Interreg Europe

European Union | European Regional Development Fund

ERP
Energy Renovation Path

European Union
European Regional
Development Fund

REBUS
Interreg Europe

Contents

REBUS
Interreg Europe

Energy Renovation Path (ERP)

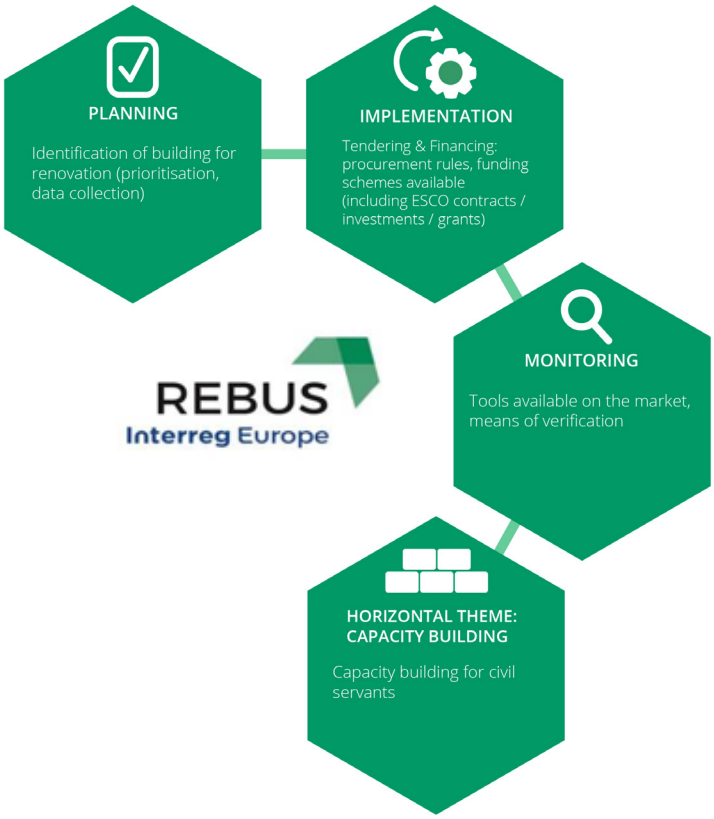
Introduction

What is an Energy Renovation Path?

The Energy Renovation Path (ERP) is a guide that intends to positively influence strategic decisions of public policy makers dealing with energy efficiency renovations in public buildings. This guide was elaborated thanks to the Interreg Europe REBUS project.

What is REBUS?

REBUS supports local authorities in planning, implementing and monitoring energy renovation works in public buildings by designing a model Energy Renovation Path (ERP) that can be applied to all renovation projects and helps to overcome most typical challenges encountered in the process. In planning, a lack of reliable information, skills and effective decision-making structures often hinders the process of prioritising buildings to be renovated. In implementation, it affects the public tender process and subsequent works. In monitoring, it leads to difficulties in selecting/using tools that can monitor project impact and post-investment consumption.
REBUS uses interregional exchange among different European regions to identify experiences to be included in the ERP, which is the tool REBUS proposes to address the identified need. Experiences refer to energy efficiency renovations in public buildings, with the focus on four main topics: Planning, Implementing, Monitoring and Capacity Building.



REBUS
Interreg Europe

Scope of the document

The REBUS ERP, developed thanks to the interregional exchange, helps public authorities to improve the following aspects of their energy policy content and management:

- Raising awareness on potential savings related to energy renovations of public buildings and improving their energy efficiency;
- Collecting feedback and streamlining data on energy efficiency needs of public buildings;
- Using this feedback to select buildings for renovation;
- Drafting tenders for renovation works that include energy efficiency baselines, targets and monitoring measures;
- Ensuring correct execution, monitoring and verification of implemented energy efficiency measures;
- Managing buildings in a more effective way after renovation;
- Increasing energy awareness and thematic knowledge of all key stakeholders; i.e. local administration, procured contractors, building managers and staff responsible for building maintenance, building users.

The Energy Renovation Path collects experiences from Good Practices identified, including useful tips and guidelines on planning, implementing and monitoring renovation works in public buildings.

The goal of the ERP is to help improve energy performance in order to save energy and thus save money to invest in services for citizens.

Planning is the vital first phase of the energy renovation process. It is of utmost importance to devote adequate time and resources to project preparation activities as the way they are executed influences all further steps: final selection of energy saving solutions and technologies, selection of the financing model, selection of the contractor, correct implementation of proposed measures and verification of real and long-term results of the project. A poorly implemented project can be always corrected but a poorly prepared project generally cannot be saved. Therefore, when preparing the energy renovation project, consult the check list below to see if all baseline requirements are in place, and then delve deeper into each requirement via the consulting tips, "dos and don'ts", useful experiences and good practices identified by the REBUS consortium.

REBUS
Interreg Europe

STEP 1: Knowing your baseline

- Establish a coherent database of all buildings under your management, which will include both static data and dynamic data . A geo-referenced database is ideal.
- Make sure that the database is regularly updated with verified new data, especially consumption data from meter readings, invoices, smart meters, etc. Verify the data, especially if it is provided by others (e.g. building managers).
- Make sure that your buildings have up-to-date documentation, including energy audits and/or energy certificates. Any documentation can be uploaded in the database for reference.
- When possible, categorise the buildings according to available data (age, type, function) to facilitate the comparison
- Establish a benchmark between buildings – generally and within each specific building category identified. Which are the biggest energy consumers? Which use more energy than the average in their category? Try to visualise data on a map to best identify or group energy-intensive buildings. Try to find out the reason for this excessive consumption and what can be improved with technical as well as organisational measures. Take notes for future activities.

[1] Static data here refers to the type, area, volume, technical and energy characteristics of the building and its key systems, type and approximate number of users.

[2] Dynamic data here refers to energy consumption, water consumption and weather reference data; e.g. heating degree days.

DOs:	DONTs:
- Create a complete building database and update it regularly. - Collect real, bottom-up data with state-of-the art methodologies and tools. - Make a nuanced categorisation of all buildings, comparing their energy characteristics and energy saving potential; this will help with the selection of buildings in regards to which should be retrofitted first. - Set up specific energy goals for each building. - Ensure the retrofitting goals are known and accepted by all parties. - Understand the municipality's long-term and holistic vision concerning energy and energy efficiency, including retrofitting of public buildings. All planned initiatives must fit within this vision.	- Don't build projects without having enough data about your building stock and its energy characteristics. - Don't stop working on a buildings database once it is established. Make sure that the data included are regularly verified and updated. - Don't rely too heavily on statistics and averages. You must have detailed bottom-up data to serve as a basis for any energy renovation project. - Avoid entering wrong data into the database. Careful verification of all information gathered is necessary. - Avoid setting unrealistic targets, based on incomplete data and wrong assumptions. - Do not forget to back-up all important files and data

Action 1: Definition of tools for data collection and setting up building inventory/database	Good practices and other relevant EU experiences
In order to define the tools and data sources needed for data collection, start defining whom the data is for and what it will be used for. For instance, the real-estate owners, tenants, technicians (maintenance) or a combination of stakeholders. The next step is defining what needs to be measured and the perspective of measuring (hours, days, months) and how to present the data. Most energy companies offer some kind of tool for handling this. There are also many systems available on the market for this purpose. There is also the possibility to develop your own system. The need for proper data collection also leads to the need for different meters in the building. Be aware that investments in new meters may be required. Remember that except for the measured data (consumption, weather data, etc.) there is also a need for collecting other data to properly plan energy retrofitting works, including static data (energy characteristics of the building and its systems; e.g. information determined via energy audits) and dynamic data (building occupancy).	The EMPOWER project The EMPOWER project uses dynamic energy monitoring to reduce carbon emissions.

Florentine Energy Agency	Energy managers in public hospitals and some public buildings, such as the Social Houses of the Firenze Municipality, collected informative energy audits stored in a detailed database, with multiple BMSs (Building Management Systems) of excellent quality. AFE recommended that the social housing of the Firenze Municipality extends the use of this BMS technology to other public buildings, and to establish a common control room to plan energy consumption and renovation measures.	
City of Malmö	The system used for monitoring energy use in Malmö is called E4. In this system, the user registers electricity, water, district heating and gas. E4 is supplied with information from their various energy suppliers, with data related to electricity usage delivered to E4 on a daily basis. At the moment, the E4 only delivers a comprehensive data compilation on a monthly basis, but since the data is gathered daily, this change can be implemented quite easily. When setting up a database, it is important to establish and secure the energy statistics that will be entered into the database. This step is necessary to properly analyse the data later. Questions to be addressed include: *What exactly should be measured, and how is it possible to secure that this will be measured and controlled for (e.g. nothing else added or withdrawn)? How can you secure that this will be measured properly both before and after the renovation?*	
BORA 94	In order to receive support from the targeted policy instrument (TOP), each applicant must provide an energy certificate for the renovations. This energy certificate outlines the current situation of the targeted building(s), including comprehensive energy consumption data. The format and content of the energy certificates are determined by Hungarian law. The energy consumption of the buildings should be proven through utility bills, but well-supported estimations from energy experts are also accepted. A major data collection process concerning public administration owned buildings was implemented on national level in Hungary on 2013 (National Building Energy Performance System, managed by ÉMI).	

PNEC	In Poland, some examples from the pilot implementation of different data collection tools and inventories can be used as reference by other municipalities; for example: - The online data collection tool implemented by Częstochowa—each month, representatives of all municipal buildings log into the system and provide data on the last month's consumption of utilities (gathered from meter readings or invoices). Data from all buildings are collected in one database and thus can be monitored and benchmarked. The building representatives have been adequately trained to properly use the system and understand meter readings/invoices. - The energy management system following ISO 50001 implemented in Dzierżoniów municipality—the system includes a database of buildings with historic and current data on utilities consumption, enabling comparison of the current consumption to the established baseline (and thus checking which buildings consume more/less than expected, which are improving, etc.). The data is collected and periodically verified with the help of building managers. - Smart metering systems implemented in the Niepołomice municipality, which enable more advanced data analytics.	
SERDA	The South-East Region of Romania-Buzau utilises some tools and inventories containing energy consumption data, CO2 emissions and a set methodology. However, the system of data collection and analysis needs to be clearer and bettered integrated. The action lines were established in Sustainable Energy Action Plan 2015-2020- PAED South-East Region of Romania-Buzau. A new template containing integrated data serves as a solution to this issue and will act as an effective measuring tool. The template includes: 1. Energy surveys (audit energetic) 2. Energy bills 3. CO2 emissions 4. The values for the Primary Energy consumption, 5. Heating energy demand 6. Cooling energy demand 7. Hot water energy demand 8. Thermal comfort 9. Internal air quality 10. Area 11. Number of users 12. Age of users 13. Location: urban, suburban or rural area 14. Construction year	

Durham County Council	A concern of Durham County Councils' is whether a database is effective, user friendly, readily available and compatible with existing databases. Durham County Council has installed in their municipal buildings a piece of software called "Energy Manager Live" (powered by Systemslink), which is an energy monitoring and targeting software system that processes large amounts of complex data on gas, water, electricity, oil and biomass. Since this software was installed in 2010, it has helped reduce up to 25% of energy costs in some buildings. The software also features an interactive portal created for each site, so that building users and managers can see how much energy they are using and compare current and past consumption. This raises awareness of energy consumption and costs, and has increased transparency for the bill payer. Energy consumption data is collected half-hourly for each site, meaning that the data can be managed by almost immediately identifying energy waste (such as boilers being left on overnight), water leaks and billing mistakes. In addition, invoice data and direct meter reads from premises managers are added to corroborate the data.	
Region of Crete	A template was created following national legislation requirements. Energy managers filled in the template with all the characteristics of each building in terms of energy consumption in order to create the database.	

Action 2: Collecting data on energy use, energy performance and past renovations of the public buildings;	Good practices and other relevant EU experiences
Data collection is one of the most important steps when working strategically with energy reduction. Accurate and ideally long-term data (min. 12-month data for the baseline determination) is essential for taking on this work. The data should be saved as long as the building exists, in order to be able to continually work with energy reduction. The building as well as the refurbishment of the building is often quite static, but the operations in the building could differ on occasion. It is useful to save this kind of data and to use this data to improve operational performance of the building as well.	Building Typologies and Performance Indicators Platform from the Impulse project

Florentine Energy Agency	There are some good examples of collecting energy usage data in the Versilia and Arezzo hospitals, where monitoring in real time with BMS is possible. Here, there is also is an agreement with the private companies of the external services, so they can collect and use any kind of data. The monitoring system is obligatory in the projects in order to take part in the regional call that allocate ERDF funds.	
BORA 94	Although local governments have data on energy consumption through utility bills in Hungary, in many cases this is not collected and not examined from an energetic point of view. In case of previously retrofitted buildings, energy certificates are typically only available if the particular call had such requirement for it.	
PNEC	There are increasingly more examples of Polish municipalities regularly monitoring energy consumption in their buildings. They use different tools for monitoring, mostly Excel-based, but there are also examples of more advanced tools (i.e. online databases, smart metering). Regarding overall energy performance, in principle each energy-retrofitting project is preceded with an energy audit, which provides input on the overall energy characteristics of the buildings and its key systems. - What is often lacking in Poland is the original construction documentation of the building and information on past interventions. There is, therefore, a need for collecting missing historic data, which is often done on the occasion of the energy audit; however, this causes the procedure to be more costly. Smart metering systems implemented in the Niepołomice municipality, which enable more advanced data analytics.	

SERDA	According to the law, is mandatory for the building managers to achieve an energy audit for each building. It is also mandatory for the public building managers to publicly display their energy certificate. The incomplete database is kept in the INCERC Institute in Romania, but unfortunately is unused by the authorities. Regarding Romanian public buildings, a database storing data on energy, maintenance and renovation costs exists but only on an informative level. Its use is mandatory from the planning phase until the end.	
Durham County Council	DCC has obtained historic data from existing records or software, backfilling any gaps with data from energy providers, or by using building profile consumption patterns. DCC owns hundreds of sites and therefore it is common for metering issues to cause gaps in energy data. This data can amount to significant omissions from a building's energy profile; therefore, establishing good relationships with their energy suppliers is very important in backfilling the missing data. Having a complete energy record for a building then allows past and present consumption to be examined and the benefits of energy renovations accurately assessed.	
Region of Crete	According to Greek legislation, since 2015 an energy audit for each public building is mandatory. The audit results and energy certificate must be publicly displayed and all data is gathered in a governmental database, which aims to create the baseline of energy data use and public buildings' energy performance. However, data from past renovations prior to 2015 is missing. At the same time, there are some regional and local databases (e.g. Excel sheets) with maintenance and renovation costs available for use, but only on an informative level and are occasionally used and updated from the planning phase until the end.	

Action 3: Understanding of all important land/ building ownership/ conservation issues	Good practices and other relevant EU experiences
It is important to understand and consider all relevant roles and legislation, as well as cityscape and conservation issues when planning renovating/retrofitting. This knowledge should be included within the chosen tool (or while developing your own tool) and permanently available within the local administration. Each issue should be constantly monitored to ensure up-to-date and accurate information.	Database created by the Sherpa Interreg-Med Project

Florentine Energy Agency	The refurbishment of Versilia Hospital offers a good example for the understanding of all land, building ownership and conservation issues, as the overall planning phase took into account conservation issues and limitations of the land. Insulation, renewable energy, promotion of technological innovation, monitoring the provision of energy services, control of lighting, heating and air-conditioning activities were all tailored to the specific building being renovated.	
City of Malmö	It is important to understand and consider roles and legislation as well as cityscape and conservation issues when renovating. The City of Malmö normally involves other authorities as well as tenants early in the process.	
BORA 94	Before realising any (in most cases EU funded) energy refurbishment projects, rules and legislation issues for proper planning are respected, including the specific regulations on heritage buildings and conservation issues.	
PNEC	Planning for energy refurbishment projects is imposed by the law. In case of historic buildings, all refurbishments must be consulted with the heritage conservator and his/her guidelines must be followed throughout the process.	
SERDA	The law provides the direction, the rules and other specific issues for energy refurbishment projects, but a monitoring organisation is necessary in order to maintain the investment on the long run.	
Durham County Council	DCC as an organisation contains the in-house expertise to examine ownership and conservation issues that may be affected by the installation of renewable or energy efficiency technologies. These issues are investigated during the project planning process to ensure all legislation is followed and opportunities maximised.	

Region of Crete	According to Greek legislation, in each public building a person should be appointed as Energy Manager who is responsible on the building's energy issues. Nonetheless, in some cases the person appointed is overwhelmed by his/hers workload which prohibits its duties on energy. This problem can be overcome by establishing an entire energy management team, rather than a single Energy Manager.	

STEP 2: Ensuring availability of necessary skills, capacities & structures

- Establish what skills and expertise are necessary to successfully prepare and carry out an energy renovation project. Can you utilise the necessary skills and expertise within the local administration?
- If not, what can be done to obtain these skills and capacities? Train municipal staff? Hire new personnel? Hire external experts for the project? Cooperate with another municipal or regional authority's technical service?
- If not done already, consider hiring or appointing a permanent energy manager, who will be responsible for overall energy management and all energy-related projects implemented in a municipality. The cost will pay back quickly!
- It is also worth considering appointing an energy manager and/or setting up an energy team on the building level

DOs:	**DONTs:**
- Plan for continuous training of the personnel - Hire an energy manager. If not possible, establish cooperation with experienced energy expert, with relevant references - Assign energy responsible on the building level - Establish structures/regime that will help to ensure that energy efficiency is considered in all local projects and initiatives	- Don't be afraid to seek external support in case you don't have enough capacities within your own administration. - Don't underestimate the role of training and exchange of experience. Encourage your staff to participate in training and networking activities and allow them to devote some working time for it.

Action 4: Ensuring necessary skills and capacities within local administration to successfully prepare, implement and monitor energy renovation project	Good practices and other relevant EU experiences
Planning, implementing and monitoring of energy renovation projects, as well as ensuring that they fit into local strategies and policies, requires adequate technical, legal, financial, organisational skills, which should be permanently available within the organisation (and not just for a specific project). Establish exactly what these skills and capacities are and make sure that they are available in your local administration. If not, consider what can be done to obtain them. Training existing staff? Hiring new employees? Establishing cooperation with external consultancies or other regional authorities? Consider hiring or appointing an energy manager, who will be responsible for all energy issues, including overseeing of energy consumption in all public buildings and supervising energy renovation projects.	Eco-advisors network in Poland; Training for employees of Local Energy Management Agency in Hungary The Big Switch Off

BORA 94	The employees of the Energy Agency participated in an SEAP-driven, five-day training, receiving the required knowledge and skills for the operation. The main goal was to incorporate the content of the SEAP in the everyday operation of the employees of two neighbouring municipalities, Rácalmás and Mezőfalva. The extensive programme included the following: climate issues, energy production, energy efficiency in buildings, green public procurement, strategic planning in Energy Management Agencies (SEAP, SECAP). The training was practical, including study visits to underpin the knowledge acquired. The Agency is established and running and a pilot investment, a geothermal heat pump, was installed in a local kindergarten. Trainings and practical handbooks were delivered to ensure wide-scale dissemination of project results.	
Durham County Council	The Big Switch Off good practice from Durham provides support and advice for staff who may or may not have energy management as part of their job role. The support and guidance supplied by the Low Carbon Economy team at Durham enables staff to make more informed decisions on how their behaviour has an impact on energy usage. This is not high level but has led to significant savings in energy use across the authority's estate.	
Region of Crete	n Greece, the planning, implementation and monitoring of energy renovation projects is ensured by each authority's technical service staff. If this is not an option, a cooperation with external consultancies or other regional authorities is established.	

Action 5: Assigning energy personnel responsible on the building level	Good practices and other relevant EU experiences
Each building should have a person who is responsible for energy issues, including monitoring energy consumption and invoices, proper maintenance of the building and its energy systems and implementation of simple energy saving measures. The person should be involved in any energy renovation project from the very beginning. This may be either a trained staff member (e.g. caretaker) or a new person hired for this purpose. Consider also going one step further and establishing a whole energy team, as in the Euronet 50/50 MAX project. This process will help to involve key users in the energy management and renovation process.	The Euronet 50/50 MAX project School Carbon Reduction Programme The Big Switch Off

PNEC	PNEC participated in the EURONET 50/50 MAX project from 2013-2016, aiming to mobilise energy savings in public buildings through the implementation of the 50/50 methodology in 500 schools and nearly 50 other public buildings from 13 EU countries. The 9-step methodology increases energy awareness of the building users and actively involves them in energy–saving actions. Achieved financial savings are shared equally between the building users and the local authority which covers the energy bills. EURONET 50/50 MAX was supported by the European Commission through the Intelligent Energy Europe (IEE) programme. The project will widely disseminate the 50/50 concept on the European and national levels to encourage more public authorities to implement the 50/50 methodology in their buildings. The project is a continuation of the very successful EURONET 50/50 project which tested the implementation of the 50/50 methodology in over 50 European schools and won the European Sustainable Energy Award 2013. Thanks to the new project, the 50/50 network will spread across Europe involving new schools and other public buildings.	

Durham County Council	Both of Durham's good practices focus on raising awareness and providing guidance and support for building managers to control and ensure they are energy efficient. This is done in public buildings through the Big Switch Off and in our schools through the ECO2 Smart Schools Programme (formerly School Carbon Reduction Programme). As budgets are often managed at a building level (particularly with schools) then the onus is on them to maximise their energy efficiency and keep the financial savings.	
Region of Crete	Each building should and in some cases have a person that is responsible for energy issues. Nonetheless, this person is often overwhelmed by their workload which prohibits their duties on energy. This problem can be overcome by establishing an entire energy management team, rather than a single Energy Manager.	

Action 6: Ensuring that the energy efficiency perspective is considered in all planning, investment and management activities related to public buildings	Good practices and other relevant EU experiences
An energy efficiency requirement should be embedded into all development decisions and political manifestos. The **horizontal theme of capacity building** is an essential precursor to instil a shared culture of sustainability, therefore avoiding sustainability being framed as a single issue instead of the overarching issue. A powerful tool for staying focused during energy projects is to have energy efficiency as a separate task on the agenda for all project meetings, as well as involving an energy expert from the project start to its end. A project's risks often occur when going from the planning phase to the implementation phase, or from implementation to maintenance. The energy expert can ensure that project goals are successfully transferred from one phase to another.	Training for employees of Local Energy Management Agency in Hungary

City of Malmö	The City of Malmö secures the success of energy efficiency projects by determining the goals for energy use before the project begins. Throughout a project, energy is always a point on the agenda of project and production meetings. Energy usage is calculated to ensure that the goals are measured and fulfilled. This energy calculation is used even after project completion to optimise energy usage during the building's lifecycle.	

BORA 94	The employees of the Energy Agency participated in an SEAP-driven, five-day training, receiving the required knowledge and skills for the operation. The main goal was to incorporate the content of the SEAP in the everyday operation of the employees of two neighbouring municipalities, Rácalmás and Mezőfalva. The extensive programme included the following: climate issues, energy production, energy efficiency in buildings, green public procurement, strategic planning in Energy Management Agencies (SEAP, SECAP). The training was practical, including study visits to underpin the knowledge acquired. The Agency is established and running and a pilot investment, a geothermal heat pump, was installed in a local kindergarten. Trainings and practical handbooks were delivered to ensure wide-scale dissemination of project results.	
Durham County Council	Durham has a Carbon Management Programme Board involving senior local authority Officers. This group drives forward strategy on reducing carbon emissions and its sub groups (capital and revenue) ensure that effective projects are brought forward and highlighted for potential investment (using either internal or external funding). The process is managed by the Technical Services Unit and Chaired by the Director for Regeneration and Local Services, with representation from each of the service areas.	
Region of Crete	Energy efficiency is on the agenda of every project and meeting within the municipalities that participate to the Covenant of Mayors initiative. Additionally, the implementation of SEAP by regional authorities and the obligation to implement the EU directives into Greek legislation minimises the chances of overlooking energy efficiency throughout all development decisions.	

STEP 3: Building Prioritisation

- Clearly define the criteria for the selection of buildings for renovation, ensuring adequate balance between economic, environmental and social factors. In principle, the renovations should lead to energy and financial savings with reasonable, reliably calculated payback periods according to the lifetime of the building itself. In some, well-justified cases, however, the rise in consumption may be expected due to the necessity of reaching minimum heating and lighting standards.
- If not, as in some well justified cases, a rise in consumption may be justified due to the necessity of reaching minimum heating and lighting standards. In this case, the achievement of this necessary social factor is also acceptable.
- Base the prioritisation process on real data. Involve experienced experts and employees and relevant stakeholders.
- During selection, use nuanced and holistic views

DOs:	**DONTs:**
- Carefully establish building selection criteria, ensuring adequate balance between economic, ecological and social ones. Make sure that the selection is based on a bottom-up, reliable data.	- Avoid ad hoc or one-man decisions. - Don't be tempted to refurbish too many buildings within a given project with limited budget. You will achieve poorer results in terms of energy and financial savings and will have to enter the building with another intervention in a couple of years. The better option is to complete a comprehensive refurbishment of a limited number of carefully selected building reclaiming their full energy-saving potential. - Also, if you don't have experience in a certain area, don't go too big too quickly. Sometimes it is better to start with smaller-scale projects to gain experience.

Action 7: Defining criteria for building selection (e.g. the biggest energy consumer in absolute terms or per m2)	Good practices and other relevant EU experiences
When defining which buildings to work with first, an inventory of the status and overall energy consumption must be created and analysed. Interesting parameters to check are energy consumption per m2, total energy consumption for the building, deviation from the expected consumption regarding type or function of the building, etc. It is also necessary to consider a given building's complexity. Define the main factors of energy consumption in a given building: building construction or technical systems. 1) If building construction, start controlling from the roof first, and continue with facade and windows, doors, etc. Continue down to the basement. 2) If technical systems, skip ahead to the optimization aspect of energy saving. Remember the five main parts to control: - Heating/cooling - Hot water or Domestic Hot Water (DHW) - Ventilation - Building electricity use (as lighting etc.) - Operations (as computers etc.). Compare the result with other selected buildings! Although the main reason for the energy renovation is obtaining energy and financial savings, remember that also other criteria (environmental, social, safety reasons, etc.) should be considered when selecting buildings for the project.	Building Typologies and Performance Indicators Platform from the Impulse project

Florentine Energy Agency	In 2018, the Tuscany Region launched a call for improving energy efficiency of public buildings. This call was drafted with the support of the REBUS project. Among the evaluation criterion, additional scores were included as follows: 1. Technical quality of the project in terms of objectives: Reduction of nonrenewable global primary energy requirements (EPgl, nren). 2. Project planning and workability: Advancement of the design level of the interventions at the time the application is submitted. 3. Energy class of the building: Buildings are given "points" for their energy class. More points are given to the lower classes. 4. Building volume: Greater gross volume of the building. 5. The project concerns building intended for school: - Sporting and hospital use = 0-4 points - Scholastic = 4 points - Hospital = 4 points - Sport facilities = 2 points - Other type = 0 points	

	6. The project involves the transformation of the building into a nearly zero energy building = 3 points 7. The project provides context for seismic preventi on interventions = 0-4 points. A project that provides for the context of earthquake preventi on measures for which an application has been submitted to the call for applications as per DD13747 / 2016 and at least the technical and economic feasibility project is approved on the date of submission of the application = 4 points 8. The project provides for interventions for seismic prevention at the same time, for which at least the economic technical feasibility project is approved at the date of submission of the application to this announcement = 2 points 9. The project also provides for interventions for the removal of asbestos = 2 points 10. The project involves the use of monitoring and control systems for the energy consumption of the building and the plants = 2 points 11. The project concerns buildings already included in the SEAPs adopted and / or approved by the municipality = 3 points	
City of Malmö	A nuanced categorization is needed to determine buildings by size, building category, age, usage and energy consumption. When possible and in line with the targeted goal, utilise ROI. In a building with a large area, a small mitigation of energy consumption per square meter can make a great contribution in total energy usage, while a small building with a large mitigation of energy consumption of energy consumption per square meter in total can make only a small mitigation due to the relatively small total area. The Department of Internal Services of Malmö has used different approaches to define and categorise buildings. One is identifying big energy users where a small percentage saving would have a great impact on energy costs. Another is comparing expected energy use to real energy use to identify buildings with high potential. Varying approaches are needed because of varying structure of buildings. Together, the different approaches create an effective net through which high potential buildings are identified.	

BORA 94	In the call TOP 3.2.1-16, the following main criteria are listed in terms of defining criteria for building selection: - 100% municipality owned buildings; - Only municipal buildings with restricted functions (e.g. educational, cultural, public administration, social, recreational, healthcare, day-care are supported); - There are specific investment cost constraints to narrow down the pool of potential buildings (e.g. in case of €5000 support, 1 ton CO2 equivalent GHG savings are necessary to undertake; the net eligible investment cost for 1 GJ primary energy savings shall not exceed approx.. €360 GJ; restrictions for RES application (solar system: €1500/kW, sun collector system €900/m2, biomass furnace €500/kW; heat pump systems on average: €800/kW; these amounts are higher in case of heritage buildings.	
SERDA	The main idea behind categorising buildings for SERDA is to establish the base criteria for energy consumption MW/m2/yr. According to Norms C107/2005, completed in 2010, and based on energy inquiries (energy audits) and energy bills, SERDA can determine their biggest consumers of energy. These two main criteria can be relevant in choosing the building to be refurbished and retrofitted. There are some criteria and regulations already established in the national and local strategy regarding energy efficiency, as well as in the Sustainable Energy Action Plan 2015-2020 (PAED) of the South-East Region of Romania-Buzau. However, these are not mandatory regulations. The criteria are listed below. The criteria is based on national Norms and Methodology. One example is the Norm C107/2005, completed in 2010 and 2016, which regards "the thermos-technical calculation of the construction elements of a building". Another is the Norm MC001/2006 – "The Methodology for the calculation of the Energy Performance of the Building", through which all the necessary calculations can be realised, thus providing relevant information about the energy consumption and CO2 emissions of the buildings. All the data is synthesised in the Energy Performance Certificate of the building and based on current data from the energy bills and energy consumption of the buildings. From here, the criteria for building selection can be defined.	

	On the other hand, concerning the City of Buzau, currently there is no available database with the respective information. To conclude, based on the Energy Performance Certificate of the building and on the current data regarding the energy bills and energy consumption of the buildings, relevant criteria for building refurbishing selection can be set, such as the following: 1. The values of the Primary Energy consumption 2. CO2 emissions 3. Heating energy demand 4. Cooling energy demand 5. Hot water energy demand 6. Thermal comfort 7. Internal air quality 8. Area 9. Number of users 10. Age of users 11. Location: urban, suburban or rural area 12. Year of construction	
Durham County Council	The County Durham uses three criteria to identify buildings that require energy management support, either through renovation or lower cost measures such as controls and training. The criteria are: 1. High energy consumption: Buildings with high energy consumption will typically have poor heating controls and poor user control (behaviour) of electrical equipment (i.e. not turning something off). Poor controls will reveal themselves through high out-of-hours consumption and an unrealistic baseline for the size or use of the building (i.e. the amount of gas and electricity being used to provide basic services such as maintaining a minimum temperature). 2. Low space utilisation (poor SAP performance): Buildings that have poor space utilisation will naturally have high energy consumption. For example, if a building's controls are set to maintain a certain temperature during normal working hours, but the place is only used for some of these working hours, energy is being used wastefully. 3. Is the building fit for purpose?: Poor space utilisation is often a sign of a building not fit for purpose.	

Region of Crete	For all the 44 buildings of the Region of Crete (owned and rented), all the available information has been gathered in a database. Specific selection criteria were set in order to make a comparative assessment between buildings, identifying the ones that there are multiple reasons to give them priority for energy refurbishment. These criteria are: 1. Energy consumption/efficiency 2. Energy cost 3. Carbon emissions 4. Number of employees 5. Number of visitors 6. Work schedule 7. Area of the building 8. Construction year 9. Comfort conditions for the users / social needs 10. Refurbishment need 11. Financial resources 12. Visibility / urban planning strategies 13. Energy behavior These criteria provided the required information for fulfilling the prioritisation process.	

STEP 4: Energy Renovation (ER) Team Building

- Ensure that all necessary personnel, representing all relevant departments of local administration (responsible for buildings, investments, energy issues, fundraising, legal issues, etc.) is involved in project preparation. Ensure also the involvement of key stakeholders.
- Constantly improve personnel skills and capacities by organising trainings, encouraging participation in exchange platforms, etc.
- Assign clear roles and responsibilities
- Establish efficient communication and reporting regimes that ensure a necessary flow of information and fast decision-making
- Encourage frequent and informal communication. Make sure that all key actors are involved and consulted to ensure sense of shared ownership.
- Ensure high-level and long-term support for the ER team so that they have necessary resources to successfully complete, monitor and evaluate the project
- Develop different working processes for different types of buildings and different needs

DOs:	DONTs:
- Select the right people to be responsible for the project and help them build a team of experienced staff and stakeholders. Use an organizational chart. - Make sure that all relevant departments are involved. - Ensure high-level support for the team. - Ensure efficient communication regime.	- Don't underestimate the role of communication and reporting. Without appropriate and efficient flow of information it is hard to coordinate the project and ensure quick decision-making. - Don't keep the project within a small group of specialists.

Action 8: Identifying and selecting reliable and prepared energy and other experts for ER planning and execution	Good practices and other relevant EU experiences
It is important to appoint or assign a skilled person (or team) that will be responsible for overseeing energy renovation projects–from planning through implementation to monitoring. The person, preferably a permanent municipal energy manager, needs to have enough experience and technical expertise to oversee the project and build a team involving representatives of all key departments (representing not only the energy-responsible unit, but also the legal unit, financial unit, PR unit, etc.) and stakeholders. The latter will not only ensure wide variety of competences but also integration with other projects and activities implemented on the local level and in buildings. If necessary, seek external expertise—experts in the energy efficiency field are available and can provide information, tools, guidance and training.	The Mercury Project for BMS Durham's "The Big Switch Off" campaign

Florentine Energy Agency	Energy managers have been appointed in many regional buildings. They are involved with a project beginning in the planning phase to guarantee smooth execution of renovation works.	
City of Malmö	The public procurement process needs to be considered as the contracting expertise. The City of Malmö also relies heavily on internal expertise and finds that this offers the city more consistent and effective support.	
BORA 94	Calls for energy efficiency renovations require involving energy experts during the planning and implementation phases. During planning, energy experts work together with specialized experts, such as architects and electrical and mechanical engineering experts.	

PNEC	Generally, in Poland, people dealing with the energy-related projects are becoming more and more prepared for this task—especially in case of municipalities, which often establish energy managers. A good example are the 55 municipalities from the Małopolska Region (including Raciechowice, which is a member of the REBUS Local Stakeholder Group). These 55 municipalities each hired eco-advisors responsible not only for preparing and managing energy-related projects on behalf of the municipality, but also for educating and involving citizens in energy-related initiatives. The eco-advisors, in preparation for the job, have taken part in an extensive, one-year post-graduate studies course involving technical, financial and social topics surrounding energy efficiency. In the municipalities that do not have qualified staff, it is recommended to hire external consultants for supervising the investment. It is necessary, however, that the municipal staff has enough internal capacities to verify his/her work.	
Durham County Council	If external expertise is being procured, DCC uses a rigorous procurement policy and frameworks to ensure that the contracts are awarded to companies that can demonstrate the most appropriate technical skills, relevant and compelling evidence of previous work and expertise or technologies that will best deliver the project brief (within appropriate cost parameters). Durham is fortunate to have a highly skilled internal Low Carbon Team that is able to produce effective tender briefs.	
Region of Crete	During the planning phase, a municipality's ER team consists of staff that deals with energy related projects and hence their experience progresses with each project. Within the team, the energy manager has a significant role of keep things on the right track. If a municipality does not have the required personnel/experts, they can hire external consultants.	

Action 9: Assigning roles and responsibilities and establishing communication regime	Good practices and other relevant EU experiences
Assign clear roles and responsibilities and establish an adequate communication and reporting team to ensure efficient flow of information and quick reaction to any issues identified.	Clearly defined departments and roles of CRES

Durham County Council	Within the local authority, DCC has different teams responsible for aspects of energy efficiency and effectiveness. Within the Low Carbon team, one section oversees daily energy management issues; another develops new low carbon project ideas; another manages energy efficiency support with external businesses and organisations. They are supported by a corporate funding team. In addition, specific work is contracted to ensure good value and high quality expertise (e.g. in school support delivered by a partner charity). All of this is guided by the Carbon Management Plan for the authority.	
Region of Crete	The latest legislation, L.4555/2018, obliges all public authorities/services to create clear job descriptions. Its implementation will eventually create a solid base for clarifying each personnel's role and responsibilities while simultaneously minimising the response time when an issue emerges. Below are the divisions within the Centre for Renewable Energy Sources and Saving (CRES), the Greek organisation for Renewable Energy Sources (RES): • **Division of Renewable Energy Sources** - Wind Energy Department - Biomass Department - Geothermal Energy Department - Solar Thermal Systems Department - Ocean Technologies Department - RES and hydrogen technologies Department - Photovoltaic Systems and Distributed Generation Department • **Division of Development Programs** - Department of Development Project Studies - Department of Development Project Applications • **Division for Energy Efficiency** - Industry and Energy Efficiency Measurements Department - Buildings Department - Environment & Transport Department - Energy Investments Support Department	

	• **Division for Energy Policy and planning** - Energy Systems Analysis Department - Market development - Marketing Department - Dissemination of RES & EE Applications Department - Training Department - Energy Information Systems & Planning Department • **Division of Financial and Administrative Services** - Human Resources Department - Projects' financing & administrative support Department - Account & financial services Department - Technical Support & Procurement Department	

STEP 5: ER Project Preparation

- Determine baseline consumption and baseline characteristics of buildings selected for renovation using proven methods and tools and reliable, bottom-up data.
- Make sure that all necessary building and project documentation is in place and easily available (energy audits and/or energy certificates, feasibility study, etc.)
- Devote adequate time and resources for studying the energy audit/certificate, preparing the investment, conducting economic and financial assessment—such as cost-benefit analysis, LCA or LCCA[3] —etc. If you do not have the experience or skills to evaluate the documents yourself, seek external help.
- Communicate with and involve all users related to the building (tenants, technicians, users, caretakers, etc.). Discuss with them about internal conditions, thermal comfort and other demands that can be relevant for planned renovation. Encourage shared ownership.
- When selecting and planning energy conservation measures, keep in mind the five requirements for an efficient energy building:
    1. Air tightness
    2. Reduction of thermal bridging effects[4]
    3. Continuous thermal insulation
    4. Ventilation with heat recovery
    5. Higher standards for windows - Investigate good practices in Europe with Passive House or Net Zero Energy Building standards[5] (https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings/nearly-zero-energy-buildings).

[3]There is an EU Commission Delegated Regulation on cost-benefit analysis (244/2012/EU): https://publications.europa.eu/en/publication-detail/-/publication/40347d51-cd2d-4935-9ae1-293171ba12d2. Additional methods of financial assessment: Life-Cycle Assessment; Life-Cycle Cost Assessment.

[4]Different EU countries use different measures for thermal bridging. Hungary uses internal dimensions, while Germany uses external dimensions. If a construction joint is considered "thermal bridge free", it must still be evaluated in Hungary whether or not a detailed energy audit/certificate is needed.

[5]Additional standards to look to include the RAL guidelines for installation of windows and external doors or the EAE European guidelines for the application of ETICS (external thermal insulation composite system).

- Consider Passive House standards that are the most clearly defined and utilise the Retrofit methodology[6] , including a tool for calculating the energy balance and solutions called PHPP.
- When selecting particular solution/technology, take into consideration not only the current market offer and prices, but also future maintenance and predicted energy costs
- Carefully estimate energy and financial savings associated with all identified/planned energy saving measures. Identify potential risks hindering achievement of these savings. What can be done to minimise these risks?
- Document the whole process for easier reference in the future
- Establish an efficient energy monitoring team to be able to observe changes in consumption and evaluate real results of planned measures (the team must be established prior to investment to be efficient)
- Make sure that the final project fits into not only the local environmental/energy strategy but also with other policies and that it is not in conflict with other planned/implemented projects
- Ensure that the environmental economic and social advantages/ disadvantages are addressed holistically to demonstrate the wider resonance with other policies and plans
- From the very beginning, raise building users' knowledge and awareness on energy issues (technical energy saving measures are more efficient when combined with behavioural change, so develop ad-hoc campaigns including information on how to use energy more efficiently, how the money saved will be used, etc. Make sure that technical intervention and educational campaign are implemented in parallel). When possible, a user manual can be distributed.
- Remember that sometimes simple measures may bring significant results. Don't underestimate their power.

DOs:	DONTs:
- Make sure that the project is preceded with adequate and documented studies (energy audit, feasibility study, economic and financial assessment). - Engage building users from the very beginning and consult them throughout the project in order to develop it based on real demands. - When planning concrete energy saving measures and solutions, consult good practices and best available technologies.	- In principle, don't underestimate the planning phase of the process. It is actually the most important phase, where most time and effort should be dedicated. Poor refurbishment can be always repaired but poor project cannot. - Don't take an energy audit for face value. Since it is obligatory within many financing programmes, there are many companies that produce them quickly and inaccurately. Read the audit carefully and check if the data is correct and recommendations reasonable. If you cannot do it yourself, ask for external help.

[6]Other EU projects that adopt the Retrofit methodology include BUILD UP, NewTrend, EPISCOPE & TABULA, etc.

- Remember that the energy refurbishment should always lead to energy and financial savings. This is its primary objective. Poorer financial outcome is justifiable only when the building doesn't meet basic standards in terms of users comfort and health (e.g. because it is under-heated, under-lit). - Look at a given building in a holistic way – not only as a structure, but also as a set of installations, functions and equipment. All these elements and interactions between them need to be taken into account when planning the refurbishment (e.g. putting insulation on the wall requires adaptation of internal HVAC systems, new heating source should be adapted to the new thermal characteristics, etc.). - Plan the investment in a way that will ensure that after the refurbishment the building will be not only energy efficient but also comfort able for the users. - Consult your project with other departments' investment and action plans. Seek for synergies and avoid mutual disturbing of investments. - Analyse and identify the most appropriate financial schemes. - Define how you will measure energy mitigation resulting from the project. - Always be compatible with your regional/ national energy strategy. - Communicate as much as possible. - Demonstrate wider project relevance.	- Don't forget about involving building users in project preparation. They are an important "component" in influencing building consumption. Make sure that their practices and needs are taken into consideration when planning refurbishment and that it is combined with awareness raising and educational activities. (See Big Switch Off good practice). - Don't forget to establish a communication channel between master users and the building/energy manager. - When deciding on energy conservation measures, don't go just for the low hanging fruits. Aim for long-term success. - Avoid making quick decisions without consulting and involving experienced experts and building users. - Avoid partial retrofitting solutions (e.g. insulation of only one side of a building, or partial replacement of windows and doors). - Don't frame the benefits only as economical or environmental. - Don't rush! Plan and prepare.

Action 10: Ensuring that all necessary building and project-related documentation is gathered and analysed	Good practices and other relevant EU experiences
Make sure that all the necessary building documentation (technical documentation, energy audits) and project-related documentation (different project options, feasibility studies, etc.), as well as the data for baseline calculation are available and carefully analysed. This will provide the basis for the final selection of energy conservation measures, establishing baseline and projected savings and future monitoring.	Building Typologies and Performance Indicators Platform from the Impulse project

Region of Crete	Since the implementation of national Greek legislation L.4412/2016, each project must have all the required documentation that demonstrates that is developed enough in the planning stage to proceed to the implementation phase. This means that all possible setbacks related to documentation should be noted prior to moving to the next phase of the project—especially when funding is requested. In addition, the new Regulation on the Energy Performance of Buildings (KENAK 2017) sets an integrated energy design in the building sector that promotes energy efficiency documentation of buildings.	

Action 11: Ensuring involvement of building users from the very beginning	Good practices and other relevant EU experiences
Building users should be consulted during project preparation, especially those who are responsible for building operation and maintenance. They should also be involved in gathering data for a building database. For such databases to work effectively, those who have access to it must receive training so that they are familiar with the programme and know how to interpret it, and feel comfortable to ask questions so that the software remains accessible. Master users need to be aware of any staff changes so that building managers remain aware and proactively involved with their building energy management.	Durham's "The Big Switch Off" campaign This case study project supports building managers and users intensively to monitor energy use and change behaviours.

Florentine Energy Agency	Technically skilled energy managers operate in many public buildings, and are in contact with building users. On the other side, there is a lack of information for the majority of energy managers and building users.	
City of Malmö	To be convinced that the targeted buildings are in line with the goals of energy mitigation, the City of Malmö carries out a series of tasks. Interviews with tenants, building users and technicians can confirm the adoption of measures and also highlight the main needs for the building renovation. During a project's planning phase, useful information can often be added through building user consultation sessions. To add this as an action later in the process is often more expensive or even impossible.	
BORA 94	According to the relevant call, during project implementation, building users must be informed through a training on the benefits of the development, the applied new technological solutions and their appropriate use.	

Durham County Council	DCC uses the "Energy Manager Live Portal" (powered by Systemslink) software with building managers. This is supported by regular electronic correspondence and simple training tools that are reviewed and updated when necessary. In addition, training sessions are offered periodically to new premises staff or to existing staff as a refresher.	
Region of Crete	Building users and maintenance and operation staff are consulted during project preparation. The ER team visits the building and discusses the current conditions, current problems and future needs of the users.	

Action 12: Ensuring that planned ER project will be appropriate to businesses' and users' needs	Good practices and other relevant EU experiences
Assess the needs of local business and of the building users. Identify any conflicts (or potential conflicts) of interest and think of how to deal with them. Always discuss with your team before making any decision.	Implementation of the Net-metering Legislation within the building stock by the region of Crete

Florentine Energy Agency	The regional call is a good start for business and user needs, as it gives € 34 million for public building renovation. AFE must use this opportunity to build an effective system and methodology of renovating buildings.	
City of Malmö	It is crucial to make the project as financially solid as possible. One way of doing this is to examine the possibility of broadened the scope of the project, exploring if it is possible to scale the project up by examining other buildings to see if there are other buildings with the same needs. If so, the total cost for these building renovations will probably be less expensive than the result of separate renovations of the same buildings.	

	There is also a need to take the building users' perspective into consideration. Is it possible to make all the renovation at one time without disturbing the user activities in the building, or shall it be renovated in sections? Is it possible to move the tenants' operations to an alternative building during the renovation? One example of this is the refurbishment of the Mazetti building in Malmö, where there are ten different tenants and ten different rental contracts. A workshop will be performed to sort out what approach will be the best, and how to plan the different steps in the renovation. The City of Malmö conducts an ongoing dialogue with the technicians in the building to secure that all projects will be appropriate and relevant. Being a landlord, the city has the opportunity to install more energy efficient techniques in conjunction with maintenance/exchange of technical parts. This has enabled the city to decrease energy use.	
BORA 94	Municipalities represent the municipal needs when negotiating an energy expert. The energy expert usually suggests the most optimal energy efficiency solutions, taking into consideration the clients' needs.	
PNEC	Current and possible future functions, as well as the building users' comfort and needs, are usually taken into consideration when planning energy retrofitting projects. There is a need, however, for more in-depth studies of the building characteristics' influence on human well-being and health, which could be further considered in the future.	
SERDA	In terms of user needs, the proposed project will improve the thermal comfort and the air quality, and the energy costs will be minimised. During each retrofitting project, it is important to find the best solution of not disturbing building users—through either a step-by-step refurbishing project or by moving users, if possible, to another location. In terms of business, energy price has a continuously rising trend, so having control over the energy consumption is a smart business approach.	

Durham County Council	If a site demonstrates a business need for further technological interventions, such as solar panels, DCC would always consult with the building manager to ensure that they were on board with the technology being implemented and understand why there was a business need. For example, this might be to reduce peak electricity demand or to help meet the objective of a renewable energy policy. Consulting with a building manager also offers a more comprehensive understanding of the building's use and therefore helps identify conflicts between business and user needs.	
Region of Crete	In terms of business, the needs and energy saving requirements are met by the ER team, which makes certain that all technical and legislative standards are fulfilled. In terms of user needs, a timetable is constructed the energy renovation, including the best solutions in order to avoid users' disturbance. The step-by-step approach of renovating a building often minimises risks.	

Action 13: Selection of energy saving solutions and technologies	Good practices and other relevant EU experiences
Carefully select energy conservation measures, considering best available technologies, prices and market availability. Keep up to date with the existing R&D and innovative technological solutions. Follow available good practices (compatible with your regional/national energy strategy) and engage in regional and interregional exchange. Ask for expert consultation from local universities. Analyse all gathered data and case studies to check which solutions could be applied in your building(s) and if their implementation is economically viable.	The SHERPA project

Florentine Energy Agency	In order to obtain the regional funds for a submitted project, one of the criteria is the effectiveness of the intervention. Public administrations have to look for the most energy efficient and innovative renovation options existing on the market.	

BORA 94	When planning an EU funded energy refurbishment project, a feasibility study is mandatory to be elaborated that considers all important aspects to be taken into consideration including the most suitable solutions and technologies.	
PNEC	When preparing the investment, the best solution for the particular building (or group of buildings), budget, environment, external requirements, etc. must be met, which might also be most proven and cost effective solution. This is done within the feasibility study of a renovation project, which is a standard when planning investments and a must when applying for external financing.	
SERDA	The five criteria for a Passive Building defined by Passive House Institute are: 1. Air tightness 2. Thermal bridge free design 3. Continuous thermal insulation 4. Ventilation with heat recovery 5. Higher standards for windows The most energy efficient and innovative renovation option on the Romanian market is the Enerphit Standard, which is an energy retrofit with Passive House components, developed by the Passive House Institute from Darmstadt, Germany. The criteria for a Passive House defined by the Passive House Institute include reaching a very high energy performance of the building—i.e. decreasing the energy consumption with a factor of 10, a high level of comfort and a high indoor air quality.	
Region of Crete	The Regulation on the Energy Performance of Buildings (KENAK) introduced an integrated energy design in the building sector to improve the energy efficiency of buildings, energy savings and environmental protection. Each ER project is approached based on: - Law 3661/2008, which incorporates all the provisions of the Directive 2002/91/EC of the European Parliament. - Ministerial Decision D6/B/14826/2008, which sets specific standards and regulations for the control and maintenance of heating / cooling of the buildings which house services in the public and broader public sector, and standards for internal lighting and ventilation conditions that should prevail in buildings.	

	- Law 4122/2013, which provides measures, funding programmes and other means to improve the energy efficiency of new and existing buildings and sets rules relating to the preparation of national plans for increasing the number of buildings with nearly zero energy consumption. - Law 4342/2015 on energy efficiency, which sets several milestones demonstrating the trend of compliance with the recommendations of the 2012/27/EU Directive. All the above are interconnected with the required market research that updates the ER team's options concerning the latest energy saving technologies.	

Action 14: Ensuring strategy which will prevent from working with just low hanging fruits	Good practices and other relevant EU experiences
Long-term stability and sustainability of energy efficiency measures is vital. Long-term plans and strategies should always be pursued. Simply increasing the efficiency of a poor and carbon intensive practice may financially pay off in the short term, but may not be the best long-term approach. One way to ensure long-term payoff is to package the project in a way that makes it possible to have the project's short pay-off time results positively influence the project's long pay-off time results. This is possible if, as in the LCC (Life cycle cost) analysis, the project activities with short pay-off time finance the activities with long pay-off time. The project generates no great financial benefit but has an increased reduction of CO_2.	BELOK methodology The Sustainable Energy Action Plan (Buzau Municipality)

City of Malmö	Together with the Swedish Energy Agency, Malmö has developed the "totalmetodiken" (methodology for total renovation) as a way to enable a holistic view on refurbishment. By including many different activities, you can get reasonable payoff for combining long-term investments with short-term investments. In this way, the activities with short payoff also contribute to activities with longer payoff time. An important basis for this is the reliable drawing and technical specification of the building. A digital archive is ideal.	

BORA 94	More and more municipalities recognise the importance of long-term stability and sustainability concerning energy efficiency issues (inter-alia thanks to the related EU calls that foster and facilitate this process). For instance, in the North-Hungary region, several local municipalities joined the Covenant of Mayors initiative, which aims to support municipalities in elaborating their long-term sustainable energy and climate change strategies (SECAPs). Generally, these strategies contain the long-term plans for the public building renovations. Moreover the elaboration of SECAPs is supported by a particular TOP-3.2.1-call.	
PNEC	In case of projects funded by external sources— which is the majority of project in Poland— there is a requirement from the donor (i.e. grant operator, bank, financing institution, etc.) to achieve a certain level of energy and financial savings. However, reaching for low hanging fruits is not always a bad thing, as in the case of less experienced municipalities starting with simpler measures (organisational, behavioural). This may feed their appetites for more complex changes in the future, of course only when the correct order of investments is maintained.	
Region of Crete	At the end of 2018, the National Action Plan for Energy Efficiency was approved by the Greek Ministry for Energy, which sets specific targets of energy savings to be achieved by the public authorities and makes clear the difference between energy efficiency and cost efficiency. To this direction, the collaboration with Energy Service Companies-ESCOs is suggested.	

Action 15: Identifying and selecting the best financing options	Good practices and other relevant EU experiences
Various types of funds include European funds, local funds, state and governmental funds, sponsor funds and bank loans with small interest rates, PPP and the ESCO formula. These are only some of the available financing options. The choice for funding sources should be supported by research regarding all available financial sources, costs of their application and potential savings. This will help to assess the final costs and revenues as well as the institutional financial capacity.	The FINERPOL project The FIRESOL project

Another methodology is to fund low-medium capital projects with the understanding that they will pay for themselves over time, either through direct savings, or by mitigating the impact of increasing energy costs. When planning to use the PPP/ESCO formula, use the Public Sector Comparator to verify if such an option indeed offers better monetary value.		

Florentine Energy Agency	So far, public authorities in Tuscany have the chance to use regional and national funds (from GSE) to cover up to 100% of the expenses. AFE's most successful good practices—the Arezzo and Versilia hospitals—have used ESCO companies.	
BORA 94	Since most of the local municipalities are not in a favourable economic situation to apply for credit in Hungary, most of the time the only option municipalities have for financing energy efficiency renovations is through EU funding support, which usually covers 95-100%.	
PNEC	There are various financing options available to cover the costs of energy-retrofitting projects. Polish municipalities are usually well aware of these financing options and, compared to municipalities from other CEE countries, are successful in obtaining funding. Since there is currently quite a wide availability of non-repayable grants, these are mostly used for financing investments. In Poland, there is still limited experience with the ESCO scheme, municipal bonds and other alternative funding methods; however, there are increasingly more pilot projects implemented. This is due to the fact that even with relatively many grants available, they are not enough to cover all investments and thus there is a need to cover own contribution, which is often a barrier.	
Durham County Council	DCC asks the question if the organisation financially able to carry out the work independently. It is standard practice for DCC to fund low-medium capital projects itself using its own financial reserves or operating budgets, with the understanding that projects will pay for themselves overtime, either through direct savings or by mitigating the impact of increasing energy costs. For larger scale projects, external funds are identified, which may be applied for from the UK Government or European structural funds.	

Region of Crete	Public authorities in Greece use regional, national and European funds to cover 100% of the expenses of their energy projects. In some limited cases, loans may be used to fund such projects, especially when the payback period is short.	

Action 16: Identification of potential hold-ups; i.e. environmental, structural, ecological	Good practices and other relevant EU experiences
Identifying and planning how to avoid potential hold-ups is necessary to avoid expensive stops in the coming renovation. Appropriate risk analysis early in the process is a great advantage. To identify all potential risks it is important to consider all the different aspects of the renovation, as well as to gather and mobilise all stakeholders; i.e. architects, construction workers, building permits administrators, financial stakeholders, tenants, entrepreneurs, etc. The purpose of the risk analysis is to reduce, mitigate or prevent that risks occur.	Building Typologies and Performance Indicators Platform from the Impulse project

Florentine Energy Agency	The most important potential setback to consider in Italy is the high number of contracts of global services concerning energy between public administrations and private companies. These kind of contracts make it impossible to collect data in real time, which is necessary in developing a strategy about energy efficiency and allow the public energy manager the real power to act. The public administration can discuss many major energy issues, but they can decide on and implement small scale items. Second, Italian politics has been far from focused on energy efficiency strategies.	
City of Malmö	A potential hold-up that is quite common in Malmö is polluted ground. This can tip the business case of a renovation. The City of Malmö has managed this issue by undertaking risk analysis much earlier in the process than they had done so before, in order simply avoid certain risks entirely. Another way of avoiding risks in the context of Malmö is connected to the method of procurement. If a general manager with responsibility for all contractors is procured, the risk of unexpected hold-ups is minimised.	

BORA 94	In TOP applications, each applicant must elaborate a so-called “project plan”, which contains a risk assessment section, considering and explaining in detail all risks that can occur during the implementation and maintenance periods.	
PNEC	Risk analysis is an important part of any investment preparation, including energy refurbishments. It an important part of a proper feasibility study and is required when applying for external funding—for both public and private funds.	
SERDA	Environmental hold-ups common in Romania are heavy rains and floods. Potential structural hold-ups include earthquakes or seismic zones, while ecological hold-ups pertain to architectural protected zones and monuments, Urban Development Plans and Natural Protected Areas (Nature 2000). Economical hold-ups stem from old and non-real building standard costs. A final potential hold-up is the heavy procedures for authorization in regards to the rehabilitation of the buildings.	
Durham County Council	A common hold-up in Durham can be contaminated land, in addition to archaeological or ecologically sensitive areas, because their status requires consultation with external statutory stakeholders. DCC must always examine these aspects of planning in order to remain compliant with building and planning legislation. If operating as an individual or small company within a municipality, seeking advice from your local government office would help you ascertain if your renovation would be affected by any of these criteria.	
Region of Crete	Crete is an area with rich archaeological heritage and thus the ER team must always consider this aspect in order to comply with the national legislation. Hence, the required authorisations should be in hand prior to moving onto the next phase in order to limit the risk of unexpected hold-ups.	

Action 17: Establishing efficient monitoring regime	Good practices and other relevant EU experiences
Monitoring structures and regime must be established early in the project cycle to ensure that all relevant data is available and monitoring is conducted from the start. Monitoring should include both achieved results and the project process itself. It should lead not only to the verification of project overall performance but also to building/systems operational performance. A choice of a "value for money" monitoring system is advised.	

Florentine Energy Agency	AFE supports a major change in the decision-making process, in order to become more transparent and efficient and equip local authorities with an action plan. AFE developed through their energy projects a methodology that begins with an energy audit in order to establish a baseline in the improvement of the energy efficiency of existing buildings; i.e. insulation of walls and roofs, replacement of door and windows fittings and installation solar screens, replacement of existing winter air-conditioning systems with plant ensuring higher efficiency, condensing boilers, replacement or new installation of systems using renewable energy (heat pumps, boilers, biomass stoves and fireplaces, solar thermal plant even solar cooling technology for summer air-conditioning), etc. The results of every action must be monitored, as in KlimaHouse system. The good practice of the Arezzo Hospital features a monthly comparison between the hospital energy manager staff and the company that handles the energy global service, in order to agree about the energy consumption measurement. In the Versilia Hospital, the hospital energy manager staff and the company that handles the energy global service share the BMS system.	
City of Malmö	The Department of Internal Services of the City of Malmö monitors energy use by means of the E4 system. With this programme, Malmö can identify any changes in energy use and analyse the potential causes of these changes. Furthermore, the city's contractors dealing with operations do regularly analyses of the buildings to identify possible improvements.	

BORA 94	The energy efficiency modernisation planning is basically call-oriented; the buildings that are being renovated are most suitable for technical and professional requirements of the particular call. The development of monitoring systems is also aligned with the requirements of the call. An energy certificate issued by an energy expert is required after the retrofitting to measure success. In the years of maintenance, regularly updated data is required by the supporting managing authority to measure the energy savings achieved, but this is in many cases only an administrative data provision. Most of the time, real measurements are not provided. Good international examples of how to apply such structures/tools are needed for local level municipalities in Hungary.	
PNEC	Increasingly more often, energy retrofitting projects are implemented as a part of long-term strategies and action plans, such as Sustainable Energy Action Plans or Low-Emission Development Programmes. In these cases, the decision-making process is structured. Regarding monitoring, it is obligatory to include a chapter of any energy action plan or low carbon strategy on monitoring procedures and tools. A good methodology for monitoring projects—both in terms of project implementation and project results—was proposed by the Covenant of Mayors. It is obligatory for municipalities having SEAPs and recommended for municipalities having LEAPs.	
SERDA	There are laws and regulations surrounding energy surveys, but all the information gathered from the surveys is not centralised in a database. Therefore, a good approach to monitoring would be the creation of a new organisation (public-private) that can carry out energy surveys and research ways to recalibrate the energy inefficient problems and inadvertencies.	
Durham County Council	DCC aims to always ensure their public buildings work within the energy hierarchy. DCC does this by addressing those buildings that are most poorly performing and assessing this via energy management software and "Display Energy Certificates". A certificate that demonstrates that a building is performing at a rate of 'G' or lower is treated as a priority. Activities that reduce the amount of energy being consumed are focused upon first. As a building's efficiency is increased, supplementing the building's peak time consumption using renewable or other technologies is then assessed.	

Region of Crete	The majority of Cretan Municipalities participate in the Covenant of Mayors and thus are obliged to have SEAPs. The implementation of long-term energy saving strategies and the design of relevant action plans or Low-Emission Development Programmes, are mandatory and inspected every two years.	

Action 18: Ensuring synergies with other projects, policies, paths	Good practices and other relevant EU experiences
Identify the possible relationship with local plans and regional or national policies. Make sure that your projects fits into these plans and policies and is integrated with other implemented/foreseen projects (to benefit from the synergies and avoid unrequired interferences).	

Florentine Energy Agency	During the regional call, the coordination of activities and investments implemented in SEAPs or other plans is rewarded.	
BORA 94	Creating synergies and eliminating overlaps with other calls/policies is the responsibility of the appointed management authorities (usually ministries). This is because, in the 2014-2020 programming period, planning and programming tasks are dedicated to the national level. However, local levels are consulted in the planning process of this national effort.	
PNEC	It is becoming more common for energy retrofitting projects to be implemented within long-term strategies and action plans—such as Sustainable Energy Action Plans or Low-Emission Development Programmes—which are compulsory when applying for funds within certain priority lines within the Operational Programme Infrastructure & Environment and Regional Operational Programmes. There is still the need, however, for better coordination of activities and investments implemented by different city departments (e.g. with investments not related to energy and thus not included in SEAPs). Some guidelines on investment coordination would be useful.	
Durham County Council	DCC aims to identify relationships between local plans and policies. Within DCC, all proposals must demonstrate a financial business case in order to be approved as viable. A project may still be approved if there is a long payback period; however, the project must demonstrate additional benefits, such as meeting stakeholder needs or requirements that would present marketing opportunities, or contributing to wider policies such as the countywide climate change action plan.	

Region of Crete	As the creation of calls/policies is the responsibility of the regional authorities, activities and investments implemented in SEAPs or other plans is rewarded. Nonetheless, prior final call announcement guidelines on investment coordination and project planning seem to be essential in order for municipalities' needs to be fulfilled and sufficient time to be granted.	

Action 19: Ensuring leadership commitment to providing long term support and resource after project completion	Good practices and other relevant EU experiences
Energy reduction is a long-term commitment that requires predictable conditions, as well as adequate financial and human resources. It is important to define and secure the resources needed not only to successfully carry out the project but also ensure its proper monitoring and evaluation and correct operation of new/upgraded systems. Long-term political commitment for improving energy efficiency should be ensured, creating favourable conditions not only for the planned project but also all possible future energy efficiency activities. This requires involvement and dialogue with all political parties active in the municipality/region	Crete regional authorities' SEAPs DCC "Tracking our carbon footprint"

Florentine Energy Agency	The Tuscany Region is committed to providing long-term support after the REBUS project completion. However, it unclear if there will be other public funds available.	
City of Malmö	No leadership commitment is needed for providing support after project completion due to the real estate maintenance process. Every year, a budget is completed for long-term (next five years) maintenance of buildings within the organisation, and is included in the overall operational budget. In this way, it is possible for Swedish politicians to establish an early warning system, as they can clearly see the calculated costs for the next five years, and they can react. This provides stability to the financial situation, as decision makers are able to anticipate the coming costs for maintenance. However, a financial budget for adjustments after the implementation, not connected with the maintenance budget, is important.	
BORA 94	The call determines a five-year maintenance period for the applicants. The municipalities, which are lacking money for developments, are generally determined to successfully implement the projects and to maintain the results in the long run.	

PNEC	Utilities consumption and building maintenance costs are included in the public entities' annual budgets covered by the local budget. In case some repairs or adjustments of refurbished structures/ systems are necessary, they should be done within the guaranteed offered by the contractor. Adequate guarantees should be requested within the call for tenders.	
SERDA	Public entities (i.e. schools, hospitals, kindergartens, town halls, etc.) have an annual budget for building maintenance costs and energy consumption. According to national Romanian legislation, energy managers of renovated buildings should be able to provide maintenance costs and annual costs, as they are included in annual municipal budgets. Also, some mandatory rules are stated by Romanian law that refer to the allowed destination of the buildings, conservation and maintenance of the investment, etc.	
Durham County Council	DCC focuses on identifying the resources required to deliver outcomes, and ensuring that these resources are shared between departments. Resources can be human and financial. Capacity building is a key component for the success of any energy saving initiative. With leadership support, DCC has increased its capacity by enrolling "Eco-Champions" across the organisation in different departments to encourage the wider learning of energy conservation projects. An Eco-Champion is a member of staff who is interested in environmental issues and is willing and able to support team members to make sustainable changes to their behaviour to reduce their energy use and broader environmental impact. These Eco-Champions are supported by staff from the Low Carbon Economy Team with news updates, project ideas and themed campaigns.	
Region of Crete	All public entities have an annual budget for building maintenance. Based on Greek national legislation, the energy manager of the renovated building should cover the required maintenance costs, to be included in that annual budget. Also, repairs of and adjustments to renovated structures/systems are covered by a 15-month guarantee offered by the contractor, which is obligatory by law.	

Topic 2:

The second key step of the project lifecycle is implementation. It involves selection of the contractor(s)—who will be responsible for the installation of agreed upon energy conservation measures—and ensuring quality supervision over the installation process, making sure that energy conservation measures are implemented correctly and timely and that new or modernised systems, installations and equipment items are operated and maintained in a proper manner. As with other steps in energy renovation projects, during implementation, it is important to ensure that relevant stakeholders are involved whenever applicable. This includes the involvement of building maintenance staff, who must be aware of the implemented measures and how to handle the building after their installation.

It is very important to ensure that the contractor—before starting the work—is well familiarised with local conditions, building(s) characteristics and requirements of the building owner/investor. They need to have all the necessary information and documents and be regularly informed. Building owners should ensure that all the arising issues are immediately discussed and decisions are implemented. The works shall be commissioned only after ensuring that the energy conservation measures have been implemented properly, all malfunctions have been identified and removed and steps to ensure long-term operational performance are taken. In case of larger projects, it is worth the time to apply Quality Assurance (QA) procedures and appoint a QA manager.

The building owner may choose to implement the project in a traditional way or by using a PPP/ESCO scheme. Before making the decision, all costs and benefits of these alternative approaches must be carefully analysed and calculated.

STEP 1: Procurement of a good contractor

- Make the decision on the type of procurement (traditional, PPP, etc.)
- Set requirements for the contractor
- Prepare all procurement documentation
- Launch procurement
- Select the contractor

DOs:	DONTs:
- Carefully select the procurement type and requirements. - Consider public-private partnerships. - When establishing requirements, take into consideration both environmental and social criteria to ensure that the investment not only brings energy savings and other environmental benefits, but also that it is environmentally friendly itself and ensures adequate level of comfort for the users. - Make sure that the procurement documentation and whole procurement procedure is transparent. - Create a rigid timetable that will bind partial deliverables.	- Avoid quick, non-documented solutions. - Don´t try to "go around" the public procurement process. Try to take advantage of it. - Don't decide too quickly to use ESCO. Carefully analyse this possibility and calculate if it really brings economic added value, taking into consideration division of costs, risks, etc. ESCOs are companies that need to make profit, which may have an impact on your ROI. - Don't use price as the only criterion when selecting the contractor. - Where possible, aim beyond the minimum requirements for improving performance of buildings. - Don't be afraid to use the competitive dialogue procedure. It can be helpful in case of more complex and innovative projects.

Action 1: Definition of clear procurement rules stating energy benefits and performances to be reached after work (preferably using green and innovative public procurement principles)	Good practices and other relevant EU experiences
The definition of requirements that should be met by the contractor and contractor selection criteria is of key importance for the entire procurement and implementation process. Think not only of the technological solutions that you want to use and energy benefits/performances that you want to reach, but also of other key aspects (i.e. length of the guarantee, trainings for building(s) maintenance staff, etc.). Make sure that from the procurement documentation the bidders understand that they not only have to deliver technical renovation according to the specification but also ensure an adequate level of users' comfort both during and after the investment. Consider using GPP criteria to ensure that the renovation not only brings energy savings but also is carried out in an environmentally friendly way as a whole.	The procurement documentation is binding and accessible to everyone on the E-procurement Platform

Florentine Energy Agency	The regional call has very clear procurement rules—including rules for ESCOs—stating energy benefits/performances that can be reached after work(s). See AFE's experiences with ESCOs as they are related to the monitoring phase.	
BORA 94	Green procurement option has been available in Hungary for years; however it is not widely applied yet. Public procurement rules are constantly changing, which makes it difficult even for experts to follow them.	
PNEC	There are clear procurement rules to be followed for all public procurements. These rules allow using criteria other than price evaluation criteria. The ESCO scheme, which can be used as a reference for other municipalities that would like to fit ESCO project into existing legal framework, is also growing in popularity in Poland. In these cases, however, most often external legal support is obtained to ensure that the process is done correctly. Regarding green public procurement, green technologies are being widely promoted by various ESCOs and are often included in SEAPs an energy efficiency measure. However, they are rarely used in practice. Therefore, there is a need for more capacity building and practical examples in this area. There is also a need for wider dissemination of the competitive dialogue procedure, which is useful in more complex and innovative projects. This being said, the competitive dialogue procedure is very rarely used due to various legal hurdles and doubts, as well as a lack of good practices to follow.	
Durham County Council	Durham has a large internal procurement team that manage the public procurement process for the authority. Factors such as social value, quality and employment training opportunities are key factors as well as price.	
Region of Crete	Each call has very clear procurement rules stating energy benefits/performances to be reached after works. Nonetheless, there is not much experience to refer to or good practices to follow when it comes to ESCOs in Greece.	

Action 2: Decision on the procurement type (traditional, PPP, ESCO) and development of procurement documentation	Good practices and other relevant EU experiences
The decision on the procurement type should be preceded with careful analysis of all costs and benefits related with different procurement types (traditional, PPP, ESCO). It is worth considering developing a public-private partnership if it demonstrates economic added value when compared to traditional procurement. To establish that you should analyse division of costs and risks between public and private partner, advantages that a public partner may have over the private one (and the other way round), and so on. Use the Public Sector Comparator to compare the costs. Once the decision has been made, develop procurement documentation that is clear and transparent. Make sure that it follows both national regulations on PPP and requirements of the financing programme, if external funding is used. Include a rigid timetable that will set partial deadlines.	EPEC's Guide for Energy Efficiency in Public Buildings

Florentine Energy Agency	Public-private partnerships have already developed in Italian hospitals, in order to provide street lighting, energy renovation in buildings, etc. CET (Tuscany Energy Consortium) is a special regional institution that is in charge of the development of public-private partnership in energy efficiency sector.	
BORA 94	Although ESCO is a somewhat known alternative financing possibility for the energy efficiency initiatives in Hungary, it is not so popular yet in BORA 94's territory; only a few municipalities have taken advantage of this financing option and only for small-scale investments (such as public lighting system reconstruction). It is very rare in BORA 94's territory to find investments featuring PPP characteristics; however, a few larger energy efficiency projects can be good examples, such as the Geothermal Project of Miskolc, which was implemented by a company that is partly owned by public and private actors.	
PNEC	There are already examples of public-private partnerships developed in the energy efficiency sector, including ones focusing on improving energy efficiency in buildings (e.g. case studies of Sosnowiec, Płock and Kobyłka). There is a need, though, for more of these experiences and more favourable legal frameworks for public-private cooperation.	

Durham County Council	In schools across County Durham, a partnership approach with Solar for Schools, a company providing funded solar PV systems for schools across Europe with no upfront capital outlay was developed and agreed by energy, legal, assets and education services within the authority. This approach provided real financial and environmental benefits for the schools involved. These would not have been realised with the traditional approach. In addition, a collaboration with the company Honeywell investigating opportunities for an Energy Performance Contract for both corporate buildings and schools has been undertaken with some success.	
Region of Crete	Public-private partnerships have already been developed for providing street lighting outside of buildings. Currently these public-private partnerships are implemented for energy renovation in school buildings.	

Action 3: Ensuring that the contractor has duty to examine and repair all snagging issues, working directly with building technical staff and users	Good practices and other relevant EU experiences
Ensure there is a provision in the original specification and the contract template that the contractor will be held accountable for the resolution of all snagging issues before project handover. The contractor should work on these issues together with building technical staff and users.	

City of Malmö	This step in an energy renovation is important in order to get the full potential out of the renovation. However, it is also a complicated task. Our procurement normally contains a statement regarding the responsibility of the contractor to examine and repair physical goods broken. Other contractors are responsible for the maintenances and operation of the building, and yet others for the contact with tenants. It is a good idea to decide in advance how the phase after the renovation work will be organised and to communicate this to all parties. The City of Malmö has tested out an approach in which they take notes of all problems occurring and then do follow-ups in meetings with all parties involved.	

BORA 94	According to the public procurement, contractors are obliged to fulfil many security issues, which are stated in the contracts, such as deadlines, quality of the materials applied, the security of the construction sites, the involvement of sub-contractors, rate of their own performance and good delivery guarantees. All these restrictions are meant to eliminate problematic situations.	
PNEC	It is a common practice to ask during public procurement for an extending guarantee imposed by the law, which secures the building owner from struggling with malfunctions itself. Usually the guarantee covers at least the project timeframe and 5 years after. The guarantee can last even longer, but in this case the building owner can expect to pay a higher price to the contractor.	
SERDA	It is mandatory by the law to have warranty certificate for a period of 24-months, which includes the concern of snagging issues.	
Durham County Council	As a matter of course, County Durham includes contractual obligations for snagging issues to be rectified post-occupancy through their procurement frameworks. Final payments may be delayed to ensure contractor obligations are met.	
Region of Crete	It is obligatory by Greek law to have a 15-month period for snagging issues.	

STEP 2: Efficient cooperation with selected contractor

- Establish an efficient communication and cooperation regime
- Improve contractors' capacities (if needed)
- Ensure supervision over the contractors' work
- Provide necessary support

DOs:	DONTs:
- Organise pre-investment meetings and trainings for the contractor to ensure that he understands the local situation well and can deliver the service according to your expectations.	- Don't underestimate the need to stay in regular contact with the contractor, ensuring on-the-job supervision and support and quickly reacting to all possible problems. - Don't assume the contractor is on schedule and aware of handover requirements.

Action 4: Training of and regular meeting with the contractor	Good practices and other relevant EU experiences
Even when a contractor has been selected, it is the building(s) owner responsibility to ensure that the investment is carried out properly and according to the schedule. Appoint a Monitoring Officer and establish suitable monitoring systems to ensure effective oversight per contractor's work. Organise an initial training/meeting to get the Monitoring Officer familiar with local situation, conditions and your requirements. Meet regularly during the whole implementation process to identify and solve any important issues.	

Durham County Council	In new or retrofit buildings, DCC works with the contractor to undertake handover occupancy training sessions for on-site building managers so that they fully understand the technology included in the buildings. Longer term support, following the guarantee period, is provided by the Low Carbon Economy team and other Technical Services colleagues.	
Region of Crete	The appointed project manager sets regular meetings with the contractor in order to assure the project's proper implementation and establish a co-operation protocol.	

STEP 3: Supervision over implementation of selected energy conservation measures

- Ensure the proper implementation of energy conservation measures
- Ensure correct and efficient operation and maintenance of new/modernised systems, installations and equipment
- Ensure accordance with technical specification
- Establish a regime for identifying and reacting to any problems and malfunctions
- Commission implemented measures

DOs:	**DONTs:**
- Ensure good quality supervision over the construction works. If you don't have adequate internal capacities, reach for external ones. - Make sure that all implementation procedures are clear and transparent. - Hold regular implementation meetings. - Have a QA for larger projects. - Ensure the quality control of all the construction phases.	- Don't underestimate the need for ensuring that implemented energy conservation measures are not only properly installed but also properly operated and maintained. Verify operational performance. - Don't hesitate to use more than one construction supervisors when the project contains both; i.e. architectural and engineering aspects.

- Pay special attention to the handover phase. Make sure that all necessary knowledge is passed on. - Commission the works only when you're 100% sure that the investment was done correctly and no corrective works are needed. - Retrofit what is needed. Make ROI calculations.	

Action 5: Contracting or appointment of a good and reliable Construction Supervisor	Good practices and other relevant EU experiences
The construction supervisor(s) should be specialised in energy consumption integrated in architecture and/or engineering installations. The supervisor(s) should ensure that all the measures are implemented properly and in accordance with the project and that they are properly operated and maintained. If needed, the construction supervisor should be able to determine what measures are needed to decide and involve additional experts (e.g. thermal imaging to inspect proper fitting of insulations, windows, joints).	

BORA 94	According to national law, the selection of construction supervisors is usually based on three independent offers, in which construction supervisors state their references and professional backgrounds. In Hungary, electronic construction diaries are obligatory, to be filled out regularly by the constructor. The construction supervisor is also obliged to check the diary and add comments/remarks in it when necessary.	
Durham County Council	The construction supervisor would in most cases be employed by Durham in our Technical Services division, however in some cases this service may be procured from an external organisation who would need to ensure strict outcomes and milestones were achieved and highly qualified staff were used.	
Region of Crete	The construction supervisor(s), which in some cases could be the energy manager(s), is appointed by the public authority and has the appropriate qualifications (i.e. mechanical or civil engineer, architect).	

Action 6: Putting in place measures for quality assurance and control (in case of larger projects or parts of larger projects)	Good practices and other relevant EU experiences
Quality Assurance (QA) and control measures should be implemented in case of all larger projects or their elements to ensure that all interventions are quality ones. It is recommended to appoint a QA manager, who will secure a quality of achieved results, or set regular quality audits, by the construction supervisor(s). Installations need controlling not only during the project implementation, but also when the work is completed and when the installation has been running for a while. Performance is often not shown right away but is an essential part of a project result. Agree on criteria/areas to be controlled and, if possible, align these with economic/financial criteria/areas (payment schedule).	The Municipality of Metamorfosis in Greece has implemented ISO 50001

BORA 94	A construction controller/supervisor or the planner is often appointed to ensure quality control of installation.	
PNEC	Each investment must be formally commissioned before closing the contract with the contractor, which requires quality control of the installation. The challenge here is that sometimes this commissioning is done by the employees, who often do not have enough knowledge and experience to conduct the quality check. Therefore, more capacity building in this area is needed, and/or support from external expert—which would generate additional costs—must be obtained.	
SERDA	The law no. 10/1995, updated in 2017, foresees that there is a quality control in every step of the implementation process for quality assurance purposes.	
Durham County Council	It is DCC standard practice to ensure that the contractors carrying out works are certified and approved to install specialised equipment; i.e. they must have MCS accreditation for renewable technologies.	
Region of Crete	The Greek legislation (L.4412/2016) foresees that there is a quality control in every step of the implementation process.	

Action 7: Ensuring that energy efficiency is prioritised throughout the whole process and whole lifetime of a building	Good practices and other relevant EU experiences
The need for maximum energy efficiency needs to be considered during all works related with the project and its commissioning. Steps should be taken to ensure that it is considered also after the project closure. A continued development process should be encouraged with regular awareness raising trainings for employees through good practice programmes.	Hungarian SEAP-driven energy training for municipal staff Durham's "The Big Switch Off" campaign

BORA 94	This holistic approach is not fully respected. This being said, awareness raising towards this method is currently part of the relevant call (TOP 3.2.1.) in the forms of trainings for the relevant actors and building users.	
Durham County Council	Advice, guidance and training opportunities are provided by the Low Carbon Economy team through programmes such as The Big Switch Off, along with access to effective energy monitoring of energy data. This is overseen by the Low Carbon Economy Team, but also individual building managers have access to the data for the buildings they are responsible for.	
Region of Crete	Since 2008, Greek legislation designates that the energy managers should update and train, in set intervals, the buildings' users on energy efficiency issues.	

Action 8: Taking advantage of Good Practices available for public administration	Good practices and other relevant EU experiences
Access to available good practices is an advantage for public administrations that should be deeply explored. Getting familiar with relevant practices can help to better implement the project, solve arising problems, avoid reinventing the wheel and achieve even better results.	Comprehensive REBUS project Good Practices

City of Malmö	The City of Malmö offers instruction for building projects to public administrations. This comes in the form of a manual that contains guidelines based on experience.	

BORA 94	Good practices are regularly promoted by energy agencies, NGOs, and development agencies who are involved in international cooperation projects. These GPs are usually accessible through their websites and events.	
Durham County Council	DCC ensures that good practices are disseminated across public administration networks such as Area Action Partnerships and through working with partner organisations such as local universities and other local and regional public agencies.	
Region of Crete	Greek Regional Authorities acts as a central database for good practices collected through their participation in National and European calls. Later, they disseminate their acquired knowledge to the local authorities (e.g. municipalities).	

Action 9: Taking into consideration different budgets used to finance the building, its operation and investments 5: Contracting or appointment of a good and reliable Construction Supervisor	Good practices and other relevant EU experiences
There are different budgets for different purposes related with the building: the operation unit has a budget for rents, inventory, etc.; the landlord has a budget for maintenance and renovations; etc. When implementing energy conservation measures, it is necessary to take into account all these different budgets. A comprehensive options appraisal of the technologies available should be carried out, including all associated costs and payback. Life Cycle Cost (LCC) analysis is a powerful tool to utilise because it shows the total effects of the project and not who is benefitting.	

Durham County Council	Assessment of effective investment in energy efficiency is undertaken through a Carbon Management Board and in particular the Capital Sub Group. This group analyses the predicted returns on investment; the carbon savings and wider benefits such as staff wellbeing (e.g. LED lighting retrofit in public buildings).	
Region of Crete	Annually each local/regional authority issues its budget considering the construction of new buildings, the renovation of existing ones and the maintenance of both buildings and infrastructure.	

STEP 4: Meeting formal requirements

- Ensure all formal requirements will be met; e.g. requirements resulting from national, regional and local regulations, requirements of financing programme/instrument used, internal requirements
- Confirm investment fits into long-term strategies and policies of the municipality/region

DOs:	DONTs:
- Make sure that the project as implemented meets all necessary formal legal and technical requirements identified in the planning phase.	- Don't assume that if the investment plan was in accordance with the legal and other formal requirements, also the investment itself will be.

Action 10: Ensuring that the project as implemented meets all the formal and other necessary requirements	Good practices and other relevant EU experiences
Even when the project was prepared in accordance with key requirements (e.g. stemming from existing regulations, requirements of the financing programme/institution, etc.), it doesn't necessarily mean that it will be implemented this way. During the implementation keep in mind all the requirements and make sure that implemented project meets them. Make sure that the project fits into all relevant local and national policies and strategies.	Green University "Open Lab" of Technical University of Crete (TUC)

Region of Crete	The Greek legislation not only foresees regular inspections by the authority's project manager, but also sets a security clause for meeting all the necessary requirements appointed during the planning phase. In order to do so, a guarantee letter is issued by the contractor for specific amount (i.e. 5% of the project's budget) and attributed to the project owner (i.e. the municipality).	

STEP 5: Involving key stakeholders

- Identify and involve all stakeholders key for the implementation phase

DOs:	DONTs:
- Ensure that all key stakeholders are involved in the implementation process and can influence it. Allow building maintenance staff to share their opinions. - Seek guidance from specialist colleagues.	- Don't keep the project to yourself and try to do it all yourself. Ask for advice and delegate tasks. - Don't underestimate the role of building maintenance staff, who knows the building and its problems best. Ask for and listen to their opinions.

- Ensure efficient flow of the information between different departments and parties involved in the project. Make sure that the messages are clear and transparent. - Communicate regularly through the agreed upon processes. - Promote the successes achieved on the way (even if the investment is not yet completed). - To communicate with non-technicians, use the help of technicians that are able to explain the project with simple, non-technical language.	

Action 11: Ensuring involvement of key stakeholders, including technical staff (mechanics, electricians, engineers, etc.) in the whole process, also through organisation of periodic meetings (particularly relevant for large construction projects)	Good practices and other relevant EU experiences
The planning phase already included identification of key stakeholders that shall be involved in the project and agreeing on the communication matrix and regime to ensure proper flow of information and communication. It is important to follow this regime and keep stakeholders engaged also in the implementation phase, both those contributing to the project and those affected by the renovation. Especially important is the involvement of building maintenance staff and technicians (mechanics, electricians, engineers) in relevant parts of the project. To facilitate this, it is vital to clarify what their involvement should look like, and at what stages it is desired. A meeting structure/schedule should be established. If there are economic limitations, this should also be clear for all parties involved. If the stakeholders cannot be involved in all meetings, or some are not so relevant for every meeting, concentrate on communicating project progress in order to keep everyone up-to-date.	Region of Crete's 50/50 methodology

City of Malmö	In all refurbishment projects, all adequate personnel are in place during building preparation meetings. This is very important because in order to achieve good project results, all parties need to understand the purpose of techniques/materials as well as the goals related to energy use. An airtight building, for instance, is achieved only if engineers, contractors and other workers fully understand the materials used and why and how they are used. Engineers should be checking the work on-site and, if necessary, adjusting work descriptions and blueprints.	

	Moreover, during the renovation, there are regular building meetings planned (every 10-working days, or so) where all the partners meet and discuss progress, snagging issues/ setbacks, etc.	
PNEC	In some of the Polish municipalities—those more aware of the benefits of participative processes and experienced in implementing energy-related projects—key stakeholders are always involved in project planning and implementation.	
Durham County Council	DCC integrates technical staff into stakeholder meetings to create cohesion in the project. Mechanical and electrical engineering staff are invited to participate in the planning and implementation of all minor and major capital projects at DCC to provide specialist advice. This is replicated throughout the process where comments regarding the performance implications of value engineered HVAC services are invited. Simultaneously, this involves specialists from the low carbon economy team who can offer comment on the energy performance and sustainability of the building. DCC also involves all potential partners/ experts/ departments/ politicians affected by the renovation through stakeholder meetings. This is particularly important when DCC is working on a major capital development, as smaller more localised renovations do not require stakeholder meetings. For these cases, DCC will still keep stakeholders informed of the project's progress and invite comment (either written or verbal) as part of an inclusive and collaborative process.	
Region of Crete	During the planning phase, those affected by the renovation are taken into consideration before finalising the proposal. Hence, their involvement on set steps of the implementation phase is pre-scheduled. As in some cases, the relevant stakeholders and workers are not removed from the site and their participation and involvement is a "de facto".	

The monitoring phase of the project is very important, yet often underestimated. Solid monitoring not only helps to evaluate the real impact of an implemented project but also to signify the need for and character of any corrective or follow-up actions. Moreover, taking into consideration the cyclical nature of project planning and execution, the lessons learnt and conclusions drawn in the monitoring phase can help to plan and justify further energy saving measures implemented by the municipality. It is important to remember that good monitoring should start already in the planning phase with all necessary structures and procedures planned in advanced to ensure that all relevant data, data sources and tools are in place.

Good monitoring involves establishing solid monitoring structures, assigning clear roles and responsibilities and establishing an efficient monitoring and reporting regime. Adequate monitoring tools and monitoring indicators should be considered, including the possibility of using advanced ICT. As always, it is important to ensure involvement of key stakeholders and that the monitoring data is actually verified, analysed and communicated to appropriate decision making bodies and other relevant target groups and used in practice (to evaluate current measures, plan further measures, communicate to the public, raise energy awareness, etc.).

STEP 1: Setting up monitoring structures

- Establish efficient monitoring and reporting structures/regime
- Appoint a monitoring team
- Establish monitoring tools/methods
- Assign the necessary time, staff and financial resources

DOs:	DONTs:
- Set up the right monitoring team. - Ensure that the monitoring process builds on the same procedures and data sources as the baseline development. If this is not possible, make necessary adjustments ensuring comparability of the data. - Have a structure/template for all required information. - Secure the budget for monitoring and long-term maintenance (5-10 years).	- Don´t diversify your monitoring structure over time. Use one process, so you can compare results both over time and with other buildings. - Don´t forget to estimate a budget for monitoring, repairs and maintenance.

Action 1: Establishing monitoring structures and regime Action 2: Clear definition of the regime/system and method (i.e. web) for reporting monitoring results	Good practices and other relevant EU experiences
The method through which the project and its impact will be monitored should have been established already in the planning phase. Roles and responsibilities, monitoring structures and monitoring regime should be determined and documented. The follow-up and monitoring of a project may involve different aspects such as technical solutions, organisation and energy consumption. In terms of energy consumption, it is an advantage to think carefully about what to measure. Today's technology has few limits but it is not always efficient to carry out detailed measuring whenever possible. Installing too many meters may lead the data collection and analysis to be difficult or unmanageable. A clear description of the meter structure and why it has been selected will help future caretakers and be useful in case of any changes in the building later. Things to consider: • Do not measure too much or too often; • Ensure accessibility of meters; • Ensure regular calibration of meters; • Design the meter system in a way that it helps you find meter errors.	Region of Crete's 50-50 methodology Hungarian SEAP-driven energy training for municipal staff Green University "Open Lab" of Technical University of Crete (TUC) Malmö School Carbon

Once data collection is completed, the results must be analysed and communicated. A clear reporting regime should be established to ensure that the monitoring data is reported to decision makers, relevant departments and stakeholders and general public. Easily accessible data is advantageous and will facilitate future work. An online platform (possibly open to the public) may be established, where reports can be uploaded online and discussed with involved actors. When communicating, make sure relevant data is analysed and the necessary analysis is included. This may lead to customised material, depending on the receiver.	

Florentine Energy Agency	The Tuscany Region has established a dedicated website for the reporting of results and expenses incurred for projects financed through ERDF funds, including those on energy efficiency of public buildings. The Tuscan online system applies ad hoc monitoring tools to assess achieved objectives and results against initial set indicators.	
City of Malmö	The City of Malmö's real-estate department has a team of energy experts analysing the data from their energy management software E4, which together with the real-estate owner communicates directly with the tenants. Utilising a web-based tool for energy consumption makes it easier to analyse data and work efficiently with abnormalities.	
BORA 94	The method of reporting on the progress of projects is determined by the Managing Authority in accordance with EU regulations. Thus, each beneficiary must follow this reporting process, which is web-based; reports must be submitted through an online system called "EPTK" (Electronic Applicant Information and Communication System).	
PNEC		
SERDA	All the funds received under the ROP programme are monitored (ad hoc) for 5 years. Every six months, progress reports are submitted by project beneficiaries and the status of the building (or investment) is analysed.	

Durham County Council	DCC has nominated a team for identifying and troubleshooting problems and established internal service standards in order to ensure timely resolution. DCC has an internal team of Low Carbon Economy specialists that use the energy management software "Energy Manager Live" (powered by Systemslink) to identify energy management problems within the DCC estate and use their expertise to troubleshoot and resolve the problems.	
Region of Crete	The Euronet 50/50 project has created a web-based platform that allows free online access feedback of the recorded data. Thus, the user can be informed about a given building's hourly/daily/monthly electrical consumption. Also, within the University of Crete campus, the in-plant control systems (BMS) use central software controllers and I/O module monitors that display the data from air conditioning of buildings (Central Air Conditioning Units - Heat Pumps), the lighting of communal areas, various auxiliary systems as well as power consumption and current quality via an electronic multi-instrument. The system also collects and displays data from the automatic control of the amphitheatre's lighting, including on/off and light dimming data, so that there is no misuse of lighting.	

Action 3: Determination of monitoring tools – setting up reliable monitoring system (i.e. BMS)	Good practices and other relevant EU experiences
Monitoring shall be conducted using adequate monitoring tools. Today, implementation of a building's monitoring and control systems is really a must. The initial costs can be high, but the investment should be cost-efficient in long term. Also, try to establish a coherent approach to implementing a BMS within all buildings managed. When choosing a BMS[7] system it is essential to choose a system that can handle all the Direct Digital Control systems implemented in the building stock.	The Mercury Project in Malmö Green University of Crete (TUC) Strategy Project Green Hospital in Tuscany Versilia Hospital renovations in Tuscany

[7] Building Management Systems (BMS). BMS allows for the management and control of the CHP and HVAC plants, in addition to collecting data on electricity and natural gas consumption.

Also important for the possibility of monitoring data is an efficient method of extracting data for analysis. Prior to the implementation of the system, it is vital to define the meter tree, and how deep it is should go into the different components in the building. In the least, you should have a meter tree that can differentiate the building energy from the operational energy. Here it is vital to have all different energy sources covered (electricity, gas, hot water, etc.). If needed, confirm it is possible to differentiate between energy data from heating/cooling, hot water and ventilation. Each of these factors affects the possibility of collecting proper monitoring data.		

Florentine Energy Agency	There are reliable monitoring systems in the Arezzo and Montevarchi hospitals of Versilia and in social houses of the Municipality of Firenze, as well as in the public lighting of the city of Firenze. Additional information is available here: http://www.casaspa.it/informazioni/Libro%20misurare%20efficienza/libro.pdf https://www.ars.toscana.it/files/eventi/eventi_2013/edilizia_ospedaliera/13_novembre_2013/1_maestrelli.pdf	
BORA 94	There are more and more attempts in Hungary to install smart metering systems in both public and privately-owned buildings; e.g. in the case of the City of Miskolc, all public buildings are equipped with them already. A good example of determining effective monitoring tools is the case of the PPP-type of geothermal project, involving MIHŐ Ltd, which is owned by the City Municipality of Miskolc, and PannErgy Ltd. (private company). They have jointly decided to found a project company, called Miskolc Geothermal Ltd, in August 2009 with the intention to supply a large proportion of heat produced from renewable resources to Hungary's third largest city. The technical goal of the investment was to feed geothermal energy to the heating system of Miskolc's Avas district, situated the nearest to the facilities. The technology was designed to supply heat to the panel buildings of the local housing estates and also to some schools. The heat output of the thermal wells is transmitted to the heat consumers via pipelines and heat exchangers, and after cooling, the fluid is reinjected.	

	Depending on the momentary demands for heat output, the system could be regulated by controlling water production via the pump of the thermal well as well as the water-carrying performance of the accelerating pumps. Towards the project's end, measurements had to be performed at a number of points to determine the temperature, pressure and volume flow rate values as means of managing the geothermal heating plant via the central remote surveillance system. This system provides all necessary data and actual values to those who operate the plant, and sends immediate alerts via SMS, in case of emergency. The Geothermal Project of Miskolc has been recognised with GeoPower Market's international prize "Best Heating Project 2013". MIHŐ Ltd., the private district heating company of the City of Miskolc, operates surveillance/monitoring systems for other renewable energy projects (i.e. biomass, biogas) to monitor performance also in different districts of Miskolc.	
PNEC	There are already examples of pilot projects involving implementation of smart metering systems—for example, the comprehensive thermal retrofitting project implemented in Niepołomice—as well as BMS (e.g. Warsaw Library, Seat of the Voivodeship Fund for Environmental Protection and Water Management in Gdańsk). These examples could be used as a reference for other municipalities interested in the implementation of similar solutions. However, it must be noted that such systems are still a novelty and should be promoted and disseminated further.	
Durham County Council	Though DCC does not have a coherent approach to implementing BMS within its buildings, it utilises energy management software called Energy Manager Live (powered by Systemslink) that collates and monitors energy use (i.e. gas, electricity and water) for all of its buildings. Though this software cannot independently control the settings within each building, it can help to accurately identify erroneous consumption in close to real time, which can be resolved by internal staff or external contractors where appropriate. DCC is currently trialling the use of remotely operated BMS systems in a small number of buildings.	

Region of Crete	There are many projects involving implementation of BMS that could be imitated, such as the New building within the Technical University of Chania; the University of Crete Green University; the New airport terminal building of Sitia. Additionally, an e-monitoring system regarding electricity consumption has been implemented in several municipality buildings (e.g. Lim. Hersonisou) within the context of Euronet 50/50 project. This system transmits real-time data. Nonetheless, apart from the positive experiences with monitoring in Greece, there are also actions that should be avoided, such as the following case: Venizeleio Hospital is one of the two main public hospitals in Heraklion. In 2001, during the building's first expansion, a BMS was implemented for lighting scheduling and centralised monitoring and control of air conditioning units, as well as monitoring electrical substation. During the second expansion of the building, the new BMS could not collaborate with the initial one, forcing the engineering team to improvise solutions and measures in order to make all vital repairs and keep the system in good condition.	

Action 4: Establishing work process with the contractor(s) (Gantt chart – who, how, when?)	Good practices and other relevant EU experiences
The planned process of work must be clearly defined in the procurement procedures and the law. A planned process of work (like a Gantt chart) can provide quality assurance during the planning, implementation phase and monitoring phases.	Green University of Crete (TUC) Strategy

BORA 94	It is obligatory for project plans of EU funded investment projects to contain the planned process and milestones (Gantt chart).	
Durham County Council	Each capital project will have a schedule or works and a Gantt chart to manage the timeline for the retrofit. These are overseen by the Carbon Capital Board and managed by the Construction Programme and Project Unit within the local authority.	

Region of Crete	According to the Greek legislation, a Gantt diagram along with an organisational chart and a job description chart are prerequisites to the procurement phase. If these prerequisites are not followed, fines are issued. The contractors can alter these documents during the implementation phase in order to have the final documentation in place when the monitoring phase begins.	

Action 5: Securing funding, both for monitoring and for carrying out repairs and maintenance	Good practices and other relevant EU experiences
It is vital to project success to secure adequate funds for project monitoring, as well as to include contractual agreements and/or overall operational budget funds and measures for repairs and maintenance.	The Business Energy Efficiency Programme (BEEP), Durham The Mercury Project in Malmö

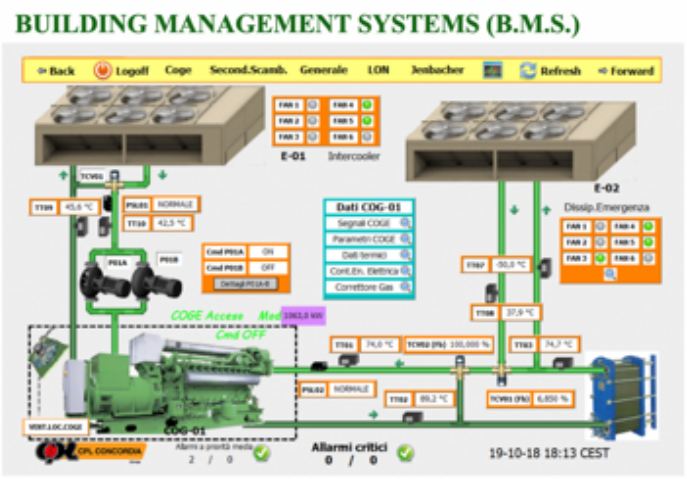
Durham County Council	The Business Energy Efficiency Project, developed by Durham County Council, successfully secured an ERDF grant of €597,439 matched by €168,140 from Durham County Council and €224,187 from local SMEs, with a total project value of €989,766 in 2016. This funding allowed expert staff the time to analyse energy data from local SMEs and also enabled a project fund that the participating SMEs could access to fund energy efficiency works and monitoring. In local authority buildings, the Low Carbon Economy Team manage a number of budgets to invest in energy efficiency. Savings made from projects are reinvested into new projects. Additional financial sources are also available in the UK such as Salix Finance.	
Region of Crete	Each regional authority has a specific budget appointed in their annual budget for building repairs and maintenance. However, applying monitoring systems in a given building—assuming there were not any monitoring systems implemented during the building's construction phase—is a decision that must be made on a year-by-year basis, depending on the available self-funding.	

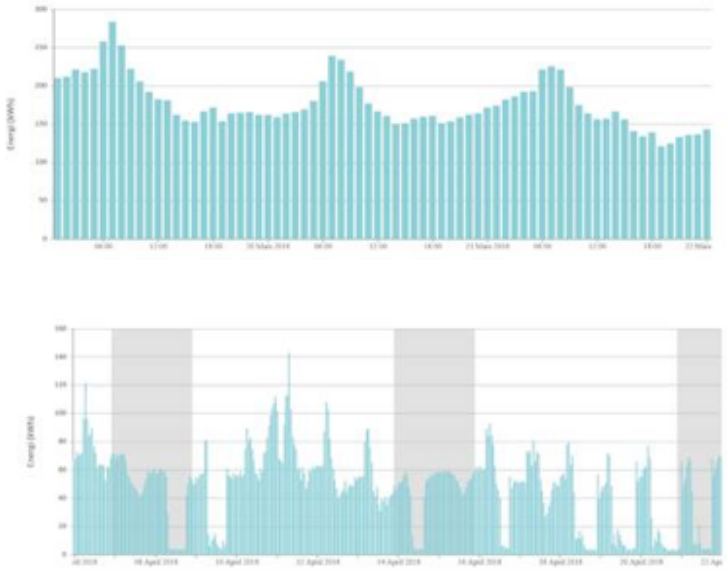
STEP 2: Ensuring efficient monitoring process

- Ensure efficient monitoring and supervision over the monitoring process
- Include different monitoring indicators and monitoring types (monitoring of building/system energy performance, building/system operational performance, project process itself)
- Ensure feedback from key stakeholders is received

DOs:	DONTs:
- Regularly check and report on the progress towards an established goal. Target an ambitious goal, such as a high energy performance of the renovated buildings – exigent requirements for the primary energy consumption, heating demand, cooling demand, air tightness of renovated buildings. - Use a clear methodology for the calculation of the building performance. - Use available ICT technologies as often as possible. They offer great support in energy monitoring and optimisation processes and are becoming increasingly available and affordable. - Use a web-based project reporting tool and make sure that all suppliers report regularly. - Ensure provided information is reliable and up-to-date. - Check and challenge data regularly. - Involve all key stakeholders in the monitoring process. Be interested not only in the quantitative, but also qualitative inputs. - Seek feedback.	- Don't underestimate the monitoring phase of the investment. Always check if the real results are proceeding on schedule. If the results are not as good as expected, analyse why, plan corrective measures and draw conclusions for the future. - Don´t assume the project is going as planned. - Don't rely too heavily on statistics and aggregated data. Use bottom-up data as often as possible. - Don´t monitor only on short-term. - Don´t envisage through the renovation projects only a singular issue (take ETICS, for example). A renovation project should be executed by an integrated team, with all the specialists involved and working as a unit.

Action 6: Identification of data sources, data collection and analysis, bench-marking	Good practices and other relevant EU experiences
Identify from where energy data can be obtained. Is special/designated access required? Is sufficient historical information available (to make a before-and-after comparisons)? Plan a diminishing but realistic reporting programme where information is monitored very frequently at first commissioning, and is tailored accordingly as the installation matures. It would be also useful to introduce a requirement (e.g. in the funding programme) that each investment should have both pre- and post-investment energy audits completed. Ensure that the same/comparable data sources and procedures are used for the planning and monitoring phase of the project.	Green University of Crete (TUC) Strategy Versilia Hospital renovations in Tuscany

Florentine Energy Agency	Through a data analysis tool connected to BMS, statistics from the hospitals of Arezzo, Montevarchi and Versilia, plus social housing and the public lighting of many Tuscany cities comes in from AFE's energy supplier. Therefore, it is possible to compare different buildings' energy usage or the energy usage in one building over time, in order to analyse potential green solutions. In Viareggio, Arezzo and Montevarchi, one of the most important components of the Green Hospital Project was the installation of Building Management Systems (BMS). BMS allows for the management and control of the CHP and HVAC plants, in addition to collecting data on electricity and natural gas consumption.  The Arezzo Hospital has a special contract for monitoring. The hospital conducts monthly rounds of meter readings separate from the those of the plant manager to certify, for example, how much electricity was self-produced via co-generators or via photovoltaic systems. This BMS tool is very useful because, for example, if AFE uses their remote control system to perform this monitoring, the manager could easily impute the lack of energy production to system errors or registration in the case of not achieving the set energy standards. Using the BMS, the data is collected by reading official tax counters stamped by the Customs Agency, while the hospital signs the reports.	

Florentine Energy Agency	This aspect is very important. In the contract that the hospital have, if the manager does not operate the co-generators or photovoltaic systems as offered by the tender, AFE has the chance to apply a penalty of 3. Sometimes the lack of energy production, so the appearance of the control certified under this point of view is fundamental and thanks to this system the hospital have never had problems.	
City of Malmö	Through the City of Malmö's data analysis tool called E4, statistics from all of Malmö's buildings comes in from their energy supplier. Therefore, it is possible to compare different buildings' energy usage or the energy usage in one building over time both, in real terms or grade day adjusted. An example of the data collected by E4: 	
BORA 94	Before and after refurbishment, an energy certificate/audit is carried out for each EU funded project.	
SERDA	Energy certificates are required of each building before and after the renovation for all public investments and comparative reports, including information on the strong and weak points of a given building. Also, SERDA is currently working on pilot project to see how different measuring approaches work over several years. SERDA will then implement all the successful measures in new projects (lesson learnt).	

	SERDA's project proposal: Comparison of the energy characteristics of the building from the existing database before and after the renovation (comparing buildings with similar characteristics).	
Durham County Council	The Low Carbon Economy Team, as part of building business cases, would always analyse energy consumption data to determine a business need for refurbishment. Part of this process would require the monitoring and reporting of energy consumption post-project completion to ensure the expected performance is being achieved. DCC produces a monthly "benefits realisation" report detailing the ongoing savings achieved from energy efficiency projects, such as the installation of solar panels, the introduction of a biomass boiler or LED lighting retrofit. All data is monitored through the Energy Manager Live software (powered by Systemslink). This system uses automated meter readings; regular meter readings by building managers and quarterly invoice data to corroborate the information	
Region of Crete	Regarding the process for energy upgrades of the Central Administration Building of the Region of Crete, the entire building stock of the Region of Crete was recorded and an integrated database was created. This database includes various information (e.g. the type of the building, schedule of use, year of construction and renovation, energy characteristics, etc.), before and after renovation.	

Action 7: Ensuring efficient monitoring process	Good practices and other relevant EU experiences
Undertake regular monitoring activities at set intervals - following established routines and using all available tools (from online management systems, to periodic meetings, etc.).	Project Green Hospital in Tuscany Malmö School Carbon The Mercury Project in Malmö Green University of Crete (TUC) Strategy

City of Malmö	Tools for data collection can be categorised into three different tools: 1. Building inventory database: a database of all needed drawings of the building (Hyperdoc). 2. Building management system: inventory of all technologies in the building (Citect). 3. Energy consumption database: database of energy consumption of all buildings' individual energy consumption (E4). Monthly analysis of deviations is performed by the City of Malmö's technicians. This often leads to further investigations, services or maintenance required.	
Durham County Council	If a fault or repair has been identified, DCC aims to identify the social, environmental and economic impacts of not doing/ doing the repair. DCC considers these impacts within the decision-making processes and jurisdiction of the Low Carbon Economy team, taking a longer-term approach than would perhaps be taken in other areas within the authority.	
Region of Crete	Within the Technical University of Crete campus in Chania, the monitoring actions implemented were: 1. Enabled electronic access to PPC telemetry data and e-bill service. The Technical Service gained a direct view of the monthly electricity consumption. 2. Establishment of electronic heating oil receipt log. 3. Procurement and installation of 18 electric telemetry devices, placing them at the focal points of the Polytechnic University. Development of data logging and analysis software. 4. Creation of an energy map with a display of energy consumption of the main units. 5. Dissemination of the results at: http://www.tuc.gr/5496.html. 6. Installation of energy meters in the students' dorms.	

Action 8: Seek feedback and ensure transparent process for responding to feedback	Good practices and other relevant EU experiences
Establish useful and up-to-date communication channels (i.e. online forums, Q&A pages, social media pages) for regular communication and feedback with end users (e.g. to gather people's opinion on the "new" building, including comfort levels, level of difficulty regarding operating the modernised systems and new equipment, etc.). Make sure these social channels are regularly used, updated and monitored.	Green University of Crete (TUC) Strategy Durham's "The Big Switch Off" campaign Malmö School Carbon

Florentine Energy Agency	A Facebook page and regular meetings are used as tools and opportunities to engage with stakeholders and receive their feedback.	
SERDA	The Buzau Municipality process for communication includes Mayor's Reports online and offline (written press), a Facebook video (by the Mayor), regular social media updates and public speeches. Transparent strategies are also published on the City Hall webpage (public consultation).	
Durham County Council	DCC establishes shared ownership of feedback responses to avoid delays. DCC has created a shared email address which is accessed by a team of people. This "energy" email address allows building managers within schools, for example, to get in touch with any concerns they have regarding their school's energy use. This on-demand support system provides reassurance that their queries will be responded to quickly. Engagement programmes such as the Big Switch Off and ECO2 Smart Schools Programme (formerly School Carbon Reduction programme), provide an additional contact point and Officer who can react quickly and act as a champion for that school or building manager.	
Region of Crete	Within the region of Crete, there are 16 municipalities that participate in the Covenant of Mayors. In this context, regular meetings of the working team—some of them open to public—are set not only as communication procedures but also as a means for formal feedback between technical staff.	

Action 9: Ensure efficient cooperation with specialists from various fields of activity (both within and outside local administration) for monitoring performance indicators	Good practices and other relevant EU experiences
Representatives from finance, M&E, sustainability specialists, senior leadership and building users should meet to discuss expected performance. This group must share responsibility of celebrating successes and tackling issues.	Malmö School Carbon The Mercury Project in Malmö

Florentine Energy Agency	AFE has a strong cooperation with their stakeholders, who are specialists in monitoring performance indicators, CET, and managing the energy usage of hospitals.	
Durham County Council	Through our Carbon Management Plan Strategy, DCC has a strategic Carbon Management Board with senior representatives from all key service areas within the local authority. Reporting to this board are two sub groups: (a) Revenue Projects; and b) Capital Projects. These groups include a range of representation from across the authority at a Team Leader level. These business-like meetings meet more regularly and focus on detailed outcomes and business case proposals to steer investment decisions and ensure that projects are on target.	
Region of Crete	Due to the Covenant of Mayors, the SEAPs report is re-submitted every two years. This allows and even obliges participants to participate in all the required meetings (internally) and cooperation (internally and externally) in order to monitor and discuss their energy performance in total.	

STEP 3: Making use of monitoring data

- Use monitoring data for investment evaluation and planning corrective/follow up measures (if necessary)
- Use monitoring data for ensuring long-term operational performance
- Use monitoring data for planning further energy saving measures
- Use monitoring data for increasing overall energy awareness and knowledge of building users
- Use monitoring data for disseminating the project and its results, communicating successes and learning from mistakes

DOs:	DONTs:
- Remember that monitoring makes sense only when the data is used in practice (e.g. for drawing conclusions for the future, coming up with further optimisation measures, justifying further funds for energy efficiency, promoting the project and its success, raising awareness and encouraging the implementation of similar initiatives...). - Ensure the bigger picture of the project is understood by your colleagues. - Set up an online platform where all the parties involved or potentially interested in the project can see the project achievements, and where the users of the building can find information, like a User-Guide, Q&A area, etc.	- Don´t keep challenges or issues to yourself. Communicate! - Don´t forget to set up a clear and flexible method for communication with the building users.

Action 10: Making practical use of monitoring data	Good practices and other relevant EU experiences
While making use of monitoring data, you must consider that there are two kinds of data. There is the slowly variable data that comes from the building itself; this could be running elevators, closing valves etc. This kind of data cannot be treated the same way as the other kind of data—the data that results from operations—which is a fast-moving data, depending of the operation at the time work is being done. These two kinds of data have different users, as well as different ways of interpreting data. Therefore, it is very important that the right monitoring data is reported to appropriate bodies. Landlords, decision makers, real-estate owners, etc. use data for: - Verification of the real impact of implemented measures; - Finding weaknesses in buildings; - Planning further energy saving measures; - Providing a base for setting budgets for new energy efficiency improvements; - Drawing conclusions for the future. Contractors use data for: - Ensuring long-term operational performance; - Comparing the settings with the real usage, to avoid unnecessary usage; - Drawing conclusions for the near future. Tenants use data for: - Presenting usage based on operation; - Comparing experienced effects operational data; Finding ways to mitigate operation usage.	

Durham County Council	Monitoring data (via the Energy Manager Live powered by Systemslink Energy software) is used for reporting back to all service users and senior management and for investigating capital investment. Through the School Carbon Reduction Project (ECO_2-Smart Schools), the data is used for an individual annual energy report produced for all schools that highlights their energy use throughout the year and suggests actions to reduce their energy use.	
Region of Crete	The existence of monitoring data is something rare for the majority of public buildings at the moment, as not so many monitoring systems have been installed in public buildings in general. Nonetheless, efforts are made to install monitoring systems, either by national, local or EU funding. In the case of hospital buildings, BMS provides data intended to assist their energy managers to verify the impact of energy renovations along with building users' habits and energy behaviour.	

Action 11: Using accessible, non-technical language to inform decision makers, building users and general public of project progress and outputs	Good practices and other relevant EU experiences
There is a need to teach municipal staff and their partners involved in energy renovation projects to better communicate with non-technical people (e.g. local decision makers, building users, general public). By doing so, they could better report on the activities taken and results achieved, as well as use the opportunity to raise awareness of these target groups. It must also be considered that energy renovation projects are only efficient when people know how to properly operate the "new" building, systems and equipment. Therefore, this communication, in which both sides speak the same "language", is very important. A user-friendly guide should be created in order to understand all the renovation work and learn how to use the renovated building properly, keeping energy efficiency at the forefront. In addition, it can be useful to organise meetings between the building users and the architects and engineers involved in the renovation project.	Durham's "The Big Switch Off" campaign The Mercury Project in Malmö

Florentine Energy Agency	A dedicated Facebook page "Europa per la Toscana" has been set up using accessible, non-technical language to inform building managers and users of ongoing project progress and outputs, as well as inputs, for open dialogue and exchange with citizens.	

Durham County Council	DCC identifies and meets with building users before any energy project or energy efficiency campaign. When carrying out The Big Switch Off campaigns in multiple corporate buildings, DCC informs building users and campaign participants of the benefits of their engagement by sharing simple, accessible displays of the energy saved and the associated carbon emissions and financial savings.	
Region of Crete	Several municipalities in the region of Crete participate with ROC's involvement and support in EU projects (e.g. SHERPA, Stratenergy, CLEAN, Euronet 50/50). These projects aim to assist the municipalities' staff to acquire and disseminate knowledge and information relevant to energy saving and sustainability to the end users. This is done through workshops and the dissemination of informative material (e.g. leaflets, emails).	

Topic 4:

HORIZONTAL THEME: CAPACITY BUILDING

The success of energy renovation projects largely depends on people – decision makers, municipal staff responsible for energy issues, selected contractors, facility managers and building users. All of these people have important role to play in the process; thus, it should be ensured that they are "energy aware" and well prepared to execute these roles.

Decision makers must have adequate capacities to understand benefits behind and the nature of energy renovation projects to be willing and able to set necessary planning, implementation, monitoring and reporting structures, assign necessary resources and ensure that energy efficiency is well embedded in municipality's long-term development strategy. Energy aware decision makers will also provide long-term political support and recognition of energy saving efforts.

Municipal staff needs to be well equipped to prepare and supervise energy renovation projects, communicate with the contractor and ensure that achieved results correspond to the projected results, also by engaging with external experts. All relevant municipal departments (not only those directly responsible for energy issues) need to be involved and educated at least to some extent in order to provide an "energy-responsible team" with the necessary financial, legal and communication support.

Since successful implementation of energy conservation measures depends not only on the capacities of municipal staff, but also on the capacities of other key stakeholders (i.e. contractors, consultants, facility managers), key stakeholders are another important target group of capacity building activities, which should be adapted to their needs and potential role in the project(s). Don't underestimate the role of building(s) maintenance staff – they need to be actively involved in all planned renovations and trained how to operate new or modernised systems, installations and equipment.

Last but not least, don't forget about the building users. Although not always directly involved in implementation of energy conservation measures, they have significant influence on building's energy consumption. Therefore, their overall energy awareness should be increased and their behavioural changes encouraged – this should be done not only within or during implemented energy renovation projects, but also on a regular basis.

There are different methods and tools for transferring energy-related knowledge and building relevant skills and capacities. They should be explored and used according to local needs. Remember that there are no methods/tools that perfectly fit all – it is better to tailor capacity building and awareness raising activities to specific target groups and the impacts that they can actually make. Ensure that available human resources are actually used in energy renovation

STEP 1: Understanding and following principles of successful capacity building and awareness raising campaigns

- Identify capacity building needs
- Identify and analyse capacity building tools and methods
- Adapt capacity building tools and methods to the needs of specific target groups
- Ensure long-term capacity building and awareness raising processes

DOs:	DONTs:
- Remember that when planning any capacity building or awareness raising activities, you need to clearly define targets, performance indicators, methods and tools. - Remember that capacity building is not about single actions but should be a continuous and well thought-out process. - Seek external opportunities and funding that may support your capacity building/awareness raising activities. - Organise regular training sessions for different target groups: employees/users/workers, etc. - Each training activity should be preceded with a training needs assessment of the target group and seceded with a comprehensive evaluation	- Don't try to organise universal trainings and campaigns – different target groups have different backgrounds and needs. You must adapt your actions accordingly. - Don't assume that all information/topics will be interesting for everyone. - Don't organise capacity building or awareness raising campaigns as single activities, without any evaluation and follow-up. - Don't forget to combine teaching theory with practical exercises. - Don't forget to communicate with the target group before and after the capacity building activity. What are their attitudes and expectations? What is their feedback? - Don´t do as you have always done. Try new things. Develop!

Action 1: Identification of target groups and determination of capacity building targets, methods and tools	Good practices and other relevant EU experiences
Identify whose skills and capacities should be improved to ensure successful implementation of energy renovation projects and overall energy efficiency in buildings. What do you want to achieve and with what methods? Plan tailor-made capacity building activities, keeping in mind that sustainability is a long-term process; thus these activities should be part of a long-term educational and engagement strategy. Also consider at what stage of the project certain efforts should be made to achieve the best results: before, during or after the project has been implemented. A communication plan will help secure the "right" kind of capacity building at the "right" time to the "right" people.	"Bielsko-Biała protects the climate" campaign Project Green Hospital in Tuscany Versilia Hospital renovations in Tuscany Durham - School Carbon Reduction Programme

There are difference benefits of capacity building at different stages: - Before: All important aspects are included in the project and the right expertise involved. - During: Everyone part of the project understands the big picture, which minimizes the risk of sub-optimisation. After: The project goals are transferred and understood by the operations staff, tenants and the public.	

BORA 94	SEAP-driven training material was elaborated upon—and is widely accessible—and was designed specifically for municipal staff in the frame of the GREENING REGIONS project. A training-series was carried out by experts from ENERGIAKLUB (NGO) in the form of regular on-site trainings upon request, for example. These trainings could be tailored to the specific needs of other municipalities as well.	
Durham County Council	Through the DCC good practice, School Carbon Reduction Programme (now called ECO2 Smart Schools), DCC has identified different user groups within the wider school community: Senior Leaders; teachers; business managers; premised managers; governors; catering staff; pupils. DCC targeted their approaches to meet the needs of these specific users. Senior Leaders/ business managers focus on financial aspects; governors on whole school approach and outcomes; teachers on learning resources and curriculum approaches; pupils with practical activities and tasks. This targeted approach has enhanced engagement and ultimately reduced carbon emissions and associated costs.	
Region of Crete	During the planning phase, all relevant parties are identified. Therefore, following the project's implementation phase, those parties involved and acknowledged participate in meetings for information and knowledge diffusion.	

Action 2: Organisation of multi-stakeholder meetings (municipal staff, other stakeholders, building users) enabling exchange of experience and opinion	Good practices and other relevant EU experiences
Meetings with all the involved persons should be organised regularly. These meetings could be matched with training sessions (see Action 5 below).	

Florentine Energy Agency	In collaboration with the Tuscany Region, AFE staff have organised ten regional stakeholder meetings, between September and October 2017 and throughout the entire regional territory, in order to reach stakeholders in all parts of the region. Over 500 participants took part in these meetings, where the REBUS project was presented and good practices from REBUS partners' regions were shown in order to help local municipalities develop their own project proposals and improve the quality of potential projects. As a result, 200 local authorities (300 projects submitted) decided to take part in the regional call for proposals for projects on energy efficiency improvement in public buildings. Moreover, bilateral meetings are periodically organised between the Tuscany Region officers and public energy managers.	
Durham County Council	Stakeholder meetings are held between facilities managers, the Mechanical and Electrical departments and Culture & Sport colleagues to better understand energy conservation behaviours of staff in buildings and exchange knowledge for ways to reduce energy consumption both through more efficient use alongside potential for investment in new technologies. The learning from REBUS partners has been shared through these forums as well as with local stakeholders through local stakeholder meetings and events and conferences.	
Region of Crete	The experience gained from several energy renovation projects' meetings, along with the latest BERs and staff exchanges from the REBUS project allowed the stakeholders—including those from municipalities, hospitals and regional authorities—to comprehend their value when it comes to knowledge diffusion and experience sharing. Regularly sharing of data and tips gained from experience with others who have the same queries creates a valuable shared experience.	

Action 3: Reaching for European funds to support vocational training and skills development for the energy efficiency field	Good practices and other relevant EU experiences
There are many examples of soft projects funded by EU or national funds that support capacity building of municipal staff, also in the area of energy efficiency. The projects' training material and approaches are freely available and can be further used in the future for increasing thematic knowledge and skills of municipal officers.	GP SEAP-Buzau SERDA GP from AFE (improve energy efficiency path) Project Green Hospital in Tuscany Versilia Hospital renovations in Tuscany SHERPA Project

Durham County Council	DCC is taking part in the Erasmus+ PEOPLE project with local stakeholder Durham University with the aim of enhancing the employability of postgraduate students. The students are researching public behavioural change regarding energy efficient transport.	
Region of Crete	The Region of Crete participates in several EU projects—such as REBUS, CLEAN, IMPULSE and SHERPA—which allows several stakeholders/stakeholder groups to enhance their knowledge and improve upon their experiences by interacting with experts or other participants experiencing similar issues abroad. A good practice that may be commonplace in one European region can be unheard of in other regions. Interregional sharing addresses this knowledge gap. More specifically, while implementing SHERPA Project the Region of Crete organizes training courses for the Energy Managers of the public sector (Region, Municipalities, hospitals, other public entities). After having identified the specific training needs in each public entity and having prepared the training contents (general and specific for each public entity), the trainers have been selected and the courses are developed.	

STEP 2: Building capacities of municipal staff

- Ensure the skills and capacities of your own personnel responsible for energy issues (incl. energy renovation projects) are improved
- Ensure the skills and capacities of other personnel involved in energy renovation projects (financing, legal, communication, etc.) are improved

DOs:	DONTs:
- Organise or participate in workshops enabling exchanging experience with other municipalities. - Challenge your own understanding of sustainability. - Expand your thinking. Develop and think in new ways! - Discuss the wider relevance of the project to the organisation and its individuals.	- Don't focus only on the staff directly responsible for energy and buildings. Involve also employees of other departments that are relevant for the whole project life cycle. - Don´t miss out on the best information currently available on the European market regarding high energy efficiency of buildings.

Action 4: Organisation of regular training sessions for municipal staff and consultants involved in energy renovation projects	Good practices and other relevant EU experiences
A thorough training programme covering both the technical systems and the measuring is crucial to proper caretaking and securing low energy use. Training should be transversal to all three topics, such as: - Criteria for data collection and building selection - Elaboration of the technical documentation for the project proposals and ESCOs schemes - Energy performance measuring, etc. Training programs should also be implemented for tenants so they understand how the building works. Trainings should also be adjusted on the basis of the participants' knowledge base. Refreshing training as the project matures should be envisaged.	SEAP Buzau Green Roof Crete GP Green University Crete GP Big Switch Off Malmö School Carbon GP School Carbon Reduction Programme

PNEC	There are examples of regular training sessions (i.e. Częstochowa, Raciechowice) and thematic training material (e.g. TOGETHER project) developed for different types of employees and users. However, such trainings are still not a common practice.	

Durham County Council	DCC coordinates and delivers regular training sessions for school caretakers and business managers to assist them in saving energy in their schools. The sessions are led by colleagues from the Low Carbon Economy Team and Education. In addition ad hoc sessions are provided when required on specific topics. In addition for corporate buildings information is provided through the broader Eco-Champions staff programme, which is part of a corporate "Inspire" staff engagement programme.	
Region of Crete	After the completion of the Green Roof of Hersonisos's Municipality Town Hall, several training meetings were held for the employees. The trainings were open to public. Within the Technical University of Crete in Chania, guidelines were regularly introduced to the students. For example: 1. Check that lights and air conditioning units are switched off (when not in use); 2. Turn off devices instead of using standby mode (when not in use); 3. Close doors and windows (when not in use); 4. Remove heating devices whenever possible; 5. Use natural lighting; 6. Supply new A+ energy efficiency devices; 7. Wear clothing according to the season; 8. Switch off air conditioning units from the central system. After the REBUS staff exchange in Durham, the Energy Managers from the Region of Crete that participated in the exchange have organized an energy-saving initiative based exclusively on the users' behavioural change which includes specific guidelines to the buildings' users.	

Action 5: Ensuring proper training of internal and external specialists directly involved in energy renovation projects	Good practices and other relevant EU experiences
The following internal and external specialists will have to be trained: architects, engineers, auditors, technicians and installers, personnel directly involved in buildings renovation and modernisation, staff with higher education involved in the inspection and control of construction works, inspectors from the central or local authorities, site supervisors and technical supervisors in charge of the execution (who can implement the new energy efficiency measures). These personnel should all be regularly trained with ad-hoc programmes.	GP SEAP- Buzau GP Training for employees of Local Energy Management Agency Project Green Hospital in Tuscany Versilia Hospital renovations in Tuscany

BORA 94	In some cases, energy institutions—such as the Hungarian Energy Efficiency Institute, together with the relevant organizations like the Chamber of Hungarian Architects—organise training activities for internal and external specialists.	
Durham County Council	The Low Carbon Economy Team provides updated training material in DCC's energy management system for the charity partner team of officers, who run the behaviour change programme in schools (ECO_2 Smart Schools, formerly School Carbon Reduction Programme), to ensure they are confident with the regular updates to the system. DCC also trains caretakers and facilities managers via the Energy Manager Live web portal for monitoring their own building energy consumption.	
Region of Crete	Capacity building supporting actions are based on seminars that are either nationally or self-funded by regional authorities (in Crete or in Athens). Also, the private sector in Greece often organises seminars, open to the public, relevant to buildings' energy savings and energy improvement. In such cases, technical services will participate.	

Action 6: Regular participation in conferences, workshops, webinars, etc. related to each topic	Good practices and other relevant EU experiences
Target those conferences that are applicable to your interest on local, regional, national and international levels.	Euronet 50/50 GP Big Switch Off

BORA 94	Beneficiaries of EU funding are obliged to upload information regarding realised developments on their websites and on their social media sites, but the latter is not obligatory. There is an illustrator map, called "TÉRKÉPTÉR", for summarising the main elements of each project implemented, but this contains only very basic information and core data about the projects, so the energy efficiency development technical data is not available to the public.	

PNEC	Beneficiaries of EU funding are obliged to upload information regarding realised developments on their websites and on their social media sites, but the latter is not obligatory. There is an illustrator map, called "TÉRKÉPTÉR", for summarising the main elements of each project implemented, but this contains only very basic information and core data about the projects, so the energy efficiency development technical data is not available to the public.	
SERDA	The Buzau Municipality regularly participates in conferences, workshops or webinars on energy efficiency, green energy and efficient building technologies.	
Durham County Council	DCC attends national conferences annually and regular regional training sessions on energy efficiency. In addition, DCC is a part of the Regional Energy Officers (ROC) that includes Energy Officers from across the northeast of England, ranging from municipalities and other public bodies (Health/ Policy/ Universities). Also Durham is a member of APSE (Association for Public Service Excellence) Energy which arranges energy specific events and seminars, and produces excellent briefing notes on new legislation and strategies for its members.	
Region of Crete	There are various events—conferences, workshops, webinars, study tours, Energy Weeks, etc.—held annually that are organised around the energy topics important for municipalities. Municipalities regularly participate in these events	

Action 7: Raising awareness on ESCO concept and EE business culture in order to increase interest in the ESCO market	Good practices and other relevant EU experiences
The procurement of procedures and costs and benefits in working with ESCO must be transparent. The main concerns with ESCO can be the higher final cost, for example. Awareness campaigns and trainings with public servants regarding ESCO implementation and costs procedures should be organised.	

Florentine Energy Agency	A regional initiative of ESCO contracts and energy efficiency culture in hospitals was taken as a good practice for the region. The results of this initiative were presented to all the main regional stakeholders in ten itinerant meetings. Attendees were municipalities and energy experts interested in applying for funding within a regional call for energy efficiency in public buildings. The aim of the meetings was to raise awareness and interest surrounding energy efficiency issues and provide thought-provoking real initiatives to encourage replication throughout the region.	
BORA 94	There are increasingly more energy agencies and other organisations promoting the ESCO concept in Hungary (e.g. LENERGY, Energy Hungary, NEG Zrt.), so it is becoming better known for public administration as well.	
SERDA	There currently no laws or regulations supporting ESCO contracts in Romania, so employing the ESCO concept is not ideal.	
Durham County Council	DCC is part of a northeast England regional approach through NEPO investigating the viability of ESCO contracts to benefit municipalities and residents in the northeast England region.	
Region of Crete	Even though regional authorities are in favour of ESCO contracts, some legislation bottlenecks prohibit their materialisation. Attempts are made to overcome these obstacles and at least one successful attempt is registered in the county of Chania.	

STEP 3: Building capacities and involvement of other stakeholders

- Identify key stakeholders
- Ensure the skills and capacities of stakeholders, including building managers and operational staff, are improved
- Ensure the involvement of stakeholders in the building renovation process
- Transfer knowledge on proper operation of new/modernised systems, installations and equipment to relevant actors

DOs:	DONTs:
- Organise regular trainings not only for municipal staff but also other key stakeholders (energy auditors, contractors, building users). - Ensure dissemination of project results among stakeholders. - Develop educational programmes for all stakeholders. - Listen. Communicate.	- Don´t assume that what interests you also interests everyone else. - Don´t give orders—sustainability should be participatory and non-prescriptive.

Action 8: Ensuring project legacy so that it is not just another initiative	Good practices and other relevant EU experiences
There must be a clear and understandable incentive for the stakeholders involved. Stakeholders must be encouraged continuously to participate and offer value to the project. Continuity and communication are main obstacles. One way to "sell" the project to stakeholders is to address added value along with value for money.	Project Green Hospital in Tuscany Euronet 50/50 GP Big Switch Off GP School Carbon GP The Mercury project

BORA 94	With long-term and systematic planning (e.g. SECAP), and through close and continuous cooperation with all interested actors and/or experts (e.g. public actors, such as decision-makers, private investors, energy experts, NGOs), BORA 94 is ensuring project legacy.	
PNEC	Project legacy is ensured by fitting REBUS into the local strategy (e.g. SEAP, SECAP, LEAP), and through the wide dissemination of the project and its results, encouraging other projects to follow up.	
SERDA	Project legacy is ensured by fitting REBUS into the local strategy, PAED, in which the directives are clearly outlined. The PAED presents transparent public policies, laws, and public administration check-ups.	

Durham County Council	Durham has a number of long-term energy related plans, both for the local authority and for the wider County. These are in the process of being updated. The REBUS programme has contributed to engaging elected Officials which has been beneficial in securing some long term carbon reduction targets (to 2030) for the authority. Many of the local stakeholders are also setting long-term ambitious goals.	
Region of Crete	After the completion of the Green Roof of Hersonisos's Municipality Town Hall, several training tours were organised specifically for local schools (see educational campaigns of Euronet 50/50 project).	

Action 9: Organising stakeholder meetings surrounding energy efficiency	Good practices and other relevant EU experiences
Integrate energy efficiency updates and knowledge sharing into the work programme to enable effective capacity building and sharing of good practices, including energy auditors, contractors and subcontractors.	GP The Mercury project

Florentine Energy Agency	AFE participated in a campaign to disseminate information regarding the regional call for energy efficiency in public buildings. Ten meetings on energy efficiency measures were organised, involving hundreds of stakeholders. AFE aims to schedule more regular meetings as a regional strategy in order to keep stakeholders engaged and informed.	
City of Malmö	The real-estate owner has recurrent meetings with the tenants, where energy efficiency is one of the subjects to discuss. However, this needs to be broadened and taken in to a more public dialogue between real-estate owner and the tenants. Also there are recurrent meetings with energy distributors, other municipalities and other organisations in order to cooperate successful.	
BORA 94	In the frame of the ongoing REBUS and EMPOWERING projects (where BORA 94 is a project partner), regular stakeholder/energy board meetings are organized targeting energy efficiency and action planning (REBUS), as well as revision of existing SEAPs and planning new SECAPs (EMPOWERING) in Borsod-Abaúj-Zemplén county. These meetings provide a great occasion to bring together all relevant actors and to facilitate and strengthen cooperation among them.	

PNEC	Within its previous projects (i.e. Energy for Mayors, MESHARTILITY), PNEC promoted the organisation of so called "Energy Forums" gathering local stakeholders and involving them in the development of local energy initiatives and projects. The methodology for organising such forums is available and can be used by other municipalities to actively involve their citizens and key stakeholders in the energy-related processes.	
SERDA	Stakeholders meetings and conferences coordinated by REBUS team where decisions are taken and new ideas of improving the energy efficiency plans are born.	
Durham County Council	Durham developed a staff engagement programme, called "Eco-Champions", for any staff interested in environmental issues. Energy efficiency and management was a priority area for meetings and e-newsletter communication. This has now merged into a broader staff transformation programme called Inspire but is continuing to have energy awareness and efficiency as a key element.	
Region of Crete	Organising annual Energy Weeks within the region (by the Region of Crete and by municipalities) to gather local stakeholders enables effective capacity building and sharing of good practices in the region.	

Action 10: Regular communication on continuous development via multiple communication routes/social networks	Good practices and other relevant EU experiences
Regularly update the stakeholder group on steering group decisions. Promote internally through the intranet and with partners through social media accounts (e.g. Facebook and Twitter) and through partner mailing lists. Promote regular staff exchange rounds.	GP Green University Crete

City of Malmö	Energy use per building is displayed on the internal City of Malmö website. It is possible for all employees to check energy statistics of all buildings in the City of Malmö.	
BORA 94	The EMPOWERING project organises regular conferences/webinars/workshops for its stakeholders on energy efficiency and SECAP issues.	

PNEC	Usually, municipalities are communicating on their energy-related projects in order to inform citizens about what is going on in the municipality, increase their energy awareness and build the municipality's image as an environmentally friendly and a pleasant place to live. The municipalities use various available channels, including the municipal website, local media, meetings, dissemination of thematic material, etc. Social media is used less frequently and the communication is usually one-way; i.e. the municipality informs the citizens, not the other way around. This should be improved upon, encouraging a more active dialogue surrounding energy issues and sustainability in Poland.	
SERDA	Mandatory communication rules are foreseen under the Regional Operational Programme and are followed by the project beneficiaries. Another effective method of communication is to have press conferences, post online news and encourage mayor and representatives feedback to the people.	
Durham County Council	Communication with stakeholders at a strategic level on energy and climate related issues is undertaken through the County Durham Environment Partnership. Through its focused sub groups this provides an opportunity for a wide range of stakeholders from across public, private and voluntary sectors to engage, in addition to residents. Within the local authority Durham uses an Intranet system for its staff; an Extranet system to share information with schools (plus the project specific energy site for schools ECO_2 Smart Schools).	
Region of Crete	Due to the Covenant of Mayors, 16 municipalities are members of the same web-based communication channel on energy related projects, disseminating knowledge and information gathered by their involvement in EU and national projects and increasing their staff capacity and efficiency.	

STEP 4: Increasing overall energy awareness and changing behaviour of building users

- Communicate with building users on energy issues
- Train building users how to use energy efficiently
- Familiarise building users with new/modernised systems, installations and equipment
- Appoint a monitoring team
- Involve building users actively in energy-saving activities and projects

DOs:	DONTs:
- Organise structured educational campaigns addressing climate change and energy efficiency. - Engage in educational campaigns organised on the national level. - When working with building users, educate them but also try to involve them in energy management processes. - Be patient—sustainability is often a complex and messy topic.	- Don´t be afraid of being challenged. - Don´t be one-dimensional.

Action 11: Organisation of educational campaigns with wider contextual relevance, structured programme and engaging multiple stakeholders	Good practices and other relevant EU experiences
Regular campaigns aiming to raise awareness on environmental protection, decreasing fossil energy consumption, encouraging renewable energy production and consumption, etc. should be organised. Both stakeholders and citizens should be encourage to get involved with the annual EU Sustainable Energy Week.	GP Euronet 50/50 MAX GP School Carbon Reduction Programme Green Roof Crete Buzau SERDA GP Big Switch Off

PNEC	There are many examples of successful educational campaigns directly toward different stakeholders, including building owners, managers and users. Among those worth mentioning: 50/50 projects implemented in pilot schools and other public buildings, trainings for municipal buildings' staff organised by the city of Częstochowa, educational activities conducted by the municipality of Niepołomice (within their thermal retrofitting project) and the work of the municipal eco-advisors hired within the regional LIFE programme.	

SERDA	The BEACON (Bridging European and Local Climate Action) project is a European campaign that intends to raise the awareness of the community in order to encourage a healthy climate with low CO2 emissions and lower energy consumption levels to meet modern European trends. The Municipality of Buzau participates in this project and has initiated the awareness campaign.	
Durham County Council	Every March, the DCC promotes and take part in "Earth Hour", an international campaign to switch off lights, directly toward municipality staff, schools and local businesses in Durham. In addition to the international hour of darkness, which takes place always on a Saturday night, DCC holds sessions on the preceding Friday (14:00-15:00 for schools; 15:00-16:00 for municipality buildings) to increase engagement and practical involvement. In addition, we promote events in UK such as Switch Off Fortnight for schools and World Environment Day for all stakeholders. These coordinated events provide a structure over a calendar year for stakeholders to hang activities on.	
Region of Crete	After the completion of the Green Roof of Hersonisos's Municipality Town Hall, several training tours were scheduled especially for local schools. Through the Euronet 50/50 project, educational campaigns were developed to: - Reduce energy consumption by changing building users' behaviour combined with small maintenance measures; - Produce change in users' behaviour with education in climate protection and environ mental issues; - Give students a greater role in the develop ment of ideas and measures to conserve energy and other resources at school; - Foster energy awareness among students to achieve greater sustainability beyond the scope of the Euronet 50/50 project, since they can disseminate what they have learned in the project at home and in other social spaces.	

Action 12: Organisation of free campaigns targeting wider public	Good practices and other relevant EU experiences
Organise free campaigns for the public (city inhabitants).	Euronet 50/50 GP Big Switch Off

Durham County Council	Durham Housing Team delivers and promotes energy efficiency advice and campaigns through the Managing Money Better service. They provide free support, including home visits to carry out free home energy assessments. These home energy assessments include: - Assessing fuel bills and helping to switch suppliers if savings can be made; - Advice and guidance to help understanding of heating system and controls; - Providing energy efficiency advice and arrange practical support, if needed, such as insulation, draught excluders and bleeding radiators. In addition other events on specific themes are developed on emerging topics. For example Durham hosted the first UK national Green Great Britain week event in October 2018 focusing on the roll out of electric cars and the associated charging infrastructure. This was open to residents and organisations. Through the County Durham Environment Partnership we encourage residents and local groups to engage in sustainability initiatives and projects through the annual Environment Awards, they recognise achievements to improve the environment of the County. The winners are promoted through regional press, social media and other communication routes.	
Region of Crete	Free campaigns for the public are organised by several regional authorities/municipalities, especially those participating in the Covenant of Mayors initiative.	

GOOD PRACTICES identified within REBUS:

1. School carbon reduction programme (Durham) – now called ECO2 Smart Schools

   A programme designed to implement energy saving learning and behaviour change within schools. The overall objective of the project is to reduce carbon emissions and costs in schools

2. Big switch off (Durham)

   A novel campaign to implement energy saving measures in existing council buildings in order to reduce carbon and energy consumption costs.

3. SEAP-driven energy training for municipal staff to set-up a local energy management agency (Hungary)

   An on-site, five-day energy training for municipal staff with the aim to incorporate the content of the local Sustainable Energy Strategy in the everyday operation of the employees of two neighbouring municipalities.

4. New Versilia Hospital and the 3 "Rs" strategy: reduction, regulation and renewable (Tuscany)

   An integrated strategy for healthcare facilities towards energy consumption reduction, proper energy system usage and regulation via BMS (Building Management System), plus the integration of renewables.

5. Green Hospital Project (Tuscany)

   More efficient and comfortable hospitals through an optimised management focused on the reduction of heat and electricity use.

6. 50/50 Methodology (Poland and Crete)

   The 50/50 methodology aims to achieve energy & financial savings by sharing economic incentives from energy savings between schools (50%) and municipalities (50%).

7. Green Roof (Crete)

   The green roof implementation on the Town Hall building, providing energy savings and improving comfort conditions for the building users.

8. 2015-2020 Sustainable Energy Action Plan of Buzau Municipality (South-East Romania)

   An SEAP to implement local policies including the Urban Development Strategy of the Municipality in the field of energy efficiency and environmental protection.

9. Green University Strategy for TUC (Crete)

   Strategy for a "Green University" to sustainably transform the campus via mid and long-term energy reduction measures.

10. Thermal retrofitting of the National Library in Warsaw (Poland)

    Thermal retrofitting of the buildings of the National Library in Warsaw combined with installation of BMS (the library occupies a complex composed of 3 units connected with internal gardens).

11. Comprehensive thermal retrofitting programme implemented in Niepołomice (Poland)

    An example of a comprehensive thermal retrofitting programme based on the Niepołomice municipality's long-term strategy for sustainable development (planning, implementing, monitoring and capacity building).

12. Mercury Project for building monitoring center (Malmö)

    The Mercury project brought together discrete Building Management Systems (BMS) into a singular system, thus providing significant savings and simplifying monitoring.

Abbreviation List

AFE –	Regional Agency for waste & resource management; formally known as the Florentine Energy Agency (REBUS Partner)
APSE –	Association for Public Service Excellence (UK)
BMS –	Building Management System
BORA 94 –	Borsod-Abaúj-Zemplén County Development Agency Nonprofit LLC; Hungary (REBUS Partner)
CEE –	Central and Eastern European (countries)
CET –	Tuscany Energy Consortium in Italy
CHP –	Combined Heat and Power, or cogeneration, refers to the use of a heat engine or power station to generate electricity and heat (to be utilised) at the same time.
CRES –	Centre for Renewable Energy Sources and Saving in Greece
DCC –	Durham County Council; UK (REBUS Partner)
DHW –	Domestic Hot Water
E4 –	The specific system used by the City of Malmö for monitoring energy usage
EAE –	European Association for external thermal insulation composite systems (see ETICS).
EE –	Energy Efficiency
Epgl, nren –	(Italian abbreviation) In Italy, the energy performance index (EPgl, IPE, EPgl, nren), also known as the Consumer Index, is an architectural parameter that expresses the total consumption of primary energy for air conditioning (in a continuous system, 24h) referred to the unit of useful surface (expressed in kWh/m2 per year).
ER –	Energy Renovation; i.e. ER Team
ERP –	Energy Renovation Path
ETICS –	External Thermal Insulation Composite System. ETICS increase the energy efficiency of buildings.
GP –	Good Practice
GSE –	GSE Italia, a GSE Group subsidiary, is an engineering company specialised in the design and construction of turnkey projects for head offices, industrial buildings, logistics platforms and R&D centres.
HVAC –	Heating, Ventilation and Air Conditioning
ICT –	Information and Communications Technology
ISO 50001 –	A specific organisation for assisting with the development of Energy Management Systems
ISO –	International Organisation for Standardisation
KENAK –	The Regulation on the Energy Performance of Buildings in Greece, which sets an integrated energy design in the building sector that promotes energy efficiency documentation of buildings.

LCA/LCCA – Life Cost Benefit Analysis, or Life Cycle Cost Analysis. There is an EU Commission Delegated Regulation on cost-benefit analysis (244/2012/EU).

LEAP – Local Energy Action Plan (Poland)

LED – Light-emitting diode. A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

M&E – Monitoring and Evaluation

NEPO – One of the largest energy buyers and providers of energy solutions to the public sector (UK).

NGO – Non-Governmental Organisation. A non-profit organisation that operates independently from the government.

Norm C107/2005 – A Romanian methodology of determining the heating energy consumption per volume

Norm MC001/2006 – In Romania, "The Methodology for the calculation of the Energy Performance of the Building"

PAED – The Sustainable Energy Action Plan (SEAP) specific to the South-East Region of Romania-Buzau

PHPP – Within Passive House standards and Retrofit methodology, a tool for calculating the energy balance and solutions

PNEC – Association of Municipalities Polish Network „Energie Cités"; Poland (REBUS Partner)

PPC – Public Power Cooperation. PPC is the largest electric power company in Greece.

PPP/ESCO (scheme) – Public-private partnership scheme. Public-private partnerships (PPP) are in essence the ESCO model applied to public institutions. ESCO is the multilingual European classification for skills, competences, qualifications and occupations. ESCO is part of the Europe 2020 strategy. In order to determine energy efficiency (EE) potential and achieve the energy savings goals in buildings, there is a necessity to adopt new ESCO business models.

PV – Photovoltaic. Solar PV refers to solar panels, a technology used to convert energy from the sun into direct current electricity.

QA – Quality Assurance

RAL – Quality Mark and seal of the German RAL Institute. Within REBUS, RAL refers to the measure of quality regarding the installation of windows and external doors.

REBUS – Renovation for Energy efficient BUildingS (Interreg Europe Project). The overall objective of the REBUS project is to improve the capacity of public authorities in European regions, to undertake efficient renovation works of their public building stock, thus saving energy and public resources.

RES – Renewable Energy Sources

ROC – Regional Energy Officers. ROC forms a network of Energy Officers from across the northeast of England.

ROI – Return on Investment. ROI is usually expressed as a percentage and is typically used for personal financial decisions, to compare a company's profitability or to compare the efficiency of different investments.

SAP – Standard Assessment Procedure. UK Gov Definition - The Standard Assessment Procedure (SAP) is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin energy and environmental policy initiatives.

SEAP – Sustainable Energy Action Plan

SECAP – Sustainable Energy and Climate Action Plan

SERDA – South-East Regional Development Agency; Romania (REBUS Partner)

SME – Small and medium-sized enterprises

TOP – Targeted Policy Instrument

TUC – Technical University of Crete

Partners

AGENZIA REGIONALE RECUPERO RISORSE

Malmö stad

BORA 94
BORSOD-ABAÚJ-ZEMPLÉN
COUNTY DEVELOPMENT AGENCY

Polska Sieć Energie Cités

ADR

European Institute for Innovation
Europäisches Institut für Innovation

Durham County Council

Περιφέρεια Κρήτης
Region of Crete

REBUS
Interreg Europe

Interreg Europe

European Union | European Regional Development Fund

European Union
European Regional
Development Fund