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CLEAN
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IASI

ACTION PLAN PLAN DE ACȚIUNI

Part I: General Information

Project:	CLEAN
Partner organisation:	IASI MUNICIPALITY
Country:	ROMANIA
NUTS2 region:	NORD – EAST REGION
Contact person:	Elena FARCA, Project coordinator for Iasi City email address: international.iasi@gmail.com phone number: +40 720 550 432

Part II. Policy context

The Action Plan aims to impact: ☒ Investment for Growth and Jobs programme
☐ European Territorial Cooperation programme
☐ Other regional development policy instrument

Name of the policy instrument addressed: Romanian Regional Operational Programme 2014-2020, FEDR. This project addresses the low carbon Thematic Objective 4C - "Support effective energy, intelligent management energy and the use of renewable energy in public infrastructures, including public buildings and the housing sector".

This policy instrument aims to promote smart sustainable and inclusive growth in all regions making them more attractive places in which to live and work. The programme addresses the major development challenges for Romania: regional competitiveness, sustainable urban development, the low-carbon economy, and economic and social infrastructure at regional and local level. It contains 8 major Thematic Objectives including the main ones of RTD, SME competitiveness, promotion of low-carbon economy. In addition to buildings, this priority includes district heating, use of smart energy management systems, sustainable lighting (including public lighting) and new strategies for energy efficiency.

The City of Iasi, in common with most other parts of Romania, faces very serious energy efficiency challenges. This is as a result of a particularly energy inefficient housing stock, creating district heating systems to the point of unsustainability and lighting systems supplied by outdated electricity transmission systems. The need to improve upon these overwhelming challenges is reflected in design of the policy instrument and the fact that four of the possible six investment priorities are included in it - 4a (renewable energy production), 4c (public infrastructure/housing/lighting), 4d (smart energy distribution) and 4e (low carbon strategies).

Iasi Municipality undertaken improvement both through 2 new projects and changes to governance through educational projects in schools. New projects would include new sustainable lighting project and energy efficient renovation of a public building of a major hospital, based on interregional learning from CLEAN project partners.

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Letter of endorsement

Energy efficiency is one of the central elements of the European Union's transition to a resource-efficient economy and to smart and sustainable development. At the level of the European Union and at the level of the Member States, a series of legislative directives and strategies have been adopted setting out the targets, objectives and constraints needed to improve energy efficiency and reduce greenhouse gases in the European Union. European Projects of territorial cooperation, supporting good practices exchanges and share of lessons learned can contribute to a better understanding of the challenges and diminish the gaps between western and eastern Europe, join efforts to find the better solutions for energy efficiency and draw together action plans meant to upgrade our communities and bring well-being to our citizens.

Through this Action Plan, we want to attract the attention of all investors: institutions, legal entities, private environment, that have to follow an energy efficiency program. We are the first to give this signal, through investments in district heating, in public buildings, public lighting.

Iasi will become a green city, from all points of view because we work actively on our air quality program, energy efficiency program, program to reduce the risk of pollution on the site, which has been awarded by international organizations. Soon, you will see the implementation a green building program in our city. In this way, Iasi will be increasingly attached to respecting environmental and well-being conditions.

Mihai Chirica
Mayor of Iasi City



CURRENT SITUATION

1. CONTEXT

1.1. About Iași City

Iași is the largest city in Nord-East region of Romania and one of the most important urban center in the country, one of the 7 growth poles at national level.

Iași population on 2018 was 373.507 inhabitants, increasing to around 390.000 in 2019. From this point of view, Iași is the 2nd largest city of Romania, after the capital Bucharest.

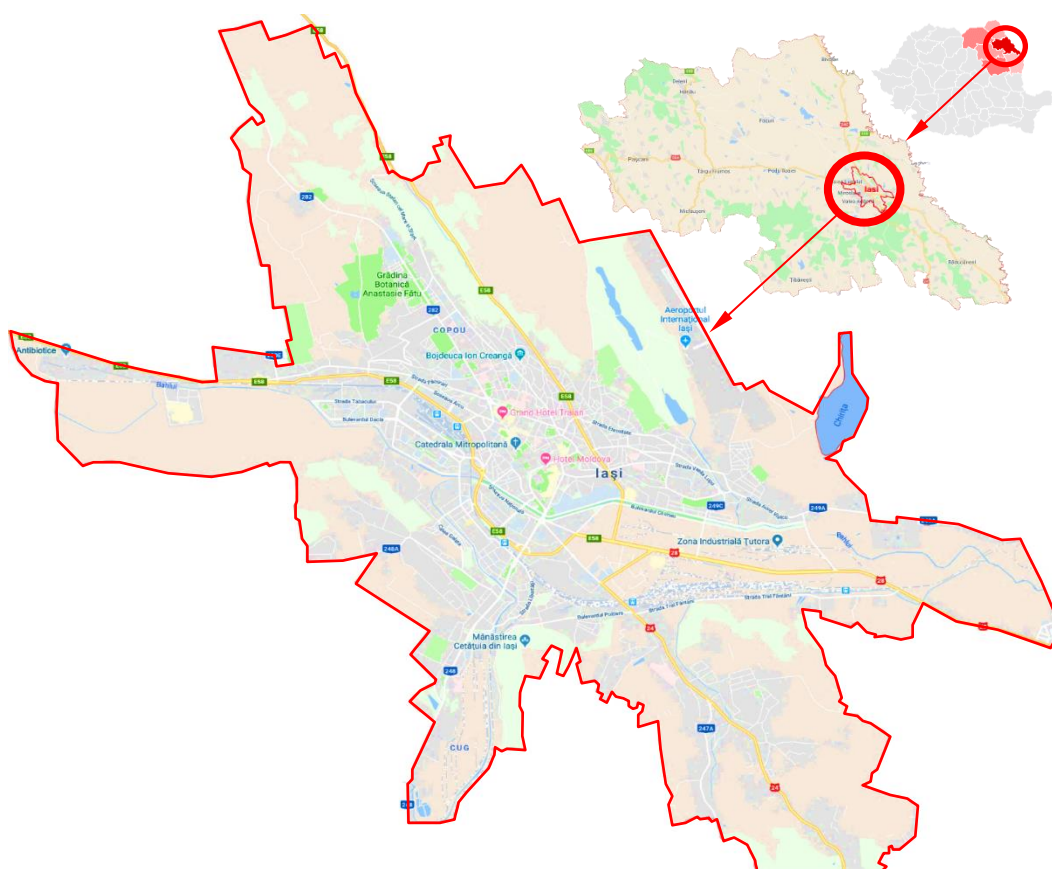


Fig. 1.1. Iași city map.

Declared on 2018 "The Historical Capital of Romania", Iași is proud of its rich patrimony with old, monumental buildings, one of the most important being the Palace of Culture, included as good practice in Clean Project. Unfortunately, like in many other East European countries (and not only) many old public buildings, hosting nowadays museums, schools, hospitals, universities or other public institutions suffer from the lack of appropriate modernisation and need important investments in sustainable systems for energy efficiency and renovations.

1.2. Relevant strategic documents at City level

Integrated Strategy for Urban Development (SIDU) 2015 - 2030

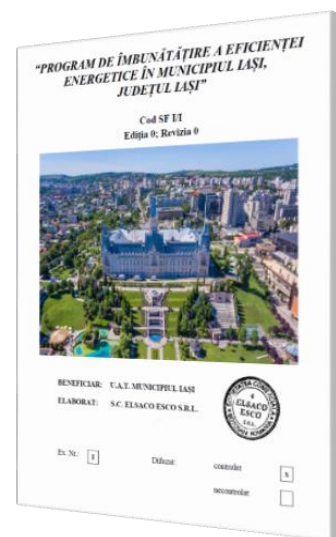
Strategic Objective no. 5. "Iași in harmony with naturea" - 5.1. Increased energy efficiency through integrated measures for energy consumption:

- Creating new facilities for alternatives energies productio
- Modernization of public lightening systems to reduce energy consumption
- Thermal rehabilitation of buildings to reduce losses and energy consumption

Energy Efficiency Improvment Program (PIEE)

PIEE for Iași City has been implemented accordingly to the Romanian Law 121/2014 for energy efficiency. The document is presenting the energetic situation in Iași on 2016 (fererence year) and the measures proposed to increase energy efficiency on main target groups:.

- Electricity supply system;
- The natural gas supply system;
- Centralized heating system with thermal energy;
- Residential sector (housing);
- Tertiary sector (public buildings);
- The public lighting system;
- The public transport system;
- Integrated urban waste management system;
- Capitalizing on renewable energy sources



Action Plan for Sustainable Energy and Climate. The Covenant of Mayors

1.2.3. Action Plan for Sustainable Energy and Climate (PAEDC) for Iași city is under development. This is a strategic document for a medium and long term containing clear measures to reduce CO₂ emissions at local and regional level. Iași City joined the Covenant of Mayors on 2017 and took the responsibility to realise and implement the PAEDC.



2. Energy consumption current situation in Iași city

2.1. Main areas of energy use/ consumption

City consumption is influenced by the structure and the type of public services provided to the citizens. According tot hat, the main consumption sectors are:

- Residential and non-residential buildings;
- Public lighting (street, perimeter, architectural);
- Public transport service;
- Public drinking water supply service (capture, treatment, distribution, treatment);
- The public waste management service;
- Industrial consumers.

The distribution of energy consumption among the most important consumption sectors in the city is shown in fig. 2.1. It can be seen that the largest share in the energy balance of the city is the residential sector, followed by the private and commercial transport sector (the industry and services sector, respectively the public buildings under the administration of the central public authorities / County Council, were not highlighted).

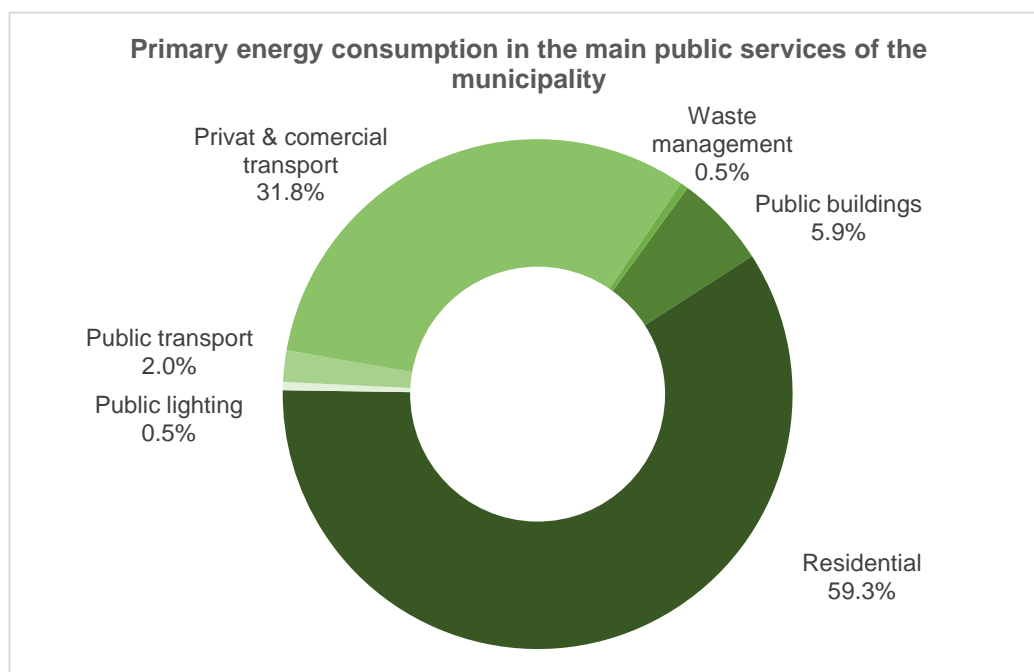


Fig. 2.1. The distribution of energy consumption among the most important consumption sectors

With regard to the consumption sectors under the direct administration of the local authorities and on which the municipality can intervene directly in order to optimize consumption through programs and investments, the most important are the service of collection and management of urban waste, public buildings, public transport and the public lighting system.

2.1.1. Public and residential buildings sector

In Iași, as in most large and medium-sized cities, the most important sector in terms of energy consumption is that of buildings. These can be classified into two large groups, namely residential buildings, which in turn can be grouped by type of property (private housing, respectively state housing) and public buildings, which are in the patrimony or administration of the authorities.

In the case of **public and residential buildings**, energy consumption is determined by:

- heating installations;
- domestic hot water installations;
- ventilation and air conditioning installations;
- indoor and outdoor lighting installations;
- electronic and home appliances.

From the point of view of final energy consumption, in public and residential buildings there are:

- consumption of natural gas or other fuels for heating and hot water;
- thermal energy consumption, in the case of buildings connected to the centralized system (SACET);
- electricity consumption for lighting, air conditioning and home appliances.



The majority of the residential and non-residential buildings in the city are constructions made during the communist regime, according to the technical standards and prescriptions in force during that period.

In Iași, the average specific energy consumption per m² in the **residential sector** is 202 kWh / m², a value that is below the national average (248 kWh / m²).

In the **non-residential buildings** sector (which does not include commercial and public buildings that are not in the administration of the municipality), the value of the specific primary energy consumption for Iași city is 209 kWh / m², while at national level, for non-residential buildings is approx. 400 kWh / m².

In order to determine the energy performance level of buildings in the residential and public buildings, the specific energy consumption indicator for heating can be compared, taking into account the local climate profile, with a pronounced continental cold season, which generates significant energy consumption for ensuring the comfort of fear in the interior spaces Figure 2.2 shows the verage values of this indicator, at the level of Romania, for various types of buildings.

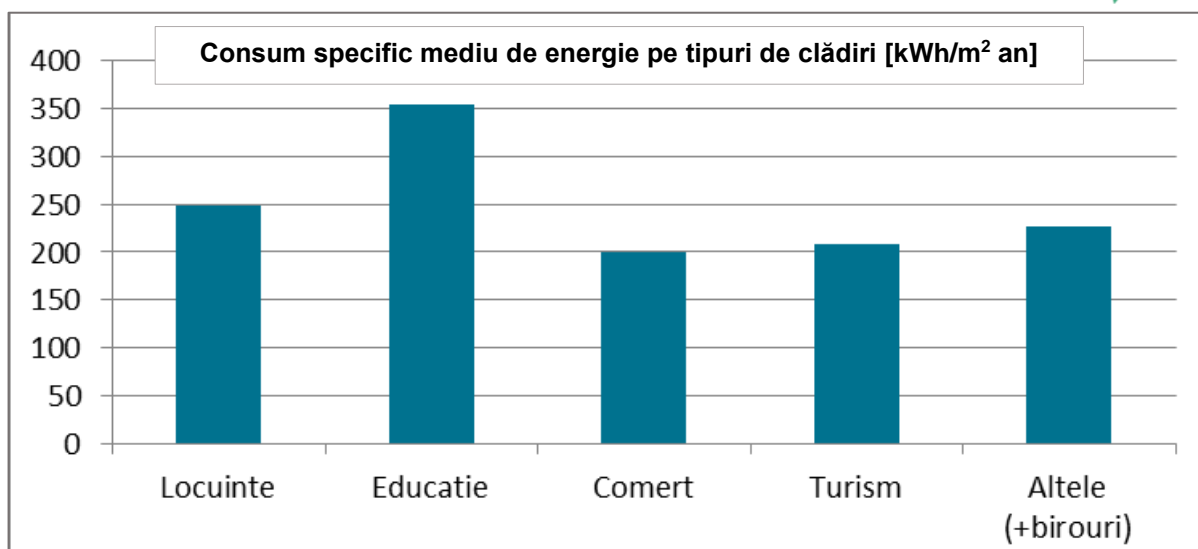


Fig. 2.2. Specific energy consumption for heating in buildings in Romania [kWh/m² an]
(Housing, Education, Commerce, Tourism, Other +offices)

2.1.2. Public lighting

Public lighting is mostly characterized by electricity consumption related to lighting, auxiliary equipment and automation. In Romania, the share of public lighting in the total electricity consumption of local public authorities is between 30% and 75%, the average being 49.7%. In Iasi, the share of lighting in total electricity consumption is 31.3%.

The lighting system of Iași City was permanently in the center of the local public administration. Thus, in accordance with the legal provisions in force, in 2005 the concession of the lighting system in a competitive system was realized to two operators with experience in the field, who each managed about 50% of the installations. The main objective of the investments made at that time was to eliminate the mercury vapor lamps and to introduce the most efficient sodium vapor lamps at that time. As a result of the investment works, carried out over 3 years, 17,145 street lighting units (of different powers 70 - 250 W) were replaced and the lighting network was extended by 175.9 km.

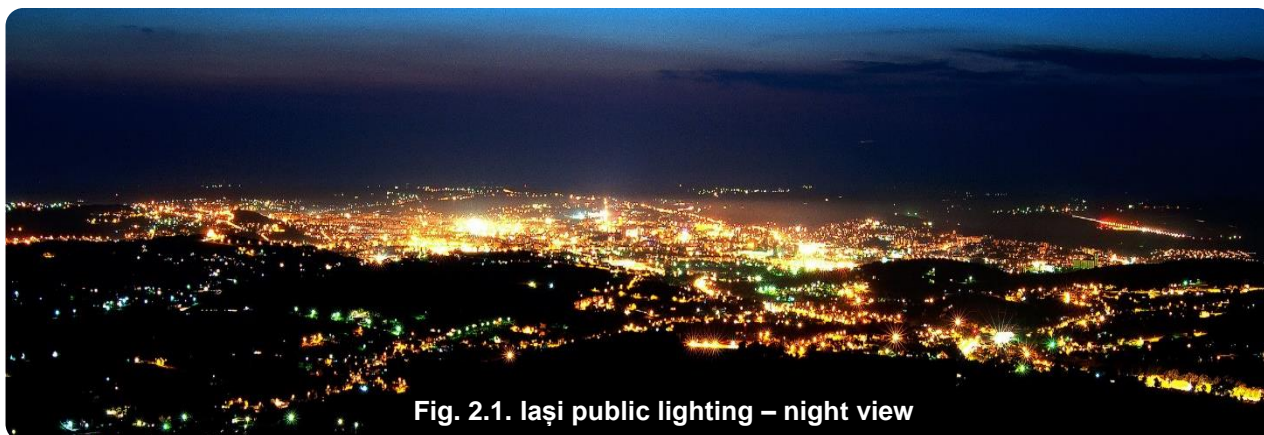


Fig. 2.1. Iași public lighting – night view

Currently, the public lighting system in Iași Municipality is made up of approximately 19,000 light sources (410 ignition points) and a total length of electric power cables of about 380 km. The structure of the luminaires according to the light technology and installed power is presented in table 2.1.

Tab. 2.1. Iași public lighting system

Nr. crt.	Corp de iluminat / Pi [W]	Pi	Tip sursă luminoasă*	Nr. buc.	Consum mediu orar	Consum total anual
		[W]	[Na, Hg, MH, LED]		[kWh]	[MWh]
1	Street lighting body 250	250	Na	1.825	501,9	2258,4
2	Street lighting body 150	150	Na	3.145	518,9	2335,2
3	Street lighting body 100	100	Na	5.130	564,3	2539,4
4	Street lighting body 70 / tip parc	70	Na	7.999	615,9	2771,7
5	Street lighting body with LED	33	LED	160	5,8	26,1
6	Street lighting body with LED	81	LED	40	3,6	16,0
7	Street lighting body with LED	50	LED	206	11,3	51,0
8	Street lighting body with LED	30	LED	88	2,9	13,1
9	Street lighting body MH70	70	MH	100	7,7	34,7
10	Street lighting body 125	125	Hg	179	24,6	110,8
	TOTAL			18872	2256,9	10156,2

* Na - sodium vapor lamp; Hg – mercur vapor lamp; MH - metal halide; LED – LED lamp

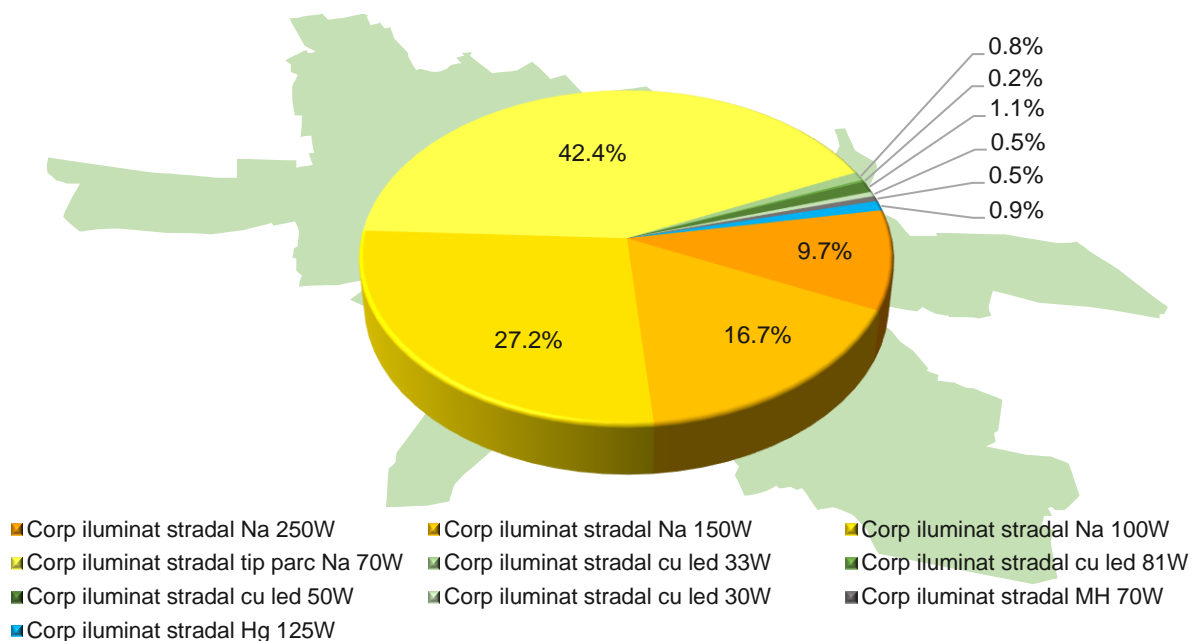


Fig. 2.3. Iași public lighting system by the type and power of the light sources

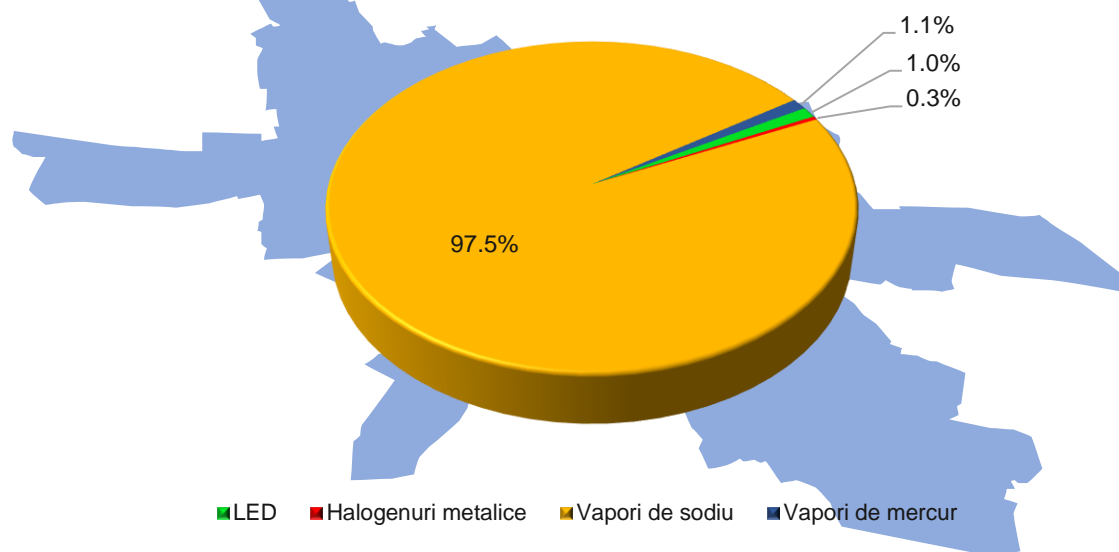


Fig. 2.4. The energy consumption of the public lighting system depending on the light technology
(LED, metal halide, sodium vapor, mercur vapor)

The electricity consumption of the public lighting system has registered a slight growth trend in recent years (fig. 2.4), due mainly to the increasing number of light sources installed following the expansion of the lighting network in the new areas of the city. Being an indicator of the quality of the services provided to the citizens and of the degree of their safety and comfort, the public lighting in Iași City has become a concern of the local authorities both in terms of its quality and performance (by ensuring the appropriate lighting parameters, according to the standards in force.), as well as from the point of view of the energy consumption they generate.

Therefore, it is increasingly obvious the need to modernize and optimize the public lighting system through concrete measures, actions and projects, which will lead to its performance increase, to the efficiency of energy consumption and, implicitly, to the reduction of greenhouse gas emissions (CO2 equivalent) associated with them.

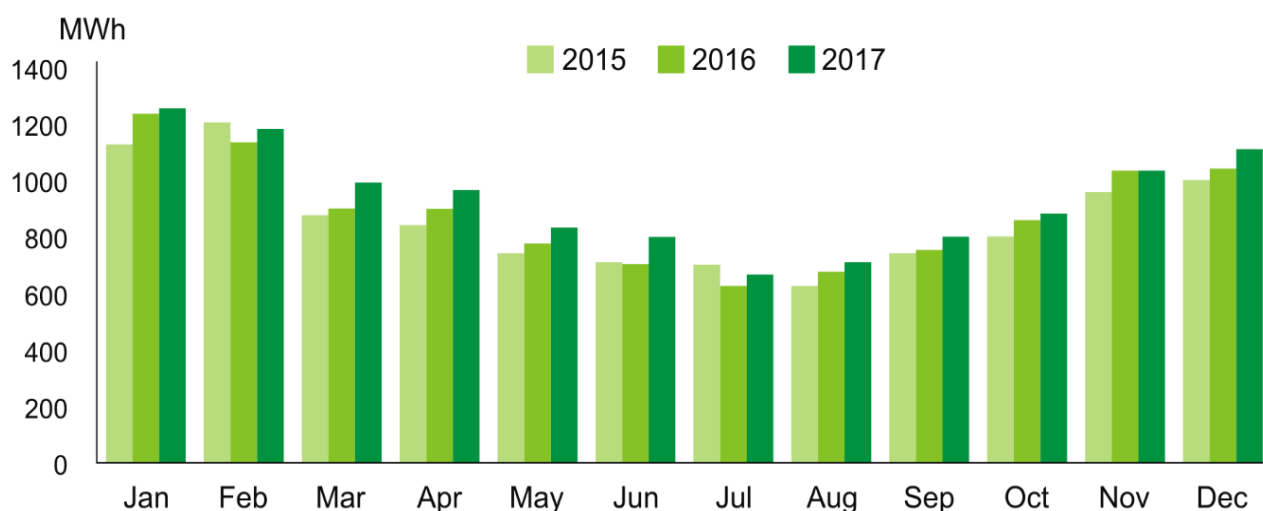


Fig. 2.5. Growth trend of energy consumption for public lighting

Iași was the first city in Romania that almost completely eliminated mercury vapor lamps. Today, lamps with discharges in metal vapors, including those with sodium, are outperformed by the luminous efficiency of LED lamps. LED technology has reached energy efficiency almost double compared to sodium lamps, so the criterion of energy efficiency requires the modernization of the public lighting system.

3. BEST PRACTICES IDENTIFIED UNDER CLEAN PROJECT

3.1. Regional Council of North Karelia - Finland

Smart Led streetlights of Penttilänranta



Smart Led streetlights of Penttilänranta: The lights have been changed to dimmable ones with motion sensors via Lumine Lightning Solutions.

Penttilänranta is a new residential district of the 4000 people in the City Centre of Joensuu. It would serve as an example of environmentally friendly area where construction companies and other businesses can try out e.g. energy saving technologies and eco-friendly solutions. The area is planned and implemented so that people resident at the area can access City Centre without using private cars. It is designed to be a sort of “car-free” zone of the City Centre. The land use and traffic arrangements has been made for the pedestrians and cyclists primarily.

One of the improvements is the street lightning of a 1 km walkway for pedestrians and cyclists, with 50 streetlights. The lights have been changed to dimmable ones with motion sensors via Lumine Lightning Solutions. When a by-passer gets close to the lamp it's brightness rises from it's basic 10 % level. The lamp stays then at maximus brightness for a short while. When the pedestrians or cyclist has moved past, the light dims back to the basic 10 % level.

Resources needed: Investment cost 80 000 €. Payback time of the investment 15 years. Estimated duration of the system 20 years.

Evidence of success: Experiences has been very good. The lights have been in use approximately 2 years and energy consumption has reduced around 70 %. Reduce of the Co2 emissions 1100 kg CO2e per year.

Potential for learning or transfer: Mercury lamps are becoming thing of the past. Many municipalities need to renew their lightning systems. LED technology has developed a lot and prices have become more affordable. When maintaining or updating the lightning system it would be sensible to take advantage of this new technology.

3.2. ERNACT (European Regions Network for the Application of Communications Technology) – Ireland

Street Lighting Retrofit with LED .



Identify existing street lighting which was high maintenance and improve it by making the lights retrofitted to LED.

Donegal County Council has identified existing street lighting which was high maintenance and a large energy user, and has now retrofitted to LED street lighting.

The now fitted LED fittings are controlled via a photocell which brings on the LED lighting at a slightly darker time of the day, due to the instant light from the LED fittings vs the Old SON fittings that take time to warm up before they reach max light output.

The Natural White light gives off a different light source vs the SON Orange lighting and this adds to the energy saving as the LED does not need to be as intense as the SON fittings. S/P ratio (the scotopic lumens to photonic lumens ratio) gives the human eye a different perception on light. Natural white light from an LED gives a better colour rendering light source, thus adding value to installing an LED Lantern.

Resources needed

It is needed a significant input from lighting maintenance contractor to complete accurate inventory. It is also requested to set up a street lighting division within Roads Directory and assign a Senior Executive Engineer to division.

Evidence of success: A complete inventory of lighting in County Donegal has now been completed. The total number of street lights is 16,605. The average annual wattage per lamp has reduced from 465 kWh to 440 kWh. This will continue to reduce as more retrofit projects are completed.

Completing an accurate inventory, lighting design, pole spacing and pole heights.

Potential for learning or transfer: Street Lighting has been identified in Donegal County Council's energy management system as its biggest Significant Energy User. This is most likely the case for many local authorities or municipalities. There is therefore a need to renew street lighting systems in order to reduce energy consumption. With ongoing developments and changes in LED technology the costs of upgrading existing SON/SOX lanterns has become more affordable. It is therefore sensible to attempt to upgrade in a phased planned way, particularly when maintaining or updating existing lighting system to take advantage of continuously improving new technology. ANEA ITALIA (Naples Agency for Energy and Environment)

3.1. ANEA ITALIA (Naples Agency for Energy and Environment)

Energy efficiency program for hospitals



Supporting the transition to low- carbon economy thanks to the reduction of energy consumption in public buildings or in buildings for public use

Italian hospitals are housed in old buildings: some statistics report an average age of about 50 years. New structures have been created recently, but the tendency is to restructure and/or redevelop existing buildings without carried out a cost-benefit analysis supports this choice, on a case by case. The high

consumption of electricity and heat are expensive in terms of costs and in terms of environmental impact for the health companies.

These funds have been allocated for the development of:

- a) Infrastructure projects and/or modernization of public buildings and installations, finalized to the energetic efficiency of the facilities or building (building envelope, thermal insulation of the floor, covering and walls, replacement of fixtures, replacing cooling/heating and lighting systems);
- b) Energy efficiency interventions of hospital building;
- c) Interventions aimed at the rationalization of energy consumption of public service, with particular reference to the field of integrated water cycle, through the dissemination of automatic control systems for the optimization of consumption and the integration of management through its purifying plants electromechanical devices and inverter of the aqueducts of transport.

The beneficiaries of this practice are the hospitals and the main stakeholders involved are the companies, citizens and public administrations.

Resources needed: The total amount of the funding for the presented projects is € 23.671.00 with the involving of n. 5 hospitals of n. 3 different provinces of Campania Region.

Evidence of success: Thanks to the collaboration between ANEA - Naples Agency for Energy and Environment (CLEAN project partner) and Campania Region we have obtained an upgrade of regional resolution with a mention of CLEAN project (Regional resolution n. 382 27/06/2017) . In fact, in order to increase the funds it was consider the possibility to mix this regional funds (from Regional Operation Program) with Thermal Account funds (from National Program)

Potential for learning or transfer: This practice is potentially interesting for other regions because the proposed measures must be accompanied to the energy audit, which identify actions that will reduce and optimize energy-consumptions.

In addition, thanks to the possibility to link this funding with other funding opportunities (national or European) the regions can get an increase of the financial envelope available for hospitals and for the public health system that bring a benefit to the whole region in terms of efficiency of public welfare.

The proper use of energy can give help to save resources to allocate to the improvement of health services. The bioclimatic architecture, the more rational use of energy, greater respect of the environmental impact, a more efficient and effective management are resolved in fact in greater comfort of the sick and therefore in a better quality of service.

It is important to make hospital's departments more liveable and comfortable for a better hospital stay.

3.2. Region of Crete (Greece)

Green@Hospital of Saint George Hospital



REGION OF CRETE
ΠΕΡΙΦΕΡΕΙΑ ΚΡΗΤΗΣ

The project aims at integrating the ICT solutions in order to obtain a significant energy saving in existing hospital buildings and other public buildings.

GREEN@Hospital project aims at integrating the latest ICT solutions in order to obtain a significant energy saving in existing hospital buildings and other public buildings, through a better management of energy resources and losses reduction.

Within the project a Web-based Energy Management and Control Systems – Web-EMCS– has been developed. It integrates, monitors and controls multiple buildings systems at the component level. Moreover models to assess the energy savings have been developed and algorithms for consumption optimisation implemented.

Four different hospitals have been selected across Europe to take part in the pilot in order to demonstrate the validity of the proposed solution under real operating conditions. Each hospital will make available specific areas selected considering the presence of: 1) renewable energy sources, 2) already available building management systems that can be easily integrated in the Web-EMCS, 3) refurbishing plans aiming at energy efficiency improvement

The work has been carried on in the three years of the project is structured to reach six main scientific objectives listed below:

- To develop a standard benchmarking model for energy measurement in hospital environment
- To develop and integrate a Web-EMCS
- To develop holistic control algorithms for energy consumption optimization
- To implement and validate the proposed solution (Pilots)
- To implement a maintenance service
- To disseminate the project results and educate

Resources needed: EU funding 1,434,978 €

Evidence of success

Pilot savings – MEASURED DATA

Electricity: 6,436 kWh/year

Oil: 584 litre/year

Tot primary energy saving: 26,321 kWhpe/year

Total primary energy saving: 55%

CO2 saving: 8,152 kg/year

Overall hospital potential savings – EXTRAPOLATED DATA

Tot primary energy saving: 1,040,624 kWhpe/year

Total primary energy saving: 56%

CO2 saving: 392,044 kg/year

Potential for learning or transfer: After the implementation phase, some problems related to the communication of the hospital's infrastructure with the centralized Green@Hospital server had to solve. Another complication that was introduced and solved with the proper maintenance of the Green@Hospital equipment was a delay in the “switch on” of the artificial lights that has been identified due to slow communication speed of the existing BEMS with the Web-EMCS. Thanks to reporting of the clinic's personnel and the maintenance team work, the problem was solved and the energy savings significantly increased during the latest months of the monitoring period. For the Green@Hospital solution set the Web-EMCS platform assists in the scheduling of maintenance plans for the installed equipment. The real-time monitoring provided by the Web-EMCS platform assists in identifying potential problems in the sensors (communication or validation) which can potentially affect the comfort level of users and the energy saving targets.

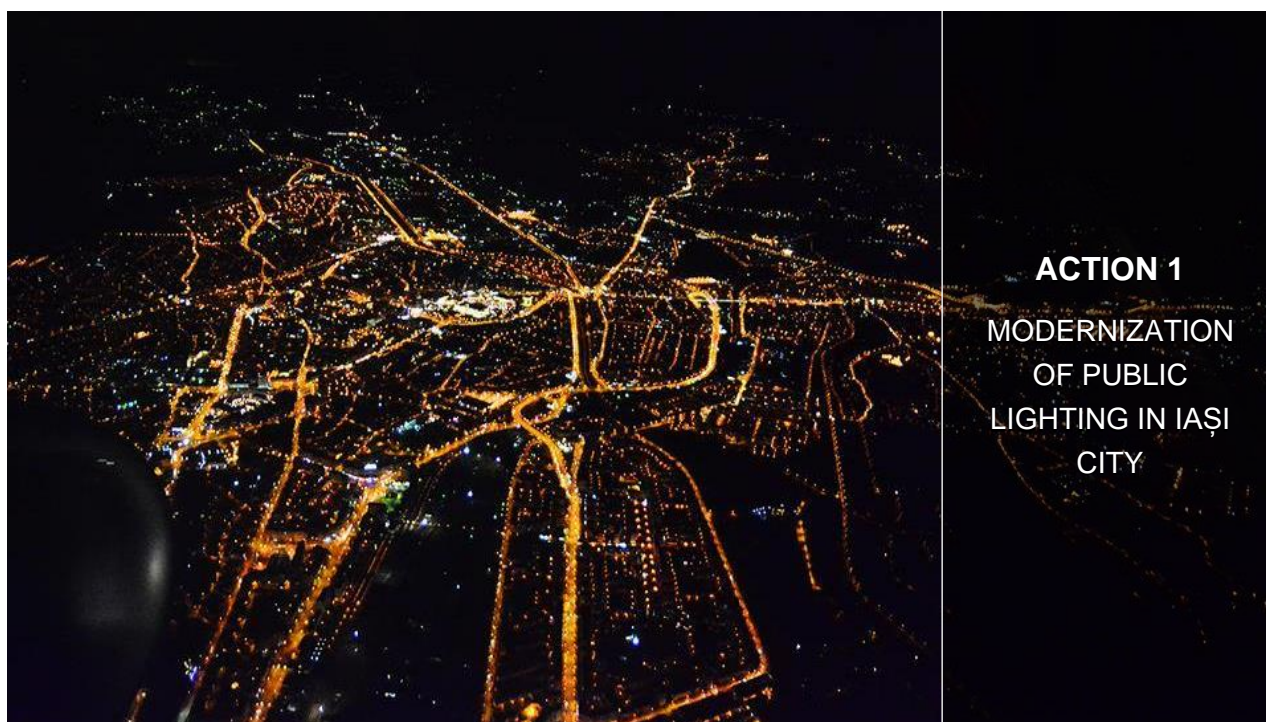
Part III. ACTION PLAN

Within the CLEAN project - Technologies and innovation for low carbon regions, 3 main directions of action were identified and established, which are confined to both the specific objectives of the Policy mentioned on Part II, SIDU, and to the actions planned and undertaken by the municipality in local planning (PAEDC, PEEIs). They set the goals and actions needed to reduce energy consumption, improve energy efficiency and reduce carbon dioxide emissions.

For each of the 3 directions, a detailed action is proposed, as following in this part of Action Plan

Action 1. MODERNIZATION OF PUBLIC LIGHTING IN IAȘI CITY

Background



As mentioned in previous chapter, the public lighting system in Iași City is made up almost entirely of luminaires with sodium vapor lamps. At present, lamps with discharges in sodium vapor pressure (HID) are outperformed by the efficiency of lamps using LED technology on the market. In addition to this, the lack of remote management of the system (both at the luminaires and the ignition points), the systems of automatic regulation of the intensity of the light and the sources of renewable energy for reducing the consumption of the network are arguments that show more and more clear the need to modernize and optimize the current system.



Lessons learned during CLEAN Project from partner's good practices

During **CLEAN project** implementation we had the opportunity to learn about the **good practices** in the field developed by the Regional Council of North Karelia – Finland, **Smart Led streetlights of Penttilänranta**. (The lights have been changed to dimmable ones with motion sensors via Lumine Lightning Solutions) and by ERNACT (European Regions Network for the Application of Communications Technology) - Street Lighting Retrofit with LED (existing street lighting with high maintenance improved by making the lights retrofitted to LED). In Penttilänranta, one of the improvements was the street lighting of a 1 km walkway for pedestrians and cyclists, with 50 streetlights. The lights have been changed to dimmable ones with motion sensors via Lumine Lightning Solutions. When a by-passer gets close to the lamp it's brightness rises from it's basic 10 % level. The lamp stays then at maximum brightness for a short while. When the pedestrians or cyclist has moved past, the light dims back to the basic 10 % level Donegal County Council has identified existing street lighting which was high maintenance and a large energy user, and has now retrofitted to LED street lighting.

The fitted LED fittings are controlled via a photocell which brings on the LED lighting at a slightly darker time of the day, due to the instant light from the LED fittings vs the Old SON fittings that take time to warm up before they reach max light output.

These solutions have been presented during stakeholders meetings in Iasi for the new project of public lighting modernisation in Iasi.

Iasi Action description

Iasi project aims to improve the efficiency and distribution of lighting in order to ensure traffic safety, visual comfort, energy saving and reduce light pollution by:

- modernization of all 287 ignition points, including with remote management;
- the modernization of 4122 lamps by complete replacement or only by modernization (respectively of the 34 new bodies on Passage O. Bancilă, with LED, which will be equipped with remote management);
- modernization of approximately 75.2 km of the public lighting system, respectively all major and significant arteries;
- the reduction of the electrical power installed in the lighting system from 724 kW (current) to 221.4 kW (after modernization), and the reduction of the energy consumption is proportionally greater, due to dimming;
- installing a number of 41 autonomous photovoltaic systems.

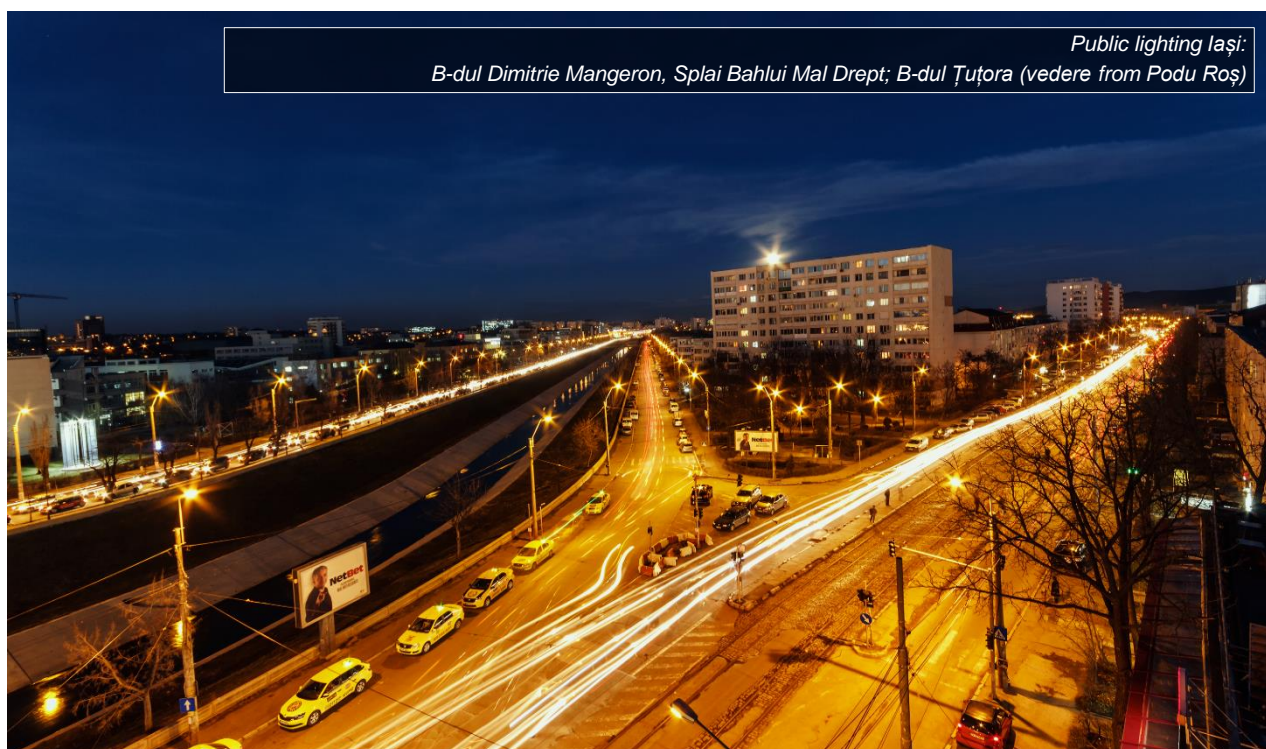
These transformations refer not only to the improvement of the lighting system, but especially to the additional benefits for the local community:

- Digital management of the ignition points, for the whole city (287 PA) will give the possibility of eliminating the delayed commands for connecting / disconnecting the lighting, but also monitoring the quality parameters of the electricity, consumption, including damage to the traffic station. This type of information is extremely useful especially in the event of a storm, with multiple faults, whose troubleshooting must be done quickly. The connection and disconnection will be possible according to algorithms adapted to both the calendar period and the weather conditions, optimizing the visual comfort with the maximum reduction of the energy consumption and, implicitly, of the related costs. Compared to sodium lamps, LEDs reach the nominal light flux practically instantaneously, which has other implications for determining when to connect.
- Lighting management at the digital level was a desirable one for lamps with discharges as well, but the technology was relatively expensive and was not widespread anywhere in the world. The progress of microelectronics makes the price of devices that track the status of the lamp, consumption, operating life etc. accessible. The progress made by this system leads to the rapid identification of any damage, including its location. Today this is cumbersome: a defect is claimed by the population, localization is more difficult (defect in the lamp or lack of voltage, or defect on the network, etc.).

With LED lamps dimming can be achieved without significant technological implications. The introduction of the dimmer will not be solely for the sole purpose of reducing electricity bills. The justification of the dimmation is based on the related benefits, which are::

- a. Adaptation of the lighting level to the traffic intensity. This function is dynamic, and not programmed. This means that the lighting system will receive information from the Traffic

- Management System, the dimming being adapted to each day: during the week or rest days, holidays or holidays etc
- b. User Priority - This feature provides the ability for anyone requesting nominal street lighting level to get this benefit quickly. It is the situation of emergency interventions, or even other night activities, including bicycle rides, if any. This function brings an extra in the relationship of the local administration with the citizens. This priority will be developed in relation to public transport, the area of passenger stations to be kept at a higher lighting level than the rest of the boulevard. This option is beneficial in terms of the psychological effect of encouraging the use of public transport.
 - c. Variable dimming on main arteries. This function has a character of finesse, because it is meant to facilitate the visual adaptation for those coming from unimpeded streets (not yet included in the project) and a dim boulevard. In this situation, on the boulevard the condition of the lighting level shall be at least equal to that of the incident street, and not in a lower case. Along the main boulevard, a variable lighting level will be achieved, with maximums in the area of intersections, which is anyway recommended.
2. Renewable sources are of major importance for sustainable development. In Iași there are some punctual applications, but the project extends the use of renewable sources, to a whole section, respectively Arcu street, with 41 photovoltaic systems.



All these works provided by the project will transform the image of Iași, which will be characterized by the care for the visual comfort, but adapted to the real needs of each site and for each moment. The relationship with the inhabitants, but also with the visitors of the city, will be based on sustained information, in order to convey customized services the lighting system offers, simultaneously with awareness of the principles of sustainable development of the community.

The overall economic activity, prolonging the presence of people in the public space for leisure (walking or cycling), will determine that the investment effect will be amplified by the more comfortable urban life, but without the excesses and energy waste that until now has been inevitable.

Budget and funding

Total budget of the project is 21.868.648,10 lei, VAT included, Iasi City cofinancing part is 436.219,37 lei. The project is submitted for European Funds financing, on Romanian ROP (ERDF)

The project has been submitted for evaluation to the management Authority for ROP on the second half of 2019 and the final approval is expected in first half of 2020 (there is a preliminary approval with request of some clarifications) The financing line is ROP 2024-2020, Priority Axis 3 – support for transition to low carbon economy, Priority 3.1 – support for energy efficiency, for intelligent management of energy and renewable energies in public infrastructure; Operation C – public light

Timeframe

24 months (2020-2022)

The timeframe includes: first 5 months (from the final approval) – administrative and logistic preparation of works (public tenders for works, equipments etc). During months 6 to 12 of project implementation works: the modernization of all 287 ignition points, including with remote management (during 10th – 12th month), the modernization of 4122 lamps by complete replacement or only by modernization (respectively of the 34 new bodies on Passage O. Bancilă, with LED, which will be equipped with remote management); (from 11th to 12th month); modernization of approximately 75.2 km of the public lighting system, respectively all major and significant arteries; (from 6th to 12th month). The rest of 12 months will be used for monitoring – evaluation and recalibration of works.

Expected impact

Reducing pollution by reducing greenhouse gases associated with electricity consumption, from 1,687.03 tonnes CO₂ equivalent to 515.57 tonnes CO₂ equivalent, inscribes the project in the policies and European and national strategies on energy efficiency and reducing pollutant emissions. Through the implementation and visibility of the project, Iasi will also encourage other communities to start investments in the direction of modernizing / improving the lighting systems.

Targeted beneficiaries

The modernized lighting system comprises the main arteries entering the city, the main connecting arteries on which the local traffic takes place. From this point of view, the beneficiaries will be all persons who live permanently or temporarily or transit through the city.

Direct beneficiaries: Permanent population of Iasi, metropolitan area 474,035 inhabitants (in 2015), Students - about 50,000 people, Tourists - constantly increasing, due to the increased attractiveness and safety of the city, the increased number of air travel, medical, university and religious tourism

Indirect beneficiaries: Industrial and economic environment, by prolonging the economic activities during the night.

Players involved:

Iași Municipality, Romanian Regional Agency for Development NE, Romanian Ministry of Regional Development, Technical University "Gh Asachi" Iasi, E-on (energy supply company). Total Energy Solutions, private companies in the field. All these project partners have been also stakeholders for the project CLEAN financed by Interreg Europe Program. Iasi Municipality is the main beneficiary of the European funding and responsible for the implementation of the project of Public light modernization in Iasi City. It will coordinate all the works in the frame of the project and insure the monitoring and evaluation of the implementation.

Sustainability

After the period of implementation on European Funds, the Municipal budget will cover the maintenance and functioning costs.

The project promotes modern, reliable technology, respectively LED lighting devices with a lifetime of 100,000 hours. This lifetime can be further increased due to dimming (about four hours / day), delaying the time when the respective devices will have to be replaced. It achieves a significant reduction in electricity consumption. The electric power installed in the modernized system will be reduced by about 500 kW, having a positive effect on reducing CO₂ emissions and thus mitigating climate change.

The main parameter by which the reduction of the energy consumption is guaranteed is the superior efficiency of the LED sources, at a minimum 150 lm/W. In addition, parameters of specific electrical power density for lighting, related to the surface, are required.

Through the dimming possibilities offered by the telemanagement system, the additional energy consumption will be reduced compared to the effect of reducing the power installed in the luminaires.

Investment description

The modernization of the public lighting system in Iași City is designed to maximize the energy saving, while simultaneously respecting all the technical regulations regarding visual comfort and traffic safety (standard SR EN 13201):

- modernization of the lighting points lighting panels (287 pcs) and equipping them with remote management modules and achieving a unitary and general telemanagement system for the entire Iasi municipality;
- creation of a central dispatcher, with a dedicated server, to ensure the interface with the remote management system;
- replacement of existing luminaires with high energy consumption, physically and morally outdated, with new, high-performance LEDs, equipped with remote management modules and individual dimming, chosen according to the criteria imposed by the lighting classes of the streets and the existing configuration in the field;
- supplementing the lighting level, where appropriate, of the lighting appliances according to the criteria imposed by the street lighting classes and the existing configuration in the field;

- replacement and / or adaptation of the brackets and clamps according to the lighting calculations corresponding to the new luminaires;
- the use of all existing poles of the electrical network as supports for the new luminaires, where the performance criteria according to the category of circulation allow it.
- implementation of renewable sources, by equipping a lighting section of the Arcu road with a number of 41 autonomous photoelectric systems.

The system will allow the implementation of large-scale dimming, at late hours of the night, for luminaires with high energy consumption. The dimming program is flexible, depending on the traffic, and is open to third-party applications, foreshadowing the implementation of the smart city concept. The implementation of dimming will be done gradually, to minimize the psychological impact on the users, being able to correlate through software systems with the rhythm of the activity and the night traffic of each area, with the criminality or the feeling of insecurity



Tab. 5.1. Project monitoring indicators

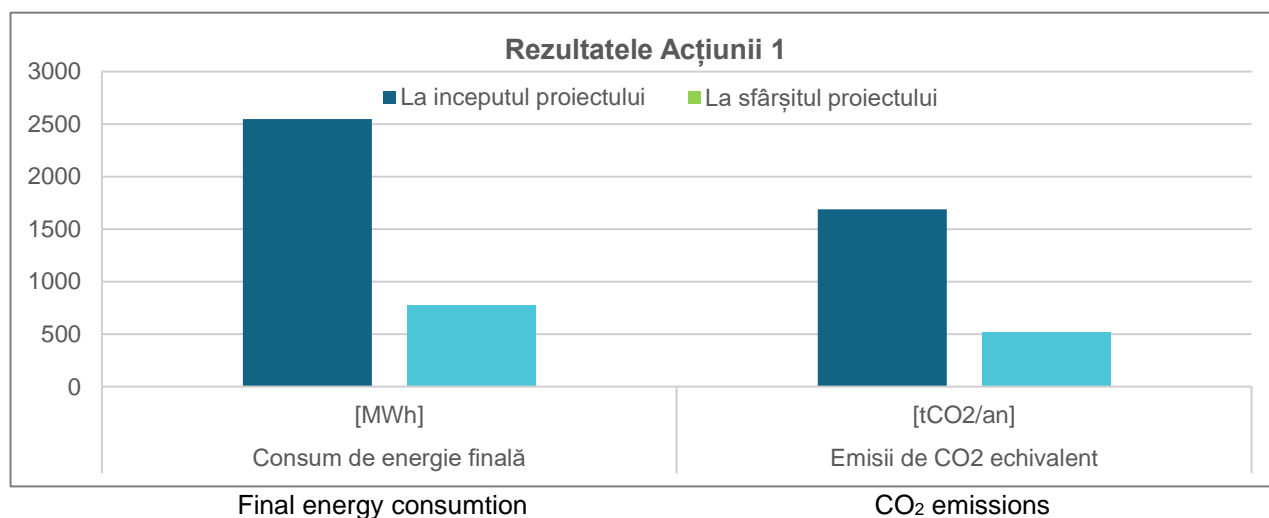
Indicators for results

Indicator name	Measure unit	Reference value	Year of reference	Target value
Final energy consumption in public lighting	MWh	2.549,00	2020	779,00

Tab. 5.2. Realization indicators

Indicator name	Measure unit	Target value
Reduction of greenhouse gases: Estimated annual reduction of gas with greenhouse effect	Echivalent tons CO2	986,00
Reducing the annual consumption of primary energy in public lighting	kWh/an	1.769.728,00

Action 1 results (at the beginning of the project / at the end of the project)



Action 2. ENERGY EFFICIENCY FOR IAȘI CLINICAL HOSPITAL FOR RECOVERY



Background

As it was presented before, the public institutions in the administration of the municipality represent a continuous concern regarding the quality of the services offered to the citizens through them. By implication, this implies and must be closely related to the performance and comfort offered to the occupants of the managed buildings, which implies, among other things, a high level of energy efficiency and concern for the environment.

In the context of the quality services offered to citizens, the specific energy consumption indicators, related to the values registered in the European Union, become one of the desires and challenges that the Iasi municipality must manage.

Lessons learned during CLEAN Project from partner's good practices

During CLEAN project some good practices of hospital energy efficiency measures have been presented by ANEA ITALIA - Naples Agency for Energy and Environment (Energy efficiency program for hospitals : Supporting the transition to low - carbon economy thanks to the reduction of energy consumption in public buildings or in buildings for public use) in March 2017, also by the Swesh Energy Agency in April 2018 (during the visit to the Sundsvall Hospital), by Region of Crete, Greece (Green @Hospital of Saint George Hospital for integrating the ICT solutions in order to obtain a significant energy saving in existing hospital buildings and other public buildings), in June 2018.

Moreover, the good examples identified in the other European cities contributed to the improvement of the project for Iasi Hospital Renovation which initially was not meant to include so important energy efficiency measures and to have a different financing. In the end, this was a double gain for the Municipality to switch the project to energy efficient renovation and to apply for European funds for the implementation of these solutions. The project is now in the period of public tender for the works to be implemented

Like in Romania, Italian hospitals are housed in old buildings: some statistics report an average age of about 50 years. The high consumption of electricity and heat are expensive in terms of costs and in terms of environmental impact for the health companies. ANEA managed to obtain European funds from ROP to modernize these hospitals a) Infrastructure projects and/or modernization of public buildings and installations, finalized to the energetic efficiency of the facilities or building (building envelope, thermal insulation of the floor, covering and walls, replacement of fixtures, replacing cooling/heating and lighting systems); b) Energy efficiency interventions of hospital building; c) Interventions aimed at the rationalization of energy consumption of public service, with particular reference to the field of integrated water cycle, through the dissemination of automatic control systems for the optimization of consumption and the integration of management through its purifying plants electromechanical devices and inverter of the aqueducts of transport.

Iasi Municipality has also submitted a quite similar project for European funding on ROP, identifying some similar problems / challenges as our Italian partner, their experience being a good model for Iasi application.



Project objectives

The general objective of the project is to increase the energy efficiency of the building of the Iași Clinical Recovery Hospital, from energy class D to energy class B, applying the innovative concept of deep renovation, which consists in the implementation of deep energy rehabilitation measures.

Currently, the building body C1 of the Clinical Hospital of Recovery Iași does not have the fundamental quality requirement E - Thermal insulation and energy saving, falling into the energy class D. The project provides for deep energy rehabilitation measures consisting of building envelope, interventions on installations and lifts and implementation of renewable energy use solutions.

Following these interventions, the building will be in energy performance class B.

Impact expected

- 1. Reduction of the annual primary energy consumption by at least 65% in the first year after the completion of the project implementation, through deep energy rehabilitation measures.**

The C1 building of the Iași Clinical Recovery Hospital currently has an annual primary energy consumption of 8,462,004.78 kWh / year. Following the measures of energy rehabilitation consisting of improving the capacity of the building envelope insulation, interventions on the installations and implementation of solutions for the use of renewable energy, the annual consumption of primary energy will decrease by 67.84%.

The C1 building currently has a specific annual consumption of primary energy from non-renewable sources of 507.37 kWh / m² / year. Following the energy rehabilitation measures consisting of improving the capacity of the building envelope insulation, interventions on the installations and implementation of renewable energy use solutions, the specific annual consumption of primary energy from non-renewable sources will decrease by 67.84% (from 507, 37 kWh/m²/year at the beginning of the project implementation, at 163.15 kWh / m² / year after its completion) . Thus, after the completion of the project, the value of the specific annual consumption of primary energy from non-renewable sources will be reduced below the maximum value of 171 kWh / m² / year, provided in the Table regarding the specific primary energy consumption for buildings in the sanitary system, climate zone III.

- 2. Reduction of the specific annual level of greenhouse gases by at least 64% in the first year after the completion of the project implementation, through deep energy rehabilitation measures.**

The C1 building of the Iași Clinical Recovery Hospital currently has a specific annual level of greenhouse gases of 134.17 kg / m² / year of CO₂. As a result of the energy rehabilitation measures consisting in improving the insulation capacity of the building envelope, interventions on the installations and implementation of renewable energy use solutions, the specific annual level of the greenhouse gases will decrease to 47.79 kg / m² / year , with a minimum of 64.38%. Thus, after the completion of the project, the value of CO₂ emissions will be lower than the maximum value of 49 kg / m² / year, provided in the Table on emissions regarding CO₂ equivalent for buildings destined to the sanitary system, climate zone III.

- 3. The increase of the annual consumption of primary energy from renewable sources up to a minimum of 45% of the total consumption of primary energy registered at the end of the project implementation, by using a heat pump using geothermal energy and 9 air heat pumps.**

From the total value of primary energy generated by the technical solutions for the use of recoverable energy (3,143,829.35 kWh / year), the primary energy is deducted from conventional sources that the plants use, resulting in a net amount of renewable energy used in the consumption of the building. 1,341,179.40 kWh / year. From the total energy consumption at the end of the project implementation (2,771,002.2 kWh / year), 1,341,179.40 kWh / year are produced using the technical solutions for the use of recoverable energy, ie over 45% of the total annual energy consumption. primary registered at the end of the implementation of the project.

4. **Reduction of the annual final energy consumption in the public building** (from non-renewable sources) with a minimum of 67% in the first year after the completion of the project implementation, through deep energy rehabilitation measures. envelope insulation, interventions on the installations and implementing solutions for the use of renewable energy, the annual final energy consumption from non-renewable sources will decrease by 67.84%.

Budget and funding:

The total value of the project: 18,973,744.24 lei, of which: Eligible value of the project: 18,699,293.11 lei, funding entity: European Union under Priority Axis 3 - Supporting the transit to a low carbon economy, Investment priority 3.1 - Supporting energy efficiency, smart energy management and the use of energy from renewable sources in public infrastructures.

Players involved:

Iasi Municipality, Iasi Hospital "Recuperare", Romanian Regional Agency for Development NE, Romanian Ministry of Regional Development, Romanian Ministry of Health, private companies

Timeframe

51 months (2019-2023)

Monitoring - Project indicators

Achievement indicator (output) for the building C1 – Hospital for Recovery "Recuperare" Iași	Value at the beginning of the project implementation (input)	Value at the end of the project (output)
Specific annual level of greenhouse gases (tonnes equivalent CO ₂)	0,134167	0,04779
Annual primary energy consumption (kWh/an)	8.462.004,78	2.721.002,2

(Additional) project indicator for the building C1 – Hospital for Recovery "Recuperare" Iași (de rezultat)	Value at the beginning of the project implementation (input)	Value at the end of the project (output)
Annual final energy consumption in the public building from non-renewable sources (toe)	727,601	233,964
Project indicator (supplementary) for building C1 - Iași Clinical Recovery Hospital (to be completed)	Value at the beginning of project implementation (input)	Value at the end of project implementation (output)
Annual specific consumption of primary energy from non-renewable sources (kWh / m ² / year) total, from wich:	507,375	163,149

- for heating / cooling	352,722	78,759
Annual primary energy consumption from renewable sources (kWh / year) total, from wich::	0	3.143.829,35
- for heating / cooling	0	2.035.039,63
- for the preparation of hot water for consumption	0	1.108.519,72
- electric	0	0

During CLEAN project timeframe, Iasi Municipality will have a permanent monitoring on works development and the impact of works / energy efficient measures applied for the "Recuperare" Hospital. It must be mentioned also that Iasi Municipality is planning the construction of another major hospital in Iasi (a Regional Hospital) starting on the next Programming Period, also on European funds and the lessons learned in the implementation of this Hospital project (so the lessons learned also in CLEAN Project) will be used. This means that CLEAN project will have a more longer impact than expected for Iasi Municipality development.

CONCLUSIONS

Through this project, as well as the other programs and actions initiated, Iași City is joining the European Union's efforts to reduce greenhouse gas emissions and to combat the effects of global warming and climate change.

The actions proposed in the CLEAN project - Technologies and innovation for low carbon regions, financed through the INTERREG EUROPE program, confirm once again that Iași assumes with responsibility the common objectives for local planning, sustainable development and sustainability, in total agreement with the priorities, general directions and policies set by the European Commission. Moreover, the action plan undertaken within this project is within the general framework of the objectives of the local public authorities in Iași, to increase the quality of the services offered to citizens and to improve the conditions of.

Each action proposed in the project defines a correct local policy of the authorities, based on sustainable development and supported by a medium and long term vision in accordance with the needs and socio-economic context in which Iași and Romania in general are.

The permanent concerns of the municipality of Iasi for reducing energy consumption and, implicitly, of greenhouse gas emissions (CO₂ equivalent) are, in fact, the common denominator of all the actions and measures that the local authorities initiate locally, with effect globally. Basically, the energy efficiency and the reduction of the environmental impact define at this moment the quality of the local administration act of the municipality. In addition, Iași City has obtained recognition of its efforts in several national and international programs or ceremonies, among which can be mentioned:

- 2019: winner of the "Sustainable City" contest organized by the French Embassy in Romania, in partnership with the Ministry of the Environment. The project of Iași City Hall: new buses investments, e-ticketing, implementation and monitoring solutions, as well as purchases of trams and electric buses.

- 2019: 4th Gala "Smart City Industry Awards (SCIA)", organized in Bucharest, Iași won the big prize of the event: Best Smart City Project.
- 2018: Iași - city ambassador for energy efficiency, within the CoME EASY project, carried out in Romania with the support of RoGBC (Romania Green Building Council). The CoME EASY project supports the signatories of the Mayors Convention to develop a sustainable energy management based on strengthening the management and awareness capacities regarding energy efficiency and renewable energy.
- 2017: within the RoGBC Awards, a project of the municipality of Iași, consisting in a Decision of the Local Council, was considered the best legislative project of the year. It is a decision regarding the introduction of a regulation for the management of the polluting factors that appear at the moment of carrying out the construction activities (construction site activities).

The city of Iași aims, through the CLEAN project and other similar projects, to cope with the challenges of sustainable and sustainable development, including through exchanges of good practices with its partners from the European Union, so its actions are more adapted to local and regional development.

Actions disseminated within this project, supported by relevant local planning strategies and documents, will essentially contribute to increasing the quality of life of the inhabitants of the city and throughout the region, by identifying and applying the most correct and feasible solutions from the point of view. view of sustainable development and reducing the impact on the environment.



The projects that Iași supports and implements are mostly based on fair, sustainable concepts, which can ensure the economic and social development of the city: innovative technology, which defines the city to which its inhabitants can connect, with whom they can interact and who can participate in the administrative act;

- equipment and materials with high energy efficiency, which are the basis of all public services provided by the municipality;
- permanent exchanges of experience, know-how and good practices with partners from the region, from the country and from the community area;
- knowing and understanding how the current society works and adapts to current changes and evolutions;
- quality and adaptability for the services offered to citizens.

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