Annex 4: Smart finance

Chapter I – Introduction

I.1. General

If the financing dilemma remains the core for modernization of infrastructures using low carbon technologies, one of the less obvious factors in why in one area of this – energy efficiency – even where the technologies for achieving this exist, investment is rather limited: this is all the more surprising as most cases the payback period for the investment is fairly short and indeed, much shorter than the lifetime of the assets needed to achieve this. The answer is that money is part of the solution, but not all of it.

A crucial element remains the type of incentive that is offered to the investor: infrastructure investment in its widest sense is concerned not only with theory but also with actual behavioural change among leaders and citizens: so incentive frameworks are especially critical. Creating proper incentives, including taxes and subsidies, information on how to operate effectively in a private-public partnership mode, etc... involves defining new concepts that are economically viable and that effectively align the goals of policymakers and private partners. In the present analysis we look at the overall perspective in the EU but we also go into more detail in a chapter which deals at a microeconomic level with the so-called "Smart City", which besides elements such as education, security, eHealth, includes those areas which are in the focus of this chapter:

- Buildings;
- Electricity distribution;
- Electricity production;
- Transport vehicles;
- Transport infrastructure.

I.2. What are the drivers for financing the development of the smart city?

Clearly policymaking and its impact both on the supply of goods in the market as well as the demand created by pricing are providing the potential to develop the smart city.

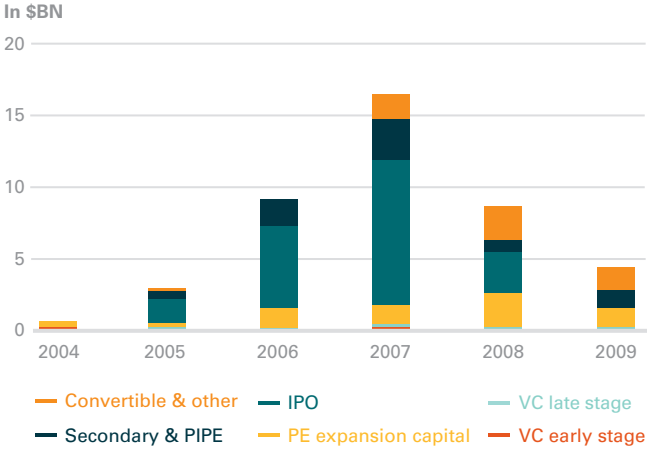
As a consequence, the amount of capital available for developing Low Carbon Technologies (LCT) has risen sharply and we can see that a significant shift in venture capital investment towards cleantech is underway. However, financing of LCT is volatile and shows a high degree of correlation with investor confidence and the global economic outlook.

I.3. What are the challenges?

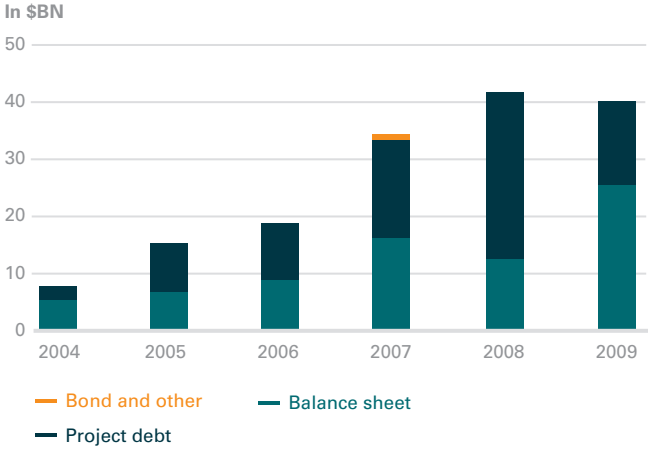
The prime challenge that the move to the LCT faces is the sheer volume of investment – estimated at 2.9 trillion euro for the period 2011–2020.

As a result, standard models for financing infrastructure investments are inadequate. So, new models and approaches are necessary. In the present chapter we examine and propose different elements of the solution, notably integrating both public and private finance, with the public funding, which today is in short supply, acting to a large extent as the stimulus for private investment through the establishment in many areas of public-private partnerships: this is already happening although not yet to the extent necessary to reach the 20:20:20 policy goals fixed by the EU. For example, since 1990, more than 1400 public-private partnerships, representing nearly €260 billion in capital, have been

Development capital ($BN) in Europe between 2004 and 2009, by financing stream – Europe (EU25) only

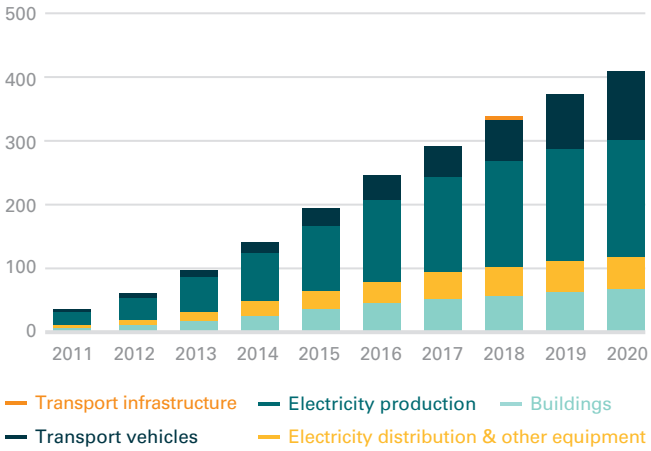


Capital raised to fund assets ($BN in Europe between 2004 and 2009 by financing stream – Europe (EU25 only)

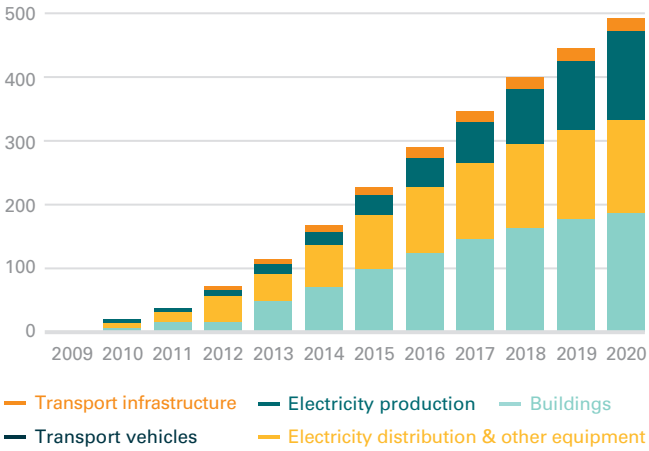


Source: Accenture

Cumulative annual emissions savings (MT CO_2e) – in Europe (EU25)



Cumulative annual cost savings ($BN) – in Europe (EU25)



Source: Accenture

established across the European Union in support of the goals of Smart Cities[1].

Among the principal challenges to be faced are:

- Unlocking access to LCT finance through capital markets and "green bonds";
- Financing energy-efficient and micro-generation assets through leases;
- Creating new investment vehicles for LCT asset management;
- Investing equity in LCT assets and developers;
- Developing advisory services to improve LCT sector risks and opportunities assessments;
- Provide a long-term and stable commitment to incentives that support the commercialization of LCT;
- Leverage public funding to stimulate private sector investments;
- Develop standards for asset-backed securities funding LCT assets and "green bonds";
- Develop the capabilities to provide LCT asset-backed securities;
- Set up dedicated investment funds to give investors strategic exposure to the LCT sector;
- Increase primary equity and debt contributions in LCT assets and developers;
- Provide debt financing for energy-efficient and micro-generation asset leases;
- Develop technical, regulatory, financial and commercial expertise to support the risk assessment of LCT assets and developers.

I.4. What are likely savings from 2011–2020?

Electricity production from low carbon sources is expected to drive emissions reductions in the first half of this decade as uptake is growing rapidly. By contrast, the second half of the decade is likely to see an acceleration in savings from technological advances in alternative fuel and electric vehicles as adoption becomes more widespread.

LCT financing is generally segmented between Development capital and Procurement capital:

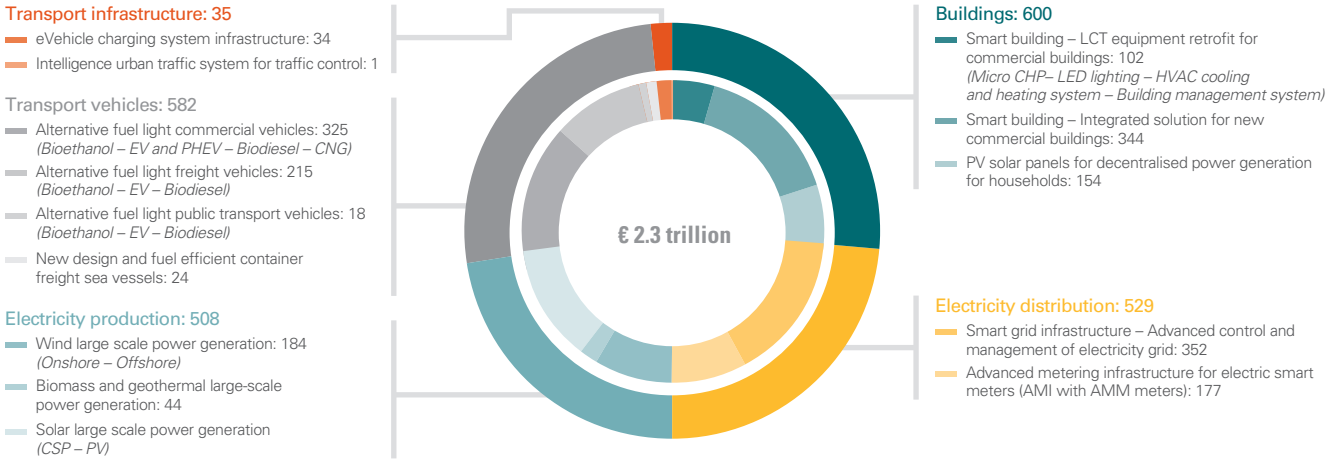
- Development capital is associated with financing the operations (R&D, production and commercialization) of companies developing technologies;
- Development capital includes banks providing equity and debt, for example to a company whose products or services are core to the LCT value chain;
- Development capital is necessary to drive innovation, product enhancement and operational efficiency in LCT. In general, development capital only attracts interest from corporate and investment banks when companies reach growth stage, i.e. commercializing products for the mainstream market. Earlier financing streams rely on venture capital and private equity investment primarily from dedicated companies.

Procurement capital is associated with financing LCT asset procurement. It refers to financing the purchase and installation of LCT assets.

Creating supply and demand for these two types of capital requires different stimuli and support measures.

1 Andreas Kappeler and Mathieu Nemoz, "Public-Private Partnerships in Europe – Before and During the Recent Financial Crisis," European Investment Bank, Economic and Financial Report 2010/04, July 2010

Cumulative procurement capital 2011- 2020



Source: Accenture – Carbon capital financing the Low Carbon Economy in the European Union

Chapter III – Capital needed

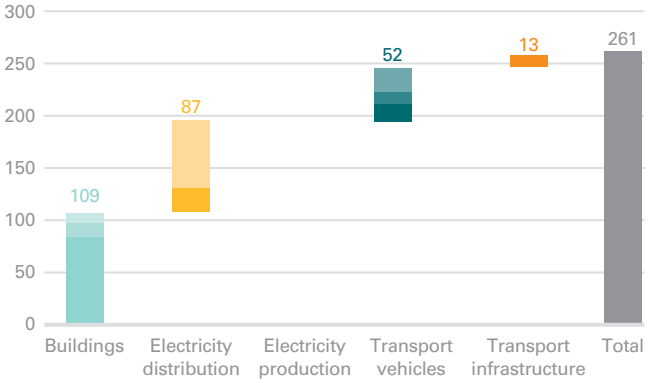
III.1. General

What is the capital needed to deploy a range of LCT in Europe between 2011 and 2020 to realize the smart city and what are the associated carbon and energy savings?

The focus to create 'Smart Cities' is on:

- Buildings;
- Electricity distribution;
- Electricity production;
- Transport vehicles;
- Transport infrastructure.

Cumulative cost savings on energy 2011-2020 (€bn) – in Europe (EU25)



Source: Accenture

In Europe (EU 25), between 2011 and 2020, the above commercially-viable LCT applications would, according to Accenture, require a total of €2.3 trillion in procurement capital and €0.6 trillion in development capital. This will enable carbon savings equivalent to 2.2 Gt CO_2e and cost savings equivalent to €261 billion cumulative over the period 2011 to 2020.

III.2. Procurement capital

The largest share of capital needs to be allocated to buildings for retrofitting LCT equipment, constructing smart buildings and decentralizing energy production. This is due to the high cost of retrofitting buildings and the fact that smart buildings command a premium price (estimated to be between five to seven per cent of total construction costs). In addition, the cost of generating power from decentralized solar PV is expected to remain high, given the premium of installing roof-mounted PV over large-scale solar projects (estimated at 25 per cent of non-roof-mounted PV) and the high per-MW cost of producing energy from solar.

Solar PV is the most capital-intensive technology within the range of LCT reviewed, and will require up to €365 bn invested in procurement. This is driven from a high cost of technology (five times more expensive than onshore wind), a low ratio of production to capacity and a high adoption rate forecast.

Smart grids, essential for managing intermittent power and decentralized energy production, will require €352 bn in investment. The cost of smart grid infrastructure would be spread across back-up electricity storage units, upgrading electricity substations,

implementing central information management systems and additional network improvements.

We expect the uptake of e-vehicle charging to be concentrated in dense urban areas and estimate that €34 bn will need to be invested to fund the infrastructure.

III.3. Development capital

Alternative energy from wind and solar will require an overwhelming 66 per cent share of all development capital required by the sector.

In other less mature sub-sectors, development capital will remain essential to help emerging technology to reach a more mature stage. Investment in these sectors is likely to be dominated by venture capital, private equity and initial public offerings.

III.4. Markets

1. Buildings
Buildings will require the greatest amount of procurement capital: €600 bn by 2020 (27 per cent of the overall total).

The carbon emissions saved by retrofitting buildings are consistent with the level of investment required, representing 13 per cent of total emissions savings or 293 Mt CO_2e.

Smart design specifications for new buildings include using eco-efficient materials, optimized HVAC air circulation systems, and a range of LCT equipment (LED, micro-generation, Building Management Systems (BMS)). We anticipate that these technologies will represent more than half of all commercial new-build properties after 2020, as new regulations on construction specifications are enforced across the EU. (€344 bn procurement capital includes the total capital cost for Smart buildings, not just the "green" premium).

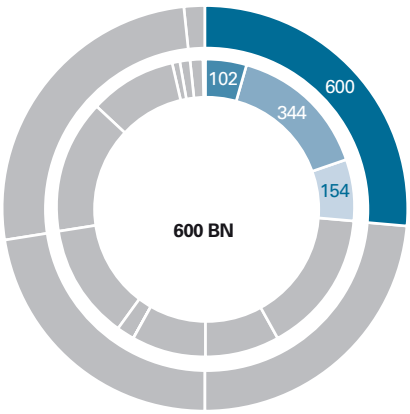
Feed in tariff incentives and a sharp drop in the cost of technology (on a per kW capacity basis) is leading to widespread adoption of solar PV panels. Given the cost of roof-top panels, which are dropping very rapidly, solar PV for buildings represents €154bn in procurement capital: this is likely to be limited to high-income private home owners who are planning to stay in their homes long-term.

Significant energy cost savings of about €85 bn will be generated from the integration of LCT retrofits in buildings. These will be achieved through reducing energy consumption from more efficient equipment and also by substituting energy sources with micro-generation. Cost savings will, however, be widely dependent on energy consumption and calibration of building management systems.

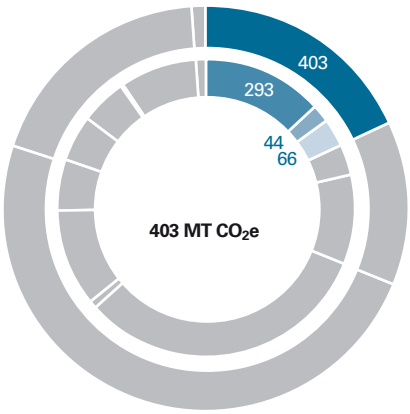
2. Electricity Distribution
Electricity distribution will require an investment of €529 bn in procurement, potentially saving 288 Mt CO_2e in carbon, 13 per cent of all identified emissions savings.

Within this total, rolling out smart grid infrastructure will be the most capital intensive part, requiring an estimated €352 bn investment in Europe by 2020, even though over only 40 per cent of the electricity grid is expected to be covered (i.e. in terms of number of substations included). The high capital intensity is explained by the

Total procurement capital, Buildings, 2011-2020, Europe (€BN)

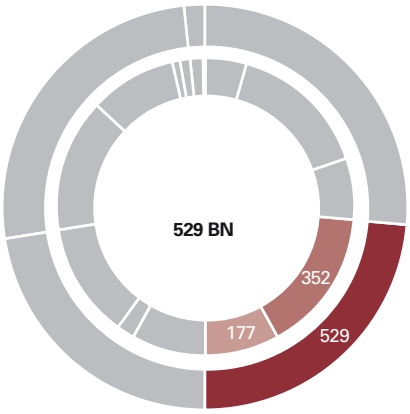


Total emissions savings, buildings, 2011-2020 Europe (MT CO_2e)

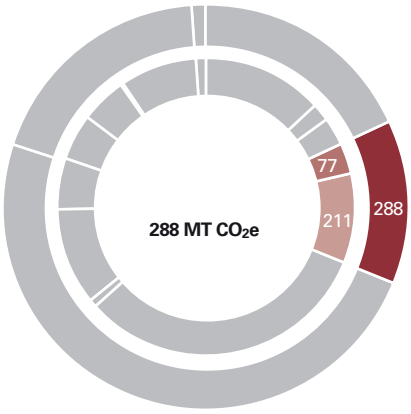


Source: Accenture

Total procurement capital 2011-2020, Europe (€BN)



Total emissions savings 2011-2020, Europe (MT CO_2e)



Source: Accenture

large range of equipment that needs to be integrated into the smart grid. This includes energy storage units, primary substation network sensors, active network management systems and hardware.

Implementing the smart grid infrastructure is expected to reduce network losses (seven per cent of electricity consumption on average in EU 25) through load optimization, which implies carbon emissions savings of 77 Mt CO_2e.

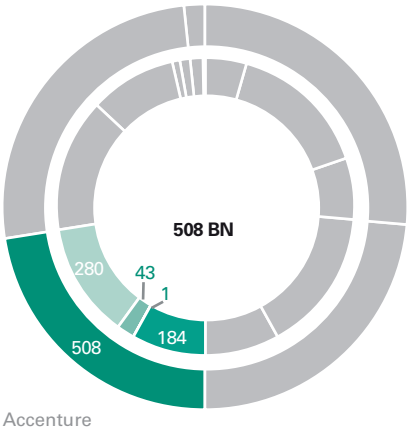
Implementing smart meters allows the consumer to reduce his or her energy consumption by monitoring energy use and adapting it based on a variable tariff, as well as automatically through smart appliances. Smart meters are expected to save 211 Mt CO_2e in carbon emissions overall.

3. Electricity Production

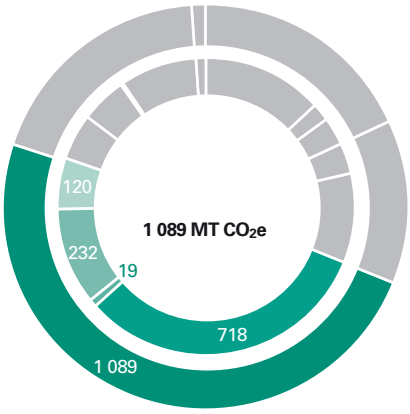
Electricity production from renewables is estimated to require €508 bn in procurement capital between 2011 and 2020 whilst generating the largest share of identified carbon savings with 1,089 Mt CO_2e (49 per cent of all LCT carbon savings identified).

The relatively high cost of solar PV and CSP power – greater than onshore wind power on a per MW-capacity basis – means it will require the greatest investment to purchase: an estimated €280 bn or 55 per cent of all renewables procurement capital. The difference in cost per installed MW-capacity is also the result of PV solar's lower capacity factor of 5-15 per cent compared with wind 15-25 per cent.

Total procurement capital 2011-2020, Europe (€BN)



Total emissions savings 2011-2020, Europe (MT CO_2e)



Source: Accenture

PV solar power's relatively small share of total electricity production and small capacity factor implies it will only substitute conventional power production in low volumes. This results in low carbon emission savings, 11 per cent of total identified savings from renewables. Although this is greatly disproportionate to the high procurement cost, PV solar power has unique operational benefits which facilitate adoption in a variety of geographical areas.

Onshore and offshore wind power will have the biggest impact on carbon reduction, largely due to a positive outlook for adoption in a number of European countries. Projected emissions savings are 718 Mt CO_2e, 32 per cent of all LCT carbon savings, more than any other technology analysed.
With rapid developments in technology and strong demand for renewable energy, investment of €382 bn will need to be put into R&D, production scaling, 65 per cent of all development capital required.

The procurement capital required for renewable power production across the large European geographies, excluding the UK, ranges from €70 bn-110 bn per country. In contrast, the UK is expected to undertake a relatively modest roll-out of renewables for power production (three per cent for onshore wind, three to four per cent for offshore wind and less than 0.5 per cent for solar in terms of the share of total electricity production in 2020).

4. Transport vehicles
Alternative fuel transport vehicles (commercial and public) are expected to require €582 bn in procurement capital, with expected carbon emission reductions of 414 Mt CO_2e between 2011 and 2020 in Europe.

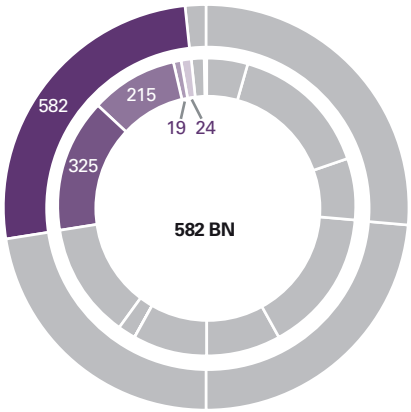
Alternative light commercial vehicles will require the greatest share of procurement capital of all LCT transport (56 per cent) as they make up the largest volume of vehicles. Adoption of compressed natural gas (CNG), electric and bioethanol vehicles is expected to remain low while take-up of biodiesel and plug-in hybrid vehicles is expected to grow at non-negligible rates over the next 10 years, representing approximately 25 per cent and 10 per cent of light commercial vehicles sales, respectively, in Europe in 2020.

Public incentives for low carbon vehicles will help to create cost savings of €52 bn. Removing these incentives (e.g. tax-rebate on biofuels or CNG) will substantially lower these cost savings and, in the worst case, remove the benefits completely.

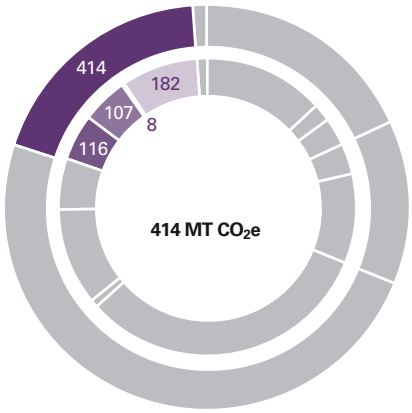
5. Transport infrastructure
The roll-out of e-vehicle charging infrastructure and intelligent transport systems is estimated to require €35 bn in procurement capital between 2011 and 2020 for the EU 25.

With ITS (intelligent traffic system) only enabling emissions savings through vehicle route and speed optimization, this transport infrastructure would lead to a modest saving of 24 Mt CO_2e in carbon emissions, with most of the benefits being operational (e.g. route or journey length). As only a small incremental improvement in vehicles' speed was taken into account, emissions savings for ITS are marginal. This could be re-assessed if additional benchmark data from large-scale implementation of ITS becomes available, which implies greater speed improvements.

Total procurement capital 2011-2020, Europe (€BN)

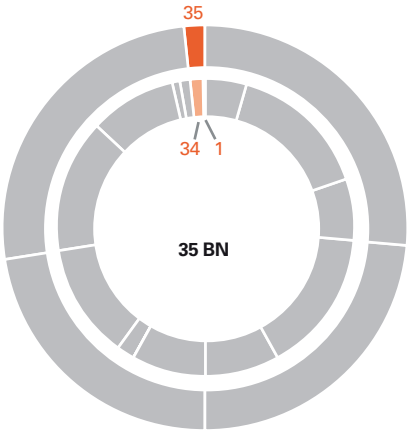


Total emissions savings 2011-2020, Europe (MT CO_2e)

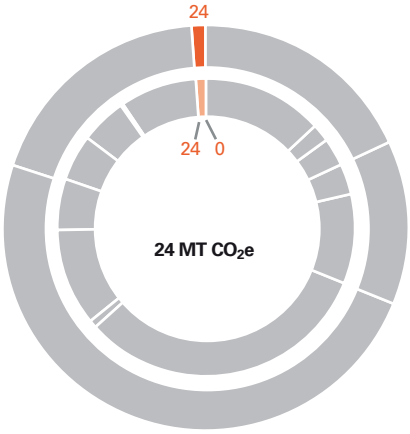


Source: Accenture

Total procurement capital 2011-2020 Europe (€BN)



Total emissions savings 2011-2020 Europe (MT CO_2e)



E-vehicle charging infrastructure is expected to require investment of €34 bn to cover 35-40 per cent of urban areas. This will comprise both high-voltage power supply stations and electricity storage infrastructure.

Emissions savings achieved by ITS are linked to the number of passenger-km covered by vehicles each year. This leads to a similar range of energy and carbon savings for the five major European geographies: between two and four Mt CO_2e.

Chapter IV – Financing technology development and procurement

IV.1. General

Of the €2.3 trillion of procurement capital required, an estimated 73 per cent will be funded externally by entities purchasing LCT equipment or infrastructure, with most of this external funding being provided by corporate and investment banks, either directly or acting as intermediaries.

The provision of primary debt through asset leases, asset finance – term loans and project finance debt will apply to an estimated €1.4 trillion of procurement capital, representing 61 per cent of the total investment required for purchasing LCT.

Equity provision to support the growth and development of LCT providers, originating from public equity, Initial Public Offerings (IPO), Private Investments in Public Equity (PIPE), expansion capital and venture capital equity is expected to provide €348 bn in development capital – 59 per cent of the total development capital required. The remaining development capital will originate from debt.

For both equity and debt underwriting (IPOs and bonds, respectively), intermediation by banks would provide public market access to capital estimated at €97 bn and €147 bn, respectively.

IV.2. Analysing existing capital flows to forecast future growth

Channelling €2.3 trillion of procurement capital and €0.6 trillion of development capital in Europe between 2011 and 2020, represents a major financing challenge as well as a significant opportunity if supportive policy frameworks, reduced technology risk and investor appetite combine to create a favourable environment for deploying capital to this sector.

IV.3. Barriers to capital provision

The [projected] inflow of capital remains markedly below the minimum level we expect will be necessary to achieve wide-scale development of Smart Cities in Europe.

The Stern report had estimated that one per cent of global GDP would be required annually to address climate change.

This value is expected to be higher for developed countries but, taking this as a minimum requirement, it represents €164 bn annually for Europe or approximately €1.6 trillion between 2010 and 2020.

The Financial Times recently estimated that about €1 trillion would be required from utilities to meet EU targets for renewables. This would need to be added to investments in transport, heavy industries and buildings to achieve the EU's desired 20 per cent carbon reduction target by 2020.

There are significant barriers preventing capital provision at the levels required across the whole spectrum of financing sources, from early-stage company developing innovative technology, through to large infrastructure assets with mature technologies such as onshore wind. Two of the most significant barriers are:

1. Policy uncertainty;
2. Restrictions on capital lending.

1. Policy uncertainty

The public sector has invested heavily in LCT at both local and national levels. In the $537 bn European stimulus package set out in 2009, $54 bn, or 10 per cent, was allocated to "green" initiatives and infrastructure. However, stability and long-term public commitment of LCT incentives (FIT, guaranteed loans, tax-credits) and carbon policies (carbon tax, and emissions reduction commitments), whilst critical, are yet to be achieved. National governments are under pressure to reduce sovereign debt, which has led to drastic cutbacks in public spending, impacting on LCT investments.

In the short-term, incentives are essential to ensure investment in LCT is viable, although the sector will become less dependent on incentives in the medium- to long-term.

2. Restrictions on capital lending

Governments have been encouraging aggressive lending targets for banks to support economic growth, e.g. SME lending targets. However, at the same time, banks are also under intense pressure to reduce risk and build their deposit base in order to ensure there is enough capital to satisfy new or anticipated regulations.

The requirement for banks to improve Tier 1 capital, which will increase under Basel III, is likely to limit balance sheet lending further (e.g. primary junior or senior debt, leases).

New regulations may also prevent banks from investing directly in private equity and numerous other types of privately offered funds. This is likely to restrict the banks' ability to fund the development of early stage LCT companies. In addition, the absence of secondary markets for LCT project finance debt has restricted the capital provision from private investors and institutions (excluding direct lenders such as corporate and investment banks).

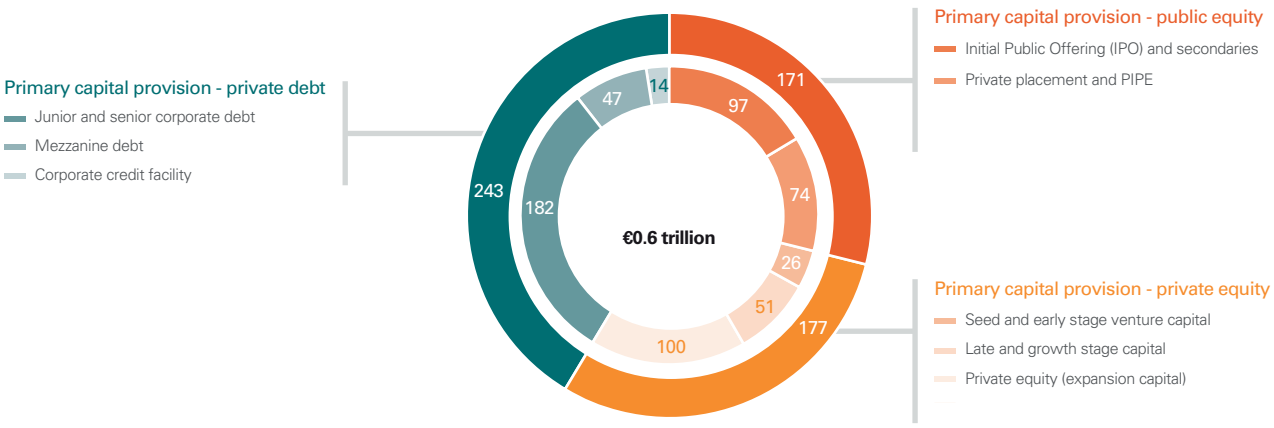
The roll-out of LCT is often fragmented and unstructured, with many small-scale projects each requiring funding, rather than a small number of large-scale projects. This means that it is often not viable for large corporate and investment banks to provide finance. However, transactions involved in both large and small projects require similar resources to conduct regulatory, technical, commercial and financial due diligence. This has filtered out a number of proposals.

Financing the retrofitting of energy-efficient and micro generation equipment in buildings, for example, is often highly fragmented with the additional difficulty of the assets often attached to the properties in which they are installed. Several European cities are struggling to achieve sufficient critical mass in their retrofit programmes to attract private sector finance.

IV.4. Development capital

Primary equity provision from early and growth stage venture capital to PIPE, IPO and private equity can be expected to raise €348 bn, the largest share of development capital required and 59 per cent of the total. As the majority of these companies are still at growth stage, most investments will be in the form of equity, not debt.

Cumulative development capital per financing stream, 2011-2020 (in €BN) (EU25)



Debt finance represents €243 bn (41 per cent of total development capital) and is composed of junior (subordinated) debt, senior debt, mezzanine debt and corporate credit facilities. Corporate debt makes up the largest share of debt financing, representing €182 bn (76 per cent of total) which will mainly be used to fund capital spending on logistics, manufacturing and sales for developers.

As the sector grows, more companies will look to public markets to raise equity from investors. Between 2008 and 2010, more than 40 LCT companies floated on the stock markets. Most of them were small, with an average transaction size of some $84 m and most listed on secondary markets such as the London AIM stock exchange. Access to public markets remains essential for growing LCT providers to reach the public equity stage, with €97 bn (16 per cent of total) in funding predicted to come from IPOs on these markets.

As an alternative to secured corporate debt (which often results in a high capital cost) or primary issuance of public equity (which can result in important dilution of current equity holders if public equity is traded at a low price), companies have also been relying on convertible bonds to secure development capital.

IV.5. Procurement capital

Of the €2.3 trillion required for purchasing LCT in the EU25 to 2020, €1.65 trillion (73 per cent) will be needed in external funding. The remaining 27 per cent is expected to come directly from the balance sheet of technology buyers.

Some types of equipment can be purchased for less than €100 m. This means that finance through secured term loans of less than €100 m is likely to become the main source of debt, making up 25 per cent of external funding for procurement. Stand-alone equipment such as vehicles, or infrastructure, such as wind farms owned by a single entity, is ideal collateral for asset-backed loans. By contrast, it is more difficult to secure finance against individual assets or equipment integrated in properties, such as building retrofits or large-scale infrastructure, such as smart grids.

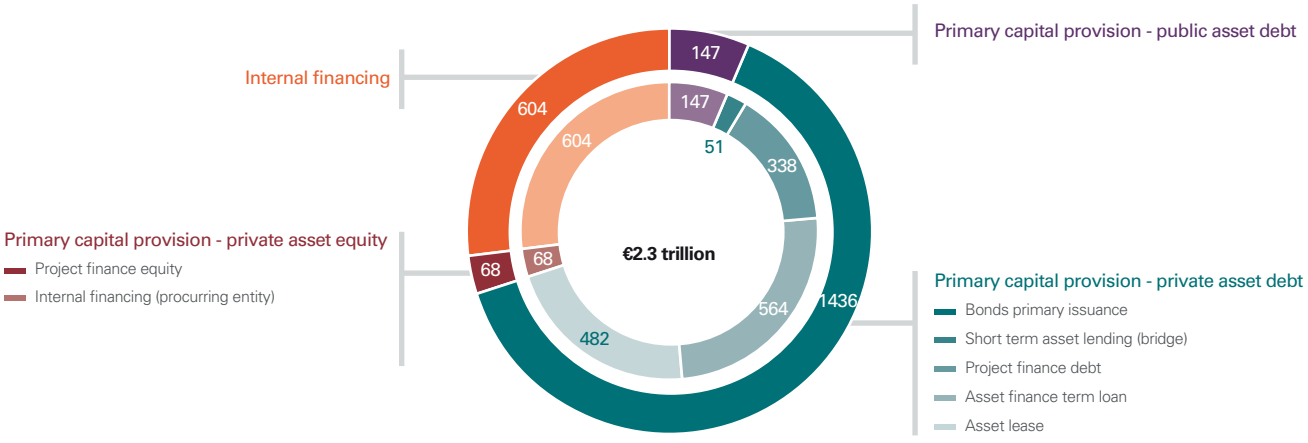
Asset leasing will form the second largest source of external capital and is expected to contribute €482 bn in funding. Asset leases have proved to be suitable for purchasing small-scale equipment, including vehicles and solar PV. Most assets cost between €10 m and €50 m to procure, within the range of conventional leases.

More interestingly, lease schemes where the cost savings achieved apply to the lease payments are possible, as payback periods of 10 years or less are expected. This payback period includes the purchase price of the asset itself, along with interest and administration fees. Over a 10-year period this could mean repayment of a fully depreciated lease with no impact on the purchasing entity's cash flow.

Project finance, which is the most suitable solution for large-scale renewables, transport and grid infrastructure generating a constant cash-flow and costing more than €100 m, is estimated to contribute €405 bn in combined debt and equity, 18 per cent of procurement capital.

Bonds are increasingly becoming a viable alternative to project finance as bank balance sheet capacity may be restricted due to regulatory requirements. The model estimates that €147 bn worth of bonds will be issued to support LCT procurement between 2011 and 2020.

Cumulative procurement capital per financing stream, 2011-2020 (in €BN) (EU25)



The role of banks in issuing bonds is limited to underwriting and placements and so does not require direct funding, unless the bank is associated with the conversion of a loan into a bond – construction loans, for example. Placing bonds with investors will therefore have minimal impact on banks' balance sheets and will not affect their Tier 1 capital ratios.

Chapter V – Increasing capital flows

V.1. General

Increasing the flow of private funding available to reach the proposed objectives in the short term (by 2020) would no doubt be facilitated by securitising the bonds issued: an estimated €1.4 trillion of procurement capital could be securitized in "green bonds" across Europe between 2011 and 2020, making this the largest single financing instrument by value for the purchase of low carbon technology (expected to be 84 per cent of total external procurement capital).

Banks could provide primary debt, securitize it into "green bonds" and place the securities on the mainstream public markets with minimal impact on their balance sheets. This would also avoid harming their Tier 1 capital ratios and risk weighted assets (RWAs).

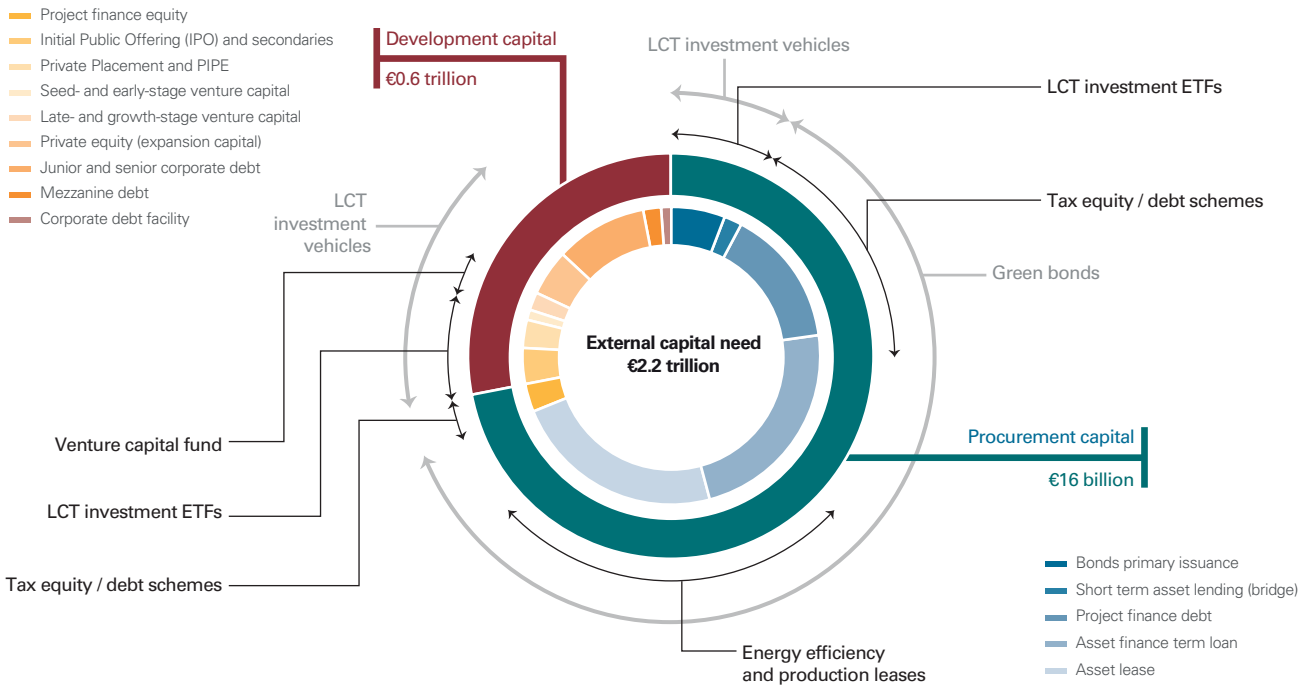
Energy-efficient equipment leases will fund an estimated €140bn of investment, eight per cent of total external procurement capital. This type of scheme is very attractive as it requires minimal to no capital expenditure from the purchaser of the technology and is highly suitable for building retrofits and decentralized power production equipment. Energy-efficient equipment leases also have the potential to aggregate large volumes of individual leases through partnerships between banks and utility or equipment providers.

Tax equity/debt schemes, specialist investment vehicles and low carbon technology ETFs will boost investment in the sector. These schemes require banks to act as intermediaries and could benefit from tax incentives that leverage private investment.

Banks require sector-specific expertise on technology, regulations and commercial dynamics to develop low carbon technology. Building up this expertise will allow banks to tailor their offerings to improve access to research on IPOs, M&A and equity for the LCT sector.

€1.65trillion is required in external capital for LCT procurement and €591bn required for development. This demand for capital is likely to lead to an important adaptation of corporate and investment banking products and services, combined with the support of public incentives.

Application of financing schemes to the development and procurement capital needs identified



V.2. Unlocking access to LCT finance

Access to capital markets for financing LCT assets has been limited. Bonds secured on mature onshore wind or solar assets were issued before 2007, but the further development of liquid bond markets was restricted during the financial crisis. At the end of 2008, pension funds were estimated to hold $25 trillion of assets under management globally with 24–40 per cent of portfolios dedicated to fixed-income, including asset-backed securities. However, the ability of institutions such as pension funds and insurance providers to access LCT investments has been limited, given small secondary debt markets and the absence of liquid, investment-grade asset-backed securities. Securitization of the long-term LCT loans and leases as asset-backed securities, which we refer to as "green bonds", will significantly increase their liquidity. We estimate that this could unlock €1.4 trillion in finance that can be used to fund LCT equipment and infrastructure. This represents 84 per cent of all identified external capital required for purchasing LCT technology. These asset-backed securities would be similar to primary bonds in terms of the underlying LCT assets they would finance. By unlocking access to 84 per cent of all external capital required for purchasing LCT, capital market products could form a significant share of institutional investments by 2020.

V.3. Financing energy-efficient and micro-generation assets through leases

Financing energy-efficient or micro-generation equipment can be expensive. To reduce the impact on cash-flow, a leasing scheme – "energy-efficient and micro-generation leases" – could be developed so that principal and interest repayments on the equipment are calculated based on the estimated amount of energy saved. Our analysis shows that principal and interest repayments for a number of building retrofits could be met solely by savings on energy costs over a period of seven to 10 years.

With demand for building retrofits and decentralized power estimated to require €140 bn in leases and loans (equivalent to fully depreciated leases), the market is considerable and has the potential to grow far beyond this conservative estimate. Indeed, if equipment is provided without the need for capital upfront, take-up is likely to increase significantly as the end-user would benefit immediately from savings.

Energy-efficient leases would support €140 bn in procurement capital while leading to savings estimated to be in excess of 350 Mt CO_2e.

V.4. Investing equity in low carbon technology assets and developers

Direct banking sector investments in a number of LCT developers and large asset financing vehicles are essential to provide stability and security to the underlying investments.

Demand for an additional €68 bn in project finance equity was identified for the LCT infrastructure we considered between 2011 and 2020 in Europe.

Banks can play a significant role in financing early and growth stage LCT, potentially supported by match funding from public institutions. This will enable LCT companies to build stable levels of equity allowing them to attract new investors. €177 bn in additional venture capital and private equity expansion capital is likely to be required by the EU25 between 2011 and 2020 to fund the growth of LCT developers.

V.5. Developing advisory services to improve LCT sector risks and opportunities assessments

Corporate and investment banking research into LCT provides technical, regulatory, financial and commercial expertise on the sector. This works to de-risk investments by improving upfront risk and opportunity assessment in the development of low carbon technologies and infrastructure.

Building this capability is essential for banks to understand the complex dynamics of the LCT sector, which include a strong interdependency on public incentives, evolving regulations, and rapid technological developments. This in turn supports a broad range of horizontal capabilities for the banking sector to provide external capital by improving investors' understanding of the risk factors involved in both debt and equity-based LCT investments.

Chapter VI – Recommendations

VI.1. General

The market for low carbon technology has emerged in the past decade, thanks to the increased cost of carbon-intensive activities, a reduction in technology costs, a large number of fiscal incentives and a favourable regulatory environment.

These incentives stem from a long-term commitment on the part of governments to improve energy security and reduce carbon emissions. A long-term agreement on carbon reduction targets and a global financing framework is still needed to provide long-term visibility on emissions regulations.

VI.2. Government

1. Policy stability is a priority
Direct measures, such as Feed in Tariffs and subsidies, and indirect measures, such as emissions trading schemes, that lower the return of carbon-intensive industries, should be carefully balanced. In the absence of stability and clarity on carbon markets (such as the expected long-term cost of emissions allowances), direct subsidies are necessary to encourage investment. These measures must be both stable and limited in time in order not cause market distortions and particularly an unreasonable rise in energy costs. Adaptation of the incentives should progressively lead the technology to be commercially viable without any public support.

2. General policy on tax incentives
Long-term commitment, for which public incentives are deemed necessary and are established, is vital to prevent any retroactive modification of incentives for a period of time commensurate with the expected investment pay-back periods (i.e. 15-25 years). There must also be clear phase-out schemes that do not change.

3. Leveraging public funding
Policymakers need to set a range of fiscal incentives and subsidies to improve returns on LCT-focused investment and make use of public funds to leverage private investment through for example:
- Capital gains tax credits (direct equity or funds);
- Tax-equity/debt schemes;
- Matching participation in venture capital equity;
- Investments.

4. Support the introduction of emerging low carbon technologies
Support schemes targeting the roll-out of emerging low carbon technologies not yet commercially viable such as:
- Feed-in-Tariffs (FITs);
- Alternative or low-carbon vehicle subsidies;
- Tax deductible interest on finance for energy-efficient equipment purchase;
- Direct regulation of the sale of green energy.

5. Standardisation of "green bonds"
Define standards for "green bond" securities and enforce compliance for securities that benefit from public incentives. This can be achieved privately through an auditing firm or publicly through a dedicated organization.

6. Local government infrastructure initiatives
Develop large-scale LCT infrastructure programs for e-vehicle charging systems, building retrofits, decentralized electricity production and others to stimulate the demand for LCT equipment.

VI.3. Corporate and investment banks

The LCT market will require €2.9 trillion in investment over the next 10 years, presenting corporate and investment banks with an unprecedented opportunity as the finance will derive primarily from banking products and services.

1. Green bond securitization
Banks need to develop capabilities for securitizing debt backed by LCT assets. This will require banks to find appropriate projects, then structure, underwrite and place securities with a range of investors.
- Global and national standards will be necessary to define "green bonds" as a security class.
- High volumes of debt will be required to conduct securitization.
- Long-term tax incentives or guarantees may be needed to improve returns on securities.
- Public or private risk-sharing instruments.

2. Providing debt finance for energy-efficient and micro-generation asset leases
Banks will need to develop partnerships with energy-efficient or micro-generation equipment providers (e.g. utility or any large service providers) to fund aggregated large equipment purchases. This equipment will ultimately be leased to consumers.
- A high volume of LCT equipment financing will be necessary for leases to be aggregated into a single, large debt facility.
- Banks can use secondary markets for asset-backed leases and loans to reduce the impact on their balance sheets.

3. Using equity to provide capital for development
Banks will need to increase equity investment in small and medium-sized LCT companies through partnerships with existing venture capital or private equity firms.
- Regulations governing banks' private equity and venture capital investments in strategic industry sectors, such as LCT, present barriers to speculative investments.
- Increasing investment in equity will require internal expertise on technology, regulations and commercial dynamics or partnerships with sector specialists.
- PE and VC LCT investments are small and complex transactions that can lead to a resource intensive due diligence process.

4. Integrated project finance
This extends project finance for LCT infrastructure projects to include equity rather than simply debt. Banks will benefit from the synergies offered by carrying out due diligence across both financing streams.
- Tier 1 risk-based capital ratio requirements associated with debt provision would drastically increase with LCT equity participation and limit investment from banks.

- Integration of insurance coverage will be necessary to mitigate the increased risk profile associated with equity investment. This will secure long-term return and protect against volatile incomes (for example, intermittent power from adverse weather). Products to achieve this include weather derivatives or other types of hedging products indexed on a production indicator of the LCT infrastructure.

5. Structured LCT investment products

Banks could provide bespoke ETFs to support the demand for securities, creating a more liquid marketplace and broad sector exposure for investors. They could set up dedicated investment funds (based around public or private equity, or debt) to provide investors with strategic LCT sector exposure and access to tax-credits for qualifying investments.

- Internal ETF and investment fund product structuring and commercialization capability is required.
- LCT sector benchmark indices are required for ETFs to track a representative benchmark index of the sector.
- In-depth expertise of publicly-listed LCT companies would be required to form benchmark indices.
- LCT securities would need to be liquid to allow funds to adapt to sector dynamics and changes such as emerging technologies or regulations impacting current LCT developers or operators.
- Securing long-term public commitment to tax-incentives targeting LCT-focused investments would be a crucial factor.

6. Understand, as a financial institution, the technical solutions and benefits of the LCT

Financial institutions, banks are very experienced in financial dossiers.
This expertise is very useful and necessary in setting up complex dossiers but they need to acquire much more technical expertise to understand the whole dossier. For a bank, it is necessary to combine both, technical and financial knowledge to take decisions in financial and technical difficult dossiers with a lot of stakeholders involved, each with other know-how, expectations and view on each project.

Chapter VII – Financing the Smart City – A practical guide

VII.1. General[2]

To achieve successful evolution to a sustainable city, the first and most important consideration is that the City Council is involved directly, steering and coordinating this transformation.

A council needs to acquire:

- insight into the legal opportunities and impediments;
- insight into finance and resources; and
- the setting of benchmark dates and monitoring of progress.

The first step and a very important one is to find local financial partners. Together, these parties have to investigate all possible financial constructions that could be possible to build the 'smart city'.

Some possibilities are PPP-constructions, local incentives, subsidies and fiscal incentives.

In practical terms, cities are increasingly resorting to European funding. We highlight hereafter the main funds available.

VII.2. Structural and Cohesion Funds in 2007–2013

From the very beginning, the political integration of Europe has considered the question of cohesive regional development by establishing that "… the Community shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions or islands, including rural areas." (Treaty Establishing the European Community, 1958).

The Structural Funds and the Cohesion Fund (SCF) are financial tools that aim to reduce regional disparities in terms of income, wealth and opportunities. And energy has played an increasing role in diminishing the development gap within the EU. Hence, Europe's poorer regions receive most of the support, but all European regions are eligible for funding under the policy's various funds and programmes. Depending on the levels of energy infrastructure and energy efficiency, the Community Support Framework of each Member State establishes different priorities and earmarks different budgetary commitments.

The Structural Funds (EUR 280 billion) are aligned in two instruments:

- *European Regional Development Funds* (ERDF), whose principal objective is to promote economic and social cohesion within the European Union through the reduction of imbalances between regions or social groups;

2 Gemeente Den Haag, Op weg naar een Duurzaam Den Haag, Kadernota 2009, 2010 ref. RIS178059A_05_JAN_2011

- *European Social Fund* (ESF), the main financial instrument allowing the Union to realize the strategic objectives of its employment policy.

The Cohesion Fund (EUR 70 billion) is aimed at Member States whose Gross National Income (GNI) per inhabitant is less than 90% of the Community average. It serves to reduce their economic and social shortfall, as well as to stabilize their economy. It supports actions in the framework of the Convergence objective, mostly for environment and transport infrastructures.

The Structural and Cohesion Funds for the period 2007–2013 contain almost €350 billion in total (over one-third of the EU budget), divided among the 27 members states as shown in the table below.

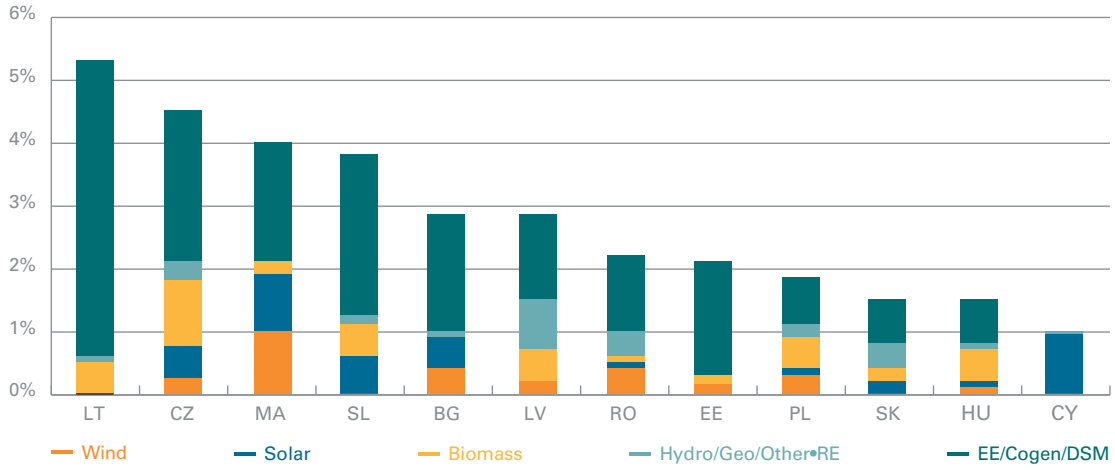
Indicative allocation by Member State, 2007-13 (current prices, in €million)

	Convergence			Regional competitiveness and employment		European territorial cooperation	Total
	Cohesion Fund	Convergence	Phasing-out	Phasing-in	Regional competitiveness and employment		
Belgium			638		1 425	194	2 258
Bulgaria	2 283	4 391				179	6 853
Czech Republic	8 819	17 064			419	389	26 692
Denmark					510	103	613
Germany		11 864	4 215		9 409	851	26 340
Estonia	1 152	2 252				52	3 456
Eire/Ireland				458	293	151	901
Greece	3 697	9 420	6 458	635		210	20 420
Spain	3 543	21 054	1 583	4 955	3 522	559	35 217
France		3 191			10 257	872	14 319
Italy		21 211	430	972	5 353	846	28 812
Cyprus	213			399		28	640
Latvia	1 540	2 991				90	4 620
Lithuania	2 305	4 470				109	6 885
Luxembourg					50	15	65
Hungary	8 642	14 248		2 031		386	25 307
Malta	284	556				15	855
Netherlands					1 660	247	1 907
Austria			177		1 027	257	1 461
Poland	22 176	44.377				731	67 284
Portugal	3 060	17 133	280	448	490	99	21 511
Romania	6 552	12 661				455	19 668
Slovenia	1 412	2 689				104	4 205
Slovakia	3 899	7 013			449	227	11 588
Finland				545	1 051	120	1 716
Sweden					1 626	265	1 891
United Kingdom		2 738	174	965	6 014	722	10 613
Interregional/ Network cooperation						445	445
Technical Assistance							
Total	69 578	199 322	13 955	11 409	43 556	8 723	347 410

NB: The figures having been rounded off, the totals might not correspond.

Budget for renewable energy and energy efficiency in Structural and Cohesion Funds

Share of SCF budget allocate to RE and EE in NMS (2007-2013)



Despite the apparent importance of energy investments for regional development and employment, until now relatively few energy-related projects have been financed through Structural and Cohesion Funds.

The European Parliament (2007) estimates that the financial allocations for sustainable energy in the period 2000–2006 were about 1.16%. Data from the European Commission (2008b) show that at the end of 2005 less than the allocated money was actually spent due to low absorption capacities (averaging only 56%).

In the current programming period, 2007–2013, the shares related to sustainable energy have slightly increased. On average, New Member States have allocated 2.4% of their SCF budget to RE and EE with a specific breakdown for each country as indicated in figure 1.

VII.3. the Pre-Accession and the European Investment Bank

The instrument for Pre-Accession Assistance (IPA) and the European investment Bank (EIB) are two financial instruments facilitating the European cohesion Policy, but they are not part of the budget of the cohesion Policy.

The European Investment Bank is a strong partner for fostering RTD and innovation in Europe. It has an overall 3-year plan, a corporate plan with priorities. Sustainability/environment is one of these priorities. New projects are evaluated in function of these criteria. Normal yearly budget of the EIB is €50 billion. This year it is €70 billion.

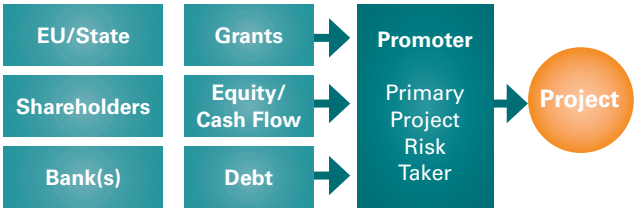
Each project that could appeal on the EIB must represent minimum €25 million. Normally, the financing of the EIB is not above 50%.

Different projects / structures require different financing plans

The concrete development of a suitable financing plan for an ETP project or the respective project promoter(s) depends on whether the project is realized and financed on a stand-alone basis (Project Finance Model) or in the context of the activity of corporation or institutions carrying full project risk (Corporate Finance Model).

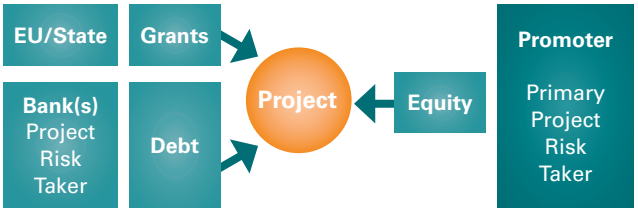
Corporate Finance Model:

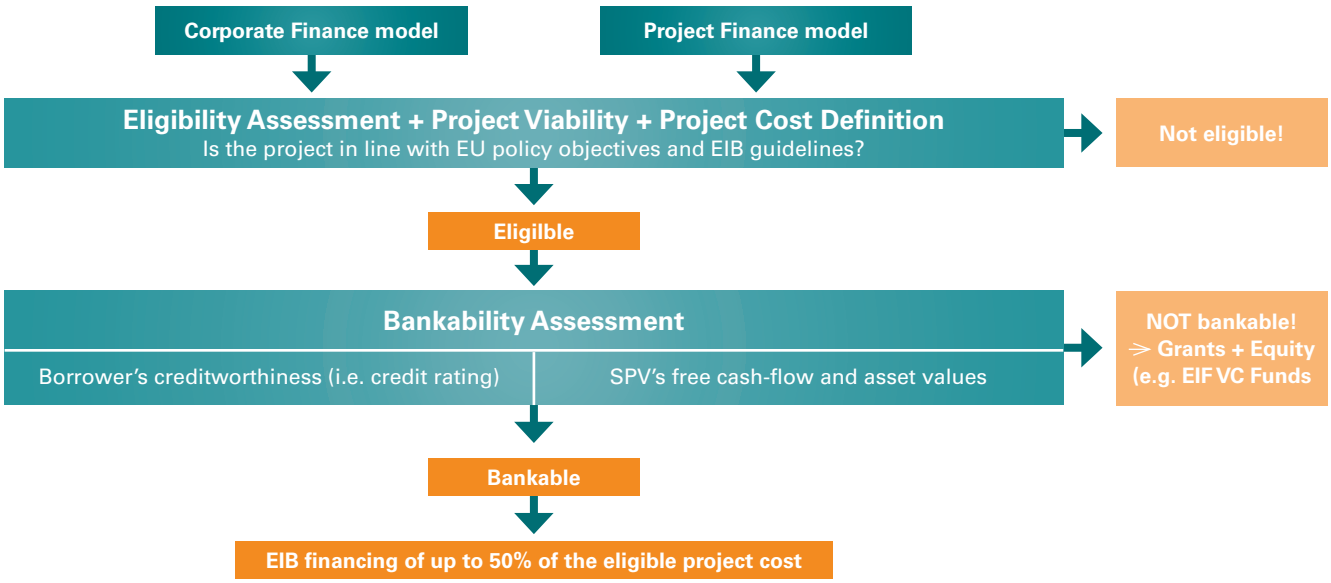
In the Corporate Finance Model, the financing partners (e.g. the EIB) providing funding to the promoter – which can be a company, a consortium of companies or an institution – on the basis of its financial strength. The financing partners are thereby exposed to the credit risk of the promoter, not of the project.



Project Finance Model:

In the Project Finance Model, the project is realised and financed via a legally and financially stand-alone (i.e. ring-fenced) project company (SPV = Special Purpose Vehicle) with the promoter(s) being a strategic partner (e.g. a stakeholder).





The EIB finances bankable counterparties promoting eligible projects (see above)
The financing model determines the assessment criteria for bankability, whereas the eligibility focuses purely on the project and hence is independent of the legal and financial structure. The diagram below illustrates the two main requirements for EIB loan financing: eligibility (conformity with the respective EU priorities and policies as well as project viability – technical and economic soundness of the project) and bankability. Furthermore, the illustration provides guidance on financing alternatives in the event that EIB requirements are not fulfilled.

Two steps:
1. Eligibility Assessment to check conformity with the respective EU priorities and policies as well as project viability – technical and economic soundness of the project;
2. Bankability Assessment to check borrower's creditworthiness and/or SPV's cash-flow and asset value.

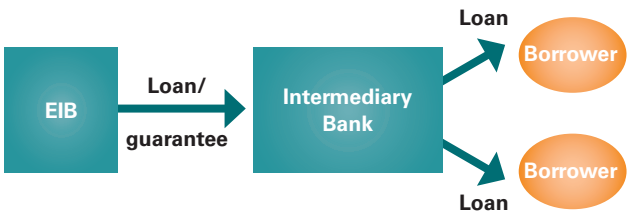
The EIB's loan amount is a function of eligible project cost
While the basic prerequisite for EIB financing is the bankability of the borrower (i.e. the promoter or the SPV), the Bank only finances eligible investments and limits its financing to 50% of the estimated total project cost.

The EIB product line is flexible (see below)
As shown below the EIB in general provides loans to the promoter of a project directly or through an intermediary bank.

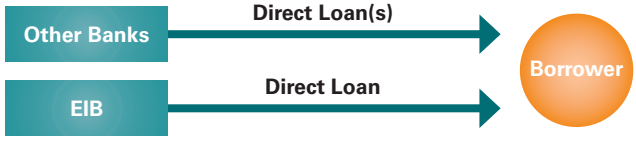
The following diagram illustrates the two main product lines of the EIB and how they can be used for ETP projects.

- Global loans are designed to cater for smaller projects of up to €15 m investment cost.
- They are EIB lines of credit made available to financial intermediaries to support smaller projects at their own risk, typically undertaken by SMEs (small and mid-sized enterprises).

Global loans:
project costs of less than €15m



Direct Lending:
project costs exceeding €15m



- In the case of ETPs qualifying under i2i eligibility criteria, promoters of any size and ownership qualify for allocations under global loans.
- The possibility of risk-sharing arrangements between the EIB and the intermediary bank is being developed.
- The EIB's direct lending products (so-called individual Loans) are designed for projects with investment costs of at least €15 m.
- They are individually structured according to the requirements of the borrower or the project.
- Individual loans require a case-by-case project appraisal focusing on the economic viability as well as the technical and financial soundness of the project.

The EIB also has structural funds with today, a much more severe focus on climate change, adaptation and mitigation.

Elena is a technical funding facility providing grants to prepare investment programmes in the area of European local Energy. The EU contribution can cover up to 90% of all eligible costs. These are the costs associated with technical assistance for preparing large sustainable energy investment programmes in cities and regions, which may also be eligible for EIB funding.

Elena Facility is a €15 million fund managed by the EIB to improve the preparation of quality projects in the fields of energy efficiency and renewable energy sources.

Different initiatives jointly launched by the European Commission, the European Investment Bank and other financial institutions will help Member States and regions to establish sound and efficient management of the funds and to make better use of financial engineering instruments:

- **Jaspers** will assist Member States and regions in the preparation of major projects.
- **Jeremie** will increase access to finance for the development of SMEs.
- **Jessica** will promote sustainable investment in urban areas. Jessica stands for Joint European Support for Sustainable Investment in City Areas. Jessica funds could be targeted specifically at projects such as:
  - Urban infrastructure, including transport, water/ wastewater, energy, etc;
  - Heritage or cultural sites, for tourism or other sustainable uses;
  - Redevelopment of brownfield sites, including site clearance and decontamination;
  - Office space for SME's, IT and/or R&D sectors;
  - University buildings, including medical, biotech and other specialized facilities;
  - Energy efficiency improvements.
- **Jasmine** will support micro-finance Institutions in Europe.

VII.4. The European Bank for Reconstruction and Development

The European Bank for Reconstruction and Development (EBRD) has also fostered energy efficiency by funding national facilities (mostly through public and private banks) devoted to fund projects and investments.

VII.5. The Covenant of Mayors[3]

It is also important to mention the Covenant of Mayors, which has become the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and use of renewable energy sources on their territories. By their commitment, Covenant signatories aim to meet and exceed the European Union 20% CO_2 reduction objective by 2020. Up to now, 3.000 signatories have encouraged the implementation of sustainable energy measures at local and regional level (e.g. Energy Days, finance and investment summits are some of the public outreach actions).

The EIB support the Covenant of Mayors initiative.

A number of EIB financial instruments can be applied to support this initiative including:

- individual loans to finance large projects (or groups of projects promoted/implemented by the same entity);
- instruments to finance small-scale investments in collaboration with the local banking sector;
- a combination of grants and loans, when subsidies are available and needed to overcome important barriers.

VII.6. The 7th Framework Program up to 2013[4]

FP7 is the short name for the Seventh Framework Programme for Research and Technological Development. This is the EU's main instrument for funding research in Europe and it will run from 2007–2013. FP7 is also designed to respond to Europe's employment needs, competitiveness and quality of life.

1. Research and development support

- Future Internet PPP (FP7) – aims to develop a better Internet infrastructure to:
  - Support smarter services in areas such as:
    - Transport;
    - Environment;
    - Energy;
    - Waste Disposal;
    - Public safety.
  - Test those services in some cities.

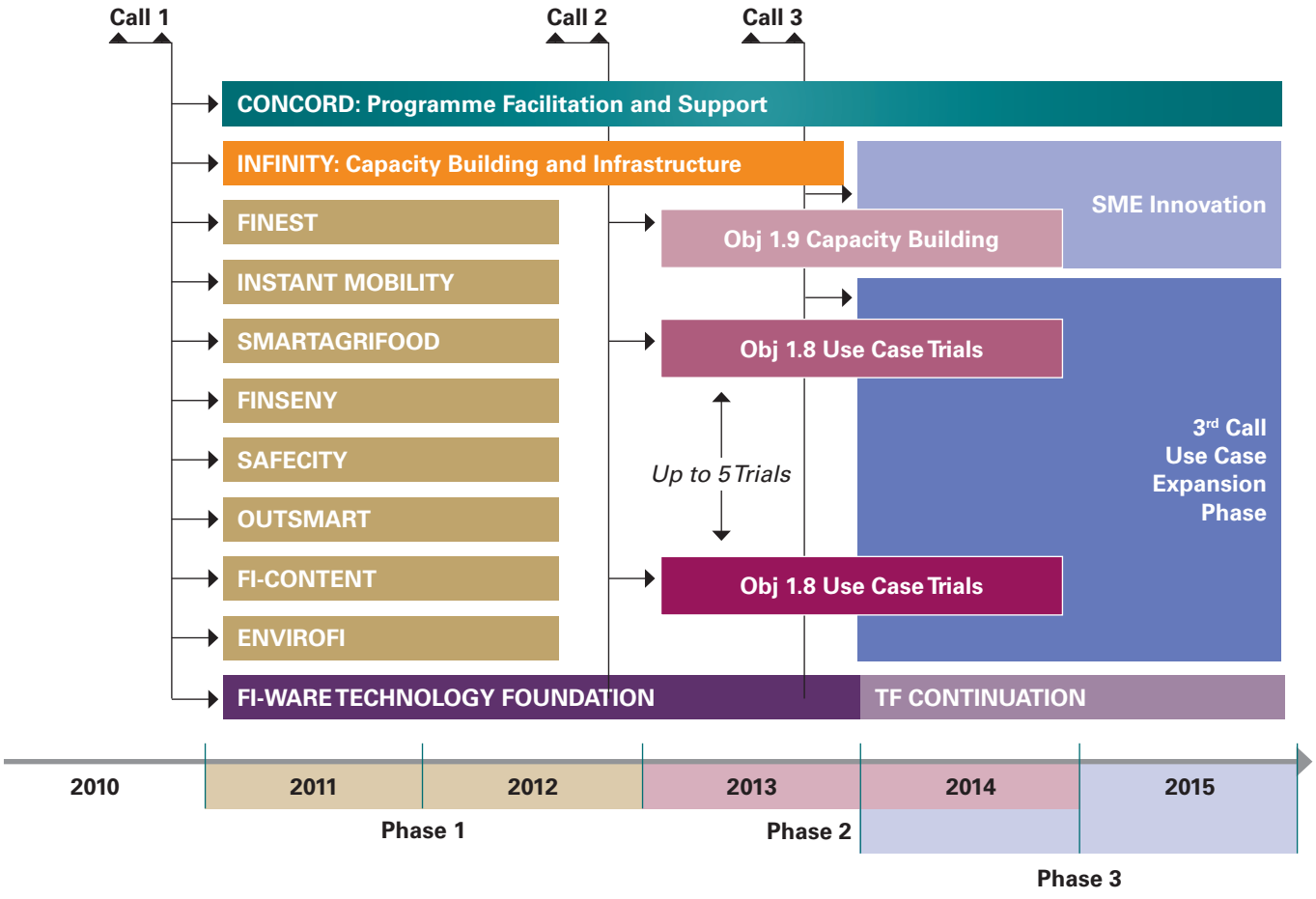
3 www.eumayors.eu
4 http://ec.europa.eu/research/fp7/index_en.cfm?pg=understanding

2. ICT FP7 Challenge 6, Calls now open:

- ICT for a low carbon economy:
  - Smart energy grids;
  - ICT for efficient water resources management;
  - energy-positive neighbourhoods*, cooperative systems for energy efficiency and sustainable mobility.
- Open Innovation for Future Internet-enabled services in cities (CIP):
  - Foster use of new innovation platforms in diverse areas:
    - E-Participation;
    - Tourism;
    - Social interaction;
    - Public sector services based on open data.
  - Deploy new Internet-based services in cities.
- Smart Connected Electro-Mobility:
  - Pilot projects to test urban and inter-urban ICT services that facilitate and enhance the user experience of electrical vehicles;
  - Contribute to pre-deployment and wider uptake of smart connected electro-mobility.

Smart City key ingredient: Future Internet

Future Internet – Public Private Partnership initiative



VII.7. The Future: the Commission's proposals for the 2014–2020 Multiannual Financial Framework

The Future: The Commission's proposals for the 2014–2020 Multiannual Financial Framework

Put forward by the Commission end of June

Common Agricultural Policy	€372 billion	36%	
Cohesion Policy	€336 billion	33%	Main ICT Opportunities
+ Connecting Europe Facility	€40 billion	4%	
Research and Innovation	€80 billion	8%	
Education and youth	€15 billion	2%	
Migration and internal security	€8 billion	1%	
External Action	€70 billion	7%	
Administration	€63 billion	6%	

1.05% of EU GNI in commitments = €1 025 billion over 7 years (2011 prices)

Horizon 2020: Commission proposes €80 billion investment in research and innovation, to boost growth and jobs.

The European Commission has presented an €80 billion[1] package for research and innovation funding, as part of the drive to create sustainable growth and new jobs in Europe. The new framework programme, "Horizon 2020" will make it easier for applicants to seek funding and is designed to help bring more good ideas to market. Horizon 2020 will run from 2014 to 2020.

Horizon 2020 brings together all EU research and innovation funding

Horizon 2020 will bring together all existing EU research and innovation funding currently provided through the Framework Programme for Research and Technological Development (FP), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT). The different types of funding provided by the existing programmes will be brought together into a single coherent, flexible framework which will run from 2014 to 2020. It will provide funding for every stage of the innovation process from basic research to market uptake, in line with the EU's commitments under the "Innovation Union".

VII.8. Connecting Europe Facility (CEF):

Connecting Europe Facility (CEF)

- Announced in the MFF proposal
- Commission proposal in November 2011 to promote the completion of:
  - "transport core network"
  - "energy priority corridors"
  - and key digital infrastructure (network and services)
- To combine market based instruments and EU direct support to optimise impact

Proposed budget 2014–2020

- Energy €9.1 billion
- Transport €21.7 billion (+ €10 billion)
- ICT €9.2 billion

Total budget envelope for CEF: €50 billion

Europe financing:
- Horizon 2020;
- European Energy Efficiency Fund;
- Elena Facility.

Digital Agenda for Europe targets "Broadband Package" adopted by Commission on 20/09/2010
- clarifying the rules for infrastructure deployment, NGA Recommendation;
- RSPP proposal, availability of spectrum for high speed wireless access; and
- Fostering investments, MFF proposal 29/06/2011 (CEF in autumn 2011).

Chapter VIII – References

- Accenture, Carbon Capital – Financing the low carbon economy, 2011
- Accenture, A New Era of Sustainability, 2010
- Accenture, CEO studies on sustainability
- UN Global Compact CEO study, Sustainability – Accenture
- EIB (European Investment Bank)
  - Clean Energy
  - Trans European networks
  - Jessica
  - Education, research and innovation
  - Sustainable transport
  - Jeremie
  - Transport
  - Guide financing projects
  - Energy
  - Elena
  - Annual report 2010
  - www.eib.eu
- European Union (websites, FP7, …)
- Agoria, Smart Cities Event, presentations
  - Fernand Dimidschstein, Managing Director Management Consulting France & Benelux, Accenture
  - **Smart Cities & Communities Initiative** Anette Rothberg, Policy officer, European Commission, DG Energy – New Energy Technologies, Innovation and Clean Coal
  - **Smart Cities: European Commission perspectives** Megan Richards, Director of Converged Networks, DG Information Society and Media
  - **How Smarter Cities are Meeting Economic and Growth Challenges** Brigitte Buyle, IBM Director Growth Initiatives Benelux
  - **Integration of buildings** Peter Van Den Heede, General Manager Low Voltage Products Belux, ABB
  - **Making Cities Work – Sustainable Urban Infrastructure** Willfried Wienholt, Vice President Urban Development, Siemens One – Siemens AG Germany
  - **New Urban IT infrastructures to co-optimise energy and transportation services at city scale** Laurent Schmitt, Vice President SmartGrid Solutions, Alstom Grid
  - **City of Amsterdam "Smartening the City"** Justine Italianer, Project Manager ASC

Addendum

Guideline for Cities

1. City council must take the lead, steer and coordinate the transformation.
2. They have to create a clear vision.
3. Acquire insight into the legal opportunities and impediments.
4. Insight into finance and resources.
5. Setting benchmark dates and monitoring the progress.
6. Look for local, financial partners.
7. Together, investigate all possible financial constructions.
8. Certainly investigate all sources the European Union can provide to finance the smart city-projects.
9. Different projects' structures require different financing plans. Corporate Finance Model – Project Finance Model.