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SMART CITIES INITIATIVE:  
HOW TO FOSTER A QUICK TRANSITION TOWARDS LOCAL  
SUSTAINABLE ENERGY SYSTEMS

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**EUROPEAN UNIVERSITY INSTITUTE, FLORENCE**  
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*Smart Cities Initiative:*  
*how to foster a quick transition towards local sustainable energy systems*

**LEONARDO MEEUS, ERIK DELARUE, ISABEL AZEVEDO, JEAN-MICHEL GLACHANT,  
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## **Abstract**

The European Commission has recently launched the Smart Cities Initiative to demonstrate and disseminate how to foster a quick transition towards local sustainable energy systems. Within this initiative, the three main challenges faced by pioneering cities, are to reduce or modify the demand for energy services, to improve the uptake of energy efficient technologies and to improve the uptake of renewables in the urban environment. We find that enough resources will need to be provided to a significant number of pioneering cities, and propose that the initiative would allocate these resources through project competition, rewarding innovation, ambition and performance, which have been ingredients of success at Member State level

## **Keywords**

Smart Cities, sustainable local energy systems, city authority incentives, EU energy policy



## **Introduction<sup>1</sup>**

The objectives of the European Union (EU) for the year 2020 are to reduce primary energy consumption by 20% with respect to the 2020 forecast, to reduce greenhouse gas emissions by 20% with respect to 1990 levels, and to have 20% of total energy consumption in 2020 produced by Renewable Energy Sources (RES). On a longer time frame, even more ambitious objectives will be required to go towards a near-zero carbon energy system by 2050 (Jones and Glachant, 2010).

Currently, about four out of five Europeans live and work in a city, with the share of energy use in cities being about the same. City authorities will therefore be instrumental to achieve the EU energy policy targets and they have the capacities to both enable and regulate the actors in the urban environment. The EU has already been successful in voluntarily committing city authorities to reduce their carbon dioxide emissions with at least 20% by 2020 (Covenant of Mayors). The EU Smart Cities Initiative's ambition is to speed up this transition towards local sustainable energy systems by supporting pioneering cities (European Commission, 2009a and 2009b).

Studies such as Kousky and Schneider (2003), Betsill and Bulkeley (2006 and 2007), Bulkeley and Kern (2006), Rabe (2007), IEA (2008a and 2009a), Satterthwaite (2008), Corfee-Morlot et al., (2009), Dodman (2009), Sippel and Jenssen (2010) and Croci et al. (2010) observe that local governments have started to become more involved in climate change policy-making and that national governments in some countries have been encouraging this trend. The contribution of our paper is then to discuss how the EU can further encourage this trend for its Member States in the context of the Smart Cities Initiative. This will be done through a strategic reflection on the key-challenges that are posed to the successful implementation of the initiative, and of the identification of the best answers to those challenges. This process includes a survey of instruments that have been used so far in Member States.

Our paper first elaborates on the role of city authorities in fostering a quick transition towards local sustainable energy systems. We consequently survey the state of the art instruments that have been used by Member States to mobilize city authorities, which we categorize into “tambourines”, “carrots”, and “sticks”. We then discuss what these instruments are and could be used at the EU level to support pioneering cities in the context of the Smart Cities Initiative.

### **1. The role of city authorities in fostering a quick transition towards local sustainable energy systems**

In this section, we elaborate on the role of city authorities in fostering a quick transition towards local sustainable energy systems. We first discuss the main changes needed and challenges faced by city authorities, which then allows us to discuss their role in the context of the Smart Cities Initiative.

#### ***1.1 Main changes needed and challenges faced***

In what follows, we discuss the three main changes needed, which are to reduce or modify the demand for energy services, to improve the uptake of energy efficient technologies and to improve the uptake of Renewable Energy Source (RES) technologies in the urban environment. We also collect experiences on how city authorities have been dealing with the associated challenges, with examples from Barcelona, Brussels, Copenhagen, Freiburg, Ghent, Heidelberg, London, Malmo, Merton,

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Munich, Samsö, Stockholm and Växjö (IEA, 2008a and 2009a; Bart, 2009; Cameron et al., 2004; EEA, 2006).

### 1.1.1 Reduce or modify the demand for energy services

The response of demand and therefore also the uptake of technologies that enable demand response (such as smart metering, smart appliances and smart applications for ticketing and intelligent traffic management, etc) are constrained by two main price distortions at the national level.

The first distortion is that prices can be artificially low because cost externalities are only partly internalized into the prices we pay for energy services<sup>2</sup>. For instance in transport, city authorities can counter this distortion with short and longer term measures. Examples of shorter term measures include installing an entrance charge to the city, regulating parking prices, or promoting walking and cycling (Calthrop, 2000; Proost et al. 2002 and 2009; Anas and Rhee, 2006). London is an interesting example of the first measure, Malmö and Växjö present examples of the second measure and Brussels is an example of the third measure. Longer term measures include the promotion of a compact city (Southworth, 2001; Muniz and Galindo, 2005, EEA, 2006). In this regard, the problem of urban sprawl can also be mentioned (Bart, 2009). Copenhagen is an interesting example of how a city authority can use its capacity as land use regulator to deal with this, so as to reduce the need for transport services, and at the same time also allowing a better development of the public transport system, thanks to its “finger plan”, i.e., densely developed fingers sticking out of the city, with green areas in between. Other examples include Stockholm and Munich, where urban development is oriented “nodally” around railway stations.

The second distortion is that energy service prices can be artificially equal across times and locations because they are often partly regulated and it is often a national policy to have equal prices. For instance in transport, city authorities can partly counter this by having time dependent entrance charges. Both London and Stockholm are examples of such a practice, having a so-called “congestion charge”.

### 1.1.2 Improve the uptake of energy efficient technologies

The main constraint for the uptake of energy efficient technologies (such as solid state lighting for street and indoor, insulation, vacuum insulation, vacuum windows, cool roofs, etc) is that they require a higher upfront payment<sup>3</sup> for savings on future energy bills, while many actors typically prefer the opposite when purchasing an appliance, facility or infrastructure (Jaffe and Stavins, 1994; European Commission, 2006; Schleich and Gruber, 2008; Eichhammer et al., 2009; IEA, 2009b).

There are two main reasons for this preference. The first can be conceived as an information problem. There is often a lack of information regarding these technologies and city authorities can be instrumental to give better information to the urban actors. Many examples exist where the city authorities have attempted to bridge this informational gap with different means: brochures, websites, DVDs, information centers, seminars, education, etc. (examples include Heidelberg, Samsö and Växjö). Furthermore, there is also a problem of information asymmetry, like in case of the landlord that will not make a higher upfront payment for energy efficient technologies because the corresponding energy bill savings go to a tenant that is not willing to pay more rent for this due to the

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<sup>2</sup> Note that fiscal policies can further distort prices to the extent that they apply a lower tax rate to energy services than to technologies that could save energy.

<sup>3</sup> For low energy buildings the additional upfront cost has been estimated in a range of 3-10% for the United Kingdom, France, Portugal, Spain and Italy and 4-6% for Germany, Austria, Sweden and Switzerland where more of these houses have already been constructed (Attali and Pindar, 2007; European Commission, 2009c).

information asymmetry between the two (Blumstein et al., 1980; Scott, 1997; IEA, 2007a; Gillingham et al., 2009; Schleich, 2009; Davis, 2010).

Second reason is transition costs. Parts of these costs are behavioral, e.g. actors typically only replace energy consuming appliances when their lifetime expires<sup>4</sup>, but an important part of it is due to the financing cost to cover this higher upfront payment for energy efficient technology investments that are typically many small-scale projects. City authorities can counter these costs by providing public funding (e.g. Malmö municipality subsidizes the installation of efficient lighting and ventilation systems) or can simply oblige urban actors to make the investment with regulations. For instance in buildings, city authorities can often make building codes stricter than the ones at the EU (European Commission, 2008) or Member State level (e.g. Freiburg and Växjö).

Note also that increasing the uptake of energy efficient technologies does not necessarily reduce the use of energy because there is a so-called rebound effect, i.e., the money savings from a higher efficiency can also increase the demand for energy services (Brookes, 1990). This effect can be significant (Greening and Green, 1997; Binswanger, 2001; UKERC, 2007).

### 1.1.3 Improve the uptake of RES technologies

Despite national support schemes for RES technologies that are allowing these technologies to come down their learning curve, the uptake of RES technologies in the urban environment (such as innovative hybrid heating and cooling systems from biomass, solar thermal, ambient thermal and geothermal with advanced distributed heat storage technologies) is constrained because of two main reasons (Coenraads et al., 2007; Ragwitz et al., 2007; European Commission, 2007a and 2007b; IEA, 2008b; Martinot et al., 2009).

A first issue is that RES is not so easy to integrate in the urban environment because of its low energy density (at least compared to fossil fuels), and because of administrative procedures. City authorities can be part of the solution because they are partly responsible for the administrative procedures, they often also own suitable sites (e.g. public buildings for PV), and they often have the authority to require other urban actors to use their sites for the uptake of RES. A well-known example of the latter is the Merton rule in the UK where 10% of the energy consumed by new buildings has to be locally produced with RES<sup>5</sup>. Another example is Barcelona that requires all new buildings and those that are deeply refurbished to heat water with solar energy. In Freiburg, the municipality created a network between energy companies and citizens, so the latter can rent their roofs to generators interested in investing in PV.

The second issue concerns the fact that RES technologies often require connection and access to the existing local energy networks that are often congested (e.g. electricity grids (Meeus et al., 2010)) or simply missing (e.g. district heating and cooling (Constantinescu, 2006; IEA, 2007b)). For instance in Malmö, the city authority made an agreement with the local energy company to share the expenses of the change of the network for the transition from natural gas to biogas.

## ***1.2 The role of city authorities in the context of the Smart Cities Initiative***

The expected role of city authorities in the context of the Smart Cities Initiative is to: 1// demonstrate that a quick transition towards sustainable local energy systems is possible with the implementation of an ambitious urban action plan; 2// contribute to the dissemination of good practices.

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<sup>4</sup> This so-called user persistence problem is very relevant because of the longevity of energy-using equipment. Note that for instance 75% of the buildings stock that will still be around in 2050 has already been built today (Urge-Vorsatz, 2007; Ravetz, 2008).

<sup>5</sup> Note that this has proven to be an effective way to reduce energy consumption so that less RES needed to be provided.

First, the ambition of the Smart Cities Initiative is unprecedented. For example, the city of Vaxjö, in Sweden, has been dedicated to the reduction of its carbon dioxide emissions since the 90s, and yet it could not achieve more than 30% reduction of its emissions between 1993 and 2005 (IEA, 2009a), while the ambition for the Smart Cities Initiative is to go towards a 40% reduction of carbon dioxide emissions (European Commission, 2009a and 2009b). This suggests that cities are expected to go beyond the practices illustrated in the previous section.

Second, the dissemination of the demonstration results in the context of the Smart Cities Initiative will be crucial to maximize its impact. It should therefore be ensured that cities contribute to the dissemination of good practices, which will require the development of evaluation and performance reporting standards.

Note that there are two additional considerations with regards to the Smart Cities Initiative, which are important but not part of the scope of this paper. First, cities can differ in climatic zone (e.g. north versus south of Europe), in size and wealth (e.g. east and west of Europe), and in their autonomy regarding higher-level governments (e.g. in Sweden, city authorities have substantial financial, constitutional and professional resource, while in the UK councils are limited to actions that common law or an Act of Parliament specifically or generally allows). As there are several types of cities, this also needs to be considered in the selection of the pioneers that will be supported. Second, a quick transition towards local sustainable energy systems implies that typically shorter term measures will be demonstrated. Still, the importance of longer term urban planning should not be overlooked as it has only recently been integrating concepts of sustainability, taking into account issues such as local and global environment, social equality, quality of life, public health, etc. (Wheeler, 1998).

## **2. State of the art instruments used by Member States to mobilize city authorities**

In this section, we present the state of the art instruments that have been used in Austria, Finland, France, Germany, Greece, Netherlands, Norway and Sweden (see Annex A for a short description and main sources) to mobilize city authorities<sup>6</sup>, which we categorize into “tambourines”, “carrots”, and “sticks”. The existing experiences with promoting measures at the local level are of high interest to review because the challenges identified in the previous section are not specific of the Smart Cities Initiative, but in fact apply to most energy initiatives at the local level.

### **2.1 Tambourines**

Tambourines are “soft” instruments whose main objective is to raise awareness among city authorities on what is expected from them. This type of instrument can therefore help solving the information problems that were mentioned in the previous section. The instrument can be dedicated to a specific part of the urban environment or even to a single technology, while it can also be used to raise awareness of city authorities in general. The most commonly used instruments include the development of information centers, the promotion of best practices, and networking.

First commonly used instrument is information center. They typically offer independent and free energy efficiency advices to individuals and also to companies. In France, *Espaces Info Energie* was launched in order to inform all urban actors on the local, regional and national policies and plans, and to help them make energy choices. In Germany, the government developed a similar program but specifically dedicated to residential buildings, *Heizspiegel*.

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<sup>6</sup> Within the presented programs and initiatives, there are some that are just in the beginning of their implementation process (such as the Dutch and the Finish initiatives); and others are more mature and have already been evaluated (as the Swedish, the German and the Norwegian cases).

Second commonly used instrument is promotion of best practices. One of the most known is the *European Energy Award* (EEA), resulting from the collaboration between Switzerland and Germany. This is a certification and quality management scheme to help ensure high-quality energy savings across city authorities. Here the city authorities are awarded according to the degree of implementation of possible improvement measures. Nowadays, there are several city authorities from different countries that became members of the EEA and they have been responsible for about 80 thousand tons reduction of CO<sub>2</sub> emissions per year.

Third commonly used instrument is networking. Even though the most known networks of cities promoting and transferring best-practices and learning among their members are international<sup>7</sup>, there are also examples of similar initiatives at the national level, including Sweden. Besides the networking, they also promote the diffusion of knowledge through training and the provision of technical consulting.

Across Europe, over 350 of energy agencies exist (national, regional and local), supporting ‘the introduction of good energy management’ and providing guidance and information (see Managenergy, Annex B). Such agencies often combine several of the instruments mentioned here above.

## **2.2 Carrots**

Carrots go beyond tambourines because they are about enabling city authorities to act. Following Olmos et al. (2010), three types of public funding can be distinguished based on their public cost: 1// public loans and guarantees; 2// public equity; and 3// subsidies.

First type of public funding is loans and guarantees that have the lowest public cost because they are refundable. Note that the public sector will only be able to provide loans and guarantees at a lower cost than the private sector in very specific cases, as when the public sector has a better understanding or coverage of the risks. Besides these cases, public loans can only be cheaper if they include a subsidy. In our survey, this instrument has not been used. Instead, the surveyed Member States have enabled third-party financing, i.e. involving so-called Energy Service Companies (ESCOs). In the case of the *Regional Market for Third-Party Financing*, in Austria, the regional government has facilitated city authorities to enter into performance contracts with ESCOs. These contracts partially transfer the risk of the future energy savings to the ESCO that is better able to manage this risk. These contracts often also include the necessary financing guarantees. In the case of Sweden, city authorities are encouraged to design action plans that include these kinds of third party financing schemes because this increases their likelihood to receive subsidies.

Second type of public funding is public equity, such as public-private equity-partnerships, which has a higher cost, except if there are profits. It is therefore typically used for risky infant technology where the cost of a public loan can be such that it only makes sense for the public sector to invest if part of the profits, if any, flow back to the public sector. Public equity is then about facilitating the incorporation of an entity that can do the targeted investment. In the survey, there is no reference to Member States using this instrument, but instead it has been adopted by city authorities. There is a long tradition of publicly owned utility companies in Europe. Inline with this tradition, city authorities have teamed up with local service providers to implement strategic changes to the local energy systems. In the case of Malmö, Sweden, the local authority, in collaboration with the local energy company, is performing a successive transition, of the gas municipal distribution network, from fossil natural gas to biogas (Malmö Environment Department, 2009).

Third type of public funding is subsidies that have the highest public cost as they are non-refundable. Note that there can be market failures that cannot be solved with loans and guarantees or

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<sup>7</sup> ICLEI is a successful example of international (at the World scale) networks. It is an international association of local governments, and local, regional and national organizations committed to sustainable development.

even with public equity, so that there might be the need to provide non-refundable resources. In what follows we illustrate the various innovative ways in which Member States have made use of this instrument.

In the case of Austria, projects on energy efficiency proposed by both city authorities and other urban actors can receive a subsidy. This subsidy covers part of the higher upfront cost, which is typically associated with the investment in energy efficient technologies. The city authorities willing to participate have to propose projects to financing; and the accepted projects are then connected to an ESCO that is responsible for all the different implementation, operation and maintenance stages.

In Finland, as part of the *Energy Efficient Agreements*, city authorities can receive subsidies for energy efficiency projects that concern municipality owned equipment and companies, and these are proportional to the energy saved and dependent on the technologies involved (higher the innovation level, higher the subsidy). The subsidies' allocation is done through project competition, according to the quality of the cities' strategy. The selection criteria focus on the ambition and feasibility of the plan, which has to be based on a subsidized energy audit. Both energy audits and the monitoring of the implementation are done by a specialized public-private company, and city authorities that do not follow their commitments can be expelled from the program.

The initiative implemented by the German government rewards cities for their innovative actions towards the reduction of carbon dioxide emissions. The prize is not more than a lump sum. To be eligible, city authorities must submit to the project competition concrete actions they have already completed. The received subsidy can only be used for additional investments in climate protection projects. The participants, winners or not, have reported a significant amount of emissions' reduction; it is estimated that the submitted projects are responsible for a reduction of about 580 thousand tones of CO<sub>2</sub> emissions per year. From the existent information, it seems that this scheme allows the achievement of significant results with a smaller budget, although it is not adequate for projects with high up-front costs.

In Greece, there is a subsidy scheme to support the refurbishment of old houses belonging to low-income families. The subsidy covers part of the investment, while the remaining has to be financed by the city authority or by the individuals. This is only applied to the implementation of concrete projects (such as insulation improvements, or increase of air tightness) and not to the development of a strategy. To receive this subsidy, eligible families have to make an application that is then evaluated according to its cost-effectiveness. City authorities are also subsidized to help on the identification of candidate families and to assist them in the application process. Additional support can still be given to families that apply through a dedicated information center.

The Netherlands is a unique case in what concerns subsidies to mobilize city authorities towards the reduction of carbon dioxide emissions. Within the *Climate Covenant*, the allocated subsidies cover part of both the investment linked with the evaluation of the current situation and the investment linked with the implementation process. The grants are defined according to the ambition of the targets taken by the municipality. When applying to this program, city authorities have to perform an energy audit (subsidized by the program), where an independent entity sets the targets and actions that can be subsidized. The CO<sub>2</sub> emission reduction due to the first phase of this program is estimated to be around 900 thousand tons. One of the biggest successes of this case is the achievement of an integrated approach, involving different local actors, which might derive from the fact that the targets and actions are not defined by the municipal government itself but by an independent entity.

In the case of Norway, instead of receiving support for the implementation process, city authorities can receive subsidies for the development of action plans. The subsidy is a lump sum, and unconditional, i.e. cities are not obliged to implement the projects mentioned in their action plans. The subsidies are allocated through project competition. The governmental grants resulted as a motivating factor to the development of local action plans. Nevertheless, most of the resulting plans are weak and without ambition; and, since the implementation was not mandatory, the majority of the strategies were never performed.

Sweden is responsible for one of the oldest local investment programs in the EU. In this case, the initiative allocates subsidies to projects proposed by city authorities that have significant impact in the reduction of carbon dioxide emissions. The subsidy is partly fixed, and partly variable, with the variable part depending on the performance according to preset targets. Only the cities that have already developed a local action plan towards a sustainable urban development are eligible. In order to receive funding, cities must go through a double selection process: firstly, cities are ranked according to the quality of their action plans and the evaluation is based on criteria such as the involvement of both the private sector and the involvement of the citizens in the plan; secondly, there is a selection of projects within the winning action plan, which is done according to their cost-effectiveness. The competitive design of this initiative counteracted the cooperation between municipalities but, at the same time, it worked as an incentive to develop strong proposals and clear strategic plans. Plus, the municipalities receiving funding have reported a multiplier effect. Though ambitious, most proposals lacked innovation during the first phase of the program, which according to experts resulted from the fact that subsidies were not enough to cover the risk. Currently, the financed projects are expected to reduce annual GHG emissions by over 1 Mton of CO<sub>2</sub> equivalent.

### **2.3 Sticks**

Sticks go beyond carrots because they are about regulating the performance of city authorities and sanctioning the lack of it. Sticks can help solve behavioral issues, and can also be a way of avoiding the public costs of using carrots, and still reach certain targets.

For example, in Norway, the central government issued a circular requiring to municipalities the development of local climate plans aiming at reducing carbon dioxide emissions and increasing sequestration. Also in Germany, the central government created a regulation requiring local authorities to create urban plans but only regarding land use and buildings; in this case, the regulation also specifies the plans' contents. Most Member States however only define planning guidelines at the national level.

## **3. How to support pioneering cities in the context of the Smart Cities Initiative**

In this section, we first introduce the existing instruments at EU level and then discuss the elements of a proposal on how to support pioneering cities in the context of the Smart Cities Initiative.

### **3.1 Existing instruments**

The Covenant of Mayors is one of the most recent initiatives of the EU. This has in common with previous initiatives<sup>8</sup> the focus on the creation of networking among city authorities and the spread of best practices. The main difference with previous initiatives is that it requires a stronger commitment from the city authorities that decide to join. Signing implies that the city authority commits to make a Sustainable Energy Action Plan (SEAP). There is a SEAP template that needs to be followed and this template requires city authorities to perform an energy audit, to set targets, and list a set of actions to reach the targets, and to do this for the built environment, the local energy networks, and the urban transport systems integrated in one plan. Signing also implies that city authorities accept to be monitored and cities that do not comply with the reporting rules, or fail to implement their self-defined targets, can be excluded from the initiative.

Despite the relatively strong commitment that follows from signing the Covenant of Mayors, close to two thousand Mayors have signed so that this initiative is already larger than its predecessors. This

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<sup>8</sup> Such as CIVITAS, Managenergy and CONCERTO, BUILD UP and the Eco-buildings concept, see Annex B, which are mainly tambourine type of instruments, but they often also support demonstration (i.e. sort of "pre-carrots").

can be partly explained by the carrots (i.e. referred to as supporting structures in the context of the Covenant) that are available for city authorities that join, which includes two instruments designed by the European Investment Bank called ELENA and JESSICA.

The Joint European Support for Sustainable Investment in City Areas (JESSICA) provides loans and guarantees (refundable) for the implementation stage of the action plan. JESSICA can only be used for city authorities belonging to Member States that agree that “their” Structural Funds such as the Regional Development Fund are used in this context. With JESSICA, the EU is taking up the role of a public lender, which exists also at the Member State level, while in the survey we rather found examples of Member States promoting partnerships of city authorities with private ESCOs. The European Local Energy Assistance (ELENA) supports the implementation of the action plan by subsidizing part of the investment, and by providing technical expertise to city authorities to find financing elsewhere.

There are also various other public funding schemes at the EU level. They include initiatives such as Energy Efficiency Buildings’ Public Private Partnership (European Commission, 2010), the European Green Cars Initiative, Intelligent Energy Europe Program, Municipal Finance Facility (for new Member States), European Regional Development Fund (ERDF), etc.

### ***3.2 Possible elements for a proposal***

In what follows, we first discuss the set of instruments, and then the implementation of instruments. We focus on “carrot” type of instruments because “sticks” cannot be used at EU level to mobilize city authorities (many Member States do not even have the authority to regulate city authorities), and the state of the art “tambourines” seem to be already at the EU rather than at the Member State level<sup>9</sup>.

#### **3.2.1 Elements on the set of instruments**

The expected role of city authorities in the context of the Smart Cities Initiative is to: 1// demonstrate that a quick transition towards sustainable local energy systems is possible with the implementation of an ambitious urban action plan; 2// contribute to the dissemination of good practices.

As discussed in section 1.2, the first expectation implies unprecedented ambition on behalf of the pioneering cities that will be supported by the initiative. In the Covenant of Mayors, city authorities define their own targets, with the requirement that these have to go beyond the 20% 2020 target (still very far from the 40% reduction referred to in the Smart Cities initiative). Plus, the ambition and innovation do not seem to be consequential for the support they can get at the urban action plan implementation stage via the instruments JESSICA and ELENA. The Swedish case indicates that this can be a problem. Sweden has a program that has been successful at reducing carbon dioxide emissions with 1000 kton annually, but the projects implemented have been limited in their ambition and innovation, and also limited transport projects have found their way to implementation. The Dutch and Finish cases provide state of the art examples of how this could be remedied, where the degree of ambition (or innovation) has an impact on the amount of public funding that city authorities can receive. Another option can be that the subsidy is specifically given to the investment in a certain technology. The promotion of ESCOs and their cooperation with municipalities can also be an option to reduce the risk of being innovative, as happened in Austria.

As discussed in section 1.2, the second expectation implies the development of evaluation and performance reporting standards. The Covenant of Mayors therefore has an important role in the

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<sup>9</sup> The experience with the European Energy Award (EEA) mentioned in the previous section illustrates that tambourines are naturally organized at the EU level because of the effectiveness regarding the transfer of information, and due to similar contexts and interests among European cities.

Smart Cities Initiative because it has already established a monitoring and reporting practice. The so-called Sustainable Energy Action Plan (SEAP) template could be extended to allow for the creation of a register of innovative and ambitious policy actions based on standardized performance reporting practices. Such a register can then facilitate the spreading of best practices (e.g. as in the case of Sweden).

### 3.2.2 Elements on the implementation of instruments

To support the necessary demonstrations by pioneering cities in the context of the Smart Cities Initiative, “subsidies” will be an important instrument. Based on the Member State experiences discussed in section 2, we can characterize the state of the art implementation of this instrument by: 1// the allocation method; 2// the evaluation of progress in the implementation of an urban action plan; and 3// the reward or sanction mechanism that is used.

First issue is allocation methods. The use of project competition to allocate the subsidies seems to be an effective way of distributing resources. This can promote innovation, public-private partnerships and even cooperation across municipalities, but the evaluation criteria need to be selected carefully. Criteria can include the technical consistency of the proposed plans (Neves and Leal, 2010), the financial capability of the city authority to implement the proposed actions and the involvement of different urban actors or the stimulation of public-private partnerships. In contrast with the state of the art Member State practices, it seems that the EU level instruments JESSICA and ELENA do not yet allocate funds through project competition. In the Netherlands, the government followed an interesting alternative to project competition, opting for an independent team to evaluate the cities’ potential of improvement, instead of project competition, and to define their targets.

Second issue is evaluation of achievements. To be able to evaluate, the creation of a standard methodology is key so that the comparison between projects and cities is possible. There are some cases where the evaluation is the municipality’s responsibility (Netherlands and Covenant of Mayors) while in others this is done by an independent entity (Austria). Both options seem to have good performances, though the first one needs some care to ensure that the measuring and reporting follow standard practices. In any case, the evaluation of the performance must be mandatory.

Third issue is reward or sanction mechanisms. The case of Sweden is an interesting implementation of performance based rewards with subsidies that are partly fixed, and partly variable, with the variable part depending on the performance according to preset targets. Sanction mechanisms are often limited to the expulsion of the cities from the program, which is also the case for the Covenant of Mayors. Though this seems to have no economic or political consequences, it can have a strong impact on the city’s public image. To condition part of the subsidy to the final output, as in the Swedish case, can be also an option to avoid that municipalities do not follow their commitments or even to prompt them to be more ambitious when defining their targets.

## **Conclusion**

Achieving a quick transition towards sustainable energy systems presents challenges that are enormous in magnitude and in the number and diversity of the actors to be involved. It is recognized that, along with measures taken at national levels (e.g. to decarbonize the production of electricity), the role of city authorities is crucial because of the energy using infrastructures and activities they condition (private buildings, transportation, etc.) or control (public buildings, street lighting, etc) so that they can also lead by example.

However, the resources (funding, but also technical expertise) needed at the city level to design and implement an ambitious sustainable energy action plan are often missing. Support for pioneering cities that can further demonstrate the potential of measures city authorities can take to modify or reduce the

demand for energy services and improve the uptake of energy efficient and RES technologies in the urban environment is therefore of strategic importance. A review of instruments used so far to develop effective local action on sustainable energy has shown that a combination of “tambourine” and “carrot” instruments are necessary to raise awareness and provide resources where they are missing, which can be public funding as well as technical expertise. The Smart Cities Initiative may therefore prove decisive in overcoming the difficulties by providing enough resources to a significant number of pioneering cities.

The lessons learned from two decades of energy management at the local level are that key elements for the initiative to achieve its unprecedented ambition include: 1// using project competition as an allocation method for public funding 2// making the allocation and the amount of the subsidy dependent on the degree of ambition and innovation of the proposed projects; 3// require planning, measurement and reporting of the performance following robust standard practices; 4// rewarding performance and sanctioning the lack of it, which could be monetary or simply related to the public image of the city (or the city authority). 5// disseminating good-practices, extending the information standardization to the creation of a register of innovative and ambitious policy actions.

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## Annex A

### **Espaces Info Energie (France)**

The French central government created an information centre that offers independent and free energy advice to individuals and small companies.

#### **Main Sources:**

Jollands et al. (2009)

### **Heizspiegel Campaign (Germany)**

Information system created by the German government that provides information to households regarding their energy consumption levels and the potential for improvements.

#### **Main Sources:**

Kern et al., (2007), Jollands et al. (2009)

### **European Energy Award (Europe)**

EEA is a certification and quality management scheme created by the cooperation between different entities in Germany and Switzerland. The aim is to help to ensure high-quality energy savings estimates.

#### **Main Sources:**

Jollands et al. (2009)

### **ICLEI Local Governments for Sustainability (International)**

ICLEI is an international association of local governments as well as national, regional and local organizations that have made a commitment to sustainable development. Its aim is to build capacity, share knowledge and support local governments in taking action.

#### **Main Sources:**

ICLEI website, <http://www.iclei.org/index.php?id=iclei-home>, visited on July 27, 2010

### **Regional Market for Third-Party Financing (Austria)**

Third-Party Financing is a program created by the regional government of Upper Austria to link municipal and private energy efficiency projects with financing in order to remove the barrier of upfront costs.

#### **Main Sources:**

Jollands et al. (2009)

### **Energy Efficiency Agreements (Finland)**

The Energy Efficiency Agreements are voluntary agreements between different sectors of the economy and the Finnish Ministry of Employment and Economy. In return of financial and technical support, municipalities agree on performing energy efficiency improvements in all municipal fully-owned equipment and companies.

**Main Sources:**

Jollands et al. (2009)

**Wettbewerb Kommunaler Klimaschutz (Germany)**

The *Wettbewerb Kommunaler Klimaschutz* is a project competition initiated by the German Federal Government to reward the most innovative cities and districts in actions that are responsible for significant reductions of CO<sub>2</sub> emissions.

**Main Sources:**

Kern et al., (2007), Jollands et al. (2009)

**Low-Income Retrofitting Projects (Greece)**

The Low-Income Retrofitting Program is a collaboration of the central government with the municipalities that promotes the refurbishment of old-houses belonging to families with low-income, through financial support.

**Main Sources:**

Jollands et al. (2009)

**Klimaatconvenant (Netherlands)**

Climate Covenant is a kind of voluntary agreement where the national government identifies the local targets and gives support to the local authorities to achieve those targets.

**Main Sources:**

Gupta et al. (2007), VROM (2007); Jollands et al. (2009), Berns (2009),

**Regulation and Grants regarding Local Action Plans (Norway)**

The Norwegian central government issued a circular requiring to all municipalities the development of local action plans to reduce CO<sub>2</sub> emissions. As a complement to the regulation, a grant was distributed among different municipalities to support the development of the plans.

**Main Sources:**

Aall et al. (2007)

**LIP and KLIMP (Sweden)**

LIP and KLIMP, created by the Swedish central government to support environmental actions at the local level, are large-scale state-funded investment programs that give grants to local environmental initiatives.

**Main Sources:**

Baker and Eckerberg (2007), Granberg and Elander (2007), Swedish Environmental Protection Agency (2009), Jollands et al. (2009)

**German Building Law Book (Germany)**

The national government created a regulation that requires municipalities to develop both building and land-use local plans, taking into account the necessity of reducing CO2 emissions.

**Main Sources:**

Deangelo and Harvey (1998)

## Annex B

### **CIVITAS**

CIVITAS is a European Commission's initiative that aims to support and evaluate the implementation of ambitious integrated sustainable urban transport strategies. CIVITAS' main contribution lies on the different demonstration projects, which usually include integrated packages of technology and policy measures in the field of energy and transport. The program is also responsible by the diffusion of best-practices, through information tools and also awards.

#### **Main Sources:**

CIVITAS, 2002, <http://www.civitas-initiative.org/main.phtml?lan=en>

### **Managenergy**

Managenergy was launched in 2002 to support the work of actors working on energy efficiency and renewable energies at the local and regional level. This support is provided through training and workshops as well as through the diffusion of information. Lately, they have also been creating some individual projects fully dedicated to the education of the younger generations.

#### **Main Sources:**

Managenergy, 2002, <http://www.managenergy.net/>

### **CONCERTO**

CONCERTO is a wide initiative addressing the challenges of creating a more sustainable future. Their support to local communities refers to the development of concrete strategies and actions towards a low carbon future, and it includes the interaction with experts, academics and private companies, as well as the promotion of demonstration projects.

#### **Main Sources:**

CONCERTO, 2004, [http://concertoplus.eu/cms/index.php?option=com\\_content&view=frontpage](http://concertoplus.eu/cms/index.php?option=com_content&view=frontpage)

### **BUILD UP**

BUIL-UP is an initiative created to raise awareness to all parties in the building chain regarding the potential of energy-saving measures in buildings; a web-portal tool was created in order to promote networking and transfer and promotion of the existing information and knowledge for energy saving measures in buildings across Europe.

#### **Main Sources:**

BUILD UP, 2009, <http://www.buildup.eu/>

### **Eco-Buildings**

Eco-Buildings is a program created by the European Commission in order to promote energy efficiency in

buildings by the use of demonstration projects, for both construction of new buildings and retrofit techniques.

**Main Sources:**

Eco-buildings, 2010, <http://www.ecobuildings.info/>

**Convenant of Mayors**

The Convenant of Mayors refers to a voluntary commitment by towns and cities across Europe to reduce their CO2 emissions beyond the EU's 20% by 2020 target. Participant cities are required to develop and implement their own Sustainable Energy Action Plan (SEAP), and to report and be monitored on their implementation of the SEAP's. Cities willing to sign up for the Convenant of Mayors but lacking the skills and/or resources to fulfill its requirements have access to some Supporting Structures

**Main Sources:**

Covenant of Mayors, 2009, <http://www.eumayors.eu/>

**JESSICA**

JESSICA (Joint European Support for Sustainable Investment in City Areas) gives Member States the option to use some of the Structural Funds (as the ERDF) to make repayable investment, such as guarantees and loans, in projects forming part of an integrated plan for sustainable urban development.

**Main Sources:**

European Investment Bank (EIB), <http://www.eib.org/>

**ELENA**

ELENA (European Local Energy Assistance) is a technical assistance grant facility to help local and regional authorities to unlock their sustainable investment potential; its objective is to increase the investment in projects in the areas of energy efficiency, renewable energy sources and urban transport. ELENA support covers a share of the cost for technical support that is necessary to prepare, implement and finance the investment program; summarizing, they help cities to prepare their projects funding.

**Main Sources:**

European Investment Bank (EIB), <http://www.eib.org/>

**Public-Private Partnerships**

Public-Private Partnerships (PPPs) were launched in order to promote research efforts in three large industrial sectors – automotive, construction and manufacturing. The initiative for the construction sector is called Energy Efficient Buildings' PPP and it will consist on a financial envelope of €billion to support the promotion of green technologies and the development of energy efficient systems and materials in new and renovated buildings. The European Green Cars initiative, the PPP for the automotive sector, has a financial envelope of €billion to support the development of new, sustainable forms of road transport.

**Main Sources:**

Pubic-Private Partnerships (PPPs), [http://ec.europa.eu/research/industrial\\_technologies/lists/list\\_114\\_en.html](http://ec.europa.eu/research/industrial_technologies/lists/list_114_en.html)

### **Intelligent Energy Europe Programme**

Intelligent Energy Europe Programme (IEE) supports cities' actions by subsidizing concrete projects that help achieve the EU's targets. These projects need to present a clear European added value and to promote partnership with other countries.

#### **Main Sources:**

Intelligent Energy Europe Programme, <http://ec.europa.eu/energy/intelligent/>

### **Municipal Finance Facility**

Municipal Finance Facility (MFF) is a program created by the European Investment Bank to strengthen and deepen the municipal credit markets by promoting the building, upgrading or refurbishing of small municipal infrastructure investments.

#### **Main Sources:**

European Investment Bank (EIB), <http://www.eib.org/>

### **European Regional Development Fund**

The European Regional Development Fund (ERDF) is a EU financial support mechanism that aims at promoting public and private investments to help reduce regional disparities across the EU.

#### **Main Sources:**

European Regional Development Fund (ERDF), [http://europa.eu/legislation\\_summaries/employment\\_and\\_social\\_policy/job\\_creation\\_measures/160015\\_en.htm](http://europa.eu/legislation_summaries/employment_and_social_policy/job_creation_measures/160015_en.htm)

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