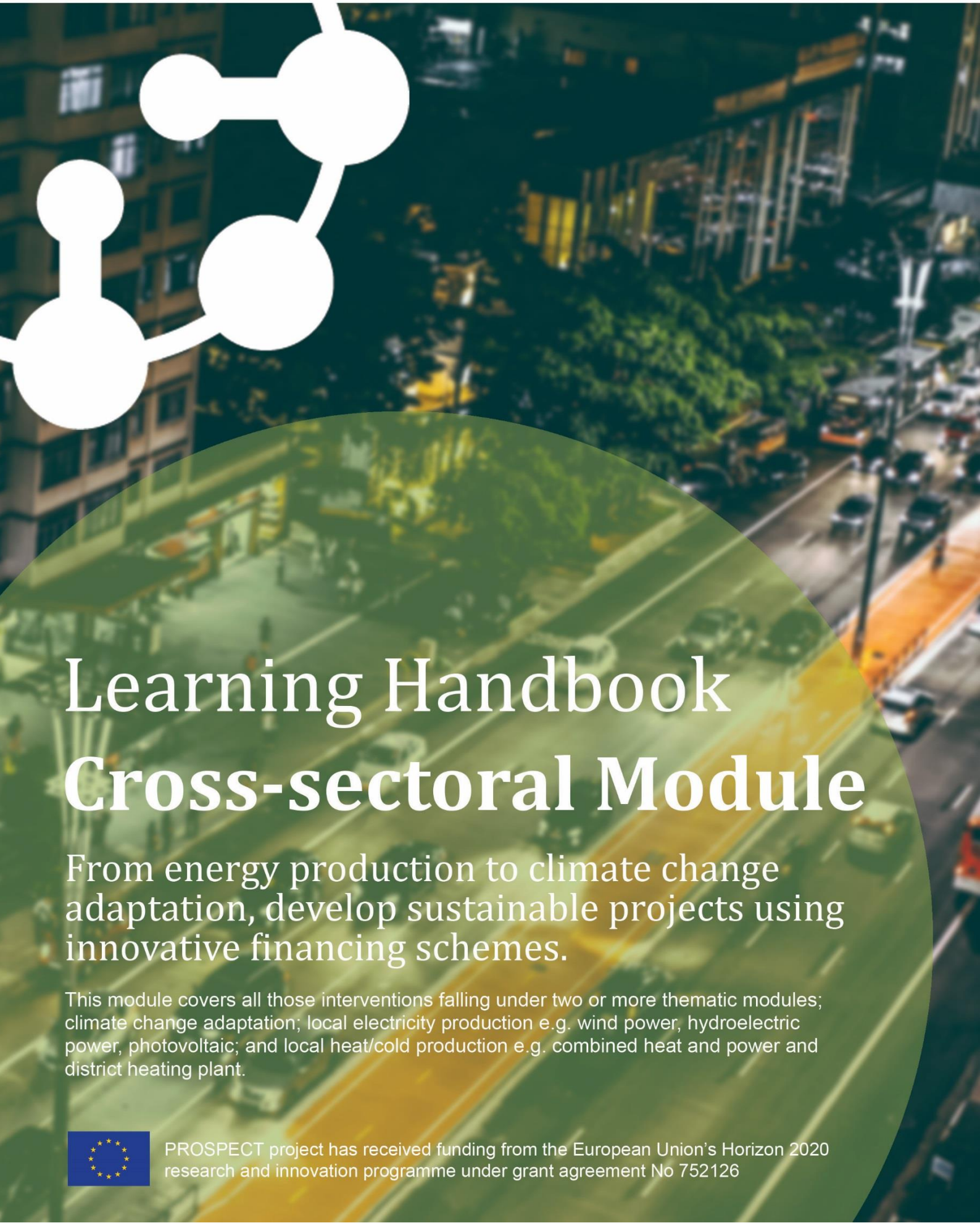
PROSPECT



Learning Handbook

Cross-sectoral Module

From energy production to climate change adaptation, develop sustainable projects using innovative financing schemes.

This module covers all those interventions falling under two or more thematic modules; climate change adaptation; local electricity production e.g. wind power, hydroelectric power, photovoltaic; and local heat/cold production e.g. combined heat and power and district heating plant.

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Module Description

The module on cross-sectoral covers all those interventions falling under two or more thematic areas; climate change adaptation; local electricity production e.g. wind power, hydroelectric power, photovoltaic; and local heat/cold production e.g. combined heat and power and district heating plant.

Module Objectives

Mentee

At the end of this module, mentees can achieve the following learning objectives:

- Understand the innovative financing schemes relevant under cross sectoral
- Recognize the barriers, incentives, advantages, and disadvantages of the innovative financing schemes
- Examine which sustainable energy and climate action projects can be financed by innovative schemes
- Analyse the success factors and lessons learnt from successful projects financed by innovative schemes

Mentor

At the end of this module, mentors can achieve the following learning objectives:

- Share content knowledge on the topic of innovative financing schemes that are relevant under the cross sectoral module
- Share practical experience on implementing sustainable energy and climate action projects and support others in overcoming different barriers
- Showcase sustainable energy and climate action projects financed by innovative financing schemes
- Learn from other cities and regions on what projects they want to implement and which innovative financing schemes they want to apply

Common Barriers

Energy efficiency investments in cross-sectoral, for example those related to climate change adaptation or to the production of renewable energy, can be quite broad. This may include local electricity and heat/cold production to satisfy consumption needs, as well as those interventions falling under two or more thematic areas. As a consequence, investments in cross-sectoral activities may carry higher complexity than in other specific areas.

According to the International Energy Agency (IEA) and Asian Development Bank (Copenhagen Centre on Energy Efficiency, 2015), the main barriers to energy efficiency in cross sectoral are as follows:

- Higher upfront cost investments
- Principal agent issues
- Lack of information among investors
- Energy-efficient products are still unfamiliar
- Risk exposure
- Discount rate problems
- External benefits are hard to quantify
- Lack of technical capacity to carry out projects
- Lack of experience on energy efficiency technologies

These barriers can hinder any intentions at end-use energy conservation in cross sectoral. Energy policies need to be brought together to overcome all of these obstacles. Therefore, governments play a pivotal role in creating the framework specifically for energy efficiency in cross-sectoral. Governments can help trigger energy efficiency investment and expedite implementation through national energy efficiency strategies. Once implemented, it is important to monitor, enforce and evaluate such strategies in order to recognize gaps and reach targets (IEA, 2018).

Wohlfarth et al. (2018) identified several problems and the influencing factors for industries regarding to cross-sectional energy-efficiency measures and proposed approaches to solve the issues, as follows:

Table 1: Approaches to respond individual problems of companies regarding energy efficiency

Problem area for energy efficiency measures	Influencing factors and indicators	Proposed approach
Lack of information/doubts in benefits of measures	Hesitation to invest/implement despite availability of profitable measures, avoidance of changes	Models of pioneer companies, information on implementation process (beyond recommendation of measures)
Energy efficiency measures have low priority, lack of time, expertise and resources	Process of searching, getting informed and implementing is too effortful, transaction costs are too high, people in charge are overstrained	Offer one-stop-solutions for companies to outsource the process
Profitable measures neglected due to financial issues	Inappropriate payback periods are applied, non-financial benefits are put into the rear, decisions about expenses cannot be made autonomous, no possibilities for financing	Reasons should be differentiated. Depending on them: Incentivize consideration of longer payback periods, demonstrate multiple benefits, implement low-level-measures which can be decided within the company, provide funds or loans.

Problem area for energy efficiency measures	Influencing factors and indicators	Proposed approach
Heterogeneity between companies within one sector, no general recommendations can be given	More influencing factors on implementation of measures than sector or companies' size	Promote individual audit; esp. for SMEs: develop self-assessment tool for recommendations on measures fitting to company-type
Motivational barriers	Predominantly in LEs implementation is stated difficult despite availability of profitable measures	Measures should directly affect as few employees as possible, shift of decision criteria from financial aspects to effort, support implementation process

Typical Projects

Typical projects under cross sectoral can range from awareness raising to solar thermal water storage. Below are the typical projects under cross sectoral, including a description of their features: from CO2 saving potentials to estimated costs for municipality and target groups and key actors drawn from the SEAP ALPS Project.

Table 2: Example of projects under cross sectoral

Action	CO2-saving potential	Estimated costs for municipality	Cost-benefit ratio	Implement ation time frame	Target group	Key actors
Solar thermal water storage	High	High	Medium	Years	Municipality, economy, citizens	Municipality, economy, citizens
Alternative energy sources- lake water and waste water	High	High	Medium	1-3 years	Municipality, economy, citizens	Municipality, economy, citizens
District heating/cooling network	High	High	Medium	1-3 years	Municipality, economy, citizens	Municipality, economy, citizens
Support local battery storage	High	High	High	Month to years	Households, municipality, electric supplier	Households, municipality, electric supplier
Awareness raising - photovoltaics	Medium – high	Medium to high	Medium	2 months to 1 year	Private owners	Municipality, energy experts, GIS experts
Photovoltaics grants and subsidies	High	Medium – high	Medium	1-3 years	Municipality, electricity supplier, citizens	Municipality, energy experts
Wind energy plants	High	High	Medium	1-3 years	Municipality, electricity supplier, citizens	Municipality, energy experts
Check for reservoirs	High	High	Medium	3-10 years	Municipality, hydroelectric supplier	municipality, energy experts, civil engineer, GIS experts
Water power plants - planning	Low	High	Medium	2 months to 1 year	Hydroelectric supplier	Municipality, energy experts, GIS experts, citizens, nature conservation authorities
Adaptation in waterpower supply	Indirect	High	High	Months-years	Municipality, energy supply companies, water administration	Municipality, energy supply companies, water administration
Repowering of existing plants	Low	High	Medium	2 months to 1 year	Hydroelectric supplier	Municipality, energy experts, GIS experts

Funding Sources

There are different options for financing cross-sectoral projects – from the city or municipality's own resources through direct budget allocation and via revolving funds to using grants from sub-national or European funds.

Table 3: Source of funds for cross sectoral

No.	Source of Funds	Description
1	**Own Funds**	Funds drawn from internal budget and resources
2	**Local (City or Municipal) or Regional Budget**	Funds drawn from the budget of local or regional public authorities
3	**National Funds**	Subsidies provided by national governmental bodies or funding through grants from national programmes
4	**European Funds**	
	Managed at the EU level	Funds that provide technical assistance and project development, usually for demonstration / pilot projects (e.g. European Innovation Partnership on Smart Cities and Communities, European Research Framework Programme, and Intelligent Energy Europe II Programme)
	Managed at the national, regional, or local levels	Funding resources and technical assistance, such as the European Structural and Investment Funds, which are managed by national, regional, or local public authorities in partnership with the European Commission through operational programmes based on strategic goals or investment priorities
5	**European Banks**	These include European Investment Bank (EIB), the Council of Europe Development Bank (CEB), European Fund for Strategic Investments, Private Finance for Energy Efficiency, European Energy Efficiency Fund, and European Bank for Reconstruction and Development
6	**Private funds**	Financing provided by private contractors, utilities, by institutional investors, crowdfunding, and through energy cooperatives

Innovative Financing Schemes

Innovative financing schemes are non-traditional ways of raising funds and facilitating sustainable energy and climate investments for cities and regions by mixing different sources (own fund, public and private funds) or engaging different partners (e.g. citizens, private sector) aside from established financial institutions (e.g. banks). Below are the innovative financing schemes relevant for this module.

Table 4: Innovative financing schemes under cross sectoral

Financial Schemes	Description
Energy Performance Contracting (EPC)	Energy Performance Contracting (EPC) is a method to implement energy efficiency projects, by which an ESCO (Energy Services Company) acts as a unique contractor and assures all of the steps of a project, from audit through installation up to operations and maintenance. The ESCO delivers a performance guarantee on the energy savings and takes responsibility for the end result. The EPC contract is the contractual agreement by which the output-drive results are agreed upon.
Third-party Financing	Refers solely to debt financing. The project financing comes from a third party, usually a financial institution or other investor, or the ESCO, which is not the user or customer.
Revolving Funds	A fund established to finance a continuing cycle of investments through initial amounts received from its shareholders, creditors or donors and later on through amounts received from reimbursements of provided funding or loans to projects. These recovered funds become available for further reinvestment in other projects under similar scope (e.g. revolving funds for sustainable energy will use the loans recovered funds to finance new sustainable energy projects).
Guarantee Funds	Loan guarantees, which provide a buffer by first losses of non-payment. A mechanisms whereby public funding facilitates/triggers investments.
Soft Loans	Soft loan schemes, are loans below market rates and with longer payback periods. Soft loans may provide interest-free periods at the beginning of the loan. A mechanisms whereby public funding facilitates/triggers investments.
Green bonds	A functionally debt instrument, like any other bond. It offers fixed return, and a promise to use the proceeds to finance or re-finance, in part or fully, new or existing sustainable projects. The bond issuer has to ensure that the proceeds are invested in green projects, such as renewable energy, energy efficiency, projects leading to reduced carbon emissions, etc.
Cooperative	A cooperative ("coop") is an autonomous association of persons who voluntarily cooperate for their mutual, social, economic, and cultural benefit. Cooperative raises equity capital through a large number of investors, including citizens, and obtain debt capital from cooperative bank or subsidized loans.
Crowdfunding	A collective effort by people who network and pool their money together, usually via the internet, in order to invest in and support efforts initiated by other people or organizations

Best Practices

The table below presents the relevant financing schemes and examples of best practices, including the city or region where the best practice is located, and the source(s) of funds.

Table 5: Best practices under private buildings

Financing Scheme	City/Region	Best Practice	Source of funds
EPC	Province of Barcelona (ES)	The project focuses on renewable and energy efficiency. It has given support to 108 implemented projects, representing around EUR 96 million of investment and a CO2 reduction of 21,600 tonnes per year.	Project development Assistance: ELENA EIB & Own Local budget (Barcelona Provincial Council)
Third party financing of an ESCO & EPC	Piedmont Region (IT)	The project targets public buildings combined with public lighting. It has resulted in 11 municipalities coordinating successful energy efficiency tenders, five municipalities entering into a contract with an ESCO for the retrofitting of 18 buildings, 10 municipalities starting to replicate the initiative and an EPC for the replacement of 120 boilers in 118 buildings.	Project Development Assistance: IEE MLEI & Private Sector Institutions and Investors (private ESCOs)
Green Bonds	Paris (FR)	The bond focuses on financing climate adaptation measures. Initially, the bond had applications of investors worth EUR 475 million to fund it. Now, more than 30 investors are involved.	Private Sector Institutions and Investors + Own Local budget.
Revolving funds	Amsterdam (NL)	This fund has financed 29 projects for a total of EUR 14 million, including the largest solar panel installation in the Netherlands, and 'HR+' glass in social housing, the instillation currently investing around EUR 80,000 per day.	Own local budget
Cooperatives	Eeklo, Asse & Beersel (BE)	These funds are geared towards local municipalities that have signed the Covenant of Mayors (CoM) but face difficulties in writing their Sustainable Energy Action Plans (SEAP). They use the revenues of wind projects in Eeklo, Asse and Beersel to pay the monthly wage of an SEAP expert who initiates renewable energy sources (RES) and energy efficiency (EE) projects at the local level.	Private Sector Institutions and Investors (Individual funds)
Revolving funds & crowdfunding	Bristol city & wider sub-region (UK)	So far, 28,000 social housing units and over 200 private homes have benefited from energy retrofitting, and the city's renewable energy capacity has been improved, with measures such as solar panel installation.	Project Development Assistance (ELENA EIB) & Own Local budget & National and Subnational Governments & Citizens finance

Overview of Financing Schemes in Cross Sectoral

Which financing schemes are more flexible and sustainable?

There are two indicators that are important to include in our analysis when it comes to choosing the right financing scheme (Mango, 2010). The flexibility and continuity of a financing scheme should be identified before implementing the financing scheme. The indicator of flexibility is whether the financing scheme is more restricted or unrestricted in use. Grants from donor agencies are commonly more restricted due to the imposed terms and conditions. The funds that are raised through fundraising events, bank interest, and general donations tend to be more unrestricted in use. This type of fund is much more preferred as a part of a financing strategy because it is more autonomous, flexible, and secure. The indicator of continuity is whether the financing scheme remains available in the long run. It ensures more security to implement projects, especially in energy efficiency investments as they generally have a longer payback time. The following matrix shows the classification of financing scheme based on those two indicators.

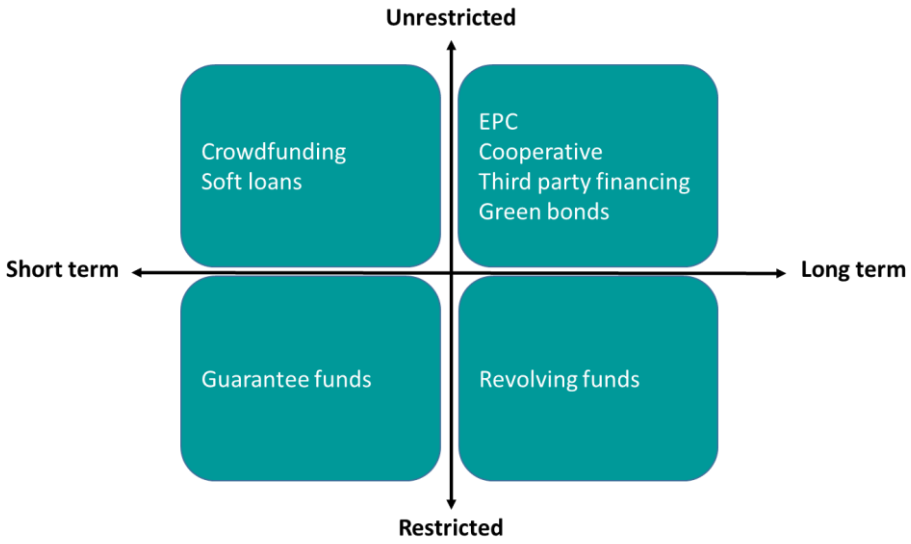


Figure 1: Financing Schemes Matrix of Flexibility and Continuity

In general, a mix of financing schemes is needed as most of these schemes are not a stand-alone financial solution. They need to be combined with other schemes to sufficiently support a project. However, based on Figure 1, it is recommended to have some of the funds from the financing schemes that fall in the top right quadrant. Funds that are less restricted and more sustainable in the future are more favourable.

Crowdfunding and soft loans are quite flexible, however they do not provide long-term financial means. Crowdfunding is especially meant for smaller projects within a short period of time. Guarantee funds can be versatile in terms of sectors that can be financed, like soft loans, but with complex bureaucracy they are less attractive to potential customers. Revolving funds can be sustainable because the funds will be replenished after the loan repayments, especially if the funds are combined with other types of scheme, such as soft loans and guarantee funds. It will increase the capital of the funds and potentially be able to finance other similar projects. However, revolving funds are usually administered by government, so they tend to have specific targets and projects that are eligible for the funds.

The financing schemes that fall in the top right quadrant of the matrix are green bonds, third party financing, cooperative, and EPC (Energy Performance Contracting). Green bonds have a high level of transferability, making them more adaptive in any situations and conditions. They are typically intended for large-scale projects with long investment period. Many investors are attracted to green bonds due to the fixed interest rate, so this type of scheme is considered more predictable and less risky. Third party financing is very replicable and usually combined with EPC. They are more likely to serve the needs of the clients. Cooperative schemes, just like crowdfunding, obtain their funds from citizens and other investors. They are more autonomous in the form of organisational instruments, making them more flexible. They usually consist of different stakeholders that have the same aim of energy infrastructures decentralization and taking part in the decision making.

How to apply each financing scheme in general?

EPC

Table 6: EPC step-by-step

Data collection • analysis of the current state of the buildings or systems that wish to be refurbished • identification of priority refurbishment areas • data collection
Definition of quality and procurement criteria • what energy measures? • expected service life • which control system? • maintenance costs • other criteria for technology solutions
Detailed analysis of investment costs & savings • development of the baseline • identification of potential public support
Tendering & selection of ESCO • tendering (based on criteria defined above) • identification of potential ESCOs • development of EPC contract
Implementation • implementation & tracking results • accounting

Guarantee funds

Table 7: Guarantee funds step-by-step

1. Detailed Energy Audit A necessary condition for a successful application with the Energy Efficiency and Renewable Sources Fund is the presence of a detailed energy audit allowing for an energy analysis and choice of energy saving measures
2. Principal Eligibility Criteria All energy efficiency projects approved and supported by the guarantee fund should meet the eligibility criteria imposed by the provider
3. The Project Cycle • Project identification (Project Developer) • Initial project screening (when necessary, the fund provider/external consultancy company) • Completion of Initial Project Proposal (IPP) (Project Developer)

- Submission of IPP and accompanying documents to the fund provider (Project Developer)
- Assistance in IPP and accompanying documents completion and improvement (the fund provider)
- Project appraisal and assessment (the fund provider)
- Formal decision for approval of financing (the fund provider)
- Completion of negotiations for financing and disbursement of funds

Soft loans

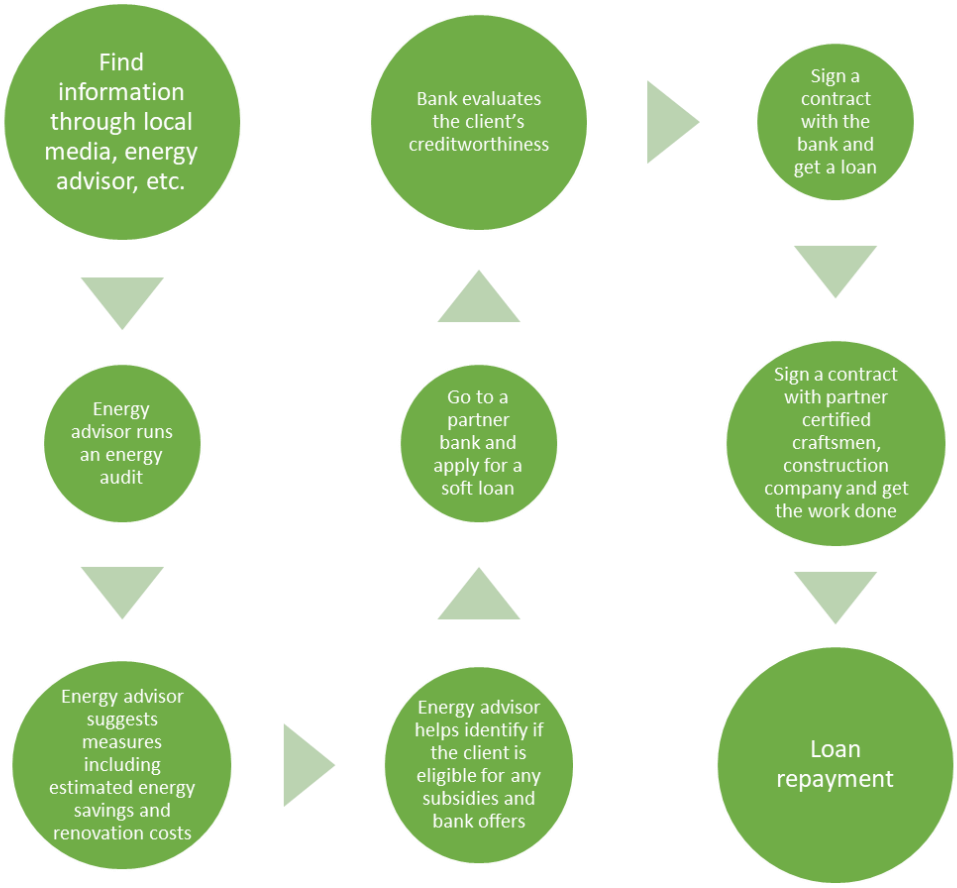


Figure 2: Soft loans step-by-step

Revolving funds

Table 8: Revolving funds step-by-step

Application	1. Prepare the documents and application that are submitted to the fund
Review process	2. Energy Agency 2.1. The energy audit request is submitted 2.2. The energy audit is prepared and returned to the Fund 3. Council/Financial Department 3.1. Request for assessment of creditworthiness and future cash flow 3.2. Calculations and creditworthiness are assessed and cash flow is prepared 4. Clients 4.1. Request for renovation assessments 4.2. Renovation cost assessment provided
Process of approval	5. The fund gathers all information about the building and submits it to the Board of Members. 6. If the Board of Members approves the application, the documents approving the renovation are sent to a Construction company. 7. Managing Bank 7.1. Immediately after the application for renovation is approved, the request to provide financing is sent to a Managing Bank. 7.2. Financing is provided to a construction company.
Renovation and post-renovation	8. At this stage, a construction company is able to start the renovation. 9. Repayments 9.1. Once the renovation is completed, the building energy consumption is reduced. Homeowners pay back the loan through the utility bills to the Financial Department. 9.2. Savings after the renovation are then calculated and sent from the Financial Department to the Managing Bank.

Third party financing

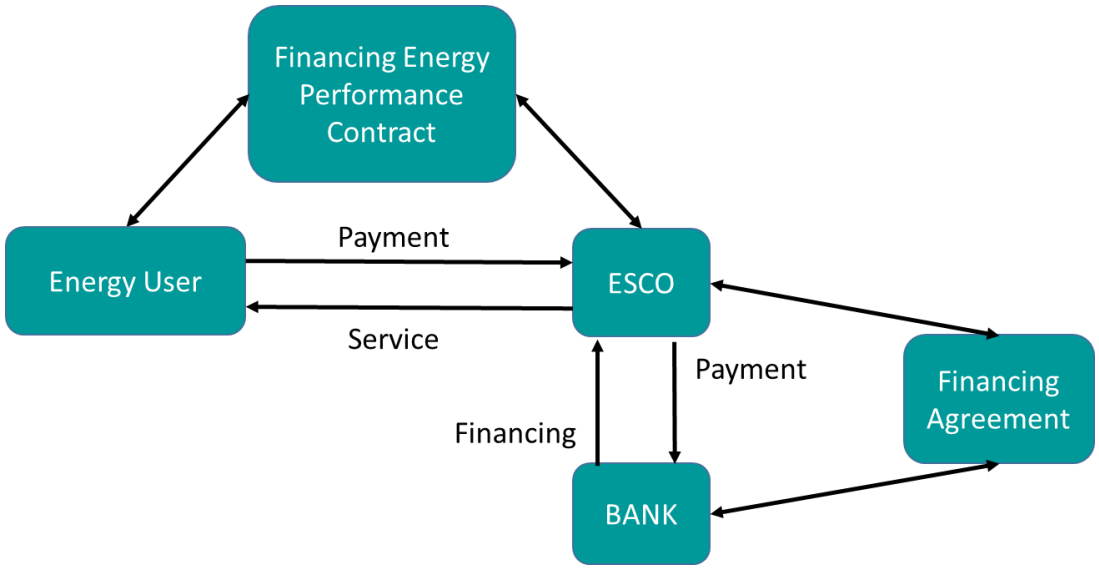


Figure 3: Third Party Financing with ESCO borrowing

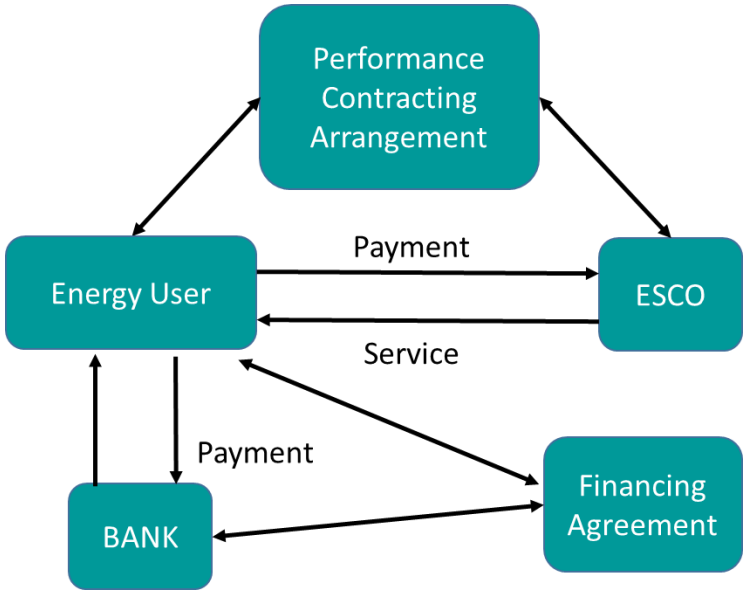


Figure 4: Third Party Financing with energy user/consumer borrowing

Green bonds

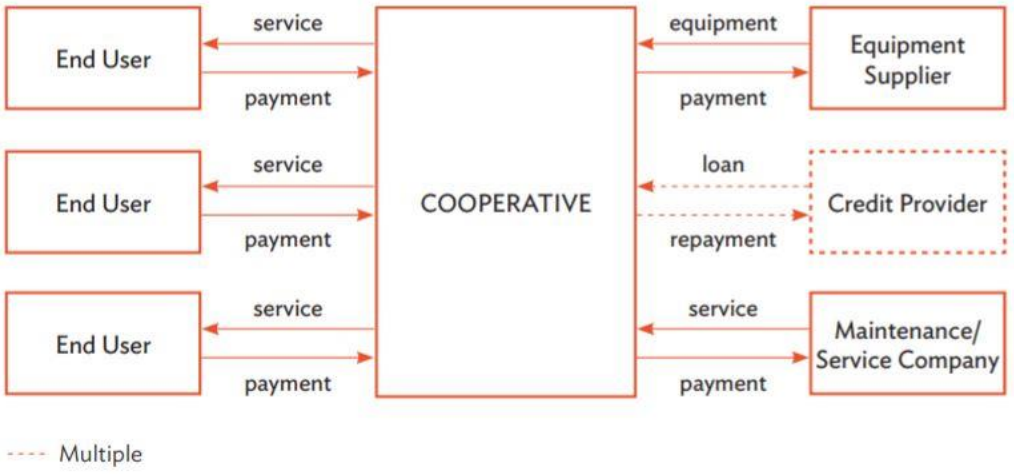
Table 9: Green bonds step-by-step

Defining "green" criteria	There are several evolving standards and guidelines for defining the criteria of a Green Bond. To choose the right guidance or develop your own, in line with investor expectations, is challenging and requires detailed deliberation. Moreover, the green portfolio that should be associated with a Green bond must be carefully chosen to ensure continuous commitment and expected returns over the tenure of the bond. It is recommended for the issuers to opt for external verification by adopting one of the following: • **Second-party review and consultation:** This involves advice from a consultant that may not be made public. • A**udit**: This denotes verification of the entire process, or a part of it, by third parties. This is required to be made public at issuer discretion. • **Third-party certification**: This involves certification of green bonds by qualified third parties.
Issuing the Green bond	While issuing a Green bond, several factors such as the tenure, the issue size, the prepayment penalty clause, etc., play an important role. Although the factors are more or less similar to any other bond, the commitment to invest in green projects complicates the process.
Monitoring performance	This is on Green e of the most essential stages in the life cycle of a Green bond. Continuous monitoring of proceeds, and the environmental and social performance of associated projects/assets, is important to ensure compliance with the basic commitment and to maintain trust among investors. Continuous monitoring and verification by a third party will be key to build trust among stakeholders and, in turn, increase the demand.
Reporting performance	Transparent communication with investors about the performance of the Green bond is expected from all issuers. This will provide the much-needed element of trust among the investor group and will attract potential investors in future.

Source: Ernst & Young LLP, 2016

Cooperative

A cooperative business model is usually established by a not-for-profit community organization. It is funded by member investments, with or without external financial support (Asia-Pacific Economic Cooperation Energy Working Group, 2009). The cooperative takes care of all administrative and operational functions, such as the installation, maintenance, and safe operation of projects. It also manages the finance and payments between users, construction companies, and the cooperative (Asian Development Bank, 2015).



Source: Asian Development Bank, 2015

Figure 5: Main features of cooperative business model

Crowdfunding

Table 10: Crowdfunding step-by-step

Making a contract	A contract between the project developer and the CFP, regulating the fees and conditions. Often, fees include: • a one-time listing fee of 5 to 10% of the amount raised, and • an annual fee of about 1% fee on the amount raised (or sometimes on the outstanding balance). Additional costs can include: • a financial services fee of 0.25% to up to 3%, for handling financial transfers between the crowd investor, the CFP, and the project. • Some platforms may charge an extra fee for marketing efforts, up to 5%, depending on how much effort the CFP itself, as opposed to the project, undertakes.
Listing of the project	The listing of the project on the website of the CFP. Before listing, the CFP and the developer would agree on: • the duration of the campaign (typically 1 to 3 months), • a minimum target amount to be raised, and • a clear description of the terms and conditions for the crowd investment. This description (the 'pitch') would include at a minimum a brief explanation of the project and the project developer, the target amount for the campaign (minimum and maximum thresholds), the minimum (and depending on the national legislation also the maximum) amounts each investor may invest, the dividends and other rewards the investor can expect, the duration of the project and the exit strategy for the crowd investor to recuperate its full investment and dividends. Typically it also includes • a long description of all the risks and a warning, required by the financial oversight authorities of the country, that this is a risky investment, and that the investor may lose all his/her money.

Fundraising campaign	The fundraising campaign runs through several stages, from pre-kick-off presentations to the crowd announcing the upcoming investment opportunity, to the kick-off of the campaign, with continuous updates to potential investors about progress in fundraising, and a final stretch all-out effort to reach at least the target, or even better, overshoot it.
Pledge and contract phase	Crowd investors can pledge online a certain investment amount. Then they need to be cleared in accordance with moneylaundering regulations and crowdfunding legislation, a service often provided by Page | 17 a bank or payment services provider. Once cleared, investor and the CFP (or in some cased the project itself), enter into individual equity investment agreements, preferably online.
Implementation phase	The implementation is when the crowdfunded amount is transferred to the project and the project provides regular payments and update reports to crowd in accordance with the agreement signed by the project. During that phase, the project pays an annual fee to the CFP (here 1% p.a. on the original fundraised amount) for monitoring and continued investor communication.

Source: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2016.

What are the case studies in Europe?

EPC

A 5-star hotel in Madeira, Portugal, used EPC to reduce its energy bills and improve its energy efficiency. The project was conducted for 6 years and financed by ESCO (60%) and public funds (40%). It is estimated to save about 208 t CO_2 emissions. The energy measures implemented were circulation pumps and efficiency lighting, as well as 250 kWh Photovoltaic (PV) Plant. The investment cost of the PV Plant was the highest among other energy measures, which was 343,661 € with financial savings of 44,321 €/year. The payback period for the PV Plant is 7.8 years. This project is assessed as a best practice for combining renewable energy sources and energy efficiency measures to achieve considerable reduction in the electricity costs (Trust EPC South, 2015).

Guarantee Funds

The French cooperative Enercoop was called for tender organized by EDF in 2008. The EDF wanted to buy electricity produced by a hydropower plant in order to supply its consumers. The Crédit Coopératif, Enercoop's banking partner, would not take the risk of guaranteeing the investment costs alone and asked for counter guarantees. Enercoop asked Cooperatives Europe and Ecopower to support it. Ecopower and Enercoop had never met before. Ecopower decided to help Enercoop in its project by vouching for Enercoop through their banking partner Triodos. Ecopower also decided to buy shares of the cooperative Enercoop to help Enercoop refinance its capital. This encouraged Triodos, la Nef (French ethical finance operator) and the Macif (French mutual fund) to bring counter guarantees to the Crédit Coopératif. SOREGIES, a local supplier of electricity, also helped Enercoop by guaranteeing they would buy back the energy from the call for tender to Enercoop in case of bankruptcy. The Crédit Coopératif then agreed to guarantee for Enercoop, resulting Enercoop to win the call for tender (REScoop, 2014).

Soft Loans

Germany launched a solar roof program in 1999. The program was supported by KfW bank group that offered a soft loan. With the ease from lower interest rate compared to the market rates provided by the soft loan, around 100,000 solar roofs were successfully installed. This is

supported by the fact that producers of renewable energy are usually not obliged to pay some taxes because of the lower negative external costs (Topo et al., 2014).

Revolving Funds

A scheme of revolving fund, called CARES (Community and Renewable Energy Scheme), was established in 2011. Since then, over 400 renewable energy projects were financed. The scheme is financially supported by the Scottish Government and managed by Local Energy Scotland. It supports local community projects to accelerate community or locally owned renewable productions. The scheme provides initial capital up to £10,000 and loans up to £150,000 and cover up to 90% of agreed costs with a fixed interest rate at 10%. The loan repayments will then replenish the initial fund of the scheme (REScoop, 2014).

Third Party Financing

A shopping center in Madrid, Spain, called CC Parquesur de Madrid has a high level of consumption with old and inefficient equipment for heating & cooling (H&C). It decided to conduct an energy efficiency project for the duration of 15 years. The project was fully covered by a third party (bank) with the total investment cost of 7.5 M €. The implemented measures include for high efficiency HVAC (Heating, Ventilation and Air Conditioning) with CCHP (Combined Cooling, Heating and Power) and DH&C (District Heating and Cooling). Using EPC, the guaranteed energy savings is 20% with the estimated of 196 t CO_2 emissions saved. (Trust EPC South, 2015).

Green Bonds

One of the world's largest corporate issuers of green bonds is ENGIE, formerly known as GDF Suez. It is the second largest French electricity producer that has issued a green bond worth EUR 2.5 billion to finance its renewable energy and energy efficiency pipeline. The projects include wind farms and hydroelectric plants as well as smart metering for energy efficiency. The construction of integrated district heating networks powered by low-emission biomass plants is also one of the projects financed. The projects must meet certain requirements in five areas: environmental protection, contribution to local development and the well-being of local communities, fair and ethical relationships with suppliers and sub-contractors, human resources management, and good corporate governance for the selected projects. The criteria were determined by GDF SUEZ with the Vigeo ESG rating agency. The funds from the issued green bond will be leveraged in a traceable way that will be verified by one of the GDF SUEZ statutory auditors (Cochu et al., 2016).

Cooperative

The Krk Island Energy Cooperative is a Croatian initiative that aims to be a pioneer in European transition towards a 100% renewable energy future. A wide variety of actors engaged in the project, from the municipality to local small to medium enterprises and individual citizens. The Krk cooperative successfully managed to lower the costs of permits and installations of renewable energy sources in households through a lengthy process of negotiation and the help of citizen mobilization. As a result, the costs of PV solar systems in the region are also reduced. The cooperative also actively raise awareness and encourage citizen engagement to conduct renewable energy sources projects as they affect local economy growth and create new jobs

(Community Power, 2018). More case studies can be found on http://www.communitypower.eu/en/publications.html.

Crowdfunding

One of the top renewable energy crowdfunding platforms is Windcentrale in the Netherlands. Since its launch in 2010, it has successfully raised money around 14.3 Million Euro until 2014. It was once raised 1.3 Million Euro in only 13 hours. Investors come from private individuals who wish to own windmills and use the energy generated in their households. On average, every investor gets around 500 kWh per year, which is sufficient to cover their energy costs for the next 12 – 15 years. If energy prices keep increasing at 3 percent per year, financial returns of 7 percent provided by Windcentrale are very attractive (Renewable Energy World, 2014).

What is the summary of the financing schemes?

Table 11: Overview of financing schemes

Financing Scheme	Adopted best in sector	Strengths	Weaknesses	Approached to
EPC	• Public buildings • Public lighting • Private buildings • Cross sectoral	• Turnkey contract • EPC provider manages the performance risks • Professionalism and expertise of EPC providers • ESCO can bring some financing	• Traditionally focussed on low hanging fruits (high returns) • Increases transaction costs • Requires more developed skills on the client side • Lack of standardised framework and templates • Difficulties to enforce legal rights for ESCO service providers	Transforming market
Guarantee Funds	• Private buildings	• Reduces the risks for banks and enables them to lend greater amounts • Anecdotal evidence suggests that energy efficiency loans experience "market standard" or better credit performance therefore risk sharing facilities can be a transition phase until energy efficiency loans are mainstreamed • Provides extra leverage for private sector funds	• Time to structure and negotiate • Moral hazard if substantially all risk is removed from bank lending • Know-how to implement at regional and local government levels	Mature market

Financing Scheme	Adopted best in sector	Strengths	Weaknesses	Approached to
Soft Loans	• Public buildings	• Easy to roll out, however careful ex-ante analysis of supply and demand and legal/tax framework needed • Standardised supply offering at the same time flexibility according to individual preferences (repayment, interest rate fixation etc.) • The use of Cohesion funds for soft loans in housing is facilitated with the "renovation loan" (off-the shelf instrument) • Allows 1:1 refinance to commercial banks (Basel III compliant) • Positive impact on public budgets due to leverage effects	• Capacity/ willingness of owners to take more debt (ie very country dependent) • Risk aversion of banks (calling for guarantees from Governments) • Leverage effect of public funds is usually less than 10x and grants are often required alongside to improve energy efficiency ambition	Mature market
Revolving Funds	• Public buildings • Private buildings • Cross sectoral	• Enables to recycle capital for future use • More efficient allocation of public funds • Allows long-term sustainability of public investment • Direct and clear impact on the financial barrier issue, which is lack of liquidity • Can help demonstrate the commercial viability of EE investments and provide credit histories, paving the way for future commercial financing	• Temporary impact on the financial barrier issue • Does not contribute to long-term market transformation, unless it lasts for so long that sustained stable demand will have been created • Does not call for any particular innovation from the market • Limited budget to finance the measures • Payback period limited to 15 years • The set up and operation of a revolving fund can be administratively difficult, for example, it may be needed to apply significant effort in educating financial administrators on how to recognise savings	Mature market

Financing Scheme	Adopted best in sector	Strengths	Weaknesses	Approached to
Third Party Financing	• Public buildings • Private buildings • Cross sectoral	• Provides a guaranteed energy-saving outcome (if combined with EPC) • Guarantees lower operating costs (energy, maintenance), better quality of equipment, better living/producing conditions • No need to employ special know-how, personnel or equipment (if combined with EPC) • Reduces the maintenance and repair costs since they will be included in the fixed costs • Protects from indirect causes affecting energy price changes	• Non - transparent administrative / financial / technical framework which leads to ambiguous interpretation of the relevant legislation and uncertainty for the potential client • Unattractive investment environment, e.g. The Financing Institute requires mortgage of estate and/or electro mechanical equipment in order to provide financing • The mechanism for financing, investing, designing, constructing and security of the project is not yet well-defined	Transforming market
Green Bonds	• Public buildings • Private buildings • Cross sectoral	• Large and deep pools of investor finance • Applies to most building segments • High leverage effect • Limited need for public funding • Strong market signalling • Simplifies to attract new investors	• Needs large size to provide liquidity to bondholders (eg. $300+ million) Limited to cost effective investment within the investment timeframe of each fund • Should deliver adequate return investment performance returns to investors, aligned with the investment risk, and (if possible) measurable and comparable to financial instruments that provide a similar level of returns.	Transforming market
Cooperative	• Cross sectoral	• Start-up capital can include government or donor funding. • Trust in co-operatives and mutual and growing interest in community based schemes	• As tasks are performed by managers selected from among the members, management skills and capacity can be limited. • The participation of managers is voluntary, so a lack of commitment can sometimes be a problem	Premature market

Financing Scheme	Adopted best in sector	Strengths	Weaknesses	Approached to
Crowdfunding	• Cross sectoral	• Allows raising funds through institutional channels • Allows full transparency and open communication on projects • Improves efficiency in the financial sector (by increasing range of investment options for potential investors on one side and by providing funding solutions for projects not bankable in the traditional financial market) • Improves efficiency in the real economy (as the validation from the crowd is often used as a test for early stage products and to assess potential demand for a product or service)	• Nu guarantee of sufficient funding • Investors may be inexperienced or wish to exit • The process is not regulated • It may be challenging to fulfil commitments to a multitude of small investors • The lack of a secondary market • Insolvency of the platform operators • Misinformation or insufficient information to price the invested securities correctly • The risks of the loss of a portion of the capital or failure to obtain the expected returns	Premature market

What are the policy recommendations for improving cross sectoral energy efficiency?

According to IEA (2011), the areas that need further development are as follows:

- Upgrade national energy efficiency strategies and action plans.
- Increase efforts in financing, especially with the development of savings verification and measurement protocols, and forming public-private partnerships.
- Expand efforts to stimulate risk-mitigation schemes, such as public-private partnerships.
- Increase quality and coverage of energy indicators.

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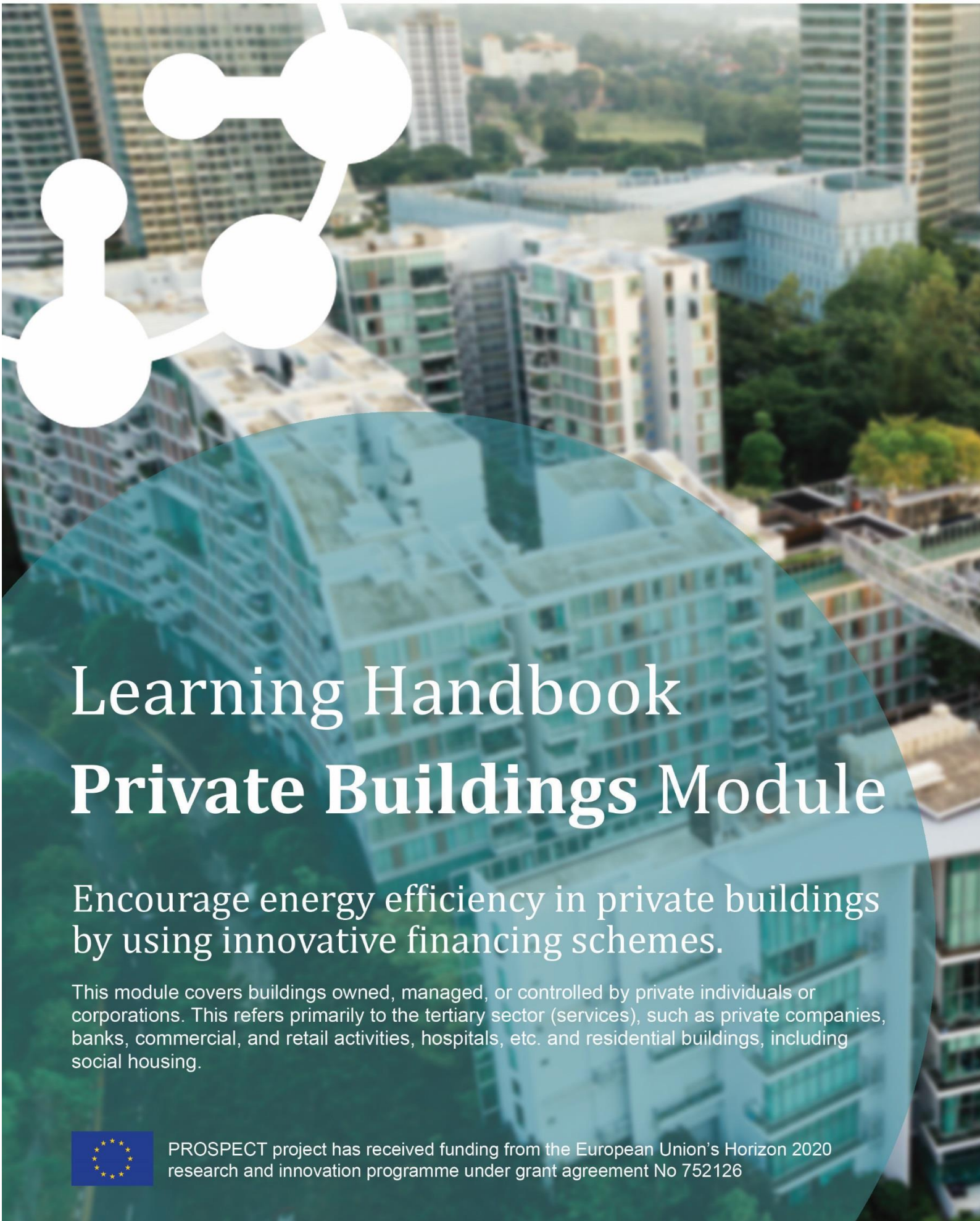
PROSPECT



Learning Handbook

Private Buildings Module

Encourage energy efficiency in private buildings by using innovative financing schemes.

This module covers buildings owned, managed, or controlled by private individuals or corporations. This refers primarily to the tertiary sector (services), such as private companies, banks, commercial, and retail activities, hospitals, etc. and residential buildings, including social housing.

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Module Description

The module on private buildings covers buildings and facilities owned, managed, or controlled by private individuals or corporations. This refers primarily to the tertiary sector (services), such as private companies, banks, commercial, retail activities, and residential buildings, including social housing. Actions under private buildings can include renewable energy for heating; energy efficiency in heating; indoor lighting; and new construction or refurbishment.

Module Objectives

Mentee

At the end of this module, mentees can achieve the following learning objectives:

- Understand the innovative financing schemes relevant to private buildings
- Recognize the barriers, incentives, advantages, and disadvantages of the innovative financing schemes
- Examine which sustainable energy and climate action projects can be financed by innovative schemes
- Analyse the success factors and lessons learnt from successful projects financed by innovative schemes

Mentor

At the end of this module, mentors can achieve the following learning objectives:

- Share knowledge on innovative financing schemes that are relevant to the private buildings module

- Share practical experience on implementing sustainable energy and climate action projects and support others in overcoming different barriers
- Showcase sustainable energy and climate action projects financed by innovative financing schemes
- Learn from other cities and regions on what projects they want to implement and which innovative financing schemes they want to apply

Sectoral Challenges

According to the European Union (EU) Directive 2010/31/EU, buildings in general are responsible for 40% of total energy consumption in the EU, with the highest share from residential buildings. This is exacerbated by a number of studies that anticipate an increase in energy consumption in consequence of more appliances usages in the future (Building Performance Institute Europe (BPIE), 2010).

The EU composed a common framework, called The Energy Performance of Buildings Directive (EPBD), for enhancing energy efficiency in buildings. The EPBD becomes more stringent as it requires a goal of Zero Energy Buildings in a building energy code (Takagi et al., 2014). Applying energy efficiency in buildings might potentially help the EU achieve the target 20% energy saving by 2020 (Deloitte, 2016).

The opportunities for energy savings in buildings is quite high, up to 41 % savings by 2035 (International Energy Agency (IEA), 2012a). However, the energy savings potential has not been widely recognised by the consumers or companies of the existing buildings, creating energy efficiency gap (IEA, 2007). The EU acknowledged it and therefore is more concerned about existing buildings that need substantial renovations and retrofits, as energy efficiency measures are already implemented in some new buildings (BPIE, 2010). Up to 1.2% of buildings are renovated every year (European Commission, 2016). This rate is very low, and it needs 1.8% more to reach Europe's targets in carbon reduction, energy security and resource efficiency stated in COM[1] (BPIE, 2014). To adequately address the concern, the EPBD was revised in April 2018 to speed up the building renovation with more energy efficient systems.

It is commonly more challenging to promote retrofits of residential buildings due to the fact that the proprietors are not a single entity and the levels of individual investments and returns are low (Energy Sector Management Assistance Program (ESMAP), 2014). Moreover, the "split incentive" prevents building owners and tenants from investing in energy efficiency (BPIE, 2010), which appears in two situations. When the building owner invests in energy efficiency, the tenant will reap the benefits as the tenant pays the actual energy consumption. However, this is not the case when the energy consumption is estimated and included in a fixed cost that needs to be paid by the tenant. The way in which the tenant consumes energy determines the amount of savings on energy bill that the building owner can profit.

The relatively low energy prices compared to other factors makes energy efficiency investment seem less important to consumers and companies. They are more likely to invest in safety, health, comfort, and aesthetic improvements. This leads to a small proportion of their investments going

[1] As defined in COM (2011) 112: A Roadmap for moving to a competitive low carbon economy in 2050, COM (2011) 885: Energy 2050 Roadmap, and COM (2011) 571: Roadmap to a Resource Efficient Europe

to energy efficiency measures (BPIE, 2010). Finding affordable financing and attractive incentive schemes is a major challenge to improve energy efficiency investments in private buildings (ESMAP, 2014).

Common Barriers

The most common barrier on energy efficiency in private buildings is related to finance. Investing in energy efficiency requires upfront costs, which is often discouraging private entities with no easy access to capital or less concerned for the investment (Fuller, 2008). The relatively small size of energy-efficient projects with uncertain risk exposure makes commercial banks hesitant to provide financial services to the projects (de T'Serclaes, 2007). Due to the uncertainty, a high discount rate is adjusted, coupled with a long payback time making investment in energy efficiency is unappealing, especially to the financier who is not well-informed (BPIE, 2010).

Another barrier comes from legal institutions and bureaucracy. Inadequate laws and regulations for energy efficiency hinder the viability of energy efficiency project investment. Necessary knowledge about energy efficiency is also lacking amongst the actors in the building chain in general. A summary of key barriers is presented in Table 1.

Table 1: Key barriers in private buildings investments

Institutional, political and regulatory barriers	Informational/capacities	Financial and economic barriers
Lack of legal framework for energy efficiency	Lack of understanding of economy-wide benefits from energy efficient retrofit	High interest rates (approx. 12.5% in 2015)
Lack of compulsory or voluntary standards	Poor availability of information and statistical data on the existing building stock	Suppressed heating demand due to fuel poverty
Lack of legal recognition for potential condominium associations (CAs), which could mobilize collective investments	Lack of understanding of private benefits from energy efficient retrofit amongst tenants/owners	No incentives to private banks for delivery of low cost credit lines, resulting in minimal marketing efforts and extended administrative procedures
Lack of a responsible body or central information point for energy efficiency	Poor awareness amongst building occupants of best daily practices for energy efficiency	
No competition between electricity and gas distribution companies		

Source: Halonen, et al. (2017)

Typical Projects

Typical projects for the energy consumption in private buildings can range from awareness campaigns to efficient heating in residential buildings. Below are the typical projects under private buildings, including a description of their features: from CO2 saving potentials to

estimated costs for municipality and target groups and key actors drawn from the SEAP ALPS Project.

Energy management for companies

The aim of this project is to obtain energy savings by adjusting heating/cooling systems and recognizing any malfunctions as well as the consumption behaviour. Energy management can be broken down into four actions: energy accounting, education for caretakers, adjustment to existing technical facilities, and annual report. Energy accounting includes monitoring energy consumption to identify necessary measures. Caretakers need to get training to maintain the technical equipment, such as heating systems. Adjusting heating and ventilation systems regularly may save energy up to 15% without breaking the bank. Annual reporting helps see the transparency of energy costs.

Awareness raising of citizens regarding residential buildings

Since Province of Torino, Italy, highly depends on gas and petroleum from abroad and neighbor regions for its energy sources, the provincial government feels the need for the transition to renewable sources and starts saving energy. The government promotes home energy efficiency to the citizens through informational booklets, presentations, videos, and technical data sheets that provide concise but exhaustive picture on the importance of energy saving. The government also developed an interactive software, which allows citizens to simulate the amount of energy that can be obtained by installing solar, thermal, and photovoltaic panels at home. Beside raising citizens' awareness, this also motivates the citizens to improve energy efficiency and save energy at home. More information on http://www.provincia.torino.gov.it/ambiente/energia/sportelli_energia/index.html.

Table 2: Example of projects under private buildings

Action	CO2-saving potential	Estimated costs for municipality	Cost-benefit ratio	Implementation time frame	Target group	Key actors
Energy management for companies	Medium	Savings above expenses	Very high	2-3 years	Enterprises	Municipality and possibly external experts, enterprises
Awareness raising of citizens regarding residential buildings	Medium-high	100-200 Euro/check	High	2-month preparation, 1-month campaign	Private owners	Municipality, energy expert
Energy advice service	High	Medium	Medium	3 months	Citizens	Municipality, energy experts and citizens
Electricity saving contest	High	Medium	Medium	3 months – 1 year	Citizens	Municipality, energy supply company and citizens
Improvement of indoor lighting	High	Medium	Medium to high	1 month	Enterprises	Municipality, enterprises, LED dealers
Efficient heating regarding residential buildings	Medium-high	Medium to high	Medium	2 months to 1 year	Private owners	Municipality, energy experts, GIS experts
Energy efficiency in new construction regarding residential buildings	Medium	Medium	Medium	1 year	Private owners	Municipality, energy experts, building enterprises
General energy efficiency guideline for procurement	Medium-high	Low	High	1 year	Enterprises	Municipality, enterprises

Energy advice service

The target of this action is citizens looking to save and/or produce their own electricity and reduce their energy consumptions. The municipality should offer this energy advice service with no cost for the initial advice to attract and reach more citizens. The service should have the option to be performed right at the client's home, so a direct quick check on the energy can be executed to reveal saving potentials. The service should include information about incentives for energy-saving work and presenting the latest energy-saving technology.

Electricity saving contest

Residential buildings have a large energy saving potentials. To encourage citizens to be more aware of their energy consumption, thus save energy at home, municipalities can organize an electricity saving contest with attractive prizes. Municipalities can collaborate with the local energy supply company to make a large public relation campaign. The contest can start with participants showing their electricity bills of the last two years to set a baseline. The electricity

bill of the following year is compared with the baseline. Participants who managed to save a certain percentage, for example 10%, get a bonus. Savings above it will be given additional payment, e.g. 3 cents per kWh. The best participant wins the first prize.

Improvement of indoor lighting

Information events on how to reduce energy consumption of lighting can be held by municipalities, targeting enterprises and private households. Municipalities may try to approach enterprises directly or give incentives to support the use of energy-efficient lighting at private buildings. Energy-efficient lighting includes LED technology with lower maintenance. Lighting system can also be improved by regulating light intensity (dimming).

Efficient heating regarding residential buildings

Efficient heating systems can save 30% of the energy bills. Municipalities can introduce the efficient heating systems to private households by providing information through flyers, internet, etc. The information should cover any available potentials in efficient heating systems and how renewable energies can be used for heating systems. Cooperation with energy suppliers is recommended.

Energy efficiency in new construction regarding residential buildings

Municipalities can set energy standard for new residential buildings, e.g. by incentives (such as bonus system for applying renewable energy and high insulation standard) and by urban development contracts. Marktoberdorf is a city in Germany that is active in advancing energy transition to renewable energies and climate protection. Regarding new construction of residential buildings, the municipality has several types of residential buildings that can earn climate points, which then can be exchanged for certain incentives. For example, if the citizen builds an energy-optimized and ecological house, the citizen can earn points – for every point 0.90 € / m^2 is received. Types of residential buildings include passive house (passivhaus) that uses very little or no energy and leverage sun as a heat source.

More information on http://www.klimaschutz-marktoberdorf.de/downloads/Klimaschutzprogramm_Neubaugebiete.pdf.

General energy efficiency guideline for procurement

A general efficiency guideline is of use to implement energy efficiency measures in all departments in enterprises, especially when it comes to procurement. The city of Kempten, Germany, created an energy guideline in 2016 for the construction and operation of urban real estate. The guideline includes thermal insulation in building construction, heating and cooling systems, lighting systems, etc.

More information on https://www.kempten.de/energiemanagement-787.html.

Funding Sources

How can private entities finance private building projects? There are different options for financing private building projects – from the city or municipality's own resources through direct budget allocation and via revolving funds to using grants from sub-national or European funds.

Table 3: Source of funds for private buildings

No.	Source of Funds	Description
1	**Own Funds**	Funds drawn from internal budget and resources
2	**Local (City or Municipal) or Regional Budget**	Funds drawn from the budget of local or regional public authorities
3	**National Funds**	Subsidies provided by national governmental bodies or funding through grants from national programmes
4	**European Funds**	
	Managed at the EU level	Funds that provide technical assistance and project development, usually for demonstration / pilot projects (e.g. European Innovation Partnership on Smart Cities and Communities, European Research Framework Programme, and Intelligent Energy Europe II Programme)
	Managed at the national, regional, or local levels	Funding resources and technical assistance, such as the European Structural and Investment Funds, which are managed by national, regional, or local public authorities in partnership with the European Commission through operational programmes based on strategic goals or investment priorities
5	**European Banks**	These include European Investment Bank (EIB), the Council of Europe Development Bank (CEB), European Fund for Strategic Investments, Private Finance for Energy Efficiency, European Energy Efficiency Fund, and European Bank for Reconstruction and Development
6	**Private funds**	Financing provided by private contractors, utilities, by institutional investors, crowdfunding, and through energy cooperatives

All EU funding sources for local climate and energy actions (including private buildings) can be found on this guide.

Stakeholders Involved

There are several stakeholders with influence and power over the governance of buildings as presented in Figure 1 from World Resource Institute. Governments implement energy efficiency policies and private-sector actors (e.g.: building owners, construction company, architects investors) deal with their building management, investment, construction, design, and energy performance. Other stakeholders from private sectors (e.g.: building tenants and civil society organizations) also have a role in shaping the buildings energy consumption (Becqué et al., 2016). Understanding the stakeholders' roles can help determine the city's "capacity to act" in building energy efficiency matters (Hammer, 2009; Hinge et al., 2013).

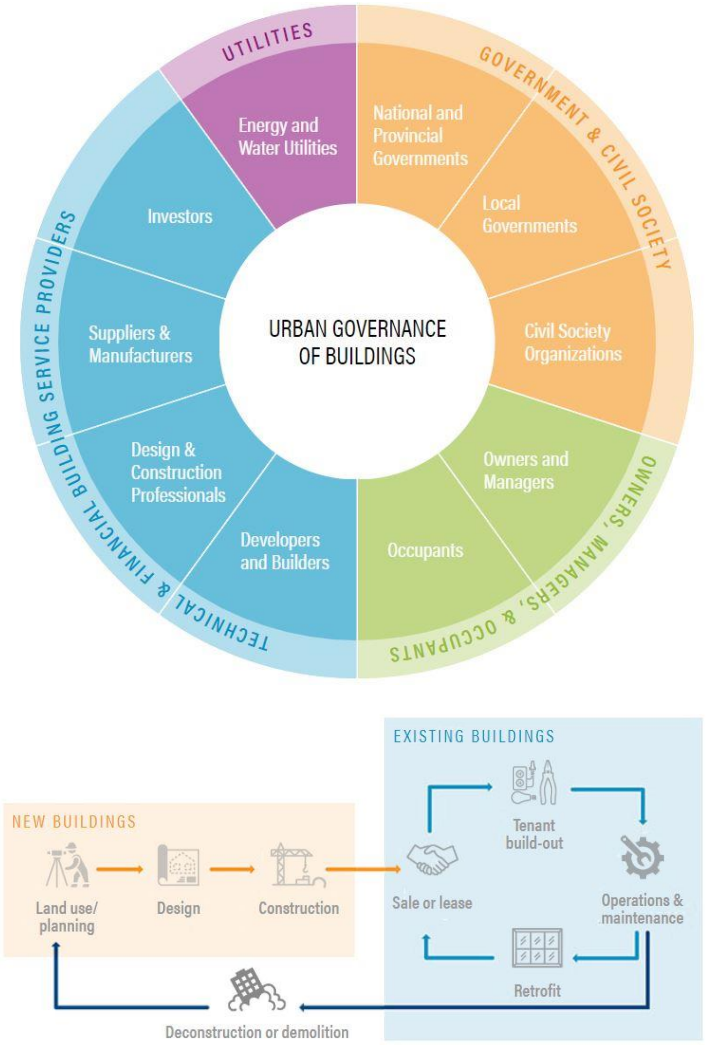

Figure 1: Stakeholders involved and lifecycle of buildings. Source: World Business Council for Sustainable Development (2009) and Becqué et al. (2016).

Innovative Financing Schemes

Innovative financing schemes are non-traditional ways of raising funds and facilitating sustainable energy and climate investments for cities and regions by mixing different sources (own fund, public and private funds) or engaging different partners (e.g. citizens, private sector) aside from established financial institutions (e.g. banks). Considering the availability of best practices, this module private buildings will focus on revolving fund, soft loans, and guarantee funds as common innovative financing schemes.

Table 4: Innovative financing schemes under private buildings

Financial Schemes	
Energy Performance Contracting (EPC)	Energy Performance Contracting (EPC) is a method to implement energy efficiency projects, by which an ESCO (Energy Services Company) acts as a unique contractor and assures all of the steps of a project, from audit through installation up to operations and maintenance. The ESCO delivers a performance guarantee on the energy savings and takes responsibility for the end result. The EPC contract is the contractual agreement by which the output-drive results are agreed upon.
Third-party Financing	Refers solely to debt financing. The project financing comes from a third party, usually a financial institution or any other investor, or the ESCO, which is not the user or customer.
Revolving Funds	A fund established to finance a continuing cycle of investments through initial amounts received from its shareholders, creditors or donors and later on through amounts received from reimbursements of provided funding or loans to projects. These recovered funds become available for further reinvestment in other projects under similar scope (e.g. revolving funds for sustainable energy will use the loans recovered funds to finance new sustainable energy projects).
Guarantee Funds	Loan guarantees, which provide a buffer by first losses of non-payment. A mechanisms whereby public funding facilitates/triggers investments.
Soft Loans	Soft loan schemes are loans below market rates and with longer payback periods. Soft loans may provide interest-free periods at the beginning of the loan. It is a mechanisms whereby public funding facilitates/triggers investments.

Best Practices

The table below presents the relevant financing schemes and examples of best practices, including the city or region where the best practice is located, and the source(s) of funds.

Table 5: Best practices under private buildings

Financing Scheme	City/Region	Best Practice	Source of funds
Soft loans & third-party financing	Picardy (FR)	Renovation of 2.000 private homes in 3 years, resulting up to 75% energy savings	Local budget, national funds through subsidies from Agence National de l'Habitat (Anah) and French national energy agency ADEME, European Investment Bank loan, European fund through ELENA (European Local Energy Assistance) subsidy, and own funds (property owner)
Soft loans	Parma (IT)	Parma Progetto ENERGIA – Soft loans for energy renovation of residential buildings (Infinite Solutions)	Private funds through Cassa di Risparmio di Parma e Piacenza (Bank Cariparma - Crédit Agricole)
Soft loans & guarantee funds	Brussels Region (BE)	Brussels Green Loan with a zero to low interest rate to helps pre-finance energy renovation of 51,494 housing units	Regional budget, financial cooperative with Crédal (private funds), and Regional Energy fund

Financing Scheme	City/Region	Best Practice	Source of funds
Revolving funds & soft loans	Lithuania (LT)	JESSICA Holding Fund with 800 buildings renovation and 50% energy savings achieved	Own local budget and European funds & banks through European Structural and Investment Funds (EIB JESSICA, UDF)
Soft loans & revolving funds	Amsterdam (NL)	The Amsterdam Investment Fund supported financially-sustainable and profitable projects implemented by local businesses, residents, private housing owners, and community organisations. It has financed the projects for a total of at least €14 million by 2014. Its aim is to lower CO_2 emissions and energy bills for citizens and business	Municipal budget which comes from revenues from the sale of shares in 'N.V. Nuon Energy' – a former local utility company
Soft loans & guarantee funds	Centre Region (FR)	Regional schemes targeting private housing owners, community organisations, SMEs & business to support sustainable energy projects, such as the construction of a biogas plant which aims to reduce the gas consumption by 40%	Regional budget, private funds through local commercial banks ((Crédit Agricole, Caisse d'Epargne et Banque Populaire), and European bank through EIB
Soft loans & revolving funds	Delft (NL)	The Delft Energy Saving Fund provides private housing owners and non-profit organisations to invest in renewable energy systems and/or energy saving measures with interest rate 4% below market rate	Municipal budget partnered with local Dutch bank
Soft loans & revolving funds	Estonia (EE)	The KredEx Revolving Fund, inspired by the KfW (German public bank), provides soft loans for multi-family apartment building owners who wish to improve energy efficiency of their homes. Four years later after it was launched in 2009, 798 buildings were renovated	National fund (via loan), KredEx internal budget from the profits of its financial operations, European bank through CEB (via loan), and European fund through European Regional and Development Fund (ERDF)
Soft loans, third-party financing & revolving funds	Ile de France Region (FR)	A semi-public company called SEM Energies POSIT'IF facilitates energy renovation of private condominium owners and social housing organisations	Regional fund, private funds and European fund

For more information about the best practices above, see the comparative study and the case studies on the guidebook of financing the energy renovation of residential buildings. They were prepared in the framework of the **INFINITE Solutions project** (INnovative FINancIng for Local SusTainable Energy Solutions). Furthermore, see **RenoWiki EU** for more resources related to initiatives of energy efficiency in buildings (including private buildings, such as residential and commercial buildings).

Guarantee Funds

What you need to know about guarantee funds

What are guarantee funds?

One of the most commonly used financing tools to facilitate private investments in energy efficiency projects are guarantee funds. Guarantee funds enable the engagement of financial institutions and allow sharing of credit risk or distribution of loss in energy efficiency investments. Guarantee funds are a way of transferring credit risk from a creditor to another entity (guarantor) that is capable and ready to deal with part of the risk and/or cover the loss (ESMAP, 2014).

To illustrate, loans are provided to the debtor (or borrower) by a commercial lender (or financier). However, should the loans default or if the debtor fails to meet the conditions of the loan and is unable to pay the lender, another entity – the guarantor - absorbs the credit risk and/or covers the loss. Guarantee funds are different from debt financing as in the latter, direct loans, including the interest charged, are paid back over time by the debtor. However, debt financing, such as soft loans, and guarantee funds can complement each other.

Guarantee funds, along with first-loss facilities, are classified under risk-sharing facilities which cover the risk in case of payment default and if necessary, offer additional funding. The first-loss can be absorbed by a guarantor, lowering the risk, so banks and equity investors are more willing to invest (Energy Efficiency Financial Institutions Group or EEFIG, 2014). Guarantee funds are also known as credit and/or risk guarantees and sometimes guarantee payments or programmes.

Why are guarantee funds important?

As commercial lenders may perceive it risky to invest in energy efficiency projects for reasons, such as long payback periods or high perceived risk exposure, the use of guarantee funds may

address the wariness of investors, enable them to accept the risk of debt lending, and improve their confidence in investing. However, to facilitate private sector investments, guarantee funds sponsored by public authorities should address commercial and non-commercial (e.g. financial stability, policy changes) risks. Guarantee funds are a signal to financial institutions that projects, such as in energy efficiency, are worth lending to not just for commercial but also for social reasons (Association of Conservation of Energy or ACE, 2013).

Guarantees provided by public authorities, such as Estonia's KredEx and German KfW, can create a 'breathing space' which, according to the ACE (2013), is a condition in which energy efficiency investments have an opportunity to demonstrate good performance, so that they seem promising and a guarantee is no longer necessary. Successful guarantee schemes for energy efficiency investments can then increase bank involvement in financing (Makinson, 2006).

However, according to the Association of Conservation of Energy, a consideration in assessing whether guarantee funds are a success is the extent to which these guarantee funds remain necessary. Investors, in the long run, may no longer find the need for guarantee funds should energy efficiency projects become more familiar, credible, and mainstream. The current economic condition, the increased reluctance to give on loan across all sectors, and the less fruitful investments may be the reasons public sector guarantee funds are still essential in Estonia and Germany (ACE, 2013). Guarantee funds are then meant as temporary interventions by the public sector to enable private investments and gain the trust of commercial lenders (FEDARENE, 2015).

Which energy projects can guarantee funds be used?

Guarantee funds are intended for large infrastructure projects. However, these have wider applications (United Nations Environment Programme, 2004). Risk-sharing facilities, such as guarantee funds, have been used in energy efficiency projects in public and private buildings whether these are commercial buildings, public rental and private rental buildings, and owner-occupied housing (EEFIG, 2014). In Bulgaria, the Energy Efficiency and Renewable Sources Fund (EERSF), which include guarantee funds, can be used for energy efficiency enhancements by municipalities, corporations, and private individuals in industrial processes, renewable energy sources (RES) projects targeting end-user consumption, retrofitting of building, improvements of heat sources and distribution systems, and street lighting. Having supported many projects in various sectors including private buildings sector, guarantee funds have proved themselves as a versatile financing mechanism.

However, guarantee funds are not meant as stand-alone solutions and are not applicable for all market situations (Makinson, 2006). Based on reported experiences, young firms in energy efficiency, especially energy service companies or ESCOs, typically need guarantee funds in addition to public support instruments for debt financing, to secure the capital needed (Makinson, 2006). In general, all types of risk-sharing facilities, like guarantee funds, can be combined with dedicated credit lines or soft loans (EEFIG, 2014). For example, KredEx's energy efficiency schemes for the residential sector in Estonia are supported by loans, grants, and guarantees (ACE, 2013). According for the Conservation of Energy, this combination of different funding sources, such as in Estonia, and their accompanying interest rate and duration of loan are more encouraging than market loans.

Are there different types of guarantee funds?

There are different types of guarantee funds available: public guarantee schemes, corporate guarantee schemes, international schemes, and mutual guarantee schemes. Public guarantee schemes are usually established by public policies, involve state subsidies, and managed by private organizations or administrative government units (OECD, 2008). In case of loan default, the guarantees are paid from the government budget. An advantage of public guarantees is that this has higher credibility in the banking sector (OECD, 2008).

On the other hand, corporate guarantee schemes are funded by the private sector, such as banks, and are managed by corporate leaders. International schemes are usually provided through bilateral or multilateral agreements between governments or non-government organizations. Oftentimes however, these international schemes incorporate guarantee funds and technical assistance to firms (OECD, 2008). Mutual guarantee schemes, which are also known as mutual guarantee associations, societies, or funds, are formed by private, independent organizations. Funded by membership fees and sometimes from government support, these are managed by borrowers who have limited access to bank loans.

How are these public guarantee funds structured?

In Bulgaria, partial credit guarantees and portfolio guarantees are offered to private individuals, companies, or municipalities. Under partial guarantees, there are two options: 80% on a pari passu basis or 50% on a first loss basis after the bank creditor. Individual or per project guarantee commitments is up to BGN 800, 000 (Energy Efficiency and Renewable Sources Fund (EERSF), 2018).

Portfolio guarantees are classified into two: ESCO portfolio guarantee which is designed to attract more ESCO companies and make them comfortable guaranteeing the risk of project beneficiaries and the residential portfolio guarantee which is meant to kick start the market of EE investments in the residential sector by providing market products that overcome the lack of legislation the country (EERSF, 2018).

ESCO portfolio guarantees

ESCOs commonly depend on debt financing to fund a project. Consequently, they also rely on the client's payment to pay back their own debt. If the client fails to pay in time, it will cause a delay in ESCO's debt service performance. EERSF offers ESCO portfolio guarantee to cover such issues in the cash flow of the ESCO and absorb some of the risk of the ESCO. The following provides further detail:

- EERSF signs a framework agreement with the ESCO to issue a portfolio guarantee for a preapproved portfolio of projects;
- The ESCO wins a tender for an energy efficiency project;
- EERSF approves the project and adds it to the portfolio of approved projects;
- EERSF guarantees that it will cover up to 5% (the percentage is negotiable) of the defaults of the delayed payments of this portfolio;
- With this guarantee, the ESCO gets better interest rates on its debt with commercial banks and has a piece of mind that there is 5% failsafe trigger that will prevent cash flow disruptions and will reduce the risk of the clients.

The 5% of the investment can cover the delayed payments made by the client because generally the amount of the client's payment per month is much lower. Cases of delayed payments are more likely to happen and EERSF can act as a financial buffer to assume the risks. Besides, such product gives a great advantage to EERSF's own funds. For example, EERSF provides a guarantee of BGN 500 000 to aid a portfolio of investments worth BGN 10 million.

Source: EERSF

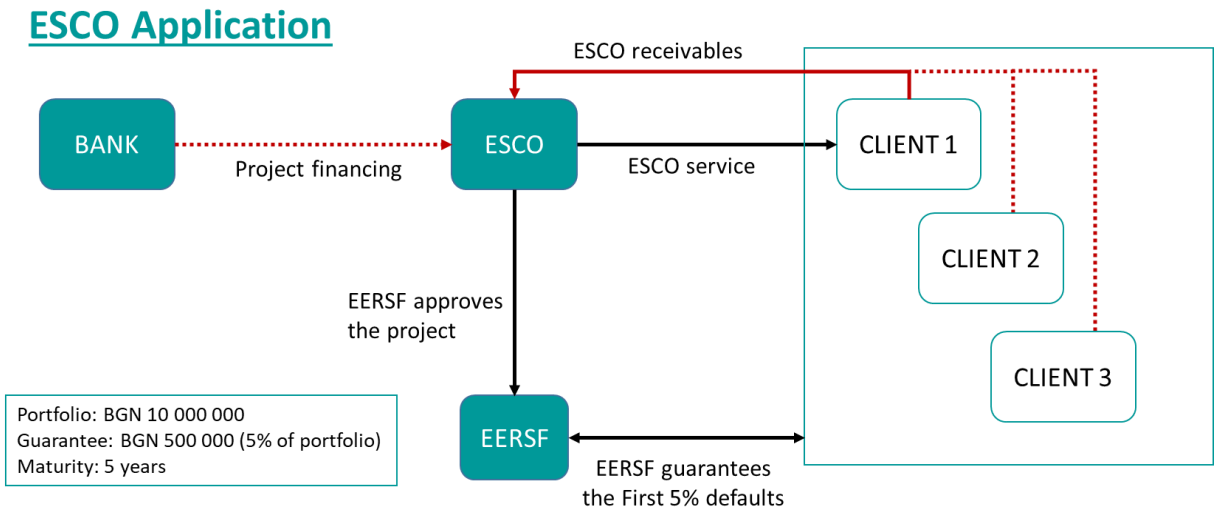

Figure 2: ESCO Portfolio Guarantees. Source: EERSF

Residential portfolio guarantees

EERSF offers the residents in a building to invest in an energy efficiency project and find a first class company to execute it. The project gets a bank loan, but each household in the building will be responsible to pay back the loan according to their own built-up area. This concept is known as residential portfolio guarantee.

The first 5% of defaults within this block (or portfolio of blocks) will be assumed by EERSF. Default is simply when the customer fails to repay the loan. The default rates are commonly up to 3%, so the guarantee from EERSF is enough to assume the entire risk of the commercial bank. Together in a partnership, EERSF and commercial banks are developing this guarantee product. EERSF acts as an intermediary between the commercial banks and the residents to run an energy efficiency project, as there are no household associations in Bulgaria coupled with inadequate energy performance regulations.

Source: EERSF

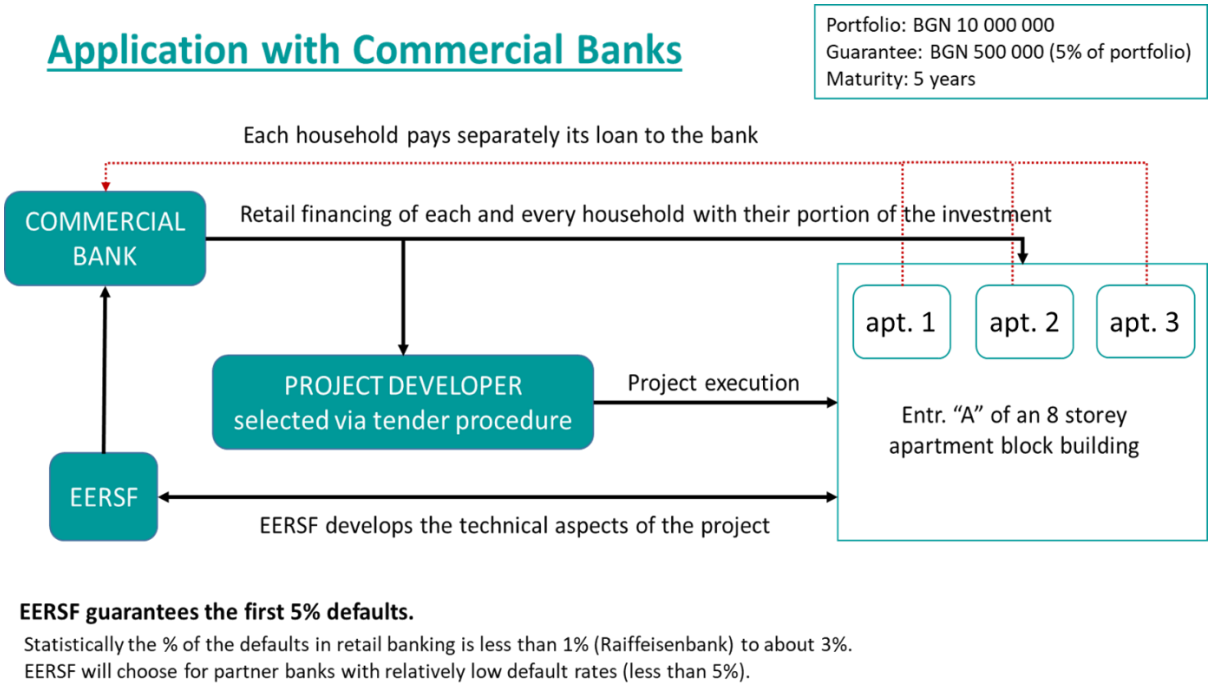

Figure 3: Residential Portfolio Guarantees. Source: EERSF

Other guarantee fund structures in general, especially for small enterprises, can be found on this thesis along with the tools for choosing the right guarantee fund structure that will best fit certain situation.

How do guarantee funds work exactly?

Guarantee funds have a covered and uncovered part of the loan. The covered part of the loan is allocated to the guarantor while the uncovered part of the loan is allocated to the lender (ESMAP, 2014).

Guarantee funds may cover all risks no matter the cause. However, a partial risk guarantee may only cover losses in certain cases. Guarantees usually do not cover all risks to encourage the lenders to investigate their customer's creditworthiness. Guarantees may provide access to bank loans for energy efficiency projects (ESMAP, 2014).

The debt recovery process starts once there is a loan default. The loan can be recovered from a guarantee fund which can allow for up to the maximum amount it contains (FEDARENE, 2015). Further, when this guaranteed scheme is incorporated with a preferable loan mechanism, the loan would be more likely accessible at reduced prices as the guarantee lowers the creditor's risk. In Europe, according to Makinson (2006), most guarantee funds for energy efficiency investment typically provide 50% guarantees.

How can guarantee funds be priced?

It is very important to address correct pricing for guarantee funds. The price should be low enough, so the borrowers can easily access the guarantee funds, yet high enough to make the banks realize afterwards that using guarantee is unnecessary as the energy efficiency projects are promising. In fact, guarantee funds are overpriced. Without these considerations on the cost of

guarantee funds, banks will rely heavily on guarantee funds and it will be hard to abolish (Makinson, 2006).

What are the advantages of guarantee funds?

Guarantee funds enable leveraging of public funds and eases the perception of risk among commercial lenders for energy efficiency projects (ESMAP, 2014). Furthermore, these funds reduce the risks for financial institutions, such as banks, and enables them to lend greater amounts and provide extra leverage for private sector funds (EEFIG, 2014). Also, according to EEFIG (2014), risk-sharing facilities, like guarantee funds, can be a temporary medium to help finance energy efficiency projects until they are recognized to have better credit performance, therefore loans for energy efficiency projects are more widely available later on. If the customers can succeed in paying back the loan with the support of public sector guarantees, the banks will consider energy efficiency as a real bargain on their lists (Makinson, 2006).

What are the limitations of guarantee funds?

According to EEFIG (2014), the main obstacles for guarantee funds are oftentimes the excessive bureaucracy at EU level that discourages smaller financial intermediaries and novices. According to ESMAP (2014), credit and risk guarantees are only for a small number of municipalities and a partnership with a **solid bank** is needed to create a project pipeline. Further, guarantee funds have the following limitations: time needed to structure and negotiate; moral hazard if substantially all risk is removed from bank lending; and knowhow and expertise to implement at regional and local government levels (EEFIG, 2014; FEDARENE, 2015).

What are the market conditions required for guarantee funds?

The market conditions necessary for guarantee funds include good banking partners willing to lend/assume risks; municipalities must be marginally creditworthy and willing to borrow; municipalities able to retain energy cost savings and pay for energy based on consumption; and reasonable, competitive lending rates (ESMAP, 2014). According to Makinson (2006), a few times, guarantees are not befitting to be applied when the banks have insufficient liquidity, such as local banks where the Bulgarian BEERECL programme is partnered with to provide debt financing. In other cases, when the problem lies in other factors, such as unwillingness to take risks, it should be considered to use guarantees under a public financing scheme.

How can guarantee funds be rolled out at a larger scale?

According to EEFIG (2014), these are the necessary conditions to roll out guarantee funds at larger scale:

- Template approach to execution of risk-sharing facilities using ESIF 2014-2020
- Consensus view as to at what stage and for what market segments this Financial Instrument is most useful and pressure by EU public financial institutions to develop faster in those identified segments and Member States
- Greater degree of collaboration/ resource commitment on the design and implementation of these instruments by private and public sector Financial Institutions

- Further consideration of the role public guarantees might play in support of the energy efficiency services markets

According to FEDARENE (2015), it is essential to create a flexible approach that can be adaptable as time passes considering the uncertainties in the future. It is also important to maintain communication with homeowners, advisers, and installers through a good feedback system. Further, according to FEDARENE (2015), the financial conditions and the availability of other financing schemes in each country should be taken into account when drawing attention from potential investors.

Mobilising commercial finance that is supported by public sector can be a great tool for energy efficiency projects to access capital more easily and generate positive cash flow and cash position of ESCO. The lower the risk for the end-user, the more likely the project is considered a success. Therefore, risk-sharing facilities, like guarantees, can encourage private sectors to invest in energy efficiency as guarantees assume some of the risks, reducing the risk for end-user (Makinson, 2006).

Who can lead and provide guarantee funds?

A public-sector funding with the aim of supporting wider private investments can lead a risk-sharing facility (EEFIG, 2014). For energy efficiency projects in cities and municipalities, loan guarantees are usually provided by donors, while there are cases that these have been provided by or together with local – or even higher levels – of government to cover part of the loss (ESMAP, 2014). For example, KredEx had a total of €66.3 million financial inputs and leveraged funding. These funding came from the Council of Europe Development Bank (CEB) and European Union (EU) structural funds which provided €49 million while the Estonian government offered €17.3 million.

In Bulgaria, the EERSF, which was established through the Energy Efficiency Act (EEA) by the Bulgarian Parliament in 2004, received initial capital from the Global Environmental Facility through the International Bank of Reconstruction and Development and the World Bank with $10 million, the Governments of Austria and Bulgaria with €1.5 million each, and private companies in Bulgaria (EERSF, 2018). EERSF serves multiple roles: as a lending institution, as a credit guarantee facility, and a consulting company. It also offers technical and financial support, such as guarantees, for Bulgarian firms, municipalities and private individuals in energy efficiency project development. In 2013, the European Bank for Reconstruction and Development and the Bulgarian Ministry of Economy and Energy provided € 5M in grant to further finance partial credit guarantees for ESCO projects in public buildings (CITYnvest, 2015).

In Severn Wye, United Kingdom, **The Revolving Retrofit Guarantee Fund** was developed by the Hungarian consultancy Global Environmental Social Business (GESB). This finance mechanism makes loan finance more accessible by providing a low-cost guarantee. Severn Wye acknowledged the role of GESB to advance the loan financing in the UK by adjusting the approach of the Revolving Retrofit Guarantee Fund that was a success in Hungary (BUILD2LC Project, 2017). This involved developing a loan portfolio relevant to the housing stock and potential in the local area, establishing a guarantee fund and seeking investors to provide loans.

Severn Wye have been working with South Gloucestershire and Stroud District Councils to introduce loans to homeowners wanting to improve the energy efficiency of their homes. The

loans are available for various energy efficiency improvements including renewable technologies and upgrading heating where suitable. Householders going through this scheme are also able to take advantage of any grants the may be eligible for through national schemes including the Energy Company Obligation funding or Green Deal. This scheme requires householders to use installers registered on the Link to Energy database.

Severn Wye and Global Environmental Social Business initially had to develop debt products adjusted to the housing units and to the possibility in the vicinity. Consequently, they also needed to attract investors to give on loans and seek source of finance for the guarantee fund. There were several steps in the establishment of the pilot loan based on the project report (FEDARENE, 2015):

- **Collating and mapping local retrofit markets**: data on the housing stock and on the potential for measures in order to draw up a first portfolio of potential financers.
- **Develop a draft prospectus**: including measures and estimates of costs and savings.
- **Identifying potential commercial partners**: GESB and Severn Wye compiled a list of potential commercial funders (banks) and spent several months contacting them to explain the programme (See "main barriers" Section below).
- **Establishing the Guarantee Fund**: four local authorities had supported the project from the start. Three of them agreed to put their own funds into a Guarantee Fund.
- **Establishing the loans pot**: identifying investors to provide loan capital proved unsuccessful. Therefore, a reduced pilot loan scheme was launched with funds from the two of the local authorities (South Gloucestershire and Stroud District Councils), and from supporting charities such as Sainsbury Family Charitable Trusts and Severn Wye's own charity reserves.
- **Establishing legal agreements**: between the various parties involved.
- **Obtaining permissions, licences and verifying compliance with regulations**: financial service regulations for providing loans, consumer credit regulations for referring people for loans, and regulations regarding correct presentation of information on promotional materials.
- **Agreeing loan product details and processes**: loan duration, interest rates, fees, household eligibility, credit and affordability checking, and a clear map of the customer journey.
- **Promotion and marketing**, promotional materials, referral networks and marketing plans

A new initiative beyond the scope of Green Deal hardly attracted most of the large financial institutions to commit to at that moment during the phase of identifying potential commercial partners. The goal of the initiative was aligned with the three-year "Countdown to Low Carbon Homes" project's, which was conducting a full pilot loan during the project. However, it was postponed until 2014 to launch the initiative due to the legal and financial hassles, not to mention the challenges faced when seeking finance. Hence, in case of replication, the financial conditions and the availability of other financing schemes in each country should be taken into account when drawing attention from potential investors.

Moreover, Severn Wye had never participated in a financial market until then. GESB offered a financial adviser and technical knowledge of establishing the Revolving Retrofit Guarantee Fund to support the project. Severn Wye benefitted from the GESB's assistance as it saved time and even reduced their risk.

This calls for a specialist advice about loan mechanisms when the energy agency or organisation is inexperienced in the financial market, like Severn Wye.

It is worth noting that in this case, the loan pilot was a part of the Countdown to Low Carbon Homes project. Hence, the legal advice and support was not necessary at first nor was it included in the budget.

As the "Countdown to Low Carbon Homes" project was completed, Severn Wye needed to check if the payment for the work was made. Any charges quoted to the client need to comply with specific regulations, in which the annual percentage rate of charge (APR) and referrals are clearly specified. It is important to note that this challenge might be encountered by any energy companies who are willing to replicate this scheme, though it comes down to the availability of funds within the scope of work.

Source: FEDARENE

Other possible sources of funding for a guarantee scheme can be found on this manual of guarantee funds for small enterprises p.51.

Who can apply for guarantee funds?

Guarantee funds can act as a means for end-users as well as energy service companies (ESCOs) to ease the access to affordable debt financing (Makinson, 2006). In some cases, the customer can be the guarantor using the future savings on energy bills according to the project contract that can be paid monthly or quarterly within few years. In this case, the customer must possess high creditworthiness and a strong balance sheet. The risk of this type of model comes from the failure of the energy efficiency projects resulting the customer unable to profit from energy savings. Therefore, Energy Performance Contracts (EPCs) act as a point of reference in energy efficiency projects, by which the ESCO plays a major role in the project, such as taking care of the operation and maintenance. Above all, the ESCO must guarantee the savings from energy bills, so it reduces the customer's financial risk (Makinson, 2006).

Furthermore, in some circumstances the ESCO assumes the risk and looks for the funding in this model. In order to arrange more equitable risk allocation between contractual parties (the ESCO and the client), EPCs are getting more adaptable, especially in advanced markets. Energy efficiency projects that are funded through a lending platform will mostly need a guarantor. If the ESCO owns a solid balance sheet (backed by the equity) and other businesses with solid income statements, the ESCO may be exempt from a guarantee scheme (Makinson, 2006).

In Severn Wye, United Kingdom, from the loan pilot project started until April 2015, there were 151 clients in Stroud and 196 clients in South Gloucestershire considering the loan. Unfortunately, only four loans have been processed further in South Gloucestershire and none in Stroud to date. The loan pilot projects are still in progress (FEDARENE, 2015).

How to apply for guarantee funds?

In Bulgaria, under the EERSF (2018), the procedures are as follows:

1. **Detailed Energy Audit**
   A necessary condition for a successful application with the Energy Efficiency and Renewable Sources Fund is the presence of a detailed energy audit allowing for an energy analysis and choice of energy saving measures

2. **Principal Eligibility Criteria**
   All energy efficiency projects approved and supported by the Bulgarian Energy Efficiency and Renewable Sources Fund (EERSF) should meet the following eligibility criteria:
   - The project should involve the application of well-proven technology;
   - The project cost should range between BGN 30 000 and BGN 3 000 000 although exceptions are possible if strongly justified;
   - The equity contribution of the Project Developer should be at least 10%;
   - The repayment period is up to 7 years.

3. **The Project Cycle**
   - Project identification (Project Developer)
   - Initial project screening (when necessary, EERSF/external consultancy company)
   - Completion of Initial Project Proposal (IPP) (Project Developer)
   - Submission of IPP and accompanying documents to EERSF (Project Developer)
   - Assistance in IPP and accompanying documents completion and improvement (EERSF)
   - Project appraisal and assessment (EERSF)
   - Formal decision for approval of EERS financing (EERSF)
   - Completion of negotiations for financing and disbursement of funds

Note: The normal time period for project appraisal is 6 weeks, provided that the Project Developer manages to submit well on time all necessary documents, accompanying the IPP.

When can guarantee funds be used?

When corporates or private individuals decide to invest in energy efficiency projects but want to keep financial stability with adequate income streams, they tend to turn to debt financing provided by commercial banks. However, small-medium enterprises (SMEs) and private individuals (such as homeowners) with low to medium income are most likely unqualified to get a loan from commercial banks (Deelen & Molenaar, 2004). Commercial banks provide dedicated credit lines with risk sharing programs only if the potential borrower has good borrowing capacity, collateral, and creditworthiness (ESMAP, 2014).

Banks consider collateral important as it indicates the client's commitment to pay back the debt. Besides, collateral can help compensate for loan default through the sale of seized collateral. To determine how good a collateral is according to banks, ask the following questions (Deelen & Molenaar, 2004):

- Is the ownership easy to verify?
- Is it easily and cheaply seized?
- Is it irremovable?
- Is it inexpensive to convert it into cash or any other desirable asset?
- If it consists of movable assets, is it relatively cheap to store or manage?
- Does its value remain relatively stable over time?
- If it has a low monetary value, does it have a high and stable personal value to the borrower?

If all the answers to the questions are unequivocally "yes", then the collateral may be quite passable for a bank. However, SMEs and private individuals with low to medium income will often have a hard time giving "yes" answers to all questions, except the last one. When they are unable to provide adequate collateral, guarantee funds can be used. However, guarantee funds are not meant for weak entrepreneurs and banks that under perform. There are four Ps needed for successful guarantee schemes (Deelen & Molenaar, 2004):

1. Well-**p**repared entrepreneurs
2. Good **p**rojects
3. Good **p**erforming banks
4. **P**rofessional bank staff who conduct an evaluation of the borrower

What has guarantee funds achieved?

As of June 2017, 193 projects have been financed by EERSF in Bulgaria.

	Number of Projects	Project Size (BGN Million)	EERSF Financing (BGN Million)
Projects Financed	193	79.5	56.0
Municipalities	102	40.0	26.9
Corporate Clients	68	24.9	18,4
Hospitals universities and others	23	14.6	10.7

Of these 193 projects, 33 were credit guarantees with 29 projects under portfolio guarantee on ESCO contract and 4 under partial credit guarantees (on credit contracts).

	Number of Projects	Project Size (BGN Million)	EERSF Financing (BGN Million)
Total credit guarantees	33	24.2	4.42
Portfolio guarantee on ESCO contract	29	17.5	0.6
Partial credit guarantees (on credit contracts)	4	6.7	3.8

What are other guarantee funds set up in Europe?

KredEx

The Credit and Export Guarantee Fund KredEx was established in 2001 by Estonian Ministry of Economic Affairs and Communication. The aim of KredEx is to support the financing of corporates, reduce the debt risk related to export, and encourage new residential constructions and renovations that are based on energy efficiency in Estonia (BPIE, 2010). KredEx in partnership with most of credit institutions in Estonia has arranged Housing Loan Guarantees. These guarantees allow certain eligible applicants to make a lower initial payment for buying new living properties or having existing ones renovated. These guarantees charge 3% of the guarantee amount to be paid once upfront. KredEx provides up to 24% of the value of the loan guarantee property, no more than €19,200.

The Housing Loan Guarantee is only for young families with a child of up to 15 years old, young professionals, and residents of restituted buildings. A young professional must be younger than 31 years old who has completed secondary or vocational secondary education, either employed

or self-employed. A resident of restituted buildings is a person who has a tenancy agreement in a restituted building (returned to a former owner) as illegally expropriated property by means of ownership reform. This restitution is usually found in post-Soviet states.

There is another loan guarantee specifically for renovations called Apartment Building Loan Guarantee. The targets of this guarantee are apartments with low market prices and informal apartment community, so that the borrower is not an independent legal person. For this guarantee, KredEx offers up to 75% of the loan amount. However, they charge yearly around 1.2 – 1.7% of the guarantee balance. The participating banks in this mechanism are Danske Bank, SEB, Swedbank, Nordea, Krediidipank, and Versobank.

There are two groups that are well-suited for The Apartment Building Loan Guarantee. The first group is apartment buildings that have a higher risk evaluated by the bank, so it is difficult to finance renovation through a bank loan. A high risk can be caused by a high share of borrowers, a high unit cost of investment per m^2 compared to the market rate, or the location of the apartment building that is in a mono-functional settlement or in a below-market-rate area. The second group consists of apartment buildings that need a guarantor to cover the risk in case of payment difficulties. The loan guarantee requires the apartment association or the communities of apartment owners to be creditworthy. If these apartment associations would like to carry out a major reconstruction, KredEx also offers Reconstruction Grant for such cases.

The offered financing schemes (grants, loans, and guarantees) are exclusively for apartment buildings that have at least 2 (or in some cases, 3) apartments. Any apartments belong to this group and meet the above criteria are eligible for the offered financing schemes, with the exception of the apartment loan scheme that requires apartments built prior to 1993.

Table 6: KredEx scheme costs and benefits

Financial inputs (and leveraged funding)	Financial returns (direct and indirect)	Take up rate	Energy saving	CO2 impact (or greenhouse gas equivalent)
CEB loan and EU structural funds grant: €49 million; Estonian government: €17.3 million (2010-2011). Total: €66.3 million.	The small income from loan interest is returned to the revolving fund.	Since 2000, 21,979 households have used the housing guarantee. 9.2% of housing loans issued in Estonia in 2011 had a KredEx guarantee. Since 2004, there have been 583 apartment loan guarantees (3.4% of apartment buildings) There have been 391 apartment loans since 2009 (2.3% of apartment buildings). By 2011, there have been grants to 266 apartment buildings (1.6% of apartment buildings). Also 1,038 smaller audit grants.	Apartment loans' average predicted energy saving is 39.3%. Expected saving from apartment loans and apartment grants is 75 GWh per year, expected saving over 20 years is 1,500 GWh (KredEx data)	Expected savings translate into 0.077 Mt CO2 per year.

Source: Association for the Conservation of Energy (2013)

More information on the schemes offered by KredEx for apartment associations and housing can be found on their website.

FOGIME

The FOGIME was founded by the French development bank for SMEs (BDPME) and the French Agency for Environment and Energy Management (ADEME) in November 2000. It aims to be a loan guarantor for SMEs in energy sustainability investments. According to International Energy Agency (2012b), "eligible investments include: high performance production, use, recovery and energy storage equipment; energy efficient modifications of production processes and renewables". FOGIME provides private sectors around 17.8 million Euro in total to guarantee their loans up to 244 million Euro. The SMEs that can benefit from this guarantee must have been established for more than 3 years with less than 500 m FF turnover and less than 500 staff headcounts. FOGIME can guarantee 70% of the loan in up to 15 years. This amount of loan guarantee is particularly higher than the average coverage rates for other SME projects insured by BDPME (IEA, 2012b).

Regional Investment and Guarantee Fund (Ile de France)

The Regional Guarantee Fund was set up in Centre Region, France via partnership with OSEO, which is a public company that offers SMEs financing related to energy efficiency by means of credit and guarantee support. The Regional Guarantee Fund is also in support of very small enterprises (VSEs) that wish to undertake sustainable energy projects. The goal of the Regional Guarantee Fund is to assist VSEs and SMEs in their creation, growth, innovation, foreign investments and to provide new job opportunities. The Regional Guarantee Fund can guarantee 50% of the loan in cooperation with the local partner banks. As the local partner banks hand the guarantee application to OSEO directly, the beneficiaries does not need to take further action. The following figure depicts how the financing scheme is implemented.

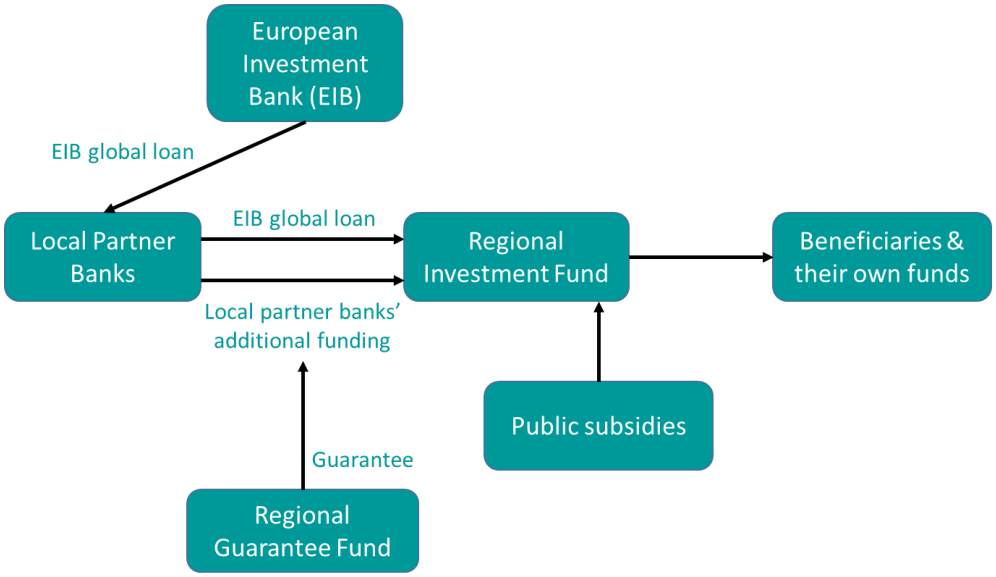

Figure 4: Business model of the Regional Guarantee Fund. Source: Energy Cities (2014)

What is the summary of guarantee funds?

Risk mitigation programs, such as loan guarantees, attracts more private investments in energy efficiency as it can lower the risks for the lenders, so they are less reluctant to give on loan. Loan guarantee scheme cannot be a stand-alone financing. Dedicated credit lines like soft loans are

good pairs for guarantee funds. The following table presents an overview of risk mitigation programs, including guarantee funds based on EEFIG (2014).

Table 7: Risk-sharing facilities (Guarantee funds and First-loss Facilities - Supply Drivers)

Adapted for sectors:	Commercial	Public	Public rental housing	Private rental housing	Owner-occupied housing
	+		+	+	++
Led by:	Public sector funding with the aim of supporting wider private investments				
Advantages	○ Reduces the risks for banks and enables them to lend greater amounts ○ Anecdotal evidence suggests that energy efficiency loans experience "market standard" or better credit performance therefore risk sharing facilities can be a transition phase until energy efficiency loans are mainstreamed ○ Provides extra leverage for private sector funds				
Weaknesses	○ Time to structure and negotiate ○ Moral hazard if substantially all risk is removed from bank lending ○ Know-how to implement at regional and local government levels				
Main obstacle/legal changes required	Often extensive and complex handling of risk-sharing facilities at EU level ("red tape") especially for smaller financial intermediaries and first-time users				
Best practice examples	○ IFC's CEEF programme (Hungary, Czech Republic, Estonia, Latvia, Lithuania and Slovakia) ○ France's proposal to use the obligation from article 7 of EED to create a national guarantee fund for renovation loans ○ EERSF in Bulgaria ○ European Energy Efficiency Fund (EEEF)				

What are the key lessons learnt from guarantee funds?

Guarantee scheme is not a new thing in Europe. However, Estonian's credit guarantee agency, KredEx, presents alternative schemes that include energy efficiency projects, which was uncommon at that time. KredEx serves as a guideline for best practices of guarantee schemes as it has gained credibility with commercial banks in a short time. KredEx also makes it less complicated to manage a loan program, especially with the possibility of less administrative fees. It also offers more opportunities for smaller buildings and apartments, especially vulnerable groups like big families and residents in restituted buildings[2] (ACE, 2013).

However, there are several drawbacks of guarantee funds seeing from KredEx case study. The end-beneficiaries are still mindful of taking the loan guarantee. This is represented by the lower take-up rate than it was hoped for. This might be due to additional required documents such as energy audit and building design documents. Another major drawback is that the complex reporting system makes it unattractive to beneficiaries. It can be quite cumbersome, as banks

[2] ACE (2013) explained that restituted buildings are "buildings that were confiscated under past regimes and then returned to previous owners. A tenant living in restituted premises is a person having a tenancy contract in living premises restituted (returned to a former owner) as unlawfully expropriated property through ownership reform. This restitution is a common issue in ex-Soviet states."

report to KredEx, and KredEx then reports to the Ministry and CEB (Council of Europe Development Bank), and then the Ministry must report to the EC (ACE, 2013).

The following lessons learnt are taken from KredEx case study in Estonia based on Association for the Conservation of Energy (2013).

- Preparation takes a long time – for Estonia it was 2 years;
- A legal framework is needed to support measures; KredEx benefitted from a 2001 Government directive giving it a permit to grant state aid and a new law (Enterprise Support and State Guarantees for Loans Act, from 2003) meaning that KredEx's loan guarantees are counter-guaranteed by the State. Before that banks had no guarantee against the bankruptcy of KredEx.
- Combining different measures is beneficial
- An all-round approach - awareness raising, promotion, state and local support, legal and financial framework

Soft Loans

What you need to know about soft loans

What are soft loans?

A soft loan is a financing scheme for energy efficiency projects that allows the loan interest rate to be reduced below the market interest rate and may even provide zero-interest rates at the beginning of the loan agreement (ACE, 2013; EEFIG, 2014; FEDARENE, 2015). Soft loans may also grant concessions, such as longer repayment periods, with certain conditions to meet (EEFIG, 2014; FEDARENE, 2015). Soft loans are versatile in all types of buildings.

Soft loans are commonly offered by governments , both in the form of tenders and direct negotiations, to be more fitting to customers' needs, thus sometimes are called preferential loans or dedicated credit lines. With longer maturity provided by soft loans, homeowners who take the loan for energy efficient-renovation work in their homes can adjust the monthly instalments based on their financial conditions coupled with the savings on energy bills (Energy Cities, 2017a). A lot of public international financing institutions and national governments are trying out the loan programs to trigger the market and close the lending gap left by the passive local and traditional banking sector actors (Makinson, 2006).

Soft loans alone are oftentimes not sufficient to finance energy efficiency projects. Grants and subsidies are complementary to attract more customers and make the projects even more cost-effective. These grants are usually designed for certain groups that are vulnerable or hard to approach who are most likely unable to access the loan scheme. This expresses the need of improvement in the energy efficiency market, which normally requires high investments (BPIE, 2010). It can trigger market development, especially for small energy efficiency companies and ESCOs in under-developed markets (ACE, 2013). In the US, it has been proven that soft loans have

helped many smaller residential and commercial energy efficiency projects to be carried out (Makinson, 2006).

Why are soft loans important?

Many countries give incentives for homeowners and enterprises who wish to conduct energy renovation work of buildings, such as subsidies from local to national government and tax credits. Commercial banks provide consumer loans and mortgages. However, such financing schemes are mostly not adequate or suitable, especially for SMEs and homeowners with low to medium income. According to CITYnvest study in 2015, energy renovation work is very expensive with the range of investment between €200 and €1200 per m^3. Therefore, existing financing schemes are often not sufficient to finance energy efficiency projects.

Subsidies, for example, are not designed to pay the whole investment costs. In most subsidy schemes related to renovation, most eligible measures must be able to demonstrate energy upgrade or savings. Quite a few subsidies can only be used for certain energy renovation works that are predefined. On top of that, these subsidies can only be reimbursed once the renovation work is finished and paid for. The initial costs are the most common obstacle for SMEs and homeowners with low to medium income.

Consumer loans are too pricey due to the high interest rates and short maturity periods, in which the loan should be repaid within a short period of time. Whereas the payback from the energy renovation work takes up to 15 – 20 years and even more, especially the payback from deep renovation work.

Mortgages, however, are more attractive because they can secure long-term finance (20 – 30 years). The main issue here is that mortgages usually charge high admin fees. Moreover, when purchasing the property, the renovation work has to be planned in order to taken into account in the mortgage.

When enterprises and homeowners conduct energy renovation work financed by loan, they will pay less for their energy consumption, therefore they will be able to perform the debt service better. However, it is not acknowledged by financing institutions when they assess how creditworthy the potential customer is. They are unwilling to take on the risk of giving on loans to vulnerable groups, such as low and very low-income households and SMEs.

These issues can be overcome by soft loans (combined with other financing schemes). With soft loans, the vulnerable groups can access financing sources that fit to their needs, investment capacity, and ability to perform debt service. Further, soft loans can help develop the local energy renovation market and provide new job opportunities. This is proven by the Picardie region (France) within 2007 – 2010, where the government made an investment in a soft loan scheme. With the investment of less than 9 million euros, the scheme ended up encouraging energy renovation work worth approximately 90 million euros and providing 330 jobs in the local building sector. The loan scheme was offered with zero interest rate coupled with grants and technical advice (Energy Cities, 2017a).

How do soft loans work exactly?

In private residential sector, a soft loan acts as an incentive for homeowners. The idea is that homeowners who wish to conduct energy-efficient refurbishment work in their homes can

finance the work through debt-financing with an interest rate below the market conditions. The following diagram simply displays how European Bank for Reconstruction and Development (EBRD) or other international financing institutions commonly offer a soft loan in an energy efficiency investment.

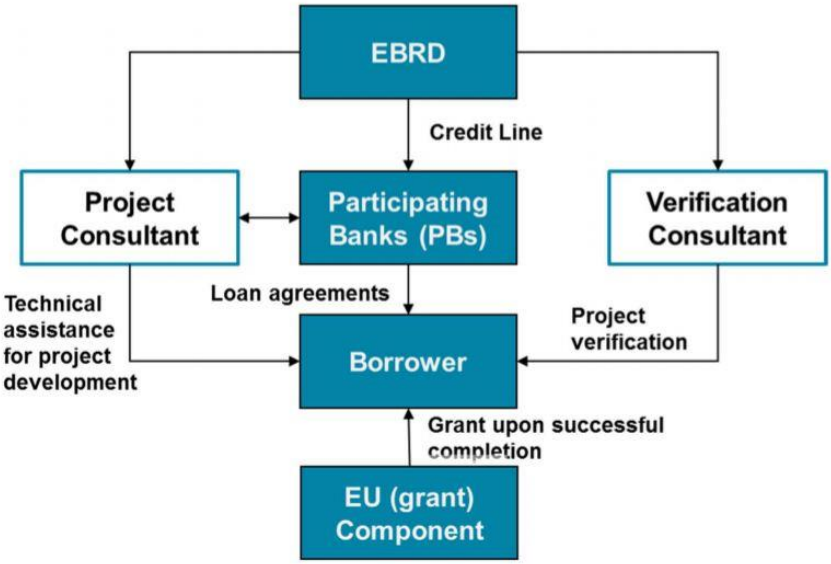

Figure 5: Typical soft loan provided by EBRD. Source: KANTOR Management Consultants Consortium, 2017.

In Frederikshavn, Denmark, and Bordeaux Metropole, France, soft loans are offered by banks. The banks evaluate the homeowner's creditworthiness to decide if the homeowner is qualified for the soft loan. The local government does not financially support the scheme, nor does it assume any risks. However, the local government successfully convinced the banks to form partnerships in the energy renovation of the city's residential buildings. It led to a development of a new product by the bank partners: soft loans. The banks' motivations include a new business area development, homeowners' passive capital mobilization, and increase in banks' market value through their clients' properties.

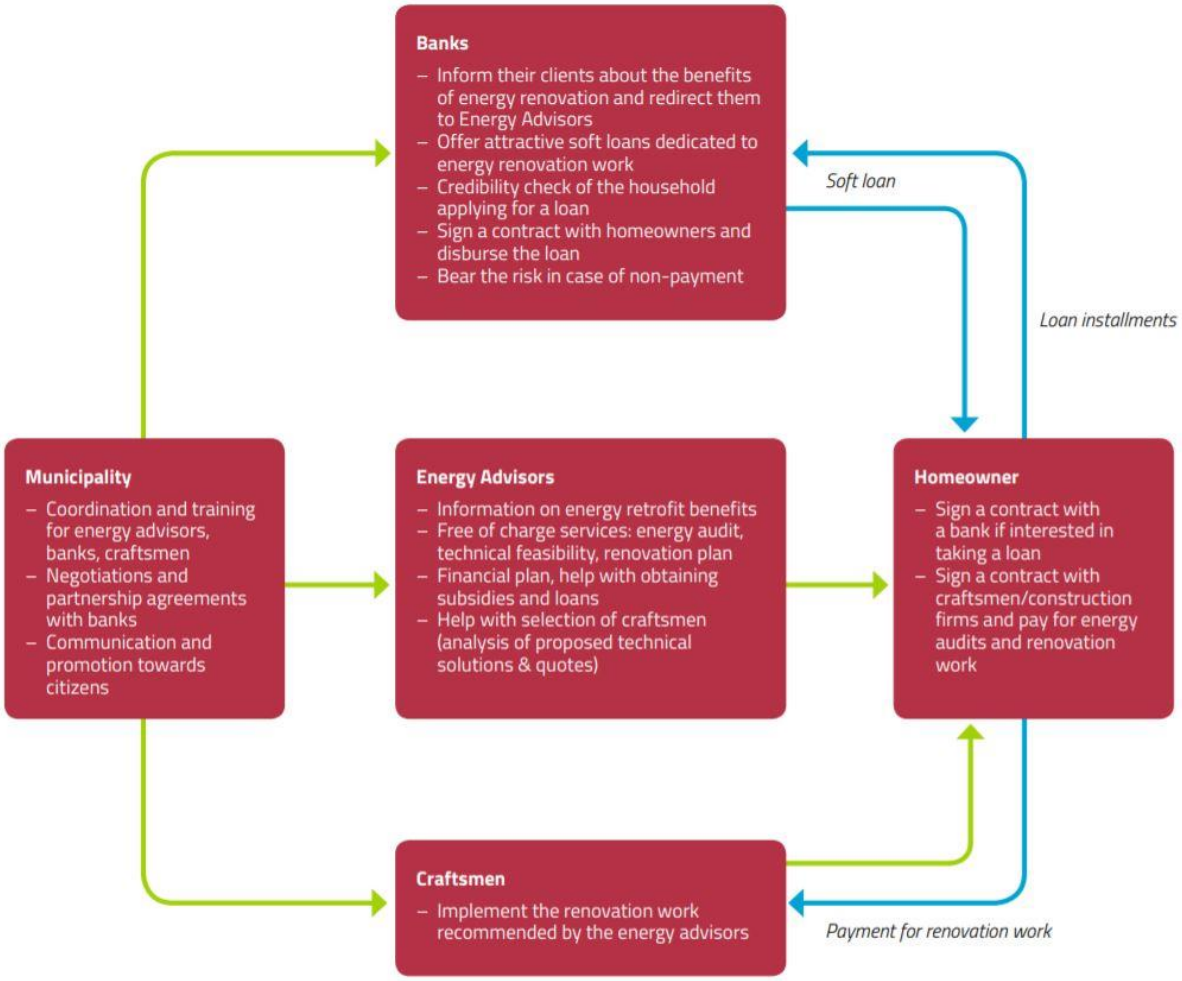

Figure 6: A business model of a soft loan scheme in Frederikshavn, Denmark. Source: Energy Cities, 2017a.

Soft loans are very adaptable to meet certain needs. There are several other business models of soft loan schemes that can be found on Infinite Solutions Guidebook.

What are the advantages of soft loans?

According to BPIE (2010), EEFIG (2014), ESMAP (2014), and KFW (2011), the advantages of a soft loan scheme are as follows:

- Can be scalable
- Funds can revolve
- Usually offers longer duration than commercial loans
- Allows 1:1 refinance to commercial banks (Basel III compliant)
- Positive impact on public budgets due to leverage effects
- Address the higher investment cost by reduced interest rates and/or better loan terms
- Financial benefits give a signal to the market about desired improvements
- Leverage effect of public funds is usually between 4 and 10, which is higher than traditional grants
- Easy to roll out, however careful ex-ante analysis of supply and demand and legal/tax framework needed

- Standardised supply offering at the same time flexibility according to individual preferences (repayment, interest rate fixation, etc.)
- Can be used for ambitious renovation/refurbishing project as well as for individual measures: large flexibility
- The use of cohesion funds for soft loans in housing is facilitated with the "renovation loan" (off-the shelf instrument)
- Allows raising the ambition of the investment in terms of energy savings (e.g. by combining the loan with a grant component)

What are the weaknesses of soft loans?

According to BPIE (2010), EEFIG (2014), ESMAP (2014), and KFW (2011), the weaknesses of a soft loan scheme are as follow:

- Serves only creditworthy clients
- May be insufficient to attract investment
- Capacity/willingness of owners to take more debt (i.e. very country dependent)
- Risk aversion of banks (calling for guarantees from Governments)
- Often complicated, time consuming and static application processes which act as a hurdle for projects
- Loans often require the additional implementation of costly non-energy related measures which change project characteristics
- Requires strong and willing bank partners to develop project pipeline

What are the main barriers of soft loans?

According to EEFIG (2014), Energy Cities (2017), and FEDARENE (2015), the main barriers of a soft loan scheme are as follow:

- The energy refurbishment process is unclear (i.e. what measures can be taken, what these will cost, and whether or not the refurbishment will pay the investment back)
- Transaction costs to implement (technically) and manage long-term programs within financing institutions
- Increased regulations/provisions for (promotional) banks hinder commitments of credit lines (EBA-supervisory, State-Aid rules, etc.)
- Specific procedures must be followed to select the partners (time-consuming, strictly supervised, etc.)
- Awareness of homeowners or corporates who are not convinced that investing in energy saving measures is profitable
- Other households' or firms' investments take priority over energy efficiency investments
- Market actors (e.g. construction companies, craftsmen, real estate agencies, financing institutions, consultants, and energy auditors) are not coordinated and do not offer easy, global and guaranteed energy saving solutions

What are the market conditions required for soft loans?

The market conditions necessary for soft loans include good banking partners willing to lend/assume risks; potential clients must be marginally creditworthy and willing to borrow;

clients able to retain energy cost savings and pay for energy based on consumption; reasonable, competitive lending rates; reasonable tenors and collateral requirements. Corporates or homeowners with weak and/or limited or no borrowing capacity are usually not eligible to take on soft loans (ESMAP, 2014).

The conditions below are examples of the existing standard market conditions set by banks to households wishing to take on soft loan for energy refurbishment works in Frederikshavn, Denmark, as of November 2016.

Table 8: Loan conditions offered by partner banks to households in Frederikshavn

Bank	Loan conditions
COOP Bank	○ **Loan amount**: 10,000 DKK (€1,350) - 80,000 DKK (€10,000) ○ **Interest rate**: 0% ○ **Maturity**: max 5 years ○ **Grace period**: 0 month ○ Low income homeowners are encouraged to implement energy renovation in several steps. Once the first measure is implemented and paid for through energy savings, the homeowner starts another measure. This model gradually improves the homeowner's creditworthiness as well as the value of the house.
Danske Bank	○ **Loan amount**: variable, theoretical framework between 20,000 and 200,000 DKK (€2,700- €27,000), but in practice, and in most cases about 200,000 DKK (€27,000). ○ **Interest rate**: 5.5 % - 13.6 % or less (variable, depending on creditworthiness). The homeowner may choose a fixed rate for 10 years or a floating rate. ○ **Maturity**: An agreement between the bank and the customer. The loan can be redeemed at any time - maximum repayment period of 30 years. ○ **Grace period**: individual agreements but recommended time is less than 6 months.
Nykredit Bank	○ **Loan amount**: variable, typically between 50,000 and 300,000 DKK (€6,700-€40,300). ○ **Interest rate**: 3.3% - 10.0% (lowest interest rate for up to 60% of the house value, the highest rate for up to 100% of the house value) ○ **Grace period**: individual agreements but recommended time is less than 6 months.
Arbejdernes landsbank	○ **Loan amount**: two types of loan 1. Energy loan: up to 100,000 DKK (€13,500) with no requirement for a guarantee and 200,000 DKK (€27,000), with a requirement for a guarantee 2. Home loan: up to 250,000 DKK (€33,600). ○ **Interest rate**: 1. Energy loan: variable depending on creditworthiness. Typically 6.6 %, when a guarantee is required and 7.1% when a guarantee is not required. 2. Home loan: 4.7 % - 9.6 % (lowest interest rate for up to 60% of the house value, the highest rate for up to 100% of the house value) ○ **Maturity**: 1. Energy loan: up to 10 years 2. Home loan: up to 20 years ○ **Grace period**: up to 6 months.

How can soft loans be rolled out at a larger scale?

According to EEFIG (2015), these are the necessary conditions to roll out soft loans at larger scale:

- Comprehensive framework, e. g. including energy audits and independent expert advice
- Large network of on-lending banks and equal conditions for all

- Long term horizon and stability
- A set of criteria that can easily be understood, processed and checked (MRV), possibly using software instruments.
- An effective information strategy directed towards the final beneficiaries.
- Greater involvement with Energy Performance Contract providers in selected subsectors.

Who can lead and provide soft loans?

Government financially supports a soft loan scheme to trigger capital investment particularly to vulnerable groups in less-developed or high unemployment areas by promoting loans with below market interest rate (CITYnvest, 2015). Soft loans are commonly a result of public-private partnerships where the government gives a financial aid to the bank, which leads to an attractive interest rate offered by the bank to its customers (ACE, 2013). National or international development banks (e.g. European Bank for Reconstruction and Development (EBRD) and EIB) commonly offer such dedicated credit lines and distribute them to designated markets through regional partner retail banks (Interreg, n.d.).

Who can apply for soft loans?

In residential sector, soft loans may be accessed by individual residential or non-residential clients. A group of clients, such as an apartment community, may also be eligible to apply soft loans (ACE, 2013; FEDARENE, 2015). Households with low to medium income who are often not eligible for commercial loans can access a soft loan financing scheme. Households, especially elderly, with very low and irregular income may be offered soft loans under certain circumstances (e.g. social housing) and often combined with subsidies (Energy Cities, 2017a).

Soft loans for energy efficient homes can be offered in the form of mortgages, called preferential mortgages. Existing mortgages can be extended on better terms to offer clients an opportunity to pay for energy efficiency improvements. Soft loans may seem to be an efficient financing scheme for energy refurbishment of buildings, however building owners need to obtain supplementary funds, not to mention additional debt financing. Many building owners are not willing or able to raise their debt ceiling for energy efficiency investments (ACE, 2013; FEDARENE, 2015).

The following table provides examples of the eligibility requirements for soft loans in residential sector in several countries.

Table 9: Examples of eligibility criteria for soft loans in energy efficient home investment. Source: Energy Cities, 2017a

City/Region	Type of housing	Type of households	Measures
Frederikshavn (DK)	○ All types of housing in private ownership (not only buildings constructed before 1970) in the municipal area	○ No specific conditions regarding the households' income	○ Insulation of the building envelope ○ Electricity and heating systems ○ Ventilation and heat recovery ○ Renewable energy production technologies ○ Control and monitoring of energy devices ○ Other renovation work not directly related to energy efficiency improvement
Bordeaux Metropole (FR)	○ All types of housing (single-family, apartments, condominiums) built before 1st January 1990 ○ The owner-occupied housing units are the main target, however, rented properties are also eligible	○ Households meeting the eligibility criteria of the national 0% Eco-loan ○ No specific conditions regarding the households' income	In the framework of the national 0% Eco-loan, at least two measures out of the list below must be implemented: ○ Thermal insulation of roofs, walls, doors and windows; ○ Installation, regulation or replacement of heating systems connected or not to energy efficient ventilation systems or hot water production; and ○ Installation of hot water production equipment using renewable energy sources. All work has to be performed by certified professionals holding quality accreditation. Eligible costs also include energy audits, project management (e.g. architect fees), insurance, etc. In the context of the soft loans offered by partner banks: homeowners can only have one energy renovation measure carried out (e.g. window replacement).
Parma (IT)	○ Single family houses and apartments ○ The housing unit has to be the owner's main residence	○ Parma inhabitants ○ Homeowners ○ Have to pass the banks' creditworthiness check	○ Thermal insulation of roofs, walls, glass walls, doors and windows ○ Installation, regulation or replacement of heating systems connected or not to energy efficient ventilation systems or hot water production ○ Installation of renewable energy sources. All work must be performed by certified professionals able to deliver a declaration of conformity required by the law. Only measures going beyond the national energy efficiency standards are eligible.

How to apply for soft loans?

According to Energy Cities (2017), the procedures for soft loans in general are as follows:

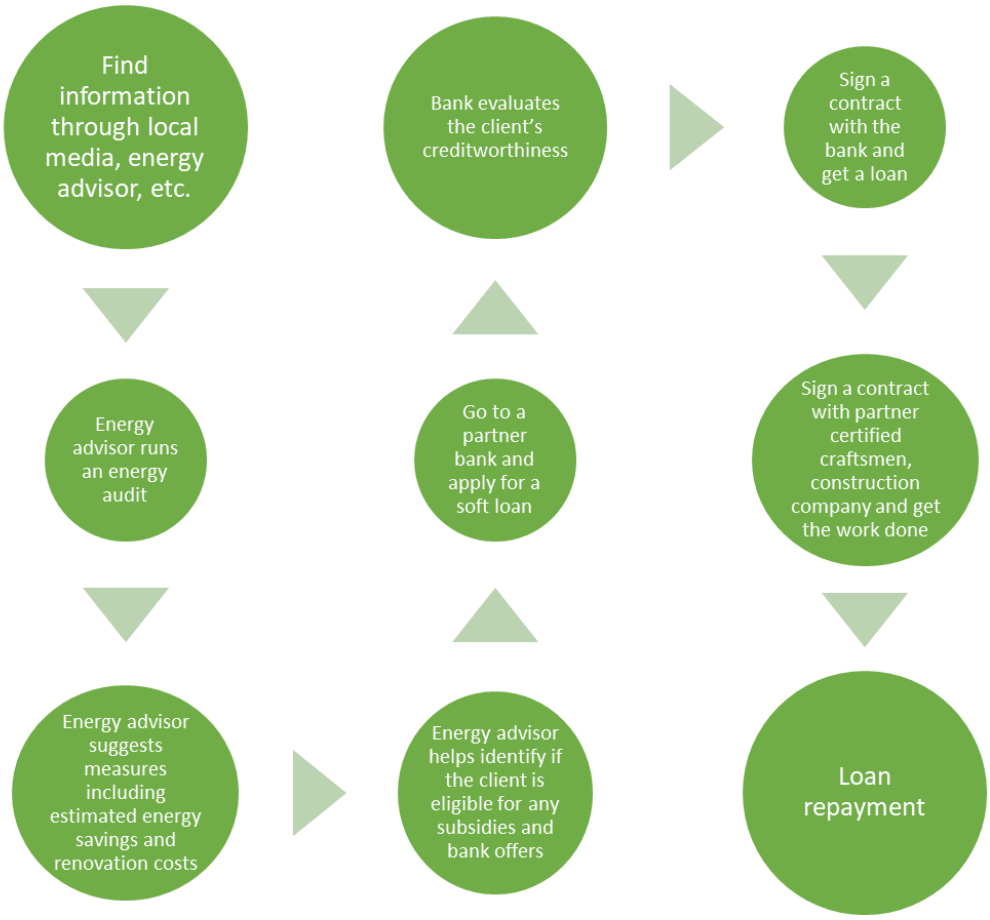

Figure 7: Step-by-step guide to a soft loan application process

Note: The procedures may vary in each city/region/country depending on the local initiative, policy, administrative culture, client's case, etc.

When can soft loans be used?

Just as guarantee funds, soft loans can be used only if the potential borrower has good borrowing capacity, collateral, and creditworthiness (ESMAP, 2014). When companies or private individuals decide to invest in energy renovation work but want to keep financial stability with adequate income streams, they tend to turn to debt financing provided by commercial banks. However, small-medium enterprises (SMEs) and private individuals (such as homeowners) with low to medium income are most likely unqualified to get a loan from commercial banks (Deelen & Molenaar, 2004). Soft loans can be the solution to trigger energy efficiency market, so the high risk that commercial banks perceived is reduced due to the success rate of soft loans (Voïta et al., 2012).

What are other soft loans set up in Europe?

Soft loans alone are not sufficient for low to medium income private individuals or companies to access in order to finance their energy efficiency investments that require high upfront costs.

Therefore, soft loan initiatives are usually combined with other financing schemes, such as guarantee funds and revolving funds. **KredEx**, for example, provided not only loan guarantees, but also revolving funds in the form of renovation soft loans. Supported by structural funds from the EU and extra credit lines from the Council of Europe Development Bank, KredEx offered soft loans at an average 4% fixed rate for 10 years to apartment communities. Other examples include **The Amsterdam Investment Fund** and **The Delft Energy Saving Fund** that combine revolving funds with soft loans. Through soft loans, The Amsterdam Investment Fund helped local enterprises, residents, housing associations, and community organizations in energy efficiency projects to reduce their carbon footprint and energy consumptions. The loan repayment is being revolved to invest in similar projects in the next 14 years. The Delft Energy Saving Fund has the same approach but focuses particularly on citizens and non-profit organizations. It offers preferential loans with interest rate as low as 1.5% that is due in 10 years (FEDARENE, 2015).

Other soft loan mechanisms can also be combined with non-financial incentives such as technical support for the clients. This type of soft loan scheme is provided in several cities and regions in Europe including **Parma (Italy), Riga (Latvia) Frederikshavn (Denmark), Bordeaux Metropole (France), and Brussels Capital Region (Belgium)**. They collaborate with local banks and financing institutions to develop such soft loan schemes (Energy Cities, 2017a). A guidebook to soft loans and comparative analysis from Infinite Solutions provides further information related to those case studies.

Below are some initiatives that solely provide soft loans.

The Ecopack (Wallonia, Belgium)

A public interest body called SWCS (Société Wallonne du Crédit Socia) in Wallonia is in charge of this soft loan scheme. The loan is funded from a share capital with the regional government and the social housing association and also from the loan offered by CEB and commercial banks that are guaranteed by the regional government. Since May 2012, the Ecopack has provided loans with zero interest rate for home energy efficiency improvements. The amount of loan offered ranges from €2500 to €30000. As the energy renovation works are executed, the payments are made gradually and directly to the contractor or materials supplier. The clients then can pay back the loan for up to 12 years, depending on their total taxable income. Until 2015, over 8000 households were refurbished with the help of the Ecopack (FEDARENE, 2015).

Table 10: Requirements and main barriers of the Ecopack

Eligibility criteria of beneficiary	Conditions for energy renovation works	Main barriers
○ The loan's value must be set between €2 500 minimum and €30 000 maximum. ○ The building's initial construction permit must be dated before the 1st of December 1996. ○ The building must be sanitary. ○ The building must be on the territory of Wallonia. ○ The homeowner must not have its workplace in that building, unless it is permitted by the SWCS. ○ The loan applicant must be either the occupying homeowner or the tenant. ○ The applicant must already occupy the place before submitting the loan request. ○ The applicant's total taxable income must be evaluated within the acceptable scope (€18.700 - €93.000).	○ The enhancements covered by the loan must be comprised of at least 2 types of works (which constitutes a package of works called "bouquet de travaux"), of which at least one must improve the energy performance of the building. Other small works can therefore be included (e.g. adding a thermostat) but also works that could be disconnected from the energy efficiency goals (replacement of the sewage system, replacement of the floors, lining of the chimney system, etc.). ○ Works must be carried out by contractors authorized by the SWCS. ○ Works have to wait the SWCS' approval. ○ A preliminary study of the home must be carried out in case of insulation of the walls or floors, unless an energy audit was already made. ○ For the applicants with total taxable income of less than 18.700 € (cat. 1), thermal insulation of the roof is a package of works ("bouquet de travaux") by its own. ○ The adding of photovoltaic panels and micro-generation systems can be considered as part of the package of works, but benefits from a different financing instrument (certificats verts), and therefore is not covered by the Ecopack. ○ The works must be carried out within a 2 year period.	○ The wide accessibility to this loan had created a windfall effect, overloading the SWCS' capacity of processing demands and lengthening the whole procedure. ○ An instrument limited to homeowners that are able to take on additional debt. ○ No wide-scale scheme has proven effective on a wide national scale. ○ It remains questionable to what extent demand does not remain artificial when it is only created by publicly incentivized loan.

Source: FEDARENE, 2015

Table 11: An overview of the works covered by the Ecopack

Energy performance works	Other types of works
○ Thermal insulation of roofs, walls, floors. ○ Replacing of window frames or of the glazing. ○ New ventilation systems. ○ Installation of a natural gas condensing boilers. ○ Installation of heat pumps. ○ Installation of biomass boiler. ○ Connection to a CHP network. ○ Carrying out of energy audits	**Associated works (« travaux induits »):** ○ Replacing, repairing of the roof. ○ Exterior walls skin. ○ Dress the interior walls. ○ Replacement of the sewage system. ○ Replacement of the floors. ○ Lining of the chimney system. **Small works contributing to energy savings:** ○ Adding a thermostat. ○ Isolation of heating pipes. ○ Thermographic audit. **Works targeting renewable energy generation** ○ *Covered by the Ecopack*: Solar thermal collectors for domestic hot water and/or heating. ○ *Not covered*: Photovoltaic panels and micro-generation systems.

Source: FEDARENE, 2015

More information can be found on: https://swcs.be/

Community Energy Loan Scheme in Kilkenny (Ireland)

This loan scheme is a product from St. Canice's Kilkenny Credit Union in a partnership with Sustainable Energy Authority of Ireland (SEAI) and Carlow Kilkenny Energy Agency (CKEA). The loans provided a lower interest rate of 6.4% than the market rate with an opportunity to obtain a rebate of up to 30% of the related costs. The loans specified several energy renovation measures that would be funded including the upgrade of heating systems, high efficiency boilers or stoves, the installation of attic or wall insulation, replacing windows or external doors, and sola panel installation.

The very first procedure of getting the loan is to submit the application form and CKEA will conduct a home energy audit for €100. This fee can be returned if the applicant does not meet the eligibility criteria. Once considered eligible to be the loan beneficiary and the energy audit is finished, St. Canice's Kilkenny Credit Union will contact the applicant to discuss it further (FEDARENE, 2015).

More information can be found on: http://www.stcanicescu.ie/community-energy-loan/

What is the summary of soft loans?

Soft loans are a financing scheme usually provided from public funding that reduces the interest rate below the market rate, so soft loans can be more accessible to those who wish to conduct energy efficiency buildings renovation, which usually requires a high upfront investment. The following table presents an overview of soft loan financing schemes based on EEFIG (2014).

Table 12: Soft loans (Supply Driver)

Adapted for sectors:	Commercial	Public	Public rental housing	Private rental housing	Owner-occupied housing
	+	+		+	++
Led by:	Public sector funding usually with private money levered and often deployed alongside a grant programme.				
Advantages	○ Easy to roll out, however careful ex-ante analysis of supply and demand and legal/tax framework needed ○ Standardised supply offering at the same time flexibility according to individual preferences (repayment, interest rate fixation etc.) ○ The use of Cohesion funds for soft loans in housing is facilitated with the "renovation loan" (off-the shelf instrument) ○ Allows 1:1 refinance to commercial banks (Basel III compliant) ○ Positive impact on public budgets due to leverage effects				
Weaknesses	○ Capacity/ willingness of owners to take more debt (i.e. very country dependent) ○ Risk aversion of banks (calling for guarantees from Governments) ○ Leverage effect of public funds is usually less than 10x and grants are often required alongside to improve energy efficiency ambition				
Main obstacle/legal changes required	○ Transaction costs to implement (technically) and manage long-term programs within financing institute ○ Increased focus on optimal rather than minimum energy efficiency standards				
Best practice examples	KfW, NRW.BANK, Kredex, EBRD Sustainable Finance Facilities (SEFF), etc.				

What are the key lessons learnt from soft loans?

Similar to guarantee funds, soft loans on energy efficiency alone are not able to cover the whole investments. Taken from Bordeaux Metropole case study, one financing scheme will not be suitable for all types of households or buildings. For very low-income households or corporates, a soft loan scheme should be combined with a subsidy, third party investment and/or guarantee fund, as the soft loan scheme typically aims for low to medium income target groups.

When signing a contract, it is hard to specify a fixed interest rate that is in favour for both parties (the financing institution and the client). This is due to the nature of interest rate uncertainty that is growing most of the time. As a result, soft loans could be unappealing for some type of groups, especially those with higher incomes.

If one of the eligibility requirements for getting a soft loan is the energy savings achieved or energy efficient measures implemented, the loan provider will need to assure that, especially when the loan comes from a public funding. Such monitoring may result in more intricate procedures and increased costs for the institution and the partners. Consequently, it will discourage the potential clients to get the soft loans (Energy Cities, 2017a).

Revolving Funds

What you need to know about revolving funds

What are revolving funds?

A revolving fund is a pool of capital replenished by the cost-savings from energy efficiency and renewable energy projects or by the interest paid by the sustainability measures financed by the fund. These cost-savings or interest revenues continuously finance new investments in similar projects, resulting in a sustainable funding cycle. Revolving funds can be a potential solution to deal with the long payback time of the projects. It may be more effective for the long term if coupled with other financing schemes, mostly with soft loans (BPIE, 2010). It may also be a good complementary to an ESCO (de T'Serclaes, 2007).

What are the types of revolving funds?

There are two types of revolving funds:

1. **External revolving fund**: it is often developed and managed by a selected fund manager (with its compensation tied to the fund's performance), or by a utility or specially created organisation. This type of revolving fund lends to multiple municipalities, which must repay the loan in an agreed date. It can form a partnership with service providers of energy efficiency or ESCOs to carry out the projects for the borrowers. It is very likely that the incentive payments should be made according to the energy savings achieved (ESMAP, 2014).
2. **Internal revolving fund**: it is a revolving fund developed by a single municipality of which the municipality funds the initial investment and may also take control (ESMAP, 2014). The structure of an internal revolving fund varies depending on the city's needs as well as local conditions. Other factors include "mayoral powers, regulatory and legislative context, type and scale of infrastructure project, and the risk/reward profile of stakeholders" (C40,

2016). The internal revolving funds need an initial capital contribution, which can come from the municipality's own budget, grants or loans from external sources and donors.

Why are revolving funds important?

Revolving loan funds commonly have certain targets and eligible types of groups determined, such as ESCOs or schools that wish to improve energy efficiency of their building portfolio. Individual building owners mostly do not belong to the beneficiary group (National Renewable Energy Laboratory (NREL), 2011). Traditional investors are not used to energy efficiency projects and are unwilling to provide financing. Revolving loan funds help overcome this issue. For example, ESCOs cannot take many big projects as they are short of necessary funding for upfront investment. Revolving loan funds can assist ESCOs in this regard by providing more accessible pool of funds. This also applies to other segments of the building market, such as fairly large institutions and corporates (Becqué et al., 2016).

Revolving funds can also help prove that energy efficiency projects can be commercially feasible in the long run. This financing scheme helps the capacity development of service providers, such as energy auditors, craftsmen, construction companies, and ESCOs. Therefore, revolving funds can help encourage more commercial financing in the energy efficiency market (Limaye et al., 2014).

How do revolving funds work exactly?

Most revolving fund programs offer loans with a specific maturity and determine what types of projects that can be funded (NREL, 2011). The funding sources of a revolving loan fund usually come from government, which may be in the form of dedicated taxes on energy sources. The execution may be handled by partner banks, including the evaluation of loan applications, monitoring of loans and collection of loan repayments (Voïta et al., 2012). The money from loan repayment goes back to the revolving fund to make new loans for similar projects. The additional fees like the interest rates paid by the borrowers are mostly to cover program administration cost, so the initial capital of the fund is not disturbed. Revolving funds are usually managed by government bodies or non-profit organizations with the aim of making positive change within target beneficiaries (NREL, 2011). The following figure shows the cash flow in a revolving loan fund for energy efficiency (EE) or renewable energy (RE) projects.

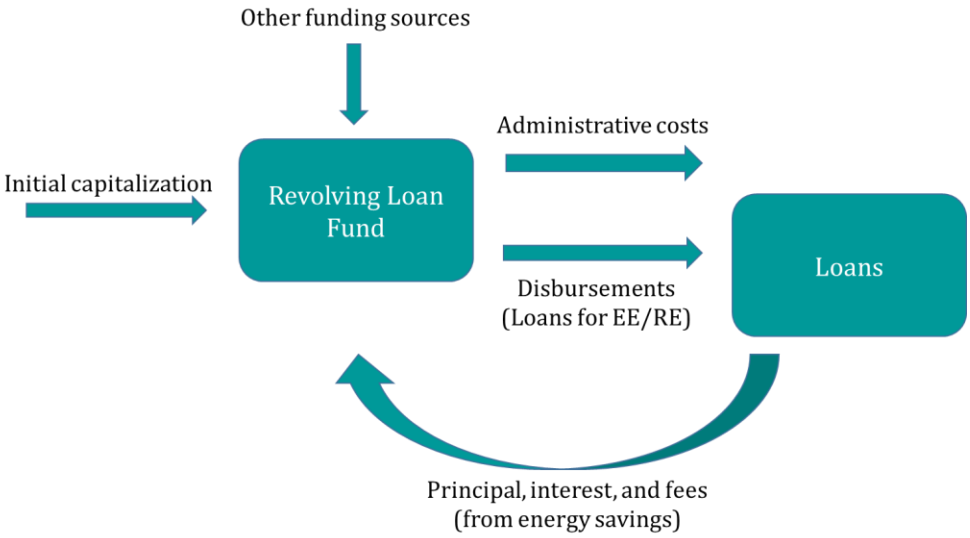

Figure 8: Cash flow of revolving loan fund. Source: NREL, 2011.

What are the advantages of revolving funds?

According to BPIE (2010), FEDARENE (2015), and de T'Serclaes (2007), the advantages of a revolving fund scheme are as follows:

- Enables to recycle capital for future use
- More efficient allocation of public funds
- Allows long-term sustainability of public investment
- Direct and clear impact on the financial barrier issue, which is lack of liquidity
- Can help demonstrate the commercial viability of EE investments and provide credit histories, paving the way for future commercial financing.

What are the weaknesses of revolving funds?

According to BPIE (2010) and de T'Serclaes (2007), the weaknesses of a revolving fund scheme are as follow:

- Temporary impact on the financial barrier issue
- Does not contribute to long-term market transformation, unless it lasts for so long that sustained stable demand will have been created
- Does not call for any particular innovation from the market
- Limited budget to finance the measures
- Payback period limited to 15 years
- The set up and operation of a revolving fund can be administratively difficult, for example, it may be needed to apply significant effort in educating financial administrators on how to recognise savings

What are the main barriers of revolving funds?

According to FEDARENE (2015), the main barriers of a revolving fund scheme are as follow:

- Parallel negotiations with many different partners

- Economic situation in the country may change dramatically and therefore change the behaviour of final beneficiaries
- Complex architecture of the fund: the preparation takes a very long time (and incurs considerable costs)
- Final beneficiaries, even with active awareness raising measures, remain reluctant

How to identify appropriate measures to be financed through revolving funds?

The following steps can be undertaken to check whether a measure is appropriate to be financed through the revolving fund (Energy Cities, 2017b):

1. **Consult potential customers in charge of planning new construction, renovation, retrofits or maintenance about your scheme.** Ask about what is on their schedule. Try to steer their investment decisions towards energy efficiency beyond the current standard by offering additional Internal Contracting funding.
2. **Check whether the energy saving measure will not be the subject of, or affected by, a more significant retrofit or new construction**, which could replace the whole installation before the investment of the measure is paid back.
3. **Examine the profitability of a project**, by determining:
    a. The economic parameters: the investment cost and the resulting expected financial savings calculated by multiplying the energy savings and the cost per energy unit.
    b. The payback time: the investment divided by the annual energy cost savings.
    c. The operational lifetime of a measure: which depends on the durability of its technical parts.

Only projects with feasible investment costs and payback times are suitable for funding via Internal Contracting. Therefore, consider the following:

Payback time < operational life of the measure = economically viable

Payback time > operational life of the measure = not viable

How to manage the investments of the revolving fund?

The initial monetary value of the fund is set up at the start of the scheme. New investments are financed by energy cost savings gained and paid back by the implemented measures previously invested by the fund.

In order to be able to finance several energy saving measures throughout the years using the initial monetary value of the revolving fund, a few aspects need to be considered:

1. **The fund cannot cope with investments of any size**. The cost of a single investment has to be lower than the fund's value.
2. **The total annual investment should be limited to only a share of the fund's value**, since the fund is intended to pay for investments made in different years with paybacks also extending over several years.

The investment cost and payback period must be suited to the revolving loan fund in order to sustain the implementation. The longer the payback period, the lower the investment that can be funded annually, as it takes longer time to replenish the fund. “Increased investment costs can completely halt this business model” (Energy Cities, 2017b).

Who can lead and provide revolving funds?

Public entities usually contribute to revolving funds by subsidizing interest rates or finance the main investment partially or fully (Voïta et al., 2012). Government can set up a revolving fund when the funds and expertise are sufficient. In some cases like Riga (Latvia), an energy agency can also establish this business model and coordinate all stakeholders on behalf of the city. Energy audits and energy retrofit works can be conducted by the energy agency within the framework of the energy refurbishment projects that is eligible for the revolving fund (Energy Cities, 2017a).

The primary issue in creating revolving funds is seeking the initial capital of the fund. The initial capital can be obtained from government’s own funds and budget, grants/loans from donors or other external funding sources. Revolving funds may be developed and administered by local, regional or even national government. “In such cases, the funds are often managed by competitively selected fund manager with its compensation tied to the fund’s performance.” When revolving funds are established at a local level, they can encourage to recognize total costs and benefits of projects in the long run (Interreg, n.d.).

Who can apply for revolving funds?

According to Limaye et al. (2014), the eligibility requirements used to evaluate potential beneficiaries of revolving funds may include the following:

A. For debt financing:
   - Creditworthiness of the potential beneficiary
   - Existence of consumption-based payments for heating
   - Good energy bill payment discipline
   - Existing comfort level of at least 50 percent[3]
   - Building in reasonably sound structural shape
   - No current or imminent plans for closure/privatization
   - Ability to retain cost savings to allow loan repayments[4]
   - Potential use of commercially available technologies
   - Minimum and maximum loan amounts
   - Proper project preparation and documentation

B. For energy service agreements:
   - Availability of historical energy bill data
   - Consumption-based billing and good energy-bill payment discipline
   - Building in reasonably sound structural shape
   - No plans for closure or for major changes planned in building operations
   - Willingness and ability to sign energy service agreement spanning multiple years
   - Willingness to work with the fund's payment security mechanism

The Bulgarian Energy Efficiency Fund (BEEF) is an example of a revolving fund initiative that is intended for energy efficiency investments. The beneficiary groups include industrial, commercial, and residential buildings. Below are the main eligibility criteria for getting the fund:

- The project should involve the application of well-proven technology
- The project cost should range between €15,000 and €1,500,000
- Minimum equity of 10 percent under co-financing and 25 percent for stand-alone financing
- Payback time of up to five years
- Required collateral: mortgage, pledges under Special Pledges Act, claims on accounts and commercial contracts, financial risk insurance, bank guarantees, etc.

How to apply for revolving funds?

According to Energy Cities (2017), the procedures for revolving funds in the case of Riga (Latvia) are as follows:

[3] The "comfort level" in a building is defined as the ratio of the actual energy consumed for providing heating comfort to the amount of energy that would be needed to provide the desired or standard comfort level. If this ratio is small, it is unlikely that the EE project that will be designed to provide the desired comfort level can provide cost savings.

[4] Alternatively, existence of a payment security mechanism that will assure loan repayment.

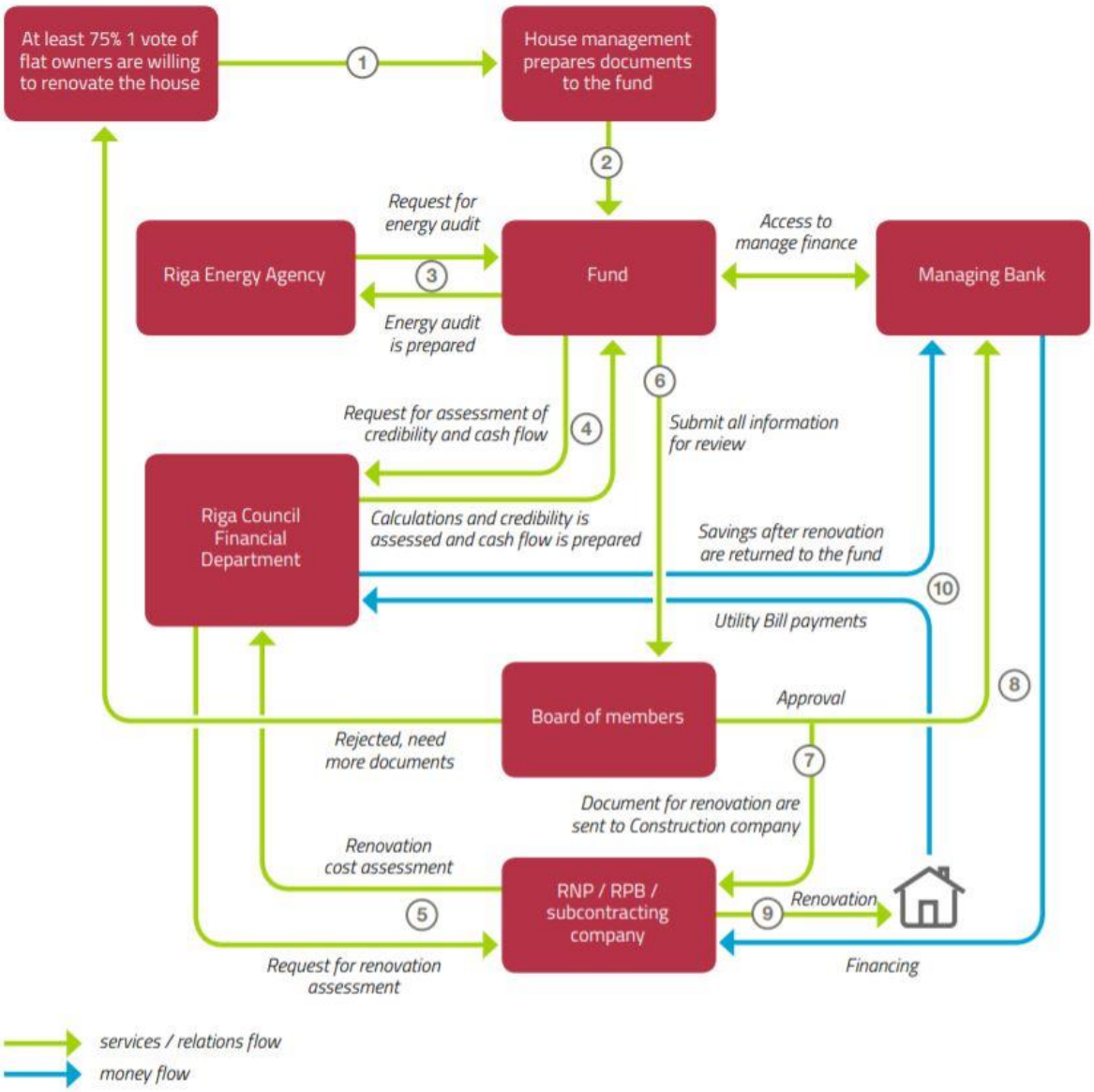

Figure 9: Business model of Riga Energy Agency's revolving fund

Table 13: Step-by-step guide to applying for revolving fund of Riga Energy Agency

Application	1. At least 75% + 1 vote (or 2/3) of flat owners are willing to renovate. 2. House manager prepares the documents and application that are submitted to the fund
Review process	3. Riga Energy Agency (REA) 3.1. The energy audit request is submitted 3.2. The energy audit is prepared and returned to the Fund 4. Riga Council/Financial Department 4.1. Request for assessment of creditworthiness and future cash flow 4.2. Calculations and creditworthiness are assessed and cash flow is prepared 5. Riga House Managers (RNP)/ Riga City Builder (RPB) 5.1. Request for renovation assessments 5.2. Renovation cost assessment provided
Process of approval	6. The fund gathers all information about the building and submits it to the Board of Members. 7. If the Board of Members approves the application, the documents approving the renovation are sent to a Construction company. 8. Managing Bank 8.1. Immediately after the application for renovation is approved, the request to provide financing is sent to a Managing Bank. 8.2. Financing is provided to a construction company.
Renovation and post-renovation	9. At this stage, a construction company is able to start the renovation. 10. Repayments 10.1. Once the renovation is completed, the building energy consumption is reduced. Homeowners pay back the loan through the utility bills to the Riga Financial Department. 10.2. Savings after the renovation are then calculated and sent from the Financial Department to the Managing Bank.

What are other revolving funds set up in Europe?

Lithuanian Energy Efficiency Housing Pilot Project EEHPP

The EEHPP implemented a revolving fund scheme in 2001. One of the goals is to support energy efficiency projects in the residential sector. The scheme aims to encourage private initiatives to improve energy efficiency. It was financially supported by the Lithuanian government, the World Bank, the Danish Ministry of Housing and Urban Affairs and the Dutch Ministry of Economics. Within four months, over 200 households carried out energy efficiency works with the help of the EEHPP. The measures include new heat substations, window replacement, as well as roof and wall insulation (de T'Serclaes, 2007).

The European Dexia-Fondelec Energy Efficiency and Emissions Reduction Fund

This initiative ran from 2000 to 2010. The aim was to support companies and projects in energy efficiency investments, mainly in Central and Eastern Europe. The initiative acted as a trigger for energy refurbishment in private sector. The funding sources come from Dexia-Public Finance International Bank, FondElec Group, and EBRD. The initiative became the first commercial investment vehicle that supports the carbon credits distribution to shareholders by investing in energy-saving projects (de T'Serclaes, 2007).

Energy Fund Den Haag - ED

This fund was established by the Municipality of The Hague in 2013. The funding sources came from the municipality's own fund, EFRD and Programme Authority "Opportunities for West". This fund focuses more on renewable energy and energy efficiency projects in the territory of The Hague. Through the fund, the municipality intends to attract more private funding to support both the funds and the projects. This fund also incorporates other schemes, such as soft loans and guarantee funds, as guarantee funds serves best with complementary financial instruments. The beneficiaries of this fund come from public and private sectors, including project developers, housing corporations, businesses, foundations and NGO's and public entities e.g. municipalities, local authorities. As of December 2014, the fund supported almost € 4 million for five projects, one of which was the installation of solar panels for a football club house (CITYnvest, 2015).

Bulgarian Energy Efficiency and Renewable Sources Fund - EERSF

The fund was set up in 2005 under a form of a public-private partnership. The initial capital was obtained from the Bulgarian and Austrian Governments, the Global Environment Fund (GEF) through the World Bank's International Bank of Reconstruction and Development (IBRD), and the private sector in Bulgaria. The fund does not only target public sector, but also private sector including Project developers, ESCOs, Project contractors, housing corporations and businesses. The aim is to create a sustainable market-based capacity for developing and financing commercial energy efficiency projects in Bulgaria. The fund also helps prove that energy efficiency investments are profitable so the market in this sector can be more developed. The EERSF also provides technical support free of charge. Like most of the guarantee fund initiatives, the EERSF includes other financial instruments, such as soft loans and guarantee funds. As of December 2014, the EERSF has funded 53 projects in the private sector for a total amount of 13.1 million BGN with a total project investment value of 18.6 million BGN (CITYnvest, 2015).

Romanian Energy Efficiency Fund

This fund, also called FREE (Fondul Român pentru Eficienţa Energiei), began to operate in June 2003 with an initial fund of US$10 million from GEF. The FREE allows corporates in the industrial sector and other energy consumers to carry out energy efficient projects under commercial conditions. Within 5 years, 12 projects in the private sector have been accomplished. The projects included changing old energy generation equipment to more energy-efficient one. Each project must profit at least 50% from energy savings to be eligible for the fund (Limaye et al., 2014).

What are the key lessons learnt from revolving funds?

As the loan payback time can take years, the fund will take a long time to replenish its capital. Therefore, a revolving fund needs one or more dependable funding sources to continue financing other projects (Limaye et al., 2014). Take an example from the Bulgarian revolving fund, BEEF. The government's support decreased gradually making the BEEF lacked ownership at the end of the project. The government did not seek more funding sources for the BEEF to grow its initial capital (World Bank, 2010), making BEEF unable to sustain longer.

Overall, to be more sustainable, revolving funds should be combined with other financial instruments. Various public financial incentives, such as tax credits, tariffs, depreciation, and mandated audit, can increase the funds and develop the market. The funds should be able to offer

interest rates below the market rate, like soft loans, and/or other incentives, like technical assistance, to appeal to potential clients (de T'Serclaes, 2007).

Toolbox and Materials

- **Tools for choosing guarantee fund structures**
- **Materials on Energy Efficiency in Buildings**
- **Building (Energy Efficiency) Upgrade Value Calculator for Commercial Properties**
- **Comparative Study on Financing Schemes Used for Energy Efficiency in Buildings**
- **Guide to Financing the Energy Renovation of Residential Buildings through Soft Loans**
- **BPIE: Financing Energy Efficiency in Buildings**

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PROSPECT

Learning Handbook
Public Buildings Module

Innovative financing schemes to improve the energy performance of public buildings.

This module covers buildings and facilities owned, managed, or controlled by public authorities. Facilities refer to energy consuming entities that are not buildings, such as wastewater treatment plants.

PROSPECT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 752126

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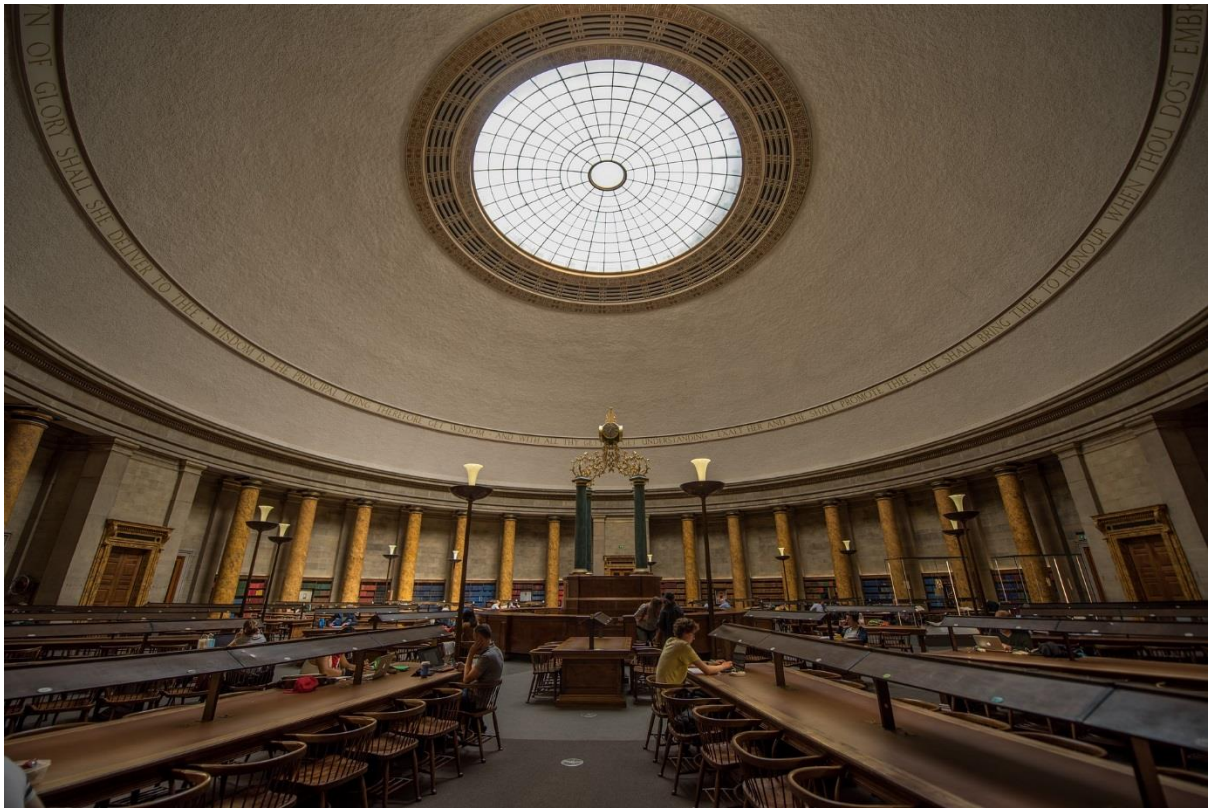
Module Description

The module on public buildings covers buildings and facilities owned, managed, or controlled by public authorities. Facilities refer to energy consuming entities that are not buildings, such as wastewater treatment plants.



Module Objectives

Mentee

At the end of this module, mentees can achieve the following learning objectives:

- Understand the innovative financing schemes relevant under public buildings
- Recognize the barriers, incentives, advantages, and disadvantages of the innovative financing schemes
- Examine which sustainable energy and climate action projects can be financed by innovative schemes
- Analyse the success factors and lessons learnt from successful projects financed by innovative schemes

Mentor

At the end of this module, mentors can achieve the following learning objectives:

- Share content knowledge on the topic of innovative financing schemes that are relevant under the public buildings module

- Share practical experience on implementing sustainable energy and climate action projects and support others in overcoming different barriers
- Showcase sustainable energy and climate action projects financed by innovative financing schemes
- Learn from other cities and regions on which projects they want to implement and which innovative financing schemes they want to apply

Sectoral Challenges

Public buildings cover about 12% by area of the EU building stock. With energy efficiency investments in public buildings, the benefits are two-fold: (1) energy savings, productivity and value improvements accrue to the owner while generating (2) increased employment, reduced emissions, and improvements to the public (Energy Efficiency Financial Institutions Group or EEFIG, 2015).

In a survey conducted by EEFIG (2015), the top ten (10) key drivers affecting demand for energy efficiency investments in public buildings are:

1. Rules on public authority accounting, procurement and reporting
2. Leadership and awareness at key decision makers' level
3. Standardization
4. Buildings regulation, certification and energy performance certificates
5. Facilitation and technical assistance
6. Effective enforcement of regulation
7. Clear business case
8. Regulation which impacts on timing and scope of renovation
9. Regulatory stability
10. Measurement, reporting, and verification (MRV) and quality assurance

With these drivers, here are the main approaches proposed for energy efficiency investments in public buildings EEFIG (2015):

- Key decision makers and facilities managers must be responsible for energy use reduction
- National public procurement procedures should be adapted in light of the need to renovate public buildings at scale, in particular regarding the procurement of energy performance contracts
- Public authority accounting should be reviewed to take a balanced view of the benefits as well as costs of energy efficiency investments in public buildings to be accounted for
- Up-scaled public resources, in line with the regulatory framework, to be invested to develop investment pipelines and projects, relevant data, and provide more education and training leading to more energy efficient buildings regulation

Typical Projects

Typical projects under the sector of public buildings, drawn from the SEAP ALPS Project, include the following:

Table 1: Example of projects under public buildings

Action	CO2-saving potential	Estimated costs for municipality	Cost-benefit ratio	Implemen-tation time frame	Target group	Key actors
Energy management for municipal buildings	Medium	Savings above expenses	Very high	2-3 years	Municipality	Municipality, External experts
Energy saving contracting	High	Very little to none or negative cost	High	1 year, contract will last for 7-20 years	Municipality	Municipality and ESCO (contractor)
Improvement of municipal indoor lighting	High	Medium	High	1 month	Municipality	Municipality and ESCOs specialising in lighting
Energy check for municipal buildings	Medium	1000 euros (average per building)	High	1 month	Municipality	Municipality, Energy expert
Building standards in new construction of municipal buildings	Medium	About 10-15% higher than conventional buildings	Medium	1-2 years	Municipality	Municipality, External experts
Implementation of renewable energy sources at municipal buildings	Medium	<10 cents /kWh[1]	Medium	3 months	Municipality	Municipality, External experts

Adapted from the SEAP ALPS Project

Energy management for municipal buildings

Energy management for municipal buildings helps municipalities towards the transition to sustainable fuels. It requires four actions in order to be implemented:

- Energy accounting (a monthly monitoring of electricity, heat and water consumption)
- Education of caretakers
- Regular adjustments to existing technical facilities such as heating, cooling and ventilation systems
- Annual report

[1] Source: Solar Power Europe 2016

Energy Saving Contracting

Energy Saving Contracting are a possible solution for municipalities that need sustainable financing for public buildings. The energy service company (ESCO) ensure that the action will generate energy cost savings sufficient to pay for the project over the term of the contract.

Improvement of (municipal) indoor lighting

Indoor lighting can have a significant impact on municipalities' budget, especially because of the daily energy wastes. Replacing normal bulbs with LED lighting is an effective solution to both reduce energy consumption and costs.

Energy check for municipal buildings

Energy check helps cities in minimizing energy wastes in public buildings. These controls, carried out by external experts, reveals the hidden potential and the pitfalls in the energetic system. Combined with a proper training for the municipal staff, this solution guarantees energy saving and promotes awareness raising.

Building standards in new construction of municipal buildings

Creating and implementing new standards for building's energy efficiency can help municipalities in their transition towards sustainability. Cities that choose these solutions can also provide support to other municipalities, for example through the creation of guidelines and recommendations for implementing the new standard.

Implementation of renewable energy sources at municipal buildings

Municipalities have a great impact on climate change, they can lead and upstream the transition towards sustainable pathways. Through the own production of renewable energy cities can drive this paradigm switch and can aim to be both economically and energetically independent.

Funding Sources

How can public authorities finance sustainable energy and climate action projects? There are different options for financing projects – from the city or municipality's own resources through direct budget allocation and via revolving funds to using grants from sub-national or European funds and the involvement of energy service companies (ESCOs) for energy performance contracting and financing by citizens through crowdfunding.

Look at the quick reference guide for financing opportunities for local climate and energy actions from the Covenant of Mayors. The guide shows who the beneficiaries are, the participating countries, the focus areas, type of funding, managing structure and coordination, and further information.

Table 2: Source of funds for sustainable energy and climate action projects

No.	Source of Funds	Description
1	**Own Local (City or Municipal) or Regional Budget**	Funds drawn from the budget of local or regional public authorities
2	**National Funds**	Subsidies provided by national governmental bodies or funding through grants from national programmes
3	**European Funds**	
	Managed at the EU level	Funds that provide technical assistance and project development, usually for demonstration / pilot projects (e.g. European Innovation Partnership on Smart Cities and Communities, INTERREG Programmes, such as the North-West Europe Programme)
	Managed at the national, regional, or local levels	Funding resources and technical assistance, such as the European Structural and Investment Funds, which are managed by national, regional, or local public authorities in partnership with the European Commission through operational programmes based on strategic goals or investment priorities
4	**European Banks**	These include European Investment Bank, European Fund for Strategic Investments, Private Finance for Energy Efficiency, European Energy Efficiency Fund, and European Bank for Reconstruction and Development
5	**Private funds**	Financing provided by private contractors, utilities, by institutional investors, crowdfunding, and through energy cooperatives

Decision Tree

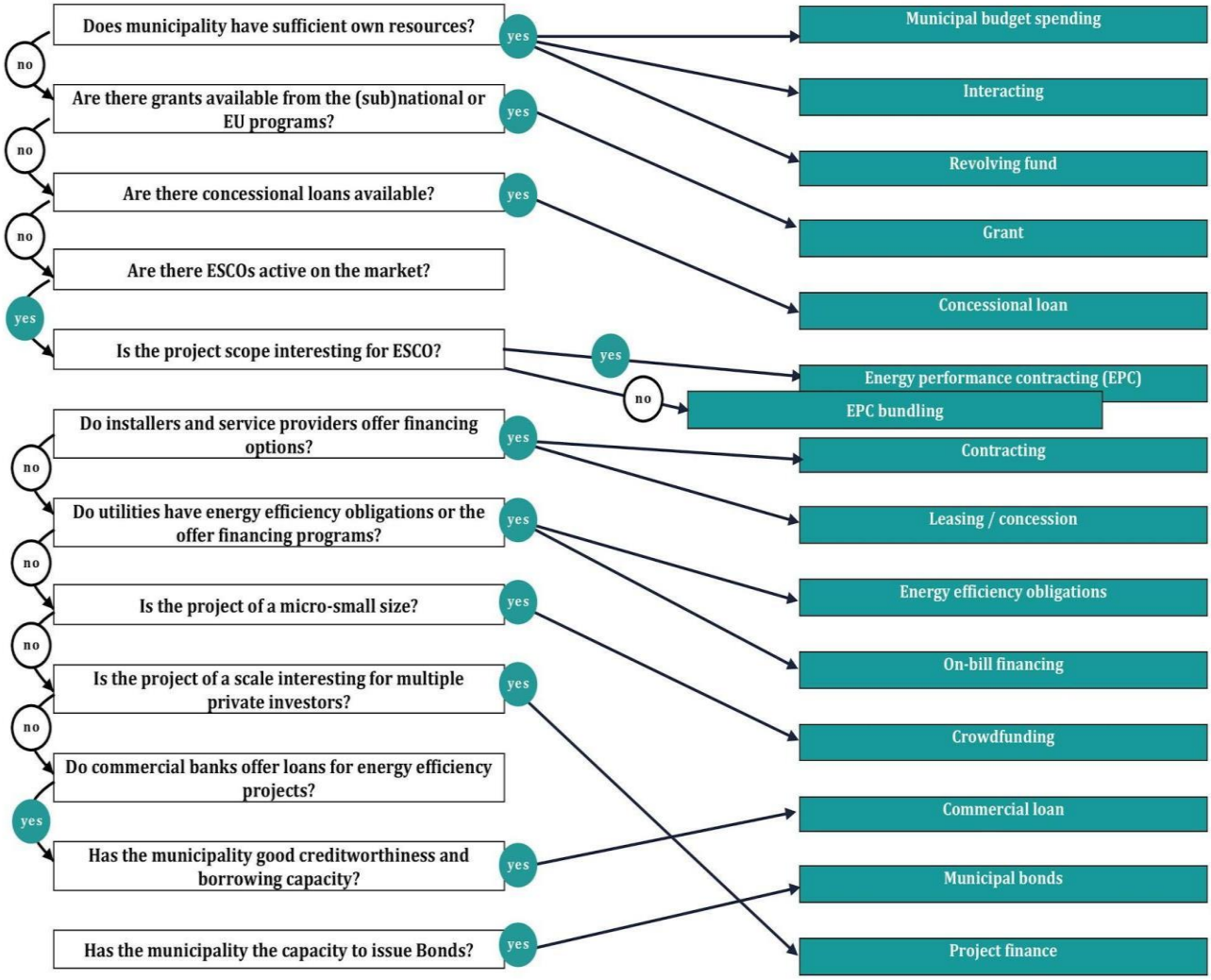
The decision tree represents a flow chart of the most appropriate financing mechanisms to address specific situations faced by municipalities in financing energy efficiency (EE) projects. The scheme is not binding as, in many cases, multiple mechanisms may be combined.

The first thing to address is whether the municipality has sufficient resources to fund the project(s) or not. If the municipality has sufficient financing for the project(s), it can allocate part of its budget for the project(s); by establishing a budget line item for project and carrying out the mechanism of general budget financing. If the municipality does not have enough funds, it should seek any grants available from donors. If there are available grants, the municipality should apply for them. Often this grants do not cover the entire project cost as they represent a mechanism of partial budget financing. It is often possible that funds may also come from the national government; in this case the municipality will capture new budget for financing part of the project(s). If the fund does not come from the national government, it is possible to look for energy efficiency funds; this financing scheme is subject to EE fund eligibility criteria.

Beside this funds, commercial banks can also offer dedicated credit lines and/or risk sharing programs. In order to take advantages of these opportunities, the municipality must respond for its creditworthiness as well as its collateral and borrowing capacity.

Other financing systems can be found in commercial or financial ESCOs; if there are ESCOs in the market the municipality should develop favorable EPCs by negotiating them with ESCOs. If the ESCO is not an option, leasing or vendor financing programs can be searched. In such case, when the eligibility criteria are satisfied, similarly to the commercial financing scheme, the municipality should negotiate the leasing or the vendor financing agreement. Finally, if the municipality has the capacity to issue municipal bonds it should create a municipal bond program by taking into account the transaction costs and market situations.

Select the relevant financing model for sustainable energy and climate action projects using a simple decision tree below:



Source: Novikova, et al., 2017

Figure 1: Decision Tree

Innovative Financing Schemes

Innovative financing schemes are non-traditional ways of raising funds and facilitating sustainable energy and climate investments for cities and regions by mixing different sources (own fund, public and private funds) or engaging different partners (e.g. citizens, private sector) aside from established financial institutions (e.g. banks). Considering the availability of best practices, we will focus on Energy Performance Contracting and Revolving Funds in this module.

Table 3: Innovative financing schemes under public buildings

Energy Performance Contracting (EPC) and third party - EPC	Energy Performance Contracting (EPC) is a method to implement energy efficiency projects, by which an ESCO (Energy Services Company) acts as a unique contractor and assures all of the steps of a project, from audit through installation up to operations and maintenance. The ESCO delivers a performance guarantee on the energy savings and takes responsibility for the end result. The EPC contract is the contractual agreement by which the output-drive results are agreed upon.
Revolving Fund	A fund established to finance a continuing cycle of investments through initial amounts received from its shareholders, creditors or donors and later on through amounts received from reimbursements of provided funding or loans to projects. These recovered funds become available for further reinvestment in other projects under similar scope (e.g. revolving funds for sustainable energy will use the loans recovered funds to finance new sustainable energy projects).

Best Practices

The table below presents a summary of the financing schemes and examples of best practices, the city or region where the best practice is located, and the source(s) of funds.

Table 4: Best practices

Financing Scheme	City/Region	Best Practice	Source of funds
EPC	Umeå (SE)	Creative financing for energy renovation	Private Sector Institutions and Investors + Own Local budget
	Rotterdam (NL)	Rotterdam Green Buildings	European Funding Programmes (INTERREG NEW) + Own Local budget (City of Rotterdam invested EUR 1 million)
	Greater London Authority, England and Wales (UK)	RE:FIT	Project Development Assistance (ELENA) EUR 2,884,680 (LDN) EUR 2 228 227 (Wales) + Own Local budget (Greater London Authority GBP 270 000 (approx. EUR 307 000)+ Other public authorities' building owners + public financial institutions and funds such as Public Works Loan Board, Salix or London Energy Efficiency Fund

Financing Scheme	City/Region	Best Practice	Source of funds
	Flemish Region (BE)	Regional Energy Services Company Vlaams Energiebedrijf - VEB	Own Local budget (Flemish Region, Flemish investment company & VEB)
	Paris (FR)	Refurbishment of municipal schools via EPC (ELENA project)	Project development Assistance: ELENA EIB + Own Local budget + ESCO (public-private cooperation)
Third Party Financing – EPC	Ljubljana (SL)	(Energetska Obnova Ljubljane (EOL)	Project Development Assistance (ELENA) + Own Local budget +Private Investments (bank consortium)
Revolving funds	Stuttgart (DE)	Stuttgart's Internal Contracting scheme (Infinite Solutions)	Own Local budget (Municipality)
	Águeda (PT)	Águeda's Internal Contracting scheme (Infinite Solutions)	Own Local budget (municipality)
	Koprivnica (HR)	Koprivnica Fund	Own Local budget (Municipality + Regional Authorities)
	Province of Liège (BE)	RenoWatt	Own Local budget + Private Sector Institutions and Investors + Financial Institutions Instruments (EEEF – Technical Assistance EUR)

Energy Performance Contracting

What you need to know about energy performance contracting

What is energy performance contracting?

Energy performance contracting, or EPC, is an innovative financing scheme offered by energy service companies (ESCOs) to public building owners who are in need of energy efficiency (EE) improvements but have limited financial means or technical capacities to implement such projects on their own. What makes EPC innovative is that an ESCO finances the project based on the guaranteed energy savings that will be generated in the future. In principle, the ESCO will only receive service fees – and get the return of investment – once the project delivers energy savings.

What are the characteristics of EPC?

In EPC, a public building owner and an ESCO engages in a public-private cooperation – formalized by a contract. EPCs are usually long term with about a contract of 8 to 15 years. However, short-term contracts of 2-3 years are also possible for EE improvements that require low levels of investment. EE improvements can range from optimization of lighting, heating and ventilation to replacement or new installations of electrical devices up to deep renovation of building structures. EPC can be applied in public buildings whether existing or new as long as these have energy saving potentials. In EPC, pooling of buildings is recommended to generate additional cost reductions and create economies of scale.

The difference between an EPC contract and any other turnkey project is that the company offering ESCO is not done once the (re)construction is done but is rather still responsible for the performance of the building(s), the savings that will occur, and the monitoring and building maintenance for the duration of the project. This ensures that ESCO has a stake in the building achieving savings and that the most efficient solution is offered.

What is the typical content and structure of an EPC Contract?

The EPC contract between a public building owner and the ESCO has the following key elements as outlined in the Energy Performance Contracting Manual (TRANSPARENSE Project):

- The ESCO guarantees a certain amount of yearly savings (**guarantee of savings**) to be achieved throughout the duration of the contract
- The **volume of investment** to bring the guaranteed savings and a commitment by the client to pay the investment after its installation
- Clear **definition of a reference scenario** (baseline) of the future energy consumption;
- Obligation of the ESCO to provide a **report on yearly savings evaluation** that documents the actual amount of achieved savings in the respective year
- Responsibility of the ESCO for **design and implementation of the energy saving measures** correctly
- Obligation of the client to provide pre-agreed **conditions for implementation** of the energy saving measures
- Planned **duration of installation** of the investment
- **Ownership transfer** of the installed energy saving technologies to the client
- **Means of payment** for the services and savings
- Declaration of the **purpose of operation of the facility** on which the contract covers
- **Length of the contract**
- **Method of recalculation** of the guaranteed savings in case any of the input parameters differs from the presumptions defined in the reference (baseline) energy consumption scenario
- **Final report** – prior to the end of the paying-off period the ESCO hands over to the client the final report including the total amount of cost savings, guaranteed savings, given reduction in the price and bonuses calculated for the entire paying-off period, etc.

What is the role of the ESCO?

An ESCO usually operates as a commercial entity regardless if it is owned by a public entity e.g. public utility company. It also serves as a general contractor that provides the energy services required and offers a service package for the public building owner. ESCOs can provide the whole range of necessary energy services – from planning, management, implementation, and monitoring of energy management services and technical improvements. The ESCO shoulders the associated economic, technical, and administrative risks in carrying out the EE improvements. This, of course, depends on the investment size and contract duration. The main economic risk for ESCOs is not meeting the guaranteed energy savings which means reductions in EPC service fees.

What is the role of the public building owner?

Public building owners, with the support of local facilitators, can design and plan an EPC project. Public building owners generally have low-to-medium economic risk levels. However, it should be noted that an EPC contract is usually contracted in energy (e.g. amount of kWh save due to the agreed baseline), not actual energy costs. This means that if either building usage levels or the energy prices change, this is a risk for the building owner. Energy savings still keep occurring, but the monetary savings are not evident. On the other hand, should an ESCO fail to provide its services, or should the calculated energy savings be lower than predicted, a public building owner can withhold payments and penalties can be set. Even if the ESCO has designed and planned the EPC project and installed and operated equipment and technical facilities, the public building owner retains full ownership of the public building. As the ESCO is asked to ensure the quality of the technical facilities from installation until operation, such as repairing of damages, the public building owner should grant ESCO staff unconditional access.

What are local facilitators and their roles?

Local facilitators can be local or regional energy agencies, engineering offices, legal advisers, architects, and economics. Facilitators should be knowledgeable and experienced about EPC concepts and business models, techniques and economics of EE in buildings, and public procedures and codes of conduct. Commercial facilitators can be contracted. However, standard service procurement procedures should be followed. Local energy agencies may be involved without tendering if financed by the membership fees of municipalities. Facilitators can assist in the preparation of EPC contracts, in managing EPC tender procedures and contract negotiations.

What other financing sources can be used?

In most EPC projects, the ESCO is mainly the investor and financer. Other financing sources are usually not necessary for EPC projects that require low investments. However, in big projects, such as deep renovation of public buildings, the owner may share investment costs, avail of subsidies, or makes use of other financing sources. These include subsidies, such as feed in tariffs for power generated from renewables or in combined heat and power plans, on specific technical measures and subsides on interest rates paid by the ESCO which reduce financing cost. Find out more under "*How can EPC be combined with other financing sources*?"

How can the energy savings be guaranteed?

First, the ESCO and public building owner set the baseline energy consumption of the building prior to EPC. This can be based on the energy consumption costs prior to EPC (the reference year), such as, for example, the energy cost paid by a public building owner at a specific time of the reference year (e.g. € 100 on December 31, 2016). Some EPC contracts are agreed in energy units instead of monetary ones. These can be adjusted based on factors, such as the occurrence of extreme climatic conditions or time and intensity of occupancy. Since the baseline energy consumption is determined in the contract as fixed rate, any increases of energy prices does not significantly impact the EPC contract.

Using the baseline energy consumption, the ESCO can calculate and guarantee an annual energy cost savings to the public building owner throughout the contract period. Both ESCO and public

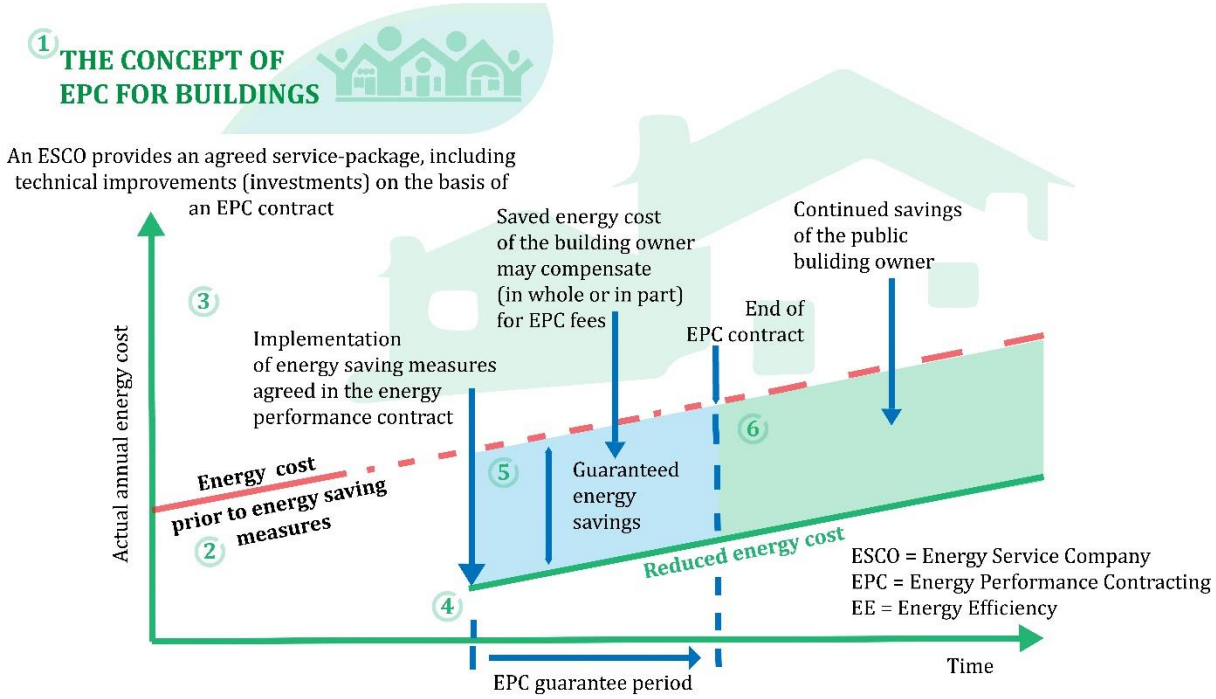
building owner will establish how to evaluate and verify the energy savings that will be generated after the EE project is implemented. The ESCO ensures that the energy savings will be achieved, while the public building owner guarantees the payment of EPC service fees to ESCO.

The ESCO provides energy reports and energy savings records. The ESCO should also be transparent in the adjustments of technical parameters, such as in the use and conditions of the building or in the installation and removal energy devices. Usually, the ESCO conducts periodic metering of consumption using automated systems or by remote access and control.

How is the EPC service fee calculated?

A fixed proportion of the guaranteed savings will be the EPC service fee which the ESCO gets from the public building owner to attain a profit margin and maintain the installations. The remaining proportion can be kept by the public building owner, or shared among the two parties, depending on the mutual agreement. In EPC, the yearly EPC service fee remains constant all throughout the duration of the contract. The EPC contract is not affected by rising energy prices although this can be reflected in the energy bills.

The service fees for EPC is calculated to ensure repayment of all costs of the ESCO as well as the expected return of investment. However, the fees should not go beyond the value of the guaranteed savings in the baseline year. The payment can be received either partially or in whole, depending on the agreement. Likewise, the payment scheme can be arranged.



Source: GIZ in EnPC – INTRANS (2015)

Figure 2: EPC: In Summary

1. EPC is contractual agreement between an ESCO and a public building owner
2. Baseline energy consumption of the public building is set during the reference year
3. Energy saving measures, including installations of technical facilities, are implemented
4. Once the energy saving measures are completed, the EPC guarantee period starts
5. Saved energy costs of the building owner may be used in whole or in part for EPC service fees
6. When the EPC contract ends, the continued savings are retained by the public building owner

What are the advantages of EPC?

- The investment risks are transferred from the public building owner to the ESCO
- Usually no investment or up-front capital required from the business owner
- ESCO provides the required energy services which the public building owner benefits from
- ESCO guarantees EE improvements which serve as basis for their payments
- Maintenance costs are transferred from the building owner to ESCO during the contract duration
- The value and productivity of public buildings are optimized through ESCO's professional services

What are the common incentives for EPC?

The development of EPC is facilitated by the following:

- EPC guidelines, tools and sample contracts available in the country (or under preparation)
- National or regional data bases of ESCOs and facilitators
- National and regional competence centres promoting EPC
- Promotion of inter-municipal cooperation and/or poling of public buildings in EPC projects
- Trade associations of ESCOs promoting EPC as a business model
- Regional and local energy agencies and/or associations of local authorities promoting and facilitating EPC

Political and legal incentives

- High political commitment for EE and economical energy savings at the national level
- National EE law and supporting laws promoting EE in public buildings
- EE objectives and standards for public buildings stipulated in national policies and programmes
- Promotion of EPC as an innovative EE service in regional and national programmes and policies

Economic

- Expectation of increasing energy prices
- Energy saving insurances for new ESCO
- Higher market value and increasing comfort level of renovated buildings
- Feed in tariffs for renewable energies

Financial

- Limited municipal budgets increasing the interest in EPC as a financing model
- Subsidies for municipal EE programmes and projects (planning and implementation
- Tax incentives

What are the common barriers for EPC?

Political and legal

- Procurement rules and procedures for public authorities (complex tendering procedures)
- Restrictive regulations concerning financing cooperation of public authorities with the private sector
- Little interest in EPC as a financing tool among municipal decision makers
- Requirements concerning the comparison of EPC and building owners' own investment

Administrative

- Lack of understanding of the EPC concept among municipal decision makers and initiatives
- Lack of qualified and motivated personnel in some public administrations or public services
- Non-transparent, lengthy, or complex decision making processes in municipalities
- Competition between investments in EE and investments in other public services
- Distributed responsibility for buildings, energy bills, maintenance and operation of facilities in municipal administrations
- Lack of finance and/or personal capacities for project preparation, tendering, contract negotiation

Economic

- Risk of incorrect calculation of baseline consumption
- Decreasing energy prices for fossil fuels
- Feasibility of EPC only for bigger buildings
- Long payback time

Financial

- High cost of loans
- High planning and bidding cost
- Limited access of ESCOs to bank loans

Technical

- Lack of experience in the calculation of baseline consumption
- Lack of attractive best-practice examples in the country
- Lack of knowhow and experience among local public utilities
- Lack of calculation tools and sample contracts
- Lack of qualified local facilitators promoting EPC projects
- Lack of local ESCOs offering EPC services

Other barriers

- Bad reputation of EPC among public administrations and decision makers
- High barriers for the market entrance of new ESCos
- Poor image of ESCOs among public administrations and decision makers
- Lack of information on EPC in public buildings

Would you want to know more incentives and barriers – and whether these apply to your country or not? Take a look at a summary of these incentives and barriers across nine (9) European countries from EnPC - INTRANS.

Are there guidelines for managing EPC projects?

The EPC Code of Conduct promotes a professional and transparent approach for managing EPC projects. There are nine (9) guiding principles:

1. The EPC provider delivers economically efficient savings
2. The EPC provider takes over the performance risks
3. Savings are guaranteed by the EPC provider and determined by M&V
4. The EPC provider supports long term use of energy management
5. The relationship between the EPC provider and the client is long-term, fair and transparent
6. All steps in the process of the EPC project are conducted lawfully and with integrity
7. The EPC provider supports the client in financing of EPC project
8. The EPC provider ensures qualified staff for EPC project implementation
9. The EPC provider focuses on high-quality and care in all phases of project implementation

Learn more about the EPC Code of Conduct from TRANSPARENSE.

What are the business models for EPC?

There are three business models for EPC. The major differences lie on the scope of planned investment, targets for guaranteed energy savings, and contract duration. These business models may have overlaps as projects may mix different features. Below we bring an overview of EPC models of different scope, straightforwardly named "basic", "light" and "plus" as in the EnPC – INTRANS project.

EPC Basic

EPC Basic is the most common EPC business model that aims to facilitate investments in fast-paying EE improvements or those that can generate high energy savings effect.

Table 5: Features of EPC Basic Business Model

Features	Description
State of building and planned investment:	The building still serves its purpose and there are plans for the building to be used for a prolonged future period (at least as long as the EPC contract is in force), but energy systems installed and used in the building are outdated and inefficient. Energy rehabilitation of the building is planned.
Energy savings guaranteed:	Typically, 20-60% compared to the baseline
Investor:	ESCO or building owner (making use of subsidies, if available)
Financing:	ESCOs own equity, loans, subsidies, financial contributions from the building owner
Contract duration accepted in the market:	5-15 years

Box 1: Case Study Example for EPC Basic Business Model

Case study: Oberndorf, Germany

EPC business mode: EPC Basic

Basic description: A pool of seven municipal buildings

Total bid price: 2.521 Million Euro

Guaranteed savings: 0.216 Million Euro (i.e. ~ 64%) less energy cost per year

Contracting period: 11 years and 8 months

What were the contracted measures?

- Establishment of a building management system
- Different renovation measures per building, including e.g.:
- Replacement/renovation of HVAC units (central heating / cogeneration / biomass)
- Rehabilitation of lighting systems in a sports hall
- Replacement of thermostats in a conference building
- Insulation of the upper ceiling in a school

Source: Kea in EnPC – INTRANS

EPC Light

In this business model, the ESCO is contracted to optimize technical facilities to facilitate EE. However, EE improvements are realized with little to no investment in technical facilities.

Table 6: Features of EPC Light Business Model

Features	Description
State of building and planned investment:	All public buildings with energy savings potentials
Energy savings guaranteed:	Typically 10-20% compared to the baseline
Investor:	ESCO (usually only minor equipment)
Financing:	ESCO bears only the staff cost
Contract duration accepted in the market:	2-3 years

EPC Plus

Under EPC Plus, the ESCO's services extend to comprehensive structural measures. Here, the investment costs may be shared between the ESCO and public building owner. Other financing sources can be explored.

Table 7: Features of EPC Plus Business Model

Features	Description
State of building and planned investment:	Building does no longer serve its (current or future) purpose. Building and installed energy systems are outdated and/or dysfunctional. Deep renovation/rehabilitation is more economic than constructing a new building. Deep renovation is planned.

Features	Description
Energy savings guaranteed:	Ideally >70% compared to baseline
Investor:	ESCO or building owner share the investment cost (both making use of subsidies, if available)
Financing:	ESCOs own equity, loans, subsidies, financial contributions from the building owner
Contract duration accepted in the market:	10-20 years

Box 2: Case Study Example for EPC Plus Business Model

Case study: Hanzehal Zutphen

EPC business model: EPC Plus

Basic description: large sports and events facility buildings

Contract duration: ~11 years

Total bid price: Approx. 500,000 EUR of which 210,000 EUR for energy saving measures (paid back from energy savings).

Initial energy costs (baseline): 65,000 EUR/y

Guaranteed savings: 19,000 EUR/y (i.e. 30% (gas) and 7% (electricity))

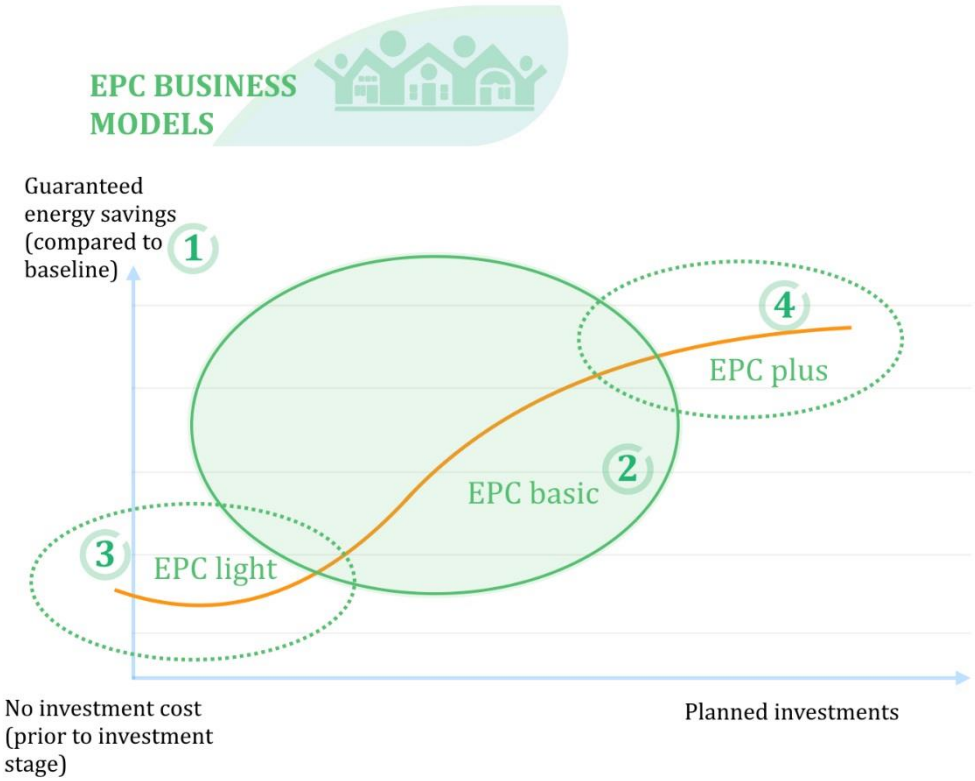
Reduction of CO2 emissions: 40 t/y (guaranteed)

Contracted measures:

- Roof renovation and insulation
- Wall insulation
- Solar PV / solar water heating
- Sensor lighting
- Building management system
- Contract-related figures:

Source: Transparense in EnPC – INTRANS

EPC plus projects are the most beneficial in terms of high energy savings guarantee. However, for most public building owners, a starting point can be EPC basic or EPC light business models. Find out more about the business models and their corresponding features by looking at the Comparative Overview of EPC business models at EnPC - INTRANS.

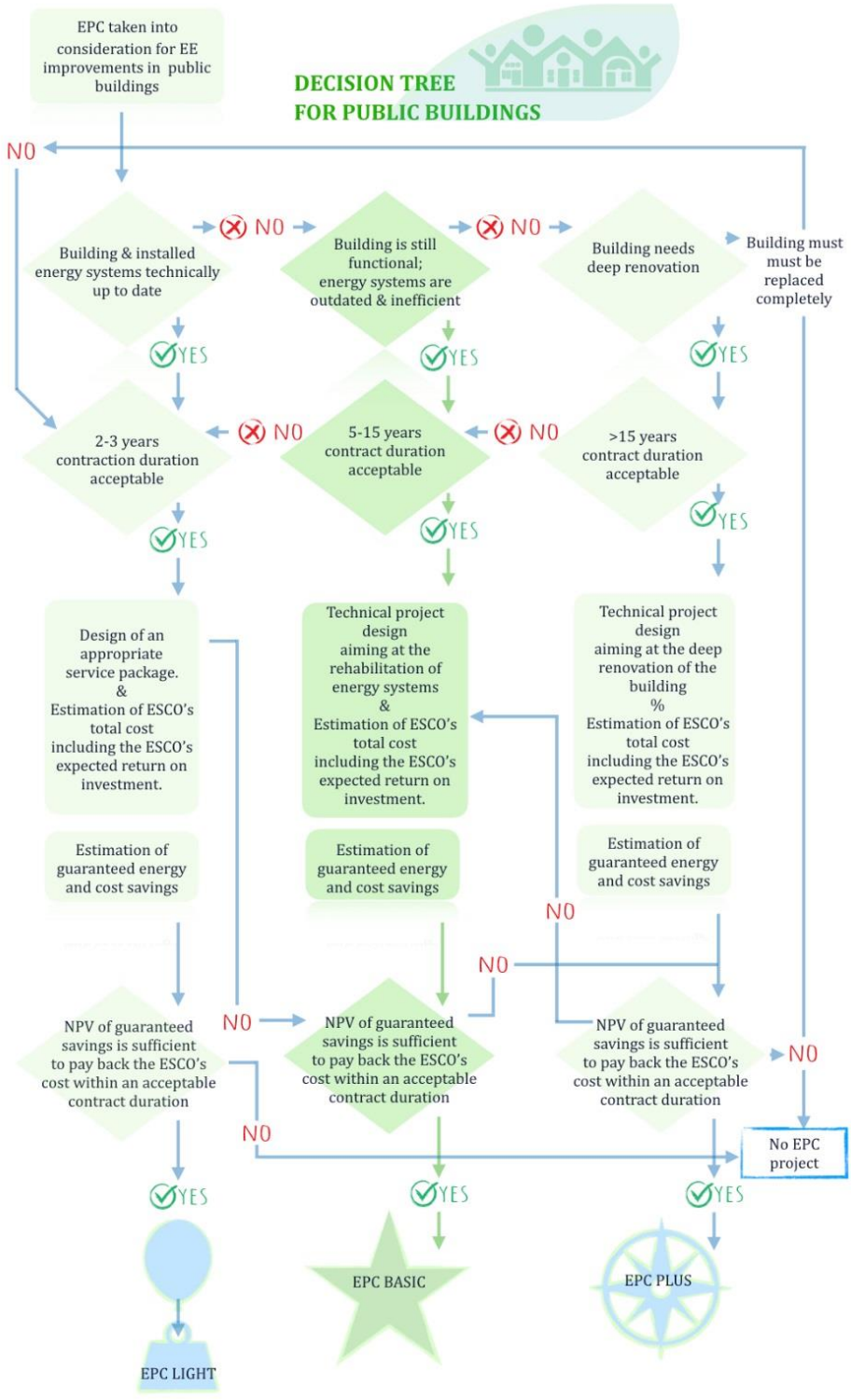


Source: EnPC – INTRANS (2015)

Figure 3: EPC Business Models

How can building owners decide which business model to use?

Use this decision tree to select the appropriate business model for public buildings in your city. Find out which EPC business model that you can use based on your context.



Source: EnPC – INTRANS (2015)

Figure 4: Decision tree

Note: The net present value (NPV) of guaranteed savings is very important to identify the complete cost that may be financed by the ESCO. The investment volume and services depend on the guaranteed energy savings and the contract duration. Learn more about the variations on EPC business models that have been applied in Europe and its framework conditions in the toolbox.

What are the key lessons learnt from EPC projects?

Contract and finance

- Available subsidies and grants should be used and included in the financial concept for an EPC project
- Bundling of buildings in one EPC helps in decreasing transaction costs and creating economies of scale
- EPC may also include solutions to non-energy problems in the buildings (e.g. fire protection) in the same contract
- Besides the energy and maintenance savings, EPC plus can integrate non-energy related savings (health and safety requirements, comfort improvements, increased building value and others)
- A neutral and qualified third party acting as an arbitrator should be nominated in the contract and its decisions acknowledged in advances as binding by both parties
- Financing options for EPC projects
    - Very good experience exists with financing by EE Funds
    - Additional financing by the building owner can be helpful for the financing of the EPC
    - Insurances for the calculation of savings are an appropriate instrument to mitigate the risks for ESCOs, in particular for new un-experienced ESCOs

Facilitator

- Most of the public building owners rely on proficient facilitators in
    - Project planning and preparation
    - Investigation and activation of potential grants and subsidies from local, regional, national, and EU sources
    - Compilation of tender documents and assistance with the tendering process
    - Tender evaluation and contract negotiations
    - Quality control of provided installations and services
    - Measurement and verification of achieved savings
    - Checks and approvals of EPC's bills
    - Verification of possible financing instruments (soft loans, instruments and grants)
- Capacity development of local facilitators is therefore priority for the development of local capacities for EPC in public buildings

ESCOs

- For new ESCOs access to the EPC market relates to high economic and administrative barriers
    - Economic and technical risks are rated high by most of the interested companies

- New ESCOs usually must provide additional bank guarantees or insurances which increase the cost

Process

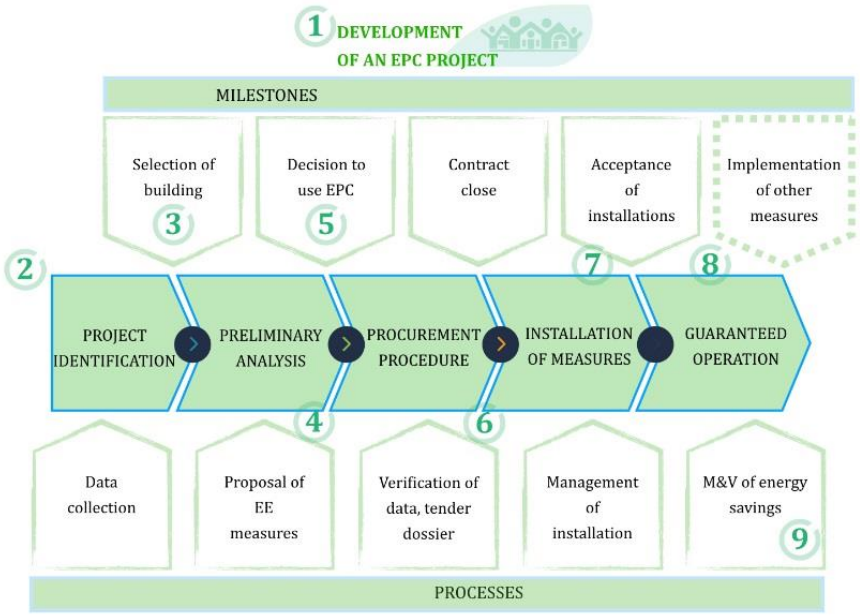
- Monitoring and verification of guaranteed savings is often complex and may lead to debates between the ESCO and the building owner
- Adjustments may be required regularly, depending on, for example:
  - Weather conditions
  - Changes in consumer behaviour
  - Type, intensity, and frequency of building use
  - Installation of additional, or removal of old consumer device
  - Replacement of old consumer devices by new, more energy efficient devices
  - Changes in building structure (additional renovations) and of installed facilities
- Simplified measurement and verification methods as well as key performance indicators, if agreed by both parties in advance, may help to reduce both complexity of calculations, and reasons for debate

Source: EnPC – INTRANS (2015)

How to develop energy performance contracting for public buildings

Project Development Phase

In developing an EPC project, there are five subsequent phases, namely (1) project identification, (2) preliminary analysis, (3) procurement procedure, (4) installation of measures, and (5) guaranteed operation. Each phase has a corresponding process and milestone.



Source: EnPC – INTRANS (2015)

Figure 5: Development of an EPC project

Project Identification

A public owner's building stock can be screened and identified for their energy savings potentials once there is political commitment to improve energy efficiency in public buildings. The buildings that are most suitable for EPC projects can be further selected.

How can data be collected for project identification?

For project identification, the first process is **data collection**. This can be done depending on the availability of energy audits. The data collection process can then be done in two ways, depending on:

- With up to date energy audit
- With no existing energy audits

Data collection will be followed by an analysis of savings potentials depending on the targeted EPC business model, followed by calculation of energy performance indicators.

How can building(s) be selected?

The milestone for the project identification phase is the **selection of building**. "Final selection of buildings should take into consideration political priorities (visibility, public interest) as well as economic and technical savings potential per building".

Different data sources can be examined to select EPC projects. These data sources include energy audits or energy performance certificates, data on energy consumption, contracts on energy delivery and energy management, and results of on-site inspections.

Which criteria can be used to select EPC projects?

The following three (3) criteria matter in selecting EPC projects.

- Current high energy cost. Low energy cost means insufficient monetary value of savings, while high energy cost provides opportunities for repayment of the EPC project investment cost from guaranteed savings.
- Obsolete or non-functioning energy facilities and need for new standards to be achieved. If the energy facilities are up-to-date, there is likelihood that EE improvements may not pay off during the EPC guarantee period.
- Future use of building or if the planned purpose is ensured. Measuring and verifying the energy savings will be difficult if the building will not be used or if the intensity significantly changes during the EPC guarantee period.

Examine a checklist for on-site inspections in the toolbox.

Preliminary Analysis

After project identification, the next phase is preliminary analysis. "For each building taken into consideration, rough analysis of building conditions and saving potentials has to be performed in order to provide a sound basis for the development of tendering documents" (EnPC-INTRANS, 2016a)

The process entails **proposal of EE measures**, while the milestone for preliminary analysis is the **decision to use EPC**. The "decision to use EPC instead of implementing a project in the traditional owner-directed way should be taken based on comparative economic assessment of options. Limitations, if any, of the public building owner's technical and financial capacities should be taken into consideration.

Which points of view matter in EPC projects?

There are two views that matter for an EPC project: the public building owner's and the ESCO's.

For a public building owner, EPC is very appealing if the annual EPC service fees are less than or equivalent to the monetary value of the annual guaranteed savings. The monetary value of the guaranteed savings is calculated based on the energy price paid during the baseline year (fixed price basis).

Among ESCOs, two assessments matter: an assessment of net present value (NPV) of cash flows during contract duration and an assessment of the internal rate of return (IRR). EPC is very

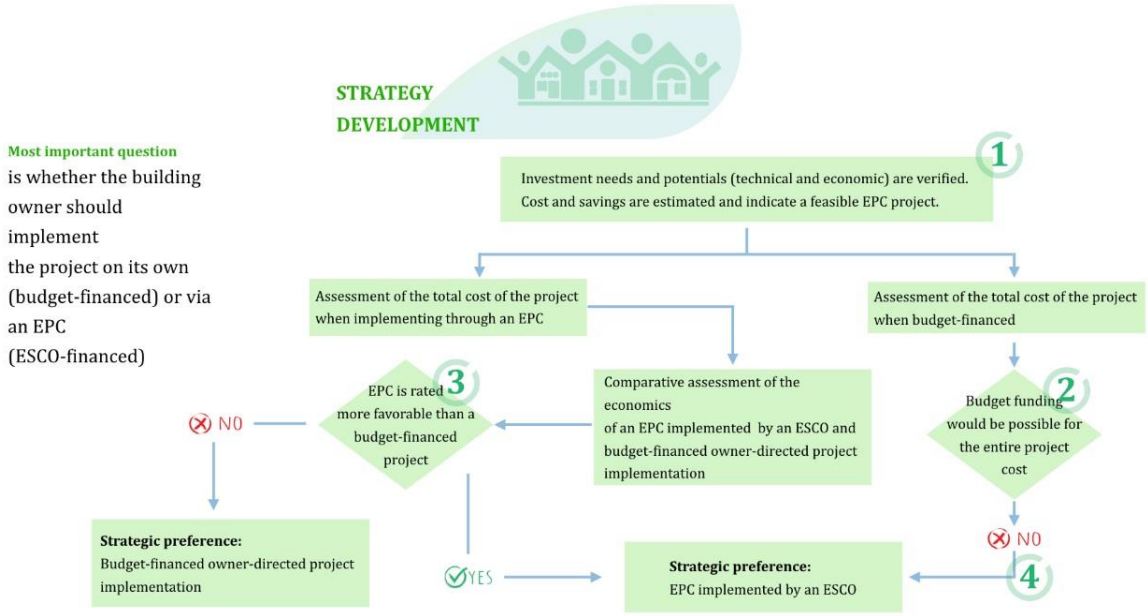
attractive for ESCO the higher the total net present value (NPV) of all cash flows in the project are and the higher the IRR of the project will be.

To attract qualified bids, EPC projects must be economically feasible from a commercial point of view.

How can the economic pre-feasibility be assessed?

You can examine the economic pre-feasibility assessment of an EPC project from a commercial point of view using a tool from EnPC – INTRANS. Note: Results created with this tool cannot replace a detailed economic assessment or a feasibility study in any case.

How can a building owner decide whether to fund the project or via EPC?



Source: EnPC-Intrans (2015)

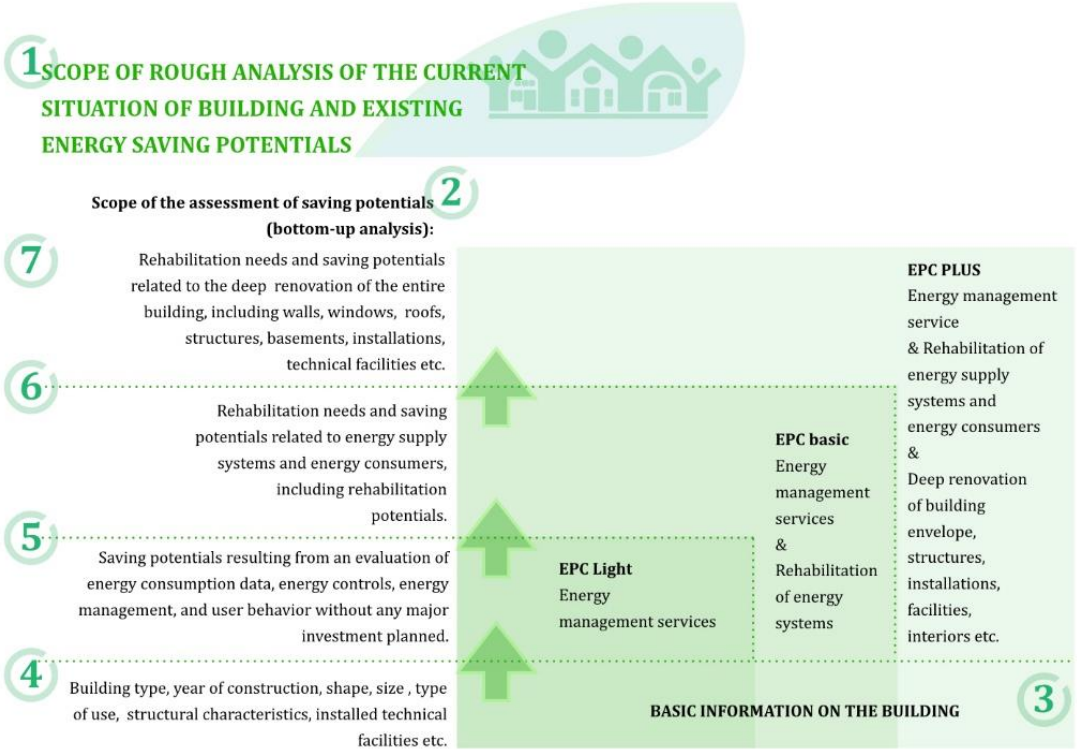
Figure 6: Strategy Development for EPC Project

1. *Investment needs and potentials (technical and economic) are verified.* This basic information was gained during a rough analysis performed at the pre-tendering stage.
2. *Budget funding would be possible for the entire project cost*. If budget funding is possible for the entire project cost, there are still important potential benefits of EPC to be taken into consideration (e.g. transfer of risk, mobilization of ESCO's technical knowhow and service capacities).
3. *EPC is rated more favourable than a budget financed project.* Public building owners are always obliged to go for the most economical option. Therefore, permitting of EPC projects in public buildings is often depending on the proof of economic advantages of projects compared to traditional (owner-directed) public investment projects for the building owner (additional benefits are often not taken into consideration by permitting authorities. Although this has been proven already in many completed EPC projects in Europe in ex-post evaluations, major barriers for the permitting of EPC projects may still occur from: a lack of permitting authorities trust in EPC business models, a lack of

experience in the comparative assessment of EPC projects, a lack of life-cycle-cost perspective in public investment planning, and a lack of accepted methods for such a comparative assessment when performed ex-ante during permitting procedures. It is therefore recommended to study the national budget laws and regulations carefully in advance in order to make sure that the results of comparative assessment of EPC project economics are finally accepted by relevant permitting authorities.

4. *The lack of own budget for the financing of investments in EE improvements is still the major incentive* for many building owners in emerging ESCO markets to make use of EPC business models.

How can the current situation of the building and existing energy saving potentials be analysed?



Source: EnPC-Intrans (2015)

Figure 7: Current situation for energy saving potentials

1. Scope of rough analysis of the current situation of the building and existing energy savings potentials: "This rough analysis has to be performed at a very early stage of the project development process providing among other things the basic information needed for the compilation of the tender document. This rough analysis has to be verified by the contracted ESCO during the first phase of project implementation"

2. Scope of the assessment of saving potentials: "the scope of the rough analysis has to be adjusted to the complexity and ambition of the intended EPC project".

3. Basic information of the building: A checklist for onsite inspections (rough analysis) performed during the preparatory phase of an EPC project is available.

4. The basic information on the building is required as the basis for the planning of any kind of EPC project

5. Rough analysis for the preparation of an EPC light project may focus on the assessment of energy saving potentials related to improved energy controls, facility management, management of building use and use behaviour without any major investment.

6. In most of the EPC projects (usually developed on the basis of EPC basic business model), the analysis is focusing on the identification and assessment of fast-paying energy saving measures creating a relatively high energy saving effect per invested amount. This may include the improvement, rehabilitation, or replacement of outdated and inefficient energy supply and distribution infrastructure in a building. Many projects include a fuel switch e.g. from decentralized heating to district heating, a switch from heating only to combined heat and power generation units, or a fuel switch from fossil to renewable energies. Additional measures e.g. thermal insulation of hot spots may also be of interest.

7. Deep renovation of a building (EPC plus) requires comprehensive analysis of all building components to allow for developing an outline of a comprehensive refurbishment programme for a building which may be discussed e.g. in competition to concepts for the construction of a completely new building instead.

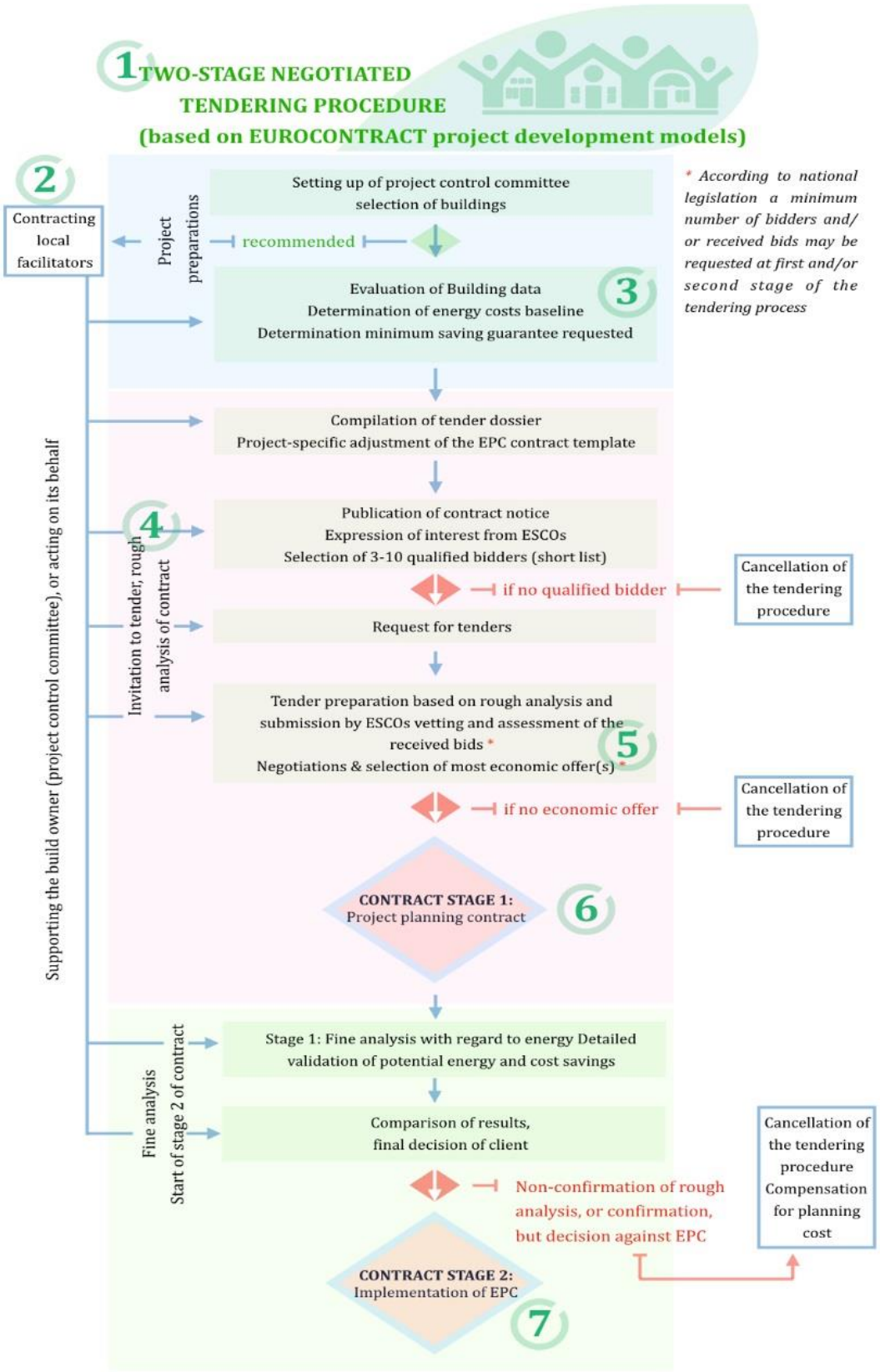
Procurement Procedure

The phase on procurement procedure entails a process of **verification of data, tender dossier,** while the milestone for this phase is the **closing of the contract**.

Procedures must follow rules for EU and national public procurement. “Data given, and assumptions made on the basis of the rough analysis performed during tender preparation have to be verify at the first stage of EPC contract implementation.”

What are the tendering procedures possible?

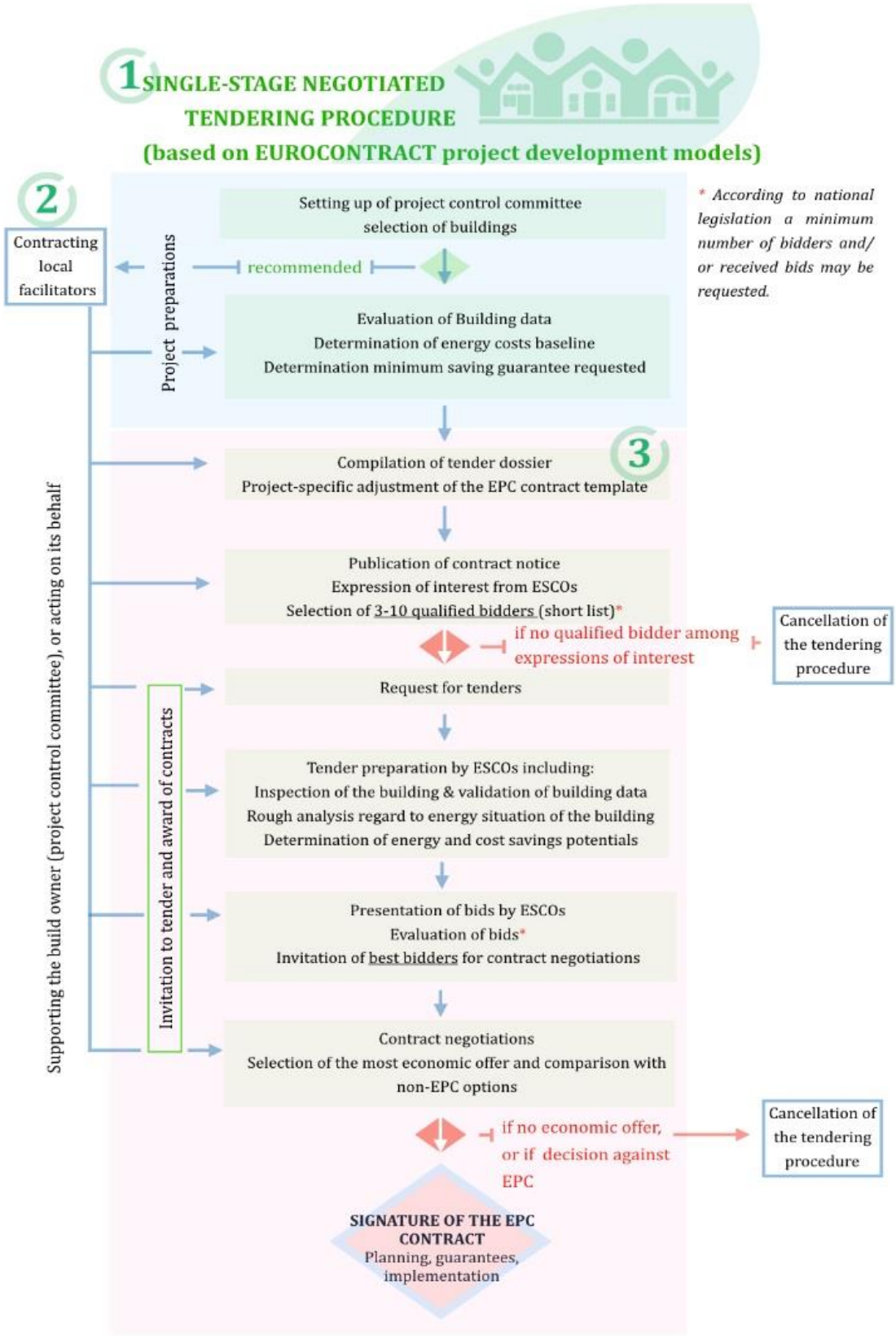
There are two options: a two-stage negotiated tendering procedure and a single-stage negotiated procedure.



Source: EnPC-Intrans (2015)

Figure 8: Two stage negotiated tendering procedure

1. Practitioners recommend using the two-stages approach for the tendering of EPC projects because
    a. Project preparation effort is relatively little prior to entering into the tendering stage
    b. A major share of the project planning cost is transferred into the contract scheme and may be included in the services covered by EPC fees
    c. Detailed planning is performed by the ESCO during first contract phase
    d. Little upfront cost are to be paid by the building owner
2. The first step in the preparation of tendering procedures should always be the contracting of a local facilitator supporting the public building owner during the tendering process and beyond
3. Rough analysis of the building conditions and existing energy saving potentials provides the basic input for the tender dossier
4. At least 3-5 ESCOs (if no other stipulations made in national law) should be invited to submit their tenders. If more than 5 ESCOs submit their applications, transparent selection criteria must be applied. Qualification criteria can include economic capacity of the ESCO measured in turnover in energy services and in particular in EPC and number and relevance of (up to 5) own reference projects based on ESCO/EPC business models. Eligibility criteria, for example, can include professional or trade register extract; proof of liability insurance (with minimum coverage level); legally required licenses and certificates; corporate structure (legal status, statuses, shareholders); declaration concerning payment of legal taxes and duties; number of employees (e.g. during the past 3 years); economic, technical and financial capabilities. Additional criteria, for example, can include commitment to the European Code of Conduct. Clear information on the selection criteria and ratings must be included in the tender dossier, especially in the Call for Expressions of Interest.
5. Proposed selection criteria for the identification of best initial tenders can include, for example:
    a. Project concept (weight 50%)
    b. Net present value (NPV) of guaranteed savings (weight 20%)
    c. Net present value of net income of building owner (weight 20%)
    d. CO2 emission reduction in tons/year (weight 10%)
6. Subject of negotiations with ESCOs may be, for example, extent and quality of the designed measures, preserving requested the parameters of internal environment, observing the existing standards and laws, compatibility with the existing equipment, time schedule of activities; calculation of guaranteed savings in referential and real prices; determining the reward for the applicant, and the share of the contracting entity on extra savings; and contracting entity requirements, call to adjust the tender.
7. Stage 2 of the contract starts only if the fine analysis confirms the assumptions made during tender preparation on the basis of previous rough analysis.



Source: EnPC-Intrans (2015)

Figure 9: Single-stage negotiated tendering procedure

1. Single-stage negotiated tendering procedure is possible if required by national law.
2. Services of local facilitators during tendering preparation have to be more comprehensive.
3. The tender dossier must be very detailed and specific in technical and economic terms. Rough analysis is not sufficient as the basis for a tender dossier in a single-stage tendering of EPC projects. Therefore, the tender preparation cost for a single-stage tendering are usually higher than for a two-stage tendering process. Tendering procedure may however come to an earlier end (contract close)

Installation of measures

In this phase, agreed measures are implemented during the preparatory phase of EPC contract implementation – and before the commencement of the guarantee period. The process in this phase involves **management of installation**, while the milestone is the **acceptance of installations.**

Guaranteed operation

The phase on guaranteed operation starts when the agreed measures are accomplished by the ESCO and the public building owner have completed the provisions in the EPC contract. The process entails **monitoring and verification of energy savings,** while milestone for this phase will be the **implementation of other measures**.

What are the sources of finance for EPC?

Box 3: Own local budget

Location: Flemish Region (BE)

Project: Regional Energy Services Company Vlaams Energiebedrijf - VEB

Results
This two fold model, which encompasses both energy supply and energy efficiency for public buildings has been qualified as having high scalability by CITYnvest.
By May 2015 its supply arm had already generated savings of EUR 12 million, 20% of the region's total energy bill, EUR 9.8 million directly in energy savings and EUR 2.2 million in admin and billing expenses, while only delivering to 8% of the total market.

In terms of energy efficiency, the VEB has one project with OPZC Rekem (Psychiatric center) successfully tendered based on the EMPC model, and is currently in the process of tendering two other projects (De Vlaamse Opera (Flemish Opera) and BLOSO Gent (Regional Sports administration of Flemish authorities).

References:

http://www.citynvest.eu/content/vlaams-energiebedrijf

Box 4: Own local budget and private sector institutions and investors

Location: Umea, Sweden

Project: Creative financing for energy renovation

Results
This is Sweden's largest energy performance contract (EPC) project, combining private investment from Siemens with public funds.
130 properties were retrofitted (425,000 m2 floor area, 50%+ of total area of municipally owned buildings) over 8 years from 2008-2016. Consistently exceeding its targets, the total investment of EUR 15.2 million has resulted in an annual saving of EUR 1 million from an energy reduction of 20%, along with a decrease in CO2 emissions by 5,800 tons/year and a number of other, smaller benefits.

This project has been chosen due to its ambitious scale, its recent completion and the highly beneficial ratio of investment/return for the municipality.

References:
http://www.covenantofmayors.eu/IMG/pdf/CovenantOfMayors_BestPracticePublication_web.pdf#page=7

http://www.umea.se/download/18.65c1214d14f38ac155364e34/1446109851846/01.+Climate+change+Mitigation+and+Adaptation.pdf

Box 5: Own local budget and European Funding Programmes

Location: Rotterdam, the Netherlands

Project: Rotterdam Green Buildings

Results
This project combines European structural investment funds (ESIF), municipal investment, and energy service company (ESCO) funding. It has already achieved scale-up from its pilot phase.
The pilot, focused on public swimming pools, raised an investment of EUR 2.6 million, 10% from equity provided by the ESCO, 90% from bank loans to the ESCO. It resulted in improved energy efficiency of 34%, and savings on gas, electricity, heating and water of 43%, 56%, 35%, 9% respectively, representing a CO2 emissions decrease of nearly 2,000 tons. Additionally, there was a saving of 15% in maintenance costs, and in seven of the nine pools the water quality actually improved too.

References:

http://www.citynvest.eu/content/rotterdam-green-buildings-0

Find out more about the best practices in EPC for public buildings through the compilation of best practices from the EnPC INTRANS Project.

References

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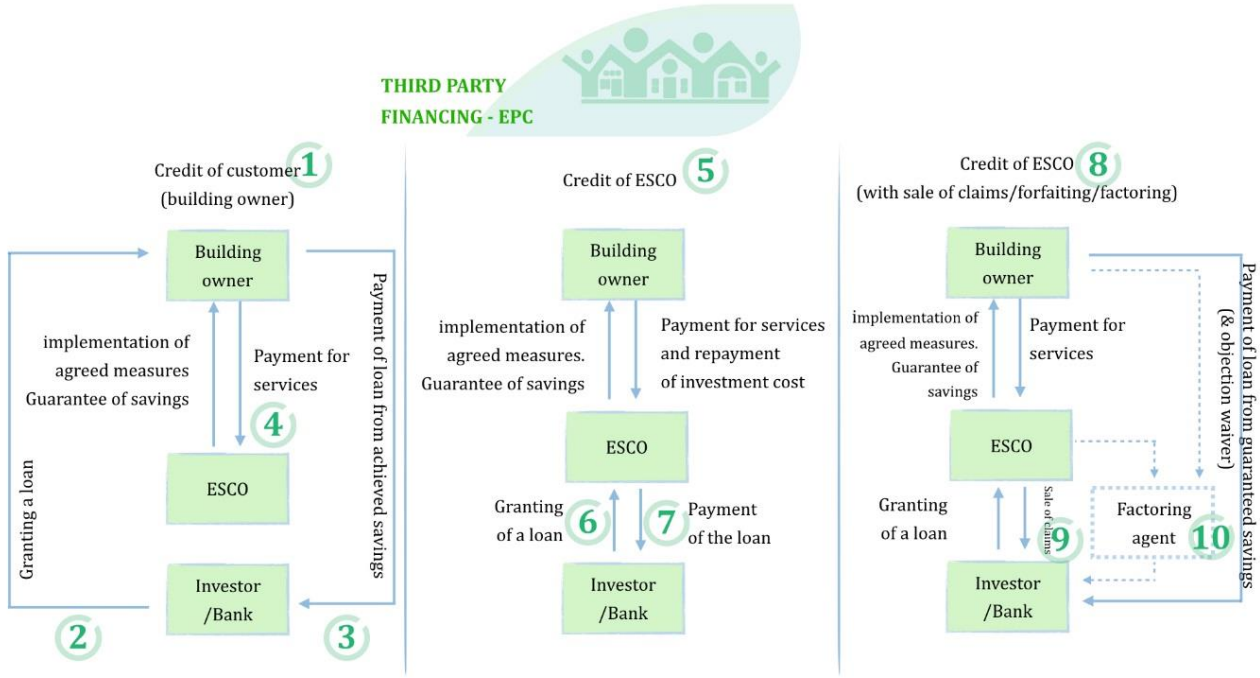
- Szomolanyiova, J. and Sochor, V., 2013. D3.1. Energy Performance Contracting Manual for EPC beginner markets. Report of the EU funded project TRANSPARENSE: Increasing Transparency of Energy Service Markets.

Related Projects:

- **CombineS:** Combing energy services with subsidy schemes to finance EE in Central Europe
- **EFFI:** Efficient implementation of energy services in SME
- **EnPC Intrans:** Capacity building on energy performance contracting
- **ENTRANZES:** Policies to enforce the transition to nearly zero energy buildings in the EU-27
- **EUROCONTRACT:** European platform for the promotion of energy performance contracting
- **EPC_PLUS:** Energy performance contracting plus
- **TRANSPARENSE:** Increasing transparency of energy services markets

Third Party Financing - EPC

In developed EPC markets, the most common financing model for EPC is third party financing. Third party financing can be described as debt financing – wherein the building owner acquires financing resources from a third party, usually investors or banks, instead of getting these from the internal funds or the ESCOs. The ESCOs offer guaranteed savings to accommodate the repayment of the debt during the duration of the contract. These guaranteed energy savings offer positive project cash flow and minimizes the risk of repayment of the bank. In this arrangement, the interest costs during the period of construction and installation are included in the project financing agreement.



Source: ENPC-Intrans (2016)

Figure 10: Third Party Financing

Figure 11: EPC - Bank - Market

Box 6: EPC in Ljubljana

Scheme: Third party financing – EPC

Location: Ljubljana, Slovenia

Project: Energetska Obnova

Ljubljane (EOL)

Sources of funds: Project Development Assistance (ELENA) + Own Local budget

+Private Investments (bank consortium)

Results

With a total cost of EUR 1,498,400, 90% supplied by ELENA, this project mobilized investment of EUR 50,700,000. The replication potential is considered high, notably the use of ESCOs for energy efficiency and renewable energy products. The largest project of its kind in Slovenia, it may become the model for similar projects in the country. To achieve economies of scale, several tenders have been organized for groups of similar buildings, or buildings looking to implement the same green technologies. It has resulted in total energy savings of 79 GWh per year, achieving a 24,593 tons annual reduction of CO2.

References:

http://www.eib.org/attachments/documents/elena-completed-eol-en.pdf

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Revolving funds

What you need to know about revolving funds

What are revolving funds?

As the name suggests, a revolving fund is a pool of capital replenished by the **cost-savings** from energy efficiency and renewable energy projects or by the **interest** paid by the sustainability measures financed by the fund. These cost-savings or interest revenues continuously finance new investments in similar projects, resulting in a sustainable funding cycle.

What are the types of revolving funds?

There are two types of revolving funds:

1. **External revolving fund:** it is often developed and managed by a selected fund manager (with its compensation tied to the fund's performance), or by a utility or specially created organisation. This type of revolving fund lends to multiple municipalities, which must repay the loan in an agreed date. It can "contract EE service providers, or ESCOs, to implement the projects for the borrowing municipalities, possibly with incentive payments linked to the achievement of expected savings". (ESMAP, 2014)
2. **Internal revolving fund**: it is a revolving fund developed by a single municipality, "which provides the initial capital and may also manage the fund itself." (ESMAP, 2014). The structure of an internal revolving fund varies depending on the city's needs as well as local

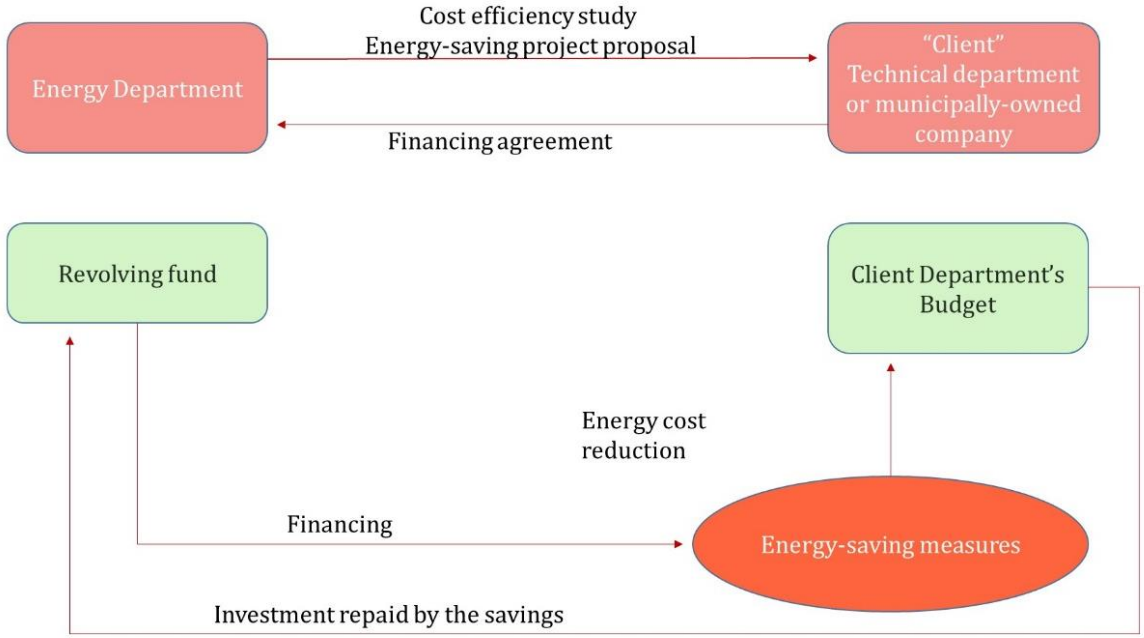
conditions. “The strategy employed to leverage finance for low carbon projects depends on a variety of factors such as mayoral powers, regulatory and legislative context, type and scale of infrastructure project, and the risk/reward profile of stakeholders.” (C40, 2016) The internal revolving funds need an initial capital contribution, which can come from the municipality’s own budget, grants or loans from external sources and donors.

How are revolving funds used for implementing energy efficiency projects in public buildings?

When used in the public buildings sector, revolving funds are commonly developed by municipalities (internal revolving fund). The revolving fund typically provides loans to public agencies in order to cover the initial investment costs of energy efficiency projects (World Bank, 2014). Similar to EPC, the savings resulting from the projects are used to repay the revolving fund until the original investment is recovered, plus interest and service charges. This scheme is called internal contracting (or intracting) that includes a revolving fund (Energy Cities, 2017).

What is the idea behind an internal contracting that includes a revolving fund?

Internal contracting, or intracting, is a municipal internal performance scheme that enables the municipality “to finance multiple investments for energy savings without being tied to an external contractor. This requires that a revolving fund be setup” (Energy Cities, 2017). The public administration operates the scheme, which supports cooperation between two separate organisational units of the same public administration. “For example, the municipal department for the environment may serve as the contract or (ESCO) for the ‘customer department’ without own investment funds. The money saved through energy efficiency measures flow back to a dedicated budget line – a revolving fund (energy saving trust) – until the investments have been paid off” (Energy Cities, 2016).



Source: Energy Cities, 2017

Figure 12: Internal contracting financing scheme including a revolving fund

Does internal contracting always include a revolving fund?

The internal contracting scheme does not necessarily include a revolving fund. Creating an initial revolving fund is a political decision, and a financial department responsible for budget issues is strongly involved in its development (Energy Cities, 2017). Although it is not compulsory, including a revolving fund in an internal contracting scheme can result in several advantages, which are further described.

What are the differences between internal and external contracting?

Table 8: Internal & External Contracting

Aspects	Internal Contracting	External Contracting
Administrative	Within the limit of the fund size	No administrative limit from the local authorities perspective
	Fast implementation: measures can be selected, financed and implemented quickly. No need to undertake a public tendering process or get legal advice when drawing up the contract.	Long delay (in particular because of auditing and contract negotiations)
	Reduced need for exact quantification of the energy savings and the monitoring	Risk of litigation related to the quantification and qualification of the realized savings

	All savings realized flow back to the municipality	Savings realized thanks to the users behaviour changing are not taken into account
	Part-financing to enhance the energy-related quality of standard retrofits	
	Supplementary financing to trigger investments through combined funding	
Legal		Third party investor (ESCO) takes the risks and guarantees the energy savings
	Simple agreement, possibility of integrating an environmental bonus	Complex contracts to be agreed and signed
		Difficult to evaluate those measures for which no dedicated meter has been installed
		Renegotiation of the contract in case of changes in the building use patterns and times
Financial	No mark-up for business risk and profit or for interest on capital deployed	Additional external costs for the energy audit and planning
	Not subjected to interest rates	Interest rate follows the market
	Financing of small-scale projects (e.g. replacement of pumps, thermostats or control devices) of considerable interest because of their short payback-period	Often a constrained focus on highly profitable measures thus small-scale projects unlikely to be of interest though they might be highly sustainable
Technical	City selects the measures to be implemented	Selection of most profitable measures, no integrated approach
	Know-how remains in the city departments	Expertise recommended to oversee the actions of the ESCO partner
	Small effort required to monitor projects across their entire life time	

Adapted from: Energy Cities, 2017

What are the advantages of setting up an internal contracting with a revolving fund?

The World Bank (2014) lists a few advantages of setting up this scheme, such as:

- Since both the borrower and lender are publicly owned, such funds may often offer **lower-cost financing with longer tenors** (repayment periods) and **less-stringent security requirements** than typical commercial loans.
- Because EE projects have positive financial rates of return, capturing these cost savings and reusing them for new investments creates a **more efficient use of public funds** than typical budget or grant-funded approaches.
- It can help demonstrate the commercial viability of EE investments and provide **credit histories for public agencies**, paving the way for future commercial financing.

Besides these aspects, Energy Cities (2013) includes other advantages when implementing an internal contracting (intracting) with revolving funds, such as:

- With intracting, the **municipality has the expertise** contrary to contracting where expertise is outsourced. The economic vision of qualified municipal staff also tends to be more favorable to the municipality. Contracting also involves the risk of financing only those measures that are the most profitable for the contractor, thus disregarding the municipality's social and financial needs.
- Intracting enables the municipality to **keep control** over its freedom of decision-making in relation to equipment and building use, with no need to consult an external partner.
- **Low risk** of disputes arising from the quantification or characterization of energy savings or from the estimation of savings not recorded by dedicated meters.
- **Savings are instantly achieved**. Compared to contracting, intracting requires minimal administrative efforts and implementation is facilitated. A change in building use, for example, does not require renegotiating the agreement.

What are the common barriers of setting up an internal contracting with revolving fund?

According to Energy Cities (2013), the drawbacks are similar to the ones from EPC:

- **Limited budget** to finance the measures.
- **Payback period** limited to 15 years.
- **Comprehensive retrofitting is excluded**, and new buildings cannot benefit from this financing scheme.

C40 (2016) also highlights barriers to setting up a revolving fund:

- The set up and operation of a revolving fund can be **administratively difficult**, for example, it may be needed to apply significant effort in educating financial administrators on how to recognize savings.
- The **costs** related to the operation of a revolving fund can be high, especially in cases in which an external fund manager is contracted.
- Revolving funds generally require **cross-department collaboration** and can be administratively difficult to establish.
- A city will need to find the **initial capital** to create the fund, with some cities using national or international transfers or the sale of property within the city to capitalize the fund.

How can internal contracting with a revolving fund help municipalities to overcome structural barriers?

Based on the experience of at least five cities that developed internal contracting including a revolving fund, the Energy Cities (2017) lists a few common administrative and budgetary

constraints that prevent the implementation of energy-savings investments. The table below shows these constraints and the solutions offered by internal contracting.

Table 9: Solutions provided by internal contracting to common structural barriers

Common structural barriers	Solutions provided by internal contracting
No holistic view of costs for energy consumption and investment budgets for improvements *Funds available for paying the operating costs such as the annual energy purchase and maintenance are strictly separated from the budget for investments. This can result in a lock-in situation: on the one hand administrative services have to pay enormous energy bills due to poor condition of public buildings; on the other hand, the departments are not able to re-finance the urgently needed energy-saving measures by paying back the energy costs saved into the investment budget.*	Internal Contracting is a holistic scheme that is used to implement procedures that link all aspects of energy management such as maintenance, energy consumption, energy efficiency improvements, new equipment (including its installation) and energy costs.
Limited investment budgets *Installing modern technology usually requires modern onsite supporting infrastructure. Thus, instead of a simple replacement, a specific refurbishment is necessary. If such a situation has not been "foreseen" and a special budget has not been prepared, the financing needed for the refurbishment can overburden the regular budgets, thereby not allowing the most efficient alternative to be selected as regards both profitability and resource savings.*	Internal Contracting can be used to finance the additional cost of buying the most suitable technology at the lowest total cost. Moreover, financing through this scheme may increase the number of retrofits. This can help to keep the average age of the installed equipment low and may reduce maintenance costs.
Limited maintenance budget *Often maintenance is optimized in order to minimize the costs of one single maintenance activity or to keep within a yearly budget for technical equipment. This approach often goes hand in hand with cheap, non-durable, low-tech equipment, causing high energy demands and frequent replacements, both ultimately resulting in expensive operating costs. Energy efficient, durable technology with a low life-cycle cost would require a higher initial budget.*	Internal Contracting offers a way out of this dilemma by financing the additional costs for the optimal solution exclusively during the transition phase.
Fixed schedules of budget negotiations *When budget lines are negotiated within a fixed schedule, financial demands not considered during the previous budget negotiations have to be placed on hold until the next round. In addition, small investments are often considered not worth fighting for in budget negotiations.*	Internal Contracting can respond quickly to the financial demand and can ensure that these energy-saving measures will be considered.
Conflicts of interest *In a complex municipal organisation, every unit has its designated tasks and will always and rightfully spend its budget to fulfil them. Thus, when it comes down to a final budget decision, there is no specific support for energy efficiency measures, even though the technical knowledge and awareness of the profitability of sustainable*	Internal Contracting helps to overcome this barrier by demonstrating that energy efficiency measures can pay off. Moreover, Internal Contracting with its revolving fund can be the single recipient for all financial contributions if the city council has the political objectives of improving energy efficiency and the use of renewable energy, as well as combatting climate change. Both the unit managing the Internal Contracting and councillors can highlight the purpose of the fund and its

technology exist, as well as the desire to combat climate change.	activities in (political) discussions. Over time, the city council will become familiar with "its" Internal Contracting and confident in the efficiency and effectiveness of the donations it receives. Consequently, the revolving fund is likely to receive further funding without requiring too much effort to convince the city council of its benefits.

What are the prerequisites to the introduction of internal contracting?

The prerequisites to the introduction of internal contracting are (Energy Cities, 2017):

- Ability to assess energy consumption and to investigate saving measures and potentials.
- Initial funding needed to start investing in energy saving projects and create returns.

How much initial fund is required to set up the revolving fund?

In order to start the operation of the internal contracting scheme, the revolving fund will need sufficient initial fund. The amount varies according to what the city is able to provide and/or acquire, and the types of measures available for implementation. For example, small initial funds will only be able to invest in low cost measures, with short payback time and easy to start with. For example, Koprivnica's revolving fund was created with an initial fund size of € 20.000,00, but there were no low-cost measures available. Therefore, the fund had to be larger and external financing sources were used. In the case of Águeda, the revolving fund was fully financed by the municipal budget, with € 300,000 as a seed.

How can internal contracting with a revolving fund be set up?

How to develop a business case for an internal contracting scheme?

Even though internal contracting presents several advantages, it implies a significant change in business-as-usual procedures and the involvement of different units within the same organisation. Furthermore, the energy management issues and/or financial procedures related to the scheme might not be familiar to decision-makers or relevant staff (Energy Cities, 2017). Therefore, political support is essential for the implementation of the scheme.

In order to get this support, you can prepare a **business case** for the scheme and communicate its main ideas to colleagues through an internal communication campaign. For example, the case can be presented to a variety of city departments, including the City Manager, the Chief Financial Officer, the Budget Director, the Finance Department and Building and Equipment Services Department. The main goal is to raise awareness of and interest in internal contracting.

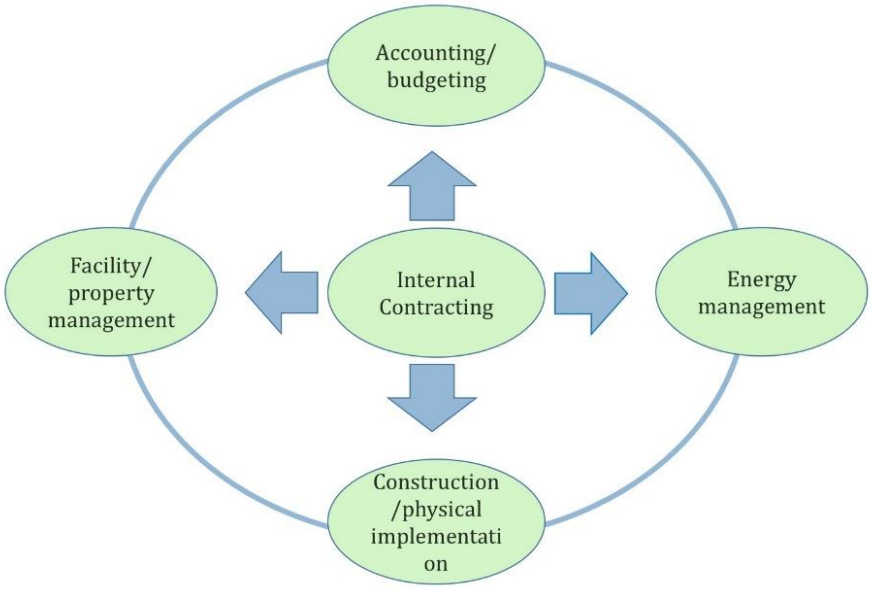
This section compile suggestions from Energy Cities (2017), World Bank (2014), and C40 (2016). Mainly, the steps to be taken and components to be covered in the business plan are the following:

- **Convene key stakeholders** (such as staff interested in innovative financing approaches and energy efficiency) to discover market gaps, create innovative projects and to ensure continuous collaboration.
- **Describe the projects** that could be implemented through the scheme and create a clear investment strategy.
    - Identify uncontroversial investments that have resulted in energy efficiency improvements (e.g. replacing damaged windows).
    - Illustrate how internal contracting could work on these easy to grasp examples.
    - Outline how internal contracting can enable further investments in (advanced) energy savings or the use of renewable energy.
- **Define the scheme objectives and target markets**.
    - Focus on the initial activities and on a few targeted markets, such as schools and hospital, which could offer high energy efficiency potential while having limited capacity to implement EE projects.
- **Demonstrate how other municipalities have been able to accomplish big energy projects** using an internal contracting with a revolving fund.
    - Show how those efforts apply to your city.
- **Demonstrate the value of the scheme** by quantifying potential energy savings.
    - Consider including other benefits, such as relieving the general fund from personnel costs and helping to deal with deferred maintenance.

- **Put together a five year and 15 year project pro-forma**.
    - Demonstrate what the fund would look like over time, focusing on the magnitude of savings and the effect on the general fund budget.

How to define the internal contracting team?

Setting up an internal contracting scheme with a revolving fund entails **varied organisational tasks** that will be undertaken by **professionals with different experiences and skills**. Depending on the size of the public administration, these tasks could be linked to individuals within one working unit or to several units, each in charge of one task (Energy Cities, 2017). The following illustration shows the tasks of an organisation that need to be connected to set up internal contracting.



Adapted from: Energy Cities, 2017

Figure 13: Tasks that need to be connected for internal contracting

In order to select the professionals or units that will be part of the internal contracting team, define a list of criteria, considering:

- Candidates knowledge and understanding of energy efficiency technologies and options
- Candidates capabilities in financial analysis and project appraisal
- Candidates understanding of EE and energy services markets, among other aspects

Examples of teams for intracting schemes:

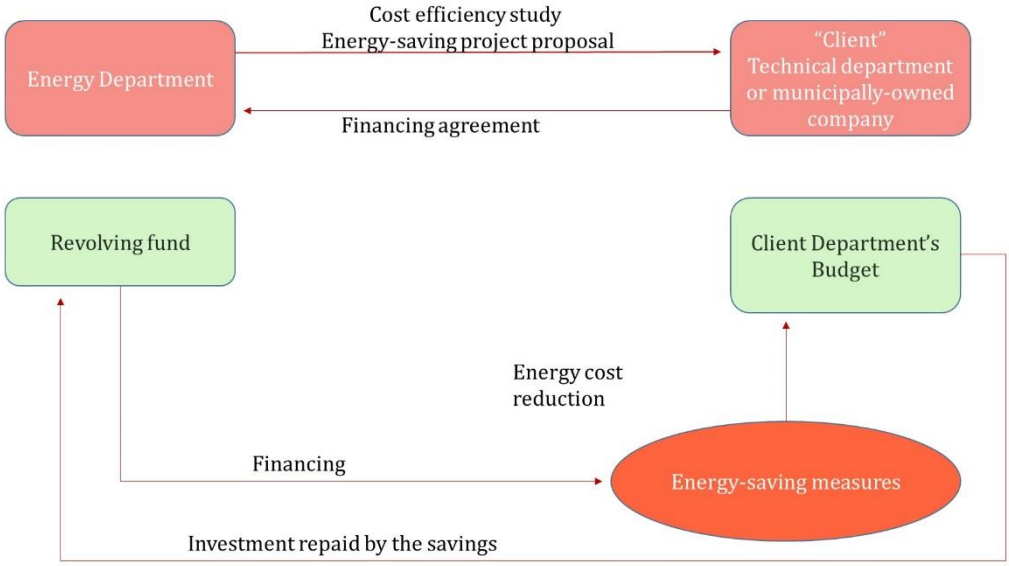
Adapted from Energy Cities (2017)

Who manages the internal contracting scheme, and what are the managers' main responsibilities?

An internal unit has to be appointed to manage and operate the scheme. The tasks and responsibilities of this unit will be (but may not be limited to) the following:

- Assessing energy consumption of the organisation
- Investigating and defining energy saving potentials and measures
- Managing the cooperation between different independent departments
- Functioning as a contact and reference point for the scheme team and other staff involved
- Dealing with technical, financial, and accounting issues

This role can be undertaken by the unit in charge of energy management, such as the example illustrated in the figure below. In this case, the unit should be upgraded to a fully in-house competence centre for internal contracting.



Adapted from Energy Cities, 2017

Figure 14: Example of internal contracting financing scheme including a revolving fund

The figure 14 shows the Energy Department has access to the energy saving (revolving) fund.

> "Due to its energy management abilities, the Energy department proposes cost-efficient energy saving projects to its 'client', a technical department or municipally-owned company. These measures are financed through the 'Energy savings revolving fund'. Cost savings made by the client (by saving energy as soon as the proposed measure is implemented) over the following years are used to repay the capital invested to the Energy department. As soon as an energy saving project is accepted by the client and planned by the Energy department, it receives financing from the revolving fund. Implementation of the project immediately leads to reduced energy consumption and, therefore, declining energy costs, resulting in a smaller energy bill for the respective department. These savings are gradually paid back to the revolving fund."
>
> (Energy Cities, 2017)

How can internal contracting with a revolving fund be operated?

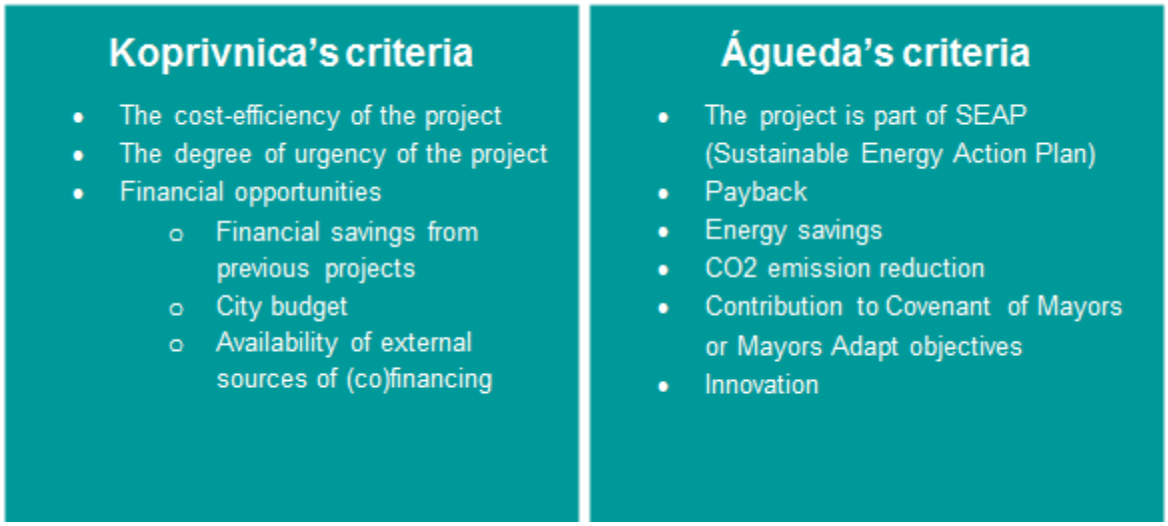
How to select the projects to be financed through the scheme?

In any type of revolving funds, it is crucial to have a clear idea of the types of projects that will be funded. Therefore, it is important to define the **selection criteria** based on two aspects:

- the purpose of the revolving fund
- the factors that can influence the successful implementation of the projects

Differently of other types of revolving fund, when using revolving funds as part of internal contracting, the fund "**must be used solely for financing energy cost saving measures**. If energy improvement is the sole reason for a retrofit, then energy cost saving measures can be entirely financed through Internal Contracting. Any additional renovation work has to be financed through conventional construction or maintenance budgets. However preparatory work may be necessary to implement the energy saving measures, e.g. strengthening the structure of a roof to support the weight of a photovoltaic installation. Thus, the cost of this work has to be included as part of the energy saving measure" (Energy Cities, 2017).

Examples of projects selection criteria used in Intracting schemes



Adapted from Energy Cities (2017)

How to identify appropriate measures?

The following steps can be undertaken to check whether a measure is appropriate to be financed through the revolving fund (Energy Cities, 2017):

1. **Consult potential customers in charge of planning new construction, renovation, retrofits or maintenance about your scheme.** Ask about what is on their schedule. Try to steer their investment decisions towards energy efficiency beyond the current standard by offering additional Internal Contracting funding.
2. **Check whether the energy saving measure will not be the subject of, or affected by, a more significant retrofit or new construction**, which could replace the whole installation before the investment of the measure is paid back.
3. **Examine the profitability of a project**, by determining:
    a. The economic parameters: the investment cost and the resulting expected financial savings calculated by multiplying the energy savings and the cost per energy unit.
    b. The payback time: the investment divided by the annual energy cost savings.
    c. The operational lifetime of a measure: which depends on the durability of its technical parts.

Only projects with feasible investment costs and payback times are suitable for funding via Internal Contracting. Therefore, consider the following:

Payback time < operational life of the measure = economically viable

Payback time > operational life of the measure = not viable

How to manage the investments of the revolving fund?

As explained, the initial monetary value of the fund is set up at the start of the scheme. New investments are financed by energy cost savings gained and paid back by the implemented measures previously invested by the fund.

In order to be able to finance several energy saving measures throughout the years using the initial monetary value of the revolving fund, a few aspects need to be considered:

1. **The fund cannot cope with investments of any size.** The cost of a single investment has to be lower than the fund's value.
2. **The total annual investment should be limited to only a share of the fund's value**, since the fund is intended to pay for investments made in different years with paybacks also extending over several years.

"To operate, the revolving fund constantly requires that investment cost and payback times of the financed measures are appropriate to the fund. Longer payback times not only prolong the refinancing of the investment, and hence of the fund, but lower the investment which is annually financeable. Increased investment costs can completely halt this business model. To ensure the revolving fund is not overloaded in the first years of Internal Contracting – which would cause suspension of investments – as a rule of thumb one can state:

The monetary value of the revolving fund should be at least 3 times as much as the investments planned for the first year when starting the Internal Contracting scheme, thus enabling investments with 5-year payback time."

Furthermore, the fund can be organized into different parts or amounts, in which the capital available in each part is dedicated to certain types of projects. This strategy was adopted by Stuttgart. The city divided the capital of the fund into three different parts:

- **Invested capital:** used to finance energy saving measures implemented in previous years and yet to be paid back.
- **Earmarked capital**: used to finance already assigned energy saving measures which are being prepared for implementation.
- **Free capital**: capital that can be contracted for new measures.

For more information on the financial development of the scheme, read the chapter 3.2 Financial Aspects of the Infinite Solutions guidebook (Energy Cities, 2017).

How to monitor and evaluate the operation of the scheme?

Monitoring and evaluation entails routinely gathering information on the implementation of the projects to measuring the quality and effect of the internal contracting scheme. The table below summarizes the main aspects of monitoring and evaluation as identified by the World Bank (2014):

Table 10: Monitoring and evaluation of revolving funds

Step	Activities
Monitoring: tracking the technical and financial status of projects by employing a monitoring system that is appropriate for the type and scale of the projects and able to track both technical progress and financial status.	• Consider all project stages and components (planning, implementation, outcomes and impacts, replicability, visibility, and so forth) • Conduct field supervision and periodic audits as agreed • Conduct periodic progress reports • Perform electronic reporting techniques
Evaluation: aims to determine whether project objectives set in terms of expected outputs, effects, and impact are being or will be met. Evaluation is needed to test planning assumptions, monitor overall results, compare programme performance, fine-tune implementation processes, and incorporate lessons learned into improving the fund's future operations. Often the evaluation of the fund's performance is conducted by an independent third party.	• Conduct evaluation by combining quantitative and qualitative data • Perform the evaluation at specific times (mid-term, interim special studies, completion, after completion) • Compare the fund's achievements relative to expected performance
Measurement and Verification: M&V is designed at the project level. It entails establishing the baseline as well as modifying it as needed if operating conditions change. There are many methodologies and protocols for M&V, ranging from simple methods such as "deemed savings," where the savings are calculated using stipulated formulas, to detailed metering or simulation modelling. Because the accuracy and precision of the M&V results is proportional to its cost, and it is desirable to use a pragmatic approach that balances the M&V costs against the	• Develop baseline characteristics and typical operating conditions • Lay out a clear methodology for measuring energy savings that is acceptable to all parties • Develop estimates of the actual energy savings, cost savings, and

required quality of the savings estimates. The most important aspect is that all parties agree to the level of detail of the M&V plans. For public agency projects involving efficient lighting, deemed savings may be adequate. However, where a large portion of the energy use is for heating, simple commissioning tests may be used to determine the amount of energy needed to heat one square meter of floor space by one degree before and after the renovation	other performance characteristics of a project.
Reporting: involves providing information to the appropriate organisations (in this case the funding sources) on implementation progress so that timely decisions can be made, if needed, to ensure progress is maintained according to schedule and performance goals. The collected data—both quantitative and qualitative—are provided in periodic reports to assess the status and quality of project activities.	Periodic reports can cover the following aspects: • Financial reporting — a periodic summary (usually monthly) of transactions, receipts, and disbursements by type, cash flows, outstanding balances, and so forth over the reporting period; • Technical reporting • Annual reports — annual reporting of technical, financial, and administrative results

Adapted from World Bank (2014)

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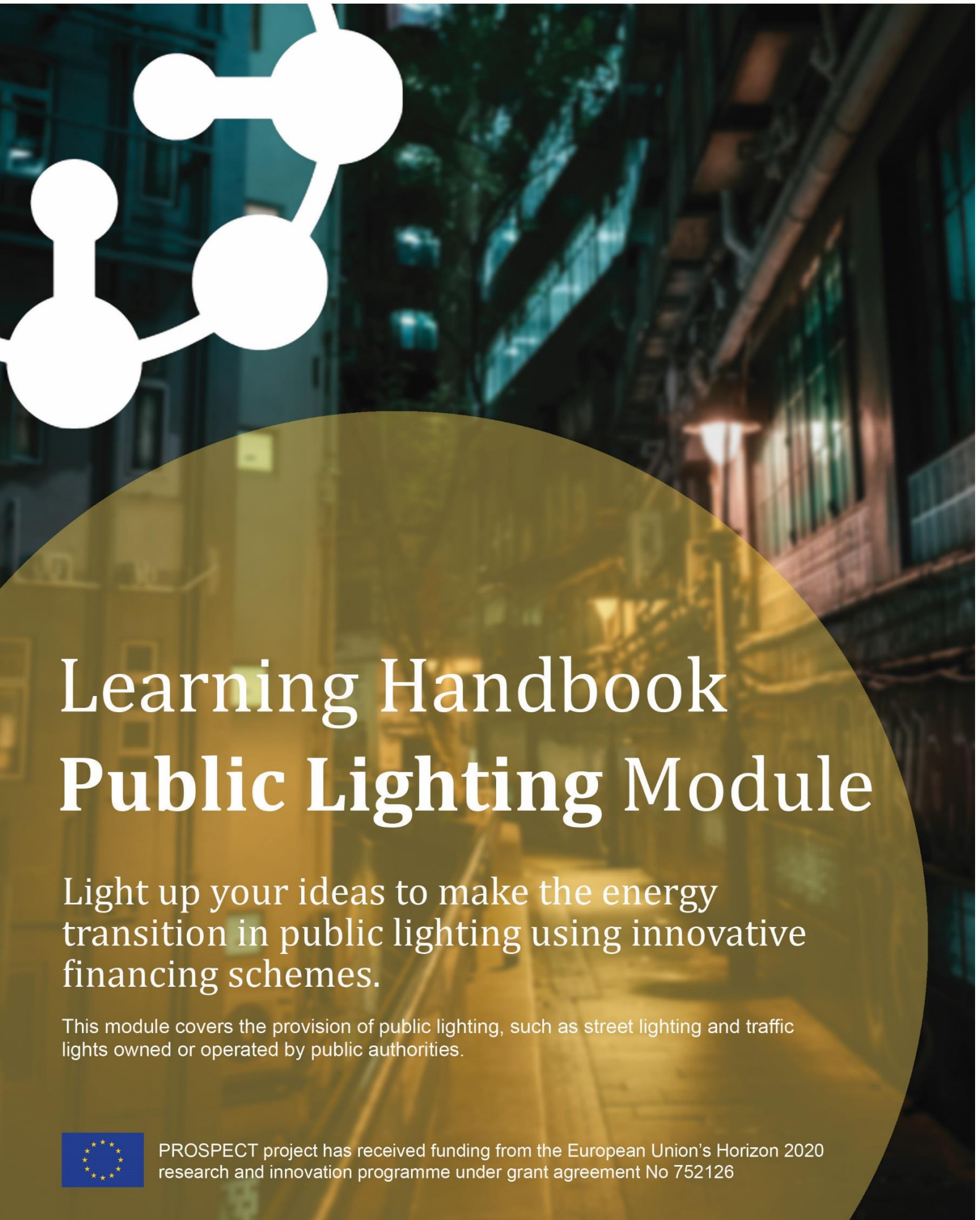
PROSPECT



Learning Handbook
Public Lighting Module

Light up your ideas to make the energy transition in public lighting using innovative financing schemes.

This module covers the provision of public lighting, such as street lighting and traffic lights owned or operated by public authorities.

PROSPECT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 752126

Contents

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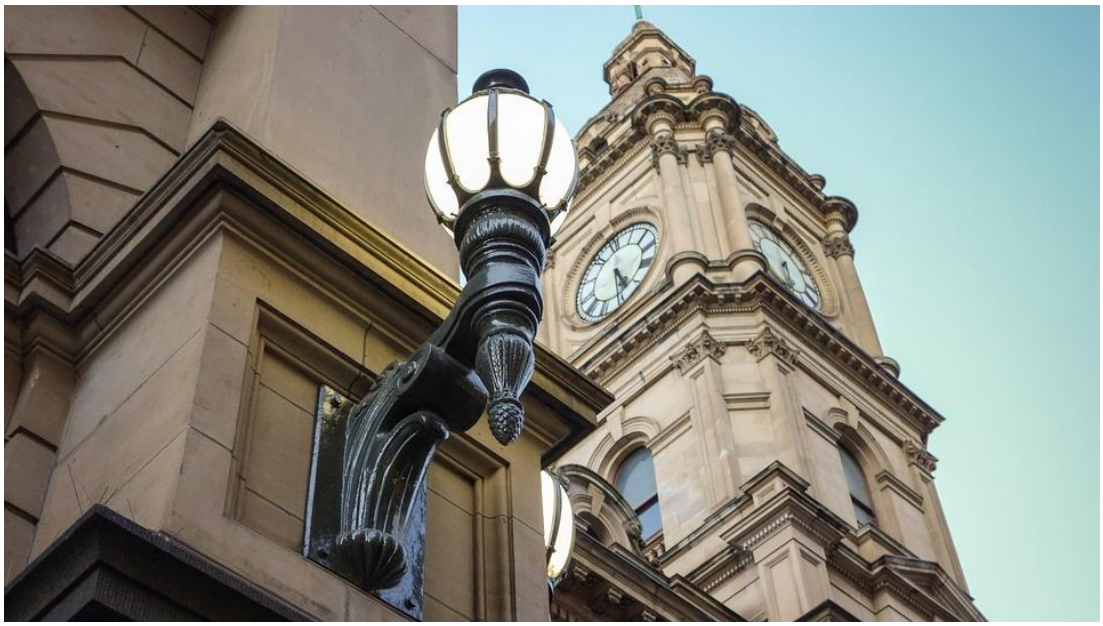
Module Description

The module on public lighting covers the provision of public lighting owned or operated by public authorities. Non-municipal public lighting is under private buildings. Examples of public lighting include LED street lighting and integrated renewable power e.g. solar photovoltaic.



Module Objectives

Mentee

At the end of this module, mentees can achieve the following learning objectives:

- Understand the innovative financing schemes relevant under public lighting
- Recognize the barriers, incentives, advantages, and disadvantages of the innovative financing schemes
- Examine which sustainable energy and climate action projects can be financed by innovative schemes
- Analyse the success factors and lessons learnt from successful projects financed by innovative schemes

Mentor

At the end of this module, mentors can achieve the following learning objectives:

- Share content knowledge on the topic of innovative financing schemes that are relevant under the public lighting module
- Share practical experience on implementing sustainable energy and climate action projects and support others in overcoming different barriers
- Showcase sustainable energy and climate action projects financed by innovative financing schemes
- Learn from other cities and regions on what projects they want to implement and which innovative financing schemes they want to apply

Sectoral Challenges

Public lighting for roads and public spaces provides road traffic safety and improve sense of security on the streets. However, public lighting consumes high electricity. Street lighting, in particular, uses approximately 35 TWh of electricity consumption from over 56 million functioning streetlights. With outdated, inefficient street lighting systems, up to half of the municipal energy bills goes to street lighting alone! As public lighting also costs a lot of money, measures for improving lighting infrastructure have not been widely undertaken (OÖ Energiesparverband, 2017).

However, advanced technology nowadays can offer 30-70% of electrical energy savings from the public lighting sector (Intelligent Energy Europe, 2007). Refurbishing the old lighting system with LED technology can save half of municipal's energy budget. Combining LED lights with networking and intelligent controls can save additional 30% of the budget (Navigant Consulting, 2017). This is called smart street lighting that has helped Oslo, Norway save 70% of its energy consumption and 1440 tonnes of CO_2 emissions per year[1]. Moreover, energy is saved through cheaper and less frequent maintenance, lower lighting replacement cost, and automatization which comes hand in hand with the advanced lighting systems.

The EU has acknowledged this energy savings potential and integrated it in the new Ecodesign Working Plan 2016-2019. One of the main targets that are covered in the Ecodesign legislation is street lighting. The Ecodesign Working Plan 2016-2019 ensures that the energy measures must be efficient to be durable and sustainable in the long run. The missions are to introduce new energy and financial savings in lighting products and discontinue the least energy-efficient type of lamps in the market[2]. Consequently, cities and municipalities should be ready to replace the inefficient street lamps, but the amount of the investment needed is a big hindrance for many municipalities (OÖ Energiesparverband, 2017). Additionally, the plenty of options when planning to implement smart public lighting can confuse municipalities. The upgrade options can vary from the costs to the networks. Municipalities must assess the various options that can help them achieve their goals and satisfy their needs (Navigant Consulting, 2017).

Common Barriers

A survey among stakeholders in Central Europe through the DYNAMIC LIGHT project identified the most significant barriers to energy efficient street lighting investment. The strongest barriers relate to financial and economic obstacles, particularly insufficient financial resources; shortage of public funding from the national or regional budgets; and high investment costs.

Further, there is also a knowledge gap among stakeholders in terms of existing funding sources – whether public or private – and a need to raise awareness among public authorities. In terms of implementation capacity and procedures, there is also lack of skills and experience among municipalities, as well as lack of human resources in the municipality.

[1] https://www.c40.org/case_studies/10000-intelligent-streetlights-save-1440-tco2-and-reduce-energy-consumption-by-70

[2] Ref. Ares(2018)476175 – 26/01/2018

Table 1: Summary of barriers in public lighting investments

Financial and economic	Policies and frameworks	Awareness, access to information and past experience	Implementation capacity and procedures
Insufficient own financial resources	Lack of guidance on the national level	Unfamiliarity and reluctance to introduce new contractual and financing mechanisms	Lack of skills and experience among municipalities
Insufficient national or regional public funding	Poor enforcement of energy efficiency policies	Lack of awareness of potential funding sources	Lack of human resources in the municipality
High upfront investment cost	Energy efficiency is not a priority on the municipal level	Lack of awareness of potential energy savings	Project complexity, including multiple stakeholders

Source: Novikova, et al. (2017)

Learn more about the actors involved in public lighting, the barriers to investment in street lighting upgrades, and the need for awareness and experience on financing by public authorities, by reading the report on **Baseline Inventory of financial models** from the Dynamic Light project.

Typical Projects

Typical projects under public lighting can include improvement of public street lighting, energy saving contracting, integrated renewable energy, and light management systems. Below are the typical projects under public lighting, including a description of their features: from CO2 saving potentials to estimated costs for municipality and target groups and key actors drawn from the SEAP ALPS Project.

Improvement of public street lighting (LED)

IKK – Energetische Stadtsanierung – Stadtbeleuchtung (Urban Energy Refurbishment – Public lighting) offered attractive financing schemes for German municipalities to improve the energy efficiency of their public street lighting using LED technology. The energy measures that were eligible for the financing schemes included lighting of pedestrian crossings, parking lot lighting, lighting in public open spaces, traffic lights, etc. The program supported long-term and low-interest investments. Through this program, KfW contributes to the implementation of the climate protection goals of the Federal Government.

Energy saving contracting

Energy saving contracting (or Energy performance contracting EPC) helped municipalities in Germany to transform their street lighting into LED using external funding sources. The contractor in this case is an energy service company (ESCO) that designs and conducts the project as well as arranges the project financing. The ESCO guarantees savings on the energy bills which can be used by the municipality to pay back the ESCO for the project. Once the contract ends, the municipality can benefit from the energy savings.

Integrated renewable energy (photovoltaic)

As part of its commitment to a sustainable municipal development, the city of Ascha (Germany) is implementing a new solar street lighting system. The existing street lighting will be replaced by a PV-powered LED system. This transition to renewable energy sources allows municipalities to save costs in the long term and to become independent.

Light management systems

Oftentimes considered as smart lighting, light management systems can include light sensors, motion detectors, dimming, etc. Especially dimming of LEDs can be beneficial in street lighting to save energy during midnight until early dawn, when public lighting is less needed. Light management systems should be able to reduce light intensity based on the time and use.

Table 2: Example of projects under public lighting

Projects	CO2-saving potential	Estimated costs for municipality	Cost-benefit ratio	Implementation time frame	Target group	Key actors
Improvement of public street lighting (LED)	High	Medium	Medium to high	3 months	Municipality	Municipality, External experts
Energy saving contracting	High	Very little	High	1 year, contract will last for 7-20 years	Municipality	Municipality and ESCO (contractor)
Integrated renewable energy (photovoltaic)	High	Medium	Medium to high	1 month	Municipality	Municipality
Light management systems	Medium	Medium	Medium	3 months	Municipality	Municipality, energy expert

Funding Sources

How can public authorities finance public lighting projects? There are different options for financing public lighting projects. These can range from the city or municipality's own resources to grants from sub-national or European funds. European banks can be one of the financing sources as well as private sectors via ESCOs for EPC and citizens through crowdfunding.

Table 3: Source of funds for public lighting

No.	Source of Funds	Description
1	**Own Local (City or Municipal) or Regional Budget**	Funds drawn from the budget of local or regional public authorities
2	**National Funds**	Subsidies provided by national governmental bodies or funding through grants from national programmes
3	**European Funds**	
	Managed at the EU level	Funds that provide technical assistance and project development, usually for demonstration / pilot projects (e.g. European Innovation Partnership on Smart Cities and Communities, INTERREG Programmes, such as the North-West Europe Programme)
	Managed at the national, regional, or local levels	Funding resources and technical assistance, such as the European Structural and Investment Funds, which are managed by national, regional, or local public authorities in partnership with the European Commission through operational programmes based on strategic goals or investment priorities
4	**European Banks**	These include European Investment Bank, European Fund for Strategic Investments, Private Finance for Energy Efficiency, European Energy Efficiency Fund, and European Bank for Reconstruction and Development
5	**Private funds**	Financing provided by private contractors, utilities, by institutional investors, crowdfunding, and through energy cooperatives

For more information on how to find a suitable financing model for public lighting investment please refer to this guideline.

Decision Tree

The decision tree represents a flow chart of the most appropriate financing mechanisms to address specific situations faced by municipalities in financing energy efficiency (EE) projects. The scheme is not binding as, in many cases, multiple mechanisms may be combined.

The first thing to address is whether the municipality has sufficient resources to fund the project(s) or not. If the municipality has sufficient financing for the project(s), it can allocate part of its budget for the project(s); by establishing a budget line item for project and carrying out the mechanism of general budget financing. If the municipality does not have enough funds, it should seek any grants available from donors. If there are available grants, the municipality should apply for them. Often this grants do not cover the entire project cost as they represent a mechanism of partial budget financing. It is often possible that funds may also come from the national government; in this case the municipality will capture new budget for financing part of the project(s). If the fund does not come from the national government, it is possible to look for energy efficiency funds; this financing scheme is subject to EE fund eligibility criteria.

Beside this funds, commercial banks can also offer dedicated credit lines and/or risk sharing programs. In order to take advantages of these opportunities, the municipality must respond for its creditworthiness as well as its collateral and borrowing capacity.

Other financing systems can be found in commercial or financial ESCOs; if there are ESCOs in the market the municipality should develop favorable EPCs by negotiating them with ESCOs. If the ESCO is not an option, leasing or vendor financing programs can be searched. In such case, when the eligibility criteria are satisfied, similarly to the commercial financing scheme, the municipality

should negotiate the leasing or the vendor financing agreement. Finally, if the municipality has the capacity to issue municipal bonds it should create a municipal bond program by taking into account the transaction costs and market situations.

Select the relevant financing model using a simple decision tree below from the **DYNAMIC Light project**:

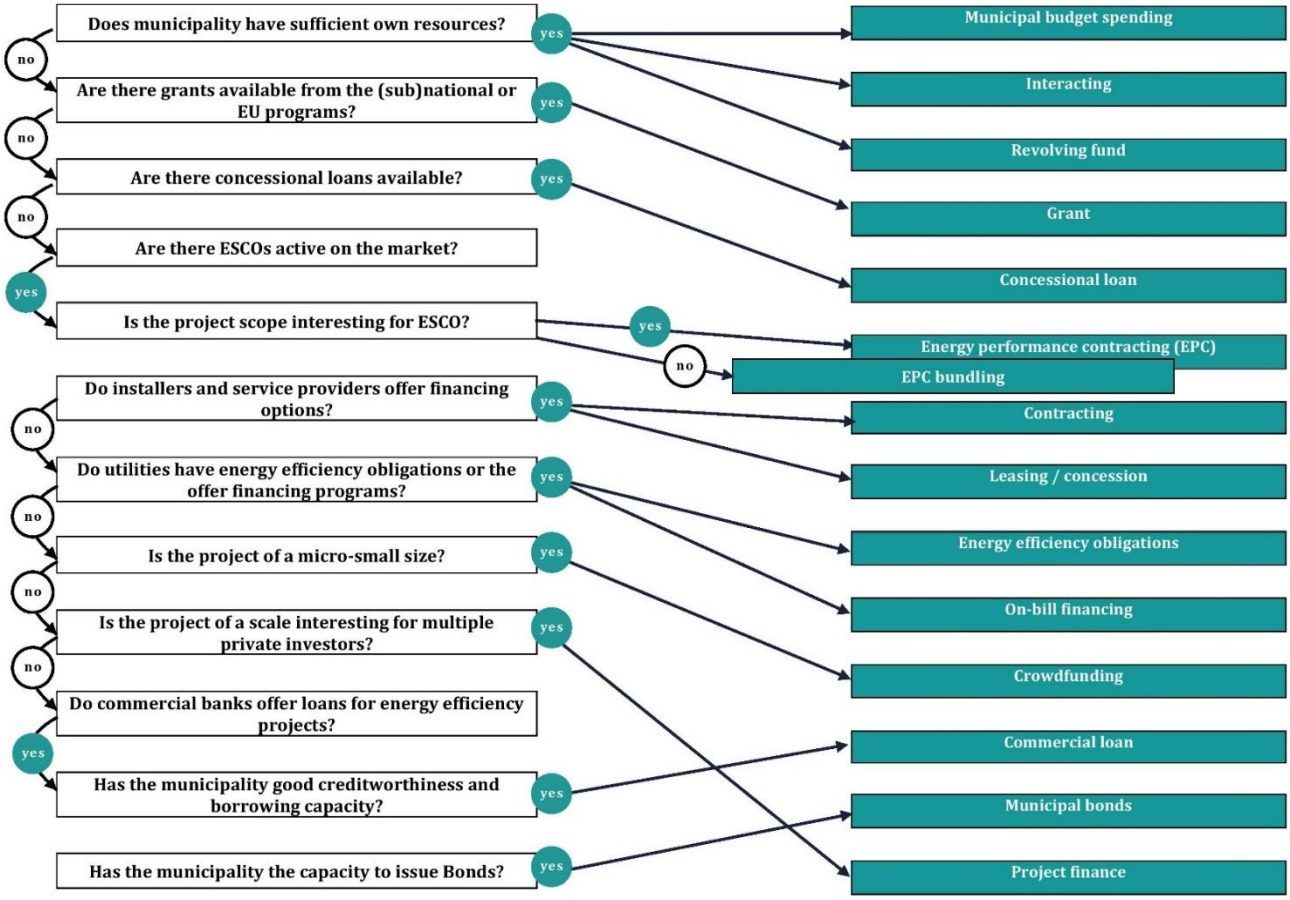


Figure 1: Decision tree Source (Novikova, et al., 2017)

Innovative Financing Schemes

Innovative financing schemes are non-traditional ways of raising funds and facilitating sustainable energy and climate investments for cities and regions by mixing different sources (own fund, public and private funds) or engaging different partners (e.g. citizens, private sector) aside from established financial institutions (e.g. banks). Below are the innovative financing schemes relevant for this module. Considering the availability of best practices, we will only focus on energy performance contracting as an innovative financing scheme under public lighting.

Table 4: Innovative financing schemes under public lighting

Financial Schemes	
Energy Performance Contracting (EPC)	Energy Performance Contracting (EPC) is a method to implement energy efficiency projects, by which an ESCO (Energy Services Company) acts as a unique contractor and assures all of the steps of a project, from audit through installation up to operations and maintenance. The ESCO delivers a performance guarantee on the energy savings and takes responsibility for the end result. The EPC contract is the contractual agreement by which the output-drive results are agreed upon.
Crowdfunding	A crowd-funding involves an open call, mostly through the internet, for the provision of financial resources either in form of donation or in exchange for some form of reward and/or voting rights.
Revolving Fund	A fund established to finance a continuing cycle of investments through initial amounts received from its shareholders, creditors or donors and later on through amounts received from reimbursements of provided funding or loans to projects. These recovered funds become available for further reinvestment in other projects under similar scope (e.g. revolving funds for sustainable energy will use the loans recovered funds to finance new sustainable energy projects.

Best Practices

The table below presents examples of best practices under energy performance contracting, including information on the city or region where the best practice is located, and the source(s) of funds. Most of the projects were implemented in the frame of the project "Streetlight-EPC", funded by the Intelligent Energy Europe Programme.

Table 5: Best practices under public lighting

Financing Scheme	City/Region	Best Practice	Source of funds
EPC	Municipality of Gunskirchen, Upper Austria (AT)	Refurbishment of street lighting system to energy-efficient LED technology	ESCO and own Regional budget (subsidies of regional contracting programme)
	Municipality of Dírná, Aouth Bohemia, Czech Republic (CZ)	Small project: Renovation of public lighting on the main square	Own local budget and local government subsidy
	Municipality of Kostrena, North-West Croatia (HR)	Replacement of street lighting and improvements to parts of the infrastructure (e.g. pole replacement and repair, relocation of the measuring points, implementation of a street lighting monitoring system).	National Fund and the Environmental Protection and Energy Efficiency Fund
EPC	Kilkenny City, Carlow Kilkenny County (IE)	Improvement of the lighting standard and energy efficiency of the street lighting system via EPRP (Energy Performance Related Payment), a type of EPC model	Own regional budget through a grant from the Sustainable Energy Authority of Ireland (regional contracting programme) + ESCO
	Province of Teramo (IT)	Management of street lighting installations through private companies and ESCOs	Project Development Assistance: IEE and Third party financing (ESCO)
	Municipality Demir Kapija, Macedonia (MK)	Reconstruction and expansion of the existing street lighting system (urban and non-urban)	ESCO (a supplier and equipment provider from the private sector)

Financing Scheme	City/Region	Best Practice	Source of funds
	Municipality Gdańsk-Zaspa – Park JP II, Pomerania (PL)	Energy Saving Lighting of Pomerania	Own regional budget and the Voivod Fund for Environmental Protection and Water Management in Gdańsk
	Kalmar, Southeast Sweden (SE)	Lighting renovation of pedestrian and bicycle tunnels with Life Cycle Costs (LCC) calculation	Own Local Budget and ESCOs

Energy Performance Contracting

What you need to know about energy performance contracting

What is energy performance contracting?

Energy performance contracting, or EPC, is an innovative financing scheme offered by a contractor (usually ESCOs) to clients (e.g. a municipality) who are in need of EE improvements but have limited financial means or technical capacities to implement such projects on their own. What makes EPC innovative is that an ESCO finances the project and implements energy efficiency investments, such as the refurbishment of a street lighting system to LED technology.

EPC can be classified into four models based on two elements: the distribution of modernisation works over time and the energy savings. Based on the latter element, EPC can be divided into guaranteed savings model and shared saving model. In this module, we focus more on the project with EPC - guaranteed savings model. The project is based on the guaranteed energy savings that will be generated in the future, which will be stated in the EPC contract. If the energy savings are lower than guaranteed, ESCO must cover the shortfall. If the energy savings are higher, the client will take advantage of it entirely (Novikova, Stelmakh, & Hessling, 2017). In principle, the ESCO plans and conducts the project and will only receive service fees – and get the return of investment – from the client using the savings from energy costs. The client eventually reaps benefits from energy and cost savings after the end of the contract.

What are the characteristics of EPC?

In EPC, a client (e.g. a municipality) and a contractor (e.g. an ESCO) engage in a public-private cooperation – formalized by a contract. EPCs are usually long term with a contract of about 8 to 15 years depending on energy prices. EE improvements under public lighting sector can include new control systems, system optimisation, and retrofitting of poles.

A very common measure in public lighting is the replacement of an old street lighting system to LED technology, which often requires significant investments in advance. This obstacle can be overcome by EPC where technologies with short payback times are available. EPC can also be applied in public lighting whether existing or new as long as these have energy saving potentials. In EPC, pooling projects are recommended to increase the level of investment.

Moreover, the EPC model is flexible. It can be adapted according to client's needs in various forms. There are two core elements that makes EPC different from other types of financing schemes. Those are contractually guaranteed energy savings and financial consequences for the ESCO if the guaranteed savings are not achieved (STREETLIGHT EPC Project). These are:

- **Contractually guaranteed energy savings**: Through the analysis of the existing installation and the design of the new system, the client and ESCO agree to a certain level of energy savings that will be achieved. The energy savings are included and guaranteed in the EPC contract;
- **Financial consequences for the ESCO if the guaranteed savings are not achieved.** Such consequences can take many different forms, e.g.:
  a. Withholding or reduction of the payment to the ESCO according to level of achieved savings.
  b. A bank guarantee can be set up, enabling the client to draw this guarantee if the agreed savings are not achieved.
  c. Retention of a percentage of the payment for the refurbishment work until an assessment shows the savings have been achieved over time.
  d. The ESCO is required to adjust or replace the equipment until the savings are achieved.

What is the typical content and structure of an EPC Contract?

The EPC contract between a public building owner and the ESCO has the following key elements as outlined in the Energy Performance Contracting Manual (TRANSPARENSE Project):

- The ESCO guarantees a certain amount of yearly savings (**guarantee of savings**) to be achieved throughout the duration of the contract;
- The **volume of investment** to bring the guaranteed savings and a commitment by the client to pay the investment after its installation;
- Clear **definition of a reference scenario** (baseline) of the future energy consumption;
- Obligation of the ESCO to provide a **report on yearly savings evaluation** that documents the actual amount of achieved savings in the respective year;
- Responsibility of the ESCO for **design and implementation of the energy saving measures** correctly
- Obligation of the client to provide pre-agreed **conditions for implementation** of the energy saving measures
- Planned **duration of installation** of the investment
- **Ownership transfer** of the installed energy saving technologies to the client
- **Means of payment** for the services and savings.
- Declaration of the **purpose of operation of the facility** on which the contract covers

- **Length of the contract**
- **Method of recalculation** of the guaranteed savings in case any of the input parameters differs from the presumptions defined in the reference (baseline) energy consumption scenario.
- **Final report** – prior to the end of the paying-off period the ESCO hands over to the client the final report including the total amount of cost savings, guaranteed savings, given reduction in the price and bonuses calculated for the entire paying-off period, etc.

What is the role of the ESCO?

An ESCO (or any other EPC contractor) usually operates as a commercial entity regardless if it is owned by a public entity e.g. public utility company. It also serves as a general contractor that optimises the energy services systems and system operation by the means of construction and maintenance. ESCOs can provide the whole range of necessary energy services – from planning, management, implementation, and monitoring of energy management services and technical improvements. The ESCO shoulders the associated economic, technical, and administrative risks in carrying out the EE improvements. The ESCO must make sure that the equipment functions properly and be ready to replace any defective parts. This, of course, depends on the investment size and contract duration. The contract can also include how much time a defective part needs to be replaced (e.g. within three days). The main economic risk for ESCOs is not meeting the guaranteed energy savings which mean reductions in EPC service fees. At the end of the contract, a maintenance contract can be developed where the ESCO continues maintaining the well-functioning system.

What is the role of the public lighting owner?

Public lighting owners (e.g. municipality) with the support of local facilitators can design and plan an EPC project. At the initiation phase of the project, all concerned staff should take part in the process to make sure everyone involved agree with the decision. They need to understand the business model and build trust in it.

Public lighting owners generally have low-to-medium economic risk levels. Should an ESCO fail to provide its services, a public lighting owner can withhold payments and penalties can be set. Even if the ESCO has designed and planned the EPC project and installed and operated equipment and technical facilities, the public lighting owner retains full ownership of the public lighting. As the ESCO is tasked to ensure the quality of the technical facilities from installation until operation, such as repairing of defective parts, the public lighting owner should grant ESCO staff unconditional access.

However, the ESCO does not supply energy, so the public lighting owner should remain responsible to obtain the electricity from an energy supply company, for example. An experienced ESCO will try to include the existing staff from the public lighting owner (e.g. municipality's staff) and service providers (e.g. local electrician) to be in charge in the project. The tasks could be collecting data of the street lighting system, controlling the quality, implementing the measures, and revising the annual accounts.

What are local facilitators and their roles?

Local facilitators can be local or regional energy agencies, engineering offices, legal advisers, architects, and economists. Facilitators should be knowledgeable and experienced about EPC concepts and business models, techniques and economics of EE in lighting, and public procedures and codes of conduct. Commercial facilitators can be contracted. However, standard service procurement procedures should be followed. Local energy agencies may be involved without tendering if financed by the membership fees of municipalities. Facilitators can assist in the preparation of EPC contracts, in managing EPC tender procedures and contract negotiations. Consequently, facilitators have to consider the points of view of engineers (who sometimes overestimate the contractual challenges) as well those of financing experts (who may tend to underestimate the technical delivery of the savings guarantee). Facilitators can also perform the energy audit to determine reliable numbers on saving potentials as done in many cases of Streetlight-EPC projects.

What other financing sources can be used?

In most EPC projects, the ESCO is mainly the investor and financer. Other financing sources are usually not necessary for EPC projects that require low investments. In many cases, an investment of several ten thousand euros is the minimum size of investment for an EPC project, otherwise the cost of preparing the project (including setting up the contract) represents too large of a proportion of the savings. However, this strongly depends on the specific circumstances.

EPC has also been used for rather small projects. In some cases, it can be useful to combine smaller projects with other streets or projects to achieve the threshold investment level. However, in big projects, such as extending the street lighting system, cannot usually be financed by the savings, hence the client may make use of other financing sources. These include subsidies, such as feed in tariffs for power generated from renewables or in combined heat and power plans, on specific technical measures and subsides on interest rates paid by the ESCO which reduce financing cost. Find out more about these under: *What are the sources of finance for EPC?*

How can the energy savings be guaranteed?

First, the ESCO and public lighting owner set the baseline energy consumption of the lighting prior to EPC. This can be based on the energy consumption costs prior to EPC (the reference year), such as, for example, the energy cost paid by a public lighting owner at a specific time of the reference year (e.g. € 100 on December 31, 2016). However, these can be adjusted based on various factors. Factors that are unmanageable by the ESCO, such as energy prices and change of operation times, will be overcome by comparing the energy costs and energy consumption levels to those of the reference year.

Using the baseline energy consumption, the ESCO can calculate and guarantee an annual energy cost savings to the public lighting owner throughout the contract period. Both ESCO and public lighting owner will establish how to evaluate and verify the energy savings that will be generated after the EE project is implemented. The ESCO ensures that the energy savings will be achieved, while the public lighting owner guarantees the payment of EPC service fees to ESCO.

The ESCO provides energy reports and energy savings records. The ESCO should also be transparent in the adjustments of technical parameters, such as in the use and conditions of the lighting or in the installation and removal energy devices. Usually, the ESCO conducts periodic metering of consumption using automated systems or by remote access and control. However, it is advised that the staff from the public lighting owner keep track of the savings and verify them regularly. The staff should be competent to check the progress, evaluate and suggest relevant corrective action.

There is also a possibility that the guaranteed savings are not achieved. In such case, the public lighting owner (client) can lower the economic risk by anticipating it in the contract. The client can state in the contract that the payments made by the client to the ESCO reflect the achieved savings. It should be agreed that the client can reduce the payment accordingly. Another option is to involve the use of bank guarantees that the client can easily pull once the guaranteed savings are not achieved.

How are the EPC service fees calculated?

A fixed proportion of the guaranteed savings will be the EPC service fee which the ESCO gets from the public lighting owner to attain a profit margin and maintain the installations. The remaining proportion can be kept by the public lighting owner, or shared between the EPC and the owner to motivate the ESCO for achieving additional savings. In EPC, the yearly EPC service fee remains constant throughout the duration of the contract. The EPC contract is not affected by rising energy prices because it uses the energy cost in a baseline year, although the rising energy prices will surely affect the client's energy bills.

The service fees for EPC is calculated to ensure repayment of all costs of the ESCO as well as the expected return of investment. However, the fees should not go beyond the value of the guaranteed savings in the baseline year. Figure 2 shows the relationship between the EPC service fee and the energy costs. In this case, the annual guaranteed savings are 30% of the energy costs in the baseline year, while the ESCO service fee is set to be 80% of the guaranteed savings during the contract period. The payment can be received either partially or in whole, depending on the agreement. Likewise, the payment scheme can be arranged.

Increase in price from energy provider, or increase in energy demand is not covered by the EPC, unless it is specifically stated so.

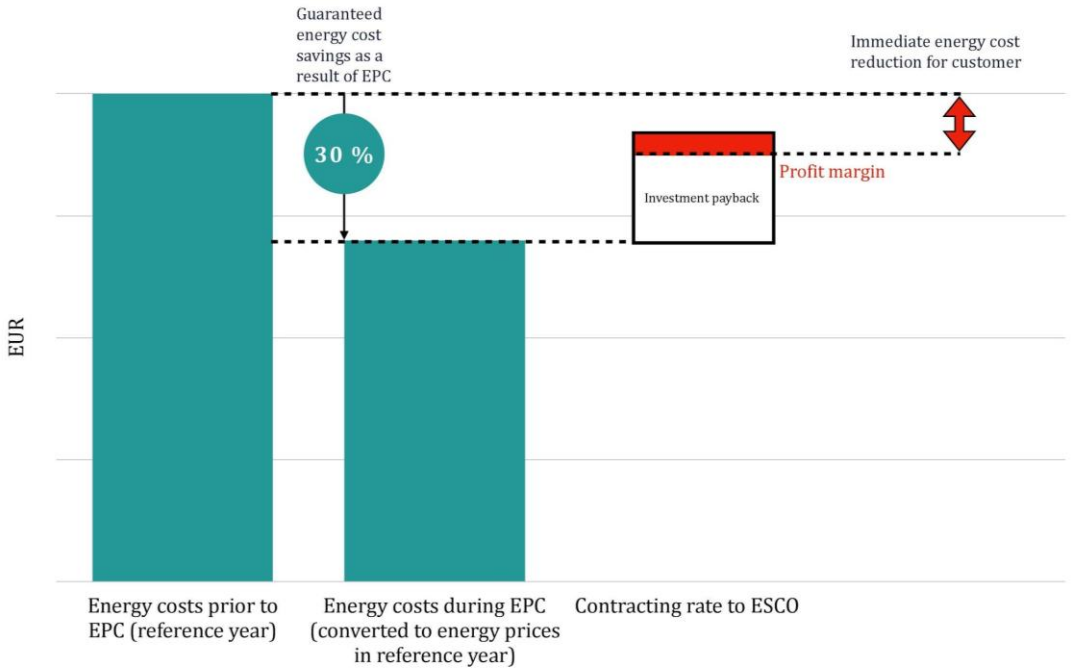


Figure 2: EPC service fee and energy costs in EPC arrangements (Source: GIZ)

What are the advantages of EPC?

- The investment risks are transferred from the public lighting owner to the ESCO
- Usually no investment or up front capital required from the business owner
- ESCO provides the required energy services which the public lighting owner benefits from
- ESCO provides guaranteed energy savings, which serve as basis for their payments, assuring the client of the financial outcome of the project
- The maintenance of the public lighting system is taken care by ESCO's professional services, so the expected savings are more likely to be achieved

What are the common incentives for EPC?

The development of EPC is facilitated by the following:

- EPC guidelines, tools and sample contracts available in the country (or under preparation)
- National or regional data bases of ESCOs and facilitators
- National and regional competence centres promoting EPC
- Promotion of inter-municipal cooperation and/or pooling of public lighting in EPC projects
- Trade associations of ESCOs promoting EPC as a business model
- Regional and local energy agencies and/or associations of local authorities promoting and facilitating EPC

Political and legal incentives

- High political commitment for EE and economical energy savings at the national level
- National EE law and supporting laws promoting EE

- Promotion of EPC as an innovative EE service in regional and national programs and policies

Economic

- Expectation of increasing energy prices
- Energy saving insurances for new ESCO
- Feed in tariffs for renewable energies

Financial

- Limited municipal budgets increasing the interest in EPC as a financing model
- Subsidies for municipal EE programmes and projects (planning and implementation)

What are the common barriers for EPC?

Political and legal

- Procurement rules and procedures for public authorities (complex tendering procedures)
- Budget and accounting rules for local public authorities
- Restrictive regulations concerning financing cooperation of public authorities with the private sector
- Little interest in EPC as a financing tool among municipal decision makers
- Requirements concerning the comparison of EPC and clients' own investment

Administrative

- Lack of understanding of the EPC concept among municipal decision makers and initiatives
- Lack of qualified and motivated personnel in some public administrations or public services
- Non-transparent, lengthy, or complex decision making processes in municipalities
- Competition between investments in EE and investments in other public services
- Distributed responsibility for energy bills, maintenance and operation of facilities in municipal administrations
- Lack of finance and/or personal capacities for project preparation, tendering, contract negotiation

Economic

- Risk of incorrect calculation of baseline consumption
- Decreasing energy prices for fossil fuels
- Feasibility of EPC only for bigger projects that can achieve minimum investment threshold

Financial

- Limited or lacking public funding and limited (or no) access to loans by municipalities
- Lack of collaterals
- High cost of loans
- High planning and bidding cost
- Limited access of ESCOs to bank loans

Technical

- Lack of experience in the calculation of baseline consumption
- Lack of attractive best-practice examples in the country

- Lack of knowhow and experience among local public utilities
- Lack of calculation tools and sample contracts
- Lack of qualified local facilitators promoting EPC projects
- Lack of local ESCOs offering EPC services

Other barriers

- Bad reputation of EPC among public administrations and decision makers
- High barriers for the market entrance of new ESCOs
- Poor image of ESCOs among public administrations and decision makers
- Lack of information on EPC in public lighting

Would you want to know more incentives and barriers – and whether these apply to your country or not? Take a look at these incentives and barriers across nine (9) European countries from EnPC – INTRANS Project.

What are the challenges and solutions in EPC projects?

Challenges might differ in each region based on the economic, regulatory, and institutional circumstances. The low energy prices in Eastern European countries results longer payback periods, which hinder ESCOs from undertaking the EPC projects. There are cases where municipalities wanted to implement EPC, but no qualified ESCOs on the market. In other cases, there were ESCOs trying to offer services like EPC to municipalities, but the lack of trust from the side of municipalities hindered the implementation of EPC. This could be due to the municipalities were ill-informed of EPC. Another challenge is the lack of incentives from the side of contractors (e.g. ESCOs) to increase energy savings beyond the savings stated in the contract. This can be solved in EPC – shared savings model, where both parties benefit from the additional energy savings.

The following figure illustrates the challenges in implementing EPC that were encountered during the Streetlight-EPC project.

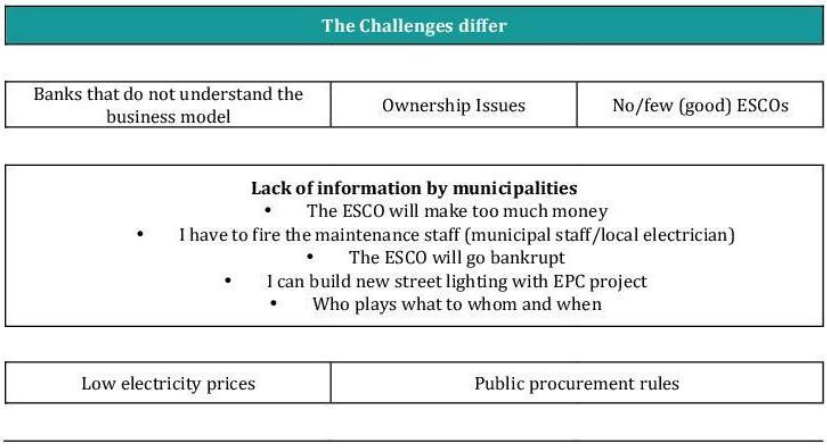


Figure 3: Challenges in EPC projects

Based on these challenges, here are the solutions identified by the Streetlight EPC project. Some challenges can be addressed with the help of market facilitators and some others need interventions from political and legislative sides on regional, national, and EU levels.

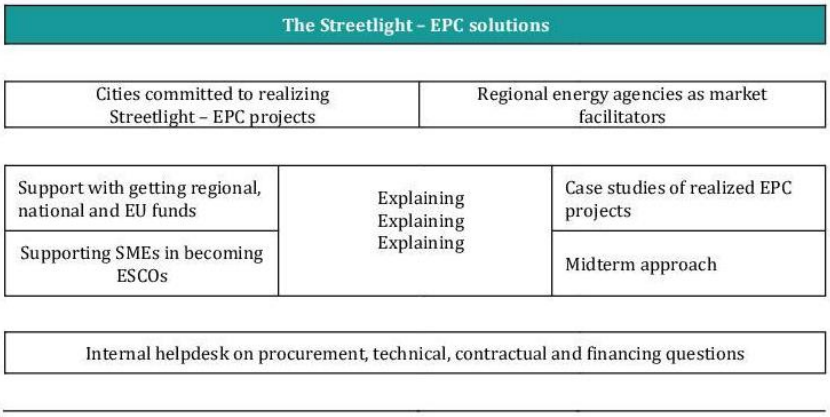


Figure 4: Solutions in EPC Projects

Are there guidelines for managing EPC projects?

The EPC Code of Conduct promotes a professional and transparent approach for managing EPC projects. There are nine (9) guiding principles:

1. The EPC provider delivers economically efficient savings
2. The EPC provider takes over the performance risks
3. Savings are guaranteed by the EPC provider and determined by M&V
4. The EPC provider supports long term use of energy management
5. The relationship between the EPC provider and the client is long-term, fair and transparent
6. All steps in the process of the EPC project are conducted lawfully and with integrity
7. The EPC provider supports the client in financing of EPC project
8. The EPC provider ensures qualified staff for EPC project implementation
9. The EPC provider focuses on high-quality and care in all phases of project implementation

Learn more about the EPC Code of Conduct from TRANSPARENSE (http://www.transparense.eu/).

What are the business models for EPC?

There are various business models for EPC reported by the Streetlight-EPC project. These business models may have overlaps as projects may mix different features.

EPC Basic

EPC Basic is the most common EPC business model that aims to facilitate investments in fast-paying EE improvements or those that can generate high energy savings effect. The ESCO will take on the liability of (most of) the related risks, including the operating risk, as they are responsible for operation and maintenance. The client pays the service fee that is calculated based on the prior state and the EE improvements as agreed in the contract. It is not necessary for the client to understand deep technical knowledge within the administration as it will be done by an external specialist. However, the client must acknowledge that the ESCO will obtain most of the energy savings achieved throughout the duration of the contract as a repayment of the investments made.

EPC Light

In this business model, the ESCO is contracted to optimize technical facilities to facilitate EE. However, EE improvements are realized with little to no investment in technical facilities. This model is perfect for the public lighting owner that has no sufficient capital and staff to undertake adequate energy management. As an external energy manager, the ESCO offers some measure to optimize the energy related installations. The measures can range from energy management systems improvement, lighting control improvement, sensors installation in certain areas that can generate high potential savings, to lamps replacement. The contract duration can be adjusted based on the needs and typically short in period from two to three years.

EPC and subsidy

As the name suggests, this advanced EPC model is supported by a subsidy scheme for ESCOs, integrating construction measures with installation of high-efficiency equipment. This will result in major synergy effects when the project is undertaken efficiently, hence cutting the energy consumption optimally. However, in some regions, an ESCO cannot take the subsidy, but only the client.

Integrated Energy Contracting

This model is a combination of Energy Supply Contracting (ESC) with Energy Efficiency Measures, which are offered by EPC, including minor measures for comprehensive refurbishment. In ESC, an ESCO is also an energy supplier that earns profits from selling energy to the client. The integrated energy contracting model aims to lower energy consumption by applying energy efficiency improvements, such as lamp substitution to LED technology. The model also intends to use energy supply from renewable energy sources.

EPC contracting with Code of Conduct

As explained earlier in "Are there guideline for managing EPC projects?", there is a signature of Code of Conduct that can act as a compass to EPC projects. If an ESCO adhere to the Code of Conduct, it can ensure the quality of EPC projects. The ESCO will gain the trust of potential clients, so they are more likely to use the ESCO's service. Some projects that used the Code of Conduct can be found in http://www.transparense.eu/.

Lighting manufacturers offers ESCO services

As an approach to direct sales of streetlight products, some lighting manufacturers provide ESCO services. They are responsible for the technical and financing risks that may occur, as they provide the energy services themselves. This attracts the potential customers to purchase their products.

EPC contracting with capital from National Funds

EPC market is newly developed in some countries across the EU. As a result, it is reasonably difficult to find any ESCOs in the country. Conducting EPC projects needs a support from the national government both financially and technically. The government could make use of National Funds for energy efficiency. The government could also obligate energy savings by contract to a municipality.

Combine EPC for street lighting and other facilities

EPC for street lighting might be less viable due to the size of the project. To reach the minimum investment threshold, the project can also integrate other facilities in the contract. Possible combinations could be street lighting and public buildings and/or indoor lighting of buildings and/or facade lighting.

EPC and detailed energy audit cost

In the beginning of an EPC project, it is important to perform a thorough energy audit to assess the viability of the project. It is also needed to arrange the tendering process for ESCO. However, it could be a challenge to get the audit done comprehensively, especially when the inventory of the street lighting system is lacking or inadequate. It could cost a significant amount of money. To overcome this barrier, an advanced EPC model can be developed where the ESCO also performs the energy audit. The audit cost will be included in the EPC contract, if both parties (the ESCO and the client) agree to proceed further after the audit results. Otherwise, the client will pay the energy audit cost to the ESCO.

What are the key lessons learnt from EPC projects?

EPC model

- A wide range of EPC models shows how versatile EPC is. EPC is adjustable in any particular settings, from legal, economic to social ones, of each region and project
- The hindrances that each region encounters in establishing EPC project are different, such as the shortage of ESCOs, proprietary rights, and specific procurement rules. Thus, finding an appropriate EPC model is one of the solutions besides mediating with facilitator, political and legislative authorities
- The essential features that must be included in every EPC model are contractually guaranteed savings and financial consequences for the ESCO if the savings are not achieved

Contract and finance

- Bundling of street lighting systems and other facilities in one EPC project helps in decreasing transaction costs and creating economies of scale. Small and uncomplicated projects are more suitable to urge SMEs to take a part in the ESCO market
- Available subsidies and grants should be used and included in the financial concept for an EPC project
- A neutral and qualified third party acting as an arbitrary should be nominated in the contract and its decisions acknowledged in advances as binding by both parties
- Financing options for EPC projects
    - Very good experience exists with financing by EE Funds
    - Additional financing by the public lighting owner (e.g. municipality) can be helpful for the financing of the EPC
    - Insurances for the calculation of savings are an appropriate instrument to mitigate the risks for ESCOs, in particular for new un-experienced ESCOs

Facilitator

- Most of the public lighting owners (e.g. municipality) rely on proficient facilitators in

    - Project planning and preparation
    - Investigation and activation of potential grants and subsidies from regional, national, and EU sources
    - Compilation of tender documents and assistance to the tendering process
    - Tender evaluation and contract negotiations
    - Quality control of provided installations and services
    - Measurement and verification of achieved savings
    - Checks and approvals of EPC's bills
    - Verification of possible financing instruments (soft loans, instruments and grants)
- Capacity development of local facilitators is therefore first priority for the development of local capacities for EPC in public lighting
- Facilitators must guide the staff from the public lighting owner through every phase of the project, ensuring the staff get a grip on the project

ESCOs

- For new ESCOs access to the EPC market is connected with high economic and administrative barriers
    - Economic and technical risks are rated high by most of the interested clients
    - New ESCOs usually have to provide additional bank guarantees or insurances which increase the cost
- ESCO needs to understand about the technical, contractual and economic aspects thoroughly, so the client can trust the ESCO and the EPC model they bring.
- In tendering process, ESCO should be selected based on the performance, not the lowest price offered

Process

- To achieve the favourable outcome, it is important to have a good technical project preparation, such as accurate and significant inventory of the public lighting system as well as a good-quality audit to help specify the reasonable guaranteed savings
- Monitoring and verification of guaranteed savings is often complex and may lead to debates between the ESCO and the client
- Adjustments may be required regularly, depending on, for example:
    - Weather conditions
    - Changes in consumer behavior
    - Type, intensity, and frequency of lighting use
    - Installation of additional, or removal of old consumer device
    - Replacement of old consumer devices by new, more energy efficient devices
    - Changes in lighting pole (retrofitting) and of installed facilities
- Simplified measurement and verification methods as well as key performance indicators, if agreed by both parties in advance, may help to reduce both complexity of calculations, and reasons for debate

Source: EnPC – INTRANS and Streetlight-EPC Project Publication

How to develop energy performance contracting for public lighting?

The project development consists of five steps according to the Streetlight-EPC project. The following table presents general steps of a lighting refurbishment project with EPC. The steps and order may vary depending on the project and regional context.

Table 6: Steps in project development

Data collection • analysis of the current state of the lighting system • identification of priority refurbishment areas • data collection (luminaires/lamps, light poles, etc.)
Definition of quality and procurement criteria • how much light is required/desired? which colours? • expected service life • which control system (dimming, reduction during night, etc.)? • maintenance costs • other criteria for technology solutions
Detailed analysis of investment costs & savings • development of the baseline • identification of potential public support
Tendering & selection of ESCO • tendering (based on criteria defined above) • identification of potential ESCOs • development of EPC contract
Implementation • implementation & tracking results • accounting

The facilitators can support in each step of the project development. At the step of **data collection**, the public lighting owner (e.g. municipality) can discuss the data with the facilitator to get an advice on the next phases. Some checklists that were created by the Streetlight-EPC project can be used and be found in the **website**. The checklists also contain an initial general evaluation to see the economic viability of a public lighting refurbishment with EPC.

At the step of **definition of quality and procurement criteria**, it is important to understand which LED technology that can be suitable for the needs of public lighting. A facilitator that is highly knowledgeable of LED technology for public lighting can help set the criteria and compare different offers at the tendering stage. A summary of important aspects to know before converting to LED technology can be found in the **Toolbox**.

The facilitators can give technical and financial advice at the step of **detailed analysis of investment costs and savings**, minimizing the risk of inaccurate calculation of baseline

consumption. The facilitators can offer a list of ESCOs at the step of **tendering and selection of ESCO**. At the step of **implementation**, the facilitators can communicate results and findings to other cities.

What are the sources of finance for EPC?

One of the main hindrances to implement EPC project is the lack of capital to fund the project. According to OÖ Energiesparverband in the publication of Advanced LED EPC models, "with the financial crises, (pre-)financing for energy efficiency investments has become increasingly burdensome for ESCOs and their customers, especially if they reach their credit lines, credit liabilities and fixed assets burden balance sheets." Therefore, choosing the right financing scheme is crucial.

There are some aspects that should be taken into consideration:

- Direct financing cost (financing conditions, interest rates, fees, etc.)
- Legal aspects (rights and duties, ownership, contract cancellation, etc.)
- Required collateral (securities) by financing institution
- Taxation implications (VAT and purchase tax, corporate income tax, etc.)
- Balance sheet and accounting implications (who activates the investment, balance sheet effects like credit lines, performance indicators Maastricht criteria, etc.)
- Management expenditure (transaction cost, comprehensive consultancy, etc.)

The following information show some case studies of public lighting project.

Location: Municipality of Ribeira, Galicia, Spain

Project: Urban lighting renewal and CityTouch system integration

Results: In less than six months, the municipality replaced around 8,600 street lighting with LEDs and over 75% are controlled using a smart street lighting management system. With the help of an ESCO, Ferrovial Servicios, the municipalities paid no upfront project cost, as the ESCO covered the cost of the new lighting instalment and maintenance. The municipality would then pay back the ESCO monthly using the estimated 70% savings from the electricity bill. The project has successfully achieved the estimated cost saving and the municipality has received much less complaints on lighting faults from the citizens.

Source: Philips Public Lighting

Location: Municipality of Białowieża, Poland

Project: Enhancing a UNESCO World Heritage site with street lighting renewal

Results: Having a primeval forest, Białowieża attracts many tourists. The municipality wanted to keep a certain amount of darkness at night for the forest animals' needs, while at the same time facilitating the citizens and tourist traffic with energy-efficient lighting. The municipality refurbished its public lighting and implemented Philips's CityTouch lighting management system that remotely allows easy control and adjustment of the lighting. The project was partly funded by Poland's SOWA program, a large scale green investment scheme that supports EE projects in public lighting. This project was funded by a subsidy and a loan. With approximately 77% energy saved as a result of this project, the municipality has saved PLN 150,000 (over €34,000) per year.

Source: Philips Public Lighting

Location: Municipality of Rainbach, Upper Austria

Project: Street lighting project under Upper Austrian EGEM programme

Results: This 10-year project aimed to replace the old street lighting to LED technology for EE improvement. The municipality decided to use EPC after consulting with a lighting planner. More than half of the investment cost was financed by the EPC project. The municipality also obtained subsidies through regional contracting program and environmental subsidy.

This project resulted a significant guaranteed maintenance cost savings. Over 70% of the savings were guaranteed by Linz AG, the ESCO of the project. The total number of lamps used after renovation is only 27% of the total number before renovation. The annual electricity cost was cut down to 58%.

Source: STREETLIGHT EPC Project

Credit financing

Credit (or loan) financing in general is a financial model under which a financing institution (FI) lends a borrower (customer, in our case it can be an ESCO) a capital for a certain purpose over a period of time that is set in the agreement. The borrower has to pay back the loan within a fixed period of time with additional interest rates and other transaction costs, such as administrative ones. As long as there is a proof of purchase, the loans are reimbursed to prevent the financial abuse.

The borrower must be creditworthy who can pay the loan back within the agreed period of time. To increase the chance of getting the loan from an FI, the borrower should be connected to "BASEL II". It means that the borrower is assessed by international standard criteria that determine the level of the borrower's creditworthiness.

The following figures depict types of credit financing scheme based on European Energy Service Initiative (EESI):

a) Credit financing scheme typically provides the customer a credit from an FI that will be returned with extra costs as debt service and securities. The securities serve as a guarantee to cover the risk of the FI as depicted in the following figure.

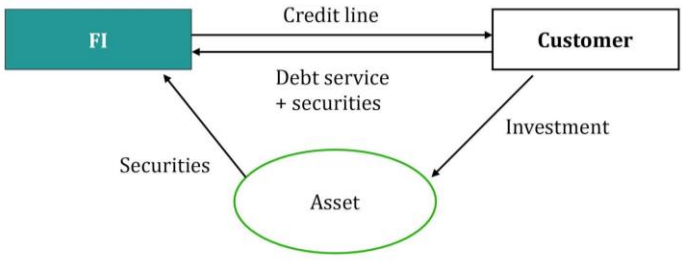


Figure 5: Credit financing - General Scheme

b) Credit financing can also form a basic cash flow relationship, where the ESCO lends the credit, as shown in the following figure (figure 6). The ESCO is in charge of refinancing the credit line for investment as well as implementing energy efficiency measures. The

contracting rate that is paid by the customer can be used by the ESCO to perform the debt service. This type of scheme is called "traditional" ESCO-Third-Party-Financing.

Figure 6: Credit financing - cash flow in EC projects with ESCO financing

c) In some cases, the customer can be the lender of the credit, which is shown in the following figure. The implementation of the energy efficiency measures by ESCO is funded by the customer from their credit line, subsidies, or from maintenance reserve funds. This type of credit financing scheme, also called Operation-management-EPC model, is recommended if the customer has better finance conditions than the ESCO.

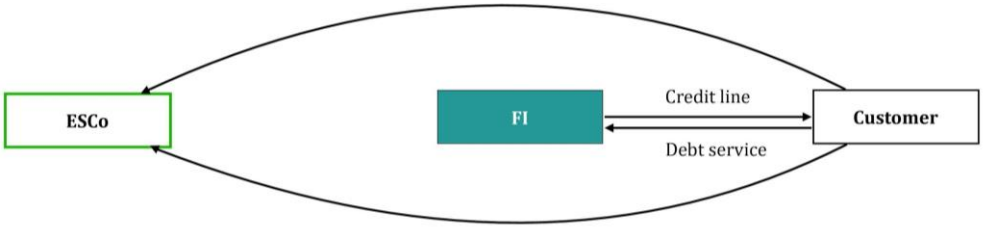


Figure 7: Credit financing - cash flow in EC project with customer finance

Leasing financing

To use an asset without having the right to own it can be done through leasing. Assets in our case mean investments into EE measures. According to EESI, "leasing is a contract between the owner of the asset (**lessor**) and the user (**lessee**), wherein the former grants exclusive rights to use the assets for a certain period (basic lease term), in return for payment of a lease. The lease is typically paid in annuities to the leasing finance institute (**LFI**)." The lessee can be either an ESCO or the client (public lighting owner) which is depicted in Figure 8 below.

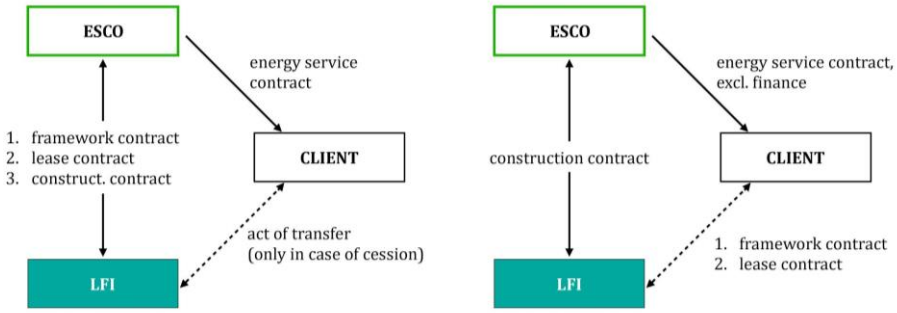


Figure 8: Contract relationship of a leasing agreement with ESCO (left) or Client (right)

According to ESSI, "the LFI takes over financial and administrative services and risks and concludes a framework and lease contract either with the ESCO (sometimes including a cession agreement for a part of the contracting rate) or with the client. The LFI signs a construction contract for the energy efficiency investments with the ESCO."

Cession and forfaiting of contracting rates

Another financing model under EPC is the one under which an ESCO acts as a cedent[3] and an FI acts as a buyer. This is called cession, where the ESCO hands over the contracting rates, which is paid by the ESCO's client, to the FI. The FI takes over the ESCO's right to claim the contracting rates in the future.

There are two kinds of cession:

a) **Cession**: A cession can be included in a credit or lease financing. The contracting rates that are handed over to the FI can be used as (additional) security or guarantee for the FI. The ESCO's client can directly pay all or parts of the contracting rates to the FI as agreed.
b) **Forfaiting**: A cession that is implemented without a financing agreement (credit of leasing) beforehand is called forfaiting. The FI takes over the contracting rates and pays the discounted present value one time directly to the ESCO.

What are the recommendations for implementing EPC projects?

Here are some recommendations for implementing EPC projects from the STREETLIGHT EPC Project:

- Good technical project preparation is key. EPC is a long-lasting partnership – the right approach in project preparation is therefore key for the success of the project

[3] A cedent is a party in an insurance/guarantee contract who transfers its right to the insurer/guarantor (in our case is FI) for certain potential losses.

- LED: offers choice, requires knowing your needs. LED solutions are proven technologies that are suitable for very small and very large projects and that permit high-energy savings at high lighting comfort levels.
- Better projects through EPC. If the right approach is taken, EPC supports solutions with higher level technical quality than would have otherwise been chosen.
- Small is (also) beautiful. In order to profit from European financing mechanisms, projects need multiple-million level investments. Also, in principle, specific transaction costs in relation to savings decrease with the project size, making more projects economically viable.

Toolbox and Materials

- **Guide to Streetlight Refurbishment with Energy performance Contracting**
- **Checklist for Streetlight Refurbishment with Energy performance contracting**
- **Quick check lighting refurbishments: hall**
- **Quick check lighting refurbishment: outdoor parking**
- **Policy recommendations from the STREETLIGHT EPC Project**
- **How to implement smart street lighting**
- **Real-life examples of Siemens's intelligent street lighting**

Related Projects:

- **Streetlight-EPC:** Creating demand and supply for EPC street lighting refurbishment projects in 9 regions in Europe by setting up regional EPC facilitation services
- **PARIDE:** Province of Teramo (Italy) provides technical assistance to accelerate the implementation of tangible investments on energy efficiency in the street lighting sector
- **ICP Europe Protocols:** Increasing confidence in project performance while reducing due diligence-related transaction costs, one of the focuses is street lighting
- **DYNAMIC Light:** Towards, dynamic, intelligent and energy efficient public lighting
- **TRANSPARENSE:** Increasing Transparency of Energy service markets
- **EnPC Intrans:** Capacity building on energy performance contracting

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PROSPECT

Learning Handbook
Transport Module

Develop sustainable transportation systems using innovative financing schemes.

This module covers the provision of and management of mass transit systems by public authorities, as well as private transport.

PROSPECT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 752126

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Module Description

The module on transport covers the provision of and management of municipal fleet (public works, school buses, fire, police, etc.) and mass transport systems by public authorities, as well

as private and commercial transport. Actions under transport include municipal fleet procurement and mobility management.

Module Objectives

Mentee

At the end of this module, mentees can achieve the following learning objectives:

- Understand the innovative financing schemes relevant under transport
- Recognize the barriers, incentives, advantages, and disadvantages of the innovative financing schemes
- Examine which sustainable energy and climate action projects can be financed by innovative schemes
- Analyse the success factors and lessons learnt from successful projects financed by innovative schemes

Mentor

At the end of this module, mentors can achieve the following learning objectives:

- Share content knowledge on the topic of innovative financing schemes that are relevant under the transport module
- Share practical experience on implementing sustainable energy and climate action projects and support others in overcoming different barriers
- Showcase sustainable energy and climate action projects successfully financed by innovative financing schemes in their municipality/ region
- Learn from mentees cities and regions on what projects they want to implement and which innovative financing schemes they want to apply

Sectoral Challenges

In Europe, more than 60% of the population live in urban areas (European Commission, 2018). Citizens share not only space, but also the infrastructure developed for mobility. If current trends continue, by 2050 over 82% of the entire EU population will live in cities, demanding more infrastructure for transportation. What is even more challenging is the ever-increasing number of city dwellers that are moving to the suburbs, creating a phenomenon of urban sprawl leading to settlement structures with longer travel distances (Eurostat, 2017).

Longer distances and inadequate public transport imply larger numbers of car ownerships which results of increasing congestion (European Court of Auditors, 2014) and infrastructure maintenance costs, while reducing availability of parking spots. Transport congestion in and around urban areas has also economic costs. Delays and pollution amount to nearly 100 billion euro each year, or 1 % of the EU's GDP. Noise, due to road traffic, is also a growing problem.

The transport sector, excluding international aviation and maritime emissions, contributed to 21% of the total EU-28 greenhouse gas emissions in 2015 (EEA, 2017b). Furthermore, from 1990 to 2015, road transportation was the only of the largest key source categories for CO2 emissions that hasn't been reduced in the period, presenting the highest increase in absolute terms of CO2 among all energy-related emissions and accounting "for 24 % of CO2 emission in 2015" (EEA, 2017a).

These transport-related challenges have pushed cities to find new ways to improve mobility while, at the same time, reducing congestion, accidents, and pollution. Local governments, knowing more about their circumstances, are in the best position to create solutions for these transport challenges. In fact, the 2030 climate and energy proposals aim to intensify the EU's strategy to set ambitious CO_2 standards for vehicles. For example, public authorities are required to take account of life time energy use and CO_2 emissions when procuring vehicles, and there is a target to reduce the greenhouse gas intensity of fuels by 6% by 2020 (https://ec.europa.eu/clima/policies/international/paris_protocol/transport_en).

Typical Challenges

Political - National, Regional and Local

Regions and cities seems to be committed in changing the current situation of urban transportation (Isaksson & Storbjörk, 2012), from private car ownership towards enhanced public services. However, the overall trends suggest something different. Personal mobility and car-use have constantly risen. Transportation require both long term planning and a holistic approach in order to improve its efficiency in the long term. Among the factors to take into account when planning are spatial planning, design, modal split, and accessibility (Forward et al., 2014).

Incompatible Infrastructures and Standards

The majority of the existing transport infrastructure in Europe have been created with the purpose to serve national rather than European economy. The consequences of this tendency are cross border bottlenecks that limit the integration of European transport and the consequent

growth of European economy (Golińska & Hajdul, 2012). Another significant challenge is the lack of comprehensive standards for infrastructure design, power supplies, traffic management and data exchange.

Typical Projects

Creation of biking lanes, awareness campaigns on the use of public transports, and mobility planning are among the typical projects to achieve sustainable transportation. Other projects, drawn from SEAP ALPS Project, under transport can include the following actions with their features – from CO2 saving potential and estimated costs for municipality to target groups and key actors.

Table 1: Example of actions under transport

Action	CO_2-saving potential	Estimated costs for municipality	Cost-benefit ratio	Implementation time frame	Target group	Key actors
Mobility management of municipal fleet	High	Medium	Medium to high	1 month	Municipality	Municipality, municipal staff
Bicycle promotion actions	Indirect - Medium	Medium - high	Medium	Months - Years	Municipality, citizens, companies, schoolchildren	Municipality, citizens, traffic consultants
Mobility action plans	Indirect - Medium	Medium - High	Medium	Months - Years	Municipality, citizens, companies	Municipality, citizens, traffic consultants
Attractive public transport system	High	high	Medium to high	1 year	Municipality	Municipality, citizens, bus companies
Tools to foster environmental friendly traffic in cities – congestion charge	Indirect - Medium	medium	Medium to high	Months - Years	Municipality, citizens, companies	Municipality, citizens
Pedestrian promotion actions – infrastructure	Indirect - Medium	medium - high	medium	Months - Years	Municipality, citizens, companies, schoolchildren	Municipality, citizens, traffic consultants
Implementation of car sharing for citizens and enterprises	medium	none - low	medium	1 year	Municipality, citizens, companies	Municipality, citizens, public transport, private car sharing companies

Funding Sources

How can public authorities finance sustainable energy and climate action projects? There are different options for financing projects – from the city or municipality's own resources through direct budget allocation and via revolving funds to using grants from sub-national or European funds and the involvement of energy service companies (ESCOs) for energy performance contracting and financing by citizens through crowdfunding.

Table 2: Source of funds for sustainable energy and climate action projects

No.	Source of Funds	Description
1	**Own Local (City or Municipal) or Regional Budget**	Funds drawn from the budget of local or regional public authorities
2	**National Funds**	Subsidies provided by national governmental bodies or funding through grants from national programmes
3	**European Funds**	
3.1	Managed at the EU level	Funds that provide technical assistance and project development, usually for demonstration / pilot projects (e.g. European Innovation Partnership on Smart Cities and Communities, INTERREG Programmes, such as the North-West Europe Programme)
3.2	Managed at the national, regional, or local levels	Funding resources and technical assistance, such as the European Structural and Investment Funds, which are managed by national, regional, or local public authorities in partnership with the European Commission through operational programmes based on strategic goals or investment priorities
4	**European Banks**	These include European Investment Bank, European Fund for Strategic Investments, Private Finance for Energy Efficiency, European Energy Efficiency Fund, and European Bank for Reconstruction and Development
5	**Private funds**	Financing provided by private contractors, utilities, by institutional investors, crowdfunding, and through energy cooperatives

For financing opportunities for local climate and energy actions from the Covenant of Mayors learn more here: quick reference guide. The guide shows who the beneficiaries are, the participating countries, the focus areas, type of funding, managing structure and coordination, and further information.

Innovative Financing Schemes

Innovative financing schemes are non-traditional ways of raising funds and facilitating sustainable energy and climate investments for cities and regions by mixing different sources (own fund, public and private funds) or engaging different partners (e.g. citizens, private sector) aside from established financial institutions (e.g. banks). Considering the availability of best practices, we will only focus on green bonds in this module.

Table 3: Innovative financing scheme under transport

Financial Schemes	Description
Green bonds	Local government (or their agencies) can issue green bonds to fund their sustainable energy and climate projects. A green bond can operate as a normal bond, which is a debt that will be paid back, depending on the characteristics of the bond, with interest. These can be made attractive via tax-exemptions.

Green Bonds

What you need to know about green bonds

Figure 1: Green Bonds in a Nutshell (Doris Kramer, 2018)

What is a green bond?

Green Bonds are bonds where proceeds are exclusively applied to finance or refinance, in part or completely, new or already existing green projects. In this module, we focus on green projects in the sector of transport. These can be bicycle promotion, car sharing, or other projects presented in Table 1: Examples of projects under transport.

Who can issue a green bond?

Green bonds can be issued by:

- City governments
- Utilities: water, transport, energy, etc.
- Corporations that are developing, building or managing green assets for issuers
- States or development banks

What is the difference between a normal bond and a green bond?

As any bond, green bonds are financial assets used for raising capital from investors through the debt capital market. During "maturity" phase, the issuer - whether governments, corporations, banks, or individuals - raises a fixed amount of capital from investors; when the "principal" phase is reached, the issuers repay the capital with an agreed amount of interest called "coupons".

The difference between green bonds and other regular bonds is the term/label "green", which assures the bonds' proceeds will be exclusively used to finance or refinance "green" projects that result in environmental benefits (OECD, 2015).

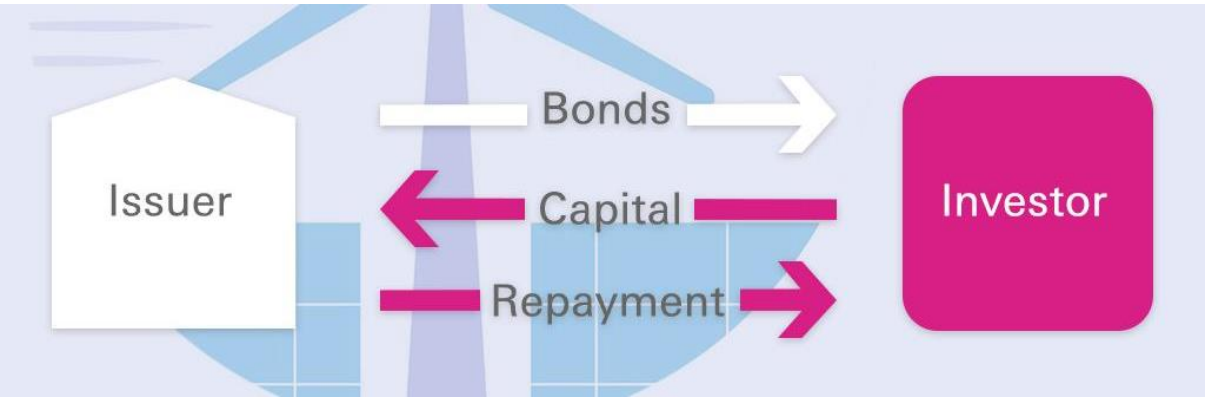

Figure 2: Issuer and Investor in the Green Bond market (Deutsche Bank, 2014)

Which are the existing standards for Green Bonds?

There are different standards the most renowned are The Green Bonds Principles (GBP) and the Climate Bonds Standards (CBS). Nowadays, all bonds labelled as green are aligned with the GBP (or GBP-based frameworks). The GBP is the "de facto" market standard for green bonds. The CBS, which integrates the GBP, are still relevant as they include "more detailed sector specific eligibility criteria and have a certification mechanism."(European Commission, 2016)

As an example, the city of Paris issued green bonds, declaring: "*The City of Paris is committed to the wellbeing of its population, sustainable development, and supporting the French economy. As part of this commitment, the City of Paris has elected to develop a Sustainability Bond Framework in accordance with the Green and Social Bond Principles 2017, for the future issuance of Climate and/or Sustainability Bonds*" (City of Paris Sustainability Bond Framework.)

Table 4: Types of Bonds (Adapted from Climate Bond Initiative, 2018)

Type	Proceeds Raised by Bond Sale	Debt Recourse	Example
General Obligation Bond	Earmarked for green projects	Full recourse to the issuer; therefore same credit rating applies as to the issuer's other bonds	As of 31 December 2016, European Investment Bank (EIB) remains the largest issuer of Green Bonds with over EUR 15bn raised across 11 currencies, of which the EUR equivalent of 3.8bn so far this year. The EIB provides the market with benchmark Green Bond issuances in EUR, USD and GBP, but has also issued CABs in SEK, CAD, ZAR, CHF, AUD, JPY, TRY and BRL (in synthetic format). EIB is increasing liquidity, size, and scale of Green Bond issuance, in addition to gradually building green reference yield curves. For more information, see: http://www.eib.org/
Revenue Bond	Earmarked for green projects	Revenue streams from the issuer, such as taxes or user fees, provide repayment of the bond	Iowa Finance Authority issued $321,5 millions of State Revolving Fund revenue bonds in February 2015, with 1- to 2- year tenors, 1 to 5 percent coupon, rated AAA. The green bonds were backed by water-related fees and taxes. Proceeds were earmarked for water and wastewater projects.
Project Bond	Ring-fenced for the specific underlying green project(s)	Recourse is only to the project's assets and revenue.	No issuance seen in the market yet
Securitized Bond	Either (1) earmarked for green projects or (2) go directly into the underlying green projects.	Recourse is to a group of financial assets that have been grouped together as collateral.	Hawaii State Government issued $150 million, AAA-rated of green asset backed securities in November 2014. The securities were issued in two tranches: $50 million, 8 years, 1.467 percent coupon and $100 million, 17 year, 3.242 percent coupon. The bonds were backed by a Green Infrastructure Fee applied to the bills of the State Utility's electricity customers. Proceeds went to loans to install distributed solar panels, connectors, and storage
Municipal Bond	Either (1) earmarked for green projects or (2) go directly into the underlying green projects.	Recourse is to a group of financial assets that have been grouped together as collateral.	In 2013, Gothenburg issued its first green bonds for SEK 500 million. The city made a second foray into the green bonds market in 2014 with a SEK 1.8 billion issuance, a third issuance for SEK 1 billion in 2015, and a forth issuance for SEK 1 billion in 2016. To date, the city has been able to raise a total of SEK 4.36 billion via the financial markets. Gothenburg's green bonds are the first financial product that allows mainstream investors (about 98% of the capital market) access to climate financing at no additional cost. (Gothemburg Green Bonds, Sweden)

The EU green bond market is generally well developed due to its well-established existing finance infrastructure; the active involvement of EU based organizations and political support. However, there are significant differences in the green bond market development across EU Member States, caused mainly due to the differences in the national bond market development and policy frameworks. The EU green bond market is led by Multilateral Development Banks (such as EIB, EBRD), municipalities (e.g. Ile de-France, Gothenburg) and corporations (e.g. utilities and producers of green solutions) (European Commission, 2016)

In order to develop an overarching strategy in this area, the European Commission set up a High-Level Expert Group (HLEG) on sustainable finance at the end of 2016. The group was tasked to prepare a comprehensive blueprint for reforms along the entire investment chain.

Figure 3: Tasks of the technical expert group (European Commission, 2018)

Who are the actors involved?

The main actors in the market can be categorized as **issuers** (entities with green projects needing funding or refunding), **underwriters** (financial institutions arranging the issuance of the green bonds), **external reviewers** (verifying the "greenness" of the underlying projects) including rating agencies, intermediaries (such as stock exchanges), and **investors** (particularly those with a mandate to invest in green assets).

Issuers of green bonds may benefit from reputational gains and upgraded environmental risk management processes due to commitments to green disclosure. On the other hand, bond investors, especially long-term and responsible investors, are provided with an emerging class of green assets and more opportunities to actively engage with issuers on ESG (Environmental, Social, Governance) factors related to the financed projects (European Commission, 2016).

What are the roles of each actor?

Issuer: It is the main actor, the entity that decides to create the bond for financing green projects.

Underwriter: In support of the issuer, generally is a bank that provide the economic and environmental knowledge necessary to structure the Green bond and its framework

External Reviewers: An external actor, it provides an independent assessment on the green bond framework created by the issuer and the underwriter.

What are the advantages for the issuer?

Local governments that set up a Green Bond normally mention the following advantages (OECD, 2017):

1. Demonstrating and implementing issuer's approach to ESG issues
2. Improving diversification of a bond issuer's investor base, thereby expanding funding sources and potentially reducing exposure to bond demand fluctuations
3. Strong investor demand can lead to oversubscription and potential to increase issuance size
4. Evidence of greater proportion of "buy and hold" investors for green bonds which can lead to lower bond volatility in secondary market
5. Reputational benefits (e.g marketing can highlight issuer's green credentials and support for green investment)
6. Articulation and enhanced credibility of sustainability strategy (putting one's "money where their mouth is) leading to enhanced dialogue with investors
7. Access to "economies of scale" as majority of issuance costs are in setting up the processes

Other less common advantages related to green bonds are:

1. Tracking of proceeds use and reporting leads to improved international governance structures, communication and knowledge sharing between projects side and treasury side of business (G20 Green Finance Study Group, 2016)
2. For municipalities, a tool to reach constituencies physically located close to the green project they intend to support and provide them with opportunities to invest in programs that have direct proximal impact (World Bank Group, 2015)

What are the common challenges?

Green Bonds are a recent financial instrument to support green investments and international organizations and banks are currently developing standards in order to regulate and stream the growth of this emerging market. Because of these, most of the current barriers to setup a Green Bond are based on the lack of knowledge on the green bond technical requirements and on the

impediments to access the green bond market. Here are the barriers adapted from G20 Green Finance Study Group (2016):

Financial related barriers:

- Costs of Meeting Green Bond Requirements
- Difficulties for International Investors to Access Local Markets
- Lack of Domestic Green Investors

Knowledge related barriers:

- Lack of Awareness of the Benefits of Green Bonds
- Lack of Univocal International Guidelines and Standards
- Lack of Green Bond Ratings, Indices, and Listings
- Lack of Supply of Labelled Green Bonds

What are the prerequisites to set up Green Bonds?

The key factors that influence a city's Green Bond strategy are (Padraig Oliver & Climate Policy Initiative, 2016):

- National regulation dictates whether a city is legally able to issue their own bonds in domestic or international capital markets and currencies
- The size and risk profile of the green infrastructure investment indicates the likely investor segment to target
- The creditworthiness of a city's own balance sheet established either through a rating from an external credit rating agency or implicitly rated through external due diligence dictates its attractiveness to investors. Investment-grade credit ratings denote if the city has a low risk of default with typical thresholds at BBB- or Baa up to a AAA maximum rating.
- A city's level of engagement with or ownership of other organizations that have access to capital markets and may want to include city-based green projects in potential bond issuance, including:
    - City-based entities such as public utilities or agencies that city administrators exert a degree of control over
    - Public-private partnerships
    - Commercial banks or private sector companies with access to capital markets
    - National-level development agencies and banks
    - Multilateral or bilateral development agencies and banks

Some cities may have all these variables in place, while others can find limited options. You can easily check your options for developing a Green Bond strategy by using the decision-tree below:

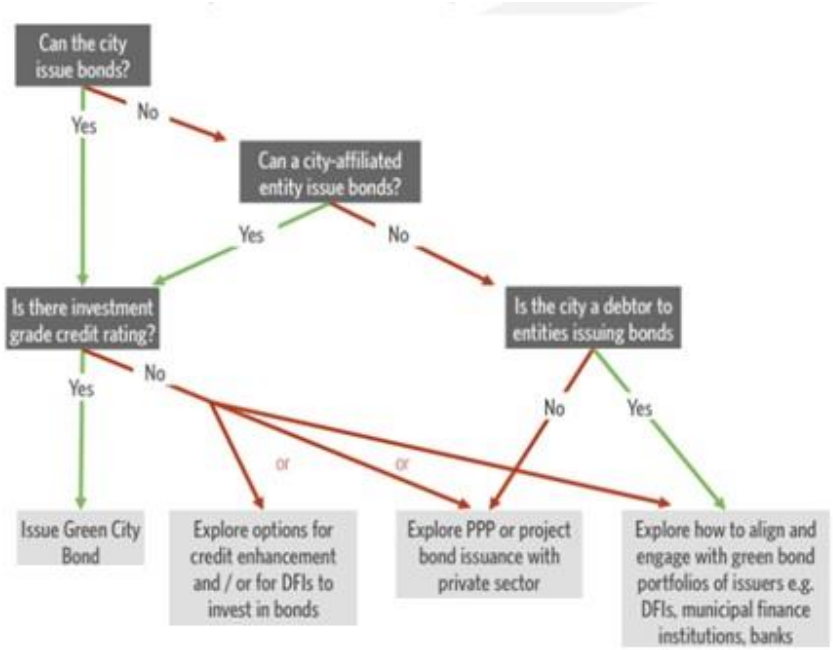

Figure 4: Decision Tree for Municipalities (Padraig Oliver & Climate Policy Initiative, 2016)

What are the steps for issuing Green Bonds?

The process has three (3) different phases: Pre Issuance, Issuance, and Post-Issuance, which are further explained below.

What is the Pre Issuance Phase (Phase I)?

It is the preparation for issuing the green bond. The first step is to **identify and qualify Green Projects and Assets**. Here the "greenness" of the issuing entity doesn't matter, it is all about the project or the specific physical asset. Therefore, if you are able to issue a regular municipal bond, you can also issue a green bond as long as there are green assets or projects (Green City Bonds, 2015).

Also, it is essential to set up an **independent review** who will help to identify green assets, protecting the issuer reputation. In a further stage, the issuer needs to establish the right procedures for **tracking and reporting** the use of the proceeds. "To ensure all proceeds are applied to green projects, the sum of the cash on hand and amounts invested in assets or projects must not be less than the amount of the bond." (Green City Bonds, 2015)

In summary, the key steps of the Pre Issuance Phase are:

- Analysis of the green bond market, to check risk and opportunities given by the issuance of the bond. Capital and debt markets should be regulated and stable, in order to minimize the risks.
- Creation of a Green Bond Framework, to structure the bond and to align it with international standards.
- Verification of the Green Bond Framework (and offer) by an independent institution, to assess quality and coherence of the Framework.

What is the Market Analysis?

The market analysis supports the issuer to verify the existing conditions to access the green bond market. Through this preliminary analysis the issuer can check how feasible and convenient it is to issue a green bond; for example, by checking opportunities and threats offered by the market. This phase is focused on three aspects:

- Analysis of Existing Assets
- Target Investors
- Assessment of Environmental Risks & Opportunities

While assessing risks and opportunities inherent to the business of the company, the issuer should give special attention to environmental aspects. "This is because these issues will be subject to the analysis of potential investors." (FEBRABAN & CEBDS, 2016)

What is the Green Bond Framework?

The Green Bond Framework is the core of the pre issuance phase. In this document the issuer firstly provides and overview of its commitment to sustainability issues, generally through the support of a financing institution (i.e. bank) that acts as "underwriter". Then there is a clear statement of how the bond will be aligned to the 4 Green Bond Principles, which are:

1. Use of Proceeds

2. Process for Project Evaluation and Selection

3. Management of Proceeds

4. Reporting

To have a practical example of what the framework is please check the link: FRAMEWORK FOR A TFL GREEN BOND - London Case Study

What is External Review?

The issuer should use an external reviewer to confirm the alignment of their Green Bonds with the key features of the GBP. The external review can be performed through:

a) Consultant Review
b) Verification
c) Certification
d) Rating

The review may be partial or used only to cover certain critical aspects of the issuance phase. Although there is this chance it is suggested that the external review should be performed on the entire framework as well as it should be open to public consultation.

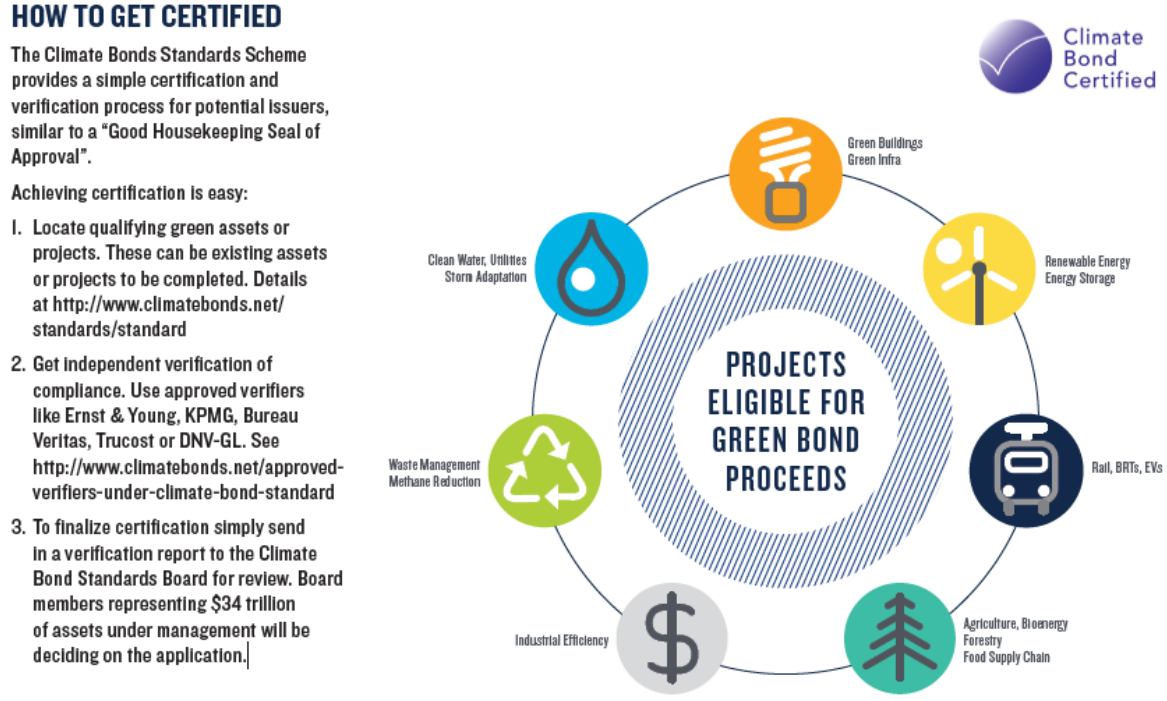

Figure 5: Example of Certification: Climate Bond Initiative (Green City Bonds, 2015)

What is the Issuance Phase (Phase II)?

Key steps of the Issuance phase are:

- Preparation of the offer:
  - The preparation of a Green Bond offer is very similar to that of a conventional bond, thus the issuance will follow the rules and procedures applicable to the type of bond chosen for the operation.
  - The preparation of the offer includes a series of documents to support the issuance (such as the issuance indenture, rating report, corporate documents of the issuance approval, and audited financial statements of the issuer), which may vary depending on the type of bond used.

- Structuring the offer:
  When applicable, the issuer must choose the financial institution that will structure the bond offer

- Presentation of the offer to potential investors:
  This happens through a series of presentations (roadshow) made with the support of the underwriting bank.

- Offer distribution and allocation:
  The Bond is placed on the Market, they can circulate among the major stock markets as the London Stock Exchange Market.

Actors Involved:

- Issuer
- Underwriting Bank, it structures the bond offer and can act as sustainability consultant
- Investor

Interpreted from:

(FEBRABAN & CEBDS, 2016)

What is the Post Issuance Phase (Phase III)?

Key steps of the Post issuance phase are:

- **Monitoring and Reporting**, which consists of:
    - Annual Reports
    - List of the Projects to which Green Bond proceeds have been allocated
    - Brief description of the projects and the amount allocated
    - Expected impact of the project. Best Practice, Not mandatory
        - Transparency in communicating the expected impact
        - Monitor the achieved impact

- **Management of the Proceeds**, which implies:
    - Tracking of proceeds
    - Managing unallocated proceeds
    - Earmarking funds to Nominated Projects & Assets
    - Assessment of the process by a third part
    - Transparency

What are the monitoring and reporting activities?

It is important that the Issuer keeps up to date the information on the use of the proceeds, as previously mentioned. Therefore, an annual review should be provided for public view. The annual review should include a brief description of the projects and the amounts allocated, and their expected impact. The core aspect in this phase is transparency: the GBP recommends using qualitative performance indicators and, when possible, quantitative ones.

How is the proceeds managed?

Net proceeds coming from green bonds (or an equal amount to these net proceeds) need to be tracked by the issuer and "attested to by the issuer in a formal internal process linked to the issuer's lending and investment operations for Green Projects. So long as the Green Bond is outstanding, the balance of the tracked proceeds should be periodically adjusted to match allocations to eligible Green Projects made during that period" (ICMA, 2017).

The issuer should also inform investors about the types of temporary placement for the balance unallocated proceeds.

Best Practice

The city of London wanted to enhance and provide a better and sustainable transport service to the citizens. The expected increase of London's population pushed the municipality to consider an increase in the transport capacity of the city. In order to do that, the municipal authorities decided to align with the latest good practices.

Next to Paris, Gothenburg, Stockholm, and Orebro Kommun, London is a pioneering issuer of Green Bonds. This bond of GBP 400 million (approximately EUR 447 million) will fund low carbon transport projects from Transport for London's business plan until 2021.

London financed five eligible green project categories that could foster the mobility in the city such as low carbon transport projects, station and line upgrades on rail and underground, low-emission hybrid buses, and cycling improvements.

Table 5: Best practice in transport

Financing Scheme	City/Region	Best Practice	Source of funds
Green Bonds	Greater London Authority (UK)	Transport for London (TfL) Green Bond	Private Sector

Read more about the London green bond from the Climate Bonds Initiative or through the Transport for London website.

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