

Project: Artificial intelligence platform to prevent Climate change natural hazards (ARCA):

Appendix to the Deliverables (Ver. 1.1):

Del. 1.1.1- Report on the design and deployment of the cross-border wireless sensor networks

Del. 1.2.1- Report on the deployment of the drones and video cameras

Del. 1.4.1- Report on the test and validation of the infrastructure

Partner: MECOnet

Test places: Podgorica, MECOnet premises and Podgorica's hills (Dajbabska Gora)

Authors: Radovan Stojanović, Matija Stojanović, Jovan Djurković, Viktor Vuković

Deployment of ARCA Equipment in Lovćen National Park

1. Introduction

The ARCA project has deployed and tested a range of environmental monitoring equipment in **Lovćen** National Park, Montenegro, to support forest health monitoring and wildfire risk assessment. The deployed system includes TreeTalker sensors, an ARCA Mobile WatchStation equipped with visible and thermal cameras, and drone-based LiDAR and RGB surveys. Together, these technologies provide continuous environmental observations and support early wildfire detection.

2. Deployed Equipment

2.1 TreeTalker Monitoring System

The TreeTalker monitoring system consists of two complementary sensor types:

TreeTalker Cyber

- Sap flow velocity
- Radial growth
- 28-band spectrometer
- Accelerometer (tree inclination)
- Air temperature and relative humidity
- LoRaWAN/NB-IoT communication

TreeTalker Fire

- CO₂ sensor
- Volatile Organic Compound (VOC) sensor
- Smoke and particulate matter sensor
- Infrared canopy temperature sensor
- Infrared camera
- RGB camera
- Air temperature and relative humidity
- LoRaWAN/NB-IoT communication

Together, these sensors continuously monitor tree physiology, forest health, environmental conditions, and wildfire risk indicators.

2.2 ARCA Mobile WatchStation

The ARCA Mobile WatchStation includes:

- Hikvision DS-2DE5425IWG-K/4G RGB camera
- Dahua DHI-TPC-BF1241 thermal camera
- Solar-powered energy system (80 W photovoltaic panel)

The system provides high-resolution visible and thermal imagery for wildfire monitoring and environmental surveillance.

2.3 Drone Platform

A DJI Matrice 400 equipped with the DJI Zenmuse L3 LiDAR payload is used for aerial surveys. The drone acquires RGB imagery and LiDAR data for 3D mapping and wildfire risk assessment. The aircraft is operated on a rental basis when required.

3. TreeTalker Deployment

TreeTalker sensors were installed at two locations within Lovćen National Park:

- **Location 1:** Jezerski Vrh, <https://maps.app.goo.gl/2ftju6Yi3kKcefkeA>
- **Location 2:** Ivanova Korita, <https://maps.app.goo.gl/mfTw36HWRLxjeRdh6>

A total of **24 sensors** have been deployed:

- Location 1: 8 sensors (4 TreeTalker Cyber + 4 TreeTalker Fire)
- Location 2: 16 sensors (8 TreeTalker Cyber + 8 TreeTalker Fire)

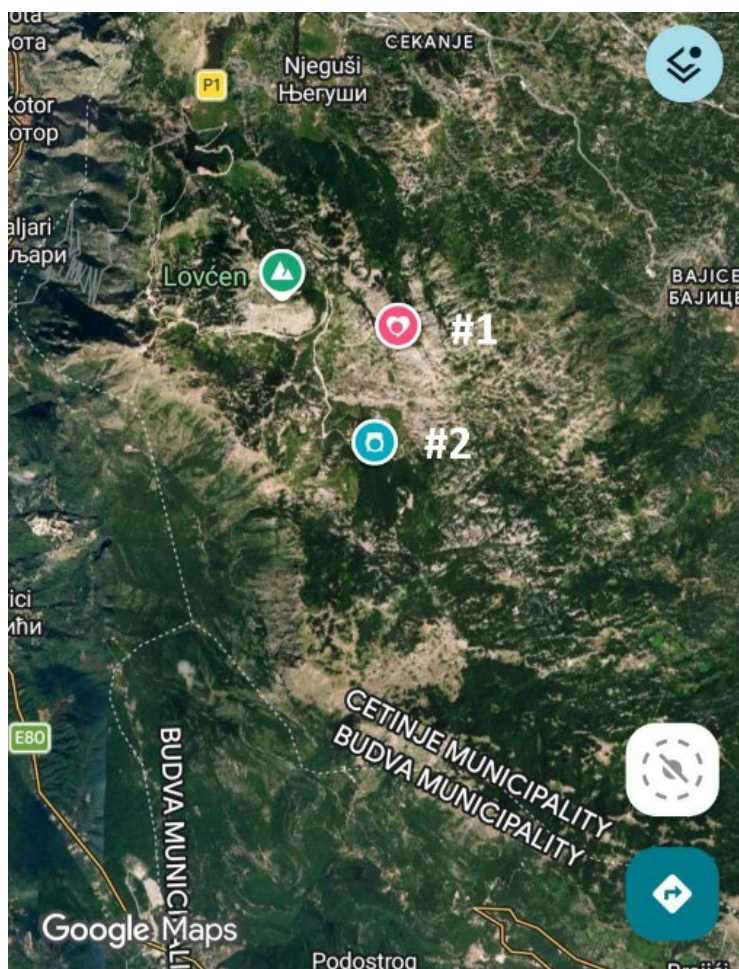


Figure 1. Locations of the TreeTalker monitoring sites in Lovćen National Park.



Figure 2. TreeTalker Fire and TreeTalker Cyber sensors installed on trees at the Jezerski Vrh and Ivanova Korita monitoring sites.

4. Camera Deployment

The ARCA Mobile WatchStation is currently installed near **Jezerski Vrh**, providing continuous visible and thermal monitoring of the surrounding landscape.

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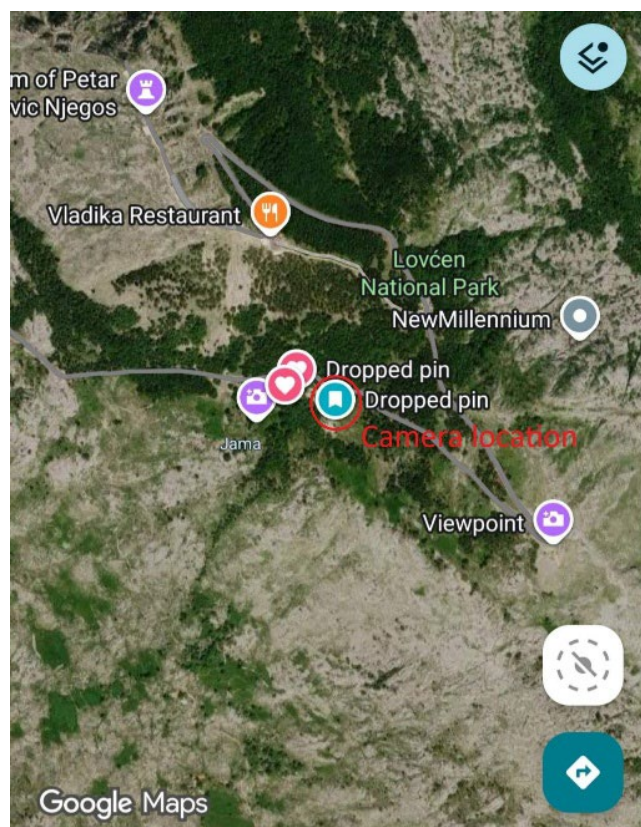


Figure 3. Location of the ARCA Mobile WatchStation equipped with RGB and thermal cameras, location: https://goo.gl/maps/kn2J8b78LEm1K4dP8?g_st=ac

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Figure 4. ARCA Mobile WatchStation installed at the Jezerski Vrh monitoring site.

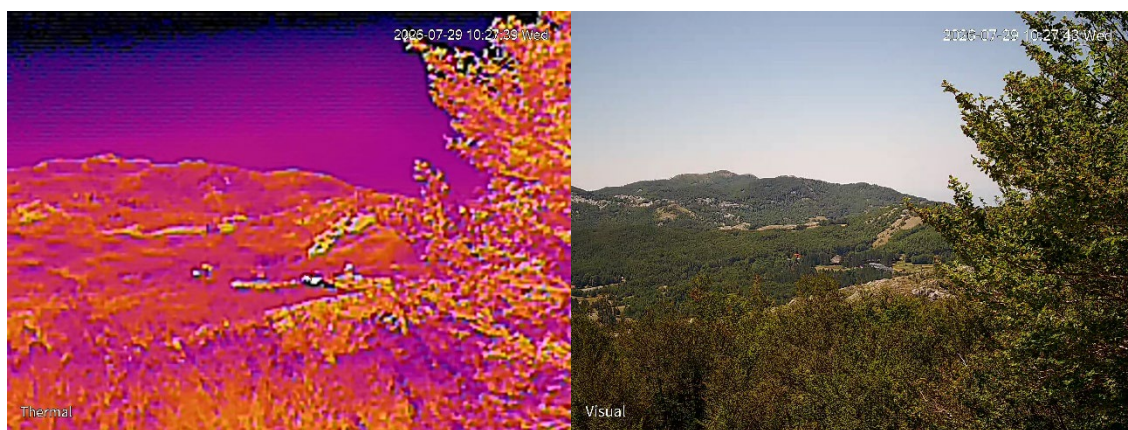


Figure 5. Example visible (RGB) and thermal images acquired by the Mobile WatchStation at Jezerski Vrh.

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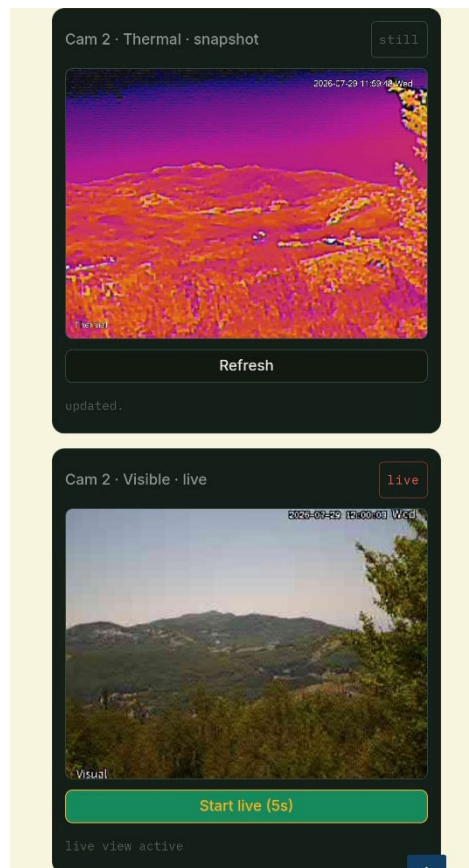


Figure 6. Live thermal and visible camera feeds displayed in the MECOnet application.

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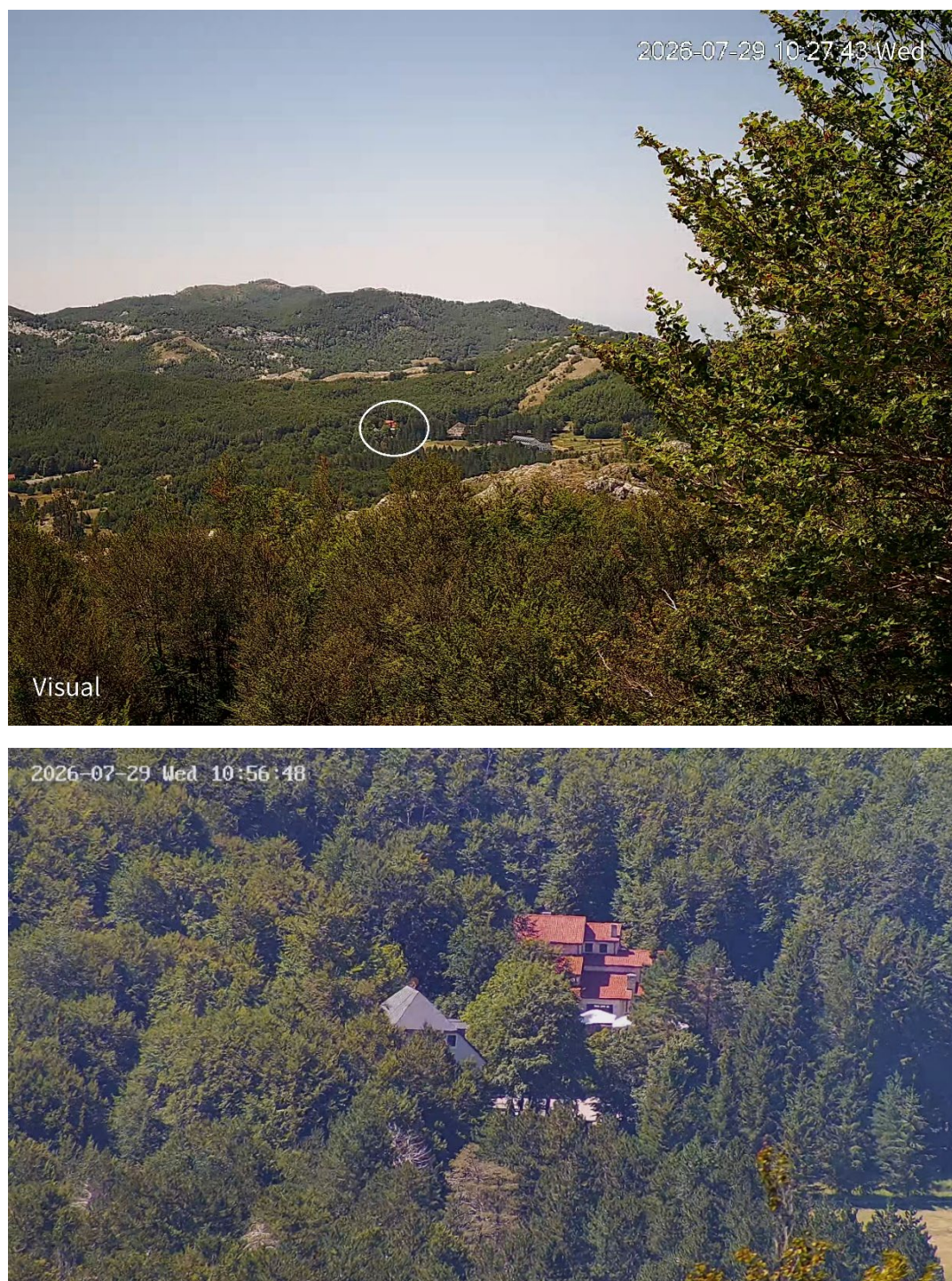


Figure 7. High-resolution RGB imagery demonstrating the zoom capability of the Mobile WatchStation.

5. Drone Surveys

Drone surveys are performed to collect RGB imagery and LiDAR data across selected areas of Lovćen National Park. These datasets support vegetation assessment, terrain modelling, and wildfire risk analysis.

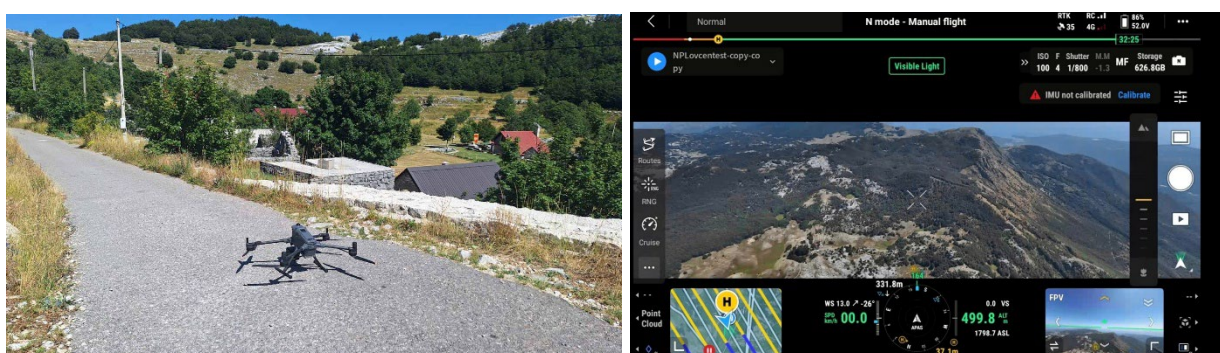


Figure 8. DJI Matrice 400 equipped with the Zenmuse L3 payload during LiDAR and RGB data acquisition for wildfire risk assessment in Lovćen National Park

6. Team

Team that implemented deployment and testing phase of ARCA equipment on Lovćen national park was:

1. Prof. dr Radovan Stojanović, MECOnet and University of Montenegro
2. Jovan Djurković, dipl. ing., MECOnet
3. Matija Stojanović, MSc in law, MECOnet
4. Viktor Vuković, student, volunteer in MECOnet
5. Slobodan Čavor, dipl. ing forestry, National Parks of Montenegro
6. Ibrahim Fazlić, dipl. ing forestry, National Parks of Montenegro
7. Raffaele Cerreta. Nature 4.0 Ltd, Italy
8. Dorin Caraman, Nature 4.0 Ltd, Italy

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Figure 9. Team in work

7. Supplementary data and image resources

You can access additional images of the system deployment and testing at:

https://drive.google.com/drive/folders/1CGGbGBRNKwhFOfhC37V_1Z5EQGnnNYpl?usp=sharing