

European Innovation Partnership on Smart Cities and Communities

Strategic Implementation Plan

Draft

08.10.2013

Foreword

The High Level Group of the European Innovation Partnership for Smart Cities and Communities would like to present our Strategic Implementation Plan for speeding up the transformation of European Cities into "Smart cities". We invite all our stakeholders to respond to our plan, especially in terms of commitments and actions to deliver progress.

The plan outlines our ideas on how to best harness innovative technologies, innovative funding mechanisms and innovative public private partnerships. It highlights actions needed to create the right framework conditions to make our cities better places to live and to do business in, to reduce energy use, carbon emissions and congestion.

The High Level Group and our Sherpa Group will continue to work on an Operational Plan which will set out in further detail how we believe we should move forward.

We are grateful for the help and support we have received from the European Commission Services and especially from our Sherpa Group and the Stakeholder Platform.

Executive Summary

Cities are becoming more and more of a focal point for our economies and societies at large, particularly because of on-going urbanisation, and the trend towards increasingly knowledge-intensive economies as well as their growing share of resource consumption and emissions. To meet public policy objectives under these circumstances, cities need to change and develop, but in times of tight budgets this change needs to be achieved in a smart way: our cities need to become 'smart cities'.

The European Innovation Partnership on Smart Cities & Communities seeks to significantly accelerate the industrial-scale roll-out of smart city solutions integrating technologies from Energy, Transport and Information and Communication Technologies (ICT). This is where there is most untapped innovation potential and most environment and societal benefits to be gained. The partnership was launched in July 2012¹ and its overarching goal has hence been formulated thus:

This partnership strives at a triple bottom line gain for Europe: 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 targets². This will be achieved through the wide-reaching roll out of integrated, scalable, sustainable Smart City solutions – specifically in areas where energy production, distribution and use; mobility and transport; and information and communication technologies are intimately linked.

The Partnership aims to overcome the challenges that remain as road blocks on our way to 'smartening up' Europe's cities. In addition to innovative solutions the Strategic Implementation Plan will also create value for Europe by, helping to align existing city initiatives and projects, helping to create economies of scale and more effective knowledge sharing. It looks to establish strategic partnerships between industry, innovative SMEs, European cities and other stakeholders at local level and across borders in Europe. Major challenges include adopting a cross-sector approach, and making necessary change in the existing financial models, procurement regimes, regulatory framework and knowledge base.

As an initial output the Partnership has agreed on this Strategic Implementation Plan (SIP), which is a result of the work of a High-Level Group, their supporting Sherpa group and contributions from the Smart Cities stakeholder platform³. In order to focus energy and gain momentum, the plan concentrates on three specific, vertical areas for the time being:

- *Sustainable Urban Mobility – Alternative energies, public transport, efficient logistics, planning;*
- *Sustainable Districts and Built Environment –improving the energy efficiency of buildings and districts, increasing the share of renewable energy sources used and the liveability of our communities;*
- *Integrated Infrastructures and processes across Energy, ICT and Transport – connecting infrastructure assets to improve the efficiency and sustainability of cities*

¹ ["Smart Cities and Communities - European Innovation Partnership" \[COM\(2012\)4701\]](#)

² ["An Energy Policy for Europe" \[COM\(2007\) 1 final\]](#)

³ <http://www.eu-smartcities.eu/>

The Plan puts forward eight key horizontal enablers on the themes of *Decisions, Insight, and Financing*.

To successfully implement this SIP, and the forthcoming Operational Plan, and develop these three vertical priority areas and eight key horizontal enablers, we have proposed a number of actions; examples of which include:

1. Create a number of “Lighthouse Initiatives” that bring together groups of cities with industry and innovative SMEs from the ICT, energy and mobility & transport sector to deliver common Smart City solutions thus creating scale and reducing risk for political decision makers as well as investors, to progressively support wider implementation across the EU as well as showcasing the competitiveness of European industry and innovative SMEs.

To unleash the full potential of innovation and make best use of infrastructural and other synergies, these "Lighthouse Initiatives" must focus on the integration of technologies across the ICT, energy and mobility & transport sector so to achieve, e.g., advances in 'zero/plus' energy districts, increased use of alternative energies, public transport and efficient logistics, or green, widely available ICTs and multiple-use infrastructures. Continuous progress monitoring must be assured.

2. Apply new business and financial models, public-private partnerships that combine industry with public investments at European, national, regional and local level, as well as European procurement schemes so to deliver improvements faster across the three vertical areas.
3. Advance Smart City open standards through the CEN-CENELEC-ETSI Smart City coordination group in the form of a common technical committee to develop a common landscape and strategic programme for smart city standards.
4. Develop infrastructure platforms and common architectures for smart city information.
5. Make widely available, relevant data in the urban domain through culture change towards “open data by default” with public and private actors.
6. Develop tools for scalable integrated design, simulation and multi-criteria optimisation to enable multi-stakeholder analyses of different spatial and sectorial perspectives (i.e. performance and life-cycle assessments, sustainability assessment, and visualisation of impacts).
7. Create a common framework to develop citizen insight and share rapidly amongst EU cities.
8. Develop a Smart City Strategy at a policy level which allows for the creation of ‘innovation zones’ that free up cities or areas from the constraints of regulation in selected domains and for limited duration in order to act as an incubator to test solutions. To scale up and make broadly available the lessons learned.
9. An annual programme of 100 short term staff exchanges between cities, industries and relevant NGOs to crowd-source the best ideas. To begin in 2014
10. Implement collaborative, integrated smart city planning (city planning forums) and operation, that maximise city-wide data to deliver more agile processes; employing modern multi-criteria simulation and visualisation tools.
11. Agree a common Smart City indicator framework to help cities self-evaluate, monitor progress, and more reliably compare themselves with other cities and to provide certainty for long-term industry investments in innovation.

1 Introduction and goals

Definition:

Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and financing to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society.

In order to achieve a decarbonisation of Europe's economy in line with the EU' 20/20/20 energy and climate goals today's ICT, energy (use), transport systems and infrastructures have to drastically change. This is highlighted in the illustration below. The EU needs to shift to sustainable production and use of energy, to sustainable mobility, and sustainable ICT infrastructures and services.

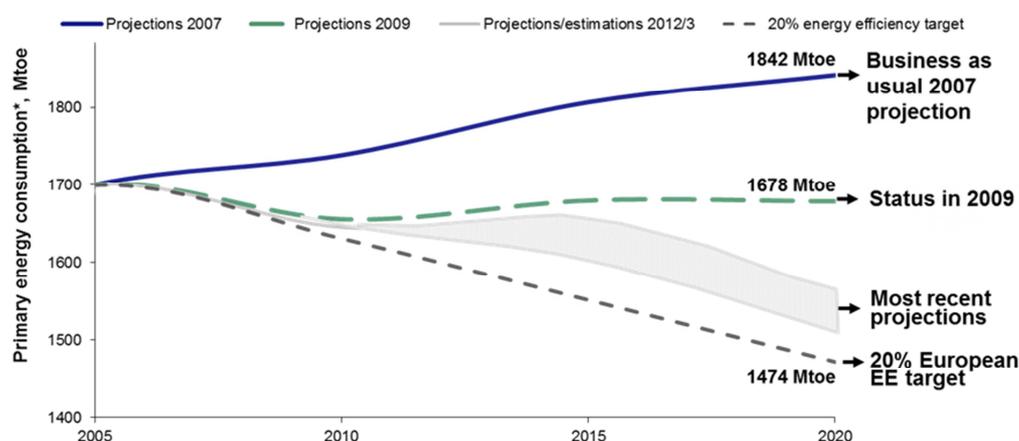


Figure 1: Primary energy consumption scenarios for 2020⁴

Cities and urban communities play the crucial role in this process. Three quarters of our citizens live in urban areas, consuming 70%⁵ of the EU's overall energy consumption and emitting roughly the same share of greenhouse gases. Of that, buildings and transport represent the lion's share (see illustration below). The trend towards urbanisation continues at unprecedented pace at European and global scale and risks increasing traffic congestion and pollution which in turn risks rendering cities dysfunctional, undermine competitiveness and seriously affect quality of life. Furthermore, cities are a huge economic and purchasing power in Europe and account for 19% of the total expenditures in the EU. If combined and thought through in a smart way this could trigger a significant potential for economic growth and jobs by combining market pull and technology push, even without reliance on traditional funding mechanisms.

Whilst it is true that European cities and regions are different from each other, it is also true that they have many similar needs that can be tackled best through a common approach. This Partnership focuses on those areas where ICTs, energy and mobility overlap and seeks those approaches and solutions that are common and transferable from city to city. Many solutions have indeed already been developed, however scale-up at industrial strength has not occurred.

⁴ Source: European Commission 2013

⁵ http://www.eumayors.eu/IMG/pdf/com_brochure_en.pdf

Increasing market opportunities and reducing investor risk can, however, drive down costs to an extent that will ultimately make for mass production and broad use. Developing integrated solutions throughout Europe will allow industry to deliver what cities and regions need, with better quality and at lower costs to the benefit of, and with the involvement of, society.

The European Innovation Partnership⁶ for Smart Cities and Communities⁷ aims to make this possible by accelerating the market uptake of smart city solutions. To this end the Partnership seeks to engage stakeholders at various levels from cities and regions, industry, SMEs, and research in order to create critical mass.

Smart solutions triggered by the Partnership should contain elements of ICT, energy, and transport/mobility. The solutions should be scalable and replicable and aim at ultimately contributing to and possibly out-performing the EU's 20/20/20⁸ climate action goals by increasing energy efficiency, increasing the use of renewable energy sources and reducing energy consumption and green-house-gas emissions. Tools, methods and processes developed in this context should differentiate themselves by the holistic approach linking planning, design and operation while keeping in mind citizens' needs.

The Partnership produced the present Strategic Implementation Plan (SIP) as a result of the work of a High-Level Group⁹, their supporting Sherpa group¹⁰ and contributions from the Smart Cities stakeholder platform¹¹. This Strategic Implementation Plan outlines the priorities and proposes implementation actions for the widespread deployment of smart city concepts. It also proposes specific actions on regulatory issues, standards, business models and public procurement schemes.

It is recognised that cities encompass significantly more domains than the three covered in this Strategic Implementation Plan. However we see the current focus as an important starting point that will build momentum and, may then later on expand in scope to other urban domains

⁶ Europe 2020 Flagship Initiative Innovation Union SEC(2010) 1161

⁷ The European Innovation Partnership for Smart Cities and Communities – <http://ec.europa.eu/eip/smartcities>

⁸ European Union's 20/20/20 sustainability targets for the year 2020: a 20% reduction in EU greenhouse gas emissions from 1990 levels; raising to 20% the share of EU energy consumption produced from renewable resources; and a 20% improvement in the EU's energy efficiency. Furthermore, Europe is offering to reduce emissions by 30% by 2020 (subject to commitments by other countries), by 40% by 2030 and by 60% by 2040. The goal for 2050 is 80-95% reduction from 1990 levels.

⁹ High level representatives from industry, research and cities, which are appointed by the European Commission in their personal capacity http://ec.europa.eu/eip/smartcities/whos-who/index_en.htm

¹⁰ http://ec.europa.eu/eip/smartcities/whos-who/index_en.htm#sherpa

¹¹ Smart Cities Stakeholder Platform: a collaborative, networking and knowledge sharing tool in the domain of Smart Cities and Communities. – <http://eu-smartcities.eu>

2 Problem analysis

The context that underpins this SIP, and calls for scale and accelerated action has been discussed. At present, European Member States, cities and communities throughout Europe, are taking different approaches to how they respond to the challenges of urban transformation. By itself this is not unexpected, however given the extensive commonalities that exist at a systemic level between cities, and the constant need for progress, there is scope for a more coordinated and complementary approach. This will: access the economies of scale that can deliver more affordable solutions; focus innovations from across Europe on the integration of the three areas; and help Europe to remain globally competitive.

The EIP is a stakeholder-driven initiative with the EC in a mediating / facilitating role, so that the principle of subsidiarity remains intact.

Given the scope and complexity of cities, the approach taken in preparing this Strategic Implementation Plan has been to consider three ‘vertical’ domains, and eight ‘horizontal’ enabling themes (see illustration). For the former, potential exists to improve outcomes through applying smart approaches that integrate across city systems, exploit existing assets, whilst also upgrading with new assets. For the latter, coordinated actions at a European Institution and Member State level can deliver the enabling environment within which cities, industry, and other stakeholders can achieve success, at scale, faster.

These eleven inter-dependent priority areas are considered to be the most important concerning Smart Cities and Communities, and the intersection with the areas of energy, transport and ICT.



Figure 3: Priority areas

Each priority area is discussed individually, against three main considerations: the context and challenges we are addressing; the drivers and desired state we seek; and what actions can help result in game-changing outcomes.

Vertical Priority Areas

2.1 Sustainable Urban Mobility

2.1.1 Context & Challenges

Good mobility for citizens and businesses greatly increases the attractiveness and competitiveness of cities. Meeting Europe's goals (20/20/20)¹², tackling congestion, improving air quality, accessibility and sustainability in most cities will require substantial changes in the transport system and its operations, and in the mobility behaviour of people and businesses. Public transport and soft modes, especially walking and cycling, need to become more attractive. Too many vehicles in cities are powered by oil, and alternative fuels¹³ are under-used. Commercial vehicles are essential for the city economy, but they contribute to and suffer from congestion. Effective ways are needed to attract people towards collective transport means, while these need better integration towards seamless multimodality. Public and other transport services, timetables and ticketing, and interchanges – are not always well connected. Finally, we need to re-think how the public and private sectors cooperate, and how to engage citizens and businesses more directly in new mobility systems and services that should serve them.

2.1.2 Ambitions

A first priority is to reduce and avoid demand for emission-intensive transport modes while facilitating the increased mobility of people, goods and information and ensuring that efficient transport is devised around smart integrated infrastructure and mobility planning. Secondly, *a shift* from more energy intensive and environmentally harmful modes of transport to less polluting, better integrated and more efficient modes is required, for example public transport, favouring efficient logistics and non-motorized modes. Thirdly, *reduced impact* can be achieved through improved, cleaner transport technology and policy solutions, driven by better management of mobility. Zero- and low-emission vehicles will connect with each other, with infrastructure and with "the smart grid". Urban transport strategies and new public-private actions will "get sustainability done" in towns, cities and region. Already, a number of Member States, regions and cities have set up initiatives in electric transport and mobility.

2.1.3 Recommended Actions

1. Make solutions widely available in cities through various types of actions to reach the objectives of the vision above, focusing on:
 - alternative fuels; infrastructure, vehicles, fuels and energy management;
 - inter-modal mobility hubs to ensure connections between public transport modes, connect other mobility services, and optimize energy efficiency;

¹² White Paper COM(2011)144 outlines the following targets: halve the use of conventionally fuelled cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO₂-free city logistics in major urban centres by 2030. As a follow up, the European Commission intends to present late 2013 an Urban Mobility Package focusing on Urban Mobility Plans, urban road user charging and access restriction schemes, and urban freight flows.

¹³ EU Clean Power for Transport Package (COM (2013)17): the main options for the different transport modes are: liquefied petroleum gas (LPG), natural gas and biomethane (in the forms of CNG, LNG and GTL), electricity, biofuels and hydrogen.

- in the logistics supply chain in urban areas ('last mile');
 - to create new opportunities for personal, sustainable mobility and efficient logistics by harnessing the intelligence of the urban transport system and its users; connecting networks and creating, analysing and utilizing data.
2. Create a "deployment toolkit" to transfer models, blueprints and lessons learned on sustainable urban solutions in all of Europe's cities, and directly to their citizens and businesses;
 3. Bottom-up approach to encourage active involvement of citizens to take ownership so this can function as a platform and an inspiration for (small and medium) enterprises in the search for sustainable options.

2.2 Sustainable Districts and Built Environment

2.2.1 Context & Challenges

Districts are where society and place come together. They are where people literally live and make decisions about key city systems (transport mode; energy consumption; waste); 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, modernise 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. However, since buildings last 40+ years, 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, technologies and materials.

Cities – as systems with people, energy flows, materials, services and financing – need to be explored in an integrated and global way *to ensure resilient cities* (e.g. reliable energy supply during sudden natural or manmade events) and sustainability. Therefore the *integration* into, and *interoperability* between, urban systems is needed – alongside co-creation by, and involvement of citizens.

Recognising 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.

2.2.2 Ambitions

For the sustainable development of our districts and built environment *co-creation and integrated urban planning* are needed. This includes citizen and industry engagement, and the implementation and deployment of effective and user-friendly technologies and services. Urban planning is closely related to the economic and social activity of communities; i.e. technology is seen as an enabler of a good quality of life. In city planning and city management the identification, integration and optimisation of different energy, transport and data flows (e.g. citizen preferences) as well as a close link to urban planning processes are needed for creating sustainable smart environments.

Transition of our districts to low carbon and zero/plus energy/climate neutral status can be achieved by implementing and optimising: local renewable energies with existing energy production (e.g. smart energy networks, virtual power plants); storage systems; and demand control. Further, user friendly zero-energy or energy-positive new buildings/ autonomy at building blocks level, and deep and smart retrofitting of existing building stock using the latest knowledge, technologies and materials are needed. Policy measures to support an increase of the rate of retrofitting of the old stock of buildings should be sought since it contributes directly to the achievement of emissions targets and to growth and local jobs creation. The implementation of any new technologies must fit within existing structures and environments since the renewal of building stock is costly and generally takes very long.

Integrated, affordable and user friendly multi-optimised solutions (materials and systems such as high performance insulation solutions, smart heating, cooling, and ventilation; smart lighting – both indoor and outdoor, and electrical vehicle charging) should lead to broadly affordable and comfortable, safe, secure and cost efficient buildings and districts.

2.2.3 Recommendations

1. Develop a scalable integrated design, simulation and multi-criteria optimisation toolkit which enables multi-stakeholder analyses of different spatial and domain perspectives as integrated ecosystems (addressing integration of renewable energy sources, performance and life-cycle assessments, sustainability assessment, and visualisation of impacts). Interoperability with operational systems actually in use is essential for take-up.
2. Develop and agree (between an established network for dialogue between cities, industry and SMEs) on a set of “building blocks” based on large common city challenges in the longer-term; this will help build up new business models and speed up broadly deployable solutions available
3. Scale up significantly the upgrading of the existing building stock with affordable solutions, and develop and deploy zero/plus energy buildings with innovative technical solutions and materials. Pilot at the same time new business/financial models. Use *innovation zones* as “incubators”.
4. Develop auditing tools/systems and development of framework on measured variables: Define certification criteria for data and information on CO₂, energy use, gas use, water use, etc. using as much as possible existing criteria.

2.3 Integrated Infrastructures and processes across Energy, ICT and Transport

2.3.1 Context & Challenges

Cities have grown and thrived, economically and socially, because of the benefits of common shared infrastructures. The latest and fastest growing infrastructure is information and communication technology. ICT has supported innovation in many infrastructures – though predominantly only *independently*. Now is the time to consider the potential from *integration* across these infrastructures, and their related operational processes. This combined approach recognises the inter-dependencies between urban systems. Importantly, this new integrated approach offers strategic (e.g. capital) and operational (cost reduction, system effectiveness) gains by exploiting *existing* assets. Through focused application in select cities it is entirely feasible to exceed the EU climate goals.

2.3.2 Ambitions

Governance of such change presents significant challenge, given the sector-specific and administrative-boundary-focused implementation and operation of current individual infrastructures. This is the case in domains such as electricity, district heating/cooling, public and private transport, community spaces, lighting and other utility systems.

Success requires change to planning processes, alignment of budgeting, adoption of new business models, more collaboration in approval processes, and acceptance of joint operations and risk. However, with economic pressures, social opportunities, and technological advancements, the time is ripe to re-evaluate – at pace – how we can increase the value and performance of our shared urban infrastructures – existing and new. This must all be done whilst cities are in full motion, i.e. integration of new innovations alongside and within existing infrastructures. These are common and real issues, thus scalable, more common, and replicable solutions are of utmost importance.

Opportunities emerge through advancement in technologies and other innovations. Modern ICTs – social media, mobile devices, analytics, cloud, sensors – offer opportunities for digital transformation in cities. ICTs will become a critical skeleton linking infrastructures and users through real-time information – enabling cities to shift from reactive to predictive operations. This can optimise use of low carbon intermittent energy for both energy consumption and transportation applications. New and fast-evolving technologies include: embedded sensors that provide location and state information; near field communications that enables people to interact with infrastructures (e.g. transport ticketing systems); next generation technologies (e.g. change to energy efficient street lighting and ubiquitous bi-directional energy management); mobile devices as the ubiquitous means by which people can become a ‘sensor’ within overall city infrastructure systems.

Managing the flow of electricity around an urban area grid is vital to increase energy efficiency, e.g. through new mechanisms to interconnect energy users and energy infrastructures, so that they may moderate their consumption depending on the grid conditions as well as the energy carbon footprint. Similar approaches can be applied to urban mobility and other linked domains.

2.3.3 Recommended Actions

1. *Identify and implement visible, evidence-based examples of rapidly-available value from integrating infrastructures.* The on-going evolution towards smart grids in Europe clearly demonstrates the overall gains that can be had from sharing active and passive infrastructures, as well as related services, across sectors. What is needed now are more ‘quick wins’ that create visible added value almost immediately. An example would be “the humble lamppost” that as street furniture is also put to use as a strategic asset for WiFi remote-controlled CCTV systems (for safety, parking, and traffic monitoring), for communications (e.g. maintenance needs) and the like. We need more of such quick wins that offer early gains, as they will progressively build confidence and momentum.
2. *Develop a common architecture for integrated urban platforms* that can enable joint procurements and common solutions designs; and through which other cities can acquire solutions faster and with reduced technological risk.
3. *Build and test business models that resolve investment / return conflicts,* where solutions use common infrastructures between sectors.

Horizontal Priority Areas / Enablers

Decisions:

2.4 Citizen focus

2.4.1 Context & Challenges

Citizens are at the heart of a city and also at the heart of the challenges cities face through on-going urbanisation and demographic mix, consumption habits as well as increasing expectations as regards quality of life. Citizens must therefore also be at the heart of the solution. Yet presently, citizens are insufficiently engaged, motivated or empowered to contribute. And cities do not have a deep enough understanding of their citizens to actively and effectively engage them. A fundamental change is required, without which we simply cannot sustain current norms. With a better understanding of citizen's motivations, cities and their partners could define effective strategies and tools to equip citizens to be actors in smart city systems: ensure that they are informed, motivated to act responsibly, proactive and participative, or even co-create. If smartly mobilized, the effect of citizen's behaviour, choices, creativity and entrepreneurship could be enormous, offering huge untapped potential. ICTs play a vital role in this – particularly as the Internet, not least through smartphones, becomes all-pervasive – as well as the willingness to be open towards new citizen-driven initiatives that might not fit with the current administrative system.

2.4.1 Ambitions

When citizens are engaged in shaping their public spaces, public transport and public services, and there is a true culture of empowerment and co-creation between citizens and cities, as well as other relevant stakeholders, citizens can help build the cities and the services to better reflect their interests. From the provision of relevant information to citizens so they may make better decisions, to the harvesting of their ideas, and last but not least for the co-creation of designs the contribution of citizens can add to the efficiency and effectiveness of the innovation process. There is also a need for better feedback and incentive for those who participate, to make citizen engagement interesting and attractive. Existing urban knowledge sharing networks and user groups can play an important role in support of this. Experience from the private sector can help, as many of the concepts, processes and tools from business can be applied to the public sphere to help governments improve their own feedback and improvement cycles, whether they relate to infrastructure, societal issues or other problem areas.

2.4.2 Recommended Actions

The change to an 'outside-in' model of citizen-centricity requires a suite of actions, and a clear sustained commitment to make the change. There are however a few specifics that will accelerate matters, and whilst none of them alone may cause radical change, in combination they can support large scale sustained change. In addition it is important to give citizens relevant information in an easy to understand way, and to enable and encourage them to choose energy efficient and low carbon ways to work, live, and travel.

1. Develop a common European framework by which cities can achieve deep customer insights (citizen, business, visitor); and use this to accelerate experience sharing between cities. In addition create systems to encourage citizens to choose low carbon options.

2. Remove barriers from experimental initiatives that innovate and increase knowledge, and support co-creation. Examples could include: 'legislation hack days', or 'white label' applications for opinion harvesting.
3. Establish local citizens committees that can work with local public authorities, SMEs and larger industry as well as academia to set the local targets for smart city developments.

2.5 Policy and Regulation

2.5.1 Context & Challenges

Cities need an adequate set of framework conditions in the field of policy and regulations in order to be able to become smart. The need for action in the field of policy and regulation is highlighted by the following:

EU-wide complexity: policy and regulation is a EU, Member State and regional level prerogative, so change requires considerable due diligence processes

Silo Thinking: Cities, and authorities in general, often focus on stand-alone smart cities projects, which involve only specific parts of the municipal administration. The same holds at higher tiers of administration. Specialized staff tend to focus on their respective areas, and are less open to collaboration across thematic borders.

Regulations that inhibit smart city roll-out: Regulations, ranging from local permits for industry, to legal directives and acts that govern city-wide planning, to conflict with national standards, can all impede the implementation of smart cities strategies.

Uncertainty: Private companies are hesitant to invest in new technologies and infrastructure where there is policy uncertainty, and limited technology integration. Technological uncertainties and differences in technical standards between various countries often hinder a large scale, Europe-wide deployment of Smart City concepts.

2.5.2 Ambitions

A strategic vision backed up by all stakeholders and supported by long-term policies, regulations and frameworks is the basis for an effective and efficient change process. Alignment, both horizontally (different policy fields) and vertically (local, regional, national, EU), using a participatory approach guarantees a holistic view and commitment to the smart-city process.

2.5.3 Recommended Actions

Innovative forms of governance are needed to enable the integration of different stakeholders within the process. Platforms and forums (both formal and ad-hoc) are needed to bring together policy makers and experts to work on the identification and mapping of conflicts/gaps/hurdles; improvements to the regulatory framework (improve/abolish/consolidate and simplify) ; and to initiate a process of training and education for city stakeholders (sharing of knowledge/ best practices).

Actions needed on the policy level are the following:

1. Encourage cities to develop a Smart City Strategy and implementation plan to give this topic priority on the policy agenda and enforcing greater recognition of across policy domain thinking.
2. Challenge policy and regulation to enable the application of innovative funding models that combine existing public and private funding sources with new types of funding, which at the same time allow cities to gain more influence on their own finances.
3. Implement “innovation zones” in cities to test and evaluate the effect of revised policies and regulations, as well as consider different or reduced form of regulation in specific fields.

2.6 Integrated planning & management

2.6.1 Context & Challenges

Our current approaches are insufficiently agile to cope with a more entrepreneurial approach to planning, and to respond to the pace of change in demographics, societal expectations, and technology. We require a major change in capabilities; more inclusive and involving processes; and greater collaboration within and across traditional administrative and industry boundaries. Integrated planning and management involves spatial, temporal and technical coordination of diverse policy areas and planning resources to achieve defined goals using specified instruments. Its success requires the early, dynamic, and comprehensive involvement of multiple governmental and non-governmental players, private sector, and citizens. It is particularly challenging as it involves managing long-term planning perspectives alongside short-term actions, dealing with new levels of integration, and addressing a diverse set of domains to achieve political and professional ambitions – addressing both existing (retrofit) and new-build urban territory.

2.6.2 Recommended Actions

A number of initiatives are recommended to accelerate and demonstrate a better approach, specifically:

1. Improving collaborative governance mechanisms dedicated to integrated planning & management (e.g. a metropolitan-area / city-wide integrated planning forum).
2. Maximising the use of city-wide data (e.g. obtained through location-based city sensing systems and as part of city operations) to deliver a more dynamic and informed planning process across short and long time horizons.
3. Using urban simulation models to capture the dynamics and impacts of urban development, including socio-economic aspects. Interoperability with operational systems actually in use is essential for take-up.
4. Focussing on the use of energy-models and energy-mapping from district to city-wide scale, addressing all relevant sectors. This can deliver early benefits.
5. Using visualization, decision support and peer-to-peer-tools, to engage a broad stakeholder more intuitively and easily in the process.

Insight:

2.7 Knowledge Sharing

2.7.1 Context & Challenges

Cities too often share what they wish others to see – the good things. Real gains, however, also come from sharing what went wrong in a more open manner. Industry typically remains closed to cross-industry sharing, assuming more is unique than is often the case. What is shared could also frequently benefit from improved structure; from more focus on the evidence of achievement; and from a better means to compare initiatives respecting the different contexts of cities.

Sharing knowledge about new ideas and technical solutions, what works on the ground and what doesn't, is vital to ensure a broad uptake of innovative solutions. A lot of good practice and established methods of knowledge sharing already exist; including staff exchanges between city administration, mentoring, and peer reviews. However their application is too patchy, and too slow. These can be applied and further developed in different policy areas, governance levels, and sectors. This can help ensure knowledge on innovations is rapidly fed through administrative and sector systems.

2.7.2 Ambitions

Knowledge sharing must be facilitated, and take place at all levels – from international to local – and across sectors to maximise the impact and benefits of the EIP. Tighter collaboration between groups of cities and between sectors is needed. This will help ensure replication and uptake of good practices as well as broader engagement. At an international level, city networks play an important role in networking cities, industry and academia – and facilitate the sharing of good practice and knowledge in a wide range of areas. The European Commission also clearly plays a vital role in supporting knowledge sharing trans-nationally, also ensuring alignment with Horizon 2020 ambitions. At national level, member states must ensure that knowledge is shared between progressive and emerging cities and businesses. At city level, knowledge sharing must support exposure to new solutions, processes, models and ways of working. This will help build capacity within city administrations, which is particularly important given increasing integration across departments, and with external partners. Innovative solutions must be cascaded down through public administrations as well as to smaller private enterprises, to help speed overall uptake.

2.7.3 Recommended Actions

1. Increasing transfer of knowledge between cities and their partners is recommended (e.g. via conferences), by exploiting and improving on best practices. Encourage life-long learning.
2. As a quick win, enable 100 short staff exchanges annually from 2014 onwards between cities, industries and relevant NGOs; crowd-source best ideas from programme's alumni. Repeat regularly.
3. The appointment of “knowledge brokers”, at city level, is recommended to ensure the transfer between sectors and governance levels.
4. Initiatives must integrate knowledge sharing activities and replicability from the outset, with allocation of resources for that purpose.

5. A one-stop web-based tool at EU and national level for smart city solutions is also recommended to allow city administrations, developers and business to easily access and exchange information and ideas about new solutions.

2.8 Baselines, Performance Indicators and Metrics

2.8.1 Context & Challenges

There is a multitude of indicator sets in place, but only a few that are generally accepted. The result is that cities tend to use those that suit their purposes; and have significant difficulty in making a fair comparison between cities – and at times within their own city.

This Partnership seeks to support cities in becoming more energy efficient, using more renewable energy and saving 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 gains can be clearly evidenced – to city leadership and society. Measuring a city's progress can raise societal awareness for a low-carbon lifestyle, support industry in identifying new business opportunities, and help city administration in coordinating and monitoring the transformation process. For this, a comprehensive indicator system, based as far as possible on real data, is needed.

2.8.2 Ambitions

Although there are many good indicator systems in place for cities, such as the Reference Framework for Sustainable Cities, Global City Indicators Facility, the European Energy Award and the like; there is no broadly-accepted indicator system that reflects the 'smart city' approach. Developing one would enable cities to self-evaluate and compare their progress. This will require unambiguous operational definition of the term 'smart city' from which city indicators can be derived, and improved consistency and comparability of urban data among European cities. Greater acceptance is also required at city leadership levels to more openly report on progress against common agreed indicators.

2.8.3 Recommended Actions

1. Develop an agreed indicator system that allows cities to self-evaluate their progress towards "smartness" and compare with other cities in a more reliable manner. To ensure its broad scale application, the indicator system should be developed in a stakeholder process that engages city representatives and other relevant stakeholder groups, and is supported by the European research community.
2. Any such development must be based and start from existing such systems so to assure overall coherence. It should be developed for practical application in European cities, and take into account not only the outcomes of the EIP, but also build on experience from previous indicator systems for sustainable urban development. Besides the 20 / 20 / 20 targets, other aspects such as technological innovation, citizen engagement, transparency and social inclusion should be taken into account. It should comprise strategic (including political) as well as operational levels and be based as much as possible on real data. The operational level should be designed as an open framework allowing integration of future, and as yet unforeseeable innovation.

3. The indicator system should enable a city to measure progress in absolute terms over time, with reference to a baseline. It should also support relative progress in comparison with other cities; although this requires recognition of the different settings of cities (socio-economic; geographic; political & administrative etc), and consideration of the specifics of what is being compared. It is therefore recommended to link the indicator system to a typology of European cities.

2.9 Open data governance

2.9.1 Context & Challenges

The quantity of data collected globally in the past few years equates to the total volume we had amassed in all human history before. We are facing a profound transformation that will remain dynamic for many years to come. Such data can come from private, public, societal as well as commercial sources and can offer very significant potential, yet our ability to generate value at scale from this is still in its infancy. This must change: we need to speed up from the current experimentation stage towards the value adding stage. In doing so, it is vital to understand: what tools will help deal with the massive volumes; how to incentivise data owners to make pertinent data available to third parties; how to work with varying data quality and what formats will best support data interoperability; how to ensure that citizens and city officials have the right skills and understanding of data so that it can be effectively used; how to manage perceived and real privacy issues; how to offer customers a choice in data usage; and what regulations and policies must change. This is both an 'open data' and a 'big data' challenge.

2.9.2 Ambitions

By 2020 the data value chain in Europe will be developed at an industrial scale, data recognised as one of the key enabling resources of the 21st century with its quality, transparent accessibility and openness as well as conformity to shared formats ensured by design. Open and standardised data will have been recognised as the most economical way of achieving interoperability across a city's sectors and services. Citizens' trust into data-sharing arrangements will be secured through clear agreements defining which data is made public, which data is not, and how advanced anonymisation techniques will guarantee adequate privacy. A well-developed ecosystem of innovative industry and SMEs will develop new families of value-added services and applications drawing on and integrating this data across sectors and sources with a focus on (real-time) visualization and decision-support tools so that cities and citizens may make better informed decisions every day. Open repositories integrating data at all levels (local, regional, national, EU) will foster cross-cutting innovation and co-creation of services in smart cities.

2.9.3 Recommended Actions

In order to progress in reaching this next stage, radical changes must happen:

1. Drive cultural change: relevant data from public and private sources should be considered "open by default", and thus be made readily available also to third parties - with adequate anonymisation measures ensured by design; a focus should be put on building applications with a clear added value to citizen to make good use of this data.

2. Greater accessibility and readiness for integration of (open) data from the three principal source types (public, private and societal) along the lines and beyond the Directive on the re-use of public sector information¹⁴
3. Innovative forms of engagement of (open) data providers – with large-scale experimentations integrating the various dimensions of cities, data and partnerships
4. High-level services to be developed on top of open data models for interoperability (integration) across a city's sectors and services, visualization and data aggregation (at levels from districts, communities, to cities, regions, region clusters, etc.)

2.10 Standards

2.10.1 Context & Challenges

Standardisation can provide confidence in the market as it can support industrialisation of solutions; align approaches between city systems; speed replicability, and help to create scale. As such, different forms of standards (guides, frameworks, protocols and technical specifications) must be employed appropriate to the life-cycle of any system. Specific to smart cities, the variety of systems, the increased integration across them, and the dynamic and growing volumes of shared data, present a particularly challenging context. The lack of a common agreed means to support interoperability across city systems is inhibiting cities from confidently making advancement to: optimise real-time multi-modal transport data; integrate renewable energy sources into the grid and enable more dynamic operations; reduce variation in building systems; really exploit location-based information; increase citizen participation, or provide common platforms for developers.

2.10.2 Ambitions

Developing a holistic framework and programme for smart city standards is necessary, important, and non-trivial. This may involve both new, and updates to existing documents, presently managed by various international, European and national standardisation bodies.

A reference architecture into which standards can fit would enable interoperability between city systems and entities at many levels. New standards for Smart Cities should be developed swiftly with full consultation and agreement from relevant stakeholders, and with the principle of adoption / adaptation of existing materials. Examples of such include: internet protocols (IPv6), data formats (jpeg, xml), radio frequency identification (RFID) tags, and building energy performance standards.

2.10.3 Recommended Actions

1. The CEN-CENELEC-ETSI Smart Cities Coordination Group should set up a dedicated common technical committee and be closely involved in implementing the work of this Partnership, in a manner similar to the Smart Grid Coordination Group.
2. The present existing/planned standards landscape for smart cities and communities should be mapped out and gaps identified, involving various other stakeholders and consortia to participate in this process.
3. A common architecture for smart city information platforms should be developed to demystify and accelerate adoption of interoperable information platforms in cities.

¹⁴ Directive 2013/37/EU

4. Europe should be active at international / global level on standardisation matters (e.g. with ISO or the International Telecommunications Union) so to maintain Europe's pre-eminence in standards development, and promote Europe's competitive advantage in the development of Smart Cities and Communities.

Funds:

2.11 Business Models, Procurement and Funding

2.11.1 Context & Challenges

In most cases, new investments will be needed to generate the broad uptake of smart city solutions. However, due to the economic crisis and increased demand for public services (demographic change, care, transfer of tasks from central government levels etc.), the public sector – locally and centrally – has limited budgets. This means that new market-oriented and sustainable strategies of public-private cooperation must be developed and cities must seek greater levels of external investment. The investment community seeks certainty, and scale. However, most cities, at an individual level, presently deliver neither of these. Continuing 'business as usual' will not create enough value and scale for city administrations, cities, businesses and solution providers.

The goals developed in the vertical priority areas cannot be achieved in traditional ways, for several reasons. Firstly, there is a need for smart solutions that are developed in collaboration between citizens, local and global industries, municipal utilities and the local public agencies – this often defies conventional procurement and tendering procedures. Secondly, although solutions must be local, such typically small-scale individual solutions are unnecessarily expensive and preclude the development of a business case for innovative smart city solutions at pan-European scale. Finally, the matching and combining of complex city needs with industrial needs for longer term process and product innovation can be improved significantly.

2.11.2 Ambitions

Smart cities will integrate local solutions within a European or global market, by aggregating local demand and developing common solutions.

Business models for smart cities and communities should consist of a more modular approach to local ecosystem solutions, which can be used in cities throughout Europe, and thus define a European market for smart city solutions, technologies and products. Local ecosystems are collaborations between industry, governmental bodies and citizens to meet specific local goals.

Financing of smart city solutions will be possible, if investments in smart assets are used for lowering the operational expenditure. Investments from different stakeholders can be combined, making cost per implementation more affordable, by creating a European market for broadly usable solutions (aggregated demand), and ensuring a long-term perspective for investments. Citizens should be also involved in innovative “crowdfunding” mechanisms¹⁵, in order enhance their sense of awareness by getting tangible outcome from smart cities initiatives.

Procurement procedures need to be changed and new procedures need to be developed. For smart city solutions, cities need to participate in local governance entities, with joint ventures and joint investments. Cooperation between cities, aggregating targets and requirements across Europe,

¹⁵ EC public consultation on crowd funding http://europa.eu/rapid/press-release_IP-13-906_en.htm?locale=en

engagement and stimulation of technological providers along industrial value chains (e.g. from production of new materials to new ICT systems solutions, or systems to store energy) hold the potential to drive innovation much quicker into smart cities. This requires new forms of public procurement of innovation and engagement with industries.

2.11.3 Recommended Actions

1. *New business models with innovative local partnerships and adapted procurement* -. Enable cities to create local ecosystems: collaborations between industry, governmental bodies and citizens to meet specific local goals, with a valid business model addressing financial and non-financial value.
2. *Create a European market for innovation that opens up investment*. By creating a European system that incentivises and qualifies local ecosystems that are viable at local and European levels, they can bring innovative solutions that address specific city needs, and also add value towards addressing European challenges as a whole. By sharing solutions, more cities can apply similar approaches, and benefit from common designs and innovations. This will create scale, thus lowering costs and create a stronger business that can more readily attract investors.

3 Implementation – “Making European Cities & Communities Smarter”

3.1 A Commitment to Pace, Scale & Value

This SIP seeks to *accelerate* action; make an *evidence-based step-change* clearly visible; and do so at *scale*. This will require far greater collaboration within and across areas; a change to some traditional and complex city value chains; and the development and application of more common co-created approaches – implemented together, or at minimum repeated across Europe’s cityscape. In doing so we will create a more buoyant cities market that attracts funders and innovators. This is not only good for those that live in, work in, and visit our cities – it will also be good for the European economy in and beyond Europe.

Cities face chronic profound budget and economic pressures, and recognise the risk of non-attainment of 20/20/20 goals: a setting common to all. Cities are also at different stages in their smart city development. However, cities are becoming the new ‘*units of change*’ in our urbanising world. So, although the task of implementing this SIP, and its supporting Operational Plan, is not a – trivial one, there are clear drivers to do so – and in doing so, do it differently – recognising the vital role that cities play in achieving and sustaining our goals.

To move forward at accelerated pace in such a heterogeneous and complex landscape requires commitment and clarity of actors and roles. New forms of alliances are of utmost importance to ensure trans-sectorial approach. Different industries must come together, and current competitors must increase the level of collaboration. Likewise, cities may need to work more across their own administrative boundaries, and increase collaboration with other cities – in developing common approaches, common designs, and common solutions. The result of which will deliver *scale* and greater *certainty*, which will reduce risk and help attract investment.

The members of the High Level Group commit to support, promote and implement the actions of the SIP within the limits of their competences. It invites EU institutions, public bodies at all levels, industries, city networks, and academia to proactively contribute to make demonstrable improvement.

3.2 Making Implementation Happen

The concept of “*Lighthouse Initiatives*” is proposed as an important new vehicle to support success in deploying smart city solutions that will enable (over-)achievement of 20/20/20 goals, across the three domains of: urban mobility; districts and built environment; and integrated infrastructures. We propose to establish city-groupings that will commit, together with industries and other stakeholders to develop new solutions based on integrated technologies across the ICT, energy and mobility sectors so to develop common smart city solutions to address cities' needs. In doing so, and to optimise later scale-up, these city groupings should to deliver common frameworks and designs, and importantly also evidence the value these solutions deliver. An early on dialogue between these players has to be established and promoted under the Strategic Implementation Plan.

A process to form lighthouse initiatives should be established, that also ensure they address the key actions noted in this SIP. This will require collaboration between the European Commission, Member States and Industry, as well as the involvement of cities and research institutions. Over the next 7 years, we envisage a portfolio of at least 20 - 25 lighthouse projects each with approximately 6-10 cities (and partners), which have the potential for Europe wide roll out – dependent on levels of commitment, and access to / creation of funds. Successful lighthouse initiatives will provide a solid foundation and give confidence to other cities, in the knowledge they can apply tested solutions (and that have already attracted investment) – that will be better, faster, and cheaper to implement.

Success also requires action on the enabling themes discussed. We must target the main hurdles that stand in the way of innovation, replication, collaborative solutions, and rapid scaling in the EU – and work jointly with cities, as well as (EU and national) regulators, policy makers, industry and academia to develop appropriate solutions. So the likes of: exploiting modern ICTs to engage civic society to change habits; agreeing common protocols for information exchange (city information platforms); setting up cross-agency integrated planning boards; creating ‘innovation zones - incubators’ in cities where policy and regulations can be altered to foster innovation and increase pace of change; and applying new business models, will all be vital to success. These enabling actions will help strengthen capacity in cities as well as industries and SMEs and ensure that they can progressively support actions beyond these three vertical domains.

A number of principles will ensure focus and alignment in implementation: close city–industry collaboration; outcome and user-centric approach to service design; open governance and information principles; inclusive and balanced SME participation; integration of physical and digital infrastructures; actively seek to innovate, learn, and share knowledge; collaborative governance. These should be embodied in the set-up of the lighthouse initiatives.

3.3 Building the Cities Market

Action requires funds. Our ambition is to attract Investor, Industries, EC, national, regional and City funds to back these initiatives – both through conventional and new sources. In principle we seek to scale up ‘shovel ready’ solutions where risk is lower and funds can increase the scale and speed of impact. Less mature areas may warrant access to seed funds, and funding structures that adjust with time and outcomes. Ideally, EC and other public funds can create the platforms that attract highly-gear private / investor funds with confidence.

The “*European Advantage*”: this plan recommends various actions at a coordinated European level. There is a strong logic for doing so. Coordinated actions that enable increase take up and scale of shared integrated smart city solution can create a buoyant new cities market, and deliver significant benefit as a result: to European cities, European industry and SMEs, , and most importantly societal as well as sustainability benefits.

Accelerated progress and scale–up will be sustained through evidence of success, which will require monitoring and open reporting of delivery of value. Clearly, such an ambitious programme will require continued coordination, involving a range of actions and actors to support learning and knowledge exchange, and maximise value. The High Level group, Sherpa group, and Stakeholder Platform commit their support in this regard. The High Level group is also committed to meet on a regular basis to review the progress made, revise this plan as needed and push to overcome hurdles for the longer term implementation of the Strategic Implementation Plan.

The European Commission is invited to respond to this Strategic Implementation Plan (informed also by the Operational Plan in development), and consider what actions will help to build the necessary momentum that will help transform our cities and reach Europe's 20/20/20 energy and climate targets.