2nd Replication Assessment Reports of the Follower Cities

Cork, Graz, Porto, Suceava and Valletta

Update on 15 February 2018 of

Final Version, 30 June 2017

D7.2 Updated Baseline Assessments

Follower Cities of GrowSmarter

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 646456. The sole responsibility for the content of this document lies with the author and in no way reflects the views of the European Union.

Table of Contents

Summary

As part of the GrowSmarter project, five cities (Cork, Ireland; Graz, Austria; Porto, Portugal; Suceava, Romania; and Valleta, Malta) have been engaged as Follower Cities (FC) to complement three Lighthouse Cities (LC): Barcelona, Spain; Cologne, Germany; and Stockholm, Sweden. The main task of these FCs is to identify, and eventually replicate, priority Smart Solutions implemented by the LCs which they find to be applicable to their own cities. A Smart City Liaison Group (SCLG) was established in each FC to bring together multiple key stakeholders in order to assess the deployment of replicable Smart Solutions in two stages.

This report constitutes the accumulated findings of all five FCs' second assessments. Each SCLG analysed the replicability and scale-up potential of applying the three LCs' Smart Solutions to different districts of each city. Not only does this consolidated report address technical aspects, but it also delves into cross-cutting matters like stakeholder engagement, political framework conditions, existing barriers and possible synergies with other initiatives. All of this knowledge will then be translated into a viable Replication Plan for each FC, providing more concrete details of how LCs' Smart Solutions can be feasibly deployed, and even scaled up to new districts within the cities.

As can be seen later by investigating the individual cities' assessments, all five of FCs find strong replication potential for implementing Smart Solutions inspired by the examples set by the LCs. It also is worth emphasising the point that even though all three LCs are major European metropolises (ranging from around 2-5 million inhabitants), their Smart Solutions are not exclusively applicable in large population centres, but also can be adapted for Europe's smaller and medium-sized towns (the FCs' range from about 100-400.000 residents). The point being that Smart Solutions are not necessarily dependent on population sizes, and can often be scaled up or down as needed.

Furthermore, it becomes clear that each of the FCs have a wide range of existing policies which already feed into or connect with their smart city development plans. These can thereby serve as guidelines steering them towards the Smart Solutions which are most appropriate to their own context. While some of the cities draw upon policy frameworks at a national level, all of them can look to existing local planning processes (e.g. general urban development plans or even specialised planning documents like smart city strategies, SEAPs[1] and/or SUMPs[2]) for guidance. Furthermore, because of such policies and past experiences, many of the FCs already have solid organisational structures in place to support their smart city ambitions.

Such solid, and diverse, support structures will be crucial for helping the FCs to resolve any potential conflicts. In general, there are a few broad obstacles which must be commonly overcome, to varying degrees, in all five FCs (e.g. lack of funding/staff capacity, administrative hurdles, old infrastructure, citizen participation/acceptance, etc.). Otherwise, there also remain other barriers specific to certain FCs and/or even distinct types of Smart Solutions (e.g. requirements for specific investment contributions, public procurement restrictions, protected heritage districts, sceptical/opposing stakeholders, etc.) which also must be addressed.

One of the major ways of avoiding, or at least mitigating, such problems is through the thorough engagement of key local and regional stakeholders in smart city planning processes. This is precisely the reason why the GrowSmarter project has insisted that all cities build on pre-existing relationships and groups to establish strong SCLGs. This is an approach which has been proven to be more than just a formality, since it can give a real voice to all relevant stakeholders – other than simply contributing different perspectives, they also can all gain a true sense of ownership of the whole

[1] SEAP = Sustainable Energy Action Plan, see also related SECAPs (Sustainable Energy and Climate Action Plans)
[2] SUMP = Sustainable Urban Mobility Plan

process, and therefore have a vested interest in seeing it done well. Though some of the FCs have established large SCLGs, and others relatively small ones, they have all succeeded in bringing on board many of the key stakeholders to support the cities in their smart plans.

With such a framework in mind, readers are now invited to discover in more detail all of the interesting findings that each of the FCs have uncovered. With further reading, it will become clear that each of GrowSmarter's LCs has already proven itself to be inspirational, and it is likely that each of the project's FCs will in turn serve as future models inspiring replication to even more cities.

1. Objective

The Follower Cities (FCs) are committed to preparing for the replication within their territories of the Smart Solutions demonstrated by the Lighthouse Cities (LCs). In order to ensure appropriate and effective transfer of knowledge, experiences and Smart Solutions, the FCs will develop a baseline assessment for replication.

To this end, objectives of the Replication Assessment include the following:

- Identify and assess the full potential of replication and up-scaling of Smart Solutions on a city level and for specific districts
- Provide a matrix for FCs to develop their smart city projects through in-depth understanding of concept, approaches, applications, opportunities, challenges, needs, success factors of smart city applications in LCs
- Support related and necessary local smart-city stakeholder engagement
- Support the political and technical capacity development process through mapping the framework conditions for deploying Smart Solutions and identifying opportunities and needs for a knowledge transfer
- Prepare and engage FCs as 'sounding boards' in observing, supporting and evaluating the Lighthouse projects.

2. Parties engaged in the 2nd Replication Assessment Report

The Smart City Replication Assessment is prepared by the FC Liaison Group. Cork, Graz and Porto are supported through all activities by ICLEI. Suceava and Valetta are supported by REC

Lead supporter: Carsten Rothballer, Coordinator, ICLEI Europe (carsten.rothballer@iclei.org)

Gabor Heves, Expert – Smart Cities and Mobility, REC (gheves@rec.org)

2.1 City of Cork

Lead author: Aidan O'Riordan, Project Leader, City of Cork (aidan_oriordan@corkcity.ie)

Members of Follower City Cork Liaison Group

INTERNAL (Cork City Council)

- Ann Doherty, Chief Executive
- Ruth Buckley, Head of ICT & Business Services
- Brian Cassidy, Senior Executive Engineer-Housing
- Seamus Coughlan , Senior Engineer-SPED
- Claire Davis , Cork Smart Gateway
- James Goulding, Executive Engineer- Environment
- Anthony Holmes, General Foreperson- Housing

- David Joyce , Director of Environment & Recreation
- Michéal Lyons, Executive Engineer
- Paul McGuirk , City Centre Co-ordinator SPED
- Conor O'Leary, Senior Executive Engineer-Housing
- Aidan O'Riordan, Programme Manager-ICT
- Adrienne Rogers, Head of Enterprise
- John Walsh, Energy Manager
- Jeremy Ward, Senior Executive Planner-SPED
- Ian Winning, Senior Executive Engineer-Roads

EXTERNAL

- Dirk Pesch, Head of Centre- Nimbus Embedded Systems Research
- Mike Hayes, Senior PM (Energy Efficiency)-Tyndall National Institute for ICT Research
- Tony Day,Director- IERC (International Energy Research Centre)
- Kieran Lettice, Cluster Manager-Energy Cork
- Darren Reidy, PPN Secretariat-Cork City Public Participation Network
- Conor Healy, Chief Executive-Cork Chamber of Commerce
- Liam Ring, Technical Services Manager-ESB
- Mr. David Clements, Transportation Planner- NTA (National Transport Authority)
- Donal Kissane, General Manager-Bord Gais
- James Fogarty, Divisional Manager-Cork County Council
- John Forde, Economic Development-Cork County Council
- Caroline O'Driscoll, Chairman- IT@Cork
- Captain Paul O'Regan , Harbour Master -Port of Cork

2.2 City of Graz

Lead author (Follower City of Graz): Christian Nussmueller, Local Project Coordinator (christian.nussmueller@stadt.graz.at)

Members of Follower City Graz Liaison Group

Municipality Level (core group):

- Executive Director for Urban Planning, Development and Construction, Mr Bertram Werle
- Executive Office for Urban Planning, Development and Construction, Mr. Kai-Uwe Hoffer
- Urban Planning Department, Head of Unit, Mr Bernhard Inninger
- Urban Planning Department, Oliver Konrad
- Environment Department, Head of Unit, Dr. Werner Prutsch
- Environment Department, Wolfgang Goetzhaber
- Road Management Department, Head of Unit, Mr Thomas Fischer
- Road Management Department, Mr Bernd Cagran
- Road Management Department, Mr Werner Zipper
- Department for Traffic Planning, Head of Unit, Mr Martin Kroissenbrunner
- Department for Traffic Planning, Mr Mark Thaller
- ITG-Informationstechnik Graz GmbH, Managing Direktor, Mr Friedrich Steinbrucker
- Holding Graz - Kommunale Dienstleistungen GmbH – Linien, Ms Elena Just-Moczygemba
- Citycom, Mr Alexander Schaffler

Smart City Graz Pilot Project Consortium:

- Energie Steiermark, Mathias Schaffer
- SFL technologies, Mario Müller
- Architektur GmbH, Markus Pernthaler
- Energie Graz, Stromnetz, Wolfgang Knaus
- Green Tech Cluster Styria, Bernhard Puttinger
- ALFEN Consult, Hans Wilhelm Alfen
- Technical University Graz, Department for Urban Construction, Ernst Rainer
- StadtLABOR Graz, Barbara Hammerl, Hans Schnitzer
- AVL List, Erwin Hauser
- SOT Sue Ost Treuhand, Johannes Ruhs

2.3 City of Porto

Lead author (Follower City of Porto): Paulo Calçada, Head of Innovation Unit (paulo.calcada@portodigital.pt)

Support: Margarida Campolargo, Innovation Unit

Members of Follower City Porto Liaison Group

- Fernando Rui Russell Cortez Barbosa Pinto, DMSI
- João Sendim, DMVP
- João Neves, DivDMVP

2.4 City of Suceava

Lead author (Follower City of Suceava): Dan Dura, Project Manager, Suceava Municipality (dandura@primariasv.ro)

Members of Follower City Suceava Liaison Group

- Airoaie Doru, SC Auto Adria SRL, manager@autoadria.ro
- Cojocaru Cristina Elena – Suceava Regional Commissariat – elena.cojocaru@apmsv.apm.ro
- Lucian Harsovschi – Local council of Suceava Municipality – harsovschi@primariasv.ro
- Francu Raluca – SC Relians Corp – raluca.francu@relians.ro
- Munteanu Cristina – Association Ecological Group of Cooperation –GEC Bucovina – gecbucovina@rdslink.ro
- Robest Greceanu – Suceava County Council – robert.greceanu@cjsuceava.ro
- Harabagiu Andrei - NGO TRANSIRA – andreihara@yahoo.co.uk
- Lazar Gabriela - European Integration and Development Strategies Office, Suceava Municipality – gabriela.lazar@primariasv.ro
- Lungu Lucian – ”Stefan cel Mare” College – cn_stefan@yahoo.com
- Murariu Lucian – Romanian Road Authority, Suceava Agency – murariu_lucian@yahoo.com
- Pentiuc Radu – Faculty of Electrical Engineering and Computer Science, ”Stefan cel Mare” University Suceava – radup@eed.usv.ro
- Petrcu Gabriel – Local Transport Authority Office, Suceava Municipality – gabriel.petruc@yahoo.com
- Popescu Mihai – ”Stefan cel Mare” University Suceava – mihap@seap.usv.ro
- Romaniuc Darie – SC Local Public Transport SA Suceava – tpl@suceava.rdsnet.ro
- Gheorghe Hritcu – auditor for energy – hgh_sv_ro@yahoo.co.uk
- Bejenariu Ana Maria – Association of residents”Areni”– ana_bejenariu@yahoo.com
- Neculai Croitor – SC ATOM Consulting srl – nicu.croitor@gmail.com
- Simona Strimbeanu - European Integration and Development Strategies Office, Suceava Municipality –ssimona.strimbeanu@gmail.com

2.5 City of Valletta

Co- authors (Follower City of Valletta):

- Victor Battistino, Senior Manager, Malta National Electromobility Platform (MNEP), City of Valletta (victor.battistino@transport.gov.mt)
- Peter Paul Barbara, Director of the Sustainable Mobility Unit, Transport Malta and National Coordinator MNEP (peter.p.barbara@transport.gov.mt)
- Alexandra Ellul, Manager MNEP, Transport Malta (alexandra.ellul@transport.gov.mt)

Members of Follower City Valletta Liaison Group

- Ministry for Transport, Infrastructure and Capital Projects – Permanent Secretary – christopher.a.cutajar@gov.mt
- Ministry for Energy and Water Management – Permanent Secretary – anthony.a.gatt@gov.mt
- Enemalta Corporation – Chairman's Office – frederick.azzopardi@enemalta.gov.mt
- Valletta Local Council and other regional Local Councils – Michael Cohen, Advisor, Local Councils Affairs – michael.cohen@transport.gov.mt
- Sustainable Energy and Water Conservation Unit (SEWCU) – info – energywateragency@gov.mt

3. Timeline and replication roadmap

The Smart City Replication Assessment can be understood as a living document that which is continuously (and at least annually) updated and refined as needed to reflect the latest developments of the potential and framework conditions for the replication of Smart Solutions. Two public reports are foreseen; the first for month 6, the second for month 30. Subsequently, the Replication Assessment will lead to the development of a Replication Plan in month 48.

The Replication Assessment is part of the overall replication roadmap of the Follower Cities (FCs) of GrowSmarter and can be characterized by the following milestones:

Milestone 0	• FC made initial selection of LCs' Smart Solutions for replication
Milestone 1	• Establish a multi-stakeholder Smart City Liaison Group
Milestone 2	• 1st Replication Assessment for deployment of Smart Solutions
Milestone 3	• Establishment of capacity development programme and stakeholder process in FC
Milestone 4	• 2nd Replication Assessment for deployment of Smart Solutions
Milestone 5	• Development of Replication Plan in FCs
Milestone 6	• Up-scaling and replicability Report

4. Structure of the Replication Assessment

The Smart City Replication Assessment consists of the following main sections:

Smart City Replication Profile	• Mapping the overall framework conditions and potentials for replication within the city territory
Smart Solutions Selection	• Description of replication potential of selected Smart Solutions of LCs within FC
Smart District Replication Profile	• Per potential replication site/district: Mapping of district related framework conditions relevant for the replication of the selected solutions
Smart Measure Specifications	• Assessment and adaptation of measures towards the most effective deployment and integration at site/district level

5. Replication Assessment of the Follower City Cork

5.1 Smart City Replication Profile

5.1.1 Mapping the overall framework conditions for replication within the city territory

Q1 What is the overall replication potential for Smart Solutions until 2020 and beyond?

Cork City is Ireland's most southerly city, the state's second city and the regional capital of Munster. Located on the Atlantic seaboard, the city has long been associated with port activities, given its location in a sheltered protective estuary on the second largest harbour in the world. Cork City Centre is the historic, cultural and commercial heart of Cork and the South West region and its success is fundamental to the well-being of the local and wider Irish economy and to the projection of a vibrant image for the overall city. It has the greatest concentration of employment in the city and an expanding residential base. It is essential that the City Centre continues to develop its role as the key economic driver of the region and withstands the threat of vacancy, dereliction and locational competition heightened by the economic recession.

Cork's evolution as a port town, and City since its Charter in 1185, has been historically connected to its geographical location. A seventeenth century merchant city with closer links to Amsterdam, Bristol and Swansea than Dublin, it developed as a "Dutch" merchant city with a port focus, a trading culture and a built environment to match this role and status. Land reclamation gave the city its Georgian urban extensions, and later Victorian tentacles of housing lined the ridges on both sides of the city providing homes to merchant princes, whose frontages overlook and address the city. Later suburban development was slower until the 1960s onwards, when Cork grew beyond its organic shape, rolling over ridges and hills to the open countryside, subsuming villages into its urban structure.

Today Cork is a well-connected and dynamic small city of 120,000 people and a metropolitan population of 300,000 approximately. It has a big heart and a diverse range of assets, within the city and close at hand, that make it a great place to live and learn and a very appealing place to do business. Capital has been attracted to come to the city since the seventeenth century and more notably since the Ford Factory in the 1920s, and the pharmaceutical and ICT companies that have made Cork their home since the 1980s.

There is a clear commitment in Cork to the pursuit of smart, sustainable and inclusive development for our region with a view to ensuring our ability to continue to compete on a global level into the future. The Cork region is governed by two local authorities, Cork City Council and Cork County Council. The councils regularly collaborate on projects in a number of areas and functions and have developed an initiative for the region called the Smart Gateway. The objective is to combine hard infrastructure, social capital, including local skills and community institutions, and (digital) technologies to ensure the development of Cork as a smart, sustainable and inclusive place in which to live and work, capable of competing with other cities globally.

Cork has been very active in the 'Smart' space already; there are many examples of completed projects and operating services. Cork has many assets in pursuing a 'Smart' agenda: ICT Research and Technology Organisations, strong collaborative history and networks with industry, and a sense of community. Now, the recent research into the Smart Gateway concept and missions to leading Smart

Cities in Europe show that significant benefits could be achieved through pursuing the 'Smart' agenda in a more structured way.

Cork has been heavily involved in European initiatives such as the Covenant of Mayors, CIVITAS and POLIS. The Sustainable Energy Action Plan (SEAP) submitted to the Covenant of Mayors outlines a 20% reduction in emissions by 2020. Involvement in these networks has aided in the realisation of the importance of pursuing a smart agenda for Cork and has had a direct influence on the city's development plans[3] and the Cork City Energy Plan all of which clearly align with the replication work which we plan to undertake within the GrowSmarter project.

The European Green Capital Award initiative was launched by the European Commission in 2008 with the objective of recognising cities that are leading the way with environmentally friendly urban living. Cork City has recently applied to the European Commission Environment Directorate to be considered to for the European Green Capital Award (EGCA) for 2017. The application was made by Cork City Council supported by Cork County Council, Energy Cork, ESB Networks and Gas Networks Ireland. Other organisations who contributed to the application included Cork Environmental Forum, UCC, CIT, Irish Water, Cork Airport, Port of Cork and Cork Chamber of Commerce. The application allowed us to showcase the many innovative and very successful green initiatives taking place in Cork and the European Green Capital initiative presented us with an opportunity of documenting these and benchmarking us against other environmentally proactive cities. The bid was unsuccessful, but the Directorate commented a number of our initiatives, particularly sustainable travel in the Park NRide project and the new bike share scheme. The 2015 European Green Capital is Bristol with previous winners including Stockholm, Hamburg, Vitoria-Gasteiz, Nantes and Copenhagen.

The Smart Gateway Initiative envisages a comprehensive suite of underlying enabling technologies across the region to stimulate innovation, give access to open data streams, and create seamless interaction between individual systems – a system of systems. Resident engagement is seen as a key component in this initiative.

There is a range of international factors driving the Smart City agenda. These include negatives – rapid urbanisation, environmental and quality of life stresses, economic competition; and positives – increasing technology capabilities, dramatically reducing costs, the exploding 'internet of things'. Increasing citizen expectations are a significant driving force, in terms of the quality of interaction with government and access to information and services. Through our dedication to the smart agenda we want to position the region to take full advantage of the opportunities that these international changes will present. As the 'Smart' agenda is deliberately pursued in a planned manner over time, we expect specific benefits to include:

I. Fuelling and supporting sustainable economic development – driving innovation

II. Facilitating job creation – leveraging existing stakeholder activities

III. Facilitating citizen involvement and participation

IV. Promote resource efficiency

V. Improving citizen quality of life and services

[3] Cork City Development Plan 2015-2021 http://www.corkcitydevelopmentplan.ie/

VI. Providing an attractive environment for all

VII. Attracting additional funding

We intend to build on these strong foundations of co-ordination and collaboration on a smart agenda for Cork in order to pursue both national and European funding mechanisms going forward to support our development as a Smart Gateway.

Q2 How does the "Smart City" approach feed into/connect with your existing local planning processes?

A set of project criteria have been produced which will ensure that all smart city projects align with the current suite of development plans in the region. These include the South West Regional Planning Guidelines[4] and the Cork City and County Development Plans as well as the Cork City Energy Plan 2013. As already mentioned, both Cork City and County Councils regularly collaborate on projects in a number of areas and functions. Within this spirit of collaboration in 2001 the Cork Area Strategic Plan (CASP)[5] was published. The plan sets out a vision for the development of the Cork Gateway to 2020 as a leading European city region which is globally competitive, socially inclusive and culturally enriched. CASP is a non-statutory land use and transportation plan for the greater Cork area. Although CASP is a non-statutory plan many of its elements have been adopted by the statutory South West Regional Planning Guidelines, to which all city and county development plans must adhere.

Cork 2050 is a joint submission by Cork County Council and Cork City Council to the National Planning Framework. It is a whole of Cork proposition presenting an evidence-based strategy for maximising the unique capacity of Cork to complement Dublin. Cork 2050 also positions Cork as a driver of growth internationally on behalf of the State and will deliver balanced regional growth through collaborative leadership.

Given the strong alignment between the principles of Smart and those of sustainable development as laid down in our suite of development plans governing the Cork region, it became clear to the CASP steering committee that pursuing a Smart agenda for Cork simply made sense and was the next step in ensuring our region develops as a sustainable, inclusive globally competitive region going forward.

Q3 Is there a (strategic) plan and organisational structure in place to become a "Smart City"?

The bodies governing the Smart Gateway Initiative are composed of Cork City and County Councils and the Tyndall and Nimbus research centres of University College Cork and Cork Institute of Technology respectively. The governing body has sought input and advice from representatives across the triple helix during several meetings and at a larger workshop which was organised in order to build the business case for the Cork Smart Gateway Imitative. This document sets out the concept of the Smart Agenda and how it applies to Cork region and how it fits within the policy context, European, national and local. It lists some of the existing Smart assets of the region such as the

[4] South West Regional Planning Guidelines 2010-2022
http://www.swra.ie/index.cfm/page/regionalplanningguidelines
[5] CASP 2001-2020 http://www.corkcity.ie/casp/strategicplan/

Metropolitan Area Networks and the Research Centres including Nimbus and Tyndall. It then describes the vision and objectives for the Smart Gateway initiative as well as exemplar projects to be delivered during the pilot two year period. Finally a funding and governance model incorporating the quadruple-helix for the initiative is proposed. The business case was later adopted by the CASP steering committee.

The Cork Smart Gateway Governance Model is based on the following actions many of which are currently in process:

1 Establish a Project Management Office (PMO) with dedicated Co-ordinator & staff
2 The PMO will report directly to a steering group made up of the funding stakeholders;
3 PMO to be responsible for delivery of objectives within a defined budget
4 A memorandum of understanding defining deliverables, schedules of payment, roles & responsibilities in particular addressing all aspects of fiscal transparency and accountability, would be signed by all funding stakeholders at the outset;
5 A formal annual review of the workings of the PMO would be carried out by the steering group.
6 An annual report would be produced for the steering group and for the CASP committee.
7 The domain experts group (currently known as the smart steering group) would continue to meet at least 4 times a year to be kept informed of progress, opportunities for collaboration etc.

A formal report would go to council and to either the PPN (public participation network) or the LCDC (Local community development committee) as appropriate. The establishment of a formal framework for citizen participation is an essential part our smart initiative which we intend to pursue as a priority going forward.

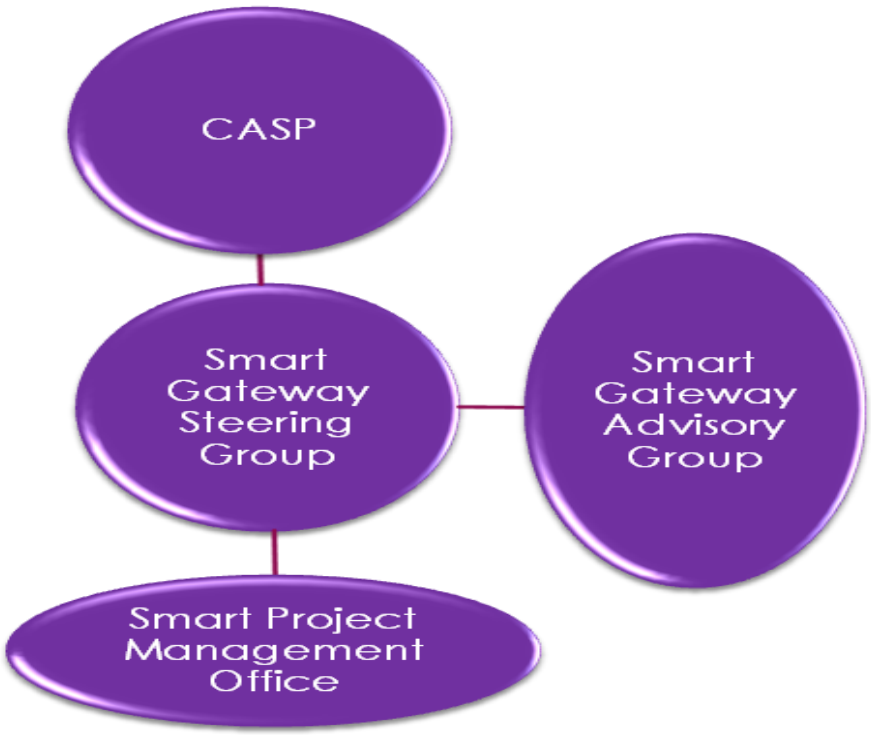


Figure 1: Governance Structure for Cork Smart Gateway

Q4 Are there synergies and/or conflicts of the "Smart City" plan and organizational structure with existing initiatives and their structures within the city?

There are many synergies between the Cork Smart Gateway Initiative and existing initiatives and structures within the city. Organisations such as Energy Cork, a multi-sector energy cluster and IT@Cork, a multi sector ICT cluster, provide opportunities for collaboration and innovation to achieve energy and emission reduction and other climate targets while at the same time seeking opportunities for further ICT enabled enhancements in citizen quality of life and engagement. Cork City and County Councils have established structures for joint initiatives as well as internal organizational groups and initiatives. These will operate in parallel to the Smart Gateway initiative however with representatives on the Technical Advisory Group for the Smart Gateway it is expected that there will be many opportunities for information exchange. As shown and mentioned above the Smart Gateway Initiative was born out of the CASP committee within that overall framework for the strategic development of Cork. The Smart Gateway Steering Group which was set up to drive this agenda included representative from both city and county councils as well as representatives from Tyndall and Nimbus research centres. A memorandum of understanding has been agreed and signed by Cork City Council, Cork County Council, Nimbus Research Centre at CIT and Tyndall National Institute and this sets out the terms of agreement relating to the governance model of the Smart Gateway Initiative.

The establishment of a Project Management Office (PMO) is facilitated through the support of each of these bodies. Tyndall and Nimbus will provide and pay for an appropriately skilled person each to support and report directly into the program manager ideally based on site with the Programme Management Office (PMO). Cork city and Cork county councils will also assign staff resources to the PMO on a full time or part time basis.

The Water Services and Systems Innovation centre (WSSI) which is an initiative which was seed funded by both Cork City and County Councils and Cork Institute of Technology is aimed at supporting companies to develop 'Smart' systems and products in the water sector. It is envisaged that this WSSI will be integrated into the working of the Smart Gateway at a time yet to be identified, to take advantage of the synergies which exist between these initiatives.

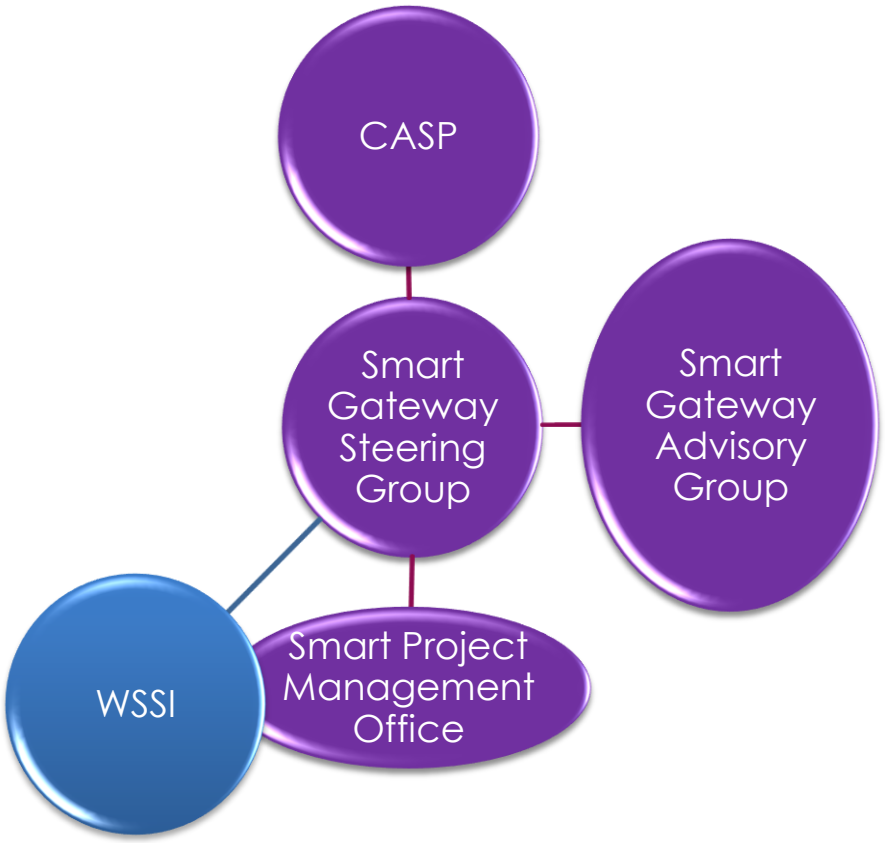


Figure 2: Proposed Integration of WSSI into the governance structure of Cork Smart Gateway

On a broad level both city and county councils as local authorities have a democratic mandate and the Smart Gateway Initiative provides the ideal means of improving resident engagement, connecting the residents with their respective local authorities. It aligns perfectly with our efforts to move towards more evidence based policy making and to ensure that services are delivered in the most resource efficient, responsive and proactive way possible.

In terms of conflicts, Cork City has buildings originating from the Medieval to Modern periods particularly in the City Island area. As such these buildings are in conservation areas and a number of buildings are listed buildings. There could be perceived conflicts between utilising new technologies on listed buildings. Planning exemptions with regard to renewable energy technologies would NOT apply to these buildings. Each planning application would have to be dealt with individually, with no guarantee that the technology would be permitted on the development

Q5 Which and how are regional and local stakeholders involved in the Smart City strategy and planning process on a city level?

As is clear from the above the Smart City Liaison group contains representatives from across the quadruple helix. It is envisaged that this group will meet on a quarterly basis and will act as both a Technical Advisory Group for the Cork Smart Gateway Initiative as well as the Smart City Liaison Group for the project.

As the process develops we envisage inviting further stakeholders to join the group as relevant and necessary depending on specific subject matter which is being discussed at the time. One of the first initiatives delivered by Cork Smart Gateway was a comprehensive citizen engagement survey and business survey which yielded a number of interesting results to help shape future planning and initiatives.

Q6 What are past (<5 years) and current projects that are closely related to the "Smart City" concept?

Cork has a successful track record of implementing 'smart' projects. There are many examples of both demonstration projects, where new ICT-related technologies have been trialled; and of full deployment projects, where technologies have been rolled out for enduring beneficial use. These projects have been led by one of the Local Authorities, by Nimbus, or by Tyndall, depending on the particular project in question.

These projects have delivered measurable improvements in innovation, support of economic activity, quality of life, and/or performance of the specific systems they address; they represent real progress towards a Smart region. Some of these examples demonstrate the real benefits of the partnership approach between public, private and academic bodies – which is at the core of the 'Smart' agenda.

Some specific examples of 'Smart' assets from projects and initiatives already undertaken in Cork – a far-from-exhaustive list, include the following:

- **CITY COUNCIL ELECTRIC VEHICLES:**

The **Drive4Zero** is a unique and exciting initiative that aims to promote the use of electric vehicles in Ireland using Cork as a pilot area. This **Drive4Zero** initiative provides a real opportunity to leverage special savings, unique product offerings and a variety of advantages to convince more people that driving an electric car is the right choice for many reasons.

Several people, organisations, companies and groups have come together to make **Drive4Zero** a reality. The initiative has been spearheaded by Minister for Agriculture, Food & Marine with responsibility for Defence, Simon Coveney T.D., who is an electric car driver, electric vehicle (EV) ambassador and a passionate advocate of EVs.

The project team are based at the Science Foundation Ireland Centre for Marine Renewable Energy (MAREI) UCC and are co-ordinating the efforts of the **Drive4Zero** stakeholders and partners. www.drive4zero.ie

Green eMotion Project – Cork City Council Electric Vehicles Fleet

Cork City Council deployed a number of electric vehicles, including 3 Pedelecs, on the corporate fleet all of which was funded on the Green eMotion EU Project. The feedback by users has been very positive and the EVs continue in daily use without any difficulty to deliver significant energy savings.

The Fire Department of Cork City Council purchased an EV van with the support of Green eMotion and fitted out the vehicle for use as a 'Cardiac First Responder'. The EV is marked up in the distinctive Fire Brigade Livery with Emergency Blue Lights and is regarded as ideally suited to this niche application. The unique profile has highlighted the viability of EVs for robust operations in the urban environment.

"The Green eMotion Project – preparing the future of European electromobility" was completed in 2015 by a consortium which consisted of more than 40 partners from industry, the energy sector, electric vehicle manufacturers, and municipalities as well as universities and research institutions. ESB ecars, Cork City Council and Codema were the lead Irish partners.

The project has defined and demonstrated a European framework that connects all electromobility stakeholders for a seamless, cost-efficient, and interoperable electromobility ecosystem. The Green eMotion Internet site (http://www.greenemotion-project.eu/) shows a short project summary on the starting page. A link to the Green eMotion Result Report that summarises the main findings is also available for public access.

- **REGENERATION OF AREAS OF THE CITY USING SMART SOLUTIONS:**

Cork City Council is redeveloping and regenerating areas of existing social housing. These developments will meet. The highest standards in sustainability and energy efficiency in building construction. One such development in an area called the Glen will see the building of 58No. dwellings and a large community centre; on an existing bus-route. Space heating and domestic hot water will be provided by a 500kW wood pellet boiler connected to a district heating system. There will also be a solar PV area on the community centre generating 12,000kWh per annum.

The Council has also begun the regeneration of the North West part of the City –Knocknaheeney. This is a €200million project that will see more than 1000 new housing units been built in the next few years.

- **CORK CITY COUNCIL ENERGY PLAN 2013:**

Cork City Council has developed a multi year energy plan for the organisation. The objective of the Plan is to help Cork City Council realize energy savings of 33% in order to meet targets set-down by Government. There is a legal requirement (SI 426) for Public Bodies to reduce their energy consumption by 2020. The Plan focuses on our public building stock and Street Lighting in particular and how we could use existing "smart technologies" to help reduce our overall consumption. The Plan outlines how we will introduce energy efficiency principals in procurement, consider sustainability in all relevant decision making.

- **GENERAL DEVELOPMENT CONTRIBUTION SCHEME:**

Cork City Council will apply an exemption or percentage reduction to contribution fees if a new development incorporates a renewable energy system with a capacity up to 0.5MW.
(Larger capacity development will be charged at €1,000 per each 0.1MW above an installed capacity of 0.5MW).

- **ENERGY EFFICIENCY DESIGN OF BUILDINGS IN CORK CITY COUNCIL:**

Buildings are a significant contributor to carbon emission globally. The EU has recognized this fact and has drafted up legislation titled the European Performance e Building Directive (EPBD 2010/31/EU). These regulations have been transposed into Irish law. The energy efficiency design for domestic and non-domestic buildings are drafted up by the Department of the Environment, Heritage & Local Government (DOEHLG). Given its relatively mild climate, it is generally considered that Cork City has significant potential to minimise the need for heating through low-energy design. While several factors in low-energy construction lie outside the scope of traditional planning considerations (detailed construction standards are the remit of Building regulations (Technical Guidance Document L))26, there are ways in which the planning process can facilitate and encourage low-energy design, such as building orientation to maximise solar gain and reduce the need for electric lighting. The planning process (particularly pre-application consultations) can also be used as a channel for information provision to both applicants and their agents regarding low-energy design.

- **SCOOT TRAFFIC MANAGEMENT SYSTEM:**

SCOOT (Split Cycle Offset Optimisation Technique) is a tool for managing and controlling traffic signals in urban areas. It is an adaptive system that responds automatically to fluctuations in traffic flow through the use of on-street detectors embedded in the road. SCOOT has proven to be a world leader in Urban Traffic Control that typically reduces traffic delay by an average of 20% in urban areas. www.scoot-utc.com

- **NIMBUS RESEARCH CENTRE, CORK INSTITUTE OF TECHNOLOGY:**

The Nimbus Centre at CIT is Ireland's research centre devoted to the field of networked embedded electronic systems. We are Ireland's largest 'Internet of Things' (IoT) research centre. Embedded systems are the electronics controlling our cars, appliances and a rapidly increasing number of everyday items. Wirelessly connecting and controlling these items is known as the 'Internet of things'.

Nimbus has 4 divisions: Research, Learning, Trialling and Industry. The 'Industry' division is known as the TEC Gateway.The Centre boasts a range of complementary research and development expertise. The research focus includes wireless sensor and actuator network design and analysis, vehicular and mobile network protocol design and analysis, sensor data fusion, radio localisation systems, embedded hardware design, miniaturisation, reliability analysis, embedded software systems, embedded interaction based user interfaces, cloud based software platforms, and system integration and optimisation tools. www.nimbus.cit.ie

- **TYNDALL INSTITUTE, UNIVERSITY COLLEGE CORK:**

Established with a mission to support industry and academia in driving research to market, Tyndall National Institute is one of Europe's leading research centres in Information and Communications Technology (ICT) research and development and the largest research facility of its type in Ireland. Established in 2004 as a successor to the National Microelectronics Research Centre (NMRC founded in 1982) at University College Cork, the Institute hosts over 460 researchers, engineers and support

staff, including a full-time postgraduate cohort of 135 students, generating over 200 peer-reviewed publications each year.

With a network of over 200 industry partners and customers worldwide, Tyndall generates around 30M income each year, 85% from competitively won contracts nationally and internationally. Tyndall is also a lead partner in European research programmes in its core areas of ICT, communications, energy, health and the environment worth 44M, including 6M accruing to industry in Ireland (from Framework 7). www.tyndall.ie

- **INTERNATIONAL ENERGY RESEARCH CENTRE:**

The International Energy Research Centre (IERC) is an industry led, world-leading, collaborative programme of research and innovation in integrated sustainable energy system technologies. The inclusiveness of the IERC will facilitate the development of Irish Energy Policy and will assist in developing innovative implementations of EU energy goals. www.ierc.ie

- **IRUSE CENTRE, UNIVERSITY COLLEGE CORK :**

The Informatics Research Unit for Sustainable Engineering is an inter-institutional research group based at the Environmental Research Institute, U.C.C. and the Department of Civil Engineering, NUIG.

It aims to research and develop integrated knowledge and information frameworks for sustainable engineering design. IRUSE focuses on the building life cycle of both green field and refurbishment projects. http://zuse.ucc.ie/iruse/

- **WATER SYSTEMS & SERVICES INNOVATION CENTRE:**

This is an initiative which was seed funded by both Cork City and County Councils and Cork Institute of Technology, and is aimed at supporting companies to develop 'Smart' systems and products in the water sector.

- ITTEC International Trialling of TEchnology Centre – a suite of real-world technology test beds in Cork including Mallow Town
- Mallow 1 Gigabit Fibre Connection
- Metropolitan Area Networks (MANs) – broadband networks in County towns and Cork city
- CCTV networks

Transport for instance is an area where the council have been very proactive. Participation in European projects such as NICHES+, TRENDY TRAVEL and COMPETENCE have resulted in knowledge sharing, commercial partnerships, enhanced mobility in the city and the introduction of best practices in the area of sustainable transport. It has been shown from past European projects that participation in pan European consortiums greatly benefits the Cork region through knowledge sharing. Participation in the EU projects is seen as an important strategic initiative which will assist the council's development of an all-encompassing Smart & Sustainable City. http://nimbus.cit.ie/tec/water-systems-and-services-innovation-centre-launch-read-more/

Q7 Which sites/districts are projected to be developed in the next five/ten years?

There are several sites within the city centre which are projected to be developed over the next five to ten years. We intend to focus the implementation of our smart solutions on these sites within the city centre area. Such sites include the development of an events centre on the site of an old distillery and the redevelopment of an old cinema site into a retail/office development. We see these planned developments as being the catalyst for a number of Smart Initiatives.

The city centre district as chosen for the GrowSmarter replication assessment can be characterised as the majority of the central business district as located on the central island between the 2 channels of the River Lee, to include McCurtain Street to the North. This is considered the heart of Cork City and covers an area of approximately 67 hectares.

Reasoning for selection of the chosen district:

The City centre area will be the major focus for investment, new projects and various strategies in the coming years, as evidenced by the relevant urban plans outlined below. The choice of this area is based on the scope that exists for various smart solutions to be incorporated into projects and initiatives which are earmarked for this district.

Relevant Urban Plans in existence for the District:

Cork City Development Plan 2015 – 2021 (Cork City Council)

The Plan refers to the city centre as a priority development area. As a regional capital and national Gateway city, the success of the City Centre is both a key driver of the sub-region and a key indicator as to the health and prosperity of the metropolitan area.

The City Centre is the symbol of the vibrancy and vitality of Cork City. It contains a diverse range of primary uses (including retail, office, cultural and civic functions), which complement each other and support a range of other services. While there has been significant investment in the public realm and in private sector development in the last decade, the City Centre has faced increasing challenges, particularly during the economic recession.

Core objectives include:

1. Maintaining the City Centre as the vibrant 'healthy heart' of the region. A sustainable mix of land uses is a key factor in maintaining and enhancing the vibrancy and attractiveness of the City Centre to business, residents and visitors, while also reducing trip demand by concentrating various functions within the most accessible area. The Plan seeks to build on and enhance the existing mix of uses in the City Centre, and to develop retailing, offices, residential and other commercial uses, public services, and community and cultural facilities to create a dynamic and inclusive atmosphere in the City Centre so that Cork City and region has a 'Healthy Heart' as promoted in the City Centre Strategy 2014.
2. Maintaining and developing a City Centre of high quality. Cork City Centre enjoys a unique urban character and sense of place. Its particular combination of streets and spaces, framed by buildings of character and surrounded in the wider context by a natural landscape of sloping ridges and attractive river corridors are integral parts of the Cork City Centre experience. It is important to respect and enhance the city's built and natural heritage and use its distinctive

character to inform development schemes of high architectural and urban design quality which are locally distinctive and secure environmental improvements, across the City Centre.

3. Easing access to and movement around the City Centre. The City Centre is a key focus for inter-urban and commuter rail transport links throughout the region and country, resulting in a high level of accessibility. It is important to ensure that all people, including business, its customers and its employees can easily access the City Centre to ensure the city's continuing prosperity and growth. To attract inward investment, the City Centre must aspire to having a high quality integrated transport network which will require substantial investment in public transport on an ongoing basis. The City Council will therefore aim to promote improved public transport and better conditions for pedestrians and cyclists, whilst accommodating essential vehicle needs.

Cork City Centre Strategy, FEBRUARY 2014 (Colliers International, Brady Shipman Martin Bjerkne & Co. Cork City Council)

The ambition of this Cork City Centre Strategy is to help deliver a **healthy heart** for the Cork Region and the south of Ireland that helps grow the Irish economy.

The principal objective is to facilitate more **people** working in, living in, shopping in, spending leisure time in, and visiting the city centre. However the significant achievements in the City Centre over the past 20 years should also be acknowledged, specifically the increasing residential population, upgrading of the public realm, new shopping districts and improved public transport and non-car transport modes. This objective going forward requires:

1. Development of modern business workplaces;
2. The infrastructure for high quality city living, working and visiting e.g. transport, cycling, schools, quality public spaces;
3. Development of places for people to live;
4. Keeping the retail, leisure and cultural offer fresh and appealing.

City Centre Movement Strategy: Multi-Modal Movement Strategy Report, March 2013 (MVA, Arup, Cork City Council)

The purpose of this strategy is to support the movement of sustainable modes in the city centre. A key objective of the Study is to improve the general vibrancy of Cork City Centre to promote sustained economic growth and to deliver a more attractive environment for shoppers, visitors and tourists.

The key principles of the CCMS include:

1. The re-allocation of roadspace on the city centre streets to ensure a more appropriate balance between the different transport modes serving the city and provide travellers to the city with a greater choice of travel mode.
2. The management of through traffic within the central city streets, this will act to improve the environment for all users including public transport users, pedestrians and cyclists.

Following significant public consultation and representation and input from local and national politicians the multi phased plan has commenced and will significantly transform the city experience for all in the coming years

5.2 Smart Solutions Selection

Description of replication potential of selected Smart Solutions of LCs within FC

The table below shows which solutions the Follower Cities plan to replicate.

		Follower Cities				
Area	***Smart Solutions***	*Porto*	*Graz*	***Cork***	*Valetta*	*Suceava*
Housing measures	*1. Efficient and smart climate shell refurbishment*		*X*	***X***		*X*
	2. Smart building logistics and alternative fuelled vehicles					
	3. Smart, energy saving tenants through information	*X*	*X*			*X*
	4. Smart local electricity production and integration with buildings and grid			***X***		*X*
Integrated measures	*5. Smart lightning, lampposts as hubs for communication*	*X*	*X*	***X***		*X*
	6. Waste heat and local heat integration by new business models		*X*			
	7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.	*X*				*X*
	8. Big data protocol for saving energy and improving the quality of life	*X*				
Mobility measures	*9. Sustainable delivery*				*X*	
	10. Smart traffic management					*X*
	11. Alternative fuel driven vehicles for decarbonizing and better air quality	*X*		***X***		*X*
	12. Smart mobility solutions		*X*	***X***	*X*	*X*

Smart Solutions Cork plan to replicate (according to GA)

Activity participating in the Lighthouse Project will help the local authority to meets its emissions and energy reduction targets. The Sustainable Energy Action Plan (SEAP) submitted to the Covenant of Mayors outlines a 20% reduction in emissions. On top of this the National Energy Efficiency Action Plan requires a 33% energy efficiency improvement by all public bodies, a 20% reduction in GHGs and a 33% share for renewable electricity generation. The Lighthouse Project has been earmarked as an initiative that will help the local authority meets these targets. Cork City Council have previously implemented a number of initiatives in the city and plan to further develop the region as a Smart and Sustainable City.

Actions in relation to the Grow Smarter smart solutions:

1. Efficient and Smart Climate Refurbishment

The city council is currently undertaking a deep retrofit programme of civic buildings including insulation, boiler replacement and active controls and energy efficient lighting. As part of the EPB directive the city council are required to upgrade the energy rating of its housing stock. Therefor City of Cork plan to replicate measures from smart solution. The City Council will replicate, within its public buildings and housing stock, a number of the measures identified in the Lighthouse cities including those related to heat recovery, hot water losses and energetic certification. Within public buildings, as part of a continued programme of improving energy efficiency the city council will replicate initiatives in the area of energy certification, lighting and integration of renewable. Funds will be made available for Cork City Councils own funds along with additional funding from SEAI (Sustainable Energy Authority Ireland)

4. Local Electricity Production and Integration

As part of the above retrofit the city council may have an interest in the appropriate deployment of wind turbine / solar PV technologies within civic buildings. As part of the continued retrofit of public buildings the city council will replicate where feasible the measures implemented in the area of RES solar energy. The city council may also have an interest in the appropriate deployment of additional wind turbine technologies on civic buildings. Funds will be made available for Cork City Councils own funds along with additional funding from SEAI.

5. Smart Lighting, lampposts as hubs for communications

The city council has installed photocell technologies across its lighting stock to drive a reduction in energy usage. The City Council will replicate the measures implemented for sensor controlled, self-controlled and remote controlled LED lighting for pedestrian and cycle paths.

Funds will be made available for Cork City Councils own funds along with additional funding from NTA (National Transport Authority) on an existing 5 year programme of works within the City.

11. Alternative fuel driven cars for better air quality in cities

The local public transport operator is currently trialling the operation of a CNG bus. The city council is currently conducting a trial of a CNG van as part of its fleet. The city council has

shown a commitment to sustainable transport through the on-going use of EVs as part of its operational fleet. Cork City Council, in the context of a new tender for the provision of the Park and Ride facility, will replicated CNG/EV measures designed to further promote the use of sustainable transport alternatives. Funds will be made available for Cork City Councils own funds along with additional funding from NTA.

12. Smart mobility solutions

Free parking spaces are currently provided in city car parks for those taking part in certain car sharing initiatives. A city bike scheme is scheduled for introduction in Q3 of 2014. Cork City Council will replicate measures to enhance the level of service and options available to the users of sustainable transport options within the city centre, in particular those related to electrical and cargo bike pools and sharing systems. This will be used to support goods distribution in existing Pedestrian Zones. Funds will be made available for Cork City Councils own funds.

5.3 Smart Measure selection

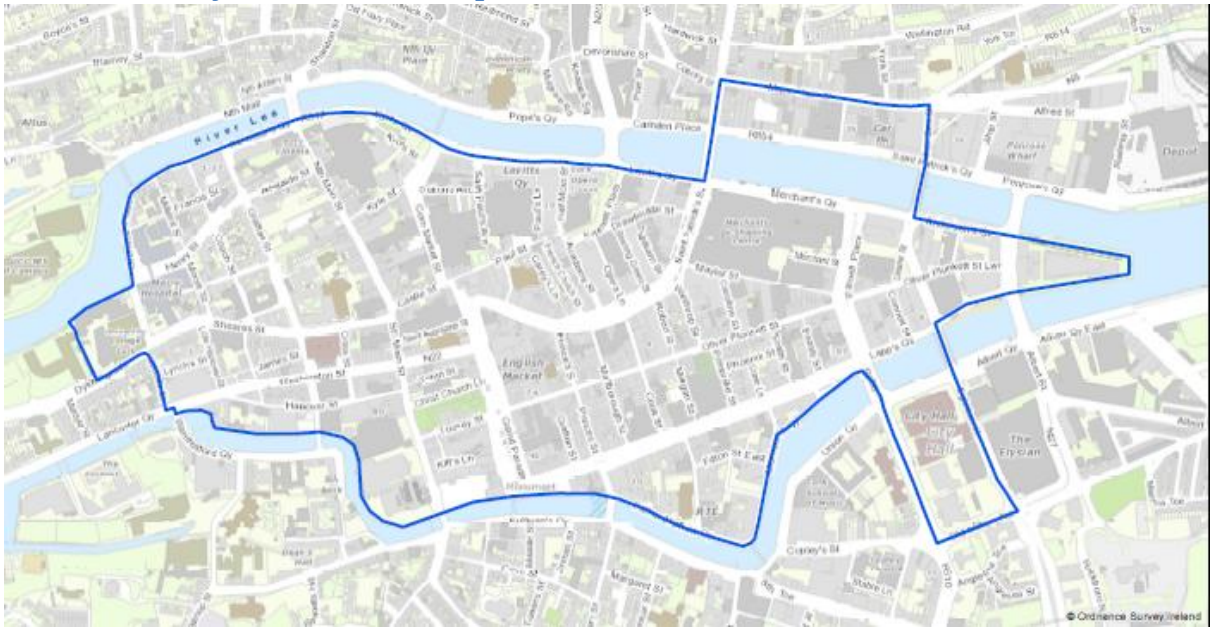
The table below specifies which smart (bundle of) measures within the 12 solutions each FC plans to replicate.

SC Measure	Measure title	Follower City Cork
Low Energy Districts		
Solution 1 - Efficient and smart climate shell refurbishment		
1.1 - Energy efficient refurbishment of the building	Energy efficient refurbishment of residential buildings - Stockholm	
	Climate shell refurbishment - Cologne	X
	Energy quality assurance - Stockholm	X
	New adaptative control and regulation techniques for heating systems - Barcelona	
	Re-build an industrial site: Ca l'Alier - Barcelona	
	Efficient and smart climate shell and equipment refurbishment - Barcelona	
	Efficient and smart climate shell refurbishment of residential buildings - Barcelona	X
	Efficient and smart climate shell and equipment refurbishment of tertiary buildings - Barcelona	X
	Energy efficient swimming pools - Barcelona	
Solution 2 - Smart building logistics and alternative fuelled vehicles		
2.1 Integrated multimodal transport for construction materials	Construction consolidation centre - Stockholm	
Solution 3 - Smart, energy saving tenants		
3.1 Active House/Home energy	Home Energy Management – Cologne	

management system/Smart home system	The Active House – Stockholm	
	An Open Home Net – Stockholm	
	Hubgrade - Energy Saving Centre – Stockholm	
	Adaptive Temperature Control System - Stockholm	
	Home Energy Management System (HEMS) - Barcelona	X
	Virtual Energy Advisor - Barcelona	
	Dynamic Pricing Models - Barcelona (Stochastic Model of Appliances Energy Consumption)	
Solution 4 - Local renewable energy production and integration		
4.1 Virtual power plant	Residential Estate Management – Cologne	
	Smart Energy & Self-Sufficient Block - Barcelona	X
4.2 Smart energy and self-sufficient block	Building Energy Management System (BEMS) to minimise consumption of fossil fuels and electricity - Barcelona	
Integrated infrastructures		
Solution 5 - Smart lighting, lamposts and traffic posts as hubs for comm.		
5.1 Smart streetlighting	Smart LED streetlighting - Stockholm	X
5.2 Combined electrical charging and street lighting poles + wifi	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Barcelona	X
	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Stockholm	
5.3 Smart meter information analysis and actuators	Smart Meter information analysis and actuators - Barcelona	X
Solution 6 - New business models for district heating and cooling		
6.1 Open district heating with feed-in of waste heat	Open district heating – Stockholm	
6.2 District heating and cooling rings	District heating rings - Barcelona	
6.3 Smart local thermal districts	Smart local thermal districts – Barcelona	
Solution 7 - Smart waste collection , turning waste to energy		
7.1 Optical sorting of waste 7.2 Introduction of AWCS 7.3 Waste collection statistics for individual households/businesses	Smart waste management - Stockholm	
Solution 8 Big open data platforms		
8.1 Big consolidated open data platform	Big consolidated open data platform - Stockholm	
	Big open data platform - Barcelona	
	Urban Cockpit – Cologne	
	Urban Traffic – Cologne	
	Urban Environment Cologne	
8.2 Urban models		
8.3 Semi-automatic instance mapping		

8.4 Integration of sensor and heterogeneous data in standard data format	Integration of sensor data in a uniform in standard-driven data format - Barcelona	
8.5 Sustainable connected lighting to enhance safety and mobility		
Sustainable Urban Mobility		
Solution 9 - Sustainable delivery		
9.1 Integrated multi-mode transport for light goods	Communal service boxes for sustainable deliveries – Stockholm	
9.2 Micro-distribution of freight	Micro distribution of freight - Barcelona	
Solution 10 - Smart traffic management		
10.1 Traffic management through MFD 10.3 Travel demand management 10.4 Traffic control systems for passenger vehicles 10.5 Traffic signals synchronised to prioritize movement of goods	Smart traffic signals – Stockholm and Barcelona	
Solution 11 - Alternative fuel driven vehicles		
11.1 Developing charging infrastructure	Normal charging infrastructure for electric vehicles – Stockholm	X
	Fast charging infrastructure for electric vehicles – Stockholm and Barcelona	X
	eTankE - Cologne	
	Vehicle to X (V2X) Charging for EVs - Barcelona	
11.2 E-mobility management system		
11.3 Charging infrastructure for electric tricycles for micro-distribution		
11.4 Refueling facilities for alternative heavy duty fuels	Alternative fuels for heavy duty vehicles – Stockholm	
11.5 Smart guiding to alternative fuel stations and fast charging		
11.6 Small distributed CNG grid	Small distributed CNG grid - Barcelona	
Solution 12 Smart mobility solutions		
12.1 Green parking index	Green parking index – Stockholm	
12.2 Electrical and cargo bike pool		
12.3 Mobility hub	Mobility Hub – Cologne	X
12.4 Electrical and conventional car sharing		X
12.5 Conventional/PHEV/CNG vehicle sharing fleets		
12.6 Smart taxi stand system	Smart taxi stand system - Barcelona	

5.4 Smart City and District Replication



The map above depicts the city centre area of Cork, in which it is proposed that we implement our smart solutions. This district hosts a significant mix of residential and commercial activity and has been identified for development in a number of strategies such as the Cork City Centre Strategy, Cork City Movement Strategy and City Development Plan. The North West of the district contains a number of residential units that may be appropriate for the renovation measures while the South East of the zone contains public buildings identified for retro-fit and potential alternative energy source installations. As a major artery exiting the city the North-most point of the zone will form a significant test bed for the mobility and lighting measures including air quality monitoring and the development of a mobility hub. The City Council is actively collaborating with the residents and traders of Oliver Plunkett Street, running through the centre of the district, with a view to the development of a specific themed quarter given it unique mix of Cork's historic and iconic buildings and businesses. Finally a significant portion of the district has been identified for inclusion in an application for Purple Flag status, an accreditation process for town centres that meet or surpass the standards of excellence in managing the evening and night-time economy.

5.5 Smart District Replication Profile

5.5.1 Mapping of district related replication framework for selected Smart Solutions

Q1 What are the main characteristics of the district and what is the replication potential?

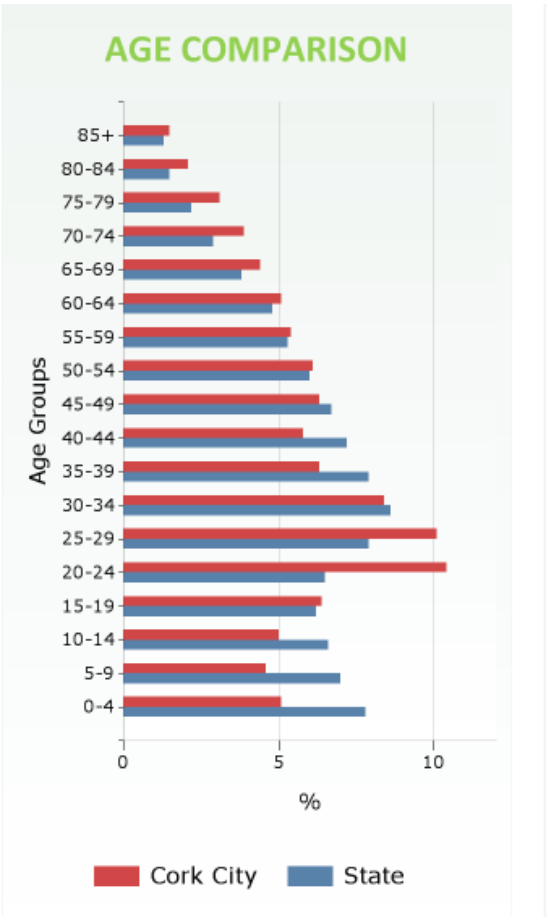
Population:

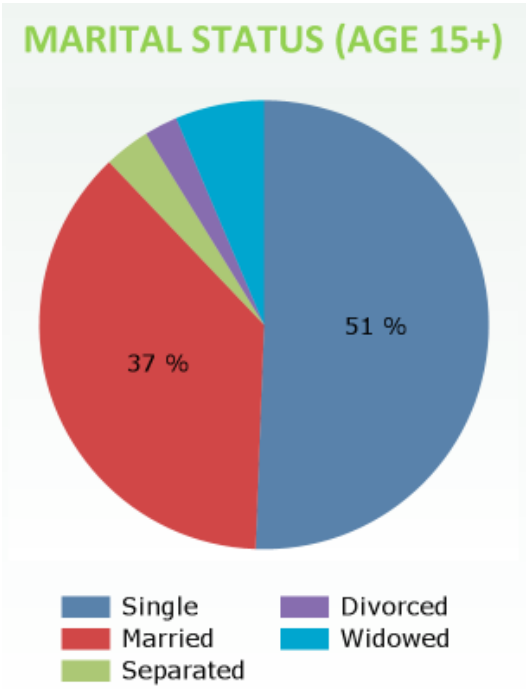
The population of the designated City Centre District is in the region of 2900 based on the 2011 CSO census. A significant number of people would commute to the City Centre area on a daily basis for the purposes of work.

Demography:

According to the CSO area study of Cork City as a whole, the percentage of 0 – 15 year olds was below the national average while those in the 20 – 30 year old bracket were above the national average. In terms of marital status the study found that over 50% of 15+ year olds were single and 37% were married.

The most popular means of travelling to work was by car accounting for 50.3% of journeys. In addition Non-Irish nationals accounted for 12.5 per cent of the population of Cork City compared with a national average figure of 12.0 per cent. We would expect that figures for the chosen city centre district would be in line with these findings.



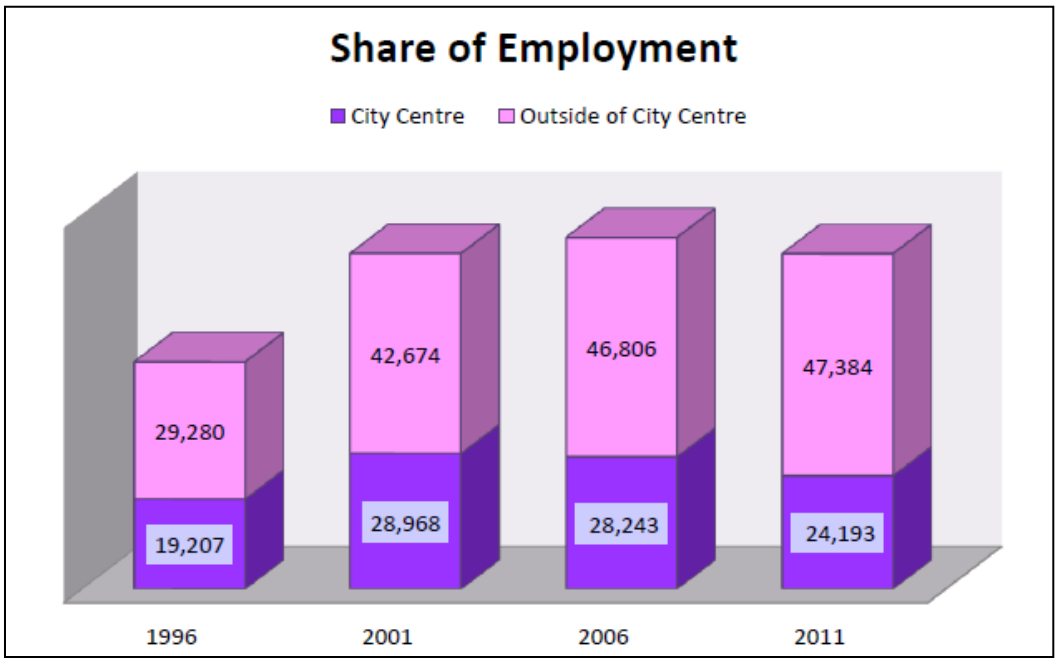


Source: www.CSO.ie

Employment:

The City Centre Sector recorded a total of 24,184 jobs for 2011 and experienced a significant loss falling by 13% over a five year period or 3,502 jobs, compared to 2% (725) fall recorded in the 2006 survey. It appears that there is a growing trend of the City Centre sector losing employment share while outer sectors are gaining employment share. In 2006, 38% of the overall city employment was contained within the City Centre Sector, down from 40% in 2001. That share has since dropped to 34% over a five year period. The drop in the City Centre share has been as a result of both businesses relocating to suburban locations and suburban areas gaining employment as a result of new developments being constructed in recent years. A key objective of the Smart Gateway is to promote economic activity across the region and in particular the city. As the key district of the city it is

important that this increased activity translates into improved employment and quality of life prospects for the citizens of the district and beyond.



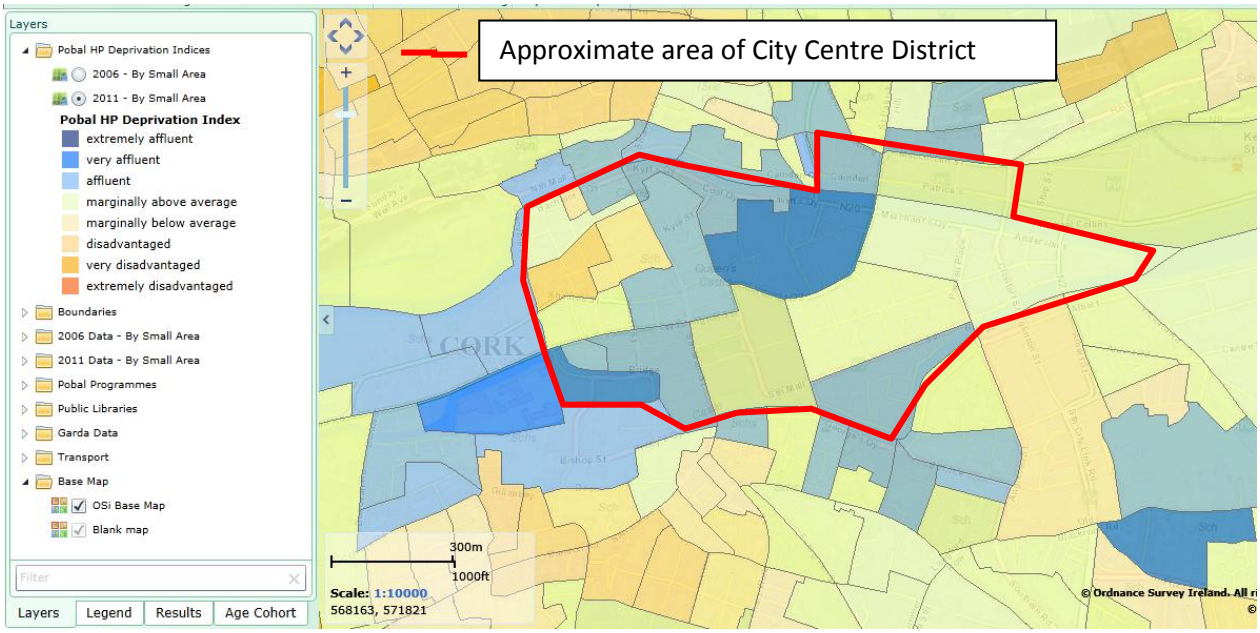
Source: Cork City Employment and Land Use Survey 2011

ACTIVITY	2006	2011	Absolute Change	% Change
ACCOMMODATION AND FOOD SERVICES	3,628	3,623	-5	-0.1%
BUILDING AND CONSTRUCTION	220	127	-93	-42%
BUSINESS AND FINANCE	3,287	2,554	-733	-22%
MANUFACTURING	1,234	925	-309	-25%
PERSONAL SERVICES	1,914	1,130	-784	-41%
PROFESSIONAL SERVICES	6,498	6,096	-402	-6%
PUBLIC ADMINISTRATION AND DEFENCE	3,140	2,826	-314	-10%
RECREATION AND ENTERTAINMENTS	786	677	-109	-14%
REPAIRS	176	88	-88	-50%
RETAIL	5,641	4,717	-924	-16%
TRANSPORT, COMMUNICATION AND STORAGE	744	664	-80	-11%
UTILITIES	246	568	322	56%
WHOLESALE	181	198	17	9%
TOTAL CITY CENTRE	27,695	24,193	-3,502	-13%

Source: Cork City Employment and Land Use Survey 2011

Income:

Pobal deprivation statistics indicate that the city centre district contains a mixture of relatively affluent areas with some pockets of marginal deprivation, notable the marsh area to the west and the area around the tip of the island.



Source: Pobal Maps

Economy:

The city centre economy covers a diverse range of business sectors. The main sectors would be retail, food and accommodation, followed by personal and professional services. Other economic sectors would include business and finance, public administration and a small amount of manufacturing. The Cork City Employment and Land Use Survey 2011 provides a breakdown of new jobs by activity (See below).The current strategies for the City Centre as well as the Smart Gateway initiative will look to both increase the opportunities for employment within the district but also look to position the City Centre area to deliver and support more value add activity such as ICT hubs and incubation space.

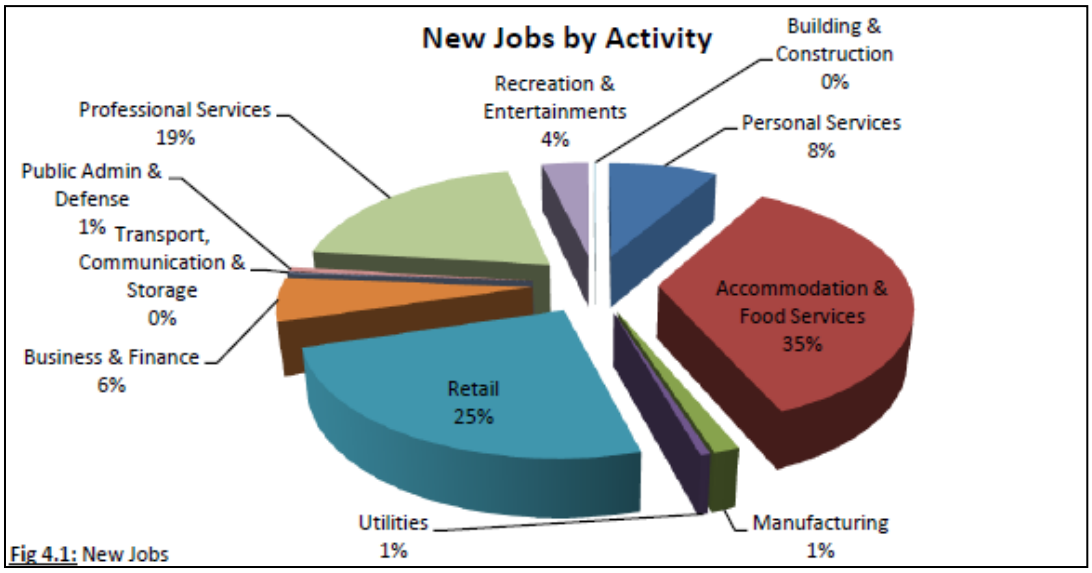


Fig 4.1: New Jobs

Source: Cork City Employment and Land Use Survey 2011

Culture:

The City Centre area represents the largest cultural centre in the region and includes a wide offering including theatres, museums, educational institutions, bars and restaurants. The City centre also

plays host to multiple festivals and events throughout the year which draw visitors from a wide catchment area.

Cultural tourism is a key component of urban tourism based upon the arts and heritage characteristics of towns and cities. Cork City has developed its own tourism and visitor economy capitalising on its qualities as a cultural destination and an area of local distinctiveness with the city acting as a gateway and a base for regional tourism. It is one of the oldest cities in Ireland and has a rich archaeological record and a strong medieval history. It addition, it's pre-eminence as a trading centre and maritime merchant port in the eighteenth and nineteenth century created tangible industrial archaeology and historic remains. The Smart Gateway initiative will examine and exploit opportunities to improve the quality of life and environment for citizen and visitor alike, aligning with other strategic initiatives and branding projects.

Q2 Are there synergies and/or conflicts related to the Smart Solutions with the existing infrastructure, socio-economic profile and social acceptance?

N/A

Q3 How will local stakeholders be involved in the replication of Smart Solutions?

Through stakeholder involvement in statutory structures such as the City Public Participation Network and the Local Community Development Committee. Also through collaboration opportunities promoted by the Smart City Liaison Group and Wider Technical Advisory Group of the Cork Smart Gateway initiative. There are also a number of plans which reference some of the solutions being replicated and which go through a formal consultative process such as the Local Community and Economic Plan.

Equally the citizen engagement survey and the business survey undertaken in 2016 provide significant insights into citizen and business expectations but also the preferred communication content and methodologies.

5.6 Smart Measures Specifications

5.6.1 Progress towards replication of measures/measure bundles within the selected districts

Q1 What is the replication potential of the Smart Measure(s)?

Replication Measures

Solution 1: Energy and Smart Climate Shell Refurbishment

Solution 4: Smart Local Electricity Management

Solution 5: Smart Street Lighting

Solution 11: Alternative Fuel Driven Vehicles

Solution 12: Smart Mobility Solution

5.6.2 Replication of Solution 1 - Climate shell refurbishment - Cologne

Solution 1 – replication also including:

Energy quality assurance - Stockholm

Efficient and smart climate shell refurbishment of residential buildings - Barcelona

Efficient and smart climate shell and equipment refurbishment of tertiary buildings - Barcelona

The potential for replication of the Low Energy District solutions is significant owing to a number of obligations, commitments and corporate objectives including:

- *Their added value e.g. reducing carbon emissions, GHGs, Fossil fuel dependency*
- *Improve the quality of life and health outcomes for the residents*
- *Requirement to comply with initiative and policies such as Paris Accord, EU directives, Ireland Climate Change Strategy, Reducing Fuel Poverty*
- *Development of Works Specifications and measures to replicate smart measures in old housing stock*
- *Approximately 500 apartments will undergo deep retrofit measures between now and 2020*
- *Finance needs to be allocated in order to ensure implementation*

Theme:	**Low Energy District**
Smart Solution:	• **Smart Building Shell Refurbishments**
Replication Committed:	**Yes**
Measures	**Update**
Climate Shell Refurbishment	1. Sarahville Place: Energy Efficiency Improvement measures to a block of 9 apartments.
Energy Quality Assurance	Wolfe Tone Street (also applicable to all projects) as Project management team includes Energy Advisor for each project
Rebuild of an Industrial Site Ca L'alier	
Efficient and smart climate shell and equipment refurbishment: 200 unit apartment building	**Ard bhaile/Gleanamoy lawn (social housing)** underwent a "deep retrofit" in **2016**. 197 Houses/Apartments received Air-to-Air Heat Pumps and Low Energy Bulbs. The local community centre received a 12kW air-to-Water heat pump, LED lighting upgrade, HW pipe insulation and Cavity Wall Insulation under Better Energy Community (BEC) scheme

	2016.The projected combined energy sayings are 2.9GWh. 54 Additional apartments will be retrofitted in 2017. Measures include heatpumps for remaining units, LEDs and windows and doors upgrades
Efficient and smart climate shell and equipment refurbishment: tertiary buildings	**Leisureworld public swimming pool Bishopstown** upgraded all the existing lighting fittings to LED in **2016**. This is a Pay as You Save model. (PAYS). All the lighting was replaced with no capital provided upfront. The initial cost of the LED lights will be paid from the savings accrued over a 5 year timeframe. **Cork City Central Library** will undergo a major energy efficiency upgrade in 2017. The Library will replace an old boiler and central heating system with an efficient Air to Air Heat Pump. The library will also install LED Lighting Upgrade a Solar PV array Projected Savings 285,785 kWh **~ 30% onsite energy usage** **Leisureworld public swimming pool Bishopstown** to install 2 x High Efficiency Boiler Upgrade & 4 new Pumps , Works will be complete by Aug 17 ,Projected Savings **887,000kwh ~ 20% of onsite energy usage**
Efficient and smart climate shell refurbishment: residential buildings	Sarahville place, Sunview Fairhill (Passive Rainwater Harvesting System)
Commitments:	
Replicate within Public Bldgs / housing stock measures including heat recovery, hot water losses, energy certification. CCC will replicate energy efficiency, lighting and integration of renewables into Public Bldgs. Make available funds from CCC funds with additional SEAI funding.	Insulated hot water cylinder fitted to over 1000 houses, Over 5000 houses have received a Building Energy Rating Certificate, All retrofitted houses houses fitted with CFL/LED lighting. Funding received from CCC, DHPCLG, SEAI, Sale of energy credits. Photovoltaic cells fitted in community centre in

	Ard bhaile/Glennamoy. Geothermal fitted in library in Tory top Road and New Civic Offices to heat water.
Additional Measures:	
	Passive rainwater harvesting system fitted to 32 ap. This system apartments in Sunview, Fairhill

5.6.2 Replication of Solution 4 - Smart Energy & Self-Sufficient Block - Barcelona

The renewed activity in capital programmes along with energy saving commitments opens up the opportunity to incorporate smart local electricity management solutions

Theme:	**Low Energy District**
Smart Solution:	• **Smart local electricity management**
Replication Committed:	**Yes**
Measures	**Update**
Residential Estate Management	
Smart Energy and Self Sufficient Block	**Ballyvolane Firestation** deployed a 10.5kW solar PV system onto Ballyvolane Firestation. The project involves connecting 42 solar PV panels to a string-invertor. The DC electricity. Inverters convert the DC electricity to alternating current (AC) electricity, which is the type used by consumed by the Firestation. It is predicted that this will save 24,000kWh per annum – approx 15%.
Building Energy Management System	
Commitments:	

Replicate in retrofit of public bldgs measures in area of RES solar energy. Consider deployment of wind turbine technologies in civic buildings. Make funding available using CCC funds along with SEAI additional funding.	
Additional Measures	

5.6.3 Replication of Solution 5 - Smart LED streetlighting - Stockholm

Solution 5 – replication also including:

Combined electrical charging and street lighting poles + Wifi-to-grid connection - Barcelona

Smart Meter information analysis and actuators - Barcelona

The requirement for a significant upgrade of the city's lighting stock to meet energy reduction targets as well as the remedial work required on the infrastructure itself provides the opportunity to incorporate additional measures and functionality.

Theme:	**Integrated Infrastructures**
Smart Solution:	• **Smart Street Lighting**
Replication Committed:	**Yes**
Measures	**Update**
Smart LED street lighting	A series of 'Pilot' Centrally Managed Systems, CMS for Dimming & Trimming of lighting have been implemented. However, LED lighting using factory set profiles is the preferred method at present.
Streetlights as wifi to grid connectors and electrical chargers	Options for these use cases under consideration
Smart meter information analysis and actuators	Options for these use cases under consideration in the context of the National Programme of Energy Efficient street lighting upgrades on

	which Cork City Council is an active participant.
Commitments:	
CCC to replicate measures for sensor controlled, self controlled and remote controlled LED lighting for pedestrians and cycle paths. Funding will be made available from CCC as well as additional NTA funding on 5 yr programme of works for city.	Options for these use cases under consideration and are being proposed as options at design stage for Capital schemes
Additional Measures	
SMART Sensors	Cork City is putting in place two pilot projects to test SMART Sensor applications. The first of these projects involves the installation of two banks of sensors on the City's SMART Street (Mc Curtain) to measure a number of parameters including air borne pollutants, luminosity, humidity and pressure. These sensors will be linked wirelessly to the City Council's Open Data platform giving members of the public direct access to live or near live data. Should this pilot prove successful funding will be sought to roll this system out across the City Centre. The second project involves the testing of new air quality sensors produced by Analogue. These are to be set up in 10 locations around the City (with two coinciding with the locations of existing sensors for validation purposes). The purpose of this pilot is to test new devices that are being readied for market and commercial production.
Public Lighting: LED Street Lighting Pilot Schemes & Energy Efficiency in 2016	Schemes comprising 350 lanterns being 3% of the total inventory undertaken in such a way as to inform further investment to deliver an improved asset by removing the most degraded equipment. The LED lighting upgrade featuring Dimming Profiles was completed successfully to

	deliver a 40% reduction in the electrical demand on those routes as well as achieving an estimated 5% energy reduction on the overall lighting inventory

5.6.4 Replication of Solution 11- Normal charging infrastructure for electric vehicles – Stockholm

Solution 11 – replication also including:

Fast charging infrastructure for electric vehicles – Stockholm and Barcelona

The provision of a comprehensive charging infrastructure as well as the introduction of alternative fueled vehicles to the City Council fleet is a significant priority for the city.

Theme:	**Sustainable Urban Mobility**
Smart Solution:	• **Alternative Fuel Driven Vehicles**
Replication Committed:	**Yes**
Measures	
eTankE electric charging	ESB ecars are the operator for 'Rapid' Charge Points, CPs at key interchanges
Fast charging infrastructure for EVs	Cork City Council facilitated the installation of on-street EV 'Fast' Charge Points by ESB ecars as the national operator of the EV charking network.
Standard speed charging infrastructure for EVs	Installation of CPs in multi-storey car parks in progress & proposed additional CPs with payment system for Park+Ride to be considered in the longer term.
Renewable fuels for heavy duty vehicles	Gas Networks Ireland, GNI are installing a network of CNG refuelling stations to include another facility located at Little Island, County

	Cork.
Vehicle to grid charging (V2X)	
Commitments	**Update**
In the context of a new tender, consider provision of Park & Ride facility, replicate CNG/ EV measures. Increase number of alternative fuel vehicles in its fleet.	The provision of fleet vehicles for the operation of the Black Ash P+R is undertaken at present on a Service Level Agreement. Discussions are ongoing with the National Transport Authority, NTA in relation to a future tender.
Trial operation of CNG bus, and trial of CNG Van. Ongoing use of EV's as part of CCC fleet	City Council's fleet to be reviewed with a view to possible deployments of EVs & CNG options.
Replicate CNG/ EV measures. Funds will be made available using CCC funds along with some NTA funding	In the mean time, the Transportation Division participated with Energy Cork on the preparation proposal package for the "Ireland's Greenest Bus Fleet" IGBF initiative promoting CNG as an alternative fuel for busses as submitted to the NTA.
Additional Measures	

5.6.5 Replication of Solution 12- Mobility Hub – Cologne

Solution 12 – replication also including:

Electrical and conventional car sharing

The promotion of measure aimed at ensuring more effective, efficient and an environmentally friendly mobility infrastructure is high priority for the city

Theme:	**Sustainable Urban Mobility**
Smart Solution:	• **Smart Mobility Solutions**
Replication Committed:	**Yes**
Measures	**Update**

Green parking index	
Mobility hub	
Smart taxi stand system	
Commitments:	
Replicate measures to enhance level of service and options available to sustainable transport options in city centre, especially relating to Electrical and cargo bike pools and sharing systems . This will be used to support goods distribution in existing Pedestrian zones.	Cork City Council participated on the Green eMotion EU Project on electromobility which finished in 2015. The knowledge gained informed policy, including deployment of Pedelecs and EVs on the Council's fleet. We now have some very good local examples of staff members using the Pedelecs for site inspections to street lighting, fibre optic sites, VMS signs and RTPI at bus stops. The driver of one of the Kangoo EV vans, our UTC System Inspector, has also opted to use a Pedelec for city centre trips in connection with traffic signal junction controller duties.
Free parking spaces currently provided in city car parks for those involved in some car sharing initiatives. Public Bike Scheme	Public Bike Scheme operated on behalf of NTA continues to function very successfully in Cork.
Enhance service and options to users of sustainable transport in city centre, especially electrical and cargo bike pools and sharing systems. Funds to be available from CCC own funds.	Secure Bicycle Parking has been identified as an issue and discussions are ongoing with – Cyc-lok - a particular system manufacturer with a view to facilitating the deployment at UCC, Kent Railway Station and a suitable city centre location.
Additional Measures	
	Transportation Division, Cork City Council won the ITS Ireland Award 2016 for "Contribution to ITS implementation and deployment in Ireland". The submission provided an overview of the ITS measures which included the renewal of street lighting along the route. The ITS measures incorporating bus priority & traffic signal control on the cycle track optimised operations on the UCC to City Centre scheme.

Key Local and National Policies include

1. *Paris Accord, EU directives, Ireland Climate Change Strategy, Reducing Fuel Poverty*

4. *Paris Accord, EU directives, Ireland Climate Change Strategy, Reducing Fuel Poverty, City Development Plan*

5. *Paris Accord, EU directives, Ireland Climate Change Strategy, Reducing Fuel Poverty, City Development Plan, City Centre Strategy*

11. *Paris Accord, EU directives, Ireland Climate Change Strategy, Drive4Zero, City Centre Strategy, City Centre Movement Strategy*

12. *City Centre Movement Strategy, Green eMotion*

5.6.6 Other Potential Solutions

Theme:	**Low Energy District**
Smart Solution:	• **Smart Building Logistics**
Replication Committed:	**No**
Measures	**Update**
Construction consolidation centre	
Commitments:	**N/A**
Additional Measures:	

Theme:	**Low Energy District**
Smart Solution:	• **Smart energy Saving Tenants**
Replication Committed:	**No**

Measures	**Update**
Home Energy Management	
The Active House	
An Open Home Net	
Hubgrade Energy Savings Centre	
Home Energy Management System	1. Ard bhaile Glennamoy Lawn: Hand Held devices used to control use of energy. 2. Lakelands Crescent: 82 houses fitted with Climote energy control and savings device.
Virtual Energy Advisor	
Dynamic Pricing Models	
Commitments	**N/A**
Additional Measures	
Theme:	**Integrated Infrastructures**
Smart Solution:	• **Waste Heat Recovery**
Replication Committed:	**No**
Measures	**Update**
Open district heating using waste heat	
District heating rings	
Smart local thermal districts	
Commitments:	**N/A**

Additional Measures	

Theme:	**Integrated Infrastructures**
Smart Solution:	• **Smart Waste Collection**
Replication Committed:	**No**
Measures	**Update**
Automated waste collection, monitoring and reuse	
Commitments	**N/A**
Additional Measures	
SMART Compactor Bins	Given the subsurface geomorphologic composition of the tidally influenced river deposited marsh sediments which underlie the City of Cork the installation of subsurface waste handling infrastructure is particularly problematic. As such Cork City is looking to find surface mounted solutions. We are thus piloting SMART bins which have a number of key features: Internal mechanical compaction mechanism delivering up to 5 time the capacity in the same physical space Solar Powered so no need for additional power infrastructure Intelligent features e.g. automated notifications via wireless communications methods when the bin is nearing capacity

Theme:	**Integrated Infrastructures**
Smart Solution:	• **Big Data Management**
Replication Committed:	**No**
Measures	**Update**
Urban Cockpit	
Urban Traffic	Real time parking availability at car parks notified on Cork Open Data server
Urban Environment	
Big consolidated open data platform	
Commitments:	**N/A**
Additional Measures	

Theme:	**Sustainable Urban Mobility**
Smart Solution:	• **Sustainable Delivery**
Replication Committed:	**No**
Measures	**Update**
Communal service boxes for sustainable deliveries	

Micro-distribution of freight	
Commitments:	**N/A**
Additional Measures	

Theme:	**Sustainable Urban Mobility**
Smart Solution:	• **Smart Traffic Management**
Replication Committed:	**No**
Measures	**Update**
Smart traffic signals	
Commitments:	**N/A**
Additional Measures	

Q2 What is the business case and do financing opportunities already exist?

Solution 1

Each measure will be integrated into the wider city council capital expenditure programme and as such will be subject to the preparation of a comprehensive business case and application for national and, in some cases, European funding.

The business case includes measures to support:

- *Better Health outcomes and quality of life for residents, reduced fuel bills redcued incidence of fuel poverty.*
- *Prolonged life of housing stock*

Assembly Regional Operational Southern Program 2014 – 2020 as a potential funding opportunity amongst others

The ownership of the solutions will be vested in the residents

Q3 What are the main challenges and barriers related to the measure(s)?

Solution 1.

There are few technology barriers to be overcome to deliver on the objectives of the measures. However the scale of project replication could be a challenge to economic replication. The strict rules around procurement can cause some challenges as can traditional cultural attitudes towards initiatives such as district heating schemes. Financial and other resources can be ongoing challenge to replication.

Solution 4.

There are few technology barriers to be overcome to deliver on the objectives of the measures. However the scale of project replication could be a challenge to economic replication

Solution 5.

Few technological barriers. However the sourcing of funding at an economical level to replace the infrastructure across the city is a challenge

Solution 11.

Funding of innovative measures. Limited influence over the strategic direction of the local public transport operator.

Solution 12.

Funding of innovative measures beyond proof of concept. Limited influence over the strategic direction of the local public transport operator.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

Solution 1, 4, 5.

These solutions will be integrated with the current and future City Council capital programme. Measures and solutions that impact on house construction and retro-fit are particularly relevant at this time owing to the recognized acute shortage of suitable accommodation within the district and wider city.

Solution 11

The solutions will be promoted across the organization, influencing fleet procurement and wider promotion of alternative fuel vehicles. We will also seek to influence the decision making process of the NTA.

Solution 12

Incorporate smart mobility solutions into future service provision

Q5 What user / stakeholder involvement is foreseen?

Solution 1, 4, 5.

Local resident groups, political representatives and industry

SEAI, DHPCLG, CCC, Southern Assembly

Solution 11, 12

Solution 1, 4, 5.

Local resident groups, political representatives and industry

SEAI, DHPCLG, CCC, Southern Assembly

Public Transport operator, National Transport Authority

Q6 What is the potential implementation timeframe?

Solution 1, 4, 5, 11, 12

3 to 5 years

5.6.6 Replication needs of Smart City Measure(s)

Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

Solution 1, 4, 5, 11, 12.
Regular communication on each sub solution or projects including technical specification, lessons learned and issues raised by stakeholders

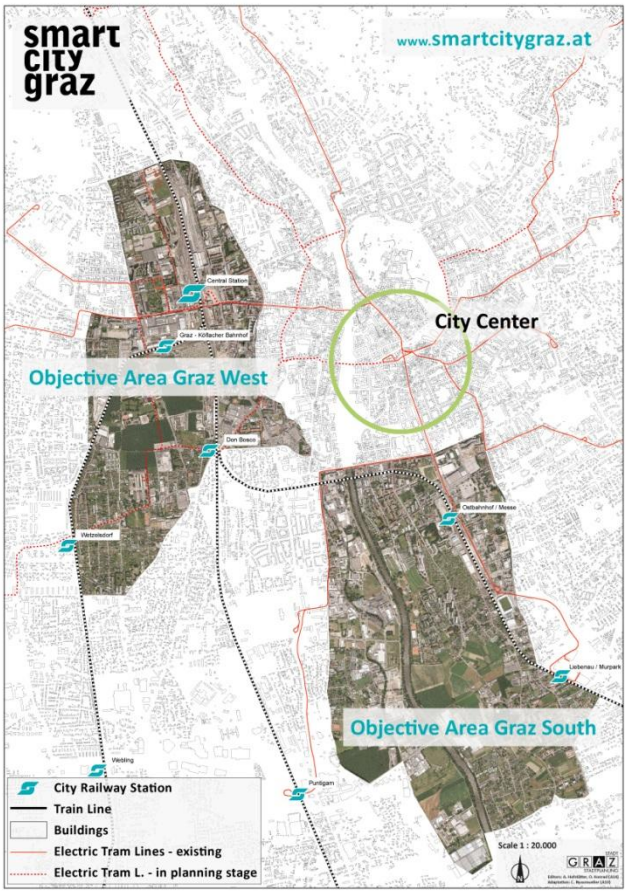
6. Replication Assessment of the Follower City Graz

6.1 Smart City Replication Profile

6.1.1 Mapping the overall framework conditions for replication within the city territory

Q1 What is the overall replication potential for Smart Solutions until 2020 and beyond?

The Smart City Urban Development Strategy of Graz had been developed since 2010 in the course of the strategy formation project "I live Graz" which was national funded by the Austrian Climate and Energy Fund. It was politically decided on local level by the municipal council midyear 2013.



Within "I live Graz", the vision, guidelines and roadmaps for the Smart City Graz were elaborated using the ZEUS method.

Methodological approach of the Smart City Graz Strategy

The classical approaches of improving a situation is to describe the current situation, to analyze strengths and weaknesses and based on this apply changes (continuous improvement). Mostly it gets more difficult to find new improvements as development progresses according to the law of diminishing marginal utility. In other words same efforts lead more and more to smaller successes. This is also the method of "classical urban development".

Based on the current state, driven by interests of investors, citizen, economic, politics, etc. and influenced by (mega-) trends (migration, demographic change, changes in economic situations, etc.) planning activities are implemented in different fields of action, mostly not or too less coordinated. The involvement of relevant actors is mostly carried out too late and sometimes very hesitant. This often leads to opposition against new expediently infrastructural constructions (e.g. streets, wind turbines or hydro-electric power plants).
The development of livable cities as a consequence of many individual actions hence can be seen as a lucky coincidence. With the approach described a system could be improved but hardly not changed.

For the methodological approach of the Smart City Graz Strategy on the other hand with the overarching goal of a livable city in the year 2050 the strategic focus lies on systematic innovation based on following principles:

- Urban development should not be limited to the balance of interests between target groups.

- Urban development must be seen as urban policy which should point out potentials and should develop perspectives. It do not have to command majority backing in the first phase but should have the aim to convince as much as possible by continuous integration of parties concerned.

This approach was already tested in the preceding project „ZEUS“ (Zero Emissions Urban System). Within the framework of Smart City Graz this approach had been extended substantially. The main difference is a modified objective function. While the ZEUS-project was targeting “only” an emission-free urban environment, the Smart City Graz Strategy targets a comprehensively livable Smart City which goes far beyond the waste and emission topic and as well includes important many other material/non material aspects.

Thus the implementation of the Smart City Graz Strategy follows these steps:

1. *Development of ideal visions of a livable city in the year 2050 including several thematic fields and an intermediate target for 2020*
2. *Selection and Definition of suitable smart city indicators to be able to measure the progress*
3. *Development of a roadmap which describes the necessary foci and milestones and the time priorities for the implementation.*
4. *Development of an action plan for the time period until 2020*

I live Graz - Abstract
With its 276.526 inhabitants (01/2015), the Styrian provincial capital Graz bundles the requirements of a university, administrative and economic centre.
The goal: thanks to its high quality of life, by 2050 Graz will probably nearly double its population while using a fifth of the resources. In the course of the project additionally one or two national and international demo projects need to be identified.

The way

In Roadmaps 2020 and 2050 and (adapted) action plans by 2020, concrete measures are pooled together in the five considered areas (region, city, district, quarter and project) and the existing strategies are adapted. To achieve the vision one or two international demonstration projects are being developed.
The area of focus: communication and information transparently conveying information is an essential component of the “I live Graz” project in order to integrate the participating actors and citizens. The way to deal with new technologies needs to be communicated in a comprehensible and target group-specific way.

One result of this strategy process was the designation of two appropriate smart city objective areas one in the western part of the city (“Smart City Graz West”) and one south of the city center (“Smart City Graz Süd”). These areas should become the main focus for Smart City Pilot Project within the first phase of the implementation.

Based on this overall Smart City Strategy, Graz actually aims to match different topics of the strategy with suitable funding schemes on EU and national level.

ENERGY VISION SMART CITY GRAZ

In 2050, the city of Graz finds itself at sustainable energy equilibrium. The total energy required is produced 100% from the region and from renewable energy sources. This could be energy from waste heat source of industry within the city or neighbouring municipalities, a central run-of-river power plantin the city (construction has already begun in 01/2017), PV (Big Solar Graz Project – currently: feasibility study phase; concept: PV modules need to be installed in neigbouring municipalities because of the lack of free space in the city center of Graz – question of an strategic energy planning for the functional urban region), biogas, , wind-power, also geothermal sources in small sales (only on building level) which could supply smaller areas in a decentralized system. As pointed out this is a very ambitious vision – we are aware that with today's technologies these goal is still unachievable. Main conclusion from the topical point of view is, that there is a strong need for technical large scale solutions to make an real effect on the existing district heating system of Graz. All small scale technologies (building level) might be smart, but would not lead to the big change.

Currently (2015) 70% of the energy for the central district heating system of Graz is produced in private owned a coal-fired and gas-fired power plant in a municipality south of Graz (Mellach). Since the operating company of these plants announced a premature exit from the supply contract with the City of Graz in 2013 a comprehensive search for alternative energy sources began ("Heating Supply Graz 2020/2030" led by the Environmental Department of Graz). Outcome of this strategy process was the fact, that in a short and medium term as compensation for the soon closed plant in Mellach a gas-fired power plant has to be built owned by the municipality ("natural gas as a bridging technology"). Renewables have in a short and medium term only a potential to cover 10% of the whole heating demand of the City of Graz (appr. 1.000 GWh/a) according to current calculations. This figure orientates towards the current demand, since Graz is a growing city (in average plus 1800 residential units per year and already implemented refurbishment of the largest residential complexes, we assume that this energy requirement will not decrease in the mid term.

2050 the citizens of Graz understand the value of energy and use it consciously and efficiently.

Establishment of specific targets for future urban development projects:

- *Reduction of Greenhouse Gas Emissions by 20% (these 20-20-20-targets were primary following the EU-targets; on local level we interpret it currently as improvements on district level with reference to the average across the City)*
- *Increase of the share of renewables by 20 %*
- *Increase of the energy efficiency by 20%*
- *Reduction of land consumption for buildings and infrastructure*
- *Implementation of compact, energy-optimized building structures*
- *Optimized development of public transport infrastructure – avoidance of settlement patterns which foster motor-driven private transport*

www.smartcitygraz.at

I live Graz - Details

Initial situation/ Description of the City or urban region

268,602 people were living in the city of Graz – Austria's second largest city and capital of Styria province – in May 2013. This corresponds to a population density of 2,058 inhabitants per square kilometre. Together with the surrounding municipalities, around 405,000 people currently have their main place of residence in the Graz region. The long-term trend shows a steady increase in inhabitants. Current forecasts predict an increase to approximately 490,000 inhabitants by 2050. Due to its sheltered situation in a basin, Graz is disadvantaged in terms of climate in winter due to hampered exchange of air in atmospheric inversion conditions. There is particular need for action with regard to carbon dioxide and particulate matter emissions.

The main sources of energy used are distant heating (33%), heating oil (~25%), electricity (~20%) and gas (~15%). Renewable energies amount to ~5%.

At one third, motorised private transport makes up the largest percentage in the modal split, with a slight decrease apparent for the first time in 2008. A continuous increase in bicycles, from 8.3% in 1982 to 16.1% in 2008, can be observed. Public transport shows a slight increase, currently amounting to just under 20%.

The "Mobility Concept Graz 2020" which was approved by the municipal council in 2012 aims to the share of cyclists from 16% to 20% in 2020. An urban traffic planning guideline and specific measures complement this Mobility Concept.

The aim of the "I LIVE GRAZ" project was to work out the vision and strategic principles for the Smart City Graz, to define the appropriate measures, and to initiate the first steps.

Thematic content/ technology areas covered

A total of eight central topics have been processed for the future development of the city of Graz towards the goal of "Zero Emission". Individual indicators were created for the seven specific topics "Economy, Society, Mobility, Energy, Supply/Disposal, Buildings Ecology".

In the eighth, overarching topic – "City" – strategies were elaborated with regard to the future development of the city.

The eight topics are combined in five focal actions in accordance with the options available to a city: Urban planning, Citizen participation and awareness raising, Economic incentives
Legal conditions, organisational development.

Visions developed until 2020/2050

Vision 2020: Graz has established itself as a Smart City with a high level of urban quality of life and as a centre of innovation, technology and services of international standards, ranking among the top ten of Europe's medium-sized cities

Vision 2050: The sustainable city worth living in Graz is a dynamic city with compact development and mixed urban use, with attractive public space and an extremely high quality of life. By rigorously pursuing Smart City strategies and creating a broad awareness, it was possible significantly to reduce consumption of resources and energy and associated pollutant emissions, and to take major steps towards realising a zero-emission city. 100% of energy required in Graz is

generated in the region and from renewable sources. As a city of research, qualification and business, Graz is an international touchstone for value creation by means of innovative urban technologies and systems.

Roadmap developed

In the spirit of consistently pursuing these visions, the five focal actions for developing a sustainable city worth living in – the Smart City Graz – are essentially tackled concurrently. The "Smart City Graz" roadmap contains the following two milestones on the road to a completely smart city in 2050:

- *2020 milestone: development of 5 Smart City quarters*
- *2030 milestone: development of a total of 25 Smart City quarters (strategic defined urban development sites) and 5 Smart City districts (according to existing administrational district term; currently Graz is structured in 17 districts)*

The development of an energy-efficient, resource-saving and low-emission city comprises the following guidelines:

Focal action 1: Urban planning

This focal action comprises all tasks of the municipal administration which are relevant for planning and development issues (e.g. urban planning, traffic planning, energy planning, construction planning, open space planning. Main goal is the systematic alignment of all planning and subsequently all implemented construction projects with the vision of the Smart City Graz Strategy for 2050.

- *Infill development of existing residential structures and development of residential brownfield sites before repurposing building land*
- *Promotion of compact and dense development structures connected to existing public infrastructure*
- *Mix of uses (Mobility: a well functioning mix of usages within a urban structure causes short distances in everyday life and finally leads to a sustainable traffic behaviour (modal split). Mixed usages are economic functional and stable as long as minimum built densities (1,8 – 2,0) lead to a sufficient number of inhabitants. Increasing housing densities moderately the share of required road space can be reduced up to 25%. A part of this space-saving could be used for public green.*
- *Safeguarding and creation of attractive public green and outdoor spaces*

Modification of competition programmes to achieve the target Smart City qualities (indicators)

Focal action 2: Citizen participation and awareness raising:

- *Early involvement of groups affected by planning*
- *Target group-oriented citizen's information and participation*
- *Accompanying district management for district development projects*
- *Promotion of awareness raising for sustainable lifestyle*

Focal action 3: Economic incentives:

- *Efficient handling of resources and public funds*
- *Promotion of research, innovation and development projects in urban development*
- *Private-law quality agreements with investors to implement sustainable urban development measures*
- *Promotion of green economy company set-ups*
- *Initiation of investment funds to finance infrastructure measures*

Focal action 4: Legal conditions:

- *All relevant (provincial) laws encourage the implementation of the Smart City Graz objectives*
- *Municipal regulations supply these legal conditions*

Focal action 5: Organisational development:

- *Commitment to the Smart City Graz policies*
- *Smart City as an interdisciplinary project with clearly defined responsibilities in organisational units and overarching project management*
- *Ongoing communication and transdisciplinary co-operation*
- *The municipal administration of Graz (and its participations) as a model for other stakeholders*
- *Accompanying monitoring and evaluation*

Action plan developed

The catalogue of measures for 2020 provides the following measures for the individual action focuses (selection):

Urban planning

- *Implementation of the Demo project SCP-Graz Mitte*
  This first national funded Smart City demo project aims to demonstrate new innovative urban technology components to make use of RES to be strongly linked into an integrated urban development site (goal: zero emission quarter)
- *Targeted control of the urban development*
- *Systematically monitoring and ongoing analyses of the Demo project SCP Graz Mitte*
- *Initiation of further Smart City quarters (Living labs)*

Citizen participation and awareness raising

- *Target group-oriented citizen's information and participation with with diverse mix of tools and methods*
- *Accompanying district management for district development projects*
- *Focal campaigns, training and coaching for sustainable lifestyle.*

Economic incentives:

- *Promotion of implementation of Smart City quarters (here the municipal administration aims to convince investors of added values by investing in sustainable building technologies or high standards of public space around their building complexes;*

unfortunately calculation of life cycle models is not standard for investors at the moment who intend to build and sell their infrastructure fast and do not care how it will function in the long term.)

- *Promotion of green economy company set-ups*
- *Initiation of investment funds to finance infrastructure measures*

Legal conditions:

- *Urban development agreements with investors governing Smart City target qualities / indicators assume the form of secondary legislation*
- *Elaboration of land planning and legal specifications for future investors in Smart City quarters*
- *Demand for legal amendments by Styria Province, e.g. embodying the Smart City objectives in the Styrian Land Planning Act*

Organisational development:

- *Formation of the municipal core team, an overarching project management team, and set-up of internal municipal communication*
- *Establishment and continuation of co-operation with partners*
- *The city as a model: definition of binding standards*
- *Motivation of all staff in the "Graz House"*
- *Creation of a monitoring and evaluation system for all Smart City agendas (annual report with development of energy use and greenhouse gas emissions)*

Outlook

Due to its cross-disciplinary project approach, the I LIVE GRAZ project has led to new solutions and furthermore to the Smart City Graz strategy.

This strategy is the basis for a smart and comprehensive future-oriented urban development in Graz. Measures planned in the framework of this project will guide our forthcoming work.
First submissions of pilot projects in national and international programmes have already been made. In the target area Graz Mitte (Graz Centre), implementation of Smart City pilot projects is intended to enable the application of additional innovative urban technologies and systems and thus trigger the development of the whole district in the direction of a smart sustainable neighbourhood.

STEK 4.0 Stadtentwicklungskonzept Graz, 2013: 1. Principle/§3: "Graz is developing into a Smart City"
(Urban Development Concept – mandatory local regulation: According to the spatial planning law of the Province of Styria the STEK 4.0 is aimed as the overarching planning instrument which outlines the medium and long termed goals of the City of Graz for the next 15 years. The precise land development plan of Graz has to respect the framework of this strategy paper in regard to the dimension of residential areas as well as for other functions or land uses. On the other hand the STEK 4.0 has additionally to respect superior targets of the regional development programme like e.g. priority zones for green infrastructure or settlement development. Due to the fact, that

the STEK 4.0 is enacted by the Styrian government as an ordinance the role of it became more important than in the past.)

- *financing and funding opportunities available (European, national , local programmes, private investment etc.)*
    - *national funding by the Austrian Climate and Energy Fund*
    - *as from 2015/16: specific Investment Priority within the national EDRF-programme for capital expenditure projects (e.g. public buildings like schools, etc.) which save carbon dioxide in the framework of Smart City Strategies in Styrian municipalities*
    - *urban development contracts between municipality and private investors pre-arranging the co-financing of public infrastructure in pilot development sites (mobility measures, open space, etc.)*
    - *etc.*

- *legislation frameworks affecting the solution's development / implementation*
    - *Steiermärkisches Raumordnungsgesetz 2010 (defines legislative planning instruments oft he municipality)*
    - *4.0 Stadtentwicklungskonzept Graz, 2013 (Urban Development Concept – mandatory local regulation for urban development – see description above)*
    - *OIB-Richtlinie 6 - Energieeinsparung und Wärmeschutz (Österreichisches Institut für Bautechnik, 2015)/Austrian Institute of Construction Technology (national standards for energy savings and thermal insulation for buildings as a basis for the application for subsidies for housing construction and refurbishment of the province*
    - *regulations for subsidies for housing construction and refurbishment (province level)*
    - *further regulations/laws for specific topics (mobility, energy, etc.)*

Currently, there are no special fiscal incentives for deep refurbishment:
A major obstacle for Cities like Graz to implement deep refurbishment projects within EU-funding-schemes is the fact that Austria seems to have comparatively high energetic building standards on national level, which constitutes the baseline for the EU-funding of innovative renovation/retrofitting measures within e.g. the Horizon 2020 Programme.
On the one hand, new residential buildings in Austria widely comply with high energy standards. On the other hand, we lack comprehensive refurbishment strategies for building ensembles, on district or even better on city level.
Since energy costs are mostly seen as further offsettings and transitory items (also in the social housing sector) we can see a limited motivation of investors in bearing higher costs for implementing higher standards in refurbishment/retrofitting measures of residential buildings. Therefore from our point of view at the moment it would be necessary to

a. *to offer attractive financial instruments as well as fundings on EU-level to foster the implementation of highly innovative pilot projects in the refurbishment of (public but also private owned) building ensembles or whole urban districts.*
b. *detach fundings for energy efficiency improvements of refurbishment measures within Horizon 2020 from the national energy standards to give noticeable incentives also to further developed cities and stakeholders to participate in such EU-funding-schemes.*

Q2 How does the "Smart City" approach feed into/connect with your existing local planning processes?

As described above the Urban Development Concept of the City of Graz predetermines the aim to become a Smart City. Other local strategies have to follow this overall mandatory local regulation.
An urban refurbishment strategy should be developed within the next years – this is one of the major reasons for us to take part in the GrowSmarter project. This strategy should tackle both private and municipal buildings as well since the housing stock of the municipality itself is rather limited in comparison to private housing cooperatives.
A communal energy concept (Kommunales Energiekonzept 2020/KEK 2020) was first elaborated in 1992 and since then it was repeatedly revised. Currently the City of Graz/Environmental department is working on a strategy to secure the supply of district heating within the urban region on a long-term basis (within this process all alternative energy supply options suitable for Graz were evaluated in 2014).
The „Grazer Mobilitätskonzept 2020"/Graz Mobility Concept 2020 consists of three parts: targets, policy paper/directive for traffic planning and a set of implementation measures.
In the field of E-Mobility Graz and the surrounding region was chosen as a „model region" to be funded by the Austrian Climate and Energy Fund (www.emobility-graz.at and www.klimaundenergiemodellregionen.at).

E-Mobility- Model Region Graz
Within this national funded project the City of Graz and the surrounding region aims to optimize the regional traffic/transport system and to foster the usage of e-vehicles, cars as well as bikes. Within current urban development projects and urban construction projects (like e.g. the Smart City Graz Pilot Project) these e-mobility measures should be considered too. Goal for the year 2020 is to increase the rate of electric vehicles of new registrations of automobiles up to 15% (baseline: total of new registrations of automobiles 2009: 15.318; 15% = 2.300 e-vehicles per year) and a significant shift towards environmentally friendly means of traffic.
In parallel the expansion of the required charging infrastructure in public areas and in companies will be promoted. Additionally renewable energy sources (e.g. PV) are promoted to supply clean energy for the e-mobility-measures helping to reduce CO2-emissions on regional level.

Other municipal strategies to tackle current urban challenges :

- *Establishment of a Digital Agenda for Graz including a Data-Guideline for internal/external project partners (e.g. preconditions for the installation of sensing hardware in the public space)*
- *Sustainable city logistics (Microhub structures, SUMPS, …)*

- *A Green Lab, a Moblility Lab and and an Energy Lab structure will be established in Graz until 2018 with the help of national funding of the KLIEN-Fun. With the help of these Lab structures we intend to drive forward these three important urban issues with the help of external specialists (scientific community, NGOs, private stakeholders, investors).*

Q3 Is there a (strategic) plan and organisational structure in place to become a "Smart City"?

A strategic plan to become a "Smart City" based on 8 indicator-sets, which are seen essential for a smart city, has been worked out within the strategy-development process „I live Graz" (2011-2012).

Proposed indicator-sets (to be further developed)

1. Urban planning (Urbane Planung)

Individual indicators on level Smart City quarter (Personenindikatoren - Quartiersebene):

- *User density: individuals per square meter gross floor area*
  (Nutzerdichte: Personen / m² BGF)
- *Usage intensity for public space: individuals per square meter public space*
  (Nutzungsintensität öffentlichen Raum: Personen / m² öffentlicher Raum)

Area indicators on level Smart City quarter (Flächenindikatoren -Quartiersebene):

- *density of construction (Bebauungsdichte)*
- *Public Space (collectively used area) – Share of circulation areas/green infrastructure/squares [percentages]*
  (Öffentlicher Raum – Verkehr/Grünflächen/Plätze [% Anteile])
- *Transportation route areas – Share for private car transport/public transport/foot and cycle paths*
  (Verkehrs)flächenanteile (Öffentlicher Raum): MIV/ÖV/Fuß- und Radweg [% Anteile]
- *Modal Split [% Anteil]*
- *Consumtion of building space per project: built-up area/ circulation area/open space*
  Bauflächenverbrauch/Projekt: Bebaute Fläche/Verkehrsfläche/Freifläche [% Anteil]
- *Energy efficiency*
  We found out that a major obstacles for external stakeholders like local residential property developers to implement deep refurbishment project are mixed ownership structures in housing estates (majority resolutions pro deep refurbishment) and the obligation to meet the comparatively high energetic building standards on national level as a precondition to become eligible for housing subsidies of the provincial government (financing problem).
  There are no specific standards set on municipal levels – national standards are to be implemented (http://www.oib.or.at/sites/default/files/richtlinie_6_26.03.15.pdf).
- *Energieeffizienz (Dauerleistung/Einwohner) [Watt/J]*

- *Living space per resident*
  Wohnfläche pro Einwohner [m²/EW]
- *development of the total amount of residential areas and circulation areas*
  Entwicklung Siedlungsfläche und Verkehrsfläche (ha)

Cost indicators (Kosten Indikatoren):

- *infrastructure costs per resident*
  Infrastrukturkosten je Einwohner (nach Stadtteilen)
- *costs for social infrastructure per resident*
  Sozialinfrastrukturkosten je Einwohner (nach Stadtteilen)

Other indicators (Sonstige Indikatoren):

- *routes across the site/passageways of foot and cycle paths - mesh size*
  Fuß- und Radwegdurchwegung – Maschenweite
- *proportion of green space for different types of landuse*
  Grünflächenanteil - mind. Werte – Kernstadt/Wohngebiete/offene Bebauung/Industrie [%] (Quelle: Freiraumplanerische Standards)
- *catchment area of public transport*
  ÖV Einzugsgebiet [Hüllkurve] 300m (Kat 1) (Quelle: STEK 4.0)
- *quarters calling for (immediate) action*
  Stadtteile mit Handlungsbedarf ; großen Handlungsbedarf/Handlungsbedarf (Quelle: STEK 4.0)
- *public sport fields per district*
  Bezirkssportplätze pro Bezirk (Quelle: STEK 4.0)
- *catchment area of public gardens and parks*
  Einzugsbereich Parkanlagen [600m] (Quelle: STEK 4.0)

Indicators not yet quantifiable (Noch nicht quantifizierbare Indikatoren):

- *quality of public space and urbanized ground floor zones per built-up area*
  Qualitätsvoller öffentlicher Raum und urbane EG Zonen / bebaute Fläche m² pro Quartier
- *mixed use of urban areas on distict level*
  Nutzungsdurchmischung im Quartier und Stadtteil
- *individual identification with the district*
  Identifikation mit Stadtteil

2. Citizen participation and awareness raising (BürgerInnenbeteiligung und Bewusstseinsbildung)

Citizen participation (Bürgerbeteiligung):

- *total number of participation processes*
  Anzahl der Partizipationsprozesse
- *level of satisfaction with process results*
  Zufriedenheitsquote mit dem Prozessergebnis

- *web-services containing participation tools, information and visualizing of development projects*
  Online--Plattformen für Beteiligung, Information und Visualisierung der Projekte.
- *neighbourhood/district management initiatives accompanying the urban development projects*
  Stadtteilmanagement begleitend zu Stadtteilentwicklungsprojekten

Awareness raising (Bewusstseinsbildung):

- *"Ecological Footprint"*
  ökologischer Fußabdruck

Quality of life (Lebensqualität):

- *Model of collecting and analysing data relevant for quality of life within the City of Graz (Lebensqualitätsindikatoren LQI-System der Stadt Graz)*
  11 groups of indicators; representative population surveys all five years; calculation of need for action for all districts as a strategic planning tool for the departments of the municipality

3. Economical aspects (Wirtschaftliche Aspekte)

Using resources and public money effectively by coordinated investment decisions (Effektiver Umgang mit Ressourcen und öffentlichen Mitteln durch abgestimmte Investitionsentscheidungen):

- *Share of budget for municipal Smart City Projects compared to total of the annual construction budget of the City of Graz*
  Budgetmittelanteil Smart City Aktivitäten am städtischen Jahresbudget (Budget für Bau, Förderung und Information)
- *Costs for social infrastructure per inhabitant (district level)*
  Soziale Infrastrukturkosten je Einwohner (nach Stadtteilen)
- *Costs for technical infrastructure per inhabitant (district level)*
  Technische Infrastrukturkosten je Einwohner (nach Stadtteilen)

Promotion of scientific and innovative urban development projects (Förderung von Forschungs-, Innovations- und Entwicklungsprojekten im Bereich von Stadtentwicklung):

- *Number of projects*
  Anzahl der geförderten laufenden Innovations-, Forschungs- und Entwicklungsprojekte für zukunftsfähige urbane Entwicklung

Quality agreements with investors under civil law for a targeted implementation of sustainable urban developmnet measures (Zivilrechtliche Qualitätsvereinbarungen mit Investoren zur zielgerichteten Umsetzung zukunftsfähiger Stadtentwicklungsmaßnahmen):

- *Share of quality agreements compared to the total of urban development projects*
  Anteil von Qualitätsvereinbarungen bei Stadtentwicklungsprojekten

Promotion of attracting „Green Economy"-companies (Förderung der Ansiedlung von „Green Economy" Unternehmen):

- *Share of „Green Economy"-companies and companies with environmental certifications/labels to the total of companies in Graz*
  Anteil der „Green Economy" Betriebe und der Betriebe mit Umweltzertifizierungen an allen Betrieben in Graz

4. Legal framework (Rechtliche Rahmenbedingungen)

Zoning plan (Bebauungsplan):

- *Zoning plan proceedings including Smart City indicator assessment*
  Bebauungsplanverfahren mit Smart City Indikatorenbewertung (Anzahl der relevanten urbanen Bauvorhaben)

Zoning fee (Widmungsabgabe/Mehrwertabgabe):

- *Zoning fee earmarked for the purpose of financing smart urban development projects*
  Zweckgebundener Einsatz der Widmungsabgabe für smarte urbane Projekte

Smart City targets embedded in legislation (Gesetzliche Verankerungen der Smart City Ziele):

- *Number of decisions and regulations taking into account Smart City targets made by the local government*
  Anzahl der erlassenen städtischen Beschlüsse und Verordnungen in Hinblick auf Smart City
- *Interventions to adopt legal frameworks on province and national level*
  Interventionen zur Anpassung gesetzlicher Rahmenbedingungen durch Bund und Land

5. Organisational development (Organisationsentwicklung)

Political commitment and responsibility (Politisches Bekenntnis und Verantwortlichkeit):

- *Share of municipial departments included in Smart City projects*
  Anteil der beteiligten Abteilungen an Smart City Aktivitäten
- *Share of municipial employeed included in Smart City projects*
  Anteil der beteiligten Mitarbeiter/innen an Smart City Aktivitäten
- *Number of Smart City Projects and activities implemented by local administration*
  Anteil der Smart City Projekte und Initiativen

Communication and co-operation (Kommunikation & Kooperation):

- *Number of relevant external stakeholders*
  Anzahl/Anteil der relevanten, externen Kooperationspartner
- *Number of cooperation with other Smart Cities*
  Anzahl/Anteil der Kooperationen mit anderen Smart City Städten (vergleichbarer Größe, ähnlicher Herausforderungen)

City setting a good example (Stadt als Vorbild):

- *Number of exemplary Smart City projects per year*
  Anzahl der Smart City Vorbildprojekte der Stadt pro Jahr
- *Number of employees involved into the forward the motivating process*
  Anteil der Mitarbeiter/innen im Motivationsprozess

Monitoring and evaluation issues (Monitoring und Evaluierung):

- *Number/Share of urban development projects which are checked for the Smart city indicators*
  Anzahl/Anteil der Projekte (z.B.: Bebauungspläne), bei denen die Smart City Indikatoren überprüft werden

In terms of organisational structure we are currently taking up a process to establish an internal smart city working group including all relevant departments with the aim to set up institutionalized working structures for integrated urban development projects in the framework of the Smart City Strategy. This group started their work in September 2015.

At the moment the Smart City process is mainly promoted by the Executive Office for Urban Planning, Development and Construction which is also the leader of the PPP-consortium of the "Smart City Pilot Project Graz Waagner Biro". An internal resumption process which should again bring together all relevant units within the municipality with the aim to establish the smart city strategy in all relevant departments (see also Q3 above).
In 2016-2017 there was a strong collaboration between several municipal departments elaborating a H2020 Smart City Application, which was at the end not successful. Nevertheless this process led to important side products/effects like the set up of a Sustainable Energy Action Plan for Graz or the establishment of a strategic group for digitalization issues (currently elaborating an Digital Agenda and a Manual for internal/external projects dealing with sensitive data.
To sum it up the process to install an internal smart city working group as a formal unit stagnates at the moment mainly because of limits of administrational logics. It is not foreseen within the administration to set up a task force or a special unit consisting of members of different departments which tackles an highly integrated strategic issue like interdisciplinary Smart City development.

Q4 Are there synergies and/or conflicts of the "Smart City" plan and organizational structure with existing initiatives and their structures within the city?

- *initiatives (see also Q6): ECR Energy City Graz Reininghaus, +ERS - Plus Energy Network Reininghaus Süd, EU-Project Act4PPP, I Live Graz (as the strategic starting point for the Smart City Strategy Graz), etc.*
- *synergies: Urban Development unit and EU-unit are cooperating ideally because they are located within the same department (Executive Office for Urban Planning, Development and Construction)*
- *conflicts: typical vertical structures within the traditional administration system are more than ever confronted with horizontal integrated planning approaches in regard*

to the Smart City strategy process – this sometimes leads to conflicts; more/specific staff for specific tasks like Smart City strategy would always be ideal; at the moment most of the employees are tackling the smart city-topic beside their basic work load;

Q5 Which and how are regional and local stakeholders involved in the Smart City strategy and planning process on a city level?

"Smart City Pilot Project Graz Waagner Biro" –Consortium (13 national and international partners are taking part in the first Smart City Graz project):

- *Stadt Graz (Consortium Leader)*
- *Holding Graz (implementing mobility measures within the pilot project; 100% owned by the City of Graz)*
- *Energie Steiermark (energy supplier on regional level/province level)*
- *Energie Graz GmbH & Co KG (local energy supplier)*
- *FIBAG - Forschungszentrum für integrales Bauwesen – Hans Höllwart*
- *SFL technologies (private company; investor of the Science Tower subproject; developer and producer of PV-Graetzel cell technology)*
- *AVL List GmbH (AVL is the world's largest independent company for the development of powertrain systems with internal combustion engines as well as instrumentation and test systems)*
- *DI Markus Pernthaler Architekt ZT GmbH (architect and technical support of the smart city pilot project)*
- *Technische Universität Graz (scientific partner)*
- *StadtLABORGraz (NGO; deals mainly with participation issues/stakeholder processes within the pilot project – represent opinions of organised civil society, but also the voice of the anonymous local citizen)*
- *SOT – Süd-Ost Treuhand Gesellschaft m.b.H. (funding/accounting management)*
- *Alfen Consult GmbH (scientific partner)*
- *ECO WORLD STYRIA Umwelttechnik Cluster GmbH (200 companies and research centers are working on the Green- and Cleantech solutions of tomorrow within the Cluster ECO World Styria)*

Smart City Pilot Project Waagner Biro:

- *executive committee/steering board (two times per year): political representatives (town councils), managing directors of the companies within the consortium*
- *Project Steering group (one SCP-Jour Fixe once per month): Consortium Leader City of Graz, work package leader, representatives of all consortium members*

Q6 What are past (<5 years) and current projects that are closely related to the "Smart City" concept?

- *ECR Energy City Graz Reininghaus (http://www.hausderzukunft.at/results.html/id5854)*
  Urban strategies for the new conception, construction, operation and restructuring of an energy self-sufficient city district
  The aim was the development of a valid set of specific values and a guideline as a basis for energy self-sufficient district development. Based on the results, a masterplan (energy-network) for the district Graz-Reininghaus shall be developed. Future-oriented "city-building-blocks" will be implemented as flagships of innovation.
  Lead Partner: Technical University of Graz, Department for urban building; project partner among others: City of Graz, Executive Office for Urban Planning, Development and Construction;

- *ECR Energy City Graz - subproject 3: +ERS - Plus Energy Network Reininghaus Süd*
  The multifunctional neighbourhood "+ERS - Plus Energy Network Reininghaus Süd" was realized within the urban planning area of Graz-Reininghaus. The project aims to optimize the energy concept of the single buildings as well as of the building cluster in order to achieve a plus-energy standard within the residential neighbourhood.
  (http://www.hausderzukunft.at/results.html/id6854)

- *Act4PPP within the Central Europe Programme (www.act4ppp.eu)*
  Many cities and regions in Europe are increasingly challenged by their responsibilities to provide public services and infrastructure, to offer social housing or to develop brownfield sites etc.. To increase their capacities and the efficiency of public actions they search for private partners for cooperation, joint actions and institutionalised public private partnerships (PPP). ACT4PPP will provide a platform for cities and regions from all over Central Europe to exchange experiences and know-how and assist them in applying more and better targeted public private cooperations.

- *I Live Graz*
  The Smart City Urban Development Strategy of Graz was developed in2010 (in the course of the strategy driven project "I live Graz") and was adopted on a politically level midyear 2013.

- *Other EU-funded programmes/projects in the field of integrated urban development and urban mobility realised by the Executive Office for Urban Planning, Development and Construction of the City of Graz: www.graz.at/eu-urban*

Q7 Which sites/districts are projected to be developed in the next five/ten years?

- *The **"Smart City Pilot Project Graz Waagner Biro"** as the first national funded Smart City flagship project in Austria is intended to be a première, demonstrating new urban energy technologies for a smart zero-emission quarter offering great quality of life. The renovation plan for the Helmut-List-Halle includes the building of an energy plant that will provide the entire city district with carbon-neutral energy. At the same time, the building will offer*

acoustic insulation for the district. At the heart of the design is the use of "Grätzel" (dye-sensitized solar) cells, which also act as noise protection elements in the glass walls and the roof construction. Within this first implemented Smart City Graz pilot project, the use of innovative technologies allows the majority of the energy demand to be locally generated. Innovative developments in terms of buildings, energy networks and mobility will be linked up to form an urban whole. The integrated holistic planning process involving all relevant players will make smart urban development tangible and come alive. The exchange with national and international partner cities will support learning and reflective processes and further the disseminations of findings and results. (http://www.smartcitygraz.at/projekte-ebene-03-geschichtlicher-abriss/).
Possible starting points/aspects relevant for the GrowSmarter project at the moment: Smart, energy saving tenants through information, Smart lightning, lampposts as hubs for communication, Smart mobility solutions;

- *The second Smart City-development site is **Graz Reininghaus**, a huge development site of 100 hectare close to the city centre located on a former brewery area also in the western part of Graz. (http://www.smartcitygraz.at/projekte-ebene-03_graz-reininghaus/)*
  Possible starting points/aspects relevant for the GrowSmarter project at the moment: energy saving tenants through information, Smart lightning, lampposts as hubs for communication, Waste heat and local heat integration by new business models, Smart mobility solutions;

- *While the Waagner Biro and the Reininghaus development sites are located within the Smart City target area Graz West within the Smart City Strategy there was defined a second target area in the south of the city center (Smart City target area Graz South). This second area is not yet set-up in such a detailed way because potential urban development projects haven't started yet. Smart City target area Graz West is seen as the frontrunner for possible following Smart City developments in Graz.*

6.2 Smart Solutions Selection

Description of replication potential of selected Smart Solutions of LCs within FC

The table below shows which solutions the Follower Cities plan to replicate.

		Follower Cities				
Area	***Smart Solutions***	*Porto*	***Graz***	*Cork*	*Valetta*	*Suceava*
Housing measures	*1. Efficient and smart climate shell refurbishment*		***X***	*X*		*X*
	2. Smart building logistics and alternative fuelled vehicles					
	3. Smart, energy saving tenants through information	*X*	***X***			*X*
	4. Smart local electricity production and integration with buildings and grid			*X*		*X*
Integrated measures	*5. Smart lightning, lampposts as hubs for communication*	*X*		*X*		*X*
	6. Waste heat and local heat integration by new business models		***X***			
	7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.	*X*				*X*
	8. Big data protocol for saving energy and improving the quality of life	*X*	***X***			
Mobility measures	*9. Sustainable delivery*		***X***		*X*	
	10. Smart traffic management					*X*
	11. Alternative fuel driven vehicles for decarbonizing and better air quality	*X*		*X*		*X*
	12. Smart mobility solutions		***X***	*X*	*X*	*X*

Smart Solutions Graz plan to replicate (according to GA)

Smart Solution 1. Efficient and smart climate refurbishment

The issue of innovative energetic district redevelopment will become strategically relevant in Graz for the next years and will additionally play an important part within our Smart City-Strategy in near future. Thus the City of Graz would especially benefit from innovative energetic district redevelopment know how and as well from ICT-knowhow as expected outcomes of the prepared GrowSmarter project. Both Smart City Districts GRAZ WEST (Waagner Biro, Graz Reininghaus) and GRAZ SÜD defined within the official city development plan have a potential concerning refurbishment of multi-storey-buildings of the 1970s (energy efficient renovation).
Graz intends to replicate smart solutions in integrating know how from the lighthouse cities in refurbishment strategies which should be developed first for these local Smart City districts; besides innovative financing schemes (PPP) for implementation purposes should be expedited in Graz within the Horizon 2020 Project.

Smart Solution 3. Smart, energy saving tenants

Within the Smart City Strategy of Graz various target-group-specific participation actions are implemented at the moment like "Energy regular´s table" organized by Stadtlabor Graz on behalf of the municipality. The City of Graz aims to gather additional know how in this field of action from GrowSmarter that should be implemented within existing strategies.

Smart Solution 5 Smart lightning, lampposts as hubs for communication

This Solution had been skipped because of the following reasons:

- *A city-wide rollout of dynamic light control is strategically not (anymore) in the interest of the Road Authority Department, because the potential energetic savings does not have a favorable relationship to the investment costs.*
- *While attempts are still being made on a variety of technologies and manufactures in Graz, at present the concerns about the data integrity and any technical dependencies of individual suppliers are too high.*
- *Furthermore, the issue of potential data transfer is also regarded as highly questionable, also in the sense of the "Guidelines for digital data management of the city of Graz" currently under preparation and the required absolute data integrity of the city.*

Smart Solution 6. Waste heat and local heat integration by new business models

Because of the change of global economic parameters the existing long-distance heating grid in Graz is currently disputed. Questions of cost effectiveness and alternative decentralized district solutions are in discussion (e.g. miniature cogeneration plants considering in advance the opportunity for a future expansion option). As replication measures within the GrowSmarter project the City of Graz plans to set up a local action group gathering local stakeholders from the administration, the energy supplying companies and other relevant sectors as well. After this first step a discussion and a decision-making process will be started to define the main points for a new "waste heat and local heat integration strategy". Subsequently the first steps to implement waste heat and local heat integration pilot projects could then be defined.

Solution 8. Big open data platforms

Since December 2016 the municipality has formed a "Steering Group for Digitalization" integrating the Exexutive office for urban planning, construcion and development, the Road administration department, the CEO of the municipal Informationtechnology provider company, the Holding Graz, the environmental department, the Surveying department and the Chief executive director of the municipal administration which aims to tackle issues of ICT-driven pilot projects, topical external requests for industrial partnerships, etc. in an orderly manner respecting the public interests, data privacy issues of and more.
Until autumn 2017 a "Digitization Strategy Graz" and "Guidelines for the digital data management in the City of Graz" shall be approved by the municipal council.
In this regard an urban data platform (partly open) and environmental sensing pilot projects are intended to be implemented the next years.

Smart Solution 12. Smart mobility solutions
Citizens feedback on traffic plans, direct mobility surveys and mobility monitoring is beside an attractive supply of eco-friendly urban mobility and freight transport is foreseen within the local Smart City Strategy - additional knowhow which could be implemented in existing strategies would be strongly appreciated and could be seen as a replication measure growing out of the Horizon 2020 project which would have real value for future civic participation processes driven by the municipal administration of Graz.

6.3 Smart Measure selection

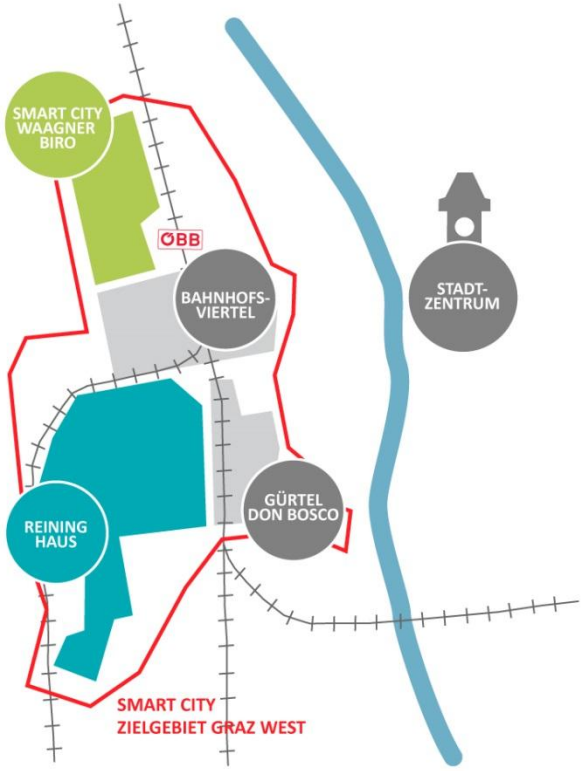
The table below specifies which smart (bundle of) measures within the 12 solutions each FC intend to replicate.

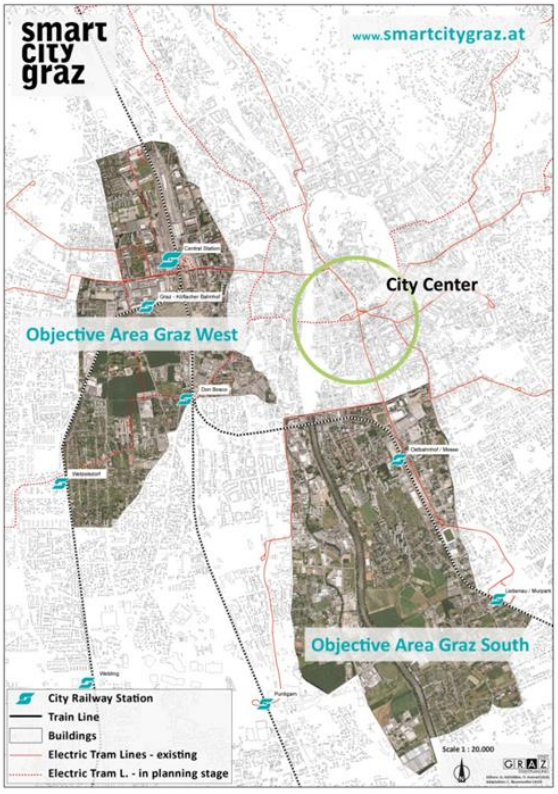
SC Measure	Measure title	Follower City Graz
Low Energy Districts		
Solution 1 - Efficient and smart climate shell refurbishment		
1.1 - Energy efficient refurbishment of the building	Energy efficient refurbishment of residential buildings - Stockholm	X
	Climate shell refurbishment - Cologne	X
	Energy quality assurance - Stockholm	X
	New adaptative control and regulation techniques for heating systems - Barcelona	
	Re-build an industrial site: Ca l'Alier - Barcelona	
	Efficient and smart climate shell and equipment refurbishment - Barcelona	
	Efficient and smart climate shell refurbishment of residential buildings - Barcelona	
	Efficient and smart climate shell and equipment refurbishment of tertiary buildings - Barcelona	
	Energy efficient swimming pools - Barcelona	
Solution 2 - Smart building logistics and alternative fuelled vehicles		
2.1 Integrated multimodal transport for construction materials	Construction consolidation centre - Stockholm	
Solution 3 - Smart, energy saving tenants		
3.1 Active House/Home energy management system/Smart home system	Home Energy Management – Cologne	X
	The Active House – Stockholm	
	An Open Home Net – Stockholm	
	Hubgrade - Energy Saving Centre – Stockholm	
	Adaptive Temperature Control System - Stockholm	
	Home Energy Management System (HEMS) - Barcelona	
	Virtual Energy Advisor - Barcelona	
	Dynamic Pricing Models - Barcelona (Stochastic Model of Appliances Energy Consumption)	
Solution 4 - Local renewable energy production and integration		
4.1 Virtual power plant	Residential Estate Management – Cologne	
4.2 Smart energy and self-sufficient block	Smart Energy & Self-Sufficient Block - Barcelona	
	Building Energy Management System (BEMS) to minimise consumption of fossil fuels and electricity - Barcelona	

Integrated infrastructures		
Solution 5 - Smart lighting, lamposts and traffic posts as hubs for comm.		
5.1 Smart streetlighting	Smart LED streetlighting - Stockholm	
5.2 Combined electrical charging and street lighting poles + wifi	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Barcelona	
	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Stockholm	
5.3 Smart meter information analysis and actuators	Smart Meter information analysis and actuators - Barcelona	
Solution 6 - New business models for district heating and cooling		
6.1 Open district heating with feed-in of waste heat	Open district heating – Stockholm	X
6.2 District heating and cooling rings	District heating rings - Barcelona	
6.3 Smart local thermal districts	Smart local thermal districts – Barcelona	
Solution 7 - Smart waste collection , turning waste to energy		
7.1 Optical sorting of waste 7.2 Introduction of AWCS 7.3 Waste collection statistics for individual households/businesses	Smart waste management - Stockholm	
Solution 8 Big open data platforms		
8.1 Big consolidated open data platform	Big consolidated open data platform - Stockholm	X
	Big open data platform - Barcelona	X
	Urban Cockpit – Cologne	
	Urban Traffic – Cologne	
	Urban Environment Cologne	X
8.2 Urban models		
8.3 Semi-automatic instance mapping		
8.4 Integration of sensor and heterogeneous data in standard data format	Integration of sensor data in a uniform in standard-driven data format - Barcelona	
8.5 Sustainable connected lighting to enhance safety and mobility		
Sustainable Urban Mobility		
Solution 9 - Sustainable delivery		
9.1 Integrated multi-mode transport for light goods	Communal service boxes for sustainable deliveries – Stockholm	X
9.2 Micro-distribution of freight	Micro distribution of freight - Barcelona	
Solution 10 - Smart traffic management		

10.1 Traffic management through MFD 10.3 Travel demand management 10.4 Traffic control systems for passenger vehicles 10.5 Traffic signals synchronised to prioritize movement of goods	Smart traffic signals – Stockholm and Barcelona	
Solution 11 - Alternative fuel driven vehicles		
11.1 Developing charging infrastructure	Normal charging infrastructure for electric vehicles – Stockholm	
	Fast charging infrastructure for electric vehicles – Stockholm and Barcelona	
	eTankE - Cologne	
	Vehicle to X (V2X) Charging for EVs - Barcelona	
11.2 E-mobility management system		
11.3 Charging infrastructure for electric tricycles for micro-distribution		
11.4 Refueling facilities for alternative heavy duty fuels	Alternative fuels for heavy duty vehicles – Stockholm	
11.5 Smart guiding to alternative fuel stations and fast charging		
11.6 Small distributed CNG grid	Small distributed CNG grid - Barcelona	
Solution 12 Smart mobility solutions		
12.1 Green parking index	Green parking index – Stockholm	
12.2 Electrical and cargo bike pool		
12.3 Mobility hub	Mobility Hub – Cologne	X
12.4 Electrical and conventional car sharing		
12.5 Conventional/PHEV/CNG vehicle sharing fleets		
12.6 Smart taxi stand system	Smart taxi stand system - Barcelona	

6.4 Smart City and District Replication





6.5 Smart District Waagner Biro Replication Profile

6.5.1 Mapping of district related replication framework for selected Smart Solutions

Q1 What are the main characteristics of the district and what is the replication potential?

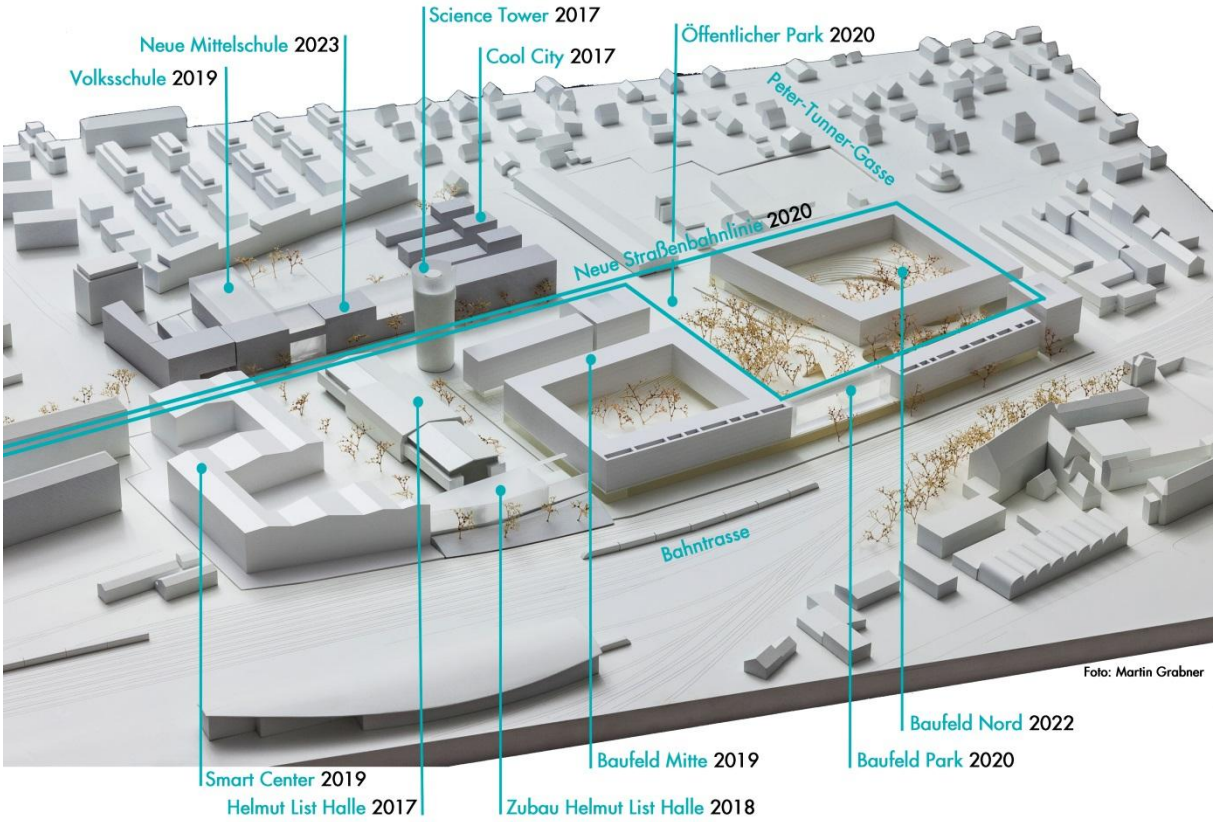
SMART CITY TARGET AREA GRAZ WEST
The "Smart City Graz"-strategy will be first implemented around Waagner-Biro-Straße in Graz West. This former industrial area near the center of Graz is an important local land reserve that will be developed into a sustainable place to live and work, boasting a high quality of life. National funding of the Climate and Energy Foundation facilitates flagship projects that implement modern technologies, deliver sustainable energy and preserve resources. In addition, a new residential area and a high-quality public space will be created.

SMART CITY GRAZ WAAGNER BIRO
A new, energy-autonomous city district will emerge in the former industrial area next to the main railway station of Graz, surrounding the cultural venue Helmut-List-Halle.
Energy technologies for the intelligent "Zero-Emissions City" will be used for the first time in Graz. The project components include integrating Grätzel cells and implementing flagship construction (e.g. the research tower), a local energy network and residential and commercial areas with innovative building technologies, sustainable urban mobility and generous open spaces.

KEY FEATURES OF THE PROJECT

- *Realizing the first local energy network*
- *Implementing Grätzel cell technology in building facades*
  One of the core technologies of the Smart City Graz project are Grätzel (dye-sensitized solar) cells. The Science Tower will be enveloped in colored to whitish translucent photovoltaic cells, housed between glass plates. These solar cells imitate the photosynthesis in plant leaves, turning light into electrical current.
- *Science Tower: The cornerstone of Smart City Graz Waagner Biro is the construction of the "Science Tower," by FIBAG and SFL Technologies. The 60-meter-high research tower north of Helmut-List-Halle will house research institutions and feature a publicly accessible rooftop garden.*
- *Meeting Smart City goals through PPP contracts in the energy, mobility, building*
- *technology and public space sectors*
- *Accompanying city district management to involve all actors*

The Smart District Waagner Biro is the first Smart City pilot project in implementation in Graz; as outlined before a strong PPP-consortium under the leadership of the municipality is supporting this project.
Coming from this SDmart City pilot demo site ther Smart City strategy Graz implies the transfer of experiences made here to other Smart City demo sites like e.g. Reininghaus. One example are the PPP urban development contracts which were first established and tested in Waagner Biro and are now transferrned (in an adapted way) to the Reininhaus site.



all planning processes follow the overall Smart City Strategy and the master plan defined for this district

What financing and funding opportunities exist?

- *national funding by the Austrian Climate and Energy Fund*
- *as from 2015/16: specific Investment Priority within the national EDRF-programme for capital expenditure projects (e.g. public buildings like schools, etc.) which save carbon dioxide in the framework of Smart City Strategies in Styrian municipalities*
- *urban development contracts between municipality and private investors pre-arranging the co-financing of public infrastructure in pilot development sites (mobility measures, open space, etc.)*

Q2 Are there synergies and/or conflicts related to the Smart Solutions with the existing infrastructure, socio-economic profile and social acceptance?

To be completed when info is available.

Q3 How will local stakeholders be involved in the replication of Smart Solutions?

To be completed when info is available.

6.6 District Graz Reininghaus - Smart Measures Specifications

To be completed after development process has fully started (currently start of main building measures is on hold because of legal reasons);

Currently the masterplan of the quarter development is elaborated, there is only an open issue between an existing industry and the housing developer about the costs-sharing of emission-reducing measures.

6.7 Smart District Waagner Biro:

6.7.1 Progress towards replication of measures/measure bundles within the selected districts

List the selected measures/measure bundles you intend to deploy within the selected district here and then answer the following questions for each measure/measure bundle.

6.7.2 Replication Measures

Smart Solution chosen (only No is used to answer following questions):

1. Efficient and smart climate refurbishment

3. Smart, energy saving tenants through information

6. Waste heat and local heat integration by new business models

8. Big (open) data platforms

9. Sustainable delivery

12. Smart mobility solutions

Q1 What is the replication potential of the Smart Measure?

- *1: an urban refurbishment strategy should be developed in the medium-term; main question is how deep refurbishment on district level/level of building ensembles could be financed at all! (currently there is only an object based funding foreseen on provincial level)*
- *3: energy saving issues are to be taken more serious not least after the Paris Agreement 2016*
- *6: existing long-distance heating grid in Graz was disputed the last years because of supply security reasons; currently issues of alternative sources for the existing heat network (industrial waste heat, big solar plants incl. buffers), cost effectiveness and alternative decentralized district heating solutions are in discussion;*
- *8: Since December 2016 the municipality has formed a "Steering Group for Digitalization" which aims to tackle issues of ICT-driven pilot projects, topical external requests for industrial partnerships, etc. in an orderly manner respecting the public interests, data privacy issues of and more.*
  In this regard an urban data platform (partly open) and environmental sensing pilot projects are intended to be implemented the next years.
- *9: At the moment the City of Graz plans to test an open system service box for sustainable deliveries as one part of a more comprehensive urban logistic demo for the development sites og Waagner Biro and Reininghaus.*
- *12: promoting eco-friendly urban mobility measures is one of the top priorities of Graz because of the need to improve air quality above all in reducing particulate matter.*

Key policy and legislation frameworks affecting the solution's development / implementation

- *1: Urban Development Concept of the City of Graz; Energy and Climate Protection Strategy Graz; Steiermärkisches Raumordnungsgesetz 2010 (defines legislative planning instruments of the municipality); OIB-Richtlinie 6 - Energieeinsparung und Wärmeschutz (national standards for energy savings and thermal insulation for buildings as a basis for the application for subsidies for housing construction and refurbishment of the province; regulations for subsidies for housing construction and refurbishment (province level)*
- *3: Energy and Climate Protection Strategy Graz (Kommunales Energie- und Klimaschutzkonzept für Graz - KEK GRAZ 2020)*
- *6: Energy and Climate Protection Strategy Graz; strategy paper "Heating Supply Graz 2020/2030"*
- *8: Until autumn 2017 a "Digitization Strategy Graz" and "Guidelines for the digital data management in the City of Graz" shall be approved by the municipal council.*
- *9: „Grazer Mobilitätskonzept 2020"/Graz Mobility Concept 2020; E-Mobility- Model Region Graz Strategy*
- *12: see above*

Status quo of deployment of solution (e.g. feasibility study available etc.)

- *1: not yet existing*
- *3: diverse information campaigns and online energy saving calculators provided by the environmental department*
- *6: strategy paper "Heating Supply Graz 2020/2030"*
- *8: strategy papers in elaboration*
- *9: feasibility study in elaboration within the EU-den project NOVELOG (Weblink: novelog.eu)*
- *12: E-Mobility- Model Region Graz (project in implementation)*

Specify area and scope of potential implementation (e.g. deep refurbishment of m^2)

- *1: can not be assessed at the moment*
- *3: Smart District Waagner Biro*
- *6: cannot be assessed at the moment*
- *8: cannot be assessed at the moment*
- *9: pilot installation planned of one box system next to a new built housing complex in Waagner Biro, installation of a Microhub planned between both sites Waagner Biro and Reininghaus*
- *12: Smart District Waagner Biro*

What needs to happen for the Smart Solution to get implemented?

- *1: the achievement of developing a specific refurbishment strategy on the medium term as a part of the smart city strategy; rethinking of allocation of funding for refurbishment measures (increasing attention on innovative refurbishment measures for old buildings; until now new buildings were focused by the relevant social housing cooperatives/private investors/funding bodies on province level)*

- *3: approval of innovative financing models in regard to concrete benefits for the tenants; cost-efficient implementation strategies for the municipality*
- *6: necessary consent to new business models from the local energy suppliers (partly owned by the City)*
- *8: innovative financing models for such applications*
- *9: Service Box project: funding decision from the KLIEN-Funds; Microhub: positive feasibility study; finding of an adequate building infrastructure;*
- *12: some smart solutions are already implemented yet, nevertheless Graz intends to learn more from the project partners*

Q2 What is the business case and do financing opportunities already exist?

no business case/financing opportunities yet

<u>Potential financing opportunities (European, national, private etc.)</u>
1: national ERDF-Programme
3: Energy provider still mainly want to sell energy at the moment – additional services are developing tentatively.
6: Two excess heat delivery contracts between City of Graz and local industries could be implemented in 2016
8: ?
9: demo project applied for national funding
12: national funding schemes by Austrian Climate and Energy Fund

<u>Market up-take / expected consumption</u>
not yet known

<u>Future financing model and ownership of Smart Solution</u>
not yet known

Q3 What are the main challenges and barriers related to the measure(s)?

Technological barriers
6: no real competitive system to existing large scale (high temperature) district heating grid (covering main parts of the town)

1, 6, 8, 9, 12: Main barrier: financing of innovative smart city measures

3: Lack of personal interest of tenants to save (heating) energy.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

- *1: ideally innovative refurbishment measures for old buildings should enable a transfer of suitable smart city-technologies also to existing urban infrastructure*

- *3: energy saving behaviors of users concern new buildings as well as old buildings*
- *6: in this field of action in Graz only isolated solutions will be realistic to implement because the existing district heating system is technical designed for higher temperature conditions than state of the art-heating solutions*
- *8: for the development of a municipal "Big (open) data platform" it is necessary to join existing data sources within the administration (e.g. geodata) with new gathered data*
- *9: Open Delivery Service Boxes could be installted either in new built or already existing housing complexes; Microhubs should be installed near the city center to maximize the effects of it;*
- *12: ideally existing mobility infrastructure and initiatives could be complemented with smart solutions of the GrowSmarter-project*

Q5 What user / stakeholder involvement is foreseen?

1: amongst others: Technical University Graz, Environmental Department, Urban Planning Department, social housing cooperatives, private investors (e.g. homeowners, landlords associations, construction companies, real estate companies), funding bodies on province level
3: amongst others: StadtLABORGraz (NGO; deals mainly with participation issues/stakeholder processes within the pilot project), tenants, landlords, Environmental Department (have certain experiences with this issue so far)
6: amongst others: Technical University Graz, Environmental Department and Energie Graz, our local energy service provider, industries providing excessive heat
8: municipal administration, open data community, citizen in general, scientific researchers, external hardware providers, etc.
9: Housing companies, transport companies, municipal administration, hub operator, customers, etc.
12: amongst others: traffic planning department, e-mobility GmbH as an outsourced division of Holding Graz (municipal economic enterprises), Energie Graz

<u>What are their main interests (I)/objectives (O)/expectations (E)?</u>

Solution 1
I: innovative financing schemes for implementation purposes to convince housing companies and housing associations owning real estate to implement innovative refurbishment measures (e.g. cost-effective retrofit installations of elevators or balconies or barrier-free/accessible ground floor apartments);
O: fostering to create a refurbishment strategy/guideline for the City of Graz in the medium-term
E: to learn from experiences from the lighthouse cities in implementing refurbishment measures (also without the usage of EU-funding or other funding schemes)

Solution 3
I: to learn new (information/educational/didactic) approaches in motivating tenants to optimize their daily energy usage

O: to include such approaches within the participation measures within the Smart City pilot project and perhaps also within other city-wide projects
E: to learn from experiences from the lighthouse cities in implementing such information approaches

Solution 6
I: to get known of innovative approaches in regard to waste heat and local heat integration (main problems: only isolated solutions possible in Graz; costs of provide backup systems; new heating approaches are competing directly with existing Business Model of the municipality)
O: to get new ideas and inputs how to combine exiting and new heating systems at city level
E: to be able to get known of heating strategies of lighthouse cities and discuss them on expert level

Solution 8
I: getting an integrated overview over existing data within the administration to be able to define the needs for new data to be collected for planning/strategic purposes
O: to make use of the data to enhance living quality within the city
E: to get new findings and deduction how the city is functioning with the help of big data analytics; selected data sets are intended to put into an open data platform – other (more sensible data) should be used for internal strategic/planning purposes.

Solution 9
I: feasible business models for the operation of micro hubs and b2c and b2b-delivery with cargo bikes/electric vehicles
O: reducing freight transport traffic (emissions, energy requirements, etc.) within the whole city area
E: to learn from the LH-cities and transfer adapted solutions

Solution 12
I: to get known of innovative approaches in regard to smart mobility issues (beside technical solutions as above financing models are relevant for Graz)
O: to learn from experiences from the lighthouse cities in implementing such measures
E: to complement existing pilot strategies with know-how from the GrowSmarter-project

<u>What group(s) can be supportive (SU), skeptical (SK) or blocking (B) towards the solution?</u>
Solution 1
SU: municipal planning departments, environmental dep., dep. of provincial administration level
SK: social housing cooperatives, private investors
B: not yet known

Solution 3
SU: municipal planning departments, environmental dep., Stadtlabor Graz

SK: tenants, local population
B: not yet known

Solution 6
SU: local scientific community, municipal planning departments
SK: environmental dep., local energy supplier
B: parts of local politics (there is a strong need to save save public finance and therefore there is a tendency to preserve the current district heating system and to oppose it with decentralized supply solutions – "either or" instead of "one complementing the other system" – rethinking of this strategy takes place at the moment

Solution 8
SU: all municipal departments
SK: financial department
B: local population if not communicated in a transparent way

Solution 9
SU: municipal administration, citizen
SK: freighters, customers
B: urban transport companies

Solution 12
SU: e-mobility Graz, Holding Graz, traffic planning department, other municipal planning departments
SK: not yet known
B: traditional car industry and petrol companies

Q6 What is the potential implementation timeframe?

6.7.3 Replication needs of Smart City Measure(s)

Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

Financing aspects of smart solutions and contractual aspects between municipalities and industrial partners would be interesting in general.

7. Replication Assessment of the Follower City Porto

7.1 Smart City Replication Profile

7.1.1 Mapping the overall framework conditions for replication within the city territory

Q1 What is the overall replication potential for Smart Solutions until 2020 and beyond?

The city of Porto is the second-largest city in Portugal and one of the major urban areas in Southern Europe. Porto has more than 250,000 inhabitants and it's the centre of a large metropolitan area with more than 1.8 million inhabitants.

In February 2010, the Porto Digital association founders, led by the City Council, launched a new strategic plan, which aimed to foster the development of Porto as a knowledge based city and in which the innovation area has a paramount importance. As the name of the strategy hints, such strategy leverages the investments done by the Municipality since 2005 on a large scale fibre optic backbone and in an advance ICT platform.

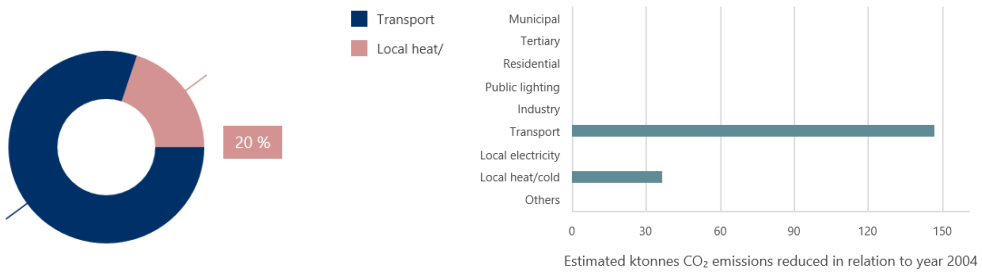
Porto has also designed and embraced a policy strategy aiming at implementing measures for the implementation of Smart City principles. Citizen's centred sustainability, energy efficiency, R&D and economic growth are the main areas of interest of the City who started different programmes and projects in those areas. The implementation of this innovative strategy adopted an interdisciplinary approach in which the city well-known strengths are aligned with the excellence of the work developed by the Academia. With the support of reference industry partners, the strategy developed was able to contribute to the creation of hundreds of qualified jobs and to transform the city centre into a place where people, especially young entrepreneurs, are inspired by a new risk culture and integrated in a new multicultural and international ecosystem. As a clear result of this strategy the city is now attracting more people for the city centre, creating new jobs, developing solutions required by citizens, reducing social exclusion, and increasing the city security.

As an example of the impact of the aforementioned strategies, the University of Porto was awarded a grant of 1.6M€ from the FP7 Capacities program, justified by the development of the Porto Living Lab and the expansion of the Centre of Competence in Future Cities of the University of Porto. Also as another example of this strategy 'impact, UPTEC, the Science and Technology Park of University of Porto, won the RegioStar 2013 award in Smart Growth.

Another example is the Porto´s Sustainable Energy Action Plan (SEAP-P), which was created aiming at responding to the commitments assumed under the Covenant of Mayors. The Municipality together with AdEPorto (Agência de Energia do Porto - Energy Agency of Porto) had previously foreseen an Action Plan following the energy diagnosis and CO_2 emissions inventory, the Energy Matrix, published in 2007 with data referred to 2004. The Porto Smart City strategy is fully aligned with the sustainable Energy action plan developed. The interventions in progress reflect this this alignment of strategies. The rehabilitation of the different areas of the city take into consideration the energy efficiency of buildings, the reduction of CO2 emissions and the behavioural transformation of citizens by involving them in the decision making process.

Within the strategy of the city, several initiatives have been undertaken with a special focus on the implementation of the projects in accordance to the Porto´s sustainable strategy. With the support of the designed strategies (essentially based in Porto's Sustainability Strategy of 2009), Porto has been implementing the several projects aiming at addressing sustainability and energy efficiency issues.

As presented in the figures bellow the Porto's SEAP defines an ambitious goals for greenhouse gas reduction in several areas, but foremost important is to highlight that the new smart City Strategy expands this targets to new areas. For instance, the public lighting infrastructure is already being replaced by a LED technology and the end of 2015 at least 10% of the total infrastructure will be replaced.



SEAP - Estimated greenhouse gas emissions reduction in 2020.

Promotion of urban rehabilitation of the historic center of Porto, World heritage, contributing to the development and for social and business dynamics of this area of the city. Give the priority to reduce motorized individual transport by encouraging collective means of transport, favouring unequivocally intermodality and creating infrastructure for less polluting forms of transportation, such as bike and enhancement of footpaths. Affirmation of the city of Porto as an "Educator", who values education and correct training of all its citizens as a necessary condition for citizenship. Develop attractive conditions for the reception of advanced services and intensive economic activities, based on the relation to research and development institutions. Boost Porto as a City of Innovation and Science through cooperation platforms between economic agents, business, and research and development entities. Promoting Porto s a sustainable city, in its relationship with the territory in historical aspect, its sustained centrality function, and "brand in the region". The measures directly related to the reduction of CO2 emissions and energy efficient materialize in various interventions such as placing solar panels in social buildings, building refurbishment, creation for the Observatory of Energy and Environmental Sustainability of Buildings, the fleet moved STCP the natural gas.

The structuring of the measures took into account a set of methodological steps guided by energy efficiency criteria and assessed by their potential contribution to the reduction of CO_2 emissions, namely:

- Characterization of Porto´s quantitative and qualitative (electricity, heat, etc.) specific energy needs, in line with the Energy Matrix (2007);
- Integration of energy issues within an urban sustainability framework, as defined in the " Porto's Sustainability Strategy" (2009);
- Identification of the Porto energy carriers (final energy), needed for buildings and their activities; mobility and transport; and general productive activities (industry, commerce, etc.);
- Definition of the final energy options according to useful energy[6]: heat for cooking, domestic hot water and environmental comfort; electricity and fuel for transport; electricity for artificial lighting, appliances, etc. Example are solutions for domestic hot water, representing about 25% of the consumption for a Portuguese average household, with solar systems using natural gas as back up, or the promotion of district heating and cooling networks on natural gas, the cleanest fossil fuel for the paradigm change;

[6] The portion of final energy which is actually available after final conversion to the consumer for the respective use. In final conversion, electricity becomes for instance light, mechanical energy or heat. (www.euronuclear.org).

- Assignment of high priority to the demand management and to the access to more efficient technologies. Demand management examples are the improvement gained from higher insulation of either rehabilitated or new buildings, better management of solar gains (shading,...) and public transportation promotion as the alternative that overcomes any individual using energy vehicle. Examples of access to more efficient technologies are the exploitation of the potential intelligent natural lighting; the spread of low consumption, public and interior, artificial lighting; the expansion of very efficient electrical appliances; but, also the perspectives for new urban mobility paradigms. Porto, as other cities in the Europe, is facing a intense change in the mobility sector. New and innovative forms of transportation are appearing every day. The most important new paradigms are related to the use of the electrical car, the implementation of a consistent programme for intramodality in collective transportation and new models such as car sharing or mechanisms such as Uber.

Equally a Local Action Plan was developed in the context of the CSI (City Sustainable Investment) programme (integrated in the URBACT initiative), conceived as to explore European Structural Funds to achieve a smarter city. Amongst the objectives of this Plan, it is important to emphasise the creation of a UDF (Urban Development Fund) specialised in sustainable and affordable projects, and the strengthening of technical training and information improvement.

The Local Action Plan comprises three main actions: Support Fund for the Renovation of Buildings of the Historic Centre of Porto; Technical Assistance; and Pilot Project.

In the constitution of the LAG (Local Action Group), a set of criteria was considered, including the need to include:

- different levels of government: national, local and metropolitan;
- different sectors of activity that were chosen from the diagnosis of the city (this diagnosis was made through a multi-stakeholders analysis with an important participation of the research and academic partners of the city) - the best activities to sustain a process of growth in the future (2014-2020). In the composition of the LAG, a set of principles was considered, namely the need to represent the different areas of activity and the main entities related to the management of the Urban Development Funds (UDFs), including those related to the Europe 2020 strategy. Thus, the LAG of Porto, includes 21 entities and about 50 active members.
- representatives of the private sector, public sector and of other forms of organisation;
- entities directly associated with the management of UDFs and the Holding Fund;
- Educational, R&D and training institutions;
- institutions in the Entrepreneurship and SME area;
- active institutions in the social area;
- institutions in the area of mobility.

The strategy for the city of Porto included, so far the use of different funding's to ensure the valorisation of the city ecosystem. As an example it is important to refer the creation in July 2009 of the JESSICA Holding Fund Portugal (JHFP), with a total amount of 130M€, from which Porto clearly benefitted. Its Investment Committee comprises the Managing Authorities of the five Operational Programmes as well as the Operational Programme for Territorial Enhancement (OPTE) and the Directorate General of Treasury and Finance. The tender process that took place between 2010 and 2011 resulted in the creation of three UDFs run by three separate entities (Caixa Geral de Depósitos, Banco Português de Investimento and Turismo de Portugal) in five regions of continental Portugal. In Porto, there are two operational UDFs, one managed by Banco Português de Investimento and the other by Caixa Geral de Depósitos. 54% of the 20 projects identified until today in the city are related

to tourism. Tourism has an element with an important impact In the city transformation. Its significant influence in the cities growth and rejuvenation, given its cross-cutting impact on the society, leads to strong effects on the many aspects of the economic, social, cultural and territorial city life.

Tourism can work, if properly planned and efficiently managed, as a catalyst for a dynamic economic growth and social development in cities by re-building infrastructure, creating jobs, stimulating local business, developing partnerships, creating distinctive local attractions, and others. In these cases innovation is commonly used as a vehicle for developing new products, addressing to existing and new market niches and upgrading the quality of the city services.

In the city, the multiplier effect of JESSICA is of 5 with one Euro of JESSICA investment leveraging five Euros of private investment.

Q2 How does the "Smart City" approach feed into/connect with your existing local planning processes?

As described above Porto has been implementing strategies and plans designed to ensure that it becomes a Smart City. The move towards a Smart City is not the result of a single initiative neither a question of an accumulation of initiatives. The main success factor is a change of mentalities at all levels of the Local Public Authorities and the ability to exploit the articulation of local and regional/national initiatives, mutually reinforcing and creating the relevant scale and impact.

The particular attention given by the Local Authorities to innovation favours and reinforces also the adoption of Smart City concepts as it links the advanced thinking of innovation clusters with the administrative practices.

As an example it could be mentioned is the important attached to the connection between the SEAP-P, the urban mobility plans and the territorial development.

Within the context of the Smart City Plan and organizational structure, several synergies have been articulated although some constrains regarding legislation can be identified. The City, as an energy system or a cluster of energy systems, is not isolated. It is interlinked and part of the North Region and of the Country system, aspect that may bring benefits, such as the contribution to the national renewable electricity program (focussed on the decarbonisation of the electricity mix) put in motion in the last decade. Regarding the electricity mix evolution, REN – Redes Energéticas Nacionais (National Energetic Grid Lines) – draws two expectable evolution scenarios of the national electricity production system in the period 2009-2013 and until 2020 : Reference Scenario2, which includes energy efficiency measures of PNAEE – National Energy Efficiency Action Plan; Efficiency Scenario3 – 20%, assuming a total CO_2 emissions reduction by 20% in 2020, compared to the ones verified in 2005 (in line with the European Union objectives Europe 2020). In the contrext of the city, the main goals of such initiatives and plans are to improve the quality of life of the citizens, contributing to the city´s actractiveness for social and economical purposes. The aim is to improve economic growth, attract new investements and implement an energy and sustainability framework integrated with the national and European ones. At the same time such plans call upon the Academia to exploit the benefits of ICT based systems such as smart grids. The implementation of pilots and the development and integration of technologies, possible on top of open services platforms, is a path being explored by the Municipality.

As a conclusion, the example of sustainable energy is here provided to illustrate how the integration of the city dimension in national initiatives provides critical mass and the rigth dimension, making the city more attractive and economicaly viable, creating a push/pull mechanism in which technological innovation is triggered in a context of innovation ecosystems of startups that respond to the needs of the public authorities and the expectations of the citizens.

The Porto Municipality has implemented in June 2015 the new Integrated Management Center in the Town Hall. This center brings under one roof the services responsible for Mobility, Municipal Police,

Fire department, Civil and Environmental Protection, and its main objective is to contribute to increased efficiency and effectiveness in areas such as street cleaning and waste collection, security and civil protection and traffic control, among others.

The Integrated Management Center is a key step in the creation of the first National City Operator, the municipality is developing, and where the use of collection tools and advanced data analysis, implemented within a "Smart City" concept, will promote an effective "smart" management of the municipal services.

Cities are generating an increasing amount of information from the traffic light systems that can adapt to the dynamic mobility standards, traffic cameras, which more or less automated identify a wide variety of situations in the public highway , environmental sensors, which are now able to give us information in real time and on a scale never before possible. The information generated by these platforms will require an agile management and multi-service, for only in this way can all this information be translated in efficiency gains with clear and objective improvements in services provided to citizens.

With this new management center, and the creation of the City Operator, the City Council intends to put the city of Porto in a new level of integrated management services following its own strategy of innovation and inspired by the best practices.

In addition to the initiatives presented above, the Municipality decided, in 2001, to implement a Monitring system of Urban Life Quality (MSCQL). Running since then, this project has been capable to compile data on the living conditions and wellbeing of the city, monitoring the progress path in severel dimensions. This trend monitoring exercise, which includes the environmental, economic and social level (with crucial impact in the quality of life of the citizens), has been accompanied, over time by a performance comparaison of the Porto metroplotitan area with the reality observed at a national level and with the European Benchmarks. Another component of this project is the mesurement and data collection of the citizens perception about the city quality of life. With these two areas coombined, the city aims at providing a solid support for decision making by deepening the kowledge about the challenges that the city and the citizens face in their dayli lifes. Thus this is a platform provided by the municipality for an easier access to relevant information, to stimulate the debate, to rise collective awareness on several matters and to stimulate collaboration between citizens and local governemnt.

Q3 Is there a (strategic) plan and organisational structure in place to become a "Smart City"?

Porto Municipality has been consolidating the local ecosystem for the creation of a multidisciplinary and cross-sectorial strategy for the implementation of the Smart City concepts.

Within this strategy, Porto Digital, a company owned by the Municipality of Porto, has emerged as one of the main organisation/infrastructure capable of supporting this intervention.

The aim of Porto Digital is to contribute decisively to a structural change in the operating mode of the city, to make it ready to improve and address the challenges. Recognizing the difficulty of this task, four key points were conceived as a goal to achieve measurable results:

- Education - make a qualitative leap in terms of infrastructure to support the use of ICTs in education covering all the way from primary school to university and R & D laboratories.
- Employment - to increase the competitiveness of the business fabric of the city of Oporto and make it more attractive for investment.
- Bureaucracy - reduce inefficiency and bring citizens closer to the public administration.
- Quality of life - improving urban quality of life for residents, workers and visitors to the city of Porto.

Porto Digital will act at several levels, to ensure that citizens, academia, industry and Public Authorities can cooperate, benefit and be active partners in the process of creating a Smarter City. Porto Digital acts therefore at the level of:

- Infrastructure – to allow a generic access to the digital world (looking at digital as a basic services, equivalent to energy, communications, water or sanitation)
- Promotion - enticing real communities to the digital world, looking to its articulation with the real world by producing contents in areas such as scientific, informative, tourist, recreational and cultural
- Accessibility - spreading access points to the Internet and services throughout the city
- e-Government - redesigning administrative processes, exploring the notion of e-citizens and adding transparency to local government
- Sub-sectorial projects - representing an intervention at the level of a sector area (such as employment, economy or culture) aiming at modernizing the economic fabric and increasing competitiveness through business cooperation activities, research and development, investment attraction, increased productivity and increased qualified employment.

Q4 Are there synergies and/or conflicts of the "Smart City" plan and organizational structure with existing initiatives and their structures within the city?

There are many synergies between Porto City, Porto Digital and other entities and initiatives in the field. Organizations such as UPTEC, INESC Porto and others create a multi-sector cluster which provides opportunities for collaboration and innovation to achieve economic growth, to address mobility issues and to improve energy efficiency.

Q5 Which and how are regional and local stakeholders involved in the Smart City strategy and planning process on a city level?

It becomes clear, from the stated above that the local ecosystem being induced by the City of Porto includes a significant number of partners which are representatives of the local and regional dimensions.

The stakeholders involved in this process include the structure described below.

The governing bodies of the Municipality of Porto are the City Council (the executive office) and the Municipal Assembly (deliberative body). Porto Digital will, as described above, act in different domains to ensure the cooperation between the stakeholders of the city.

As an example of other stakeholders involved from the City side, the urban regeneration plans in the city centre are managed by Porto Vivo, SRU - Sociedade de Reabilitação Urbana da Baixa Portuense, S.A. (Society of Urban Rehabilitation of the Centre of Porto); the Integrated Management Centre will play an important role in the strategy; and APOR (Agência para a Modernização do Porto – Agency for Porto´s modernization) is a partner which creates synergies for better cooperation between public and private entities and promotes the upgrading and modernization of the urban, industrial and business fabric of the city.

The aim, and very much the reality, is to involve all the relevant stakeholders from the local ecosystem considered important for such developments. Those stakeholders are from the academia side, such as the University of Porto, the Polytechnic of Porto, from the research side, such as INESC Porto, and from the entrepreneurial side, such as UPTEC.

Q6 What are past (<5 years) and current projects that are closely related to the "Smart City" concept?

In the last 5 years Porto has been part of several projects that are very relevant in the Smart City domain and in coherence with the Political strategy to transform Porto into a Smart city.

- Enter.Hub - European Network exploiting Territorial Effects of Railway Hubs and *their Urban Benefits*

  The Enter Hub project aims at:

  - Supporting and promoting a global vision of transport and territorial development, considering mobility, transport networks and in particular the TEN-T as a European backbone in terms of connections and interaction but also in terms of territorial development;
  - Promoting sustainable, common and easily available transport systems all over Europe, to make cities and regions more accessible, more attractive and more competitive;
  - Sharing practices and using an exchange and learn approach in order to enrich their common and strategic vision of future Europe at different territorial scales, also in view of the new financial programming period 2014-2020, concerning urban and infrastructures development.

- CIVITAS – ELAN – Mobilising Citizens for vital cities:

  The mayors of the cities of Ljubljana, Gent, Zagreb, Brno and Porto have agreed to a common mission statement “To ‘mobilise’ our citizens working with them to develop clean mobility solutions for vital cities, ensuring health and access for all.”

  As a policy-driven project, CIVITAS-ELAN will make significant contributions to major global, EU and national policy processes. In responding to citizens’ needs, CIVITAS-ELAN has identified 18 common headline objectives for each CIVITAS policy field:

  - Increasing energy efficiency
  - Using alternative fuels
  - Cleaning up vehicle fleets (electric, hybrid, integrated strategies)
  - Implementing effective, high quality mobility solutions
  - Planning intermodal infrastructure with public participation
  - Charging for access
  - Managing public space and access
  - Improving mobility management
  - Making walking and cycling more attractive
  - Establishing a mobility dialogue with the citizens
  - Developing integrated & target-group specific safety/ security strategies
  - Increasing road safety
  - Improving security in PT
  - Implementing flexible mobility services
  - Rationalising freight distribution
  - Giving priority to clean modes

- Enhancing traveller information & ticketing
- Introducing telematics for clean modes.

- Future Cities: Porto Living Lab

  The Future Cities Project aims to turn Porto into a smart city, a living lab, by providing it with a wide range of sensors and communication equipment, thus creating the conditions for future research and development using advanced technologies for data collection through mobile platforms, wireless communication and large-scale information processing. This living lab enables the development of research in areas such as sustainability, mobility, urban planning and information and communication technology.

  As in all Living Labs the main methodological approach is based on open and user centered innovation: the pilots and experiments already accomplished (e.g. with taxis, buses) show how important has been for the city to adopt such a methodology as potential future solutions benefit from an early validation and adoption by citizens.

- CSI Europe:

  Porto Vivo, SRU participates in the project "CSI Europe: City Sustainable Investment in Europe - asking financial instruments work for cities", which aims at analysing the role of financial instruments in the planning of sustainable urban development. Some concrete results deserve a lot of credit, namely in the context of urban revitalisation.

- Scale up Porto:

  The project ScaleUp Porto emerges as an initiative that aims to stimulate the Innovation ecosystem targeting existing high growth and high potential businesses and giving them access to opportunities in the area of financing, skills and customers.

  The Municipality of Porto has already carried out several initiatives in the area of entrepreneurship and innovation with the objective of consolidating the city ecosystem of innovation, fostering employment, economic development, internationalisation and the well-being of citizens.

Q7 Which sites/districts are projected to be developed in the next five/ten years?

The district areas of intervention for the next 5 to 10 years are mainly identified by the ARU (Areas of urban Rehabilitation) defined by the Porto Municipality. There are 7 ARU created in the Porto City which aim at addressing different issues all around the urban area.

- ARU do Centro Histórico do Porto
  The ARU of the Historical City Centre is the first of seven ARU to be created in accordance to the provisions of RJRU (Regime Jurídico de Reabilitação Urbana – Legal System for Urban Rehabilitation) which provides that municipalities must, within 5 years from the date of entry in effect of this law, implement a strategy for urban rehabilitation of the SRU areas (Sociedade de reabilitação urbana – Society of urban rehabilitation), converting them into one or more ARU (área de reabilitação urbana – area of urban rehabilitation).

- ARU dos Aliados
  The Aru of Aliados, consists of an urban fabric which suffered a profound transformation since the late nineteenth century. This transformation gave Aliados a prominent role at a city

and regional level, as this location is considered the administrative, economic and civic center of the city. The concentration of services and activities on this site, translated into an emptying of their housing function. According to the last population census (2011) there were registered less than thousand and a half residents, which corresponds to a density lower than the average. However, in recent decades, due to the relocation of several activities, especially those related to the financial sector, public and private investments in transport infrastructure and urban regeneration, touristic activities and others, the area of the Aliados has been reversing this trend and is also the aim of the ARU contribute to this recovery.

- ARU do Bonfim
  This ARU is characterized by its morphologically homogenousness, due to the urbanizing process that began in the mid-nineteenth century. Traditionally this area included a wide variety of uses, ranging from the housing through the existence of small industrial units, commercial spaces and services. However, this area has suffered in recent decades a gradual abandonment process for its population, leaving the elderly.

- ARU da Cedofeita
  The ARU Cedofeita is a territory resulting of an urban structure designed in the late eighteenth and early nineteenth century and was gradually filled in during the following centuries. Traditionally it includes a mix area of housing, commerce, services and several higher education institutions.

- ARU de Miragaia
  The area included in this ARU is a scenic drive and very characteristic and striking the city. The touristic potential of this area is evident by the presence some of the most emblematic gardens of Porto. There are also many public buildings and collective use equipment located in its ARU, such as the Customs building, the Santo António Hospital, the Library Almeida Garrett and even the Pavilion Rosa Mota. There are some narrow residential fringes and rehabilitation initiatives, thus, it is intended with this ARU give a new framework and encouragement to these initiatives, creating for such, tax benefits of Municipal levels, complementing already provided for in the Statute of Tax Benefits to support urban regeneration.

- ARU da Lapa
  The ARU da Lapa is characterized by a urban fabric formed from the nineteenth century, The urban fabric and its buildings, and the existence in this place of a diversified commercial offer, supported by some services and facilities, are more than enough reasons to make this highly attractive region in housing terms, and evidence of this is the fact that it has the highest population density of the city (102 res. / ha, Census 2011).

- ARU de Santos Pousada
  Along with the residential area, there are still, in this ARU, many old industrial buildings (now emptied of that function and in an advanced state of degradation), urban voids and old workers blocks. It is therefore an area with a discontinuous urban fabric, which fall within built-up areas of considerable size, as those remaining industrial units are now abandoned, and whose recovery and destination are factors to take into account when drawing up a strategy for rehabilitation and revitalization of this part of town.

- ARU de Campanhã
  This ARU covers part of the parishes of Bonfim and Campanhã, comprising an area of approximately 112ha. Despite the problems of physical degradation and socio-economic vulnerability that persist in this urban area of the city there is a set of urban transformation opportunities that, once implemented, may significantly contribute to the revitalization of the eastern part of the city, which is the specific goal of this ARU.

All these areas, due to their particularities aim at addressing different challenges and implementing several solutions that include mobility, energy, refurbishment, ICT and others.

According to the goals of the project, the needs of intervention and the evolution of each programme (ARU), the selected District for intervention is the Campanhã area. This area of intervention will be characterized more in detail bellow.

Q8 What are the main areas of interest of the FC in the Smart City concept?

As stated above, the urban strategies for smart city and sustainable development include projects and programmes which, in some cases are already being implemented. In this context it is important to highlight projects such as Porto Living Lab (Future Cities) in which the main areas of intervention are already identified. In this case, the creation and promotion of a local ecosystem, working as a Living Lab plays an essential role in the entire field. The Porto Living Lab is the result of a long term partnership between the Porto Municipality and University of Porto, with strong support of the Industry and relevant partners.

The Porto ecosystem, developed in the last years aims at turning Porto into a Smart City, by:

- Providing it with a wide range of sensors and communication equipment, thus creating the conditions for future research and development using advanced technologies for data collection;
- Implementing solutions for Smart governance and monitoring. Several initiatives are already in place and more are being programmed for administrative simplification and participatory governance;
- Increasing visibility and public awareness for different fields such as sustainability, mobility, urban planning and information and communication technology;
- Promoting energy efficiency through refurbishment, innovative technological solutions and community participation;
- Increasing the usage of alternative energies (solar , biomass , geothermal) in order to reduce the dependency for the classic energy sources (coal, petrol)
- Supporting companies at different stages, from start-ups to scale-ups and stimulating public and private investments;
- Implementing integrated solutions for mobility, through the creation of integrated infrastructure and mobility and urban planning. Implementing the electro mobility and sustainable urban transportation and traffic.
- Separating waste collection and recycling implementing measures for citizen behaviour transformation
- Innovative PPP financing schemes for Smart City Projects.

7.2 Smart Solutions Selection

The table below shows which solutions the Follower Cities plan to replicate.

		Follower Cities				
Area	***Smart Solutions***	***Porto***	*Graz*	*Cork*	*Valetta*	*Suceava*
Housing measures	*1. Efficient and smart climate shell refurbishment*		*X*	*X*		*X*
	2. Smart building logistics and alternative fuelled vehicles					
	3. Smart, energy saving tenants through information	***X***	*X*			*X*
	4. Smart local electricity production and integration with buildings and grid			*X*		*X*
Integrated measures	*5. Smart lightning, lampposts as hubs for communication*	***X***	*X*	*X*		*X*
	6. Waste heat and local heat integration by new business models		*X*			
	7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.	***X***				*X*
	8. Big data protocol for saving energy and improving the quality of life	***X***				
Mobility measures	*9. Sustainable delivery*				*X*	
	10. Smart traffic management					*X*
	11. Alternative fuel driven vehicles for decarbonizing and better air quality	***X***		*X*		*X*
	12. Smart mobility solutions		*X*	*X*	*X*	*X*

Smart Solution 3. Smart, energy saving tenants

Almost 18% of the Porto's population leaves in social neighbourhoods, which makes it a top priority in the Municipality strategies. In order to increase the quality of life and the sustainability in social neighbourhoods, the City of Porto has invested more than 160M€ in the refurbishment of buildings in the last 10 years. The City Council will replicate, within its social neighbourhoods infrastructure, a number of the measures identified in the Lighthouse cities. Namely, in the smart and energy savings, the city council is expecting to use the developed solutions to help more than 12000 tenants in the city' social neighbourhoods to reduce their energy consumption.

Smart Solution 5. Smart lightning, lampposts as hubs for communication

The city council is building an infrastructure using the public furniture such as traffic lights and lamppost, to install low energy communication equipment and a distributed sensing infrastructure. This infrastructure is developed using a “Zero site” concept in which all the spots could be shared by several companies and partners, such as Telcos or R&D institutions. In partnership with the University of Porto the city council has installed already 6 sites. The city council expects to use the project results to increase the number of sites with this concept to more than 60 new sites.

Smart Solution 7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles

Porto already produces 40GWh of energy by burning the non-recycled garbage, which represents two times the energy used in the lighting infrastructure. The City Council plans to use the solutions developed among the measures within this smart solution in the GrowSmarter to increase these results by developing new garbage management infrastructure.

Smart Solution 8. Big data protocol for saving energy and improving the quality of life

The Porto Living Lab is the result of a long term partnership between the Porto Municipality and University of Porto, with strong support of the Industry. Porto Living Lab aims to turn Porto into a smart city, a living lab, by providing it with a wide range of sensors and communication equipment, thus creating the conditions for future research and development using advanced technologies for data collection through mobile platforms, wireless communication and large-scale information processing. In this context the City Council plans to replicate the Big Data protocol developed in GrowSmarter as a reference protocol for the Porto Living Lab infrastructure.

Smart Solution 11. Alternative fuel driven cars for better air quality in cities

In the follow up of the ambitious target defined to reduce the CO_2 emissions the city council is defining a new mobility plan in each it will promote low CO_2 emission fuels, such as bio-gas. The city council will replicate the validated solutions developed in GrowSmarter in this context.

7.3 Smart Measure selection

The table below specifies which smart (bundle of) measures within the 12 solutions each FC plans to replicate.

SC Measure	Measure title	Follower City Porto
Low Energy Districts		
Solution 1 - Efficient and smart climate shell refurbishment		
1.1 - Energy efficient refurbishment of the building	Energy efficient refurbishment of residential buildings - Stockholm	
	Climate shell refurbishment - Cologne	
	Energy quality assurance - Stockholm	
	New adaptative control and regulation techniques for heating systems - Barcelona	
	Re-build an industrial site: Ca l'Alier - Barcelona	
	Efficient and smart climate shell and equipment refurbishment - Barcelona	
	Efficient and smart climate shell refurbishment of residential buildings - Barcelona	
	Efficient and smart climate shell and equipment refurbishment of tertiary buildings - Barcelona	
	Energy efficient swimming pools - Barcelona	
Solution 2 - Smart building logistics and alternative fuelled vehicles		
2.1 Integrated multimodal transport for construction materials	Construction consolidation centre - Stockholm	
Solution 3 - Smart, energy saving tenants		tbd
3.1 Active House/Home energy management system/Smart home system	Home Energy Management – Cologne	
	The Active House – Stockholm	
	An Open Home Net – Stockholm	
	Hubgrade - Energy Saving Centre – Stockholm	
	Adaptive Temperature Control System - Stockholm	
	Home Energy Management System (HEMS) - Barcelona	
	Virtual Energy Advisor - Barcelona	
	Dynamic Pricing Models - Barcelona (Stochastic Model of Appliances Energy Consumption)	
Solution 4 - Local renewable energy production and integration		
4.1 Virtual power plant	Residential Estate Management – Cologne	
4.2 Smart energy and self-sufficient	Smart Energy & Self-Sufficient Block - Barcelona	

block	Building Energy Management System (BEMS) to minimise consumption of fossil fuels and electricity - Barcelona	
Integrated infrastructures		
Solution 5 - Smart lighting, lamposts and traffic posts as hubs for comm.		tbd
5.1 Smart streetlighting	Smart LED streetlighting - Stockholm	
5.2 Combined electrical charging and street lighting poles + wifi	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Barcelona	
	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Stockholm	
5.3 Smart meter information analysis and actuators	Smart Meter information analysis and actuators - Barcelona	
Solution 6 - New business models for district heating and cooling		
6.1 Open district heating with feed-in of waste heat	Open district heating – Stockholm	
6.2 District heating and cooling rings	District heating rings - Barcelona	
6.3 Smart local thermal districts	Smart local thermal districts – Barcelona	
Solution 7 - Smart waste collection , turning waste to energy		**tbd**
7.1 Optical sorting of waste 7.2 Introduction of AWCS 7.3 Waste collection statistics for individual households/businesses	Smart waste management - Stockholm	
Solution 8 Big open data platforms		**tbd**
8.1 Big consolidated open data platform	Big consolidated open data platform - Stockholm	
	Big open data platform - Barcelona	
	Urban Cockpit – Cologne	
	Urban Traffic – Cologne	
	Urban Environment Cologne	
8.2 Urban models		
8.3 Semi-automatic instance mapping		
8.4 Integration of sensor and heterogeneous data in standard data format	Integration of sensor data in a uniform in standard-driven data format - Barcelona	
8.5 Sustainable connected lighting to enhance safety and mobility		
Sustainable Urban Mobility		
Solution 9 - Sustainable delivery		
9.1 Integrated multi-mode transport for light goods	Communal service boxes for sustainable deliveries – Stockholm	
9.2 Micro-distribution of freight	Micro distribution of freight - Barcelona	
Solution 10 - Smart traffic management		
10.1 Traffic management through MFD 10.3 Travel demand management	Smart traffic signals – Stockholm and Barcelona	

10.4 Traffic control systems for passenger vehicles 10.5 Traffic signals synchronised to prioritize movement of goods		
Solution 11 - Alternative fuel driven vehicles		**tbd**
11.1 Developing charging infrastructure	Normal charging infrastructure for electric vehicles – Stockholm	
	Fast charging infrastructure for electric vehicles – Stockholm and Barcelona	
	eTankE - Cologne	
	Vehicle to X (V2X) Charging for EVs - Barcelona	
11.2 E-mobility management system		
11.3 Charging infrastructure for electric tricycles for micro-distribution		
11.4 Refueling facilities for alternative heavy duty fuels	Alternative fuels for heavy duty vehicles – Stockholm	
11.5 Smart guiding to alternative fuel stations and fast charging		
11.6 Small distributed CNG grid	Small distributed CNG grid - Barcelona	
Solution 12 Smart mobility solutions		
12.1 Green parking index	Green parking index – Stockholm	
12.2 Electrical and cargo bike pool		
12.3 Mobility hub	Mobility Hub – Cologne	
12.4 Electrical and conventional car sharing		
12.5 Conventional/PHEV/CNG vehicle sharing fleets		
12.6 Smart taxi stand system	Smart taxi stand system - Barcelona	

7.4 Smart City and District Replication

There are several sites and areas in the city centre that are programmed to be developed over the next years as described above. The aim is to focus the implementation of smart cities solutions on these previously identified areas. Within those areas the main focus goes to Campanhã and Bonfim which were the object of a new strategy, ARU Campanhã (Área de Reabilitação Urbana de Campanhã). In the areas identified the main goals are to create a sustainable development based in the opportunities that they present, namely in what concerns an integrated infrastructure, smart refurbishment, mobility and energy, together with a special concern related to social innovation and the creation of a local identity.

7.5 Smart District x Replication Profile

7.5.1 Mapping of district related replication framework for selected Smart Solutions

Q1 What are the main characteristics of the district and what is the replication potential?

In the case of Porto, and due to the characteristics of the identified Smart Solutions areas (see chapter (5.2 – Smart solution selection), the aim is to make the interventions as broad as possible. It is important, when considering the data collection that the area of intervention includes, as much as possible, different contexts within the city to make its analysis and consequent strategy implementation as efficient and replicable as possible. Having said that, and thus including a large area of the city as part of the district, Porto city has an elected area of priority intervention as described below.

Priority area of intervention:

The eastern part of the Porto City is a priority area of action of the current Municipal Executive, to create conditions for territorial and social cohesion of the City and its harmonious and sustainable development.

The Master Plan (Plano Director Municipal) of Porto, currently in effect, includes as one of its strategic objectives the reduction of existing urban disparities, underlining the need to develop efforts in fields such as equity on the location of public investments, social and territorial cohesion by the adding value to currently troubled territories. Although with a strong focus on social housing, the goal does not fail to equate several other dimensions of territorial social cohesion, in particular those that refer to the existence of major imbalances of urban development at city level and the prevalence of both physical and social degradation in specific territories.

Urban area and Population:

The delimitation of the intervention zone covers an area of approximately 8.13 square kilometres, with a number of 32,659 inhabitants. This area is characterized by challenges related to water resources with high pollution issues, old industrial zone, important social challenges, but also very positive opportunities such as the fact that it is the largest mobility hub in the city and the fact that it contains important heritage sites.

Urban Context:

An Urban Rehabilitation Plan was developed for the area of Bonfim and Campanhã consisting of the restructuring of space for sustainable development of the intervention area.

The Campanhã railway station, the main external rail link to the city is in the centre of this area of intervention. The surrounding territory of this important transport infrastructure currently shows a combination of problems related to the sharp deterioration of many buildings, lack of quality of the public space, weak economic and cultural vitality and strong social vulnerability, which cannot be fought with measures of isolated sectorial policy.

The development of transport, including the construction of bridges over the Douro, contributed to the continuity of the great urban transformations over the 20th century, of this area marked by very strong industrial presence of which there are still some traces. In recent decades, and following the developments of the Portuguese cities, the eastern side of the city, experienced a strong deindustrialization process. This trend has become more evident from the 80s of last century, when many units were closed and transferred to municipalities in the periphery.

Employment:

In the past decade, there has been an intensification of this phenomenon, and employment in manufacturing industries located in the Porto area decreased by more than 7,000 jobs between 2003 and 2012. A significant part of the hand labour still depended, until very recently, of this sector, is located in the east area of the City. Difficulties in finding new employment opportunities arise and were further aggravated by the global problems at national level which contributed to substantially worsen unemployment rate, which in the case of Campanhã already exceeded 24% of the active population 2011.

The parish of Campanhã concentrates almost half of social housing in the city of Porto. To register the large concentration of population at risk of poverty, with households affected by unemployment, large families without livelihoods and social problems.

In this territory a variety of advantages and opportunities can be recognize easily vis-a-vis those who are, today, desirable conditions for sustainable urban development, in particular: very favourable internal and external connectivity; local heritage values and symbolics able to design a new local identity; environmental and landscape features; large deactivated plants and urban voids with potential installation of new functions and activities; and significant number of buildings of interest to rehabilitate.

There is a clear need to design and implement an integrated intervention strategy for this area of the city. A strategy which promotes the local assets and capital gains, by successfully facing the challenges that the socio-economic development faces in order to improve the living conditions and citizen's well-being, leveraging one that is intended to be a process of transformation of the whole eastern part of Porto.

Q2 Are there synergies and/or conflicts related to the Smart Solutions with the existing infrastructure, socio-economic profile and social acceptance?

tbd

Q3 How will local stakeholders be involved in the replication of Smart Solutions?

The local stakeholders of the district will be selected and responsibilities will be defined within the first period of this project. Nevertheless, the stakeholders involved in the city transformation and mentioned in Q5, will play an essential role, according to each area of expertise, in the development and application of the solution.

7.6 Smart Measures Specifications

7.6.1 Progress towards replication of measures/measure bundles within the selected districts

Low Energy District

Smart Solution 3: Smart energy-saving tenants

In the city of Porto, the water supply system is managed by a municipal company called Águas do Porto[7] (AdP). AdP has been making a significant investment in order to assure a sustainable water use, which, among other initiatives, includes water leakage detection and the promotion of reasonable water consumption by its clients.

Both these two objectives (lower water leakage and lower water consumption) can be partially achieved by the real-time monitoring of the water consumption levels of each client. By comparing water supply levels (distribution) with water consumption levels, it also prevents fraud and detects water leaks.

The solution that is being deployed in the city of Porto comprises a telemetry system and a mobile app, which are complementary.

The telemetry system is made of wireless water meters that are installed at each client's home and data concentrators, which collect data from several meters on a single point. The water consumption data can be collected by walk-by (when necessary), by drive-by (around one measure per month) and on a real-time basis (data is sent to AdP by cellular communications).

Wireless water meters which are being deployed in the city of Porto.

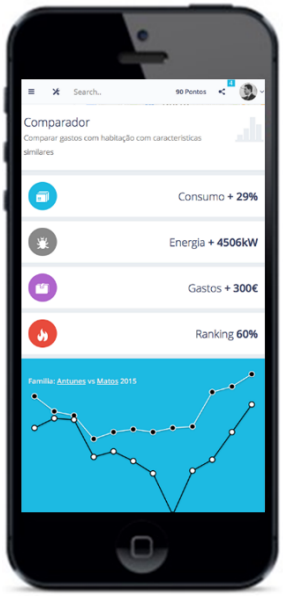
The mobile app[8] is optional and provides general information about the water quality, and valuable information to its clients about its consumption profile (like alerts, consumption analysis, notifications and warnings, consumption comparison with other similar clients), and promotes a more sustainable water consumption.

[7] www.aguasdoporto.pt
[8] https://app.aguasdoporto.pt

AdP client's mobile app which is being used in the city of Porto.

Presently, around 20.000 wireless water meters have already been deployed in the city, which covers around 13% of all the water meters installed in the city (more than 150.000).

An additional solution is also being piloted and tested in the city of Porto (in the Damião de Góis neighbourhood), which intends to reduce all the utilities (water, gas and electricity) consumption. This system is based on a mobile app and an online platform, and fosters competition between different client through gamification. The clients which have the best results (higher consumption reduction, for example) receive some kind of award, which in the end, promotes a sustainable utilities usage.



Utilities monitoring mobile app, which is being piloted and tested in a neighbourhood in the city of Porto.

Q1 What is the replication potential of the Smart Measure(s)?

The main motivations are to reduce water consumption, both downstream (by each client) and upstream (by detecting water leaks and water consumption fraud).

The solution is fully designed and tested, and has been implemented in the city over the past few years.

The deployment of wireless water meters is constrained by financial issues (significant investment at the start) and by operational issues (some old water meters are located inside each home, and not on the outside).

Q2 What is the business case and do financing opportunities already exist?

The system deployment in presently financed by Águas do Porto, which is also the owner of the wireless water meters.

The system design, test and the first deployments were co-financed by the Interreg IV SUDOE programme.

Ideally, this system can be installed on all the existing water meters in the city.

A possible financing scheme, which could increase the deployment speed of this solution, would make the clients order and pay the wireless meter, and be compensated during some years with a lower water fee.

Q3 What are the main challenges and barriers related to the measure(s)?

The solution was designed and developed with companies which manufacture the wireless meters, the data concentrators and the portable data meters, and also with companies which develop the software. New solutions on this field are being launched by many companies, so a close and permanent dialogue with companies is useful and mandatory.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The wireless water meters can be installed on ordinary water meters, which are already deployed in the city as part of the water supply infrastructure.

The system functioning only requires cellular communications and the deployment of data concentrators.

Q5 What user / stakeholder involvement is foreseen?

Clients may be sceptical, because this solution brings several privacy issues and concerns, as it enables AdP to know in real-time when someone is or is not at home.

The clients which have in-house water meters may block (or remove) the wireless meter installation.

Environmental conscious or cost-sensitive clients will be the main supporters of this solution, as it will enable them to monitor their water consumption, and thus, reduce it.

Q6 What is the potential implementation timeframe?

More than a decade, unless an alternate and significant funding scheme is available.

Integrated Infrastructure

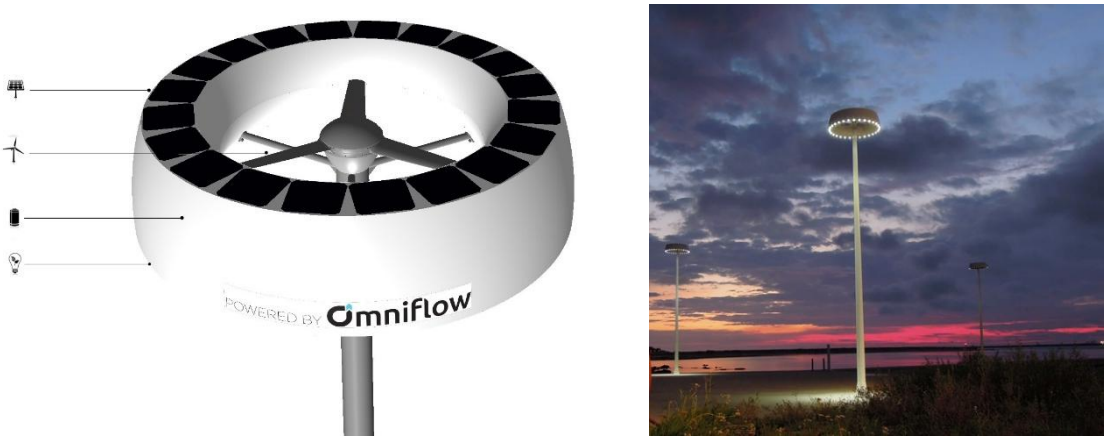
Smart Solution 5: Smart street lighting

The Municipality of Porto is currently analysing and testing different smart street lighting solutions. The way we envision it, smart street lighting systems should (ideally) comprise the following features:

- Environmentally friendly
    - Low electricity consumption (LED light)
    - High energy autonomy, in the sense that it is capable of generating and storing the electricity required to power the system (wind or solar powered)
    - Excess energy is supplied to the electric grid
- Remotely monitored and controlled
- Compatible with the existing lighting and electricity infrastructures
- Minimal on-site maintenance required
- Can incorporate additional equipment, such as, Wi-Fi hotspots, 4G small cell antennas, environmental sensors and weather stations, surveillance and monitoring cameras, power plugs for electric vehicles charging, etc.

Although we are aware that such a complete and adjustable solution is not easily found on the market as a turn-key solution, we are already working with some solutions that are complementary and can partially respond to the city's needs.

Presently, the Municipality of Porto is deploying two pilots with autonomous light poles. The system comprises 13 units of the OMNILED platform, which is developed by a local company (OMNIFLOW[9]). The LED light poles are fully autonomous and work off the grid (renewable energy is provided by a wind turbine and solar cells, and the energy is stored on batteries), they are remotely monitored and controlled by a dedicated web platform, and may incorporate some additional hardware equipment, such as cameras, and Wi-Fi and small cell antennas.



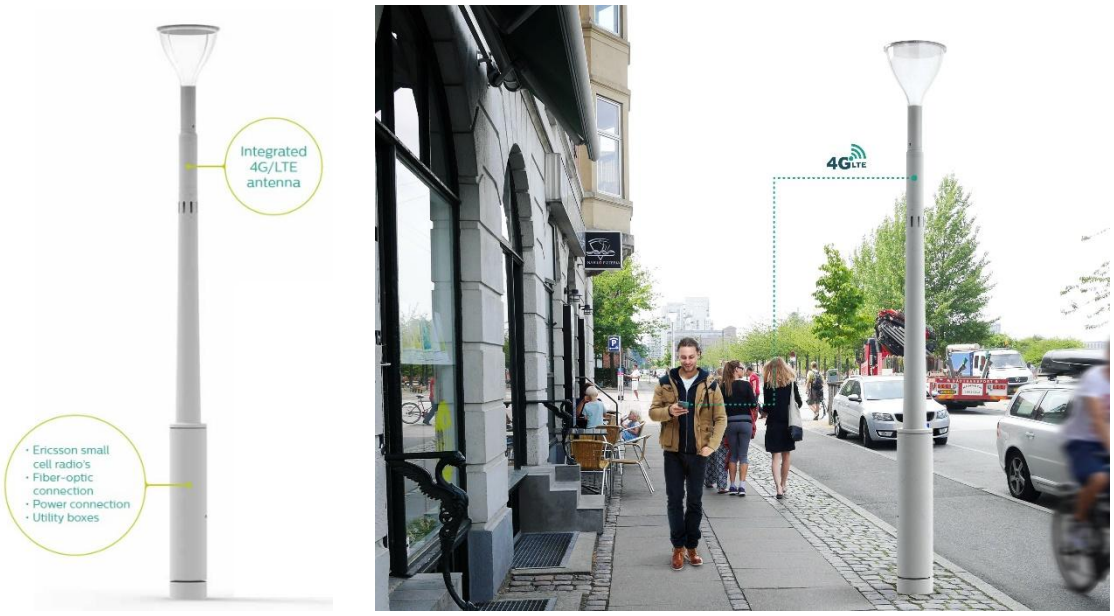
OMNILED solution from OMNIFLOW (image credits: OMNIFLOW).

[9] www.omniflow.pt

The Municipality of Porto is presently analysing and assessing another smart street lighting, this one from Philips Lighting (Lightpole Site Slim[10]), both on a technical and business model point of view.

The LED light poles are connected to the grid, are remotely monitored (but not controlled), and can incorporate other equipment, such as, 4G/LTE antennas and communication hardware and Wi-Fi hotspots. Depending on the installed hardware, it requires connection to a wired or wireless communications network.

This solution is clearly a very well designed one, in the sense that the used equipment is embedded on the light poles, and thus, has no visual impact (as is the case, when we need to use equipment boxes on light or traffic light poles).



Lightpole Site Slim solution from Philips Lighting (image credits: Philips Lighting).

The third solution is not a light pole, but suits some of the requirements of a smart street lighting solution described above. This solution (Vodafone Small Cells) is provided by Vodafone Portugal and is basically a pole with communications equipment. The system comprises cellular communications hardware (small cells) and/or Wi-Fi hotspots.

It benefits the telecom company (Vodafone Portugal) because it can easily expand the 4G/LTE coverage, in particular at touristic hotspots; and it benefits the city, because the poles can be equipped with Wi-Fi hotpots, and thus, they increase the public Wi-Fi coverage (Wi-Fi Porto Digital).

[10] www.lighting.philips.com/main/systems/connected-lighting/connected-lighting-for-smart-cities/smart-cities-initiative/smart-pole

Vodafone Small Cells solution from Vodafone Portugal (image credits: Vodafone Portugal).

The Municipality of Porto is now planning to install these poles on four locations in the centre and the historic centre of the city, and is discussing with the company the technical and operational details of its deployment.

Q1 What is the replication potential of the Smart Measure(s)?

The main benefits of these smart street lighting solutions are to be environmentally friendly, in the sense that they use low-power light sources (LED) and they can generate and store their own energy by incorporating wind and/or solar generators. Accordingly, this reduces the energy bill of the city and lowers its CO_2 emissions.

Besides, the incorporation of communications and sensing equipment (embedded on the poles, instead of boxes on poles) has no visual impact; allows the telecom operators to expand their coverage without the need to use large and heavy equipment on top of the buildings (with an unpleasant visual impact); and enables the city to expand the sensing and the public Wi-Fi networks and coverage.

Q2 What is the business case and do financing opportunities already exist?

Although we should not make any 'public' statements about the proposed commercial conditions from the companies, we can make the following comments about their business models:

- OMNIFLOW is a regular equipment and software supplier of a turn-key solution. In this particular case, this solution is being deployed because OMNIFLOW won an ideas contest promoted by the Municipality of Porto (Desafios Porto[11]).
- Philips Lighting
    - The company supplies these light poles to the city free of charge, and in exchange, they are free to negotiate with telecom operators the use of the small cell communications equipment, which are embedded on some light poles.
    - The light poles remain property of the company; accordingly, they are third-party owned city infrastructure.
    - Although the light poles are made available for free, they require a significant investment in terms of deployment and communication cabling costs.

[11] www.desafiosporto.pt/en

    - The existence of a long-term contract, and the fact that the company is the one who chooses the places to deploy them in the city (where they identify better business oportunities for selling the communication cells), are two major handicaps of this solution.

- Vodafone Portugal
    - The company supplies these poles free of charge to the city, and in exchange, they use the embedded small cells for their telecom operations.
    - The poles remain property of the company; accordingly, they are third-party owned city infrastructure.
    - Although the poles are made available for free, they require a significant investment in terms of deployment and communication cabling costs.
    - The fact that the company is the one who chooses the places to deploy them in the city (where they need to expand the cellular communications' coverage), is a major handicap of this solution.

Q3 What are the main challenges and barriers related to the measure(s)?

Several companies have been contacted by the Municipality of Porto, and other companies have contacted the Municipality of Porto. The city plans to adopt different solutions, and not a 'one size fits all' solution, because different areas of the city have different and specific requirements and needs.

The city scale deployment of these solutions will take time, a significant investment, and will require finding the right business partners, with adequate and fair business models.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The smart street lighting solutions require:

- Connection to the electric grid (in case they don't generate their own energy, or in case they can supply the excess energy to the grid, or just as a redundant option), which is already available in the city.
- Connection to the city's optical fibre network (in case it is equipped with Wi-Fi hotspots), which is already available in the city.
- Connection to a private communications network, in order to connect the small cells equipment to the telecom's network (which is the case of Philips Lighting and Vodafone Portugal).

Q5 What user / stakeholder involvement is foreseen?

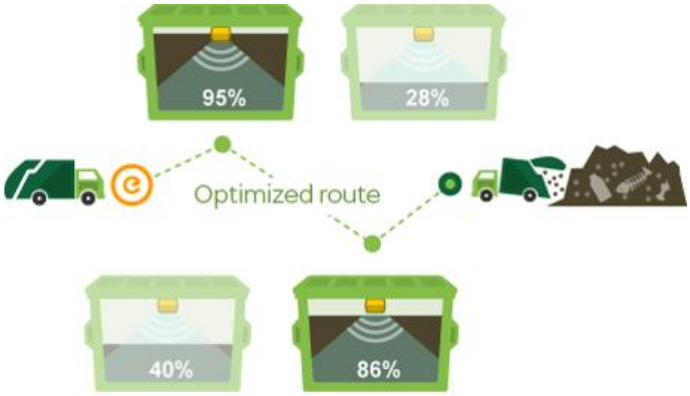
The implementation of these solutions involve equipment manufacturers and suppliers (of the poles or light poles solutions); telecom operators interested in using the embedded communications equipment; electricity suppliers that may be interested in supplying energy to the vehicle chargers or to buy the excess energy created by the autonomous light poles; and the Municipality of Porto, which is interested in expanding the public Wi-Fi coverage and the sensing network with minimal visual impact.

Q6 What is the potential implementation timeframe?

The OMNIFLOW's solution will be fully deployed and working until September 2017. The Vodafone Portugal's solution is expected to be fully deployed and working until the end of August 2017. No decision has been made yet about the solution from Philips Lighting.

Smart Solution 7: Smart waste collection

The Municipality of Porto has been studying the possibility of implementing a smart waste collection system in the city. It is well known that a smart waste collection system enables measuring and forecasting the fill-level of waste containers; accordingly, the waste collection routes can be properly designed, managed and programmed, and thus, optimized, by avoiding unnecessary journeys and stops (figure below).



Waste collection optimization with bin sensors.

The study that the Municipality of Porto has been doing involves, at first, two different but complementary assessments: technology and efficiency.

The technology assessment intended to test a waste collection system on a pilot demonstrator. The system comprised waste bins equipped with fill-level sensors, data aggregator hub, processing units and communication devices. Data from each sensor was collected at the aggregator hub, and after being processed, it was sent to the final destination by using a given communication channel (Wi-Fi, cellular communications, or by a delay-tolerant network or opportunistic communication system).

These tests were particularly innovative, because they involved using the vehicular network available in the city (buses which communicate among themselves and with the city infrastructure) as 'data mules'. In this system, buses act as 'data mules' in the sense that they carry the bin sensor data until they reach a fixed communication unit or a city's Wi-Fi hotspot, which are connected to the city's optical fibre network, and finally routes the data to the destination. Accordingly, sensor data is transferred without any communication costs, which is not the case of cellular communications.

These tests proved that the system's technology was not only suitable for collecting data from waste bin sensors, but also from other sensors and meters, like the wireless water meters described at the "Smart Solution 3: Smart energy-saving tenants" section.

The efficiency assessment involved measuring the real collection efficiency of the different waste types (undifferentiated, selective and glass), based on historic data. The main collection efficiency results were the following:

- Undifferentiated: 96%
- Selective: 39%
- Glass: 14%

These results enable the Municipality of Porto to take informed decisions regarding the eventual installation of waste bin sensors for the different waste types, which results in the following main conclusions:

- The collection efficiency of the undifferentiated waste is already very close to 100%. Accordingly, the installation of bin sensors would not bring any significant efficiency gains, when considering a cost-benefit analysis.

- The collection efficiency of the selective and glass waste is very low, in particular for the glass. Accordingly, the installation of bin sensors will bring significant efficiency gains, and thus, significant cost reduction.

Q1 What is the replication potential of the Smart Measure(s)?

The main motivations are to reduce waste collection costs (fuel, human resources, vehicles, etc.), by optimizing waste collection routes.

The Municipality of Porto is still analysing and evaluating different technological solutions (from a cost-benefit point of view), and no decision has yet been made regarding the future deployment of waste bin sensors in the city.

Once implemented, this solution will benefit all the city.

The implementation of this solution requires a significant investment on the installation of the waste bin sensors and data aggregators.

The city has different types of waste bins, which are manufactured by different companies, and many bins can't be easily equipped with sensors.

Q2 What is the business case and do financing opportunities already exist?

The deployment of a smart waste collection system may be done in two ways: 1) installing sensors on the already existing bins in the city; 2) specify the requirements of the smart waste collection system and order future bins already equipped with sensors that comply with the requirements and specifications.

Q3 What are the main challenges and barriers related to the measure(s)?

The previously described tests have been made with the cooperation of local companies and the University of Porto.

Business dialogue with companies is mandatory, in order to identify proper technological solutions that fit the city's need, from a hardware and software point of view, and taking into consideration that the city can't be vendor locked-in (both to the waste bins and to the sensing technologies).

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The waste bin sensors communicate with data aggregators, which need to be deployed. As noted before, the wireless water meters also require data aggregators to operate (around 3.000 units are already deployed in the city). Accordingly, we could have significant economies of scale if both sensors (waste and water) can communicate with the same data aggregators, so there are important synergies with the "Smart Solution 3: Smart energy-saving tenants".

Besides, these data aggregators can send data to its final destination through the already available city networks, in particular, the Wi-Fi and fibre networks (which are owned by the Municipality of Porto through Porto Digital[12]) and the vehicular network (which is co-owned by STCP and is connected to the city's Wi-Fi and fibre networks).

Q5 What user / stakeholder involvement is foreseen?

The main motivations are to reduce waste collection costs (fuel, human resources, vehicles, etc.), by optimizing waste collection routes.

The main supporters will be the city inhabitants and local companies, because this will potentially provide a better waste collection service, and will reduce operating costs, which may, in the end, reduce collected taxes.

The waste bin manufacturers may not be supportive, because the eventual mandatory requirement of supplying waste bins with sensors (with some requirements and specifications) will increase their manufacturing costs, will require them to work and use unknown technologies (for many of them) and may require some customization for the city of Porto, instead of having a standard solution for any city (as is normally the case of an ordinary waste bin).

Q6 What is the potential implementation timeframe?

Not yet defined.

Smart Solution 8: Big data management

In terms of big and open data management, the Municipality of Porto (with the coordination and support of Porto Digital) has been working on several initiatives, in particular, the following:

- Urban Platform
- Hackacity
- Open Data Platform
- Integrated Management System (CGI)

The Municipality of Porto is presently designing, specifying and developing an Urban Platform, which will collect and analyse mobility, environment, energy, waste and civil protection data for the city management and service provision. The Urban Platform is a software infrastructure which will use open APIs from the FIWARE[13] platform as building blocks, and will be developed according to the following principles and guidelines:

1. City data flows
   The Urban Platform brings together data flows within and across city systems.

[12] www.portodigital.pt
[13] www.fiware.org

2. City level engagement
   The Urban Platform enables the city to shift from fragmented operations to predictive effective operations, and engages and serves city stakeholders in order to transform outcomes at local level.

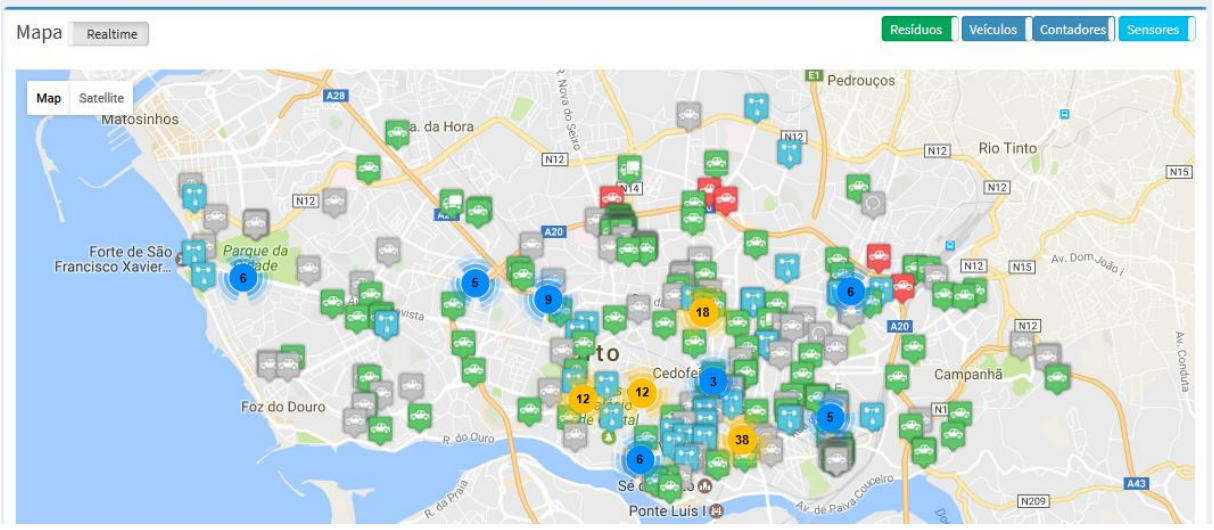
3. Security and privacy
   The Urban Platform implements data privacy and security policies, assuming that it will be a valuable target for attackers.

4. Low integration effort
   The Urban Platform integrates with existing or future systems with relatively little adaptation effort, and itself cannot represent an obstacle to the city's legacy or greenfield systems.

5. High scalability
   The Urban Platform is designed for performance and scalability, and is able to support extremely large quantities of data with almost no degradation of performance, and allows tackling scale problems by the simple addition of resources.

6. Data and executable code
   The Urban Platform consumes and produces data and supports executable code (analytics, bigdata, computing engine) to be able to process and transform that same data.

7. Open sourced, no vendor lock-in
   The Urban Platform adheres to open solutions to speed adoption and to prevent vendor lock-in.



Prototype version of the dashboard of the Urban Platform.

Hackacity[14] is a hackathon that aims to test big data and promotes its use to develop solutions that will have an impact in the city, but also fosters collaboration amongst stakeholders. For 24 hours, participants get together to develop solutions based in open source platforms as FIWARE to address challenges faced by the citizens, using data provided by the city. The FIWARE platform provides a

[14] www.hackacity.eu

rather simple yet powerful set of APIs that ease the development of smart applications in multiple vertical sectors, whose specifications are public and royalty-free.

It started in 2015 in the city of Porto. In 2016, the city of Porto challenged the cities of Amersfoort/Utrecht in Netherlands, Olinda/Recife in Brazil and Santander in Spain – with the support of the Open and Agile Smart Cities (OASC) initiative – to work together, as a first attempt to implement an integrated approach of the use of data for the creation of innovative city solutions.

The 2017 edition took place in June, and brought together the cities of Porto[15] in Portugal, Garanhuns[16] and Cuiabá[17] in Brazil and Utrecht[18] in Netherlands on four local Hackacity events. The Utrecht event took place within the 2nd FIWARE Summit. The cities of Zagreb in Croatia, Santander in Spain and Paterborn in Germany did not organize an event, but they contributed to the Hackacity events by providing data to the participants.

Photos of the 2017 edition of the Hackacity Porto (2-3 June 2017).

The Open Data Platform of the Municipality of Porto[19] is already developed and available online. The first development phase represents an investment of around 300.000 Euros, and also included making available 800 datasets (so far, closed). The second development phase is expected to last until 2018, involves an additional investment of around 300.000 Euros, and will make 400 datasets open and available at the Open Data Platform.

[15] https://hackacity.eu/porto
[16] https://hackacity.eu/garanhuns
[17] https://hackacity.eu/cuiaba
[18] https://hackacity.eu/utrecht
[19] http://dadosabertos.cm-porto.pt

Webpage of the Open Data Platform of the Municipality of Porto.

Finally, the Municipality of Porto also created the Integrated Management Center (CGI), which provides real time information and promotes an integrated action amongst different public stakeholders and services, such as, security (Police and local Police), emergency (civil protection, medical emergency and firefighting), public transportation, and services of the Municipality of Porto (such as, environment and waste, mobility and traffic, and fleet management).

It was launched in 2015, and was significantly upgraded in 2016. It now comprises an operation room with 82 m^2 and a crisis room with 48 m^2, it monitors the city through the lens of 130 cameras and is connected to the city's fibre network with a 10 Gbit/s connection (owned and operated by Porto Digital).

Integrated Management Center (CGI) of the Municipality of Porto in 2015 (left) and 2016 (right).

Q1 What is the replication potential of the Smart Measure(s)?

The main objectives are to use data to bring value added to the city. Data can provide valuable information for informed decision making by the Municipality of Porto and the city's services; besides, the availability of city's open data enables companies to add value and to offer new services and solutions that increase the quality of life of the inhabitants, visitors and tourists.

By aggregating, processing and delivering rich data, the city's services can work more effectively and in a predictive way, instead of working on a reactive, fragmented and isolated way. Besides, data processing creates new data, which would not be available in a raw analysis.

The Urban Platform is presently being designed, specified and developed, and should be fully operational at the end of 2018. The Hackacity events take place every year at the city of Porto since 2015. The Open Data Platform is deployed and working, and 400 open datasets will be made

available at the Open Data Platform until 2018. The CGI is fully working since 2016, but will be improved when the Urban Platform is operational.

Q2 What is the business case and do financing opportunities already exist?

All these initiatives are funded by the Municipality of Porto. Possible complementary sources of funding include the H2020 EU programme and the Urban Innovative Actions programme.

Since the Urban Platform will gather data from different sources (sensors, cameras, other equipment), and since we want to develop it based on open APIs, we may need customized developments in order to adapt the available APIs to the existing hardware standards and protocols.

Q3 What are the main challenges and barriers related to the measure(s)?

Each of the 'vertical' solutions of the Urban Platform (such as, mobility and environment) will be developed by companies. The Municipality of Porto will launch a public procurement procedure for this development. The preliminary developments of the Urban Platform, in particular, the integration with the FIWARE node, are presently being made with the cooperation of a Portuguese company.

Hardware supply and software development will be made by companies.

The Municipality of Porto and Porto Digital are working on the design, specification and implementation management of the different solutions, and its integration with the city's sensing and communications infrastructure.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The Urban Platform will gather data from sources already deployed in the city and from others sensors that will be deployed in the near future.

Data is transmitted from its sources to the Urban Platform and to the CGI by broadband communications, which include the city's Wi-Fi and fibre networks already available in the city.

Data from wireless energy and water meters (SS3), smart street lighting and additional equipment (SS5), waste bin sensors (SS7) and electric vehicles (SS11) can be gathered and processed by the Urban Platform, and can be used by the CGI for predictive or reactive operations.

Q5 What user / stakeholder involvement is foreseen?

Real-time or historic data, and open or closed data, is 'owned' and provided by several sources within the municipality, services and companies. Although the principles behind the Urban Platform and the CGI are supported at the top level of the City Council, each stakeholder may be sceptical and block data release.

Q6 What is the potential implementation timeframe?

Described above and at Q1.

Sustainable Urban Mobility

Smart Solution 11: Alternative fuel driven vehicles

The Municipality of Porto has been making a significant investment in the electric mobility, by replacing the current diesel fleet by electric and hybrid vehicles, which are used by the municipality services, the police and the municipal companies.

In 2016, the Municipality of Porto acquired and received four 100% electric vehicles and one hybrid (electric and fuel engines) vehicle for urban cleaning and garden maintenance operations. The electric units have an autonomy of around 100 km and are used for public space cleaning, waste collection at the city centre and garden maintenance. The hybrid units have an autonomy of around 400 km (80 km electric) and are used for high pressure water cleaning. In 2016, the Municipality of Porto also received 12 new electric vehicles for passengers.

More recently, in 2017, the Municipality of Porto ordered 390 new electric vehicles, which represents a global investment of 10 million Euros. The replacement of the current diesel vehicles by these new electric units will have a significant impact on fossil fuel consumption (less 450.000 litres until 2022), on CO_2 emissions (less 2.300 tons until 2022) and on operational costs (less 600.000 € per year on fuel consumption).

Electric vehicles on urban cleaning, waste collection and garden maintenance operations in the city of Porto.

Besides, the public bus company (STCP) – which operates in the cities of Porto, Gondomar, Maia, Matosinhos, Valongo and Vila Nova de Gaia, and is managed by several municipalities under the leadership of the Municipality of Porto – has also been making a significant investment in alternative fuel driven vehicles, in particular, by replacing the diesel buses by gas ones.

In 2017, STCP launched an international public procurement procedure in order to buy 188 new gas and electric bus units (173 gas, 15 electric), which represents an investment of 46,7 million Euros and will renew around 45% of the entire bus fleet. The first 35 units are expected to be delivered in 2018.

At the beginning of the year, STCP also tested a 100% electric bus, which is made by a Portuguese manufacturer (CaetanoBus[20]). The tests were made on a real route (904), which connects the centre of Porto to the centre of Vila Nova de Gaia, and provided valuable information to STCP regarding the specifications and operational conditions of this type of vehicles, and enabled STCP to evaluate the feasibility of using electric vehicles on a regular operation. This bus has an autonomy of 80 km (the batteries are fully charged in 30 minutes) and can reach a maximum speed of 70 km/h, and was the first electric bus used in the city of Porto on public bus operations.

Electric bus (eBUS) being tested in a real route in the city of Porto.

Presently, 38% of the STCP's bus fleet is powered by diesel and 62% is powered by gas. The ambition is to have a fleet made of more than 90% gas or electric vehicles by 2019.

In September 2017, the car-sharing company Citydrive[21] will start operating in the city of Porto with a fleet of 200 units of 100% electric vehicles (Nissan Leaf). Later, the company expects to provide a similar service of 100% electric shared scouters. Both kinds of vehicles can be charged at the public chargers already available throughout the city.

Q1 What is the replication potential of the Smart Measure(s)?

The main motivations are to reduce CO_2 emissions and fossil fuel consumption (thus reducing pollution levels in the city associated with mobility) and to reduce fuel costs.

The replacement of diesel vehicles by alternative fuel driven vehicles (electric, hybrid and gas) is already taking place, and the acquisition of new vehicles has already been formalized (both by the Municipality of Porto and STCP).

The implementation of the solutions are only dependent on legal and mandatory measures associated with public procurement procedures and time.

Q2 What is the business case and do financing opportunities already exist?

The acquisition of these new vehicles is funded by the Municipality of Porto and STCP, and is co-funded by national and European funds.

The acquisition of the electric and hybrid vehicles by the Municipality of Porto will be made by a renting contract, which includes vehicle's maintenance and insurance along the 4 years' duration of the contract (until 2022).

The main technological barriers include vehicle's autonomy and battery charging time.

[20] http://caetanobus.pt/en/
[21] www.citydrive.pt

Q3 What are the main challenges and barriers related to the measure(s)?

Availability of proper financing (because fleet renovation is expensive), long-term vision (because it takes times to have results) and proper support infrastructure (because the operation of these new vehicles require adequate energy supply infrastructures).

Dialogues with companies are important in order to have adequate solutions that properly fit the city's needs.

We also expect that the use of alternative fuel driven vehicles in public services (municipality, police, public bus company) will motivate inhabitants to change their own cars for alternative energy sources, and thus positively contributing to the city's environmental sustainability.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The operation requires electrical (public and private) and gas (private) supply infrastructures, which are already available in the city.

In the case of electric vehicles, they will be mainly charged at the municipality's and STCP's own premises, with the exception of the car-sharing services, which will use the public network of electric chargers.

The STCP's gas buses will be refilled at their own premises, at a gas station which is already available (because STCP has been using gas buses for several years).

Q5 What user / stakeholder involvement is foreseen?

The main motivations are to reduce CO_2 emissions and fossil fuel consumption (thus reducing pollution levels in the city associated with mobility) and to reduce fuel costs.

Both leading institutions (the Municipality of Porto and STCP) have these objectives on their environmental and sustainability policies and strategies.

Q6 What is the potential implementation timeframe?

Described above.

7.6.2 Replication needs of Smart City Measure(s)

Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

tbd

8. Replication Assessment of the Follower City Suceava

8.1 Smart City Replication Profile

8.1.1 Mapping the overall framework conditions for replication within the city territory

Q1 what is the overall replication potential for Smart Solutions until 2020 and beyond?

The north-east Romanian city of Suceava (population about 107,000), one of Romania's oldest settlements, has been the capital of Suceava County since 1388. Suceava lies 450 km from Romania's capital Bucharest, on a main European highway. The government is making efforts to improve the region's transport network as part of a broader urban regeneration using EU Cohesion Policy grants. Figuring on UNESCO's World Heritage List, Suceava is home to orthodox monasteries and churches, and a 14th century castle. The local industry is based on glass and wood manufactories, textiles and construction materials.

Suceava faces the combined challenges of increased motorized traffic, and stringent European environmental and energy targets. The municipality, which owns the local public transport company, has already taken part in initiatives to encourage sustainable urban mobility, including the CIVITAS II (2005-2009) Smile Project, and MIDAS (2006-2009), part of the Intelligent Energy for Europe's STEER Programme.

In 2013 Suceava Local Council approved a Sustainable Energy Action Plan (SEAP) regarding energy efficiency and implementation of project regarding increase of alternative usage at local level, implementation of the electro mobility concept. The main objective of SEAP is to reduce the greenhouse gas emissions by at least 20% by 2020 and to promote the investments carried out within Suceava Municipality which can lead to an efficient use of energy by improving the existing energy performance or the development of constructions, installations, equipment and technologies enjoying high energy efficiency, including feasible renewable energy sources.

SEAP is the methodology according to which Suceava Municipality will reach its objectives by 2020, using the results of BEI (Baseline Emission Inventory) in view of identifying the best fields of action and the best existing opportunities in order to meet the local objective of reducing CO_2 emissions. SEAP defines the concrete reducing measures, together with the time frames, assigned responsibilities and estimated budgets.

SEAP should be considered a communication and promotion tool for the decision-makers, baseline tool for implementation. SEAP should not be regarded as a rigid document, as circumstances change and, as the ongoing actions provide results and experience, it may be necessary to revise the plan on a regular basis.

SEAP concerns measures within the competence and reach of local authorities. Therefore, local authority is expected to play an exemplary role and consequently to take outstanding measures related to the local authority's own buildings and facilities, vehicle fleet, producing energy from renewable sources, urban mobility etc.

According to the Sustainable Energy Action Plan, Sustainable Urban Mobility Plan (SUMP) and Local Development Strategy (ISDS) in the next 20 years the municipality will have to focuses on the following fields (no prioritization):

- Buildings and facilities (municipal, residential and tertiary buildings, public lighting);
- Transport (municipal fleet, public, private and commercial transport);
- Centralized heating system – using renewable resources ;
- Local energy production (solar heating installation and solar photovoltaic modules, high-efficiency cogeneration, biomass fuel heating installations);
- Urban planning (strategic urban planning, sustainable mobility urban planning, development of local regulations to support sustainable constructions);
- Procurement (local energy-efficiency regulations, local regulations on the utilization of renewable energy sources);
- Electric vehicles (private and public) and electric busses for public transport
- Communication (technical assistance and consulting services, financial support and subsidies, information and awareness campaigns, training sessions);
- Waste management (selective collecting, recycling).

Suceava municipality would like to benefit from the available existing funding opportunities – ERDF, national and regional funds (For example, central governmental funds for rehabilitation of public buildings or a possibility to access regional funds by forming an association of at least 2 municipalities for funding and implementation of common projects), private and public – in order to continue the implementation of the energy efficiency measures at local level (620 mil Eur available at the regional level for the period 2014 -2020, 85 % from the EU and 12% from the national budget):

SUMP and ISDS for the city of Suceava were designed and approved in 2017. These documents include measures, actions and indicators for future local development in the priod of 2016 – 2023.

Q2 How does the"Smart City" approach feed into/connect with your existing local planning processes?

In 2013 we finalized the Sustainable Energy Action Plan (SEAP) and in 2015 the Suceava Sustainable Urban Mobility Plan was finalized and presented to the local stakeholders, decision makers and members of the Local Support Group. SUMP and ISDS for the city of Suceava were designed and approved in 2017. These documents include measures, actions and indicators for future local development in the period of 2016 – 2023.

The main objectives of the actions included in the above mentioned documents will be:

- Correlating the local energy framework with the national and European ones;
- Better life quality;
- General contribution to town's attractiveness;
- Increased attractiveness for trade and industry;
- Supporting economic growth;
- Attracting investments;
- Compliance with the European and National Policies on Climate Changes

These priorities are fully in line with the principles of the smart city approach. Therefore the Grow Smarter Project will be an unique opportunity for Suceava Municipality to have access of different practical solution and best practice experience transfer which will sustain local efforts for becoming a "Smart City".

Q3 Is there a (strategic) plan and organizational structure in place to become a "Smart City"?

The is a strong willingness and political support at local level for implementation of the smart measures in order to become a SMART City but for the moment we cannot say that there is a specific structure at local level that is mainly involved and responsible for this issue
New internal structure was created in march 2017 in order to have representatives from different departments which will be responsible to define, select and prioritized the projects and actions regarding local sustainable development.

Q4 Are there synergies and/or conflicts of the"Smart City" plan and organizational structure with existing initiatives and their structures within the city?

Suceava Municipality is partner since September 2016 in the URBACT III project called : SMART IMPACT. This project aim is to create a local structure and group which will be able to define measures and actions regarding implementation of the SMART CITY concept in order to increase the efficiency and transparency of the local public authority activity.

Q5 Which and how are regional and local stakeholders involved in the Smart City strategy and planning process on a city level?

In the past 5 years the Urbact Support Local Group (USLG) was involved in the designing process for the local strategies and plans concerning energy efficiency at local level, sustainable development and mobility as well.

USLG is a consultation only body, meaning the group can only provide ideas and feedback from the perspective of a different stakeholder, but they can also influence their own institutions, companies and groups. Their ideas and documents are presented to the local council for improvement and future implementation.

The Suceava ULSG has been meeting since early 2010 to discuss the challenges and opportunities associated with enabling electro-mobility It has provided an opportunity for the diverse stakeholders involved with a particular issue, to come together, identify issues of concern and seek ways to overcome them. With representatives from local authorities, local private companies, NGO's, local media,local retailers, electricity generators/distributors and retailers as well as academic institutions and private consultancies, the ULSG has provided a focused approach to looking at the challenges while incorporating the experience of other European partner cities, in developing an approach that can taken forward in Suceava and Romania also.

Usually the meeting took place 4 to 6 times per year as a regular basis and of course anytime when the municipality intent to design a local strategy and a public consultation is not only requested but recommended.

Our intention is to continue the cooperation within this group during the Grow Smarter implementation phase and for this reason we do used opportunities created by the meeting held by

the other local and regional working groups (including the one created especially for design of the Integrated Development Strategy) in order to discuss, evaluate and define SMART ideas for the measures which need to be Implemented into the city of Suceava.

Q6 What are past (<5 years) and current projects that are closely related to the "Smart City" concept?

Suceava Municipality implemented between 05.2012 – 11.2012 phase I and 12.2013 – 12.2015 phase II the project"**Sustainable Urban Markets"** that was co financed by the European Union through the European Regional Development Fund, under the Interregional Cooperation Programme URBACT II. – www.urbact.eu/urbanmarkets

The budget allocated to the Romanian partner was 5.437,50 Euros for Phase I and 61.124,39 euro for Phase II, of which 80 % is co-financing from the European Union, while 20 % are national contribution (of which 13 % budget State and 7% local budget).
The main objective of the project were : demonstrate the catalytic effect that urban markets have in the major thematic areas that generate sustainable growth: regeneration of the historic city centre, the development of economic activities with low CO2 emissions, the promotion of local entrepreneurship and stimulating employment.

Suceava Municipality was partner in the URBACT project called "**Electric Vehicles in Urban Europe" EVUE** which lasted from December 2009 - May 2010 (development phase) and July 2010 – December 2012 (implementation phase). www.urbact.eu/evue

The budget allocated to the Romanian Partner was of 12.500 euros for development phase and 38.945 euros for implementation phase, of which 80 % is co-financing from the European Union, while 20 % are national contribution (of which 13 % budget State and 7% local budget).

The EVUE project was focused on identifying and implementing the framework and infrastructure required that will enable electric vehicles to become the preferred mode of choice in urban areas. By directly targeting a major source of air and noise pollution in our cities, it was hoped to improve the lives of all citizens and ensure that urban areas mitigate their negative environmental impacts as efficiently as possible.

„Electric Vehicles in Urban Europe" EVUE II in which Suceava Municipality was partner was implemented between December 2013 – March 2015.

The budget allocated to the Romanian Partner was of 43.000 Euros of which 80 % is co-financing from the European Union, while 20 % are national contribution (of which 13 % budget State and 7% local budget).

Electric Vehicles in Urban Europe (EVUE II) focused on the development of integrated, sustainable strategies and dynamic leadership techniques for cities to promote the use of electric vehicles. Urban initiatives to encourage the public and business to use EV's contributed to EU clean air and car fleets targets, making cities more attractive and competitive. Between 2009 and 2015, nine cities across Europe: Beja, Katowice, Frankfurt, Lisbon, London, Madrid, Oslo, Stockholm, Suceava and Zografou,

supported by the URBACT programme, worked together to share knowledge and experience of how EVs can be implemented in the urban environment under the EVUE project.

"**Electromobility-electric vehicles for a green municipality"** project co–financed (80 %) by the Government of Switzerland through the Swiss-Romanian Cooperation Programme.

The project budget of 3.112.490 CHF (2.563.511 euro) will be used (in the second part of 2015) in order to implement the electro mobility concept. In this project the following activities will be conducted :

- purchase of electric vehicles for Suceava Municipality fleet: 11 vehicles, 2 vans, 1 sweeping machine, 1 tanker
- the installation of charging infrastructure for electric vehicles: 14 standard charging points, 14 fast charge points, 56 parking spaces for electric vehicles (in public car parks, underground car parks, residential areas)
- acquisition of 10 electric bicycles and their charging system (equipped with photovoltaic panels 5KW)
- also the amount of 225.000 RON is designated for developing a technical-economic documentation that will be used to obtain the grant for the project "Environmentally friendly public transport system interurban"(purchase a total of 40 electric buses for public transport)

"**Modern and efficient public lighting management in Suceava Municipality".**
The project budget is 6.417.314 CHF from which 5.238108 CHF are Swiss Govern grant.In the next 18 month we will replace all the 3816 existing old light units from Suceava city with units that use light sources with LED technology and in the same time **a telemanagement system of the lighting units will be implemented.This project will conduct to an important reduction of energy consumption and CO2 emissions.**

In the past 5 years in Suceava there were construction works for rehabilitation of 380 apartments (structure, heating system) in order to reduce the waste of energy and to improve energy efficiency using 0,864 million Euro.

Starting from 2013 in Suceava, through a PPP, a new city power plant is functional, using only biomass, provided both heating for the entire city and energy. This project is considered to be a starting point for increasing the production of green energy at local level. 2011 was the starting point of a major waste management project at county level. This project includes transfer stations for waste, a new landfill with biogas production plant, modern systems for environment protection and separate recycling facilities – 2, 3 million Euro - ERDF funds. For the moment Suceava city is working of a tender documentation for the waste management supplier at local level.This will be a 7 year contract that will include facilities for separate waste collection in order to increase the level of waste recycling at local level and to reduce the consumption of raw materials.

Other already implemented projects:
- rehabilitation of 55 %of the city heating transport system (isolation, pipe lines, transfer points) – 102 km and 28 heat centres - in order to reduce the lost energy into the system - own funds

- rehabilitation of the public lightning system - 24 km of network, replace the old lamps with new and energy saving ones and implementation of a telemanagement system in order to reduce the energy consumption and increase the efficiency - 1,2 mil Euro project ERDF funds
- rehabilitation of 26 km of city streets in order to reduce the traffic congestion and increase the number of PT passengers (including 10,5 km of bikes lanes) - 8,7 mil Euro ERDF funds
- construction of a 164 underground parking facility in the city center together with the rehabilitation of the main city center pedestrian area in order to create facilities for reduce traffic congestion, traffic emissions and encourage walking instead of driving - 11, 4 mil Euro - ERDF funds
Two ongoing URBACT III projects, **FREIGHT TAILS** and **SMART IMPACT**, which are acting also in the field of developing local action plans for freight, traffic and smart measures to be implemented in Suceava city.

Starting from January 2017 Suceava Municipality is partner in INTEREG project called MOLOC _ **"Low carbon urban morphology. New urban morphologies, new governances, new challenges for cities in energy transition".** Through this new project in the next 3 years a Local Integrated Plan will be developed for Suceava City with measures regarding energy efficiency in resediential and public buildings. This new Plan will be used for future application in order to secure funding for implementation of energy efficiency projects.

Local, regional and transnational meetings will be organized (first one in September 2017) as part of MOLOC project with the Local Support Group in order to disseminate informations related to energy saving behaviour, equipments and technologies.

Q7 Which sites/districts are projected to be developed in the next five/ten years?
Future projects to be implemented:

- rehabilitation of public lighting system - replacement of the all lamps with LED ones for the entire city - reduce the energy consumption - 3,2 mill Euro - SWISS funds - 2017
- electro mobility for the city - 15 EV's and 28 charging points also 10 electric bikes in order to promote electro mobility - 2.0 mill Euro Swiss funds - 2017
- 30- 45 electric busses to replace the existing diesel ones for the PT company - ERDF funds - 2018
- rehabilitation of the educational infrastructure (in order to reduce the energy consumption) and also 200 apartments - till 2020 using ERDF funds
- establish a photovoltaic panels grid for own municipal needs - ERDF funds till 2018
- implementation of a metropolitan area PT system with intermodal points and transfer facilities in order to reduce the traffic emissions
- new city belt for the metropolitan area in order to divert the heavy traffic from entering into the city
-rehabilitation of the main city markets (including introduction of energy saving systems, recycling facilities and mobility plans for freight
- Rehabilitation of the Town Hall building – 2018 – including measures for increase the energy efficiency
- Improvement of the separate waste collection system – 2018 – 2013

- Rehabilitation of 36 km from the local heating network system – ERDF funbding – to be implemented starting from 2019
- Replacement of the existing bulbs from all schools and high schools into the city with new LED systems – 2018 – 2019

8.2 Smart Solutions Selection

Description of replication potential of selected Smart Solutions of LCs within FC

The table below shows which solutions the Follower Cities plan to replicate.

		Follower Cities				
Area	***Smart Solutions***	*Porto*	*Graz*	*Cork*	*Valetta*	***Suceava***
Housing measures	*1. Efficient and smart climate shell refurbishment*		*X*	*X*		***X***
	2. Smart building logistics and alternative fuelled vehicles					
	3. Smart, energy saving tenants through information	*X*	*X*			***X***
	4. Smart local electricity production and integration with buildings and grid			*X*		***X***
Integrated measures	*5. Smart lightning, lampposts as hubs for communication*	*X*	*X*	*X*		***X***
	6. Waste heat and local heat integration by new business models		*X*			
	7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.	*X*				***X***
	8. Big data protocol for saving energy and improving the quality of life	*X*	*X*			
Mobility measures	*9. Sustainable delivery*				*X*	
	10. Smart traffic management					***X***
	11. Alternative fuel driven vehicles for decarburizing and better air quality	*X*		*X*		***X***
	12. Smart mobility solutions		*X*	*X*	*X*	***X***

8.3 Smart Measure selection

The table below specifies which smart (bundle of) measures within the 12 solutions each FC plans to replicate.

SC Measure	Measure title	Follower City Suceava
Low Energy Districts		
Solution 1 - Efficient and smart climate shell refurbishment		
1.1 - Energy efficient refurbishment of the building	Energy efficient refurbishment of residential buildings - Stockholm	X
	Climate shell refurbishment - Cologne	
	Energy quality assurance - Stockholm	
	New adaptative control and regulation techniques for heating systems - Barcelona	
	Re-build an industrial site: Ca l'Alier - Barcelona	
	Efficient and smart climate shell and equipment refurbishment - Barcelona	
	Efficient and smart climate shell refurbishment of residential buildings - Barcelona	X
	Efficient and smart climate shell and equipment refurbishment of tertiary buildings - Barcelona	
	Energy efficient swimming pools - Barcelona	
Solution 2 - Smart building logistics and alternative fuelled vehicles		
2.1 Integrated multimodal transport for construction materials	Construction consolidation centre - Stockholm	X
Solution 3 - Smart, energy saving tenants		
3.1 Active House/Home energy management system/Smart home system	Home Energy Management – Cologne	X
	The Active House – Stockholm	
	An Open Home Net – Stockholm	
	Hubgrade - Energy Saving Centre – Stockholm	
	Adaptive Temperature Control System - Stockholm	
	Home Energy Management System (HEMS) - Barcelona	X
	Virtual Energy Advisor - Barcelona	
	Dynamic Pricing Models - Barcelona (Stochastic Model of Appliances Energy Consumption)	
Solution 4 - Local renewable energy production and integration		
4.1 Virtual power plant	Residential Estate Management – Cologne	
4.2 Smart energy and self-sufficient block	Smart Energy & Self-Sufficient Block - Barcelona	
	Building Energy Management System (BEMS) to minimize consumption of fossil fuels and electricity -	

	Barcelona	X
Integrated infrastructures		
Solution 5 - Smart lighting, lamposts and traffic posts as hubs for comm.		
5.1 Smart streetlighting	Smart LED streetlighting - Stockholm	X
5.2 Combined electrical charging and street lighting poles + wifi	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Barcelona	
	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Stockholm	X
5.3 Smart meter information analysis and actuators	Smart Meter information analysis and actuators - Barcelona	
Solution 6 - New business models for district heating and cooling		
6.1 Open district heating with feed-in of waste heat	Open district heating – Stockholm	
6.2 District heating and cooling rings	District heating rings - Barcelona	
6.3 Smart local thermal districts	Smart local thermal districts – Barcelona	
Solution 7 - Smart waste collection, turning waste to energy		
7.1 Optical sorting of waste 7.2 Introduction of AWCS 7.3 Waste collection statistics for individual households/businesses	Smart waste management - Stockholm	X
Solution 8 Big open data platforms		
8.1 Big consolidated open data platform	Big consolidated open data platform - Stockholm	
	Big open data platform - Barcelona	
	Urban Cockpit – Cologne	
	Urban Traffic – Cologne	
	Urban Environment Cologne	
8.2 Urban models		
8.3 Semi-automatic instance mapping		
8.4 Integration of sensor and heterogeneous data in standard data format	Integration of sensor data in a uniform in standard-driven data format - Barcelona	
8.5 Sustainable connected lighting to enhance safety and mobility		
Sustainable Urban Mobility		
Solution 9 - Sustainable delivery		
9.1 Integrated multi-mode transport for light goods	Communal service boxes for sustainable deliveries – Stockholm	
9.2 Micro-distribution of freight	Micro distribution of freight - Barcelona	
Solution 10 - Smart traffic management		
10.1 Traffic management through MFD 10.3 Travel demand management	Smart traffic signals – Stockholm and Barcelona	X

10.4 Traffic control systems for passenger vehicles 10.5 Traffic signals synchronized to prioritize movement of goods		
Solution 11 - Alternative fuel driven vehicles		
11.1 Developing charging infrastructure	Normal charging infrastructure for electric vehicles – Stockholm	X
	Fast charging infrastructure for electric vehicles – Stockholm and Barcelona	X
	eTankE - Cologne	
	Vehicle to X (V2X) Charging for EVs - Barcelona	
11.2 E-mobility management system		
11.3 Charging infrastructure for electric tricycles for micro-distribution		
11.4 Refueling facilities for alternative heavy duty fuels	Alternative fuels for heavy duty vehicles – Stockholm	
11.5 Smart guiding to alternative fuel stations and fast charging		
11.6 Small distributed CNG grid	Small distributed CNG grid - Barcelona	
Solution 12 Smart mobility solutions		
12.1 Green parking index	Green parking index – Stockholm	
12.2 Electrical and cargo bike pool		
12.3 Mobility hub	Mobility Hub – Cologne	
12.4 Electrical and conventional car sharing		
12.5 Conventional/PHEV/CNG vehicle sharing fleets		
12.6 Smart taxi stand system	Smart taxi stand system - Barcelona	

8.4 Smart District Replication

As Suceava city is actually a medium size one we do consider that all the city area (52 kmp) could be named as”replication district“. Nevertheless, based on the last 10 years process of transformation, we will nominate the”Centru”district as the replication one for this project.

8.4.1 Smart District”Centru”Replication Profile

As Suceava city is actually a medium size one we do consider that all the city area (52 kmp) could be named as “replication district“. Nevertheless, based on the last 10 years process of transformation, we will nominate the “Centru“ district as the replication one for this project.

8.4.2 Mapping of district related replication framework for selected Smart Solutions

Q1 What are the main characteristics of the district and what is the replication potential?

The main information related the Centru district are :

- Population is about 25.000, but with the main public offices and private business located here, we can add a number of 2000- 5000 commuters per day
- The population structure here is about 37 % over 60 years, 47% 25 to 60 and 16% less than 25.
- The main public institutions buildings (from local and county level)are located in the district, together with a lot of banks, shops, central market, supermarkets,schools and high schools, restaurants, hotels
- Employment is mainly state 45 % – for public institutions and 55 % private sector
- The most important culture objectives are located here (including XV century monasteries and castle) the largest green areas are also here, the main leisure area and the only one 100% pedestrian street are here

There is a mixture of old apartments building (build in 1950 to 1980), new offices and shopping buildings (build after 1998) and a residential area with small old houses, most of them well preserved.

This specific document mentioned specific measures to be implemented in the district in order to improve the quality of life : rehabilitation of the old apartment buildings, of the lighting system, of the green areas, introduction of bikes lanes, extension of the pedestrian area, implementation of electro mobility concept, vehicle access restriction, increase the public transport accessibility.

In the past 15 years there were a lot of investments in rehabilitation of the district (streets, water and sewage network, public lighting, central heating system), traffic management and mobility efficiency.

There is still a strong demand of investments, mainly for the old apartment's buildings, for energy efficiency projects, efficient and smart climate refurbishment, smart waste collection, mobility management, sustainable delivery, smart lighting and alternative fuel driving vehicles.

Having in mind that this district includes the city centre there are still problems to be addressed in the field of traffic pollution reduction, delivery of goods, traffic management, smart local energy production including alternative sources of energy.

The district was included in the Local Sustainable Development Strategy in the Sustainable Energy Action Plan but also has its own Development Urban Plan created in 2013.

This specific document mentioned specific measures to be implemented in the district in order to improve the quality of life:

- rehabilitation of the old apartment buildings,
- rehabilitation of the lighting system,
- rehabilitation of the green areas,
- introduction of bike lanes,
- extension of the pedestrian area,
- implementation of electro mobility concept,
- vehicle access restriction,
- increase public transport accessibility.

ERDF funding are available for the period of 2015- 2020 also local and central budget funds could contribute to district development.

In the next 5 years Suceava Municipality would like to invest in projects for:

-rehabilitation of the second part of the city castle, rehabilitation of the main green area, replacement of the existing lamppost for public lighting (with LED technology), increase energy efficiency in private and public buildings, installation of charging points and EV's, electric buses for local public transport system, alternative fuelled vehicles for goods delivery, smart mobility solution (access restriction, extension of the pedestrian area).

Q2 Are there synergies and/or conflicts related to the Smart Solutions with the existing infrastructure, socio-economic profile and social acceptance?

Suceava Municipality is partner since September 2016 in the URBACT III project called: SMART IMPACT. This project aim is to create a local structure and group which will be able to define measures and actions regarding implementation of the SMART CITY concept in order to increase the efficiency and transparency of the local public authority activity.

Suceava municipality would like to benefit from the available existing funding opportunities – ERDF, national and regional funds (For example, central governmental funds for rehabilitation of public buildings or a possibility to access regional funds by forming an association of at least 2 municipalities for funding and implementation of common projects), private and public – in order to continue the implementation of the energy efficiency measures at local level (620 mil Eur available at the regional level for the period 2014 -2020, 85 % from the EU and 12% from the national budget):

SUMP and ISDS for the city of Suceava were designed and approved in 2017. These documents include measures, actions and indicators for future local development in the period of 2016 – 2023.
Two ongoing URBACT III projects, **FREIGHT TAILS** and **SMART IMPACT**, which are acting also in the field of developing local action plans for freight, traffic and smart measures to be implemented in Suceava city.

Starting from January 2017 Suceava Municipality is partner in INTEREG project called MOLOC –

"Low carbon urban morphology. New urban morphologies, new governances, new challenges for cities in energy transition". Through this new project in the next 3 years a Local Integrated Plan will be developed for Suceava City with measures regarding energy efficiency in resediential and public buildings. This new Plan will be used for future application in order to secure funding for implementation of energy efficiency projects.

Q3 How will local stakeholders be involved in the replication of Smart Solutions?

We do have a Local Support Group created in 2009 for the EVUE URBACT project and we do expect that the group will continue to be active and involved in Grow Smarter project also. The group has representatives from public institutions, private companies, local producers, NGO 's, university, consultancy companies, citizens associations,schools and high schools.This group was responsible

also for production of the Local Action Plans and we will invite also other potential members to join our local group (private companies mainly).

During the performing of the Sustainable Development Strategy there were meetings with citizens and district private companies.

The main interest is the sustainable development of the district, the reduction of traffic pollution, increase the quality of life, reduce unemployment and create a better environment for the young generation and for future private investments in the district.

We do expect to have a potential big interests from the young generation and possible few skeptical ideas and reaction from the oldest part of the inhabitants.

8.5 Smart measures Specification

8.5.1 Progress towards replication of measures/measures bundles within the selected district

Solution 1 – Efficient and smart climate shell refurbishment
1.1 Energy efficient refurbishment of the building
- Energy efficient refurbishment of residential buildings – Stockholm
- Efficient and smart climate shell and equipment refurbishment of residential buildings – Barcelona

Solution 2 – Smart building logistics and alternative fuelled vehicles
2.1 Integrated multimodal transport for constructions materials
- Construction consolidation centre – Stockholm

Solution 3 – Smart energy saving tenants
3.1 Active House/Home energy management system/ Smart home system
- Home Energy Management – Cologne
- Home Energy Management System (HEMS) – Barcelona

Solution 4 – Local renewable energy production and integration
4.2 Smart energy and self-sufficient block
- BEMS to minimize consumption off fossil fuels and electricity – Barcelona

Solution 5 – Smart lighting, lampposts and traffic posts as hubs for communications
5.1 Smart street lighting
- Smart Led street lightening – Stockholm
- Combined electrical charging and street lightning poles

Solution 7 – Smart waste collection, turning waste to energy
Smart waste management – Stockholm

Solution 10 – Smart traffic management
10.1 Traffic management
- smart traffic signals – Stockholm and Barcelona

Solution 11 – Alternative fuel driven vehicles
11.1 Developing charging infrastructure
- Normal charging infrastructure for electric vehicles – Stockholm
- Fast charging infrastructure for electric vehicles - Stockholm and Barcelona

8.6 Replication of bundle of measures 1.1

Q1 What is the replication potential of the Smart Measure(s)?

In order to achieve national objectives on climate change by 2020, necessary measures to be adopted correspond to the **Memorandum "Approval of the final values of Romanian objectives for Europe 2020 strategy"**, signed by the Romanian Government on June 8th, 2010.

The main measures concern the following areas:

- *development of institutional capacity in the field of energy and climate change;*
- *reduction of greenhouse gas (GHG) emissions by promoting carbon capture and storage technology (CCS);*
- *increase the share of renewable energy in the final energy consumption;*
- *increase energy efficiency.*

Romanian Energy Strategy for the period 2011 - 2020 will aim at fulfilling the main objectives of the new Energy - Environment Policy of the European Union, objectives also assumed by Romania.

The main directions of action of Romania's energy strategy, converging with the EU energy policy, are:

- choose a balanced energy mix, meant to provide the energy sector with competitiveness and security of supply with a focus on internal resources, namely coal, harness able economic hydropower potential, nuclear power potential and renewable energy sources potential;
- effectively manage and rationally use in safe condition exhaustible primary energy sources in Romania and maintain an acceptable level (in terms of economy and security) of the primary energy sources import (limited / controlled dependency);
- increase energy efficiency on the entire chain: extraction - production - transport - distribution - consumption; Romania no longer affords to waste energy while the sources of energy have a reduced availability and increased cost; energy efficiency is the most cost-effective way to reduce emissions, improve safety and lower competitiveness and energy service bill;
- promote energy production from renewable sources, so that the share of electricity produced from these sources in total gross electricity consumption would be 33% in 2010, 35% in 2015 and 38% in 2020;
- promote the use of renewable energy sources in accordance with EU practices, based on the National Allocation Plan in terms of renewable energy drawn up in 2010;
- create market conditions meant to stimulate greater energy savings and increased investment in low carbon technologies;
- facilitate investment in those projects that contribute to achieving the objectives set for 2020 according to EU policy;
- achieve objectives of environmental protection and reduce emissions of greenhouse gases.
- support research, development and dissemination of research results applicable in the field of energy.

There is a strong political support at local level for implementation of measures concerning energy efficiency. Also the citizen's level of awareness regarding the positive impact of the energy efficiency

measures is quite high and it is expected to increase in the next period of 5 to 15 years, so the people's support to measures like the one in the project is it expected to be at a medium to high level.In the past 10 years our experience of working with local stakeholders shows that there is a significant support for investments that could contribute to reduce the environmental impact of human activities.

The local development strategies, regional, national and European policies encourage and support local authorities in the implementation process for energy efficiency measures. The environmental impact of almost all actions undertaken by our local public authority is quantifiable and also taking into consideration not only because of"fashionable behavior"reasons but for the fact that immediate and adequate actions are needed in the process of improving the quality of life into the city.
There is a huge need for actions regarding energy efficiency in public and private buildings at local level , as the majority of these were built in 1960 – 1980, and the quantity of the non recoverable energy is quite high and the energy consumption is also at a very high level.

Feasibility studies for energy efficiency in public buildings (Town Hall and schools), private buildings (apartments blocks) are under designing phase and are expected to be finalized in the second half of 2017. There are close to 200 apartments and 1400 mp of public buildings which will be rehabilitated.
The technical documentation and application dossier will be send to the MA for ERDF programme 2014– 2020 as calls for projects are opened already and this kind of actions are eligible for local municipalities.

If application will be successful the grant contract will be signed in the first half of 2018 and works are to be completed till end of 2020.

Q2 What is the business case and do financing opportunities already exist?

8.7 Smart solution: Efficient and smart climate shell refurbishment

In the past 5 years in Suceava there were construction works for rehabilitation of 380 apartments (structure, heating system) in order to reduce the waste of energy and to improve energy efficiency using 0,864 million Euro – (central government not reimbursable funds).
For the moment we are working for the technical documentation necessarily for ERDF funding for rehabilitation the educational infrastructure (in order to reduce the energy consumption and improve energy efficiency – heat recovery and green energy production) and also for 200 apartments - using ERDF funds. It is expected that till 2020 these projects will be implemented.
The central market will be rehabilitated: Introduction of utility systems (especially lighting and heating) using alternative, renewable power sources. The rehabilitation process already started with construction works for the structure (walls and main roof).

- Currently our municipality has already finished several technical documentation (strategies, feasibility studies) for the implementation of the proposed measures. For almost all of them implementation request a technical execution project and these documents are not available yet.
- For the measures like: EV's, charging points, rehabilitation of the public lighting system, extension of the pedestrian"zero emission area", rehabilitation of the streets infrastructure and of the main central market we do have already secured the grant contracts, the technical

documentations are available and in the second part of 2015 we will expect to sign the agreement for construction works.

- For other measures like: introduction of electric busses, establish of solar panels, rehabilitation of the municipal buildings and apartments buildings our municipality intention is to apply for ERDF funding.
- In this case we do expect that, soon after the application calls will be open – july 2015, we will start the process of preparation the technical documentation, we will prepare the requested documents and will apply for ERDF funding in 2016.
- Usually, if successful, the evaluation period is 6 -9 months, so 2017 could be the starting point for projects implementation.
- Even we mentioned the ERDF funds as the main source for financing our local proposed measures there need to be also a substantial (up to 15 %) contribution from local budget and we do expect to have access also on central budget for the next 5 – 10 years.
- Regarding technological barriers, as concepts like electric vehicles, charging points, solar panels are quite new and less developed at local and national level, we do expect to have few problems during the implementation phase. In the same time we do count on our previous experience from other European projects that created the premises for transfer of best practice and knowledge from more advanced city partners around Europe.
- We do expect that the implementation of the smart measures (especially electric vehicles, charging points, alternative energy production and waste recycling) will determine a development of local and national market for the companies that are dealing with these innovative and new technologies. Also we do expect that this new technologies will determine the development of the local jobs market with benefits not only at local but also on regional and national level.

The Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at"Increase of Economic Competitiveness" incorporating:

- Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
- Priority Axis 3.1 :"Supporting energy efficiency, smart energy management and renewable energy used in public infrastructures, including public buildings and housing sectors"
- Priority Axis 4.2 : Capitalisation of Renewable Energy Resources

Q3 What are the main challenges and barriers related to the measure(s)?

The governmental financing authority established a strict set of rules and procedures for the awarding of the non reimbursable funds. These rules, which include several specific actions to be undertaken, including several compulsory activities and interventions, which significantly increase the rehabilitation costs of the buildings in general the costs for rehabilitation of the buildings is quite high.

ERDF rules impose that the private owners (private individuals or association of residents) need to to have their own contribution to the total costs, up to 15 %. There are situations when implementation of the project is blocked due to the fact that owners are unable/unwilling to provide the necessary co-financing.

According to ERDF regulations the local authority needs to co finance 25 % of the total costs and in this case decision regarding prioritize of the projects and time schedule depend on the cash flow and funds available from the local budget.

As the procurement procedures are quite difficult and time consuming, complains are very often present during development of the tender procedures, the road from the grant contract and start of the construction works could be a long oneand this could conduct to delays in the implementation of the project.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The smart proposed solution will be integrated with already existing implemented measures for increase energy efficiency for apartments buildings (reduce energy consumption, central heating using biomass for heat and energy production), rehabilitation of the central market and other public buildings, production of the energy from the renewable sources, rehabilitation of the heating network system.

Q5 What user / stakeholder involvement is foreseen?

We do have a Local Support Group created in 2009 for the EVUE URBACT project and we do expect that the group will continue to be active and involved in Grow Smarter project also. The group has representatives from public institutions, private companies, local producers, NGO 's, university, consultancy companies, citizens associations, schools and high schools. This group was responsible also for production of the Local Action Plans and we will invite also other potential members to join our local group (private companies mainly).

- During the performing of the Sustainable Development Strategy there were meetings with citizens and district private companies.
- The main interest is the sustainable development of the district, the reduction of traffic pollution, increase the quality of life, reduce unemployment and create a better environment for the young generation and for future private investments in the district.
- We do expect to have a potential big interests from the young generation and possible few skeptical ideas and reaction from the oldest part of the inhabitants.

Q6 What is the potential implementation timeframe?

2017 – 2023

8.8 Replication needs of Smart City Measure(s)

Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

Our main purpose is to find out more information, best practice example or any suggestions from the leading cities, about:

- How is it working the process of getting the political approval for a new investment with some innovative technologies like the smart measures?
- Any already successful"recipes "for implementation of a smart measure would be very useful for a city like Suceava which already expressed the wiliness of becoming a smart city

- We do expect to be able to learn more about the introduction of measures that conduct to improve energy efficiency and for this reason we would like to transfer the best practice and experience from the city of Barcelona, not only for the rehabilitation of the residential and municipal buildings but also in being able to develop facilities at local level for"technological parks"for companies which will invest in new green technologies in order to develop the local market and to create new jobs
- One of our smart measures is in connection with the lighthouse cities measures like Home Energy Management Systems that will be installed in a pilot residential and municipal building, visualizing and manage energy consumption.
- City of Stockholm and the measures to be implemented in this project is a very reliable example of a"state of the art"example for mobility management and actions to avoid traffic congestion and to reduce traffic emissions.Our goal in this project is to transfer the best practice from Stockholm mainly in connection with the cycling facilities and traffic management and before these in connection with alternative solution for public transport (biogas or electric busses) in order to increase the number of passengers, reduce the car dependency, avoid traffic congestion and change people's behavior regarding mobility habits
- The aim of Suceava city measures is to replicate the lighthouse city experience (Stockholm in this case) in order to substitute the car in other trips, that are less regular and more individual.
- Our goal is to offer different and alternative solutions completing the existing public transport network like bike pools, e-bikes, EV-pools.
-

We consider that a successful preparation of the follower cities for replication of the smart measures involved meetings with both representatives from the public sector (procurement, technical, economic and design also) and with representatives from the private sector (consultancies, constructors, car dealers, retailers, providers for technologies and equipment).

Beside of these we consider that future links between local private sector and the same one from the lighthouse cities could contribute to development of local and European market but in the same time could facilitate the implementation and transfer of smart measures to the follower cities.
Of course that the site visits to a power plans or a recently refurbished neighborhood could be useful for us but in the same time we do consider that there is a strong demand in a cooperation between follower cities which can benefit each other and also provide necessarily technical support during the replication of smart measures process.

8.8.1 Replication of bundle of measures 2.1 - Integrated multimodal transport for constructions materials

Q1 What is the replication potential of the Smart Measure(s)?

Smart solution included in the new SUMP elaborated for the city of Suceava. Overall, there is a very good replication potential for replicating Smart Solution 2.1, as outlined here.

During the last 15 years a number of important changes have been made at the local level in terms of the aspect and spatial development of the inner city commercial area. The redefinition of the central market square (underground parking) with pedestrian priority in the Marasti and part of the Enescu streets has had the most impact on city life and traffic calming. In parallel however the fact that services, the construction sector and general goods delivery activities have significantly increased over the last decade means that the number of vehicles entering and transiting the city also

continues to increase (especially vehicles involved in goods delivery). Traffic congestion and level of air pollution is a major concern for local authorities.

In this situation the Municipality continues its aim of supporting local growth and (economic) local development but to achieve this through a sustainable approach to servicing and distribution. Freight TAILS is regarded as an opportunity to initiate and deliver appropriate local actions, measures and regulation for freight delivery (timing, routes, access, speed, weight, restrictions).

In order to achieve this it is recognised that a number of challenges will be encountered and that understanding and capacity will require to be developed across the whole (public/private) governance spectrum. This includes focussed consideration of the following aspects in the case of Suceava:

- Increasing local stakeholder confidence in sustainable freight system implementation in the city
- Increasing local stakeholder awareness and knowledge about the impact of conventional freight and other traffic in terms of the environmental consequences and effect on people's daily life, public health etc.
- Introduction of a delivery consolidation system for Suceava city
- Planning innovative measures to reduce the overall demand of road trips, to make freight movements sustainable and efficient, optimising support for local business development, but at the same time making delivery processes cleaner, safer and much more friendly for city life
- Creation of a local stakeholders' network and a commitment platform, regarding all future measures meant to initiate freight delivery implementation
- Awareness raising of applicable green energy sources, energy efficiency and alternative and sustainable modes of transportation (including freight)
- Introduction of local regulation for freight delivery (time schedule, routes, weight, access, speed)
- Implementation of specific actions for local sustainable mobility

The work already carried out in the EVUE project to plan for introduction (public transport) and encouragement of e-mobility has inspired the Municipality to extend this stimulation to the urban freight transport sector. However the development phase of the Freight TAILS project already provided some important insight into the problematic of establishing an integrated and sustainable regime for city logistics. In terms of generating support, raising awareness and engaging with operators and clients as well as designing a package of mutually reinforcing measures the conclusion is that the most useful type of Integrated Action Plan for Suceava at this stage would be development of a strategic policy document to look at the challenge in a holistic way. In this optic the option is to use the operational phase to elaborate a Sustainability Urban Logistics Plan engaging with private actors to reach joint agreement on project objectives outputs and results. Pursuit of electric or alternative fuelled last mile logistics can still form an important part of this policy orientation and can even be subject of pilot activity.

Integrated Action Plan for freight distribution will be finalized till March 2018 with actions for local level – including Consolidation Centre – designed together with the stakeholders which are part of the URBACT Local Group and the areas of intervention will be linked to the commercial areas of the city (supermarkets, open markets, pedestrian zone).

Q2 What is the business case and do financing opportunities already exist?

In 2013 Suceava Local Council approved a Sustainable Energy Action Plan (SEAP) regarding energy efficiency, implementation of projects regarding increase of alternative energy usage at local level and implementation of the electro mobility concept. The main objective of SEAP is to reduce the greenhouse gas emissions by at least 20% by 2020 and to promote the investments carried out within Suceava Municipality which can lead to an efficient use of energy by improving the existing energy performance or the development of constructions, installations, transport, equipment and technologies enjoying high energy efficiency, including feasible renewable energy sources.

SEAP is the methodology according to which Suceava Municipality will reach its objectives by 2020, using the results of BEI (Baseline Emission Inventory) in view of identifying the best fields of action and the best existing opportunities in order to meet the local objective of reducing CO_2 emissions.
SEAP concerns measures within the competence and reach of local authorities. Therefore, local authority is expected to play an exemplary role and consequently to take outstanding measures related to the local authority's own buildings and facilities, public and private fleets, producing energy from renewable sources, urban sustainable mobility etc.

According to the Sustainable Energy Action Plan, Sustainable Urban Mobility Plan and Local Development Strategy in the next 20 years the municipality will have to focuses on the following fields:

- Transport (municipal fleet, public, private and commercial fleets - including freight);
- Urban planning (strategic urban planning, sustainable mobility urban planning, development of local regulations to support sustainable mobility);
- Procurement (local energy-efficiency regulations, local regulations on the utilization of renewable energy sources);
- Electric vehicles (private and public) and electric busses for public transport

In the past 5 years a number of studies and strategies were approved at local level: Urban Integrated Development Plan – 2010, Urban Sustainable Mobility Plan – 2014 , Sustainable Energy Action Plan – 2012, Local Action Plan (electro mobility) – 2012 in order to implement a sustainable development of the city, reduce traffic congestion and air pollution.

As it is demonstrated by the city of Barcelona, urban freight consolidation centres can be operated on a fully commercial basis. The same way, Suceava's SUMP which was finalized in 2017, includes, among other measures regarding improvement of traffic management into the city, the smart solution which consist in building of a Consolidation Centre, which will be operate by a private company.This Centre will act as a transfer station for all goods which need to be distributed into the city of Suceava and will be linked with a set of new local regulation regarding freight delivery (time schedule, routes, weight) with the general objective of the reduction of the traffic volume and traffic emissions in the city of Suceava.

The Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at "Increase of Economic Competitiveness" incorporating:

- Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
- Priority Axis 4.1 : Promotion of Local Sustainable Mobility Plans and Strategies for Reduction of CO^2 Emissions
- Priority Axis 4.2 : Capitalisation of Renewable Energy Resources
- Priority Axis 3.1 :"Supporting energy efficiency, smart energy management and renewable energy used in public infrastructures, including public buildings and housing sectors"

Q3 What are the main challenges and barriers related to the measure(s)?

- Procurement procedure for the local operator/operators of the consolidation centre it is expected to be long and difficult

- We do expect to have some opposition from the local and national freight delivery companies, the shop owners and other business which could be potentially affected by the new local regulation regarding freight delivery and consolidation centre

- New sets of local transport and delivery regulations (weight, time schedule, routes, access) need to be approved by the local council and implemented at local level

- There could be potential delays in project implementation as the construction of the consolidation centre could be eider 100 % financed from the local budget or through PPP, because there are no ERDF funds available for this smart solution

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

Building Energy Management Systems to minimize consumption of fossil fuels and electricity

Q5 What user / stakeholder involvement is foreseen?

In the various policy documents already produced by the city and shaping city management, planning and concrete intervention some fundamental key objectives can be identified as a reference base for action, namely:

- To reduce the overall demand of road delivery trips but also make the freight movement sustainable, efficient, safer and cleaner
- To reduce the traffic congestion and accompanying air pollution
- To implement a delivery consolidation system at local level
- To implement a local regulation for goods delivery

The Municipality would like to build a Consolidation Centre with 2 or 3 alternative possible locations in order to reduce the traffic congestion and the number of freight vehicles entries into the city centre, residential areas and commercial areas.

Members of the Freight TAILS Local Group will represent the following stakeholder groups/organisations building on the"Local Stakeholder Group" established to follow the EVUE and EVUE II URBACT projects, which is still active in supporting formulation of mobility policy and action in Suceava:

- Public transport (operators and associations of operators)
- Public institutions (Department of Environmental Protection, County Administration, local traffic police)
- Local media (newspaper, local radio)
- Private Sector including car dealers and companies that have activities related to freight distribution, logistics operators
- Non-governmental Organizations (researchers, environment protection activists, human resources development)

- Education centres (high-schools, university of electric engineering and public administration, organization of students)
- Local decision makers (Suceava Local Council, leading staff of Suceava Town Hall)
- Retailers and shopping centre management

We do expect to have some less supportive stakeholders groups which are connected with local and regional freight and distribution companies, as some of the new regulation regarding freight and Consolidation Centre could determine significant changes and impacts over their business.

Q6 What is the potential implementation timeframe?

2020 - 2023

8.8.2 Replication of measure 3.1 – Home energy management systems

Q1 What is the replication potential of the Smart Measure(s)?

In order to achieve national objectives on climate change by 2020, necessary measures to be adopted correspond to the **Memorandum "Approval of the final values of Romanian objectives for Europe 2020 strategy"**, signed by the Romanian Government on June 8th, 2010.

The main measures concern the following areas:

- *development of institutional capacity in the field of energy and climate change;*
- *reduction of greenhouse gas (GHG) emissions by promoting carbon capture and storage technology (CCS);*
- *increase the share of renewable energy in the final energy consumption;*
- *increase energy efficiency.*

Romanian Energy Strategy for the period 2011 - 2020 will aim at fulfilling the main objectives of the new Energy - Environment Policy of the European Union, objectives also assumed by Romania.

The main directions of action of Romania's energy strategy, converging with the EU energy policy, are:

- choose a balanced energy mix, meant to provide the energy sector with competitiveness and security of supply with a focus on internal resources, namely coal, harness able economic hydropower potential, nuclear power potential and renewable energy sources potential;
- effectively manage and rationally use in safe condition exhaustible primary energy sources in Romania and maintain an acceptable level (in terms of economy and security) of the primary energy sources import (limited / controlled dependency);
- increase energy efficiency on the entire chain: extraction - production - transport - distribution - consumption; Romania no longer affords to waste energy while the sources of energy have a reduced availability and increased cost; energy efficiency is the most cost-effective way to reduce emissions, improve safety and lower competitiveness and energy service bill;
- promote energy production from renewable sources, so that the share of electricity produced from these sources in total gross electricity consumption would be 33% in 2010, 35% in 2015 and 38% in 2020;
- promote the use of renewable energy sources in accordance with EU practices, based on the National Allocation Plan in terms of renewable energy drawn up in 2010;
- create market conditions meant to stimulate greater energy savings and increased investment in low carbon technologies;

- facilitate investment in those projects that contribute to achieving the objectives set for 2020 according to EU policy;
- achieve objectives of environmental protection and reduce emissions of greenhouse gases.
- support research, development and dissemination of research results applicable in the field of energy.

There is a strong political support at local level for implementation of measures concerning energy efficiency. Also the citizen's level of awareness regarding the positive impact of the energy efficiency measures is quite high and it is expected to increase in the next period of 5 to 15 years, so the people's support to measures like the one in the project is it expected to be at a medium to high level.In the past 10 years our experience of working with local stakeholders shows that there is a significant support for investments that could contribute to reduce the environmental impact of human activities.

The local development strategies, regional, national and European policies encourage and support local authorities in the implementation process for energy efficiency measures. The environmental impact of almost all actions undertaken by our local public authority is quantifiable and also taking into consideration not only because of"fashionable behavior"reasons but for the fact that immediate and adequate actions are needed in the process of improving the quality of life into the city.

There is a huge need for actions regarding energy efficiency in public and private buildings at local level , as the majority of these were built in 1960 – 1980, and the quantity of the non recoverable energy is quite high and the energy consumption is also at a very high level.

Feasibility Studies are designed for rehabilitation of private and public buildings and the measured proposed to be implemented include also installation of HEMS. Also for the new public buildings which will be constructed at local level HEMS are compulsory to be considered, designed and installed.

The project for replacement of the existing bulbs with LED systems into the schools and high schools from Suceava city, which is funded through Swiss Romanian Cooperation program and will be implemented since the second half of 2017, does include also HEMS.

Suceava Municipality will implement in the next 3 years a regional project concerning energy efficiency in residential and public buildings. Within this projects there will be meetings with local and regional stakeholders and much more important, local public authority will developed several dissemination campaigns regarding the impact of HEMS among the energy consumption, energy efficiency and the quality of life.

There are national regulation which established that implementation of the measures regarding increase of energy efficiency in particular for public and residential buildings are compulsory.

Q2 What is the business case and do financing opportunities already exist?

Smart, energy saving tenants through information

In the next 4 years Suceava Municipality is planning to develop pilot Home Energy Management Systems for public buildings (schools, cultural centers, apartments buildings) in order to promote among public servants, children and citizens "smart energy behavior" that is expected to conduct to

reduction of energy consumption, friendly attitude to environment and also test the citizens availability to implement future measures concerning energy efficiency improvement.

"Green education" of peoples and especially young people by means of promotion, public information campaigns, invention projects and by setting up a class curricula within school programs for professional trainings

Similar actions described for measure 1.1 need to be fulfilled in order to complete the implementation of the activities related to this smart solution.

ERDF funding opportunities are open and available for local authorities till the end of 2021 for implementation of activities connected with this smart solution and also national governmental funding schemes are available.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at"Increase of Economic Competitiveness" incorporating:

- Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
- Priority Axis 3.1 :"Supporting energy efficiency, smart energy management and renewable energy used in public infrastructures, including public buildings and housing sectors"

Q3 What are the main challenges and barriers related to the measure(s)?

As the financing authority established a strict set of rules and procedures for the awarding of the non reimbursable funds, rules which include several specific actions to be undertaken, several compulsory activities and intervention in general the costs for rehabilitation of the buildings is quite high.

ERDF rules impose that the private owners (individual or association of residents) need to have their own contribution to the total costs, up to 15 % , there are situation when implementation of the project is blocked due to the fact that some of the already mentioned rules are not fulfilled or agreed by the owners.

Home Energy Management Systems are quite a new and not very well developed at national and local level. The market exist but still not well developed and the costs for procurement and installation of this equipments is still high and the majority of the population could not afford it.

According to ERDF regulations the local authority needs to co finance 25 % of the total costs and in this case decision regarding prioritize of the projects and time schedule depend on the cash flow and funds available from the local budget.

As the procurement procedures are quite difficult and time consuming, complains are very often present during development of the tender procedures, the road from the grant contract and start of the construction works could be a long one and this could conduct to delays in the implementation of the project.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The smart proposed solution will be integrated with already existing implemented measures for increase energy efficiency for apartments buildings (reduce energy consumption,central heating

using biomass for heat and energy production), rehabilitation of the central market and other public buildings, production of the energy from the renewable sources(as solar panels and waste disposal), rehabilitation of the heating network system.

Q5 What user / stakeholder involvement is foreseen?

- increase of energy efficiency, reduction of CO2 emissions, reduce the energy costs, improve the quality of life, change in people behavior regarding energy and environment, reduce the costs from the local budget for heating and lighting of the public buildings

- we do expect to be able to learn more about the introduction of measures that conduct to improve energy efficiency and for this reason we would like to transfer the best practice and experience from the city of Barcelona, not only for the rehabilitation of the residential and municipal buildings but also in being able to develop facilities at local level for ”technological parks”for companies which will invest in new green technologies in order to develop the local market and to create new jobs.

- even the benefits both for environment, quality of life and own budget is easy understandable and accepted by the majority of the residents and decision makers, the fact related to the significant, still, cost of the HEMS could determine delays in implementation and less supportive groups.

- Local companies dealing with energy production and distribution, EPA, NGO’s, consultants, constructions companies, manufacturers , local university (mainly for technology and energy).

Q6 What is the potential implementation timeframe?

2018 - 2023

8.8.3 Replication of bundle of measures 4.2 - Smart energy and self-sufficient block

Q1 What is the replication potential of the Smart Measure(s)?

As it is outlined below, there is a very good replication potential of these measures, due to the high national and local political commitment to increase the use of renewable energy sources. The production of energy from alternative sources is encouraged and financially supported by the central government, as Romania has to reach the reduction of CO2 emission with 20 % till 2020 according to the European agreements already signed.

The strategy for renewable energy sources valorisation approved by the Government Decision no. 1535/2003 has transposed into Romanian legislation the Directive 2001/77/EC. Therefore, valorisation of renewable energy sources is thus a major policy objective of the European Union, and thus Romania enrolled in the context of gradually renouncing to the use of conventional fuels and obtaining energy independence from foreign sources of energy.

Romania has a great potential of renewable energy sources due to its geographic location, as follows:

- solar energy - the exploitable potential of producing electricity by photovoltaic systems is about 1.200 GWh / year; the Southern Plain and Dobrogea are representative areas in this sense;

- ❖ wind energy - the wind energy potential is high in the Black Sea coast, highlands of Moldova and Dobrogea and mountain areas. In these areas, wind turbines can be installed with a total power of 14.000 MW;
- ❖ biomass - biomass energy potential is high across the country, estimated at about 7.594 thousand toe / year, which represents almost 19% of total primary energy consumption in 2000. About 54% of the heat produced from biomass is obtained from burning forest residues;
- ❖ geothermal energy - now about 70 pumps for hot water (with temperature above 60˚C) in different geographical areas. Geothermal reserve with current mining possibilities in Romania is around 167 thousand toe; West Plane and South Plane are representative areas in this sense.

National Renewable Energy Action Plans (NREAP) 2010 and promotion programmes

National Renewable Energy Action Plans (NREAP) 2010 contain the general objectives of the renewable energy source valorisation strategy, as follows:

- integrate renewable energy in the national energy system structure
- reduce technical, functional and psychosocial barriers in the use of renewable energy and, at the same time, identify cost and economic efficiency elements
- promote private investments and create conditions to facilitate access of foreign capital on renewable energy markets
- ensure independence of the national economy energy consumption
- ensuring, where necessary, energy supply for isolated communities by valorising local renewable energy potential
- create conditions for Romania's participation on the European market of"green certificates" for renewable energy.

There is a strong political support at local level for implementation of measures concerning energy efficiency. Also the citizen's level of awareness regarding the positive impact of the energy efficiency measures is quite high and it is expected to increase in the next period of 5 to 15 years, so the people's support to measures like the one in the project is it expected to be at a medium to high level.In the past 10 years our experience of working with local stakeholders shows that there is a significant support for investments that could contribute to reduce the environmental impact of human activities.

The local development strategies, regional, national and European policies encourage and support local authorities in the implementation process for energy efficiency measures. The environmental impact of almost all actions undertaken by our local public authority is quantifiable and also taking into consideration not only because of"fashionable behavior"reasons but for the fact that immediate and adequate actions are needed in the process of improving the quality of life into the city.
Production of energy from alternative sources is encouraged and financial sustained by the central government as Romania has to rich the reduction of CO2 emission with 20 % till 2020 according to the European agreements already signed.

As an example for a concrete measure, a feasibility study for the construction of a photovoltaic park in the city – with solar panels and special grid – will be conducted in the next 2 years. ERDF requirements for secure funding need to be followed in the next 4 years in order to start the project implementation.

Q2 What is the business case and do financing opportunities already exist?
Smart solution: Smart local electricity production and integration with buildings and grid

Local strategies and development plans include measures to increasing the local dependency on renewable electricity. Main funders include the Romanian Government, Swiss Government, ERDF and ESF. In the next few years the following actions will be implemented from these funds:

- establish a photovoltaic panels grid for own municipal needs - ERDF funds till 2021

- photovoltaic panels will be installed in 2017 in order to provide the amount of energy necessarily for the charging station for the electric bikes (**co–financed (80%) by the** Government of Switzerland through the Swiss-Romanian Cooperation Programme)

- alternative sources of energy for heating and lighting of the public local markets (food and local products mainly) like : mounting of systems providing the lighting and heating demand for three markets in Suceava, implementing the heating system to heat the halls in the Commercial Complex Bazaar - water-water system (geo-thermal power), mounting of inside heating systems and appropriate thermal insulation, mounting of photovoltaic panels in the three markets in Suceava, information of traders and citizens on the alternative solutions to provide the thermal power, introduction of equipment providing the optimization and reduction of power consumption (light sensors, heat distributors, etc.), implementation of systems providing the rain water and domestic water recycling and reuse in an integrated mechanisms for cost efficiency, consumption reduction and protection of natural resources.

- photovoltaic panels will be installed till 2020 in order to provide the amount of energy necessarily for the public lighting into the parks and green areas from the city of Suceava (**co–financed (80 %) by the** Government of Switzerland through the Swiss-Romanian Cooperation Programme)

- rehabilitation of the Bazaar Commercial Centre (own by Suceava Municipality) – the main commercial building will be rehabilitated in order to increase the usage of daily lights, to reduce the waste of energy and also geothermal underground pumps will be introduced in order to provide the necessarily amount of heating by using alternative sources of energy. (**co–financed (80 %) by the** Government of Switzerland through the Swiss-Romanian Cooperation Programme) - 2022
  The Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

  The most relevant programme with potential association to the Smart solution is the Operational Programme directed at"Increase of Economic Competitiveness" incorporating:

  - Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
  - Priority Axis 4.2 : Capitalisation of Renewable Energy Resources
  - Priority Axis 3.1 :"Supporting energy efficiency, smart energy management and renewable energy used in public infrastructures, including public buildings and housing sectors"

  There are Feasibility Studies performed for the Smart solution mentioned above but some of these technical documentations need to be updated and prepared for existing funding opportunities.

Q3 What are the main challenges and barriers related to the measure(s)?

According to ERDF regulations the local authority needs to co finance 25% of the total costs and in this case decision regarding prioritize of the projects and time schedule depend on the cash flow and funds available from the local budget.

Photovoltaic systems are quite a new and not very well developed at national and local level. The market exist but still not well developed and the costs for procurement and installation of this equipments is still high and the majority of the population and public authorities could not afford it.

As the procurement procedures are quite difficult and time consuming, complains are very often present during development of the tender procedures, the road from the grant contract and start of the construction works could be a long one and this could conduct to delays in the implementation of the project.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

The smart proposed solution will be integrated with already existing implemented measures for increase energy efficiency for apartments buildings (reduce energy consumption, central heating using biomass for heat and energy production), rehabilitation of the central market and other public buildings, production of the energy from the renewable sources(as solar panels and waste disposal), rehabilitation of the heating network system.

Q5 What user / stakeholder involvement is foreseen?

- We do expect to have a wide range of support from the local stakeholders for introduction of these smart solutions as these measures objective are connected to reduction of energy consumption and improving the quality of life into the city

- Topics include: reduction of energy consumption and CO2 emissions , increase the usage of alternative energy, development of a local market for alternative energy solution and equipments, reduce the costs for public lighting for the local budget, development of the local job market

Q6 What is the potential implementation timeframe?

2017 – 2020

8.8.4 Replication of bundle of measures 5.1 and 5.2 2 - Smart street lighting and combined electrical charging

Q1 What is the replication potential of the Smart Measure(s)?

Replication is already in progress in Suceava, both with regards to LED lighting as well as with creating an infrastructure for e-mobility. The modernization of the public lighting infrastructure in Suceava municipality is the project which is under implementation phase at the moment.

Suceava Municipality also plans to continue the development of the vehicle charging infrastructure in the following years and one of the Smart solution which was taken into consideration is: combined electrical charging and street lighting poles. We need to perform a Feasibility Study, to evaluate the financial impact, to design the technical documentation and to find the appropriate source of financing the project implementation.

The following section summarises the current situation, first about smart lighting, then about e-mobility.

Indicators for the realization of the general objective:

- Power consumption related to the municipal public lighting reduced by at least 1,814 MWh/year (strictly referred to the replacement of the lighting units[22])
- CO2 emissions related to the municipal public lighting reduced by at least 1,271 t/year (strictly referred to the replacement of the lighting units)
- The number of projects in the energetic field in Suceava municipality increased by at least 1 until 2017

Specific objective The modernization of public lighting on the entire areal of Suceava municipality[23] in view of obtaining power savings as a response to the policy of climatic changes, including the increase of citizens' safety and comfort

Indicators for the realization of the specific objective:

- The number of lighting units with LED technology newly introduced in the municipal lighting system increased with 4.300 until the end of the project implementation
- The number of telemanagement systems of lighting units implemented in the municipal lighting system increased by 1 at the end of the project implementation
- A reduction of at least 10% of the crimes committed during the night as a result of the project implementation

The project „Electro-mobility – electric vehicles for a „green" municipality" is included in the list of priority projects mentioned in the SEAP, having as priority status (after the EEA procedure): HIGH PRIORITY. The SEAP list of priority projects came in direct response to the development options mentioned by all dialogue partners and which the community must address in the following period: the priorities set forth by the stakeholders, the general and specific opinion of the population, the opportunities provided by the ongoing access to European funds through operational instruments, as well as the priorities of local government political plans were considered..

The project outline described in SEAP was approved with conditions, and subsequently, on 12.09.2013 the Assistance Agreement by means of the Project Preparation Facility was signed.

From November 2009 to January 2013, Suceava Municipality has implemented the project EVUE Electric Vehicles in Urban Europe, developed under the URBACT programme, which aims to change the mentality of citizens on road traffic and passenger transport in view of supporting the use of green transport modes, especially electric, in order to reduce pollution caused by road traffic. By means of this project, Suceava Municipality plans to become a pioneer in introducing electric vehicles in the public and private sector in Romania, also having in view to set up additional measures to create an appropriate operating system as part of an integrated electric mobility strategy.

Suceava Municipality will implement a Dispatch office that will manage the entire system of charging electric cars. By means of RFID cards that can be purchased from the specialized offices of the Mayoralty based on a contract, chargers can be unlocked and the municipal vehicles can be charged, as well as the vehicles of citizens who purchased the cards. Through GPRS communicators, data will be transmitted to the central dispatcher which will meter every action to access the system following

that monthly internal settlements will be performed (within the Mayoralty - for their own cars) and between the Mayoralty and the citizens who procured the cards.

Each standard or fast charging point, when an RFID card is used, will unlock the protection of the charging socket, releasing the terminal to plug in the cable.The construction works related to the electro-mobility system proposed to be carried out under the project are structured on 4 objects:

Object 1 – STANDARD CHARGING POINTS

- Setting up a standard charging point (14 standard charging points – SCP) – having a longer charging duration, the standard charging network will be primarily located where the electric vehicles procured by the municipality will be parked, namely at the headquarters of institutions they are assign to. The operating conditions of the electric vehicles procured under the project allow for a longer parking time, for example during the night; The electric power of the standard chargers is 7,4kW.
- These EV charging services will be monitored in a centralized way, by means of a Dispatch Office, implemented within the Energy Office of Suceava Municipality.
- For each charging point, both fast and standard, two parking spaces will be set up, for which there will be road signs and road markings.

Object 2 – FAST CHARGING POINTS

- Setting up a fast charging network (14 fast charging points - FCP) – Having a maximum 2-hour duration, (depending on the characteristics of the electric vehicles), this network will be uniformly distributed within the municipality, in the most crowded urban areas. These fast charging points will be used by the municipal electric vehicles, but they will also ensure the necessary charging infrastructure for the electric vehicles of individual EV owners. The electric power of fast chargers is 22kW.
- These EV charging services will be monitored in a centralized way, by means of a Dispatch Office, implemented within the Energy Office of Suceava Municipality.
- For each charging point, both fast and standard, two parking spaces will be set up, for which there will be road signs and road markings.

Object 3 – ELECTRIC BIKES CHARGING POINT

- Setting up a charging point for 10 electric bikes, which will operate based on renting
- Equipping the points with 10 electric bikes;
- The electric energy supply of bicycles will be performed by means of photovoltaic panels with an installed power of up to 5 KVA (with possibility of storage); the panels are mounted on an independent steel structure and are oriented in view of maximum intake.

Object 4 – Electrical vehicles Purchase

- 2 Electrical utility acquisition:
  - Vehicle – Electrical sweeper
  - Vehicle – Electrical tank
- Acquisition of 11 electric cars
- Purchase of two electric vans

The project aims to improve the environment parameters, contributing to a sustainable environment climate in the context of the overall sustainable development in Suceava Municipality, through:

- Aligning to international standards in the field of energy efficiency by selecting an innovative solution, which can ensure the improvement of the essential environment aspects affected by road traffic: reduced CO_2 emissions in the atmosphere;
- Implementing forward solutions, modern and innovative technologies commonly used in European Union countries, through implementing a pilot electro-mobility system:
  - Setting up a network including 28 charging points for electric vehicles;
  - Setting up a bike-sharing system for 10 electric bikes, supplied by photovoltaic panels;
  - Procurement of 15 electric vehicles.
- Ensuring a thorough management of energy resources, by permanently monitoring the efficient operation of the charging equipment included in the electro-mobility system, by means of the Dispatch office implemented.

This project aims to refresh the car fleet which now is worn out and has a high mileage causing malfunction and pollution at the same time. To this aim, 15 electric vehicles will be procured, as follows:

- 11 electric cars;
- 2 electric vans;
- 2 utility vehicles: 1 electric sweeper and 1 electric tanker;

Q2 What is the business case and do financing opportunities already exist?

Smart lighting, lampposts as hubs for communication

In the past 3 years in Suceava we successfully finalized the rehabilitation of the public lightning system - 24 km of network, replace the old lamps with new and energy saving ones and implementation of a management system in order to reduce the energy consumption and increase the efficiency - 1,2 mil Euro project ERDF funds.

In 2017 we have started the extension of this measure at the entire town level by implementing the project for rehabilitation of public lighting system - replacement of the all lamps (4300) with LED ones for the entire city in order to reduce the energy consumption - 3,2 mill Euro - (**co–financed (80 %) by the** Government of Switzerland through the Swiss-Romanian Cooperation Programme).

Through this project 4300 existing old lampposts will be replaced with new one (LED technology) in the Centru district. There will be also an implementation of a telemanagement system that will allow the Municipality to manage the utilization of the public lighting system in order to reduce the energy consumption and to minimize the environmental impact.

Smart charging of electrical vehicles (including combined electric charging and street light poles)

Suceava Municipality secured in 2013 a **3.112.489,61 CHF grant contract co–financed (80 %) by the** Government of Switzerland through the Swiss-Romanian Cooperation Programme .

In the second part of 2015 the grant contract was signed and the implementation of the measures began in early 2017.

Through this contract there were available funds as follow:

Stimulating the use of electric vehicles by:
Setting up an infrastructure including 28 charging points in public places, out of which 14 standard charging points (SCP) and 14 fast charging points (FCP), selected based on the area of interest, the technical possibility to carry out the electric energy connection and to obtain property of land where the works are set to be undertaken
Implementing a bike charging and renting system (e-docking) for 10 electric bikes;
Energy autonomy by implementing renewable energy sources to feed the electric bike charging system - **1 photovoltaic charging system for bikes;**
618.225.6 CHF for 1 infrastructure corresponding to the pilot electro-mobility system carried out in Suceava Municipality that means: install of charging points for electric vehicles - at least 28; parking spaces for electric vehicles - at least 56; bike-charging and sharing centers in Suceava Municipality - at least 1; photovoltaic systems in Suceava Municipality -at least 1
Through this project there will be local and national dissemination activities in order to increase the number of electric vehicles used by private owners and public institutions, to increase the number of charging points.

There will be also activities related to development of local and national markets for car dealers and companies responsible for charging points installation. Suceava Municipality will implement the car sharing concept for EV's and will develop public dissemination campaigns in order to change public behavior and perception regarding EV's and to increase the number of EV's both of local and also national level.

One interesting idea is to create the " zero emissions " products - as we would like to encourage local producers (food, crafts) to increase the bio production and to deliver the products by using "zero emissions " vehicles - especially to local markets located in the Centru district.
The Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at"Increase of Economic Competitiveness" incorporating:

- Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
- Priority Axis 4.1 : Promotion of Local Sustainable Mobility Plans and Strategies for Reduction of CO^2 Emissions

Q3 What are the main challenges and barriers related to the measure(s)?

Specific equipments are quite a new and not very well developed at national and local level. The market exist but still not well developed and the costs for procurement and installation of this equipments is still high and this costs (even when funding are secured) could affect the local budget.

Having the fact that the is not a local market for charging station – both for installation, maintenance and delivery – we do expect to have some delays and difficulties during implementation and exploitation phases, as the lack of trained technicians and personal could create some gaps into the systems.

According to ERDF regulations the local authority needs to co finance 2 % of the total costs and this amount raise to 15 % in the case of Swiss Romanian Cooperation Program and in this case decision regarding prioritize of the projects and time schedule depend on the cash flow and funds available from the local budget.

As the procurement procedures are quite difficult and time consuming, complains are very often present during development of the tender procedures, the road from the grant contract and start of the construction works could be a long one and this could conduct to delays in the implementation of the project.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

There will be links with smart solutions regarding – charging infrastructure for electric vehicles, production of energy from renewable sources, regulation for freight delivery, smart traffic signals and lights.

Q5 What user / stakeholder involvement is foreseen?

There will be consultation with citizens, private and public companies, SMEs and chamber of commerce. The objectives are:

- increase the quality of the urban public spaces, development of new smart technologies for local market, reduce the energy consumption and CO 2 emission, increase the quality of life into the city, reduce the costs for the local budget, transfer of smart solution and dissemination to local and national level

- as the poles and charging infrastructure are both public property we do expect to have a smooth implementation of this smart solution . However we do expect to have some less supportive individuals as residents could not be pleased all the time with the technical solution, location, time schedule

Q6 What is the potential implementation timeframe?

2017 - 2023

8.8.5 Replication of measure 7.3 - Smart waste collection

Q1 What is the replication potential of the Smart Measure(s)?

In connection with the smart waste collecting, turning waste to electricity, heat and biogas for vehicles our expectation is to be able to transfer the experience from city of Stockholm mostly in connection with separate waste connection, recycling facilities and production of ”green energy” by using biomass and reduce the dependency of the conventional energy sources.
A new waste management system is implemented at county level and a new landfill site is located in the vicinity of Suceava City. As this new system includes separate waste collection and transfer stations Suceava Municipality would like to benefit from the existing infrastructure in order to extend the concept and implement the equipment necessarily for the production of energy using waste.
The technical documentation needs to be designed and the appropriate source of funding has to be correctly identified, as the ERDF funding is not available for this type of measures.
For the moment Suceava city is working of a tender documentation for the waste management supplier at local level.This will be a 7 year long contract and will include facilities for separate waste collection in order to increase the level of waste recycling at local level and to reduce the consumption of raw materials.

Q2 What is the business case and do financing opportunities already exist?

Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.

Starting from 2013 in Suceava, through a PPP, a new city power plant is functional, using only biomass, provided both heating for the entire city and electric energy. This project is considered to be a starting point for increasing the production of green energy at local level.

2011 was the starting point of a major waste management project at county level.

This project includes transfer stations for waste, a new landfill (with biogas production plant and modern systems for environment protection and separate recycling facilities) and it was financed using ERDF funds.

In the next 6 years Municipality would like to continue the development of the existing separate waste collection – increase the level of recycling with 25 – 20 % till 2020. Special facilities (bins, advertising) will be located in the district area with the main purpose of increasing the waste recycling.there will be specific actions undertaken with local retailers, supermarkets and producers for the development of facilities (locations but also incentives) for separate waste collection and recycling – especially plastic bottles and paper

The Romanian Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at"Increase of Economic Competitiveness" incorporating:

- Priority Axis 4.2 : Capitalisation of Renewable Energy Resources
- Priority Axis 3.1 :"Supporting energy efficiency, smart energy management and renewable energy used in public infrastructures, including public buildings and housing sectors"

Q3 What are the main challenges and barriers related to the measure(s)?

As the procurement procedures are quite difficult and time consuming, complains are very often present during development of the tender procedures, the road from the grant contract and start of the construction works could be a long one and this could conduct to delays in the implementation of the project.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

Energy production using waste together with Home Energy Management Systems will contribute together to reduction of energy consumption and CO2 emission.

Q5 What user / stakeholder involvement is foreseen?

A consultation process is planned to be performed, involving NGOs, private companies and associations of residents. The implementation of the Smart solution will probably require a partnership between local and county public bodies. The objectives are:

- reduce the impact against environment, increase the percentage of the separate waste collection and recycling materials, reduce the amount of the waste which reach the waste disposal, create alternatives for energy production – using biomass and waste -, increase the public places aspect and the quality of the life into the city, changing people's behavior, reduce the costs for public services for the local budget

Q6 What is the potential implementation timeframe?

2018 – 2022

8.8.6 Replication of measure 10.1 - Smart traffic signals

Q1 What is the replication potential of the Smart Measure(s)?

In the past 5 years a number of related studies and strategies were approved at local level: Urban Integrated Development Plan – 2010, Urban Mobility Plan – 2014, Sustainable Energy Action Plan – 2012, Local Action Plan (electro mobility) – 2012. Their aim is to implement a sustainable development of the city, reduce traffic congestion and air pollution.

The city's SUMP includes specific actions and measures to implement a smart traffic lights system, such as: green waves, special priority for public transport, and real time information systems. Therefore smart traffic signals have good replication potential in Suceava.

As the next step, the technical documentation needs to be designed and the appropriate source of funding has to be correctly identified, as the EDRF funding could be available for these types of measures.

Background:

Suceava faces the combined challenges of increased motorised traffic, stringent European environmental and energy targets mainly in the context of reduction the traffic emissions, waste recycling, economic growth, increase the energy efficiency, secure funding for implementation of local infrastructure projects and implementation of the sustainable development local plans, increase the quality of life into the city.

Also based on these strategic documents on local level Suceava Municipality had implemented a number of projects (with the total amount of 22, 4 mil euro) for rehabilitation of main streets and boulevards, traffic lights, for underground parking places, extension of the pedestrian area in the city centre, modernization of the public transport fleet and cycling lanes with the main purpose of increasing the sustainable mobility, reduce traffic congestion, reduce traffic emissions and increase the quality of life into the city.

Suceava Municipality expresses the intention to apply for ERDF funds for implementation of a metropolitan public transport system (by sending an official letter of intent to Regional Development Agency). This new project will include electric busses, intermodal points and transfer facilities (park and ride) and also system monitoring and controlling traffic signals an time providing real time information to users on traffic conditions in order to reduce the traffic emissions and impact against environment and public health, to reduce traffic congestion and energy consumption (especially conventional fuels).

Technical documentation is under the designing phase for a project concerning smart traffic lights, CCTV system, real time information system. It is expected that the project will be implemented in 2019.

SUMP includes specific actions and measures which consist in implementation of a Smart traffic lights system as : green way", special priority for public transport, real time information systems.

The technical documentation needs to be designed and the appropriate source of funding has to be correctly identified, as the EDRF funding could be available for this type of measures.

Q2 What is the business case and do financing opportunities already exist?

Integrated traffic signal and lights management

Suceava Municipality expresses the intention to apply for ERDF funds for implementation of a metropolitan public transport system (by sending an official letter of intent to Regional Development

Agency). This new project will include electric busses, intermodal points and transfer facilities (park and ride) and also system monitoring and controlling traffic signals an time providing real time information to users on traffic conditions in order to reduce the traffic emissions and impact against environment and public health, to reduce traffic congestion and energy consumption (especially conventional fuels).

The Centru district that is located in the city centre is the main hub for the local public transport will benefit from the implementation of this project. It is expected that there will be an increase of the PT attractively, the number of passengers will increase and there will be a reduction of the private cars traffic volumes in the city centre.

The Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at "Increase of Economic Competitiveness" incorporating:

- Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
- Priority Axis 4.1 : Promotion of Local Sustainable Mobility Plans and Strategies for Reduction of CO^2 Emissions

Q3 What are the main challenges and barriers related to the measure(s)?

As for the moment we are in the very early stage and we do not have technical studies (including traffic surveys) we will be able to add more information for this section in the following stages necessarily to be carried out in order to have the accurate data for the implementation of the measure.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

This section will be updated in early 2018, based on the findings of the Local Action Plan from the URBACT project. Currently the two main topics are:

Consolidation Centre

Combined electrical charging and streets lighting poles

Q5 What user / stakeholder involvement is foreseen?

To reduce the traffic congestion and air pollution

To improve the quality of life into the city

To create premises for a sustainable development of the city

Public consultaion and traffic studies need to be established and completed before the start of the Smart measure implementation as a significant number of stakeholders (private companies, citizens, residents, public transport operators) could be affected.

The ongoing FREIGHT TAILS URBACT III project has a Local Support Group which aim is to define the actions and activities to be included in the Local Action Plan. There are regular meetings and consultation related to the proposed measure and at the moment actions are design.

Q6 What is the potential implementation timeframe?

2021 – 2023

8.8.7 Replication of bundle of measures 11.1 – Developing charging infrastructure

Q1 What is the replication potential of the Smart Measure(s)?

Suceava Municipality would like to create the local charging infrastructure network for EV's in order to have the premises for the increasing of the EV,s used in private and public sectors, to reduce the traffic emissions and promote alternative ways of travelling. Therefore there is good replication potential for developing charging infrastructure in Suceava.

In order to achieve these goals some ideas/actions need to be considerate :

For electric vehicles to actually become attractive for the possible users, it is necessary to increase the technological performance and reduce the procurement price;

The first steps must be taken by the local administration together with other public institutions, therefore public investments need to be made launching the concept on the market;

Charging points should be present in public parking spaces around supermarkets, in the City Hall parking area and in the parking areas of other public institutions, as well as in underground parking spaces, and the places should be reserved and specially marked for electric vehicles;
The use of electric vehicles in the city by public institutions, strategic economic operators using large vehicle fleets and especially by those economic operators performing distribution activities involving frequent travels in urban areas is an efficient method for promotion, and could be subjects for replication.

Stimulating the consumption of green power against conventional power to increase the ratio of power consumption from renewable sources in the total power consumption can be achieved by signing partnerships between the Municipality and the investors interested in alternative power production projects.

It is essential to communicate with young people about electric vehicles because it is a medium and long term project directly addressed to them;

The political segment continues to be the hardest to approach, however the new legal provisions at the European Union level shall be translated into the national laws and the performance of specific indicators for a smart economy shall determine the Romanian authorities to take decisions to finance and support the green power and industrial sectors.

- One must consider the need to train technical staff providing maintenance services for electric vehicles;
- The laws in the technical field must be improved on an ongoing basis according to the European Directives in the matter;

Background:

In an increasingly globalized context, Romania's energy policy is made within the changes and developments taking place at national and European level. Under these circumstances, Romania's energy policy must be correlated with similar documents at European level in order to ensure the conformity of our country's policy with EU policy in the field.

Global warming currently involves two major problems for mankind: on the one hand, the need to drastically reduce emissions of greenhouse gases to stabilize the concentration of these gases in the atmosphere and thus prevent human influence on the climate system and enable natural ecosystems to adapt naturally, and, on the other hand, the need to adapt to climate change effects, since these effects are already visible and unavoidable due to the inertia of the climate system, regardless of the outcome of actions meant to reduce emissions.

The European Commission launched in March 2010 the Europe 2020 Strategy to exit the crisis and prepare EU economy for the next decade. In practice, the Union has set five key objectives - on employment, innovation, education, social inclusion and environment / energy - to be achieved by 2020.
In order to achieve national objectives on climate change by 2020, necessary measures to be adopted correspond to the **Memorandum "Approval of the final values of Romanian objectives for Europe 2020 strategy"**, signed by the Romanian Government on June 8th, 2010.

The main measures concern the following areas:

- *development of institutional capacity in the field of energy and climate change;*
- *reduction of greenhouse gas (GHG) emissions by promoting carbon capture and storage technology (CCS);*
- *increase the share of renewable energy in the final energy consumption;*
- *increase energy efficiency.*

Romanian Energy Strategy for the period 2011 - 2020 will aim at fulfilling the main objectives of the new Energy - Environment Policy of the European Union, objectives also assumed by Romania.

The main directions of action of Romania's energy strategy, converging with the EU energy policy, are:

- choose a balanced energy mix, meant to provide the energy sector with competitiveness and security of supply with a focus on internal resources, namely coal, harness able economic hydropower potential, nuclear power potential and renewable energy sources potential;
- effectively manage and rationally use in safe condition exhaustible primary energy sources in Romania and maintain an acceptable level (in terms of economy and security) of the primary energy sources import (limited / controlled dependency);
- increase energy efficiency on the entire chain: extraction - production - transport - distribution - consumption; Romania no longer affords to waste energy while the sources of energy have a reduced availability and increased cost; energy efficiency is the most cost-effective way to reduce emissions, improve safety and lower competitiveness and energy service bill;

- promote energy production from renewable sources, so that the share of electricity produced from these sources in total gross electricity consumption would be 33% in 2010, 35% in 2015 and 38% in 2020;
- promote the use of renewable energy sources in accordance with EU practices, based on the National Allocation Plan in terms of renewable energy drawn up in 2010;
- create market conditions meant to stimulate greater energy savings and increased investment in low carbon technologies;
- facilitate investment in those projects that contribute to achieving the objectives set for 2020 according to EU policy;
- achieve objectives of environmental protection and reduce emissions of greenhouse gases.
- support research, development and dissemination of research results applicable in the field of energy.

Romania has been using the "Joint Implementation" mechanism as host country since 2000. The legal framework for the development of these projects under the"Joint Implementation" mechanism consists in concluding and ratifying Memoranda of Understanding with various states. Romania concluded 10 such memoranda with governments and ministries of Switzerland, Netherlands, Norway, Austria, Denmark, Sweden, France, Finland and Italy. In this context, Suceava Municipality is the recipient of a grant awarded by the Swiss State Secretariat for Economic Affairs by means of the Swiss-Romanian Cooperation Programme to prepare an own Action Plan for Sustainable Energy and some project drafts to start its implementation

The WHITE PAPER Roadmap to a Single European Transport Area - Towards a competitive and efficient transport system in terms of resources, which establishes that by 2050 the European cities will have to drive only clean, non polluting cars was adopted by Decision no. 38/2011 and thus Romania was aligned to the overall European transport policy, articulated around the objectives of developing and implementing new and sustainable fuels and new propulsion systems, optimizing the performance of multimodal logistic chains, including by an increased use of more energy-efficient ways, increased transport efficiency and infrastructure use by information systems based on market incentives.

The approval of this strategic document bonds our country and encourages Suceava Municipality to adopt certain measures linked to the objective of"*Development and implementation of fuels and sustainable propulsion systems"* through introducing by 2020 an information framework for implementing a multimodal transport system by decisively shifting to cleaner cars and fuels and reducing with 50% the number of cars with conventional fuel by 2030 and eliminating them progressively in cities by 2050.

The National energy saving potential and energy loss reduction potential is estimated at 27-35% of primary energy resources (industry 20 - 25%, buildings 40 - 50%, transport 35 to 40%).
In order to reduce energy intensity in sectors with high energy consumption and achieve the targets set up in the National Strategy for Energy Efficiency as well as in the Action Plan for Energy Efficiency corresponding to Directive 2006/32/EC on energy end-use efficiency, the following measures in transports will be taken:

- improve the quality of public transport in order to use it to reduce private car transport;

- extend public transport network through new transport routes;
- render traffic and more efficient parking management;
- provide means of public transport for employees by the beneficiary companies;
- encourage a greater development of vehicles running on tracks and part of the urban transport (trams, trolleybuses);
- increase the energy efficiency of vehicles by establishing minimum efficiency criteria;
- introduce norms to support the energy-efficient and clean vehicles;
- use gaseous fuels and biofuels in transport.

Q2 What is the business case and do financing opportunities already exist?

The main objective for this Smart solution will be: to stimulate the use of EV by creating a charging infrastructure, installing charging points in public and private car parks

Alternative fuel driven cars for better air quality in cities

For the action Implementation of a local public transport with electric buses and establish measures to encourage the use of electric public transport means Suceava Municipality secured in 2013 200.000 CHF as part of a **3.112.489,61 CHF grant contract co–financed (80 %) by the** Government of Switzerland through the Swiss-Romanian Cooperation Programme. This amount will be used (in 2014) for performing the Feasibility Study and Technical Documentation which will allow the Municipality to apply for a funding scheme through ERDF in order to implement the electro mobility concept for public transport (purchasing of 30- 40 electric buses and charging facilities for local public transport company).

Also we have to mention here that Suceava will be starting from 2017 the first Romanian city with an electro mobility project implemented (municipal electric vehicles, electric bikes and charging points).
The city centre roads infrastructure will be rehabilitated, with a 25% extension of the existing pedestrian"zero emission"area, there will be access restriction regulation for this area located in Centru district and only EV's will have permanent access.

Citizen engagement for smarter use of road space

The City Urban Plan is under a redesigning process and one of the new innovative parts of this study will be an Urban Mobility Plan (for public and private companies, public transport, measures for encouraging alternative ways of travelling). Based on the conclusion from this plan we will be able to start the implementation of other new innovative mobility projects at local level.

Car and bike pools in integrated mobility solutions

The new municipal EV's will be used for promoting the car pooling concept among public servants, citizens and private companies starting from 2016.

In 2013 we finalized the construction of 10,5 km of cycling lanes into the city centre (using ERDF funds) ad in 2015 other 4,6 km will be finalized (as part of another ERDF funding project for rehabilitation of the city road infrastructure).

The construction of a 164 underground parking facility in the city center together with the rehabilitation of the main city center pedestrian area in order to create facilities for reduce traffic

congestion, traffic emissions and encourage walking instead of driving - 11, 4 mil Euro - ERDF funds was accomplished in 2013.
The electric bikes which will be available in Suceava from 2017 will be used for promotion of this alternative way of traveling (among citizens and tourists) as a rental system will be developed at local level.

The Regional Development Agency is the authority responsible for the North East Region Operational Programmes in respect of ERDF and ESF funding.

The most relevant programme with potential association to the Smart solution is the Operational Programme directed at"Increase of Economic Competitiveness" incorporating:

- Priority 4 –"Increase of energy efficiency and sustainable development of the energy system"
- Priority Axis 4.1 : Promotion of Local Sustainable Mobility Plans and Strategies for Reduction of CO^2 Emissions

The EV's charging infrastructure is owned by the Municipality and access for private vehicles owners will be permitted based on specific agreements which will be singed as soon as the charging facilities will be operational.

If the Smart measure will be a successful one and the demand for charging infrastructure on local level will increase in the following years.

Q3 What are the main challenges and barriers related to the measure(s)?

The type of access to charging (open or restricted) and charging technology (manual or preferably intelligent) chosen will be a subject matter to be decided by decision makers in charge at the time, while the network capacity will be discussed with the electricity supplier and distribution operator. In what concerns the charging way and times, the type of supply technology used will allow rapid charging in on-street points and standard charging in off-street points, on public parking spaces. The public procurement will be a 2-stage procedure to provide a competitive dialogue with tenders in order to obtain a better understanding of the power equipment market.

By entering into public-private partnerships or concession contracts to provide installation, maintenance and operation of technological equipment in designated parking spaces, the number of above-ground charging points on public space could be increased, as well as the interest in the type of business.

The measures thus taken must consider all target groups; there must be a good communication and information between public authorities and local community, the benefits of this type of approach to planning are now well understood: the transparency of decision-making, legitimacy by public participation in decision-making, better public acceptance and a higher rate of success correctly and effectively respond to community needs and integrate ideas and opinions coming from all levels.

Moreover, since vehicles and associated equipment with the same performance characteristics are required, buying an increasing number of vehicles in a single auction removes obstacles such as low interest from producers, lack of models on the Romanian market and high prices for those models entering however the market. Great benefits arise from the fact that such acquisition may show to manufacturers / dealers which is the demand, supports bringing new models on the market,

accelerates the introduction of new technologies, leads to lower prices, helping to introduce EV infrastructure and supports the appearance of new business opportunities for EVs maintenance and service and related equipment. A two-step procurement procedure will be recommend, with pre-qualification of tenders and invitation to tender, preparing a plan of communication with vehicle manufacturers and dealers in order to determine the appropriate technical specifications of the equipment and ensure visibility and information on organizational rigours of a public tender procedure which most private market players are not used to.

The same complex project provides training for bus drivers on driving such vehicles and to ensure proper operation of equipment. At the same time, it will consider the need of technical training for mechanical and electrical specialists, specifically for this equipment.

The definition of the target group was required as an orientation guide for setting strategic objectives and activities planning, since they are actually the main beneficiaries of current planning measures and results.

- - traders active in the field of people transport by car (taxis)
- - car dealers
- - car service operators
- - car manufacturers
- - local public transport operators (SC TPL SA Suceava)
- - providers on the electricity market (producers and carriers indirectly)
- - providers of technological charging equipment
- - citizens (residents, students and tourists)

As the funding scheme for installation of the first 24 charging points is already established, we may need to have future discussion with local decision makers in order to secure funding for the extension of the network at local level and for future other actions related to this Smart solution.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

This is still to be defined. At presently the following integration points are considered: Smart Traffic signals and lights, electrical charging and streets lighting poles, freight delivery and consolidation centre.

Q5 What user / stakeholder involvement is foreseen?

Suceava Municipality would like to benefit from the transfer of knowledge and best practice experience of the city partners in GROW SMARTER project in order to increase the chances of a successful implementation process for the electro mobility concept planned for Suceava city.

It is expected that this new project should allow us to gain more experience, to allow access to funding resources together with the rest of the city partners, to continue the work with USLG, to achieve sustainable changes in people's behaviour regarding electric and alternative vehicles ,improve local team skills and to promote the local experience at regional and national level.

It is expected that after a successful implementation of the project (purchasing EV's, installation of charging points and electric vehicles in public transport, charging points foe vehicles in public spaces and underground parking places) Suceava City should become an example of integrated sustainable mobility management – electromobility - for the rest of the cities in Romania.

Also after this project shall be implemented, it is expected that the local decision makers should be much more"flexible"and should support local regulation and tax incentives designated to increase

and ecouraging the aquisition of EV's for private and public sectors, improve the traffic conditions and reduce the traffic impact against environment.

Through this project there will be local and national dissemination activities in order to increase the number of electric vehicles used by private owners and public institutions, to increase the number of charging points. There will be also activities related to development of local and national markets for car dealers and companies responsible for charging points installation. Suceava Municipality will implement the car sharing concept for EV's and will develop public dissemination campaigns in order to change public behaviour and perception regarding EV's and to increase the number of EV's both of local and also national level.

When talking about benefits coming from participation in European projects we have to mention that one of the most valuable one is the transfer of best practice and know how between partners.Our expectations from this new project are directly linked with the possibility of learning from the experience of the lighthouse cities in domains that are connected with the"green city"concept.

For example having in mind that in the next 3 years Suceava City will start the implementation of the electro mobility concept at local level we expect that the participation in this project will facilitate the transfer of best practice that Stockholm has in the field of electric vehicles, charging points and facilities for electric vehicles.

Q6 What is the potential implementation timeframe?

2017 – 2019

8.8.8 Replication needs of Smart City Measure(s)

Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

Our main purpose is to find out more information, best practice example or any suggestions from the leading cities, about:

- How is it working the process of getting the political approval for a new investment with some innovative technologies like the smart measures?

- Any already successful "recipes" for implementation of a smart measure would be very useful for a city like Suceava which already expressed the wiliness of becoming a smart city

- We do expect to be able to learn more about the introduction of measures that conduct to improve energy efficiency and for this reason we would like to transfer the best practice and experience from the city of Barcelona, not only for the rehabilitation of the residential and municipal buildings but also in being able to develop facilities at local level for "technological parks" for companies which will invest in new green technologies in order to develop the local market and to create new jobs

- One of our smart measures is in connection with the lighthouse cities measures like Home Energy Management Systems that will be installed in a pilot residential and municipal building, visualizing and manage energy consumption.

- City of Stockholm and the measures to be implemented in this project is a very reliable example of a ”state-of-the-art” example for mobility management and actions to avoid traffic congestion and to reduce traffic emissions. Our goal in this project is to transfer the best practice from Stockholm mainly in connection with the cycling facilities and traffic management and before these in connection with alternative solution for public transport (biogas or electric busses) in order to increase the number of passengers, reduce the car dependency, avoid traffic congestion and change people’s behavior regarding mobility habits

- The aim of Suceava city measures is to replicate the lighthouse city experience (Stockholm in this case) in order to substitute the car in other trips, that are less regular and more individual.

- Our goal is to offer different and alternative solutions completing the existing public transport network like bike pools, e-bikes, EV-pools.

We consider that a successful preparation of the follower cities for replication of the smart measures involved meetings with both representatives from the public sector (procurement, technical, economic and design also) and with representatives from the private sector (consultancies, constructors, car dealers, retailers, providers for technologies and equipments).

Beside of these we consider that future links between local private sector and the same one from the lighthouse cities could contribute to development of local and European market but in the same time could facilitate the implementation and transfer of smart measures to the follower cities.
Of course that the site visits to a power plans or a recently refurbished neighborhood could be useful for us but in the same time we do consider that there is a strong demand in a cooperation between follower cities which can benefit each other and also provide necessarily technical support during the replication of smart measures process.

What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

As Suceava Municipality committed to implement a number of smart measures at local level in the future 5 years the transfer of best practice examples from the LHCs will be very useful for a smooth and fruitful implementation of the projects.

In regard with this we would like to have information related to :

- Dialog with the politicians and decision makers which can conduct to approval of the project implementation and, more important, to allocation of necessarily funds for this
- The road map from an idea to a successful project implemented at local level in LHCs
- Technical details regarding : financing scheme, best practice solution, evaluation results, public consultation, involvement of the local,regional and national private sector and industrial partners, procurement and dissemination

Capacity building needs and areas of interest:

Local councilors, politician, Municipality’s staff, decision makers and technical experts from local public administration, local NGO’s, private companies (especially the ones involved in energy sector,

construction sector, freight, lighting and electric vehicles are potential interested in exchange of best practice examples, knowhow and technology related to measures concerning energy efficiency in private and public buildings, public lighting, waste management, electric vehicles and traffic management.

We do also expect to have some interest from local University in the IT domain related to local platform for real time information.

Business dialogues with companies involved in implementation:

We do consider that business cases already tested, implemented and evaluated in LHCs could contribute to a better understanding of the problems, measures and outcomes for the local decision makers and stakeholders and also could contribute to future smooth implementation of the replication measures.

9. Replication Assessment of the Follower City Valletta

9.1 Smart City Replication Profile

9.1.1 Mapping the overall framework conditions for replication within the city territory

Q1 What is the overall replication potential for Smart Solutions until 2020 and beyond?

Energy Mix

The Government of Malta is fully committed to continue with its policy of having a sustainable national energy mix brought about by four main policy drivers including the implementation of a number of solar power energy related projects; conversion from the use of heavy fuel oil to a gas-fired electricity generating plant which is now fully commissioned and the purchase of electricity from the European Continent through the installation of the Malta-Italy electricity inter-connector, use of diesel mixed with bio-fuel for transportation.

Following these policy initaitves, the Government has hence implemented and still is implementing a number of measures to diversity Malts's energy mix and the use of such energy sources. Malta has been connected to the European energy grid since the 24th March of 2015, as the electricity interconnector (connecting Malta to Sicily) was fully commissioned and the Maltese grid was synchronized with the Italian grid for the first time.

The Combined Cycle Gas Turbine (CCGT) 200MW plant and the Liquified Natural Gas (LNG) facility powered by natural being sourced from the LNG plant has been commissioned earlier on this year. The LNG facilities will also supply gas to the existing 144 MW Diesel–operated power plant, known as the BWSC plant, which has been converted to run on natural gas. Enemalta (the sole energy provider for the Maltese islands) started receiving its first gas-fired electricity in April 2017. This new energy source is expected to reduce Malta's dependency on electricity generated through oil-fired sources.

Furthermore, the Maltese Government is also working on a gas pipeline connecting Malta to the trans-European Natural Gas Network via an approximately 155 kilometre pipeline to the port of Gela in Sicily to deliver natural gas for the generation of electrical power. This project is currently at design stage and is looking into the future demand for gas, security of supply, competitiveness, sustainability, and identifying those aspects that qualify it as a Project of Common Interest (PCI).

Furthermore one also need to point out that during the last few years, the electricity provider had finished installing in all of the Maltese residences and businesses, a Smart Meter, whereby data of the respective electricity consumption can be gathered and billed remotely to the effect that all Smart Meters are now connected to the electricity billing system.

It is expected that in the future Malta will have an intelligent SMART electricity grid in the future to complement the expected increase in national Electric Vehicle fleet.

In terms of the Valletta Region, certain actions have been undertaken which target the geographical area as the two districts with the highest recorded emission levels. Three projects have specifically target the Valletta Region:

- The 'Vertical Connections Project' has improved the accessibility of the city through the installation of a vertical lift, facilitating connectivity between the lower part of Valletta to the highest upper main point, adopting a cleaner transport technology. The direct beneficiaries of the project include the local population of Valletta and the Grand Harbour area and the Cruise Liner incoming tourists.

- The 'PORT-PVEV Project' tackled the renewable energy theme by providing for the installation of solar power generation systems at port administration buildings and within port areas. The pilot actions aim to realize joint innovative interventions to guarantee reducing energy consumption into the ports and their public facilities. The project allowed an Italian-Maltese exchange of solutions to increase the eco-efficiency of the ports with the diffusion of sustainable and energy-saving practices for sea transport. In particular, the following actions were taken:

  - ✓ Identification of physical interventions to be implemented in the port area and a high level strategic environmental assessment to evaluate ex-ante the actual and future environmental efficiency in the port and hinterlands.
  - ✓ Feasibility study on the provision of renewable energy to power berthing vessels to include drafting of local port plans to identify the best location for a shore supply pilot targeting heavily polluting ships in harbour.
  - ✓ Installation of PV panels on identified buildings (Transport Malta Head Office) in respective port areas.
  - ✓ Installation of Photo-voltaic powered Vehicle Recharging Car Ports.
  - ✓ Installation of normal and fast vehicle recharging infrastructure.
  - ✓ Purchase of 13 electric vehicles which replaced and added on the current fleet of Transport Malta Port Activities

  The project has achieved a total of 185 tonnes of CO2 emission savings within the region.

- The 'D-Air Project' which focused on the Airport (located barely 7km from Valletta Centre and within in the Southern Harbour District) Carbon Footprint, on which an Implementation Plan has been developed, listing measures focusing on surface transport accessing the airport and airport operations. If implemented the Plan will result in 39,000 tonnes of CO2 emissions saved.

Renewable Sources of Energy

DECISION No 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

- 20% RES of Total Energy Used

As of 2010, Malta had planned to achieve its 2020 renewable energy targets through a number of identified major projects of solar, wind and waste to energy combined heat and power plants. However, studies highlighted significant environmental concerns surrounding the proposed wind farm projects. Furthermore, attempts to tap NER300 funds for the development of a floating wind farm were also unsuccessful. As a result, renewable energy will be generated from a higher number, but smaller capacity sources of renewable energy distributed across the Maltese Islands. Priority is given to deployed technologies, mainly solar photovoltaic systems and solar water heating.

Investment in PVs is being incentivised through grants and attractive feed-in tariff s. Schemes financed through national and ERDF funds have been launched to assist domestic households. The scheme launched in May 2013 was taken up by March 2014 and resulted in the installation of circa 23MWp of PV systems, generating around 37GWh/ year. By the end of February 2015, 8331 households benefitted from this grant. The industrial and commercial sectors as well as non-profit organisations have been assisted through ERDF funds, whilst Local Councils could tap national funds. The Government is banking on tapping new ERDF funds to further incentivise the deployment of PVs within the domestic and commercial sector. In fact, the Operational Programe for ERDF and Cohesion Fund for 2014-2020 published in March 2015, re-extends the scheme until 2020.

Smart meters are installed for every electricity consumer, with the aim of changing consumer behaviour through information on energy consumption. By the end of February 2015, nearly 96 per cent of meters were installed.

Transport

Malta has a very ambitious medium to long term program as far as transportation in Malta is concerned. This programme was kick started wih the public transport reform programme which was kicked off in 2011, with a number of additional sub reforms taking place in the interim period. The result of this was that by end 2016, Malta has totally reorganised its national Public Transport to a modernised bus public transport system using the latest Euro V and Euro VI buses. The results of the reform speaks for themselves as from the 31.7 million passengers using public transport by the end of 2016, the number of passengers using public transport rose to 43.3 million passengers per year.

A major corner stone in public bus transport services was the introduction of the ***Tal-Linja Card*** which is a debit card used by public transport users similar to the London Oyster card. In addition, the transport operator also introduced real time data at key bus termini and bus stages to indicate the time of bus arrivals and departures. This service is also complemented by the introduction of the

Tal-Linja App, which is a dedicated journey planner for public transport users. In the very near future, Transport Malta will also introduce a multi modal national journey planner.

Concurrently with the bus public reform programme, TM also introduced new public maritime ferry services, a ferry service that runs on a schedule in between Malta's maritime ports around Valletta.

By 2017, the number of passengers using this service accounted for one million passengers per year. In 2017, TM started to design three new additional routes and infrastructure to complement them to include additional maritime ports in the Valletta region as well as further up North in St. Paul's Bay to Sliema and Valletta as a pilot project in its own right.

In addition, a substantial investment is being earmarked to introduce passenger waiting facilities which are coupled by ITS deployment to provide real time information services.

In the meantime, in 2013, the Government and Transport Malta upped the efforts to promoting the use of more sustainable modes of transport and the use of electric vehicles by setting up the Malta National Electromobility Platform and the publishing of the Malta National Electromobility Action Plan.

In 2017, Transport Malta published for the first time a national strategy for Transport, entitled the National Transport Strategy 2050 and the National Transport Master Plan 2025. A major undertaking in the Master Plan is that by 2025, half of the national vehicle fleet will be made up of electric vehicles which will be powered through a mix of PV farms and the gas powered Power station recently in operation.

The Action Plan also include a roll out programme of a Electric Car Charging Network to service electric vehicle owners by 2020 made up of 500 charging points. This will complement the already deployed 114 networked charging points located in key public parking areas around Malta and Gozo.

In addition TM is also currently working to introduce a national e-car sharing programme and a national bicycle and e-bike sharing programme.

Other initiatives include a full deployment of ITS services from the from the ground up, a process kick-started with the completion of the MODUS project and the carrying out of SUMMITS I, II and III phasing of ITS deployment to improve in introduce real time intelligent traffic management services and introduce a host of new ITS backed transport services and real time information services in line with the European ITS Framework Directive and C-ITS.

Furthermore TM is currently working on a detailed study to implement an Mass Rapid Transport System to complement the current bus public transport and maritime public transport services.

The final aims and objectives of the Government of Malta is that by 2025 we will move to an ITS based transport ecosystem.

Current Transport Scenario Including Modal Split

Malta has an extensive road network stretching over 2,400 kilometres of road in 2014. Malta also has one of the densest networks in the world with 762 km of roads in every 100 km2 of land area. Key sections of the Maltese road network form part of the Trans-European Network – Transport (TEN-T).

Despite continued land use decentralisation away from the Valletta hub area, the average length of car trips during the morning peak is quite short - 5.5km, this compares well with commuter journey distances within most other European towns and cities but is much lower when compared at a national level. The average number car trips made by drivers on a typical weekday in Malta is 3.20 which is notably higher than averages for other selected countries reported in the 2012 JRC study[24] for which daily car trip averages range from 2.4 in Spain to 2.9 trips in France.

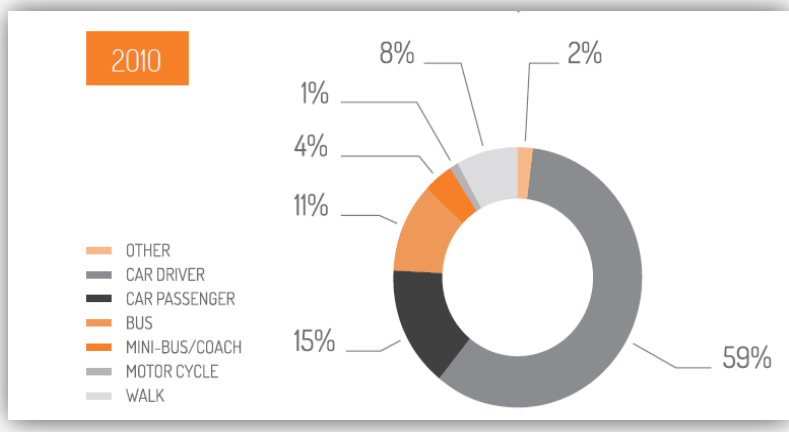
Around 74% of trips are made by car and bus travel only accounts for 11% of the national modal split. Most car trips are made as drivers, which equates to very low average car occupancy (1.25 people per car). About 50% of trips take less than 15 minutes; business car trips take an average time of 19 minutes which is notably less the average time for sample of countries reported which ranges from 25-30 minutes.

Trips by bus take 33.5 minutes on average (excluding time waiting for the bus and walking to and from bus stops). The predominance of road transport is confirmed by the high rate of motorisation, which is 759 licensed vehicles/1,000 inhabitants in 201329. Other features of the private vehicle fleet are the high average vehicle age of 13.6 years (two-thirds of which are petrol engine) and the low penetration of low-emission technologies (0.22% of the stock of licensed vehicles in 2013). The comparison between traffic flows and road capacity indicates that congestion problems during the most critical morning peak hour arise primarily in the central section of the TEN-T network, particularly around Marsa, Santa Venera, Qormi and Kappara, as well as the distributor linkage between the airport and the urban centre of Qormi. There are also congestion problems on certain sections of the roads in the coastal area of Sliema, on the radial axis towards the Valletta / Floriana Peninsula as well as on different urban sections in the Inner Harbour.

Privately owned vehicles represent the main mode of transport in Malta, with modal shares that range from 50% (movements inside the peninsula) to 90% (interzonal movements not involving the Harbour). Despite the lower use of private vehicles inside a region, the public transport modal share is not usually over 20%, as soft modes such as walking or cycling have a higher modal share within a region than at a national level due to the relatively short distances of travel. The higher share of public transport (25-30%) is obtained when connecting the Valletta and Floriana peninsula with other regions.

The latest Modal Split Study carried out for the Maltese Island is highlighted in the Figure below, which is extracted from the National Transport Strategy 2050:

[24] *Driving and parking patterns of European car drivers - a mobility survey, JRC 2012.*



The coastal area around the Valletta and Floriana Peninsula (hereinafter referred to as the 'Valletta Hub') is a remarkable focus of trips in Malta. When examining the peak hour for internal travel on weekdays between 7:30hrs and 8:30hrs (which accounts for over 11% of the daily travel demand), some 30,000 people movements are observed to involve the Valletta Hub either as an origin or destination of a trip.

Within the Valletta Hub, the Inner Harbour is the main destination and the main inter-regional connectivity is with the North West region, which accounts for some 68% of people movements to and from the Valletta Hub. There is also significant amount of mobility that takes place solely within the Valletta Hub area, with more than 9,400 short-distance trips occurring within this limited geographical area in the morning peak alone. These trip patterns mainly occur inside the North Inner Harbour and between the North Inner Harbour and the South Inner Harbour.

Road freight movements are mainly related to short-medium range deliveries across the Maltese territory. Traffic with industrial estates/ports/airport, and the transportation of goods between Malta and Gozo accounts for small shares of total freight movement (<10%). Freight movements are largely concentrated around the central sections of the Maltese TEN-T network, especially across the critical road system of Marsa, Hamrun and Santa Venera. These movements are higher during the AM peak hour.

For more detailed information, please refer to the following link:
http://www.transport.gov.mt/transport-strategies/strategies-policies-actions/national-transport-strategy-and-master-plan.

Energy for Transport

DECISION No 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

- 10% of TRANSPORT FUELS GENERATED FROM RENEWABLE ENERGY SOURCES

In order to promote the use of biofuels, a biofuel substitution obligation has been imposed on importers/wholesalers of fuel for the transport sector. The obligatory share for 2014 is equal to 4.5 per cent. In 2013, the RES share in road transport was 4.04 per cent (pending audit) and the provisional figure for 2014 is 4.54 per cent.

Other measures aimed at reducing the impact of transport on climate change and air quality are in place.

An Annual Circulation tax has been introduced by Government whereby all vehicles registered with the Authority for Transport in Malta shall pay a fee according to the vehicle specifications, emissions and age. The tax is applicable to all petrol and diesel engine vehicles.

Schemes are also in place aimed at reducing the number of old motor vehicles from the road while promoting the use of clean and energy efficient vehicles as a way to contribute towards the reduction of traffic generated pollution and improvement of air quality levels. **A grant scheme to incentive the purchase of new, category M1 motor vehicles (passenger vehicles with a seating capacity of up to eight passenger besides the driver) is aimed at reducing the number of old motor vehicles from the road and thus reducing air emissions.** Subject to various conditions, the grant scheme provides the following incentives:

a) €900 will be given to persons registering a new Category M1 vehicle with CO2 emission levels up to 100g/km;

b) €700 will be given to persons registering a new Category M1 vehicle with CO2 emission levels between 101 and 130g/km;

c) €3,000 will be given to persons registering a new Category M1 Plug in Hybrid vehicle with CO_2 emissions 0-50 g/km;

d) €2,000 will be given to persons registering a new category M1 Hybrid Vehicle with CO_2 emissions between 51-65 g/km;

Such grants are given upon the purchase of a new M1 motor vehicle that qualifies for the grant scheme whilst at the same time de-registering a vehicle in the same category.

Grants for converting combustion engine vehicles to run using LPG/Autogas are available for Category M1 vehicles. Such converted vehicles benefit from a reduction of 10% on the amount of CO_2 which is either reflected in a reduction on the amount of the annual circulation fee or a reduction on the amount of registration tax upon registration, depending when the vehicle was registered.

Electric Vehicles

An Action Plan specifying the manner of deployment of both the charging infrastructure and the continuous entry into the market of battery electric vehicles has been published by Government in November 2013. Entitled the Malta National Electromobility Action Plan, the document identifies 22 projects earmarked to facilitate the deployment of 500 charging points and 5000 electric vehicles.

Most of the projects are earmarked for EU funding, be it ERDF, CF, and centralized EU funding programmes.

Several of the projects earmarked have already commenced or been completed in the past few years. These include the DEMOEV project which was the first project introducing electromobility to the islands. The project installed the first basic Electric Car Charging network which has seen the installation of 90 charging points across the islands. The project also introduced 24 full electric vehicles to the national fleet and distributed the vehicles among volunteers in order to test at first hand the feasibility of the new technology.

This project was followed by the PORT-PVEV project which targeted businesses and promoted sustainable mobility as part of day-to day operations. The project installed three solar charging stations incorporating 4 charging points each. The stations generate solar power on site and use it to directly charge electric vehicles. The service has been offered to the public free of charge. As part of the same project, 13 full electric vehicles have been introduced to the national fleet and are used by Transport Malta as part of daily operations.

In line with the Action Plan mentioned above, Government has introduced a number of schemes aimed at the improvement of clean vehicles and supporting infrastructure. The financial incentives were first introduced in 2014 and have been published annually since then. As the public accepts the concept of electromobility, the incentives keep improving with the scheme published I 2017 offering the following:

A Grant of €8,000 is provided to private individuals, private companies, Local Councils and Non-Government Organisations registering a new full electric vehicle while de-registering and scrapping another combustion engine propelled vehicle which is at least 10 years old from year of manufacture; €5,000 is given when registering a new or used (conditions apply) full electric vehicle and not de-registering and scrapping a combustion engine vehicle. The second hand registered full electric vehicle should not exceed 12,000 km on the odometer and should not be older than 24 months. In addition, €2,000 grant is given when registering a new or used electric quadricycle.

For the business community, the maximum amount of grant is provided according to the De Minimis Rule (i.e. a maximum of €200,000 in de minimis aid per single undertaking over a period of three consecutive fiscal years).

Spurred on by DIRECTIVE 2014/94/EU on the deployment of alternative fuels infrastructure which states that:

- Recharging points should be established taking into account the number of electric vehicles estimated to be registered by the end of 2020 in each Member State. As an indication, the appropriate average number of recharging points should be equivalent to at least one recharging point per 10 cars" For Malta, the target of BEVs registered by 2020 is 5000, therefore a total of 500 charging points are to be installed on the road network by then

The government of Malta issued further incentives to facilitate market entry of the latest charging technologies being introduced on the European and International markets.

With respect to the deployment of public electric vehicle charging network, Government has adopted a phased approach such as to make sure that the deployment is carried out in a manner to benefit from the continuous developments taking place in the field of electric car charging infrastructure as well as the developments of the vehicles themselves while also meeting actual demand.

In line with the National Electromobility Action Plan mentioned above, Government has introduced the following schemes:

a) **Government Grant on the Purchase and Installation of Electric Vehicle Charging Pillars for the Business Community and NGOs**

This is a scheme open to the business community and NGOs that the Government, in conjunction with Transport Malta, is launching to incentivise the installation of Electric Vehicle Charging Pillars.

The grant will amount to a maximum of €2,000 per electric vehicle charging pillar. Every eligible entity can install more than one electric vehicle charging pillar but shall be entitled to only one 'total' grant under this scheme which will be inclusive for up to a maximum of five (5) charging pillars. A company may install the pillars specifically for its use or for the use of its clients.

b) **Government Grant for the Upgrading of New Plug-in Electric Vehicle Importers' Service Centres and Staff Training**

This scheme aims to incentivise the upgrading of Electric Vehicle Service Garages. It aims to assist the market entry of the new plug-in electric vehicles in the Maltese Islands which are not yet available on the national market while assisting car importers to start offering support services on their sold EVs.

The grant is set at a maximum of €25,000 per applicant car importer, and their current service garages to cater for the maintenance of plug-in EVs; both on EV models already sold in Malta as well as new models which have not yet been introduce on the local market. The grant can also be used for staff training and re-training.

The Action Plan, however, also covers the deployment of alternative technologies for transport such as hydrogen propulsion and related infrastructure.

References:

- Malta National Reform Programme, Ministry of Finance, April 2015
- Budget Document 2017, Ministry of Finance, November 2016
- Malta National Electromobility Action Plan, Ministry for Transport and Infrastructure, November 2013
- Programming of European Funds for Malta, Operational Programme I (ERDF-CF), Ministry for European Affairs, March 2015

Q2 How does the "Smart City" approach feed into/connect with your existing local planning processes?

Transport Malta has just completed the National Transport Strategy (NTS) and National Transport Master Plan (TMP) covering all relevant transport modes (land, public transport, maritime, and aviation) for the short, medium and long term. It is to be noted that during the drafting of the strategy and master plan, Transport Malta had carried out a continuous stake holder consultation process with tall major stake holders including the Planning Authority so that the policies of both entities will be synchronised with each other.

By means of this strategy, Transport Malta has laid out its long term vision of how transport will shape itself by 2050. The Masterplan on the other hand offers a detailed Action Plan on how the first part of the strategy will be realised for the short and medium term spread out over a period of 10 years..

The Transport strategy was compiled in parallel with the new Strategic Plan for the Environment and Development (SPED) which was drawn up by the Malta Environment and Planning Agency (MEPA) which plan strictly deals with land planning issues.

It is to be noted that as from 2017, Transport Malta will start working on the drafting of a fully fledged Sustainable Urban Mobility Plan (SUMP) for Valletta and the whole of the Valletta region. This project is being financed by the CIVITAS Action Programme through the Destinations Project. The SUMP will include a number of measures which will be implemented or piloted and then audited to ascertain whether the results that they were intended to achieve in the first place have been achieved.

Moreover, further to the EU Commission's Communication entitled 'Together towards competitive and resource-efficient urban mobility' Transport Malta sought to introduce the concept of urban planning at a local and regional level. So far, such planning has always taken place at a national level, which shouldn't be surpirising considering Malta's size. However, there are certain benefits to be had if each local council, or groups of local councils within the same region, were to take a higher level of resonsibility and interest in the medium to long-term development of their locality.

To promote the concept of sustainable urban mobility planning, as part of the events held in Malta during the various European Mobility Week editions, Transport Malta subsidizes a Permanent Measures Award. The Awards consist of a competition open to all local councils for the best permanent measures proposals, which measures must promote sustainable mobility and planning within the locality. The winning Local Council is awarded a cash grant to implement the proposed measure. The Awards are intended to introduce Local Councils to the concept of thinking on what needs to be done in terms of sustainable mobility within their localities as well as serve as an incentive for Local Councils to start exploring different forms of funding to implement the measures which are right for their localities, including private public partnership arrangements and participation in EU funded project.

Q3 Is there a (strategic) plan and organizational structure in place to become a "Smart City"?

It is inevitable that by 2025, not only Valletta City but the whole of Malta will become a country which can be regarded or considered to be as one City, a Smart City or better still, a Smart Island. This will not happen in the short term but on the longer term, as Malta will continue to put in place the respective infrastructure and ICT-based services.

The smart city concept will not only be applied in a holistic manner to transportation, energy nd planning but also to data gathering exercises and the provision of all government service provided to the general public. This process has long been started and will continue to be applied until all Government services will be digitized and provided on line. The use of mobile telephony and computer peripherals among the population is one of the highest in Europe which reflects the extraordinary economic growth that Malta is currently experiencing.

From a transport perspective, Transport Malta is already moving in that direction, whereby an ITS and c-ITS based ecosystem will be implemented on the medium to long term. For this to happen, Transport Malta is planning in this direction already and by laying down the key foundations of the transport ecosystem in the short term as more ITS infrastructure, smart EV charging infrastructure with the use of solar energy together with the presence of more electric vehicles and autonomous driven machines are introduced in the national vehicle fleet, all based on Artificial Intelligence.

In the meantime however, the Government , besides developing the smart city concept it has also embarked to introduce in Malta by importing and implementing the SmartCity® product, a concept developed by TECOM investments of Dubai City in October 1999 and which starting officially to implement the project in 2000. The SmartCity® concept is a product of building a city based on digitisation and a knowledge based society thus serving as a test bed for new ICT-based technologies from the ground up. It will host a number of leading ICT based comanies including Smart Health Services. Apart from Offices, retail outlets and so on, the small city will also include Smart accomodataion units as described below.

This project is being developed along the east coast of Valletta in the limits of Kalkara, where recently the Government had opened a new Science park on the outskirts of SmartCity SmartCity Malta (SCM) is the first European outpost of this SmartCity Global method of business townships, creating a network of opportunities for knowledge based companies.

It will have the most advanced and reliable ICT infrastructure available in Malta today. Through progressive implementation of technology and services, SmartCity Malta has developed its proprietary ICT infrastructure concept to meet the technical demands of mission critical digital operations.

Environment Sustainability comes with:

- Rainwater harvesting and storm water management
- Use of water efficient landscaping
- Use of solar photovoltaic paneled LED lights and energy efficient LED street lighting

- HVAC LED optimization and VRV system
- Heat recovery wheels
- Limited glazing in build environment
- Appropriate metering to meet energy end use.

Q4 Are there synergies and/or conflicts of the "Smart City" plan and organizational structure with existing initiatives and their structures within the city?

The Smart City Concept fits well as a means of getting the Valletta Region on track to address the environmental and sustainable transport targets. There are no current conflicts and synergies in between all stake holders involved including all national, public and other government agencies as well as the private sector will be build.

Public Financial resources however are still lacking to implement long term measures in this regard leaving dependence for the implementation of these measures on PPP arrangements with the aid of EU funded projects were possible. However some element of public finance and a mix of EU funds will be made available on specific projects and elements of the smart city concept as already indicated above, especially for transport and ITS interventions. Transport Malta also does not include direct private investment as in the case of the e-car sharing programme as well as e-bike sharing programme, whereby both services will form part of the overall smart transport and energy ecosystem.

Q5 Which and how are regional and local stakeholders involved in the Smart City strategy and planning process on a city level?

The main stakeholders include:

- Ministry for Transport and Infrastructure
- Ministry for Finance and Investment
- Ministry for Sustainable Development, the Environment and Climate change
- Ministry for Energy and Health

- Transport Malta
- Malta National Electromobility Platform
- Malta Resources Authority
- Malta Environment and Planning Agency

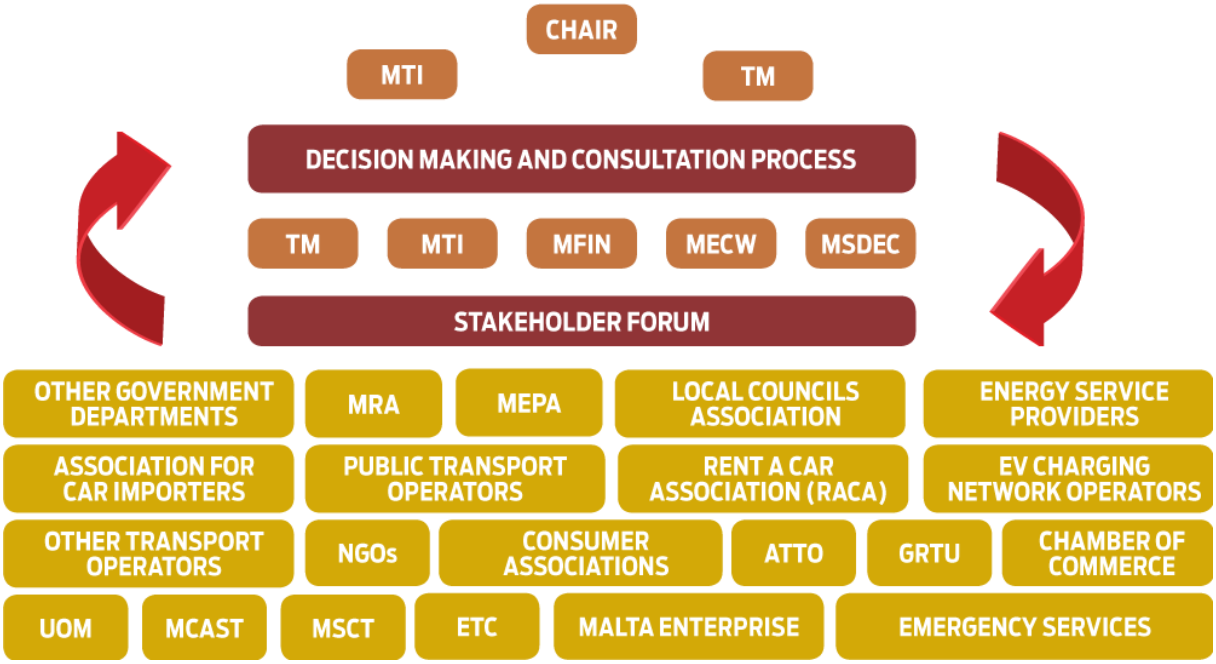
- Valletta Local Council
- Local Councils Association

- Energy Service Providers

- Association for Car Importers
- Rent a Cab Association
- EV Charging Network Operators

- Consumer Associations
- General Retailers and Traders Union
- Chamber of Commerce

Organizational structure of the stakeholder forum:



Q6 What are past (<5 years) and current projects that are closely related to the "Smart City" concept?

PAST PROJECTS

The **Valletta Vertical Connections Project** - Better accessibility through innovative and cleaner transport (2009 – 2013): Funded through ERDF, the vertical connections project connects the lowest part of Valletta and the highest point of the City through the installation of a lift. The lift facilitates accessibility to the centre of the City and the waterfront where the Valletta Gateway Terminal and the Valletta Cruise Port are situated, guaranteeing modal shift adopting a cleaner transport technology.

MODUS (2010 -2015): Funded under ERDF, the MODUS project strives to mitigate negative trends in Maltese transport by making public transport more efficient and reliable. This is done through various measures that will minimize road congestion and make public transport more attractive, including the introduction of accessible Bus Interchanges connecting public transport routes together and facilitating commuters' shift between routes; launch of two Park and Ride facilities; Extension and introduction of new bus priority lanes; Introduction of an Intelligent Transport Management

System that will allow Transport Malta to monitor the traffic situation on all Maltese roads in real time, all day, every day. The system will enable TM to respond quickly to congested areas and divert traffic to alternative routes. The real-time traffic monitoring offered by the system will also allow TM to respond to accidents as they occur as well as any other incidents that happen on roads, such as flooding. TM will also be able to alert and deploy the personnel necessary to handle the situation at hand without any delay, while diverting traffic in real time using Variable Message signs at key locations.

DEMOEV (2010 – 2014): funded under Life+, the DemoEV demonstration project introduces EVs in Malta (24 in total) to be used and tested by volunteers ranging from households to SMEs. The vehicles' feasibility, efficiency, charge autonomy and design are demonstrated to the general public over 12 months with the aim of expanding the use of green transport.

Through this project the Government introduced the foundations of the Malta National EV Charging Network whereby 90 electric car charging points installed at different strategic locations on the road network to be used by EV owners within the general public.

In addition a real time EV Charging App was also introduce whereby EV owners and users can pre book or book in real time a charging pillar for a maximum of four hours. The system is an intelligent one, accompanied by a smart electric meter and the app can advise users which charging pillars are occupied, not occupied or out of service.

PORT-PVEV (2012 – 2015): funded under the OP Italy-Malta 2007-2013, this project contributes towards energy efficiency improvements in port operations and the attainment of carbon neutral road transport within the Valleta port area (Grand Harbour and Marsamxetto Harbour) and the respective port areas and hinterlands.

This has been done through the deployment of 13 full electric vehicles to be used and demonstrated by Port Authority officials during port operations activities; the installation of fast charging points within Port Authority premises; the installation of a Photovoltaic farm on the on roof of the Transport Malta Head Office situated at the Port spanning over 1,704 square meters, which offset the charging of electric vehicles and provide energy for part of the Transport Malta energy needs.

The most novelle deliverable of this project was the building and installation of three solar electric car charging stations to test and demonstrate carbon neutral road transport. These solar car ports are intelligent in their own right. Solar energy captured through the PV array on top of the car port is stored in a battery room built adjacent to the car port and connected directly to both the electricity grid and the charging pillar. Once the battery storage is filled up, the excess solar energy produced will go into the electricity grid not to be wasted. Once EVs start to charge during the day, the batteries keep being replenished by solar energy. At night, while car charging takes place, and if the batteries are emptied, the electric cars will keep on charging from the electricity grid.

D-AIR (2012 – 2014): Funded under INTERREG IVC, the D-AIR project contributes to convert airports into environmentally sustainable transport hubs. The project deals with two main elements of airport operations that fall under the competence of public authorities and bodies, namely; surface accessibility to airport zones and carbon neutrality for airport operator activities. Based on the

studies and exchange of best practices completed during the lifetime of the project, the end result is an Implementation Plan which has been endorsed by national decision making bodies and which will be followed as guidelines to future policy after the termination of this project in order to create a truly decarbonized airport region.

STREETS (2012 – 2015): Funded under Italy-Malta 2007-2014, the STREETS project contributes towards the strengthening of efficiency, sustainability and integration within a joint transport system aiming at an improved internal (Maltese road network) and external (Malta to Sicily transport) accessibility and competitiveness. The main result provides a contribution to overcoming the current bottlenecks identified within and between Malta and Sicily in strong connection to inadequate land and air infrastructures, logistics and commercial services. This project thus provides the basis for better accessibility through an eco-friendly transport system.

MEDNET (2012 – 2015): Funded under MED Programme, the MEDNET project establishes a network of Mediterranean port authorities and transport experts – on a long-term basis – focusing on the exchange of experiences concerning port and custom procedures and the simplification of clearance of vessels and cargoes. This is expected to enhance the common understanding of such procedures and promote the introduction of smart information systems to ports and potentially other intermodal nodes. As part of the MEDNET project TM has commissioned a detailed study which serves as a Masterplan to be implemented by Transport Malta to effectively prepare the way for the implementation of the National Single Window - a directive which aims at the harmonization of port procedures, limiting unnecessary bureaucracy and facilitating administration at the port area.

PROMETEUS

The aim of the project, which has a total Budget allocation of €1.4 Million is to stimulate a learning process based on the identification, analysis and exchange of knowledge and practices in the field of e-mobility by the elaboration and implementation of e-mobility action plans, as well as promoting it.
Considering the European framework, the project will carry out a joint analysis of e-mobility approaches in the different partners' regions, highlighting the specific territorial contexts and the respective demands (tourism, urban areas, high vehicle ownership) for electric vehicles.

The second part of the project will identify valuable experiences and practices of local and regional measures that were intended to promote e-mobility in the respective municipalities and regions, which are then further investigated through activities such as study visits and thematic workshops.
Besides electric propulsion itself, implementing and promoting electromobility means also a combination of stakeholders, technologies and activities from different actors (such as public administrations, suppliers, parking operators, companies with transport fleets, private car owners, charging infrastructure installers, suppliers of mobility services, etc.). Such analysis will be used to characterize and evaluate the possible sources and forms of promotion (regulations, aid schemes, Planning Authority incentives in terms of use of the road space, economic incentives, market measures and public awareness).

Based on the findings of such analysis, the project will draw up specific e-mobility action plans to be strongly integrated in the policy instruments identified in each participating region or updating

existing ones already in place. A shared monitoring system will be designed and implemented to measure the Action Plans' effectiveness.

Transfer of knowledge and good practices will be guaranteed both within the partnership through joint project activities and through dissemination activities to the general public including the relevant stakeholders.

Malta will be addressing Axis 3: Supporting the shift towards a low-carbon economy in all sectors (corresponding to thematic objective 4) 4(e) - *Promoting low-carbon strategies for all types of territories, in particular for urban areas, including the promotion of sustainable multi-modal urban mobility and mitigation relevant adaptation measures.*

The other partners in this project are:

- Austria – Regional Government of Carinthia
- Spain – General Directorate of Industry and Competitiveness of Castillia y Leon
- Italy – Lazio Region
- Slovakia – Presov Self Governing Region
- Italy – Politecnico di Milano, Poliedra

DESTINATIONS Project

By adopting an integrated view of tourist and residents' mobility, CIVITAS DESTINATIONS aims to address the problem of high seasonal mobility demand in smaller touristic destinations. In this regard, the project brings together Funchal (Portugal), Las Palmas (Spain), Elba (Italy), Rhetymno (Greece), Limassol (Cyprus) and Malta who together will work towards finding solutions to common problems.

In such destinations mobility is highly car dependent, and congestion and other harmful mobility impacts bloom when and where they are less desired.
To show how to address this challenge, CIVITAS DESTINATIONS will implement a set of mutually reinforcing innovative mobility solutions in each of the participating sites, who, through testing innovative solutions, sharing experience and learning from best practices .

The DESTINATIONS Partnership brings together six demonstration sites Funchal (Portugal), Las Palmas (Spain), Elba (Italy), Rhetymno (Greece), Limassol (Cyprus) and Valletta (Malta) as well as four follower cities from China who will be following closely the measures implemented in the demonstration sites and learning from experiences gained.

In Malta, the project is focused on the Southern Harbour and Northern Harbour districts termed as the Valletta Region. While housing approximately 50% of the local resident population, the region also houses both the Valletta Cruise Port and the Malta International Airport. As such, the region experiences a high number of annual visitors. As of 2016, 1.8 million tourists visited Malta, 90% of whom also visited Valletta at some point during their stay.

To this effect, the region endures a high number of mobility demand, which – particularly in recent years – is putting a high strain on the local transport infrastructure resulting in high traffic congestion and journey delays. In order to mitigate these negative externalities, a number of initiatives, which have yet been untested in Malta shall be implemented in order to assess their success in the local context and thus form the basis for future transport policy development.

Q7 Which sites/districts are projected to be developed in the next five/ten years?

Being the centre for administration, business and transport – including the international airport, both the Grand Harbour and the Marsamxetto Harbour which cater for cargo shipment, cruise landings and the Malta-Sicily ferry, as well as the main land transport hubs – the Valletta Region is the main focal point for development over the medium and long term.

Projects planned for implementation include:

- Pilot projects and relevant studies on the use of hydrogen energy for transport
- E-bike sharing projects and schemes focusing on better accessibility within urban centres for tourists and residents
- E-car sharing projects targeting tourists and commuters
- Developing a Regional SUMP for Valletta
- The improvement of harbour ferry and water taxi landing sites within the Grand Harbour and Marsamxetto harbours to encourage modal shift from congested roads to the sea while better connecting ferry landing sites at Valletta, Sliema and Cottonera together as well as with other modes of public transport through ITS infrastructure
- The introduction of last mile delivery of goods using clean and energy efficient vehicles within the Valletta City
- Extending the Modus project to increase the role of ITS on the national network, particularly within the urban centres, to focus on road safety and intermodality
- Real time app for a national safe cycling route network.
- Safe cycling streets based on the “share the road” concept. Two main corridors will be implemented. The upgraded streets and promenades will include specific signs, speed management, ITS infrastructure, reduction in current speeds.
- The introduction of Smart Local Transport Hubs, 45 in total across Malta and Gozo in key strategic areas where multi modal transport services will be provided for transport users.
- SUMMITS I, II and III. These three projects reflects a three phased approach of ITS deployment on Malta’s road network, much of it to based on Artificial Intelligence.

Q8 What are the main areas of interest of the FC in the Smart City concept?

Smart Solution 11 (Alternative fuel driven vehicles):

To build on the electric vehicle charging point network implemented through the DEMOEV project with which forty-five charging pillars have been installed nationwide in Malta, Government will

continue the deployment of additional 400 charging points. Current pillars are dual-point, meaning that as of 2014, ninety charging points have been available for public use.

Furthermore, as part of the PORT-PVEV project, additional charging points and solar charging stations have been installed in and around the Valletta port area. Each solar charging station can house up to 4 vehicles at any given time, adding the national charging point network by an extra 11 points for public use. Solar Charging points are being installed together with batteries in order to store energy generated on site by the solar station and use it to charge vehicles directly; thus making available and demonstrating carbon neutral transportation.

In order to manage the various public charging points, a monitoring platform for the existing charging points is already in place which specifically covers the forty-five pillars that have been installed as part of the DEMOEV project.

However, the setup of a national e-platform is planned. This will connect current and future charging points and enable their remote management and monitoring while ensuring interoperability and the competitively of the charging infrastructure on the national transport network. The e-platform must cover the entire island since focusing the remote monitoring on specific isolated regions within the road network would not generate economies of scale.

As stated above, as part of the EU Directive on Alternative Fuels Infrastructure, and in accordance with the targets indicated in the Malta National Electromobility Action Plan, Malta is bound to install a total of 500 charging points nationwide by 2020. This, coupled by the drive to encourage the take up of electric vehicles particularly by the commercial sector – namely, economic operators with sizeable vehicle fleets – the interoperability, monitoring and management of the different charging systems is a high priority for the Government.

As stated above, within the Valletta Region, several electromobility projects will merge over the coming five years. To this effect, Transport Malta is very interested to learn from the experience of other cities on how charging infrastructure for electric vehicles can be effectively managed to provide the best service to its users, maintain an open, competitive market, including different propulsion technologies, while leaving the least possible negative impact on the electricity grid.

Through its participation in the development of Solution 11 and the development of its Replication Plan, Transport Malta aims to achieve the following:

- Identification of the locations where future charging points should be installed in the Valletta region (which encompass the Inner and Outer Harbour Regions);
- Roll out plan (including timeframes) of the charging infrastructure installation;
- Funding and financing options to support this investment;
- Stakeholders to be involved;
- Type of infrastructure to be installed (keeping in mind evolving technologies and demand);
- Identification of a suitable e-management system for the existing and future infrastructure to be deployed.

Smart Solution 12 (Smart mobility solutions):

Malta will look at the actions implemented with respect to car sharing, be it conventional car sharing, electric car sharing as well as e-bike sharing (PEDELEC) in specific urban cores.

The studies and knowledge-gathering exercise to be conducted by Transport Malta during the GrowSmarter project on these vehicle sharing platforms is essential before Transport Malta can attempt to carry out an actual pilot project in Malta, especially since there has so far been no experience with car sharing of any form in Malta.

E-Car/Car Sharing and e-bike sharing are both included in Malta's National Electromobility Action Plan and hence are of top priority both for the Transport Authority and the Government. These will further contribute towards the promoting of additional modes of transport, in the case of PEDELEC and addressing traffic congestion problems in specific urban cores by developing the concept of vehicle sharing.

Through its participation in the development of Solution 12, Transport Malta aims to achieve the following:

- Identification of the locations from where future e-Car/Car sharing and e-bike sharing services may be offered;
- Type of infrastructure to be installed (keeping in mind evolving technologies and demand);
- Roll out plan (including timeframes) of the infrastructure installation;
- Funding and financing options to support this investment;
- Stakeholders to be involved;
- Identification of a suitable e-management system for e-Car/Car/e-bike sharing system.

The Smart Solutions which Transport Malta will be following and studying as part of GrowSmarter merge three technologies; BEVs (e-bikes, electric quadricycles and electric vehicles), vehicle charging systems and vehicle sharing software and management systems. The integration of BEVs with vehicle sharing technologies can potentially increase the utility of vehicle sharing by reducing some barriers to the use of BEVs and increasing the amount of prospective users, while merging vehicle sharing software with vehicle charging stations allows for a comprehensive, space saving solution which may create hubs where electric vehicle owners may charge own cars as well as share public vehicles with interested users. Such a solution would be ideal for Malta where parking space is such a limited commodity.

The GrowSmarter project will allow Transport Malta to better understand the various options of monitoring and managing charging infrastructure which is intended for public use. Considering the authority's current development of the MODUS project and, more specifically, the implementation of the Intelligent Management Transport System (ITMS) forming part of the same project, the opportunities that GrowSmarter offers could not have come at a better time.

A remote management system that manages various electric car charging points is currently in place. It is operated by a private operator and caters for the 90 points which have been installed as part of the DEMOEV project. However, the operational costs for the management of these 90 points are astronomical and it is in the National interest for Transport Malta to find a more economical way of monitoring these points, especially when considering that since the end of the DEMOEV project, a further three solar charging stations have been constructed as part of the PORT-PVEV project. Moreover, since the new Solar Charging Stations do not form part of the DEMOEV project, they neither form part of the management and monitoring system catering for the initial 90 points.

As stated above, the current 101 points are only the beginning, and at least another 399 points must be available on Maltese roads by 2020. All new points must be monitored and managed if the public is to be provided with an efficient and effective service. On the other hand, segmenting the system between various private operators will not provide the best comprehensive solution, while at the same time, private operators should not be deterred from bidding to operate segments of the system in order to maintain a healthy level of competiveness, ensure the best technology on the market at the right prices.

In order to solve this problem, a Government operated, umbrella management platform must be created to which all the separate segments of the network are connected. This will allow standardisation, deter abuse, and ensure a seamless service no matter the type of infrastructure and respective operator.

Moreover, in order to ensure the best level of monitoring, the umbrella platform must be connected to the ITMS and monitored from the Central Hub which is to be housed at Transport Malta and manned on a 24/7 bases. Herein lies one of the main opportunities which GrowSmarter offers as the project will not only study the best technological solution which is most adapted to offer the needed monitoring service, but it will also offer the right solution of how such a monitoring system can best be connected to the ITMS. ITS in Malta is currently at its infancy stage, therefore now is the best time to develop the service with the right solutions that meet the country's needs. With ITS being such a new experience for the island's transport managers, learning from the wider experiences offered by countries such as Cologne and Stockholm will offer Malta a well of know-how and ensure that Transport Malta has the right guide on which to plot its own system.

Through the sharing of best practice and knowledge gathering exercise made possible by GrowSmarter, Transport Malta will also look at funding options which will be used as guidelines for Transport Malta when it comes to contracting the monitoring service and connecting such solutions to the ITMS. The funding options will also be studied in terms of financing the deployment of the remaining 399 charging points to be installed on the national network, as well as financing the vehicle-sharing systems.

9.2 Smart Solutions Selection

Description of replication potential of selected Smart Solutions of LCs within FC

The table below shows which solutions the Follower Cities plan to replicate.

		Follower Cities				
Area	***Smart Solutions***	*Porto*	*Graz*	*Cork*	***Valetta***	*Suceava*
Housing measures	*1. Efficient and smart climate shell refurbishment*		*X*	*X*		*X*
	2. Smart building logistics and alternative fuelled vehicles					
	3. Smart, energy saving tenants through information	*X*	*X*			*X*
	4. Smart local electricity production and integration with buildings and grid			*X*		*X*
Integrated measures	*5. Smart lightning, lampposts as hubs for communication*	*X*	*X*	*X*		*X*
	6. Waste heat and local heat integration by new business models		*X*			
	7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.	*X*				*X*
	8. Big data protocol for saving energy and improving the quality of life	*X*				
Mobility measures	*9. Sustainable delivery*				***X***	
	10. Smart traffic management					*X*
	11. Alternative fuel driven vehicles for decarbonizing and better air quality	*X*		*X*		*X*
	12. Smart mobility solutions		*X*	*X*	***X***	*X*

9.3 Smart Measure selection

The table below specifies which smart (bundle of) measures within the 12 solutions each FC plans to replicate.

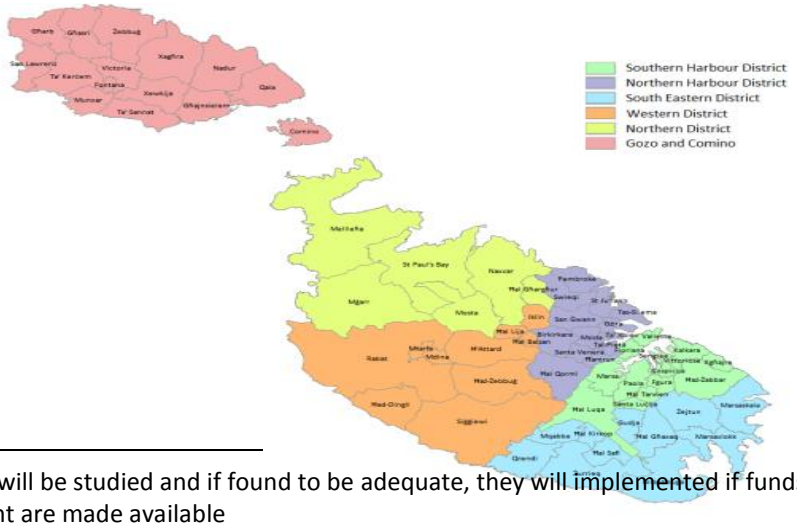
SC Measure	Measure title	Follower City Valletta
Low Energy Districts		
Solution 1 - Efficient and smart climate shell refurbishment		
1.1 - Energy efficient refurbishment of the building	Energy efficient refurbishment of residential buildings - Stockholm	
	Climate shell refurbishment - Cologne	
	Energy quality assurance - Stockholm	
	New adaptative control and regulation techniques for heating systems - Barcelona	
	Re-build an industrial site: Ca l'Alier - Barcelona	
	Efficient and smart climate shell and equipment refurbishment - Barcelona	
	Efficient and smart climate shell refurbishment of residential buildings - Barcelona	
	Efficient and smart climate shell and equipment refurbishment of tertiary buildings - Barcelona	
	Energy efficient swimming pools - Barcelona	
Solution 2 - Smart building logistics and alternative fuelled vehicles		
2.1 Integrated multimodal transport for construction materials	Construction consolidation centre - Stockholm	
Solution 3 - Smart, energy saving tenants		
3.1 Active House/Home energy management system/Smart home system	Home Energy Management – Cologne	
	The Active House – Stockholm	
	An Open Home Net – Stockholm	
	Hubgrade - Energy Saving Centre – Stockholm	
	Adaptive Temperature Control System - Stockholm	
	Home Energy Management System (HEMS) - Barcelona	
	Virtual Energy Advisor - Barcelona	
	Dynamic Pricing Models - Barcelona (Stochastic Model of Appliances Energy Consumption)	
Solution 4 - Local renewable energy production and integration		
4.1 Virtual power plant	Residential Estate Management – Cologne	
	Smart Energy & Self-Sufficient Block - Barcelona	
4.2 Smart energy and self-sufficient block	Building Energy Management System (BEMS) to minimise consumption of fossil fuels and electricity - Barcelona	
Integrated infrastructures		
Solution 5 - Smart lighting, lamposts and traffic posts as hubs for comm.		

5.1 Smart streetlighting	Smart LED streetlighting - Stockholm	
5.2 Combined electrical charging and street lighting poles + wifi	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Barcelona	
	Combined electrical charging and street lighting poles + Wifi-to-grid connection - Stockholm	
5.3 Smart meter information analysis and actuators	Smart Meter information analysis and actuators - Barcelona	
Solution 6 - New business models for district heating and cooling		
6.1 Open district heating with feed-in of waste heat	Open district heating – Stockholm	
6.2 District heating and cooling rings	District heating rings - Barcelona	
6.3 Smart local thermal districts	Smart local thermal districts – Barcelona	
Solution 7 - Smart waste collection , turning waste to energy		
7.1 Optical sorting of waste 7.2 Introduction of AWCS 7.3 Waste collection statistics for individual households/businesses	Smart waste management - Stockholm	
Solution 8 Big open data platforms		
8.1 Big consolidated open data platform	Big consolidated open data platform - Stockholm	
	Big open data platform - Barcelona	
	Urban Cockpit – Cologne	
	Urban Traffic – Cologne	
	Urban Environment Cologne	
8.2 Urban models		
8.3 Semi-automatic instance mapping		
8.4 Integration of sensor and heterogeneous data in standard data format	Integration of sensor data in a uniform in standard-driven data format - Barcelona	
8.5 Sustainable connected lighting to enhance safety and mobility		
Sustainable Urban Mobility		
Solution 9 - Sustainable delivery		
9.1 Integrated multi-mode transport for light goods	Communal service boxes for sustainable deliveries – Stockholm	
9.2 Micro-distribution of freight	Micro distribution of freight - Barcelona	
Solution 10 - Smart traffic management		
10.1 Traffic management through MFD 10.3 Travel demand management 10.4 Traffic control systems for passenger vehicles 10.5 Traffic signals synchronised to prioritize movement of goods	Smart traffic signals – Stockholm and Barcelona	
Solution 11 - Alternative fuel driven vehicles		

11.1 Developing charging infrastructure	Normal charging infrastructure for electric vehicles – Stockholm	X[25]
	Fast charging infrastructure for electric vehicles – Stockholm and Barcelona	X[26]
	eTankE - Cologne	
	Vehicle to X (V2X) Charging for EVs - Barcelona	
11.2 E-mobility management system		X[27]
11.3 Charging infrastructure for electric tricycles for micro-distribution		
11.4 Refueling facilities for alternative heavy duty fuels	Alternative fuels for heavy duty vehicles – Stockholm	
11.5 Smart guiding to alternative fuel stations and fast charging		
11.6 Small distributed CNG grid	Small distributed CNG grid - Barcelona	
Solution 12 Smart mobility solutions		
12.1 Green parking index	Green parking index – Stockholm	
12.2 Electrical and cargo bike pool		
12.3 Mobility hub	Mobility Hub – Cologne	
12.4 Electrical and conventional car sharing		
12.5 Conventional/PHEV/CNG vehicle sharing fleets		
12.6 Smart taxi stand system	Smart taxi stand system - Barcelona	

9.4 Smart City and District Replication

The Districts with the highest potential for Replication of Smart Solutions are the Northern Harbour and Southern Harbour Regions – shown in purple and green in the map below. These two districts form the Valletta Region and together are acting as Follower City to this project.



[25] Solution will be studied and if found to be adequate, they will implemented if funds from Central Government are made available

[26] -ditto-

[27] Solution will be studied and if found to be adequate, they will implemented if funds from Central Government are made available

9.5 Smart District Harbour Replication Profile

9.5.1 Mapping of district related replication framework for selected Smart Solutions

Q1 What are the main characteristics of the district and what is the replication potential?

Southern Harbour District:

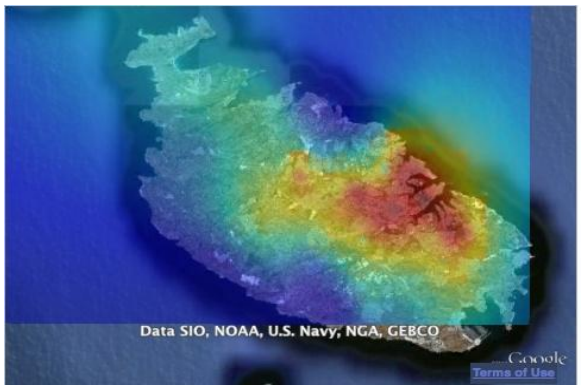
Area: 26.17 Km^2
Population: 79,438
Population per Km^2: 3,035
Demography: Males: 39,575 Females: 39,863
Employment: 29,561 persons aged 15 and over who are employed
Major Transport Hubs: Malta International Airport (TEN-T Core Network); Grand Harbour (TEN-T Core Network) including the Valletta Cruise Port; Valletta Gateway Terminal, Malta-Sicily ferry landing site and Valletta and Cottonera ferry landing sites; Valletta, Marsa, Fgura Bus Interchange Termini.

Northern Harbour district:

Area: 24.02 Km^2
Population: 120,449
Population per Km^2: 5,014
Demography: Males: 59,335 Females: 61,114
Employment: 50,110 persons aged 15 and over who are employed
Major Transport Hubs: Marsamxetto Harbour including the Sliema Ferry landing site; Sliema, St Julian's Bus interchange termini

These two districts have the highest potential for replication since they house the most prominent transport, administrative and commercial hubs, as well as being the most densely populated districts on the island. Development done in these districts is felt by the highest per capita population, while due to their density, they are the districts most in need of improvement.

Traffic congestion is rampant in these districts. From Air Quality data gathered periodically by the Malta Environment and Planning Agency (MEPA), depicted in the map below, it is evident that these two districts are in the line of fire when it comes to poor air quality – due to the high level of road traffic congestion, emissions within the port areas and the airport.



Poor air quality not only affects the quality of life of the population – these two districts alone house 47.88% of the entire Maltese population – but also historical infrastructure located in the area which deteriorate from acid rain and the dirty air. Valletta, the three cities of Cottonera and Fgura are four cities surrounded by 4-century old bastions which form a major role in the Maltese national heritage.

As the Maltese population feels the effects of poor air quality and rampant traffic congestion, so do tourists who throng to these two districts annually. 90% of tourists who visit Malta, also visit Valletta, while 64% visit Sliema – located across the harbour from Valletta. Of the 1,520,828 tourists who visited Malta in 2014, 492,207 where cruise passengers who landed in the Valletta Cruise Port – these numbers are staggering when keeping in mind that Malta's residential population amounts to 417,432 residents.

Moreover, Sliema, Gzira, St Julian's and Valletta house the main tourist resorts on the island.

As stated above, the districts also house the main transport hubs, therefore in solutions that generate potential for intermodality, vehicle-to-infrastructure communication, green modes of public transport and ITS, these Districts hold the greatest potential for replication and improvement.

The National Transport Strategy and Transport Master Plan

Following a request by Government to develop the National Transport Strategy and Master Plan, the Integrated Transport Strategy Directorate has analysed all modes of transport (land, public transport, maritime, and aviation), for internal and international transport. This analysis looked closely at the needs of the country (both Malta and Gozo), identified problems and sought to understand what we expect to face in future – short, medium and long term. Through the National Transport Strategy, Government will develop a vision of where Malta wants to be in the long term, the strategic direction required to get there.

Besides being a requirement for Malta to be able to access EU structural and innovation funds (2014-2020), this exercise will be the first fully comprehensive look holistically at all transport modes, and also the inter-modality that clearly will become the future for both freight and passenger transport. Transport Malta is working closely and intensely both with JASPERS (Joint Assistance to Support Projects in European Regions) as well as specially contracted experts from Spain and Italy (INECO-Systematica Consortium) to support the local team.

The National Transport Model

For these purposes, a National Transport Model (NTM) will be constructed to inform policy and provide an integrated transport analysis. The model will be an update of the TRIPS transport model last developed by Malta in late 1980's and early 1990's when formulating the Structure Plan (1992) and which is now obsolete. The new model will be used for the testing and appraisal of transport scenarios and provision of transport forecasts which will be used to refine the NTS and develop the TMP for Malta. The model will assist Transport Malta's work by producing outputs for more detailed local or project models as input into the engineering design process, economic and financial analysis, environmental assessment, and for monitoring of current and future projects.

Budget Document 2017

The encouraging rise in the number of passengers making use of public transport is a clear sign that gradually the Maltese public is regaining confidence in this service. During the last year public transport carried over 40 million passengers, an increase of 7% on the previous year and a rise of 18% when compared with 2012. This has an effect on the use of private vehicles on the roads and we shall continue to insist with the public transport provider for further improvement of the service. Whilst striving to improve public transport and providing better infrastructure, we shall be taking further measures to offer incentives to particular groups in a way that rewards the use of organised transport. Both with regards to frequency and punctuality as well as the level of service offered to passengers.

In an effort to encourage more people to use public transport instead of their own private vehicle, every young person reaching the age of 18 in the course of 2017, will be given a one year free travel pass for public transport amounting to a maximum of €312 for every young person.

Solar Farms are also encouraged on a smaller scale; the Government, through the Malta Resources Authority, has launched and is implementing additional schemes for the installation of photovoltaic panels and solar water heaters for households, as well as initiatives to encourage efficient use of energy.

In the last budget we introduced an incentive for enterprises that invest in bicycle racks for the parking of their employees' bicycles when these opted to use this means of transport to commute to work. This scheme will be extended for another year. Moreover we continued with the incentive schemes for the purchase of electric vehicles, whilst also scrapping IC vehicles. We also introduced schemes to fund the installation of charging points and the upgrading of service garages to start catering for electric vehicles.

<u>National Electromobility Action Plan</u>

Published in 2013, the strategy notes the importance of electric mobility and its relevance to land transport in Malta and Gozo. The Government of Malta has set an indicative target of 5,000 electric vehicles uptake by 2020. To meet this target, the Action Plan lists 22 projects to be implemented by 2020. The projects are planned at a national level, however since tourism and transport infrastructure are geographically focused in the two districts under review, the majority of the project will be focused in these areas.

Projects include:

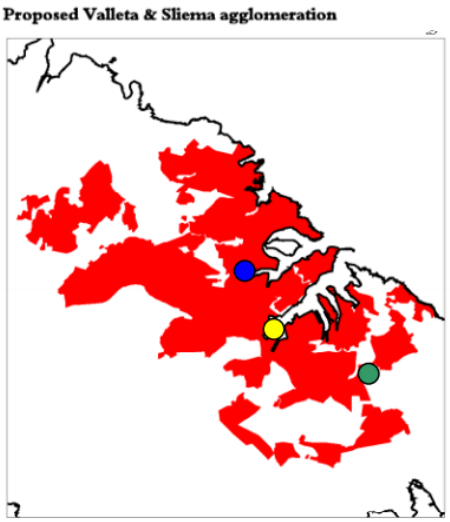
- Building of a Hydrogen Fuel station

- E-car Sharing for Hotels
- Studies into light rail and monorail
- Public Transport Routes for electric buses
- Carbon Neutral Transport infrustructures

Air Quality Plans and Measures

Published in 2010 by MEPA, this document is aimed to act as policy guidance to reduce daily average PM_{10} concentrations in ambient air in the Maltese agglomeration. The measures contained in this document are proposed for the major sources of PM_{10} in the Maltese Islands, more specifically the construction industry, power generation and traffic.

In its measures, the document focuses on the Valletta (Southern Harbour) and Sliema (Northern Harbour) agglomeration as it is the zone in exceedances.



Malta agglomeration and location of PM_{10} measuring stations

With respect to power generation, the measures contained in this document are conditions already set out and legally binding.

With respect to the road transport sector, national data shows that this sector is the major contributor to the exceedances of PM_{10} concentrations in ambient air.

Measures proposed for the road sector include, but are not limited to, the facilitation of carpooling and car sharing, restrict circulation of public buses falling in the Euro 3 category and lower (implemented by 2011), improvement of Valletta Park and Ride (extended to Marsa and Pembroke), improvement of cycling infrastructure, reform of the Valletta Controlled Vehicle Access system, measures to encourage local car dealers to promote the sale of cleaner technology vehicles (under implementation since 2013).

This document is currently being updated by MEPA in consultation with Transport Malta.

Funding varies between national, cohesion policy and ERDF, other Centralized EU funding projects and PPPs.

Q2 Are there synergies and/or conflicts related to the Smart Solutions with the existing infrastructure, socio-economic profile and social acceptance?

Synergies exist particularly with the projects planned over the coming five years as described in Q1 above.

Q3 How will local stakeholders be involved in the replication of Smart Solutions?

When it comes to the implementation of all sorts of infrastructure on public land, the Malta Environment and Planning Authority must be consulted since all permits are issued from said authority. The Authority will check that relevant impact studies are in place and that no major negative impacts will result; both on the environment, air quality and the road network; as a result of the development in question.

When the infrastructure is particularly relevant to the generation of energy from renewable resources the Malta Resources Authority will also be consulted extensively.

The Malta Tourism Authority will be consulted when it comes to implementing infrastructure and equipment in areas of high tourism value and when it comes to implement measures that may impact the flow of tourism.

All Local Councils within the selected districts will be kept on board throughout the consultations.

Consumer organizations, the General Retailers and Traders Union and the Chamber of Commerce will be consulted when measures may impact the market.

The Ministry for Finance and the Ministry for European Affairs will be consulted on matters related funding and resources, in terms of the latter Ministry, consultations will occur when the project is targeting EU funding.

9.6 Smart Measures Specifications

9.6.1 Progress towards replication of measures/measure bundles within the selected districts

9.6.2 Replication of measure 11 / bundle of measures 11.1 a, 11.1 b and 11.2

Q1 What is the replication potential of the Smart Measure(s)?

Malta has already a National in place which is currently being updated as a number of measures have been implemented; others are in the process of being implemented while newer ones are being included. Through this project we have just completed a study on full deployment of the national EV charging point network. We are also in the process of rolling out a national E-Car Sharing service, later on this year with a private operator.

- Reason for interest / value for money (if not redundant)

The interest for Malta is that it already has an electromobility action in place since December 2013, hence our interest is natural.

- key policy and legislation frameworks affecting the solution's development / implementation

The policy framework is embedded in the Malta National Electromobility Action Place which is in place and currently being updated

- Status quo of deployment of solution (e.g. feasibility study available etc.)

Through the Grow Smarter project we have carried out a Cost Benefit Analysis, Technology Study and Gap Analysis as well as an implementation plan till 2020, to continue with the deployment of the infrastructure in line with the respective EU Directive, which mandates Malta to put in place a minimum of 500 charging points nationwide. Transport Malta is in the meantime asking the Ministry of Finance for the respective finance to continue with the deployment

- Specify area and scope of potential implementation (e.g. deep refurbishment of m^2)

The area for the implementation is the wider Valletta Region . The potential is indicated in the respective studies being carried out and referred to above.

- What needs to happen for the Smart Solution to get implemented?

Acquiring the necessary finance from central government to continue with the roll out of the equipment.

Q2 What is the business case and do financing opportunities already exist?

- Assess the current business case for the solution

The business case comes out from the Cost Benefit Analysis

- Name potential financing opportunities (European, national, private etc.)

National Funds, Private investment, ERDF Funds, other EU funds

- Assess market up-take / expected consumption

This is being carried out as part of the Cost Benefit Analysis Process.

- Describe future financing model and ownership of Smart Solution

Financing will come from various pots, including private investment, national funds and EU Funds where applicable such as when testing new technologies.

Q3 What are the main challenges and barriers related to the measure(s)?

- Describe technological barriers if any

None

- Describe procurement barriers if any

None

- Describe other barriers (regulatory, financial, etc.)

Financial …. This depends on the allocation of funds as far as direct national investments are concerned.

Q4 How does the Smart Solution integrate with the existing and future infrastructure?

- Links to/integration with other measures / Smart Solutions,

The smart solution will be implemented and the current infrastructure will be integrated within the new smart solution, ie, a national overarching platform which will integrate the charging infrastructure due to the fact that it is interoperable

Q5 What user / stakeholder involvement is foreseen?

- What are their main interests/objectives/expectations?

Yes stakeholders were being consulted by our consultants who carried out the respective studies, Also stake holders are already included in the structure of the MNEP, that is, the Malta National Electromobility Platform. The structure of the latter already has a stakeholder relationship in built within it.

- What group(s) can be supportive, skeptical or blocking towards the solution?

There aren't any groups blocking the solution.

Q6 What is the potential implementation timeframe?

The planned implementation time frame is 2017 – 2020.

9.6.3 Replication needs of Smart City Measure(s)

Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?

Since we know what we require and where the infrastructure has to be installed (from the CBA Process), apart from funding, we would require the latest up-to-date technical information on the technology available. Therefore we would recommend technical visits specifically on charging infrastructure in any or all of the Lighthouse Cities, wherever the infrastructure in these locations is the most modern. Business dialogues with companies involved in implementation would also be useful.

Conclusions

As can be seen throughout all the above sections of this document, as well as other reports from the project, Stockholm (Sweden), Cologne (Germany) and Barcelona (Spain) have each provided effective inspirational examples as Lighthouse Cities (LC) of measures which just about any other city could also replicate. In fact, as an embedded part of the GrowSmarter project, Cork (Ireland), Graz (Austria), Porto (Portugal), Suceava (Romania) and Valleta (Malta) have since the beginning been engaged as Follower Cities (FC) to demonstrate that it is quite possible for cities in other contexts, seemingly regardless of size, to adapt the successes of the LCs to also grow into smarter cities.

Having established multi-stakeholder Smart City Liaison Groups (SCLG), each of the five FCs has been able to assess all the LCs' Smart Solutions in order to understand more precisely how such replication could feasibly take place to deploy similar measures, and even be scaled up, or down, to other districts. Other than having a broad participatory approach, like the SCLG, it has been shown to be crucial to also have solid institutional structures in place which are able to synergise their own plans with those of both national policies and local planning processes, especially those specialised ones which are relevant for desired replication (e.g. SEAPs for energy, SECAPs for climate mitigation and adaptation, SUMPs for mobility, etc.), to support any smart city ambitions.

Such relationships, structures and frameworks in turn become key aids for facilitating the replication of Smart Solutions. They tend to prove quite beneficial to cities in overcoming obstacles and resolving conflicts which arise. Nonetheless, the FCs have already identified potential risks which they will try to avoid or mitigate, some of which are common problems, and others are either specific to the FCs' contexts or are issues tied to particular types of measures.

- *Lack of funding or staff capacity* is a recurring problem for local governments, and in particular for more smart initiatives which are not always seen as priorities by all decision-makers (or even the public at large). For the former, many of the FCs are turning to national and EU funding windows (though sometimes municipal or private contribution minimums remain problematic) or exploring public-private partnerships. For the latter, capacity-building is a common theme, including developing innovative technology/science parks to streamline smart city efforts more effectively.
- *Administrative hurdles* are also quite common, both within and external to the FCs. Public procurement procedure often are prohibitively restrictive for smart city measures, requiring workarounds or alternative financing. As a fairly specific example, older districts are often protected for their cultural/historical heritage, making certain measures (e.g. deep retrofits of buildings) quite cumbersome to implement while still complying with legal restrictions, or in other cases, the ability for the city to influence transport companies' strategies is limited.
- In many cases, *existing infrastructure* within the FCs can act as either a burden or a driver to Smart Solutions. If infrastructure upgrades in order to align with goals for a smart city are seen as too complicated or costly, (political) authorities may choose to delay any replication. On the other hand, some FCs have taken a need to improve certain infrastructure anyway (e.g. lampposts or road works) to drive the parallel integration of Smart Solutions into them.
- *Stakeholder participation and acceptance*, in particular by citizen groups, of Smart Solutions is a prevalent concern in most countries, though the degree of public/private approval varies greatly not only among countries, but also according to specific topics. For example, some smarter innovations (e.g. switching energy systems or closing off areas to traditional cargo transport) may be perceived as a threat to incumbent businesses or public interests (e.g. higher costs for smarter energy or worries about data privacy with smart meters), resulting in scepticism, or even outright opposition, to cooperate. On the other hand, a broad

engagement of civil society and appropriate private sectors seems to have already prevented potential conflicts within the FCs.

- For some of the measures, there is not necessarily *sufficient demand* among businesses or the general public to drive the growth of Smart Solutions for the FCs' intentions. For example, not every country has reached a point of saturation where EVs or HEMSs are seen as cost-effective investments. Nonetheless, there are a few cases among the FCs where Smart Solutions seem to be inspiring new business ventures (e.g. telecoms' interest in smart lampposts), and for customer markets (e.g. EV- and E-bike sharing programmes aimed at tourists) to become developed enough to take advantage of them.

Despite the many barriers listed above, the FCs clearly intend to replicate Smart Solutions from the LCs. The most popular grouping for measures to be implemented revolve around the concept of *Low Energy Districts*, with its measures intended to be replicated by the FCs in 19 instances – however, the other two groupings, *Integrated Infrastructures* and *Sustainable Urban Mobility*, are not so far off, tied with 13 replications planned for each. At a more individual level, the four most popular Smart Solutions seem to be:

- 1. *Efficient and smart climate shell refurbishment* (9 measures to be replicated by 3 FCs)
- 11. *Alternative fuel driven vehicles* (8 measures to be replicated by 4 FCs)
- 3. *Smart, energy saving tenants* (7 measures to be replicated by 4 FCs)
- 5. *Smart lighting, lamposts and traffic posts as hubs for communication* (6 measures to be replicated by 3 FCs)

As can be surmised from the above information, there is no single Smart Solution being replicated by all five FCs – conversely, there are four measures which are only planned for implementation in a single city each. Of course, all this is a reflection of quite different local contexts and needs driving each of the FCs towards certain smart city priorities over others, which logically results in interesting variations amongst the FCs' assessments of their preferred LCs' Smart Solutions:

- Cork appears to be more intent than any other FC to realise *Low Energy Districts*, with nearly half of the Smart Solutions it has selected for replication being clustered around this concept, indicating a clear need from their side to address energy issues within the city.
- While Graz also intends to concern itself greatly with smart energy issues, it also seems to intend implementing more *Integrated Infrastructures* solutions than other FCs, in particular for *Big, open data platforms*, but not very much oriented towards mobility concerns.
- In the case of Porto, they are still very much in an exploratory mode, still weighing options for which precise Smart Solutions the city wishes to replicate, but it would seem that energy topics are not as much of a burning issue, since they seem to be leaning much more towards enacting infrastructural and mobility solutions instead.
- Suceava's smart city approach clearly is aiming for a quite broad range of options, with strong interest in eight of the twelve Smart Solution groupings, more than any other FC, and as can be seen from the details in their report above the city is already quite aware of the benefits of linking up strong synergies between its diverse smart intentions.
- On the other end of the spectrum, Valleta's contribution to the national SmartCity Malta initiative, at least within the GrowSmarter project, will (so far) be exclusively focused on developing smarter *Sustainable Urban Mobility* solutions, since they did not indicate single other type of measure to be replicated.