GREAT FOREST FIRES OF THE 21st CENTURY. EUROPEAN COOPERATION TO PREVENT THEM.

OFIDIA 2
Operational FIre Danger preventIon plAtform 2

Wildfire monitoring and prevention: science, innovation and cross-border cooperation towards informed decisions for firefighting

European Forest Week

Prof. Giovanni Aloisio - CMCC Foundation
Prof. Stergios Anastasiadis – University of Ioannina

Food and Agriculture Organization
of the United Nations

Project main facts

European project funded by the Cooperation Programme Interreg V-A Greece-Italy 2014-2020.
The project is co-funded by the EU, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

Start Date: 30/03/2018

End Date: 29/03/2020 extended until May 2021

Total Budget: Euro 1.854.000

Priority Axis 2: Integrated Environmental Management

Thematic Objective 6: preserving and protecting the environment and promoting resource efficiency

Specific Objective 2.2: Improvement of joint management and governance plans for biodiversity of coastal and rural ecosystems, paying attention to the natural resources and protected areas, and development of environmental protection measures

Beneficiary Partners:
- CMCC Foundation (Project Coordinator)
- Apulia Region – Civil Protection Section
- University of Ioannina
- Decentralized Administration of Epirus-Western Macedonia, Forest Directorate (DAEWM)

Associated Partners:
- Municipality of Lecce
- ARIF (Regional Agency for Irrigation and Forest Activities)

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Achievements

Big Data Infrastructure

- Decision Support System for wildfire monitoring and prevention
- Weather parameters, fire behavior and fire danger indices
- High Performance Computing and data management facilities
- High resolution weather modelling and fire danger forecasting

Forest Fires Monitoring & Patrolling

- Weather stations and wireless sensors networks
- HD video cameras, drones and off-road vehicles

Wildfire Control Room at Puglia Civil Protection for fire hazard forecasting and monitoring

FireAware crowdsensing mobile **App** to send an alert notification to the Civil Protection in case of a potential fire hazard, including images and the distance from fire

Cross-border Education and **Lifelong Learning** through awareness-raising campaigns on fire danger prevention and biodiversity protection

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No boundaries between the two regions

Apulia
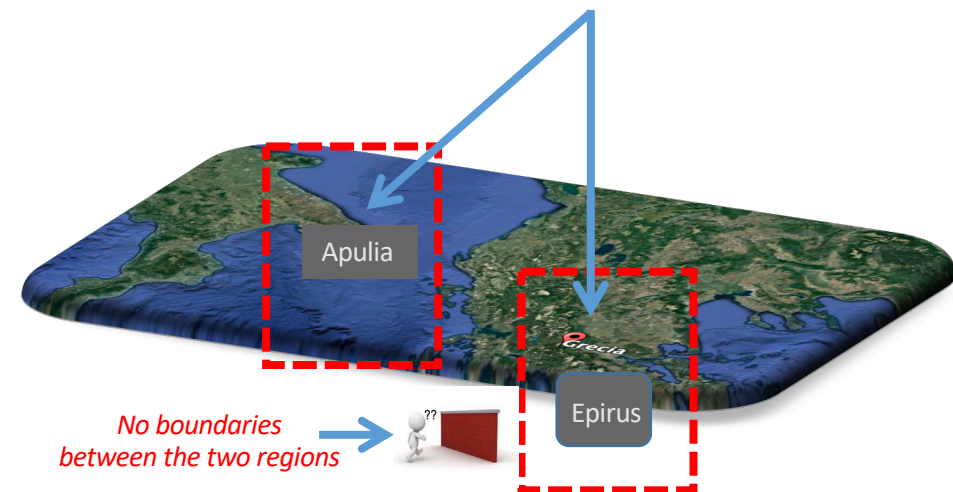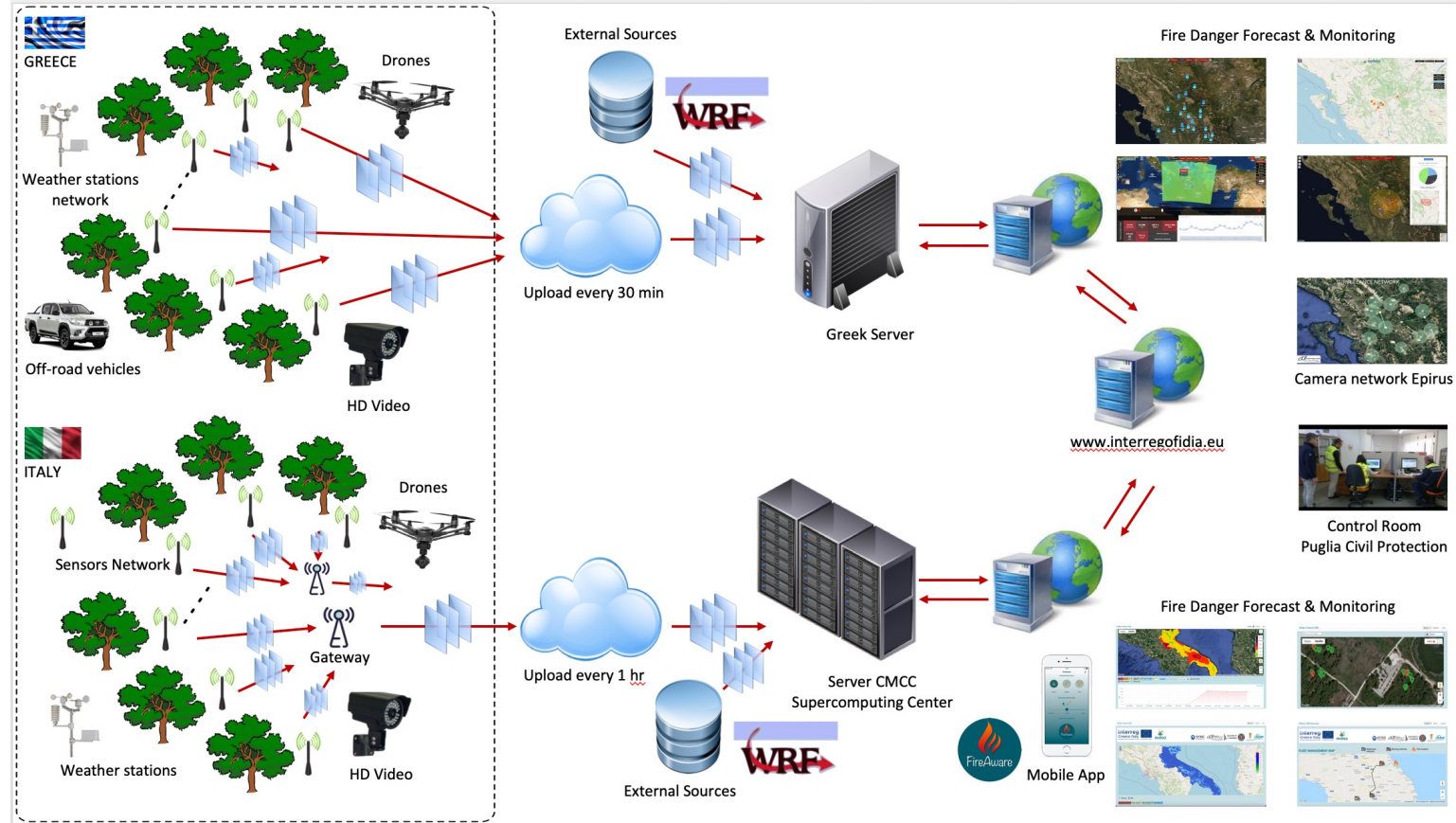
Epirus

OFIDIA2 – System Architecture

Sensors network for real-time monitoring

Puglia, Italy
120 Wireless sensors
Drones
2 Weather stations
5 HD video cameras

Epirus, Greece
12 Video cameras
1 Thermal camera
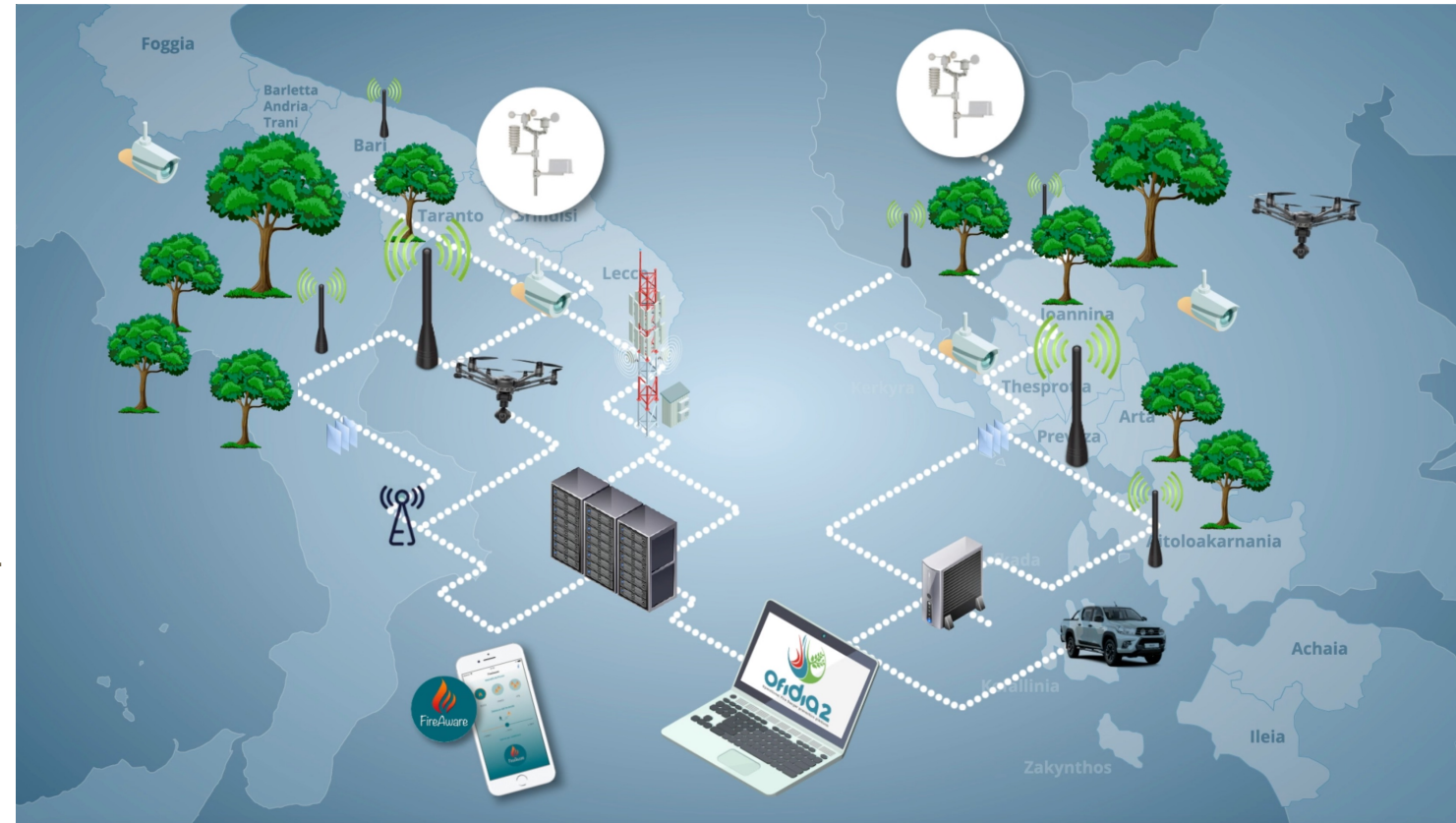6 Weather stations
2 Drones
2 Off-road vehicles

Computing infrastructure

HPC Data Center   @CMCC
Servers and workstation   @Ioannina Univ.
Desktop & workstations   Greece & Italy
Tablets + Video walls   Greece & Italy

Operational Services

Monitoring dashboards   Greece & Italy
Weather forecast - WRF model   Greece & Italy
Decision Support Systems & Viz   Greece & Italy

Wireless Sensors

Pre-alarm sensors

Water transport inside the plant

Log moisture measurement

Growth of the tree diameter

Foliage Health (light transmission in 12 spectral bands)

Leaf temperature measurement

Alarm sensors

Gas concentration measurement (CO2, O3, PM 2.5-10)

Flame detection

Tree stability with gyroscopic sensor
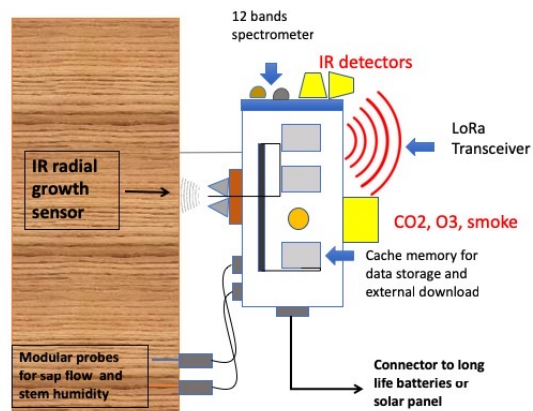
Wireless sensors specifically developed and customized for the project

The TreeTalker®Fire

Weather Stations

Air Temperature
Relative air humidity
Total precipitation
Solar radiation
Wind speed and direction

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Decision Support System for wildfire monitoring and prevention (Puglia)

High resolution weather modelling
Weather parameters
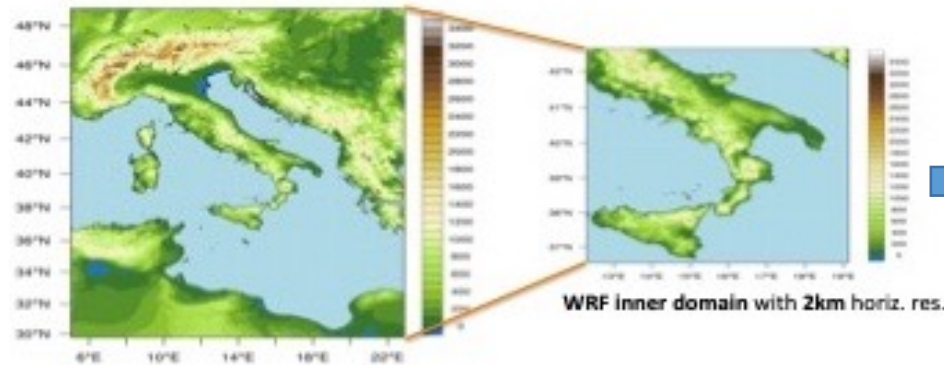
Fire danger forecasting
Fire danger indices & risk maps
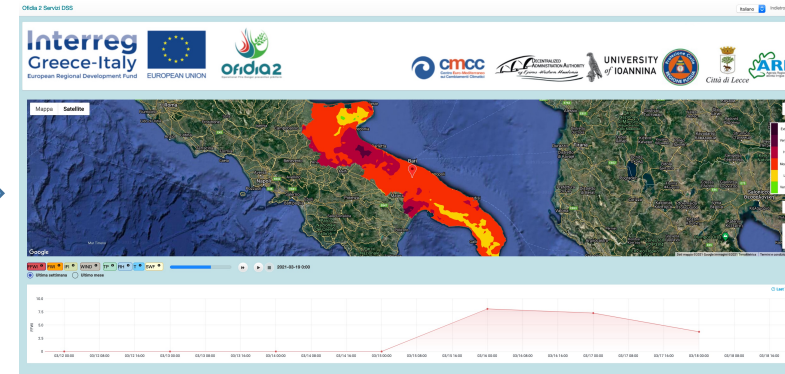
Fire-behavior projection models
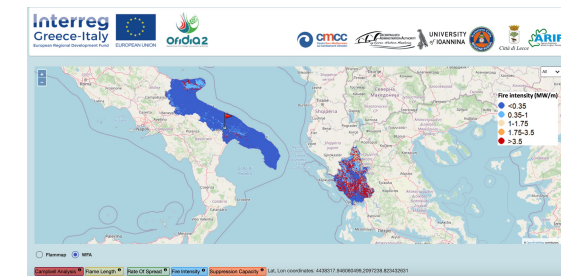
Fleet-management application
for the management of Civil Protection volunteers
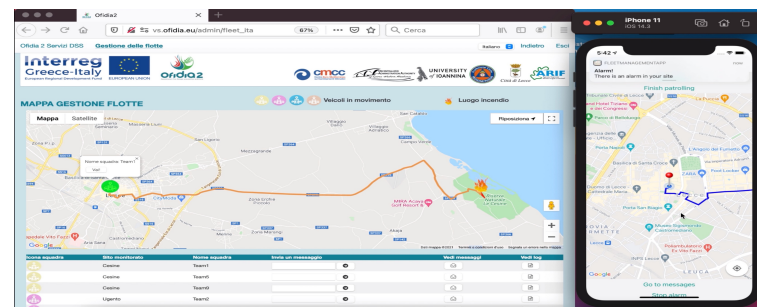
High Performance Computing
Data management facilities
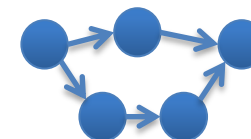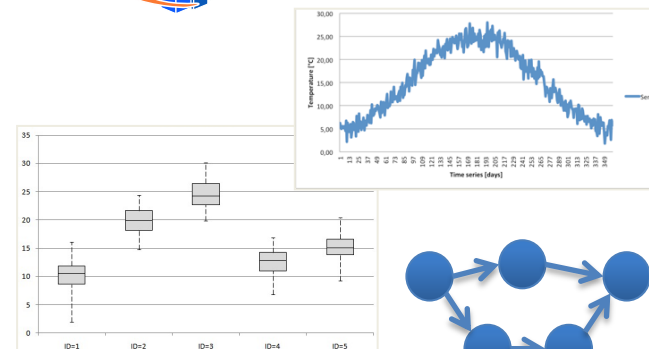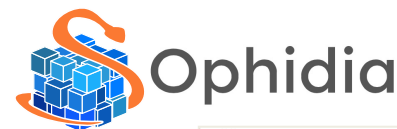
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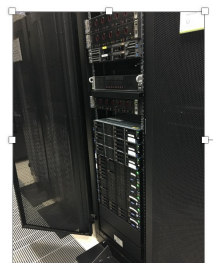
Decision Support System for wildfire monitoring and prevention (Epirus)

Forecast with a Click
anywhere on the map

Fire Incidents
on circled region

Weather History with a Click
from weather stations


Forecast History

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Fire Danger Indices

- FFWI (Canadian), FWI (Fosberg), IFI (Ichnusa) fire danger indices for the next 72h computed each day through an operational chain run at the CMCC Supercomputing Center

- 6 risk levels for FFWI and FWI (Extreme, Very High, High, Moderate, Low, Very Low)

- 5 risk levels for IFI (Extreme, High, Moderate, Low, Very Low)

- Weather variables visualization (temperature, solar radiation, relative humidity, wind speed and direction, total precipitation)

- Visualization of the single ignition point or the aggregate value for the last week or month.
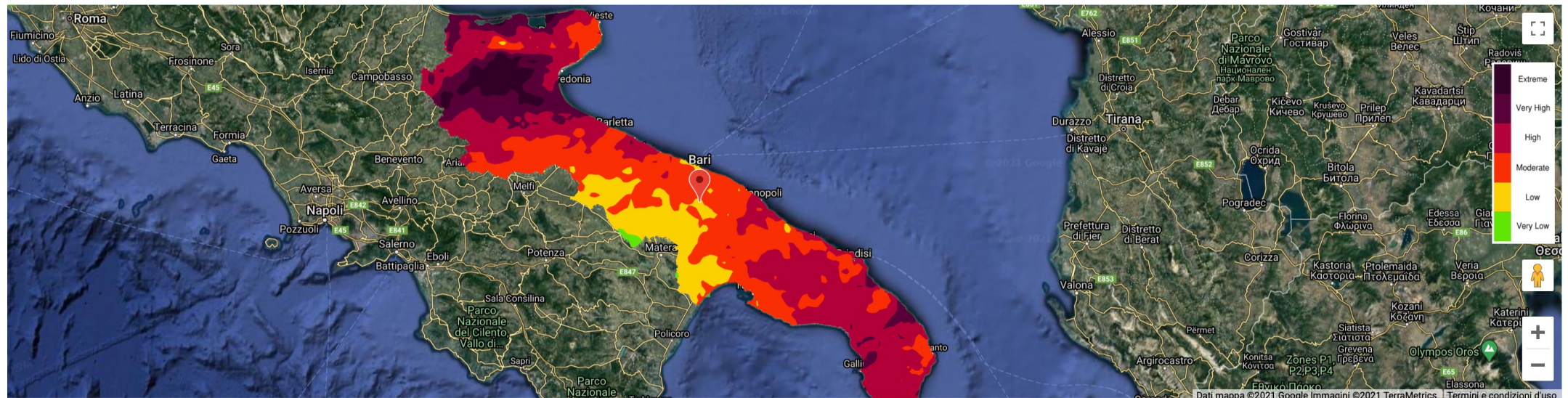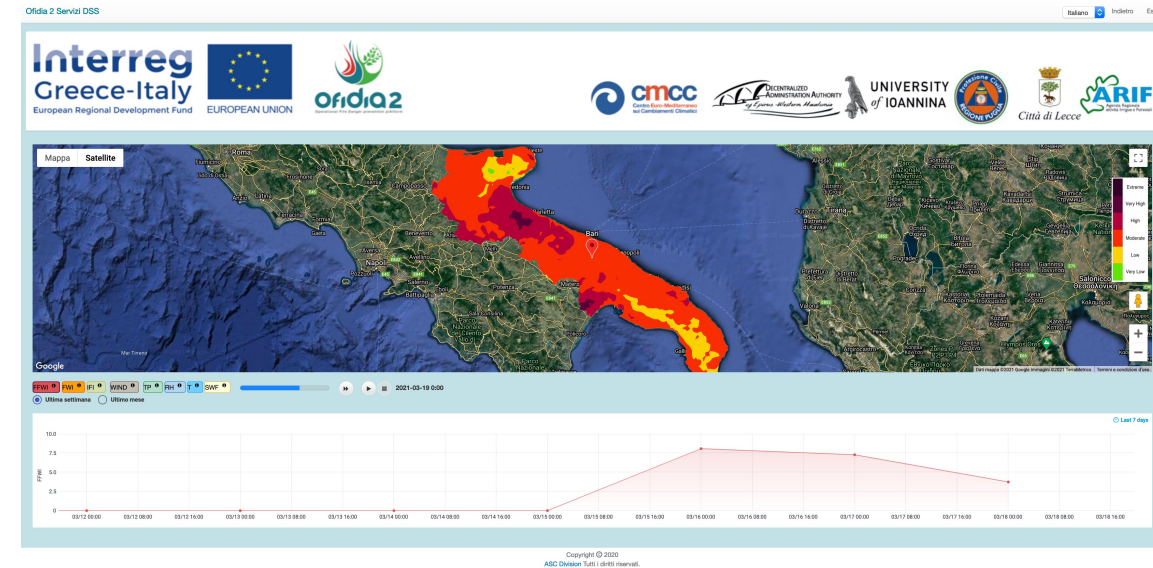
Fire Danger Indices

- FFWI (Canadian), FWI (Fosberg), IFI (Ichnusa) fire danger indices for the next 72h computed each day through an operational chain run at CMCC or U.Ioannina

- 6 risk levels for FFWI and FWI (Extreme, Very High, High, Moderate, Low, Very Low)

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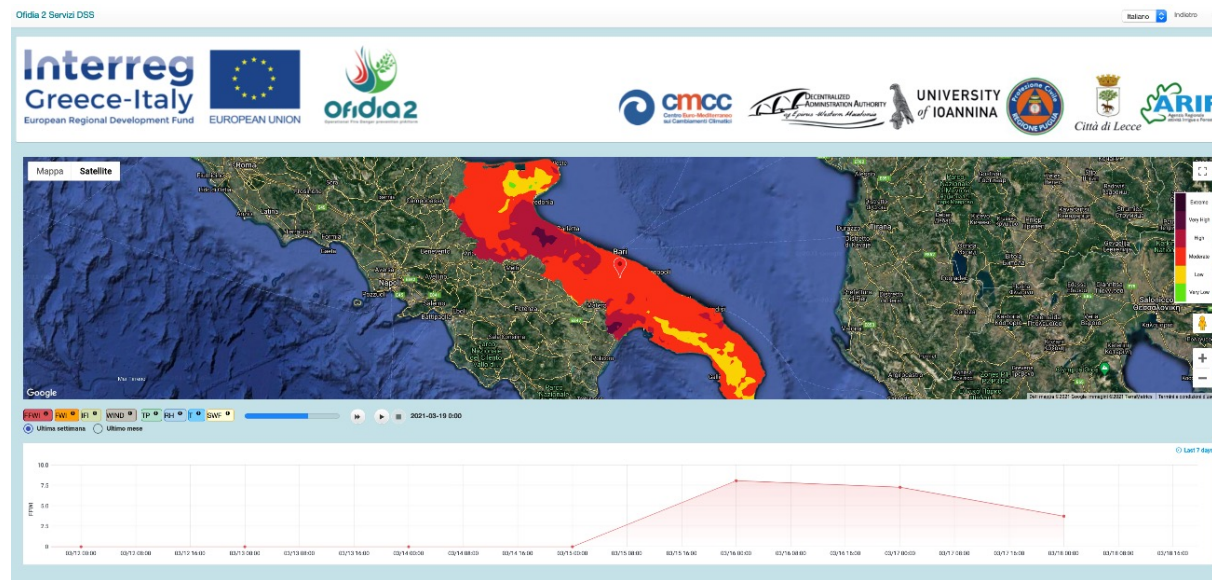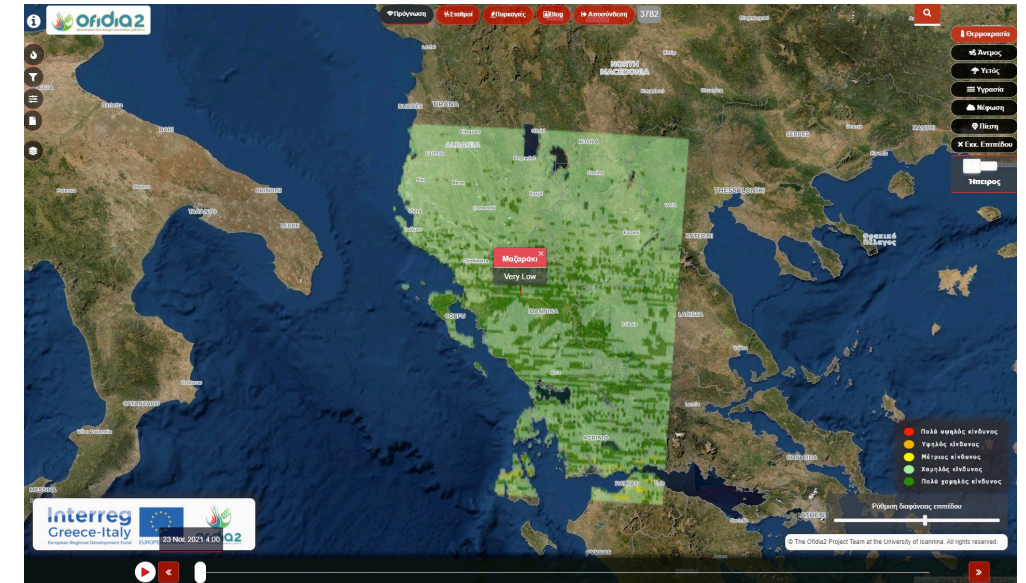
Filter with Weather Criteria
on circled region
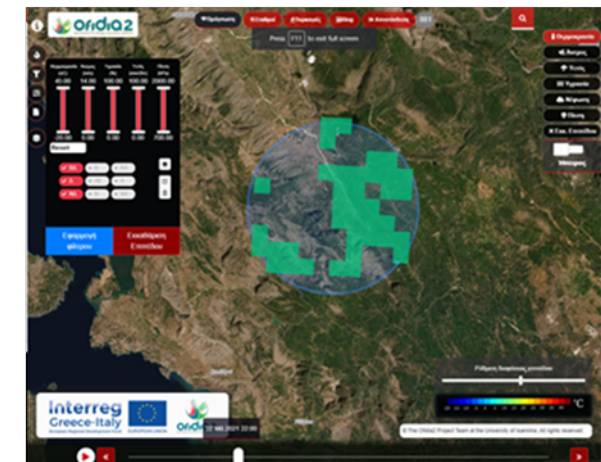
Fire Behaviour

**Flammap and WildFire Analyst simulators**

- Flammap only for the Apulia region
  - Burn probability (BP), conditional flame length (CFL), fire potential index (FPI), fire size (FS) maps

WildFire Analyst for the Apulia and Epirus regions

- Campbell analysis, Fire Intensity (FI), Flame length (FL), Rate of Spread (ROS), Suppression Capacity (SupCap)

Maps are dynamically calculated based on wind speed (km/h), direction (°C) and relative humidity (%) variables from the WRF model
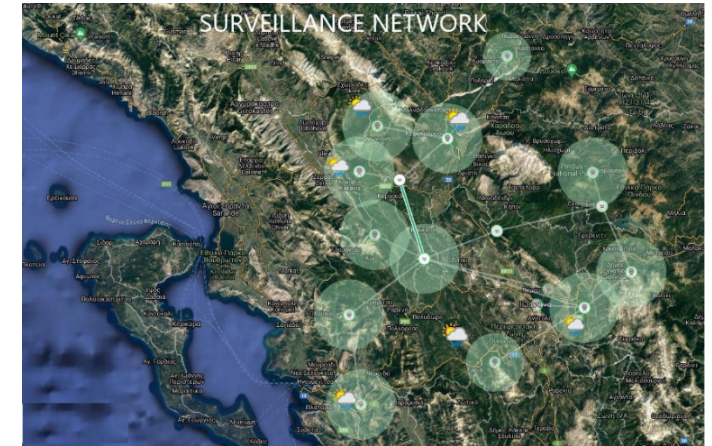

Flammap – Burn Probability

Flammap - Conditional Flame Length

WildFire Analyst – Flame length

WildFire Analyst – Campbell Analysis

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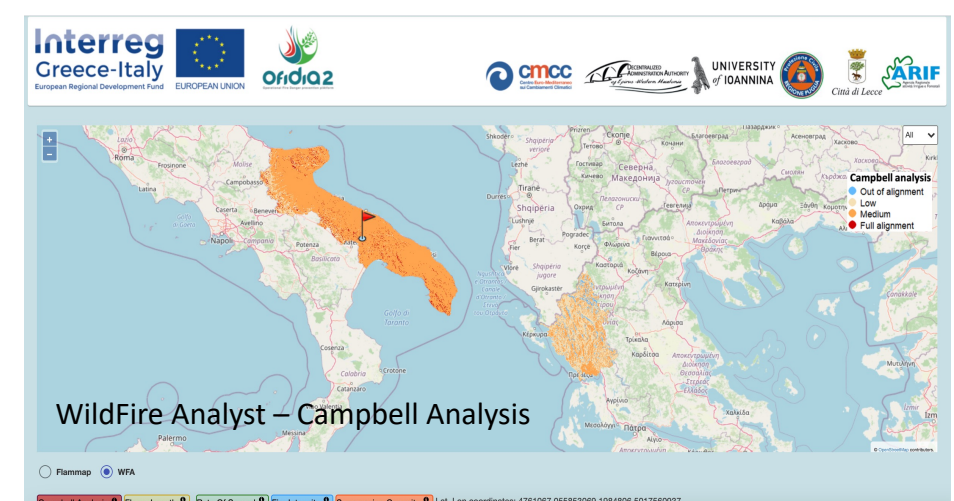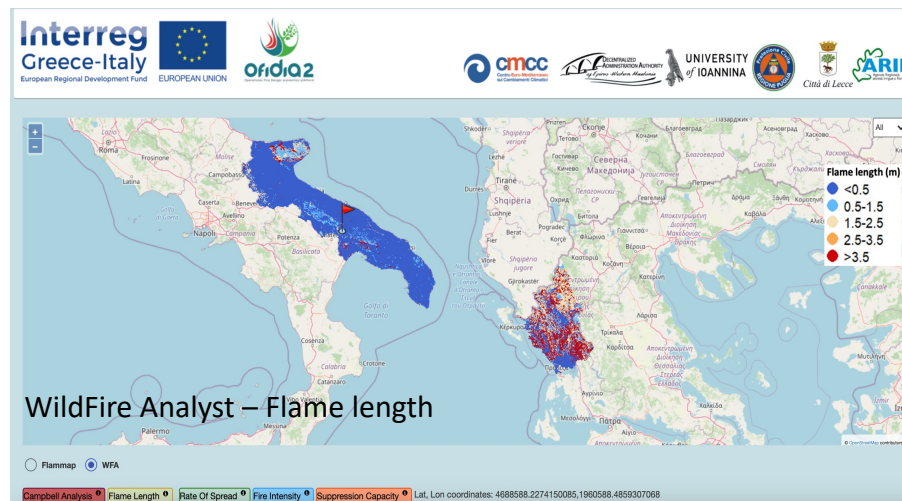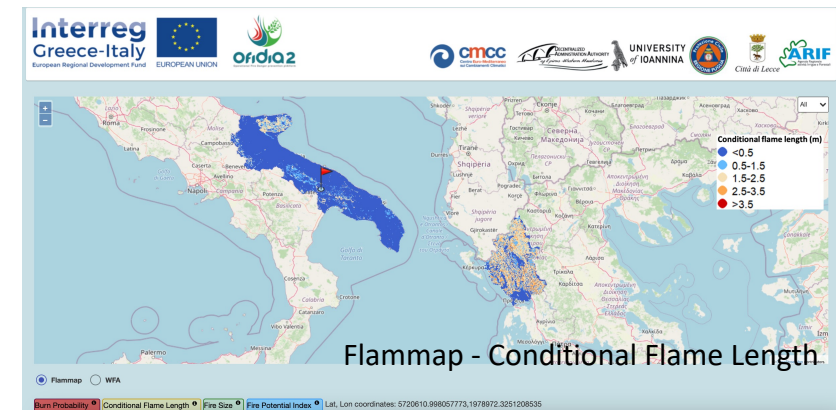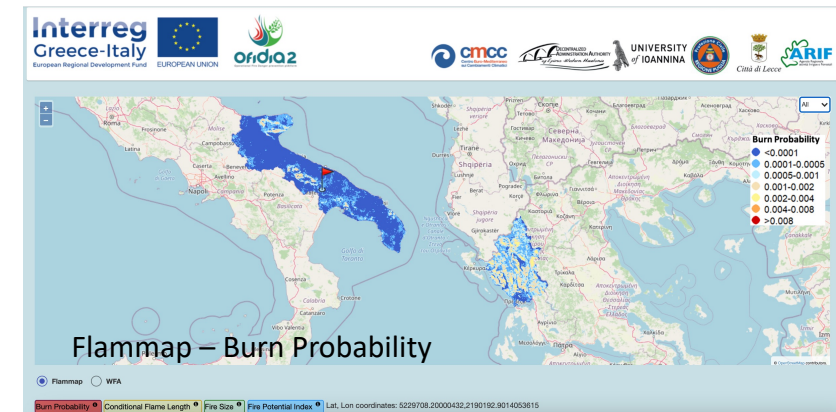
Forest Fires Monitoring & Patrolling (Epirus)

Off-road Vehicles

HD video cameras

Drones

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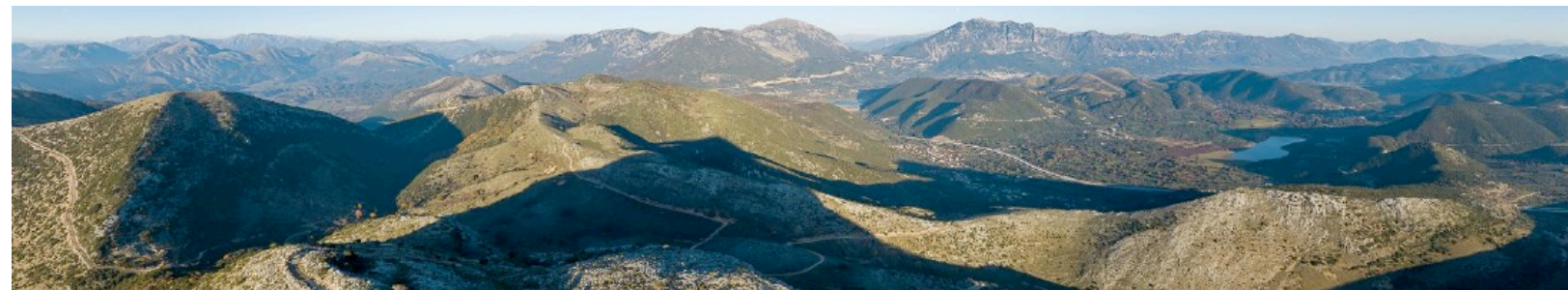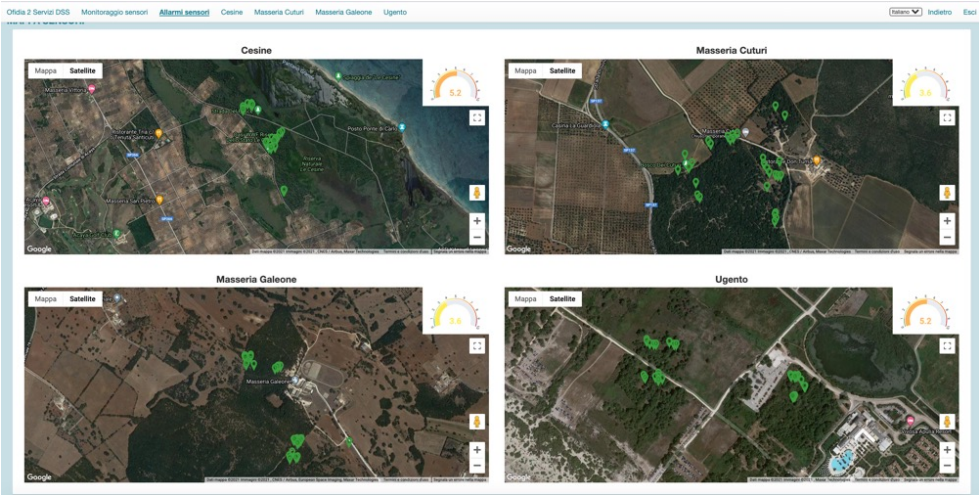
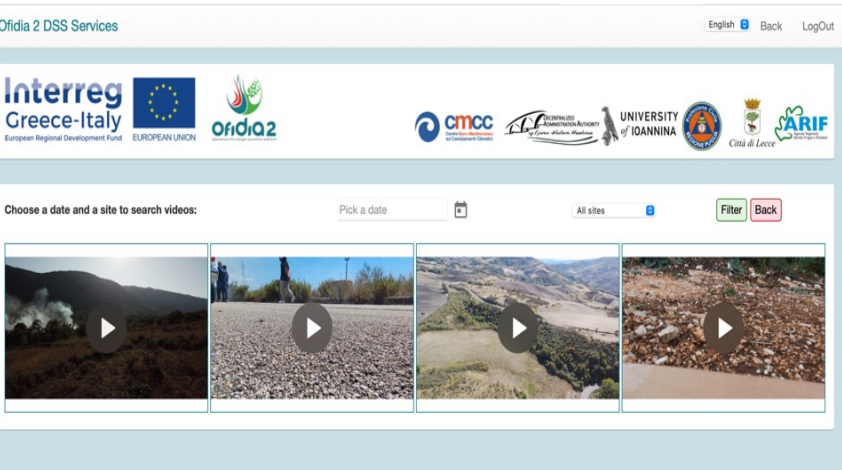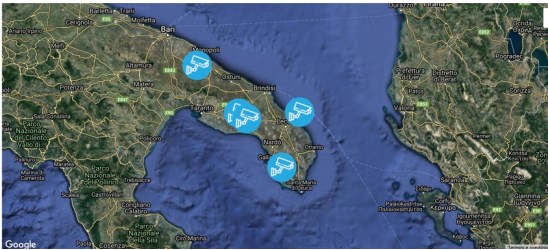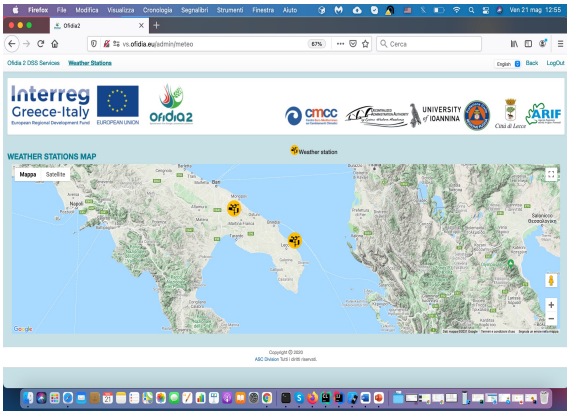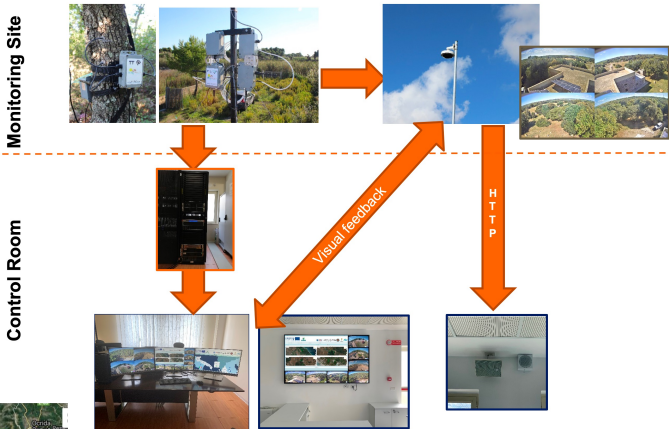# Forest Fires Monitoring & Patrolling (Puglia)

Wireless sensors networks

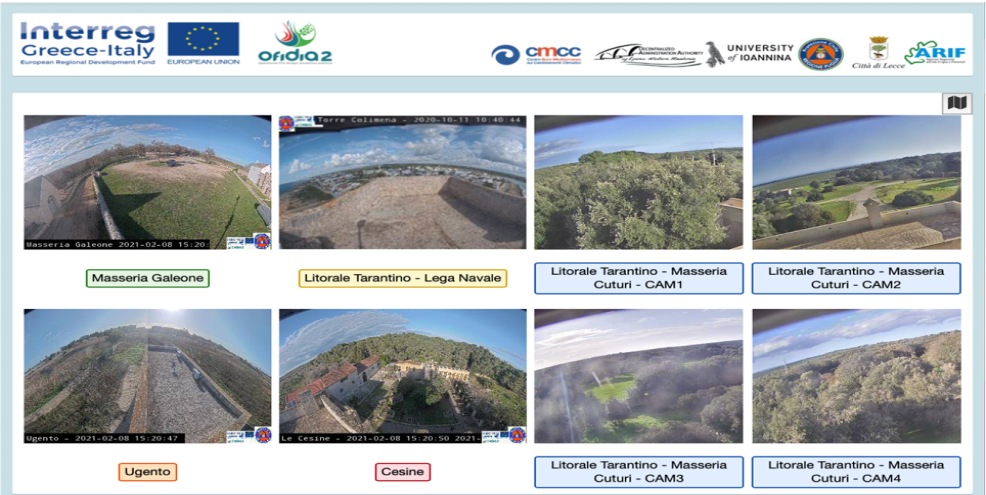## Weather stations

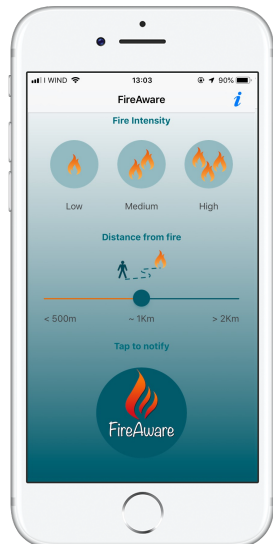## Environmental Monitoring

Drones

HD video cameras

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Wildfire Control Room at Puglia Civil Protection for fire hazard forecasting and monitoring

Education and **Lifelong Learning** through awareness-raising campaigns on fire danger prevention and biodiversity protection

FireAware crowdsensing mobile **App** to send an alert notification to the Civil Protection in case of a potential fire hazard, including images and the distance from fire

Social Awareness of fire danger risk

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Now that this project has successfully come to an end, we would be happy to share our results and achievements to start new and fruitful collaborations beyond borders

THANK YOU

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