Smart Cities
Stakeholder Platform

Financing models for smart cities
SMART CITIES STAKEHOLDER PLATFORM

FINANCE WORKING GROUP

GUIDANCE DOCUMENT

FINANCING MODELS FOR SMART CITIES

Document information

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DISCLAIMER

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The contents are the sole responsibility of the editor, the text and recommendations do not necessarily represent a full common position agreed by all members, nor do they necessarily represent the views of the institutions to which the members belong.
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ABSTRACT

The purpose of this document is to identify the barriers and potential solutions for the financing of smart city innovative technological solutions, in particular in the areas of low-carbon energy and transport, as well as ICT.

Barriers to financing smart city technological solutions can be summarised as follows:

a) Perception of high risk when investing in innovative solutions and energy efficiency measures;
b) Uncertain energy price policies and uncertainty about fossil fuel prices;
c) Large volumes of investment required;
d) Long-term delays before reaching maturity/profitability;
e) Limited capacity for public funding: high public deficits in municipalities and incapacity to raise funding from capital markets.

To attract the necessary capital for investments, smart cities innovative technological solutions have to be found to:

a) Reduce the real and perceived risks of investment;
b) Attract long-term finance from specialised institutions (i.e. pension funds);
c) Develop project aggregation mechanisms to create bankable and sizeable investments with reduced transaction costs;
d) Develop off balance sheet investment systems\(^1\) with private mechanisms (development of single purpose vehicles and PPPs)

This document discusses the potential financial mechanisms and models that can be applied to overcome these barriers, e.g. debt and equity mechanisms and the use of new contractual models. It also discusses how to integrate socio-economic benefits in the project preparation process to estimate the value of the benefits to society that cannot be recovered by the project. This allows estimating a justified and reasonable level of public subsidies required to implement a project which would be not bankable otherwise.

This document also details some existing best practices and links to further information.

\(^1\) Investments that are not registered as liabilities in the municipal budgets.
1. Finance Challenges

The responses to the Commission’s consultation on the Smart Cities and Communities Initiative[^2] indicated that respondents believed that innovative low-carbon products and services for smart cities should be supported by market uptake measures including: innovative financial schemes and facilities; the development of new business models, the standardisation and labelling of products and services; and public procurement.

Financing smart cities requires integrated solutions to ensure energy efficient urban development. Grids, energy efficient buildings, energy supply systems, transport and the behaviour of citizens will need to lead to considerable energy savings and green house gas reductions, which is the final aim.

Strategic planning, integrated municipal departments and procurement processes will need to be backed up by innovative financial mechanisms to leverage the necessary private funding to support the large-scale and to some extent radical transformation in energy use.

Specific guidance documents have been prepared for urban planning, stakeholder engagement mechanisms, public procurement and the use of EU funds. This document aims at further exploring non EU-led finance, as well as options for the future that can be launched with EU support, national support, local schemes or private financial institutions.

1.1 The opportunities and financial challenges

Over the next decade, the costs of energy will continue to fluctuate, and cities will strive to increase economic growth whilst achieving carbon reduction targets. In this context, there are likely to be increasing opportunities for the public sector to drive investment in smart technologies in the low-carbon and environmental goods and services (LCEGS) sector through public procurement by, for example:

- retrofitting of public sector building stock;
- smart energy grids and broadband access;
- electric vehicle charging infrastructure;
- installation of heat networks;
- onsite renewable energy generation;
- involvement in more general adaptation / mitigation initiatives.

There is growing recognition that the LCEGS sector is a growing part of the EU economy, with the associated economic and social benefits that this brings. This high value sector has potential for exponential growth based on increased global demand for low-carbon resource-efficient goods and services.

The long term socio-economic benefits of a smart city transformation linked to energy use are generally recognised, in terms of economic returns, as well as living standards and health benefits. Even if showing important economic rates of return (ERR), such a large-scale costly transformation is less attractive for private

financiers. The internal rates of return (IRR)\(^3\) of some components are uncertain and in some cases perceived as excessively risky. The more innovative the solution, the more difficult it is to raise finance.

Regulatory uncertainty also plays a role. Fuel and energy prices are highly dependent on policy frameworks. The lack of full costing of fossil fuel externalities, as well as changes in policy on feed-in tariffs and other renewable subsidies, damages the risk-adjusted internal rate of return on investment.

One can summarise the financial challenges as follows:

a) Perception of high risk when investing in innovative solutions and energy efficiency measures;

b) Uncertain energy price policies and uncertainty about fossil fuel prices;

c) Large volumes of investment required;

d) Long-term delays before reaching maturity/profitability;

e) Limited capacity for public funding: high public deficits in municipalities and incapacity to raise funding from capital markets.

To attract the necessary capital for investments, smart cities innovative technological solutions have to be found to:

a) Reduce the real and perceived risks of investment;

b) Attract long-term finance from specialised institutions (i.e. pension funds);

c) Develop project aggregation mechanisms to create bankable and sizeable investments with reduced transaction costs;

d) Develop off balance sheet investment systems with private mechanisms (development of single purpose vehicles and PPPs)

The EU, governments and public financial institutions have the capacity to develop the necessary tools to promote innovation and the deployment of novel solutions. This document will present a number of tools that either already exist or are in development, as well as potential long-term solutions.

However, it is important to note that not all challenges can be solved through financial engineering. Many barriers are regulatory and region specific. Member States should ensure that their regulatory frameworks are not creating barriers to innovation.

\(^3\) ERR estimates the total value of an investment including externalities (positive or negative). IRR represent the financial rate of return on the investment for the investor.
2. Removing the Barriers

The introduction of smart city innovations is hampered by a number of financial barriers. The lack of public financial capacity requires business models appropriate to attract private financing. Projects have to be bankable, but even when this is the case private finance is often not easily available. The reasons may be related to risk, long delays to maturity of investments, or to the impossibility of monetising the benefits of the infrastructure. This last issue is particularly complex. In such cases, an infrastructure with a clear positive socio-economic impact cannot be self-financing, because the positive results cannot be charged directly (such as an increase in public health, a better investment atmosphere in the region, etc). The Economic Rate of Return (ERR) to the city is high, but the Internal or Financial Rate of Return (FRR) is too low, thus public assistance instruments are required to compensate private financiers.

This document can only cover general rules and solutions for finance, as each project will need its own instrument based on the specific barriers encountered, the institutions involved and the regional economic circumstances.

This section will present the nature of the barriers and the potential solutions. This document does not detail specific instruments offered by financial institutions. For EU funds please refer to the guidance document on EU funds.4

2.1 Risk

Every investment is subject to risk and it is not the role of the public sector to remove reasonable risk levels and thus create perverse incentives, mutualising risks and privatising profits. In the area of novel energy infrastructures and energy savings schemes, risks, real or perceived, are however too high to attract the necessary volume of investment. By identifying the nature of the risks that limit private interest, the public sector can unblock private finance. In some cases public intervention can be very limited indeed.

2.1.1 Nature of risks:

**Technology risk:** Risk that the new technology does not perform as expected in real life deployment.

**Operational risk:** Risk that the operation of the infrastructure or technical application is suboptimal due, for example, to the lack of skilled operators.

**Construction risk:** Risk of unexpected complications or delays affecting the return on investment.

**Market risk:** Risk that the market demand for the new infrastructure or service is below expectation, leading to a loss making operation.

**Policy risk:** Risk that the regulatory framework changes, e.g. feed-in tariffs or carbon price, leading to a fall in the profitability of the project.

4 This document can be retrieved at www.eu-smartcities.eu/publications
2.1.2 Risk reduction instruments

According to risk and magnitude, different instruments can be deployed.

**Technology risks**

Technology risks are the most complex to address and uncertainty is significant, especially at the level of basic R&D. This is, however, a recognised area for public grant funding. The risk remains very high at the early stages of market deployment. Technology risks may be real or perceived. The risk level depends largely on the perception of the investors, and this is, for example, why there has been an absence of finance for energy efficiency projects because of a lack of understanding of the market opportunities.

The public sector can offer particular financial instruments to leverage private financing:

- **Grant co-financing**: to reduce the volume of investment from the private sector and thus the potential losses.
- **Equity support**: offering equity to private developers
- **Guarantees to banks and private investors**: sheltering the private sector for first losses of projects

**Operational risks**

Operational risks can be mitigated with the appropriate investment in skills:

- **Technical assistance** is key to reduce this risk.

**Construction risks**

To mitigate construction risks for private capital, public authorities and public banks can offer subordinate loans or guarantees for projects. In so doing risk premiums fall, reducing the interest rates for developers.

**Market risks**

The main market risk is demand risk, particularly in early deployment stages. Guarantees can be offered to reduce the exposure of projects to lack of demand in early stages. Another particularly strong risk perception is in the area of energy efficiency. Private operators find it difficult to capture the energy savings as a means to recover the investment. The lack of user data and the high transaction costs of single operations discourage investors. Therefore, energy efficiency projects require the agglomeration of many energy efficiency interventions (i.e. housing estates, districts), and the set up of a clear monitoring mechanism. Increasing the lending volume and the risk spreading attracts large financial investors.

**Policy risks**

Policy stability is an important condition for investment in the renewable energy sector. Investments are very sensitive to energy prices, and the carbon price or feed-in tariffs are a key part of the assessment of a project’s value. In some cases there may be a reasonable argument for such guarantees, for example in the case of a failure to reach expected price levels in the ETS, or compensating for policy u-turns in the area of feed-in tariffs.
2.2 Levels of investment and maturity

The levels of investment required for large city infrastructures may be very high. While support through loan guarantees may mobilise the private sector, this is not enough for very large projects, with long-term delays to maturity (and in particular innovative projects with higher technology risks).

Attracting funding for large projects with long terms to maturity requires the involvement of institutional investors, such as pension funds. This can only be achieved if the credit rating of projects is high; this is unlikely to be the case for innovative projects. To attract investors with a long-term investment perspective, there is a need to create the right product, i.e. a secure large project. The projects’ risks can be diminished through amalgamation, i.e. many projects financed together to spread the risk. The issue of bonds and the use of guarantees for the bonds is an efficient method to raise funding for an expenditure class, without exposing investors to single project risks.

An example of such a scheme is the planned EIB Deep Green Platform, which will issue bonds for energy efficiency projects in Europe. Bonds are discussed later in the paper.

2.3 Lack of profitability of projects with high socio-economic value

A significant problem in many projects with high social value is the difficulty in monetising their positive externalities. When a project is not profitable enough to make it bankable despite the existence of economic returns to society, there is a need to find a mechanism to recover some of the benefits to finance the projects. The most straightforward is with subsidies by the state. The transfer from taxpayers to the project developers and operators is a way to charge society for the benefits of the project.

Identifying the positive externalities of a project, quantifying them and deciding the level of public support is a complex matter. There is no single solution, but this report will provide an example of how this is being approached in the area of energy efficiency for social housing.
3. MODELS

The complex processes of urban and territorial transformation leading today’s cities to become a SMART CITY entail a series of actions and local initiatives, aimed at both creating value in the area and generating "returns" for investors. These returns can be of different types, often combined:

a) economic returns resulting from national and international financial mechanisms that encourage the use of renewable energy sources and the reduction of CO₂ emissions, for example through new market mechanisms such as White Certificates, Green Certificates or Emission Trading⁵;

b) economic returns resulting from the sale of new services such as distributed energy management, telemedicine, broadband availability, essentially achieved because of SMART infrastructures;

c) economic returns resulting from the sale of energy produced or saved and fed into the grid;

d) economic returns arising from the cost reduction of existing urban services, for both businesses and citizens;

e) efficiency returns generated by the increase in the quality and efficiency of urban infrastructures;

f) image returns: projects with strong implications of a social nature can attract the interest of Impact Investors, that is, those who are looking for initiatives able to generate blended returns (mix of financial and social returns).

The investment needed to promote SMART initiatives requires resources that are significant and often different from traditional ones. However, the current economic situation makes it very difficult to finance any project, let alone innovative ones. This does not only constrain spending and investment, but could also undermine the administrative capacity of public institutions to carry out projects for a SMART CITY.

3.1 Sources and types of financing: the basics

⁵ White Certificates, or more properly Energy Efficiency Certificates (EEC), are titles that certify the energy savings achieved by various parties through the implementation of specific interventions (e.g. energy efficiency improvements) and that are worth the recognition of a financial contribution, thus representing an incentive designed to reduce energy consumption in relation to a distributed asset. Green Certificates are a form of incentive through the issuance of bank bonds towards the production of electricity from renewable sources. Emissions Trading is an administrative tool used to control emissions of pollutants and greenhouse gases at EU and international level through the monetary evaluation of these emissions and the trade of emission allowances.
Innovative investment projects in the areas of energy, transport and ICT for cities hold many similarities with other investment projects. Raising funds for their financing is based on the same generic principles and models of investment financing as elsewhere in the economy. In order to better reach out to private sector investment sources it is therefore necessary to understand how private sector investment and financing decisions are taken. The text below is an extract with some adaptations by Medarova et al. (2013).

Investments represent decisions to acquire assets, be it real assets in the form of fixed and working capital (i.e. land, buildings, plants, equipment, but also patents, trademarks) or financial assets (i.e. securities, deposits), taking into account the operational costs of the investment over the lifetime of the projects. The financing decision then concerns the question of how much capital the company needs to raise in order to fund the related operations, and what the funding mix should include. Firms can generate capital internally, through their own net operating cash flows, or externally through equity capital markets, bond markets or the banking system (particularly for short- and medium-term borrowing).

The financial system acts as a conduit through which the cash surplus of ‘savers’ is channelled to companies and government entities that need cash. The various components of the financial system, the main actors and the way they interact are described in Figure 1. The cash-deficit firms that want to raise funds are on the right hand side. The suppliers of capital, mostly the household sector, are on the left hand side. The institutions and processes that facilitate the transfer of funds between these two groups constitute what is called the financial system (Hawawini and Viallet, 2007).

The financial system operates through two alternative financing channels, known as direct and indirect financing.

1. Direct financing

One way for firms to raise money is to obtain it directly from savers by selling them securities for cash. A security is a certificate that specifies the conditions under which the firm has received the money.

2. Indirect or intermediated financing

Very often, firms cannot access the financial markets to sell their securities directly to investors. This is the case in many newly established firms and also firms that are too small to issue sufficient amount of securities to appeal to investors. These firms rely on indirect or intermediated financing. Indirect or intermediated financing refers to raising capital through financial intermediaries, such as commercial banks, insurance companies, pension funds and venture capital funds that act as agents between the ultimate recipients of capital and the provider of capital.
There are a number of different actors involved. They include commercial banks, leasing companies, mutual and other funds, investment banks and venture capitalists\(^6\). Commercial banks typically offer short- to medium-term loans with terms of one day to ten years. Long-term loans can be obtained from insurance companies and pension funds. Venture capital firms supply equity to newly established firms with limited track records, and can either focus on short-term or longer-term gains (Hawawini and Viallet, 2007).

Each type of investor has a different appetite for risk. Some focus on debt instruments and others on equity. Their requirements for guarantees or security vary, as do the rates of return they seek, their degree of involvement in the companies in which they invest, and how they realize their return on investment. Therefore, different companies/projects, which have different size, risk profile and potential to generate a return on investment will pursue different financing strategies. For a strategy seeking to leverage funding to succeed it needs to be tailored to the interests of investors.

Outside of this core financial system, funds can also be obtained through government budgets, investment agencies and/or international financial institutions (ISD, 2002).

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\(^6\) These are investors providing capital to early-stage, high-potential, high risk, growth startup companies. The funds are usually provided as equity to the companies.
3.1.1 Senior debt instruments

Debt financing refers to the acquisition of funds by borrowing: a lender provides capital to a borrower for a defined purpose over a fixed period of time. These can be loans or bonds, structured as recourse or limited recourse debt with full or limited guarantees.

**Loans** can take a number of forms, but fundamentally they are of two types:

1. **Secured** – the borrower pledges a specific asset as collateral\(^7\), of which lender may take possession in the event of a default;
2. **Unsecured** – where there is no potential asset to take possession of in the event of a default; interest rates tend to be higher as a result.

Loans have three main elements:

a) Face (or nominal) value – the amount of money owed by the borrower;
b) Interest rate – the cost of borrowing, which will be higher for riskier projects; and
c) Maturity (or tenor) – the term over which the loan is to be repaid.

Financing with recourse means that the company stands behind the project or venture and the related debt; the financiers can have claim on the company’s assets in the event of default. Financing with recourse is usually used by companies for core investment activities.\(^8\) However, they also frequently opt for the so-called limited or non-recourse financing depending on the characteristics of the investment (see project financing below).

Debt instruments also include bonds, which are debt securities issued by companies or governments. They entitle the lender to recover the investment over a certain period (usually long term) with interest. Bonds provide the borrower with external funds to finance long-term investment. These are similar to loans, but are simpler to trade. If bonds are issued by project companies to raise funding from the markets for a specific project on a non-recourse basis, they are often called ‘project bonds’. EU Project Bonds are a financial instrument because they are enhanced by an EU/EIB-funded risk-sharing mechanism, to increase their credit rating. This reduces risks and the interest rate required by the investors to buy the bonds thus lowering the costs of capital for the promoters of the project.

For investors the strength of bonds is that these are classified as senior debt and are therefore the last financing source to cover the costs of any losses. This security is required, as bonds then have lower interest rates and long terms to maturity. A particularly interesting aspect of bonds is that they can be raised for a class of investment, a fund that is used to finance many projects, reducing the transaction costs of raising funds for single projects. Bonds are also easier to trade.

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\(^7\) Collateral is a borrower’s pledge of specific property to a lender, to secure repayment of a loan.

Debt instruments may require some sort of a guarantee mechanism. In some cases, where risks are too high to attract private finance, guarantee programmes/mechanisms (often publicly backed) could be provided for companies/projects to access debt financing. Guarantees can be applied in all phases of a project’s development to improve both access and the terms of financial products that would be under-supplied if there were no guarantees (Rezessy and Bertoldi, 2010). There are some common guarantee structures available:

- *Pari passu* partial guarantees (e.g. the EIB and the Commission offer guarantees sharing the risks in parallel);
- Portfolio first loss and second loss guarantee (e.g. the European Commission takes the first loss up to a designated amount, followed by the EIB with a second loss if the amount is exceeded);
- Subordinated recovery guarantees (providing partial coverage of risk exposure against loans);
- Loss reserves acting like loss guarantees, and liquidity support schemes.

Guarantees have an important function to bridge the gap between the perceived risks and the actual risks, thus assisting beneficiaries in providing them access to finance, reducing their cost of capital, and expanding loan tenor9 and/or grace periods10 to match project cash flows (Rezessy and Bertoldi, 2010). In other words, they can overcome risk-related barriers in financing companies/projects.

### 3.1.2 Subordinated debt and mezzanine financing

Subordinated debt finance is capital that sits midway between senior debt (e.g. long-term secure bonds) and equity in the order of repayments i.e. level of seniority. Because it sits after the senior debt, it is considered more risky in terms of collateral rights and right to cash flow as senior debt holders have preferential rights to those. There are fewer sources of subordinated debt financing. It is usually obtained from insurance companies, subordinated debt funds and finance companies, or it is raised with public offerings of high-yield bonds to institutional investors.

Mezzanine debt financing has features of both debt and equity financing. It is considerably cheaper than equity (it does not involve forgoing control of the company) and also could help raise sufficient capital to meet the risk-return requirements of senior lenders. It is often considered a complementary or alternative solution to portfolio guarantees as it can reduce or substitute the amount of senior debt (Rezessy and Bertoldi, 2010), but it is less suitable for large projects with long terms to maturity.

### 3.1.3 Equity financing

Equity financing refers to the acquisition of funds by issuing shares of common or preferred stock in anticipation of income from individuals and capital gains as the value of stock raises. Equity is a residual claim or interest and the most junior class of investors in an asset, after all liabilities are paid. Equity financing can

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9 Period of time until a loan is due.

10 The initial time where no repayments are due, or a period after the due date of a loan where late payments are not penalised.
come in the form of public listing or private equity (venture capital or growth capital).

There are different levels of seniority of equity and debt financing when it comes to the order of repayments. Depending on who is the lender and what are the agreements on the debt and equity, the finance for a company can be listed in the following order of repayment priority. The top form of financing needs to be reimbursed first and at the bottom there is equity, which can only be paid once all other loans have been covered (if anything is left):

- Senior secured debt
- Senior (unsecured) debt
- Subordinated debt (mezzanine financing)
- Equity

The financing architecture of a project, such as the share of equity financing and any risk mitigating public support, needs to be measured according to the needs of potential investors. The risk-return tradeoff has to be right. For each risk level, investors need a minimum return to participate, and the higher the risk, the higher the return needs to be. Either the risks are mitigated through financial instruments or the ratio of debt to equity has to be lower. Public equity with low interest can thus allow higher returns to be spread among private investors, improving their risk return prospects.

3.1.4 Public finance mechanisms

Governments are able to design expenditure/investment programmes in order to respond to investment needs and respond to market barriers and market failure. This can take the form of traditional grant support schemes, technical assistance, soft loans and other forms of financial instruments (including debt and equity).

Grants are a traditional form of support, which do not normally require repayment. They are often used to support high upfront costs for some projects or basic research. Grants can increase the financial rate of return on investment and leverage additional resources through requirements on co-financing / matching funds.

Interest subsidies (i.e.) soft loans are another instrument often used by governmental institutions/agencies. Common conditions for soft loans usually entail:

- Extended payback periods;
- Low or zero interest rates;
- Short-term interest deferral periods; and/or
- Inclusion of payback grace period.

Revolving funds offer loans that can be repaid with revenue earned, which can then be reinvested in new projects in the same area. Revolving funds are considered to be particularly important when liquidity is scarce.

Financial instruments are increasingly being used by governments to attract private investors. These are combinations of grants and loans aimed at changing the costs and risk return profile of projects to attract investors, and expand the leverage of funding from the private sector to finance projects with public objectives.
3.2 From public funding to contractual models

Traditionally, a lot of energy and transport infrastructure has been financed directly from public funds. There is, however, a need to better use the limited public financial resources and change the model for financing new “smarter” infrastructures.

This requires that the funding model to realise a SMART CITY shifts from the use of “traditional” tools such as public (e.g. municipal, regional, national) resources to contractual models of Public Private Partnership (PPP), able to attract private capital.

There are essentially two categories of (private) investors: i) big investors able to sustain high financial pressures, and ii) small investors able, by associating, to establish a "critical mass" sufficient to trigger processes of urban transformation foreseen in SMART initiatives.

3.3 Investment needs for Smart City projects

Defined as above, the Smart City system imposes a threefold need:

a) To create mechanisms of private investment incentive and aggregation.

b) To identify criteria aimed at determining the level of priority and feasibility / sustainability of the SMART initiatives, able to verify the bankability and the cost / benefit ratio with respect to the real needs in the area.

c) To protect the security of investment through the implementation of security mechanisms and data quality certification.

Figure 2. Scenario of the funding mechanisms for SMART initiatives
3.4 The pivotal role of stakeholders in the new investment model

The Smart City scenario imposes a dynamic organizational model whereby five major types of stakeholders are essential:

1. **Promoter bodies**, which promote the implementation of SMART initiatives (infrastructures, new services, etc.). These bodies can be national authorities, administrative bodies, government agencies, large private investors, etc.
2. **Achieving bodies**, which are in charge of physically building infrastructures and SMART services and of ensuring efficiency over time. These entities can be businesses, construction companies, etc.
3. **Financial institutions** whose task is to aggregate flows of investment by private capital, through PPP mechanisms. These entities can be banks, foundations, capital management bodies, large private investors, etc.
4. **Certification authorities** that are able to evaluate the effectiveness of SMART initiatives, to certify and protect sensitive data and investors’ information. These bodies can be scientific institutes, consortium companies, financial certification companies, etc.
5. **Guarantor bodies**, that, through systems of insurance policies, provide coverage of private investments made through PPP mechanisms. These bodies can be insurance agencies, national banks, international banks, capitals management bodies, foundations, managers of programmes and/or national and European investment funds, etc.

3.4.1 The certification authority

The role of certification authorities is crucial: when private capital is scarce, both from industrial and financial operators, and where there is very little ability to attract international resources, the PPP funding mechanism can only be successful where projects are structured in a new way, with a clear explanation of procedures and timing, risks and allocation, social and financial results.

If so, private capital will even succeed in leveraging public resources, which in Member States with austerity policies will most likely come from the EU. This is so because where private capital is involved, there is a greater attention to ex ante evaluation; which increasingly become a pre-condition of public funding.

Equally, there is greater attention to the management dimension, as well as affordability and sustainability over time. In the past, the availability of substantial public resources enabled the financing of projects often only because the initial capital costs were taken into consideration and not the operational costs.

The involvement of private capital requires the construction of economic and financial plans where investment costs, operating costs, capital costs, implementation and management timelines, and revenues are clearly laid out. The business plan becomes the document where the public and private interests find a synthesis. Without such a balance, there is no public-private partnership, and most likely no Smart City investment.
3.4.2 The guarantor bodies

The other important bodies for the new finance model are the guarantor bodies. In order to raise substantial funds on the market for strategic investments in the energy, transport, environment and digital technology sectors, there are financial tools that can contribute to the role of guarantor for Smart initiatives. For example, the "Margerite" Fund, which consists of a capital tool aiming to "catalyse investments in infrastructures necessary for the implementation of EU key policies in the fields of climate change, energy security and trans-European networks".

Box 4.1: Tools by way of debt at the EU level

a) LGTT, the Loan Guarantee instrument for TEN-T projects, designed for transportation projects, intended to cover the risks represented by scarce revenues during the initial operation phase of a given project;

b) SMEG, the guarantee scheme for SMEs that provides counter-guarantees to national guarantee schemes, as well as direct guarantees to financial intermediaries in order to increase and improve the offer of financing with debt capital to PMIs.

c) Among the tools that combine support for capital and debt, there is the European Fund for Energy Efficiency, a structured finance tool set up to invest in energy efficiency and renewable energy projects, promoted by local authorities, and in particular to support the development of energy services companies.

3.5 New funding mechanisms

There are a number of financing mechanisms that can be used for specific needs, depending on the nature of the investment, e.g. the level of maturity, the size and the time to financial recovery.

This section describes the following:

- Models for early demonstration and deployment of innovative solutions using a grant, guarantee and loan blending mechanism.
- Project financing
- Spread shareholding
- Smart bonds
- Crowdfinance
- Energy performance contracting for energy efficiency

3.5.1 Financing demonstration and deployment of innovations

Low-carbon technologies go through the same innovation and deployment cycle as any other technology, i.e. from basic research to demonstration, to pre-commercialisation and finally to commercialisation. While low-carbon technologies have a considerable market potential, some of them have long lead times before reaching commercialisation. The latter is particularly true for complex technologies in the energy sector. The level of technological maturity as a key risk for low-carbon investments changes along the technology innovation cycle, and with it the suitability of financial instruments to address this risk appropriately. Figure 2 illustrates how grants and financial instruments can address specific risks at specific stages of the cycle. Figure 3 presents the
relationship between the valley of death (or technology death risk area) and the costs and profitability of projects.

For basic research and first and limited demonstration tests, grant finance is the most appropriate financing mechanism. Once the basic research period and pilot testing is over, there is generally a need for large scale testing and/or demonstration. At this stage of the innovation cycle a considerable amount of finance is needed, which is however often difficult to attract. This stage of the process is often described as the technology ‘valley of death’ (Murphy and Edwards, 2003). Grant finance is often no longer available and revenue is not yet generated.

At the same time, risks are still rather high (UNEP, SEFI, 2005). Technical risks are related to the potential failure of the innovation. Operational risks are caused by unexpected implementation problems, higher maintenance costs, losses due to unexpected delays or the absence of required infrastructure. Other risks include regulatory and financial barriers independent of the technology itself, such as price expectations of energy and potential regulatory changes, and finally the risk that the operator goes bankrupt due to this or other operations. In order to bridge the ‘valley of death’ public support can take the form of soft loans or loan guarantees. Private equity may be available in the form of venture capital (which may be triggered and leveraged by publicly backed financial instruments).¹¹

**Figure 3. Financing the low carbon technology innovation cycle**

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¹¹ Text adapted from Medarova et al. 2013
There are a number of support schemes in the EU to assist innovative businesses to start up or to demonstrate and deploy innovations.

For large and mid-cap companies, the Risk Sharing Financing Facility (RSFF) provides loans for up to 50% of the costs guaranteed by the EU budget and also provides an equity facility.

For mid-cap and small and medium enterprises there is the Risk Sharing Instrument, which is supported by the EIB and the EU budget. It is available through financial intermediaries.

To access information on how to use those facilities and the intermediaries please refer to:

http://www.eib.org/products/rsff/how-to-apply/index.htm
http://www.eif.org/what_we_do/guarantees/RSI/index.htm

3.5.2 Project financing

Project financing consists of a financial transaction through which public administrations fund public works whose financial burden is partly or wholly borne by private capital, on the basis of a financial plan able to ensure a self-financing process of the operation itself (Procurement Code, Art. 153).

The main guarantee for the repayment of the funding is represented by the cash flows of the project, which must be demonstrated with appropriate levels of certainty, and by an effective management of risk, which gives the opportunity to limit the possibility of a reduction in the expected cash flows.
The economic / financial sustainability assessment of an individual initiative is based solely on the quality (intended as the ability to generate cash flows against a certain level of risk) of the individual project and not on the creditworthiness of individual shareholders.\textsuperscript{12}

This financing mechanism can be used for a broad variety of projects; one of its particularly interesting applications is the financing of large-scale infrastructure-related projects.

3.5.3 Smart bonds

Smart bonds are real purpose bonds (that is, bonds that are paid off following the achievement of a specific goal, such as the construction of infrastructure, the implementation of a service or an efficiency increase); their return is guaranteed by the economic benefits derived by the SMART initiatives financed in the area. Through smart bonds many small private investors are involved in contributing to the creation of infrastructure that over time produces an economic return for all the stakeholders, including the investors themselves.\textsuperscript{13}

3.5.4 Spread shareholding

The spread shareholding mechanism is similar to that of smart bonds, but with one major difference: investors do not buy bonds, but shares of ownership in the infrastructure that they are financing through their investments. This type of investment involves a higher level of risk for investors, but also the possibility of a greater profit. Investors in fact become owners of a part of the Smart infrastructure, and share the profits.

The spread shareholding and the smart bond mechanisms can be used in combination, creating two funding lines integrated into a concept similar to that of the banking investment lines: "guaranteed" (low-yield bonds) and "at an increased risk / profit" (the stock market).\textsuperscript{14}

\textsuperscript{12} The difference with respect to the spread shareholding mechanism is that the ownership of the infrastructure is not shared between the shareholders but belongs to a single entity, which distributes profits among investors for a specific period of time on the basis of contractual arrangements stipulated \textit{ad hoc}. This system has been used, for example, for an energy plant in Turin, the first case in Italy of a wholly-owned public society funded through project financing, fully underwritten by BNP Paribas – which in January 2008 awarded the tender for the procurement of financial resources - and involving the financial participation of the EIB, UniCredit Corporate Banking and SACE .

\textsuperscript{13} The return to investors is represented by a fixed interest rate, high enough to ensure the competitiveness of the smart bond mechanism in the bond market. This system has similarities with the Social Impact Bond system: bonds with social impact, that promise gains to investors only if certain performance targets are achieved. This type of bond is much used in the UK, which in 2010 developed the first Social Impact Bond through the launch of a pilot project dedicated to the care of detainees and thanks to the collaboration between different organizations that operate both inside and outside prison. The project aims to bring down the rate of crime recurrence: if it drops by 7.5%, investors receive an annual payment - guaranteed up to 37.5% by the Ministry of Justice and to 62.5% by the Big Lottery Fund - which can reach a maximum of £ 8 million depending on the degree of success achieved. The data collected so far appear to be substantially positive and investors have a good chance of seeing their capital yield at the end of the project.

\textsuperscript{14} This system has similarities with the "Solare in multiproprietà" system, a project to produce renewable energy promoted in the municipality of Castelleone (Cremona) by GASenergia, an association founded by GAS in 2007 and operating nationwide. It concerns the construction
3.5.5 Energy performance contracting for energy efficiency

Energy efficiency projects are encountering particular barriers to raising finance. Regulatory complexity and uncertainty, high upfront investment, the scale of projects, low consumer and investor awareness or scepticism about recovering investment costs from energy savings are key barriers to the uptake of well-proven energy efficiency measures, particularly in the buildings sector (Medarova et al. 2013).

While regulatory complexity can be addressed by regulatory reforms only, the other barriers can be addressed through financial instruments and organisational structures. First, financial instruments such as loan guarantees or senior or subordinated debts to banks, to extend lending at low interest rates, can promote investment in energy efficiency in buildings. This kind of instrument, however, requires the bank to run specific contracts with each owner for each loan, resulting in high transaction costs. To avoid this, funds can also be channelled through specialised funding bodies such as energy service companies (ESCOs), who then finance the investments and have the required specialised knowledge and expertise to implement such projects (see Figure 2). These companies can organise a large portfolio of projects, thus agglomerating small projects into a large one, spreading the risks and setting up cost recovery mechanisms. Risk mitigation strategies include energy performance contracting (EPC) where the ESCO undertakes to achieve the agreed savings objectives and is directly or indirectly compensated through the savings achieved (Medarova et al., 2013).

While a successful model to finance energy efficiency projects, the setting up of ESCOs and their operation require the right regulatory environment and skills. The EIBs’s European PPP Expertise Centre has produced a detailed guidance document accompanied by detailed specialised guidance on planning, procuring, financing, etc.

EIB (2012), ‘Guidance on Energy Efficiency in public buildings’, EPEC, Luxembourg, which can be retrieved at:

(last accessed 3/11/2013)

of a photovoltaic system on timeshare structures of public bodies facilities. The project “Solare in multiproprietà” can be considered innovative in its application field, because it is based on spread shareholding and on the involvement of the public body: this model of public-private collaboration brings with it a strong socio-cultural value, in addition to the undeniable economic and environmental benefits derived from it. The participating private entities financed the plant through the establishment of a special purpose society with a spread shareholder system and they now receive, in proportion to the shares held, the revenues resulting from public incentives and from the sale of energy produced, for a period of 20 years.
Some examples of successful mechanisms to finance energy efficiency are presented in section 4.1.

3.5.6 Crowdfunding

Crowdfunding has been defined as “the collective effort of individuals who network and pool their resources to support efforts initiated by other people or organizations”. The internet usually acts as the main channel for gathering the financial resources. Compared with other financial funding instruments, crowdfunding really distinguishes itself through the motivation factors behind the participation of the funders who, depending on the type of project, often decide to invest due to emotional, geographical and other personal preferences. Although this funding mechanism is still in its infancy, figures show that it is gradually gaining momentum. It is estimated that around €2.2\(^{15}\) billion (De Buysere et al. 2012) were raised in 2012 across the globe, compared with €1.2 billion in 2011 and €400 million in 2009 (De Buysere et al., 2012, and Best, Neiss & Jones, 2012).

It has been suggested that crowd funding carries a potential for supporting citywide projects and overcoming barriers related to financial and other constraints. In particular, the city of Chicago has been identified as one of the examples where local community members could play a large role in the implementation of renewable energy projects through an alternative, community-based crowdfunding model (Silberg, 2012). Another example that illustrates how a company may use crowdfunding as a way to attract resources for its innovative ideas is that of a company in the USA (Mosaic), which offers an interest return to non-accredited investors for its clean energy projects. So far, the company has managed to raise about $1.1 million for solar projects through its crowdfunding.

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\(^{15}\) Figures are only indicative and should be treated with caution.
platform. The number of small investors interested in participating in these projects is steadily growing (Bornstein, 2013).

### 3.5.7 Public subsidy based on monetising positive spillovers

A considerable barrier to attracting private finance for infrastructure or the renovation of buildings is the lack of well-developed profitable business models, i.e. mechanisms to ensure clear returns on investment. This is more acute when the benefits of the projects are diffuse or not accruing to the direct beneficiaries, but to society in general due to positive spillovers. How can, for example, public health benefits gained through a reduction in traffic emissions, be used to finance a project, regardless of how positive the social impact may be? In cases of non-bankable projects with high social returns, public support needs to be envisaged.

This may be the case for projects involving the refurbishment of social housing, introducing energy efficient technologies. It may be that the value of the energy saving itself is not sufficient to compensate for the retrofitting of the buildings. However, the health, employment and social impacts of the renovation may generate savings for the state’s social welfare and health system that exceed the grant necessary to cover the financial gap. An interesting methodology to estimate the benefits of the projects can be found in the city of Malmö, with the project “Regeneration Dialogue”\(^\text{16}\). The analysis demonstrates that what the state saves in social support due to expected positive employment and social impacts greatly outweighs the public financial subsidy required by the state to undertake the investment.

### 3.5.8 Fiscal incentives

Returns on investment are strongly affected by the fiscal regime. Tax incentives have been used, for example, for cars, which are now correlated to the level of emissions. In the area of buildings, however, energy efficiency is not being taken into account in property related taxation. A number of property taxes, such as taxes on the purchase value of properties, could be differentiated depending on the level of energy efficiency of the buildings.

4. **BEST PRACTICE EXAMPLES**

4.1 **Best practice for energy efficiency projects**

This section presents a limited number of practices and references to specialised literature with more detailed information.

4.1.1 **ESCOs operation using ELENA in practice – an example from Spain**

In the Province of Barcelona (Spain), ELENA contributed approximately €2m to an investment programme for the implementation of energy efficiency projects through the involvement of energy service companies (ESCOs) and the development of public-private partnerships to implement renewable energy investments in public buildings. Between 2010 and 2013, projects are to target the installation of photovoltaic plates on the roofs of public buildings, retrofitting of public lighting and traffic lighting systems and the refurbishment of municipal buildings. ELENA promotes and analyses potential project applications by municipalities and provides technical support to municipalities in the implementation of the projects. The leverage factor for this operation is estimated to be between 50 and 250. In the best case scenario, it is expected that an additional €500m will be mobilised for the investment programme. Expected outcomes include 114 GWh/y PV-electricity production, 280 GWh/y energy savings, 185,000 tCO₂eq/y CO₂ reduced, 3,000 jobs created/sustained in PV installation and maintenance, and 2,000 jobs created/sustained in energy efficiency.


4.1.2 **JESSICA support for energy efficiency in Lithuania**

In 2009, the Lithuanian government established a €227m JESSICA holding fund, managed by the EIB, as a way to mobilise funds (€127m from the ERDF and €100 from national funding), aiming to also leverage €20-40m from commercial banks to promote energy efficiency measures in multi-apartment buildings. In 2010, the first loan agreement was signed between the EIB and Šiaulių bankas, in which the latter commits to provide 20 year, low interest loans (3 per cent for the entire loan period) to homeowners for the total amount of €6 million. The goal is to support the renovation of 1000 buildings between 2010 and 2015. By April 2011, approximately 100 projects and five project loan agreements (amounting to more than €1m) had been approved. These projects are expected to positively contribute to achieving the EU’s 20 per cent target for energy efficiency as well as national refurbishment plans for 2020. After the refurbishment, it is estimated that the average energy savings for a single house will be approximately 50 per cent or 125 MWh a year. Some success factors behind the Lithuanian experience include: political support, significant demand for renovation of the existing housing stock, and the inability of national financial schemes to adequately respond to this issue, as well as the use of established national institutions such as the housing and urban development agency (HUDA) (text from Withana et al., 2011).
4.1.3 KfW guarantee scheme for energy efficiency

KfW introduced an energy efficiency programme to support loans to private owners for energy efficiency refurbishments. Since 2006 KfW has provided low-interest loans and grants for investments in residential buildings supported by a €4 billion grant and guarantee fund of the Federal Government. KfW also provides advice on energy efficiency measures through in-house experts. The magnitude of the support depends on the savings achieved. KfW delivers energy efficiency certificates, which have become a national standard and directly affect the value of properties.

The results between 2006 and 2012 have been as follows\textsuperscript{17}:

- Over 3 m homes (including apartment buildings) were either renovated or newly built according to KfW energy efficiency standards.
- The programme has led to a reduction of approximately 6 m tonnes per year over this period.
- The programme is credited with having secured or created on average 240 000 jobs per year.

4.1.4 Selected specialised literature with best practices

For energy efficiency in public buildings the most appropriate models are based on PPPs, for this the EIB’s EPEC (European PPP Expertise Centre) has recently produced specialised guidelines and case studies:

EIB (2012), ‘Guidance on Energy Efficiency in Public Buildings’, EPEC, Luxembourg, which can be retrieved at:

(last accessed 3/11/1013)

\textsuperscript{17} Figures provided by KfW
This report is also accompanied by a large number of detailed guidance documents on different challenges facing energy efficiency projects, e.g. planning, procurement, financing, monitoring, reporting, etc.

For an overview of energy efficiency financing models and programmes across Europe we recommend:


http://www.eeb.org/?LinkServID=9752FE1D-B396-3C0E-9B3380E32EC94147&showMeta=0 (Last accessed 11/11/2013)

4.2 Some examples of best practice for urban development projects

4.2.1 The London Green Fund

The London Green Fund was launched in 2009 with the principal aim of supporting the city’s ambitious climate change objectives, including a target to achieve a 60% reduction in carbon emissions by 2025 (Powell, 2010). Its total budget is £100 million, of which £50 million originates from the European Regional Development Fund, £32 million from the Great London Authority and £18 million from the London Waste and Recycling Board (EIB, 2009). The Fund is part of JESSICA (Joint European Support for Sustainable Investment in City) which is a joint initiative by the European Commission, the European Investment Bank (EIB) and the Council of Europe Development Bank, aiming at supporting sustainable urban development and regeneration. To achieve this, JESSICA enables Member States to allocate some of their EU structural funds to Urban Development Funds (UDF) which in turn support urban development projects through three financial tools; equity investments, loans and guarantees that can increase private sector engagement. One of the key aspects of this model is the re-allocation of any returns from successful investments to other urban development projects (EIB, 2013a and b). The London Green Fund (or London JESSICA) has two major focus areas: energy efficiency and waste infrastructure. In the former case, the Fund aspires to provide decentralized energy infrastructure as well as improve the sustainability of public, private and voluntary sector buildings, mainly via debt financing. Waste infrastructure such as waste-to-energy and recycling facilities are financed through equity investments (EIB, 2009).

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4.2.2 Urban development in Poland

Amongst others, the EU’s JESSICA fund is also being implemented for urban renewal and regeneration in Poland. The country’s environmental policy foresees the urban or industrial development of several regions which frequently have a high historical value. However, this process is often constrained by the shortage of sufficient funds. To meet this need, JESSICA provides support in the form of loans and guarantees aimed at revitalising degraded city districts, post-military and post-industrial sites and also enhancing business centres. Loan conditions include a grace period of 4 years, durability of maximum 20 years as well as no fee requirements for investors\textsuperscript{19}. About €257\textsuperscript{20} million had been allocated by 2011 for projects in 5 different regions\textsuperscript{21}.

4.3 Other sources of best practices

<table>
<thead>
<tr>
<th>Existing good practices (and bibliography)</th>
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<tr>
<td>[4] Ener-in-Town was an Intelligent Energy Europe funded project that commenced in January 2006 and lasted for 30 months. Its aims were to...</td>
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\textsuperscript{21} In particular, in Wielkopolskie, Zachodniopomorskie, Śląskie, Pomorskie and Mazowieckie.
establish greater control over energy consumption in municipal buildings.
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Smart Cities Stakeholder Platform

... brings together people, industry and authorities from across Europe to make our cities more energy efficient, better to live in and growth-friendly.

... is about developing concrete innovative solutions for cities through tailored innovations.

... facilitates the exchange of knowledge and best solutions across smart cities in Europe.