

GREEN PROCA

Green Public Procurement in Action

Case study report on lighthouse projects

Evaluation and Monitoring



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1. Introduction

The aim of the project partners of Green Proca is to identify and support lighthouse projects regarding to products or services that comply with GPP criteria or establish green procurement processes to link green criteria within the Sustainable Energy Action Plans.

Within the lighthouse projects the tenderers receive support to define procurement criteria and to prepare tender documents.

A total of 39 lighthouse projects were performed:

- **Resulted annual tCO₂ savings: 26,014 tCO₂ eq/a**
- **Resulted annual electricity demand savings: 3,704 MWhel/a**
- **Resulted annual heat demand savings: 52,802 MWhth/a**
- **Resulted annual savings in € as a result of the procurements: 1,346,566€/a**

The experience gained through the lighthouse projects can be used for the integration of public procurement guidelines. Furthermore they serve as best practices published on www.gpp-proca.eu.

2. Lighthouse projects description

Italy

A total of ten lighthouse projects were performed.

The municipalities of Arenzano, Catania, Mascalucia, Licata, La Spezia, Gualtieri, Noceto, Fiorenzuola d'Arda and Reggio procured thermal and electric energy services integrated with energetic efficiency actions within the Consip framework contract SIE 3 (Servizio Integrato Energia 3 – Integrated Energy Service 3), an open procedure. The object of the initiative is the procurement of the thermal energy carrier and the implementation of energy efficiency interventions of the building-plant system with a goal of 25% consumption reduction. The heating energy service can be complemented with the supply and management services for cooling and electric power.

SIE 3 consumption reduction target was achieved through the redaction of energy efficiency projects of the building-plant systems and the commitment of the supplier to implement energy efficient initiatives on the buildings of the Administration. This energetic performance contract included:

- supply of the energy carrier (both thermal and electrical);
- supply of all the materials required to ensure a correct and constant service provision;
- ordinary and extraordinary maintenance of the heating and cooling facilities and of the electric systems;
- remote management and control of the systems and of the relevant provided service levels;
- take on the responsibilities connected with the systems management (so-called role of the Third responsible);

- first aid on emergency call in case of technical failure or malfunction;
- execution of all technical and bureaucratic requirements;
- production of sanitary hot water;
- energy efficiency of the building-plant systems of 25% on historical consumption.

The project PadovaFIT, co-financed by the European Union and sponsored by the City of Padova, aims to refurbish , from the point of view of energy conservation , the architectural heritage of the city of Padova, in particular the private sector as responsible for 30% of greenhouse gas emissions. The project is mainly aimed at apartment buildings of medium/large size and low energy efficiency for which major or minor interventions of refurbishment never occurred. An Energy Service Company (ESCO) has been appointed to perform the works in the subscribing buildings.

Germany

A total of six lighthouse projects were performed.

The interventions relate to green procurement of public street lightning, office equipment as well as energy supply of buildings.

The following paragraph summarizes the interventions carried out in the German lighthouse projects:

1. Public buildings in Berlin owned by Berliner Immobilienmanagement are supplied by environmental friendly electricity from solar panels on their roofs.
2. The heat supply of a group of buildings in Koloniestraße 44 in Berlin is provided by facility contracting. Additionally a CHP generation is installed and operated for the designated contract period of 15 years.
3. The city of Haldensleben received public subsidies by the Federal Environment Ministry within the framework of the climate protection initiative for converting public street lighting from mercury vapor lamps to lights with modern LED technology.
4. In order to restructure the street lighting the existing out-dated mercury vapor lamps are replaced by modern LED-lamps in the urban area of the city Norden.
5. For 13 street sections in the city Plauen the existing street lights are replaced by highly efficient LED technology.
6. The foundation Haus der Geschichte der Bundesrepublik Deutschland advertised the conclusion of contracts with a term of five years each, covering lease and service performance of computer printers and digital copiers as an open procedure according to § 3 EG Abs. 1 VOL/A.

Hungary

A total of five lighthouse projects were performed.

Within the framework of the lighthouse project, buildings that were able to implement energy

renovations were done with support from the Széchenyi Terv and the Energia Operative Program (KEOP). For these reasons the local governments had to adhere very strictly and consistently to the defined and specified requirements. In order to determine the final technical content of the energy renovation of the specified buildings, the following options were examined:

- replacement of windows
- additional insulation of the façade
- renovation of the heating system
- renovation of the roof in order to ensure thermal insulation.

The interventions carried out in the Hungary lighthouse projects referred to energy efficient retrofit of buildings (kindergarten, nursery, elementary schools) in District XVIII, District XX, District III.

Slovakia

A total of four lighthouse projects were performed.

Two of them were in the municipality of Nova Baňa (1 for building refurbishment and 1 for public lighting) and the remaining two were implemented in Trnava (both dealt with building renovations).

The municipalities of the lighthouse projects in the municipalities of Nová Baňa and Trnava were as follows:

1. The Municipality of Nová Baňa applied for a public subsidy for the project “Thermal insulation of the Municipal Office building and the Building of the Business Centre”. The goal of the project was to improve the thermal insulation of the roof, as well as to replace windows, replace the entrance doors, and to complete a renovation of outdoor walls. The procurement included the design and the execution of building renovations. Results: The building of the Business Centre was completely renovated, including the roof insulation and replacements of old windows (43 pcs in total) and entrance doors by the new ones, having better technical insulation parameters. The entire facade and outdoor walls were insulated, as well.
2. Refurbishment of street lighting in the municipality of Nova Baňa, II phase. The goal of the project was to improve technical parameters of the public lighting under the achievement of substantial electric energy savings and CO2 emission reduction. The project dealt with the installation of 705 new LED lamps - to replace 471 existing old lamps by the new LED ones, as well as by installing 234 LED lamps on existing supporting points. Results: Achieved savings of CO2 emissions shall reach a level of 65,69 t per year. Expected electric energy savings shall achieve approximately 80%, i.e. 938,36 GJ by the installation of the high-tech lighting technologies with substantial energy-saving potential. The esthetical image of the City shall be improved, as well.
3. Elementary school Gorkeho str, replacement of windows at the special pavilion. The

project dealt with a replacement of windows at the special pavilion belonging to the Elementary school at Gorkeho street. The goal of the project was to improve the thermal parameters of the school building, and thus to achieve the energy savings. The environmental criteria which were required by the municipality:

- U_w (max 1,2 W/m²K), certificate ISO 9001,
- transport of both dismantled material and construction waste is required to be disposed at a certified landfill, which is not farer then 5km from the site
- supplier must submit a proving document that the waste were disposed at such a landfill under meeting all legislative requirements and corresponding technical standards in force

Results: The CO₂ emissions before refurbishment were 8,75 t/y and they were reduced to the level of 1,35 t/y after the building refurbishment. The energy savings were achieved due the better heat transmission coefficient of new installed windows (U_w max 1,2 W/m²K)

4. Elementary school Spartakovská, optimization of the heating system and the thermal insulation of the gymnasium (two halls). The goal of the project was to improve the thermal insulation of the school building, and thus to achieve energy savings, as well as to improve the internal environment of buildings to be more comfortable and healthier for children. Required was to make the external wall insulations by using the polystyrene EPS 100 with a thickness of 100 mm. The insulating material for roofs shall have been used like KINGSPAN KS 1000 X-DEK XM or any other equivalent with physical and thermal insulation characteristics. The construction waste shall have been removed by a supplier and delivered to the next certified landfill (in order to minimize the impact to the environment). Supplier was obliged to submit certificates on used material, as well as the landfill's confirmation on the acceptance of the delivered construction waste. Results: The refurbishment of roofs and insulation of external building walls improved the technical parameters of the school buildings, and thus mitigated the environmental impacts. Achieved savings of CO₂ emissions reached a level of 0,11 t per year. Electric energy savings achieved 26,68 MWh

Poland

A total of tree lighthouse projects were performed.

One of them concerned refurbishment of buildings and two of them outdoor and indoor lighting modernization.

Lighthouse projects implemented in Poland included:

1. The design and execution of renovation of outdoor lighting and lighting in the tunnels

connecting buildings of the Voivod Psychiatric Hospital in Gdańsk – implemented by Prof. Tadeusz Bilikiewicz Voivod Psychiatric Hospital in Gdańsk.

The procurement included the design and execution of renovation of outdoor lighting and lighting in the tunnels connecting buildings of the Voivod Psychiatric Hospital in Gdańsk. The subject matter description included i.a. development of building design, acquiring administrative approvals, supervision of works, installing 10 outdoor lighting points and 51 tunnel lighting points (36W LED).

As a result 51 luminaires were replaced (fluorescent lamps of 72W to new LED 36 W) and 30 new were installed (LED 36 W). Additionally, 10 outdoor lamps were installed (LED 70 W).

2. Installation of street lighting in Darżyno – implemented by the Municipality of Potęgowo
42 LED lamps (35 W) along bicycle/walking lane and 9 LED lamps (49 W) along the national road were installed. Moreover, the project included installation of 51 lighting poles and 2 460 m of cables.
3. Thermal renovation of four multi-family buildings located in Kościerzyna – implemented by the City of Kościerzyna

The subject tender included refurbishment of four communal multi-family buildings including exchange of windows and doors, thermal insulation of walls and roofs, installation of central heating and hot tap water systems, solar installations and electrical systems.

Romania

A total of three lighthouse projects were performed.

The municipalities of the lighthouse projects, Cluj, Giurgiu and Zimandu Nou procured thermal rehabilitation for blocks of flats, respectively LED conversion for public lighting.

The City Town Hall of Cluj implemented the project “Increase energy efficiency in 38 blocks of flats (Group I-VII)”. For the thermal rehabilitation of +38 blocks of flats, +40 lots launched as a direct procurement. The municipality of Cluj is a signatory of the CoM and has had its SEAP approved since 2013 with an overall CO₂ emission reduction target of 20%.

Context of the public procurement project

The majority of block of flats stock in Romania and thus in Cluj were built under the communist regime, respectively from 1950-1990 (Government Emergency Decree 18/2009 regarding the energy efficiency increase for blocks of flats). The local and national authorities initiated in 2000s a national strategy and plan in order to convert the energy intensive blocks of flats into energy efficient ones. In line with the above strategy, Cluj Municipality managed to implement seven group projects (9 initially planned) funded by EU via the Regional Operation Program.

The City Town Hall of Giurgiu and the Local Council, launched a direct procurement procedure for "Extension of public lighting network - lighting network on N. Titulescu Boulevard"

Context before the public procurement project:

- Partial public lighting with low illumination capacity and with advanced deterioration and usage;
- The existing street lamps are high-pressure discharge lamps with mercury / sodium;
- Giurgiu streets length is 131 km, and the public lighting system in the municipality contains 80 points of light.

The Zimandu Nou is a municipality located in Arad County. It is situated in the Aradului Plateau and it stretches over 7430 hectares. The population counts 4476 inhabitants. It managed the tender "Supply and instalment of public lighting systems for rehabilitating and modernizing the public lighting system in the Commune".

The tender with clear cut technical requirements meant to achieve energy efficient street lighting with reduced CO2 emissions, reduced energy consumption, limitation of light pollution and optimisation of maintenance costs.

Bulgaria

A total of eight lighthouse projects were performed.

The lighthouse projects are implemented as follows:

1. Improvement of energy efficiency of street lighting in the municipality Sapareva Bania: the project is performed by SEC with the consulting company SOFENA. The objective of the initiative is to improve the energy efficiency of the street lighting, as it represents 60% of the costs for energy of the municipality. The chosen solution lead to 80% energy savings.
2. Improvement of energy characteristics of the building of Diagnostic and Consulting Centre XII in Sofia: the project is performed by SEC with the consulting company SOFENA. The objective of the initiative is to improve the energy efficiency of the building through insulation of the building envelope and change of lighting. The foreseen measures will improve the energy efficiency of the building from energy class D to energy class B.
3. Improvement of energy characteristics of 3 students' hostels of the Technical University of Sofia: the project is performed by SEC with the consulting company SOFENA. The objective of the initiative is to improve the energy efficiency of the buildings through insulation of the building envelope and installation of solar thermal collectors for domestic hot water. The foreseen measures will improve the energy efficiency of the building from energy class E to energy class B.
4. Installation of PV system on the roof of the hospital of Bratsigovo: the project is performed by ARM. The objective of the initiative is to realise an installation for independent supply of green energy for the needs of the hospital. The installed PV panels produce 33, 60 MWh electricity per year.

5. Improvement of energy characteristics of the kindergarten 'Bozhura Furnadzhieva' in Bratsigovo: the project is performed by ARM. The objective of the initiative is to improve the energy characteristics of the building through insulation of the building envelope and change of heating system with such on biomass. The foreseen measures improved the energy characteristics of the building from energy class E to energy class B, all heat energy is supplied by wooden pellets.
6. Improvement of energy efficiency of street lighting in the municipality Zlatograd: the project is performed by SEARM. The objective of the initiative is to improve the energy efficiency of the street lighting. The chosen solution with LED lamps lead to 80% energy savings.
7. Improvement of energy characteristics of three buildings (two schools and one administrative building) in Zlatograd: the project is performed by ARM. The objective of the initiative is to improve the energy characteristics of the buildings through change of their heating systems with such on biomass and in one school installation of solar thermal collectors for domestic hot water. The foreseen measures improved the energy characteristics of the building from energy class C to energy class B, all heat energy is supplied by wooden pellets.
8. Improvement of energy characteristics of the building of the hospital in Madan: the project is performed by ARM. The objective of the initiative is to improve the energy characteristics of the building through change of heating system with such on biomass and new lighting with LED and energy efficient lamps. The foreseen measures improved the energy characteristics of the building from energy class C to energy class B, all heat energy is supplied by wooden pellets.

2.1 Tender type

Italy

The Integrated Energy Service is a performance-based contract for the management of heating, cooling and electrical systems through which the supplier has to guarantee the following: a pre-determined "comfort situation"; energy savings and carbon dioxide reduction. The ESCOs must reach the Energy Saving Goals (both heating and electrical) for which they had undertaken during the tender process. Consip Framework Contract SIE3 was activated on 20/12/2013 and was divided into 12 lots. It was an open procedure.

Framework contract issued by Consip Spa is accessible for the supply by Italian public authorities. The initiative attributed a prominent relevance to the efficient use of resources and, therefore, was aimed at inhibiting:

- inefficient performance of the building-plant system
- high energy consumption due to the incorrect management and maintenance
- unrespect of the CO2 emissions in the atmosphere.

Regarding Padova Fit Project, the Energy Service Company has been selected through an open Public Tender managed by the Padova Municipality, awarding a supply contract to third parties

and its application field is outside the Public Procurement Code (Dlgs. 12.4.2006 n. 163 adopting Directives 2004/17/CE and 2004/18/CE).

Germany

Most of the German lighthouse projects invited tenders for an open tender process in accordance to the Berliner Ausschreibungs- und Vergabegesetz from Juli 8, 2010. Only two undertook a selected tender process. In particular:

- LP1 Selected tender process (December 2014)
Tendered services: Installation and operation of a PV plant
- LP2 Open tender process
Tendered services: facility-contracting for heat supply and installation of a new heating system including CHP plants
- LP3 Selected tender process with an invitation to tender for six electrical contractors (January 2015)
Tendered services: de-installation and disposal of existing street lights and installation of LED lightning technology
- LP4 Open tender process (July 2014)
Tendered services: de-installation of existing street lights including poles and installation of LED lightning technology
- LP5 Open tender process (December 2015)
Tendered services: supply of street lights with LED technology
- LP6 Open tender process in accordance to § 3 EG Abs. 1 VOL/A (September 2015)
Tendered services: 5-year -lease contract for printers and copiers

Hungary

In order to implement the projects, local governments followed the procurement directive 2004/18/EK, the corresponding public procurement law (year 2011 CVVIII law) and the associated implemented regulations. Special attention had to be paid to the specifications outlined for construction related procurements, since the content of the documentation is strictly regulated by law 306/2011. (XII.23)

In each and every case the public procurement, year 2011 CVVIII law/part 3 directives, must be adhered to, namely the national laws and regulations must be followed. It is also necessary to bear in mind that the estimated value of any project didn't exceed 150 million HUF, and furthermore it is not allowed for the projected work to be broken down into parts, in order to present a seemingly reduced cost. According to Kbt. 121. § (7) the contracting authorities conducted negotiated procedures without announcement, and in several cases, a procedure without announcement but no negotiation. (Kb.t 122/A.§)

At the above mentioned cases, the contracting authorities don't have to publish a notice, they can invite at least three tenderers, describing the contractual capability requirements of the tenderers. When selecting economic operators, in compliance with the principle of equal treatment, special attention should be paid to micro, small and medium sized enterprises.

The A 122/A rules of procedure proved to be very popular among the contracting authorities. In the contracting year 2014, 56% of tenders fell into this category, while in the year 2015, the percentage increased to 62.7. In terms of value in the processes, 38% were in this group.

Slovakia

All four projects were public tenders.

Poland

All three contract awarding procedures were open tenders.

Romania

The City Town Hall of Cluj applied the direct procurement offline procedure for thermal rehabilitation of +38 blocks of flats. To do this it has launched tenders for +40 lots. Due to lack of eligibility or contractors' capacities, some of the lots had to be relaunched until the targeted number of rehabilitated blocks of flats and block commercial spaces was reached.

For the Zimandu case an offline open tender was undertaken with the estimated budget for the works contract of 719,139lei + VAT equivalent of 163,805 € + VAT. The budget allocation was ensured via the local public budget and supply credit. While the simple payback period is of 14,5 years (based on the resulted annual costs savings).

The Municipality of Giurgiu undertook a direct procurement with clear cuts technical requirements meant to achieve energy efficient street lighting with reduced CO2 emissions. The estimated budget for the works contract was 135257, 17 lei + VAT equivalent of 30300 € + VAT. While the budget allocation was ensured via the local public budget and in line with the investment plan 2016.

Bulgaria

The tenders are of open type procurement.

The approach of the municipality of Zlatograd (3 buildings) and the Technical University of Sofia (3 buildings) to launch one procurement tender for three buildings is very successful. This approach lead to:

- Better technical solutions
- Lower prices

- Simplified process of procurement.

The tenders depends also on the different programmes for financing of the projects.

All tenders are related to the policies of the municipalities for decrease of the energy consumption, decrease of harmful emissions, to increase the share of RES and to reach some energy independency.

The chosen solutions are according the specific condition of the buildings (with/without insulation), the type of existing heating systems and the street lighting systems (type and number of existing poles).

2.2 Environmental criteria

Italy

The following paragraph gives an overview of the environmental criteria considered in the lighthouse projects' procurement processes.

The initiative attributed a prominent relevance to the efficient use of resources and, therefore, was aimed at inhibiting:

- inefficient performance of the building-plant system
- high energy consumption due to the incorrect management and maintenance
- unrespect of the CO₂ emissions in the atmosphere.

In particular, SIE 3 ensured a thermal comfort with a temperature between 18° and 22°. The contract held in consideration the Environmental Minimum Criteria (Criteri Ambientali Minimi - CAM) related to the taking in charge of the energy services for buildings, adopted by the Ministry of the Environment with the Ministerial Decree 07 March 2012 (Official Gazette n.74 dated 28 March 2012). Moreover, it dealt with the proper disposal of the waste generated by the Convention operations. The protection of users and workers health and safety was guaranteed by the provision of compliance with the obligations on the correct and efficient disposal both in the extraordinary maintenance stages and the so-called regulatory compliance stages (interventions on technical systems and building-plant systems to ensure that the most modern technical standards are respected).

The lighthouse projects procurement framework left plenty of room to environmental criteria since the suppliers were obliged to perform an initial energetic check of the building-plant system in order to assess the primary energy demand. Subsequently, the suppliers within the first year after the taking over of the systems are obliged to make an energy audit of the building-plant system. This audit was aimed at providing an overall outlook of the energy consumption and at identifying a plan of actions for energy improvement, consumption and GHG emissions reduction and use of renewable sources. The suppliers equipped all the buildings under the SIE3 Convention with an energetic certification and committed to ensure the respect of the emission limits fixed by the relevant regulation. The combustion process of boilers had to respect the emissions threshold

levels identified in the regulation and its subsequent amendments and revisions for the several types of fuels. The suppliers within the beginning of the second heating season installed and managed a controlling system to quantify the savings. This consumption reduction was obtained thanks to the realization of interventions aimed at enhancing the efficiency of the systems. These operations are expected to have direct benefits connected with health and safety.

Lastly the suppliers were responsible for the correct disposal of the waste coming from the cleaning services and the removal and disposal of the residues of asbestos.

Germany

The following paragraph gives an overview of the environmental criteria considered in the lighthouse projects' procurement processes.

LP1 The aim of the tender was the procurement of electricity supply from renewable energy sources. The electricity supply should preferably be self consumed by the owner of the building on which the PV plant was installed or by direct neighbours.

LP2 The tenderers were committed to prove three references in the field of facility contracting of a heating boiler system with a thermal output of 2,000 kW in combination with the operation of a CHP plant.

The installed CHP plant, which provides a higher efficiency level compared to the heating boiler system, should at least cover 10 % of the annual heat consumption.

Furthermore, the original energy source used in the existing heating system (mineral oil) should be switched to natural gas, as latter is more environmental friendly due to a lower CO2 emission factor.

LP3 Lamps with efficient LED technology should replace the inefficient mercury vapour lamps.

The requirement for the street lighting with LED technology referred to a life span of 50,000 hours. According to the local lighting situation 61 light spots should have a rotationally symmetrical luminous intensity distribution and the other 9 light spots a symmetrical luminous intensity distribution.

LP4 The aim of the tender was to replace inefficient mercury vapour lamps with LED technology to reduce the energy consumption and the CO2 emissions by 70 %. The new technology should lower the lighting emissions while improving the illumination level.

The submitted offers were rated by criteria concerning energy consumption as well as product quality (e.g. maintainability).

LP5 The following requirements were formulated for the tendered lamps:

- efficient high-power-LED technology (160 lm/W)
- precise light distribution according to the requirements of the area to be illuminated
- efficient thermal management: integration of the heat sink directly in the diecast housing
- special lenses for optimised lighting of each area throughout the entire life-span
- energy saving, electronic operational unit, optional also with automatic luminous flux adjustment "CLM" (Constant Lumen Management)

- integrated thermal monitoring of LED-modules, which prevent modules from excessively high temperature and automatically reduce power
- automatic power reduction according to the time of day

LP6 As a technical minimum requirement all equipment in use at least had to comply with the environmental label standard of “Blauer Engel” (“Blue Angel”) or meet comparable standards. Apart from documented proof the equipment was obliged to have an automated power saving mode, be equipped without Korona-wires and provide a closed toner system (applies to printers only). Furthermore, it had to be ensured that all devices were suitable for the use of recycling paper (EN 12.281; 2003-01).

Slovakia

The following paragraph gives an overview of the environmental criteria considered in the lighthouse projects’ procurement processes.

LP1 Applied environmental criteria were as follows:

- Complete insulation of roof, as well as ceilings over the cellar
- Replacement of windows and entrance doors,
- Request to supply and install the windows with 6-chamber system of Uf 0,92 W/m²k.

LP2 Applied environmental criteria were as follows:

- Regulation of lighting during nights if the traffic intensity is low
- To supply a design of lamps which should be suitable for LED technology
- Min luminous capacity of 60 lumens
- Requirement for waste disposal according to the Act No.. 223/2001 Z. z. On Wastes and amended regulations,
- To provide all necessary tests, certifications a revisions according to relevant standards and legal requirements, and to submit all relevant protocols to the Municipality as the Contractor

LP3 Applied environmental criteria were as follows:

- A supplier needs to dispose all wastes he produces during the project execution, whereas he is obliged to submit a confirmation to a Purchaser about an appropriate waste disposal according to the respective legislation in force in the Slovak Republic.
- A supplier is obliged to provide all necessary tests, controls and measurements (on his own costs), which are required for a proper completing of a project jobs.
- A supplier is obliged to submit certifications for all materials intended to be used before their application

LP4 Applied environmental criteria were as follows:

- A supplier needs to dispose all wastes he produces during the project execution, whereas he is obliged to submit a confirmation to a Purchaser about an appropriate waste disposal according to the respective legislation in force in the Slovak Republic.
- A supplier is obliged to provide all necessary tests, controls and measurements (on his own costs), which are required for a proper completing of a project jobs.
- A supplier is obliged to submit certifications for all materials intended to be used before their application

Poland

The following paragraph gives an overview of the environmental criteria considered in the lighthouse projects' procurement processes.

LP1 Lighting renovation in Voivod Psychiatric Hospital in Gdańsk

Detailed requirements included:

- for outdoor lighting:
 - lamp lumen maintenance decrease after 100 000 h of operation – not higher than 30%;
 - colour rendering index (CRI) ≥ 70 ;
 - colour temperature $\leq 5700\text{K} \pm 100\text{K}$
 - electric shock – protection class II; class I optionally;
 - initial efficiency – minimum 110 lm/W;
 - power factor $> 0,95$;
 - the casing equipped with remote control allowing to define schedules (so called light scenarios) with possibility to program up to 5 scenarios per day with individual schedules for all week days;
- for lighting in tunnels:
 - lamp lumen maintenance decrease after 50 000 h of operation – not higher than 20%;
 - colour rendering index (CRI) ≥ 80 ;
 - colour temperature $\leq 4000\text{K}$;
 - electric shock – protection class I;
 - initial efficiency – minimum 90 lm/W.
 - the contractor will program luminaires in accordance with the following lighting scenario:
 - 100% of power from 6:00 to 20:00
 - luminaires turned off from 20:00 to 6:00
- 5 year manufacturer warranty for the whole luminaire with electronic power supply circuit
- to confirm that the offered lighting luminaires meet the lighting requirements included in photometric calculations and the standard PN-EN 13201, the offer must be accompanied by

purchaser reserves the right, at the stage of implementation, to have selected luminaires tested by an research unit accredited by the Polish Centre for Accreditation in order to confirm technical specifications contained in the offer.

LP2 Street lighting in Darżyno

Detailed requirements included:

- power factor $\geq 88\%$
- light efficiency – min. 120 lm/W
- luminous flux – min. 3500 lm along bicycle lane and 5000 lm along the national road,
- power reduction module (between 20.00-23.00 and 5.00-6.30 down to 70% and between 23.00-5.00 down to 30%)

LP3 Thermal renovation in Kościerzyna

Detailed requirements included:

- insulation of external walls with Styrofoam - 14 cm,
- roof insulation with hard styrofoam (thermal conductivity coefficient for polystyrene $\lambda < 0,038\text{W}/(\text{m}\cdot\text{K})$ and the thickness of 14 to 20 cm) protected with heat weld roof membrane,
- exchange of windows and doors (heat transfer coefficient $U = 1.40\text{ W}/(\text{m}^2\cdot\text{K})$,
- installation of 116 m² (in total) of solar collectors to support preparation of hot tap water.

Romania

For all tender in Romania, the practice was and still is to request the certification in line with ISO 14001 or equivalent, valid at the offer submittal date. Also accepted as proof is the audit report finalization and the proof for certification on the way to be obtained.

Unfortunately this standard for ensuring quality and environmental protection in the data sheet of tenders does not really contribute to the environmental performance of the tenderer and of the tender results. Hereby one must keep in mind that the cost of acquiring an ISO 9001&14001 certificate from the Romanian open market is of only 470 Euros and even less. This state of play is in contradiction with the recommendation for selecting and excluding tenderers given by Buying green! A handbook on green public procurement 3rd Edition. According to the mentioned guide "In order to check whether companies can perform the environmental management measures associated with a contract, contracting authorities may ask them to demonstrate their technical capacity to do so. Environmental management systems such as EMAS or ISO 14001 can serve as a (non-exclusive) means of proof for that technical capacity"

The Environmental technical specifications when used are defined by the subject of the contract, relate to characteristics of the particular work being purchased. They are formulated in line with national standards and/or in terms of performance or functionality. Rarely are they formulated in

correlation with specifying materials and production methods, especially production methods (principle of proportionality).

Supply or service procurement procedures are still dominated by no environmental technical specifications.

Green requirements as per the LED Street Lamp Technical Fiche and Technical Memoir (ToR):

- Technical and functional parameters: Supply Voltage 230 V 50 Hz; 48 LED; 90W electrical power; IP65 protection degree; 12060lm luminous flux; -40°C...+60°C working temperature; 10...90% working humidity conditions; Mounting bracket with adjustable angle (horizontal/vertical)
- Performance specifications and conditions regarding exploitation safety: extremely reduced faulty rate; 0,92 minimum power factor; ballast efficiency 85%
- Conditions for conformity with relevant standards: Electromagnetic Compatibility Directive; Low Voltage Directive; RoHS Directive; complying with the Community rules in place; quality and conformity certificate
- Guarantee conditions: at least 5 years
- Other technical requirements: Maintenance according to the producer's specifications
- Power consumption calculation as designed 2.16KW
- Each switch must be equipped with three phase and single phase, automatic ignition system and measurement of electricity consumed
- CE Marking, the type of lighting and production company

Direct procurement with clear cuts technical requirements meant to achieve energy efficient street lighting with reduced CO₂ emissions.

Bulgaria

All municipalities where lighthouse projects are implemented have action plans that include environmental criteria. It is on the basis of these action plans that the lighthouse projects could be realised.

The lighthouse projects reached additional energy savings and additional reduction of CO₂ emissions because:

- They include installations for energy production from renewable energy sources;
- They include improvements of lighting (street lighting and building lighting) based on innovative solutions;
- They include the implementation of control systems that allow to reach the best results from the heating and lighting systems;
- The insulations of the building envelopes are assessed in order to reach the most optimal cost effective solution following LCC calculations;
- An integral approach was applied at the elaboration of the lighthouse projects taking into account all aspects of the existing buildings, their heating and lighting systems and the street lighting systems.

In all tenders are taken into account the safety and health measures, the necessary guarantees from the supplier regarding his capacity and expertise, guarantees for quality and efficiency of the

products and their installation, commitments regarding the sustainable use of building waste.

2.3 Tender process

Italy

The SIE framework contract procurement process provided that the Administration has to identify an Energy Manager to issue the supply order, to support the Administration during the inspections, to evaluate the technical and economic estimate presented by the supplier, to monitor the timely execution of the contractual obligations, to verify the fulfilment of the qualitative standards and to supervise the achievement of the energy targets.

The procurement process in some cases lasted even more than 18 months due to the complexity of the adherence and subsequent stages of the supply proposal. The Administrations took part in the initiative by adopting a municipal resolution of expenditure commitment that was followed by the following contractual rounds:

1. The Administration issued the request to obtain the service supply
2. The supplier prepared and sent to the Administration the technical and economic estimate and the relevant attachments
3. Evaluation of the Economic and Technical Plan
4. The Administration issues the request to obtain the supply of the services as identified by the supplier

After having evaluated and approved the estimate, the Administration issued the request of the Convention services that has a duration of 6 years. Then, the supplier had to write the minutes of service taking over representing the official document of obligation assumption.

Regarding Padova Fit the Municipality of Padova has ratified with the Decision n. 2011/48 of 6.6.2015 the Sustainable Energy Action Plan SEAP that envisages actions to reduce and improve energy use in households. An Energy Service Company (ESCO) has been appointed to perform the works in the subscribing buildings. The Energy Service Company has been selected through a Public Tender managed by the Comune di Padova. The technicians of the municipality are in charge of supervising the actual energy savings achieved through the refurbishment actions.

Germany

The following paragraph summarizes the details of the tender processes. Among other things it outlines the number of bidders, the selection criteria as well as the selected bidder.

- LP1 The owner of the existing PV plant on the other building of the Technik Museum received the award for the installation and monitoring of the new PV plant.
- LP2 The bidding was exclusively possible via the tendering platform www.vergabeplattform.berlin.de.
- LP3 At submission deadline four offers had been handed in. The most economic and reasonably priced tenderer was contracted to refurbish the street lighting in March 2015.
- LP4 For the comparison of bids, public services were using the rating matrix, which was developed by the Federal Government within the framework of the LED-indicator-brand-initiative. Under this term the bids were evaluated taking into account the following main

criteria by pre-determined score rating:

- Cost
- Energy consumption in kWh/year or energy consumption in kWh/(km*year)
- Product quality and photometric features (Luminous color, level of lighting, maintainability)
- Aesthetics (Determination by a local assessment committee)

Beyond the rating matrix additional scores for extraordinary positive and extraordinary negative features were allocated. In case the advancement guidelines of the BMUB (e.g. a minimum of 60 % power saving [kwh/year]) could not be complied with, this was a criterion for exclusion.

Following the call for bids an adequate amount of bids were received whereof public services have chosen and commissioned one contractor.

LP5 The city of Plauen received four offers. The bidder with the most economic offer was awarded the contract for installing the LED-pylon-lights.

LP6 The contract was awarded to the bidder submitting the most economical offer. Evaluation criteria were price (70 %) and energy efficiency (30 %). The basis for evaluating the energy efficiency was – in accordance with the resolution 2009/347/EG – the TSV-value (typical electricity consumption). As per 1st February 2016 the contract was signed.

Hungary

Procurement procedures can be broken down into the following distinct phases:

- Proposal and preparation of documents for a modernization/renovation project which, in every case, must include the input and cooperation of the managers/decision makers of the institutions in question and their approval.
- Various alternatives and any consequential cost factors: alternative methods of testing, appraisal, inspection; the most optimal technical solution possibilities., Typically, local governments have extremely limited budgets for cost overruns and can therefore contribute very little in such cases.
- Contractual terms and conditions
- Definition/description of financial/economic and technical/professional requirements and eligibility
- Evaluation criteria, which in every case, was the lowest tender. In Hungary in 2015, the lowest tenders were accepted 86% of the time. Only in 14% of the cases were the most advantageous tenders chosen.
- Determination of the organizations invited to tender
- Sending out a call for proposals for organizations invited to tender, which is the commencement date of the official start of the procurement process and transfer of documents.
- Tendering period: the minimum period is not specified in Kbt. a 121 paragraph 7, in case of a negotiated procedure; according to paragraph a 122/A, the minimum period is 15 days.

During the tendering period, an organized visit was not guaranteed since the buildings in question are public and therefore could be checked on the outside at any time. Additional information was not requested.

- Opening of tenders, preparation of minutes of meetings, notifying tenderers of the above
- Tender evaluation, preparation of individual evaluation sheets, notices sent of missing documents, if applicable
- In the case of negotiations, participants are offered the opportunity to submit modifications
- Selection of winning tenderer, recommendations prepared in view of a final decision
- Decisions according to the rules of the contractual authority
- Contract with winning tenderer, partial contracts are written as separate contracts

Slovakia

The following paragraph summarizes the details of the tender processes.

- LP1 The tender process was organized using open procedure as contract below the threshold. The tender was announced by contracting authority Nová Baňa City. The subject of the contract was insulation of the business centre. The specification was defined with respecting significant potential impacts on the environment. The contracting authority evaluated the tenders on the basis of the most economically advantageous tender. Two tenderers submitted the tenders within requested place, date and time. The electronic auction was realised. The contracting authority concluded a contract during the tender validity period. The contract was concluded in accordance with the tender documents and with the tender submitted by the successful tenderer.
- LP2 The tender process was organized using open procedure as contract below the threshold. The tender was announced by contracting authority Nová Baňa City. The subject of the contract was upgrading public lighting in Nova Bana City. The specification was defined with respecting significant potential impacts on the environment. The contracting authority evaluated the tenders on the basis of the lowest price. Two tenderers submitted the tenders within requested place, date and time. The electronic auction was not realised. The contracting authority concluded a contract during the tender validity period. The contract was concluded in accordance with the tender documents and with the tender submitted by the successful tenderer.
- LP3 The tender process was organized using Electronic contracting system (ECS) as contract below the threshold. The tender was announced by contracting authority Trnava City. The subject of the contract was replacement of windows, glass walls with doors and construction works on Elementary School Gorkeho. The specification was defined with respecting significant potential impacts on the environment. The contracting authority evaluated the tenders on the basis of the lowest price. Fourteen tenderers submitted the tenders using ECS. The contract was concluded in accordance with the tender documents

and with the tender submitted by the successful tenderer.

LP4 The tender process was organized using open procedure as contract below the threshold. The tender was announced by contracting authority Trnava City. The subject of the contract was complete reconstruction of the roof insulation and external cladding on Elementary School Spartakovska. The specification was defined with respecting significant potential impacts on the environment. The contracting authority evaluated the tenders on the basis of the lowest price. Four tenderers submitted the tenders within requested place, date and time. The contracting authority excluded one tenderer in accordance with the Act of public procurement in Slovak republic. The electronic auction was realised. The contracting authority concluded a contract during the tender validity period. The contract was concluded in accordance with the tender documents.

Poland

The following paragraph summarizes the details of the tender processes.

LP1 The procedure was an open tender process with total value over 30 000 EUR. The procurement began in February 2015, 4 tenderers made offers and in April 2015 the contract was awarded. As a result, the cost of procurement was approx. 25 500 EUR.

LP2 The procedure was an open tender process. The procurement began in February 2015, 15 tenderers made offers and in March 2015 the contract was awarded. As a result, the cost of procurement was approx. 50 000 EUR.

LP3 Contract awarding procedure was an open tender with value of the contract lower than the PLN equivalent of EUR 5 186 000. The procurement took place in July 2015. The cost of procurement was approx. 340 000 EUR.

In all cases periods of publication of tenders, awarding and contractual signature time lasted approx. 2 months. Works were executed within 3 to 8 months after awarding the contract, depending on the scope of works indicated in the tender.

However, the most time consuming was the process of preparation of these procurements. All lighthouse projects applied for and received external co-financing for their implementation. Preparation period lasted approx. 12 months on average. It was necessary to develop e.g. energy audits, functional-utility programs, bill of quantities, estimate of costs or building designs beforehand. Firstly, in order to apply for co-financing and secondly to attach them to tendering documents (to be able to describe subject matter appropriately).

Implementation required involvement and cooperation of different departments and staff members in municipality or hospital administration. Persons responsible for procurement, energy, building construction, building maintenance, budget and finances, investments as well as external experts were engaged in the preparation phase of the whole tender and tendering documents.

Romania

The following paragraph summarizes the details of the tender processes.

The case of Cluj reconfirmed the conventional procurement procedure:

- Compliance with all requirements requested by norms, law, decisions of local authority, standards on building work as requested by the ToR, Technical Specifications and Execution Details. Compliance with the specific legislation on thermal rehabilitation and guidelines applicable when the public procurement was initiated and when the procurement contracts were signed (e.g.: Emergency Government Ordinance Ordonanta 63/2012 regarding blocks of flats energy efficiency increase, specific normative related to thermal rehabilitation issued by MDRAP)
- The estimated execution duration for each lot was 5 months while for each group approximately 12 months
- The imposed works guaranteed was 36 months from the reception of works

In the case of Cluj the procurement processes proved to be the most challenging activity of any EU funded rehabilitation programme, both due to the amount of lots launched, paper work, prevention and facing contestation and disputes from tenders of interested parties, delays in the tender process due to contestation/disputes.

The case of Giurgu considers:

- Eligibility: similar experience, availability of personnel authorized by the National Authority for Energy Regulator, ISO 14001 availability
- Although the award criteria was lowest price, the environmental and technical criteria were set by installing street lamps with LED of 90W and replacing the existing street lamps are high-pressure discharge lamps in mercury / sodium
- Contract duration: 60 days from contract signature.

The case of Zimandu Nou considers:

- Eligibility: similar experience, availability of personnel authorized by the National Authority for Energy Regulator, ISO 14001 availability
- Although the award criteria was lowest price, the environmental and technical criteria were set by installing street lamps with LED of 30-60W and replacing the existing old incandescent street lamps
- ISO 14001 and ISO 9001 certificate availability had to be proven by the tenderers
- Minimum parameters requested for the LED illumination system, new unit panels, ground resistance and maintenance each 1-2 years
- Performance specifications and conditions regarding exploitation safety
- Reduce / increase lumen output based on sensors that can be mounted on any lighting equipment / control devices tendered (including area) and which can be managed based on the operation of multiple devices lighting serving the same purpose, without however being directly connected to the same sensor;

- Online interface allows defining in advance the special days in a year, having operating scenarios different from the rest of the year, for each working group part (e.g. Easter, Christmas, City Days, etc.)
- Issuing reports and export data in compatible "excel" and ".pdf", as requested by the system administrator for at least the following: energy consumed, type of operation, malfunctions, the lifetime of the lamps;
- Not accept for the tender retrofitted equipment type, i.e. luminaires developed for discharge or incandescent lighting sources, which were later adapted for LED sources. Tenders that did not meet these requirements were declared non-compliant.
- Guarantees requested: construction and installation 2 years, alimentation source minimum 5 years, LED sources and luminaires at least 5 years
- Contract duration: 120 days from contract signature

The allocated funds for 2007-2013 and 2014-2020 supported green investment schemes through Regional Operation Programme and Environmental Sectorial Programme. However all lighthouse projects and the investment/projects analysed while searching for municipalities opened for cooperation on lighthouse projects reconfirmed the strongly rooted lowest price procedure taken by all local authorities.

This is further supported by the White Paper The Road to Sustainable Public Procurement issued in 2015, the lowest price criteria is the most used criterion in Romania. Statistically this is represented as 97% lowest price award criterion and only 3% the best value for money out of a pool of public procurement signed contracts of 17,4 billion Euro in 2014.

Bulgaria

The procurement process was performed according to the requirements of the Public Procurement Act.

Following a decision of the municipal council for implementation of measures for improvement of the energy efficiency of given buildings or street lighting are performed market assessments in order to select the most appropriate technology as:

- LCC assessment of cost efficiency;
- Technical feasibility;
- Availability of the products, local products (in the Rhodope region there is a big potential for use of local biomass).

On the basis of the results of this assessment are elaborated projects that include: technical specifications, technical solutions, financial evaluation, requirements to the provider as qualification and expertise, requirements to the preservation of the environment as disposal of building waste, requirements to the safety and health issues of the systems and materials, and requirements for the efficiency of the installations.

For the buildings the requirements are formulated in such way that the buildings after the implementation of energy saving measures get a better certificate for energy performance than

this required by the regulations.

The solutions for street lighting include innovative technologies which efficiency is proved through LCC assessments.

The criteria for selection of the offers are always based on the requirements of the technical specification and the technical solution, but they depend also on:

- The legislation – requirement for selection according to the lowest price;
- The programmes for financing energy efficiency measures – criteria for energy performance and criteria for term of completion of the works;
- The specific situation in a municipality – criteria for longer term of payment.

The procurers avoid to make directly GPP as this requires a lot of additional calculations and explanations. The lack of a simple methodology for reporting green procurement s one of the barriers towards a wider implementation of GPP.

3 Efficiency actions

Italy

The efficiency actions undertaken by the suppliers on the buildings of the several Administrations participating in the lighthouse projects belong to several categories and were done on different types of public buildings, although with a prevalence of school premises. The most common efficiency actions were done on plants and systems and on the envelope of municipal buildings. Installation of co-generators, more efficient condensation generators, remote control heating and cooling systems, automatic regulating devices, thermostatic valves and inverter electro-circulators or accelerators. Often generators have been replaced with condensing boilers, methane has been set as the main energy carrier and pipes have been insulated. Some boilers have been powered by biomass and the layout of several distribution systems has been renovated.

The initiatives provided the adoption of a consumption control and monitoring system to obtain reliable information on the actually achieved energy savings also through remote systems. Some supplier offered to conduct the monitoring and to forecast the expected benefits by means of the IPMVP protocol (International Performance Measurement and Verification Protocol). The measures of energy efficiency considered by the protocol include savings in the use of fuel and water, the temporal shifts of electric power, the reduction of electric consumption through the installation or modification of the systems and the change of management procedures.

After the implementation of the identified actions, the data are collected again according to the same collection method used during the first stage.

The suppliers emphasized the key role of the conduct adopted by the Administrations since it can prejudice the good performance of the building-plant systems. An analysis of the interactions between users and system was performed to define unique objective levels of comfort perception. The analysis was made mapping the user profile, interviewing the users to elaborate suggestions

on the behaviours to adopt or avoid, verifying the implications and the discomfort of the users behaviours, producing a manual of good practices and behaviours to be favoured.

Further analysis were conducted at micro-environmental level to allow the collection of data on wellness, air quality, average radiant temperature. Lastly, the discomfort indexes were identified and incorporated in a report containing the design guidelines for the elimination of the criticalities.

For the Energy Management service the supplier provided a total monitoring solution of the system functioning, the energy consumption and other data representative of the environmental conditions. This solution allowed to access the monitoring data both from the stations located in the contractual management seats and the operations room that is endowed with visualization systems allowing to inspect remotely each building-plant system and afterwards to aggregate the punctual data.

Germany

The efficiency actions undertaken in the field of building, street lightning and office equipment are described below.

- LP1 The efficiency of the electricity supply could be improved. Respectively the electricity is used directly by the building owners or a third person in vicinity.
- LP2 The existing heating supply system was completely modernized and therefore higher efficiency level could be accomplished. Additionally, a highly efficient CHP generation plant provides electricity for the building.
- LP3/4/5 In order to restructure the street lighting the existing out-dated lamps, mostly inefficient high-pressure mercury lamps, were replaced by modern LED-lamps.
- LP6 Old printers and copiers were replaced by more efficient equipment which comply with technical minimum requirements.

Hungary

The goal of the various organizations' leaders involved in these renovations, was to utilize the financial means available in the most efficient manner so that the energy consumption of their respective institutions would be significantly reduced. During the preparatory stages of the procurement procedure, in fact even earlier, it was important to examine what renovation projects were feasible, not only financially, but also within a realistic time frame.

It is a well-known fact among the experts within the local governments, (we have also emphasized this during consultations and trainings and through a specific case study) that the most effective solutions are to be found in the following cooperative projects:

- replacement of windows
- additional insulation to façades and roofing
- renovation of heating systems

The decision on the technical content was influenced by two factors: certain modernization works

had already been completed and/or if there was not sufficient funding for all the above renovations.

In the public procurement specifications, all the projects were based on mandated technical requirements and in every case, the projects resulted in significant energy cost reductions.

Slovakia

All Lighthouse Projects implemented in Slovakia were focused on improvement of the energy efficiency. The projects have been oriented into two areas: 1/ Buildings and 2/ Street Lighting.

The measures implemented by the suppliers on the buildings of the respective administrations participating in the lighthouse projects focused mostly on the improvement of the thermal characteristics of the buildings. Thus, these measures consisted of thermal insulation of walls and roofs as well as in replacement of doors and windows. Implementation of this kind of measures helped to increase the energy performance of specific buildings elements (measured through their U-values,) as well as the respective buildings as a whole. The most important benefit of these actions on the building envelopes lies within establishment of basis for finalization of complex refurbishment. i.e. complementing the already implemented measures with actions on the side of building technologies. The other measures were implemented only in one Lighthouse Project (LH4), where the optimization of heating system took place.

The energy efficiency actions implemented within the refurbishment of public lighting system consisted in replacement of the outdated luminaries with new ones based on LED technology in the first place, and was systematically complemented with installation of remote control lighting system including automatic regulating devices.

An analysis of the interactions between users and system was performed to define a potential in improving the procurement process towards GPP. The analysis was made by mapping the user profile, interviewing the users to elaborate suggestions on the behaviours to adopt or to avoid, verifying the implications and the discomfort of the user's behaviours, producing a manual of good practices and behaviours to be favoured.

Poland

All Lighthouse Projects implemented in Poland were focused on improvement of the energy efficiency. In particular the lighting renovation through the determination of detailed technical parameters of lamps and light parameters helps to select appropriate light sources by the tenderer; the refurbishment of four communal multi-family buildings including exchange of windows and doors, thermal insulation of walls and roofs, installation of central heating and hot tap water systems, solar installations and electrical systems.

Romania

Newly introduced procurement processes for buildings:

The Public Authorities involved in the lighthouse projects obtained a guaranteed 30-50% savings on electricity and heating consumption for residential buildings thanks to the procurement framework. This tendering structure implies provision of:

- The Energy Audit Report: energy audit for buildings which proves and energy performance of minimum 40% reduction of energy consumption for heating; achieving a specific energy consumption for heating lower than 90-100 kWh/m²/y depending on the climatic zones of Romania; energy audit for buildings are accompanied by the thermic and energy fiche of the building, respectively the energy performance certificate; indicators: total energy saving from thermal rehabilitation in GWh/y
- The technical expertise of the building which proves that there are no structural consolidation/repairs needed that conditions the thermal rehabilitation of the building

For 2014-2020 the procurement framework uptake is all works procured must be grounded in the technical expertise report and/or Energy Audit Report; indicators: overall total annual consumption of primary energy (kwh/y); specific heating energy annual consumption (kwh/m²/y); specific energy annual consumption (kwh/m²/y); emission equivalent CO₂ (kgCO₂/m²/y); overall building surface (m²); number of rehabilitate buildings; number of households with an improved energy classification.

Newly introduced procurement processes for public lighting:

The technical projects contain: execution instructions, technical specifications regarding the use of material, machinery, tests, and checks, indicating the standards, norms and prescriptions that must be complied with.

The indicators: emissions of NO_x, SO₂, COV (t); emissions of fine particles (PM₁₀ and PM_{2.5}) (t); nitrogen (mg/l); CO₂ equivalents (t e CO₂); recycled, recuperated or reused waste (t).

Contracting authorities not aware/not using: Life Cycle Cost, the order 8 of National Authority for Energy Regulation from 2012- recommendation guide on for public procurement of equipment and services for public lighting.

Bulgaria

In the Bulgarian lighthouse projects were implemented the following energy efficiency actions and control of the systems:

- One installation for production of electricity through PV system. The installation has control system for evaluation the produced energy and the condition of the equipment.
- Thermal insulations of the building envelope and change of old windows with energy efficient ones in 5 buildings. The quality of the work is assessed through pictures with thermo-camera.
- In 5 buildings are installed new heating systems and boilers on wooden pellets. All these systems are equipped with thermostatic valves on radiators for a permanent control of the

heating in all premises, remote control of the boilers, automatic regulating systems.

- In two buildings are installed thermal solar collectors for domestic hot water. In both buildings are installed control systems that ensure a maximum performance and control of the systems.
- In two buildings the lighting was improved through the installation of LED or energy efficient lamps with dimming where appropriate.
- In 2 cities street lighting was improved through the change of lamps with LED lamps. The systems are equipped with automatic remote control and partially dimming systems.

4 Cost, energy and CO₂ savings

Italy

Lighthouse project 1: ARENZANO	
<i>Project name</i>	Efficient Arenzano
<i>Product group</i>	Buildings
<i>Project region</i>	City: Arenzano, Province: Genova, Region: Liguria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): € 16.899,74
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): 331,368 MWh
<i>CO₂ savings (expressed in tep)</i>	Annual CO ₂ savings Thermal CO ₂ savings objective (natural gas): 66,94 tCO ₂

Lighthouse project 2: LA SPEZIA	
<i>Project name</i>	Efficient La Spezia
<i>Product group</i>	Buildings
<i>Project region</i>	City: La Spezia, Province: La Spezia, Region: Liguria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): € 300 218.13
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): 5.886,630 MWh
<i>CO₂ savings (expressed in tep)</i>	Annual CO ₂ savings Thermal CO ₂ savings objective (natural gas): 1.189,10 tCO ₂

Lighthouse project 3: LICATA	
<i>Project name</i>	Efficient Licata
<i>Product group</i>	Buildings
<i>Project region</i>	City: Licata, Province: Agrigento, Region: Sicily
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural

	gas): € 21 515,97
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): 285,357 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (natural gas): 57,64 tCO2

Lighthouse project 4: MASCALUCIA	
<i>Project name</i>	Efficient Mascalucia
<i>Product group</i>	Buildings
<i>Project region</i>	City: Mascalucia, Province: Catania, Region: Sicily
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (diesel): € 3.560,51 Thermal consumption reduction objective (natural gas): € 14 509,03
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (diesel): 33,276 MWh Thermal consumption reduction objective (natural gas): 192,428 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (diesel): 8,92 tCO2 Thermal CO2 savings objective (natural gas): 38,87 tCO2

Lighthouse project 5: GUALTIERI	
<i>Project name</i>	Efficient Gualtieri
<i>Product group</i>	Buildings
<i>Project region</i>	City: Gualtieri, Province: Reggio nell'Emilia, Region: Emilia Romagna
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): € 44.147
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): 865,632 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (natural gas): 174,86 tCO2

Lighthouse project 6: NOCETO	
<i>Project name</i>	Efficient Noceto
<i>Product group</i>	Buildings
<i>Project region</i>	City: Noceto, Province: Parma, Region: Emilia Romagna
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural gas) : € 45.491
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (natural

	gas): 891,97 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (natural gas): 180,18 tCO2

Lighthouse project 7: REGGIOLO	
<i>Project name</i>	Efficient Reggiolo
<i>Product group</i>	Buildings
<i>Project region</i>	City: Reggiolo, Province: Reggio nell'Emilia, Region: Emilia Romagna
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): € 40.162,50
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): 787,500MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (natural gas): 159,07 tCO2

Lighthouse project 8: FIORENZUOLA D'ARDA	
<i>Project name</i>	Efficient Fiorenzuola
<i>Product group</i>	Buildings
<i>Project region</i>	City: Fiorenzuola d'Arda, Province: Piacenza, Region: Emilia Romagna
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): € 68.913,50
<i>Energy savings (expressed in kWh)</i>	Annual energy savings Thermal consumption reduction objective (natural gas): 1.351,245 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (natural gas): 272,95 tCO2

Lighthouse project 9: PADOVA FIT	
<i>Project name</i>	Padova Fit
<i>Product group</i>	Buildings (residential and tertiary)
<i>Project region</i>	City: Padova, Province: Padova, Region: Veneto
<i>Cost (expressed in EUR)</i>	15.872.573 € in the private market
<i>Energy savings (expressed in MWh)</i>	Annual energy savings 15.200 MWh
<i>Renewable energy production (expressed in MWh)</i>	Annual energy savings 2.300 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings 4.850 CO2 tCO2

Lighthouse project 10: CATANIA	
<i>Project name</i>	Efficient Catania
<i>Product group</i>	Buildings

<i>Project region</i>	City: Catania, Province: Catania, Region: Sicily
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction objective (diesel): € 121.386 Thermal consumption reduction objective (natural gas): € 37.348
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective (diesel): 1.134,45 MWh Thermal consumption reduction objective (natural gas): 495,33 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective (diesel): 304,03 tCO2 Thermal CO2 savings objective (natural gas): 100,110 tCO2

Germany

Lighthouse project 1: PV plant on the roof of public building	
<i>Product group</i>	Buildings
<i>Project region</i>	City: Berlin, Federal State: Berlin
<i>CO2 savings</i>	Expected annual CO ₂ savings: 21 tCO ₂

Lighthouse project 2: Facility –Contracting for the heat supply	
<i>Product group</i>	Buildings
<i>Project region</i>	City: Berlin, Federal State: Berlin
<i>Energy savings (expressed in MWh)</i>	Expected annual primary energy savings: 730 MWh
<i>CO2 savings (expressed in tep)</i>	Expected annual CO ₂ savings: 236 tCO ₂

Lighthouse project 3: Replacement of existing lightning with LED technology in Haldensleben	
<i>Product group</i>	Lightning
<i>Project region</i>	City: Haldensleben, Federal State: Saxony-Anhalt
<i>Energy savings (expressed in MWh)</i>	Expected annual energy savings: 20 MWh
<i>CO2 savings (expressed in tep)</i>	Expected annual CO ₂ savings: 12 tCO ₂

Lighthouse project 4: Replacement of existing lightning with LED technology in Norden	
<i>Product group</i>	Lightning
<i>Project region</i>	City: Norden, Federal State: Lower Saxony
<i>Energy savings (expressed in MWh)</i>	Expected annual energy savings: 266 MWh
<i>CO2 savings (expressed in tep)</i>	Expected annual CO ₂ savings: 157 tCO ₂

Lighthouse project 5: Replacement of existing lightning with LED technology in Plauen	
<i>Product group</i>	Lightning
<i>Project region</i>	City: Plauen, Federal State: Saxony

<i>Energy savings (expressed in MWh)</i>	Expected annual energy savings: 61 MWh
<i>CO2 savings (expressed in tep)</i>	Expected annual CO ₂ savings: 24 tCO ₂

Lighthouse project 6: Leasing of energy efficient printers and copiers	
<i>Product group</i>	Office equipment
<i>Project region</i>	City: Bonn, Federal State: North Rhine-Wastphalia
<i>Energy savings (expressed in MWh)</i>	Expected annual energy savings: 6 MWh
<i>CO2 savings (expressed in tep)</i>	Expected annual CO ₂ savings: 5 tCO ₂

Hungary

Lighthouse project table 1	
<i>Country</i>	Hungary
<i>Project name</i>	Budapest District XVIII., energy efficient retrofit of 3 buildings: kindergarten and nursery
<i>Product group</i>	<input type="checkbox"/> Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Budapest, District XVIII.
<i>Cost savings (expressed in EUR)</i>	Heating energy saving € 18 000
<i>Energy savings (expressed in kWh)</i>	Saved annual heating energy demand (district heating): 253.6 MWh
<i>CO2 savings (expressed in tep)</i>	Thermal CO ₂ savings objective (district heating) : 73.58 tCO ₂

Lighthouse project table 2	
<i>Country</i>	Hungary
<i>Project name</i>	Budapest District XVIII., energy efficient retrofit of 3 buildings: kindergarten and nursery
<i>Product group</i>	<input type="checkbox"/> Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Budapest, District XVIII.
<i>Cost savings (expressed in EUR)</i>	Heating energy saving € 15 000
<i>Energy savings (expressed in kWh)</i>	Saved annual heating energy demand (natural gas): 316.11 MWh
<i>CO2 savings (expressed in tep)</i>	Thermal CO ₂ savings objective (natural gas) : 64.14tCO ₂

Lighthouse project table 3	
<i>Country</i>	Hungary
<i>Project name</i>	Budapest District XX., energy efficient retrofit of 7 kindergarten buildings
<i>Product group</i>	<input type="checkbox"/> Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Budapest, District XX.
<i>Cost savings (expressed in EUR)</i>	Heating energy saving: n.a.
<i>Energy savings (expressed in kWh)</i>	Saved annual heating energy demand (natural gas and district heating):

	326.17 MWh
<i>CO2 savings (expressed in tep)</i>	Thermal CO2 savings objective (natural gas : 77.29 tCO2)

Lighthouse project table 4	
<i>Country</i>	Hungary
<i>Project name</i>	Budapest District XX., energy efficient retrofit of 3 public buildings: elementary schools
<i>Product group</i>	<input type="checkbox"/> Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Budapest, District XX.
<i>Cost savings (expressed in EUR)</i>	Heating energy saving € n.a.
<i>Energy savings (expressed in kWh)</i>	Saved annual heating energy demand (natural gas and district heating): 340.86 MWh
<i>CO2 savings (expressed in tep)</i>	Thermal CO2 savings objective (natural gas: 87.21 tCO2)

Lighthouse project table 5	
<i>Country</i>	Hungary
<i>Project name</i>	Budapest District III., energy efficient retrofit of 3 buildings: elementary school and 2 kindergartens
<i>Product group</i>	<input type="checkbox"/> Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Budapest, District III.
<i>Cost savings (expressed in EUR)</i>	Heating energy saving € 12 600
<i>Energy savings (expressed in kWh)</i>	Saved annual heating energy demand (district heating): 290 MWh
<i>CO2 savings (expressed in tep)</i>	Thermal CO2 savings objective (natural gas: 68.51 tCO2)

Slovakia

Lighthouse project table	
<i>Country</i>	Slovakia
<i>Project name</i>	Renovation of the Business Centre Building in the Nova Bana Municipality
<i>Product group</i>	<input type="checkbox"/> Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Central Slovakia
<i>Energy savings (expressed in kWh)</i>	30%

Lighthouse project table	
<i>Country</i>	Slovakia
<i>Project name</i>	Modernization of public lighting in Nova Bana Municipality, 2nd phase
<i>Product group</i>	<input checked="" type="checkbox"/> Public lighting <input type="checkbox"/> CT

	Building and maintenance
<i>Project region</i>	Central Slovakia
<i>Energy savings (expressed in kWh)</i>	938,36 GJ
<i>CO2 savings (expressed in tep)</i>	65,69t/y

Lighthouse project table	
<i>Country</i>	Slovakia
<i>Project name</i>	Elementary school Gorkeho str, replacement of windows at the special pavillon in Trnava Municipality
<i>Product group</i>	Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Western Slovakia
<i>CO2 savings (expressed in tep)</i>	7,4 t/y

Lighthouse project table	
<i>Country</i>	Slovakia
<i>Project name</i>	Elementary school Spartakovská, optimization of the heating system and the thermal insulation of the gymnasium (two halls) in Trnava Municipality
<i>Product group</i>	Public lighting <input type="checkbox"/> CT <input checked="" type="checkbox"/> Building and maintenance
<i>Project region</i>	Western Slovakia
<i>Energy savings (expressed in kWh)</i>	26,68 MWh
<i>CO2 savings (expressed in tep)</i>	0,11 t/y

Poland

Lighthouse project 1: Lighting renovation in Voivod Psychiatric Hospital in Gdańsk	
<i>Project name</i>	The design and execution of renovation of outdoor lighting and lighting in the tunnels connecting buildings of the Voivod Psychiatric Hospital in Gdańsk
<i>Product group</i>	Public lighting
<i>Project region</i>	City of Gdańsk, Pomerania Region
<i>Cost savings (expressed in EUR)</i>	Resulted annual cost savings: € 562
<i>Energy savings (expressed in MWh)</i>	Resulted annual electricity savings: 7 MWh
<i>CO2 savings (expressed in tep)</i>	Resulted annual CO2 savings: 8 t CO2

Lighthouse project 2: Street lighting in Darżyno	
<i>Project name</i>	Installation of street lighting in Darżyno
<i>Product group</i>	Public lighting
<i>Project region</i>	Potęgowo municipality, Pomerania Region
<i>Cost savings (expressed in EUR)</i>	Resulted annual cost savings: € 2 815
<i>Energy savings (expressed in MWh)</i>	Resulted annual electricity savings: 22 MWh
<i>CO2 savings (expressed in tep)</i>	Resulted annual CO2 savings: 26 t CO2

Lighthouse project 3: Thermal renovation in Kościerzyna	
<i>Project name</i>	Thermal renovation of four multi-family buildings located in Kościerzyna
<i>Product group</i>	Building and maintenance
<i>Project region</i>	City of Kościerzyna, Pomerania Region
<i>Cost savings (expressed in EUR)</i>	Resulted annual cost savings: € 13 920
<i>Energy savings (expressed in MWh)</i>	Resulted annual heat demand savings: 430 MWh
<i>CO2 savings (expressed in tep)</i>	Resulted annual CO2 savings: 150 t CO2

Romania

<i>Country</i>	<i>Romania</i>
<i>Project name</i>	<i>Supply and instalment of public lighting systems for rehabilitating and modernizing the public lighting system in the Zimandu Nou Commune</i>
<i>Product group</i>	☒ Public lighting
<i>Project region</i>	<i>Zimandu Nou Commune, Arad County, V of Romania</i>
<i>Cost savings (expressed in EUR)</i>	<i>Annual costs savings of 11,287 €</i>
<i>Energy savings (expressed in kWh)</i>	<i>Total cumulated energy savings 141083 kWh/y (141.083 MWh/y)</i>
<i>CO2 savings (expressed in tep)</i>	<i>132.3 tCO2</i>

Lighthouse project table	
<i>Country</i>	<i>Romania</i>
<i>Project name</i>	<i>Extension of public lighting network - lighting network on N. Titulescu Boulevard, Giurgiu</i>
<i>Product group</i>	☒ Public lighting
<i>Project region</i>	<i>Giurgiu, Giurgiu County, S of Romania</i>
<i>Cost savings (expressed in EUR)</i>	<i>Annual costs savings of 543 €</i>
<i>Energy savings (expressed in kWh)</i>	<i>Total cumulated energy savings 7057 kWh/y (7.057 MWh/y)</i>
<i>CO2 savings (expressed in tep)</i>	<i>6.615 tCO2</i>

Lighthouse project table	
<i>Country</i>	<i>Romania</i>
<i>Project name</i>	<i>Thermal rehabilitation of blocks of flats (Group I-VII) resulting in 1365 flats (38 blocks of flat)rehabilitated-Cluj Municipality</i>

<i>Product group</i>	✕ Building and maintenance
<i>Project region</i>	Cluj, Cluj county, NV of Romania
<i>Cost savings (expressed in EUR)</i>	Total cost savings EUR 362,940.00
<i>Energy savings (expressed in kWh)</i>	Total cumulated energy savings (as per final energy performance certificate) 20370000 kWh/y (20370 MWh/y)
<i>CO2 savings (expressed in tep)</i>	15780 t CO2/year

Bulgaria

Lighthouse project 1: SAPAREVA BANIA	
<i>Project name</i>	Sapareva Bania
<i>Product group</i>	Street lighting
<i>Project region</i>	Sapareva Bania, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings annual costs savings from electricity (EUR) – 40055.38 EUR/year
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Electricity consumption reduction: 447.471 MWh/year
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings CO2 savings: 305.62 tCO2/year

Lighthouse project 2: DIAGNOSTIC AND CONSULTING CENTER XII	
<i>Project name</i>	Diagnostic and Consulting Center XII
<i>Product group</i>	Buildings
<i>Project region</i>	Liulin, Sofia, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings 23147 EUR/year
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal energy consumption reduction 445.2 MWh/year Electricity savings 46.4 MWh/year
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings): 173.03 tCO2/year

Lighthouse project 3: TECHNICAL UNIVERSITY OF SOFIA	
<i>Project name</i>	Technical University of Sofia

<i>Product group</i>	Buildings
<i>Project region</i>	Sofia, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings 21 515.97 EUR/year
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal energy consumption reduction 854.934 MWh/year
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective: 466.43 tCO2/year

Lighthouse project 4: PV SYSTEM IN HOSPITAL, BRATSIGOVO	
<i>Project name</i>	PV system on hospital's roof, Bratsigovo
<i>Product group</i>	Buildings
<i>Project region</i>	Bratsigovo, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy sproduced Electricity production: € 3 008
<i>Energy savings (expressed in MWh)</i>	Annual green electricity produced 33,60 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Eletricity CO2 savings 27,52 tCO2

Lighthouse project 5: KINDERGARTEN "BOZHURA FURNADJIEVA", BRATSIGOVO	
<i>Project name</i>	Kindergarten "Bozhura Furnadjieva"
<i>Product group</i>	Buildings
<i>Project region</i>	Bratsigovo, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Thermal consumption reduction 8500 EUR/year
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction 68,0 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective: 65,61 tCO2

Lighthouse project 6: STREET LIGHTING ZLATOGRAD	
<i>Project name</i>	Street lighting in Zlatograd
<i>Product group</i>	Street lighting

<i>Project region</i>	Zlatograd, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Electricity consumption reduction objective: € 23 275
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Electricity consumption reduction objective: 260,78 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Electricity CO2 savings 178, 16 tCO2

Lighthouse project 7: THREE MUNICIPAL BUILDINGS ZLATOGRAD	
<i>Project name</i>	Efficient buildings in Zlatograd
<i>Product group</i>	Buildings
<i>Project region</i>	Zlatograd, Bulgaria
<i>Energy savings (expressed in MWh)</i>	Annual energy savings Thermal consumption reduction objective: 588,85 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Thermal CO2 savings objective: 452 tCO2

Lighthouse project 8: HOSPITAL MADAN	
<i>Project name</i>	Hospital "Dr. K. Chilov" Madan
<i>Product group</i>	Buildings
<i>Project region</i>	Madan, Bulgaria
<i>Cost savings (expressed in EUR)</i>	Annual energy savings Electricity consumption reduction: € 9 690
<i>Energy savings (expressed in kWh)</i>	Annual energy savings Electricity consumption reduction: 224,121 MWh
<i>CO2 savings (expressed in tep)</i>	Annual CO2 savings Electricity CO2 savings objective: 94, 60 tCO2

5 Challenges, unexpected situations and open issues

Italy

The most ambitious energy efficiency interventions are obviously also the most expensive and, therefore, there is a trade-off between the cost of the efficiency actions in the short term and the energy savings that they can provide in the long term. In this tender framework, the suppliers have

not an incentive to perform significant actions due to the high costs. That is why an encouraging mechanisms has been adopted to push the suppliers towards more structured and long-lasting interventions through the sharing of the extra savings between the Administration and the supplier.

The tender required the suppliers to realize energy efficiency interventions identified on the base of the needs and opportunities detected during the inspections, emerged from the energy check and the audit. This exposed the suppliers to unexpected situations due to exogenous factors and provided an insurance to the Administrations which obtained maintenance and efficiency interventions to resolve inefficiency and neglect. Moreover, the initiative implied a high degree of technic-administrative complexity requiring management skills, knowledge of field regulations and the strong ability to supervise the contract management.

The energy mapping and the technical registry of the municipal buildings allowed an increasing awareness of the challenges that the Administration is asked to face. Therefore, the action plan is expected to become more and more systematic and ambitious since it is aimed at ensuring a governance of all the real estate assets. The final purpose is to achieve an high efficiency level in the criticality management and a more effective resources use.

Another challenge for the future is to increase the awareness of the users in order to favour the onset of virtuous behaviours contributing to the consumption reduction and the relevant polluting emissions and to promote a wellness culture of the occupants. The target to enhance wellness is motivated by the eagerness to improve the life quality in terms of environmental, thermal and visual comfort and to reduce the effect of the other polluting sources.

Germany

Two of the six lighthouse projects gave their view on challenges of the procurement process. Their opinions are summarized in the following paragraph:

LP4 So far, public services haven't pronounced the acquisition (small figures) of street lighting. However, due to the budget available for the project, advertised bidding became necessary. After having decided about the type of lights and following the above mentioned inspection by public services the call for bids was prepared.

For both, public services and bidders, the call for bids proceeded without any problems. Public services are satisfied with the results of the call for bids and will rerun further ones in this manner.

LP5 According to the assessment of the procurement office of the city of Plauen the bidding process went without any problems. Therefore - once subsidies are granted - the renewal of lights in the remaining five street sections is supposed to be advertised and accomplished in the same way in 2016.

Hungary

Challenges, unexpected situations

- To coordinate the institutions' needs with the possibilities available to the local governments
- To map the optimal technical solutions within the allotted budget (there is no time to make any corrections)
- To complete the project on time since in every instance the buildings were in use during the work period

Open issues

- In summary, determining the most advantageous tender, determining additional evaluation criteria, beyond the tender price
- Application of Life Cycle Cost in the case of construction investments

Slovakia

The main barriers in implementing Lighthouse projects are connected mostly with a lack of experience and knowledge about the GPP principles and calculating LCC, lack of information on benefits if GPP is applied in a daily life, as well as lack of awareness in this area. Therefore, it was quite a problem to identify some appropriate light house projects. Contracting authorities were very often concerned with potential complications and problems if a tendering process was conducted according to the GPP rules. It was necessary to explain the municipalities that they actually procure according to the GPP rules in many cases, even their main criterion was the lowest price. Contracting authorities don't have enough information regarding GPP, and if they have – sometimes the information is incomplete or incorrect. They don't know all the environmental and social impacts of purchasing particular products or services. From their first point of view – they usually see only complications. We presented that the GPP is able to lead to win-win situations in some cases where the reduction in environmental impacts of public purchases is coupled with a reduction of the related costs - while applying environmental criteria during procurement procedures can sometimes mean higher initial purchasing costs, but the overall costs often actually decrease since the higher purchasing prices of green goods and services are compensated by lower operating, maintenance or disposal costs. We expected a smaller lack of legal expertise in applying environmental criteria, practical tools and information and training as we have found during the lighthouse projects implementation. The after-tender analyses, as well as small GPP manuals were offered to be submitted to the LHP-concerned municipalities as a tool when organizing a similar purchasing process in future

The other well-known problem is that the use of green criteria and general GPP rules are only recommended and not obligatory according to the Slovak legislation. Therefore, a political acceptance and stronger governmental support would be needed for a successful involvement of GPP rules.

Poland

In case of lighthouse project 1 in the tunnels connecting buildings initially it was intended to only

exchange the lighting points 1: 1. However, the measurements of light intensity indicated that the number of light points had to be increased from 51 to 81.

The main barriers to implementation of GPP include lack of knowledge on GPP and lack of information and awareness on GPP benefits resulting in insufficient support and acceptance. Public authorities are often concerned with complications in tendering procedures related to questioning validity of green criteria or e.g. LCA methodology used. Moreover, LCA methodologies have to be accepted by the city council so that they can be used by employees responsible for public procurement. As there are no official requirements/methodologies (as there are for transport) municipalities are not eager to work on their own method because of the risk of questioning the methodology.

Political acceptance and encouragement is necessary for successful introduction of GPP. Lack of full implementation of EU directives into Polish law hindered the process of encouraging municipalities to implement GPP. On the other hand, indirect help and support for GPP implementation comes from EU funding schemes by means of setting up prerequisites to obtain financing. In many cases it was required that the investments made by public authorities had to contribute to CO₂ emission reduction, reduced use of fossil fuels and energy efficiency improvement. This indirectly lead to introduction of green requirements in public procurements.

Lack of awareness and experiences were the main reasons for including GPP in other key sectors of SEAPs of Low-Carbon Economy Plans (instead of setting GPP as a key sector of SEAP/LCEP). In the municipalities involved GPPs were not implemented systematically. The situation is slowly changing due to changes in the legal framework and raising awareness of public procurers. Further promotion, trainings and examples of best practises are crucial for their implementation on a broader scale.

Romania

The most ambitious energy efficiency interventions are obviously also the most expensive and, therefore, there is a trade-off between the cost of GPP and the efficiency actions in the short term and the energy savings that they can provide in the long term. In this tender framework, the suppliers have not an incentive to perform significant actions due to the high costs.

Overall much more resources should be allocated for rewarding the procurer's team/personnel in terms of national GPP award and European GPP award (e.g. rewarding energy efficiency and primary energy savings, continuation of GPP assistance, participation in the European GPP not just of the senior management but of the actual personnel which managed up taking GPP principles into tenders, increased visibility and PR for the procurers signing up for preparation of lighthouse projects, continuous information provision on GPP, continuous specialised support for GPP).

Bulgaria

The participating municipalities and state organisation are aware of the benefits of energy efficiency measures and innovative solutions. Such more ambitious solutions are usually more

expensive, but the understanding of their benefits from the city councils make them feasible.

The biggest challenge is how to overcome the administrative barriers, the complexity of the public procurement process and to keep the mandatory criteria - "lowest price".

These barriers can be overcome at a preliminary stage of the procurement process.

A preliminary assessment of available technologies, simple LCC assessments and evaluation of several scenarios result in choice of technologies and technical requirements that incorporate green criteria. Such approach is very suitable for decisions for buildings. Earlier is applied a LCC approach at building design, better are the results.

Another problem that arose at the implementation of the lighthouse projects is the requirement for "free competition". If the technical requirements are too high, or the chosen technology too innovative, there will not be at least three offers. The preliminary market assessment can overcome this barrier, moreover too innovative solutions might not be suitable and efficient and are much more expensive.

6 The continuity elements between lighthouse projects' energy efficiency interventions and SEAPs

Italy

The municipalities adhering to the lighthouse projects are all signatories of the Covenant of Mayors and, therefore, they had adopted a SEAP beforehand and they have an audit of emissions and energy absorption by fuel type and sector at city level. The totality of these cities/towns identified the intervention on municipal real estate as fundamental actions to achieve the CO2 reduction objective declared in their SEAPs. We can then conclude that the participation in the lighthouse projects by means of Consip Spa convention SIE 3 provided them with the opportunity to approach their Covenant of Mayors' target in terms of energy efficiency and thus CO2 emissions reduction.

The majority of the municipalities obtained energy efficiency interventions in the framework of the lighthouse projects on school and city hall buildings through the replacement of doors and windows with low-transmittance ones, the thermal insulations of circuits, plants and envelope, the installation of photovoltaic plants and the replacement of the heat boilers with more efficient ones. All the actions results have been closely monitored to assess progress and eventual bottlenecks through consumption accounting systems and energy consumptions management systems.

Nonetheless, we must be frank in acknowledging that the impact of municipal buildings on the overall budget represents only a minor share. This means that significant results can be achieved only provided a combination of actions targeted at other municipal scopes of action and to other sectors such as residential and tertiary buildings. Thus, for what concerns the actions going beyond the interventions on real estate, the SEAPs identified measures such as:

- Public lighting: replacement of mercury vapor lamps with high pressure sodium or more effectively with LED lamps; installation of flow regulators, astronomic clocks and remote

control devices; refit the artistic lanterns of the historic city center.

- Urban mobility: development of “soft-mobility” by building urban bicycle paths, implementing car-sharing and car-pooling, coastal cabotage through electrically powered boats; replacement of municipal automobile fleet with low environmental impact vehicles powered by biomethane or electric vehicles; campaign for the sensitization to sustainable mobility; creation of limited traffic zones; implementation of a monitoring system of the vehicular traffic.
- Green energy: procurement of certified energy from renewable sources, promotion of energy production from renewable sources for agricultural, industrial and tertiary sectors.
- Residential buildings: installation of solar photovoltaic plants and support to increase the energy performance levels of private buildings by granting subsidies; promotion of energy production from renewable sources.
- Secondary and tertiary sectors: installation of photovoltaic plants on industrial warehouses and greenhouses; establishment of a technical committee for the enhancement of energy efficiency and renewable sources in the industrial sites and tertiary sector.
- Municipal building regulation: obligation to comply with the energetic requirements of the energy class A for new buildings or existing buildings subject to energy renovation; insertion of an energetic section to the municipal building code.
- GPP: adoption of “green criteria” in the public purchasing procedures of goods and services with respect to the product groups: stationary, cleaning services, electric and electronic equipment and devices (e.g. PC, monitors and printers) and catering.
- Communication and training: training for municipal employees on the GPP and environmental sustainability topics; sensitization campaigns addressed to the school pupils and information plans addressed to citizens; stakeholders involvement through a consultation plan or a permanent stakeholders’ forum on the SEAP topics; creation of an energy info point; establishment of local certifications to promote green products, services or conducts.

On the other hand, the SEAPs were in some cases rather ambitious and identified actions going beyond both the interventions on real estate and the most common energy sources and readily exploitable technologies, such as:

- Installation of solar panels.
- Exploitation of tide power for the production of renewable energy.
- Promotion of energy production from renewable sources in both municipal and residential buildings through the installation of biomass systems, thermal solar plants and micro-wind power plants.

Germany

Over 3,700 European cities and municipalities signed the Covenant of Mayors and therefore pledge action to support implementation of the EU 40% greenhouse gas-reduction target by 2030 in contrast to 1990. Their aim is to tackle mitigation and adaptation to climate change. Two of the

communities engaging in the lighthouse projects are committed to a Sustainable Energy Action Plans (SEAP) to reduce their greenhouse gas-emissions through investments in energy efficiency and renewable energies.

Berlin has an overall CO₂ emission reduction target of 40% until 2020. With the implementation of the lighthouse projects the greenhouse gas emissions could be reduced through the local electricity production from renewable energy sources and through the efficiency intervention for the heat supply of a public building.

The other participating local authorities applied green procurement in order to achieve their community targets for reduction of CO₂ emissions.

Hungary

The 5 lighthouse project of Hungary are located in 3 different districts in Budapest: District III, District XVIII and District XX.) The districts are operating with independent municipalities under the capital city Budapest, that means they can develop their own SEAPs.

One of the 3 municipality (District XVIII.) is a member of the Covenant of Mayors. The energetic refurbishment of the public building is a highlighted part of their Plan and they systematically go ahead with energy retrofit projects in accordance with SEAP.

Slovakia

No one of the Slovak Covenant of Mayors signatories was willing to participate in the Green ProcA Lighthouse projects activities. The reason may be found in changed priorities of the cities' administrations after the municipal elections in 2014, as well as in the weak focus on GPP within the SEAPs (most of them contained only strategic description indicating that the city will focus on GPP utilization in future).

The Slovak Green ProcA partners therefore focused on other cities and have identified public administrations with a more proactive approach. The project partners, in communication with these cities, provided extensive information regarding GPP implementation, and thus the capacities of the cities were raised to implement GPP regularly and independently.

The basic element providing for continuity of the started actions consisted in elaboration of recommendations (based on practical experiences and activities of the cities) for future procurements in line with the GPP standards. These recommendations can be used in future also as a basis for a complex GPP strategy within the SEAP preparation as several of the cities addressed have expressed their interest to join the Covenant of Mayors for Climate and Energy.

Poland

Only one of the municipalities performing lighthouse project – City of Kościerzyna - is a signatory of the Covenant of Mayors. The city became signatory of the CoM in May 2011 and in August 2012 the City Council adopted Sustainable Energy Action Plan. SEAP indicates that the city office, as well as other municipal units are going to implement a GPP system. Its long-term vision is to become an energy efficient city with clean air and significant use of renewable energy sources. City with modernized energy and heating infrastructure and environment friendly transport. One of the

aims is to reduce energy use in buildings through comprehensive thermal renovation. Thermal renovation of the buildings in the lighthouse project 3 were included in actions undertaken in the residential buildings sector in SEAP. Therefore, implementation of the LHP helped in achieving CO2 emission reduction objectives declared in the SEAP.

The other two participants (Potęgowo municipality and the hospital situated in the city of Gdańsk) are not CoM signatories. However, both Potęgowo municipality and the city of Gdańsk adopted Low-Carbon Economy Plans. These Plans are based on SEAP rules and they include the same information with additional requirements regarding air pollution reduction.

Potęgowo municipality continues to promote and invest in energy efficiency and CO2 emission reduction measures. The Commune Council accepted the Low-Carbon Economy Plan in 2015. The aim of the Plan is to transform the municipality towards low-carbon economy through GHGs emission reduction (at least by 20% until 2020), increase of energy from RES (min. 30% in final energy use in 2020) and reduction of energy use (by 15% until 2020). In order to achieve these goals the commune undertakes multiple actions including thermal renovation of public utility buildings, RES installation, energy efficient lighting. Additionally, the commune is implementing GPP. The role of the Public Procurement Department is to coordinate implementation of GPP i.a. by providing information and support to other departments in development of the relevant criteria, technical specifications etc. One of the “green” projects in Potęgowo municipality was installation of street lighting in Darżyno.

City of Gdańsk also adopted the Low-Carbon Economy Plan in 2015. Among many action improving energy efficiency and RES utilisation the municipality decided to implement GPP policy by developing a comprehensive document defining types of procurements which have to include environmental end energy efficiency requirements as well as standards and other documents to be incorporated in tenders.

Romania

The municipalities adhering to the lighthouse projects are all signatories of the Covenant of Mayors and, therefore, they had adopted a SEAP beforehand and they should have an audit of emissions and energy absorption by fuel type and sector at city level.

Using the data collected by means of the questionnaires conducted in WP 2, below are the very positive percentage values for each of the following questions addressed to the Public Administrations of Romanian SEAPs on the implementation of GPP.

- Do you use GPP guidelines? 55.5% yes 44.4% no
- Are you familiar with the process of Life Cycle Costing (LCC) or Life Cycle Analysis (LCA)? 55.5% yes 44.4% no
- Has your institution defined GPP measures in the SEAP? 100% no

- How many of procurement processes over the EU-threshold year include green criteria?
88,88% 11,11%

Based on the networking activities from WP4 and WP6, it is perceived that dominating the market is a lack of coordination between the stated GPP aims and the rest of the SEAP core activities. Specialized personnel or allocated man hours for coordinating the above, monitoring them and the actual correlation is missing, or exceptionally where specialized technical personnel exists they are not involved in all the stages of GPP process and heavily unmotivated with minimal-average revenues (Euro 207 to Euro 424 Net Salary).

Recommendations for stakeholders, GPP state of the art and barriers

Stakeholder recommendation: Development of a shared computational methodology to calculate CO2 emissions (for old/new buildings and their components, ITC, other). It should come with explanations of compliance with EU directives/recommendations, examples and user manuals.

State of the art on GPP diffusion: The perception of GPP is not deep and consolidated among the public administrations with SEAPs; this would be even more partially achieved for the public administrations without SEAPs. The GPP law (law 69) was issued in March 2016 aiming at a 5-20% uptake of GPP from overall national public procurement. A package of 4 new procurement laws in line with Directive 2004/18/EC on public procurement and repealing, was issued in May 2016.

The procurement market needs both top down (e.g. legal compliance and obligations) and bottom up approaches (e.g. ProcA project).

SEAPs drafters have not always performed a thorough analysis of the territory needs and criticalities (no performance indicators for GPP, the GPP measures are generic and mostly not correlated with other SEAP measures, PP is most of the time not perceived as GPP because of the general lowest price practice). The SEAP self-monitoring is rather sketchy.

Barriers: Often public authority is understaffed, its personnel is not endowed with the technical knowledge and there is not a synergetic linkage between the officers dealing with policies definition, the public procurement department and project developers/managers who manage the implementation stage.

GPP is most of the time funded through structural funds and procurers have applied in over 94% of the cases (last 5 years) the lowest price selection and award criteria.

The application norms for Law 69 are to be issued in October 2016, leaving the market unstimulated

The public procurement legal variations and contradictions, the deep liquidity shortage for municipalities and ability to provide co-funding rates higher than 10% hampers /prevents the implementation of innovative projects or pure GPP projects.

Bulgaria

Two of the municipalities involved in lighthouse projects development signed the Covenant of Mayors in 2015. Their SEAPs are under elaboration, they will include GPP in them. All municipalities have plans for energy efficiency including targets for reduction of CO2 emissions,

energy savings and share of RES.

These plans include measures as:

- Energy efficiency of buildings – improvement of energy characteristics of municipal buildings and private dwellings, more specifically blocks of flats. The improvements include thermal insulation of the building envelope, change of windows with energy efficient ones, installation of solar collectors for domestic hot water, heating systems on biomass or geothermal energy, PV systems for production of electricity;
- Street lighting – energy savings through implementation of innovative solutions, remote control, diming;
- Urban mobility – development of integrated systems for urban transport;
- Promotion and support for energy from RES –solar thermal, wind farms, geothermal energy, biomass and PV.

Many municipalities are interested in GPP. In July 2016 were adopted changes in the Act for Public Procurement. The major change is in the requirement for the compulsory criteria for “lowest price”, now this criteria is for “best economic offer”. These changes will allow procurers to apply LCC assessment at selection of offers and to implement more widely GPP approach.

7 Lessons learnt and conclusion

This case study on the lighthouse projects drew the attention on some lessons learnt that worth to be listed.

Italy

First of all, the Administrations taking part to the lighthouse projects learned how to manage in a sustainable and with an organic approach their real estate and obtained a guaranteed savings. This savings has been achieved through a number of efficiency interventions identified according to the climate area of the municipality. This allowed to elaborate a coherent plan of actions with respect to the peculiar conditions of the climatic zone.

Secondly, the actions described in the SEAP were used by the local Authorities to set up the energy efficiency interventions plan to be implemented by suppliers who have a thorough knowledge of the territory and can, then, provide targeted actions keeping into accounts criticalities and peculiarities. Therefore, the lighthouse projects municipalities harmonized the energy efficiency actions with the commitments made with the adhesion to the Covenants of Mayors.

Lastly, the lighthouse projects provided a tangible evidence of the applicability of advanced protocols such as the IPMVP also to the public authorities' buildings thus creating an important evidence of the feasibility and of the progress in the required standards of the public contractor. This systematized approach to monitoring allows to obtain disaggregated data for elaborations to trace the consumption trends (e.g. by time slots), the ordinary and extraordinary maintenance operations (e.g. systematic failures) and more generally on the functionality of the building-plant systems.

In conclusion, given the broad adhesion of the Italian cities and towns to the Covenant of Mayors, the Convention SIE 3 managed by Consip Spa might provide more significant technological improvements and more radically promote the use of advanced energy certifications and protocols. Moreover, an overall comfort based on proper light conditions, suitable thermal standard and high air quality should be adopted and there should be an explicit prohibition to use materials and substances that have been classified as harmful by the European Union. Last but not the least, data collected in the monitoring phase represent a precious starting point for the elaboration of analysis aimed at assessing the actual efficiency of the implemented actions and at formulating proposals for the advancement of the following editions of the Convention.

Germany

In summary, in every lighthouse project the public institutions purchased environmental friendly and sustainable products. In their tender processes they used environmental criteria in addition to conventional criteria for the selection of the bidder. Through the realised efficiency interventions as well as the use of renewable energy CO₂ emissions could be reduced by about 455 tCO₂/a. Furthermore the energy consumption could be reduced by about 1 GWh/a.¹

With the participation in the lighthouse projects the municipalities promoted the implementation of the respective SEAPs and environmental community targets.

Hungary

The challenges and problems:

- too frequent changes in laws and regulations; for example: between 01 January 2012 and 31 October 2015, the laws regarding public procurement were modified 15 times. This results in uncertainty towards laws and regulations.
- often there is no transitional period between the publication of a law/regulation and the date it goes into effect. Therefore, it is very difficult to adapt to these changes in a timely manner; for example: the detailed law regarding construction investment public procurement 306/2011.(XII.23) Government Order was published in the Hungarian Gazette on 23 December, 2011 and went into effect on 01 January 2012.
- over-politization of procurement procedures and regulations coming from the top echelons of the government, naturally, through indirect channels
- the dangers of corruption
- very tight time frames
- fear of procurement procedures that yield no results, which may jeopardize the timely implementation of supported projects, both in terms of scheduled completion and accounting

Lessons learnt

¹ For LP2 the energy savings and the CO₂ reduction refer to primary energy because the energy source for the heat system was changed. Therefore the accumulated number is slightly higher than the actually saved final energy.

- the importance of team work
- the importance of communication: listening to each other and understanding each other
- starting a project's preparatory work in a timely manner
- the importance of preparing the specifics of procurement documentation
- establishing the basic requirements of a project
- how and what can we evaluate beyond the tender price
-

The agreements reached with the local governments, have been compiled by the Energiaklub and HAB-749, along with findings and recommendation and have been forwarded to the aforementioned entities. These documents are also available on the website (<http://gpp-proca.eu/hu/mintaprojektek/>).

Slovakia

Other lessons learnt:

- GPP is able to lead to win-win situations in some cases, where the reduction in environmental impacts of public purchases is coupled with a reduction of the related costs
- The opportunity of introducing GPP targets and incentives must be carefully evaluated with sector and country specific analyses
- The willingness to pay for greener public purchases might not be the only determinant of demand for sustainable goods/services by public bodies.

Recommendations:

- Motivating and encouraging mayors and municipal management to support their procurement staff to apply the GPP rules, establishing internal working groups on GPP which could support a cooperation among different municipal departments dealing with a topic of a public procurement.
- To continue in GPP trainings not only in general, but also focused specifically to different product groups (buildings, public lighting, IT equipment, office devices, etc), as well as on a practical use of LCC
- Monitoring and dissemination of best practice examples and success stories
- Improving the data availability to make a GPP design and its implementation more efficient.

Poland

Municipalities and the hospital implementing the lighthouse projects annually save 459 MWh and 184 t CO₂. Consultations, meetings and trainings provided under the Green ProcA project supported the projects and helped to introduce possible "green" elements in the procurements. Based on these experiences some municipalities decided to introduce GPP policies and internal procedures regarding at least one or more product groups. However, the process is resource and

time consuming and LCC/LCA methodologies should be prepared for specific procurements. Therefore, the results are going to be visible in a longer term.

Municipalities are very interested in topic of GPP and there is high need for trainings/assistance/consultation. More awareness and better understanding among local authorities and different stakeholders results in higher acceptance of GPP and support for GPP policy.

Other lessons learnt:

- Determination of detailed technical parameters of lamps and light parameters helps to select appropriate light sources by the tenderer;
- A requirement to submit photometric tests of the light sources offered is one of the elements that guarantee the achievement of the desired effects and the quality of lighting for the purchaser;
- More attention could be given to award criteria. Next time it is worth assigning weight to requirements on LED lamps (with possibility to get additional points);
- It is important to assign weight to requirements on insulation materials;
- More attention should be given to award criteria like energy efficiency;
- Description of subject matter should include requirements of the conservator and take into consideration period of executing works (excluding periods of breeding birds identified at the site), etc.

Recommendations:

- Political acceptance and encouragement is vital. Encouraging mayors and management staff to support their employees handling public procurement, establishing working groups, supporting cooperation between representatives from different departments.
- Trainings and other supporting measures such as official templates and promotion of good practice examples of GPPs for different products groups (especially buildings, lighting, IT equipment) which could be used by municipalities.
- Assistance from experts in the development of algorithms assessing the weighting and LCA methodology.
- Monitoring and dissemination of achieved results.

Romania

Cluj:

- Management of tenders (+40 lots launched); Project management for 38 blocks of flats with overlapping periods; Management of projects funded by EU via Regional Operation Program Romania-structural funds

- Relationship management with the flat owners, association of flat owners and avoiding breaking property rights
- Understanding that GPP can be achieved if the objectives of the procurement are very clearly set on achieving energy efficiency, reduced energy consumption/total energy, reduction of GHG emissions from household. Close monitoring of the norms, standards and legal compliance by the contractors. Quality and trustworthy site supervisors delegated. Unbiased energy audits before and after the works.

Giurgiu & Zimandu Nou:

- The guarantee conditions of at least 5 years, should have been set for a longer duration – closer to the payback period- because a too short planning horizon has a too short-term perspective to realize the potential benefits of durable products that naturally have a longer life expectancy;
- This procurement has a very good (14,5 years) payback period as it entails using the existing polls and its arms;
- The life cycle costs could not be incorporated in the evaluation as there were no data (production costs, maintenance costs, taxes/subsidies, disposal costs/resale value, remnant value or end-of-life costs.) provided by the designer in the technical specifications;
- There was no discount rate and inflation rate for calculation of the estimated budget included in the public documents of the tender. The lighting service modernisation, energy savings and reduction of GES criterion and reduction of lighting pollution were the main criteria of the procurement procedure

Success factor and lessons learnt

Bigger municipalities engaged in ambitious GPP initiatives, while smaller one are willing to take investment steps in line with the new structural funds programming period 2014-2020.

There is further need for transparency of the procurement process and for incorporation of life cycle costs, discount rate and inflation rate for calculation of the estimated budget included in the public documents of the tender, requiring longer guarantee periods, requiring extended maintenance period in line with the new Romanian procurement law and GPP law.

There is also further need for building environmental awareness and linking GPP/SEAPS with climate change prevention and assess the feasibility and potential of greenhouse gas mitigation/adaptation; evaluate capacities and data availability in relation to climate impacts and vulnerability assessment; elaborate methodologies/guidance to help decision makers develop effective adaptation policies/strategies; reduce environment and security risks related to climate change.

Bulgaria

There is a need of trainings and awareness raising for experts of the municipalities for a wider implementation of GPP.

Small municipalities don't have the capacity for LCC assessments and market investigations, as the number of experts don't cover all the aspects of the goods and services that should be procured.

Solutions as joint procurement or join procurement office can solve this problem.

The training of multipliers is also very important. In many cases the municipalities assign to energy agencies or consulting companies energy audits and assessments of different technical solutions. Trained in GPP experts can suggest better solutions and demonstrate the cost effectiveness and viability of these innovative solutions.