FinEst Centre
for Smart Cities

SMART CITY CHALLENGE 2024

City Challenge

Max 3 pages

send to smartcity@taltech.ee by May 15, 2024

Challenge Title – (max 5 words, no acronyms) Smart street lightning system

City/county and country: Maribor, Slovenia

Main contact from your city/county – name, organization, job title, e-mail, phone

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1. What is the future urban challenge that would need a solution to?

- **Please describe the challenge of your city / county neighboring a city?**

Energy consumption per inhabitant for road and street lighting is currently 100% higher in Maribor than predicted by national regulation for the maximum allowed consumption. Energy consumption for lighting has to be reduced bellow the limit determined by regulation which is 45 kWh/ per inhabitant. With the new solution for lightning system, light pollution can be reduced at the same time implementation of new smart lightning system allows new smart city functionalities. The lighting functionalities can reduce the quantity of used energy depending on the needs or time. Implementation of smart lightning system would improve smart functionalities.

- Why is it important for your city to solve it? How big priority it is for you and why?

Investments in the smart public lighting system are essential in order to ensure traffic safety in road traffic, a lower level of vandalism and favorable living conditions in urban centers. Public lighting in the Municipality of Maribor is in large among cost-inefficient and non-compliant with the Regulation on light limit values and environmental pollution (Official Gazette of the Republic of Slovenia, it. 81/2007, 109/2007, 62/2010, 46/2013 – hereinafter regulation). Energy consumption for lighting must be reduced bellow the limit determined by regulation – 45 kWh/per inhabitant. Energy consumption per inhabitant for road and street lighting is currently 100% higher than predicted by regulation on the maximum allowed consumption. According to the public lighting cadastre, there are 15,177 lamps in the Municipality of Maribor (status per day 30/05/2023). The lamps are connected to 363 outlets. In most cases, there are high-pressure mercury lamps and high-pressure sodium lamps of various wattages installed. The lamps are installed on 13,909 poles. Poles are mostly metal (candelabres) of various dimensions, wooden or concrete. More than 100 different types of lamps are installed in the area of the Municipality of Maribor from different manufacturers and there are 7 types of lamps.

According to the cadastre, the total power of the installed lamps is 1,450 kW. As some of the lamps are outdated, they consume a lot of energy, and do not provide additional functionalities that are enabled by the new smart lighting systems.

- Is this a unique challenge/problem of your city, why or is this by your knowledge a challenge/problem that many cities have – which kind of other cities?

The public lighting infrastructure is particularly well placed to take up the role of a connectivity platform that offers not only smart lighting but also a series of other functionalities and benefits to cities. Omnipresent in cities, lampposts have a great potential for standardisation and could integrate various sensors, telecommunication technologies necessary in smart cities, as well as offer access to charging. Currently, cities spend 20+% of their energy bills on lighting, while 75% of public lighting assets in the EU are more than 25 years old and mostly use inefficient lamps. Many cities are already upgrading their lighting infrastructure to energy-efficient Light Emitting Diodes (LEDs), some advanced to smart lighting with dimming and safety-supporting controls. Additionally, there are examples of cities that use their lampposts for other applications, such as air quality monitoring, Wi-Fi provision, video surveillance for public security, and electric vehicle (EV) charging. Smart connected lighting provides on average more lighting hours, but with dimmed power, optimally adjusting the local momentaneous need and the preferences of the citizen for the specific place and time. More lighting hours now come with lower overall energy demand and a longer lifetime of the LED lamps. Automated fault detection further reduces downtown and discomfort. The energy consumption can additionally be measured more accurately, ensuring that the city pays the correct price. Energy-saving of 50-70% is possible while using such smart connected lighting. Considering that around 360 million street lights are projected to exist on the globe by 2029, and that only a quarter of them currently uses LED lamps , the energy-savings globally could be significant (Smart lightning in cities, Colclough G.: https://smart-cities-marketplace.ec.europa.eu/sites/default/files/2021-06/Smart%20Lighting%20Factsheet_0.pdf).

2. Innovation.

- How have you solved that issue so far? Why aren't the present solutions good enough? Are there legal obstacles, which ones?

According to the public lighting cadastre, there are 15,177 lamps in the Municipality of Maribor (status per day 30/05/2023). Due to the large network of public lighting, the city is solving the problem of reducing energy consumption at the level of public lighting in different parts of the city only partially. The city currently did not have sufficient digital maturity to monitor the energy consumption and have other digital smart solution incorporated into street ligtning.

Light pollution in the city is mainly the result of public lighting and public lighting surfaces. In Maribor, there is no system in place to control consumption energy in the city. Monitoring of energy use is carried out through consumption points, which can be accessed by the maintenance of the distribution network. Data on electricity consumption are recorded by the maintenance of the distribution network or the system operator of the distribution network. The problems are also specific for lamps that illuminate individual buildings, playgrounds, etc. and are tied to the wiring of the respective building or facility. As it is impossible on such lamps to implement the advanced monitoring of energy consumption, we can currently only estimate it.

The electricity distribution network is managed by Elektro Maribor d.d., which collects data on actual usage electricity through meters installed in the same location as the ignition points. Electricity consumption is recorded manually every month, at some gas stations they have introduced itnalso a remote data reading system.The meters capture consumption for a one-

month period. Remote data is always transmitted on the same date of the month and also covers the consumption for that month. Data is mostly transferred via own telecommunications lines, but where this is not possible, they use them for data transmission by phone or GSM network.

In the Municipality of Maribor (113,000 inhabitants) in 2022, the use of electricity was per resident was 64.47 kWh. With the partial projects that the municipality has already planned, the annual energy consumption per inhabitant will decrease to 59.5 kWh. In order to reach the target value of electricity consumption per inhabitant, it will be necessary to implement solutions to reduce it to less than 5,028,500 kWh of annual use or by at least 31%.

- What should be the main features, characteristics of the future solution to be potentially best for that challenge or problem?

The solution should comprehensively regulate the public lightning system, enable the reduction of energy consumption, reduction of night ligtning of public areas. The solution should also regulate other functionalities of smart lighting systems. They should enable monitoring of environmental parameters, noise measurements, traffic count etc.

3. Expected impact of your pilot solution.

- What is the expected impact to your city environment you expect to see if the challenge gets solved?

We expect to lower the energy consumption and to reduct the light pollution.

- What is the expected impact to your citizens you expect to see if the challenge gets solved

Collected data enabled by smart lighting functionalities will be publicly available, thereby increasing the citizens awareness, improvement of traffic safety.

- What is the expected impact to your city governance you expect to see if the challenge gets solved?

We expect that he luminous flux from lightning lamps which are used as a light source and are radiating upwards will be equal to 0%. We expect that lighting fixtures will be without radiation to the upper hemisphere. The city officials will easier monitor energy consumption, environmental parameters and noise in the city.

4. Piloting

- Would you be interested to become a piloting partner of a proposed solution? Why? Describe shortly your capability to participate.

We would be interested to become a piloting partner. Maribor is the second largest city in the Slovenia in Podravje region and has the ambition to work climate neutrality by 2030. Local policies and strategies addressing the needs of citizens are developed and implemented within the close cooperation with different stakeholders. City has adopteed most strategic documents. Maribor is building on its previously adopted strategic documents such as Smart city strategy 2030 where the measures for the implementation of smart lighting are defined. The city has experiences with HORIZON and Interreg projects implementation.