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CENTRAL EUROPE



**Dynamic Light**

European Union  
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Dynamic Light - Final Conference

Wismar, Germany 26<sup>th</sup> - 27<sup>th</sup> March 2019



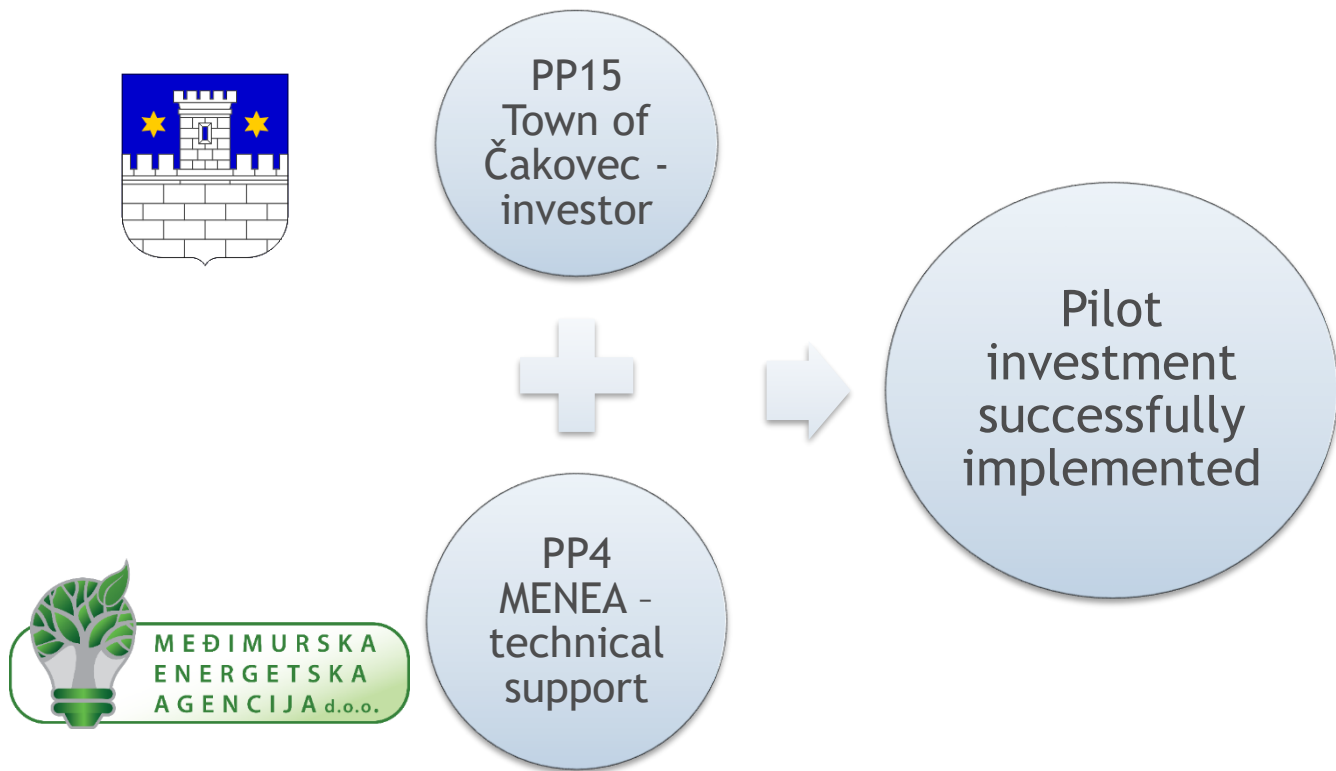
**Dynamic Light - Implementation of Dynamic Lighting  
Pilot System in Town of Čakovec**



Medjimurje Energy Agency Ltd. MENEА / Town of Čakovec | Alen Višnjić, M.Sc. / Slobodan Veinović

# BASIC INFORMATION

## Project partners involved



# BASIC INFORMATION

## The Town of Čakovec

- North Croatia
- Bordering Slovenia and Hungary



- 15,200 inhabitants
- Area of 10 km<sup>2</sup>



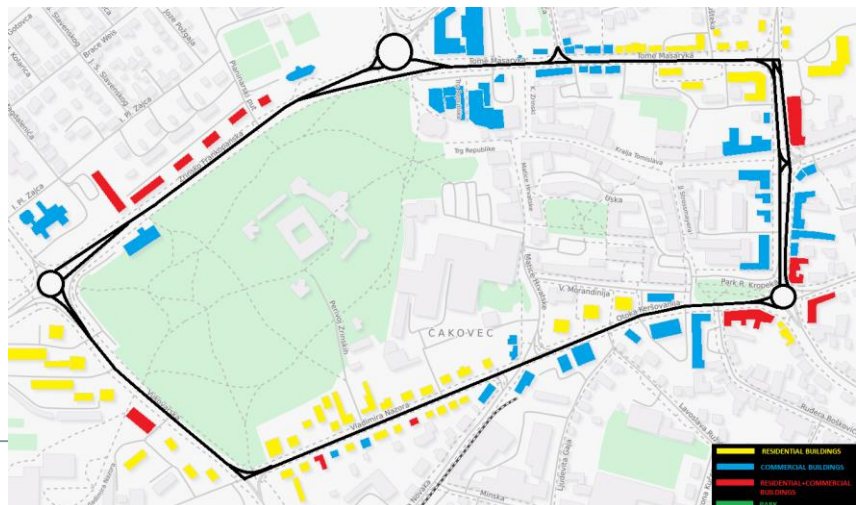


# PREPARATORY STEPS FOR THE PILOT IMPLEMENTATION

Field survey of current state of public lighting - comparison with Energy audit

Stakeholder analysis

Area functionality - land use and zoning



GIS - based database developed for two districts in the Town of Čakovec

Strategy of the public lighting modernisation and decrease of light pollution in the Town of Čakovec

Action plan of the public lighting modernisation in the Town of Čakovec

# PREPARATORY STEPS FOR THE PILOT IMPLEMENTATION



Analysis of the global lighting situation

Analysis of the specific lighting situation

Planning of intelligent light concepts for the pilot area





# PILOT AREA IN THE TOWN OF ČAKOVEC

„Ring Čakovec” - Ivan Mažuranić Street, Eugen Kvaternik Square, Otokar Keršovani Street, Vladimir Nazor Street, Vukovar Street, Zrinski-Frankopan Street and Toma Masaryk Street



Hiring external experts

Coordination with external experts and  
Town of Čakovec

Market research

Creating project documentation

Final meeting with Town of Čakovec  
regarding project documentation

Technical support to Town of Čakovec for  
process of public procurement





## Intelligent light concept

Current geometry of the streets and lightning infrastructure

LED luminaires

System for control and management of public lighting

Wireless communication

Weather sensors (rain and fog)





## Technical framework - lumminaires

### TYPE 1

- 160 W
- 67 pieces
- 3000 K
- $\geq 90$  lm/W
- 50,000 h
- IK 08, IP 66
- From  $-25^{\circ}\text{C}$  to  $35^{\circ}\text{C}$

### TYPE 2

- 130 W
- 75 pieces
- 3000 K
- $\geq 110$  lm/W
- 50,000 h
- IK 08, IP 66
- From  $-25^{\circ}\text{C}$  to  $35^{\circ}\text{C}$

### TYPE 3

- 120 W
- 8 pieces
- 3000 K
- $\geq 110$  lm/W
- 50,000 h
- IK 08, IP 66
- From  $-25^{\circ}\text{C}$  to  $35^{\circ}\text{C}$

## Technical framework - control and management system requirements

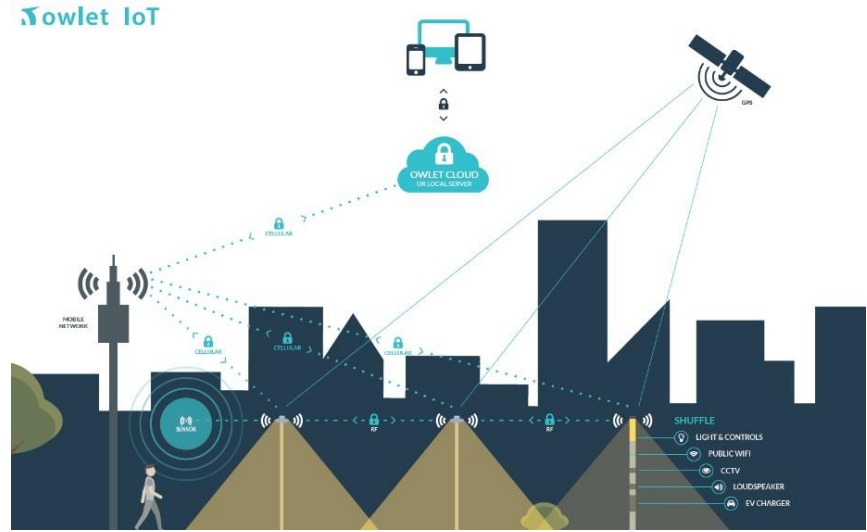
Cloud based platform

Wireless communication

Openness of the system to other manufacturers



# PILOT INVESTMENT - TOWN OF ČAKOVEC



Schreder Axia 2.2

OWLET IoT

Rain and fog weather sensors



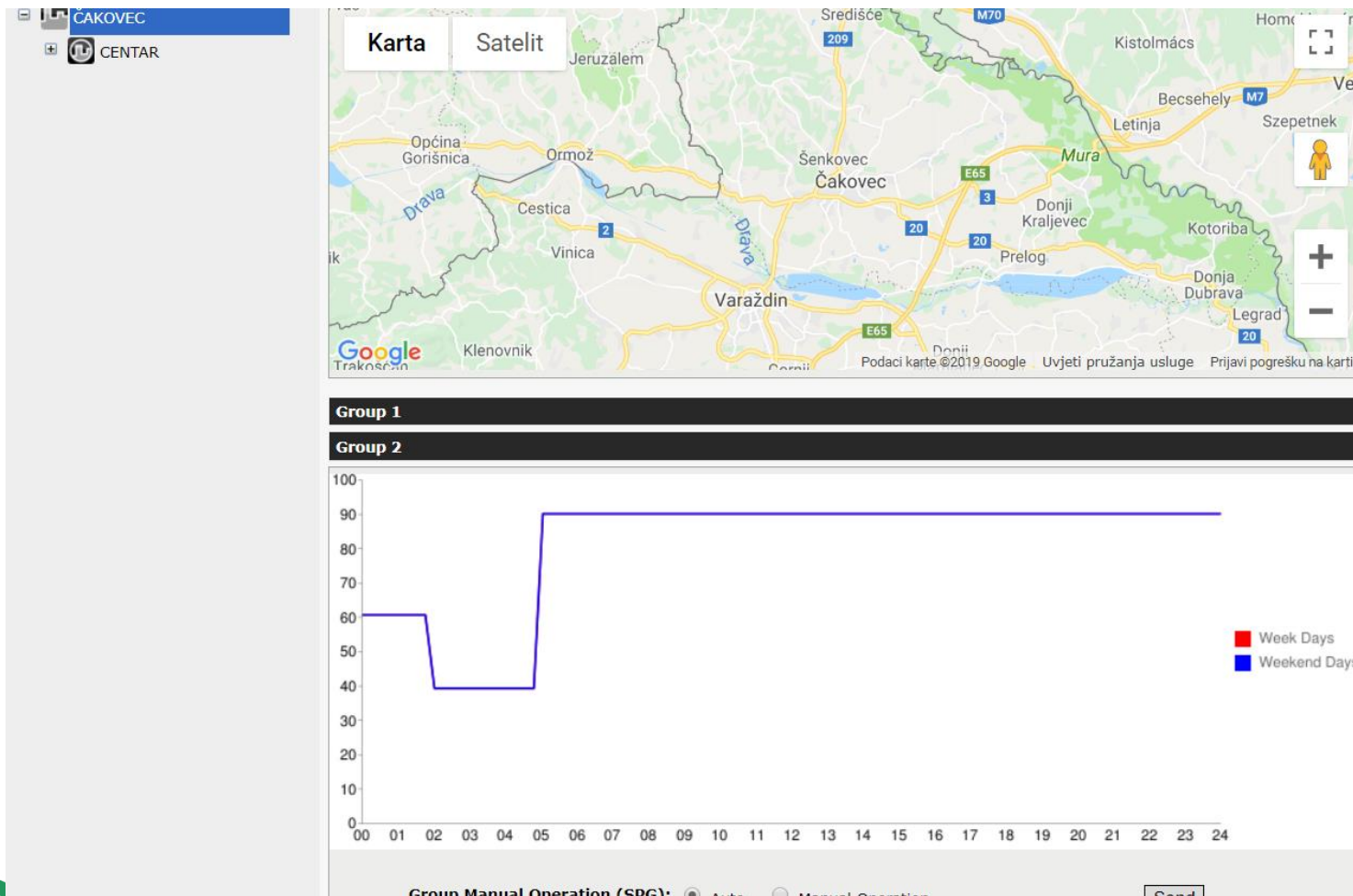


## Implementation of works



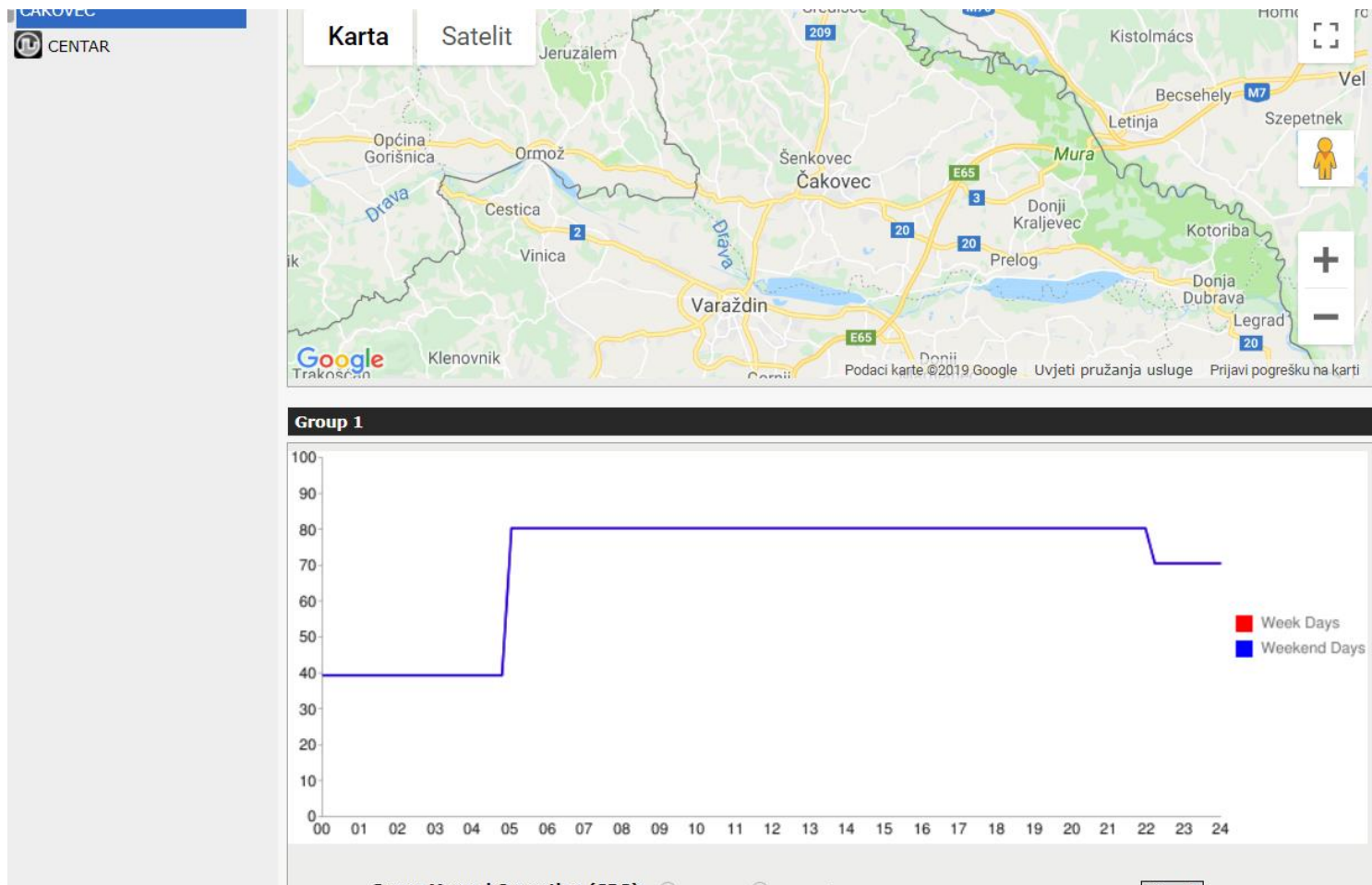
# PILOT INVESTMENT - TESTING REGIMES

## OWLET IoT interface - regime No.1





## OWLET IoT interface - regime No.2



# PILOT INVESTMENT - FIELD TESTING

## Toma Masaryk Street

40%



70%



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# PILOT INVESTMENT - FIELD TESTING



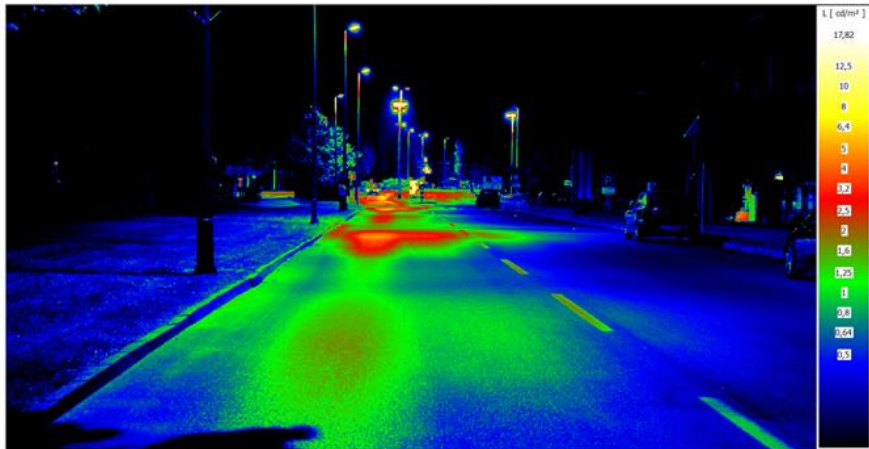
# PILOT INVESTMENT - TOWN OF ČAKOVEC

Before

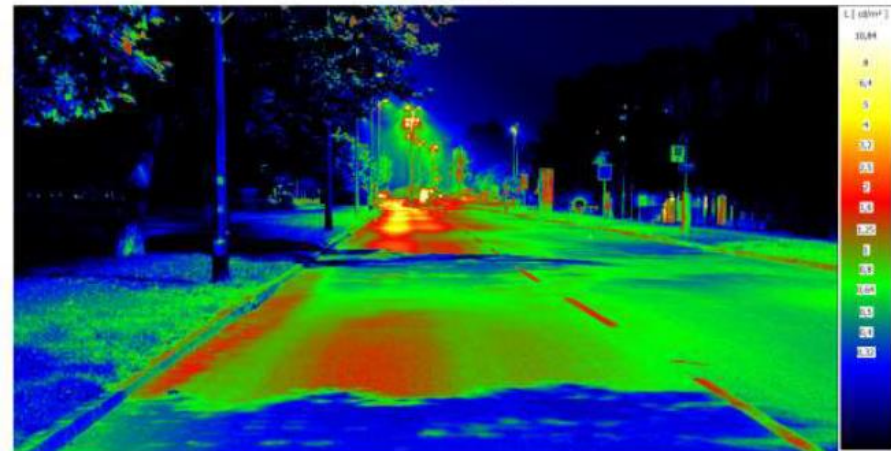
Measurements

After

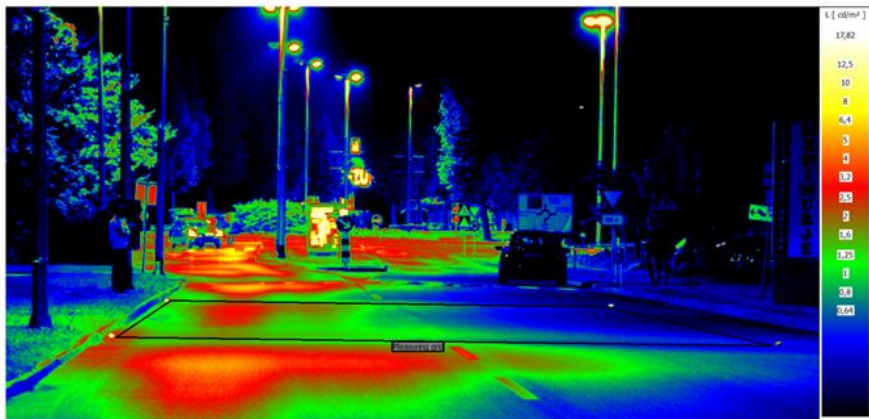
Luminance image



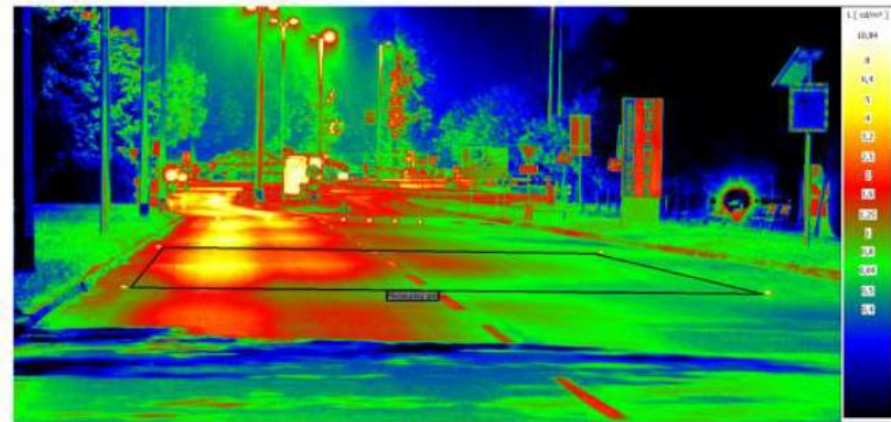
Luminance image



Measurement field



Mjerno polje



## Comparative overview and expected results

	<u>Before</u>	<u>After</u>
Number of luminaires	160	150
Installed power kW	58.23	19.86
Annual consumption (kWh)	238,743.00	81,438.30
Annual costs (€/kWh)	28,070.00	9,574.50
CO <sub>2</sub> emissions (tCO <sub>2</sub> /a)	89.77	30.60





## Financial overview

### Actual investment

- 79.816,66 € (VAT included)

### Annual savings

- 18.500,00€

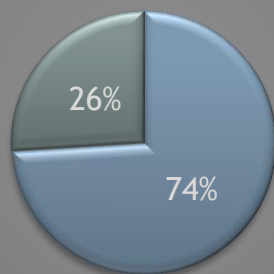
### Return of investment

- 4,3 years



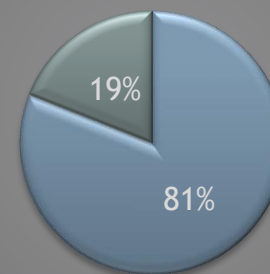
## Satisfaction of end users of pilot area

Informed about light pollution concept?



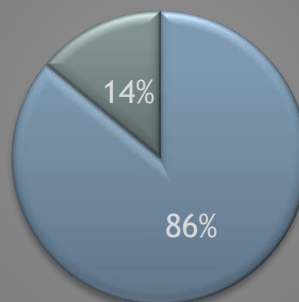
Yes No

Awareness on Dynamic Light pilot installation?



Yes No

Better illumination with LED lighting?

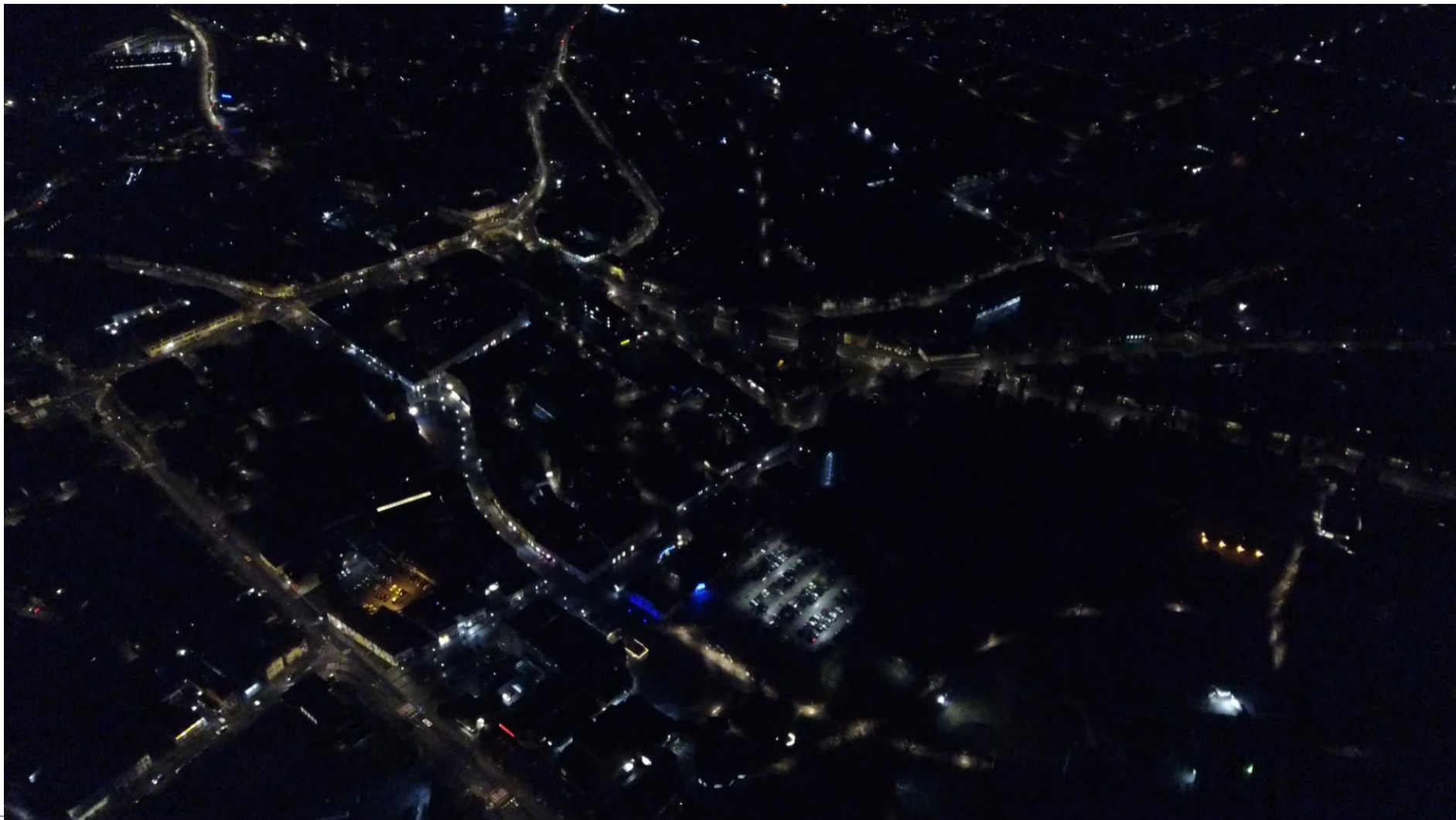


Yes No



# PILOT INVESTMENT - TOWN OF ČAKOVEC

## Aerial view





## Medjimurje Energy Agency Ltd. - MENEА

Contact: Alen Višnjić, [alen.visnjic@menea.hr](mailto:alen.visnjic@menea.hr)

Maja Bratko, [maja.bratko@menea.hr](mailto:maja.bratko@menea.hr)

Phone: +385 40 39 55 59

Web page: [www.menea.hr](http://www.menea.hr)



## Town of Čakovec

Contact: Slobodan Veinović, [veinovic@cakovec.hr](mailto:veinovic@cakovec.hr)

Phone: +385 40 31 49 20

Web page: [www.cakovec.hr](http://www.cakovec.hr)

