1.1.12 Public lighting (street lighting) - Giurgiu (RO)

Giurgiu is a Romanian local public authority which adhered to the CoM on <u>August 5, 2008</u> and adopted its SEAP with the support of Green-Twinning project on January 30, 2014. According to the Romanian Government Ordinance no. 22/2008 on energy efficiency and promotion of the use of renewable energy at the end users, local authorities of towns with over 20.000 inhabitants have the following responsibilities and duties:

- To take actions towards improving energy efficiency, particularly by promoting measures that generate the largest energy savings in the shortest period of time;
- To take actions in order to improve energy efficiency in lighting systems (new energy
 efficient lighting lamps, digital control systems, etc.)
- To develop programs in order to improve energy efficiency, which include short-term and long term measures (3 6 years), targeting an investment program based on feasibility studies.

With a view to fulfilling its above legal obligations and implementing measures outlined in its SEAP, Giurgiu assessed the action "Efficient lighting systems: indoor for main public schools and street lighting in the city of Giurgiu". The objective of the sustainable energy action is:

- to ensure an appropriate level of lighting;
- to reduce energy consumption;
- to improve the quality of local environment.

The financial indicators have been calculated taking into account the EE aspects with investments and energy savings resulting from the replacement of existing lamps with LED (which have the highest lighting performances and reliability at affordable costs). The networks' extension, installation of energy management devices, change of the existing lighting networks with underground ones etc. have not been considered. The findings of the study "Improving the energy efficiency for street lighting in Giurgiu" are presented in the present Chapter, while the findings of the study "Improvement of energy efficiency for inner lighting in schools" are presented in Chapter 4.1.13.

Giurgiu has concluded a twinning agreement with L'Alcúdia municipality (Figure 13) which has significant experience in public lighting and ESCO contracts. In this respect, Giurgiu included in its SEAP, the present sustainable energy action and developed the assessment studies taking into account the financing of street lighting through a PPP.



Figure 1 Signing of the twinning agreement between Giurgiu and L'Alcúdia

The street lighting system in Giurgiu does not cover the entire municipal area; it is obsolete and does not meet the mandatory lighting standards (from the point of view of the design as well as from the point of view of the execution - old equipment with high energy consumption, lack of energy and safety management etc.).



Figure 2 Street lighting in Giurgiu

Technical aspects

In this respect, a reference level (for meeting standard's mandatory requirements) has been considered and the related main financial indicators have been calculated. The aspects in Table 12 have been taken into account:

Table 11 Aspects considered in the sustainable energy action assessment study for the street lighting in Giurgiu (reference level)

Function	Requirements	Benefits	
Ilumination of roads	Safety of traffic	Costs mitigation for contributors	
Ilumination of residential areas	Safety of persons	Lower the number of accidents	
Ilumination of commercial areas	Pleasant habitat	Reducing crimes	
llumination of buildings and	Personal orientation	Efficient use of roads	
monuments	r ersonal offertation	Lincient use of foaus	
Ilumination of parks and gardens	Improve traffic	Targeted orientation	
Ilumination of walking areas	orientation	Visual and mental comfort	

The results of the audit for the existing lighting sources is described in Table 13 for both existing and reference level - corresponding to mandatory standards. The calculations' assumptions were the following: (i) annual operation duration of lighting system: 3.938 hours (ii) energy tariff (without VAT): 92,44 €/MWh and (iii) CO₂ electricity generation emission factor for Romania: 0,701 tCO₂/MWh.

Table 12 Audit results for existing and reference level

		Present situation	Reference level (i.e. meeting standards' requirements)	
The state of the s	Power unit	Number of lamps of same power		
	Lamps 20 W	1797	E - 1 N. J	
	Lamps 50 W	1128	-	
Lamps	Lamps 70 W	3158	4083	
	Lamps 150 W	1208	2000	
	Lamps 250 W	-	1208	
	Total	7291	7291	
		Present situation	Reference level (i.e. meeting standards' requirements)	
Annual	energy consumption (MWh/y)	2233	3496	
Emissions CO ₂ [tCO ₂ /y]		1565	2451	
Annual	Total of which:	1248	1544	
costs	electricity	206	323	
		1010	4004	
(thd €/ <i>y)</i>	maintenance	1042	1221	

For the variant corresponding to the reference situation (only the replacement of old inefficient lamps with LED) the main results are:

Annual energy consumption: 1.288 MWh/y

Annual costs for energy: 119 €/y

CO₂ emissions: 903 tCO₂/y

• Investment costs (for LED lamps): 1552 thd €

Respectively (compared to the situation when the present situation meets the standards' requirements):

Energy savings: 2.208 MWh/y

Costs with energy savings: 204 thd. €/y

CO₂ savings: 1.548 tCO₂/y

Several options and scenarios have been analysed and optimum solution found is:

- Installation of a lighting system using LED technology, more efficient than the existing ones and with lighting performances corresponding to lighting regulations and standards in force;
- Installations of lamps' support;

- Installation of metallic pillars;
- Underground network;
- Underground networks also for existing system and separation between lighting networks and energy distributor's networks;
- Installing distribution equipment, measurement and protection devices;
- Extension of lighting in areas where is missing or does not meet present standards' requirements;
- Implementation of a telemanagement system.

Financial aspects

The project may be financed from two main sources: (i) variant 1: local budget (25% of investment costs) & National/ European funds (75% of investment costs) and (ii) variant 2: possible financing through Norwegian funds. Another variant has also been considered with PPP and ESCO contract. The associated financial indicators, taking into account a discount rate of 5% and a 10-year time frame for the analysis are: NPV of 24.524 thd € and IRR of 5,32 %. The payback period is 7,6 years.

Socio-economic aspects

Several benefits identified are:

- Mitigation of the number of accidents or other vandalism during night time;
- Support and stimulation of socio-economic development of the town;
- Increasing civilization, level of comfort and quality of life;
- Increasing level of individual and collective safety within local communities;
- Ensuring road and pedestrian safety;
- Ensuring functioning and safe operating, under conditions for economic and financial profitability and efficiency;
- Achievement of a basic municipal infrastructure for the socio-economic development of the municipality;
- Reduction of costs of health care resulting from the improvement of the quality of life of the citizens;
- Creation of new working places, supporting local suppliers and workers and enhancing the energy self sufficiency of the local community;
- Be an example for other municipalities in Romania and EU.

Table 14 below summarises the results of the technical, financial, socio-economic and organisational analysis of the action entitled "Improvement the energy efficiency for streets' lighting in Giurgiu municipality".

Table 13 Summary of the findings of the assessment study of "Improving the energy efficiency for street lighting in Giurgiu"

	Title	Improving the energy efficiency for street lighting in Giurgiu		
Technical/ Environmental Assessment	2 scenarios	Only lamps replacement	Optimum solution	
	Baseline scenario data (kWh, tCO ₂ , €)	3496196 kWh/y 2451 tCO ₂ /y 329412 €		
	Technology employed	LED lamps	LED lamps, Management systems, Safety systems	
	Technology providers	Various (determined on bid demand)		
	Technical specifications	LED lamps		
	Energy savings	2.208 MWh/y	Not applicable	
	CO ₂ savings	1.548 tCO ₂ /y	Not applicable	
Financing scheme		 Variant 1 - Local budget (25% investments costs) & National/ European funds (75% investments costs) Variant 2 - Possible financing through Norwegian funds 		
	Project cost	1.551.959 €	36.812.000 €	
Financial assessment	Annual maintenance costs	1.221.000 €	10.004.155 €	
	Annual project revenues	204162 €		
	Discount rate	5 %		
	IRR (%)	5,3 %	Not applicable	
	NPV (€)	24.524 thd €		
	Payback period (years)	7,6 years		
Organisational assessment	Time-schedule	24 months - the start of the action has not been established yet.		