Guidelines for Joint Actions for Energy Efficiency

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WP N 3 - Testing

Activity N 3.1 - Definition of a common methodology for testing Joint Actions

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Introduction

These guidelines are intended to provide partner organizations with useful indications on the technical and administrative steps needed to effectively plan, design, implement, manage and monitor joint actions for energy efficiency, preferably within the framework of joint SEAPs.

The ENERJ project builds on the awareness that a joint approach to energy planning, especially for small local authorities, can allow achieving more effective results than an isolated one, since – as it was also acknowledged for by the EU Commission (see i.e. the Quick Reference Guide for Joint Sustainable Energy Action Plan issued within the framework of the Covenant of Mayors) – aggregated municipalities can:

- more easily identify opportunities for high-impact actions
- benefit from economy of scale
- more effectively tackle the problem of lack of human and financial resources
- bundle efforts on SEAP preparation, implementation and monitoring.

A joint SEAP (or, in the more recent formulation, SECAP - Sustainable Energy & Climate Action Plan) is carried out collectively by a group of neighbouring local authorities, which engage in building a common vision, preparing an emission inventory and defining a set of actions to be implemented both individually and jointly in the concerned territory. This joint approach is specially designed for small-sized municipalities within the same territorial area, with indicatively less than 10,000 inhabitants each, but can be also suitable for urban agglomerations (i.e. a metropolis and its suburbs).

The joint SEAP document, containing both individual and shared measures, is common to all signatories and should be approved by each City Council, but can be prepared according to two different options:

- Option 1 - individual CO2 reduction commitment: each signatory in the group individually commits to reducing CO2 emissions up to a common target and is thus required to complete its own SEAP template. Impacts on energy savings, renewable energy production and CO2 emissions reduction corresponding to the joint measures should be divided among each municipality sharing these measures in their individual templates.
- Option 2 - shared CO2 reduction commitment: the group of signatories collectively commits to reducing CO2 emissions up to a common target. Only a single common SEAP template is to be filled-in by the group of signatories.

In both cases, the group of signatories is encouraged to appoint a body/authority responsible for coordinating the SEAP development and implementation: this role can be delegated to the respective Covenant Territorial Coordinator or to the most active/advanced municipality within the group.

1. The coordination & governance structure

Importance of a joint coordination & governance structure

An appropriate governance structure is crucial for the successful implementation of any energy efficiency action plan. In case of joint energy planning, coordination and governance have an even greater importance. Therefore, it is necessary for municipalities undertaking joint energy efficiency actions to create a dedicated body/authority or a steering cabin, responsible for coordinating the development, implementation, management and monitoring of energy efficiency actions on the whole involved territory. The steering cabin could involve different competences and should be managed by the energy manager.

The energy manager is a crucial figure in all phases of the energy efficiency interventions, from the energy planning, to the elaboration of the main tendering documents, to the monitoring of the implementation of the energy measures. The energy manager should also stimulate the policy makers' commitment on energy efficiency issues. In most countries, the law makes it compulsory, for bigger municipalities, the appointment of an internal energy manager, and recommends it also for groups of neighbouring small municipalities.

Composition of the joint coordination & governance structure

The joint coordination and governance structure shall be established taking into account the following aspects:

- Representativeness of the involved local authorities (at political and technical level);
- Involvement of a territorial coordination body, regional energy agencies or national energy agencies (i.e. for Italy ENEA Italian National Agency for new technology, Energy and sustainable Economic Development);
- Involvement of multiple professional figures with different competences, according to a multidisciplinary approach: energy management, spatial planning, architectural design, engineering, financial management, public procurement, communication, data management, etc.;
- Organizational structure, formed i.e. (as suggested by SEAPs guidelines) by a steering committee, including politicians and senior managers providing strategic direction and political support, and a technical committee;
- Assignment of adequate financial resources.

Functions of the joint coordination & governance structure

- Collecting and analysis data on public buildings:
  - Collect and harmonize energy data at local level (municipality and provinces);
  - Coordinate energy audits and the identification of the most suitable EE measures to undertake (the management should be able to planning, in the short e medium term, the energy audit activity on its own building stock, by using internal human sources, through a preventive training, and/or using external sources);
  - Creation of an energy audit database (or update of an existing one) at local level, to be aware of the status of its own building stock and to allow the territorial coordinator body to manage a comprehensive energy audit database at larger scale.

- Planning and design of energy efficiency actions:
  - Develop joint energy plans (SEAPs or others);
  - Coordinate the design of the energy efficiency interventions, assessing their financial, technical and administrative feasibility and the potential environmental benefits, starting to knowledge of energy behaviour of its own stock buildings (once implemented the database);
  - Inform, involve and coordinate the relevant administrative sectors;
  - Coordinate tendering procedures (preferably through a single public procurement authority - Central Purchasing Body), being able to include in tendering documents the technical and economic elements needed to improve energy performance at zero cost (i.e. through EPC contracts).
- Monitoring of the energy actions implementation (expected by SEAPs or others):
  - Supervise and monitor the single actions implementation and their environmental impacts through the identification and measurement of an adequate set of indicators);
  - Monitor the status of SEAP implementation in term of number and quality of energy efficiency measures, and evaluate the real energy saving achieved in a defined time period.
- Training and communication activity:
  - Perform transfer of knowledge and capacity building activities;
  - Organize and carry out training courses addressed to public officers and staff, with the purpose to improve knowledge of energy efficiency, and on the essential tools to evaluate EPC viability in public tenders. At first it is needed to have a professional figure as an Energy manager inside the structure to coordinate these courses;
  - Design and implement awareness-raising activities addressed to the general public and/or to specific target groups, according to the type of energy efficiency actions to undertake.

2. Preliminary analysis activities

Preliminary analysis activities include:

- Survey of building stock: building characterization, identification of performance indicators, description of the technological systems;
- Energy audits: collection of energy data and preliminary analysis according to reference standard UNI CEI EN;
- Preliminary evaluation of technical and economic feasibility of the energy efficiency interventions and actions;
- Creation of a joint database of buildings.

Possible models to perform the analysis are displayed below.

Building characterization

CHARACTERIZATION OF THE BULDING			BUILDING:…… ADDRESS:…….. USED TO *(please indicate the occupancy and activities profiles, the intended use, the property type, the number of occupants etc.):* ……
SYMBOL	**DIMENSIONS**	**VALUE**	*Please insert building internal and external pictures, to provide an immediate visual knowledge of the building:*
Sn	TOTAL NET SURFACE (m2)		
S	TOTAL GROSS SURFACE (m2)		
Vn	NET VOLUME V (m3)		
V	GROSS VOLUME (m3)		
S/V	RATIO S/V (m^{-1})		
h	EAVES HEIGHT (m)		
N°	FLOORS ABOVE GROUND		

CONSTRUCTION TYPE			*Please specify (short description): composition of the walls and roof, main types of the windows, flat or sloping roof, value of flat surfaces available for new photovoltaic system and/or solar thermal generation, year of construction, etc.*	
TYPE OF STRUCTURE			**YES/NO**	
LOAD-BEARING WALL				
MIXED STRUCTURE OF REINFORCED CONCRETE AND WALLS				
REINFORCED CONCRETE				
WOOD				
OTHER				
PERIMETER WALLS			**YES/NO**	**THERMAL INSULATION (YES/NO)**	**AVERAGE THICKNESS (cm)**
WALL MADE OF CONCRETE BRICKS FULL					
WALL MADE OF TUFF BRICKS FULL					
WALL MADE OF BRICKS SEMI-FULL					
BRICK BY BRICK AND CAVITY					
OTHER					
ROOFS			**YES/NO**	**THERMAL INSULATION (YES/NO)**	**AVERAGE THICKNESS (cm)**
WOODEN FLOOR OR CONCRETE-WOOD					
BRICK-CONCRETE FLOOR					
FLAT FLOOR PRACTICABLE					
SLOPING ROOF					
OTHER					
WINDOWS			**YES/NO**	
GLASS	SINGLE			
	DOUBLE			
	LOW EMISSION DOUBLE			

	TRIPLE	
FRAME	WOOD	
	PVC	
	ALUMINUM OPEN JOINT	
	ALUMINUM THERMAL BREAK	
	WOOD/ALUMINUM	
	OTHER	
TYPE OF ROLLER BLIND OR OTHER	NOT PRESENT	
	ALUMINUM	
	WOOD	
	INSULATED	
	NOT INSULATED	
SHADING SYSTEMS		**YES/NO**
PRESENT		
NOT PRESENT		
TYPOLOGY		

CLIMATE DATA OF THE PLACE		
Tmm	MONTHLY AVERAGE TEMPERATURES (°C)	
Igmm	IRRADIANCE SOLAR GLOBAL AVERAGE MONTHLY (W/m2)	
PVr	VAPOR PRESSURE RELATIVE (kPa) FOR CALCULATION OF THE RELATIVE HUMIDITY	
Vv	AVERAGE WIND SPEED (m/s)	

INDOOR CLIMATE DATA		
Tri	WINTER HEATING TEMPERATURE (°C)	
Tci	TEMPERATURE COOLING (°C)	
Np	AVERAGE NUMBER OF PEOPLE PER SQUARE METER (Np/mq)	
	OCCUPANCY AND ACTIVITIES PROFILE: TIME OF USE, SLOTS TIME AND TIME PERIOD OF INACTIVITY	
Qli (W/m3)	CONTRIBUTION OF INTERNAL HEAT, ROOM FOR ROOM AND TOTAL VALUE	
N° VOL/h	RENEWAL FRESH AIR	

THERMOPHISICAL SPECIFICATIONS OF THE BUILDING ENVELOPE				
ELEMENT OF THE BUILDING ENVELOPE	DIMENSION (m2)	THERMAL TRASMITTANCE U (W/m2·K)	AVERAGE THICKNESS (cm)	THERMAL TRASMITTANCE - REGULATION LIMIT UL (W/m2·K)
ROOF				
GROUND FLOOR				
PERIMETER WALLS NORTHERN EXPOSURE				
PERIMETER WALLS EXPOSURE EST				
PERIMETER WALLS SOUTHERN EXPOSURE				

PERIMETER WALLS EXPOSURE WEST				
WINDOWS NORTHERN EXPOSURE				
WINDOWS EXPOSURE EST				
WINDOWS SOUTHERN EXPOSURE				
WINDOWS EXPOSURE WEST				

THERMAL BRIDGES	
SHORT DESCRIPTION OF THE THERMAL BRIDGES TYPOLOGY	
INSULATED (YES/NO)	

NOTE:	1) The thermal transmittance values of the building opaque envelope walls, roof and windows, must be obtained by direct measures on the field, or taken from calculation, prior knowledge of the technical specification of the building envelope. Those values will be use to calculation of the building energy consumption. 2) The minimum surface must be greater than 250 m2.

Performance indicators

ENERGY PERFORMANCE INDICATORS			
INDICATOR	**U.M.**	**SYMBOL**	**VALUE**
SPECIFIC ENERGY CONSUMPTION OF THE BUILDING ENVELOPE, FOR WINTER HEATING	kWh/m³·year	EH	
SPECIFIC ENERGY CONSUMPTION OF THE BUILDING ENVELOPE, FOR COOLING	kWh/m³·year	EC	
SPECIFIC PRIMARY ENERGY CONSUMPTION FOR WINTER HEATING PLUS DHW (DOMESTIC HEAT WATER)	kWh/m³·year	EPH	
SPECIFIC ENERGY PRODUCED BY RENEWABLES - SOLAR THERMAL GENERATOR	kWh/m³·year	EFERSOL	
SPECIFIC ENERGY PRODUCED BY RENEWABLES - PHOTOVOLTAIC SYSTEMS	kWh/m³·year	EFERFOT	
SPECIFIC ENERGY PRODUCED BY RENEWABLES - BIOMASS	kWh/m³·year	EFERB	
SPECIFIC ENERGY PRODUCED BY RENEWABLES - GEOTHERMAL	kWh/m³·year	EFERG	
TOTAL SPECIFIC ENERGY PRODUCED BY RENEWABLES (SOLAR THERMAL GENERATOR, PHOTOVOLTAIC	kWh/m³·year	EFERT	
BUILDING ENERGY PERFORMANCE CLASS (ACCORDING TO NATIONAL LAWS BASED ON EU DIRECTIVES)			

REAL DATA ABOUT ENERGY CONSUMPTION PER YEAR, CONCERNING LAST 2 YEARS, FOR ALL ENERGY VECTORS								
ENERGY VECTOR	**U.M.**	**CONVERSION FACTOR**		**LOWER CALORIFIC VALUE LCV**		**TOTAL ANNUAL CONSUMPTION**		
TYPOLOGY		**VALUE**	**U.M.**	**VALUE**	**U.M.**	**VALUE**	**kWh**	**TEP**
ELECTRIC ENERGY	kWh	0,000187	TEP/kWh	1	kWh/kWh			
NATURAL GAS	SMC	0,00082	TEP/SMC	9,59	kWh/SMC			
OIL	liter	0,00093	TEP/liter	10,85	kWh/liter			
LPG	kg	0,001099	TEP/kg	12,76	kWh/kg			
WOOD	kg	0,00045	TEP/kg	5,13	kWh/kg			

NOTES :	
	① For what concerns thermal and electric energy consumption, attach: • Daily medium profile of the energy consumption of the day type, with maximum sampling interval of 30 minutes • Annual trend of the total average monthly consumption (load histogram month by month, for a typical year or for the last 2 years) ② In addition, specify : • Operating mode of the heating generators: continuous heating, intermittent heating and number of hours of daily working, as well as heating working period of the year. ③ For what concerns the calculation of the energy consumption: • The calculation of consumptions must be obtained by certified software, starting from knowledge of the real data of the envelope building and of the technological plants or, alternatively, obtained from energy vector billing, considering the grid energy losses.

Technological systems

HEATING AND DHW THERMAL					
HEAT GENERATION AND INTENDED USE (HEATING AND/OR DHW) (describe number of boilers and their working type: single way or cascade way)		TOTAL POWER INSTALLED (KW)	PRESENCE OF CLIMATE CONTROL MODULE ON THE HEAT GENERATORS (YES/NO) (describe kind of technology adopted)	GENERATOR TYPOLOGY (CONDENSING BOILER, HEAT PUMPS, 3 STARS, TRADITIONAL BOILERS, ETC.)	PRESENCE OF REGAIN HEAT SYSTEMS FROM EXHAUST FUMES (YES/NO) (describe typology and efficiency %)
1					
2					
3					
…					
HEATING TERMINAL TYPOLOGY AND DISTRIBUTION GRID		TOTAL NUMBER OF INSTALLED HEATING TERMINALS	PRESENCE OF THERMOSTATIC VALVES ON RADIATORS (YES/NO)	PRESENCE AND TYPOLOGY OF PIPELINE'S THERMAL INSULATION OF DISTRIBUTION GRID (description of the type and state of use)	PRESENCE OF LOCAL CLIMATE CONTROL MODULE OF THE INDOOR TEMPERATURES (YES/NO) (describe kind of technology adopted)
RADIATORS WALL					
WATER FAN-CONVECTOR TO WALL					
WATER FAN-CONVECTOR TO FLOOR					
OTHER (to specify)					

AIR CONDITIONING PLANTS AND AIR TREATMENT PLANTS (UTA)					
N° REFRIGERATED UNITS/UTA INSTALLED		TOTAL POWER INSTALLED (KW)	EFFICIENCY (%)	GENERATORS TYPOLOGY (description)	PRESENCE OF REGAIN HEAT SYSTEMS (YES/NO) (describe typology and efficiency %)
1					
2					
3					
…					

ELECTRIC PLANTS						
TYPE OF USERS AND SUPPLY CONTRACTS WITH DEALER	MULTI-HOUR RATE (YES/NO) (describe typology and time slots)	TOTAL POWER INSTALLED (KW)	USED CONTEMPORARY POWER (kW)	COMMITTED OR REQUEST POWER (kW)	REACTIVE CONSUMPTION POWER (kWAR)	OPPORTUNITY OF REFORMULATION OF THE CONTRACTS (YES/NO)
TYPOLOGY OF THE CONTRACTS						
FLUORESCENT LIGHTING						
LED LIGHTING						
ELECTRICAL OUTLETS						

ELEVATORS						
SPECIAL PLANTS (NOT POWER PLANTS)						
AUXILIARY SERVICIES POWER FOR HEAT GENERATORS						
OTHER AUXILIARY SERVICES						

Energy efficiency action model

ENERGY EFFICIENCY ACTIONS AND THEIR TECHNICAL-ECONOMIC FEASIBILITY				Building…… addressed in…… used to: (indicate the occupancy and activities profiles, intended use, the property type, the number of occupants etc.) …….. ……				
		Elements subjected to improvement measures	**Energy retrofit actions**	**Difficulty of the intervention (from 1 to 5)**	**Economic and technical feasibility (yes/no)**	**Energy saving expected (%)**	**Cost of the single intervention (€)**	**Payback period (years)**
BUILDING		Opaque elements such perimeters wall, roofs and ground-exchanging envelope elements	Internal and external thermal coat for improvement of the thermal transmittance values, and increasing of thermal phase shift					
		Windows with single glass and/or without thermal break	Substitution of windows or only of glass					
		Solar exposure adverse to cooling	Use of shading systems					
		High height of the rooms for heating and cooling	Installation of the ceiling					
TECHNOLOGICAL PLANTS	THERMAL HEATING PLANTS	Thermal insulation of the pipelines and thermal collectors	Improving of the efficiency of the thermal insulation by thickness and features adequate					
		High temperature of the exhaust fumes	Utilization of regain heat systems from exhaust fumes					
		Burner of the boiler, oversized with respect to thermal power installed	Substitution of the inefficient burners					
		Use of burning oil	Substitution of the oil with natural gas					
		Boiler with low performance and/or oversized with respect to real	Substitution of the boilers with high performance ones (condensing boiler,					

ENERGY EFFICIENCY ACTIONS AND THEIR TECHNICAL-ECONOMIC FEASIBILITY				Building…… addressed in…… used to: (indicate the occupancy and activities profiles, intended use, the property type, the number of occupants etc.) …….. ……				
		Elements subjected to improvement measures	**Energy retrofit actions**	**Difficulty of the intervention (from 1 to 5)**	**Economic and technical feasibility (yes/no)**	**Energy saving expected (%)**	**Cost of the single intervention (€)**	**Payback period (years)**
		used power	3 stars, etc.), and decrease of total installed power					
		Climate control modules on the heat generator and/or local climate control modules (indoor temperature) inefficient or not present	Adoption of efficient automatic temperature control systems and/or efficient local (different for different exposures) climate control modules					
	DHV (DOMESTIC HEAT WATER) PLANTS	Automatic control system of the flow water temperature, not present or inefficient	Adoption of efficient automatic control systems of the flow water temperature					
		Inefficient thermal insulation of the inertial storage tank and/or of the pipelines	Improving of the efficiency of the thermal insulation by thickness and features adequate					
		Storage tanks capacity insufficient with respect to real thermal power required	Substitution of the inertial storage tanks					
	DISTRIBUTION SYSTEMS	Inefficient thermal insulation of the pipelines	Adjustment or substitution of the thermal insulation of the pipelines					
	AUTOMATIC CONTROL SYSTEMS	Automatic control system at local level (zone or heating terminals), inappropriate or not present	Adoption of automatic control systems on heating terminals (control sensors, thermostatic valves, controller on the fans) Adoption of automatic control systems on the pipelines (2-way valves, 3-way valves)					

ENERGY EFFICIENCY ACTIONS AND THEIR TECHNICAL-ECONOMIC FEASIBILITY				Building…… addressed in…… used to: (indicate the occupancy and activities profiles, intended use, the property type, the number of occupants etc.) …….. ……				
		Elements subjected to improvement measures	**Energy retrofit actions**	**Difficulty of the intervention (from 1 to 5)**	**Economic and technical feasibility (yes/no)**	**Energy saving expected (%)**	**Cost of the single intervention (€)**	**Payback period (years)**
		Automatic control system at central level (heating generators), inappropriate or not present	Adoption of automatic control systems on heating generators (cascade controls of the boilers, climate probes, inverter systems, circulators and/or pumps with variables speed)					
	AIR CONDITIONING	Dissipation of the high energy quantity by air extraction systems	Installation of heat recovery systems (with high efficiency > 50%)					
		Functioning at the maximum load even in times of no use of the rooms	Adoption of automatic control system on the central machines and distribution grid, for splitting the system in more section, and use the timer devices					
		Imbalance of the environmental comfort conditions of different zones supplied by the same hydraulic circuit	Splitting of the power circuits that supply more zones having different thermal and exposure conditions					
ELECTRIC PLANTS	LIGHTING	High energy consumption	High efficiency lighting appliance – LED technology					
			Electronic ballast (for fluorescent lamp) instead of electro-mechanical ballast					

ENERGY EFFICIENCY ACTIONS AND THEIR TECHNICAL-ECONOMIC FEASIBILITY				Building…… addressed in…… used to: (indicate the occupancy and activities profiles, intended use, the property type, the number of occupants etc.) …….. ……				
		Elements subjected to improvement measures	**Energy retrofit actions**	**Difficulty of the intervention (from 1 to 5)**	**Economic and technical feasibility (yes/no)**	**Energy saving expected (%)**	**Cost of the single intervention (€)**	**Payback period (years)**
			Lamp with high energy efficiency Control systems: • presence people/no people • daylight (dimmer) • light flow control					
	ELEVATORS	High consumptions in stand-by mode	Systems for switch off the auxiliary lights when the elevator is not used					
			Use of LED technology for all lighting systems and signal lights					
		High consumptions of the hydraulic engines	• Electronic valves (not electrical resistances for heating of oil and less needs of oil cooling) • High efficiency engines for control of the hydraulic pumps • Inverter VVVF - electronic drives that allow to change voltage and frequency parameters to control the electric pumps • Soft start (reduction of the absorbed power of the electrical pumps, at the starting)					
		High consumptions of the electric engines	• High efficiency engines • Inverter VVVF • Adoption of recovery systems					

ENERGY EFFICIENCY ACTIONS AND THEIR TECHNICAL-ECONOMIC FEASIBILITY				Building…… addressed in…… used to: (indicate the occupancy and activities profiles, intended use, the property type, the number of occupants etc.) …….. ……				
		Elements subjected to improvement measures	**Energy retrofit actions**	**Difficulty of the intervention (from 1 to 5)**	**Economic and technical feasibility (yes/no)**	**Energy saving expected (%)**	**Cost of the single intervention (€)**	**Payback period (years)**
			for electric energy					
	CONTRACTS	Electricity supply contracts not convenient for the owner	Evaluation of the daily medium profile of the energy consumption of the day type and monthly, and reschedule of the contracts with electricity dealers					

BUILDING ENERGY PERFORMANCE CLASS EXPECTED (AFTER THE INTERVENTIONS) ACCORDING TO NATIONAL LAWS BASED ON EU DIRECTIVES	

Creation of a joint database of buildings

A joint SEAP requires first of all a joint building database. A joint database should rely on existing data, and will provide an overview of the general situation of the building stock, possibly avoiding the investment of additional resources; on the contrary, the investment needs can be identified starting from the database itself.

The first step is to identify the possible data sources. Data can be provided by municipalities, provinces, regions, or the state itself; presence, availability, quality and quantity of data sources vary a lot depending on the location and the situation. When the data exists but is not publicly available, agreements can be made among public authorities in order to ensure that it can be used for public purposes to the benefit of all.

If data from different authorities participating in the joint SEAP differ in terms of contents and level of detail, it is useful to prepare a template containing a common, minimum set of data that can be provided by all of them. An example of this is provided in the following table; the type of common data and pre-set choices will of course depend on the construction traditions and techniques of each area.

Dataset	Data format	Useful for…
GENERAL DATA		
Name of building	text	*identifying building and providing univocal name for common database*
Location of building	geographic coordinates	*identifying location and positioning in common geographic database*
Type of building	text / pre-set choices (e.g. school, hospital, offices)	*pre-characterisation of possible retrofit actions*
Responsible authority	text	*identifying authority responsible for maintenance and retrofit*
Year of construction	year	*providing general idea of building characteristics in terms of energy efficiency*
Year of renovation/retrofit	year	*providing general idea of energy efficiency of building*
Type of renovation/retrofit	text	
GEOMETRIC DATA		
Total net/gross surface	sq m	*generally identifying needs in terms of quantity/quality of energy, and budget necessary for retrofit and operation*
Total net/gross volume	cu m	
Number of storeys above ground	number	
Height of eaves	m	*identifying average height of ceilings (given the number of storeys) for heating/cooling purposes*
TECHNICAL DATA		
Type of building structure	text / pre-set choices (e.g. load-bearing walls, reinforced concrete, steel, mixed)	*providing general idea of building characteristics in terms of energy efficiency; providing first idea of possible retrofit actions and limitations*
Type of external walls	text / pre-set choices (e.g. masonry, brickwork, hollow blocks/bricks, cavity walls with insulation)	*providing general idea of building characteristics in terms of energy efficiency; providing first idea of possible retrofit actions and limitations*
Type of windows	text / pre-set choices (e.g. single/double glass, wood, PVC, aluminium, mixed)	*providing general idea of building characteristics in terms of energy efficiency; providing first idea of possible retrofit actions and limitations*
Type of roof	text / pre-set choices (e.g. flat, pitched, walkable/non-walkable)	*providing idea on suitability for installation of renewable energy systems*
Type of heater	text / pre-set choices	*providing general idea of building characteristics in*

	(e.g. gas, oil, LPG, wood)	*terms of energy efficiency;* *providing first idea of possible retrofit actions and limitations*
Energy efficiency class of heater	pre-set choices (A++, A+, A, B, C, etc., or not labelled)	*providing information on energy efficiency in standard terms*
Presence of air conditioning	Y/N	*providing general idea of building characteristics in terms of energy efficiency;* *providing first idea of possible retrofit actions and limitations*
Energy efficiency class of air conditioner	pre-set choices (A++, A+, A, B, C, etc., or not labelled)	*providing information on energy efficiency in standard terms*
Energy efficiency class of building	pre-set choices (A++, A+, A, B, C, etc., or not labelled)	
DATA ON CONSUMPTIONS		
Electric energy consumptions	kWh/mc*year	*providing information on energy efficiency;* *providing first idea of possible retrofit actions;* *providing preliminary idea of return time for the retrofit investment*
Heating energy consumptions	cu m, l, kg, etc.; depending on type of fuel	
DATA ON ACTIONS ENVISAGED BY EXISTING SEAP OR OTHER PROGRAMME/PLAN		
Type of action	text	*providing information on possible synergies with actions already ongoing*
Short description of the action	text	
Funding source	text	
Funding available	€	

The above data, once collected, will give a preliminary idea about the number, type and characteristics of buildings object of possible actions in the joint SEAP; and, consequently, about the possible actions to be undertaken, among which a more detailed analysis of the building characteristics that can only be made via targeted surveys such as technical surveys on the type of external partitions, energy audits, and/or energy performance certifications of the single buildings.

Once the data has been collected, it is useful to organise it into a geographic database, which can be the basis for any future decision on the actions to be undertaken; such database should be available to any participating authority, but it could also be free for use by investors such as energy service companies, enabling them to propose investments.

3. Stakeholders involvement

Identification of the stakeholders

The involvement and appropriate management of stakeholders from different sectors – from policy-makers to end-users – is crucial to design and implement effective and incisive energy policies.

Stakeholders are defined as any relevant person, group or organisation with an interest in the issue/project at stake, either because they will be affected by it (victim, gainer) or because they have influence, knowledge or experience within the issue.

In order to properly identify and address relevant actors, stakeholder mapping is recommended.

Stakeholder mapping is a collaborative process of research, debate, and discussion that draws from multiple perspectives to determine a key list of stakeholders across the entire stakeholder spectrum.

Mapping can be broken down into three phases:

1. Identifying: listing relevant groups, organizations, and people
2. Analysing: understanding stakeholders' perspectives and interests
3. Mapping & Prioritizing: visualizing stakeholders' relationships with the project objectives and other stakeholders & ranking stakeholders' relevance for identified issues.

The process is as important as the result, and its quality depends on the knowledge of the people who take part in it. It is therefore important to engage in this process a cross-functional group within the project staff.

The first step to take is the identification of the stakeholders to involve according to the categories of buildings that will undergo energy efficiency interventions (target groups).

The working group brainstorms and lists all those who are directly or indirectly affected by the project, have influence or power over its development, or have an interest in its successful or unsuccessful conclusion. Where possible, it is recommended to identify individuals.

Stakeholders could be identified by answering questions such as:

- Who is directly or indirectly affected by the projects' topic?
- Who can be affected, either positively or negatively, depending on the plan/project?
- Who cares about the plan/project to the point of being involved and providing help?
- Who are the political or technical representatives of those who probably will be affected?
- Who can be interested to know the plan/project?
- Who is responsible of monitoring/regulating the plan/project?
- Who can be your opponents?
- Who can help with financial or technical resources?

The main categories of target groups can be identified as follows:

1) Energy policy makers and planners:

- Local authorities (Municipalities) and their departments dealing with energy planning
- Regional authorities
- National authorities (where relevant)
- Covenant of Mayors Coordinators
- Local/Regional/National Energy Agencies

2) Suppliers of energy-related services:

- ESCO – Energy Services Companies
- Energy management authorities
- Trade associations (sectors: industry, commerce, building, energy-related systems, energy services...)

3) Energy users:

- Large energy users (large industries, hospitals, malls, superstores, etc.)
- Associations of condominium managers
- Small and Medium Enterprises

4) Experts:

- Professional associations, grouping professionals who work in energy-related fields (engineers, architects, etc.)
- Universities and Research Centers (working specifically on energy issues)
- Single experts

5) Civil society organizations: environmental associations, local interest groups, NGOs, citizens associations…

6) Citizens: owners, tenants, condominiums, buildings users…

EXAMPLE: STAKEHOLDER GROUPS FOR THE METROPOLITAN CITY OF CAPITAL ROME
1) Energy policy makers and planners: - Lazio Region - 43 Municipalities of the Province of Rome (CoM signatories) - ENEA (National energy agency) **2) Suppliers of energy-related services:** - Energy suppliers: ACEA, ENEL, etc. - ESCO associations: ASSOESCO, FEDERESCO - GSE (National energy managing authority) - Trade associations: industry (Confindustria Energia), commerce (Confesercenti - Province of Rome), building (ACER – Builders' Association of the Province of Rome), systems installers (Confartigianato) **3) Energy Users:** - ANACI, National Association of condominium and property managers – Rome branch - Managers/Energy managers of: hospitals, large-scale retail companies, large industries **4) Experts:**

- Architects Registration Board of Rome and Province
- Engineers Registration Board of Rome and Province
- ENEA – "Casaccia" Research Centre
- Centre for Hybrid and Organic Solar Energy (CHOSE) of the University of Rome "Tor Vergata"

Once the list of stakeholders has been drafted, it is useful to make further analysis to better understand stakeholders' relevance and the perspective they offer, in order to understand their relationship to the issue(s) and to each other. To carry out the analysis, it could be useful to use the following criteria:

- Contribution (value) - Does the stakeholder have information or expertise on the issue that could be helpful to the project?
- Impact / Legitimacy - How legitimate is the stakeholder's claim for engagement?
- Willingness to engage - How willing is the stakeholder to engage?
- Influence - How much influence does the stakeholder have? On who?
- Necessity of involvement – Could the stakeholder derail or delegitimize the process if it were not included herein?

The third step is represented by the mapping and prioritization of stakeholders.

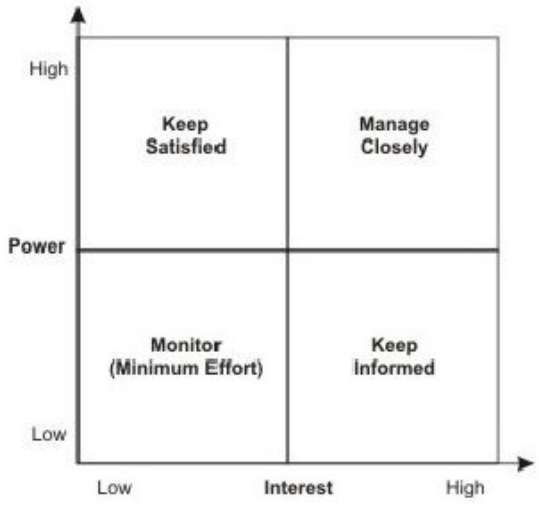
Mapping stakeholders is a visual exercise and analysis tool that can be used to further determine which stakeholders are most useful to engage with, and how to deal with them.

Several techniques exist, which help identifying i.e. which stakeholders are most powerful and have most influence, thus helping decision-makers formalize/prioritise strategies. Matrix or grids (that can be used separately or in combination in order to get a more complete information) can help classifying stakeholders in relation to their:

- power and influence
- influence and impact
- power and legitimacy
- power and interest
- power and dynamism

For example, in the following Power and Interest matrix, each stakeholder's position on the grid shows the actions to take to deal with him/her:

- High power, high interest (Key players, manage closely): these are the people you must fully engage with, and make the greatest efforts to satisfy, because their co-operation is of key importance for the project success
- High power, low interest: powerful people, but scarcely interested in the project; they are generally expected to be passive, but may move into a group of key players on an issue of particular interest;
- Low power, high interest: people to keep informed (as they may be able to influence more powerful stakeholders) and monitored (to ensure that no major issues are arising)
- Low power, low interest: people who need only minimum effort and monitoring.



Once the mapping is completed, it is possible to define a strategy with the aim of increasing stakeholders' consent and support and of minimizing potential negative impacts. It is therefore important to understand the stakeholders' needs and to communicate frequently and regularly with them in order to ensure that they understand the progress and needs of the project, besides feeling engaged.

4. Funding, tendering and contracting

ELENA - European Local Energy Assistance

The ELENA - European Local Energy Assistance[1], managed by the European Investment Bank (EIB), provides EU Regional and Local authorities (either single or associated) with financial support for energy efficiency investment programmes, covering up to the 90% of the technical assistance costs needed for their preparation and implementation. The grant can be used to finance feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, preparation of tendering procedures, contractual arrangements, and project implementation units.

Access to ELENA funds is usually limited to energy efficiency investment programmes above EUR 30 million over a period of 2-4 years; smaller projects can also be supported, provided that they are integrated into larger investment programmes.

The type of supported energy efficiency actions are the following:

- Energy retrofit of public and private buildings, commercial and logistic properties and sites, and street and traffic lighting
- Integration of renewable energy sources (RES) into the built environment
- Renovation, extension or building of district heating/cooling networks, including combined heat and power (CHP) and decentralized CHP
- Local infrastructure including smart grids and ICT, infrastructure for energy efficiency, energy-efficient urban equipment and link with transport

The procedure is thus structured:

1. The public or private promoter contacts ELENA providing a brief description of its entity and of the planned investment programme. The description should include information about the type of investment programme(s), the approach to be adopted for implementation, the expected investment cost and the time schedule of the programme, the main needs and scope of the technical assistance requested, a justification of costs, and the indication of the requested amount
2. The ELENA team reviews the provided information and assesses the investment programme, providing support during the application process. Projects are evaluated and co-funded on a first-come-first-served basis.
3. If the assessment is positive, the promoter completes the application form and submits it to the EU Commission, which gives the final approval.

Public-Private Partnerships

Alternative financing schemes involving private actors can include:

Energy Performance Contracting (EPC): it is a contractual arrangement between a beneficiary (i.e. a public authority) and an Energy Service Company (ESCO) regarding energy efficiency improvements or the installation of plants for the production of renewable energy. Normally an ESCO (usually selected through a public tendering procedure) implements the measures and offers the know-how and monitoring during the whole term of the contract. Essentially the ESCO will not receive its payment unless the project delivers

[1] http://www.eib.org/attachments/thematic/elena_en.pdf

energy savings/production as expected. The contract should guarantee a fixed percentage of reduction of final energy costs, ensuring the reimbursement of the investment to the ESCO. ESCOs can finance the investments either through their own funds or through financing mechanisms made available by a financial institution.

- **Soft loan schemes** (below market rates and longer payback periods) and loan guarantees (buffer by first losses of non-payment): mechanisms whereby public funding facilitates/triggers investments in EPC.
- **Portfolio guarantees for ESCOs**: they reduce the risks of payment delays, thus reducing the overall costs of financing (solid protection from later payments).
- **Revolving Loan funds**: sources of money from which loans are made for multiple sustainable energy projects. They can provide loans for projects that do not have access to other types of loans from financial institutions, or can provide loans at a below-market rate of interest (soft loans). This counts as an example of financial instruments using European Structural and Investment Funds (ESIF).
- **Crowd-funding**: it pools resources of different actors, mostly utilizing an internet-based platform. This can happen in combination with energy cooperatives, which are business models based on shared ownership and democratic decision-making procedures.
- **On Bill Financing**: it is a mechanism with which energy suppliers collect the repayment of a loan through energy bills. It leverages the relationship between a utility and its customer in order to facilitate access to funding for sustainable energy investments.
- **Green Municipal Bonds**: they are issued by Local governments (or their agencies) to fund sustainable energy projects. A green bond can operate as a normal bond (e.g. a debt that will be paid back, depending on the characteristics of the bond, with interests) and can be made attractive via tax-exemptions.

Focus on EU financial instruments

The main available EU financing channels which can subsidize energy retrofit projects/programmes are the following:

- **HORIZON 2020**, EU 2014-2020 Framework Programme for research and innovation, supports researchers, entrepreneurs, no-profit associations and public bodies in the implementation of innovative projects, and also focuses on clean energy in the building sector, contributing to increase the market attractiveness of energy efficiency investments. Co-financing can reach 100% of total eligible costs for R&D projects and 70% for innovation projects.
- **INTERREG EUROPE** is an EU-funded regional cooperation programme, aimed to support economic development and to reduce differences among regions in terms of wealth, incomes and opportunities, and, more specifically, to make the use of Structural Funds more efficient and effective, also targeting energy efficiency issues. The beneficiaries are Public bodies and bodies under public law, especially those responsible for the management of Structural Funds.
- **LIFE +** is an EU Programme that also supports projects on environment and resource efficiency (including energy issues). Co-financing rate is of 60%, and beneficiaries include public and private bodies. LIFE financial instruments entail the Private Finance for Energy Efficiency (PF4EE), managed by EIB, which helps intermediary banks in Member States to develop and offer specific loans for energy efficiency projects aligned with the national energy efficiency action plans, and

provides support and technical assistance. Moreover, small municipalities or other public bodies can benefit from dedicated loans (from € 40,000 up to € 5 million) to undertake small energy efficiency investments, able to use energy savings to repay up-front borrowing.

- **Urban Innovative Actions (UIA)** is an initiative of the European Commission providing European urban areas with resources to test innovative solutions to tackle major urban challenges. The initiative can co-finance 80% of the costs related to project activities, up to € 5 million per project. Proposals must be submitted by Municipalities or associations of Municipalities with a total population of 50.000 inhabitants or more, and shall preferably involve private actors.
- **EEA Grants and Norway Grants** foresee funding from Iceland, Liechtenstein and Norway to 16 EU countries in Central and Southern Europe and in the Baltic region, with the purpose to reduce socio-economic gaps and strengthen bilateral relationships in various sectors (including energy and RES), according to the specific needs and priorities of each beneficiary country. Beneficiaries include public institutions and governmental agencies. The involvement of private actors is recommended.

EU also provides financial instruments, which can take the form of loans, stocks and guarantees, i.e.:

- **Cohesion Fund** targets EU Member States with a Gross National Income (GNI) per inhabitant lower than the 90% of EU average, with the aim to reduce socio-economic inequalities and promote sustainable development. To this purpose, it also supports investments in energy efficiency and RES. Co-financing can cover up to the 100% of eligible costs. Financial instruments supported under the Cohesion Fund include loans (when not available on the market and/or providing better conditions than the available ones), guarantees (ensuring the reimbursement of the initial investment, thus facilitating the access to commercial loans also for high-risk investments) and stocks (where the capital is invested in a share of an investment product, thus allowing the investor to share profits and participate to the management).
- **European Structural and Investment Funds (ESIF)** represent the larger EU budget allocation for investments on energy efficiency in buildings and SMEs. In the programming period 2014-2020, ESIF embed the European Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development (EAFRD), and the European Maritime and Fisheries Fund (EMFF). Every Member State is responsible of the selection, implementation and monitoring of co-financed projects.

Energy Performance Contracts (EPC) - main features, advantages, criticalities, criteria and aspect to be considered to evaluate the chance to introduce EPC in the public tender.

The EU wide **definition** of EPC provided by the Energy Efficiency Directive (EED) is the following:

"contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings".

In EU countries, two major EPC models are used: guaranteed savings model and shared savings model.

In the Guaranteed savings model, the ESCO assumes the entire design, installation and savings performance risks, guaranteeing a certain level of energy savings. Therefore, the EPC contract has to include clauses specifying the obligation of the ESCO to guarantee energy savings and to pay the difference if they are not achieved (it is recommended to require a guarantee of savings of energy costs in constant prices of the base year, thus also enabling easier comparison of different tenders). If savings exceed the guaranteed level, the excess is divided between the customer and the ESCO according to specific contract provisions (usually, the customer receives at least 50% of the excess savings).

In the Shared savings model, the actual costs of energy saving measures are not included in the contract, and the client is not obliged to pay off those costs; in return, the ESCO does not guarantee the savings. The monetary value of the achieved savings over the contract period is divided between the client and the ESCO according to an agreed formula (usually a percentage distribution) included in the performance contract and depending on the cost of the project, the length of the contract and the risks taken by the parties. In a classic shared savings arrangement, the ESCO provides the financing as well as project development and implementation performance risks, and also bears the interest rate risk and risk of rising utility costs beyond the escalation clause agreed to in the contract.

Besides the obvious environmental benefits deriving from the implementation of energy efficiency actions, the **main advantages of using EPC,** from the client's (i.e. a public authority) perspective are the following:

- Budget relief and financial risk relief: the capital to finance the EPC project can either be supplied by the EPC provider or by a third party
- Transfer of technical risk from the partner to the ESCO, which assumes the contractually agreed performance risks of the project (payment on results)
- No need for up-front capital on the customer's side: energy efficiency investments are repaid directly from energy savings and related financial savings
- Savings guaranteed: the ESCO guarantees the achievement of the contractually agreed level of savings and is obliged to compensate savings shortfalls
- Turnkey service: the energy service company (ESCO) provides all services needed to design and implement the project, taking care of all phases: economic and financial feasibility, planning and execution of the necessary works, operation and maintenance of the facilities, measurement and assessment of savings, and financial provision

Some **disadvantages/criticalities**, though, exist:

- EPC requires a sophisticated contract with setting of the baseline consumption, as well as adequate capacities to deal with complex procedures
- EPC projects require adequate time and resources (both in terms of qualified personnel and funds) to cover the start-up phase (definition of baselines and preparation of tendering documents), train operators, carry out administrative procedures and monitoring & evaluation activities
- EPC arrangements may not fit neatly into existing procurement rules and procedures

- The payback period of the bulk of the energy saving measures to be implemented has to be less than the required number of years (often 10 years) to be commercially viable.
- Only a certain size of EPC projects can bear the overhead costs of project development, and small projects are often not suitable for EPC financing.

Moreover, low financial autonomy of municipalities, together with a lack of legal and technical knowledge on EPC, make the EPC application difficult to handle.

In general, the decision to use EPC is justified when the following conditions are met:

- Existence of a high energy saving potential
- Need for qualified implementation and operation of energy saving technologies and measures
- Payback time of the energy saving measures lower than expected contract duration
- The owner of the target building(s) is lacking expertise in energy saving technologies and in their financing and operation
- For the customer: total cost savings achieved through the contract are larger than the payments to ESCO together with the transaction costs incurred (which include labour/staff costs, legal costs, consulting costs, and all costs associated with tendering and contracting procedures, monitoring contract performance, resolving disputes, etc.)
- For the ESCO: contract revenues are larger than the total costs incurred.

EPC requires careful planning and preparation. Adequate attention has to be paid, in particular, to:

- The choice of target sites/buildings and the definition of realistic energy saving scenarios (see § 2)
- The choice of the tendering procedure and the preparation of the tendering documents
- The definition of evaluation criteria
- The drafting of the EPC contract.

As for the tendering procedure, **possible procurement approaches** include:

- Indefinite contracting: direct negotiation with one or more ESCOs pre-selected on the basis of general qualifications
- Project bundling: a pool of buildings are grouped together to award a single contract to a large ESCO
- Quality and cost-based selection (two-steps procedure) – bidders present short proposals, which are evaluated in accordance with a set of project-specific pre-qualification criteria. Bidders matching the criteria are then requested to submit detailed proposals.

Tendering documents should define clear and transparent evaluation criteria (both quantitative and qualitative) for tendering, as well as their weights and calculation methods. For instance:

- Financial evaluation criteria should aggregate the present value of all monetary benefits and all costs incurred by the client. Net Present Value (NPV) - calculated as sum of all the discounted incoming cash flows (operational cost savings) and outgoing cash flows (payments to the ESCO including costs of installed equipment, financial services, etc.) can be a suitable criterion. For the calculation, one should consider the level of the discount rate (that should reflect the financial situation of the client), the period for which the criteria will be applied, and the method to share excess savings between the client and the EPC provider.
- Additional non-financial quantitative criteria can be defined to reflect the preferences of the client or the environmental benefits of the project (i.e. emissions savings)
- Qualitative evaluation criteria (whose evaluation methodology should be clearly defined) can include energy management level; compatibility of the proposed measures with the existing system; maintenance level; activities proposed for motivating, involve and train the users; quality of technology equipment; project organisation; company expertise/qualification, etc.

After having awarded the EPC, the **contractual arrangements** must be drafted. Annex XIII of the Energy Efficiency Directive (2012/27/EU) provides indications on the minimum items that should be included in an EPC with the public sector, namely:

- List of the efficiency measures to be implemented or efficiency results to be obtained
- Guaranteed savings (usually on a yearly basis) to be achieved by implementing the measures throughout the duration of the contract. The contract has to clearly define what happens if guaranteed savings are not achieved
- Duration (usually at least 10 years) and milestones of the contract, terms and period of notice
- List of the obligations of each contracting party, including the obligation by the ESCO to fully (and correctly) implement the measures in the contract and documentation of all changes made during the project. ESCO can also be obliged to provide a yearly report on achieved savings – in both physical and monetary units.
- Reference date(s) to establish achieved savings
- List of steps to be performed to implement a measure or package of measures and, where relevant, associated costs
- Regulations specifying the inclusion of equivalent requirements in subcontracting
- Display of financial implications of the project and distribution of the share of the monetary savings achieved between parties. Means of payment for the services and savings should also be specified - usually these are paid as a monthly fixed advanced payment agreed by both parties
- Provisions on the measurement and verification of the guaranteed savings achieved, quality checks and guarantees
- Provisions clarifying the procedure to deal with changing framework conditions that affect the content and the outcome of the contract (i.e. changing energy prices, use intensity of an installation), including i.e. the method to recalculate the guaranteed savings in case any of the input parameters differs from the presumptions defined in the reference (baseline) energy consumption scenario.
- Detailed information on penalties to be applied for non-compliance with the obligations set within the contract.

Other key elements regard:

- Volume of investment needed to ensure the guaranteed savings and a commitment by the client to pay the investment after its installation
- Clear definition of a reference scenario (baseline) of future energy consumption in physical units
- Ownership transfer of the installed energy saving technologies to the client
- Disputes management procedures.

The EPC procedure is usually time-consuming, and its duration varies a lot depending on the specific features of each project. However, it is important to:

- create a long-term partnership between the EPC provider and the client, based on common goals: achievement of the energy and cost savings as well as optimising the economy of the project
- involve the appropriate management level for all key aspects of the EPC project (technical development, financing, implementation, management, maintenance, monitoring & evaluation). Strong political endorsement (in case of public administrations) is crucial. Public administrations willing to apply ESCO models should also rely on legal advisors, in order to prevent and effectively manage disputes and other legal problems

Evaluation of the technical–economic feasibility of energy efficiency programmes and projects

Energy efficiency projects represent a challenge for Local authorities both under the technological and financial point of view. In particular, when it comes to financing, such projects can be not appealing for the current market, though justified by social and environmental reasons. The choice of the optimal financial scheme for a project is therefore crucial, and should start from an assessment of its "appeal" to the market. Three cases can occur:

a) The project is fully sustainable under market conditions, and can be appealing for private investors (i.e. district heating, public lighting management): priority should be given to PPP procedures, where private actors assume the whole responsibility for project implementation and funding.

b) The project is partially sustainable under market conditions, and can thus be financed through "hybrid" mechanisms including public funds, grants, etc. (i.e. solar thermal and PV): the Municipality should assess the availability of specific financial sources to support the project sustainability (such as soft loans), also considering the possibility to provide in-kind contributions.

c) The project is not sustainable under market conditions (i.e. structural works): in this case there are two alternative situations:

    - The Local authority's internal resources are sufficient to cover the whole investment: the Municipality can directly finance the project through a public tender (traditional public procurement)
    - Internal resources can cover only a part of the whole investment: other financial sources, able to integrate them (i.e. subsidies from higher-level public institutions) have to be considered.

Of course, when assessing self-financing compared to other means of financing, the public actor must consider multiple factors, such as the priority assigned to the project, its cost-effectiveness and its urgency. In other words:

- The project should have higher priority than other public projects competing for the same funding
- The benefits that can be achieved through the project outweigh those of alternative projects
- Alternative financing mechanisms are more expensive than the returns on the project
- The timing of the project is critical – there is no time to raise alternative financing.

5. Maintenance and monitoring of environmental impacts

The main points of attention concerning the maintenance of the implemented interventions and the monitoring of their environmental impacts regard:

- *Identification of relevant indicators, setting of targets*. For example the cost of the electric and thermal bill before and after energy efficiency interventions, could be an important indicator to measure the success of the intervention. In case of actions on the building envelope, thermal bridges and shadow systems, it would be important to have an internal sensor grid, measuring temperature and humidity, connected to the remote control system, to evaluate the improving of thermo-hygrometric wellbeing. Moreover, the calculation of the actual amount of energy saved after energy efficiency intervention, can help evaluating the real effectiveness of the sub-interventions (electric and/or thermal plants like condensing boilers, led technology etc.);
- *Monitoring of implementation of energy efficiency plans and measures*. The SEAP are, at the moment, the main existing energy plans. In the last years, many municipalities have elaborated their own SEAPs, but it is not clear how many measures have been implemented so far. Therefore, the monitoring of the energy efficiency actions included in the SEAPs has become indispensable. The monitoring actions should be in charge of the energy manager.
- *Monitoring planning and procedures* (frequency, source of data, responsibilities and methodologies for data collection and processing). Each public administration should have an internal structure, or office, responsible to plan energy efficiency interventions on its own buildings; this structure should implement an energy audit database (if not existing) and update it, defining specific role, tasks and responsibility inside the staff and evaluating the chance to involve, if necessary, external expertise. The single database is the first step to build a joint buildings database with other municipalities or public administrations. It would be appropriate to establish an internal procedure to decide assignments and deadlines to complete the work, step by step (i.e. constitution of database, updating, processing data).
- *Corrective measures and management of non-compliances and defaults*. It would be appropriate to appoint an energy manager to manage the energy planning issue and to perform the monitoring of the implementation of the planned energy measures. The total or partial non-compliance with the energy plan should be carefully detected and analysed by the energy manager, who should find out the main reasons why the goals were not achieved, identify corrective measures accordingly, and update the plan.
- *Long-term maintenance planning and management*. It is very important to fix the goals of the energy plans and their implementation in the short and medium term, checking their status each defined time period. However, the maintenance of implemented interventions is crucial, too, to ensure that energy performance of the refurbished buildings remains at a good standard throughout time. The energy manager should ensure that the planning of energy efficiency actions includes the programming of maintenance activities, and that these activities are carried out in due time.

6. Practical examples/good practices

Extrapolation from the best practices already collected by partners of elements that concern points 1-5, with a short description of how these best practices successfully addressed these points.

CMRC

Title of the practice
"Energy Efficiency Milan Covenant of Mayors"
Start/end date
2009-ongoing
Location
Municipalities of the province of Milan signatories of the Covenant of Mayors initiative
Main institution involved
Province of Milan
Specific objectives *(max 500 characters)*
• Improving the energy performance of public school buildings in small Municipalities (less than 30,000 inhabitants) and achieving significant primary energy use reduction through energy retrofits • Fostering a mature ESCO market able to offer EPC with guaranteed results • Increasing the municipalities' know-how on governance aspects related to energy efficiency
Description *(max 2500 characters)*
The practice, born within the framework of the Energy Efficiency Action Plan of the Province of Milan, is based on the results of a large-scale energy audit programme carried out between 2006 and 2008 in the region of Lombardy with the aim to stimulate the implementation of energy efficiency (EE) measures in smaller municipalities. This programme did not result in a significant uptake of EE investments, due to constrained budgets, lack of borrowing capacity and of the technical capacity to develop projects. Therefore, the Province, as Territorial Coordinator of the Covenant of Mayors, decided to undertake an ambitious energy retrofit programme targeting small municipalities, based on the principles of EPC, without burdening the local administrations' budgets. A joint study conducted with the EIB identified a potential investment of € 90 million in EE measures. The Province established a dedicated Project Implementation Unit - funded 90% by ELENA (European Local Energy Assistance programme run by the EIB) and 10% by the same Province - to work as programme promoter, assessor, aggregator, facilitator and financial & technical advisor. The Unit contacted the municipalities to assess their disposition to participate in the programme, and helped them to identify and prioritise target buildings. Once the buildings have been audited, assessed and approved, the municipalities mandated the Province of Milan as Central Purchasing Body, in charge of pooling the buildings, developing a feasibility study and carrying out the procurement process (two-steps restricted procedure) for the selection of ESCOs. The selected ESCO signed a Framework EPC Agreement with the Province and an Operating Agreement with the single municipalities, installed the guaranteed energy efficiency measures (envelope insulation, micro-cogeneration, heat pumps, condensation boilers, solar thermal panels, lighting sensors, etc.) and delivered the service

accordingly, taking care of all phases: economic/financial feasibility, planning and execution of works, operation and maintenance of the facilities, and financial provision. The contract spans 15 years, guarantees 35% reduction of final energy costs, 5% of which will translate into budgetary relief for the municipalities and 30% will be used to reimburse the investment to the ESCO (shared savings). The supply of fuel and electricity is excluded from the contract.

Main actors involved/beneficiaries *(max 200 characters)*

Province of Milan (energy department), EIB, 48 municipalities of the Province adhering to the Covenant of Mayors, ESCOs selected to implement the interventions.

Management structure/procedures *(max 500 characters)*

The Province of Milan established an internal Project Implementation Unit (PIU), including: a Management Board (formed by the dedicated project members), supported by a Municipalities Committee (representatives from involved municipalities) and a Support Group (formed by members of various departments of the Province); the Board supervises a Technical Group, a Legal-Administrative Group and a Monitoring & Reporting Group - though most of the tasks have been outsourced to external specialists.

Sources and amount of funding *(max 750 characters)*

- EIB provided a 65 million € loan to cover 75% of the costs of activation of Energy Performance Contracts with a Guarantee of Results in favour of the municipalities through Energy Service Companies (ESCOs) (the remaining 25% is allocated by ESCOs through equity)
- ELENA Programme provided € 2.1 million funding (of which € 1.94 M from EIB and 10% contribution from the Province of Milan) for administrative, technical and financial assistance to project development, which was used to: set up the Programme Implementation Unit; assess existing audits, draw Terms of Reference; prepare tender documents and contracts, negotiate with suppliers and banks, handle disputes; monitor results, disseminate and transfer know-how.

Achieved results *(max 500 characters)*

The programme has implemented three calls for tender, of which two have been awarded, for a total investment of 18 M€, regarding interventions on 136 buildings in 17 municipalities; it has been the first programme in Italy covering investments in EE measures based only on EPC contracts on a regional level; it has up-scaled the dissemination of EPC in Italy, providing guidance to other public administrations involved in ESCO projects.

Difficulties encountered/lesson learned *(max 1500 characters)*

- The programme fostered a positive relation between the Province and its municipalities, and brought attention to Energy Efficiency; nevertheless, municipalities can be reluctant to accept a partial loss of sovereignty, albeit compensated with governance improvement
- The low financial autonomy of municipalities due to the "Stability Pact", combined with a lack of legal and technical knowledge on EPC, represented major barriers to the programme implementation. Without the ELENA funding and the coordination by the Province, the initiative would have not taken place; moreover, ELENA Technical Assistance was crucial for the development of innovative tender and for the management of tendering procedures
- ESCOs are reluctant to participate in tenders that exclude fuel and electricity supply
- Banks are reluctant to assume the risk and thus apply high interest rates. Finding an intermediary financial institution can be very challenging and time-consuming
- Equity funds are necessary to implement interventions having long pay-back periods
- Time and costs to train operators and carry out administrative procedures and monitoring & evaluation activities, as well as the costs of the start-up phase (definition of baselines and

preparation of tendering documents), must not be underestimated

- Public administrations willing to apply ESCO models should rely on legal advisors and include disputes management procedures in the contracts.

Potential for learning or transfer (success factors) *(max 750 characters)*

- Good use of a combination of public and private funding from different sources (EU, Province of Milan, banks, ESCOs), and exploitation of the opportunities offered by the ELENA programme and by the EIB
- Pooling of the buildings to be renovated - in order to reach a dimensional threshold that is appealing for potential investors - and use of a single contracting authority
- Attention to the training and capacity building aspect
- Establishment of a dedicated Programme Implementation Unit managing the whole process

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Title of the practice

'Lighting integrated service on public building – Energy Performance Contract (EPC)'

Start/end date

2011-2012

Location

45 school buildings located in 'Guidonia di Montecelio' municipality

Main institution involved

Guidonia di Montecelio municipality and Metropolitan City of Capital Rome

Specific objectives *(max 500 characters)*

- Improving the energy performance of public building (substitution of around 5.100 traditional lamps with LED technology) through use of EPC tool;
- Use of private funds to make energy efficiency interventions on 45 public school buildings, with guarantee of results (EPC).

Description *(max 2500 characters)*

The practice, born within the framework of the Energy Efficiency Action Plan of the Guidonia di Montecelio municipality (supported by MCR), is based on the preliminary study, with the purpose to evaluate the feasibility of the intervention. due to constrained budgets, lack of borrowing capacity, Guidonia di Montecelio municipality decided to undertake the substitution of around 5.100 traditional lamps with LED technology on its school buildings, based on the EPC. The quantification of expected results was made by preliminary study.

It was choosen an executive undertaking (Esco) through a public tender: the Esco took care of all phases: economic and financial feasibility, planning and execution of the necessary works, operation and maintenance of the facilities, and financial provision. The contract spans 15 years. The intervention has been able to guarantee 57% of reduction of electric energy consumption, and to reduce the whole installed power. 90% of the guaranteed energy saving has been used for the reimbursement of the investment of the executive undertaking (shared savings) with a predetermined maximum quote foreseen in the contract. Esco financed the whole investments based on their own funds.

The contract foresee a guaranteed minimum quote of energy saving in favour of municipality; if the saving will be greater than 57% expected (and fixed in the contract), the most of that will be kept by municipality, otherwise the risk of the eventual smaller saving achieved, will be responsible for the Esco.

The Esco must to provide the maintenance service too and to the substitution of the broken lamps included, for the entire duration of the contract.

Main actors involved/beneficiaries *(max 200 characters)*

Guidonia di Montecelio municipality, Metropolitan City of Capital Rome and the selected ESCO.

Management structure/procedures *(max 500 characters)*

Internal office of the Guidonia di Montecelio Municipality managed the whole process. it was appointed the energy manager inside the structure of the Municipality, as main responsible to carry out the technical/economic documents and the contract.

Sources and amount of funding *(max 750 characters)*

- The selected Esco provided to finance the energy efficiency interventions and, conversely, it had got 90% of guaranteed energy savings.
- Human resources:
- It was used the technical office of the Guidonia di Montecelio Municipality and it was appointed the energy manager of the Municipality, as main responsible to carry out the technical/economic documents and the contract.

Achieved results *(max 500 characters)*

The intervention has been able to achieve 57% of reduction of electric energy consumption, and to reduce the whole installed electric power. The contract foresee a remote control system to monitor the real consumption of all lamps (each lamp is equipped by a control device able to connect itself to the remote control system) . The access to the system is allowed by technical office of municipality only for the supervision, while the Esco is able to act within the system, to turn on or turn off the lights when needed.

Difficulties encountered/lesson learned *(max 1500 characters)*

The intervention has fostered a positive relation between public and private partnership, especially using EPC tool, and has brought attention to Energy Efficiency (shared vision, effective partnership);

the limit is represented by the fact that to the end of the contract the municipality will have to redeem the property of the lamps.

Potential for learning or transfer (success factors) *(max 750 characters)*

The main success factors of the practice (which can be transferred to other contexts) can be thus synthesized:

- good use of private funding, through the EPC tool with guarantee of result for at least 15 years. It was possible to rich this goal thanks to Energy manager's activity who should be ever present in these type of public tender.

References

Contact person

Title of the practice
'Street Public lighting refurbishment – Project financing tool'
Start/end date
2008-2012
Location
'Guidonia di Montecelio' municipality
Main institution involved
Guidonia di Montecelio municipality and Metropolitan City of Capital Rome
Specific objectives *(max 500 characters)*
• Improving the energy performance of street public lighting (substitution of around 10.000 traditional lamps with LED technology) through use of public and private funds; • Use of public-private partnership to make energy efficiency interventions on public lighting and renovation of the public power lighting grid.
Description *(max 2500 characters)*
The practice, born within the framework of the Energy Efficiency Action Plan of the Guidonia di Montecelio municipality, is based on the preliminary study, with the purpose to evaluate the feasibility of the intervention. due to constrained budgets, lack of borrowing capacity, Guidonia di Montecelio municipality decided to undertake the substitution of around 10.000 traditional lamps (SAP) with LED technology on its streets, based on the principle of the public/private partnership. Quantification of expected results was made by preliminary study. It was choosen an executive undertaking (Esco) through a public tender: the Esco took care of all phases: economic and financial feasibility, planning and execution of the necessary works, operation and maintenance of the facilities, and financial provision. The contract spans 20 years. The intervention was able to achieve 45% of reduction of electric energy consumption, and to reduce 33%

the whole installed power. The most of energy saving was used for the reimbursement of the investment of the executive undertaking (shared savings). Esco financed the investments based on their own funds.
Main actors involved/beneficiaries *(max 200 characters)*
Guidonia di Montecelio municipality and Metropolitan City of Capital Rome and the selected ESCO.
Management structure/procedures *(max 500 characters)*
Internal office of the Guidonia di Montecelio Municipality managed the whole process. it was appointed the energy manager inside the structure of the Municipality, as main responsible to carry out the technical/economic documents and the contract.
Sources and amount of funding *(max 750 characters)*
The selected Esco provided to finance the energy efficiency interventions and, conversely, it had got the most of energy savings.
Achieved results *(max 500 characters)*
The intervention was able to achieved 45% reduction of electric energy consumption, and to reduce of 33% the whole installed power. The municipality has achieved 1.5 GWh per year of energy saving, equal to 617 toe per year.
Difficulties encountered/lesson learned *(max 1500 characters)*
The intervention has fostered a positive relation between public and private partnership and has brought attention to Energy Efficiency (shared vision, effective partnership); nevertheless the limit is represented from the too high percentage of energy saving, returned to Esco, at the expense of the municipality.
Potential for learning or transfer (success factors) *(max 750 characters)*
The main success factors of the practice (which can be transferred to other contexts) can be thus synthesized: good use of a combination of public and private funding, and use of the opportunities offered by public/private partnership.
References
Contact person

Title of the practice
"Photovoltaic power plants on school buildings – Project financing tool"
Start/end date
2009-2015

Location
23 Municipalities of the Metropolitan City of Capital Rome
Main institution involved
Metropolitan City of Capital Rome
Specific objectives *(max 500 characters)*
• Improving the energy performance of public school buildings (around 200 buildings of Metropolitan City of Capital Rome) through use of renewable solar energy; • Use of public-private partnership to make energy efficiency interventions on public buildings
Description *(max 2500 characters)*
The practice, born within the framework of the Energy Efficiency Action Plan of the Province of Rome, is based on the preliminary study made by internal technical office of MCR, with the purpose to introduce the renewable solar energy in the public building sector. due to constrained budgets, lack of borrowing capacity, the MCR decided to undertake an ambitious solar energy programme on its buildings, based on the principle of the project financing scheme. Quantification of expected results was made by preliminary study on the basis of which was hypothesized an initial investment of € 24 million. The Province of Rome developed a feasibility study and carried out the public tender for the selection of performer subject. The selected executive undertaking elaborated the executive project and installed the photovoltaic power plants. In according to the Contractual Framework, the executive undertaking took care of all phases: economic and financial feasibility, planning and execution of the necessary works, operation and maintenance of the facilities, and financial provision. The contract spans 20 years, guarantees 30% reduction of electric energy consumption, 60% of which will is used for the reimbursement of the investment of the executive undertaking (shared savings). They finance the investments based on their own funds. The main stakeholders are the former MCR (former Province of Rome), the selected executive undertaking and the Bank selected to approve the economic and financial feasibility plan.
Main actors involved/beneficiaries *(max 200 characters)*
Metropolitan City of Capital Rome and selected ESCO.
Management structure/procedures *(max 500 characters)*
it has been involved the Technical Group of the photovoltaic office of the Metropolitan City of Capital Rome, and Legal-Administrative office too.
Sources and amount of funding *(max 750 characters)*
The selected ESCO provided 15 million € loan to cover 100% of the costs with approval of the economic and financial plan, basically based on public incentives and the shared savings achieved.
Achieved results *(max 500 characters)*
Though the initial investment ambition of 24 M€ has not been achieved, the programme can be considered successful since it has real involved 15 M€ of capital private investment, regarding interventions on 200 school buildings (owner MCR); it has been implemented the project-financing scheme based on energy savings and public incentives.

Difficulties encountered/lesson learned *(max 1500 characters)*
The programme has fostered a positive relation between public and private partnership and has brought attention to Energy Efficiency (shared vision, effective partnership); nevertheless the limit is represented from the temporary nature of the incentives mechanism.
Potential for learning or transfer (success factors) *(max 750 characters)*
The main success factors of the practice (which can be transferred to other contexts) can be thus synthesized: • good use of a combination of public and private funding from different sources (MCR, banks), and use of the opportunities offered by project financing scheme.
References
Paolo EMMI, Responsible for whole process.
Contact person
Not more available.

CIMAA

Title of the practice
"Thermal blankets - Project RETALER 2"
Start/end date
2010-2013
Location
Municipality of Arronches (PT), Campo Maior (PT), Sousel (PT) e Gavião (PT)
Main institution involved
Comunidade Intermunicipal do Alto Alentejo - signatories of the Covenants of the Mayors
Specific objectives *(max 500 characters)*
• Improving the energy performance of public pools in small Municipalities (less than 30,000 inhabitants) and achieving significant primary energy use reduction through energy retrofits • Increasing the municipalities' know-how on governance aspects related to energy efficiency
Description *(max 2500 characters)*
A public tender was launched for the purchase of thermal blankets for the municipal pools. Before, an energy diagnosis was made to the building that identified the opportunity to implement improvement measures. A technical feasibility study was carried out, which included the sizing of the equipment and identification of the necessary investment. Based on these data, the pieces of the procedure were elaborated according to the current Law.

Main actors involved/beneficiaries *(max 200 characters)*

Comunidade Intermunicipal do Alto Alentejo, AREANATejo, Municipality of Arronches (PT), Campo Maior (PT), Sousel (PT) e Gavião (PT)

Management structure/procedures *(max 500 characters)*

A working group was set up with technicians internal to the structure, technicians of the energy agency and environmental technicians of the municipalities to define the technical characteristics of the measures to be implemented.

The implementation of the measures are accompanied by the specialist expert of AREANATejo, as our external consultant.

Sources and amount of funding *(max 750 characters)*

- The investment in the acquisition of thermal blankets was part of a 2007-2014 poctep project, developed in partnership with Spanish partners, and financed at 75% FEDER;
- The project name was RETALER 2 - cross-border network of local authorities in renewable energies and we had a budget of 146.441.48 euros.

Achieved results *(max 500 characters)*

The installation will therefore allow a reduction in the annual energy water heating in the order of 42.3% in the Municipal Pool in Arronches. With the installation of this system in the Municipal Pavilion of Elvas there is a reduction of the energy charges for the heating of water in the order of 54.6%.

Difficulties encountered/lesson learned *(max 1500 characters)*

- The difficulties encountered are related to the sensitivity of the people who work in the pool since they have to be sensitized to the need to put the thermal blankets. Otherwise the reduction of consumption that is obtained with the use of the blankets does not have significant weight in the monthly invoice.

Potential for learning or transfer (success factors) *(max 750 characters)*

- There are energy efficiency measures, without a very heavy investment, that can be implemented in public buildings, in this case in public swimming pools that together can make a difference in the monthly energy bill.
- On the other hand, there are Community Funds that can be complemented by municipal investment and have very positive effects on the efficiency of public buildings - even if they are older buildings. This is a good use of these funds.

References

http://web.dip-badajoz.es/proyectos/retaler/index.php?idioma=p
Contact person
Name: Ana Garrido, Project Manager *Organisation:* Comunidade Intermunicipal do Alto Alentejo *E-mail:* ana.garrido@cimaa.pt

Title of the practice
"Lighting in public building"
Start/end date
2014/2015
Location
Municipality of Marvão (PT)
Main institution involved
Comunidade Intermunicipal do Alto Alentejo - signatories of the Covenants of the Mayors
Specific objectives *(max 500 characters)*
• Improving the energy performance of public buildings in small Municipalities (less than 30,000 inhabitants) and achieving significant primary energy use reduction through energy retrofits • Increasing the municipalities' know-how on governance aspects related to energy efficiency
Description *(max 2500 characters)*
The main objective was to replace the existing lighting in the pavilion of companies of Marvão by LED lighting. An energy diagnosis was made to the building that identified the opportunity to implement improvement measures. A technical feasibility study was carried out, which included the sizing of the equipment and identification of the necessary investment. Based on these data, the pieces of the procedure were elaborated according to the current Law. After that, was prepared and launched a public tender for the supply and installation of equipment needed for the proper replacement of the systems and its entry into operation.
Main actors involved/beneficiaries *(max 200 characters)*
Comunidade Intermunicipal do Alto Alentejo, AREANATejo, Municipality of Marvão (PT)
Management structure/procedures *(max 500 characters)*
A working group was set up with technicians internal to the structure, technicians of the energy agency and environmental technicians of the municipalities to define the technical characteristics of the measures to be implemented. The implementation of the measures are accompanied by the specialist expert of AREANATejo.

Sources and amount of funding *(max 750 characters)*

- The investment in 83 luminaires was 16.000,00 euros;
- The intervention was within the framework of a European MED SMARTMEDPARKS project and funded at 75%. The 25% were supported by the Municipality where the measure was implemented.

Achieved results *(max 500 characters)*

Reduction 6861,4 kwh which is equivalent to 1372 euros per year. This represents a reduction of 42.6% in consumption.

Difficulties encountered/lesson learned *(max 1500 characters)*

It's a simple measure, low investment and without difficulties of implementation that represents a significant difference in energy consumption.

Potential for learning or transfer (success factors) *(max 750 characters)*

- There are energy efficiency measures, without a very heavy investment, that can be implemented in public buildings, in this case in public swimming pools that together can make a difference in the monthly energy bill.
- On the other hand, there are Community Funds that can be complemented by municipal investment and have very positive effects on the efficiency of public buildings - even if they are older buildings. This is a good use of these funds.

References

http://www.smartmedparks.eu/

http://www.programmemed.eu/en/news/article/3e-lettre-dinformation-pour-le-projet-smartmedparks.html?no_cache=1

Contact person

Name: Ana Garrido, Project Manager

Organisation: Comunidade Intermunicipal do Alto Alentejo

E-mail: ana.garrido@cimaa.pt

Title of the practice

"Installation of Solar Thermal Panels in Public Buildings"

Start/end date

2010-2012

Location

Municipality of Arronches (PT) and Municipality of Elvas (PT)

Main institution involved

Comunidade Intermunicipal do Alto Alentejo - signatories of the Covenants of the Mayors

Specific objectives *(max 500 characters)*

- Improving the energy performance of public school buildings in small Municipalities (less than 30,000 inhabitants) and achieving significant primary energy use reduction through energy retrofits
- Fostering a mature ESCO market able to offer EPC with guaranteed results
- Increasing the municipalities' know-how on governance aspects related to energy efficiency

Description *(max 2500 characters)*

An energy diagnosis was made to the building that identified the opportunity to implement improvement measures. A technical feasibility study was carried out, which included the sizing of the equipment and identification of the necessary investment. Based on these data, the pieces of the procedure were elaborated according to the current Law.

Was prepared and launched a public tender for the supply and installation of equipment needed for the proper replacement of the systems and its entry into operation.

After that, we proceeded to install of 88 solar thermal panels in the Municipal Pool of Arronches for heating the pool and AQS pool and 16 solar thermal panels in the Municipal Pavilion of Elvas for AQS.

Main actors involved/beneficiaries *(max 200 characters)*

Comunidade Intermunicipal do Alto Alentejo, AREANATejo, Municipality of Arronches (PT) and Municipality of Elvas (PT)

Management structure/procedures *(max 500 characters)*

A working group was set up with technicians internal to the structure, technicians of the energy agency and environmental technicians of the municipalities to define the technical characteristics of the measures to be implemented.

The implementation of the measures are accompanied by the specialist expert of AREANATejo, as external consulting.

Sources and amount of funding *(max 750 characters)*

- Investment in Arronches was 65.000,00 euros and the investment in Elvas was 34.848,00euros
- The acquisition of the equipment and the installation was within the scope of the European project POCTEP, with Spanish partners and financed to 75%.

Achieved results *(max 500 characters)*

The installation will therefore allow a reduction in the annual energy water heating in the order of 42.3% in the Municipal Pool in Arronches. With the installation of this system in the Municipal Pavilion of Elvas there is a reduction of the energy charges for the heating of water in the order of 54.6%.
Difficulties encountered/lesson learned *(max 1500 characters)*
The difficulties were related to the activations of the guarantees of the equipment in the event of some equipment malfunction. There were no difficulties directly related to the implementation of the equipment and the reduction of energy consumption.
Potential for learning or transfer (success factors) *(max 750 characters)*
• There are energy efficiency measures, without a very heavy investment, that can be implemented in public buildings, in this case in public swimming pools that together can make a difference in the monthly energy bill. • On the other hand, there are Community Funds that can be complemented by municipal investment and have very positive effects on the efficiency of public buildings - even if they are older buildings. This is a good use of these funds.
References
http://web.dip-badajoz.es/proyectos/retaler/index.php?idioma=p
Contact person
Name: Ana Garrido, Project Manager *Organisation:* Comunidade Intermunicipal do Alto Alentejo *E-mail:* ana.garrido@cimaa.pt

ARENATejo

Title of the practice
"Biomass boiler for a swimming pool"
Start/end date
2013
Location
Alto Alentejo Region - Portugal
Main institution involved
Municipality of Sousel
Specific objectives *(max 500 characters)*
Install a biomass boiler in a swimming pool in order to reduce energy costs and maintenance.
Description *(max 2500 characters)*

Was prepared and launched a public tender for the supply and installation of equipment needed for the proper replacement of the systems and its entry into operation. Only one municipality was involved. An energy diagnosis was made to the building that identified the opportunity to implement improvement measures. A technical feasibility study was carried out, which included the sizing of the equipment and identification of the necessary investment. Based on these data, the pieces of the procedure were elaborated according to the current Law. When implementing the measure, the building had no energy class. However, at the level of expected results, there is a reduction in the annual operating costs for heating the facility (i.e. heating the DHW tank and the environment) by more than 40%, which is equivalent to about 19.000 euros. This measure have a total investment of 73.800 euros, co-financed by 75%. The use of biomass, as the main source of thermal energy, allowed to cancel all the consumption of propane gas. Although it did not translate into a reduction in direct energy consumption (the thermal requirements were maintained), there was a large reduction in energy costs through the introduction of a renewable energy source (by more than 40%).

Main actors involved/beneficiaries *(max 200 characters)*

Municipality of Sousel, CIMAA and AREANATejo

Management structure/procedures *(max 500 characters)*

AREANATejo and CIMAA were involved in the preparation of the documents to the public tender to launch.

Sources and amount of funding *(max 750 characters)*

This measure have a total investment of 73.800 euros, co-financed by 75% by the MED Programme.

Achieved results *(max 500 characters)*

This measure have a total investment of 73.800 euros, co-financed by 75%. The use of biomass, as the main source of thermal energy, allowed to cancel all the consumption of propane gas. Although it did not translate into a reduction in direct energy consumption (the thermal requirements were maintained), there was a large reduction in energy costs through the introduction of a renewable energy source (by more than 40%).

Difficulties encountered/lesson learned *(max 1500 characters)*

This type of implementation was made for the first time in the Alto Alentejo region in 2013. In this way, the introduction of biomass as an energy source was not yet consolidated. An exhaustive

technical and economic feasibility study was required to justify its implementation. It was also necessary to overcome some issues related to the logistics of biomass transportation and silo feed (through the design and construction of an appropriate structure).

Potential for learning or transfer (success factors) *(max 750 characters)*

The applicability of this measure and its results (reduction in energy costs by more than 40%) have made it a true success story. In this way, in recent years this technology has been increasingly taken into account for implementation in the facilities under the responsibility of the Municipalities of the Alto Alentejo region.

References

AREANATejo, CIMAA

Contact person

Carlos Nogueiro, First Secretary of CIMAA

Diamantino Conceição, Technical Director of AREANATejo

Title of the practice

"Installation of solar thermal systems"

Start/end date

2013

Location

Alto Alentejo Region - Portugal

Main institution involved

Municipalities of Alter do Chão, Avis and Marvão

Specific objectives *(max 500 characters)*

In Alto Alentejo region (Portugal), ZEroCO2 Project also included the development of an Energy Performance Contract under the form of a Green Public Tender with the aim of implementing measures to promote the use of renewable energy sources (solar thermal) in 7 municipal buildings.

Description *(max 2500 characters)*

Was prepared and launched a public tender for the supply and installation of equipment needed for the proper replacement of the systems and its entry into operation. Three Municipalities were involved (Alter do Chão, Avis and Marvão). An energy diagnosis was made to the building that identified the opportunity to implement improvement measures. A technical feasibility study was carried out, which included the sizing of the equipment and identification of the necessary investment. Based on these data, the pieces of the procedure were elaborated according to the current Law. At the time of the implementation of the measures, buildings didn't have the definition of the energy class. The installation of the equipment allowed to reduce the total annual energy consumption in about 56% (207,000 kWh) - for all the considered buildings. This measure had a total investment of 131.000 euros. The use of solar energy to heat the DWH and the water of the swimming pool tanks, allowed to obtain a reduction of 56% of the consumption of propane gas.

Main actors involved/beneficiaries *(max 200 characters)*

Municipalities of Alter do Chão, Avis, Marvão, CIMAA and AREANATejo

Management structure/procedures *(max 500 characters)*

AREANATejo and CIMAA were involved in the preparation of the documents to the public tender to launch.

Sources and amount of funding *(max 750 characters)*

This measure have a total investment of 131.000 euros, co-financed by 75% by the MED Programme.

Achieved results *(max 500 characters)*

The installation of the equipment allowed to reduce the total annual energy consumption in about 56% (207,000 kWh) - for all the considered buildings.

Difficulties encountered/lesson learned *(max 1500 characters)*

Nothing to report.

Potential for learning or transfer (success factors) *(max 750 characters)*

The applicability of this measure and its results (reduction in energy costs by more than 56%) have made it a true success story. Almost every municipal building that uses DHW have now solar thermal systems.

References

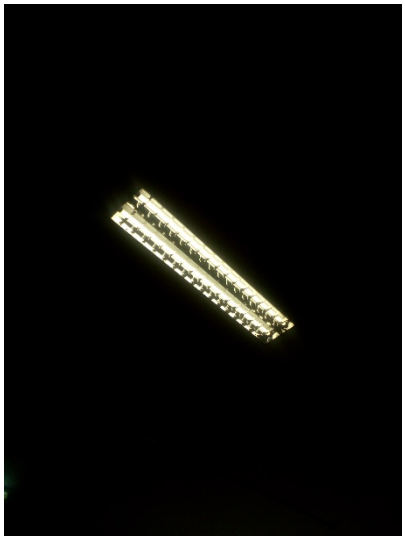
AREANATejo; CIMAA

Contact person

Carlos Nogueiro, First Secretary of CIMAA

Diamantino Conceição, Technical Director of AREANATejo

Title of the practice
"Installation of more efficient lighting systems"
Start/end date
2017 (July)
Location
Alto Alentejo Region - Portugal
Main institution involved
Municipalities of Alter do Chão, Avis, Crato, Elvas, Marvão and Ponte de Sor
Specific objectives *(max 500 characters)*
Under the EduFootprint project, the existing lighting systems were replaced by LED lighting systems in 6 schools: School of Alter do Chão, Elementary School and kindergarten of Avis, Elementary School and Kindergarten Ana Maria Ferreira Gordo (Crato), Santa Luzia Elementary School (Elvas), Kindergarten of Portagem (Marvão) and Ponte de Sor Elementary School.
Description *(max 2500 characters)*
Was prepared and launched a public tender for the supply and installation of equipment needed for the proper replacement of the systems and its entry into operation. Six Municipalities were involved (Alter do Chão, Avis, Crato, Elvas, Marvão and Ponte de Sor). An energy diagnosis was made to the building that identified the opportunity to implement improvement measures. A technical feasibility study was carried out, which included the sizing of the equipment and identification of the necessary investment. Based on these data, the pieces of the procedure were elaborated according to the current Law. At the time of the implementation of the measures, buildings didn't have the definition of the energy class. The installation of the equipment allowed to reduce the total annual energy consumption in about 20.250 kWh - for all the considered buildings. This measure had a total investment of 16.500 euros with a payback of 4,8 years. Considering the 85% financing by INTERREG MED, this measure will have a payback of 0,7 years - approximately 9 months.



Main actors involved/beneficiaries *(max 200 characters)*
Municipalities of Alter do Chão, Avis, Crato, Elvas, Marvão, Ponte de Sor, CIMAA and AREANATejo
Management structure/procedures *(max 500 characters)*
AREANATejo were involved in the preparation of the documents to the public tender, launched the procurement and followed all the work on the field.
Sources and amount of funding *(max 750 characters)*
This measure have a total investment of 16.500 euros, co-financed by 85% by the INTERRREG MED Programme.
Achieved results *(max 500 characters)*
The installation of the equipment allowed to reduce the total annual energy consumption in about 20.250 kWh - for all the considered buildings. This measure had a total investment of 16.500 euros with a payback of 4,8 years. Considering the 85% financing by INTERREG MED, this measure will have a payback of 0,7 years - approximately 9 months.
Difficulties encountered/lesson learned *(max 1500 characters)*
Nothing to report.
Potential for learning or transfer (success factors) *(max 750 characters)*
The applicability of this measure and its results (reduction in energy costs by more than 40%) have made it a true success story. In this way, in recent years this technology has been increasingly taken into account for implementation in the facilities under the responsibility of the Municipalities of the Alto Alentejo region.
References
AREANATejo
Contact person
Diamantino Conceição, Technical Director of AREANATejo

GOLEA

Title of the practice
"Energy savings contract for public buildings in municipality of Koper"
Start/end date
2012-ongoing
Location
Municipality of Koper

Main institution involved

Municipality of Koper

Specific objectives *(max 500 characters)*

- Improving the energy performance and reducing energy costs of public buildings in Municipality of Koper and achieving significant primary energy use reduction through energy retrofits.

Description *(max 2500 characters)*

ESCO company Petrol d.d. carried out a number of interventions to lower the energy use an energy cost in 31 public buildings. The main interventions were energy management implementation and heating and cooling equipment retrofit (heat pumps, biomass boilers).

Energy performance contract (duration 15 years). Public partner - municipality of Koper is entitled to 10% of savings achieved. If any additional savings above the guaranteed value of savings are achieved, municipality gets 50% of additional savings. Energy supply is not included in the contract.

Final energy for heating was expected to decrease by 3%. 70 % of buildings were to be equipped with heat pumps or wood pellet boilers as primary heat source.

Main actors involved/beneficiaries *(max 200 characters)*

- Municipality of Koper

- Petrol d.d. (ESCO)

Management structure/procedures *(max 500 characters)*

The municipality department for investments has published a public call for the project. The exact technical solutions were defined by the ESCO.

Sources and amount of funding *(max 750 characters)*

- The investment was financed by ESCO.

Achieved results *(max 500 characters)*

Final energy for heating has decreased by 24% due to better energy management and some additional measures on the thermal envelope, carried out by municipality. 53% of the energy demand for heating is now obtained from RES. The energy cost for municipality has decreased by 100.000 €/year.

Difficulties encountered/lesson learned *(max 1500 characters)*

- ESCOs are reluctant to participate in tenders that include interventions on thermal envelope as the payback period is long.
- The "critical mass" of appropriate buildings (large savings potential) has to be obtained to make a project feasible.
- The project goals set by the public partner, namely reducing energy use, emissions and cost, modernizing heating and cooling sources in its public buildings without investment were meet completely.
- There were quite some problems in the first year of the contract duration concerning relationship between ESCO and the building users, so the communication aspect is very important.

- It is important to set the right baseline and procedures for the savings evaluation and procedures for eventual redefinition of baseline (change of use, additional interventions, etc.) It is strongly recommended to get an external technical advisor from the field if there is not enough experienced staff in municipal administration.
- A large part of the savings comes from better energy management.

Potential for learning or transfer (success factors) *(max 750 characters)*

This project was the second largest project of Energy savings for a larger number of public buildings in the ownership of a municipality in Slovenia when it started in 2012. A lot of experience was gained especially on what do municipal administrations have to pay attention at the design phase of the project and how to design the project in order to be successful.

References

-

Contact person

Name: Timotej Pirjevec, Office for Social Activities and Development

Organisation: Municipality of Koper

E-mail: timotej.pirjevec@mok.si

Title of the practice

"Energy savings contract for public buildings in municipality of Brda"

Start/end date

2014-ongoing

Location

Municipality of Brda

Main institution involved

Municipality of Brda

Specific objectives *(max 500 characters)*

- Improving the energy performance and reducing energy costs of public buildings in Municipality of Brda and achieving significant primary energy use reduction through energy retrofits.

Description *(max 2500 characters)*

Municipality Brda, for the purpose of comprehensive energy rehabilitation of 3 public buildings, turned over the management based on energy performance contracting (a shared savings contract), of three facilities, namely the municipal administration building (Town hall) in Dobrovo, where the renovation was carried out by an ESCO contractor, Primary School Dobrovo where renovation was carried out by the municipality through public tender with a grant from and Branch Primary School Kojsko, where the rehabilitation project was implemented by the municipality through public tender with a grant of the Swiss Contribution project "RES in the Primorska Municipalities". The municipality invested future

savings on both schools renovated by own funds (and grants obtained) in to the EPC project. The duration of the contract is 15 years.

In 2014 the ESCO contractor carried out a comprehensive energy rehabilitation of the municipal administration building, as described in the table below. In addition, at the other two buildings, equipment was installed for remote monitoring and control. For all three facilities, in addition to contractually guaranteeing savings, the contractor will also supply heat from biomass boilers and a heat pump.

Main actors involved/beneficiaries *(max 200 characters)*

- Municipality of Brda

- Petrol d.d. (ESCO)

Management structure/procedures *(max 500 characters)*

The municipality department for investments has published a public call for the project. The exact technical solutions were defined by external consultants and ESCO.

Sources and amount of funding *(max 750 characters)*

The investment was financed by municipality (own funds and grants) and ESCO.

Investment	ESCO	Municipality	Grants	TOTAL (VAT exc.)
DOBROVO Town hall	316.783,00 €	- €	- €	316.783,00 €
DOBROVO primary school	9.430,00 €	266.747,00 €	504.088,00 €	780.265,00 €
KOJSKO primary school	37.500,00 €	2.879,04 €	128.394,74 €	168.773,78 €
TOTAL (VAT exc.)	**363.713,00 €**	**269.626,04 €**	**632.482,74 €**	**1.265.821,78 €**

Achieved results *(max 500 characters)*

The project turned out successful achieving and even surpassing all planed indicators. The specific energy use for heating of Town hall decreased from 153 to 28 kWh/m2. Specific electric energy use (without energy for the heat pump) decreased from 25 to 19 kWh/m2. Total energy costs for town hall decreased form 11.500€ to 2.200 €, while achieving far better standard of indoor thermal environment. Before the renovation only individual offices had air conditioning, now whole building has a central cooling system via fan coils and a heat pump. Remote monitoring by SCADA has proved to be crucial for achievement of such low energy use. Indoor temperatures, heating curves, heat pump parameters, pumps, as well as status of each individual fan coil is constantly monitored by ESCO and in this way energy use is optimal according to actual need. After some initial miscommunication and adoption to new technology phase was over, a strong cooperation was established between ESCO and building users which are now very satisfied with their retrofitted building.

Difficulties encountered/lesson learned *(max 1500 characters)*

- ESCOs are reluctant to participate in tenders that include interventions on thermal envelope as the payback period is long.
- If "critical mass" cannot be obtained, innovative financing mechanisms have to be developed
- The project goals set by the public partner, namely reducing energy use, emissions and cost,

modernizing heating and cooling sources in its public buildings without investment were meet completely.
- It is important to set the right baseline and procedures for the savings evaluation and procedures for eventual redefinition of baseline (change of use, additional interventions, etc.) It is strongly recommended to get an external technical advisor from the field if there is not enough experienced staff in municipal administration.

Potential for learning or transfer (success factors) *(max 750 characters)*

This project is a small scale in terms of investment but on the other side is very innovative in terms of funding model. Municipality invested its future savings resulting from two buildings it has recently renovated with own funding (including grants from different sources) in to a EPC project which enabled the renovation of Town hall building without further without further burdening of the municipal budget. In times of budgetary and public borrowing restrictions, innovative approaches must be used in order to maximise the implementation of projects. Therefore, this model could be transferred to other small MED communities.

References

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Title of the practice

"Joint public tenders for electricity, Oil and natural gas"

Start/end date

2009- ongoing

Location

n.a.

Main institution involved

Association of Municipalities and towns of Slovenia (SOS)

Specific objectives *(max 500 characters)*

- Decreasing energy prices for electricity, natural gas and light fuel oil for member of Association of Municipalities and towns of Slovenia.
- Decreasing administration costs for public tendering of energy sources

Description *(max 2500 characters)*

Association of Municipalities and towns of Slovenia (SOS) is the biggest representative association of municipalities, established in 1992. Association has 178 member municipalities (out of 212 municipalities). In 2009 first joint tender for electricity supply for 50 municipalities was prepared. Next

joint tender was published in 2012 when 100 municipalities participated. The total savings resulting from lower electricity price reached 200.000€. In 2015, first tender for natural gas an extra light fuel oil was issued. The contracts are usually signed for a period of 3 years. Both large number of participants and longer duration of contract have significant impact on price.
Main actors involved/beneficiaries *(max 200 characters)*
- Association of Municipalities and towns of Slovenia (SOS)
Management structure/procedures *(max 500 characters)*
The individual municipalities provide data on energy for their energy consumers (buildings, public lightning, etc.) Association of Municipalities and towns of Slovenia prepares a joint tender and selects an energy contractor for next 3 years.
Sources and amount of funding *(max 750 characters)*
n.a.
Achieved results *(max 500 characters)*
The project is running from 2009. First, joint tenders for electricity were published. Since 2015 joint tenders are made also for natural gas and fuel oil. Join quantities of energy reach 47 GWh for electricity, 500.000 m3 for natural gas and 900.000 litres of extra light fuel oil. The savings are substantial considering the savings in lower energy price, and in saving administration costs (one tender instead of 100 individual tenders).
Difficulties encountered/lesson learned *(max 1500 characters)*
• The project turned out to be successful since every 3 years more municipalities join and the energy prices continue to decrease.
Potential for learning or transfer (success factors) *(max 750 characters)*
This project is highly replicable.
References
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Contact person
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IRENA

Title of the practice
Program for energy renovation of public buildings for the period 2014-2015
Start/end date

2013-2016
Location
Croatia
Main institution involved
Ministry of Construction and Physical Planning
Specific objectives *(max 500 characters)*
Main objectives of the Program is to meet the requirements of Directive 2012/27 / EU of the European Parliament on energy efficiency, according to which Member States are required to renew (starting from) each year 3% of the total area floors of heated and / or cooled buildings owned and used by central government.
Description *(max 2500 characters)*
The purpose of the Program was to reduce the total costs of public buildings by 30-60%, increase energy efficiency and share renewable energy sources, implement advanced consumption measurement and contribute to the achievement of sustainable development goals. The program is implemented in three phases: incorporating buildings into the Program, project documentation and the public procurement procedure and monitoring of the program's results. The program envisaged the energy recovery of existing buildings for which there is a feasibility of reconstruction of the model elaborated by this Program, i.e. for renewable buildings, provided that the energy service provider can offer the energy savings that will be proved by the design of an energy renewal project. Although such a situation cannot always be predicted with certainty, when it comes to incorporating the building into the Program, it is estimated that a greater probability of renewal is carried out without new public sector costs if the building complies with the following conditions: 1. the building has a large energy consumption (usually> 200 kW / h / m2), 2. The building is not part of the complex, and it is possible to clearly separate the consumption of the building from adjacent, 3. The building has no disadvantages in terms of other essential conditions for the building, 4. The building is not under such a regime of protection of cultural goods that would disallow it economical energy reconstruction In order to take full advantage of the existing potential for energy savings, the program's objective is the complete renovation of buildings, with the maximum investment of private capital in public buildings, the development of energy services market and the transfer of experience from public sector buildings to the area of energy services between private entities. Investments that have a positive impact on the state budget are boosted, and the ESCO model ensures that energy efficiency improvements in public sector buildings are implemented without additional expenditure of owner / user budgets. Examples of signed contracts: • Reconstruction of Hospital OB Karlovac (https://www.youtube.com/watch?v=370ZUXcqMsk) • Reconstruction through ESCO model – Hospital KBC Križine Split (https://www.youtube.com/watch?v=TcSys3MxuNs)
Main actors involved/beneficiaries *(max 200 characters)*
Ministry of Construction and Physical Planning, Environmental Protection and Energy Efficiency Fund,

National Real Estate Management Agency, Public Administration, Public Building Owners, ESCO providers, Croatian Bank for Reconstruction and Development

Management structure/procedures *(max 500 characters)*

For the implementation of the Program, the National Real Estate Management Agency (APN) was in charge for preparation of documentation and the Fund for Environmental Protection and Energy Efficiency (FZOEU) provided funds for co-financing the implementation.

Sources and amount of funding *(max 750 characters)*

Ministry of Construction and Physical Planning,

Environmental Protection and Energy Efficiency Fund

Own funds from Public Administration, Public Building Owners,

ESCO providers

Croatian Bank for Reconstruction and Development

Achieved results *(max 500 characters)*

As part of the 2014-2015 Program, 57 public procurement have been published for the provision of energy services. There were signed 21 energy efficiency contracts for 68 buildings totalling 225,000.00 m2. The total value of the contract was 750 million kuna (without VAT). By realization of these contracts, annual savings of 70 million kWh are achieved. Out of this, 8 energy efficiency contracts were signed in 2016 for 42 buildings, totalling 114,000.00 m2.

Difficulties encountered/lesson learned *(max 1500 characters)*

There were delays in realization of the programme and it was prolonged by one year to realize all planned results. Construction companies and ESCO signed contracts with government and public administrations but that there was delay with starting the works. Construction companies and ESCO needed to provide high bank guarantees and they were losing money as they waited for government approvals to start the work.

Next time procedures and timelines should be planned more efficiently.

Potential for learning or transfer (success factors) *(max 750 characters)*

Good cooperation between public bodies and private companies and good usage of combination of European Regional Development Fund, public fund and private investors can be transferred to other partner areas.

References

http://www.mgipu.hr/default.aspx?id=15086

http://www.fzoeu.hr/hr/energetska_ucinkovitost/enu_u_zgradarstvu/energetska_obnova_javnih_zgrada/

http://www.apn.hr/energetska-obnova-1.aspx

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National Real Estate Management Agency (APN)

Title of the practice
Program for energy renovation of public buildings for the period 2016-2020
Start/end date
2017-2020
Location
Croatia
Main institution involved
Ministry of Construction and Physical Planning
Specific objectives *(max 500 characters)*
The objective of the program is a complete renewal that will result in a reduction of energy consumption in public buildings up to 70% and annual energy savings of about 50 GWh.
Description *(max 2500 characters)*
The program is co-financed by the European Regional Development Fund under the Priority Axis 4. Promoting Energy Efficiency and Renewable Energy Sources, Investment Priority 4c Supporting Energy Efficiency, Smart Energy Management and OIE Use in Public Infrastructure, including Public Buildings and Housing Sector, Specific Objective 4c1 Reduction of energy consumption in public sector buildings, Operational Program Competitiveness and Cohesion 2014 - 2020, for which 211 810 805 EUR is provided. The most significant expected impacts of the implementation of this Program are: • Complete energy recovery of public buildings, in particular buildings where social activities of education, science, culture, sport, health and social welfare are carried out • Obtaining energy savings in public sector buildings up to 70% • Achieving national goals of reducing greenhouse gas emissions, primarily CO2 emissions • Increase absorption of funds from European Union funds • Encouraging investments that have a positive impact on the public budget • Private equity investment in public buildings through ESCO model that ensures that energy efficiency improvements in public sector buildings are implemented without additional expenditure of owner / user budgets • Further development of energy services market • Reduced consumption of energy, fossil fuels and electricity • Contribution to increased use of renewable energy sources • Reduction of harmful emissions at the site resulting from combustion of liquid and solid fuels using renewable energy sources and more efficient energy consumption • Improving the environment in a refurbished location and increasing comfort in a refurbished building using more efficient heating, cooling, lighting systems • Increasing the standard of use of public buildings, creating a more comfortable and healthier environment for citizens and public space users

- Improving employee productivity and reducing absenteeism
- Increasing security to improve lighting systems, reduce faults that occur in older power systems and significantly improve systematic energy management
- Contribution to the development of the economy and increase of employment and direct employment in the construction sector and indirect employment in the supporting manufacturing industry of construction materials, in the production and installation of energy systems and devices and recruitment of highly qualified experts in the fields of architecture, construction, energy, mechanical engineering,
- Renovation of buildings where education is carried out will have a positive impact on the entire community, especially in demographically most vulnerable environments, where re-established schools serve as public space and other facilities such as cultural and social events.

Main actors involved/beneficiaries *(max 200 characters)*

Ministry of Construction and Physical Planning, Environmental Protection and Energy Efficiency Fund, National Real Estate Management Agency, Public Administration, Public Building Owners, ESCO providers, Croatian Bank for Reconstruction and Development

Management structure/procedures *(max 500 characters)*

For the implementation of the Program, the National Real Estate Management Agency (APN) was in charge for preparation of documentation and tenders.

Sources and amount of funding *(max 750 characters)*

Ministry of Construction and Physical Planning,

Environmental Protection and Energy Efficiency Fund

Own funds from Public Administration, Public Building Owners,

ESCO providers

Croatian Bank for Reconstruction and Development

Achieved results *(max 500 characters)*

The implementation of the Program encourages investments that have a positive impact on the public budget, maximizes private equity investment in public buildings, contributes to the growth of the construction sector activity and encourages increased employment in the craft and construction sector, engineering activities and manufacturing of construction products.

Specific expected results can be found in previous chapter "Description".

Difficulties encountered/lesson learned *(max 1500 characters)*

The Programme is it's beginnings so it too early to talk about difficulties encountered/lesson learned

Potential for learning or transfer (success factors) *(max 750 characters)*

Good cooperation between public bodies and private companies and good usage of combination of European Regional Development Fund, public fund and private investors can be transferred to other partner areas.

References

http://www.mgipu.hr/default.aspx?id=15086

http://www.fzoeu.hr/hr/energetska_ucinkovitost/enu_u_zgradarstvu/energetska_obnova_javnih_zgrada/

http://www.apn.hr/energetska-obnova-1.aspx

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National Real Estate Management Agency (APN)

Title of the practice

Energy Renewal of Buildings and Use of Renewable Energy Sources in Public Institutions for Education

Start/end date

2016-2017

Location

Croatia

Main institution involved

Ministry of Construction and Physical Planning, Environmental Protection and Energy Efficiency Fund

Specific objectives *(max 500 characters)*

Implementation of energy renewal and use of renewable energy in public buildings in which public institutions perform activities of education that will result in a reduction of energy consumption for heating / cooling through an integrated approach.

Description *(max 2500 characters)*

Within the framework of this program in 2015, a total of 72 contracts were signed in the amount of 8.38 million kuna for project designs and 33 contracts in the amount of 73.11 million kuna for actual construction works.

Within the call for 2016-2017 grants of 152,000,000.00 HRK were approved. The amount of grants per project proposal can be between 80.000,00 kn and 10.000.000,00 kn. Through the program, you can be funded with 35% to 85% (depending on the type of project, degree of development of the project area etc.) while the remainder should be funded from your own funds, loans and / or ESCO models.

Expected results are:

• Complete energy recovery of public buildings, in particular buildings where social activities of education, science, culture, sport, health and social welfare are carried out

• Obtaining energy savings in public sector buildings up to 50%

• Achieving national goals of reducing greenhouse gas emissions, primarily CO2 emissions

• Increase absorption of funds from European Union funds

• Encouraging investments that have a positive impact on the public budget

• Private equity investment in public buildings through ESCO model that ensures that energy efficiency improvements in public sector buildings are implemented without additional expenditure of owner / user budgets

• Further development of energy services market

• Reduced consumption of energy, fossil fuels and electricity

• Contribution to increased use of renewable energy sources

• Reduction of harmful emissions at the site resulting from combustion of liquid and solid fuels using renewable energy sources and more efficient energy consumption

• Improving the environment in a refurbished location and increasing comfort in a refurbished building using more efficient heating, cooling, lighting systems

• Increasing the standard of use of public buildings, creating a more comfortable and healthier environment for citizens and public space users

• Improving employee productivity and reducing absenteeism

• Increasing security to improve lighting systems, reduce faults that occur in older power systems and significantly improve systematic energy management

• Contribution to the development of the economy and increase of employment and direct employment in the construction sector and indirect employment in the supporting manufacturing industry of construction materials, in the production and installation of energy systems and devices and recruitment of highly qualified experts in the fields of architecture, construction, energy, mechanical engineering,

• Renovation of buildings where education is carried out will have a positive impact on the entire community, especially in demographically most vulnerable environments, where re-established schools serve as public space and other facilities such as cultural and social events.

Main actors involved/beneficiaries *(max 200 characters)*

Ministry of Construction and Physical Planning, Environmental Protection and Energy Efficiency Fund, Public Administration, Public Building Owners, ESCO providers, Croatian Bank for Reconstruction and Development

Management structure/procedures *(max 500 characters)*

For the implementation of the Program, the Environmental Protection and Energy Efficiency Fund was in charge for preparation of documentation and tenders. Fund is in charge of the activities of providing expert support to the applicant during the preparation of the project proposal, in the case of project approval, the beneficiary in the project implementation.

Sources and amount of funding *(max 750 characters)*

Within this call, HRK 152,000,000 was secured from ERDF

Ministry of Construction and Physical Planning,

Own funds from Public Administration, Public Building Owners

ESCO providers

Croatian Bank for Reconstruction and Development

Achieved results *(max 500 characters)*

74 contracts were signed for projects which will provide energy savings of 50% to 85%.

Signed contracts:

http://www.strukturnifondovi.hr/AplikacijaRepository/Natjecaji/Dokumenti/1309/20171018_%20prika

z%204c1.3.%20ugovora%20za%20web.pdf
Difficulties encountered/lesson learned *(max 1500 characters)*
The Programme is its beginnings so it too early to talk about difficulties encountered/lesson learned
Potential for learning or transfer (success factors) *(max 750 characters)*
Good cooperation between public bodies and private companies and good usage of combination of European Regional Development Fund, public fund and private investors can be transferred to other partner areas. It is good example how public fund can help beneficiaries in preparation of project documentation and actual implementation of the project.
References
http://www.strukturnifondovi.hr/natjecaji/1309 http://www.mgipu.hr/default.aspx?id=42955
Contact person
ee@mgipu.hr , obrazovanje.eu@fzoeu.hr Ministry of Construction and Physical Planning , Environmental Protection and Energy Efficiency Fund

ANATOLIKI

Title of the practice
"Joint call for energy audits in 3 neighbouring municipalities in Eastern Thessaloniki"
Start/end date
2017
Location
Eastern Thessaloniki
Main institution involved
Anatoliki S.A. – Development Agency of Eastern Thessaloniki's Local Authorities
Specific objectives *(max 500 characters)*
• Implement 12 energy audits for 12 public buildings of various typologies (schools, town halls, service buildings, etc.)
Description *(max 2500 characters)*
This good practice has been born in the framework of ENERJ: instead of separate calls for energy audits for several Municipalities, the partner held a common call in behalf of all 3 of them. More analytically, ANATOLIKI initially invited several Municipalities to present the project and discuss the potential selection of some of their buildings for the implementation of the energy audits.

The 3 Local Municipalities (Pylea - Hortiati, Thermi, Kalamaria) reached a consensus on the type of buildings and consequently of the specific buildings to be selected, collected all relevant data and informed ANATOLIKI. After selecting the buildings, ANATOLIKI published a public call, the offers were evaluated and the best offer was selected.

The subcontractor implemented the Energy Audits in close cooperation with ANATOLIKI, in order to overcome various obstacles that occurred in the meantime, such the possibility to visit each building, the lack of supporting documentation, etc.

Finally, the subcontractor submitted in good order and in the time framework defined the 12 Energy audits of the relevant buildings selected.

Main actors involved/beneficiaries *(max 200 characters)*

ANATOLIKI S.A. and the 3 Municipalities of Pylea - Hortiati, Thermi and Kalamaria

Management structure/procedures *(max 500 characters)*

The Regional Energy Office of ANATOLIKI S.A. has been directly involved in the implementation of this activity.

Sources and amount of funding *(max 750 characters)*

The amount involved for all energy audits amounts to 4.750 and it was covered 100% by ENERJ project.

Achieved results *(max 500 characters)*

The 12 Energy Audits have been implemented successfully and in good order and the 3 Municipalities have now in hands the results, including the proposals for energy upgrade of their buildings' Energy performance.

Difficulties encountered/lesson learned *(max 1500 characters)*

The major difficulties concerned the collection of the necessary data and supporting material, such as technical drawings, requirements, etc., as well as the on the spot visit of the sub-contractor to the buildings selected. The close contact of ANATOLIKI with the Municipalities of the selected buildings helped overcome these issues.

Potential for learning or transfer (success factors) *(max 750 characters)*

The main success factors of the practice (which can be transferred to other contexts) can be thus summarised to the potential for replication of this method for energy audits and/or for other similar uses

References

Contact person

Yannis Fallas, ENERJ Coordinator

Kostas Konstantinou, Director of Regional Energy Agency of ANATOLIKI