

Final pilot action report

Port of Split

PP12, deliverable no. D.4.2.10

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Introduction

This deliverable summarises the outcome of the pilot action implemented by PP12-PSA in the framework of the SUSPORT – SUSTainable PORTs project, co-funded by the Interreg Italy-Croatia Programme, consisting in:

- 1) Modernization of the public lightning in the City Port Split
- 2) mobile station to monitor air quality
- 3) purchase of hybrid vehicle

Pilot action no. 1: Modernization of the public lightning in the City Port Split

Main aim of this pilot action is the replacement of lamps in the City Port Split in accordance with the new regulations and standards for ports in order to make savings in terms of electricity consumption and carbon footprint reduction. This pilot action consists of the following steps and objectives:

- Revitalization of electrical infrastructure using energy efficient lighting
- Alignment of the existing lighting system with standard lighting values (HRN EN 12464-1 and HRN EN 12464-2),
- Environmental protection (removal of harmful light source refrigerants, reduction of greenhouse gas emissions) and in accordance with the Law on Protection from Light Pollution NN 14/19

Aim of the pilot action is to achieve energy savings and reduction of harmful gas emissions while meeting existing norms and regulations by replacing lights using the latest technologies. The application of new technologies reduces maintenance costs and thus reduces disruption and increases efficiency and safety of people.

1. Ex-ante situation

Before the pilot implementation, in the pilot area City Port Split used 148 outdoor lights (145 lamps on light poles and 3 reflectors) of different types with the VTNA and MH lights that are expensive to maintain and are not satisfactory in terms of energy-efficiency. The average illuminance was 20lx with annual electricity consumption of the lighting system of 107,566.20 kWh with 25.61 kW installed power.

Lighting system was outdated, costly and not energy-efficient. Therefore, the need for modernisation of the lighting in the City Port Split was planned and implemented in order to have an energy and cost efficient systems which contributes to carbon footprint reduction and to the safety and security of people in the port area.

Table 1. Lighting system in the City Port Split before the pilot implementation

No.	Type	Source of light	Strength (W)	Total strength (W)	Number of lights
1	ROAD LAMP	VTNA	150	2142	12
2	ROAD LAMP	MH	150	5533,50	31
3	ROAD LAMP	MH	140	16993,20	102
4	REFLECTOR	MH	400	1428,00	3
5	-	-	-	26.096,70	148

2. Pilot action description

Aim of the pilot action is to achieve energy savings and reduction of harmful gas emissions while meeting existing norms and regulations by replacing lights using the latest technologies. The application of new technologies reduces maintenance costs and thus reduces disruption and increases efficiency and safety of people.

In February 2019, a study "Modernization of public lighting in the City Port Split" was prepared. The study examined the current condition of lamps and proposed replacements in accordance with the new regulations and standards for ports in order to make savings in terms of electricity consumption and maintenance. With regard to today's regulations, the level of illumination of the existing system was checked, and a cost estimate of works with an investment estimate was given as part of the study.

In November 2020, the Main Project was prepared - an electrical project for the replacement of lighting "Modernization of public lighting in the City Port of Split", in the City Port of Split. In December 2020, a public procurement procedure for the execution of works was initiated, the tender procedure was completed in March 2021, and a contract was concluded with the selected contractor.

In March 2021 by the public procurement procedure a professional supervision for the works was selected and a contract for supervision services was concluded.

From the situation plan with the existing lighting, the calculation of the illumination of the existing and new condition was made, which was processed through the computer program Relux.

Given the requirements of the standard HRN EN 12464-2: 2014, a lamp that meets the requirements was selected since it is mounted on existing pillars. The task was to replace the existing lamps with new generation LED lamps in order to achieve energy savings and longer maintenance-free life.

Data used in the computer program are inserted as follows:

1. Gat sv. Nikola - lamp power 77W / 10930lm on a pole 10m
2. Gat sv. Petra - lamp power 119.3W / 16395lm on a pole 10m
3. Gat sv. Duje - lamp power 90.4W / 12490lm on a pole 10m
4. Boarding and parking 2-lamp power 97.8W / 13340lm on a pole 14m
5. Boarding and parking 3- lamp with a power of 90W / 12000lm
6. Boarding and parking 3-lamp power 106.4W / 14740lm and 90.4W / 12490lm on a pole 14m
7. Boarding and parking 4-lamp 90.4W / 12490lm on a 14m pole
8. Road - lamp 120W / 16000lm on a pole 10m

These lamps in their standard design have the ability to control the luminous flux in a time (programmed) period which makes them even more energy efficient.

Situation before the reconstruction:

Engaged power (with losses in the control gear 19%) is 26.10 kW, i.e the annual energy consumption with 3650 hours of operation per year is 95,265.00 kWh/a.

Total CO₂ emission: 95.265,00 kWh/god * 0,23481 kgCO₂/kWh = 22,37 tCO₂/a

Situation after the reconstruction:

Engaged power of the new situation is 12,79 kW (with losses in the distribution network 4%).

Part of the built-in LED road lamps works in the mode of dimming according to the given model which enables savings of consumption of approx. 4%.

Annual consumption of electricity after the pilot implementation is:

19.412,16 kWh/a + 26.462,50 kWh/a = 45.874,66 kWh/a

Total CO₂ emission for the new situation:

45.874,66 kWh/a * 0,23481 kgCO₂/kWh = 10,77 tCO₂/a

Energy savings and reduction of CO₂:

95.265,00 kWh/a - 45.874,66 kWh/a = 49.390,34 kWh/a which is 51,85%

22,37 tCO₂/a – 10,77 tCO₂/a = 11,60 tCO₂/a

Pilot action no. 2: Purchase of hybrid vehicle

1. Ex-ante situation

Until pilot action implementation, Port of Split authority was using car Citroen C3 from 2013. Car specifications:

- Engine: 1.2 Internal Combustion Engine
- CO2 emissions: 104 g/km
- Fuel Type: Petrol
- Emission standard: Euro 5
- Power: 50 kW

The car was used for the needs of the Port Authority Split and the average annual mileage was 19.000 km.

2. Pilot action description

For this purchase, simple procurement procedure was used. Subject of procurement was one hybrid passenger vehicle for the implementation of the SUSPORT project, the call for bids was sent on September 20, 2022. at three addresses / car dealerships, the estimated purchase value was HRK 198,000.00, the deadline for the delivery of offers was September 29, 2022.

The opening, review and evaluation of offers was carried out on October 3, 2022, only one offer was received from the offeror GT Automobili d.o.o., which was rated as the most favourable. A contract was signed with the selected bidder on October 27, 2022. and the deadline for the delivery of the vehicle was set for March 15, 2023. On 30.11.2022. the supplier GTAutomobili sent a request for consent to deliver a vehicle in blue colour, considering that they had one vehicle with identical technical specifications and equipment as agreed, only in blue colour, which he was able to deliver before the agreed delivery date, and that already until December 15, 2022. The price for that vehicle would be the same as the price from the offer, i.e. the contracted amount. The request was accepted, and the vehicle was delivered on December 8, 2022, when it was put into use.

Car specifications:

- Engine: 1.6 Hybrid
- CO2 emissions: 115 g/km but depends on where it is driven -
- Fuel Type: Petrol – Hybrid

- Gross battery capacity: 1.2 kWh
- Battery technology: Lithium-ion
- Emission standard: Euro 6d-ISC-FCM

Although from the purely specifics of both cars, Nissan Juke does not look like a better choice, it is not true. The JUKE Hybrid's intelligent drive system governs the powertrain according to many parameters, with the objective of optimising the amount of time Juke spends in EV mode. During testing, Nissan's engineers have achieved up to 80 per cent of an urban drive in pure EV mode, with short hybrid phases to recharge the battery before returning to EV mode. Since the car is used for mostly short routes inside Port Authority, it mainly drives in electric mode and CO₂ emissions are significantly lower. The unofficial estimate is **at least 100 kg of CO₂ reduction annually**.

Pilot action no. 3: Mobile station to monitor air quality

1. Ex-ante situation

So far, Port of Split Authority did not have any kind of measuring station for air quality. For that reason, and in accordance with the requirements of the Air Protection Act (Official Gazette 72/20), the Ordinance on Monitoring of air quality (72/20) and the Regulation on levels of pollutants in the air (Official Gazette 77/20) Port of Split Authority carried out this pilot action and procurement of measuring device for air quality testing.

2. Pilot action description

The tender was published in the Electronic Public Procurement Bulletin on 05/17/2022, the deadline for submitting offers was 06/02/2022. When the bids were opened, three bids were received, the most favourable of which was the bid of the company Ekonerg - Institute for Energy and Environmental Protection d.o.o. from Zagreb. A contract was signed with the selected bidder on August 30, 2022. and the deadline for implementation was 120 days from the date of signing the contract. On September 29, 2022. the equipment was handed over and put into use on October 31, 2022.

The equipment includes:

- Sequential PM_{2.5} sampler
- Sequential sampler PM₁₀
- Automatic SO₂ analyzer
- Automatic NO/NO₂ analyzer

- Automatic CO analyzer
- Mobile House
- Air conditioning
- Rack
- Electrical installation
- Router
- Lamp
- Work folding table
- Folding chair
- Voltage stabilizer
- UPS
- Wireless weather station
- Laptop
- Manifold
- PTFE sampling tube
- Pressure regulator
- Calibration mixture SO₂ +NO+CO+N₂
- Calibration unit
- Compressor with additional filters to remove gases and moisture
- Dana Logger

Mobile station to monitor air quality measures concentrations of pollutants in the port area in real time. On the basis of data collected from the measuring equipment, in real-time information on pollution are obtained and automatically delivered to the Port Authority (Port Operational Centre) and are published online at the time of measurement to the public screens installed in the harbour near the administrative building (maritime passenger terminal). This enables Port Authority to control, supervise and manage environmental pollution in the port area. The following parameters are measured: carbon monoxide (CO), nitrogen oxide (NO_x), floating particles PM 2.5.

3. Conclusions

Substantial energy, environmental and financial savings and effects have resulted from the pilot implementation and these results are even more prominent than it was guaranteed by the Main project. By dimming night lights additional savings are achieved and light pollution is reduced which also has a positive effect on the environment in comparison to the „old“ light used prior to the pilot activity.

Thanks to the SUSPORT projects, Port of Split Authority reduced 11.61 tons of CO₂ per year and ensures that the air quality in Split Port is continuously monitored.