

# **Towards an ICT Infrastructure for Energy-Efficient Buildings and Neighbourhoods for Carbon-Neutral Cities**

**Final Report on the Advisory Group Workshop,  
9 September 2010, Brussels**

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## Executive Summary

*Energy Efficient Neighbourhoods* can be viewed as a strategic concept for Europe as they are a means of providing a pragmatic and innovative approach to addressing the EU's energy and climate objectives, while at the same time taking into account specific needs of Europe's cities and urban regions.

Implementation of such a concept in a number of strategically selected Cities, to act as test beds and pilots, should provide the information, motivation, and reassurance that other European Cities need to be able to adopt the concept, with knowledge, learning and technologies being directly transferable. Moreover, any such initiative should provide opportunities which will help ICT vendors to develop and grow their markets.

This implementation should be undertaken within the context of a distinctive European approach that:

- (i) takes account of European variety;
- (ii) is broadly based, involving all stakeholders;
- (iii) adopts a user centric approach;
- (iv) adapts technologies already developed, thus optimising investments already made.

The focus should be on working with the existing building stock, since this has the potential to create a bigger impact, and to provide a sizable market opportunity for commercial stakeholders.

Within the main phase of an initiative, many issues and technologies should be considered:

- ICT architectures should address stakeholder needs and provide the basis for infrastructures that are sustainable, secure, respect individual privacy and are cost-effective.
- Investigations should also be undertaken in stimulating citizen interest in energy efficiency including the potential role of social networking technologies.
- Socio-technical, socio-economic and inclusiveness issues should be identified at an early stage and these considerations should be used to shape the technologies, business models, etc. to ensure that these matters are not left as afterthoughts.
- Very importantly, standardisation and interoperability should be addressed, along with legal, regulatory, and business aspects, with the focus on identifying and resolving the key matters that might act as barriers to wider take-up at a later stage.
- There is a need to address the development of standardised benefit assessment methods and metrics, and to apply these on a large scale.
- Demonstrations (pilot projects) should be run over an extended period to capture variations in use, changes in attitudes, etc.
- Means of transferring knowledge and learning among participating cities, as well as dissemination to other non participating cities need to be defined, along with specific actions directed at public awareness.
- Technology adaptation needs to be undertaken, making full use of existing ICT technologies as well as results emerging from completed and relevant RTD projects.

- Appropriate measures should be investigated to enable cities to reduce their costs in implementing technologies.

Exploratory work, addressing the learning from other initiatives or domains, including good practices from other regions of the world, needs to be undertaken, along with the initiation of work on ICT and Smart Cities related standardisation, with involvement of the relevant standardisation bodies.

As part of this work it will be necessary to start building appropriate Public Private Partnerships, including widening the types of stakeholders involved, and to establish working groups to address key areas. Implementation of smaller scale pilots would also be beneficial as learning exercises before starting the main pilots during the initiative. These smaller scale pilots could also be used to establish a European Living Lab focused on *Energy Efficient Neighbourhoods*.

Valorising existing ICT-based solutions and initiating the development of certification procedures and labelling schemes should also be addressed, along with the identification of specific ICT technologies and solutions with wide applicability, and the investigation of technologies with more limited applications and the risks associated with their use.

Once this preparatory work has been completed, the initiative will be able to commence and move rapidly to Pilot implementation activities.

## Introduction

This stakeholder consultation in the form of a workshop was undertaken in relation to the European Commission's possible setting up of a European Innovation Partnership initiative focused on "smart cities", and addressing the EU's energy and climate objectives of achieving: a 20% increase in the use of renewable energy; a 20% cut in energy consumption; and a 20% reduction in greenhouse gas emissions; all by the year 2020.

Any such initiative would address, among other technologies, the topic of ICT and its role in helping to achieve sustainable cities. Specifically the ICT topic of interest, and the one addressed by the workshop, is an *ICT Infrastructure for Energy-Efficient Buildings and Neighbourhoods for Carbon-Neutral Cities*.

This workshop—held in Brussels on 9 September 2010—follows on from an earlier one, held October 8<sup>th</sup>, 2009, in which a group of experts met to provide to the European Commission with their initial views on ICT Infrastructures for *Energy Efficient Neighbourhoods*.

The purpose of this new report is to present the collective views and insights of the workshop participants (see Appendix 1), with a focus on providing firm recommendations for action. Individual perspectives can be ascertained by studying the position papers (published online). The focus of this report is on highlighting the many high level issues that need to be considered, and to make recommendations about specific steps that need to be taken and topics that need to be addressed, including how to move forward over the coming years in the lead-up to the launch of an initiative.

The document is structured to provide a short explanation, for the purpose of clarity, of the concept of *Energy Efficient Neighbourhoods*. An overview of the many topics and issues addressed is then provided, leading to firm conclusions structured around: *Energy Efficient Neighbourhoods* as a strategic concept for Europe; features that could provide for a distinctive European approach; strategy; specific recommendations on topics that need to be addressed; and actions for the short-term (2011-2013).

## Energy Efficient Neighbourhoods—The Concept

For purpose of providing clarity in the reading of this report, the workshop was focused upon considering the ICT Infrastructure aspects of the concept of *Energy Efficient Neighbourhoods*. This concept is sometimes also referred to as *Energy Positive Neighbourhoods*. In principle the concept could also be applied to individual buildings, but the focus of the workshop was on neighbourhoods.

An *Energy Positive Neighbourhood* is a systems level concept where the neighbourhood generates more energy than it consumes, with surplus energy being either stored locally or exported. This definition is neutral in terms of the specific details about the energy generated and used, which makes the concept a holistic one, as it encompasses all feasible energy production and use within the neighbourhood, and its transfer around the neighbourhood, in response to changing needs. This holistic aspect is one of the key advantages of the concept, as it enables those residing in, and those using the neighbourhood, to manage and reduce their total energy use. The concept is also generic as it can be tailored to specific circumstances and priorities that prevail in neighbourhoods.

Although the definition is formulated in terms of energy use, it is clearly linked to other strategic objectives, since to achieve an *Energy Positive* circumstance requires a reduction in energy consumption within the neighbourhood. One of the consequences of this is that

greenhouse gas emissions resulting from energy consumption should also be reduced. This reduction could be further enhanced by the use of micro-generation (e.g. Combined Heat and Power) within the neighbourhood, for example by using various small-scale generating capabilities and the use of waste (and waste heat recycling) streams for energy production.

The proposed concept is also an integrating one, as it brings together many technologies and techniques to deliver an *Energy Positive* circumstance. ICTs are thus just one dimension of the concept, but **ICTs also have a specific feature as they can be used in an integrating fashion, both in terms of providing design tools, and for the purpose of operational monitoring and control, as well as delivering specific solutions in their own right.**

## Topics Discussed by the Advisory Group

A wide range of issues and challenges were exposed and discussed. The content of these discussions are structured for the purpose of this report around the following themes:

- Socio-technical, Socio-economic, User, and Regulatory Issues;
- Existing Initiatives and Key Lessons;
- Opportunities for Improvements and the Added Value of a European Level Initiative;
- Industrial Expectations re Academic Contributions;
- Commercial, Financial, and Investment Aspects, Business Models, Targets and Benefits.

### ***Socio-technical, Socio-economic, User, and Regulatory Issues***

Consideration was given to a number of issues that highlight the fact that the concept of *Energy Efficient Neighbourhoods* is not just a technical one.

One key issue that emerged from the discussions was the importance of users (mainly meaning end consumers or citizens, but also businesses and public sector organisations). **Consumer awareness and acceptance were recognised as crucial issues that need to be considered.** To some extent these matters can be addressed through awareness raising campaigns, but these on their own are unlikely to be sufficient.

It is evident that the user dimension is not fully understood. Many assumptions are made in relation to behaviour, what people want, what they are interested in, or, that they even care about energy efficiency and carbon emissions. Are consumers interested in using ICT in support of their energy consuming choices? Will systems be bought and installed, only to be forgotten about when the novelty has passed? These are real concerns.

Moreover, behaviour may not always be static, but change as a household develops over time (e.g. as children grow-up and become major energy consumers in their own right). Hence it is evident that demonstrators, which are seen as an important element of the proposed initiative, must be run over long timescales so as to observe such changes in behaviour. Moreover, it has been suggested that ICT-based systems can be used to change behaviour. But is this really the case, or is this only applicable to specific types of individuals or groups? Are there limits on the behavioural change that can be achieved? Evidently more needs to be understood about the behavioural aspects, so that commercial stakeholders are in a better position to adapt products and services to real user needs and interests.

**Crucial to acceptance are matters relating to trust, privacy, security, and confidentiality.** These can partly be addressed through technology, and must be considered within the scope of the initiative, but trust and confidence can easily be undermined by inappropriate behaviour on the part of a minority. These issues must therefore be central considerations.

Related to consumer acceptance is the matter of ensuring that individuals and smaller organisations and businesses feel that they have something to gain. To be avoided is a circumstance where devices and systems are imposed upon them by big organisations (e.g. utilities and governments). **Moreover, users are typically not interested in specific technologies, just the services that they enable,** and this must be a central concern in the development of Pilots.

The user theme also emerged from several additional matters that were discussed. Consumers for example might consider any disruption caused by the installation of new systems in existing buildings as not being worthwhile, thus, this disruption might act as a disincentive to adopt. Also, there is a danger that consumers might become confused by an array of devices, technologies and systems and not understand which ones best suit their specific circumstances. This confusion might be further compounded if existing (governmental) advice is not revised to take account of the changing landscape of energy saving options. **Also, ICT-based solutions need to be clearly positioned within the context of other solutions that compete for the consumers' money (e.g. better insulation).**

Links to other energy and sustainability issues (e.g. transport, which is also part of the proposed initiative) were also addressed from the user perspective. These links clearly have implications for the ICT infrastructure, as an ICT infrastructure can support more than just energy efficiency. This might be very important for users, who might not want a whole range of different systems, but just one.

**Embodied energy, i.e. the energy that will be consumed in creating an *Energy Efficient Neighbourhood* in order to achieve operational energy savings, should also be factored into the initiative,** as failure to address this may be damaging to public perceptions. This aspect appears to be a key element in the development of common methods and metrics for assessing benefits (see later).

Some of the members of the Advisory Group mentioned ICT interfaces and devices for increasing awareness of energy consuming behaviour. These served to highlight **the need for an inclusive approach to ensure that systems can be used by the semi-literate, the visually impaired, elderly people, etc.**

Fuel poverty<sup>1</sup> was also mentioned. *Energy Efficient Neighbourhoods* have the potential to help resolve this social problem, but it is evident that the people caught in such circumstances are not going to be able to pay for the measures that will help them escape from the problem. This raises a difficult question—**how will people who cannot now afford to pay their fuel bills, gain access to the technology in a financially constrained public sector environment?** Partial solutions to this might be found through innovative business models, technologies, financing schemes and partnerships, and product/service offerings that are tailored to the needs of this group. These developments are unlikely to happen however, unless they become clear objectives for the proposed initiative.

Regulatory and policy matters are also very important and need to be carefully considered in the development of the concept and the initiative. Regulation should encourage innovation

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<sup>1</sup> Typically defined as a circumstance where a household has to spend more than 10% of its income on purchasing fuel/energy.

and enable the entry of new market players. There is also a need to ensure the harmonisation of regulation across Member States. On the other hand, changing regulations may not be helpful as this creates uncertainty. Hence there is a need to create some certainty by having a stable regulatory regime. Achieving the right approach to harmonisation is therefore going to be a difficult issue to address, but one that must be dealt with.

This issue of stability might also be important for consumers. It is well known that ICT lifecycles can be quite short. Yet consumers do not replace expensive capital items such as boilers, window frames, etc. on a frequent basis, just because something better is available. **Consumers therefore might expect that ICT systems used for energy efficiency should be supported for many decades and that these systems should not have to be replaced because the supplier has improved the product and is no longer willing to support older systems.** Some stability is needed, which implies long term commitments, even if something better is invented or available. Such an approach would be beneficial to several stakeholder groups as it will help to create economies of scale and improve the likelihood of return on their investments.

The clear message from the above discussions is that developments must be pursued that are in line with user needs, concerns, and wishes and that the user must have a clear idea of how to proceed, so that they will know what to do. These considerations point towards a user-centric approach, perhaps building on other initiatives related to user-centricity (e.g. living labs). However, it is acknowledged that this adds to the complexity of an already complex domain where it is necessary to deal simultaneously, and in a holistic way, with energy efficiency, energy security, and carbon emission objectives. Yet, leaving the complexity of the socio-technical, the socio-economic, the user, and the regulatory dimensions out of an initiative (to be considered as afterthoughts), would do nothing for its credibility.

Evidently these are all matters that should be integrated from the start, and be used to drive it forward.

### ***Existing Initiatives and Key Lessons***

Advisory Group members identified in their individual position papers many Smart City and Smart Grid type initiatives both outside Europe (e.g. in the United States, China, Japan, South Korea, Australia, Canada, and India) and within Europe. Initiatives within the EU were identified at national, regional and city levels. The initiatives also span many technologies and other issues. Further information about these initiatives is available in the individual position papers.

What are important about these initiatives are the lessons that can be learnt from them. In particular it is evident that the context for all these initiatives varies enormously, and this is an important point for the proposed initiative, given the variety that exists within Europe (in terms of climate, social and economic development, city types, priorities, etc.). **With so many initiatives underway, there is also a danger that resources will not be deployed in an optimal way as lessons learnt from one initiative might not be taken in to account elsewhere, and work done in one place may be redone several times over in other local initiatives.**

Consideration of other initiatives, and learning from them, can also be extended to cover work where similar issues may already have been tackled. An example is the existing body of knowledge that has been developed with regard to the use of Cooperative Systems in Transport applications, which is an inherent part of a neighbourhood's energy consumption. Cooperative Transport Systems are conceptually similar to the type of supplier-user

cooperative behaviour that is sought in *Energy Efficient Neighbourhoods*, and where, legal, regulatory, security, benefit assessment, etc. are already being considered. This raises the possibility of transferring and adapting work, which is feasible given that Transport is part of *Energy Efficient Neighbourhoods* concept.

### ***Opportunities for Improvements and the Added Value of a European Level Initiative***

It would be naive to state that there are no opportunities for Europe to make improvements in relation to the issues surrounding *Energy Efficient Neighbourhoods*. The Advisory Group particularly identified that in Europe there is a need to develop an understanding among (energy) suppliers of the role that customers can take, e.g. in helping to flatten energy demand curves (cooperative behaviour). Also it is clear that within the European context (as opposed to the contexts that prevail elsewhere in the world), **Europe needs to develop a better understanding of the optimum combination of building-specific and area-specific measures.**

A better understanding of the role and limits of legislation is also needed, and, given the heterogeneity inherent within Europe (e.g. in terms of national and regional cultures, population demographics, and individual interests and attitudes) European stakeholders need to be able to better handle these aspects.

A key issue is also developing a better understanding of the impacts that various technologies can have in terms of improving energy efficiency and reducing greenhouse gas emissions. **Crucial will be a faster process for standardisation in this domain, which will be an important element in achieving interoperability.**

With so many initiatives being undertaken at local levels, ensuring added value from a European level initiative is a key requirement. The Advisory Group highlighted that a European level initiative could be more broadly based than local initiatives and could also involve a wider range of stakeholders (e.g. standardisation bodies). It could also give consideration to complete, integrated, end-to-end solutions, and would enable City Authorities to address a wider range of issues and undertake follow-up studies, which at the present time is difficult for them owing to their budgetary constraints.

Sharing knowledge, experiences, good practices, etc. among initiatives was identified as a tasks that could be undertaken by a European level initiative, along with coordination to ensure overlaps are minimised.

**The major advantage of a European level initiative is that it would enable the consideration of common issues (technology adaptations, standards, interoperability, privacy/ security issues, etc.),** and this would be highly complementary to City level initiatives, as it would create some economies of scale, avoid duplication of efforts, and provide a basis for some harmonisation in areas where this is deemed to be both essential and beneficial. By working this way with City level initiatives, it would be possible to build on the strengths that Cities can bring to the initiative. These mostly lie in their understanding of local issues, constraints, etc, and in the ability of Cities to work in local languages and to set priorities relevant to citizens' wishes and local needs. This provides an opportunity to work with a multitude of circumstances, for example, old and new cities; residential and mixed commercial/residential neighbourhoods, etc., without the high overhead that would be associated with individual European projects attempting to work directly at city level.

The Advisory Group also identified the use of common ICT procurement as a benefit of a European level approach, enabling City Authorities to benefit from economies of scale. This of course needs to be addressed within Public Procurement procedures and rules. There is also an opportunity to implement pre-commercial procurement to help bring ICT research results to market, and to create a market for such results. This will be beneficial for ICT vendors, especially SMEs, which should be included within the proposed initiative.

**A key element and advantage of a European level initiative would be the opportunity that it provides to develop and test common and standardised assessment methods and metrics, which are important in enabling the comparison of results.**

The above represents the value added proposition that can be delivered through a European level initiative.

### ***Industrial Expectations re Academic Contributions***

Industrial stakeholders expressed the view that academic and research institutions have an important role to play in specific areas where industry has less expertise and financial resources to address key topics. Industrial expectations with regard to academic contributions were mainly to:

- Provide relevant education and training courses;
- Undertake research into the social (and psychological) dimensions;
- To develop methods and metrics for, and to undertake independent scientific studies of costs, benefits, and wider impacts; and
- Development of advanced city emission and energy consumption models, behavioural models, etc.

### ***Commercial, Financial, and Investment Aspects, Business Models, Targets and Benefits***

*Energy Efficient Neighbourhoods* pose many challenges for the stakeholders who will have to make financial investments. At the moment it is not clear who will pay for systems, who benefits and by how much, and where the investment money will come from. There are no clear mechanisms for sharing costs and benefits, and no clear business models that reflect the complexity of the stakeholder chain, which is a problem in common with other areas where several stakeholders stand to gain benefits, but some may have more market power than others.

**It was clearly identified that there is a need to address investment decision support through the provision of models and tools.** The Advisory Group also stressed that incentives will be needed to improve the likelihood of return on investment for suppliers and to encourage adoption by users. Along the continuum from a purely market-driven approach to tax-funded public schemes, there needs to be some appropriate mix that recognises that both private benefits will be gained (e.g. reduced energy bills) and public benefits (e.g. in terms of quality of life, environmental protection, eliminating fuel poverty etc.). What exactly this mix will be, needs to be resolved as part of the proposed initiative.

With regard to focus, there is a clear distinction between the new build scenario and working with the existing building stock, with the latter being more challenging, but having the potential for a bigger impact given that new builds are relatively small as a percentage of the

existing building stock (<2%). The existing building stock therefore provides a more significant market for ICT vendors.

**However the case for ICT as an enabler of energy efficiency still needs to be fully proved, especially at large scale.** This proof is one of the key enablers for the development of the market. **Hence the importance that is attached to developing and using standardised assessment methods and metrics and using the proposed initiative to prove the benefits.**

Given the uncertainties that surround ICT-enabled energy saving benefits, setting targets was not seen as the way forward. In any case targets might need to be different across cities, regions, countries and the adoption of such a flexible approach could be viewed as a strength for the proposed initiative, as it would be more realistic than setting targets that might in the end not always be achieved. This approach would also stress the bottom-up dimension of working with Cities. They would be free to set their own targets based on needs, constraints, priorities and circumstances. In effect this would enable the Cities to demonstrate what can be achieved in their own contexts, rather than imposing targets in a top-down fashion. Nevertheless some global objectives need to be specified, but these could be of a more general nature, e.g. maximising the use of technologies with general applicability to help ensure wider uptake.

The parameters considered should be broad, and include such aspects as behavioural change. **Areas to be considered for assessing impacts could include: reduced end-user energy consumption; local optimisation (balance supply-demand-storage); increased efficiency of distribution networks; reduced global constraints; as well as quality of life objectives.**

## Conclusions and Recommendations

The Advisory Group offers several conclusions and recommendations to the European Commission. These are structured along the following themes:

- *Energy Efficient Neighbourhoods* as a strategic concept for Europe;
- Features that could provide for a distinctive European approach;
- Strategy;
- Specific recommendations on topics that need to be addressed; and
- Activities in the short-term (2011-2013).

### ***Energy Efficient Neighbourhoods—A Strategic Concept for Europe***

The Advisory Group is fully supportive of an initiative built upon the concept of *Energy Efficient Neighbourhoods*. The Advisory Group believes that implementation in a few strategically selected Cities, who can act as test-beds and pilots, will provide the information, motivation, and reassurance that other European Cities need, to be able to adopt the concept, with knowledge, learning and technologies being directly transferable. Moreover, the initiative will provide opportunities which will help ICT vendors to develop and to grow their markets, and also provide them with demonstration sites. In addition the proposed initiative will assist all stakeholders to address issues of relevance to them, solve problems and create certainty concerning roles, business models, etc.

## ***A Distinctive European Approach***

Strongly recommended is a distinctive European approach:

- Where European variety is explicitly acknowledged and addressed and where Cities are enabled to establish their own sustainable development strategies and pursue their own priorities, work within their constraints, etc., so as to demonstrate what is possible in specific types of circumstances;
- That is broadly based, involving all stakeholders, and new ones, and which addresses soft (e.g. behavioural) as well as hard (e.g. technology) issues; and where all the relevant issues are dealt with from the beginning;
- Which is user centric, ensuring not only that user needs are addressed, but that users are involved in the decision making, in line with the emerging social trend towards participation and participatory democracy;
- That deals with the complexity of addressing simultaneously, and in a holistic way, energy efficiency, energy security, and carbon emissions.
- Where technologies are adapted and services developed which are then shared to optimise regional, national and European investments.

## ***Strategy***

For the sake of speed and efficient use of resources the initiative should build on what has already been done at city level. This implies working with cities that have already started relevant projects and made investments in technology infrastructure. However, it is also necessary to consider wider take-up and for this many other Cities must be involved to act as early observers and followers. This will help to create a circumstance whereby other Cities will be in a better position to replicate or adapt solutions to their own contexts. This is also important for helping to ensure wider applicability beyond the Pilot Cities.

Again for the sake of speed there should be an emphasis on technology adaptation, as time to market for an R&D driven approach would be too long. The emphasis must also be on achieving the right division of labour between the European level and the city level, as proposed earlier in this report.

The Advisory Group suggests that in order to deal with the complexity implied by *Energy Efficient Neighbourhoods*, boundaries need to be defined. Although the boundaries for the proposed initiative are the city, this initially may be too large from the perspective of *Energy Efficient Neighbourhoods*, owing to the potential complexity. To address this complexity problem, the focus should initially be upon distinct neighbourhoods within the city boundaries, and these neighbourhood boundaries could be based on several aspects (e.g. electricity sub-station coverage, functional aspects of the neighbourhood, etc.). The challenge will be to identify the most appropriate boundaries to consider. Later these boundaries might be expanded to increase the size and complexity of the neighbourhood.

The focus should be on working with the existing building stock, since this represents the most challenging area, and has the potential to create a bigger impact, and to provide a sizable market opportunity for commercial stakeholders. It is also essential to use the initiative to assess benefits at a large scale, which to date has not been attempted.

A phased approach is also recommended, with preliminary preparatory work being undertaken in the period 2011-2013, followed perhaps with a few smaller scale projects (as

learning exercises) followed then by the main, larger scale demonstrations. Throughout these phases, engagement with users is essential, and the initiative should be used as a mechanism for developing citizen interest in energy efficiency, and gaining their commitment to achieving the EU's climate change objectives.

### ***Specific Recommendations on Topics to Address***

While it is not possible at this early stage to foresee all relevant issues, the Advisory Group makes the following recommendations regarding topics that should be addressed:

- Technology adaptation needs to be undertaken, **making full use of existing ICT technologies** as well as results emerging from completed and relevant RTD projects.
- ICT architectures should **address stakeholder needs** and provide the basis for infrastructures that are sustainable, secure, respect individual privacy and are cost-effective.
- Investigations should be undertaken into **stimulating citizen interest** in energy efficiency including the possible role of social networking technologies.
- Learning and **adaptation from other domains** should be included to see what can be reused and what lessons can be applied to *Energy Efficient Neighbourhoods*.
- It is necessary to make use of what is available with respect to existing power transmission and distribution grids, suppliers, aggregators, etc., ensuring that the built systems **do not place demands on the utilities to deliver changes that are not feasible within the timescale of the initiative** and with the resources that they have available. The implications of this should be investigated.
- Demonstrations (pilot projects) should be set-up that run over an extended period to **capture variations in use, changes in attitudes**, etc.
- Although previous investigations indicate the potential benefits of using ICT as an enabler for energy efficiency, further analysis is still needed to prove the case for ICT as an enabler of energy efficiency etc., including benefits at a large scale. There is a need therefore to address the development of **standardised assessment methods and metrics**.
- **Sociotechnical, socioeconomic and inclusiveness issues should be identified at an early stage** and these considerations should be used to shape the technologies, business models, etc. to ensure that these matters are not left as afterthoughts.
- Appropriate measures should be investigated to **enable cities to reduce their costs in implementing technologies and systems**, including on-demand shared technologies and services, plug-and-play systems, revenue generating services for Cities, etc.;
- **Legal, regulatory, and business aspects** need to be considered, with the focus on identifying and resolving the key matters that might act as barriers to wider take-up at a later stage.
- **Standardisation and interoperability** should be urgently addressed, covering the selection, updating and adoption of standards as appropriate, and also covering the development of interoperability testing.
- Means of **transferring knowledge and learning among participating cities**, as well as dissemination to other non participating cities have to be supported.

- Specific actions directed at **public awareness** should form part of the initiative.

### ***Activities in the Short-Term (2011-2013)***

These activities should include:

- Establishing the ground rules including defining high level objectives;
- Exploratory work addressing the learning from other initiatives, domains, etc. including good practices from other regions of the world;
- Initiation of work on ICT and Smart Cities related standardisation, with involvement of the relevant standardisation bodies (ETSI, CEN, etc.);
- Building the necessary Public Private Partnerships, including widening the types of stakeholders involved (e.g. ISPs, consumer organisations, SME associations, building automation industry representation, etc.);
- Establishing working groups to address key areas (e.g. technologies to be used; business issues; social, behavioural matters; etc.);
- Implementation of smaller scale pilots as learning exercises before starting the main pilots during the proposed initiative;
- Valorising existing ICT-based solutions and initiating the development of certification procedures and labelling schemes.
- Identification of specific ICT technologies and solutions with wide applicability and investigation of technologies with more limited applications and the identification of the risks associated with their use.
- Definition of suitable neighbourhood boundaries within the larger boundaries of cities, to enable realistic testing of the *Energy Efficient Neighbourhood* concept.

## Appendix 1 – List of Workshop Participants

### Participants:

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### Invitees Who Could Not Attend, but Who Provided Position Papers:

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