

European Innovation Partnership on Smart Cities and Communities

Operational Implementation Plan: First Public Draft

Foreword

The Sherpa Group of the European Innovation Partnership on Smart Cities and Communities herewith presents the first public draft of the Partnership's Operational Implementation Plan. We invite all interested stakeholders to respond to this plan, especially by underlining the relevance of particular ideas for actions suggested by this plan or by proposing new ideas for action.

This plan has been produced by members of the Sherpa Group; they split into altogether twelve working groups, one for each priority area as well as an additional one on issues concerning the general implementation. Working groups met many times to develop and discuss drafts, which were all presented in close to final versions to all members of the Sherpa Group on 27 January 2014 in Brussels. We tried with all drafts to make them easy to understand also by the general public, but at times a certain knowledge of EU policies and instruments is presupposed since further elaborating on those would have meant losing too much focus of the document.

This is a live document, which will be updated in view of forthcoming events and actions under this Partnership. The Sherpa Group is grateful for the support received from the European Commission's Services (Directorate-Generals for Communications Networks, Content and Technologies; Energy; and Transport and Mobility) during this process.

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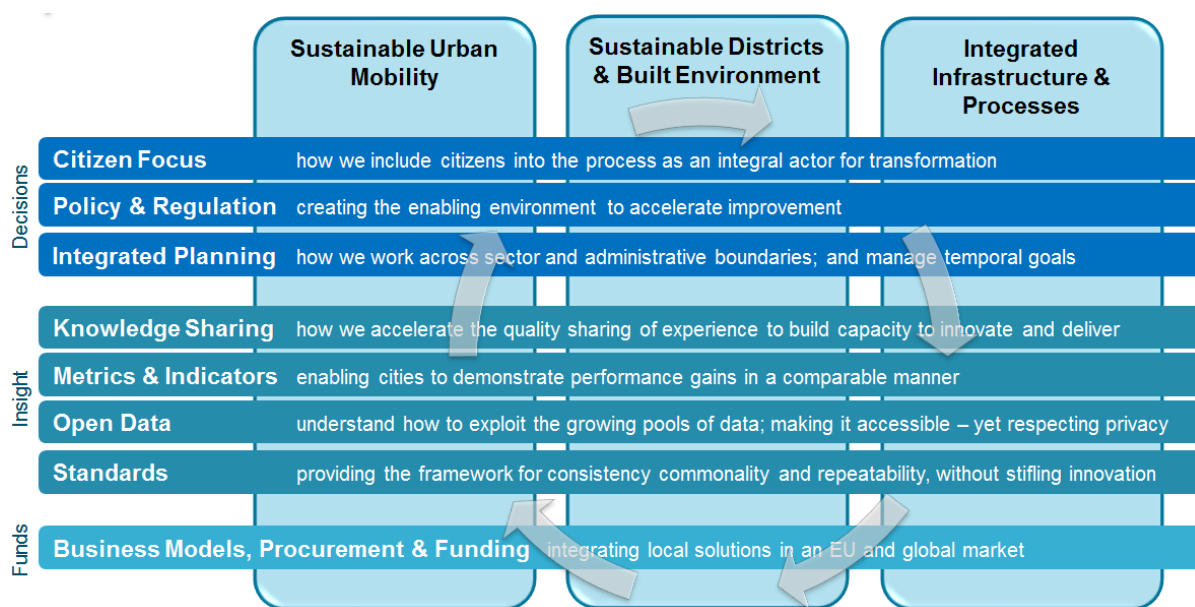
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Purpose of this Document

This Operational Implementation Plan (OIP) is a companion document to the Strategic Implementation Plan (SIP) of the European Innovation Partnership on Smart Cities and Communities.

The SIP laid out the general direction and the overall goals for the Partnership, which it defined as "a significant improvement of citizens' quality of life, an increased competitiveness of Europe's industry and innovative SMEs together with a strong contribution to sustainability and the EU's 20/20/20 energy and climate targets".¹ The SIP specified eleven priority areas as a framework for actions to advance against these goals and spelled out recommendations for actions in these areas.

The OIP takes the SIP framework with its eleven priority areas (see graphic below) and recommendations as its starting point, and develops each in more detail. It offers examples intended to inspire interested parties responding to the Commission's 2014 Invitation for Commitments, as well as guide further implementation action that the Partnership could launch at a later stage.



The OIP includes a dedicated section for each of the eleven priority areas. Each section starts with a brief introduction that provides some context and outlines why this area should be of concern to those seeking to advance smart cities in Europe. It provides a table with a number of potential actions that are relevant in the respective area, and also details how they relate to what was stated in the SIP. A limited number of these are then developed in more detail – addressing: context; goals; deliverables; preconditions; implementation methods, and monitoring. Through this more in-depth coverage we seek to make each action feel quite practical.

¹ Strategic Implementation Plan, p. 3; see "[An Energy Policy for Europe](#)" [COM(2007) 1 final] for the 20/20/20 energy and climate targets.

Similar topics may be addressed in different priority areas, however these are dealt with from the perspective of that particular priority area – such is the nature of inter-dependent city systems. This fits with the spirit of the SIP, which is crucially about overcoming sectoral silos and integrating solutions in the urban context across the sectors of information and communication technologies, energy production, distribution and use as well as transport and mobility. Specifically, the SIP makes three key recommendations to this end:

- Use agreed standards, protocols and common data formats that facilitate interoperability across systems, prevent vendor lock-in and foster competition;
- Make data accessible also to third parties (whilst fully respecting consumer privacy and protection of legitimate business interests) so to foster the development and uptake of novel applications;
- Re-use existing infrastructure and put it to multiple use.

Besides working across the sectoral domains of ICT, energy and transport and mobility it is of equal importance to integrate actors across the innovation chain, to bring together the supply and demand side and engage citizens in planning decisions at an early stage.

The intent is for this OIP to remain a live document, and it is currently publicly available in its first version. We foresee updates based on the responses to the European Commission's Invitation for Commitments process, and other ongoing EIP activities.

The latter section of the OIP discusses implementation of the smart cities and communities EIP, and identifies a number of areas that will be developed further to ensure we advance in a programmatic manner. This includes the likes of elaborating quantifiable targets against which the Partnership can benchmark its own progress.

Through the potential actions in this OIP, and continued mobilisation of European city stakeholders we firmly believe we can make advances to 'smartening up our cities' in a way that is true to the principles of this Partnership.

1 Priority Area 'Sustainable Urban Mobility'

1.1 Introduction

The SIP stresses the need for substantial changes in Europe's transport systems, as well as in the mobility behaviour of people and businesses in urban areas. Solutions concern the creation of an efficient and integrated mobility system that allows for organising and monitoring seamless transport across different modes; increasing the use of environmentally-friendly, alternative fuels; creating new opportunities for collective mobility. The proposed solutions lead to a decreased environmental impact.

1.2 Potential Actions

Key response strategies suggested by stakeholders include actions to better address transport demand as well as actions to foster more efficient, cost-effective and high-quality forms of transport. Smart city innovations provide important opportunities in this regard (Table 1).

	#	Title	Summary	Link to SIP action
Actions to better address supply	1	<i>Improve clean power for transport: vehicles and infrastructure</i>	Tackling electric/different hybrid technologies and their infrastructure to accelerate mass-shift to cleaner forms of transport will help achieve economic gains, reduce energy consumption and address the inter-dependence with energy systems and public space.	#1: Make solutions widely available
	2	<i>Foster seamless door-to-door multi-modality in urban transport</i>	Better connecting transport modes, nodes and mobility services (e.g. inter-modal mobility hubs, integrated information platforms for transport operators, cooperative ITS) will enable integrated public transport and new urban traffic and transport management solutions.	#1: Make solutions widely available
	3	<i>Further clean logistics</i>	Improving the logistics supply chain can trigger both efficiency and reduction of environmental impact (e.g. electrification of the "first and last mile of delivery")	#1: Make solutions widely available
Action to better address demand	4	<i>Open up intelligence in urban transport systems</i>	Supporting partnerships that use open data will create additional value for. Public transport, ICT and energy providers, but also private users/social media leading to demand-responsive and integrated mobility services which help minimise energy consumption.	#1: Make solutions widely available; #3: Encourage active citizen engagement
	5	<i>Enable tools for seamless door-to-door multi-modality</i>	Enable integrated ticketing and tools for personalised transport planning (e.g. inclusive mobility services, new payment services) will enable faster, smoother travel using different modes, optimize traffic streams, minimise energy consumption and traffic congestion.	#1: Make solutions widely available;
	6	<i>Promote sustainable and integrated mobility planning</i>	Planning based on the European concept of sustainable urban mobility plans (SUMP) will help to utilise synergies and links between transport, energy and ICT in urban transport effectively and engage citizens	# 3: Encourage active citizen engagement
	7	<i>Promote use of cleaner vehicles</i>	Cities can provide incentive schemes by giving priority in urban areas for the use of collective transport and for clean logistics, as well as incentives for sharing of goods vehicles and distribution infrastructure.	# 1: Make solutions widely available;

Commitments in one of these or other relevant areas of innovative smart city action are welcome. The remainder of this chapter provides more depth in three potentially relevant example actions:

1. Better integration and management of collective city transport for door-to-door seamless multi-modality
2. Better electrification of collective city transport
3. Improved urban freight logistics and distribution

A number of cross-cutting actions that are addressed in greater detail in other priority areas in the OIP also support the implementation of the actions described above, particularly if lessons learned are formed into easy to use guidance documents ("city toolkits for deployment" (SIP action area nr. 2)):

- *Discussion forums* can be set up to share know-how about new models of cooperation and to explore good practice on organisational forms that suit local partners' needs; approaches to determining the most optimal geographic scope and or suitable governance structures;
- New *cooperation forms* at city level between different organisations (both public and private) and including transport operators and community organisations;
- Designing targeted *regulatory and non-regulatory incentives* such as specific innovation zones in cities for large-scale testing; tax or fee brakes or open innovation competitions;

1.2.1 Potential Action 1: Better integration and management of collective city transport for seamless multi-modal mobility (door-to-door)

Context

Mobility around a city is of critical value for residents, businesses and visitors. Yet presently the experience is too fragmented and unreliable. Many cities face major problems with congestion, air pollution, GHG-emissions and related socio-economic costs. Attractive, accessible and integrated public transport provides an alternative transport option. It can also attract businesses. Greater use of public transport also helps avoid pollution, and facilitates low-carbon transport and better traffic management. Cities should exploit the enormous potential of integrated, ICT-based solutions for real-time and targeted transport and traffic monitoring and management. Convenient door-to-door multi-modal real-time urban mobility will increase the attractiveness of cities.

Goals

The goal is to improve and better connect public transport and 'soft' modes (especially walking and cycling) across modes by applying smart urban technologies and services to transform the traveller's experience.

Deliverables

Providing suitable (technological) options:

- Foster solutions such as inter-modal mobility hubs and stations in urban quarters to better connect transport modes, nodes and mobility services;
- Upgrade and embed intelligence (e.g. sensors, cooperative ITS solutions) in infrastructure and public transport vehicles; foster automation concepts such as automated metros and trams; develop integrated, real-time information platform for transport operators; advance new tools for business analytics; connect city transport systems to social media (use and feedback);
- Establish suitable entry and payment systems (e.g. mobility cards), enable integrated ticketing and provide tools for personalised transport planning.

Setting the right incentives/supporting actions:

- Identify models and standards for an optimum connection and use of different modes of transport (suitable settlement systems, criteria for the choice of locations of e.g. mobility stations, mobility management methods, integrate e-mobility where appropriate).
- Incorporate multimodality measures into local planning and land use policies: planning and adaptation of sustainable urban mobility plans.
- Organise information events in quarters to enabling information exchange and to increase knowledge on all existing options regarding a sustainable multimodal mobility.
- Support partnerships to encourage sharing and pooling of vehicles.
- Create financial incentive schemes to convince citizens and companies to purchase innovative technologies and services.

Preconditions

Successful actions will require the contribution and support from a broader range of actors:

- City authorities (including all relevant departments) take political decisions, provide a long-term political framework and allocate financial support to create conditions of certainty;
- Public transport service and infrastructure operators collaborate and are involved in shaping the contents of the action;

- Public and private companies from different sectors (public transport supply chain, operators and authorities, infrastructure construction, equipment, ICT, management and maintenance) need to be brought together;
- City residents are involved early on to ensure buy-in and check practical feasibility;
- Financial institutions, to enable new, attractive financing tools together with city authorities.

Monitoring

Progress can be monitored against a number of fixed output and outcome indicators:

- Concrete outputs:
 - Usage of public modes of transport
 - Passenger delays
 - Development of accurate and simple fare collection capabilities
 - Roll-out of integrated infrastructures / interchanges (mobility hubs)
 - Roll-out and integration of infrastructure and ICT
- Outcomes
 - GHG emission reduction
 - Reduction of air pollutants
 - Improved quality and accessibility of transport and mobility for both passengers and businesses

1.2.2 Potential Action 2: Electrification of public transport

Attractive, easy to use, accessible and integrated public transport network provides an alternative transport option to private transport modes for individuals and attracts businesses to cities. Greater use of public transport also helps to avoid pollution and facilitates low-carbon transport and traffic management. Shifts to integrated and cleaner technology in public transport, such as energy efficiency and electrification provide an important option for city managers and planners.

Goal

The goal is to strengthen and support the competitiveness of European companies through growing markets on sustainable mobility solutions – in Europe and globally. Electrification will strongly depend on the effective interplay of transport infrastructure, transport operators energy infrastructure and ICT, for both charging and intelligent energy management. Electrification and integration of public transport on the basis of a multi-modal approach provides a sufficient alternative to individual private transport and provides an effective option to address the need for cutting GHG emissions, limited environmental impact, improving quality of life, cutting congestion and improving energy security.

Deliverable

The right technological solutions:

- City-commitment to a strategy to roll out electric public transport modes (buses, trolley busses, trams, metro vehicles, shared mobility solutions etc.) within an approach to integrated transport and to use their infrastructure to exchange surplus energy with the energy system – using ICT to manage energy flows;
- City plan to reinforce network capacities, also in support of smart charging and integration of public transport vehicles;
- Focussed actions under these frameworks could tackle specific propulsion technologies/fuels: electric, different hybrid technologies.

The right incentives:

- Subsidies/tax breaks to operators of low-carbon public transport systems
- Create new financial instruments to invest in sustainable transport vehicles alongside the necessary infrastructure
- Using existing evidence (e.g. Green Bus fund UK) and new toolkits of the benefits of procurement of alternatively fuel vehicles – transforming public vehicle fleet, where there is significant interest and broad experience in using electric and hydrogen-powered vehicles.

Preconditions

Successful actions will require the contribution and support from a broader range of actors:

- City authorities (including all relevant departments) take political decisions, provide a long-term political framework and allocate financial support to create conditions of certainty;
- Public transport service and infrastructure operators collaborate and are involved in shaping the contents of the action;
- Public and private companies from different sectors (public transport supply chain, operators and authorities, infrastructure construction, equipment, ICT, management and maintenance) need to be brought together;
- City residents are involved early on to ensure buy-in and check practical feasibility;
- Financial institutions, to enable new, attractive financing tools together with city authorities.

Monitoring

Progress can be monitored against a number of fixed output and outcome indicators:

- Concrete outputs:
 - Number of vehicles powered by alternative fuels
 - Roll-out of network components
 - Roll-out and integration of infrastructure and ICT
- Outcomes
 - Public transport integration and demand management in real time
 - Energy security and efficiency
 - GHG emission reduction
 - Reduction of air pollutants
 - Improved quality and accessibility of transport and mobility for both passengers and businesses.
 - Reduced congestion and enhanced city financial capabilities

1.2.3 Potential Action 3: Clean, efficient urban logistics and freight distribution

Context

Urban logistics and freight is essential for every part of daily life in cities; ensuring that shops and businesses are stocked, equipment is repaired, home deliveries are made, buildings are supplied and waste is removed. Although being a modest part of overall urban traffic, inefficient planning and delivery of urban logistics and freight can have a major impact on congestion, noise, air pollution and greenhouse gas emissions. Transport delays also cause economic cost and decrease the attractiveness and competitiveness of cities. Improving the "first and last mile" of delivery is crucial for cities growth and competitiveness, particularly at a time when (partially large) increases in online-sales can lead to more home-deliveries in retail and where shops need more frequent deliveries because they chose to have much less inventory, more (fresh) produce and longer opening hours. New business models products, services and are entering the market, for example using cleaner, quiet delivery vehicles and new services to deal with the 'last mile' home delivery also tackling noise problems. Electrification of the "last mile" opens up new opportunities. Provision of parking sensors and other infrastructural intelligence enables streamlining of city logistics. Some measures are simple to take; others require up-front investment (new vehicles) or changes in urban structures (logistic centres) and require greater planning and resolve.

Goals

The goal is to make urban freight logistics efficient, seamless and low-emission through using smart urban technologies and services which can also help improve business-to-business and business-to-customer services and reduce overall energy use. A mix of alternative fuels and electrification (less energy use), enabling ICT applications for better analysis, planning and organisation, vehicle and transport equipment innovation as well as enabling planning and governance innovation is needed.

Deliverable

The right (technological) options:

- City initiatives to help improve load factors and planning of delivery and service trips; to create new distribution schemes and creation of delivery space; to switch business models to off-peak delivery; to increase the use of non-road modes including rail, bike or urban waterways; to push for early introduction of new vehicles etc.;
- City planning to support electrification of the "last mile", including logistic centres around cities and shifting to electric vehicle fleets for last mile delivery.
- Integrated urban planning for best managing urban logistics demand, for example for establishing consolidation and distribution centres in urban areas (e.g. around main train stations and waterways with smaller centres near subway or tram stations) to enable new distribution and service patterns (load consolidation both possible for multiple actors in shared or single actors in owned centres); creation of low emission zones to restrict access for heavy duty trucks or special corridors for cleaner delivery vehicles, including heavy-duty trucks that are latest state of the art in eco-efficiency and load consolidation.
- Set up platforms and tools to better share experiences from large scale pilot programmes.² This will be accompanied with work on urban logistics applications, innovative logistics management software, and local policy, as well as needs for cross-border harmonisation to enable better market development.

² For example, in the EU funded FREVUE² project 127 electric freight vehicles take part in a large demonstration programme in eight European cities.

- Develop ICT tools for city authorities to better understand, coordinate and hence optimise freight patterns in cities (information, data, modelling, prediction for better planning and regulation).

Setting the right incentives/supporting actions:

- Identify models and standards for sustainable city logistics;
- Review and adapt regulations on access to urban city centres, e.g. creating specific time window restrictions for clean vehicles, electronic access control, environmental zones, or creating "pollution-free zones";³
- Financial incentive schemes to convince freight companies to purchase EVs/hybrids to move towards zero-emission logistics.
- Labelling and certification programs for freight companies, their suppliers and consumers
- Incorporating freight into local planning and land use policies: planning and adaptation of sustainable urban mobility plans (SUMP);
- Organise driver support through trainings;
- Support freight partnerships to encourage sharing and pooling of vehicles and freight;

Preconditions

Successful actions will require the contribution and support from a broader range of actors:

- Developing broad partnerships where local authorities, inhabitants, drivers and retailers are encouraged to work together.
- Private companies from different stages in the logistics supply chain need to be brought together.

Monitoring

Progress can be monitored against a number of fixed output and outcome indicators:

- Concrete outputs:
 - Increased reliability of deliveries (company reporting on average delay of delivery)
 - Number of new ICT applications to facilitate better analysis, planning and organisation
 - Increased use of cleaner, alternatively fuel-delivery vehicles, or electric vehicles
 - Number of urban distribution centres
 - Number of pollution-free or environmental zones
- Outcomes
 - Decreased GHG-emissions of freight transport logistics in urban areas
 - Reduced costs for transport logistics
 - Reduction of air pollutants

³ If the delivery of goods can be done with less noise and exhaust fumes, then it could be done in the late evening or at night, thereby creating a split between transport of goods and transport of people. Pilot projects have been running in the Netherlands (called silent deliveries or "PIEK") and in other cities across Europe. For an overview, see www.niches-transport.org/fileadmin/archive/Deliverables/D4.3b_5.8_b_PolicyNotes/14683_pn7_night_delivery_ok_low.pdf

2 Priority Area 'Districts and Built Environment'

2.1 Introduction

The main challenge in 'Districts and Built Environment' is to reduce energy use, environmental impact and carbon footprint, entail competitive industries for jobs and growth and at the same time ensure societal and social development and the well-being of citizens. The investment needed to improve energy efficiency, generate low carbon energy, modernize infrastructure and create high quality living environments is enormous. At the same time, cities have limited access to planned financial resources for systemic change, which requires the activation of private capital combined with public investment.

Currently our existing building stock plays a major role in energy consumption (40% of EU final energy demand). This stresses the need for affordable and sustainable retrofit solutions at a large scale. However, since buildings last several decades, it is essential to find energy efficient, low carbon solutions for new buildings and districts as well. The major challenge in this area is the scaling up of (new) solutions and materials.

Recognizing every city has its different surroundings, it is essential to combine requirements:

- To give stakeholders (industry, cities, operators...) tools needed to take appropriate systemic or individual decisions and facilitate scaling up solutions by enabling industries to provide solutions that are fit for purpose and at the same time come with reasonable pricing and quality
- To provide the large scale launching ground needed for new concepts to test and unleash the market and to test and implement new financial products and models.

The starting point of the actions in this chapter is the building itself and the focus on using, combining and implementing on-the-market and near-to-market solutions. Not on reinventing the wheel, but cleverly combining and fine-tuning what is available to make it applicable at a large scale for existing as well as new buildings and districts. The focus however does not stop at the building – rather it addresses 'place-making' with people, in communities within cities.

2.2 Potential Actions

The actions in the table below are categorized according with the action areas that were mentioned in the SIP. Per area several actions are mentioned. This list of actions is not exhaustive nor excluding other potential actions and proposals.

	#	Title	Summary	Link to SIP Action
Actions to enable scale up	1	<i>Toolkits for Districts</i> (See potential actions)	Develop scalable design and multi-criteria toolkits that support integration of existing and new buildings within city districts	#1 Toolkit. Integrated planning; Open data; Standards.
	3	<i>Auditing Tools for Districts</i> (See potential actions)	Develop auditing tools/systems and development of framework on measured variables for existing as well as new buildings and districts.	#4 Auditing tools. Integrated planning; Open data; Standards
	3	<i>Monitoring Tools for Energy</i>	Develop and deploy monitoring tools to achieve performances in terms of energy efficiency and financial viability	Open data; Standards.
	4	<i>City-Region Energy</i>	Develop and enhance city region level energy management and trading systems (performance	Business Models

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		<i>Management and Trading</i>	monitoring and commissioning tools; self-learning systems for optimised management; optimisation tools for energy management based on “dynamic energy profiles” of buildings and other network nodes; forecasting algorithms).	
Actions to provide scale	5	<i>“The Green Network” (See potential actions)</i>	Establish ‘The Green Network’ as a means to mobilise relevant stakeholders to deliver large scale smart refurbishment of city districts to maximise energy efficiency achievements.	#3 Upgrade existing stock. Business models; Integrated planning; knowledge sharing,
	6	<i>Smart Materials & Solutions</i>	Develop and deploy smart materials and solutions for lighting, heating, cooling and electricity systems as well as infrastructure for electric vehicles in public (streets, open spaces, buildings) and private spaces.	#2 Building blocks for common challenges.
	7	<i>New zero energy developments (See potential actions)</i>	Develop and deploy innovative solutions at large scale for zero-energy new districts and zero-energy new buildings.	#2 Building blocks for common challenges. Business models; integrated planning; Integrated infrastructure

2.2.1 Potential Action 1: Integration of a scalable design and multi-criteria toolkits for existing and new near to zero buildings and districts

Context

Integration of scalable design and multi-criteria is one of the key actions needed in creating future low carbon cities. Co-creation platforms including specified sub-platforms, decision tools (simulation, visualization/virtualization, open data/information platforms) and living labs in order to increase the level of awareness, increase inhabitants' involvement in planning and implementation process, activate social communities, increase production of energy within the district (by *prosumers*), and increase provision of information intensive energy services.

This integrated toolkit should enable multi-stakeholder analyses of different spatial and domain perspectives as integrated ecosystems (addressing integration of renewable energy sources, global performance and life-cycle assessments, sustainability assessment, and visualization of impacts). Interoperability with operational systems actually in use is essential for take-up.

Integration/Creation of digital platforms for integrated multidisciplinary collaborative design and planning (co-simulation and optimization of complex interactions in different domains, virtual environments for viewing and commenting designs, e-learning applications, user-oriented cognitive data visualisations).

Goals

The goal is to develop a toolkit for existing and new close to zero energy buildings and districts that integrates and connects different assessment, solutions and design tools and, in addition creates different "views" for results and visualizes them. The platform also enables multi stakeholder analyses of cities as integrated ecosystems. The purpose of the toolkit is to give a more holistic view and solution of the different perspectives of city/district design.

Deliverables

- i. A Toolkit: Different existing/near-to-market tools, highlighting their main functions and target group/users
- ii. Additional tools and data collected, developed and integrated into the toolkit
- iii. Interfaces between different tools and possibilities to connect / integrate tools have been reviewed, adapted and implemented
- iv. Proof of value, through use of the integrated toolkit in existing and new districts, to support co-creation, multidisciplinary design, and assessment of multiple solutions and materials, or operation of a district/city.

Preconditions

Such initiatives require input from a number of actors. The principal ones being:

- City Authorities: active engagement on providing data and platform
- Private firms and public utilities: engagement in the process
- standardisation: CEN CENELEC, integration and data interfaces
- Research Organisations: initial tool screening, development and co-creation with all stakeholders, dissemination activities

Methods and details of implementation

An outline of work could include:

- Phase 1: Review of existing tools

- Review and select the most commonly used tools
- Analyse the existing tool (user target groups, main input and output values)
- Check the gaps and develop/collect 'missing' data (e.g. materials, technologies)
- Review of the interfaces of different tools and possibilities to connect/integrate tools
- Phase 2: Integration of tools
 - Selection of the most promising sets of tools to integrate
 - Starting the integration cases
 - Testing the integration in "labs"
- Phase 3: Pilot cases
 - Selection of pilot cases
 - Support for pilot cases
 - Monitoring of the process
 - Feedback and possible fine-tuning
- Phase 4: Dissemination and progress reports
 - Making results available on a national and European level
- Phase 5: Wide scale implementation in member states
 - Development of national frameworks for continuous work to implement integrated tools for district and city planning and operation

Monitoring

The relevant information should be publicly available to help the wide spread of information and benefits of integrated tools. Progress should be monitored and published to help the wide dissemination and adaptation. Early adopters can in such way serve as example to other cities facing similar challenges and conditions.

2.2.2 Potential Action 2: Develop auditing tools/systems and development of framework on measured variables for existing as well as new buildings and districts.

Context

To evaluate the decisions made in the city strategy it is essential to assess and measure the performance of cities and districts. The main purpose is to give cities feedback and to help them to increase energy efficiency and reduce CO2 emissions without compromising citizen's well-being.

Goal:

Develop an integrated holistic auditing tool by collecting and fine-tuning existing auditing tools/systems and decide on what to measure that can be used for evaluation in cities. Define certification criteria for data and information on CO2, energy use, gas use, water use, etc. using as much as possible existing criteria. The criteria should include also risk and economic factors.

All developed tools should be scalable in such way that both big and small cities can use them easily. Tools need reliable data (see section open data).

Deliverables

- i. Definition of the measured data (data and data transfer standards)
- ii. Definition of the criteria for the data (accuracy and availability)
- iii. Methods to audit
- iv. Framework for the auditing tools and integration of existing tools

Preconditions

The principal stakeholders are:

- Cities: Cities have wide data, it is crucial that data is available for auditing without compromising privacy
- Energy utilities and other data owners: data availability is important
- Key stakeholders (public, private, civil) collaborate and commit to follow common principles/ goals and data availability without compromising privacy or companies business models
- standardisation: CEN CENELEC
- Stakeholder engagement
- Research Organisations

Methods and details of implementation

An outline phasing of work could include:

Phase 1: Data definition

- Definition of the key data needed for monitoring and auditing based on existing tools/integration of existing tools and data availability
- Criteria for the data accuracy and availability, taking into account privacy issues
- Check the gaps and define the extra needed data. For example data on technologies, materials and other solutions.

Phase 2: Define the way to audit and integrate methods

Phase 3: Set-up monitoring and pilot

Phase 4: Evaluation, dissemination of lessons learned

- Evaluation of audited/measured districts and cities. Documenting lessons learned and feedback and further development of auditing/monitoring

Phase 5: Roll out

Monitoring

As a first indicator, the number and size of audited districts/cities should increase. Ultimately, the goal of a test ground is to roll out successfully concepts on a larger scale. This should be used as criterion for success.

2.2.3 Potential Action 3: The Green Network of large scale (deep) refurbishment of city districts for energy efficiency Introduction

Context

Although solutions for refurbishment based on innovative and existing materials and products (including green solutions), new lighting, heating and cooling systems and combinations of these, may appear more traditional, they nevertheless play a crucial role in the enormous European renovation and energy efficiency challenge. Industries involved in developing solutions for renovation and energy efficient/positive buildings have invested massively in this topic for many decades. Sharing this knowledge more directly with regions, cities, architects, urban planners and other stakeholders, will create even more sustainable customer focused solutions. It is also by adapting to a typology of buildings that the best combination of available solutions (from materials to ICT) will for efficient implementation and guarantee the best results for each individual case. Moreover adapting to the typology and specific characteristics of districts makes optimisation of energy efficiency solutions at district level possible, could lead to better, combined solutions in the public and private space and will create scale. Investing in refurbishment of buildings and districts can produce added value for owners and occupants and for the whole city. Comprehensive refurbishment, integrating optimised energy efficiency, comfort and usage concepts, can improve the district through improved comfort while preserving the historical heritage of buildings (where applicable), the renewal and revitalisation of abandoned areas. Possible wider socioeconomic impacts include increased quality of life and city/district attractiveness and local job creation. At the same time, negative impacts such as excessive costs and increases in rents must be avoided.

There are many EU and national policies and directives that point out the need for deep renovation. And through this action - 'the green network'- these targets could be reached more easily, because of the joint effort between industry, cities and the other involved stakeholders.

Goal

One of the major challenges for this action is the up scaling of these solutions. Although there are many small scale pilots to test, there are still hurdles that prevent scaling up. One of these hurdles is the sometimes long time to market, due to the many steps in the value chain for several sectors. The goal of this action is therefore to bridge these gaps and to tackle the huge European renovation challenge, starting with the building envelope itself. In doing this, the action focuses on what hurdles need to be taken away and how this can be done most effectively in order to create critical mass.

Deliverables

By 2020 a large scale (deep) refurbishment program across Europe, contributing significantly to achieving and exceeding the targets of the Covenant of Mayors, the Energy Efficiency Directive (2012/27/EU) and the Energy Performance of Buildings Directive (2010/31/EU) has been carried out in various geographical areas in Europe. The refurbishment projects cover private and public, residential and non-residential buildings. They have tested a smart combination of affordable and user-friendly solutions, materials, products and technologies using an integrated approach. The Network may also connect existing projects to this action.

Sub deliverables:

i. *Diagnosed potential at city level (should do and can do)*

The initiative has provided a 'living lab environment' to further develop, test, improve and implement pan-European integrated modelling and diagnosis methods and frameworks for low carbon districts and buildings, where also the reduction of the embedded energy of the solution, material or technology and a validated analysis of lifecycle energy use are taken into account.

The energy efficient renovation needs and potential at city level should use as far as possible existing tools, for instance assessments made in the framework of Sustainable Energy Action Plans (SEAPs) under the Covenant of Mayors.

ii. *Market challenge*

Through this action new (combinations of) replicable solutions, materials and products have been tested and facilitated market uptake and rollout. The large scale renovation projects under this action should have made them more accessible and affordable.

iii. *Adapting solutions to local circumstances:*

Renovation projects have been be part of overall urban planning and energy planning and through this served as a 'living lab environment' for (some of) the actions in the horizontal priority 'Integrated Planning'. For instance, they could be integrated with a city's Sustainable Energy Action Plan (SEAP) under the Covenant of Mayors.

iv. *Energy challenge*

The energy efficiency contribution of a combination of solutions indoors as well as outdoors (neighbourhood/infrastructure) has been tested, as well as its contribution to reducing energy demand at a large scale and its role in the city's energy system. Energy demand can now be forecasted and balanced more effectively.

The right incentives are in place: Financial and procurement challenge

Large scale renovation projects require sound cost-benefit analysis and financing models that distribute risks fairly and take into account life-cycle costs. Under this action, financing models have been developed and tested to ensure replication is it within Europe or beyond. Work on innovative financing schemes should continue, and existing models such as Energy Performance Contracting are applied more widely where this is useful. New ways of (functional) procurement and risk sharing mechanisms have been developed and are made available.

v. *Training and educational challenge*

A significant number of local employees, including civil servants, urban planners, builders and craftsmen have been trained to the latest standards, to be able to design, use and apply new technologies, sustainable, resource efficient materials and products in the built envelope. Stakeholders directly involved in renovation, such as construction companies, architects, suppliers of materials and equipment, work together to set up appropriate training programs to ensure the quality of the renovation program.

vi. *Local/regional economic employment challenge*

The renovation program has provided, through commitment of all stakeholders involved, jobs to local and regional employees, through local/and or regional contracting where possible. This has been facilitated by information and capacity building for local authorities on relevant legal issues, in particular pre-commercial and green public procurement (PCP and GPP), public procurement for innovation (PPI) and questions of state aid.

What do the proposals in this action contain?

Combine

Proposals engaging in this action cover a combination of renovation technologies, materials and products used in the built envelope such as:

- Heating, cooling, and ventilation technologies

- Materials and products used in buildings, inside as well as outside, such as high performance insulation solutions and (surface) materials like coatings and materials and solutions which , for example, interact with lighting and heating and cooling technologies and/or can store/absorb and release energy or heat, etc.
- Green roofs, facades, open spaces, colours and other solutions to reduce the ‘heat island’ effect.
- Lighting technologies – both indoor as well as outdoor.
- Multi-building solutions

Align with existing plans

Renovation projects are part of overall urban planning and energy planning. For instance, they could be integrated with a city’s Sustainable Energy Action Plan (SEAP) under the Covenant of Mayors. This includes the analysis of the existing building stock and its energy performance.

Integrate technologies

Proposals are, where applicable, to combine one of the following technologies and solutions, with the renovation technologies (mentioned under 1.) in their refurbishment program:

- Smart meters to monitor energy use and savings and support selling energy to the grid.
- Technologies to store and release energy from, for example, electric vehicles and solar charged lampposts and/or share energy with other buildings in the district and lower the total energy use and costs for its inhabitants.
- Renewable energy and energy management technologies.

Share and contribute

Partners are willing to contribute data/open data and contribute to the development and improvement of diagnosis and modelling instruments or tools and share knowledge.

Train and employ/contract local/regional

All stakeholders involved are being committed to train, employ and contract locally/regionally.

Provide scale

Projects cover a minimum amount of m² and/or dwellings since the initiative is about large scale refurbishment. The minimum size of a project depends largely on the elements of it and the local conditions. However, it is central that the pilot project is designed in such a way that it cannot only be replicated but also up scaled easily.

Preconditions

Industry Stakeholders:

- Industry (materials, technology, products, energy, ICT) provide knowledge, technologies and materials, engage with educational organizations to develop and execute trainings and offer support. They are expected to engage in local/regional collaborations and employment.
- Construction companies are a natural partner in renovation. These partners provide knowledge, support, etc., engage with educational organizations to develop and execute trainings. They are expected to engage in local/regional collaborations and employment.
- Architects

Financial stakeholders

- Regional and national financial institutions and investors, as well as the EIB, depending on the content of and the partners in the project, could work on innovative financing tools to co-develop with the major stakeholders a financial model to tackle the huge renovation challenge at large scale.

Governmental stakeholders

- Cities, in their role as public procurers, with their own engineering and support services, urban planners, as well as in the role of brokers that can help bring together relevant stakeholders.
- The Commission and Member States should coordinate different EU funding sources with each other, for instance the implementation of structural funds and their OIPs with other EU funding sources such as Horizon 2020. Information and capacity building on pre-commercial procurement for local authorities should be supported by the EU.

Citizens

- Citizens are a natural partner in the renovation challenge, not only because of the influence of their behaviour, but also because of the fact that they live in the buildings renovated, and a healthy, comfortable living environment is crucial for them.

SME Local/regional stakeholders

- Social Housing companies, real estate owners and developers, local and regional SME's (employers), educational organizations (that develop and execute training programs). Furthermore local/regional job agencies to search appropriate staffing for execution.

Academic and/or research technology organisations (RTOs) stakeholders

- They are to support in the assessment of the retrofitting potential in cities and districts, analyse the optimal mix of measures together with up-scaling potential, monitor lessons learned, knowledge broking, testing and animate, coordinate and analyse the actions. And offer support in assessments, evaluations and certification.

Other Stakeholders

- The stakeholder platform or a kind of platform could fulfil the role of combining cities with a renovation challenge to this initiative under the EIP Smart Cities and Communities umbrella.
- The Covenant of Mayors Office could be invited to disseminate the best practices and innovative solutions implemented under this action to increase replication, for instance through webinars and other capacity building activities.

Methods and details of implementation

Large project parts:

1. Training: develop, test, implement and monitor
2. Financial model: check, identify, develop, test and implement
3. Identify cities/large scale areas to be renovated/ identify what's already in place/going on and connect those initiatives.
4. Support replication

An outline phasing of the work includes:

- Phase 1: Identification
- Phase 2: Preparation and small scale testing of models
- Phase 3: Implementation
- Phase 4: Monitoring and dissemination

Monitoring

The monitoring focuses on three areas:

1. *Reduction of Energy used and GHG emissions per euro spend*
2. *Sustainability of the investment and economic growth*
Payback time of the investments, sustainability of the investment (< 10 years/or low maintenance), increased local value creation at the project scale and the ratio between privately invested € and in public-invested € following 20-20-20 goals.

3. *Replication and up scaling*

The number of initiatives using the new replicable/scalable services/concepts in other cities.

2.2.4 Potential Action 4: Large scale deployment of zero energy new districts and zero energy new buildings

Context

Since buildings last several decades, it is not only essential to find energy efficient, low carbon solutions for existing buildings, but for new buildings and districts as well. The major challenge in this action is the scaling up of (new) system solutions and materials and focus at the same time on technical building solutions and building automation as well as smart energy (district/city) networks and energy storages and the interaction with the users. This highlights the importance of holistic solutions at building level as well as district level.

Recognizing every city has its different surroundings, it is essential to combine requirements to enable industries to provide solutions that are fit for purpose and at the same time come with reasonable pricing and quality.

Goal

One of the major goals for this action is the upscaling of the number of zero energy buildings and districts and the solutions, technologies and materials that are on the market. Although there are many small scale pilots to test, there are still hurdles that prevent scaling up. One of these hurdles is the sometimes long time to market, due to the many steps in the value chain for several sectors. The goal of this action is therefore to bridge these gaps and to tackle the European ambition put down in EU policies to increase heavily the number of zero energy buildings and districts (public as well as private building). In doing this, the action focuses on what hurdles need to be taken away and how this can be done most effectively in order to create critical mass. The aim is to improve district level energy efficiency and CO₂ reduction, focusing on holistic district planning and integration to existing city structure, (near to market or on the market) building materials, heating and ventilation systems, automation and smart energy networks and energy storages and the interaction with the users.

The goal is to give a more holistic view and solution of the different perspectives of city/district design and implementation by integrating systems, and see where the gaps are in respect of technologies, materials and systems.

Deliverables

1. Combined knowledge database where different perspectives from all contributions, from materials, ICT, systems, etc. (with data on effectiveness, prize and behaviour) to near or zero energy efficient buildings & districts are gathered and made accessible to all stakeholders involved.
2. From this total offering the most promising(s) combination(s) is/are selected and tested in new built districts in various geographical areas.

Preconditions

Such initiatives require input from a number of actors. The principal ones being:

- Developers, construction companies
- Energy utilities
- System and component manufacturers
- User perspective

Methods and details of implementation

An outline phasing of work could include:

- Phase 1: Integration of systems
 - Selection of the most promising sets of systems and materials to integrate
 - Starting the integration cases

- Testing the integration in “labs”
- Phase 2: Pilot cases
 - Selection of pilot cases
 - Support for pilot cases
 - Monitoring of the process
 - Feedback and possible fine-tuning
- Phase 3: Dissemination and progress reports
 - Making results available on a national and European level
- Phase 4: Wide scale implementation in member states

Monitoring

The relevant information should be publicly available to help the wide spread of information and benefits of integrated design and construction. Progress should be monitored and published to help the wide dissemination and adaptation. Early adopters can in such way serve as example to other cities facing similar challenges and conditions. Progress monitoring can be done in KPIs like Reduction of CO₂ ekv emissions (CO₂ ekv/m²/a or CO₂ ekv/capita/a), Percentage of primary energy use by local renewable energy generation, number of energy self-sustaining cities or districts in Europe and measuring the citizen well-being with wellbeing index.

3 Priority Area 'Integrated Infrastructures'

3.1 Introduction

Significant and as yet insufficiently tapped value is offered by integrating the various existing and new infrastructure networks within and across cities – be they energy, transport, communications or others – rather than duplicating these needlessly. This point applies, both, to active and passive infrastructure. Many such infrastructures are ageing; budgets to replace them are stretched; they are procured and managed ‘in silos’; yet the potential afforded to cities and their customers through new joined-up approaches, exploiting modern technologies is substantial. This is achievable; however it will take sustained commitment from multiple parties to access value.

3.2 Potential Actions

Consistent with the spirit and messaging of the SIP, the following table of ideas provides thoughts on how infrastructures of various forms in cities can be improved and exploited in a more integrated way to add value. These are intended to provoke thought, not make specific recommendations. Two examples then follow that dig deeper, seeking to make the potential actions for these areas practical and understandable.

#	Title	Summary	Link to SIP Action
1	<i>The “humble lamppost”</i> (See potential actions below)	Reduce energy consumption and maintenance costs through implementing e.g. efficient long-lasting lighting; motion-sensing; PV-power. Use lamppost for e.g. WiFi; CCTV (parking, safety etc). Test innovative business models.	#1 Infrastructures for visible, early wins. #3 Business models.
2	<i>City Information Platforms</i> (See potential actions)	Combine and manage multiple data sources; provide interoperability and data protocols between city domains (using public + infrastructure data + domain / system data). Basis for operational and decision making improvements.	#2 Common architecture. Standards/Protocols. Big/Open Data.
3	<i>Shared infrastructure planning</i> (See potential actions)	Systematically exploit synergies between smart grid and broadband infrastructure, including shared engineering works, reuse of passive infrastructures, communications networks, data centres and services.	#1 Infrastructures for visible, early wins. #3 Business models Integrated Planning
4	<i>Transforming the Energy Chain</i>	Integrated smart grid (renewables + storage + heat pumps + EMS at consumer side). Managing a ‘two-way’ energy chain, balancing demand and supply dynamically between renewable and traditional sources. Link customer into chain as a key actor.	#1 Infrastructures for visible, early wins. Sustainable Districts
5	<i>Road systems</i>	Mobile ITS (location-based route / travel information + traffic light systems = optimized traffic flow to reduce emissions and energy consumption). Work with traffic management systems and automotive industry to re-use urban sensors deployed in street scenes. Exploit sensors and devices to predict traffic conditions / improve road and traffic management.	#1 Infrastructures for visible, early wins. #2 Common architecture. Urban Mobility

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6	<i>Intelligent multi-modal transport solutions</i>	Use real-time multi-modal info to offer choice, personalise travel, and improve customer experience. Exploit ticketing, social media, routing, vehicle location, and mobile data. More pro-active and predictive use of energy efficient modes.	#1 Infrastructures for visible, early wins. Big/Open Data. Urban Mobility
7	<i>Parking systems</i>	Connect infrastructure, people and devices, and sensors to address the up to 25% of congestion caused by people looking for parking. Mode shift through yield management pricing.	#1 Infrastructures for visible, early wins. #3 Business models. Urban Mobility
8	<i>Peer to peer transport information</i>	Create cloud-based agile processes-on-the-fly between people (and their devices) that support taxi and car sharing and offer preferential road use.	#1 Infrastructures for visible, early wins. #3 Business models. Urban Mobility
9	<i>Waste-4-Heat</i>	Use waste heat of process industries + remote heating infrastructure + local CHP system to reduce dispersed CO2 emission and save energy.	#1 Infrastructures for visible, early wins. #3 Business models.
10	<i>Adverse Events</i>	Connect key information sources with city monitoring systems (sensors, people); with city 'life-lines' infrastructures (transport, power, water, and communication) to build city resilience in the face of incidents and crisis.	#1 Infrastructures for visible, early wins. #2 Common architecture.
11	<i>Intelligent Bins</i>	Putting sensors on bins enables cities to communicate within the waste collection system, optimising truck routing, minimising energy consumption and congestion, and satisfying customers	#1 Infrastructures for visible, early wins.

The following section describes three sample actions ('potential actions') for making city infrastructures more sustainable, re-usable and affordable by integrating some city infrastructures creating value added services and eventually new business and finance models.

3.2.1 Potential Action 1: “The Humble Lamppost”

Context

Lighting in a city is everywhere. It is typically treated in a very tactical manner, evidenced by the ageing assets that exist, and volume of citizen complaints (in some cities it represents 20% of the contact centre calls). Light does not come cheap – savings on energy bills is of growing attractiveness. Quality low-energy lighting is required for ‘place-making’, for public safety and security. It is also too often on when not needed – wasting power and money; and can result in light pollution. The lamppost is also typically a single purpose asset – for light; however that is not necessarily the only role it can play. New ICT-technologies can help transform the role of the “humble lamppost”.

Goal

The goal is to demonstrate how lighting can deliver early rewards for cities providing investment funds through saving for further integrated solutions in the areas of environmental and building monitoring and traffic analysis for overall emissions reduction.

- Firstly, in terms of using the existing physical infrastructure, enhanced with digital infrastructure, for multiple purposes: synergy across city services and goals.

Secondly, in significant financial terms: lighting can represent some 20% of a cities electricity budget; and savings in energy costs and maintenance costs of 20% and 70% are not uncommon, through installation of more efficient lamps. This is therefore a “quick win” for smart cities. It addresses all three content domains of the EIP (to greater or lesser extents), and also services our 20/20/20 energy and climate goals.

Deliverables

Four main areas of deliverables are foreseen:

- Financial Savings:** Demonstrable evidence of the scale of energy savings that can be achieved through smart thinking in the use of modern lighting techniques in cities.
 - Researched savings data from cities internationally in 2014
 - City business case data in 2014
 - Alternative financing and business models in 2015
 - Early evidence from 2015
- Asset Re-Use:** Demonstrable evidence of the use of the lamppost as an asset to position equipment that provides additional services beyond the provision of light. For instance:
 - Communications – as transmitter/receiver points for WiFi communications (‘LiFi’)
 - Provide public WiFi services as a new city infrastructure
 - Public security, through use of CCTVs on posts; control of light attenuation levels, etc
 - Air quality monitoring
 - Environmental management through CCTV
 - Traffic control through using the post for CCTVs or radar
 - Parking controls through sensors on posts
 - Noise pollution monitoring
 - Reading smart meters of buildings from the outside
- Toolkits for Cities:** guidance, cases, tools, foresight to gain from early adopters.
 - Solution packaging for local service providers instead of piece meal approach. This requires a multi-disciplinary approach as the light specialists are different than WiFi or Transport specialists, for example.
- RD&I agenda:** items that warrant further research, development and innovation, with a sense of timing and value from doing so; and recommendations on who should do what.
 - A challenge for ICT security, privacy, and integrity research

Preconditions

Such initiatives require input from a number of actors. The principal ones being:

- 'City hall' – and the various departments involved. This raises the importance of alignment at political and executive level, to ensure that the coordination across the city is managed.
- Lighting Industry – fixtures and fitting providers, for which there are a number of major international firms. These may well have RD&I resources available to contribute.
- Service Operations – city field staff and/or contracted maintenance and operation companies. Few are of a scale that they are international (indeed few are national), so cities may need to represent the views of this community.
- Component companies – delivering sensors, sensor nodes, communication modules, etc.
- Ancillary Technical Providers – niche technical providers (some SMEs) of specific high-end capabilities that provide additional value-adding elements to the extended solution (ie beyond just lighting): specialist business intelligence (e.g. predictive analytics); face and/or number plate recognition (security, traffic control); etc.
- City Residents – clearly a vital actor in a transformed chain

It goes without saying that a leadership commitment to participate; and a desire to collaborate on a common logical architecture, is a requirement of success.

Methods and details of implementation

An outline phasing of work could include:

- Phase 1 Concept and Business Case (limited time as sufficient information exists)
 - International research into (i) cases (ii) technological roadmap developments
 - Outline of the core elements of an initiative; and identification of areas of innovation
 - Development of the compelling value case; business model; funding mechanism and options; procurement route(s)
- Phase 2 Proof of Concept
- Phase 3 Knowledge sharing with public bodies (e.g. City Council) on new financing models
- Phase 4 Scale Out

Monitoring

Early financial value, through energy savings and maintenance cost savings, is the principal goal here (as a quick win to engage city leadership). So monitoring of the following is suggested:

- Energy consumption reduction and related effects
 - Money; and GHG/CO2
- Associated Benefits (monitoring method will be specific to each initiative design)
 - Public security
 - Demand management
 - Behavioural change
 - Air quality
 - Traffic flow
 - Public connectivity

NB: links to related EC projects like Concerto Platinum, eeMeasure, and international standards (like IPMVP) should be exploited.

3.2.2 Potential Action 2: City Information Platforms

Context

Cities presently hold their data in multiple silos within each department of each agency that operates in the city (and indeed those related agencies in regional and national Departments). This data is of variable quality. It is also inconsistently captured between departments, and across agencies. The more progressive cities have started to open up their data sets – some holding events (*hackathons* and competitions) to coax developers to use the data in more innovative and value-added ways. This has led to greater visibility of the topic of ‘open data’ – however it has not led as yet to sustainable value at scale. Open data alone will not deliver significant value. Cities must understand how to extract value from a number of available data sources, including:

- i. data residing 'behind the firewall' in department databases
- ii. open data (released from behind the firewall, of multiple agencies)
- iii. social media data
- iv. urban sensor data (machine-to-machine / IoT)
- v. commercial data

These are all rather dynamic in form, and very different in characteristics (quality; growth; source)

For a city to significantly improve services, increase efficiency, and deliver ambitions of real-time operations they must understand how to work with all these data sources – particular to each service area. This requires that they consider data quality, security, structure, inter-dependencies, time-based matters, governance rules etc. This requires a new model to deliver sustainable value and requires new ICTs. It also requires alignment: between departments and across agencies; and between leadership, business operations and IT functions.

The direction of improvement is very clear – yet the complexity and risks involved are causing most cities to ‘sit on the fence’ and observe whilst other chart the way. A small percentage of cities are taking the brave step to explore how they can deliver joined-up data across their city to improve outcomes: a very small percentage. And of those that are innovating the approach and methods differ considerably, and there is limited collaboration between them.

The value gap from cities not being able to rapidly implement interoperable data platforms is eroding potential and very significantly inhibiting the move to ‘smart cities’. This is thus a priority area for the EIP to address.

Goal

The goal is to increase the confidence and uptake of cities to exploit the value available from a common core logical design for an interoperable city information platform (or platform types).

Deliverable

The following deliverables are foreseen:

- i. A clearly stated shared vision; conceptual, and logical architectures
- ii. Snapshot assessment of current cities approaches to addressing this need (survey)
- iii. Market assessment of provider types and solutions available; mapped to architecture with SWOT analysis
- iv. Common detailed logical design and functional specification
- v. Initial city pilots in place (dependent on procurement routes; potential to use those already in procurement)
- vi. Captured and shared ‘method’ statement for cities to use
- vii. Early case studies of initial proof of concept cities
- viii. Initial exploitation by wave 2 cities

Short timelines should be set to rapidly deliver 'beta' products, recognising the fast moving nature of the topic; thus very strong project governance and very committed and competent cities.

Preconditions

The principal conditions are:

- Industry to adhere to open principles and collaboration – also between industry types (IT, industry and SMEs, service providers, niche). The logic here is that by doing so it will help increase the available market
- Cities that can deliver a core set of agencies / departments with clear commitment from the key stakeholders (political; executive; operational; technological), and with sufficient influence and support of their service delivery partners
- Academia / RTOs: definition of common standards and data formats in order to ensure compatibility, guidelines regarding privacy and, related, anonymization. Also, development of tools for visualization of data

Methods and details of implementation

An outline phasing of work could include:

- Phase 1: Rapid Base-Line
 - City survey
 - Industry solution snap-shot
 - Demand and supply statement
- Phase2: Concept and Business Case
 - Definition of architecture
 - Value case (theoretical); plus evidence from case studies (where available)
 - Functional specification and variants
- Phase 3: Proof of Concept
 - Implementation in core participating cities
 - Early evidence of value
- Phase 4 Financing and business models
- Phase 5 Generating confidence by evidence
- Phase 6 Scale Out

Monitoring

This is primarily an enabling platform / initiative that requires sequenced service transformations to be undertaken by city departments, using the information platform to prove the synergy potential through having a common approach. As such the suggested monitoring will include:

- Evidence (financial and non-financial metrics) from these service transformations
- Numbers of cities adhering to and exploiting the logical design and method statement
- Adherence of the supply market to the logical design
- Standardisation initiatives
- EU industry successes internationally

3.2.3 Potential Action 3: “Shared infrastructure planning”

Context

The deployment of high-speed broadband networks can be made cheaper and faster by cooperating at infrastructure and services level between sectors. Various inefficiencies and bottlenecks in the rollout process exist, which lead to high costs and heavily administrative burdens for organisations wishing to deploy networks. It is estimated that up to 80% of the costs of deploying new networks are civil engineering costs. It is also believed that savings up to 30% could be achieved by adopting a set of simple measures, such as maximising use of existing passive infrastructure or co-deploying infrastructure.

Goal

The goal is to demonstrate synergies between the energy and telecommunication sectors at infrastructure and services levels whilst deploying Smart Grids in cities. In particular, the underlying vision is to work towards:

- creating a favourable business, and technological environment for a low carbon electricity grid
- clarifying which data could be transmitted in support of Smart Grids via existing (and future) telecom network infrastructures and which data might need to have a dedicated connection/network for the purpose.

Deliverables

Following two main areas of deliverables are foreseen:

- i. **Passive infrastructure sharing:** Demonstrate evidence of shared use of existing passive infrastructure (such as for example ducts, conduits, manholes, cabinets, poles, masts, antennae, towers and other supporting constructions). It will contribute to de-carbonising Europe's energy supply.
 - Making use of existing ducting, including that owned by municipalities, electricity and telecom utilities and other public bodies, could be advantageous and result in lowering development costs
 - Collaboration in the development of backbone infrastructure, through more harmonized planning and/or sharing of infrastructure could reduce CAPEX
 - Using the ICT for the deployment of the smart grid will make it more efficient and sustainable.
- ii. **Smart energy services** – the development of new applications will increase the ability to control the energy grid, to use more efficiently the energy from the renewable sources, and to contribute to energy savings.
 - The deployment of smart energy services will change the behaviour of the users in using the energy
 - The new intelligent networks will be more cost effective and energy efficient. The citizens will benefit from smaller electricity bills and the possibility to manage their own energy demand.

Preconditions

Such initiatives require input from a number of actors. The principal ones being:

- ‘City hall’ – and the various departments involved. This raises the importance of alignment at political and executive level, to ensure efficiencies regarding administrative permit granting and that the coordination across the city is managed

- ICT Industry – delivering ICT equipment and ensuring of interoperability
- Telecommunications operators - to manage the dependency of communication services on the underlying operational behaviour of distribution networks and provide information on coverage of communications services
- DSO - to describe the mission critical services for which dedicated ICT infrastructure is required and to define the ICT requirements for these services in terms of coverage, bandwidth, latency, reliability in emergency situations, and resilience.
- Third parties and service operators – ensure that provision of services is an open and transparent process (EU standard public tendering procedure)
- City Residents

Methods and details of implementation

An outline phasing of work could include:

- Phase 1 Case Studies & Business Case
 - International research into (i) cases (ii) technological options and developments
 - Development of the value cases; business model and funding options; discussion on procurement route(s)
- Phase 2 Demonstrator cases taking novel shared approaches
- Phase 3 Knowledge sharing across public bodies internationally on approaches, options, and new business models that work

Monitoring

The deployment of conventional energy networks become smart, intelligent and energy efficient. Synergies between the roll-out of broadband networks and energy networks have been identified which would affect the interaction between the new and existing infrastructure. Early financial value, through energy savings and maintenance cost savings, is the principal goal here (as a win-win for the Telcos, DSOs and city authorities). So monitoring of the following is suggested:

- avoiding duplication of communication infrastructure
- scale, design, scope and eventual stakeholders of the collaborative projects between the DSOs and Telcos
- exploitation of broadband networks or their eventual roll-out in cooperation with the roll-out of smart grid networks
- sharing of common infrastructure – e.g. poles and ducts
- cost sharing – civil engineering, ground works etc.
- DSOs deploying fibre for network operation (effectively a back-haul network) on which Telcos build access networks
- interoperability of the broadband networks and the digital communication infrastructure associated to energy networks in order to enable converged communications for the deployment of energy-efficient, reliable and cost-effective digital networks.

4 Priority Area 'Citizen Focus'

4.1 Introduction

The 'Citizen Focus' section is about industries, civil society, and different layers of government working together with citizens to realize public interests at the intersection of ICT, mobility and energy in an urban environment. Much has already been done to engage citizens for mobility, energy efficiency, sustainability and related topics – though individual entrepreneurs, rather than larger-scale industry and government are often the drivers. There are also many ICT platforms for crowd funding and collaboration. Likewise, citizens are already creating apps and services to help cities solve problems. However, these positive signs can be amplified and focused with this EIP. Two core project types were identified as organizing principles:

1. Projects that create an enabling environment for citizens to solve the problems they identify. Additionally, projects that help the most successful citizen-led projects scale – in a city or internationally.
2. Projects that facilitate a conversation between stakeholders, where citizens' voices are not only heard, but instrumental in solution design, allowing for better results and creating faster and more targeted improvements.

4.2 Potential Actions

The following table summarizes actions identified to address these topics. Four of these are articulated further in the exemplars section, others are listed here as potential inspiration for various stakeholders or to be led by other areas of the EIP.

	#	Title	Summary	Link to SIP Action
<i>Create an enabling environment</i>	1	<i>Tools for Community Insight and Engagement (see potential action)</i>	Create and prove best practice common methods to understand communities and citizens, in order to improve service planning, and engage communities in delivering intended outcomes.	#1 Develop a common European framework for citizen insights #3 local citizen engagement Open / big data
	2	<i>Social network regulation</i>	Assess how best public administration can embrace and guide the use of proprietary social networking tools to maximise public good. Convene public bodies, industry, and communities to create new solutions to ensure the citizen's voice is heard. Address legislative enablers and barriers. Develop policy insights and propose policy recommendations.	#2 remove barriers from experimental initiatives Policy & Regulation
	3	<i>'Neutral Neighbourhood' (see potential action)</i>	Stimulate competitiveness between neighbourhoods through e.g. competitions against published community-relevant metrics; within cities and between cities – to engage and mobilise citizens to (over-) achieve community goals.	#3 local citizen engagement KPIs
	4	<i>Digital Inclusion initiatives</i>	Link with ongoing digital inclusion initiatives (eg MS Digital Champions) to ensure all citizens are actively incorporated in 'smart city' initiatives.	#2 remove barriers from experimental initiatives

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Listen to and converse with citizens	5	<i>Stakeholder platform</i> <i>(see potential action)</i>	Set up a platform – <i>physical and digital</i> - consisting of relevant stakeholders such as companies, cities, local governments and respected individuals to give feedback and organize mentoring for new companies and organizations and for citizens to feedback on policies. This should build on existing on-line and other initiatives (e.g. living labs; hack days)	#2 remove barriers from experimental initiatives #3 local citizen engagement
	6	<i>Sentiment and 'bug reporting' feedback</i>	Identify and prove good practices that provide easy-to-use interfaces allowing service providers to gather a quick picture of current sentiment. These may address location (e.g. museum) or theme specific topics (e.g. streetscene). Identify good practices in the use of analytics to better inform communities and public administration.	#3 local citizen engagement Open /big data
	7	<i>Focus solutions on different motivations</i>	From Tools & Method – to action! Employ tools and methods identified in action 1 to accelerate and scale up initiatives that develop insight on specific socio-demographic groups to increase learning in specific contexts.	#1 Develop (use) a common EU framework #3 local citizen engagement
	8	<i>Polluter pays solutions</i>	Test different models for assessing how best to address 'public interest' (also using modern ICTs) – e.g. 'polluter pays' mechanisms in energy and mobility initiatives. Update the body of knowledge on such topics given the future requirement to have far greater citizen inclusion in delivering public service outcomes	#3 local citizen engagement Mobility; & Built Environment
	9	<i>City Visualisation</i> <i>(see potential action)</i>	Implement visualization techniques to involve citizens in city planning and real-time views; making the invisible visible. This could also help create funding transparency And allow citizens to take an active role in city planning.	#1 Develop (use) a common EU framework Open/big data #3 local citizen engagement

Four of these citizen-focused potential actions are outlined below.

4.2.1 Potential Action 1: Tools for Community Insight and Engagement

This action area foresees the standardization of a methodology for user research to develop EU database of citizen behaviour and attitudes toward implementation of tech and energy solutions; ‘open user research data’ posted online and linked with case examples.

Context

Most all of the challenges humanity faces come to light in cities. The growing population of many cities is the cause of, and source of resolution of, such issues. What is vital to solve challenges like minimising energy consumption, reducing waste or ensuring seamless movement around cities is to involve citizens in the process. Without proper support from citizens solutions might not become implemented and problems aggravate further.

Engaging people has many dependencies: culture, motives, trust, capability, availability, enablement, etc. These vary by nation, by city and further by local groups. In order to best motivate citizens or incentivise behavioural change, cities may benefit from deeper understanding of who their citizens are and what they need and want.

Doing this well requires a three-step approach: first a good understanding society; from which one can engage efficiently and effectively; and then motivate appropriate action. Done well, this builds capacity and resilience in society, ensures the efficacy of policy-funded services, and can help meet policy goals (like the 20/20/20 targets of the EU for energy and climate change). Where there are examples of leading practice, they too often tend to involve a patchwork of agencies, domains, or geographical boundaries. Typically, the spectrum of approaches used – from census to personal assessments – is applied in an uncoordinated manner, by some public agencies within a city. The results often deliver a poor quality picture, and also bear frustrations for individuals involved.

We must improve radically, and fast. To do so requires quality tools and approaches, new mind-sets, and rapidly shared learning.

Deliverables

i. Mapping of current practices:

- In cities – identifying and learning from the more progressive cities
- In focused domain areas (energy, mobility, ICT) across cities

This would provide an information base of tools and approaches used and their positive and negative effects in progressive cities within the EU, and sampling from worldwide leading practice – eg LATAM participatory budgeting.

Target delivery: start + 4 months

ii. Maturity Model for comparing citizen attitudes and behaviours across cities:

- A means by which cities can determine their state of progress, and thus set realistic expectations and goals for improvement over realistic time horizons.
 - Enabling policies and practices (supply)
 - Optimizing potential (demand).
- This Maturity Model must be standardised and applicable for all European cities. It should measure readiness of citizens on two key motivator-dimensions; sensibility to sustainability and openness to (technical) innovation (adoption curve).

Target delivery: start + 4 months

iii. Framework and Toolbox for Community Insight and Engagement

- A framework that helps cities determine the tapestry of tools and techniques that they could use and the outputs they can expect from each, in order to align and agree across the city agencies, and underpin the execution of the plan.

- A toolbox of methods (adopting / adapting as appropriate; and creating new only where necessary) that supports the framework and
Target delivery – ‘beta’ version: start + 9 months

iv. Communicating evidence

- Develop case studies at a city level, and for individual tools / approaches that can trigger further action at city level. These clearly should focus on practicalities of action and their concrete benefits.
- In a complementary vain openly communicate leading practices to help building of capacity in European cities.

Target delivery – ‘beta’ version: start + 18 months

Goal and how the proposed action lives up to our conditions

The goal is to develop, test, and exploit a common set of tools and methods that help cities to understand their citizens and their communities in a better manner. These tools and methods should help influence outcomes associated with transformation of the energy chain, and the movement of people around cities. Many of these tools and methods can benefit enormously from the use of modern ICT (social media, mobile devices, data analytics, cloud computing, sensor technologies, etc).

Preconditions, e.g. on entities carrying out the action

Important pre-conditions for success include:

- Engagement of recognised leaders in this field, within cities academia and Industry
- Covering the breadth and diversity of European cities
- Standardisation of pan-European data so that the diversity of European cities becomes clear
- Involving the key con/prosumers of services in cities: citizens, businesses, visitors etc.

Methods and details of implementation (how)

An outline phasing of work could include:

- Phase 1 Current State Inventory
- Phase 2 Create model for comparing citizen attitudes and behaviours across cities
- Phase 3 Create framework and toolbox for insight and engagement

Monitoring

The principal mid-term output goal concerns better take-up of common quality tools and methods. The longer term outcome goal is the active participation by society in cities to deliver faster, cheaper, better the ambitions of the city. Monitoring of the number of cities using the same framework should be applied.

4.2.2 Potential Action 2: Energy Neutral Neighbourhoods

Context

In many cities community-led initiatives are getting off the ground. Citizens assume responsibility for realizing better living conditions in their neighbourhoods. These initiatives often focus on certain themes: improving social cohesion, increasing safety and sustainability or neighbourhood maintenance. These initiatives are usually not policy driven, but arise from certain needs within the community. They are driven by active members of the neighbourhood. The establishment of local energy cooperatives, of groups of citizens taking on responsibility for maintenance and security or community-led initiatives on reducing social isolation are just a few examples.

There is an as yet unknown potential in these kinds of initiatives to help achieving broader policy objectives. The idea is to stimulate the collaboration between community initiatives, private actors and local governments aimed at realizing energy neutral neighbourhoods.

Goal

The goal of this action is to stimulate and encourage community-based initiatives through introducing an element of competition between neighbourhoods.

Deliverable

- i. Pilot cities: A neighbourhood competition initiated in 5-10 European cities, challenging communities, businesses and local governments to show how community-based initiatives can make a difference in realizing goals set by the European Union. These examples will generate an inventory on best-practices and lessons learned that can be made available to other European cities.

Target delivery: start + 24 months

Preconditions

A number of important preconditions include:

- Local city budgets
- Local city champions
- Industry participation

Methods and details of implementation

Cities in Europe should be stimulated to encourage active neighbourhoods to participate in challenges that aim at linking and engaging more community-led actions. Visible benefits are needed to make it more interesting for communities to participate. Bureaucratic procedures should be limited (or be taken care of by the local government) and gains in terms of information exchange, better practice improvement etc should be clearly explained.

4.2.3 Potential Action 3: Stakeholder Platform for innovation and societal progress

Context

We have entered an age in which innovation and societal progress are more and more realized in networked environments. New forms of collaboration between government institutions, SME's, international businesses, NGO's and citizens are developing, supported or enabled by modern ICT infrastructures. The city itself is becoming the organizing principle of our time, the city being the place where human interaction takes place.

There is a huge potential for creation and innovation in this networked society enabling cities to meet up to the societal challenges we face today. Yet, we hardly understand how these new "organizing principles" work or how they can be enhanced. Exchange of ideas and experiences and room for experiment are needed, if we aim to unleash the full potential of human interaction meeting these challenges.

Just as there are many small initiatives and local apps and projects that come out of events like hack days, governments and service providers can view each little initiative as a pilot for a broader initiative, invest in many ideas, see what works and then bring the successful ideas to broader scale, if applicable in different geographies. Additionally, such events can be used for co-creation, concept validation and usability. Better coordination at a European level can help cities and also Member States to better leverage talent and identify, build and scale compelling concepts with support from industry.

Goal

The goal of this action is to unleash the full creative potential of cities to meet societal challenges through the full deployment of modern ICT infrastructures. New models of collaboration and co-creation in cities are stimulated through the realisation of so called City Platforms, where stakeholders of all kinds form "living labs". The "lessons learned and best practices should be transferable or scale-able to other European cities.

Deliverables

i. *Realizing City Platforms*

A number of leading cities support the development of City Platforms – open to government agencies, businesses, NGO's and citizens. The initial focus should be on energy and transport/mobility, but trans-sectoral approaches involving other domains should also be stimulated. *Target delivery: start + 12 months*

ii. *Mentoring Models*

The philosophy behind realizing City Platforms is that these platforms will enhance interaction between very different stakeholders and trigger, enable or stimulate the development of local networked societies. These city platforms are - in a certain sense – living labs, in which new forms of co-creation, entrepreneurship and citizen involvement is realized. Best practices of setting these platforms up and successful initiatives, stemming from these Platforms, are exchanged between cities (in the geographical sense).

Target delivery: start + 24 months

iii. *Unified Lab concept to host user engagement, hack days, etc.*

Such a physical platform would include expansion on the Living Lab concept to include a space for regular feedback, open discussion and collaboration, e.g. hackdays. These activities would cover more topics for citizen discussion and action, e.g. legislative topics. In addition to services from the private sector, citizens continually create new grassroots initiatives. Governments and service providers can read these signals to understand the underlying needs and motivations, and step in to help – whether with regulation or services.

Even if the motions are not carried through, policy-makers would gain insights from the discussion.

This physical space could allow for many interactions, for example:

- **Co-creation** – Conduct workshops where citizens from various target demographics join service providers in creating an idea to solve a problem
- **Concept validation** – Conduct user studies with concept sketches and word documents to learn early how citizens feel about the proposed solution
- **Usability** - Conduct user studies with early prototypes or sketches showing the mechanisms for a solution to understand how usable the solution is for different types of users
- **Feature requests** – Enable citizens to request new solutions, with voting and curatorial mechanisms to identify the most requested 'features'

Preconditions, e.g. on entities carrying out the action

Pre-conditions for success include:

- Engagement of recognised leaders in this field, within cities academia and Industry
- Covering the breadth and diversity of European cities
- Involving the key con/prosumers of services in cities: citizens, businesses, visitors

4.2.4 Potential Action 4: City Visualisation

Context

The old adage “a picture paints a thousand words” has great relevance in the city context. The complexity of city systems can be daunting to understand for city engineers, let alone the general public. And as such few of the general public engage in understanding much about how their city develops or operates. Yet, place them in front of google earth and the situation changes; they are drawn in to explore.

The ability to present layered information on city systems in an intuitive fashion using modern technologies is quickly developing. We already see 2D mobile apps with mapping and selective information becoming common place for search (and other) functions.

Prospectively, such technologies can also be used to engage city residents for other more value-adding purposes including urban planning, urban mobility, public security, environmental management, energy (and other resource) usage, waste management and the like.

Also, the availability at the city level of numerous amounts and sources of data in combination with the possibility of plotting these data on various geographical levels (from street-level up to city level or even regional levels) provides policymakers, entrepreneurs and citizens with a rich source of information. It can be used for supporting innovation and policy-making as well as inform preventive action. For example, in a number of Dutch cities an “early warning system” is developed which predicts in which neighbourhoods preventive action should be taken on, for example, issues of maintaining city infrastructure and services.

Goal

The goal is to increase the pace by which European cities and companies exploit emerging visualisation technologies. This should help improve quality of life in cities, create concrete socio-economic outcomes and help European companies to take a leading position in the new smart city visualisation market.

Deliverable

Deliverables include:

- i. *‘State of the Art’ landscape*
 - o *Technology Evolution*: capturing technical developments and enabling actions (eg funded research initiatives) over the past decade, and forecast developments over upcoming years and put together a roadmap for action;
 - o *City Practices*: map practices in European cities, and importantly also in leading cities worldwide, to provide a structured and categorised capture of the various ways that visualisation is being used in cities to improve outcomes (e.g. democratic, service, resilience).

These actions can provide the essential fact base to support forward-planning at city level. Such a state-of-the-art assessment should be executed as a short-sharp exercise to develop an ‘appreciation’ of matters, rather than detailed complete research.

Target delivery: start + 4 months

- ii. *Proof of Concept (PoC) Initiatives*

Building on existing leading practices in European cities, cities and their partners can develop a number of scale PoCs that can demonstrate the value of visualisation in a number of areas. Each of these should involve a number of cities, with supporting industry / academic partners. PoCs could be set up to explore the priority usage categories identified through the above landscaping.

Target delivery: start + 12-18 months

iii. *EU Industry / Capability Development*

Developing capacities among cities and companies in this fast developing field as part of the PoCs is a key concern. These can be exploited in Europe and beyond. In parallel with the development of the PoCs, steps could be established to further strengthen frameworks for action to support competitiveness (eg through European CEN standards; accessing Innovation funds; Skills building; etc) and to identify opportunities early on.

Target delivery: (i) Implementation Plan: start + 12 months; (ii) Execution of Plan: start + 12mos / ongoing.

Short timelines should be set to rapidly deliver 'beta' products, recognising the dynamic development of technologies.

Such initiatives will clearly have strong parallels with other initiatives in areas of urban mobility and energy that will be led by and benefit from the use of visualisation techniques. As such the overlaps and synergies between citizen focus led, and energy/mobility led initiatives warrant management.

Preconditions, e.g. on entities carrying out the action

Principal preconditions include:

- Active participation of leading cities involved in this field
- Commitment of leading academics in this field
- Open collaboration between EU industry players (to support e.g. standardisation on a European level that will positively influence worldwide standards to the benefit of European companies)
- An agile mentality and approach to execution – rapid beta development and testing
- Benchmarking and tracking of worldwide leading practices to ensure ongoing EU competitiveness

Methods and details of implementation (how)

An outline phasing of work could include:

- Phase 1: Consortium of cities and industry established
- Phase 2: Technical implementation

Monitoring

Clear indicators will need to be developed, following monitoring priorities such as:

- How Europe can advance faster relative to other countries / regions?
- The evolution of visualisation approaches and technologies within each usage theme?

5 Priority Area 'Policy and Regulation'

5.1 Introduction

Innovative forms of smart city policies and regulations are needed to enable large scale implementation and roll-out of smart cities. Cities need an adequate set of framework conditions in the field of policy and regulations in order to be able to smarten up. New governance concepts are required to coordinate and integrate smart city stakeholders – cities, businesses, and research organisations – within the change process so to identify strengths, weaknesses, opportunities and threats. Stakeholders need to jointly experience and learn with new forms of governance and policy concepts to further the process of becoming a sustainable, smart city.

5.2 Potential Actions

Examples of actions that could help create and shape an enabling policy and regulatory framework are presented in the table below.

Nr	Title	Summary of relevance	Link to SIP actions
1	<i>Smart City Strategy and implementation plan</i>	Strategic vision backed by all stakeholders and supported by long-term policies and respective regulatory frameworks as the basis for an effective and efficient implementation process	# 1: Smart city strategy
2	<i>Innovation zones</i>	Create the spaces in cities to test and evaluate the effect of new innovation models, revised policies and regulations, as well as consider different or reduced forms of regulation, where feasible.	# 3: Innovation Zones
3	<i>Innovative funding models</i>	Intelligent combination of funding instruments and funding commitments will enable to bypass any credit crunch and better plan project-bundles / infrastructure investments	#2: innovative funding models Also links to SIP area nr. 8 Finance and Business models
4	<i>Gap analysis</i>	Targeted analysis of fostering and hampering factors of national and EU policy frameworks for smart cities development and providing solutions how vertical interactions of policy fields can contribute to smart cities development	# 1 & 2 Also links to SIP area 5 (Integrated Management and Planning)
5	<i>Smart city networks</i>	Bringing together stakeholders on different aspects of smart cities (i.e. energy, ICT, transport) will generate new ideas and wider buy-in	#1 Smart Strategy Links to SIP actions 4 (citizen focus), and 6 (knowledge-sharing)
6	<i>Fitness checks</i>	Systematic evaluation of which parts of the existing regulatory/policy framework foster or hamper innovation for SCC and would need adequate action, either at EU, national or regional level (depending on competency).	Also links to SIP area 5 (Integrated Management and Planning)
7	<i>Improving regulatory processes</i>	Developing an approach how new and/or unified regulations (legal, financial, etc.) can be introduced for cities in a better way, including clear targets	# 1 (Smart city strategy) and 3 (Innovation Zones)

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8	<i>Streamlining regulation</i>	Developing new approaches to create incentives for European cities to align specific policy regulations and technical standards	# 1 (Smart city strategy) and #3 (Innovation Zones)
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5.2.1 Potential Action 1: Developing a Smart City Strategy and Implementation plan

Context

Cities often focus on stand-alone smart cities projects. But experience shows that a strategic vision, backed by all stakeholders and supported by long-term policies and respective regulatory frameworks, is the basis for an effective and efficient change process. A detailed city- or even nation-wide implementation plan including intelligent and innovative funding models is key for a coordinated approach. Alignment, both horizontally (between different policy fields) and vertically (between regional, national, EU actors), using a participatory approach, guarantees a holistic view and commitment to the smart-city process. Cities need to involve a broad range of policy fields and stakeholders and formulate an integrated smart city strategy. With clearly defined targets in mind (e.g. establishment of energy- and carbon-neutral districts), cities, regional/national authorities, and EU lawmakers need to work together, asking themselves: what measures are required, what future research is needed, what political, administrative, technological and financial hurdles have to be eliminated, what regulations have to be put in place, or changed, in order to reach the goal? City authorities need to create frameworks for the deployment of integrated technologies, which allow for public-private partnerships between cities and industry, and the creation of innovative and stable business cases.

On the other hand, private companies are hesitant to invest in new technologies and infrastructure due to policy uncertainty. For instance, major stakeholders in a smart city implementation actions (e.g. energy utilities) face uncertainty in long-term investments in energy infrastructure as long as policy uncertainty regarding e.g. fossil fuels, carbon prices or feed-in tariffs prevails. A smart city strategy will need to account for these political, but also financial, uncertainties and present a suitable approach towards dealing with them. The need for long-term policies with clear targets, actions and strategic guidelines on EU, national, regional and city level will need to be addressed to enable private investors to support a Europe-wide deployment of smart city concepts. While most of this is not within the competency of cities, cities need to highlight the needs for effective policy frames at all levels to avoid being locked-in to energy-inefficient / carbon intensive / fossil fuel based technologies and developments, which will be difficult and costly to change at later point.

Goal

The goal is to increase the number of cities with a long-term smart city strategy and stakeholder involvement, thus ensuring a stable environment, i.e. regulations and policies for industry, utilities, etc.

Deliverables

- i. Self-commitment of cities to a holistic approach (e.g. a smart city strategy, a climate or energy vision etc.) derived for instance from a stakeholder process to ensure full engagement and commitment. Such a strategy should link to the priorities and actions of the Strategic Implementation Plan (SIP) of our Partnership. A possible process should define a vision as well as a roadmap and a concrete action and funding plan to reach the goal.
- ii. Definition of barriers on European, national and regional level (regulations, policies, etc.) in the way of a smart city concept. Such barriers should be agreed upon by cities, industry and other relevant stakeholders and their removal be an essential part of the strategy process.
- iii. While the circumstances in cities can be substantially different so that different smart city strategies will have to be adopted, cities should make their strategy available (e.g. on a platform) to ensure learning and the adoption of best practices.

Preconditions

Such initiatives require input from a number of actors. The principal ones being:

- **City/Local Authorities:** The smart city strategy has to be included in funding considerations. Also, cities have to self-commit to include individual smart city projects within the larger overall smart city strategy.
- **Regional Authorities:** Regional authorities are responsible for Structural Funds in many countries. The integration of regional authorities could mobilise Structural Funds for smart city implementation actions.
- **Funding Organisations:** When granting funds the wider strategy should be considered.
- **Private companies and public utilities:** Their views should shape the smart city strategy. Incentives for private companies should be discussed to actively contribute and invest in the implementation of the strategy.
- **Research Organisations:** Their views should shape the smart city strategy. Incentives for research organisations should be discussed to actively contribute and invest in the implementation of the strategy.
- **National Ministries:** They should actively be aware and support their cities to work on a smart city strategy.
- **Citizens and NGOs:** They should be informed about as well as actively included in the process.

Methods and details of implementation

An outline phasing of work could include:

- **Phase 1: Vision**
 - Understanding of global and regional trends
 - Setting a Smart City Vision
- **Phase 2: Smart City Strategy and Roadmap**
 - Deriving qualitative and quantitative targets
 - Definition of technological and non-technological measures
 - Scenario calculation and comparison with business-as-usual scenario
 - Establishing a monitoring and strategic intelligence system allowing for policy learning to support a long-term transition process
- **Phase 3: Action/Implementation plan and Funding plan**
 - Definition of concrete actions (short, medium, long-term) for implementation
 - Perform Impact Assessment for planned activities
 - Development of funding plan
 - Preparation of demonstration projects
- **Phase 4: Dissemination and progress reports**
 - Making strategy and roadmap available on a national and European level
 - Tracking of progress based on pre-defined milestones
- **Phase 5: Sustainable Smart City Development and Urban learning**
 - Commitment of Member States develop partnerships between the smart city front runners and their followers or 'emerging' smart cities
 - Development of national frameworks for continuous smart city roll-out initiatives

Monitoring

Cities committing to a Smart City strategy should make relevant information publicly available (e.g. on a platform). Progress should be monitored and published as well clearly referring to pre-defined milestones (key performance indicators). Early adopters can thus serve as example to other cities facing similar challenges and conditions.

5.2.2 Potential Action 2: Establishing Innovation Zones within cities

Context

Smart concepts require in many cases new and innovative technologies and concepts. Research and development is vital but at the same time cost-intensive and risky for private companies. It is therefore necessary to use all available instruments (e.g. innovative procurement, policies, state aid, and competition law) in order to incentivise companies to invest in innovation. Especially, a clear framework for PPPs should be established and bureaucratic hurdles reduced, thus increasing a city's attractiveness for new businesses. Since innovation refers to the technological standard in place, policies might have to differ from country to country.

At the same times, regulations or subsidies, as well as organisational and administrative arrangements, can also hinder innovation (e.g. feed-in tariffs or procurement practices can favour certain technology innovation and prevent other innovation from taking place). As a first step, an overall "fitness-check" should be conducted, identifying those parts of the policy framework that are promoting innovation and those parts of the policy framework that are hampering innovation. Innovation Zones can be used as testing ground for new and adapted regulations in a real environments, to the extent possible. This potential need for change has to be pointed out at EU, national and city level. Addressing these hurdles would allow new business models, e.g. building on active collaboration between municipalities and private investors or overcoming the gap between those investing and those benefitting from innovative, energy-efficient, green technology (e.g. owner of a building is investing in retrofitting while the tenant is benefitting from the reduced energy expenditures). However, revision and adaption of regulations and policies might be a delicate matter and of unsure outcome. Innovation Zones would therefore be space-, time- and actor-specific.

Goal

The goal is to create a testing environment that allows and supports innovative concepts, business models, etc.

Deliverables

- i. Fitness-check: Definition of regulations and policies on European, national and regional level fostering or hindering smart city implementation actions. Such barriers should be agreed upon by cities, industry and other relevant stakeholders and their removal be an essential part of the strategy process.
- ii. Establishment of an innovation zone where one or more regulations are suspended or, alternatively, where new regulations are put in place.
- iii. Streamlining administrative processes to speed up delivery, i.e. one-stop shops. In the same line cities need to devote the sufficient administrative capacities to support these processes.

Preconditions

The principal conditions are:

- National and European level: create related policy provisions on national / European level where national or European law is concerned in order to allow cities to install innovation zones
- Cities dedicate certain areas to become innovation zone
- Key stakeholders (public, private, civil society) collaborate and commit to follow common principles/ goals

- Stakeholder engagement: Depending on the concept to be tested in an innovation zone, it can affect residents to a large extent. They have to be informed about as well as actively included in the process.
- Research Organisations: They should be included in the concept phase and can contribute to monitoring and evaluation process.

Methods and details of implementation

An outline phasing of work could include:

- Phase 1: Concept
 - Idea generation for new/altered/suspended regulations with all stakeholders
 - Development of strategic partnerships
- Phase 2: Set-up of innovation zone and monitoring
- Phase 3: Evaluation, dissemination of lessons learned
- Phase 4: Roll out

Monitoring

As a first indicator, the number and size of newly installed innovation zones should increase. Ultimately, the goal of a test ground is to roll out successful concepts on a larger scale. This should be used as criterion for success.

6 Priority Area 'Integrated Planning and Management'

6.1 Introduction

Integrated planning and management involves spatial, temporal and technical coordination of diverse policy areas and planning resources to achieve defined goals using specified (financial) instruments. Its success requires the comprehensive and early involvement of all governmental and non-governmental players, private sector, and citizens. It is particularly challenging as it involves managing long-term planning perspectives and short term actions, addressing domains as diverse as transport, energy, ICT and beyond – in both existing (retrofit) and new urban territory. Our current approaches are insufficiently agile to cope with a more entrepreneurial approach and to respond to the pace of change in demography, societal expectations, and technology. This requires technical planning capabilities, more inclusive participatory and consultation processes, and greater collaboration within and across traditional policy and administrative boundaries within and between cities and communities.

The need to deal with integrated planning and management in the context of Smart Cities is obvious for the following reasons:

- It supports cities in their change from business-as-usual to low-carbon strategies and allows them to set more ambitious targets. This approach facilitates the using of methodologies to set up strategic and long-term vision for the city, the foreseeing of financing, the planning, the cooperation of multiple actors, while taking into account the local/regional/national environment.
- This kind of approach will foster implementation of local policies leading to innovative smart integrated solutions for mobility, energy, water, waste management and buildings on the district to city level which support entrepreneurial and sustainability ambitions for the utility/mobility and other sectors.
- Cities are continuously aiming at reducing the amount of energy required per unit of output, both at the level of collective city services and individual users. The integrated approach to energy and resource systems and infrastructure will play a part in increasing the energy efficiency of cities, along with the increased use of data and ICT integration.
- Integrated planning improves potential diffusion of smart technologies. ICT-technology can help in structuring planning and management of smart city initiatives and enable more transparent, efficient resource use and implementation. Data can be used to enable resource integration across City systems, by helping to identify potential value at stake and the players involved.
- The integrated planning and management helps to better identify promoters, drivers and barriers for Smart Cities developments and the means to change and handle the stakeholder interests. It reinforces the pro-active collaboration among different local actors. Cities and private sector need to have an understanding of city systems, including socio-economic aspects, to successfully develop Smart City solutions and enabling long-term objectives and commitment to secure funding.

6.2 Potential Actions

A number of initiatives are recommended to accelerate and demonstrate a better approach. The table below provides an overview and identifies links to action areas mentioned in the SIP, though it is by no means exclusive or exhaustive.

#	Title	Summary	Link to SIP actions
1	<i>Smart Planning Forum (see exemplar)</i>	Focus on the necessary governance mechanisms enabling an holistic planning approach and to make this tangible and perceivable for all relevant stakeholders and citizens	Improving collaborative governance mechanisms dedicated to integrated planning and management
2	<i>Big Data for planning and management (see exemplar)</i>	Support the implementation of data driven planning and management approaches in developing and implementing smart city projects	Maximising the use of city-wide data
3	<i>Urban Simulation and Planning (see exemplar)</i>	Urban simulation and planning models to capture the dynamics and impacts of urban development and policies	Using urban simulation and planning models
4	<i>Smart Energy Map</i>	Demonstrate agile energy maps capturing direct and indirect production and consumption of energy over sectors	Focussing on the use of energy-models and energy-mapping
5	<i>City communication and engagement</i>	Demonstration of innovative peer-to-peer and citizen-to-government-platforms for exchange of ideas and opinions regarding city planning and management issues	Using visualization, decision support and peer-to-peer-tools

6.2.1 Potential Action 1: Smart Planning Forum

Context

The SIP stresses the importance of having planning and management approaches at the city-level which are agile enough to respond to the needs of various stakeholders and holistic enough to capture synergistic benefits across silo's. This action intends to focus on the necessary governance mechanisms enabling a holistic planning approach and to make this tangible and perceivable for all relevant stakeholders and citizens. Securing long-term commitment from stakeholders and balancing long-term objectives with short-term actions is a key challenge when implementing smart city initiatives. Key needs in this context include the need for defining long-term goals, and stimulating and managing the dynamics of entrepreneurship in smart city initiatives involving public partners, private partners and citizens.

Goal

The action will demonstrate experiences and results of best practices in cities across Europe regarding collaborative governance mechanisms dedicated to integrated planning and management. The end-goal is for cities to achieve improved efficiency in developing and implementing smart city initiatives.

Deliverable

- i. Toolkit and shared experience in developing and implementing Integrated Action Plans at city level, including quantifiable contribution to energy efficiency and climate goals with a sound business plan.
- ii. Demonstrated involvement of private sector and citizens in planning Smart City-initiatives through communication and sharing of plans and results of projects, viz. web-based or through social media.

Preconditions

Preconditions for various entities include:

- Private sector, in particular financial institutions, to develop new financial arrangements which support entrepreneurial ways of implementing smart city projects
- City authorities supporting innovative governance and planning of public space. They are also important in enabling public services to cooperate across their respective silos in developing common implementation plans which provide long-term political commitment.
- Public services to collaborate on a common implementation of smart city policy objectives.
- Companies are to be expected to cooperate on developing public-private partnerships.

Methods and details of implementation

A possible implementation approach could include:

- Phase 1: Survey and collection of best practices on integrated planning and management
- Phase 2: Conceptualisation and definition of common framework for integrated planning and management for Smart Cities
- Phase 3: Testing and demonstrating

Monitoring

To monitor progress, attention can be paid to the following set of indicators:

- Number of cities having adopted Smart City plans including medium-to-long term targets involving all relevant departments and public services.
- Share of Public-Private partnerships as Smart City initiatives
- Share of citizen-driven initiatives as part of the Smart City planning cycle

6.2.2 Potential Action 2: Big Data for planning and management

Context

Data-driven planning and management strategies will contribute to planning and management strategies at the city level which are agile enough to respond to the various opportunities and needs of stakeholders arising in the city. The flow of data and information arising from a broad variety of ICT-driven technologies offers ample opportunities for optimising, assessing and communicating on the progress with implementing smart city policies. Examples can be found with regard to capturing (big) data on mobility and electric transport, energy systems, smart metering, environmental sensing and control and data and information from peer-to-peer applications and social media. As yet, the most imminent aspects related to implementing this action concern opening up of databases which are currently in use at public services and city departments. This action will clearly contribute to the visibility of the benefits of smart city-policies. Making data available for development of new services can induce possible innovations in planning and management concepts. Besides, it is an important action as it makes benefits of policies implemented across departments more visible.

Goal

The goal is to support the implementation of data driven planning and management approaches in developing and implementing smart city projects. This in itself will contribute to visibility of smart city initiatives to the public and to a playing field across cities making it easier for companies to demonstrate benefits of their smart city solutions and technology.

Deliverable

Providing support for data-driven urban planning and management policies:

- i. Assessment of best-practices from cities implementing data-driven policies for planning and management;
- ii. Harmonized standards for sharing urban data and information.

Preconditions

Preconditions for success include:

- City authorities are important in delivering commitment to open data-policy and supporting data-driven approaches to planning and management of smart city initiatives;
- Public services to collaborate on opening-up their data stores and considering data-policy as part of the implementation of smart city initiatives;
- Private sector can contribute and adhere to common standards for data-collection and exchange;
- An important precondition relates to data-ownership and privacy-aspects any of which have to be resolved at national and EU-level, e.g. in the Framework of policies like INSPIRE.

Methods and details of implementation

A possible implementation could include:

- Phase 1: Survey and collection of existing best practices on data driven planning and management policies at city level and benefits in developing and implementing smart city initiatives.
- Phase 2: Focussed actions to assess impediments (judicial, operational) of using city-wide data in planning and management and propose solutions
- Phase 3: Delivering concepts and business cases on how to maximize the use of city-wide (big) data and information in a collaborative planning and management approach
- Phase 4: Testing and demonstration in a variety of cities on small-scale projects
- Phase 5: Roll-out

Monitoring

To monitor progress, attention can be paid to the following set of indicators:

- Number of cities implementing policies and projects to open up their data-stores.
- Number of smart-city-initiatives having a feed-back of operational data and information into the planning and management process
- Share of new bottom-up information services capturing progress and benefits of urban "smartness"

6.2.3 Potential Action 3: Urban Simulation and Planning

Context

Cities can benefit greatly from quantified assessments and scenario exercises. These tools can help to better understand the impacts of policies and implementation strategies under different context conditions. This can cover a broad array of topics such as land use and urbanization, investments, energy saving and production, mobility plans, resource efficiency and variable socio-economic aspects. Pending issues relate to questions as to whether and how urban policies will contribute to an energy efficient and sustainable city, how to inform stakeholders on complex system interdependencies or how to arrive at smart decision-making? Urban simulation and planning models to capture the dynamics and impacts of urban development, including socio-economic aspects, will be a helpful tool in this context. Focussing on the use of energy-models and energy-mapping from district to city-wide scale, addressing all relevant sectors, can deliver early benefits.

Goal

The goal is to offer a common approach and methodology which can be used among cities to assess in a quantified way the effects of planning policies and implementation strategies on energy, mobility, socio-economic aspects and urban development.

Deliverable

- i. Common models and approaches across cities for energy-models and energy-mapping from district to city-wide scale, addressing all relevant sectors
- ii. Early case studies of the use of digital platforms for integrated multidisciplinary collaborative design and planning (co-simulation and optimization of complex interactions in different domains, virtual environments for viewing and commenting designs, e-learning applications, user-oriented cognitive data visualisations).

Preconditions

Preconditions for various entities include:

- City authorities are important in delivering commitment to innovative model-based planning initiatives through granting experiments for defining and developing proto-type tools and instruments
- Public services to collaborate on opening-up their data stores and considering model-based planning as part of the implementation of smart city initiatives
- Private sector can contribute to adhere to common standards for model-based planning and protocols for data-exchange from operational systems
- Academia/RTO's are important in developing proto-types for model-based planning, definition of common standards, guidelines to ensure compatibility.

Methods and details of implementation

A possible implementation could include:

- Phase 1: Define demand, supply and benefits of model-based planning and the options for simulation tools across frontrunner cities and academia/RTO's.
- Phase 2: Prepare pilot phases in a defined number of cities to define and experiment with various approaches of model-based planning; include exchange of experiences and user feedback.
- Phase 3: Delivering concepts and business cases on urban simulation and planning models to capture the dynamics and impacts of urban development in a collaborative planning and management approach
- Phase 4: Roll-out - Enable the demonstration and promotion of leading Smart City-examples in the use of simulation models in integrated planning and management

Monitoring

To monitor progress, attention can be paid to the adherence of cities in model-based planning approaches in their smart city initiatives and action plans. These approaches should contribute to the agility with which cities and stakeholders can develop, test and implements plans and show the benefits in relation to long term city policies.

6.2.4 Potential Action 4: City communication and engagement

Context

This action relates to ICT enabling city governments in communicating and engaging broad stakeholder groups in their planning and management policies regarding city development. It therefore focusses on smart visualisation tools supporting communication on city governance issues, peer-to-peer-tools and social media to engage large, informal groups into city development and governance.

Goal

The goal of this action is to support cities in communicating and engaging broad stakeholders groups, most importantly citizens, in their integrated planning and management policies. It is one of the enabling tools to collect opinions, address stakeholder interests and to secure long-term support and involvement.

Deliverable

- i. Demonstration of innovative peer-to-peer and citizen-to-government-platforms for exchange of ideas and opinions regarding city planning and management issues.
- ii. Common models and platforms to include integrated planning and management of cities as part of e-governance strategies.

Preconditions

Preconditions for various entities include:

- City authorities are important in delivering commitment to innovative services and tools (apps) which enable visualisation and interactive communication on city plans and bottom-up initiatives. This can be done e.g. through organised *hackatons* and competitions and through promotion of innovative services for stakeholder engagement.
- Private sector actors are also important in delivering commitment to innovative services and tools (apps) which enable visualisation and interactive communication when it relates to their involvement in city services. They can further contribute by adhering to common standards and protocols for data-exchange from operational systems.
- Academia/RTO's are important in developing tools for visualisation and data-capture which are necessary to build user services.

Methods and details of implementation

A possible implementation could include:

- Phase 1: Survey and collection of existing best practices and tools on communicating and engaging broad stakeholder groups in city planning and management policies
- Phase 2: Prepare experiments and *hackathons* in across a defined number of cities to support development of ICT-enabled services for citizen involvement in city planning policies

Monitoring

- Number of cities to start including integrated planning and management into their (e-)policies;
- Evidence of services informing stakeholders (citizens, private sector actors) on implementation of city policies, progress of projects and city performance related to key parameters and policies;
- Evidence of services supporting peer-to-peer-initiatives and their success in bringing bottom-up processes effectively in the city governance and planning process.

7 Priority Area 'Knowledge Sharing'

7.1 Introduction

Knowledge sharing between cities, and across sectors, is vital for smart city innovations. The SIP calls for swifter, more broadly applied, structured knowledge sharing, building on current good practices.

7.2 Potential Actions

Consistent with the five main recommended actions within the SIP, the following list of ideas provide additional thoughts on how knowledge sharing across all sectors can be improved and better exploited to accelerate action, increase confidence in those actions, and add value generally.

#	Title	Summary	Link to SIP Action
1	<i>Cross-Sector Exchanges (see potential)</i>	Implement short-term secondment between Cities-NGOs-Industry; crowd-source best ideas from alumni; review and repeat process.	#2 enable 100 city-NGO-Industry transfers
2	<i>Technical support for capacity building</i>	Provide means to ensure cities of all scales have adequate opportunity to build capacity to implement smart solutions at all levels of city administration	#1 Increase knowledge transfer #3 Knowledge Brokers
3	<i>Knowledge Brokers</i>	Appoint “knowledge brokers” in city administrations to facilitate transfer of knowledge between sectors and governance levels. Network these to improve the circulation of information about smart city solutions.	#3 Knowledge Brokers. #1 Increase knowledge transfer. Apply to domains (eg Planning; Data...)
4	<i>Readiness Check-Lists</i>	Develop “check-lists” for cities to evaluate their readiness for Smart City roll-out and identify potential need for change.	#4 integrate knowledge sharing from outset
5	<i>Bilateral Mayoral Exchange</i>	Bilateral city mayors’ meetings. This can be exchanges over half a day between two cities in a specific area, e.g. energy efficiency. Exchange of good practice at political level can lead to swifter change.	#1 Increase knowledge transfer. Planning Policy and Regulation
6	<i>Study visits; Peer reviews; Mentoring</i>	Increase exchange of experience between cities through study visits, peer reviews and mentoring schemes allowing cities to transfer knowledge and benefit from the expertise of others (building on established knowledge transfer platforms; also to disseminate results from the lighthouse projects, focusing on reliability and transferability).	#1 Increase knowledge transfer.
7	<i>One-Stop Smart City Solutions Tool</i>	Develop web tool at EU and national levels to enable city staff, developers and business to access and exchange ideas on new solutions.	#5 One-Stop web tool
8	<i>City Advisory Board</i>	Establish City Advisory Boards including cities, industry (with R&D and market knowledge) and research community, to fit priorities along entire project chain to research needs. Stimulate critical discussion of outcomes of the EIP SCC among the research community. For instance, the EERA JP Smart Cities is a platform for such discussion and dissemination.	#1 Increase knowledge transfer. Integrated Planning

7.2.1 Potential Action 1: Cross sector staff exchanges

The connections, contacts and communication between the main sectors involved in and concerned with smart city developments require strengthening. City administrations, companies (large to SMEs), relevant NGOs and academia need to better exchange and communicate. Much greater mutual understanding of needs and challenges is required to ensure they are anticipated and matched by available and forthcoming solutions. Study visits, peer reviews and mentoring programmes happen on a regular basis between cities across a wide range of areas with good results in terms of inspiring new developments and change. To scale up smart city development, a concrete and practical cross-sector approach to knowledge sharing is required.

Goals

Goals could include:

- Create a better understanding across sectors of current and future needs as well as available solutions, with a view to facilitate learning processes and mutual understanding;
- Build informal partnerships across sectors to scale up smart city development;
- Ensure that knowledge about what works and what doesn't is shared between cities and across sectors.

Deliverables

One concrete deliverable concerns short-term staff exchanges annually between cities, industry and relevant NGOs. Involvement of academia in the development of the exchange programmes and to capitalise on outcomes would be an asset. This action can start in 2014.

Preconditions

Preconditions for success include:

- European networks (cities, business (incl. SMEs) and academia): to publicise the opportunities available with the programme and ensure engage of their members. Disseminate outcomes of the programme widely.
- City administrations: to engage in developing a visiting programme, to host and send participants, to evaluate outcomes for own smart city developments.
- Business/industry: as above.
- NGOs: as above (where relevant)
- Academia: To support cities and business in the process and ensure that the programme capitalize on benefits. Facilitate contact with programme alumni to ensure best practice is extracted.

Methods and details of implementation

- Advertise the possibility for participating in cross sector staff exchanges widely across the EU through e.g. networks. Clarify cost implications and benefits to potential participants.
- Develop a short guide for staff exchanges which explains the elements to consider making the staff exchanges valuable and a win-win programme for all parties.
- Gather expression of interest from cities, industry and NGOs and match them up according to their areas interest within smart city developments. To keep costs down, consider to match partners also according to geographical proximity.
- Ensure that expectations to the exchanges are clarified with all parties before kick-off.
- Crowd source the best ideas from the program's alumni and make them publicly available.

Monitoring

Quantitative:

- Number of staff exchanges taking place annually
- Number of organisations, public and private, participating
- Number of best practices identified

Qualitative:

- Feedback from participants in exchange programs
- New or adapted/changed smart city developments in city administrations or industry following participation in the program

7.2.2 Potential Action 2: Technical support (in kind) for knowledge sharing/capacity building in city administrations and business

Context

At local level, knowledge sharing is about getting the right work processes in place to ensure that information is transferred between different administrative departments of a city administration. Members of staff must be equipped to recognize relevant smart city solutions and work processes must facilitate knowledge sharing internally. City employees must also be qualified to communicate smart city developments and solutions to the citizens, local business and other stakeholders to ensure that information trickles down administrative systems and to other sectors.

In some places this will require an up-skilling of employees and a review of work processes. Technical support for capacity building, communication and knowledge sharing in city administrations can help ensure adequate capacity to promote smart city developments and eventually boost the uptake of solutions locally. Technical support delivered through local partnerships can be a win-win situation for all partners involved increasing engagement and ownership.

Goal

The key goal is to ensure adequate capacity to promote and deliver smart city developments within city administrations and local business.

Furthermore, such action should help ensure a local level playing field of knowledge of political, legislative, regulatory and administrative framework conditions for smart city developments.

Deliverables

- i. Local smart city partnerships which stimulates knowledge sharing and capacity building between partners.
- ii. Smart skills staff training programmes in city administrations. Research organisations and academia can use their up-to-date knowledge to prepare comprehensive and practical guidelines, training documents and best practice examples.
- iii. Outreach programmes to local start-ups and SMEs with information about public support for smart city business development.

Preconditions

- The city administration must be on board to analyse its needs around work processes, up-skilling and other staff developments for better deployment of smart city solutions;
- Cities must streamline administrative processes and devote sufficient administrative capacities to support these processes;
- Local business and research institutions should be partners in delivering the technical support to up-skilling city administration employees;
- Industry partners that develop and supply new products materials and solutions should be partners in delivering the technical support to up-skilling city employees;
- Research institutions, city administrations and industry can join forces to ensure that local start-ups SMEs get the right level of information about business support available.

Methods and details of implementation

- Gather good and bad practices about existing local smart city partnerships.

- Establishment local multi sector smart city partnerships, where they are not already in place. They can be led by the city, business or research institutions but should be with a view to ensure and integrated approach to smart city developments.
- The smart city partnerships work with their local city administration to assess the city's needs and potentials, including within the city administration.
- The city administration develops a smart skills training programme for members of staff to enhance its work processes and increase the capacity of the administration around development, implementation and communication of smart city solutions.
- The training programme is delivered in cooperation with the members of the smart city partnerships.
- The city administration and the relevant research institutions develops an outreach programme to local SMEs to ensure they are informed about local smart city development needs and public support available for start-ups and SMEs.
- The smart city partnership develops a communication strategy to ensure knowledge about smart city solutions relevant for the local development is shared with all local stakeholders.

Monitoring

- Number of new smart city partnerships;
- Number of new smart skills training programme in city administrations;
- Number of city employees that have been through the training programme and their feedback- Number of local outreach programmes to start-ups and SMEs. Increases in uptake of smart city solutions locally .

8 Priority Area 'Baselines, Performance Indicators and Metrics'

8.1 Introduction

There are more than 150 credible city indicator systems in place⁴, covering all manners of geographical, thematic as well as other criteria. Not surprisingly, they all tell a different story about a city's performance. Most cities do seek to compare their performance over time on some form of consistent basis; a comparison between cities, on the other hand, is a much harder task for each has a different context. If we are to confidently advance towards our agreed 20/20/20 targets some form of common measurement framework should be in place. Although it may be complex, and although cities do indeed differ contextually, we should rise to this challenge.

Initiatives like the Global City Indicators Facility (GCIF), or the European Reference Framework for Sustainable Cities provide a sound basis of institutionally supported measurements. Yet there is presently no single, broadly-accepted indicator framework that reflects the 'smart city' approach – one that addresses cities systemically and can help cities understand better the inter-dependent nature of city systems and services; one that can help us demonstrate in an unambiguous manner how cities best use modern ICTs to improve quality of life, foster sustainability and boost competitiveness and innovation; and one that can help cities collect an improved set of data to underpin such measurements.

All this requires indicator systems, data bases and statistical standards that should be developed in close collaboration between European cities, the academic community, industrial partners, standardisation institutes and statistical offices.

8.2 Potential actions

The table below outlines a number of actions that would support the development and European-wide application of such an indicator system:

#	Title	Summary	Link to SIP Action
1	<i>EU smart city Indicator framework (See example action below)</i>	Develop and pilot an EU-wide smart city Indicator framework as a collaborative exercise; adopting/adapting existing measurement assets; and establish a means to achieve wide-scale adoption.	#1/2/3 develop/deploy indicator system
2	<i>Constituency building (See example action below)</i>	Activities related to the development of indicators, consensus-building, dissemination of results, getting the buy-in, e.g. organise a European scientific conference on smart city indicator systems and monitoring tools.	#1/2/3 indicator system Knowledge sharing
3	<i>Metrics Standards</i>	Develop and align standards for European energy, mobility and ICT data to enable comparison at local levels (within cities over time; and between cities)	Standards Open / big data
4	<i>Smart City Competitions &</i>	With focus on improvements of a city with respect to a baseline, implement competitions and awards to instil a	#3 ongoing monitoring Knowledge sharing

⁴ <http://www.jll.com/Research/jll-city-indices-november-2013.pdf>

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	<i>Awards</i>	greater emphasis on performance within cities (e.g. between city districts, involving citizens directly), and between cities – all based on a respected measurement framework.	Open / big data
5	<i>Smart City KPI Uptake</i>	Establish a business model that ensures the uptake and sustenance of the smart city indicator framework; particularly for cities with limited resources/capacities	#3 ongoing monitoring Implementation

8.2.1 Potential Action 1: Develop and provide data for an EU-wide Smart Cities indicator framework

Context

The European Innovation Partnership (EIP) on Smart Cities and Communities seeks to support cities in becoming more energy-efficient, in using more renewable energy and reducing their greenhouse gas emissions by stimulating technological innovation, engaging citizens and providing innovative concepts, processes, methods and tools. To create transparency and build confidence, all such actions need to be quantifiable against clear baselines such that wins can be clearly evidenced – to a city's leadership and its citizens. To this end, a comprehensive indicator system, based as far as possible on real data, is needed.

In recent years, several indicator systems and assessment methodologies related to specific aspects of smart cities have been developed on the European level. Relevant initiatives and projects are, for example, the Covenant of Mayors, the Green Digital Charter, CIVITAS, CONCERTO, Urban Audit, ESPON, the Reference Framework for Sustainable Cities (RFSC) as well as others. However, there is still no integrated indicator system that supports reliable progress-monitoring in all fields relevant to smart cities, both within a city over time, and in between cities.

Goals

To develop an agreed indicator framework that enables cities to self-evaluate their progress over time towards “smartness” and compare themselves to other cities in a more reliable manner. To adopt or adapt existing measurement assets in order to make data collection and use less onerous. To achieve broad acceptance and sustained use of the framework, encouraging use by all kinds of cities and their industry and partners from academia.

Deliverables

- i. *Smart City Indicator Framework & Toolkit*: aligned with actions established through HORIZON 2020. This should address the systemic nature of cities and integrate ICT/‘smart’ elements within the framework;
- ii. *Agreed Top-Level ‘Smart Indicators’*: that can be used consistently and with confidence to demonstrate progress towards the 20/20/20 energy and climate targets;
- iii. *Data Protocol*: there will be data gaps (because the framework will be based on data from other projects and databases with only few cities represented in all of these) - cities should therefore be invited to commit themselves to update and complete their datasets and help themselves and others closing data gaps;
- iv. *Dissemination method and means of sustainability*: the more cities that apply the indicator system (and share their experiences and data with other cities), the more profound the insights into barriers and success factors for smart city development will become.

Preconditions

- Collaboration between European cities, the academic community, industrial partners, standardisation institutes and statistical offices;
- Cities provide the data in a standardized format, and data is opened up;
- Protocols are established to manage sensitive data;
- A regular cycle of data updates is established.

Methods and details of implementation

Implementation of two key elements are covered: (i) the Indicator Framework, and (ii) the Data Protocol

The following six-step approach is proposed for the **Indicator Framework**:

- *Step 1: Scoping of indicators*: mapping of areas where indicators are needed and their nature (e.g. environmental). Identify in detail the action areas where we want indicators with a preliminary list of such indicators;
- *Step 2: gap analysis* of existing indicators from experience and research. This phase should look as well to what barriers may exist in the KPI area;
- *Step 3: develop the missing indicators*: through standardisation bodies or others;
- *Step 4: agreement on the indicators*: a European scientific conference could be the means to get there;
- *Step 5: define the baseline and pilot KPIs*: Through voluntary actions to see practical feasibility of indicators set for cities. This phase could also shed light on data availability, knowledge-levels of the user, practical meaningfulness of the data indicators in the urban context;
- *Step 6: Create the ecosystem* required to enable the **use** of KPIs through methodologies for data collection, data usage, assessment, training to city staff, creating the necessary availability of data, removing barriers identified during the gap analysis.

The following four-step approach is proposed for the **Data Protocol**:

- *Step 1: Analysis of Status Quo*
 - What measurement systems are typically used by cities? And what 'smart' measurement approaches are in use?
 - Which data has already been collected by the city?
 - Which data is missing to fulfil the requirements of the indicator system?
 - In which format should the missing data be collected?
- *Step 2: Data collection and data standardisation and integration*
- *Step 3: Transfer of missing data to European Framework*
- *Step 4-n: Regular (e.g. annual) data update*

Monitoring

- Use by European cities (number of) – of different types
- Qualitative feedback of use at strategic and operational levels
- Adherence to regular data updates
- Quality of data (standard format, metadata)
- Data gaps and restrictions in data availability should be documented and analysed.

8.2.2 Potential Action 2: Constituency building

Context

Given the plethora of measurement systems currently in place and the limited availability of any broadly-agreed smart indicator system; there is a significant confusion and lack of confidence in the application of city measurements. There is also generally poor and limited use of quality measurement in smaller cities, and at district level.

Goal

To build a community of users to go through the whole KPI development and use exercise. This would include actions to boost confidence amongst users, through organising a conference (or similar) to foster the exchange of knowledge and ideas on emerging research topics and best practices in the field of smart cities.

Deliverables

- i. An annual series of European conferences on the smart city indicator system; 1st of which takes place by mid-2015; inviting leading researchers to share the latest approaches and findings in this field
- ii. Emerging research agenda to sustain quality of indicator facility
- iii. Dissemination of the results (training package for users, e-learning ...).
- iv. Dissemination of the European knowledge globally.

Preconditions

- Network: researchers, companies and cities need to be in the same network to ensure meaningful outcomes;
- Resources are required for the organization of conferences, for a etc.;
- Dissemination partners that help to communicate the message to a wider community.

Methods and details of implementation

- Create a roadmap of events for the coming years
- An information exchange platform could be (re-)used (website, wiki forum or other)
- The disseminating package should be created for European and non-European dissemination
- For dissemination purposes, online conference proceedings should obviously be published online extensively

Monitoring

The success of this action can be monitored in several ways:

- Number and representativeness of participants.
- Repetition rate of the conference (on a yearly basis?)
- Feedback from conference participants
- Number of downloads of conference proceedings
- Number of participants to dissemination events (trainings ...)

9 Priority Area 'Open Data'

9.1 Introduction

Real value for cities and their stakeholders from the exploitation of large-scale data (open or not) is a new phenomenon that benefits from an array of new approaches and tools – especially considering the way software automation and information technology are changing the way that value is created in the economy; all in a highly dynamic environment. In this context, the general trend to open public data sources is a theme that underlies this OIP; however recognising that value will require exploitation of a number of different data sources (i.e. beyond just ‘open data’), appropriate to the service area in question.

Our ambition is to establish some agile projects that can quickly demonstrate the potential, and point the way for other cities and their partners.

9.2 Potential Actions

The table below identifies a (non-exhaustive) number of the potential areas where data (open or big) can be exploited or need more exploration, including:

#	Title	Summary	Link to SIP Action
1	<i>Open Data Landscape</i>	Develop landscape of City Open Data initiatives. A survey of 1st mover experiences, that captures value delivered (to build confidence of others)	All
2	<i>Environmental dynamic Open Data hub</i> <i>(See potential action)</i>	Build communities of (cities) data owners and producers publishing their data online. Develop (web) services on top of those data sets made available to end users or integrated in third-party applications	#2 accessibility of data Also Priority Areas 'Districts and Built Environment', 'Knowledge Sharing', 'Citizen Focus' and 'Standards'
3	<i>Energy Efficiency Data</i> <i>(See potential action)</i>	Use advanced technologies (e.g. thermal infrared cameras) coupled with Open Data sharing at neighbourhood level for energy retrofitting in sub-urban / rural infrastructures	#1 open by default #2 accessibility of data #4 interoperability data services Also Priority Areas 'Districts and Built Environment', 'Knowledge Sharing', 'Citizen Focus' and 'Standards'
4	<i>Social Open Data Indicators</i> <i>(See potential action)</i>	Develop indicators of social environment, to bring more information concerning social environments to the urban/city decision making process: e.g. 1) using this information as data for computers controlling smart buildings or transportation systems, 2) delivering this information to individuals to improve their decisions	#1 open by default Also Priority Areas 'Districts and Built Environment', 'Knowledge Sharing', 'Citizen Focus' and 'Standards'
5	<i>Transport system</i>	Build applications on transport data (public transport and	#4 interoperability data

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	<i>data apps</i>	road traffic data, incl. managing parking spots through sensors)	services
6	<i>Civic Engagement</i>	Develop civic engagement platforms (participatory budget processes; “Fix my Street” type of applications)	#1 open by default
7	<i>City Resource Flows / Tools</i>	Implement Resource and Material Flow Analysis in cities; capturing data dealing with a city as a set of integrated systems; develop approaches / tools to optimise systems	#2 accessibility of data #4 interoperability data services
8	<i>Data Time Horizon Analysis</i>	Evaluate “What Time” City Data – what relative ‘speeds’ of ‘real time’ are appropriate for different services. Assess the most natural time horizons to be of optimal use and value	#2 accessibility of data
9	<i>BI / Data Analytics Tools</i>	What business intelligence strategies, tools and approaches work best – for city decision support; planning; and operational performance?	#2 accessibility of data #4 interoperability data services
10	<i>Open Data Validation models</i>	Develop models for Open Data validation (e.g. through rating, or certification if there is a rationale to do so) to ensure high quality open data in a useable form and further increase trust in the use of data, and models for open data ownership and (free or not) access by stakeholders.	#1 open by default
11	<i>City Data Roles</i>	What roles and capabilities are emerging in cities in relations to data exploitation (e.g. Chief Digital Officer; Data Scientist); and what are experiences telling us?	

There is an obvious need to make a strong link from data to economic benefits at the local level. Many data initiatives emerge at a city level with the intention of nourishing a community of apps developers that would 'train' themselves with the data made available by that city but with a clear view of acquiring the skills, establishing the business models that would allow them to go beyond the city limits. Open Data hubs must attract users and activity, so that the investment in operating them does result in the creation of new value; this means : 1) to find out what the stakeholders and communities need, rather than to publish all data in anticipation, 2) to focus on making as much data as possible available in some common agreed format, 3) to find ways to address the cost of providing usable data and to invest in making them accessible – to enable value realisation across all (or as many as possible) sectors and stakeholders in cities and communities.

9.2.1 Potential Action 1: Environmental dynamic Open Data hub

Context

NB: This action exhibits potential natural links with the *Districts and Built Environment*, *Citizen Focus*, *Knowledge Sharing* and *Standards* Priority areas.

Most available open data-sets in the fields of environment and energy are inadequate for advanced applications such as:

- Smart Grid services (e.g. demand-response, load shedding scenarios) – data is too often captured too infrequently and not at the right level of granularity; insufficiently shared such that action can be taken in good time to make potential efficiencies; and held by energy providers rather than made accessible for consumers to act on so to improve performance;
- Validation and fine-tuning of energy simulation tools;
- Accurate energy performance benchmarking and audits of buildings and cities.

With the massive roll-out of connected objects and devices, there are fast-growing amounts of potentially available fresh data-sets coming from wireless sensor networks, smart energy meters, vehicle/traffic counters, air quality sensors, weather monitoring stations, etc. This data can benefit a wide community of expert users if made open and accessible by their owners.

The aim of this action is to build (most probably local and regional, possibly also national and EU-wide) communities of data owners and producers who will publish online for free their real-time data on an open data hub dedicated to energy (or by extension, environmental) issues. Web services would be developed to allow easy access to dynamic data-sets from the hub and their integration in third-party applications. Contextual data models on the platform should rely as much as possible on existing standards. The action will also strive to demonstrate the relevance of this approach by developing sample services and applications exploiting this data in a smart way with clear added-value. In parallel, the action will monitor and analyse the development of the community, with the intention to make it active and sustainable, thereby finding the mechanisms and incentives to encourage further data owners and producers to join the community.

Goal

The goal is to demonstrate the added value of releasing dynamic Open Data for environmental applications. The concept falls within the current trend of the Internet of Things, and supports future smart grids and smart cities visions, models and services. The proof of concept is necessary to demonstrate added value services and their benefits. From there onwards, it is likely that the community of data providers will grow naturally, as additional added-value services and applications will become available for the platform users.

Deliverable

- i. Review of existing data platforms;
- ii. Call for participation (in a pilot territory);
- iii. Usage and business models survey (motivations, incentives and barriers for making data available).
- iv. Data hub specifications : web services and data models;
- v. Data hub implementation, fed with data-sets from recruited volunteers;
- vi. Hackathon: development of a first set of 3rd party applications exploiting the data.

Preconditions

- Need to find pioneering volunteers for the proof of concept; volunteers need to accept to make their data-sets available for free: most probably public organisations will play an exemplary role through this action.
- Need to address security and privacy issues: it will be necessary to define the appropriate level of details when releasing dynamic data, to anticipate and prevent unwanted applications.

Methods and details of implementation

- Phase 1 : Rapid Base-Line
 - Overview of existing environmental static open data platforms (e.g. BPIE data hub);
 - Overview of existing generic dynamic open data hubs (e.g. Xively);
- Phase 2 : Setting up the community
 - Call for participation: recruitment of a set of volunteers to upload their real-time environmental data on to the platform (ideally a diverse and representative set of data, all grouped around the same pilot territory/city);
 - Wider survey among data producers to understand motivations and barriers to releasing dynamic Open Data.
- Phase 3 : Business models
 - This phase strives to map the ecosystem of stakeholders and their respective incentives, to find a sustainable model for ensuring the service continuity: business continuity already enters from design stage onwards so as to further guide the specification and development of the hub.
- Phase 4 : Developing the dynamic Open Data hub
 - Web services and data models specifications: interviews with future expert users of those data will be conducted to co-create data formats and APIs. This is to make sure delivered data are easily accessible and exploitable by their future users;
 - Implementation of the data hub and web portal;
 - Connection of the first data streams from the volunteers.
- Phase 5 : Services
 - A *Hackathon* is organised to invite third-party users to develop applications exploiting the dynamic data. (e.g. data visualisation modules, benchmarking applications, decision support tools, etc.)

Monitoring

Performance evaluation of this action is done through:

- Monitoring of the community growth (number of data providers joining the hub);
- Monitoring of developed services (number of third party applications exploiting the data hub)

9.2.2 Potential Action 2: Infrared Cameras and Open-Data Sharing at Neighbourhood Level for Energy Retrofitting in (Sub-) Urban Infrastructures

Context

Note: this action exhibits potential natural links with the *Districts and Built Environment*, *Citizen Focus*, *Knowledge Sharing* and *Standards* Priority areas.

Thermal imaging testing could become an important quality control measures in the renovation of building infrastructure. Heat losses in buildings can account for up to 50% of the total energy consumption and come from air leakage through chimneys, attics, wall vents and badly sealed windows / doors. To identify areas of energy waste, infrared imaging can become a valuable tool in identifying problems related to energy loss, missing insulation, inefficient HVAC systems, radiant heating, water damage on roofs, and much more. This strategy can be particularly effective in sub-urban and rural scenarios where the neighbourhoods are mainly constituted of individual houses: thermography, or thermal imaging, can be applied to energy audits of, both, apartments and individual houses, however the technique is even more effective when performing energy audits of individual houses which are more common in sub-urban or rural areas. A potential scenario can be described as follows:

Maria has just moved to a new house located in a medium-sized neighbourhood mainly constituting of individual houses. She would like to identify problems related to energy loss in her new house in order to take corrective action. She is going to use her mobile device with an embedded infrared thermal imaging camera and a corresponding app that collects data and suggests a corresponding corrective action. A thermal imaging camera identifies patterns of heat loss that are invisible to the naked eye. Thermal imaging quickly indicates the air leaks within a property. Maria scans the windows of the house and she finds a number of energy leakages. The app on the mobile device suggests the correct action to solve the problem: in this case replace the window glass with more performing double-glazing. The app lists the available options on the market ordered, say, by lowest price, and also allows to make direct contact with an installation expert to perform the works. It also informs her of other residents that have carried out similar work. The energy data collected by Maria is then shared on a common database of open-data at neighbourhood level such that can be re-used by public authorities as well as citizens for planning their respective corrective actions. System design ensures that users' privacy and anonymity is maintained.

The aim of the action is to build an enabling environment – both from a technical and organisational point of view – that allows the creation of rural or sub-urban networks of habitants and stakeholders providing their energy data and related retrofitting work items. Like this, continuous and coherent processes for identification of energy waste in houses and infrastructures can be set up and energy efficiency can be improved, based on the use of innovative technologies that connect to open-data datawarehouse(s) and hub(s).

Goals

Considerations for Open data are to be thought at level of the “energy status” of the built infrastructures, as well as works done by individuals. The availability of energy data is essential when performing retrofitting actions on infrastructures. A lifetime of a building is long (decades or even centuries), so it is necessary to ensure the flexibility for the new solutions that might occur in the future.

The types of communities addressed by this action are typically sub-urban and rural communities, and the stakeholders and beneficiaries are, e.g.:

- Inhabitants of the sub-urban/rural district;
- Local businesses selling material and devices for energy efficiency in houses and performing related installations.

The expected impacts are to improve energy consumption awareness of the community, while at the same time improve energy efficiency of private homes since energy audits and corresponding corrective actions can be performed by individual citizens in a cost effective way.

Deliverable

- i. Review of existing integration models and technologies (open data, system integration, interoperability and standards, virtualisation of the built infrastructures, visualisation of energy use and production ...) – *with a special focus on integration technologies, such as large databases and software analysis tools, to relate thermal data to energy leakages and suggest the corresponding corrective action;*
- ii. Development of a usage and business model (including motivations, incentives, and barriers for making data available, and consideration for privacy issues);
- iii. Call for participation of various rural territories (experimentations e.g. through living-lab approaches);
- iv. Common open-datawarehouses specifications : data models, APIs
- v. Common open-datawarehouses implementations – based on infrastructures data-sets from recruited rural territories and volunteers (see D3);
- vi. Set of recommendations and guidelines for generalisation.

Preconditions

- Need to find pioneering (preferably rural, or in case sub-urban) territories and volunteers for the proof of concept, who will accept to make their data-sets available in a common open-data warehouse;
- Need for some behavioural change at level of volunteers, ready to make available (in case under some anonymous formats to be defined) their energy data and works information – potentially relying on some “nudge” or social incentives approach, e.g. neighbouring mutual information, “green” default options, intelligent billposts, etc. (*based on Richard Thaler’s book “Nudge : Improving Decisions About Health, Wealth, and Happiness”*).
- Need to address security and privacy issues: it will be necessary to define the appropriate level of details and access authorisations when releasing the energy and works data.

Methods and details of implementation

- Phase 1 : Identification of Base-Line
 - Overview of potential similar initiatives / local platforms;
 - Overview of existing integration models and technologies ready for customisation or adaptation (e.g. data platforms / hubs for the open-data warehouses) in the application context;
 - Overview/adaptation or specification of usage and business model(s) - mapping the ecosystem of stakeholders and their incentives to find a sustainable model for ensuring a tangible and continuous operation of the decision-system for energy retrofitting;
- Phase 2 : Setting up the experimental territories
 - Call for participation of various rural territories, with recruitment of sets of volunteers (all grouped in a same pilot territory) to upload their energy data and potential retrofitting work items information in the common open data platform;
 - Wider survey among data producers to understand motivations and barriers to releasing energy data and works item information;
 - Preparation of the territory experimentation, e.g. putting in place a living-lab approach based on a continuous participation of all stakeholders from the very start of the definition of the platform and open data warehouse;
- Phase 3 : Developing the common open data warehouse(s)

- Specification of the data models for energy data and retrofitting work items – through co-creation of data formats and APIs with all the stakeholders. Similarly to action #1, this is to make sure data is easily accessible and exploitable by future users;
- Specification and development of the open data warehouse and services hub;
- Phase 4 : Deploying the common open data warehouse(s)
 - Deploying the open data warehouse and hub in territories – taking into account potential specific configurations on data privacy, collection, and management – and as a baseline for recommendations and guidelines for further generalisation;
 - Feeding the open data warehouses and services hub - based on infrastructures data sets from recruited rural / sub-urban territories and volunteers;
 - Integration of third-party applications providing and/or exploiting energy data and retrofitting work items (e.g. thermal infrared cameras, data visualisation modules, decision support tools, etc.).

Monitoring

Performance evaluation of this action is done through the following KPIs:

- Monitoring of the number of participating volunteers from rural / sub-urban territories;
- Monitoring of data warehouse logs stats (number of incoming requests, data usage analysis, etc.);
- Monitoring of the number of third party application integrated.

10 Priority Area 'Standards'

10.1 Introduction

A 'standard' is a technical specification, adopted by a recognised standardisation body, for repeated or continuous application, with which compliance is, however, not compulsory⁵ unless mandated by regulation to that effect.

It is important to remember that standards are not written by "standards professionals" but are the distilled wisdom of people with expertise in their subject matter who are in the know about the needs of the stakeholders they represent; the latter include manufacturers, sellers, buyers, customers, trade associations, users and regulators. The role of a standards developing organisation is to ensure that standards are developed in an open and transparent way, that they are clear and unambiguous, and that they are categorised in a way that makes them easily available for use to those who need them.

A standard provides a reliable basis for people to share the same expectations against a product or service and this helps to:

- Promote economic growth (competitiveness, facilitating trade);
- Provide a framework for achieving economies of scale, related efficiency gains, compatibility as well as interoperability;
- Enhance consumer protection and confidence and societal progress at large;
- Provide environmental integrity and sustainability.

Standardisation provides confidence in the ability to build and deploy smart city applications and infrastructures cost-effectively and within planned timescales. Standards that are developed based on successful smart city projects will provide confidence that these projects can be replicated elsewhere. This will make it easier for industry to develop the right portfolio of products and services, compliant with these standards, and thus enable greater competition and drive down costs. It will also allow applications accessed by citizens (e.g. on smart phones) to be used across cities and to allow progress to be compared, for example, for quality of life and sustainability indicators.

The following builds on the Recommended Actions in Section 2.10 of the Strategic Implementation Plan to show how standards can help enabling the applications and infrastructure necessary for smart cities and communities being deployed effectively and supporting integration across distinct city systems. If such applications and infrastructures are to be replicated across different cities in different countries they should not be built from scratch each time but should benefit from experience gained elsewhere.

Those standards deemed necessary for facilitating this process should be developed and maintained through an open and transparent process; this means a collaborative, consensus-driven process that is open to participation by all relevant, materially affected parties and not dominated by a single organization or group of organizations. A system as complex and as quickly evolving as a smart city, requires fast, agile and modern standardisation practices. Related, there is a need for different types of standards. This includes informal, *de facto* standards as well as formal standards developed by standards developing organisations (SDOs). This includes all levels of standards, from business and service definition standards, to vocabulary and semantic standards, and finally also technical ICT or

⁵ Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation

communication standards, the latter being mostly covered by general purpose standards. Some strands of the strategic vision for European standards are of particular relevance for smart cities⁶:

- Using standards to address key societal challenges
- Standardisation and the European single market for services
- Standardisation, Information and Communication Technology (ICT) and interoperability

Standards resulting from this process should be readily available to all interested parties for smart city applications development. In addition, smart city interoperability standards should be developed and implemented internationally, whenever practical, and therefore work on the standards needs to be carried out in collaboration with international standards bodies.

10.2 Potential Actions

Standards are enablers for the seamless integration of city systems, functions, applications and services and for the technologies and communications infrastructures underpinning these. For example, they are the enablers for platforms used for the exchange of data between previously different vertical 'silos'. Examples of actions that could help create a standardised (and therefore replicable) framework for the infrastructure for smart cities include:

#	Title	Summary	Link to SIP Action
1	<i>Smart Cities Standards Coordination</i>	A CEN-CENELEC-ETSI Smart Cities Coordination group has been set up. This should be extended to involve all relevant stakeholders and consider creating a common technical group to develop necessary standards.	#1 Smart Cities Standards Coordination Group
2	<i>Interoperability Framework</i>	Develop an interoperability framework for smart city standards including the identification of relevant existing standards and the gaps and overlaps between them.	#2 Standards Mapping
3	<i>City Information Platform Interfaces</i>	Identify standardisation requirements so that 3 rd -party developers can access the data they need (in a trusted and secure way), build and release apps that will work on any platform in any city. This would ensure that citizens moving between European cities will find a common interface to interact with city systems wherever they go and so will make it easier for them to use those services.	#3 architecture for city information platforms Integrated Infrastructures
4	<i>M2M Data Exchange standards</i>	Identify standardisation requirements for the exchange of smart city data so that data from a wide range of sensors e.g. public transport, connected cars and sensor-based dynamic traffic data can be exchanged and used by a range of applications.	#3 architecture for city information platforms Integrated Infrastructures
5	<i>City Level Energy Management and Trading systems</i>	Identify standardisation requirements to allow the exchange of energy management data. Renewable energy sources can then be plugged in more easily to create a two-way energy chain that balances demand and supply dynamically, between new alternative sources and	#3 architecture for city information platforms Districts and Built Environment

⁶COM(2011) 311 final, A strategic vision for European standards: Moving forward to enhance and accelerate the sustainable growth of the European economy by 2020

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		traditional (typically hydrocarbon) sources.	Integrated Infrastructures
6	<i>Rapid Upgrade of Existing Building Stock</i>	Identify standardisation requirements for building construction so that new materials with standardised properties (such as insulation value) can be used effectively while contributing in a transparent way to the building's EPC.	Districts and Built Environment
7	<i>Alternative fuelling infrastructures</i>	Identify standardisation requirements to enable the exchange of location information about electric vehicle charging points in public and private spaces so that drivers can locate the right points, and know when they will be able to use it with their current service provider contract	#3 architecture for city information platforms Sustainable Urban Mobility priority area
8	<i>Energy assessment and planning at local level</i>	Identify standardisation requirements for a consistent set of standards across Europe for energy assessment and planning so to allow cities to be compared. It should be possible to compare different cities on a level playing field and to assess the improvements made in a city over time against common benchmarks. This will provide transparency between the metrics and indicators used in different cities. A common methodology needs to be established for assessing the carbon footprint of a city or project and the identification of best practises that should be applied	Baselines and KPIs
9	<i>Standardised metrics and indicators</i>	Identify standardisation requirements for metrics and indicators so that different cities can be compared on a level playing field and the improvement made in a city over time can be assessed effectively. This will provide transparency between metrics and indicators used in different cities. An example of a standard required under this action is one for the assessment of social performance of buildings but many other existing standards and gaps are likely to be identified by SSCC-CG.	Baselines and KPIs
10	<i>More effective use of public transport</i>	Identify standardisation requirements to enable the integration of all forms of public transport, allowing through-/combined ticketing and the support of easier use of different modes of transport. Standards should also enable the exchange of location information about the availability of parking slots at interchanges/hubs and possibly allow for these to be booked. Development of standards for exchanging location information, e.g. data about the availability of parking slots and vehicle charging points.	#3 architecture for city information platforms Sustainable Urban Mobility
11	<i>Clean, efficient urban logistics and freight distribution</i>	Identify standardisation requirements to enable sustainable city logistics in order to improve quality of life in urban areas, improved access to homes and businesses and the smarter coordination of delivery times.	Sustainable Urban Mobility

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12	<i>Standardised methodology for research into citizen behaviour</i>	Develop a standard method for user research to develop an EU-wide database of citizen behaviour and attitudes toward technology, mobility and energy solutions. Open user research data should be posted on-line and linked to case studies	Citizen-Focus
13	<i>City maintenance platforms</i>	Identify standardisation requirements for the exchange of city maintenance information, so that citizens can contribute their various observations in real-time, e.g. needs for repairs and development proposals.	#3 architecture for city information platforms Integrated Infrastructures
14	<i>Standards Promotion</i>	Promotion of the use of standards for smart cities, both within Europe and worldwide, and demonstration of related benefits to stakeholders.	#4 Promotion Internationally

It is recognised that a lot of work has already been carried out at European and international level and that standards already exist in many of the above areas. Therefore, a survey of existing standards will be necessary before work can start on the development of new standards or extensions to existing ones. It needs to be ensured that any standardization activities are guided by the needs of cities, citizens and other relevant stakeholders so that the most critical standards are developed first. Relevant actions under Horizon 2020, Work Programme 2014 – 2015, 10. Secure, clean and efficient energy includes calls like SCC 3 – 2015 92: Development of system standards for smart cities and communities solutions⁷ need to be taken into account also. Finding the relevant focus areas has to be done in close cooperation between the public and private sector as well as organisations directly representing citizens.

This list of potential actions is far from exhaustive and many other requirements for standards could be identified in the different priority areas of the OIP.

⁷ http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-energy_en.pdf

10.2.1 Potential Action 1: Development of an interoperability framework for smart city standards

Context

A conceptual interoperability framework (rather than a reference architecture) for smart city standards should be developed to which relevant (existing) standards can be mapped. This would ensure interoperability between smart city systems and entities at many levels, ensuring that data and information can be exchanged at the appropriate level. This would further allow the easier identification of existing standards that are relevant to smart city applications, and also make it easier to identify gaps where new standards possibly need to be developed.

A good example of the *process* that could be used as a basis for this activity is the method by which the Smart Grids reference architecture was developed by the CEN-CENELEC-ETSI Smart Grid Coordination Group. However, an interoperability framework for Smart Cities will be fundamentally different to that for Smart Grids: The Smart Grid reference architecture uses a technically focused model, whereas many of the key issues for smart cities are around strategies and business processes, and about priorities such as: sustainability, wellbeing and socioeconomic development. So we need to start at a more fundamental level than reference architectures do and develop an interoperability framework that would allow a mapping all of the key issues; developing the reference architecture to support this comes only later.

Goal

The overall goal would be the exploitation of available standards and the development of new ones where gaps are identified. Without an interoperability framework it would be harder to assess whether an existing standard meets the requirement or whether a new standard needs to be developed.

Deliverable

The following deliverable are foreseen:

- i. Standards interoperability framework for smart cities

Preconditions

The needs for smart city standards have to come from the action areas identified in the EIP on Smart Cities and Communities, which involves representatives from all the key stakeholders. These stakeholders should jointly identify the need to set up an interoperability framework for smart cities and communities.

CEN, CENELEC and ETSI are the European Standards Organisations (ESOs) (in accordance with the EU Reg. 1025/2012). The ESOs have already set up the Smart and Sustainable Cities and Communities Coordination Group (SSCC-CG), and they can have an important role in identifying who is already active in developing standards on these topics and co-ordinating ongoing smart city standards work so as to ensure that, as far as possible, smart city standards are developed by those standards bodies and other agencies most qualified to undertake the work. This coordination group should jointly investigate the need and the criteria for setting up a reference architecture for smart cities and communities that will enable relevant standards to be easily retrieved by those who need them and enable clear specifications to be drawn up for whatever new smart city standards might be useful. The ESOs would work with all relevant stakeholders to meet market needs, including supporting appropriate agencies, fora and consortia in developing relevant technical specifications and other standards.

Methods and details of implementation

The interoperability framework could be developed with the involvement of all relevant stakeholders. An example of the *process* that could be used as a basis for this activity is the method

by which the Smart Grids reference architecture was developed by the CEN-CENELEC-ETSI Smart Grid Coordination Group. However, an interoperability framework for Smart Cities will be fundamentally different to that for Smart Grids: The Smart Grid reference architecture uses a technically focused model, whereas many of the issues for smart cities are centred around strategies and business processes.

The following process could be used to develop an interoperability framework:

- Agreement on a list of reference cities and case studies on which the interoperability framework would be based.
- Develop a smart city interoperability framework and use this to:
 - Identify the systems, functions, applications and services that need to be represented, focusing on the business interoperability layer.
 - Identify the data sources that need to be represented and the data that will be required to be exchanged.
 - Identify the APIs and transport protocols that will be needed to meet the data transfer requirements.
- Definition of a first interim interoperability framework.
- Testing of the interoperability framework against specified case studies and pilots. Does it allow the entities in the case studies and pilots to be represented adequately? Is it clear where interoperability needs to be ensured?
- Standardisation of the interoperability framework.

The initiatives from relevant international, European and national stakeholders need to be mapped in cooperation with standards development organisations at global level (i.e. ISO, IEC and ITU).

This action could be carried out in conjunction with above-mentioned Horizon 2020 Coordination and Support Action.

Monitoring

Pilot testing (e.g. plugtests) events should be set up at different stages in the development of the interoperability framework to ensure that it is robust and sufficiently extensible to meet the needs of future smart city systems and functions. Any correction and maintenance actions could be identified in the process.

10.2.2 Potential Action 2: Standards for City Information Platforms

Context

This action is a requirement of the 'Integrated Infrastructures and Processes' priority area but would also help to meet the needs of the 'Open Data' priority area. Cities presently hold their data in multiple silos within each department (of each agency) that operates in the city (and indeed those related agencies in regional and national departments as well). This data is naturally of variable quality. It is also inconsistently captured between departments and across agencies. The more progressive cities have started to open up their data sets – some holding specific events (hackathons and competitions) to coax developers to use the data in more innovative ways that add more value. This has led to greater visibility for the 'open data' topic – however it has so far not led to sustainable value at larger scale. Open data alone will not deliver significant value and the opening up of finance data, asset data, etc. needs to be equally considered – data that is normally kept behind firewalls.

All data used should be in a format that complies with open standards⁸ so that it can easily be re-used by other agencies in the city. However, this does not imply that such data needs to come for free.

Goal

To develop standards that will allow city administrations and service providers to open up their data to 3rd parties (developing apps, etc.) ensuring that security and privacy concerns are addressed.

Deliverable

- i. New standards or extensions to existing standards that are necessary to meet City Information Platform requirements

Methods and details of implementation

The following process could be used to identify any missing standards:

- Identification of use cases for City Information Platforms;
- Identification of standards requirements from the analysis of use cases;
- Identification of existing standards relevant to the requirements;
- Identification of gaps in standards necessary to meet the requirements;
- Development of new standards or extensions to existing standards necessary to meet requirements.

All relevant smart city stakeholders must be involved, with methods such as hackathons and competitions being used to encourage the development of new standards requirements.

Preconditions

The needs for smart city standards have to come from the action areas identified in the EIP on Smart Cities and Communities, which involved representatives from all the key stakeholders. These stakeholders should jointly identify the need to set up an interoperability framework for smart cities and communities.

⁸ An open standard is one that is developed and maintained through an open and transparent process which means a collaborative, consensus-driven process that is open to participation by all relevant and materially affected parties and not dominated by, or under the control of, a single organization or group of organizations.

10.2.3 Potential Action 3: Standards for M2M Data Exchange

Context

This action is a requirement of the 'Integrated Infrastructures and Processes' priority area. It requires the development of standards for an M2M (Machine-to-Machine) platform that all relevany data can pass over so to provide a ubiquitous data transport capability. A common API to the data transport layer is also needed to obtain maximum interoperability between smart city applications and functions.

Goal

To develop standards that would enable all smart city data to be passed seamlessly between sensors, applications, databases and other entities, independent of the underlying communications technology being used to link these.

Deliverable

- i. Requirements of Smart Cities for M2M Data Exchange.
- ii. Extensions to M2M standards that are necessary to implement data exchange in smart cities.
- iii. Common APIs to smart city functions.

Methods and details of implementation

The following process could be used to identify any standards gaps:

- Identify use cases for smart city data to be carried;
- Identify standards requirements from the analysis of such use cases;
- Contribute any new requirements to relevant standards bodies including *oneM2M*.

All smart city stakeholders should be involved in the development of the requirements.

Preconditions

The existing data architecture as developed by ISO and CEN should be taken account of (and preferably form the basis of) any requirements.

M2M data exchange standards are being developed in the *oneM2M* Partnership project, an initiative of seven regional standards organisations worldwide. European aspects, including responses to standardisation mandates, are being implemented in the ETSI SmartM2M Technical Committee. An M2M Service Capabilities layer is being developed which could provide the basis of a common API for smart cities functions.

The requirements of smart cities and communities should be identified and incorporated into the work of these bodies to ensure that any resulting platform can support the required data flows.

Monitoring

Pilot testing (e.g. plugtests) events should be set up at different stages in the development of the M2M standards to ensure that they are able to support the required smart city entities effectively. Any correction or maintenance actions could thus be identified.

10.2.4 Potential Action 4: Standards to support city level energy management and trading systems

Context

This action is a requirement of the 'Districts and Built Environment' priority area. It includes standards to support smart lighting, heating, cooling and electricity systems and appliances as well as the charging infrastructure for electric vehicles in public and private spaces.

Standards should enable the creation of a two-way energy chain that balances demand and supply dynamically between different energy sources. These include renewable and alternative energy sources and traditional (typically hydrocarbon-based) energy sources so that they together can make an appropriate and effective contribution to the energy mix. The ability of smart appliances to be switched on and off in response to energy availability and dynamic changes in pricing should also be taken into account.

Standards should allow the exchange of energy management data so to achieve this.

Goal

To develop standards that will allow all types of energy sources and smart appliances to be incorporated into smart city energy management systems.

Deliverable

- i. Requirements of city level energy management and trading systems;
- ii. Requirements for smart appliances that will be used in cities;
- iii. City-level smart appliance conformance specification;
- iv. New standards to implement energy management in Smart Cities.

Methods and details of implementation

The following process could be used to identify any missing standards that would be required:

- Identify use cases for city level energy management and trading systems, including the sources of energy, the appliances that will be supplied, and the trading conditions (contract terms, pricing, etc.);
- Identify the standards requirements from analysis of the use cases;
- Identify gaps in standards necessary to meet the requirements;
- Develop new standards or extensions to existing standards necessary to meet the requirements.

Preconditions

Energy-using and -producing Products (EupP, also called Appliances) are responsible for the management of a large part of the energy consumption and production with buildings. To establish a market for energy-efficient systems and services, there is a need to standardise the interface to these EupP so to guarantee interoperability with Facility Management Systems, Energy Management Systems, so-called Energy Boxes and other systems (for example systems linked to home automation). Standards for smart appliances are being developed that will allow conformant EupPs to get a CE EupP Plug-and-Play label so to promote take-up, deployment and installation.

10.2.5 Potential Action 5: Promotion of the use of Standards for Smart Cities

Before any of the preceding actions can be effectively implemented it might well be necessary to promote the use of standards, as well as standardisation approaches and processes, to smart city stakeholders. Not all of these may recognise and understand the benefits derived from standards and solutions based on these, or indeed the benefits to stakeholders of being involved in the standardisation process.

Initiatives that might help to achieve this include:

- Demonstrating the benefits of using and building on common approaches and common solutions by showing how they lower costs and reduce development times;
- Promoting engagement and communication with stakeholders in order to demonstrate the benefits of standards in areas where these have not traditionally been used, e.g. in the areas of economic analysis, business modelling, funding and financing, or indeed procurement;
- Promoting participation in European standardisation processes as well as the importance of working with international standards bodies to develop standardised solutions that can be deployed worldwide.

Goal

The overall goal would be to increase the replication and deployment of smart city solutions through more effective use and exploitation of standards, including the promotion of European standards worldwide.

Deliverable

- i. Exemplars on use of standards;
- ii. Case studies on the effectiveness of standards;
- iii. Guidelines of good practice to enable easier use of solutions.

Methods and details of implementation

The following mechanisms could be used to help promote the use and exploitation of standards:

- Setting up exemplars that show where standards have been used or are currently being used to create innovative systems and applications;
- Setting up a comparative case study where a standards-based approach is used to the development of a function or application, and measure (or at least assess) how this has reduced development times;
- Promoting or setting up workshops to educate smart city stakeholders on the use of standards;
- Requiring all smart city projects funded by the European Commission to prioritise the support of the development of standards as a key output. One of the most effective ways of ensuring the dissemination of a good practice is to develop that good practice into a standard;
- Promoting the use of standards, including through public procurement and relevant EU policies and legislation;
- Contributing to international standards including ISO/IEC and ITU-T.

Preconditions

All smart city stakeholders should buy into the need for this action (even if they remain doubtful of the results).

Monitoring

The use of standards in smart city systems and solutions should be monitored to see if there is an increase in use as a result of this action.

11 Priority Area 'Business Models, Finance and Procurement'

11.1 Introduction

This chapter outlines the business framework to enable economic viability of smart city solutions. Given the breadth of scope of this priority area we have provided an exemplar for each of (i) business models, (ii) finance and (iii) procurement. Each also includes a list of potential implementation actions.

Within the SIP the following priorities were identified:

- Create new integrated business models with innovative local partnerships (Local Ecosystem) and adapted procurement;
- Create a European market for innovation that opens up investments.

This chapter outlines the business framework to enable economic viability of smart city solutions. Given the breadth of scope of this priority area we have provided an exemplar for each of (i) business models, (ii) finance and (iii) procurement. Each also includes a list of potential implementation actions. Smart city solutions have to make an impact within Local Ecosystems in which prosumers, local and global industries and governments participate in order to achieve value in the built environment, mobility and other city services. However, in terms of achieving scale, accelerating uptake in the market and securing return on investments this requires multiple implementations on a European or global scale. The right business framework will attract investment to create market 'pull' and support market 'push' through innovation and stimulation of the industrial value chains (e.g. production of new materials; new ICT systems solutions; systems to store energy).

The approach for the business framework is:

- Enable cities to create Local Ecosystems for smart solutions;
- Support the replicability of these solutions;
- Stimulate an open market across Europe for investments in ICT solutions.

Striving for broad uptake across Europe of smart city solutions requires in most cases new investments in combination with a more efficient use of the currently available resources in cities. Citizens' support is important to get the needed initiatives going and accepted. Innovative solutions will only create jobs and growth if the market-pull from cities leads to a broad activation along the value chain to supply new materials for mobility and housing, new ICT systems to deal with the large amount of data and new energy systems. Combining existing available technologies and solutions is not enough. There is a need for a dynamic system of continuous improvement, creating the European critical mass for innovation uptake within available budgets and leading to sustainable growth and jobs.

Our challenges are:

- Balance cities' individual characteristics and requirements with the need for a modular approach which offers economies of scale and therefore cheaper and more broadly available technology solutions;
- Balance city/regional requirements and strategies with national or broad EU policy goals (industrial policy);
- Ensure long-term planning to build trust for (de-risk) investments.

11.2 Potential Actions

Three potential actions are outlined for: business models; finance; and procurement.

11.2.1 Potential Action 1: Integrated Business Models

Key Challenge

Connecting Local Ecosystems to a European market of smart city solutions to enable the replicability of these solutions and help create smart economies of scale.

Context

Business models for Smart Cities and Communities have to integrate technologies into a smart city concept in order to maximize their impact on the EU economy. It has to consist of and balance i) Local Ecosystems, which ii) can be used in cities throughout Europe (replicability); and iii) defines a European market for ICT solutions, materials and products. Local Ecosystems are collaborations between industry, governmental bodies and citizens to meet specific local goals (see also Appendix A and B).

Goals

Local Ecosystem

- Define criteria for projects to evaluate conditions to enable local ecosystems;
- Define a governance structure for evaluating the project-ideas;

Replicability/ Demand Aggregation

- Support the collaboration of cities in finding their smart solutions, in order to promote re-use;
- Cover the integration of technologies into an overall smart city concept in order to maximize their impact on the whole economy (meeting also the political target of bringing technology leadership back to Europe);

Create open European market

- Develop a model to aggregate demands, aiming to reduce the variety of solutions, which then allows the supply chain to leverage economies of scale;
- Create long term processes to push innovation and create long term market pull (at least 7 years);
- Push innovation across 'valley of death' by creating projects to test innovative solutions in 'real life' environment;
- Specific projects (like energy efficiency improvements) must be integrated into a broader package of buildings, streets etc.

Implementation Actions

Potential actions in order to deliver on the goals include:

- Harvest and codify existing successful leading practice examples of business model innovation (see also Appendix B);
- Define guidelines on how to create a working governance entity and viable business model (see also Appendix A and B);
- Create 'Catalyst Smart Teams' (CST) by gathering multidisciplinary experts with the objective of initiating city policies and business modelling. CSTs will work with local banks and financial institutions to design replicable models able to exploit the potentials of distributed 'small' initiatives (e.g. energy self-consumption at home level, batteries for electric cars seen as distributed energy storage capacity, etc.) (see 2.1.6);

- Enable replicability by creating network of cities to exchange solutions, identify common technology approaches between different solution streams or the major challenges (such as mobility) and a solutions inventory (technology toolboxes) sorted along cities challenges.

Impact

The potential added value for cities, citizens, the society and EU competitiveness include:

- Efficient use of budget (value for investments);
- Create sustainable jobs along industrial and service value chains;
- Improve private investments in Cities surroundings;
- Implementation and broad conceptual approaches by unleashing the innovation potential in Europe along value chains from materials to Cities;
- Gain critical mass to lower prices and allow business investments;
- Ensure broad impact of lighthouse projects in Europe (replicability);
- Definition of business framework to support replication.

Monitoring

Result based indicators

- Viable solutions: Quantity of type of solutions in a local environment with a viable business model, that is used in cities in more than two different countries;
- Implementation of solutions: number of times that the solution has been replicated;
- European open market: quantity of companies investing in the solution;
- European market size: amount of turnover and employees working on a specific solution;

Indicators to check the creation of local ecosystems and replicability

- Number of cities that have created a local governance entity for energy, mobility or built environment;
- The number of cities that participate in a network of cities to exchange solutions;
- The readiness of guidelines (check list) and engineering for financial models to combine public-private funding of larger scale projects, structural funds and European Investment Bank for demonstration projects.

Indicators to check the development of a European market

- Structured dialogue between value chain and cities to develop a 'technology tool box' for challenges;
- Public-private cooperation in establishing EU wide criteria for tenders and terms of reference;
- De-risk investments by long term planning and criteria;
- One KPI on use of Local Ecosystems.

11.2.2 Potential Action 2: Financing

Key Challenge

A key challenge concerns public funding of smart city solutions in Member States at a time when public budgets are under austerity pressures.

Context

The economic crisis is forcing a major downsize of public funding at both the local and regional level. Infrastructures are getting older and older and need refurbishment. At the same time, roll-out of innovations for smart city performances requires new systems, devices and networks. Investments are therefore necessary but money is often lacking. The organization models of local bodies (e.g. Municipalities, Provinces, Departments, etc.) are often unfit to cope with current challenges posed by technologies and society evolution. Investments availability for new smart energy infrastructures is high though. Innovative bankable business models can be the basis for economic growth. Attractive bankable energy-based business models must rely upon a bottom-up approach involving and integrating clusters of stakeholders. Cities can be seen as one of the stakeholders. By participating in Local Ecosystems cities can use their financial resources more efficient.

The financing of smart city solutions depends on the viability of the business model of the Local Ecosystem, the replicability on European level and the open market that is created by aggregating demand and defining a stable long-term perspective for investments in innovation. The basic mechanisms for the business case of smart solutions are:

- Investments in assets and as a consequence lowering the operational expenditure, e.g. energy producing building that lower the daily cost of energy;
- Combining investments of stakeholders and by doing that lower the total investment, e.g. communication infrastructure used for different types of solutions;
- Lowering cost per implementation, by creating a European market for replicable solutions (aggregated demand) and ensure long-term perspective for investments.

Goals

- Reduce real and perceived risks of the investments (speeding-up procedures and permits, making them schedulable);
- Attract long term investors;
- Mobilize public funding resources from European, national, regional and local level for smart city solutions;
- Develop Stakeholder aggregating mechanisms to create bankable initiatives (need for integrated governance);
- Attract private funds through Public-Private Partnership (PPP).

Preconditions

- Cities must be able to use their planned operational expenditure for investment in assets;
- Combined funding models between EC, national and regional funding are required;
- Rules and budget for participating in revolving fund and guarantees.

Implementation Actions

Potential actions in order to deliver on the goals include:

- Define evaluation criteria for viable smart city solutions in local ecosystems, including risk reduction. For the approved solutions financing can be done by commercial banks, revolving funds and crowd sourcing;

- Define evaluation criteria for replicability of solutions and mechanisms for aggregation of demand to create confidence for long-term investments on a European level;
- Develop concept and guidelines for combined funding models for pilot projects (e.g. SET plan, Horizon 2020, EIB loans, structural funding plus private funding to complement);
- Develop alternatives to loans (such a specific bonds to finance major investments) (could attract SMEs);
- Develop concept and “to do ‘s” for crowd funding from small lenders;
- Design and implement a series of ‘Stakeholders oriented investment areas’ (SOIA), where many categories of stakeholders (including citizens) are given opportunities to invest money and measure outcomes;
- Develop innovative financial mechanisms (e.g. purpose bonds, crowd funding, smart bonds, etc.) as alternatives to loans. This will attract SMEs and enable citizens’ involvement;
- Create international and cross border ‘Financial Investigation Teams’ (FIT) -composed by local banks and other financial institutions- to study innovative loans able to fund distributed ‘small’ initiatives (e.g. energy self-consumption at home level). This initiative is worth billions euros at EU level, when combined with energy incentives;
- Define approaches to cluster Municipalities to get the right scale for optimization in processes like public lighting, remote heating, etc. Design sustainable business models based upon clusters (Covenant of Mayors may be interested?);
- Create rules and budget for participating in revolving funds and guarantees;
- Financial contribution to smart city solutions from member states (national and regional funds): i) member states pool financial resources to enable transnational smart city initiatives in line with the ideas of this EIP; ii) member states work on a combination of national public funding for smart city demonstration and structural funding for smart city solutions (e.g. via the Joint Programming Initiative of Urban Europe or the Smart City Member States Initiative).

Impact

The potential added value for cities, citizens, the society and EU competitiveness include:

- Industry, local government and citizens will increase investment but lower operational expenditure;
- Cities can do more with less financial resources;
- The innovation capacity of the EU will increase;
- Risk-reduction in early financing phases.

Monitoring

- Percentage of leverage of public investments with private funds;
- Dissemination and application of combined funding models (e.g. SET plan, EIB, regional and local in cities).

11.2.3 Potential Action 3: Procurement

Key Challenge

The key challenge is to make a strategic switch from simply procuring solutions which are often implemented in an isolated manner at city level towards procuring solutions which actually address and solve interlinked city issues.

Context

Given the size of the public procurement budgets, procurement can have the potential to drive innovation along the value chains into smart cities by creating local ecosystems, stimulating replicability and creating a European market. However, procurement procedures are tending to isolated, short term buying of proven technology for specific questions.

Goals

- Stimulate cities to participate in local governance entities with joint ventures and joint investments;
- Cooperation between cities and aggregating targets and requirements across Europe;
- Focus on long-term impact (e.g. life-cycle efficiency and sustainability) or on long-term certainty (e.g. innovation implies risk-taking);
- Stimulate systematic dialogue between solutions suppliers and Cities as customers or as co-investors;
- Bridge scarcity of national public funding and severe delays in payment in several EU member states due to economic crisis.

Implementation Actions

Potential actions in order to deliver on the goals include:

- Define the possibility for cities to participate in an aggregation structure to combine information needs, procurement and solutions (e.g. via PCP/PPI in Horizon 2020 and/or ESIF). The use of the ~12 characteristics models (e.g. EuroCities concept) might be helpful, as well as a set of quality criteria for cities and suppliers for selection of public procurement along 12 key characteristics along cities categories;
- Develop a set of tender criteria for ‘innovation procurement’ (e.g. special emphasis on tackling risks);
- Explore and exploit the new possibilities foreseen in the revised EU Public procurement directives^{9 10}, in particular: i) the new criterion on the ‘Most Economically Advantageous Tender (MEAT)’, which allows for full life cycle costing; ii) the “innovation partnerships”, which enable a public authority to enter into a structured partnership with a supplier with the objective of developing an innovative product, service or work, with the subsequent purchase of the outcome;
- Define a network of Cities and industry for systematic and structured dialogue;
- Information (education) to get smart institutional buyers, e.g. characteristics for position of Chief Technology and Sustainability officer to be created in cities administration;
- Deploy training set¹¹ for procurement professionals on challenges (e.g. mobility, housing, data handling) and promotion of good practice^{12 13} for EU added value;

⁹ <http://www.europarl.europa.eu/news/en/news-room/content/20140110IPR32386/html/New-EU-procurement-rules-to-ensure-better-quality-and-value-for-money>

¹⁰ <http://www.innovation-procurement.org/about-ppi/legal-framework/>

¹¹ <http://www.innovation-procurement.org/training/>

¹² <http://www.innovation-procurement.org/exchange/procurement-forum/>

- Toolbox for technology solution blocks and cities ratings (having already installed such technology building blocks (EU level portal on some aspects of Smart Cities already exist (e.g. Build-up site ¹⁴ and Innovative Lighting ¹⁵);
- Develop strategy for multiphase tender process
 - Phase 1 develop and validate,
 - Phase 2 traditional ‘commercial’ tender,
 - Phase 3 implementation,
 - Phase 4 Evaluation (e.g. “Flanders in Action 2020”, learn from EU Lead market Initiatives successes and failures; companies must be allowed to participate at all stages (not only in framing of innovation and then be excluded from later phases);
- New tender models to consider value chains, origin of goods (local, EU) – while observing applicable regulations ^{16 17} – and LCA (Energy reduction in life cycle, solar panels produced from coal or hydropower);
- Develop model for licensing (e.g. as in PCP ¹⁸) to ensure longer term engagement and covering of costs by private side. Define structures for local markets, based upon licensing instead of procurement. This should lead to flexible solutions in combination with requirements for government /pricing and evaluation models. Cities must be able to invest in these models.
- Remove impediments for private-sector involvement in Smart City Calls of Horizon 2020 by seeking clarification on the issues ¹⁹ of the applicability of the non-profit principle and the need for public tendering.

Impact

The potential added value for cities, citizens, the society and EU competitiveness include:

- Use of procurement budgets to create innovative solutions;
- Increase of investments by governmental bodies and decrease of operational expenditure;
- Create economies of scale based on these aggregate demands (at regional level, incl. cross-border macro-regions);
- Testing of solutions (materials, solutions, broader solutions in real life at TRL level 6-8 in certain cities environment (target for EU public-private projects, e.g. in Horizon 2020));
- Strengthen ‘innovation’ procurement in relation to ‘traditional’ procurement to increase opportunities for innovative SMEs and big companies by making good use of the possibilities of Pre-Commercial Procurement of R&D (PCP ²⁰) and Public Procurement of Innovative Solutions (PPI ²¹) (e.g. in Horizon 2020 ²² and/or ESIF ²³);
- Long term articulation of industrial and service value chains for Smart City solutions in a dynamic eco-system.

¹³ <http://www.innovation-procurement.org/exchange/experience-exchange/>

¹⁴ <http://www.buildup.eu/>

¹⁵ http://www.innovation-procurement.org/resources/search?resource_id=611

¹⁶ <http://cordis.europa.eu/fp7/ict/pcp/docs/faq-v9.pdf>

¹⁷ <http://www.innovation-procurement.org/about-ppi/legal-framework/>

¹⁸ <http://cordis.europa.eu/fp7/ict/pcp/docs/faq-v9.pdf>

¹⁹ http://ec.europa.eu/research/horizon2020/pdf/contributions/during-negotiations/netherlands/philips_position_on_the_commission's_proposals_for_horizon_2020.pdf

²⁰ <http://cordis.europa.eu/fp7/ict/pcp/>

²¹ <https://www.innovation-procurement.org/>

²² http://cordis.europa.eu/fp7/ict/pcp/docs/pcp-newsletter-201401_en.pdf

²³ <http://cordis.europa.eu/fp7/ict/pcp/docs/23jan2014-synergies-h2020-esif.pdf>

Monitoring

- Uptake of individual projects across the EU (replication);
- Percentage or numbers of more-than-one country projects to develop and test aggregate solutions;
- Percentage or numbers of SMEs and midcaps to participate in tenders and EU public-private projects;
- Measurement of impact in cities against policy targets (like) energy reduction (needs baseline at city level to measure success);
- Number of cities with SRA score above defined thresholds (introduce assessment capacity for 'Smart Readiness and Awareness' (SRA) -at cultural, technical, administrative, organizational and ethical level- to be applied to public contracting authorities and public bodies, resulting in a scoring system to find priorities in terms of success chance (attractiveness for investors)).

12 General Implementation Modes

12.1 Introduction

The Smart Cities and Communities EIP's Strategic Implementation Plan underlines the need to *accelerate* actions; create *scale*; and deliver demonstrable *evidence* of the gains of working in *collaboration* across sectors and cities to develop *common* solutions.

The ambition of this OIP is to help stimulate the next wave of successful initiatives for smart city action to deliver real value across the EU. For context:

- *'Wave I' EU projects* involve fund disbursement on an individual project level, including multiple and oftentimes small projects.
- *'Wave II' EU projects* have successfully established more collaborative solutions that are explicitly focused at EU-wide issues. This includes such vehicles as the Large Scale Pilots (LSPs) under the 7th Framework Programme for Research of the EU. These are still largely financed through public grants and geared towards the early stages of the innovation cycle.
- *'Wave III' seeks to introduce initiatives* that:
 - Increase collaboration between public and private sectors towards greater deployment of innovative action, and certainly increase the interest and involvement of the private sector.
 - Increase the level of private co-financing of public funds and trigger private investments (commensurate with the ambition of 'scale') beyond public sector
 - Are *city-needs*-led, more than city-led; so all parties are focused on delivery of the customer's end needs
 - Focus on replicability of solutions – indeed aggregation of demand. This does not mean a 'one size fits all' approach to city building, however it does infer more common logical designs for particularly information-centric elements of the solution, which will help pooling of projects up to a scale where it becomes attractive to private investment sources to engage (greater mass, greater ability to hedge risks), and that can then deliver earlier benefits
 - Seek to create schemes for funding that makes it easier to plan implementation and decrease bureaucracy (streamlining of rules, reporting, evaluation etc.)

The Strategic Implementation Plan for this EIP proposed the concept of "Lighthouse Initiatives" to capture the need for large-scale demonstration and replication at city system level. These can be introduced much more systematically across the EU – the limited financial scope of H2020 and its "Lighthouse *Projects*" can be enlarged by supporting Lighthouse *Initiatives* through national funding programmes and systematically attracting private investment sources through the provision of risk guarantees.

"Lighthouse Initiatives" have the following characteristics:

- i. Involve a limited core group (6-10) of progressive organisations working together with the ambition to optimise the extent of common innovation and related design
- ii. Seek to attract multiple replicator cities –and related (local implementation) partners
- iii. Seek to rapidly scale up known technologies, as well as support innovation
- iv. Access funds from commercial lenders; national and city public funds; EC Structural Funds; Industry research / investment resources; research and innovation funds from domain EC Directorates (energy; mobility, ICT), and DG Research
- v. Will operate with pragmatism according to set of operational principles that will help to reduce administrative burden

12.2 Implementation Tools

A number of implementation tools can support those ambitions. These are outlined below; each addressing (i) the context, description and goals, (ii) rationale and method of implementation, (ii) monitoring and sustainability.

“**Implementation Tools**” include:

- i. Cross-cutting content management
- ii. Stakeholder coordination
- iii. Country Smart City Landscaping and Bench-learning
- iv. ‘Kitemark’ recognition
- v. Events and Marketing
- vi. Progress Monitoring
- vii. Funding

These all serve to build a platform for implementation of the EIP

12.2.1 Cross-Cutting Content Management

The SIP laid out a 3-by-8 matrix of themes, consistent with the philosophy that better outcomes will be achieved by dealing with the interdependencies between these topics – a change from present ‘incremental actions within silos’.

It is recognised that there will be stronger and weaker affinities between these various themes, and there will be other related themes (e.g. public security, healthcare etc.) that can also be logically addressed in association with the (3x8) core SIP content. But utilising such a matrix approach will help city authorities to not lose sight of inter-linkages and inter-dependencies and check how proposed actions link up.

Specifically,

- i. Such a matrix scheme could be made an important part of eligibility criteria for funding schemes, e.g. proposals should be required to utilise such a systemic approach to city planning and management (both the quality of action, and the extent to which they deal with inter-dependencies)
- ii. A means to articulate the logical synergies and inter-dependencies between city systems, cities should support ongoing activities to develop or adopt standards and protocols (e.g. the emerging urban anatomy work of the City Protocol Society²⁴) to support and inform the above

12.2.2 Stakeholder coordination

The example initiatives in this OIP convincingly demonstrate the need to involve multiple stakeholders in the successful implementation of smart city action. The table below provides an indication of this:

Actor	Key Role(s)
European Institutions	<ul style="list-style-type: none"> - Convening action - Setting and supporting policy and regulation where adequate - Supporting standardisation - Providing funds for research, innovation and large-scale deployment

²⁴ <http://cityprotocol.org/>

European Innovation Partnership on Smart Cities and Communities
Operational Implementation Plan: First Public Draft

	<p>through intelligently combining Horizon 2020, COSME, ESIF funds and other financing tools</p> <ul style="list-style-type: none"> - Promoting awards, competitions, dissemination, learning
Member State and Regional Governments	<ul style="list-style-type: none"> - Providing supportive legislative, policy and regulatory environment - Establishing innovation programmes - Supporting (national/regional) city competitiveness / competitions - Providing funds, and supporting the establishment of funding vehicles - Risk management - Market development activities (e.g. international trade missions)
Investors	<ul style="list-style-type: none"> - Commercial models that support collaboration and common solutions - Funds that enable the OIP ambitions of early scale
City Administration	<ul style="list-style-type: none"> - Leadership - Societal engagement - Policy, programmes, capacity building
City Associations and Networks	<ul style="list-style-type: none"> - Collaboration mechanisms - Benchmarking - Experience sharing and dissemination
Industry	<ul style="list-style-type: none"> - Innovations - Solutions - Research resources - New business models
Academia / RTOs / EERA	<ul style="list-style-type: none"> - Insight development, research capability, scientific support along the entire value chain - Independent validation - Dissemination - Discussion forum
Society	<ul style="list-style-type: none"> - Ideas, opinion, feedback - Engagement on service operations

To help ensure that all these parties come together in a more coordinated manner, we recommend:

- i. Effective action will require a continued platform for action at European level. In turn this will require a continued important role for the European Commission to host such a platform and support stakeholder coordination.
- ii. The "Stakeholder Platform for Smart Cities and Communities" plays an increasingly prominent role in supporting the necessary coordination and communication activities, and that further definition and communication of this role is established.
- iii. Increased coordination between existing and planned initiatives on urban-specific actions will help to utilise synergies, specifically with regard to:
 - a. Different EU policy packages and initiatives of relevance to sustainable urban development
 - b. The reference framework for sustainable cities which is supported by DG REGIO, as well as other initiatives taken to date, for instance the Covenant of Mayors, CIVITAS, Green Digital Charter, and the like
 - c. Links to other EIPs of relevance, such as Active and Healthy Aging EIP;

12.2.3 Country Smart City Landscaping and Bench-learning

Each Member State is approaching the topic of smart cities from a different angle, and applying different instruments (regulation, policy, programmes, funding, etc.) to develop their market and improve their cities. Some differences are logical, given the context and maturity of each Member State. However the opportunity to share approaches in a more structured fashion can help Member States develop better plans more swiftly – delivering the “European advantage”.

To support this process the annex of the OIP will outline a brief profile for each Member State that captures known key points regarding the context and approach being taken. It is seen to be a pragmatic first start; not intended as a firm and accurate reflection of matters within these countries.

Specific recommended actions to support this (inter-)national level comparison and learning include:

- i. Develop a more robust comparison framework; and populate with more accurate information and data
- ii. Promote increased open experience sharing – via public, industry, academia, and association means – about what works and does not work for particular contexts
- iii. Feed the insights from such exercises into EU policy and regulatory processes; national; and city-level actions

12.2.4 “Kite Mark” recognition

To help instil greater confidence from all stakeholders (including city residents), the idea of a ‘kite mark’ for smart projects is proposed. The benefit of such an approach will also include fulfilling important political and societal motives.

Specifically, it is recommended to:

- i. Design a means by which a ‘kite mark’ approach for smart initiatives can be implemented in an effective and efficient manner. This could include less formal as well as more formal certification means, as appropriate
- ii. Link this initiative to ongoing knowledge management and dissemination plans
- iii. Exploit existing and new urban networks, and the city conferences and events, in implementation

12.2.5 Events and Marketing

A growing number of city conferences and events are now taking place – with multiple sources, and of variable quality. This is both a good thing – it raises awareness; and bad – they compete for stretched resources. On balance however, this setting presents a very valuable asset for us to support the goals of the EIP; and disseminate actions resulting from it.

Current events may be national, European, and global in attendance. They also straddle a number of ‘smart’ themes and city domains – thus engaging different functional experts. Some of which well served (notably e.g. ICT); some perhaps less so, or are presently supported by function-specific events which may reduce the opportunity to deal with cross-functional opportunities (which are at the heart of many of the OIP actions).

The goal is to maximise the means by which we can exploit existing events, and establish key new ones.

In addition, the use of multi-media to increase reach, personalise and generally enhance communications and dissemination is vital to coordinate as best possible.

Specific actions that can help support our cause include:

- i. Set up an action group as part of the EIP that is specifically charged with addressing this theme
- ii. Develop an EU Smart City brand and associated messaging
- iii. Set in place social media plans for EU Smart Cities
- iv. Map the (smart) city event calendar – working with networks that may already have such data – to assess which are most impactful, and which we should seek to increase engagement with
- v. identify which international events to proactively support, and how best to position a coordinated message (notably that will help share leading EU city practices, and support EU industry exportation)
- vi. Identify which professions / themes / audiences are insufficiently served by events and marketing; and propose corrective action
- vii. Use the EIP HLG and Sherpa members to promote messaging
- viii. Develop clear goals and targets on all above and establish a suitable monitoring mechanism

12.2.6 Progress Monitoring

Given the scale and complexity of what the EIP on Smart Cities seeks to accomplish, it is vital that there are some very clear (and ambitious) goals set, which engage city officials, industry, and other stakeholders.

However, more attention and work is needed in this field to generate widely agreed approaches to progress monitoring.

- i. It is recommended that, early in the EIP cycle, attention and resource is put to developing this area. A High-Level Group champion / sponsor for this can support ownership, visibility and goal monitoring within that community. The output should include a clear programme goals; an easy to communicate roadmap; principles that will underpin programme success; and a mechanism and resource by which we will demonstrate that.

12.2.7 Funding

All the above does not come without resource input.

EIP: Although no funding instrument, the EIP can ensure a programmatic approach to coordinate the overall EIP activities – particularly for initial communication and mobilisation, and later dissemination, is a significant task. Central coordination, with federated action, will help ensure success.

Funding of City Initiatives: The funding of the collaborative and federated actions by city stakeholders is dealt with through various other initiatives – some of which are EU funds such as H2020 Calls, Structural Funds; and others as yet to be determined – a growing number through other funding means. This too is not trivial, particularly in the context of European cities of which many operate under severe fragmented and constrained budgets. However many also recognise the need and potential to address the 'smart' agenda and often seek seed funding to inform their strategies and kick-start their programmes. A successful implementation of the EIP and the related commitments under the Invitation for Commitments will largely depend on how funds, and particularly access to private finance, can be made available to such stakeholders.

- i. It is recommended that the various means by which funding can be made available is made very much simpler to comprehend for city stakeholders – most notably the modest sized cities and European SME community. The innovative SME instruments under H2020 are of particular relevance in this context.

13 Conclusion

This OIP and the SIP, of which it seeks to serve, are means to engage, develop and share ideas, and build momentum for smart cities across Europe. This is vital for the quality of life in Europe's cities and the overall well-being of its citizens, and also of very significant importance for the vitality of European businesses – notably also as they seek to compete on a global stage.

The profound challenges that we face in Europe: dwindling resources; increasing cost of resources (energy); aging city infrastructures and stretched budgets; are all very good reasons for us to put priority to our endeavours on smart cities.

The vast potential that integrating technologies across the ICT, energy and mobility and transport sector can bring to a city present a very good reason in itself, too!

European cities and companies alike are ideally positioned to benefit from this smart cities dynamic – assuming we take appropriate speedy action.

- Our society is increasingly engaged and motivated to play an active part
- We have access to enormous research and innovation capacities
- Europe's location as well as its rich culture; its varying levels of maturity – all provide high relevance to countries worldwide. This can offer great potential for European industry and innovative SMEs.

The EIP is founded on some key and explicit objectives: to **accelerate** development; to act at **scale**; to demonstrate **impact**; and in so doing ensure greater **collaboration** cross-city and sector, and seek **common solutions**. These must be forefront in all our actions towards making the political objectives real: a significant improvement of citizens' quality of life; an increased competitiveness of Europe's industry and innovative SMEs, together with a strong contribution to sustainability and the EU's 20/20/20 energy and climate targets (Strategic Implementation Plan, p. 3).

We have embarked on a new process for partnering cities and communities with innovative companies and other partners through this EIP. It can be the start of a new phase in Europe's urban development journey and warrants commitment to ensure that the start of the journey will be one sufficient city stakeholders join, that momentum will be built, and that it can be sustained over time.

Perhaps the most important ingredient however is very human, and involves a new way of leading this: both institutionally, and individually. That involves a personal choice that we can all take!

Annexes

Annex A: Local Ecosystems – a framework

Introduction

Annex A further elaborates on the framework of the Local Ecosystem described in chapter 7 on Business Models, Finance & Procurement. The annex aims to provide the reader with a more practical overview of key characteristics and a set of essential ingredients to create and maintain a Local Ecosystem.

Local Ecosystem

Definition:

A local ecosystem is a market place on city level, in which prosumers, local and global industries and governments participate in order to achieve value. These values can be financial or non-financial, such as air quality, use of public space, social interaction and other forms of quality of life. The difference between a traditional market and a local ecosystem is that a traditional market is defined by two roles: the supplier and the customer. The ecosystem combines more roles and integrates private and public investments, public and private services, consumption and production, education, job creation and a governance model to integrate all participating stakeholders in a combined business model.

Local government: How can the local government help create a Local Ecosystem?

- i) Participate in the local ecosystem: develop, join, share vision and show commitment to this vision;
- ii) Enable projects on a local scale, both financially and legal, and adopt results;
- iii) Promote achievements;
- iv) Invitation for next steps;

Criteria for projects: The aim of the project must be to define and implement the business model for the local ecosystem. For a project to create a local ecosystem it needs to have:

- i) A clear view on the governance entity (including all relevant stakeholders);
- ii) A local goal on a well-defined issue;
- iii) A clear view on the motives of each participant;
- iv) Commitment of the local government.

Risk management: There are several instruments a local government can use to reduce risks. For example:

- i) Create a sufficient period for the return on investment;
If the business case is viable for a longer period (e.g. 7 years instead of 3 years), long term licenses will help. See the case “large scale insulation” and “car sharing”.
- ii) Facilitate in lower interest rate;
If the interest rate in common business will be 10% (personal loan) a guarantee or participation in a revolving fund may lower this to below 5%. See the case “large scale insulation”.
- iii) Create a local open market;
If the required business model must give a solution for many participants, using the same infrastructure, data or delivery organization, a trusted third party is needed. The local government can start this TTP, or create the regulations and licenses for this TTP. See the case “car sharing” and “last mile logistics” as an example.
- iv) Enable replicability;

If the companies involved need to invest in solutions, it will help them to have more cities where they can sell their solution. Cities can exchange solutions and by doing this, they can help these companies in finding new costumers. In the case “last mile logistics” the software development involved is an example where a larger market helps lowering the costs.

Governance entity

Definition:

Governance Entities (GEs) manage information flows among stakeholders, collecting/aggregating/processing data related to value-added processes in smart cities. GEs also include the capacity to certify data in terms of quality and integrity with reference to defined criteria, enabling innovative financial mechanisms (e.g. smart bonds, crowd-funding, etc.). Local Ecosystems are key to initiate the building of GEs, since they enable the clustering of defined Stakeholders (including citizens) along value creating chains, generating tangible results and raising awareness among players of the smart initiatives. Local Ecosystems are attractive for investors, and can be used by local bodies and municipalities as a catalyst to start innovative “smart” policies.

Criteria for the governance entity: A local ecosystem has a viable governance structure if the following elements are operational in the total governance entity:

- i) Promoter body;
- ii) Achieving body;
- iii) Financial institute;
- iv) Guarantor body;
- v) Certification authority.

Promoter Bodies

Bodies which promote the implementation of smart initiatives (infrastructures, new services, etc.). These bodies can be national authorities, administrative bodies, government agencies, large private investors, etc.

Achieving Bodies

Bodies which are in charge of physically building infrastructures and smart services and of ensuring efficiency in the course of time. These entities can be businesses, construction companies, etc.

Financial Institutions

Institutions whose task is to aggregate flows of investment by private capital, through the PPP mechanisms. Such entities can be banks, foundations, capitals managing bodies, large private investors, etc.

Guarantor Bodies

Bodies through systems of insurance policies provide coverage of private investments made through PPP mechanisms. These bodies can be Insurance agencies, National Banks, International Banks, Capitals management bodies, Foundations, managers of programs and / or national and European investment funds, etc.

Certification Authorities

On a higher level a certification authority can be defined, to evaluate the local ecosystem and ensure the re-usability throughout Europe. By creating an independent certification, private and public funding can be made easier. The certification authority could be organized on a national level or on a regional level, depending on the existing national structure. Certification authorities are able to provide the information necessary to evaluate the quality and the sustainability of a smart initiative. Sensitive data and information are certified and protected on behalf of investors. Data are related to integrate-managed cluster of stakeholders. Certification Authorities can be created as smart new companies.

Annex B: Example cases of Local Ecosystems

Introduction

Annex B includes five exemplar cases of a Local Ecosystem as referred to in chapter 7 on Business Models, Finance & Procurement. The cases illustrate the framework described in Annex A. For each of the cases the common goal, issues, basic concept, stakeholders involved, initiator, role of the government, contract(s) and financing is shortly described.

Case: Large Scale Insulation

Common goal	Reduce residential energy usage.
Issues	Investment too high for private owners, insecure about quality of insulation. For landlords issue of split incentive.
Basic concept	Lower energy cost, but pay back investment solved in monthly pay through energy bill, so monthly cash out will be the same during payback period (7-10 years). After that lower cost. Create total solution with advice, quality control and a revolving fund with low interest.
Stakeholders involved	Utility, local government, local installation companies, banks and citizens
Initiator	(Local) government, trusted third party
Role of government	Financial guarantee in revolving fund up to 10%, in order to lower interest rate.
Contract(s)	Local corporation or foundation as central point, contracting all stakeholders.
Financing	Payments by inhabitants of the houses. Financing by banks and local government.

Case: Solar on Apartment Buildings

Common goal	Use own solar energy.
Issues	To use the PV solar from an apartment building, local grid should be used (<100 meters). But using the grid, will force the inhabitants to sell the energy to the supplier and buy it back. Then there is no business case.
Basic concept	If laws are changed, the business case for the investors is no issue.
Stakeholders involved	Utility, national government and citizens.
Initiator	Citizens.

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Operational Implementation Plan: First Public Draft

Role of government	Create legal way to use own PV installation.
Contract(s)	Associations of inhabitants will do the investment and divide the produced energy pro rata. Special contract with grid operator may be needed.
Financing	Investment by inhabitants of the houses.

Case: Car Sharing

Common goal	Government: Reduce number of cars and lower emissions; Citizens: use a car when needed at lower price and higher comfort.
Issues	Need for charging infrastructure, create initial number of electrical cars.
Basic concept	Shared cars can be used for time needed, parked anywhere without cost. Users pay per hour having the car.
Stakeholders involved	Shared car service provider, local government and citizens.
Initiator	Shared care service providers.
Role of government	Give car share providers license to parking facilities at lower tariff, long term certainty for investments and campaign support, in exchange for number of EV and (contribution in) charging points that can be used by others.
Contract(s)	License agreement between city and car share provider. Citizens have contract with car share provider and pay per use.
Financing	Investments in cars by car sharing service provider. Charging points owned by city or charging point operator (TTP).

Case: 'Last Mile Logistic'

Common goal	Less air pollution and heavy traffic.
Issues	Distribution to the house is done by large number of distributors.
Basic concept	Create local service point. Distributors deliver to service point. Last mile delivery on request by EV, driven by reintegrating long term unemployed.
Stakeholders involved	Distributors, local government, reintegration program for unemployed and citizens.
Initiator	Local government.
Role of government	Create local service points and operator. The operator connects tracking and tracing software to distributors, and creates last mile distribution delivery

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	process.
Contract(s)	City owned last mile operator has contracts with distributors.
Financing	Investments in last mile distribution organisation is partly covered by the reintegration program for long term unemployed. Tracking and tracing software once developed can be used in many cities. Investment in EV cars by government or TTP, payback in transaction fee.

Case: Energy Storage and Distributed Generation

Common goal	Increase revenues and assure environmental sustainability of distributed generation.
Issues	Power sources (including buildings as prosumers) are organized as Virtual Power Plants (VPP). Energy storage is the catalyst of the optimization process (economic and/or environmental) of this distributed power networks, enabling balancing use and production of energy. Innovative batteries are tested (including car batteries, seen as distributed storage capacity), paving the way to business models for battery charging, also at home. The context can also be used by authorities to assess the effects of change of regulations based upon the opportunities offered by technology.
Basic concept	Create a context that is “big enough” to simulate market behaviour and to create a request of products that is attractive for manufacturers and service providers (avoid mere academic tests). This enables starting the investigation of the acceptable price for a given technology (bottom-up, market driven approach vs. technology-oriented strategy).
Stakeholders involved	Manufacturers, ICT companies, owners of power plants, citizens owning buildings, regulatory bodies, SMEs.
Initiator	A cluster of companies owning power plants.
Role of government	Use the results to search for possible regulatory updates/upgrades to be proposed to the EU, taking into account the opportunities offered by technology and new business models. Assure replicability at regional and national level.
Contract(s)	The initiative is based on a business plan, where all involved Stakeholders share opportunities and risks.
Financing	Investments by owners of power plants. Manufacturing companies can fund the initiative to get market estimations and reliable data, and can test new products covering their costs. Local banks can find business options.

Annex C: Country Landscaping

1. Introduction

This annex seeks to collect, in a consistent structure, some key information on how 'smart cities' is being addressed within the Member States. It represents a work in progress, presently covering only five Member States with drafts for several others being finalised at the moment. The purpose is to provide a coarse comparison that can help countries compare context, support dialogue, and inform action. Clearly, the selection of the five Member States covered here is in no way to be taken as a value judgment, indeed it could not be for some of the most advanced Members States in terms of 'smart cities' are, unfortunately, not yet covered. Indeed, we would very many welcome contributions from interested readers that may allow us finishing this part of the work faster.

2. Landscape Format

The layout seeks to capture on '1 side of A4' general contextual information, and known initiatives within the public sector. These include the likes of:

Contextual Facts

- Urbanisation %; rate of (historical data if no forecasts)
- # cities of different populations
- General state of urban infrastructure
- Metrics on mobility, energy, broadband penetration, internet and mobile use
- Policy context on focus domains (e.g. smart meters)
- Existing City Associations
- City 'Power' – to what extent do cities hold autonomy on policy, programmes, funding etc.

Public Sector Initiatives

Policy and Strategy

- What focus and priorities

Governance

- Tier structure and implications
- City Government Department(s) leading on smart cities
- Notable roles of other sectors – e.g. Industry; Academia etc.

Programmes

- National and regional programmes of note
- Particular cities and initiatives in the limelight

Funding

- How is city funding managed; what sources

Other Matters of Note:

- Extent of public services vs. private
- Activities on smart city standards
- Academic leaders

Finland

Urban Contextual Facts

- 69% urbanised of 5.45 million total population (Statistics Finland, 2013)
- 0 cities > 1mln pop; 9 cities > 100k (Helsinki, Espoo, Tampere, Vantaa, Oulu, Turku, Jyväskylä, Kuopio, Lahti). Lead urban areas: Helsinki (603k), Espoo (257k), Tampere (217k), Vantaa (205k), Oulu (191k)
- 2012 CO₂ emissions= 60.9 MT decreased 5.9 MT from 2011. CO₂ from transport decreasing. Particulates stable. Energy consumption stabilised in 21st century: use of renewables increased to 32% of consumption in '10, (e.g. use of heat pumps increased rapidly). Travel time to work grown in recent years. Nos. cars increased since '90s, but vehicle mileage stabilised. Cities have large green areas (31-48%) – more than EU average. (Finnish Environment Institute, 2013). High investments in infrastructure (3% of GDP in land and water construction). Strengths of the Finnish transport system are good traffic flow and low congestion, well-functioning public transport and management of winter conditions. (VATT, 2012)
- Mobility metrics: volume of mobility (vehicle/day) by the Finnish Transport Agency
- Energy metrics: Household / Industrial energy consumption, Electricity & heat production (Fi Statistics)
- City networks: International Regions Benchmarking Consortium (Helsinki); European New Towns Platform (ENTP) (Vantaa); Eurocities (Espoo, Helsinki, Oulu, Tampere, Turku, Vaasa), Airport Region Conference (ARC) (Vantaa); WHO Healthy Cities National Networks (16 cities); Union of the Baltic Cities (12 cities)
- Policy Highlights: High degree of deregulated infrastructure i.e. energy, Telecom, Transport
- Policy highlight: National Climate and Energy Strategy (latest update approved by Government 20-3-13)
- City 'Power': Budget based on local income tax, state subsidies and in some cities also leaseholds

Public Sector City Initiatives

Policy and Strategy

- *Open and smart services* -strategy has been developed in cooperation of the six largest cities. Strategy is part-funded by the EU regional development fund; partly by state and cities, total budget reaching 79M€.
- Ministry of Transport and Communication has a strategy for smart transport and mobility
- "Smartness" is highlighted in several cities strategies, e.g. Helsinki, Kemi, Tampere, Mikkeli, Jyväskylä

Governance

- Council of State set targets in '08 in its long-term climate and energy strategy: energy consumption down 11% by '20, 33% by '50; requiring energy efficiency in living, construction and transport. (Ymparisto.fi)
- In the "Environmental Strategy for Transport 13-20" the Ministry of Transport and Communication the targets relate to controlling climate change, improving living environment, decreasing health issues caused by transport, and protecting the Baltic Sea (Ministry of Transport and Communication, 2012).
- The 2008 "National Waste Management Plan" sets a target that by 2016 50% of waste is recycled and 30% is used as energy; with 20% of waste to dumping grounds. (The Ministry of Environment, 2008)

Programmes

- INKA-program (Ministry of Employment and Economy) financed by Finnish Funding for Innovation (TEKES) has chosen smart city to be one of five focus areas. City of Tampere is administering the theme.
- TEKES launched "Witty City" (Fiksu kaupunki) program, to secure projects of ~100mln (40mln from TEKES)
- TEKES launched an *Electric Vehicle Systems programme, EVE*
- Smart city is a focus area of Finnish Transport Research and Innovation Partnership (FINTRIP) – a program of Ministry of Transport and Communication. Fintrip plans a programme with the theme of city mobility.
- City of Jyväskylä is participating in the PLEEC –project (Planning for energy efficient cities) (EU, FP7) and the target is to develop a model for planning an energy efficient and smart city.
- One of Forum Virium's innovation projects is *Smart City* which is involved in the development of digital urban services that make travelling and living in the city easier
- Cities of Helsinki and Oulu were participating in the FIREBALL project (Smart cities as Innovation Ecosystems Sustained by the Future Internet) (EU, FP7), 2010-2012.
- TranSmart: a spearhead program led by VTT (Gov owner R&D Institute) on Mobility / low carbon energy
- Finnish Research Institute (VTT) has a spearhead program: Productivity with Internet of Things, IoT

- VTT has innovation program Smart Energy grids, Ingrid

France

Urban Contextual Facts

- Urban population is 85% of total population. Cities represent today 22% of the whole territory, with 47.9 million inhabitants, i.e. 77.5% of the French population. Densely-populated area 12.4 % in 2012 (Capital city with 10.3 million inhabitants, 31 cities with 200 to 2000k inhabitants, 22 cities with 100 to 200k inhabitants, more than 2000 smaller cities).
- Cities are key investors in infrastructures in the transport, housing and environmental protection sectors. In most cities housing infrastructure dominates this pool.
- The cash-strapped government's limited capacity to fund major projects outright leads to some cutbacks and postponements and greater reliance on PPP funding. Currently, PPP initiatives priced at €33 billion are in the infrastructure pipeline through 2020 to fund projects that include expanding high-speed rail.
- The current government is paring back investment in nuclear power, the nation's primary energy source, and looking to gain efficiencies from energy-saving technologies, equipment, and systems as well.
- French Urban space is not homogeneous, and urbanisation can have various forms. Most complex one is "rurbanisation", i.e. extension of the city over the countryside – giving the impression of being back to the countryside.
- In terms of transportation and commuting, whilst the number of individual trips achieved per day is roughly speaking the same everywhere (between 3.0 in Paris and 3.4 in other French big cities), the use of a car is lower when the area is less heavy (1 trip among 8 in Paris, ~9 among 10 in small cities suburbs). As such, the more the habitat is dense, the more people use public transports, bicycles and walking.

Public Sector City Initiatives

Policy and Strategy

- France has created Data.gouv.fr portal in December 2011; the site now has over 350.000 data sets. The inter-ministerial mission Etalab, which is now a service of the French Prime Minister, is responsible for creating and populating the data.gouv.fr open public data portal.
- In terms of opening up data, the pioneering French local authorities were Rennes and then Paris in 2010. Montpellier and a number of other Cities, Regions and Departments also followed.
- In 2013 Etalab ran the *Dataconnexions* competition to reward the most innovative companies among those collecting and re-using public data.

Governance

- A national decentralization reform was implemented in the 1990s and 2000s to reduce the economic importance of central government decisions in French urban areas and particularly the largest ones. A governance system with three types of authority incites municipalities to join forces to provide public services.

Programmes

- Environment-oriented : Agenda 21, Grenelle de l'environnement, EcoQuartier, EcoCités
- The "Atelier National" process – exploring new approaches of projects and partnerships in regions with lack of or no engineering skills
- Territories Workshops – relying on a partnership between the State, local authorities and representatives for local consultation and co-creation
- The Urbanism Prize (Grand prix de l'urbanisme) - awarded by an international jury

Funding

- Digital infrastructure-oriented funding programmes : Quartier numérique (€200 million), Territoires NFC (€66 million)

Other Matters of Note:

- Territories developing "Smart City" initiatives include Grand Lyon, Grand Nancy, Grand Angoulême, Angers Loire Métropole, City of Nice

Germany

Urban Contextual Facts

- 74% urbanised of 80 mln total population
- 4 Cities > 1mln population (Berlin, Munich, Hamburg, Cologne)
- 80 Cities > 100,000 population (incl. 4 >1mln; and 10 >500,000)
- Lead Urban Areas (cities >500,000): Berlin, Hamburg, Munich, Cologne, Frankfurt, Stuttgart, Dusseldorf, Dortmund, Essen, Bremen, Dresden, Leipzig, Hanover, Nuremberg
- Urban Infrastructure – ‘mature & stressed’; notably aging utility systems; congested urban road network; high-maintenance rail system; mature building stock ... all exacerbated by long-term forecast public budget constraints.
- Policy Highlights: Renewable Energy Law (“EEG – Umlage”); Energy Conversion (“Energiewende”)
- City Networks: City Utility Companies – often (co-)owned by one of the top four utility companies (RWE, E.ON, EnBW, Vattenfall); large independent City Utility Companies: RheinEnergie (Cologne), MVV (Mannheim)
- City ‘Power’: Budget based on local business tax (“Gewerbesteuer”) and income tax (tbc)

Public Sector City Initiatives

Policy & Strategy

- German Government has launched an initiative on the “City of the Future” as a national platform. This is a research-to-implementation initiative with a long term perspective, supported by Ministries of Research, Ecology, Economy, and Buildings. It involves 30 stakeholder groups and 100 independent experts. It addresses four principle themes: energy and resources; climate and governance; transportation management; systems approach
- The “Morgenstadt – City of Tomorrow” initiative has been launched by the Fraunhofer Institute
- The German Innovation Roundtable has initiated the “Smart City Forum”
- “Nachhaltige Städte – Norderstedt et al.”

Governance

- So far, smart city special initiatives are not in place beyond those noted above
- Energy related issues are addressed either by Ministry of Economics or with respect to sustainability by Ministry of Environment and regarding buildings by Ministry of Transport and Buildings
- Transport related issues are addressed by Ministry of Transport and Buildings

Programmes

- National platform “eMobility” in place with four show cases (Berlin, Stuttgart-Karlsruhe, Bavaria-Saxony, Wolfsburg)

Funding

- No dedicated and significant smart city funding available

Other Matters of Note:

- Growing number of citizen funded/owned energy coops
- Academic leadership of note: Fraunhofer (Fokus, IAO, IBP); TU Berlin; TU Darmstadt; DFKI (eMobility)

Netherlands

Urban Contextual Facts

- 83.2% urbanised of 16.8 mln total population, with considerable growth expected for 4 largest cities
- 0 Cities > 1mln population
- 27 Cities > 100,000 population (Regional population and households prognosis CBS, October 2013)
- Lead Urban Areas: Amsterdam 799.442, Rotterdam 614.453, Den Haag 502.802 Utrecht 324.723
- Urban Infrastructure and Morphology – congestion has diminished due to improved highways, energy transition is lagging far behind (only 4% renewables, mainly biomass) and the Netherlands will probably by far not meet EU targets on energy, energy networks not yet attuned to large-scale decentral energy production, better use of currently built-up area, restructuring outdated business parks and 60s-70s districts, hardly any urban expansion due to current reform housing market and economic situation, especially Amsterdam and Utrecht will have considerable population growth in the next decades
- Policy Highlights: National Energy Accord (Energy Agreement for Sustainable Growth), society-wide agreement of companies, societal organisations, research institutes to improve the Dutch situation for clean energy, September 2013
- City Networks: G4, G32 (top 4 and 34 Dutch cities), VNG (all municipalities), Platform31 (dissemination of knowledge);
- City 'Power': Mid. Political decision power via elected members; Reliance on C.Gov grants / formula for city funding approved by VNG; Limited city-level revenue source; Local policy power; many responsibilities shifted recently from central or regional government to local government, many cities have austerity measures, housing associations too due to Housing Agreement (approved 18-12-2013)

Public Sector City Initiatives

Policy and Strategy

- Amsterdam has embraced the Smart City concept as an overarching principle and Amsterdam Economic Board is the thriving force behind many initiatives. Almere collaborates with Amsterdam on this, and works on projects as Big Data Centre. Amsterdam Metropolitan Solutions is a collaboration between TU Delft, Wageningen University, MIT and other partners, also TNO. Amsterdam will host a major international event on Smart Cities in May 2014.
- Other cities are applying smart city principles but are not always labelling them as such (e.g. Rotterdam). Many larger cities (from G32) explore currently how the concept can help them (e.g. Delft).
- At the 12th Nov 2013 Innovatie-Estafette 2013 in Amsterdam several partners signed the Knowledge Network 'NL – Smart Cities'. Aims: better urban quality of life, more competitive NL businesses
- Digitale Steden Agenda: Innovative solutions for cities, initiated by G4, G32, and Platform31

Governance

- Topic is addressed at national level both by Ministry of Economic Affairs and by Ministry of Infrastructure and Environment.

Programmes

- Knowledge Network is first start. No overarching national program aiming at implementation but smaller programs focusing on knowledge exchange

Funding

- No specific funding schemes at national level, many project funded by European funds (ERDF, FP7)
- Limited city-raised public budgets;

Other Matters of Note:

- Some provinces who sold their energy companies in the past are now using this money to stimulate green deals and innovation (e.g. Province of North Brabant/TU Eindhoven/Brainport)

Spain

Urban Contextual Facts

- 77.4% Urban population (2011) / 0.9% urban rate (2005-2010)
- >1M inhabitants: Madrid (3.2M, 2013), Barcelona (1.6M, 2013) Valencia (0.8M), Sevilla (0.7M), Zaragoza (0.7M), Malaga (0.6M)
- City associations (listed only those related to topic)
 - RECI (Smart Cities Spanish Network)
 - RECC (Climate Cities Spanish Network)
- Existing energy and energy related metrics (Spanish National Institute www.ine.es)
 - Waste/ residue generation by activity sector; Urban waste; Waste treatment and management; Energy consumption by activity sector; Production of energy by sources; Consumption of energy by sources
- Mobility metrics (RACC www.racc.com)
 - Transportation; Movements; Users; Airport/ train/ ports (passengers and tn)
- Notable city focus:
 - Barcelona: urban planning, transportation, municipal taxes, security, urban maintenance, municipal site development (kindergarten, sports centres, elderly homes, social housing). Decentralization of policies at municipal level through 10 districts

Public Sector City Initiatives

Policy and Strategy

- National Level:
- Barcelona: In 2011 the City launched a new strategy and transformational plan to introduce new technologies, improve the overall operation and management of the city, and foster economic growth and welfare of citizens. The strategy strongly aligns with Horizon 2020 priorities, and promotes more sustainable, smart and inclusive development, along the lines of 4 P's; Place (city), People (citizens), Private (business) and Public (administration). ICT is core to the strategy. Barcelona is working in a cyclic innovation model to provide better services to citizens so that they can integrate the changes and environmental needs in a flexible, continuous and agile way – launching innovations in different areas of the city. The strategy has been developed as a transversal innovation within the City Council.

Governance

- City transformation is a city-led policy.
- For infrastructure Central Government plays crucial role in budgeting initiatives.

Programmes

- National level: smart city activities noted in several (of the larger) cities
- Barcelona manages a portfolio of 25 smart city projects covering: infrastructure network, e-vehicle, health, apps, tools to promote innovation, ICT deployment, management through ICT etc.

United Kingdom

Urban Contextual Facts

- 90% urbanised of 63.7 mln total population (UN world development indicators – 12th of 195)
- 4 Cities > 1mln population (London, Birmingham, Manchester, Glasgow, Liverpool)
- 63 Cities > 100,000 population(ONS data 2011)
- Lead Urban Areas: Gtr London: 9.8 mln (met area 13.7m); Gtr Manchester 2.5mln; West Midlands 2.4mln
- Urban Infrastructure – ‘mature and stressed’; notably aging utility systems; congested urban road network; high-maintenance rail system; mature building stock; exacerbated by severe budget constraints.
- Policy Highlights: Energy Green Deal
- City Networks: Core Cities (top 8 English cities);
- City ‘Power’: Mid. Political decision power via elected members; 8 City Mayors; Reliance on C.Gov grants / formula for city funding; Limited city-level revenue source (ca. 5%); Local policy power; strong C.Gov; weak regions; modest strength cities (constrained by complex fragmented governance bodies)

Public Sector City Initiatives

Policy and Strategy

- UK has moved from behind on ‘smart cities’ over the past 2 years to a position in the leaders. The Technology Strategy Board (TSB) initiative on Future City Demonstrators (a competition that attracted 30 bids) developed considerable momentum. This granted £24mln funds to Glasgow; and £1mln to London, Bristol; and Peterborough. The TSB incubator programme will provide support for innovation and SMEs. Sustaining this momentum will present ongoing challenges.
- London for example has established a ‘Smart London Board’ comprising leading academics; also specific boards to address infrastructure and other key domain plans. All to support latest Vision 2020 ambitions.
- The UK Smart City strategy was launched in Oct 2013 at Ministerial level
- UK “Smart City Forum” launched Dec 2013, jointly chaired by 2 Ministers, and comprising senior (~25) membership from C.Gov, Cities, Industry/SME, and Academia. 6 thematic initiatives are now launched.

Governance

- Complex governance. Multiple C.Gov policy and funding Depts affecting cities. CLG (Community and Local Gov) Dept provides C.Gov oversight. LGA (Local Gov Assctn) provides political oversight. Most cities / city regions have some form of Local Partnership with representation from main public agencies (councils; health; emergency services; education etc.) and local enterprise to support collaborative decision making on public services, economy and the like.
- Cabinet Office presently coordinating ‘City Deals’ that agree governance and some aspects of funding at city-region level. City Minister in place (Rt Hon Greg Clark).
- BIS (Business Innovation and Skills) Department is taking a leading role in UK smart city activities.
- Focus is on cities as means for economic regeneration – notably also of the SME community.

Programmes

- TSB “Future Cities” programme, and new Future Cities Catapult organisation, both creating momentum.
- Glasgow as TSB Demonstrator city is receiving focus; Manchester visible internationally for ICT exploitation; London clearly influential as a world city.

Funding

- Central bias. Limited (~5%) city-raised public budgets; growing institutional and Industry infrastructure funding – still considered moderate risk.

Other Matters of Note:

- UK smart cities market estimated to represent €30 billion p.a. by 2020 (BIS Oct’13 SC background paper)
- Considerable and growing ‘externalisation’ of public / city services to private sector
- Key ‘smart city’ challenges captured in recent BIS (Arup) TSB Demonstrator Bid analysis report
- Coordinated programme of smart city standards launched by BSI
- Academic leadership of note: LSE (London School of Economics Centre for Cities); UCL (Urban Lab: grand challenge of sustainable cities); ... often joint initiatives with Industry