Final pilot action report

Dubrovnik port Authority

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1. Introduction

The Dubrovnik port Authority manages the area of the passenger port open to public traffic of international economic interest to the Republic of Croatia. In its operation and consideration of the future of the port of Dubrovnik, special attention is paid to environmental protection and ecology. The Dubrovnik port Authority manages the area both at sea and on land in accordance with the principles of sustainable development and rational use of natural resources. With this pilot action, we intend to reduce the inefficient use of electricity in the port's public lighting, improve light technical parameters and traffic safety conditions, reduce potential risks of environmental pollution due to the use of environmentally unacceptable lighting fixtures, and prevent light pollution.

Light pollution is a problem attributed to economic, safety and health problems that affect humans and cause unwanted health effects. It was precisely the problem of light pollution of the environment that introduced the concept of ecological lighting. Ecological lighting is lighting composed of environmentally friendly lamps and energy efficiency is often synonymous with ecological lighting.

2. Pilot action description

2.1. Aim of pilot action

In order to achieve a higher level of energy efficiency of the outdoor lighting system, it is necessary to replace the existing lighting fixtures, i.e. lamps and reflectors with new and more efficient LED light sources, and to introduce control with the possibility of reducing the level of illumination according to needs. Replacement lamps and reflectors must also meet ecological criteria. Reconstruction of the exterior of lighting includes only the replacement of lighting fixtures with more efficient lighting fixtures with LED light sources, while maintaining all existing lighting columns of lamps and reflectors. This is to avoid problems that could arise if a completely new lighting project were to be undertaken, as well as an increase in investment costs. The pilot action would reduce electricity costs, improve lighting parameters and traffic safety conditions, and align public lighting bodies with the Law on Protection from Light Pollution and the Ordinance on Illumination Zones.
Lower consumption will reduce electricity costs, and new lamps and reflectors will have fewer failures and a greater warranty against failures, thus reducing maintenance costs.

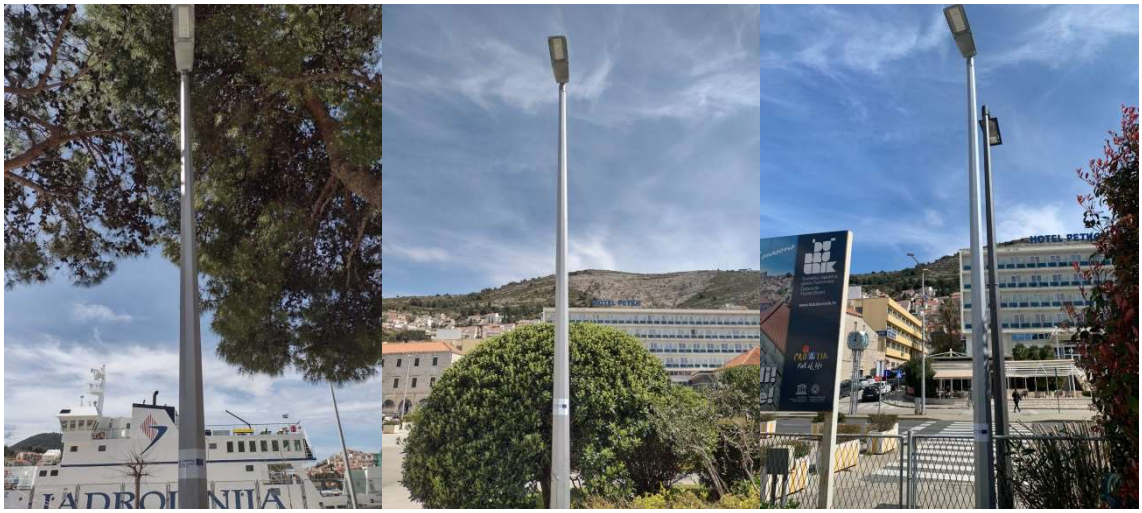

Figure 1: New LED light

2.2. Investment cost, operating costs and revenues

Total without VAT: 243.756,72 €
Total with VAT: EUR 304.695,90 €

2.3. Period of realization/construction (start date – end date) and the operating period corresponding to the technical/economic life, in years

18th of January, 2023 agreement signed. Due date is 105 days from contract signature (30th of April, 2023).
The lighting fixtures (lamps and reflectors) provided for by the project and the accompanying auxiliary equipment of the lighting system ensure a service life of at least 20 years, and the cables and electrical installation materials provided for in this project ensure a service life of at least 40 years.

2.4. Context

It is necessary to replace the existing inefficient lamps and reflectors with reflectors and lamps with high-efficiency LED light sources, armatures with quality optics and in front of connecting devices with a higher degree of energy efficiency and a control device that regulates the level (reduction) of illumination and has the possibility of inclusion in an advanced control system. Unlike the existing lamps and reflectors, the new replacement lamps and reflectors must meet the light technical parameters for the lighting of outdoor, specially controlled (fenced) and unfenced open spaces valid for workplaces of open areas of the arch, namely the norm HRN EN 12464-2:2014 (E), as well as ecological requirements for protection against light pollution. The positive effects of installing new replacement lamps and reflectors are manifested through the achievement of the prescribed light technical parameters in accordance with the Law, the Ordinance and the specified standard, along with a reduction in electricity consumption, which also results in a reduction of greenhouse gas emissions into the atmosphere.

2.5. Description of activities carried out

Data on the current state of outdoor lighting were obtained by visiting and inspecting the outdoor lighting facilities in the entire area of the port of Dubrovnik in Gruž, as well as by obtaining data from available technical and other documentation. Based on market research, the indicative price for the purchase of LED lighting was determined. An electrical engineering project for the reconstruction of the external lighting of the entire area of the port of Dubrovnik in Gruž was ordered from the manufacturer Engineering Bureau Knežević - Main project.
5th of September, 2022 a tender was announced for the replacement of the external lighting fixtures of the new operating coast with LED technology. 19th of December, 2022 Inero d.o.o. was chosen by the decision on selection as the contractor. The contract was signed on 18th of January, 2023

with a delivery time of 105 calendar days. The planned reconstruction of the outdoor lighting includes a total of 122 lighting fixtures, of which 35 are LED lamps and 87 are LED reflectors.

2.6. Problems encountered

Dubrovnik port Authority faced with a problem of public procurement, as the periods defined for purchase of the equipment were too short (due to Covid crisis), we faced with the problem of willingness of the companies to purchase and deliver requested equipment in a period defined by the documentation. Also we faced a problem concerning the total price of the equipment. At the end we managed to do in defined amount, but the increase in prices also affected a delay in public procurement and equipment installation.

3. Evaluation of the pilot action

3.1. Indicators

This section illustrates the implementation of indicators that have been chosen for the pilot action's monitoring and evaluation activities. For each indicator, as illustrated in the table below, the unit of measure and achieved values are indicated.

Indicator	Unit of measure	Value
Indicator 1	*CO2 (tons per year)*	*33,42*
Indicator 2	*kWh*	*159158*

The total installed power of all 122 pieces of LED lamps and reflectors after the planned reconstruction is 36.86 kW, which is a decrease of 38.82 kW compared to the total installed power of all 161 pieces of existing lamps and reflectors, which is 75.68 kW. Therefore, by replacing the existing lighting fixtures with LED lighting fixtures, the installed power will be reduced by approx. 51%. The projected consumption of the old lighting for 4100 operating hours per year is 310,288 kWh. New lighting should consume 151,130 kWh for the same time period. This results in savings in electricity consumption for a period of one year of 159,158 kWh. Additional savings will also be achieved by installing a public lighting management system.

4. Conclusion

By replacing the existing solutions used in public lighting, the Dubrovnik port Authority will reduce energy consumption, improve light technical parameters and traffic safety conditions, and reduce potential risks of environmental pollution due to the use of environmentally unacceptable lighting fixtures and the occurrence of light pollution. The planned reconstruction of the outdoor lighting includes a total of 122 lighting fixtures, of which 35 are LED lamps and 87 are LED reflectors. The reconstruction of the outdoor lighting includes only the replacement of lighting fixtures with more efficient lighting fixtures with LED light sources, while keeping all the existing lighting poles of lamps and reflectors. By replacing the existing lighting fixtures with LED lighting fixtures, the installed power will be reduced by approx. 51%. The projected consumption of old lighting for 4,100 operating hours per year is 310,288 kWh. New lighting should consume 151,130 kWh for the same time period. This saves electricity consumption for the period of one year: 159,158 kWh. Additional savings will also be achieved by installing a public lighting management system.