and external comfort directly related to energy consumption in the renovated building.

Multi-property building

Multi-property buildings (21,000m²) - 4 phases activities:

- 1) Selection of buildings: through a public call, 50 buildings were nominated to participate to the project. After a technical survey, we offered them the energy audit and the installation of the monitoring system. 20 of them approved their participation in the project in the owner community assembly.
- 2) Energy retrofit design: the Sharing City package has been developing on the selected 20 buildings and it includes: a complete energy audit; a co-design process with the participation of the flat owners; the installation of a monitoring system; the engineering design of the energy efficiency package including the financial and economic analysis.
- 3) On site works on 10 buildings.
- 4) Monitoring and evaluation of the real energy savings.

Sectors

Main: Building and living

Other:

- Energy
- IT and technical interfaces supply
- Economy

Benefits

Resources & energy

- reduction of energy bill
- independence in energy supply

Business & innovation

- improved data availability

Security & liveability

- behaviour change

Stakeholders

Private and public owners

Technology provider(s)

Operators

Investors

Local factors / reasons for implementing

- 60% of Milan's multi owner buildings belong to G and F energy classes
- Milan is developing a new energy policy to increase the quality and effectiveness of energy intervention in public buildings
- Milan aims to reduce energy consumption in private buildings of 55%
- The municipality is already engaged in nearly-zero energy building renovation models
- Owners' decision to invest in building retrofit (private homes)
- Availability of people to host the monitoring system in their house (private places)
- Incentive mechanisms
- Awareness about energy and environmental themes





SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

SEMS collect data from different sources. This flexible system calculates typical curves for consumption and provides a forecast of generation/consumption based on both historical data and wheatear forecast information. It could also manage buildings and charging islands energy consumption, maximising the use of the renewable energy.

SEMS will be implemented using the Monet platform, an innovative integrated system for the energy monitoring of different systems serving Smart Cities, such as:

- The electricity distribution network
- The district heating systems
- The water network
- The gas distribution network
- The public lighting system
- The e-vehicle recharging infrastructure

SEMS will:

- collect energy data for each smart grid system: distribution network; public lighting; and electric mobility;
- provide energy monitoring and reporting at municipality level;
- integrate data coming from other systems to correlate information on consumption;
- integrate energy tariffs model to estimate and simulate energy costs.
- implement load and generation profiling and forecasting;
- implement optimisation algorithms towards energy efficiency renewables optimisation.

Sectors

Main: Energy

Other:

- Mobility
- Parking
- Logistics
- Building and living
- IT and technical interfaces
- Governance and planning

Benefits

Resources & energy

- increased energy efficiency
- peak load sharing

Business & innovation

- improved data availability

Security & liveability

- increased comfort

Stakeholders

Owner

Technology provider(s)

Operator

User(s)

Investors

Local factors / reasons for implementing

- The Monet platform allows the configuration of different views (geographical, technical, and electrical) of the project area, enabling easy navigation inside the area
- The Monet system also has an algorithm engine to support load management. It will be developed further to support charging islands (AC or DC) in the Milan Porta Romana district, some of them equipped with a photovoltaic panel

Supportive and determining factors

- Definition of other measurement devices and sensors connected with the SEMS



SHARED E-MOBILITY

Milan's shared e-mobility system will include: e-cars, e-bikes, e-logistics vehicles, smart parking, e-vehicle charging, condominium e-car sharing.

Several actions are foreseen regarding sustainable mobility. Ten new Mobility Islands will integrate recharging points for electric car sharing, smart parking. 125 smart parking sensors will be used for providing innovative services, monitoring illegal parking next to the public transport stops and next to the pedestrian crossing, allowing parking control for disabled people and for load/unload logistics operations. 150 additional e-bikes will circulate in the District thanks to 14 new bike sharing stations. A new electric logistics service will be created for the district and a condominium electric car sharing service will be tested. Innovative services, such as an algorithm for forecasting availability of vehicles of car sharing and bike sharing, will be implemented.

Local factors / reasons for implementing

- Milan already boasts Italy's most advanced urban transport system for a total of 3,300 Km
- Boosting municipal investment in e-mobility

Sectors

Main: Mobility

Other:

- Parking
- Logistics
- Building and living
- IT and technical interfaces

Benefits

Resources & energy

- autonomy of fossil fuels
- reduction of carbon emissions

Security & liveability

- behaviour change
- traffic reduction

Stakeholders

Technology Provider(s)

Operator

User(s)

Investors





SMART LAMP POSTS

Smart lamp posts do not just provide light. They can also double as: sensor devices; data concentrators or gateways; network servers; application servers; or end user devices. Milan's smart lamp posts will use the LoRa protocol.

The telecommunication infrastructure using LoRa protocol enables long-range wireless coverage for the Internet of Things (IoT) paradigm.

Planning the implementation of the IOT infrastructure to enable smart city services.

By installing data concentrators for collecting data from field sensors and interfacing the same concentrators to the network server, cities have a network for new services.

People and things can communicate with data concentrators, installed on public lighting streetlights, so they can always be connected.

The lamp post will not only be devoted to illuminating the street or sidewalk where it is installed but will become a key node for network infrastructure that transforms and improves community services.

Monitoring of environmental services, security, smart mobility, parking and much more can be managed with applications from both citizens and municipalities.

The city can communicate through the streetlights by exploiting their capillary location on the land.

Local factors / reasons for implementing

- Milan has replaced its street lights with LED technology. There are 135,000 units to be converted
- The newly installed LED lamps save energy (50%) and reduce carbon emissions. They are also safer and more sustainable

Supportive and determining factors

- Smart lamp posts can also host other innovative smart city services

Sectors

Main: IT and technical interfaces

Other:

- Mobility
- Air Quality monitoring
- Water management
- Energy
- Environmental

Benefits

Governance & planning

- more efficient delivery of city services

Business & innovation

- improved data availability

Stakeholders

Technology provider(s)

Operator

User(s)

Investors



URBAN SHARING PLATFORM (USP)

The USP is an overarching collection of technical components, capabilities, standards, guidelines and processes, which provides functions and services that enable a Smart City.

The main purpose of the USP is to aggregate data and control from a wide variety of devices and sensors, store and process the data, and support visualization of the information to the city and citizens, which enables better use of the city resources.

In particular, the USP aims to: support real-time data collection from field sensors and devices; provide components for data storage and business intelligence; provide API-based access to all data and functionalities managed by the platform; support seamless integration of third-party open data and APIs; support people engagement, by enabling the development of dashboards and applications for end-users (e.g. citizens, city managers) to exploit data collected and elaborated through the USP; support proper governance processes; enable communication between different instances of the USP.

The USP enables the creation of interlinked ecosystems of open, multi-stakeholder service environments, thus enabling digital interoperability between different players to effectively support the Smart City.

Local factors / reasons for implementing

Each lighthouse city has significant existing capability which can inform the design of the USP and provide valuable skills, experience, blueprints and resources which can be shared with other cities. Over the last years, Milan's partners have invested in a set of solutions that constitute the foundation of Milan USP supporting urban smart digital interventions, in particular: the Interoperability platform of the Municipality of Milan, the E015 digital ecosystem, and the Monet SEMS.

Sectors

Main: Digital interoperability

Other:

- Governance and planning
- Mobility
- Logistics
- Parking
- Building and living
- Energy
- Lighting

Benefits

Collection and integration of data from different sources

Improved data availability for businesss, governance and innovation

Guidelines and tools for interoperability both at technical and process level

Open standards and technologies

Supportive and determining factors

- Provide a shared reference architecture that extends the strengths and capabilities of each of the cities both 'vertically' increasing each city's capability, and 'horizontally' shared between the cities, followers and scale up cities.
- Enable sharing by providing an interoperable digital platform based on open standards.
- Utilise Enterprise Architecture and API economy best practices to align city needs with services and technology.
- Provide a federated governance structure to ensure alignment between the cities.

Stakeholders

City officials
Technology providers
Platform operators
Service/API providers
End-user application providers

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EUROCITIES

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www.sharingcities.eu



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BUILDING SMART CITIES TOGETHER

SHARINGCITIES

SMART CITY BASELINE REPORT BORDEAUX



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Duration of the project: 60 months

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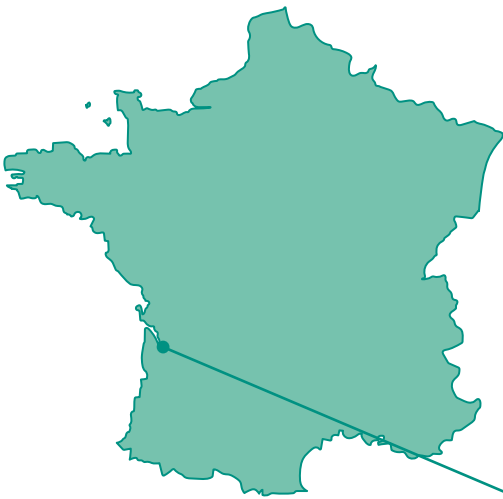
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1.

CITY CONTEXT



Inhabitants

Bordeaux metropolis: 750,000
projection for 2030: 1 million
population density: 4,888.3 per km²

Size (km²)

metropolitan area: 579 km²



City size and role

Bordeaux, capital of the new Aquitaine region, is the most attractive city in France to live and work, according to many recent studies. It is also the most popular French city for real estate investment and has benefited from significant changes over the past 15 years.

Geography

Bordeaux is a port city situated in the south-west of France. Together with Toulouse and Nantes, Bordeaux is one of the fastest growing metropolises in the country.

Economic features and key activities

Bordeaux metropolis has benefited from intense (re)development over the past 15 years.

The city has undergone a spectacular urban and economic metamorphosis, which included major structural projects. The city's first urban planning project, launched in 1995, laid the foundations for a true European metropolis.

Bordeaux has undergone major changes while retaining its distinctive character. It is the largest urban ensemble ever to be distinguished by UNESCO, and yet it is anything but an archaic

city. Often referred to as the wine capital of the world, Bordeaux boasts a singular vitality, even boldness, owing to its openness to foreigners. This, along with its lively approach to its heritage, makes Bordeaux one of the most active urban labs in France.

Thanks to the vitality of its regional excellence sectors and globally recognised clusters; to the renowned fertility of its research and higher education centre (more than 80,000 students); and to its strong presence in innovative industries and high added value markets, Bordeaux has never lost its spirit of adventure. Collectively, these have converted a sea and river-based city into an open and thriving place. The city has become a point of reference for the aircraft industries, and in the fields of laser and atomic research, math, science, and wine making. It is also renowned for its emerging clusters, such as wood treatment, video games, and e-health.

These successes are the result of the implementation of an integrated approach: the city has combined its sustainable urban development plan with a plan for social inclusion and a strong digital agenda. The related commitments are clearly identified in the Green Digital Charter, which Bordeaux signed in 2013. Bordeaux's results have also been recognised with numerous distinctions, such as:



- UNESCO World Heritage site since 2007
- Cit'ergie (French counterpart of the European Energy Award) in 2013
- Best European Destination 2015 and Lonely Planet top ten destination
- World's best city to visit by Lonely Planet

As a leader in green job creation in France, Bordeaux pays anticipatory attention to sustainable development issues, and strives to make cultural pluralism the cornerstone of social cohesion. The city believes that lifestyle and progress are, indeed, inseparable.

In October 2015, Bordeaux hosted the 22nd World Congress on Intelligent Transport Systems (ITS) that was dedicated to innovative solution to achieve sustainable mobility.

2.

GENERAL SMART CITY VISION AND AMBITION

The approach the city has taken to become smarter, whether it has a smart city strategy or not, which are the general priority areas in the city and which are specific to the Sharing Cities programme.

SMART CITY STRATEGY/APPROACH

While Bordeaux has yet to develop a smart city strategy, since 1995 it has undertaken several long-term restructuring projects aimed at building a smart and sustainable city. Since 2016, however, the city has been undergoing some administrative changes that are giving more powers to the metropolis and mutualising services of the city and the metropolis. Those changes, imposed by French law, have hindered the development of an aggregated common smart city strategy for the metropolis. During his last speech introducing the Bordeaux Smart City event, Alain Turby, vice president in charge of digital for Bordeaux metropolis offered to define the first steps of our smart city strategy as hereunder: A comprehensive Smart City policy. Smart cities are, of course, dependent on highly efficient infrastructures, be it for transportation purposes, energy and water management, or the deployment of vast smart grids of sensors capable of optimising the overall operation of an urban area.

From these essential foundations, a second stage is nowadays emerging. Bordeaux is a frontrunner in this second stage of Smart City creation. The city is aware that the expansion of technological infrastructures alone will not tackle contemporaneous issues. That is why the city promotes a citizen-centric smart city that enhances innovation and participation, creates new modes of local governance and invests in human capital, education and culture.

A collaborative approach at the territorial level

Because digital technology is a powerful incentive for sharing and scaling up, Bordeaux metropolitan area is currently working with its 28 constituent municipalities to establish a new institutional framework and modes of public action that can be pooled in several sectors. This requires the development of a strategic agenda for prioritising, gradually introducing and measuring our key actions to develop a digital and open metropolis.

This agenda is already giving rise to numerous pivotal projects on a variety of topics such as the rapid development of new forms of mobility and the quest for major innovations to ease the congestion of transportation routes that go beyond the extension of existing infrastructure. The city is also investing time and passion into a wide array of projects:

Development of social entrepreneurship and social innovation, such as the Darwin project, a renovated place that hosts an innovative ecosystem combining social entrepreneurship, sustainable development, sport, neighbourhood mediation and digital economy. It will soon host an incubator for social solidarity economy based projects.

Education is major long-term challenge for economic growth but also for the harmony and human potential of the open city. The Bordeaux metropolitan area is pushing the envelope to develop this key issue through its powerful partnership with the French national education system on digital technology in primary schools.

The city must also emphasise the importance of the creation of new neighbourhoods that strike a balance between social diversity, economic efficiency and low energy consumption. This refers to some projects, in particular the Euratlantique project, the Bassins à Flot neighbourhood and the Bastide-Niel area.

Service interoperability – a key factor for large-scale rollout

Service interoperability is one of the key factors and is without doubt the catalyst for the eagerly awaited transition to the industrial phase.

Since 2012, Bordeaux has been involved in many European calls for projects and working groups dealing with smart city standardisation issues.

This has allowed the creation of a partnership ecosystem and the emergence of several actions in which Bordeaux is involved with standardisation bodies such as ETSI, ATTM SDMC, and also with the EUROCITIES association.



Priority areas

In general:

- Citizen engagement
- Sustainable energy management system (SEMS)
- Building retrofit
- Shared e-mobility
- Smart lamp posts
- Urban sharing platform
- Mobility policy more in general or other emerging issues relevant for Sharing Cities

Within Sharing Cities

- The involvement of citizens for setting up a congestion charge scheme in Milan
- Retrofitting and new construction of disadvantaged neighbourhoods in Lisbon. Retrofitting of buildings in Porta Romana (Milan), involving private condominium
- Big scale deployment of charging stations for electric vehicles in Lisbon
- Lisbon's climate and innovation agency (LISBOA E-NOVA), an example of good governance and useful for getting European funding
- The methodology developed by London to be ready for the implementation of the General Data Protection Regulation (GDPR)
- The digital modelling developed by Transport for London
- The congestion charge set up in Milan

LATEST SMART CITY RELATED ACTIONS AND OTHER PROJECTS



Sustainable Energy Management System (SEMS)

Since 2008 the city of Bordeaux has been involved in a plan for the reduction of water, gas and electricity consumption of buildings. A climate plan was voted on in 2008 by the city representatives, committing the city to a reduction of 38% of electricity and gas consumption during the period 2008-2014. This initial plan was reviewed in 2012 for the period 2013-2016, including new objectives. The plan was divided into 3 types of actions:

- Action 1: building retrofitting activities and construction of energy-plus buildings. €12 million was invested in this during the period 2008-2014.
- Action 2: improvement of energy efficiency of technical installations – develop new renewable energy (looking at geothermal energy). An Energy Savings Performance market was established for the period 2008-2013, with 250 different buildings classified by types (schools, administration, sport, culture etc.). During the period, a €19 million contract was signed, including €2.5 million dedicated to the improvement of heating, ventilation and air conditioning installations. In 2011, a supervision scheme for buildings was launched and today there are 110 buildings connected to it.

- Action 3: changing citizens' mindset and adapting organisations: creation of an 'Energy Academy': a network of people working on energy savings in public buildings. In 2017, 85 of those people were working in 85 buildings. The annual budget for this is €60,000.

At the end of 2016, the reduction of energy consumption was about 36.1% compared to the 2007 level of consumption, approximately 33GWh of electricity and gas.



NICE project and the Green Digital Charter

The Networking Intelligent Cities for Energy Efficiency (NICE) project is coordinated by EUROCITIES. Its aim is to provide support (technical training, study visits) and tools (GDC toolkit) to the Green Digital Charter signatories. The mayor of Bordeaux signed the GDC in March 2013.

ZAC Quartier St Jean Belcier (EPA)

Bordeaux Metropolis participates in the development of Saint Jean Belcier district as part of an operation of national interest (OIN), in partnership with the Public Development Agency, which is in charge of the project. The EPA will contribute to "the creation of a sustainable development model, consistent with our climate and our way of life," and will evaluate "energy smart grids at a district scale".



Building retrofit



60% of Bordeaux's 350,000 dwellings were built before the first law establishing rules for heating and need a deep energy retrofit. In order to retrofit all those buildings, 9,000 dwellings per year should undertake an energy retrofit process for 40 years.

The city has initiated many policies to reach the objectives, with actions aiming at raising awareness and bring support to energy building retrofitting:

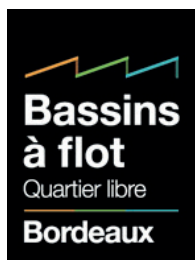
- Aerial thermography in 2007, updated in 2017
- The challenge 'Familles à Energie positive' organised for the second time in the city
- Financial support to 7 'Energy-info advisors' in the metropolitan area. The city is financially supporting an NGO which employs those advisors.
- Invested €4 million into several projects aiming at energy retrofitting of buildings

However, despite all the actions taken by the municipality in recent years, only 1,860 dwellings per year are retrofitted. This result is falling short of the initial and necessary objective to be an energy positive city by 2050. The actions must be brought to another scale to raise awareness (therefore have more demand) and increase the quantity and quality of buildings energy retrofitting.

It was noted that additional efforts in communication are needed, in order to raise awareness and ensure citizens and/or companies seize the opportunities offered. For instance, the Energy-info advisors are under occupied in some parts of the city. To raise awareness, the city started a partnership with La Poste (the postal service company) in March and April 2017. It has put in contact around 1,000 households with the Energy-info advisors of the metropolitan area. The postmen scheduled appointments during their tour so people could have more information on the possibilities offered by retrofitting work in their dwellings.

In partnership with other organisations (ADEME: Agency for Environment and Energy Management and ALEC: Local Agency for Energy and Climate), Bordeaux has initiated the co-construction and implementation of a platform for energy retrofitting of private buildings called 'Ma Rénov Bordeaux Métropole'. It gathers several stakeholders such as professional organisations and the Chamber of Jobs and Handicrafts, to boost the ecosystem of local actors working for retrofitting and buildings. This platform has its own website (launched on 24 January 2017) which is a tool open to all relevant stakeholders. The website is designed in a way to guide each household through the process to undertake and encourage users to aim at ambitious retrofitting work. Among others it:

- Facilitates the understanding (of tenants, landlords or lessors) of the steps to follow for all retrofitting projects and/or installation of renewable energy sources
- Provides access to households to adapted functionalities tailored to their needs (energy consumption diagnostic, simulator of financial help, videos sharing experience of other people, map of retrofitting projects already started in the city...)
- Facilitates the connexion between citizens and trustworthy and competent professionals
- Offers free and independent advice from energy experts to households and to companies
- Since it was launched in January 2017 and the first communication efforts, the platform has already seen the registration of 61 condominiums and 142 households living in individual houses.



Bassins à flot

By refurbishing old urban wastelands, the metropolis and its partners want to develop a mixed neighbourhood that simultaneously serves residential, economic, and recreational purposes. This new district will provide public facilities, including an ultra-high-speed broadband network. The ambition is “to promote the development of ultra-high-speed broadband telecommunications networks. This is meant to enhance habitat, quality of the neighbourhoods, and provide support for a digital ecosystem”.

Campus numérique (Digital Campus)



A major operation launched in 2008 to renovate and revitalise 260 hectares of university sites in and around Bordeaux. In the long run, 80,000 students will work together with companies and laboratories on digital innovation projects.

Shared e-mobility.

MOBiNET

MOBiNET is co-funded by the European Commission under the 7th RTD Framework Programme. It is “the Internet of (Transport and) Mobility”, an Internet based network linking travellers, transport users, transport system operators, service providers, content providers and transport infrastructure. It connects users (people, businesses, objects) with suppliers (operators, providers, systems), and brokers (or helps to broker their interactions). At its core is a platform providing tools and utilities to enable those interactions, with components both for users and for suppliers. The MOBiNET platform is a place to meet and exchange or buy location and time-dependent transport and mobility services.

CO-GISTICS

CO-GISTICS, a 7th RTD Framework Programme project, is the first European project fully dedicated to the deployment of cooperative intelligent transport systems (C-ITS) applied to logistics. CO-GISTICS services will be deployed in 7 logistics hubs including Bordeaux. With 33 partners including public authorities, fleet operators, trucks, freight forwarders, terminal operators and logistics providers, the CO-GISTICS consortium will install services on at least 325 vehicles. The Bordeaux pilot site will deploy Multimodal cargo, CO₂ estimation and monitoring, and speed advice.

Villes respirables en 5 ans (Breathable cities within five years)

In 2015, Bordeaux Metropolis was selected as one of the 20 cities for the government’s ‘Breathable cities within five years’ project. This programme aims to develop ambitious actions for an improvement of air quality. It includes four actions:



- creation of a restricted traffic zone
- development of electric mobility
- development of car pooling
- drafting of an air quality monitoring strategy

This project, coupled with a global mobility strategy, will enable the city to reduce greenhouse gas emissions and reach the targets set in its climate plan and environmental protection plan. The comprehensive mobility strategy of Bordeaux metropolis has several focuses: (presentation available)

- Focus 1: Make public transport networks more efficient
- Focus 2: Develop an ambitious policy for optimising car use (ridesharing, car sharing, e-vehicles)
- Focus 3: Establish a coherent parking policy, in liaison with the different municipalities
- Focus 4: Use soft transport modes to their full potential (cycle plan and a pedestrian plan)
- Focus 5: Facilitate the use of transport services for all citizens

Public transport

Bordeaux Metropolis has committed to developing a green public transport network, which would include: three tramway lines (58 km), with a fourth line to be added in 2019 (this 77km line will be the longest in France). By now, an 80-line bus network, with 71% of the vehicles powered by natural gas, 8% hybrid diesel/electric buses, and 1% electric buses. Five electric shuttles are already used in the historic town centre, along with two electric river shuttles. Bordeaux Metropolis is also exemplary with regard to its fleet and with 104 electric light vehicles is amongst the best equipped cities or metropolises in France. The metropolis is currently developing a low emission zone project concerning the historical centre of the city. A call for tenders has been launched so the project can start at the beginning of 2018.



Smart lamp posts



LITES

The main objective of the LITES project is to demonstrate in real life circumstances that intelligent street lighting using LED based solid state lighting can drastically reduce energy consumption. This lighting method is compliant with road classes CE2-CE5, S- and A-, according to the EN 13201 standard. Our devices can be used as secondary street lights, and can also be installed in commercial lots, pedestrian zones, or cycle tracks. They are compliant with all relevant electrical safety standards. The core element of the solution is the dimming of the lamp depending on the environment: a set of embedded sensors measures ambient light, temperature, and current, and it also detects motion. The data collected from the sensors is then processed by an embedded intelligent system, which enables the optimal regulation of light intensity levels. The partners involved in the standardisation and the entire value-chain of the project are all convinced of the prosperous future of this technology, which promises to reduce energy needs by up to 70%; provide environmental and economic benefits; and increase the level of traffic safety and comfort for end-users.

Following one year of experimentation, the objectives have been achieved: the project has developed a lighting fixture that houses the LED array, the embedded intelligent system, and the sensors. Each pilot site has been equipped with a set of lights. In order to generate demand for intelligent street lighting systems, the results of the LITES project have been presented in conferences, fairs, scientific and non-scientific magazines, as well as on websites and in video presentations.

Other



CITYkeys

This Horizon 2020 project aims to develop and validate, with the aid of cities, key performance indicators and data collection procedures for common and transparent monitoring as well as the comparability of smart city solutions across European cities.

French Tech label

Bordeaux Metropolis was awarded the French Tech label on 12 November 2014. This development intends to integrate an ultra-high-speed component which Bordeaux Metropolis and Euratlantique particularly care about for the Digital City.

Cité numérique (Digital City)

Adopted in 2013, the Cité numérique has set as goal of becoming an economic, cultural and societal lighthouse project. It is to be achieved through focusing on digitalisation and harnessing local productivity. From 1 January 2018, 1,200 people will be welcomed on a total surface area of 25,000 m². In this building, Bordeaux Metropolis will also develop, with its own funds, 2,500 m² specifically dedicated to innovation and user interface/user experience (UX / UI), including the activation and management of those premises and a 100 m² show room for start-ups.



NATIONAL AND EUROPEAN FRAMEWORK

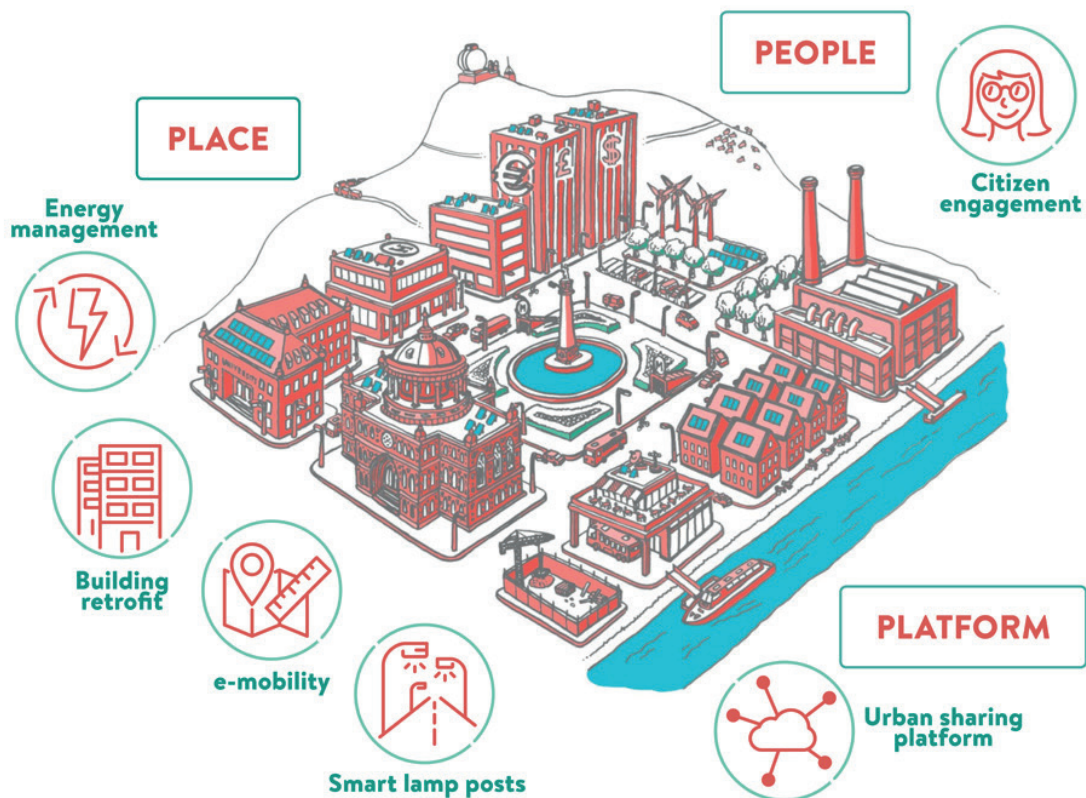
Energy, mobility, integration of infrastructures and ICT are key priorities at European level, addressed in strategies (Europe 2020, Digital single market strategy, European strategy for low emission mobility etc.), directives and other legislative measures binding for EU member states. At the same time cities are key actors in delivering and implementing innovative and integrated smart city solutions for energy efficiency, a low carbon society and in general for the transition to a sustainable economy and society of growth. The city of Bordeaux is putting in a lot of effort to be part of those objectives and be a city at the forefront of new technologies developments. The city of Bordeaux plays a really active role in EUROCITIES Knowledge Society forum, where it chairs a working group focusing on standards and interoperability, in which it shares with and benefits from other cities' experience.

The city of Bordeaux also signed the Green Digital Charter, a declaration committing cities to working together to deliver on the EU climate objectives through the use of Information and Communication Technologies (ICT). By signing this charter, the city committed to decreasing the direct carbon footprint of the ICT sector by 30% within ten years.

The city is also looking at National ADVENIR programme to support the development of charging infrastructure for electric vehicles.

3.

SHARING CITIES SMART CITY SOLUTIONS AND MEASURES



Within the Sharing Cities programme several smart city solutions are being developed.

For each measure there is a description about how the city has prioritised it, what kind of related challenges had been identified and other relevant information.



CITIZEN ENGAGEMENT

This measure envisages citizen focused activities, in particular user research, citizen engagement, the development and implementation of a Digital Social Market which will incentivise the uptake of services and behavioural change via incentive mechanisms and the development of a service layer.

Strategic approach towards becoming a smart city

The city of Bordeaux has developed an application for its citizens called 'Bordeaux ma Ville en poche' (Bordeaux my city in my pocket), an e-democracy tool according to its mayor. This app was created with a User Experience – User Interface (UX-UI) methodology, with a sample group of approximately 40 users having access to the service and constantly improving it. 'Bordeaux Ma Ville en poche' offers information to citizens about all services available in their neighbourhood (public services, parking, sport facilities, market hours, swimming pools, museums etc.) and allow residents to report problems to their local council so they can intervene quickly to fix them. The app also offers to citizens the ability to directly address their local elected representatives. Bordeaux was the first French city to propose such an app at a neighbourhood level, giving information to citizens based on where they live or where they are in the city.

At the end of September 2016, approximately 7,000 people had downloaded the app.

Regarding energy efficiency, Bordeaux Metropolis is taking part in the challenge 'Familles à Energie positive'. The city challenges its citizens to save at least 8% energy in four months compared to the previous year. Groups of five to ten families represent their neighbourhood and compete with each other. They are advised by energy experts who explain how to save energy in an easy way by changing their daily habits without any discomfort. In 2016, 178 families in Bordeaux Metropolis participated, saving on average 10% energy and 20% water, representing approximately €200 saving for each of them.

This challenge is supported by the European Union thanks to the project Energy Neighbourhood.



BUILDING RETROFIT

This measure aims to apply deep-retrofit measures to public and private residential properties affecting 15,000 citizens across the six cities and integrating the properties with low carbon energy sources (solar PV, water source heat pump) and electric vehicle charging, all wrapped together by a digital first digitally driven sustainable energy management systems wrapping it all together.

Information about priority area

Bordeaux Metropolis defined a 2016-2017 action plan to boost private initiatives on this topic and actions already under way in priority areas: Metropolitan Objectives for Ambitious Renovation.

The territory has more than 350,000 dwellings, nearly 60% of which were built before the first Thermal Regulation (RT 1974) and require a complete renovation (physical infrastructure, ventilation units and energy production). According to the Plan Climat Energie Territorial 2011, energy retrofits of 9,000 houses/year are to be planned for 40 years (including 3,000 dwellings assisted per year).

To achieve this objective, Bordeaux Metropolis has been involved for many years in raising awareness and financial support for energy renovation:

- Aerial Thermography in 2007 and updated in 2017;
- ‘Positive Energy Family’ challenge (metropolitan system for the 2nd consecutive year);
- Financial support for the 7 ‘Info-Energy Advisers’ positions in the territory;
- Envelope of €4 million devoted to the renovation of condominiums under the ‘Eco-Cities’ programme of the Investment Program of the Future (PIA), carried out by the Caisse des Dépôts et Consignations; added ‘Plan Climat’ to the energy renovation of individual houses and condominiums; ongoing programmes such as OPAH RU, PIG or SLIME by operators mandated by Bordeaux Metropolis, etc.).

Bureau’s memorandum of 11 February 2016 set the ambitious target for a ‘positive energy metropolis by 2050’ and the balance sheet of the cumulative actions listed above brings us to 1,860 units renovated per year. This result, which is still too far from the target, imposes a change of scale in order to sensitize households (and thus stimulate demand), to increase quantitatively and to optimise qualitatively the

energy renovation of buildings in the territory by offering clients technical solutions and financial resources. This requires the use of new levers and the development of tools complementary to those already mobilised.

First stage: Ma Rénov Bordeaux Métropole to stimulate household demand

Thanks to the financial support of ADEME and in partnership with the ALEC, Bordeaux Metropolis has started the co-construction and running of the platform for the renovation of energy for private housing entitled Ma Rénov Bordeaux Métropole. Together with the professional organisations and the Chamber of Arts and Crafts, it is a question of energising the ecosystem of the local renovation and building actors and bringing together all the conditions likely to favour the transition to the action of the owners in their renovation works. As the cornerstone of the platform, the website (deployed on 24 January 2017 on the occasion of the European Energy Transition Conference) is the operational and facilitating tool for all actors in the renovation projects of the habitat. It is designed to guide the household at each stage of its project and aims to encourage users to engage in ambitious renovations by:

- Facilitating the steps taken by individuals (tenants, homeowners or landlords) in all stages of their renovation and / or installation of renewable energy projects;
- Allowing households to benefit from functionalities adapted to their needs (simplified energy diagnosis of their housing, simulator of financial aid, video testimonials, maps of renovation projects carried out in the metropolitan area, etc.);
- Encouraging contacts with trusted and quality professionals;
- Bringing the free and independent services of renovation advisors to households and professionals of the project management, to companies and craftsmen working in the territory of Bordeaux Metropolis.

Since its launch at the end of January and the first waves of communication that followed, the 'Ma Rénov Bordeaux Métropolis platform has already got 61 condominiums and 142 households in single-family homes.

Second step: a metropolitan operator to offer adapted technical and financial solutions.

The third-party financing mechanism consists of financing all or part of an energy renovation of a building by a third party who conducts, directly or indirectly (in co and / or subcontracting) the whole operation: design of the works, completion, financial planning and monitoring of energy performance post-works. Following completion, the customer pays the third party financing company 'rent' (a 'third party financing charge') the amount of which is lower, equal to or slightly higher than the energy savings resulting from the renovation. At the end of the contract, the energy savings are to the benefit of the customer.

In addition, improving the energy performance of the building could be guaranteed contractually by an Energy Performance Contract (EPC).

Strategic approach towards becoming a smart city

Added to the lack of awareness of the benefits of building retrofitting, it is often considered an expensive, long and complex procedure. Thus, the city is currently setting up a third-party investment scheme. With this scheme, the investment into the building would not be carried out by the home owner but by a third-party investor. The home owner would not take on a debt but would pay a service fee to the investor, which is usually affordable thanks to the savings brought by more efficient energy consumption. Like a few other regions in France, Bordeaux Metropolis is working on having its own third-party investment operator. This would:

- Offer a complete service (audit, planning and realisation of the construction works, follow-up, a guarantee of energy efficiency)
- Mobilise and ensure financial resources with future energy savings
- Accompany and advise the owner/builder on a tailored funding plan
- Release the owner/builder from the usual financial provision to be advanced, and/or complete with available subsidies

Key stakeholders

ADEME: Agency for Environment and Energy Management

ALEC: Local Agency for Energy and Climate

NB: this company will not be allowed to propose in its services the selling of energy, it will have to focus exclusively on energy savings.

In July 2017, the metropolitan council voted in favour of the creation of this third-party investment company for energy transition, called Bordeaux Metropolis Energies (BME). This will be a public-private company in which public authorities will have the majority of shares. It should be operational in the first part of 2018 and will be complementary to Bordeaux Metropolis' initiatives to provide complete support to citizens for their energy retrofitting works.



MOBILITY

The mobility measures include:

- e-car share: delivering bold ambitions in districts consistent with growing city-wide ambitions for real scale reduction in traditional car ownership and use; learning from different city contexts – user behaviour/ownership and commercial offers from suppliers: and to support EU-wide relevant market take-up of EVs through sharing business models and the clean power for transport package.
- e-bikes: building on existing human power bike sharing schemes with introduction of e-bikes, to support shift from cars and other modes to e-bikes for those longer journeys, senior citizens, mobility impaired; integrate with EV car sharing services and charging points and local renewable energy generation.
- e-vehicles charge: installing a network of EV charge points, and integrate infrastructure with the other place-based measure and the urban shared platform: building retrofit; solar PV; humble but smart lamp posts; sustainable energy management system; to enable shift to e-mobility and achieve an advanced level of ‘digital first’ and ‘infrastructure next’ integration.
- Smart parking: implementing smart parking technologies, including evaluation of sensor type implementation (potentially different sensor types and business models), testing and capture of operational experience to incentivise e-mobility.
- e-logistics: countering the growth in conventional (particularly diesel) freight delivery vans caused by growth in on-line commerce, local deliveries and small businesses through implementing electric logistics to prove the business cases for new ways of urban logistics, and package learning for EU cities replication.

Strategic approach towards becoming a smart city

E-car sharing

A private operator, Bolloré, launched the Bluecub in 2014, the first full electric and open-access car sharing service in Bordeaux. The city delivers a temporary authorisation to occupy the territory to the

provider and provides energy for free. Today, Bluecub has over 70 stations in Bordeaux, Arcachon, and nine surrounding municipalities. It has a fleet of around 200 self-service electric cars and 250 charging stations. Under a partnership agreement with car manufacturer Renault, Bluecub also offers around 20 Twizys (compact urban EVs) for rent. Bluecub's objective is to operate 80 stations. Since 2014, 3,300 people have registered on the e-car sharing system. Users drive these e-vehicles for 30 minutes on average, mainly in Bordeaux (72%). Other car sharing services (Citiz and Koolicar) are also available, but they operate a non-electric fleet.

E-bike sharing

VCub, Bordeaux's bike sharing service, owned and managed by Keolis, has 174 stations and more than 1,800 bikes. It does not offer e-bikes, since such a service was deemed too expensive during the talks on the public service delegation contract (the contract following the public tender process, between Bordeaux and the company operating the public transport network on behalf of Bordeaux Metropolis). A new public tender is launched every 10 years to appoint a new delegate.

Since electric bikes are expensive, in 2012 Bordeaux Metropolis introduced subsidies for inhabitants or people working for a company whose headquarters are located in the metropolis who decide to buy one (up to 25% of the purchase price, financial resources permitting, with a limit of €300 for a standard e-bike and €600 for a cargo e-bike). Since 2017, this scheme has been extended to employees of companies, local authorities, and associations. Nearly 1,700 have benefited from this scheme since its launch (315 between January and April 2017). From February 2017 to the end of January 2018, the French government gives a 20% subsidy (up to €200) to help the purchase of a bike. Although these subsidies are not cumulative.

Bordeaux Metropolis also plans to launch an e-bike rental service in its *Maison du Vélo* (Bike Centre). Standard bikes, cargo bikes, and foldable bikes.

Smart parking

As part of the ALIENOR II programme, public transport information in real time (lines, timetables), as well as carpool parking spaces and park and ride availabilities will be displayed on panels located on the ring road. Real time information about the availability of parking spaces in P+R and Parcub car parks in the vicinity is also provided in different locations. Several mobile phone applications also exist, such as parking-facile.com. This app enables drivers to geo-locate 500 parking spaces in 24 locations. It also informs users about transfer options to the public transport network. Since September 2014, Keolis Bordeaux has been using Qucit's BikePredict API, which predicts VCub bike availability using open data. Qucit's Citypark application is being tested in Bordeaux. This app will estimate the time required to find on-street parking near the driver's destination. It will also show the number of spots available in parking lots best adapted to the pre-set criteria: price, distance, and search time. Those smart parking apps have been developed by start-ups. Some of those start-ups, such as Qucit's, have benefited from an incubation process organised by the city of Bordeaux. Qucit's is today a 70% publicly held company.

E-vehicle charging

Bordeaux Metropolis decided in 2015 to develop e-vehicle charging stations, there are now:

- 30 fast charging points and 24 slow charging points at BM's offices or technical services
- ten public fast charging points: nine in Bordeaux (IKEA and Auchan), and one in Bouliac (Auchan)
- public car parks: 12 in Bordeaux, one in Mérignac, and one in Pessac
- Six 'park and ride' lots (parking lots with public transport connection heading to the city centre)
- near town halls or technical services: 14 charging points, and two fast charging points

Organisational structure

The Mobility department is responsible for defining and implementing the e-mobility strategy, and is also in charge of the 'breathable cities' project. It is supported by the department for Energy, Ecology and Sustainable Development, which manages and maintains the charging points.

Key stakeholders

Bolloré group (operating car sharing services)

Bordeaux Metropolis subsidises the purchase of charging points (12.5% or 25%, in addition to government aid) by small businesses, companies and public institutions. It aims to extend the network of charging points to facilitate the use of electric vehicles.

E-logistics

Bordeaux Metropolis, in partnership with the Chamber of Commerce and Industry (CCI), encourages and supports private initiatives, such as Triporteurs Bordelais. This initiative gathers goods in an urban logistics hub, from which the 'last kilometre' delivery in the restricted traffic zone is accomplished by electric cargo-bikes.

Bordeaux Metropolis' fleet

- 104 light electric vehicles (950 vehicles total)
- 87 electric vans (parks and gardens)
- 31 e-bikes, three e-tricycles and eight electric scooters

There are not any subsidies or financial incentives provided but Bordeaux Metropolis and the Chamber of Commerce organise workshops and conferences to share experience and put businesses in touch. They also promote and advertise the actions, for instance allowing businesses to present in conferences or display advertising panels. Bordeaux Metropolis can also grant derogations to standard rules to allow experimentation such as night time delivery.

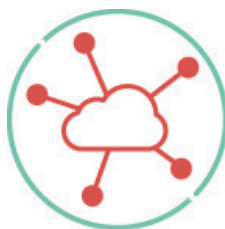


SMART LAMP POSTS

Smart lamp post presents a very visible ‘quick win’ for smart cities; and the well-proven lighting and maintenance savings offer an attractive bankable initiative. The smart approach is to consider how to develop business models and funding mechanisms that incentivise implementation of ‘smart’ measures (WiFi, air quality, parking, EV charging, etc) alongside lighting exploiting what is typically a considerable network of existing assets – in other words to multi-purpose the ‘humble’ lamp post.

Strategic approach towards becoming a smart city

The city of Bordeaux is involved in the LITES project to demonstrate in real life that intelligent street lighting using solid-state LEDs drastically reduces energy consumption. All lighting services are compliant with adequate classes so that the devices can be installed in secondary streets, commercial access, allotments, pedestrian paths and cycle tracks. The core element of the solution is the dimming of the lamp depending on the environment; a set of embedded sensors to measure ambient light, temperature, current, and detect motion. All the output data from the sensors can be then processed by the embedded intelligence enabling an optimum regulation of light intensity levels. The partners that cover the standardisation and the entire value-chain of the project are all convinced about the prosperous future for this technology and its value for the city; its significant energy saving potential up to 70%, environmental and economic benefits and the increased level of traffic safety and comfort for the end-users. This idea has proved to be right after only one year of experimentation: the objectives have been achieved by the development of a street light specially designed to house the LED array, the embedded intelligence and sensors. The ecology, energy and sustainable development department has launched an e-tender in order to deploy 150 smart lamp posts in a specific area. The lamp posts should be deployed during the first quarter of 2018.



URBAN SHARING PLATFORM (USP)

An Urban Sharing Platform (USP) is a logical collection of technical components, capabilities and processes which provides functions and services that enable a smart city. Its purpose is to aggregate data and control functions from a wide variety of devices and sensors, store, process, correlate the data and present information to the city and citizens which enables better use of the city resources and may provide support for innovative service verticals.

Strategic approach towards becoming a smart city

At the end of 2016 Bordeaux Metropolis launched a study on the urban data platform, which was completed in June 2017. Led by the company Micropole, the study laid the foundations for a strategy to collect, store, value and share the data from the metropolis. It was noticed that there is a huge amount of data available but the current structure in place doesn't make it possible to seize the potential that could be reached to enhance the sustainability of the city. Data from businesses, social media and sensors, and from partners and delegates is currently stored but possibly duplicated in silos.

The objective is to set up infrastructure and an organisation to store and distribute all the data. It would gather all data produced internally by the Metropolis' departments or externally by municipalities, delegates, partners or service providers. The data could be structured or unstructured, with various formats. Data would come from applications, sensors and other connected objects. Collecting this data would make it possible to aggregate it and then later share it with relevant actors.

This new way of collecting and organising data could bring better use for prediction, decision, new applications and the diffusion of open data.

The three pillars for its success are:

- Good governance with a cross-cutting approach, avoiding working in silos
- Sovereignty for a better control of data
- A support for more citizen participation

How was the study organised?

The first step consisted in an extensive collection of information from business and IT services to get information on what the data is, where it is, and what could be done with it. This step was carried out through eight workshops. Each workshop was related to a specific business' main area (e.g. energy,

mobility etc.) and for each workshop business representatives and IT project managers were invited to have an extensive discussion of the data and business needs.

Micropole then undertook the task of analysing the collected information in order to come up with a logical architecture and schedule the next steps to succeed.

After collecting the business's needs, it was possible to identify their different uses, which were classified into 3 main families:

- reproduce & analyse a data set
- forecast & predict a data set
- understand & model a data set

Based on the results of the study, Micropole proposed a possible scheme.

Structured and unstructured data from all internal and external sources (e.g. transactional data, reference data, geographical data etc.) could be collected and go through a batch processing mode in real time. This would allow the storage of all the available data in a data lake after it had been through several steps of processing, such as quality control and reconciliation. A data warehouse could then add an additional step for aggregation which would ensure the production of KPIs. Other data labs could also be set up to experiment with new data cross-checks or produce volatile indicators for specific topics. Data would be publicly available thanks to web services opening data platforms. The whole process would offer day-to-day statistics and more synthetic dashboards depending on business needs. (Include graphic of slide 6?)

The physical part of the scheme is currently being developed in Bordeaux Metropolis, although it is crucial that it goes hand in hand with a good governance model.

The governance model would be based on the important role of a chief data officer who would coordinate all the different flows of data and would work closely with the different departments of the city. The new GDPR regulation entering into force in May 2018 will oblige authorities to ensure consent and transparency during the whole process, so that citizens receive the information on what is done with their data. The person in charge of ensuring this will be the Data Protector Officer (DPO), who will replace the current person responsible for data privacy (Correspondant Informatique et Liberté). Data stewards will maintain and manage the analytical base, while a data custodian will guarantee the quality and reliability of the disseminated data. A data owner will be working closely with each department (e.g. mobility, energy etc.) responsible for their area of work and data related to it.

Putting in place a technical infrastructure will not be the most challenging part, although ensuring its functioning thanks to the deployment of an efficient organisation for a good flow of data might be a more demanding task.

Organisational structure

Bordeaux is involved in the European Innovation Partnership Smart Cities and Communities (EIP-SCC) for Urban data platform, in which the city can exchange valuable information on how to develop its own urban sharing platform. Bordeaux signed the MoU and is associated with 18 other European cities in the 'Demand side WG' of the partnership.

4.

GOVERNANCE

The internal organisation and modes of governance in relation to external stakeholders are essential parts of the cities' transition to becoming smarter. The Sharing Cities programme gives opportunity to the city to rethink the way of working. The cross-departmental (internal) and focus groups (with external stakeholders) are presented.

INTERNAL ORGANISATION, GOVERNANCE

Since 1 January 2016, Bordeaux metropolis has been an administration counting around 7,500 civil servants. The administrative organisation is based on 6 thematic general directorates (Mobility, Quality of life, Attractiveness, Finances, General administration and Digital) and one general cross cutting directorate in charge of territories. The smart city is mainly based on the following directorates: Mobility, Quality of life, Attractiveness and Digital.

Local governance: COPIL and COTECH

It was initially thought that the steering committee (COPIL) of the associated project, would only gather elected representatives from Bordeaux (the city being a partner of the European project, not the metropolis). It has, however, been proposed to have representatives of other departments from the metropolis: Alain Turby for the Digital Metropolis, Michel Labardin for the future means of mobility, and Brigitte Terraza for alternative mobility, soft mobility and car-sharing. The COPIL meets twice per year maximum.

The technical committee (COTECH), which relays the work carried out within the European project, ensuring the transmission of the experiments carried out in the project's leading cities, is composed of representatives of the following departments:

- DG for High quality of life (department for buildings, department for energy, ecology and sustainable development)
- DG for Digital and information systems
- DG for Mobility
- DG for Territorial development

The COTECH meets three to four times per year. It relies on the work of four thematic workings groups.



In order to fully involve the city in the project and derive more benefit from it, it has been decided that for each area there would be one representative:

- Jean-Michel DURAN for energy management systems
- Julien BERTHIER for energy retrofit of buildings
- Claire CARRE THIEBEAULD DE LA CROUEE for shared mobility
- Ghislain LUNEAU for smart lamp posts

They will represent Bordeaux in the different meetings organised within the project (peer learning visits, work shadowing visits etc.)

Bordeaux Metropolis also wishes to rely on the Sharing Cities programme to federate the various stakeholders in its territory and co-construct a vision and a concerted approach to the implementation of its smart city approach. Its objective is therefore to be accompanied in leading this consultation process, by a team with a good knowledge of local actors and initiatives, as well as experience in managing similar projects.

The planned mission is divided into three stages, starting from 2018. Each of these stages will be the subject of a preparatory meeting and a follow-up meeting where the project manager of Bordeaux Metropolis will be present and shown the relevant reports.

First step:

The aim at this stage will be to study and summarise the projects carried out by Sharing Cities consortium members, in particular those developed by London, Milan and Lisbon, the consortium's lighthouse cities. It will also include the achievements of other H2020 SCC1 consortia that validated the principle of an exchange of best practices programme last March.

**Second step:**

The relevant stakeholders identified to date were as follows:

- The public and parapublic authorities present in the territory of Bordeaux Metropolis
- The start-ups part of French Tech, based in Bordeaux
- Higher education and research institutions
- Suppliers of products and services related to energy, water, transport, telecommunications
- Construction companies or their local representative associations
- Local incubators and accelerators linked to the programme themes.

This list is not exhaustive and will be updated during the development of the project. The responsible team will have to identify the right people for each referenced entity and contact them to present the approach and organise the workshops.

Third step:

The workshops will be conducted on Sharing Cities' main themes, and selected with the stakeholders concerned, on the People, Place and Platform axes and according to the themes identified for each axis:

- People: citizen engagement
- Place: electric mobility, energy renovation of buildings, energy management systems, smart lamp posts
- Platform: Urban data platform

ANNEX 1 - FELLOW CITIES INTERESTS

The follower/ fellow cities participate very actively in Sharing Cities and give regular feedback regarding their interests. Their input is collected through an early identification of interests (before starting the peer learning visits), and is developed further based on the feedback received after the peer learning activities. Furthermore, this input builds on the experience fellow cities had in meetings co-organised with the technical implementation team of different measures (e.g. Milan, London, Bordeaux, Lisbon) over the last two years. This feedback serves as the basis for further needs analysis, planning of future activities and building of the replication roadmaps for each fellow city in year 2018 and 2019. Lisbon has also participated in the Milan peer learning and within the programme we ensure that exchange happens and replication opportunities are also shared across the six cities.



Citizen engagement

All follower/fellow cities have found citizen engagement practices of all three lighthouse cities interesting. Peer learning visits and events have given the opportunity to the experts to better understand what kind of challenges lighthouse cities meet when working with the citizens. Some of the key interests relate to the private building retrofitting experience of Milan and the participatory, co-design processes implemented both in Lisbon and Milan. All three fellow cities already have a good basis, they work closely with their citizens but it is useful to see more methods and learn what works and what does not and why.

Burgas

As the three lighthouse cities have good practices in involving citizens in different initiatives and furthermore in the decision-making process, Burgas is willing to get inspired from the experience of the partners, their methods and tools in engaging citizens.

Bordeaux

Involvement of citizens for setting up a congestion charge scheme in Milan:

Involving private condominiums in the building renovation process: Porta Romana (Milan). We need to include the private condominium representatives in the energy renovation process of their collective housing parks, in the context of energy and social precariousness.



Building retrofit

All follower/ fellow cities in Sharing Cities have indicated they are envisaging building retrofit activities, and are looking at what the lighthouse cities have already achieved. Bordeaux is particularly interested in the engagement of citizens for building retrofit, decentralising management to the inhabitants and increasing user awareness and maintenance of public facilities. Bordeaux is also looking at Milan's inclusion of union representatives in private condominiums in the energy renovation process of their collective housing parks, in order to fight energy waste and social precariousness.

The city of Warsaw is looking at the creation and development of large-scale retrofit programmes, including standardisation of solutions and large-scale procurement allowing for a reduction of costs. It is also interested in learning more about energy performance contracting, including detailed financial measures and contract provisions which don't put the municipality at risk. Before launching those projects, Warsaw is also identifying relevant energy audits to be conducted to ensure sound preparation of retrofitting projects.

The city of Burgas is particularly interested to learn about the different models for retrofit that are applied for private and public buildings. It would also be looking at the different kind of programmes, initiatives and partnerships that exist which combine deep-retrofit approaches with innovative and ICT-enabled building systems.

Burgas

What different models for retrofit are applied for private and public buildings? What kind of programmes, initiatives and partnerships exist combining deep-retrofit approaches with innovative and ICT-enabled building systems?

Bordeaux

Retrofitting and new construction of a disadvantaged neighbourhood in Lisbon:

- The constructive systems selected design and innovative way of planning and buildings
- The association of local economic sectors
- Decentralised management to the inhabitants, including user awareness and maintenance of public facilities.

Retrofitting of buildings in Porta Romana (Milan), involving private condominiums:

How to include the private condominium unions representatives in the energy renovation process of their collective housing parks, in a context of energy and social precariousness.

What is the most economical way to retrofit buildings; is it to insulate or rather add digital solutions in houses and replace boilers?

Warsaw

Creation and development of large-scale retrofit programmes. Including how many different aspects such as: standardisation of solutions/ large-scale procurement allowing for a reduction of costs. (e.g. when there are numerous buildings connected within the same areas and with similar technologies). Delivering projects via public-private partnerships.

Energy performance contracting (which arises from a number of challenges, such as detailed financial measures, contract provisions, safe guarding municipality in such proceedings). Scope of energy audits to be conducted which are needed to provide sound preparation of retrofitting projects. Challenges connected with using renewable energy sources installations during retrofits (like as to provide proper energy management solutions for retrofitted buildings).

How to include more than only the financial aspects in the building retrofit process? (social aspect, health costs savings)



Sustainable Energy Management System (SEMS)

Burgas

General presentation of existing SEMS – how has it been created, how does it operate; how exactly will it be enhanced and optimised within the framework of the project? Which stakeholders are involved? What kind of funding is foreseen? What is the concrete role of cities/municipalities within the whole SEMS?

Burgas and Warsaw are envisaging the development of a SEMS. Warsaw is taking inspiration from the lighthouse cities to create and develop a monitoring system for energy consumption in various categories of municipal buildings, and will conduct parallel research into the best tools to use and ensure the training of people to make the most of the new installations. As the city of Burgas is just starting its reflection, many questions still remain, such as: how the SEMS has been created, how it operates, what stakeholders are involved, and what the concrete role of cities/municipalities is within the whole SEMS.

Warsaw is looking at how to create and develop a monitoring system for energy consumption in various categories of municipal buildings. This question includes the issues of providing detailed energy certification for these buildings, automation of the process, and providing training for building users and managers.

Bordeaux

The city is looking at the SEMS whose deployment is in progress in the three lighthouse cities. Bordeaux is interested to understand how to involve the local eco system, and at which providers and stakeholders would be able to deploy an innovative energy management system in Bordeaux.

Bordeaux is looking at the SEMS deployment in the three lighthouse cities, as the city is interested to understand how to involve the local eco system, which would help to identify the providers and stakeholders that would be able to deploy such a management system in Bordeaux.

Warsaw

How to create and develop a monitoring system for energy consumption in various categories for municipal buildings. It includes both issues of providing detailed energy certification for these buildings, automation of the process (technical tools) or provide trainings for buildings users & managers.



e-mobility - e-vehicle sharing

Burgas

e-bikes

How are e-bike sharing systems functioning and what kind of models are applied for the optimisation of the network?

e-cars

How does it operate for the public and private sectors, what are the different business models that are implemented?

Bordeaux

e-bikes

The city is looking for an innovative business model in order to deploy e-bikes on a large scale.

e-cars

Many e-vehicle car sharing services are already available in Bordeaux. It would be interesting to compare associated KPIs with ones of the same services in development in the lighthouse cities.

How does Milan make people use the car-sharing schemes?

The three fellow cities are looking at ways to increase the amount of electric vehicles circulating, while at the same time reduce the amount of privately owned cars. This double objective can be fulfilled by the development of e-vehicle sharing schemes which are discussed in the project. All three cities are in a different status but would like to learn and maybe implement similar solutions to the digital islands/ mobility islands of Milan.

All three cities are looking at having electric cars and electric bikes. They have started the process but selecting the right business model based on the experience of the lighthouse cities will be very useful.

Bordeaux already has electric vehicle sharing schemes but would be interested to compare associated key performance indicators from services in other lighthouse cities, which would allow them to improve. In order to extend the use of those schemes, Bordeaux is also interested to know how the city of Milan made it accepted by citizens who now consider it as a good alternative for their trips.

The city of Burgas envisages setting up a sharing scheme for electric vehicles but is still investigating how it can be operated jointly by the public and the private sector, and the different business models that can be implemented.

The question related to business models is also one asked in Warsaw. In addition, the city of Warsaw would like to pay particular attention to the involvement of all relevant stakeholders in the process and to obtain a good forecast of the energy demand for a coherent deployment of charging stations. It also is also seeking information on how to ensure the electric vehicles schemes can co-exist with schemes using fossil-fuelled vehicles. This information is deemed particularly relevant to finding the right business model which will ensure the electric vehicle schemes can compete with regular car sharing schemes, or if they will need to receive additional incentives.

Warsaw**e-cars**

How to integrate e-vehicles car sharing systems and make sure those can co-exist with fossil-fuelled vehicles ones?

Business cases on e-car sharing. Especially when including their competitiveness compared to 'classic' car-sharing. It also covers the question as to whether e-car sharing shall receive additional incentives as opposed to current car-sharing schemes.

**e-mobility - e-vehicle charging**

Associated with the interest in the deployment of electric vehicle sharing schemes, follower cities are also investigating how to install a sufficient amount of charging stations throughout the city. Bordeaux is particularly interested in how Lisbon deployed charging stations on a large-scale with a standard business model for electric vehicles, offering an easy access to users. To be precise, it would look at how Lisbon made parking and charging free for electric cars, and the subscription

Burgas

How do electric vehicles public and private networks operate?

process and platform that enable this. It also seems relevant to observe where to install normal and fast loading charging points. Bordeaux is particularly interested in how Lisbon was able to successfully deploy electric vehicles charging stations.

Bordeaux

Interested in large scale deployment of charging stations for electric vehicles. Particular focus on free parking and charging points.

What is the system running the good functioning and use of the charging points? (cards, platform)

General information about implementation of smart charging procedures

The city of Warsaw is looking into innovative solutions to integrate the energy storage and charging points in the city, where there is limited room for new physical infrastructure. Warsaw is also interested to know about any alternative system that applies to professionals and delivery companies, which might have different needs than regular citizens using electric cars. The experience gathered by the three lighthouse cities on the cooperation they have developed with national administrators, energy providers and e-car sharing operators to install their charging points could clearly benefit the fellow cities for which these processes are new.

Warsaw

Collaboration with other actors such as national administrators, energy providers and e-car sharing operators.

Cooperation with other stakeholders, forecasting energy demand due to EU charging.

Possible solutions on decreasing burden put on the Grid by EU Charging Network (Energy Magazines next to Charging Points), proportions of quick and standard charging points in the city

Any specific regulation applying to professionals and logistic companies?

How to install energy storage units and charging points in city centres where room is scarce? How can they be integrated in the city centres?



e-mobility - smart parking

Burgas

How is the smart parking system connected to the other networks?

Bordeaux

How can private and innovative SMEs be involved in the smart parking deployment process?

Fellow cities are in general interested in existing solutions and Bordeaux is particularly interested in how the business models and how private companies and SMEs are involved in the smart parking deployment. Burgas has also expressed an interest in understanding better how smart parking is included in the networks and general strategy. The Warsaw national scale-up meeting has shown that there is also an interest in understanding how in Lisbon the parking company switched to a new model from being seen as the one who collects money for parking to a company which also reinvests that money. Communication has been seen as a key aspect for success and cities expressed interest in learning from good and bad experiences around this as well.



e-mobility - e-vehicle logistics

Bordeaux tries to foster the use of electric vehicles by logistic companies, its mobility department is therefore looking attentively at the developments in each lighthouse city, to analyse the pros

and cons of implementing such green delivery services. Burgas is particularly looking at how local deliveries and small businesses can be stimulated and encouraged to use electric means of transport for logistics. Warsaw is curious about the different schemes that can be

Bordeaux

Looking for innovative last mile delivery examples

Interested in e-vehicle logistics solutions and analysis on the pros and cons of implementing such green delivery services.

Burgas

How are local deliveries and small business stimulated to use electric logistics?

proposed to logistic companies and professionals using electric vehicles and their access to charging points.



Smart lamp posts

Burgas

Implementing smart lamp posts and reuse the experience of the lighthouse cities. Interested in demonstration of different services, functions and additional forms of value of the lamp posts; how collected data is used.

What can be done with the data collected? Who is using it and for what?

Bordeaux

Innovative business model like a public-private partnership for deployment at a large scale.

Most economical strategy: replacement or adaptation of existing lamp posts infrastructure?

Can smart lamp posts infrastructure offer new communication support for the cities?

The emergence of smart lamp posts and the multiple features they offer is certainly of interest for fellow cities which are carefully observing what the lighthouse cities have already done, in order to build on their successes and avoid the difficulties they might have been through already. While all cities have already planned to or effectively replaced infrastructure from several decades ago that consumes a lot more energy, they are now looking at different sorts of sensors and other features that can be installed. The experience from lighthouse cities is manifold and could help fellow cities that are looking at innovative business models that would allow a deployment of smart lamp posts at a larger scale. Bordeaux, for instance, is reflecting on whether to replace the infrastructure or adapt what already exists. It is also looking at the opportunity of new communication support offered by smart lamp posts.

Those same questions are also coming from Burgas, which is looking at the services, functions and additional forms of value offered by smart lamp posts. The multiple sensors that could be integrated into the new lamp posts will collect a large amount of data, thus the city of Burgas is already studying how this data can be used and by whom. Anticipating the use of data is of utmost importance to installing the right sensors which will be useful to the city.

Bordeaux and Burgas are also looking at replacing their lamp posts with more energy efficient lighting solutions. Bordeaux is particularly interested in Milan's process and how they were able to engage civil servants in the process.



Urban platforms

Burgas

Interested in demonstration of how an USP operates and functions.

The data management and urban sharing platform developments are providing interesting models for the follower/ fellow cities.

Bordeaux has conducted a needs analysis for common and shared urban data platforms to see if the proposal of the Sharing Cities Urban data platform will be able to fulfil those needs.

Bordeaux

Following the needs analysis of users, Bordeaux is looking at the common and shared urban data platforms to know if the proposal of the Sharing Cities Urban data platform will be able to fulfil those needs.

Can smart lamp posts infrastructure offer new communication support for the cities?



Additional interests

One of the key lessons learnt so far is that for replication the follower/ fellow cities need a lot of deep exchanges on general policy (e.g. mobility) governance, political leadership, business models, financing, ICT maturity, citizen engagement and understanding how the reality of the lighthouse cities corresponds to their own. Cities have their own ecosystem with external stakeholders and how those relationships are managed, what is the way to get the maximum out of those collaborations, and how to procure what is needed strategically are also key issues. The political, legal and financial and social dimensions are as important as the technological lessons. Due to this process being open

Bordeaux

Low emission zone

The congestion charge set up in Milan and the positive results in terms of air quality, reduced traffic and accidents, improved commercial speed and frequentation of CTs, but also in terms of public spaces (pedestrianisation) or productivity gains for deliveries.

Traffic management

Looking at the Transport for London 3D simulation model, the Sharing Cities partnership programme allows Bordeaux to benefit from an exchange of best practices on the simulation of traffic flows in dense urban areas.

Digital transition

In the framework of the new GDPR, European law, Greater London authority has launched a tender to accompany local authorities in order to respect the implementation dates (25 May 2018). The Sharing Cities partnership program allows us to benefit from the awareness of those experts and to contribute to this relevant working group.

Governance

The climate and innovation agency in Lisbon, Lisboa E-Nova and how it helps the city to identify priorities, how it is included the city's decision-making process, how it helps to implement smart city projects. Its role, structure is interesting to see if it can be replicated in Bordeaux.

to all that could matter for replication, cities came forward with further topics such as implementing a low emission zone (Milan- Bordeaux- Warsaw) , traffic management (London- Bordeaux), digital transition and privacy, data protection (London, Milan) and governance (Lisbon- Bordeaux).

Warsaw**Low emission zone**

What are the technical preconditions to implement the measure in a city?

Is there any legislative/regulatory framework that could help the implementation?

Are there additional success factor that could help?

What would be the approximate level of expenditure? Is this in line with the budget at your disposal?

What are the key people to involve in the implementation?

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BUILDING SMART CITIES TOGETHER

SHARINGCITIES

SMART CITY BASELINE REPORT BURGAS



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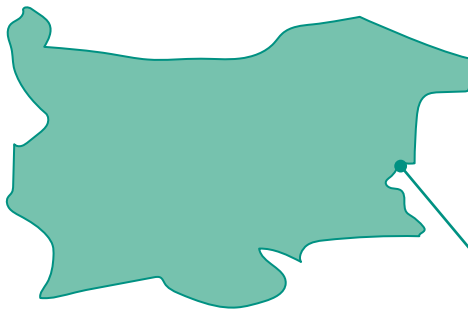
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1.

CITY CONTEXT



Inhabitants

municipality: 209,613

city: 204,618

Size (km²)

municipality: 559 km²

city: 218 km²



City size and role

Burgas is the fourth biggest city in Bulgaria, the administrative centre of Burgas municipality and the Burgas region, as well as the centre of the NUTS 2 South-Eastern Region. Burgas municipality consists of 14 settlements - one city (Burgas), one town (Balgarovo) and 12 villages.

Geography

The city is situated on a large bay on the Black Sea and this location determines its role as a major logistics point in the country. The city is part of the Orient/East-Med corridor of the Trans-European transport network, boasting good road and railway connectivity. Burgas International Airport is a distribution hub for international and domestic tourism; in combination with the four marine ports it provides excellent logistic connectivity of the municipal territory for commercial, economic, trade and tourist purposes. At the same time, more than 43% of the territory of the municipality is part of the ecological network NATURA 2000 as three wetlands are part of the city area. The area has exceptional biodiversity, especially of migrating birds.



Economic features and key activities

Burgas is an industrial city including the chemistry and oil-refining industry, food industry, electronic and machine building. There are 16,056 small and medium-sized enterprises (SMEs) and 27 large companies registered on the territory of the municipality. The location of the city determines its role as a major logistics point for sea, air, rail and road with important economic potential ensuring reliable interconnectivity of its territory. The city is taking advantage of these propitious conditions to develop its territory in a balanced way. It is preserving existing ecosystems without compromising the sustainable urbanisation and further improvement of its infrastructure, making itself smarter in order to achieve equitable economic growth and enhanced human well-being.

2.

GENERAL SMART CITY VISION AND AMBITION

The approach the city has taken to become smarter, whether it has a smart city strategy or not, which are the general priority areas in the city and which are specific to the Sharing Cities programme.

SMART CITY STRATEGY/APPROACH

Burgas municipality has not developed a smart city strategy per se so far.

During the last few years a ‘growing smarter’ approach has been adopted. This aims to improve the urban environment in the field of mobility, waste management, water management and energy efficiency in a holistic way which involves citizens. As now the city has matured to this idea, it is essential to move forward and take the next step in order to amplify the value of all these achievements. For that purpose, within the framework of the Sharing cities project, Burgas municipality will produce a roadmap including a preliminary study analysing the current status and where the city stands as to its transformation into a smarter city. Then the applicability of key measures implemented by lighthouse cities to be replicated will be identified and included in the roadmap. A further step that Burgas municipality intends to undertake is to develop a smart city strategy with the support of JASPERS¹ assisting the city during the whole process of establishing a long-term vision, main priorities as well as corresponding measures taking into account the main assets of the city enabling it to enhance its development in a smarter way.

Priority areas

Burgas municipality has realised important achievements regarding the transport system and the mobility within the city as a whole. Many other core steps have been undertaken as to the sustainable energy management and efficiency in urban areas, such as building retrofitting and improved street lighting. A key priority for the city is now to integrate smart city solutions into the urban environment in order to enhance potential and scale up these achievements. Adopting a digital first and data driven approach will contribute to the connecting up of existing infrastructure and thus improve sustainability and resilience of the city. The engagement of wider society, and working across disciplines and silos represent the main challenges in our vision for the city’s transformation. Burgas municipality will start developing a smart city strategy taking a holistic view for the overall urban development and using innovation technologies as a transversal tool to manage city’s resources and services in a more efficient way in order to meet the needs of its citizens and improve their quality of life.

1. JASPERS - <http://jaspers.eib.org/>

In general:

- Citizen engagement
- Sustainable Energy Management System (SEMS)
- Building retrofit
- Mobility
- Smart lamp posts
- Urban Sharing Platform (USP)

Within Sharing Cities

- Citizens engagement
- Energy management
- Building retrofit
- e-mobility
- Smart lamp posts
- Urban platform

LATEST SMART CITY RELATED ACTIONS AND OTHER PROJECTS



Citizen engagement


FIESTA
FIESTA IEE/13/624/SI2.687934

This project is funded by the Intelligent Energy Europe programme; its implementation started in October 2014 and lasted 36 months (ending in September 2017). FIESTA's partnership is wide and counts upon 19 partner institutions from five southern European countries (Spain, Italy, Croatia, Bulgaria and Cyprus), all committed to supporting families in the reduction of their home energy consumption. Particular attention is paid to the involvement of vulnerable consumers (such as families with low income, living in social housing etc.) in all project activities. An Energy Help Desk (EHD) has been established in each partner city and it helps families to improve their use of energy and achieve real energy savings at home. A wide range of local stakeholders (schools, social housing bodies, consumers and environmental associations, heating and cooling-device retailers and installers, energy agencies and the like) are actively involved in the project activities to enlarge the number of targeted people informed and lay the ground for the exploitation of project initiatives, including after the end of the project.



RESILIENT EUROPE Ref: 126/1432023425

The project is funded under the URBACT III programme and creates a network of 11 cities across the EU understanding and looking at communities and city challenges such as social inclusion and self-reliance of citizens through the lens of resilience. The project aims to design a local resilience action plan connecting people, the most important asset of the cities, to the urban ecosystem and infrastructure through the support and involvement of institutions as the backbone of the day-to-day operations.



Sustainable Energy Management System (SEMS)



CASCADE IEE/10/217/SI2.592431

The project involved 18 partners from 11 EU member states and aimed to exchange good practice solutions for a smarter and sustainable energy future in Europe. The City of Burgas took part in this intensive Europe-wide peer-to-peer learning and networking programme, gaining experience in the field of energy efficiency in urban transport, buildings and districts and renewable energy sources and distributed energy generation.



Building retrofit

Improvement of the educational infrastructure in Burgas BG161PO001-1.1.01-0033-C0001

A project funded under the Operational programme 'Regional development' and aiming at the retrofit, refurbishment and implementation of energy efficiency measures in seven schools and kindergartens.



Establishment of the Exhibition Centre Flora Burgas

A project financed under the JESSICA financial instrument² – it created a new exhibition centre consisting of five exhibition and conference halls with a green roof and facades and a photovoltaic (PV) solar panel system.



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Burgas Municipality



PassREG – IEE/11/072/SI2.615925

A passive house region with renewable energy: With 14 partners from 10 EU member states, the Intelligent Energy Europe Programme PassREG project aims to trigger the successful implementation of Nearly Zero Energy Buildings throughout the EU, with energy supplied as much as possible by renewable energies. Burgas was one of the selected beacon projects.

National programme for energy efficiency of multi-family residential buildings

This instrument concerns the whole territory of the country and provides 100% financial assistance for improving the energy efficiency of multi-family panel block residential buildings. It is available to owners of private residential buildings of no less than 36 apartments built using an industrial method. This reduces energy costs and greenhouse gas emissions, increases their structural integrity and extends their life cycle. Retrofit measures include structural rehabilitation and thermal energy-efficiency improvements (e.g. wall insulation, windows, roof and cellar insulation). In Burgas municipality there are 400 eligible buildings; 260 have already been selected and 185 approved. More than 100 have already been refurbished.

2. http://ec.europa.eu/regional_policy/en/funding/special-support-instruments/jessica/



Shared e-mobility

Integrated urban transport project for Burgas (ERDF): BG161PO001-1.5.01-0001-C0001

This €67 million ERDF-funded project which was realised between 2011 and 2016 involved modernisation of city public transport, in particular bus fleet renewal, introduction of a BRT line, reconstruction and renovation of the bus stations along the BRT line and end bus terminals, setting up a network of bicycle lanes, introduction of integrated management systems for public transport with the creation of a new traffic control centre (delivery and installation of Integrated Ticketing System, RTPI System, Urban Transport Management System of traffic lights and CCTV system in buses and at bus stops).

ATTAC SEE/B/0004/3.1/X

A partnership of cities and organisations from eight EU members, the project's main achievements thus far are related to the development of Burgas Sustainable Urban Mobility Plan 2014-2020 and the implementation of pilot activities. These included the introduction and testing of an experimental regular bus tourist line, an interactive smart mobility terminal and a mobile application providing real time information to travellers on all transport options in the city.

Cycling city

A model modern urban mobility project, financed under the Global Environment Facility Small Grants programme: This project introduced a model practice for integration of a sharing system for bike rental in the overall transport system of Burgas. Within the scope of its activities, 10 bike rental stations have been created with 120 bikes available, equipped with GPS navigation.



Smart lamp posts

Modernisation of street lighting in the Meden Rudnik city area and reduction of energy consumption through energy efficiency measures

Financed under Kozloduy International Decommissioning Support Fund – 983 conventional light bulbs have been replaced with 1038 LED light bulbs with different wattage.

Regional development

A number of projects, financed under Operational programme 'Regional development', related to integrated renovation of key urban spaces and sustainable development of the urban environment, include multiple measures in this field. Street and park lighting systems have been completely renewed replacing 88 existing columns and introducing 328 new smart lamp posts, some of them with combined PV solar and traditional energy consumption and video surveillance. In total, some 549 energy efficiency bulbs have been installed.



Urban Sharing Platform (USP)

Under the Integrated Urban Transport of Burgas project (ERDF) BG161PO001-1.5.01-0001-C0001

Financed under Regional Development Operational Programme, an integrated management system of the public transport has been established. It provides:

- a centralised traffic and on board bus control system, integration of all modules connected to the control and management of public transport, control of the equipment for real-time information, data generating, fleet management, dispatching, control and supervision of service, priority at traffic lights;
- a video surveillance system (CCTV) at major intersections along the route of Bus Rapid Transit line and on additional public transport lines;
- real-time information displays for passengers (PID) at the bus stops;
- an integrated electronic ticketing system.

Integrated management of flood risk in Burgas municipality project D3416/8.4.2015

Financed under the European Economic Area Grants financial mechanism. An early warning flood information system with forecasting models is about to be established with monitoring points for water levels in rivers and dams and rainfall qualities within the territory of the municipality.

Marine litter, eutrophication and noise assessment tools - (MARLEN) D3411/31.3.2015

Funded under the European Economic Area Grants financial mechanism: the main goal of this project was to build up tools for assessment of the marine environment by implementing new technologies and best practices for addressing three main areas of interest with lack of marine data, in particular marine litter detection and classification in coastal areas; regular near real-time surface water eutrophication monitoring and underwater noise monitoring.

Mobile laboratory for integrated monitoring and control over the quality of air in the city of Burgas C26/24.07.2009

Funded under the European Economic Area Grants financial mechanism: a mobile laboratory for control and monitoring of air quality, measuring eight distinct air pollutants, was delivered and started regular monitoring in the city. A website was also created for the purposes of the project (<http://www.air.burgas.bg>) giving open access to real-time data on air quality.

NATIONAL AND EUROPEAN FRAMEWORK

Energy, mobility, integration of infrastructures and ICT are key priorities at European level, addressed in Strategies (Europe 2020, Digital single market strategy, European strategy for low emission mobility etc.), directives and other legislative measures binding for EU member states. At the same time cities are key actors in delivering and implementing innovative and integrated smart city solutions for energy efficiency, a low carbon society and in general for the transition to a sustainable economy and society of growth. Burgas municipality has developed an investment programme including integrated actions seeking a lasting improvement in economic, environmental, climate, social and demographic conditions of the urban area. This is the main strategic document approved by the managing authority of Regions in Growth Operational programme and is funded under Priority Axe 1 'Sustainable and integrated urban development' of the programme in compliance with the provisions of Article 7 of ERDF Regulation 1301/2013 for sustainable urban development.

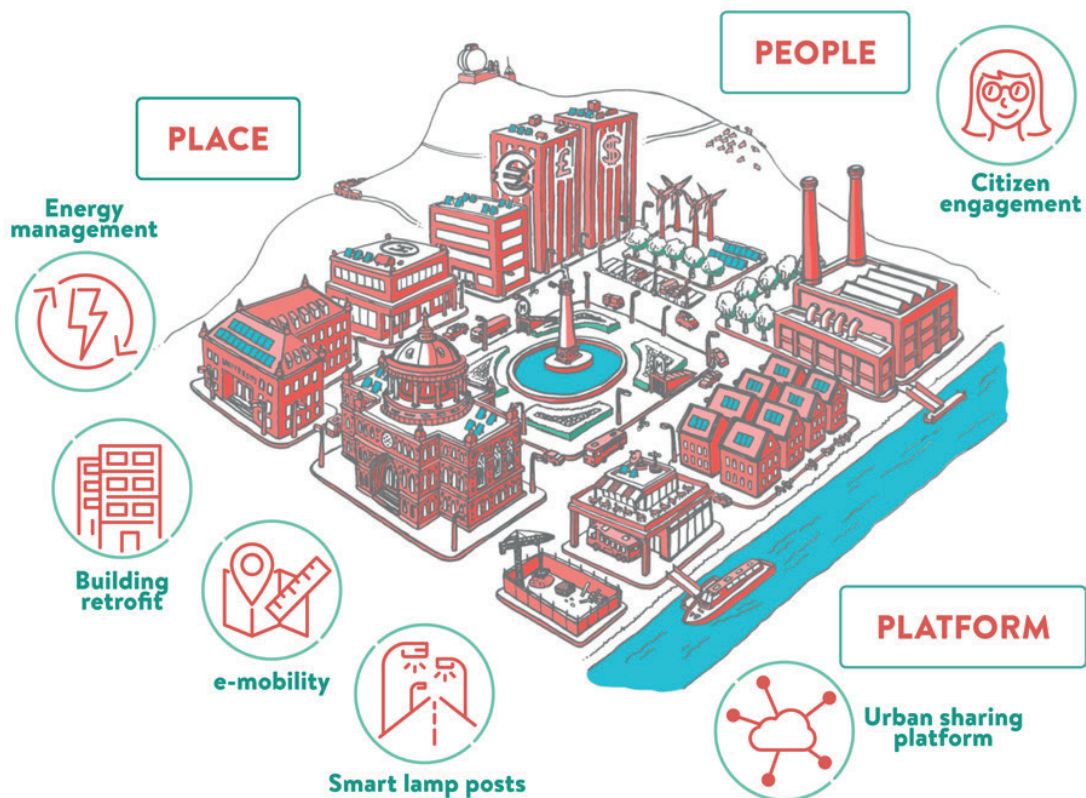


Burgas municipality is also part of the European Innovation Partnership on Smart Cities and Communities involved in the Integrated infrastructures and processes cluster, with a particular interest in the humble lamp posts and willing to implement successful business models identified as common solutions at a large EU scale.

The city is part of Covenant of Mayors, Mayors Adapt and Green Digital Charter sharing common objectives and goals with other cities trying to align principal EU 2020 priorities and local challenges and needs.

3.

SHARING CITIES SMART CITY SOLUTIONS AND MEASURES



Within the Sharing Cities programme several smart city solutions are being developed.

For each measure there is a description about how the city has prioritised it, what kind of related challenges had been identified and other relevant information.



CITIZEN ENGAGEMENT

This measure envisages citizen focused activities, in particular user research, citizen engagement, the development and implementation of a Digital Social Market which will incentivise the uptake of services and behavioural change via incentive mechanisms and the development of a service layer.

Information about priority area

While Burgas municipality has started tackling the main aspects of its urban environment in a smarter way, a general behavioural change was felt among the citizens indicating their willingness and readiness for involvement. For that reason the city is keen on using technologies to improve urban functions and to progress in a smarter way.

Public discussions represent the main tool for the municipality to inform its citizens and to promote its policies among them, but also to receive their feedback and improve planned measures. Depending on the project's scope, the city invites relevant target groups: when a strategic document, the investment programme of the city or a major city project are concerned, a series of public discussions are organised inviting all stakeholders. This is the case for example of all measures related to the Integrated Urban Transport of Burgas project or the renovation of key urban spaces and sustainable development of the urban environment. In other cases, for example when building retrofit is concerned, the municipality organises targeted public discussions with the association of the owners, presenting the benefits of the programme and mainly counting on local representatives and the presidents of the associations contributing to overcome the gap between citizens and administration.

Giving the possibility to people to directly contact the municipality online is another way to incite citizens to act and show engagement. The city has put in place an online service giving the opportunity to people to provide any feedback related to identified problems and issues or to suggestions how to improve aspects of city life.

An example related to citizen engagement in the field of waste management for the municipality is the establishment of a kind of social bond. Each citizen bringing a specific category of waste to a waste collection point is offered a membership card and collects points giving them the right to pay less local taxes.

CHALLENGES

The main challenge would be the lack of citizen engagement, unawareness of what a smart city is and what smart city options exist and have found success already. It will also be challenging for Burgas municipality to communicate in a clear way what the benefits of adoption of smart city solutions and use of new technologies are. In particular, the city has already experienced resistance and opposition on behalf of the citizens related to the introduction of smart measures in public transport, as well as to building retrofit measures.

Strategic approach towards becoming a smart city

Citizens will be involved in all stages of the smart city development using the bottom-up approach thus engaging users with different experiences, skills and needs contributing to the success of the smart city. In the short and long-term, various initiatives will be carried out parallel to the actions undertaken by the city in order to raise awareness and incite people to participate. In the field of public transport, user-centric services will soon be available completely changing the way urban mobility is perceived and gradually generating a behavioural change of citizens. Also, as far as building retrofit is concerned, information campaigns will be organised encouraging citizens not only to deep-retrofit their building but also adopt innovative actions and smart ICT solutions that will give additional value, save and optimise the consumption of energy and improve their quality of life. Similar initiatives will be conceived in all fields of smart intervention by the city.

Organisational structure

While implementing specific measures for the public interest Burgas municipality is organising public discussions involving different stakeholders. These kinds of meetings are held in the field of numerous policies led by the city aiming to present and promote new actions that the municipality is undertaking.

Key stakeholders

In order to involve the citizens, Burgas municipality organises special events and initiatives promoting different creations or solutions that the city has the intention to carry out. Also, the Consultative Councils exist for cultural, social and tourist matters and the elaboration of all strategic documents of the municipality. Citizens and all stakeholders can participate at the meetings of these councils.



SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

This measure involves the development of an advanced, data-rich, management system which gains maximum benefits from the retrofitted buildings, sharing energy data through the open platform enabling energy services to be provided that reduce energy use and bills. This will enable the design and roll out of higher level applications for citizens and authorities, taking advantage of the sensing layers and actuators installed.

Information about priority area

One of the key challenges for Burgas municipality is providing sustainable energy management across urban infrastructures (retrofitted buildings, energy utilities, e-mobility facilities etc.) integrated with a shared urban platform using ICT and data capabilities to enable a smart city. The concrete objectives are: to optimise building energy consumption by collecting energy data, provide real-time information about energy flows, and forecast consumption and production of energy for better grid management. The city has an ambition for a pilot area for this project that will encompass the public sector, in the form of municipal buildings, and the private sector, in the form of multifamily residential buildings.

CHALLENGES

Establishing an SEMS in municipal buildings on the one hand, and in a pilot district on the other, and making it interoperable with the USP will be very challenging for Burgas municipality. Apart from all technical issues related to the installation of relevant hardware and software and creation of such a system as a whole, some reluctance on behalf of citizens could also be an obstacle for the successful realisation of the SEMS. The collaborative work is challenging and in this specific case the involvement of numerous stakeholders may lead to a lack of consensus.

Strategic approach towards becoming a smart city

Creating and supporting a smart energy management system that collects and manipulates data from sensors and devices giving operators a complete view of the energy infrastructure would be a middle to long objective for Burgas municipality. In the short term, the city is planning to start working closely with the utilities in order to implement optimal instrumentation, like smart meters and distribution system sensors. Some parallel actions will be undertaken for the establishment of GIS system storing, analysing and providing information about spatial data (in particular infrastructure but also topography, soil, buildings, etc.).

Organisational structure

The city has not set up any specific organisation regarding SEMS.

Key stakeholders

As far as the SEMS is concerned, Burgas municipality is working with the Bulgarian solar association, Green energy producers association, Wind energy association, Technosun Ltd. (solar systems and RES) and start-ups.





BUILDING RETROFIT

This measure aims to apply deep-retrofit measures to public and private residential properties affecting 15,000 citizens across the six cities and integrating the properties with low carbon energy sources (solar PV, water source heat pump) and electric vehicle charging, all wrapped together by a digital first digitally driven sustainable energy management systems wrapping it all together.

Information about priority area

Retrofitting public and private buildings is the main priority for Burgas municipality as this offers tremendous opportunities not only to improve the energy efficiency in existing physical capital but also to apply innovative solutions. The city is already implementing a large scale multi-family residential building retrofitting programme. Use of renewable energy sources in those buildings - solar photovoltaic (PV) - in combination with a digital first approach (integration of smart technologies monitoring energy consumption and temperature comfort conditions) is on the agenda of the city.

CHALLENGES

Burgas municipality is in charge of negotiating agreements with associations of owners of multi-family residential buildings eligible for funding under the National programme for energy efficiency. This process is challenging on the one hand because often owners have disparate expectations about retrofitting, and on the other because the city does not have enough human resources to deal with this programme.

Strategic approach towards becoming a smart city

The main strategic objective of Burgas municipality is related to the improvement of energy and resource efficiency and supply, to the potential use of residential properties as platforms for technology that can be deployed for using renewable sources of energy – in particular, photovoltaic cells and thermal solar energy and to development of smart solutions using ICT applications, both on the part

of individual households (e.g. smart electricity and water metering) and on the part of service providers (e.g. remote electricity and water meter reading).

In the short term, the main objective of Burgas municipality is to implement deep-retrofit and energy efficiency measures in public and private residential properties (window replacement and insulation). Concretely, from 400 private residential buildings, each consisting of more than 36 independent flats, 185 have been approved for funding under the National programme for energy efficiency of multifamily residential buildings, and contracts between Burgas municipality and owners' associations have been signed. The city has already carried out procurement procedures and contracted around €50 million for 70 condominiums that will be retrofitted by the end of 2017. Also, under the Operational programme Regions in Growth, 10 additional private residential buildings which are cultural heritage will be refurbished for the total amount of €800,000 as well as one public building - Burgas City Hall €1.1 million in 2018. The city also plans the refurbishment of five more private residential buildings which are of historic importance and one more public building (Fire station building) in 2019 for the total amount of €1.1 million. Some smart solutions, taking into consideration the specificities of every building, will be integrated to various extents for each intervention, such as low carbon energy sources (solar PV in most cases), digital first monitoring of energy consumption etc. The long-term objective would be to scale up and explore intelligent solutions across retrofitted buildings – innovative incentive schemes and digital first initiatives in order to encourage people to play an integral role in the smart city transformation.

Organisational structure

Municipalities in Bulgaria are in charge of local-level implementation of the National programme for energy efficiency of multifamily residential buildings. In particular, the Energy efficiency department within Burgas municipality coordinates the whole process related to retrofitting of multifamily residential buildings: The contractual relationship with associations of owners, the contractors, and carrying out refurbishment work etc.

Measures related to retrofit of public and private buildings financed by the European Regional Development fund and part of the investment programme of Burgas municipality are jointly planned and implemented by European policies and programmes directorate and Public works directorate.

Key stakeholders

For the multifamily residential building retrofit, Burgas municipality works with all established associations of owners of multifamily residential buildings and with local companies in improving the energy performance of buildings, design and refurbishment.



MOBILITY

The mobility measures include:

- e-car share: delivering bold ambitions in districts consistent with growing city-wide ambitions for real scale reduction in traditional car ownership and use; learning from different city contexts – user behaviour/ownership and commercial offers from suppliers; and to support EU-wide relevant market take-up of EVs through sharing business models and the clean power for transport package.
- e-bikes: building on existing human power bike sharing schemes with introduction of e-bikes, to support shift from cars and other modes to e-bikes for those longer journeys, senior citizens, mobility impaired; integrate with EV car sharing services and charging points and local renewable energy generation.
- e-vehicles charge: installing a network of EV charge points, and integrate infrastructure with the other place-based measure and the urban shared platform: building retrofit; solar PV; humble but smart lamp posts; sustainable energy management system; to enable shift to e-mobility and achieve an advanced level of ‘digital first’ and ‘infrastructure next’ integration.
- Smart parking: implementing smart parking technologies, including evaluation of sensor type implementation (potentially different sensor types and business models), testing and capture of operational experience to incentivise e-mobility.
- e-logistics: countering the growth in conventional (particularly diesel) freight delivery vans caused by growth in on-line commerce, local deliveries and small businesses through implementing electric logistics to prove the business cases for new ways of urban logistics, and package learning for EU cities replication.

Information about priority area

Ensuring sustainable mobility and the interconnectivity of its territory has crucial importance for the development of the city. Starting by establishing the necessary infrastructure and improving the public transport system, Burgas municipality gradually moved forward by creating and promoting a shared bicycle system, a large network of bike lanes (around 80 km) and an extension of the range of services

offered to the citizens. Urban mobility is now perceived in a more general, integrated fashion and the city is looking ahead, constantly searching for new opportunities to build upon and upgrade all their achievements and make them smarter. In this context, the city is currently working on developing a sustainable urban mobility plan aiming to integrate and balance the use of all modes of transport available within the city and move swiftly towards more sustainable modes.

Bike sharing system – as of September 2017, the city has 14 bike sharing stations, including 146 parking spots, 15 of which are electric charging points. 95 conventional bicycles and seven electric bicycles are available in total in the rent-a-bike scheme.

For 2018, the city has planned to introduce 45 new electric bike charging points within existing stations and to buy 13 new electric bicycles. Also, a pilot project will be carried out, putting in place a bicycle shelter in a residential area next to a multifamily building with 21 parking slots for private bicycles, giving the right to residents, holding a card, to park their bikes. The shelter will be equipped with 24 hour security video surveillance and a PV roof providing energy to operate and manage the whole shelter system.

Smart parking - in the biggest carpark (500 parking spots), a new smart payment system will be introduced: The registration plates of all vehicles entering and leaving will be catalogued automatically with the help of a video stream plate recognition and the payments will be calculated on the basis this information.

e-vehicles – as of September 2017, Burgas municipality has made five e-vehicles available for the needs of the administration.

EV charging – two electric charging points exist for the moment within two municipal carparks. The city plans for 2018 to establish, in partnership with a private company, three new electric charging spots within the ‘blue’ paid parking spots area of the city. The municipality will provide two parking spots reserved for e-vehicles and the private company will put in place the electrical charging points.

EV logistics – by the end of 2017, the city will purchase an electrical van for the needs of the municipal company, ‘Transport’, in charge of controlling and sanctioning irregularly parked vehicles within the blue parking zone (to be used by the team putting on wheel clamps).

CHALLENGES

Even if sound collaboration between numerous players is already established, (public and private sectors, operators, etc.) working in cooperation with various partners is always a challenge. Funding is also something that could be a barrier for the implementation of some measures as infrastructural interventions and the purchase of e-cars and eVans could lack financing.

Strategic approach towards becoming a smart city

The main strategic objective of Burgas municipality is to carry out an intelligent and sustainable transport policy in order to satisfy the mobility needs of people and companies in the city in a way that is socially just, in line with ecological and economic circumstances and viable for the future.

Mobility is key for the balanced and sustainable development of the territory of the city but also a precondition for citizen's participation ensuring spatial and social cohesion. For that reason, Burgas municipality has deployed significant efforts to ensure interconnectivity of all urban areas. The bus fleet has been completely renewed, a rent-a-bike system has been created, two EV charging points have been created, four electric cars and four motorcycles have been introduced for the needs of the municipality.

The city plans to completely upgrade the existing rent-a-bike system to an e-bike system (already seven e-bikes and 15 charging points have been integrated within the bike sharing system), to start the smartification of the existing parking system (integration of lamp posts, installation of sensors and a parking app). In the long term the city aims to experiment with EV car sharing in a pilot area – a trial for 'condominium car sharing' with an EV charging point in a retrofitted building. By the end of 2017, in the field of EV logistics, an eVan will be tested and used for the needs of the municipal company Transport, operating the parking system within the city.

Feasibility studies are currently being carried out regarding the upgrade of the mobility system of the city – BRT extension, renovation of intercity bus station, smart traffic lights and traffic control management, traffic calmed zones, park and ride facilities.

Organisational structure

Burgas municipality, in particular the European programmes and policies directorate, Urban spatial planning directorate and Public works directorate deal with questions related to mobility in close cooperation with Burgasbus Ltd. (a company owned by Burgas municipality operating the public transport of the city) and municipal enterprise Transport (in charge of the parking, bike sharing system and EV charging, but also the traffic control and video surveillance centre).

Key stakeholders

The main stakeholders in the field of e-mobility are municipal enterprise Transport, Kingtronic Ltd. and Burgasbus Ltd.





SMART LAMP POSTS

Smart lamp post presents a very visible ‘quick win’ for smart cities; and the well-proven lighting and maintenance savings offer an attractive bankable initiative. The smart approach is to consider how to develop business models and funding mechanisms that incentivise implementation of ‘smart’ measures (WiFi, air quality, parking, EV charging, etc) alongside lighting exploiting what is typically a considerable network of existing assets – in other words to multi-purpose the ‘humble’ lamp post.

Information about priority area

For the last few years Burgas municipality, as owner of the city lighting system, has been accomplishing a citywide replacement of conventional street lighting with LED. Parallel actions have been undertaken aiming at the modernisation of some street lighting by installing new lamp posts which are upgraded not only with LED but smart features as well. This represents a strategic step for the city as these ‘humble lamp posts’ are upgraded with different environmental monitoring systems: presence detecting sensors, water level monitoring sensors, solar power panels (if needed), WiFi routers, CCTV, charging for mobile equipment plugs, etc.

CHALLENGES

The main challenge related to smart lamp posts is that most of the current lamp posts are old, which makes their use for the implementation of smart solutions impossible. The lamp posts themselves must be replaced, which involves a huge investment burden for the city.

Strategic approach towards becoming a smart city

The main strategic objective of the city is to secure and maintain an efficient, effective and appropriate public lighting system integrating new technologies and smart service infrastructure in order to improve road safety, to prevent and reduce street crime and to reduce the adverse effect of the lighting infrastructure on the environment. Burgas municipality has inaugurated an ambitious renovation scheme of its street lighting system, as mentioned above. Also, some 25 new lamp posts with solar panels have been introduced in four major public locations.

By 2018, some 1,236 conventional bulbs should be replaced with LED lights, significantly reducing the energy consumption and thus decreasing CO₂ emissions. Also, a large number of lamp posts will be replaced or installed – around 1,004, thus offering new opportunities for the implementation of innovative intelligent solutions in early 2018. The city will start exploring possibilities of multi purposing the lamp posts and adding smart features to them such as WiFi, air quality, noise and water sensors and mobile devices and wheel chair charging plugs for disabled people, etc. three pilot smart lamp posts will be installed in 2018 within the framework of a large urban renovation project.

Organisational structure

The Public works directorate is in charge of the street lighting system network – maintenance, replacement and management. The European policies and programmes directorate is also involved as far as measures funded by EU financing are concerned (in particular – project planning, implementation and reporting).

Key stakeholders

Energy suppliers, Technosun Ltd., Décor design Ltd.





URBAN SHARING PLATFORM (USP)

An Urban Sharing Platform (USP) is a logical collection of technical components, capabilities and processes which provides functions and services that enable a smart city. Its purpose is to aggregate data and control functions from a wide variety of devices and sensors, store, process, correlate the data and present information to the city and citizens which enables better use of the city resources and may provide support for innovative service verticals.

Information about priority area

Within the framework of the Integrated Urban Transport of Burgas project, an integrated public transport management system has been created. It brings together four intelligent systems: an integrated ticketing system enabling electronic ticketing and automatic vehicle location control; a real time passenger information system providing traffic information to the citizens through info boards in the buses and at the bus stations, and a smart route planner app; a public traffic management system helping the buses beat traffic jams; and a video surveillance system (CCTV) ensuring video surveillance on board of the public transport vehicles, in bus stops and at junctions. The city would like to expand this existing video surveillance system and turn it into a hub and city management tool by extending video surveillance to all relevant public spaces to improve security, etc. Also, two other systems exist for monitoring and controlling air quality and environmental noise. Real-time data on air pollution levels and noise levels in the city is available on dedicated websites. The city has also established a water level, flow and precipitation monitoring system measuring levels of rivers and dikes within the city in real time as well as in-situ monitoring systems assessing marine litter in coastal zones, surface water eutrophication, and underwater noise in the Black Sea. Burgas municipality has started to introduce a system to collect information about the overall energy consumption in all municipal buildings. The city has the ambition of creating a Geographic Information System (GIS), storing, analysing and providing information about spatial data (in particular infrastructure but also topography, soil, buildings, etc.). For the moment, possible sources of funding for the system are being explored and preliminary studies have been carried out to estimate the volume and the scope of the task, as well as the cost of the investment. The next step would be to build an urban data sharing platform where all collected data will be communicated, analysed and presented in a unified control centre. Gaining full situational awareness but also predicting, for example, weather or crime, and developing actionable tasks based on modelled patterns represent key interest for the city. Above all, the Urban Sharing Platform (USP) will be conceived as a way to provide services and information to citizens which is responsive to their evolving needs.

CHALLENGES

Information is generated and collected increasingly rapidly; these growing volumes of data must be connected or moved from their existing service operations. This could be a challenge as physically creating a platform takes time and involves different stakeholders. Creation of GIS as well as the digitalisation of all records - documents, maps and images, is on the city agenda and requires significant human efforts. It is also likely to cause organisational issues.

Strategic approach towards becoming a smart city

The main strategic objective for Burgas municipality is to create a single, transversal platform that interconnects the entire city. In the short term the city plans to bring together the online-supported participation procedures of all the city's administration departments in one place and in the long term start managing different resources in an efficient way, including infrastructure, water, public services, temperature, CO₂ emissions, public works, humidity, energy efficiency etc. The platform will be also geared towards citizen engagement and will promote the creation of services based on public information. Creating an urban sharing platform represents one of the most powerful opportunities for the city to connect with citizens in meaningful, life-impacting ways.

Organisational structure

Municipal company Transport is managing the Traffic control centre and is in particular responsible for the integrated management system of the public transport. Other existing real-time data information systems are maintained indirectly by the ICT directorate of the municipality.

Key stakeholders

Burgas municipality is working in close collaboration with the municipal enterprise Transport, Innovative Systems Burgas and other companies cooperating for the management of the existing intelligent system for public transport and its development.

4.

GOVERNANCE

The internal organisation and modes of governance in relation to external stakeholders are essential parts of the cities' transition to becoming smarter. The Sharing Cities programme gives opportunity to the city to rethink the way of working. The cross-departmental (internal) and focus groups (with external stakeholders) are presented.

INTERNAL ORGANISATION, GOVERNANCE

The administration of Burgas municipality consists of 448 people working in 28 directorates and departments. As the smart city concept has transversal significance, numerous departments are involved, to a different extent, and in their relevant field of competence, in the implementation of the growing smarter city agenda.

The European policies and programmes directorate is in charge of the overall coordination process of adoption of a holistic view related to the smart city idea and its integration into existing policies of the municipality. As far as citizen's engagement is concerned, all departments have an important role in involving people in their respective activities. Otherwise some of the departments are dealing with specific issues related to different priority areas of the project. The public works department is responsible for the maintenance of the whole network of street lighting and the Energy efficiency department is in charge of the coordination of the implementation of the national programme for energy efficiency of multifamily residential buildings. Burgas municipality works in a close relationship with Burgasbus Ltd., the company that operates the public transport within the city and with the municipal enterprise Transport, which is managing the parking, bike sharing system and electric vehicle (EV) charging, but also the Traffic control and video surveillance centre.

Cross-departmental working groups

The Burgas municipality has, over the last ten years, set up cross-departmental working groups (WGs) for various purposes on a regular basis. These can serve a project or other matter of transversal interest. Once the objective is accomplished the group stops existing. For that reason there is not a fixed number of WGs. The general precondition is the existence of a project or intention on behalf of the municipality to undertake an investment or a measure having cross-departmental implications. Each deputy-mayor under whose responsibility and competence the relevant action is undertaken is in charge of fixing the composition of the WG. The working group is set up by the means of an internal

note fixing the members of the group set by the relevant deputy mayor. One has also been set up for the purpose of the project Sharing Cities. The work packages involve representatives of various departments of the municipality.

The WGs set up for projects are: Resilient Europe (resilience of people, places and institutions), Municipal development plan 2014-2020 (main strategic planning document of the municipality), Integrated management of flood risk in Burgas municipality, Sharing Cities, Vital cities (sport), Integrated urban transport of Burgas. A WG also exists for the preparation of the investment programme of the municipality for the period 2014-2020. The main challenge of these WGs is related to taking into account all interests and achieving a consensus. The regularity of meetings depends on the advancement of the project and the needs identified during its implementation. The group meets every 3 or 6 months but could have an exceptional gathering in an urgent situation.

The role of the group is to make sure that all policies carried out by the municipality take into account all relevant aspects and to ensure internal coordination of the decision making process.

Sharing cities working group

One group has been set up for the purposes of the project involving all stakeholders and englobing all the areas of the project in May, 2016. The existing WGs are of great assistance as the established mechanism of collaboration has been used for the creation of the Sharing cities WG. Colleagues from different departments already cooperating in fields such as energy efficiency, mobility, street lighting etc. have been directly and easily involved in the Sharing cities WG.

The first time the WG met was in June 2016. During this first meeting the project was presented, along with objectives, priorities and policy areas concerned. Afterwards all meetings were held in smaller focus groups. The role of the WG is to contribute on the one hand to the elaboration of the baseline, delivering important input as to the existing situation, and beyond for the implementation of the integrated approach of a smart city intended by the decision makers. There was a second meeting in July 2017, wrapping up the achievements so far and discussing possibilities to insert replication measures into planned municipal investment programmes.

Focus groups

Focus groups were set up while Burgas municipality was about to carry out its Municipal development plan 2014-2020. Numerous meetings have been organised with all stakeholders within the territory of the municipality (business, universities, NGOs, state, regional and local public bodies etc.) in order to discuss priorities, opportunities, needs, challenges and to identify new measures to adopt. Focus groups do not exist in a permanent or officially established way. Each time the municipality plans to undertake actions affecting a determined fraction of the population ad hoc focus groups are formed. The focus groups are set up to present priorities and intentions of the city administration to stakeholders concerned by the measures, to exchange with them and to take their expectations and needs into account as much as possible. The general pre-condition is the existence of clear concept of what Burgas municipality intends to do in a given area. Then policy makers or city officers (directors,

head of department, depending on the idea or service or investment measure that will be introduced or carried out) decide on whether a focus group is needed and how to organise the meeting. Often the priorities of the municipality are more global and the needs of the citizens are more concrete which shows the existing gap between administration and people. The role of the focus groups is to align as much as possible stakeholders' needs and municipal priorities.

Sharing cities focus group

Focus groups have also been created within the framework of the Sharing Cities project, allowing representatives of the WG to exchange in a more concentrated way. They were set up after the meeting of the working group.

The following focus groups have been created for the needs of the Sharing cities project:

- Sustainable energy management and building retrofit
- Mobility
- Smart IT solutions
- Street lighting

These focus groups have been created from existing focus groups which made the working process smoother as people knew each other. All members of the WG are invited to the meetings of the focus groups. Members decide whether to participate or not. Two subsequent meetings were held with each group. The contribution of the members was of key importance to evaluate the current situation in relevant fields, what has been achieved and what, according to the focus groups, are the future vision and the main achievements in the relevant fields. Key needs and expectations are discussed in correlation with the general strategic vision for development of the city and possible concrete realisations and measures that could be carried out. The key success factors of the groups are the following: availability, awareness, transversal approach, consensus. The input of stakeholders has been significant and of key importance as to the situational awareness and to the process of gathering and putting together the main information as to what is done and where. Contribution from stakeholders has core importance for the city officials in building a strong and realistic vision of what the smart city of Burgas would be. Experts from the administration are part of the focus groups and while exchanging with representatives of business, NGOs, other institutions and citizens, all points of view are taken into consideration when relevant and included in the city policies. During these six months of consultations and discussions the relevant information has been collected and exchanges between stakeholders have been fruitful and helped Burgas municipality to fill the gap.

ANNEX 1 - FELLOW CITIES INTERESTS

The follower/ fellow cities participate very actively in Sharing Cities and give regular feedback regarding their interests. Their input is collected through an early identification of interests (before starting the peer learning visits), and is developed further based on the feedback received after the peer learning activities. Furthermore, this input builds on the experience fellow cities had in meetings co-organised with the technical implementation team of different measures (e.g. Milan, London, Bordeaux, Lisbon) over the last two years. This feedback serves as the basis for further needs analysis, planning of future activities and building of the replication roadmaps for each fellow city in year 2018 and 2019. Lisbon has also participated in the Milan peer learning and within the programme we ensure that exchange happens and replication opportunities are also shared across the six cities.



Citizen engagement

All follower/fellow cities have found citizen engagement practices of all three lighthouse cities interesting. Peer learning visits and events have given the opportunity to the experts to better understand what kind of challenges lighthouse cities meet when working with the citizens. Some of the key interests relate to the private building retrofitting experience of Milan and the participatory, co-design processes implemented both in Lisbon and Milan. All three fellow cities already have a good basis, they work closely with their citizens but it is useful to see more methods and learn what works and what does not and why.

Burgas

As the three lighthouse cities have good practices in involving citizens in different initiatives and furthermore in the decision-making process, Burgas is willing to get inspired from the experience of the partners, their methods and tools in engaging citizens.

Bordeaux

Involvement of citizens for setting up a congestion charge scheme in Milan:

Involving private condominiums in the building renovation process: Porta Romana (Milan). We need to include the private condominium representatives in the energy renovation process of their collective housing parks, in the context of energy and social precariousness.



Building retrofit

All follower/ fellow cities in Sharing Cities have indicated they are envisaging building retrofit activities, and are looking at what the lighthouse cities have already achieved. Bordeaux is particularly interested in the engagement of citizens for building retrofit, decentralising management to the inhabitants and increasing user awareness and maintenance of public facilities. Bordeaux is also looking at Milan's inclusion of union representatives in private condominiums in the energy renovation process of their collective housing parks, in order to fight energy waste and social precariousness.

The city of Warsaw is looking at the creation and development of large-scale retrofit programmes, including standardisation of solutions and large-scale procurement allowing for a reduction of costs. It is also interested in learning more about energy performance contracting, including detailed financial measures and contract provisions which don't put the municipality at risk. Before launching those projects, Warsaw is also identifying relevant energy audits to be conducted to ensure sound preparation of retrofitting projects.

The city of Burgas is particularly interested to learn about the different models for retrofit that are applied for private and public buildings. It would also be looking at the different kind of programmes, initiatives and partnerships that exist which combine deep-retrofit approaches with innovative and ICT-enabled building systems.

Burgas

What different models for retrofit are applied for private and public buildings? What kind of programmes, initiatives and partnerships exist combining deep-retrofit approaches with innovative and ICT-enabled building systems?

Bordeaux

Retrofitting and new construction of a disadvantaged neighbourhood in Lisbon:

- The constructive systems selected design and innovative way of planning and buildings
- The association of local economic sectors
- Decentralised management to the inhabitants, including user awareness and maintenance of public facilities.

Retrofitting of buildings in Porta Romana (Milan), involving private condominiums:

How to include the private condominium unions representatives in the energy renovation process of their collective housing parks, in a context of energy and social precariousness.

What is the most economical way to retrofit buildings; is it to insulate or rather add digital solutions in houses and replace boilers?

Warsaw

Creation and development of large-scale retrofit programmes. Including how many different aspects such as: standardisation of solutions/ large-scale procurement allowing for a reduction of costs. (e.g. when there are numerous buildings connected within the same areas and with similar technologies). Delivering projects via public-private partnerships.

Energy performance contracting (which arises from a number of challenges, such as detailed financial measures, contract provisions, safe guarding municipality in such proceedings). Scope of energy audits to be conducted which are needed to provide sound preparation of retrofitting projects. Challenges connected with using renewable energy sources installations during retrofits (like as to provide proper energy management solutions for retrofitted buildings).

How to include more than only the financial aspects in the building retrofit process? (social aspect, health costs savings)



Sustainable Energy Management System (SEMS)

Burgas

General presentation of existing SEMS – how has it been created, how does it operate; how exactly will it be enhanced and optimised within the framework of the project? Which stakeholders are involved? What kind of funding is foreseen? What is the concrete role of cities/municipalities within the whole SEMS?

Burgas and Warsaw are envisaging the development of a SEMS. Warsaw is taking inspiration from the lighthouse cities to create and develop a monitoring system for energy consumption in various categories of municipal buildings, and will conduct parallel research into the best tools to use and ensure the training of people to make the most of the new installations. As the city of Burgas is just starting its reflection, many questions still remain, such as: how the SEMS has been created, how it operates, what stakeholders are involved, and what the concrete role of cities/municipalities is within the whole SEMS.

Warsaw is looking at how to create and develop a monitoring system for energy consumption in various categories of municipal buildings. This question includes the issues of providing detailed energy certification for these buildings, automation of the process, and providing training for building users and managers.

Bordeaux

The city is looking at the SEMS whose deployment is in progress in the three lighthouse cities. Bordeaux is interested to understand how to involve the local eco system, and at which providers and stakeholders would be able to deploy an innovative energy management system in Bordeaux.

Bordeaux is looking at the SEMS deployment in the three lighthouse cities, as the city is interested to understand how to involve the local eco system, which would help to identify the providers and stakeholders that would be able to deploy such a management system in Bordeaux.

Warsaw

How to create and develop a monitoring system for energy consumption in various categories for municipal buildings. It includes both issues of providing detailed energy certification for these buildings, automation of the process (technical tools) or provide trainings for buildings users & managers.

**e-mobility - e-vehicle sharing****Burgas****e-bikes**

How are e-bike sharing systems functioning and what kind of models are applied for the optimisation of the network?

e-cars

How does it operate for the public and private sectors, what are the different business models that are implemented?

The three fellow cities are looking at ways to increase the amount of electric vehicles circulating, while at the same time reduce the amount of privately owned cars. This double objective can be fulfilled by the development of e-vehicle sharing schemes which are discussed in the project. All three cities are in a different status but would like to learn and maybe implement similar solutions to the digital islands/ mobility islands of Milan.

All three cities are looking at having electric cars and electric bikes. They have started the process but selecting the right business model based on the experience of the lighthouse cities will be very useful.

Bordeaux already has electric vehicle sharing schemes but would be interested to compare associated key performance indicators from services in other lighthouse cities, which would allow them to improve. In order to extend the use of those schemes, Bordeaux is also interested to know how the city of Milan made it accepted by citizens who now consider it as a good alternative for their trips.

The city of Burgas envisages setting up a sharing scheme for electric vehicles but is still investigating how it can be operated jointly by the public and the private sector, and the different business models that can be implemented.

Bordeaux**e-bikes**

The city is looking for an innovative business model in order to deploy e-bikes on a large scale.

e-cars

Many e-vehicle car sharing services are already available in Bordeaux. It would be interesting to compare associated KPIs with ones of the same services in development in the lighthouse cities.

How does Milan make people use the car-sharing schemes?

The question related to business models is also one asked in Warsaw. In addition, the city of Warsaw would like to pay particular attention to the involvement of all relevant stakeholders in the process and to obtain a good forecast of the energy demand for a coherent deployment of charging stations. It also is also seeking information on how to ensure the electric vehicles schemes can co-exist with schemes using fossil-fuelled vehicles. This information is deemed particularly relevant to finding the right business model which will ensure the electric vehicle schemes can compete with regular car sharing schemes, or if they will need to receive additional incentives.

Warsaw

e-cars

How to integrate e-vehicles car sharing systems and make sure those can co-exist with fossil-fuelled vehicles ones?

Business cases on e-car sharing. Especially when including their competitiveness compared to 'classic' car-sharing. It also covers the question as to whether e-car sharing shall receive additional incentives as opposed to current car-sharing schemes.



e-mobility - e-vehicle charging

Associated with the interest in the deployment of electric vehicle sharing schemes, follower cities are also investigating how to install a sufficient amount of charging stations throughout the city. Bordeaux is particularly interested in how Lisbon deployed charging stations on a large-scale with a standard business model for electric vehicles, offering an easy access to users. To be precise, it would look at how Lisbon made parking and charging free for electric cars, and the subscription

Burgas

How do electric vehicles public and private networks operate?

process and platform that enable this. It also seems relevant to observe where to install normal and fast loading charging points. Bordeaux is particularly interested in how Lisbon was able to successfully deploy electric vehicles charging stations.

Bordeaux

Interested in large scale deployment of charging stations for electric vehicles. Particular focus on free parking and charging points.

What is the system running the good functioning and use of the charging points? (cards, platform)

General information about implementation of smart charging procedures

The city of Warsaw is looking into innovative solutions to integrate the energy storage and charging points in the city, where there is limited room for new physical infrastructure. Warsaw is also interested to know about any alternative system that applies to professionals and delivery companies, which might have different needs than regular citizens using electric cars. The experience gathered by the three lighthouse cities on the cooperation they have developed with national administrators, energy providers and e-car sharing operators to install their charging points could clearly benefit the fellow cities for which these processes are new.

Warsaw

Collaboration with other actors such as national administrators, energy providers and e-car sharing operators.

Cooperation with other stakeholders, forecasting energy demand due to EU charging.

Possible solutions on decreasing burden put on the Grid by EU Charging Network (Energy Magazines next to Charging Points), proportions of quick and standard charging points in the city

Any specific regulation applying to professionals and logistic companies?

How to install energy storage units and charging points in city centres where room is scarce? How can they be integrated in the city centres?

**e-mobility - smart parking****Burgas**

How is the smart parking system connected to the other networks?

Bordeaux

How can private and innovative SMEs be involved in the smart parking deployment process?

Fellow cities are in general interested in existing solutions and Bordeaux is particularly interested in how the business models and how private companies and SMEs are involved in the smart parking deployment. Burgas has also expressed an interest in understanding better how smart parking is included in the networks and general strategy. The Warsaw national scale-up meeting has shown that there is also an interest in understanding how in Lisbon the parking company switched to a new model from being seen as the one who collects money for parking to a company which also reinvests that money. Communication has been seen as a key aspect for success and cities expressed interest in learning from good and bad experiences around this as well.

**e-mobility - e-vehicle logistics**

Bordeaux tries to foster the use of electric vehicles by logistic companies, its mobility department is therefore looking attentively at the developments in each lighthouse city, to analyse the pros

and cons of implementing such green delivery services. Burgas is particularly looking at how local deliveries and small businesses can be stimulated and encouraged to use electric means of transport for logistics. Warsaw is curious about the different schemes that can be

Bordeaux

Looking for innovative last mile delivery examples

Interested in e-vehicle logistics solutions and analysis on the pros and cons of implementing such green delivery services.

Burgas

How are local deliveries and small business stimulated to use electric logistics?

proposed to logistic companies and professionals using electric vehicles and their access to charging points.



Smart lamp posts

Burgas

Implementing smart lamp posts and reuse the experience of the lighthouse cities. Interested in demonstration of different services, functions and additional forms of value of the lamp posts; how collected data is used.

What can be done with the data collected? Who is using it and for what?

Bordeaux

Innovative business model like a public-private partnership for deployment at a large scale.

Most economical strategy: replacement or adaptation of existing lamp posts infrastructure?

Can smart lamp posts infrastructure offer new communication support for the cities?

The emergence of smart lamp posts and the multiple features they offer is certainly of interest for fellow cities which are carefully observing what the lighthouse cities have already done, in order to build on their successes and avoid the difficulties they might have been through already. While all cities have already planned to or effectively replaced infrastructure from several decades ago that consumes a lot more energy, they are now looking at different sorts of sensors and other features that can be installed. The experience from lighthouse cities is manifold and could help fellow cities that are looking at innovative business models that would allow a deployment of smart lamp posts at a larger scale. Bordeaux, for instance, is reflecting on whether to replace the infrastructure or adapt what already exists. It is also looking at the opportunity of new communication support offered by smart lamp posts.

Those same questions are also coming from Burgas, which is looking at the services, functions and additional forms of value offered by smart lamp posts. The multiple sensors that could be integrated into the new lamp posts will collect a large amount of data, thus the city of Burgas is already studying how this data can be used and by whom. Anticipating the use of data is of utmost importance to installing the right sensors which will be useful to the city.

Bordeaux and Burgas are also looking at replacing their lamp posts with more energy efficient lighting solutions. Bordeaux is particularly interested in Milan's process and how they were able to engage civil servants in the process.



Urban platforms

Burgas

Interested in demonstration of how an USP operates and functions.

The data management and urban sharing platform developments are providing interesting models for the follower/ fellow cities.

Bordeaux has conducted a needs analysis for common and shared urban data platforms to see if the proposal of the Sharing Cities Urban data platform will be able to fulfil those needs.

Bordeaux

Following the needs analysis of users, Bordeaux is looking at the common and shared urban data platforms to know if the proposal of the Sharing Cities Urban data platform will be able to fulfil those needs.

Can smart lamp posts infrastructure offer new communication support for the cities?

**Additional interests**

One of the key lessons learnt so far is that for replication the follower/ fellow cities need a lot of deep exchanges on general policy (e.g. mobility) governance, political leadership, business models, financing, ICT maturity, citizen engagement and understanding how the reality of the lighthouse cities corresponds to their own. Cities have their own ecosystem with external stakeholders and how those relationships are managed, what is the way to get the maximum out of those collaborations, and how to procure what is needed strategically are also key issues. The political, legal and financial and social dimensions are as important as the technological lessons. Due to this process being open

Bordeaux**Low emission zone**

The congestion charge set up in Milan and the positive results in terms of air quality, reduced traffic and accidents, improved commercial speed and frequentation of CTs, but also in terms of public spaces (pedestrianisation) or productivity gains for deliveries.

Traffic management

Looking at the Transport for London 3D simulation model, the Sharing Cities partnership programme allows Bordeaux to benefit from an exchange of best practices on the simulation of traffic flows in dense urban areas.

Digital transition

In the framework of the new GDPR, European law, Greater London authority has launched a tender to accompany local authorities in order to respect the implementation dates (25 May 2018). The Sharing Cities partnership program allows us to benefit from the awareness of those experts and to contribute to this relevant working group.

Governance

The climate and innovation agency in Lisbon, Lisboa E-Nova and how it helps the city to identify priorities, how it is included the city's decision-making process, how it helps to implement smart city projects. Its role, structure is interesting to see if it can be replicated in Bordeaux.

to all that could matter for replication, cities came forward with further topics such as implementing a low emission zone (Milan- Bordeaux- Warsaw) , traffic management (London- Bordeaux), digital transition and privacy, data protection (London, Milan) and governance (Lisbon- Bordeaux).

Warsaw**Low emission zone**

What are the technical preconditions to implement the measure in a city?

Is there any legislative/regulatory framework that could help the implementation?

Are there additional success factor that could help?

What would be the approximate level of expenditure? Is this in line with the budget at your disposal?

What are the key people to involve in the implementation?

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BUILDING SMART CITIES TOGETHER

SHARINGCITIES

SMART CITY BASELINE REPORT

WARSAW



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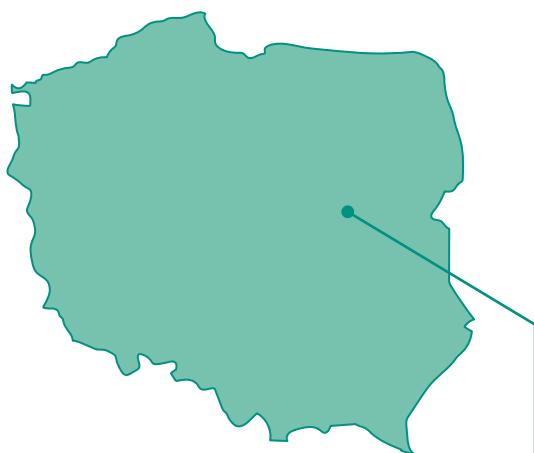
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1.

CITY CONTEXT



Inhabitants

urban agglomeration: 3 million

city: 1,753,977

Size (km²)

administrative boundaries: 517 km²

metropolitan area: 6,100 km²



City size and role

Warsaw is the capital and largest city of Poland. It is an important cultural, political, academic and economic centre. Warsaw is the 9th most populous capital city in the European Union.

Geography

Warsaw is located on the River Vistula in east-central Poland, roughly 260 kilometres from the Baltic Sea and 300 kilometres from the Carpathian Mountains. It is situated in the centre of a large lowland (Masovian Plain), in the heartland of the Mazovian Region - the most populous and the largest of 16 Polish regions.



Economic features and key activities

A major international tourist destination and a significant cultural, political, and economic hub, Warsaw's main economic sectors are manufacturing, publishing (media/digital), and financial services. In the city there are as many as 360,000 registered enterprises, while the unemployment rate remains at only 3.7% (one of the lowest in Poland).

It is home not only to many national institutions and government agencies, but also to many domestic and international companies.

The service sector employs more than 70% of the workforce. One of the biggest developments in this sector has been in banking and finance. The city is home to both the National Bank of Poland and the Warsaw Stock Exchange. There are also 78 universities and colleges with 270,000 students. Warsaw's budget expenditure for 2017 amounts to PLN 14.7 billion (€3.5 billion). In 2014, 8.3 million tourists visited Warsaw (including 2.8 million from abroad).



2.

GENERAL SMART CITY VISION AND AMBITION

The approach the city has taken to become smarter, whether it has a smart city strategy or not, which are the general priority areas in the city and which are specific to the Sharing Cities programme.

SMART CITY STRATEGY/APPROACH

Warsaw does not have a specific smart city strategy, and it has no approved formal plans to develop one in the near future either. However, smart city ideas are present in some of its documents, such as the Low-Carbon Economy Plan. The city's Infrastructure department expects the Sharing Cities programme to give new impetus to Warsaw's work on such a strategy in the coming years. A decision on the creation of a separate smart city strategy would be possible after adoption of a new Warsaw Development Strategy for 2030, which is planned for the 1st quarter of 2018.

The city signed the Covenant of Mayors in 2009, and completed its Sustainable Energy Action Plan (SEAP) in 2011. In its SEAP, Warsaw committed to reducing CO₂ emissions by 20% by 2020 compared to 2007; cutting final energy use by 20% by 2020 compared to 2007; and increasing the share of renewable energy sources (RES) to 20% by 2020. In 2014, the city management approved a detailed RES action plan, which was drafted within the framework of the EU Cities on Power project (www.citiesonpower.eu/en/about). It was consolidated with a broader Low-Carbon Economy Plan (PGN), which was adopted by the City Council in December 2015. This document covers both municipal and external projects. It envisages investments to the tune of €4 billion in projects aimed at improving energy efficiency and air quality (including investments in RES and in smart grids). The document focuses on investments with funding already secured; the majority of them are to be implemented by the city and its companies, but projects of external entities are also included, like energy companies active in the Warsaw agglomeration.

Priority areas

In general:

- Clean energy generation (also from waste), in particular co-generation
- Energy efficient buildings and districts
- Sustainable transportation, including e-mobility
- Preservation of green spaces and conservation of wildlife
- Creation of a user friendly and liveable smart city
- Engaging Warsaw in smart city related initiatives

Within Sharing Cities

- EV charging
- Smart energy management system
- Smart parking
- E-mobility
- Building retrofitting
- EV logistics
- Smart lamp posts
- e-car sharing
- Urban sharing platform

LATEST SMART CITY RELATED ACTIONS AND OTHER PROJECTS



Sustainable Energy Management System (SEMS)



CASCADE

Warsaw was a partner in CASCADE (www.cascadecities.eu), a €2.03 million networking and mutual learning project on local energy leadership. It aimed to facilitate the implementation of sustainable energy policies in large and medium sized European cities in three main areas: energy efficiency in buildings and districts, renewable energy sources and distributed energy and energy in urban transport.



E3SoHo project

Warsaw was a partner in the E3SoHo project, whose aim was to implement and demonstrate in three social housing pilots an integrated and replicable ICT-based solution, in order to reduce energy consumption by 25%. This solution controls and manages energy production and consumption systems in social housing units.



ICE-WISH project

The ambition of the EU-funded €4.9 million ICE-WISH project (www.ice-wish.eu/uk/icewish.asp) was to demonstrate how intelligent control systems (smart metering, wireless technology, cloud computing, and user-oriented display information) can reduce energy and water wastage in social housing units across Europe. Warsaw created a comprehensive, integrated consumption control and management system for use in buildings, in particular in social housing units.



Cities on Power project

As a partner in the Cities on Power project (www.citiesonpower.eu), Warsaw worked on encouraging the use of renewable energy by public and private investors in urban areas by developing and endorsing a joint RES strategy and local action plans, and by providing an interactive IT toolbox that maps local solar and geothermal potential.



HIT2GAP project

Currently Warsaw is a partner in the HIT2GAP project (www.hit2gap.eu) on development of new building focused monitoring/control tools based on advanced data treatment techniques. It will allow for new approaches to assess building energy performance data, getting a better understanding of buildings' behaviour and hence a better performance.



Building retrofit



OPEN HOUSE project

Warsaw was a partner in the OPEN HOUSE project (www.openhouse-fp7.eu), which benchmarked and mainstreamed building sustainability in the EU in a transparent and open manner (open source and available) from modelling to implementation, creating a new building assessment methodology for planning and constructing sustainable buildings by means of an open approach and a technical platform.



P2Endure project

Currently Warsaw participates in the P2Endure project (www.p2endure-project.eu), aiming to provide scalable, adaptable and ready-to-implement prefabricated Plug-and-Play (PnP) systems for deep renovation of building envelopes and technical systems.

DREEAM project

Warsaw is an associate partner in the DREEAM project (www.dreeam.eu), which focuses on demonstrating an integrated renovation approach for energy efficiency at the multi-building scale.

Other projects

Warsaw identified up to 30 school buildings that needed retrofit, including the replacement of electric installations and light fixtures, improvement of water supply, and upgrading the energy management system with sensors. The involvement of a private partner (public-private partnership/energy performance contracting) should guarantee a certain level of savings. Final decisions on the project will be made in 2018.

Another similar project concerns 25 kindergartens. The planned investment venture implemented under public-private partnership would consist of: demolition of existing buildings, along with hazardous waste (asbestos) treatment, on the basis of a subsidy allocated for that purpose from the Regional Fund for Environmental Protection and Water Management; and construction in their place of kindergarten buildings adapted to the current local needs.



Shared e-mobility

Warsaw – represented by the municipal bus operator MZA - has already purchased 20 electric and four hybrid buses (and leased 10 electric buses), complete with their associated infrastructure. In December 2016 an application was developed by the municipal bus operator MZA and submitted under the EU-funded 'Infrastructure and Environment' operational programme for co-financing the purchase of 130 electric buses together with 19 aerial chargers (which reduce battery weight and thereby improve the environmental performance of the vehicles) for €81 million (€43 million from EU funds/€38 million from the MZA budget). The resulting funding agreement was signed on 30 October 2017. MZA so far has been financing the charging infrastructure for buses at its depots. The aerial chargers (put at the ends of selected bus lines) are to be later transferred to city ownership, in order to also serve other bus operators. ZTM transport authority also awarded a contract for the operation of 50 hybrid buses to a private operator. The next such contract to be signed includes a batch of 5 hybrids. A project by ZTM, supported by the city's Infrastructure Department, aims to install public charging infrastructure for cars at park and ride (P&R) lots (currently there are only around 20 charging stations constructed by private entities). The first pilot at P&R Młociny with 4 charging points will be operational by the end of 2017, built for €20,000. Other investments are to be decided in 2018 since the new Polish law may shift development of infrastructure from cities to other stakeholders like electricity distributors. Moreover, in 2017 the



first e-bikes (100) were added to 10 dedicated stations of the city bike system Veturilo (owned by the city, managed by a private operator). A decision on possible additional e-bikes has not been made yet. Overall as of the end of 2017 Veturilo comprises 351 stations with 5,100 bikes.

Smart lamp posts

The modernisation of Warsaw's street lighting system (owned and managed by the city) in a public-private partnership (energy performance contracting) was to affect at least 24,000 lamp posts. After modernisation, energy consumption was to be reduced by at least 50%, and maintenance costs would also be lower. After obtaining documentation allowing the preparation of a tender for investments the decision was made that the project will be implemented in another formula than PPP-EPC. It is yet to be decided when the amended project starts and whether smart applications should be added to selected lamp posts, or at least these lamp post should be adapted to host such applications. It needs to be added that as a result of smaller investments implemented in the meantime we already have in Warsaw 4,063 LED street lamps: 2,508 on the roads administered by Warsaw districts, 1,415 on the roads administered by ZDM Warsaw Road Authority and 140 located in other areas (e.g. at gas stations). To put this in context, there are 111,268 street lamps in Warsaw overall (56,199 in 'district category', 42,188 in 'ZDM category' and 12,881 in 'other category').



Urban Sharing Platform (USP)

Currently there is no such integrated platform in Warsaw, and there are no approved formal plans to introduce them either. However, certain elements of a comparable platform are present in Warsaw Contact Centre, a city information service accessible by dialling 19115 or visiting a dedicated website. The city's database is also partly accessible by the public. Furthermore, Warsaw joined the VaVeL project (Variety, Veracity, VaLue: Handling the Multiplicity of Urban Sensors), aiming to increase the ability to use urban data in applications improving urban life. In Warsaw new technical solutions to be created and tested concern transport data (e.g. for creating a smart travel planner). The project results will help in planning an integrated data platform for the city in the near future.

Warsaw currently has the open data platform at its first stage of development, which contains 13 categories of data and 250 sets of open data. Our aim is to promote open data and engage people in creating civic technology tools for their city. This is why Warsaw supports competition Apps4Warsaw (in Polish: Dane po warszawsku) for the best city apps built upon publicly available open data from the City of Warsaw.

NATIONAL AND EUROPEAN FRAMEWORK

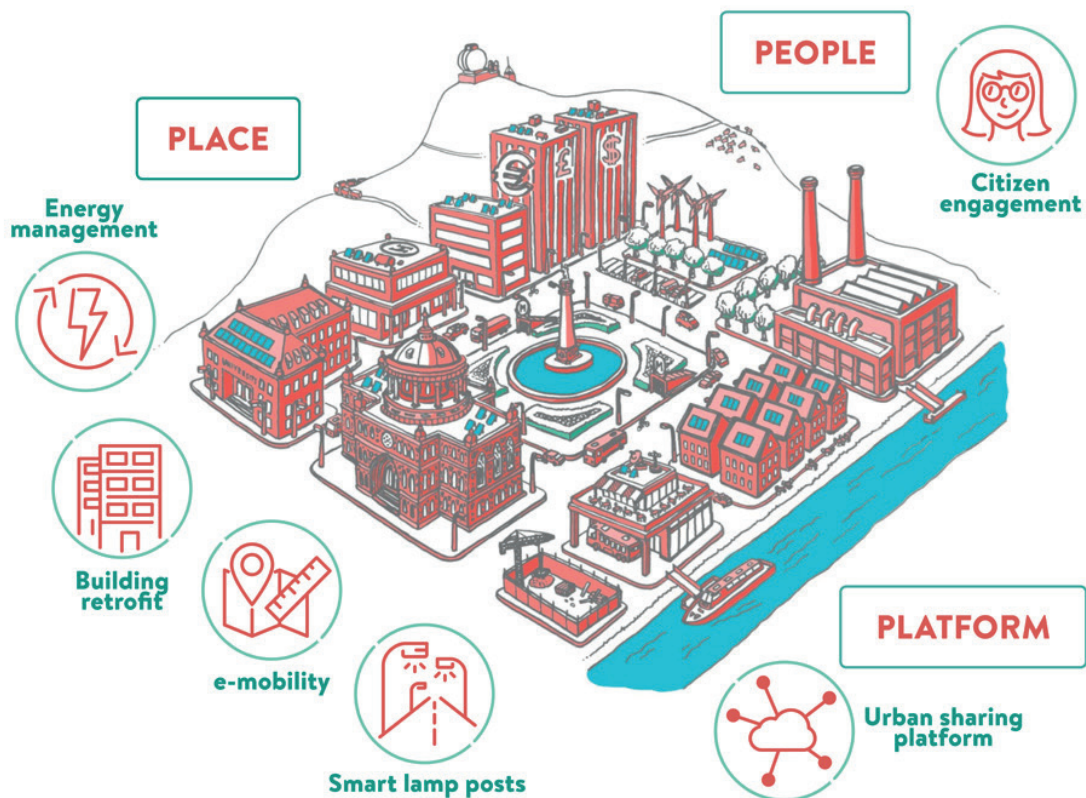
Polish cities did not use to have direct legal obligations to reduce emissions and save energy. This is about to change now. EU legislation on stricter energy efficiency standards (especially energy efficiency of buildings) is scheduled to come into force in the next couple of years. Legislative work on the content of specific national legal acts, such as binding obligations for public administration, including units of territorial self-government, is under way. An exception is the law on energy efficiency, which concerns territorial self-government as well; this legal act was adopted by the Polish parliament in 2011. This law obliges all public sector bodies to contribute to the national energy efficiency goal (assuming a 9% reduction in energy consumption in 2016 compared to the average consumption in 2001-2005) by implementing at least two out of the following five energy efficiency measures:

- contracts on the implementation and financing of projects aimed at improving energy efficiency
- purchasing new equipment, installations or vehicles with low energy consumption and low maintenance costs
- replacing existing equipment, installations or vehicles with new energy efficient ones, or upgrading them to the above standards
- purchasing or renting energy efficient buildings or parts of buildings, or conducting appropriate thermal retrofits in existing buildings
- conducting energy audits in buildings with an area exceeding 500 m² owned or managed by public sector bodies

Public sector bodies are also obliged to inform the citizens about these actions, e.g. on their websites. The national and international context supports the implementation of climate policies by Warsaw based on EU funding. The size of the city and its status as capital are also supportive of the development and implementation of said measures. The financial crisis has hindered progress in this field. Faced with a shortage of funds and declining tax revenues, Warsaw is close to its maximum permitted percentage of debt. As a result of the former highly restrictive legal rules on public-private partnerships, projects based on this formula are still rare and are sometimes perceived as lacking transparency.

3.

SHARING CITIES SMART CITY SOLUTIONS AND MEASURES



Within the Sharing Cities programme several smart city solutions are being developed.

For each measure there is a description about how the city has prioritised it, what kind of related challenges had been identified and other relevant information.



CITIZEN ENGAGEMENT

This measure envisages citizen focused activities, in particular user research, citizen engagement, the development and implementation of a Digital Social Market which will incentivise the uptake of services and behavioural change via incentive mechanisms and the development of a service layer.

Information about priority area

Warsaw has been developing and implementing a (partially informal) strategy for raising climate and environmental awareness in general, rather than working on a specific strategy for smart city engagement. Numerous events are being organised or co-organised, mainly within the framework of the Partnership for Climate platform (e.g. Warsaw Energy Day; Picnic with Climate; Tree Day; Water Day), which is coordinated by the City of Warsaw. The platform involves several stakeholders, such as NGOs, companies, city associations, and foreign embassies. In future, assisted by Sharing Cities experience, events dedicated more specifically to smart city topics shall be planned as well.

CHALLENGES

Citizen engagement is one of the most important pillars of Warsaw policy. Warsaw is interested in exchange of good practices as to citizen engagement (e.g. as to smart city solutions). Warsaw is already in general quite advanced in the field of involving citizens in actions related to clean energy, climate, sustainable transportation or sustainable development (level of lighthouse city), therefore – taking into account limited time capacity – the local staff must prioritise their actions accordingly, focusing on thematic areas that require further improvement to a larger extent than citizen engagement.

Strategic approach towards becoming a smart city

Warsaw decision makers and officials do realise that there has been an increasing demand by civil society and citizens to have a greater say in public decision making - the city is willing to be more inclusive and responsive to these needs.

The rise of innovations in technology has provided citizens with new and unprecedented opportunities to directly engage policy makers and demonstrate the potential to facilitate the link between citizens and municipality.

Warsaw has lately embraced open data with the aim of putting this information in the hands of the citizens to encourage the development of applications and solutions that the city does not have the expertise to create. This idea has been a great success with over 70 apps already created and shared with the general public.

The app that has had the biggest impact is 'Warsaw Ninja'. With this users can report any difficulty and provide information about the state of all travel by public transport. Another example is a programme 'Milion Drzew' on green land development, which plans the planting of one million trees and the launching of an educational campaign aimed at encouraging residents to take care of nature. We are providing Warsaw residents with a tool which will make the capital city green. The autumn plantings will be carried out on the basis of residents' suggestions. If there are no obstacles to the planting, submission will be accepted, and the app will display the appropriate notice. A confirmation will be also sent to the e-mail address and mobile phone of the citizen who submitted the given suggestion.

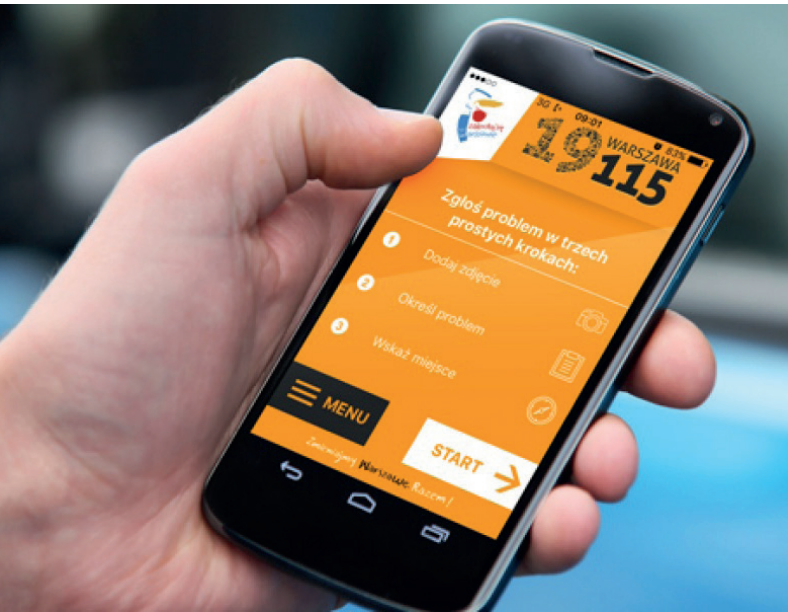
The Internet has huge potential for involving citizens in all policy areas, therefore the City of Warsaw also informs and communicates with the citizens by using social media.

One of the good examples of citizen engagement is the coaching in energy efficiency of more than 3,000 households, which results in 8.5% energy savings (conducted within the framework of the EU project STEP BY STEP). Coaching is managed by a web-based system and this system is based on a behavioural strategy. The actions suggested to households are personalised to suit their profile and the history of their activity within the intervention.

A participatory budget was launched in Warsaw in 2014. The value of all projects (more than 2,500) for four editions is €47 million. Voting in the participatory budget is possible via internet. In the last edition 95% of voters voted via internet (111,623 votes) and 5% at a voting point (5,758 votes). Thanks to the participatory budget, Warsaw inhabitants can easily submit their ideas of relevant tasks the local authorities should carry out. The amount available to residents equals 1-2% of each district's budget.

Organisational structure

In Warsaw, climate and energy-related issues are dealt with mainly by the Infrastructure Department, in cooperation with the Environmental Protection Department, the Social Communication Centre and the City Marketing Department.



The City Contact Centre Warsaw 1915 was launched on 4 November 2013. During that time, the residents contacted it nearly 1,300,000 times. It receives a call every 1.5 minutes on average. The conversations with consultants have lasted 147,351 hours in total. The majority of requests are inquiries for information, while the rest concerned interventions, suggestions and checking the request's status. The services of Warsaw 1915 are available 24 hours a day, seven days a week. The centre not only provides information on the city transport routes or issuing documents, but also allows citizens to report problems that require the intervention of the municipal services, including the Municipal Police. All requests are registered in the system, and their realisation is constantly

monitored until they are fully dealt with. However, the service does not accept reports concerning the situations that endanger someone's life and health. The Warsaw 1915 City Contact Centre is the first integrated system in Poland allowing citizens to contact local government authorities. The centre can be reached via telephone – 19115, online portal www.warszawa1915.pl, email, chat and social media.

Citizens engagement is also very important in the revitalisation programme which was mentioned earlier. Residents are always consulted on every redevelopment plan.

The main objectives of this programme relevant for this topic are:

- Socio-economic recovery through improving the quality of public space, according to the rules of spatial order and aesthetics as well as promoting entrepreneurship.
- Development of tourism and culture on the basis of national heritage resources.
- Increasing the safety of inhabitants and improving the communicational possibilities inside the housing estates.
- Integration of inhabitants, preventing and combating social exclusion.
- Warsaw authorities also stress how important citizen engagement is in the process of drawing up strategic documents like in the new municipal housing strategy.



SUSTAINABLE ENERGY MANAGEMENT SYSTEM (SEMS)

This measure involves the development of an advanced, data-rich, management system which gains maximum benefits from the retrofitted buildings, sharing energy data through the open platform enabling energy services to be provided that reduce energy use and bills. This will enable the design and roll out of higher level applications for citizens and authorities, taking advantage of the sensing layers and actuators installed.

Information about priority area

Since 2009, the city council's Infrastructure Department has been monitoring the electricity, heat, and gas consumption and expenditure of Warsaw's education units. A total of 1,197 education units (766 locations) with 961 electricity meters, 566 heat meters, and 630 gas meters are included in the programme. As a result of the activities carried out under this programme, the city has reduced its expenditure on electric energy ordered from electricity distributors for buildings' needs, and cut electricity and heat consumption, resulting in lower CO₂ emissions. Savings potential for education units: electricity, €1.3 million; heat, €1.9 million.

As a result of other categories of municipal buildings being covered by expanded monitoring activities, the programme as of the end of 2017 includes 790 non-educational municipal buildings as well (e.g. health facilities or social buildings) with 1,155 electricity meters, 205 heat meters and 158 gas meters. Saving potential for those will be estimated in early 2018.

The next step will be the introduction of smart metering in Warsaw's municipal buildings. The data on smart meters already introduced and to be introduced in these buildings will be known in 2018.

CHALLENGES

Certain issues have delayed implementation of a low-carbon area, including national legal provisions related to energy efficiency actions in spatial planning documents and initiatives; the challenges involved in financing and coordinating such a large and complex project; and finding an optimal area to implement a project of this size and complexity. Warsaw's participation in the Sharing Cities project greatly help the city to clear some of these hurdles, since Warsaw (or any other Polish city) does not have experience with designing and implementing such simultaneously large, multi-layered, costly and innovative mega projects. It also requires intensive collaboration with multiple external stakeholders, which is another challenge.



Strategic approach towards becoming a smart city

Advanced energy management systems are not operational in Warsaw's buildings yet, and such systems are still rare in other categories of buildings. Warsaw is planning to implement a low-carbon area, which will feature solutions to increase energy efficiency, protect the natural environment, and ensure low GHG emissions. This will entail activities in the fields of city planning; energy networks; building construction; transport; and waste, water and waste water management. The decision on the Infrastructure Department's implementation plan was approved by the Mayor of Warsaw and other leading city managers on 29 March 2011.

Organisational structure

The Infrastructure Department has prime responsibility for local climate change policies, and it also coordinates the implementation of both the SEAP and the PGN. It is also responsible for general energy policies, for water and waste water policies, and for Warsaw's public-private partnership projects. The inter-departmental climate protection team (chaired by the mayor of Warsaw) is a forum for exchanging information on energy and climate policy related actions, events and projects, and their interactions with other policies. Established in 2008, this team has 19 members. The sustainable energy action plan team was set up in 2011. It brings together 15 officials of the Infrastructure Department. The results of the Sustainable Energy Action Plan (SEAP) team's monitoring activities help improve the coordination of the city's activities in the fields of energy and climate. In relevant city units and in Warsaw's 18 districts 'SEAP assistants' are nominated, who ensure two-way communication during SEAP's implementation and monitoring.



BUILDING RETROFIT

This measure aims to apply deep-retrofit measures to public and private residential properties affecting 15,000 citizens across the six cities and integrating the properties with low carbon energy sources (solar PV, water source heat pump) and electric vehicle charging, all wrapped together by a digital first digitally driven sustainable energy management systems wrapping it all together.

Information about priority area

Building retrofits are included in both the Sustainable Energy Action Plan and the Low-Carbon Economy Plan. The second phase of a revitalisation programme, spanning a seven-year period between 2015 and 2022, envisages €333 million in total in investment in the city's Praga districts. This amount covers the construction of new blocks of flats and the renovation of old ones. Total investment in this category equals €130 million. The project will also connect 5,000 flats to the district heating system for €17 million in the Praga Północ, Praga Południe, and Targówek districts. Possible enhancement is being analysed of some selected programme areas with smart cities solutions and integrative planning solutions.

Strategic approach towards becoming a smart city

The city's sustainable energy action plan foresees the complex retrofitting and installation of renewable energy systems (where possible) in more than 400,000 m² of social housing units. This will cost over €38 million for the city. In return, energy consumption is expected to drop. By 2020, the city is expected to save 15,143 MWh of energy per year, and CO₂ emissions are also expected to be reduced by 15,783 Mg per year.

CHALLENGES

While new social housing units are now built to meet high energy efficiency standards, over 90,000 dwellings are still located in buildings erected before 1990 (71% were built between 1900 and 1940). In the coming years, Warsaw will face the major challenge of modernising and retrofitting multiple social housing blocks. The city's SEAP foresees the complex retrofitting of more than 400,000 m² of housing units. This translates into more than €38 million in expenditure, and brings about marked changes in energy use and CO₂ emissions. The SEAP also encompasses a long-term plan to modernise the city's housing resource management. This will include replacing the existing energy sources with more efficient and less CO₂ intensive equipment; overall reductions in energy demand; energy audits to target retrofitting; and behaviour change in household energy consumption. The challenges include securing appropriate energy behaviour of users/inhabitants (which is particularly challenging in case of social housing users, as noticed in the E3SoHo and ICE-WISH projects, among others), lax building energy efficiency standards in Polish law, financial assistance schemes available only for simpler thermal retrofit actions like insulation and window replacement, and such schemes are only available to a limited extent for building RES installations (those 3 factors make it more difficult to organise complex thermal retrofits aimed at higher energy efficiency standards).

Organisational structure

Responsibilities are highly diverse and divided in this field. Overall responsibility for energy efficiency, including buildings, rests with the Infrastructure Department. The revitalisation project in the city's Praga districts is coordinated by the Architecture and Spatial Planning Department (which cooperates with the Housing Policy Department, generally responsible for the municipal housing stock). Similarly, the Education Department is generally responsible for schools, including school buildings; the Culture Department for cultural buildings; the Sport and Recreation Department for sports facilities; while the Organisation Department is in charge of the city's office buildings. However, the vast majority of these buildings are directly managed by the districts themselves (Warsaw has 18 districts).



MOBILITY

The mobility measures include:

- e-car Share: delivering bold ambitions in districts consistent with growing city-wide ambitions for real scale reduction in traditional car ownership and use; learning from different city contexts – user behaviour/ownership and commercial offers from suppliers; and to support EU-wide relevant market take-up of EVs through sharing business models and the clean power for transport package.
- e-bikes: building on existing human power bike sharing schemes with introduction of e-bikes, to support shift from cars and other modes to e-bikes for those longer journeys, senior citizens, mobility impaired; integrate with EV car sharing services and charging points and local renewable energy generation.
- e-vehicles Charge: installing a network of EV charge points, and integrate infrastructure with the other place-based measure and the urban shared platform: building retrofit; solar PV; humble but smart lamp posts; sustainable energy management system; to enable shift to e-mobility and achieve an advanced level of ‘digital first’ and ‘infrastructure next’ integration.
- Smart Parking: implementing smart parking technologies, including evaluation of sensor type implementation (potentially different sensor types and business models), testing and capture of operational experience to incentivise e-mobility.
- e-logistics: countering the growth in conventional (particularly diesel) freight delivery vans caused by growth in on-line commerce, local deliveries and small businesses through implementing electric logistics to prove the business cases for new ways of urban logistics, and package learning for EU cities replication.

Information about priority area

For now, Warsaw has no comprehensive strategy in this field. Separate specific plans do exist, such as bus operator MZA's plans relating to buses, or ZDM's car sharing plans.

CHALLENGES

The main challenge today is to develop public infrastructure for electric charging. Apart from a few single points installed for PR purposes, for now the city has only 12 public charging points installed by RWE (currently Innogy). In the not so distant future, once there are more EVs and more charging points operational in the city, Warsaw will have to ensure that its energy grid can cope with the additional burden of EV charging (peak demand, differentiated electricity tariffs), and will also have to develop business models for the development of the related infrastructure. Warsaw in 2016-2017 was defining its plans as to public charging infrastructure, but now the actions – with the exception of bus infrastructure and a pilot project on car infrastructure at P&R Młociny – have been put on hold, since the new Polish law to be adopted by the end of 2017 envisages shifting the burden of public infrastructure development from municipalities to other stakeholders. However, the infrastructural challenges for the city will then change their nature from financial to organisational: the new proposed procedure requires e.g. lengthy consultations with electricity distributors as to reconciling their general development plans with plans on developing EV charging infrastructure in the municipality.

Strategic approach towards becoming a smart city

Warsaw supports and develops e-mobility projects (to a larger extent than other Polish metropolises), despite the fact that the Polish government is still reluctant to support our efforts (though the current Polish government launched a large e-mobility programme, with specific assistance for e-mobility yet to be materialised). By the end of 2017, in Warsaw the city staff and the local stakeholders have accomplished the following:

- testing of various electric and hybrid vehicles in various city units and municipal companies (including the long-term testing of two electric cars in the city fleet)
- installation of about 20 charging stations for passenger electric vehicles/plug-in hybrids (owned by private companies) and 30 charging stations for buses (owned by MZA municipal company) in Warsaw
- registration of 485 electric vehicles (around 60% of all EVs in Poland) and 6,249 hybrid vehicles
- introduction of 52 unregistered and six registered (i.e. cleared to operate on public roads) electric vehicles for use by Warsaw's MPWiK water and wastewater company
- introduction of four hybrid buses (in 2011) in the fleet of Warsaw's MZA municipal bus company
- acquiring by MZA of four hybrid buses and 20 e-buses by purchase and 10 e-buses by leasing
- submitting application for co-financing of 130 e-buses with associated infrastructure to Operational programme 'Infrastructure and Environment' and signing the resulting funding agreement

- signing by ZTM Warsaw Transport Authority contracts with private companies for operation of 55 hybrid buses in total
- introduction of nine hybrid cars into the municipal fleet.

So far, these developments – with the exception of charging points for passenger cars and the majority of the EV/HEV fleet - have been financed by the city and its municipal companies.

Other e-mobility measures

- e-car sharing: not decided yet, envisaged for the more distant future (the first stage of city car-sharing system, but without e-cars yet, is planned to be implemented in 2018; in the meantime selected private companies have started to offer quasi-car-sharing services)
- e-bike sharing: first 100 e-bikes implemented in 2017 (out of 5,100 in Veturilo city bike system)
- smart parking: not implemented yet, a pilot project of this kind will be modernisation of P&R Młociny to be completed in December 2017 (it will include 4 charging points for EVs, while other additional P&R functionalities related to smart parking are planned for the next related project with separate funding, to be launched in 2018)
- e-vehicle charging: 12 public-access charging stations for passenger cars, about 20 charging stations for passenger cars in total
- logistics: the city hall is not aware of such plans (although some companies have asked the city about its approach to such projects)

Organisational structure

In Warsaw e-mobility is included within a wider framework of energy and transport related activities. At the city hall, one person in the Infrastructure Department (Marcin Wróblewski) and another person in the Mobility Policy and Transportation Department (Stanisław Jedliński) deal with this topic on a more or less permanent basis. They have established a wider cooperation framework for the management of electric/hybrid buses only. This informal working group brings together representatives of the two aforementioned departments, ZTM and MZA.

The Infrastructure Department supports the introduction of alternative fuels in transport. It represents Warsaw in the e-mobility cluster that works in this field. Overall responsibility for transportation and e-mobility rests with the Roads and Transportation Department. Its main executive agencies are: the Warsaw Transport Authority (ZTM), which oversees public transport (also electric/hybrid buses); and the Warsaw Road Authority (ZDM), which coordinates the existing city bike system and the planned car sharing system. Electric bikes are to be included in the system very soon, while the introduction of e-cars for car sharing is part of the city's longer-term plans only.



SMART LAMP POSTS

Smart lamp post presents a very visible ‘quick win’ for smart cities; and the well-proven lighting and maintenance savings offer an attractive bankable initiative. The smart approach is to consider how to develop business models and funding mechanisms that incentivise implementation of ‘smart’ measures (WiFi; air quality, parking, eV charging, etc) alongside lighting exploiting what is typically a considerable network of existing assets – in other words to multi-purpose the ‘humble’ lamp post.

Information about priority area

Warsaw has no comprehensive strategy in this field. Separate specific plans foresee the modernisation of part of Warsaw’s street lighting system, which will potentially allow for adding smart lamp post functionalities. Warsaw would be interested in, for example, air quality sensors, cameras and EV

CHALLENGES

The main challenge lay in financing: how to add relatively expensive smart city functionalities to our project of retrofitting street lighting, which is based on PPP-EPC (public-private partnership, engineering, procurement, and construction). In other words, we would have to generate return on investment from energy savings. Adding further functionalities would make this task yet more difficult. Moreover, the lamp posts are in a different state of repair even in the same area/street, and this makes it even more difficult to identify areas where street lighting could or should be modernised. Furthermore, some of the lamp posts would require thorough modernisation, which would go beyond the PPP-EPC’s financial framework. Additional problem/challenge became gaps/errors detected in inventory of lamp posts conducted for project purposes. All these factors led to a decision on redefining the formula, and possibly also the scope of the project, with related analytical work starting in 2017. Therefore, unlike in the case of EV infrastructure, in this case challenges will become less organisational (since there will be fewer actors and a simpler formula involved) and more financial (how to secure a budget). Quite probable is utilisation of external funding, like EU financing.

chargers.

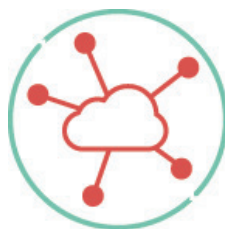
Strategic approach towards becoming a smart city

Unlike in other Polish cities, in Warsaw PPP projects like this one are divided into two stages: first there is a tender for (consortia of) advisors, who analyse the various financial/legal/technical options for physical implementation; and then a tender is announced for actual implementation. After the first stage it was recently decided in 2017 to switch from PPP-EPC to another formula (exact parameters to be defined in 2018).

Organisational structure

The Infrastructure Department coordinates Warsaw's public-private partnership projects (with a few specific exceptions). These include the retrofitting of the city's street lights (the system is owned by the city and managed by ZDM).





URBAN SHARING PLATFORM (USP)

An Urban Sharing Platform (USP) is a logical collection of technical components, capabilities and processes which provides functions and services that enable a smart city. Its purpose is to aggregate data and control functions from a wide variety of devices and sensors, store, process, correlate the data and present information to the city and citizens which enables better use of the city resources and may provide support for innovative service verticals.

Information about priority area

Warsaw has no comprehensive strategy in this field, and the city does not have approved formal plans to draft one in the near future. However, after completion of VaVeL project (which serves as a kind of a testbed), in 2018 decisions on launching such a joint urban data platform will be considered (probably without adopting any separate strategic documents as its basis, just in the form of a decision on the specific project).

Strategic approach towards becoming a smart city

The city remains in the exchange of good practices in this field, which will be helpful in designing relevant plans in the next years.

Organisational structure

The 19115 city information service for citizens is managed by the Social Communication Centre, while the city database system is operated by the Geodesy and Cadastre Department.

OTHER

Information about priority area

The quality of life of the city's disabled inhabitants will be greatly improved by the large-scale Virtual Warsaw project. The city will use beacons and smartphone applications to facilitate the mobility of visually impaired people. This project was the winner of the Bloomberg Philanthropies 2014 Mayors Challenge. In the more distant future, these beacons will be equipped with other smart applications. Within the framework of this project training courses on the use of smartphones and mobile apps for 1,000 blind and partially sighted residents of Warsaw started on November 2017. The next stage will involve co-financing of the purchase of smartphones. The City will allocate at least €250,000 for this purpose.

Organisational structure

The Virtual Warsaw project mentioned earlier is managed by the Social Policy and Projects Department.



4.

GOVERNANCE

The internal organisation and modes of governance in relation to external stakeholders are essential parts of the cities' transition to becoming smarter. The Sharing Cities programme gives opportunity to the city to rethink the way of working. The cross-departmental (internal) and focus groups (with external stakeholders) are presented.

INTERNAL ORGANISATION, GOVERNANCE

The Mayor of Warsaw holds executive powers. He/she is elected in an equal, general, and direct election. The city council of Warsaw has legislative and controlling powers.

The City Hall is divided into departments. Its 18 district offices together employ 8,468 people, who execute tasks for over 1.7 million inhabitants

The key municipal units and companies are:

- ZTM (Warsaw Transport Authority), MZA (bus operator), ZDM (Warsaw Roads Authority), Tramwaje Warszawskie, Metro Warszawskie, Szybka Kolej Miejska (Rapid City Rail) - public transport
- MPWiK - water supply and sewage management
- MPO - solid waste management
- ZOM and ZTP - cleaning and maintenance, green areas

Cross-departmental working groups (WG) and focus groups

The WG was established under the URBAN LEARNING Horizon 2020 project on integrative energy planning. The objective of this project is to mainstream and institutionalise integrative energy planning within city administrations (including taking into account aspects of energy in other municipal planning processes, like transport planning). The emphasis is on the governance processes related to the (re) development of urban sites. There have been working groups since 2015.

Since its inception, this project has envisaged the establishment of a local working group (LWG) in each partner city. These would bring together different stakeholders in the project. According to the project proposal, the LWG would be a “forum for collective, multidisciplinary learning and trust building among

different city departments, together with key stakeholders involved in the planning processes”.

The LWGs are supposed to “assemble representatives of relevant city departments as well as representatives from local distribution network operators, energy suppliers as well as developers/housing companies”. In accordance with this project's assumption, the initial proposal on the composition of the LWGs was prepared by the Infrastructure Department, which is responsible for coordinating the URBAN LEARNING project in Warsaw (drafting: Marcin Wróblewski, approval: director Leszek Drogosz). Invitations were sent out in official letters (also via e-mail and telephone) to the Warsaw LWG's projected external partners. An ordinance issued by the mayor on 14 July 2015 aimed to establish both the steering committee and the LWG (called Zespół Projektowy – ‘project team’ - in accordance with the internal city nomenclature). After the first round of consultations, the amended draft was circulated again. In its final form, the group includes: six city units; one organisation of construction developers; one research institute; and three energy companies:

- Architecture and Spatial Planning Department (BAiPP)
- Environmental Protection Department (BOŚ)
- Housing Policy Department (BPL)
- Infrastructure Department (BIN) (coordinator)
- Mobility Policy and Transportation Department (BPMiT)
- Warsaw Transport Authority (ZTM)
- Polish Association of Construction Developers (PZFD)
- Institute of Power Engineering (IEn)
- PGNiG TERMIKA S.A.
- Innogy Sp. z o.o.
- Veolia Energia Warszawa S.A.

The URBAN LEARNING cooperation framework in Warsaw envisages the following processes: energy planning; spatial planning (which also includes regulations concerning buildings); transport planning; environmental planning; and revitalisation.

The URBAN LEARNING LWG was the first formal municipal working group with such a wide thematic scope, comprising external partners as well. This is why not all partners invited were initially convinced of the importance of the project as a whole, and also of the relevance of their participation. However, during the ensuing exchanges they obtained more knowledge about the project, its progress and purposes, and this helped them overcome their initial doubts.

Sharing cities working groups (WG) and focus groups

Warsaw needed one new WG to cover all the areas, based on Warsaw's fields of interest within the framework of Sharing Cities. Since the composition of this WG and the URBAN LEARNING WG is rather similar, their meetings will often be held jointly (first part of the meeting dedicated to one Horizon project, and the second part to the other, even though, due to the general project rules, these would count as separate meetings).

The process for the Sharing Cities WG was to be identical to that of the URBAN LEARNING LWG, with one exception. During the meeting of the URBAN LEARNING LWG the members heard a brief presentation of the Sharing Cities project, and were invited to participate in the Sharing Cities WG. Accordingly, ZTM – which was originally not planned to attend that second WG meeting – will participate in Sharing Cities. The steering committee and the WG project team were supposed to be established by June 2016. They were up and running a month later, in July 2016.

The tasks of Warsaw's WG will correspond to the city's level of interest in the Sharing Cities project's specific topics and subtopics. This level of interest may be somewhat adjusted in future (for instance, our transport authorities like ZTM are interested in smart parking). Warsaw's Sharing Cities WG now brings together the following entities:

- Architecture and Spatial Planning Department (BAiPP)
- IT and Processing Information Department (BI)
- Housing Policy Department (BPL)
- Infrastructure Department (BIN) (coordinator)
- Mobility Policy and Transportation Department (BPMiT)
- Warsaw Transport Authority (ZTM)
- Warsaw Road Authority (ZDM)
- Polish Association of Construction Developers (PZFD)
- Institute of Power Engineering (IEn)



Moreover, the WG will also take on the duties of Warsaw's city board, in accordance with the Sharing Cities project terminology. The first meeting was organised in March 2017.

Warsaw does not consider it necessary to establish a separate focus groups next to the cross-departmental working group. This latter working group will be entitled to invite external experts or representatives of other institutions when needed.

Key stakeholders

In addition to the city council's departments, other units and municipal companies, the main stakeholders in the Sharing Cities-related projects, are:

- Polish city associations: Union of Polish Cities (ZMP); Union of Polish Metropolises (UMP); Association of Municipalities Polish Network Energy Cities (PNEC – this organisation has also signed a Memorandum of Understanding on Sharing Cities cooperation)
- the strategic electric grid operator PSE Operator
- the Innogy Group: Innogy Poland and the local electric grid operator Innogy Operator (which started to introduce smart grids solutions, such as smart metering)
- the dominant supplier of electric and heat energy in the Warsaw area, PGNiG TERMIKA
- the heat distributor for Warsaw's central heating system, Veolia Warszawa S.A. (which has implemented an intelligent heating network project)
- NGOs, e.g. the Institute for Sustainable Development, Polski Klub Ekologiczny, Nasza Ziemia Foundation, Koalicja Klimatyczna and WWF Polska
- energy agencies: KAPE, NAPE, MAE.

There are various channels for intense cooperation with and between these entities. There is a team dedicated to cooperation between the city and the energy companies. Certain NGOs were invited to Warsaw's climate protection team. NGOs, city associations, and companies are represented in the Partnership for Climate platform. Energy companies are also involved in the URBAN LEARNING working group. Energy agencies are partners of the city in multiple activities, including EU projects.

The city does not yet have a dedicated smart city demonstration area. An initial concept exists for a similar site - low-carbon area - and the location considered is Targówek Przemysłowy (Industrial Targówek). This area within the city will feature solutions to increase energy efficiency, protect the natural environment, and ensure low GHG emissions. The plan will affect city planning; the energy networks; building construction; transport; waste management; and water and wastewater management; and will draw on various sources of EU co-financing, PPP and other sources (such as funding based on revenues from selling Polish emission rights). We intend to utilise the results of Sharing Cities and other relevant EU projects (e.g. URBAN LEARNING on integrative energy planning) in developing the details and the implementation plan of this low-carbon area project.

ANNEX 1 - FELLOW CITIES INTERESTS

The follower/ fellow cities participate very actively in Sharing Cities and give regular feedback regarding their interests. Their input is collected through an early identification of interests (before starting the peer learning visits), and is developed further based on the feedback received after the peer learning activities. Furthermore, this input builds on the experience fellow cities had in meetings co-organised with the technical implementation team of different measures (e.g. Milan, London, Bordeaux, Lisbon) over the last two years. This feedback serves as the basis for further needs analysis, planning of future activities and building of the replication roadmaps for each fellow city in year 2018 and 2019. Lisbon has also participated in the Milan peer learning and within the programme we ensure that exchange happens and replication opportunities are also shared across the six cities.



Citizen engagement

All follower/fellow cities have found citizen engagement practices of all three lighthouse cities interesting. Peer learning visits and events have given the opportunity to the experts to better understand what kind of challenges lighthouse cities meet when working with the citizens. Some of the key interests relate to the private building retrofitting experience of Milan and the participatory, co-design processes implemented both in Lisbon and Milan. All three fellow cities already have a good basis, they work closely with their citizens but it is useful to see more methods and learn what works and what does not and why.

Burgas

As the three lighthouse cities have good practices in involving citizens in different initiatives and furthermore in the decision-making process, Burgas is willing to get inspired from the experience of the partners, their methods and tools in engaging citizens.

Bordeaux

Involvement of citizens for setting up a congestion charge scheme in Milan:

Involving private condominiums in the building renovation process: Porta Romana (Milan). We need to include the private condominium representatives in the energy renovation process of their collective housing parks, in the context of energy and social precariousness.



Building retrofit

All follower/ fellow cities in Sharing Cities have indicated they are envisaging building retrofit activities, and are looking at what the lighthouse cities have already achieved. Bordeaux is particularly interested in the engagement of citizens for building retrofit, decentralising management to the inhabitants and increasing user awareness and maintenance of public facilities. Bordeaux is also looking at Milan's inclusion of union representatives in private condominiums in the energy renovation process of their collective housing parks, in order to fight energy waste and social precariousness.

The city of Warsaw is looking at the creation and development of large-scale retrofit programmes, including standardisation of solutions and large-scale procurement allowing for a reduction of costs. It is also interested in learning more about energy performance contracting, including detailed financial measures and contract provisions which don't put the municipality at risk. Before launching those projects, Warsaw is also identifying relevant energy audits to be conducted to ensure sound preparation of retrofitting projects.

The city of Burgas is particularly interested to learn about the different models for retrofit that are applied for private and public buildings. It would also be looking at the different kind of programmes, initiatives and partnerships that exist which combine deep-retrofit approaches with innovative and ICT-enabled building systems.

Burgas

What different models for retrofit are applied for private and public buildings? What kind of programmes, initiatives and partnerships exist combining deep-retrofit approaches with innovative and ICT-enabled building systems?

Bordeaux

Retrofitting and new construction of a disadvantaged neighbourhood in Lisbon:

- The constructive systems selected design and innovative way of planning and buildings
- The association of local economic sectors
- Decentralised management to the inhabitants, including user awareness and maintenance of public facilities.

Retrofitting of buildings in Porta Romana (Milan), involving private condominiums:

How to include the private condominium unions representatives in the energy renovation process of their collective housing parks, in a context of energy and social precariousness.

What is the most economical way to retrofit buildings; is it to insulate or rather add digital solutions in houses and replace boilers?

Warsaw

Creation and development of large-scale retrofit programmes. Including how many different aspects such as: standardisation of solutions/ large-scale procurement allowing for a reduction of costs. (e.g. when there are numerous buildings connected within the same areas and with similar technologies). Delivering projects via public-private partnerships.

Energy performance contracting (which arises from a number of challenges, such as detailed financial measures, contract provisions, safe guarding municipality in such proceedings). Scope of energy audits to be conducted which are needed to provide sound preparation of retrofitting projects. Challenges connected with using renewable energy sources installations during retrofits (like as to provide proper energy management solutions for retrofitted buildings).

How to include more than only the financial aspects in the building retrofit process? (social aspect, health costs savings)

**Sustainable Energy Management System (SEMS)****Burgas**

General presentation of existing SEMS – how has it been created, how does it operate; how exactly will it be enhanced and optimised within the framework of the project? Which stakeholders are involved? What kind of funding is foreseen? What is the concrete role of cities/municipalities within the whole SEMS?

Burgas and Warsaw are envisaging the development of a SEMS. Warsaw is taking inspiration from the lighthouse cities to create and develop a monitoring system for energy consumption in various categories of municipal buildings, and will conduct parallel research into the best tools to use and ensure the training of people to make the most of the new installations. As the city of Burgas is just starting its reflection, many questions still remain, such as: how the SEMS has been created, how it operates, what stakeholders are involved, and what the concrete role of cities/municipalities is within the whole SEMS.

Warsaw is looking at how to create and develop a monitoring system for energy consumption in various categories of municipal buildings. This question includes the issues of providing detailed energy certification for these buildings, automation of the process, and providing training for building users and managers.

Bordeaux

The city is looking at the SEMS whose deployment is in progress in the three lighthouse cities. Bordeaux is interested to understand how to involve the local eco system, and at which providers and stakeholders would be able to deploy an innovative energy management system in Bordeaux.

Bordeaux is looking at the SEMS deployment in the three lighthouse cities, as the city is interested to understand how to involve the local eco system, which would help to identify the providers and stakeholders that would be able to deploy such a management system in Bordeaux.

Warsaw

How to create and develop a monitoring system for energy consumption in various categories for municipal buildings. It includes both issues of providing detailed energy certification for these buildings, automation of the process (technical tools) or provide trainings for buildings users & managers.



e-mobility - e-vehicle sharing

Burgas

e-bikes

How are e-bike sharing systems functioning and what kind of models are applied for the optimisation of the network?

e-cars

How does it operate for the public and private sectors, what are the different business models that are implemented?

The three fellow cities are looking at ways to increase the amount of electric vehicles circulating, while at the same time reduce the amount of privately owned cars. This double objective can be fulfilled by the development of e-vehicle sharing schemes which are discussed in the project. All three cities are in a different status but would like to learn and maybe implement similar solutions to the digital islands/ mobility islands of Milan.

All three cities are looking at having electric cars and electric bikes. They have started the process but selecting the right business model based on the experience of the lighthouse cities will be very useful.

Bordeaux already has electric vehicle sharing schemes but would be interested to compare associated key performance indicators from services in other lighthouse cities, which would allow them to improve. In order to extend the use of those schemes, Bordeaux is also interested to know how the city of Milan made it accepted by citizens who now consider it as a good alternative for their trips.

The city of Burgas envisages setting up a sharing scheme for electric vehicles but is still investigating how it can be operated jointly by the public and the private sector, and the different business models that can be implemented.

Bordeaux

e-bikes

The city is looking for an innovative business model in order to deploy e-bikes on a large scale.

e-cars

Many e-vehicle car sharing services are already available in Bordeaux. It would be interesting to compare associated KPIs with ones of the same services in development in the lighthouse cities.

How does Milan make people use the car-sharing schemes?

The question related to business models is also one asked in Warsaw. In addition, the city of Warsaw would like to pay particular attention to the involvement of all relevant stakeholders in the process and to obtain a good forecast of the energy demand for a coherent deployment of charging stations. It also is also seeking information on how to ensure the electric vehicles schemes can co-exist with schemes using fossil-fuelled vehicles. This information is deemed particularly relevant to finding the right business model which will ensure the electric vehicle schemes can compete with regular car sharing schemes, or if they will need to receive additional incentives.

Warsaw

e-cars

How to integrate e-vehicles car sharing systems and make sure those can co-exist with fossil-fuelled vehicles ones?

Business cases on e-car sharing. Especially when including their competitiveness compared to 'classic' car-sharing. It also covers the question as to whether e-car sharing shall receive additional incentives as opposed to current car-sharing schemes.



e-mobility - e-vehicle charging

Associated with the interest in the deployment of electric vehicle sharing schemes, follower cities are also investigating how to install a sufficient amount of charging stations throughout the city. Bordeaux is particularly interested in how Lisbon deployed charging stations on a large-scale with a standard business model for electric vehicles, offering an easy access to users. To be precise, it would look at how Lisbon made parking and charging free for electric cars, and the subscription

Burgas

How do electric vehicles public and private networks operate?

Bordeaux

Interested in large scale deployment of charging stations for electric vehicles. Particular focus on free parking and charging points.

What is the system running the good functioning and use of the charging points? (cards, platform)

General information about implementation of smart charging procedures

process and platform that enable this. It also seems relevant to observe where to install normal and fast loading charging points. Bordeaux is particularly interested in how Lisbon was able to successfully deploy electric vehicles charging stations.

The city of Warsaw is looking into innovative solutions to integrate the energy storage and charging points in the city, where there is limited room for new physical infrastructure. Warsaw is also interested to know about any alternative system that applies to professionals and delivery companies, which might have different needs than regular citizens using electric cars. The experience gathered by the three lighthouse cities on the cooperation they have developed with national administrators, energy providers and e-car sharing operators to install their charging points could clearly benefit the fellow cities for which these processes are new.

Warsaw

Collaboration with other actors such as national administrators, energy providers and e-car sharing operators.

Cooperation with other stakeholders, forecasting energy demand due to EU charging.

Possible solutions on decreasing burden put on the Grid by EU Charging Network (Energy Magazines next to Charging Points), proportions of quick and standard charging points in the city

Any specific regulation applying to professionals and logistic companies?

How to install energy storage units and charging points in city centres where room is scarce? How can they be integrated in the city centres?



e-mobility - smart parking

Burgas

How is the smart parking system connected to the other networks?

Bordeaux

How can private and innovative SMEs be involved in the smart parking deployment process?

Fellow cities are in general interested in existing solutions and Bordeaux is particularly interested in how the business models and how private companies and SMEs are involved in the smart parking deployment. Burgas has also expressed an interest in understanding better how smart parking is included in the networks and general strategy. The Warsaw national scale-up meeting has shown that there is also an interest in understanding how in Lisbon the parking company switched to a new model from being seen as the one who collects money for parking to a company which also reinvests that money. Communication has been seen as a key aspect for success and cities expressed interest in learning from good and bad experiences around this as well.



e-mobility - e-vehicle logistics

Bordeaux tries to foster the use of electric vehicles by logistic companies, its mobility department is therefore looking attentively at the developments in each lighthouse city, to analyse the pros

and cons of implementing such green delivery services. Burgas is particularly looking at how local deliveries and small businesses can be stimulated and encouraged to use electric means of transport for logistics. Warsaw is curious about the different schemes that can be

Bordeaux

Looking for innovative last mile delivery examples

Interested in e-vehicle logistics solutions and analysis on the pros and cons of implementing such green delivery services.

Burgas

How are local deliveries and small business stimulated to use electric logistics?

proposed to logistic companies and professionals using electric vehicles and their access to charging points.



Smart lamp posts.

Burgas

Implementing smart lamp posts and reuse the experience of the lighthouse cities. Interested in demonstration of different services, functions and additional forms of value of the lamp posts; how collected data is used.

What can be done with the data collected? Who is using it and for what?

Bordeaux

Innovative business model like a public-private partnership for deployment at a large scale.

Most economical strategy: replacement or adaptation of existing lamp posts infrastructure?

Can smart lamp posts infrastructure offer new communication support for the cities?

The emergence of smart lamp posts and the multiple features they offer is certainly of interest for fellow cities which are carefully observing what the lighthouse cities have already done, in order to build on their successes and avoid the difficulties they might have been through already. While all cities have already planned to or effectively replaced infrastructure from several decades ago that consumes a lot more energy, they are now looking at different sorts of sensors and other features that can be installed. The experience from lighthouse cities is manifold and could help fellow cities that are looking at innovative business models that would allow a deployment of smart lamp posts at a larger scale. Bordeaux, for instance, is reflecting on whether to replace the infrastructure or adapt what already exists. It is also looking at the opportunity of new communication support offered by smart lamp posts.

Those same questions are also coming from Burgas, which is looking at the services, functions and additional forms of value offered by smart lamp posts. The multiple sensors that could be integrated into the new lamp posts will collect a large amount of data, thus the city of Burgas is already studying how this data can be used and by whom. Anticipating the use of data is of utmost importance to installing the right sensors which will be useful to the city.

Bordeaux and Burgas are also looking at replacing their lamp posts with more energy efficient lighting solutions. Bordeaux is particularly interested in Milan's process and how they were able to engage civil servants in the process.



Urban platforms.

Burgas

Interested in demonstration of how an USP operates and functions.

The data management and urban sharing platform developments are providing interesting models for the follower/ fellow cities.

Bordeaux has conducted a needs analysis for common and shared urban data platforms to see if the proposal of the Sharing Cities Urban data platform will be able to fulfil those needs.

Bordeaux

Following the needs analysis of users, Bordeaux is looking at the common and shared urban data platforms to know if the proposal of the Sharing Cities Urban data platform will be able to fulfil those needs.

Can smart lamp posts infrastructure offer new communication support for the cities?



Additional interests

One of the key lessons learnt so far is that for replication the follower/ fellow cities need a lot of deep exchanges on general policy (e.g. mobility) governance, political leadership, business models, financing, ICT maturity, citizen engagement and understanding how the reality of the lighthouse cities corresponds to their own. Cities have their own ecosystem with external stakeholders and how those relationships are managed, what is the way to get the maximum out of those collaborations, and how to procure what is needed strategically are also key issues. The political, legal and financial and social dimensions are as important as the technological lessons. Due to this process being open

Bordeaux

Low emission zone

The congestion charge set up in Milan and the positive results in terms of air quality, reduced traffic and accidents, improved commercial speed and frequentation of CTs, but also in terms of public spaces (pedestrianisation) or productivity gains for deliveries.

Traffic management

Looking at the Transport for London 3D simulation model, the Sharing Cities partnership programme allows Bordeaux to benefit from an exchange of best practices on the simulation of traffic flows in dense urban areas.

Digital transition

In the framework of the new GDPR, European law, Greater London authority has launched a tender to accompany local authorities in order to respect the implementation dates (25 May 2018). The Sharing Cities partnership program allows us to benefit from the awareness of those experts and to contribute to this relevant working group.

Governance

The climate and innovation agency in Lisbon, Lisboa E-Nova and how it helps the city to identify priorities, how it is included the city's decision-making process, how it helps to implement smart city projects. Its role, structure is interesting to see if it can be replicated in Bordeaux.

to all that could matter for replication, cities came forward with further topics such as implementing a low emission zone (Milan- Bordeaux- Warsaw) , traffic management (London- Bordeaux), digital transition and privacy, data protection (London, Milan) and governance (Lisbon- Bordeaux).

Warsaw**Low emission zone**

What are the technical preconditions to implement the measure in a city?

Is there any legislative/regulatory framework that could help the implementation?

Are there additional success factor that could help?

What would be the approximate level of expenditure? Is this in line with the budget at your disposal?

What are the key people to involve in the implementation?

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