UNITED NATIONS
Office for Outer Space Affairs

12th Annual UN-SPIDER Regional Support Offices Coordination Meeting
Vienna, Austria, 14 – 16 November 2022

RSO Greece

Haris Kontoes, Alexia Tsouni, Stella Girtsou

National Observatory of Athens – IAASARS – Operational Unit BEYOND

BEYOND Centre of EO Research and Satellite Remote Sensing

IAASARS

http://beyond-eocenter.eu

UNITED NATIONS
Office for Outer Space Affairs

BEYOND disaster-related services

FireHUB
24/7 Real-Time Forest Fire Monitoring service - Diachronic Burnt Scar Mapping (> 35 years) - Fire Risk assessment (http://beyond-eocenter.eu/index.php/web-services/firehub)

DustHUB
Detection and diffusion of desert dust, dust, volcanic ash and toxic gases (http://beyond-eocenter.eu/index.php/web-services/dusthub)

FloodHUB
Rapid Flood Mapping - Diachronic Flood Mapping - Flood monitoring and early warning (http://beyond-eocenter.eu/index.php/web-services/floodhub)

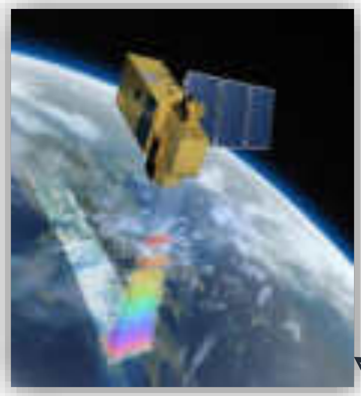
GeoHUB
Early warning and monitoring of geophysical disasters (earthquakes, landslides, volcanic eruptions) - Ground Displacement Mapping (http://beyond-eocenter.eu/index.php/web-services/geohub)

EYWA
Early Warning System for Mosquito Borne Diseases (http://beyond-eocenter.eu/index.php/web-services/eywa)

COVID - 19
Global spread monitoring of the COVID-19 pandemic (http://beyond-eocenter.eu/index.php/web-services/covid-19)

UNITED NATIONS
Office for Outer Space Affairs

BEYOND infrastructure / monitoring systems



Satellites Polar Orbit

X-/L-band Station

Sentinel Mirror Site

Satellites Geostationary Orbit
MSG SEVIRI

HELLENIC MirrorSite

Ελληνικό Mirror Site (Copernicus satellite missions) (http://beyond-eocenter.eu/index.php/web-services/hellenic-mirror-site)

GreekHUB

Sentinels GreekHUB (http://beyond-eocenter.eu/index.php/web-services/sentinels-greekhub)

Manned & Unmanned Aerial Vehicles

In-situ networks and crowdsourcing

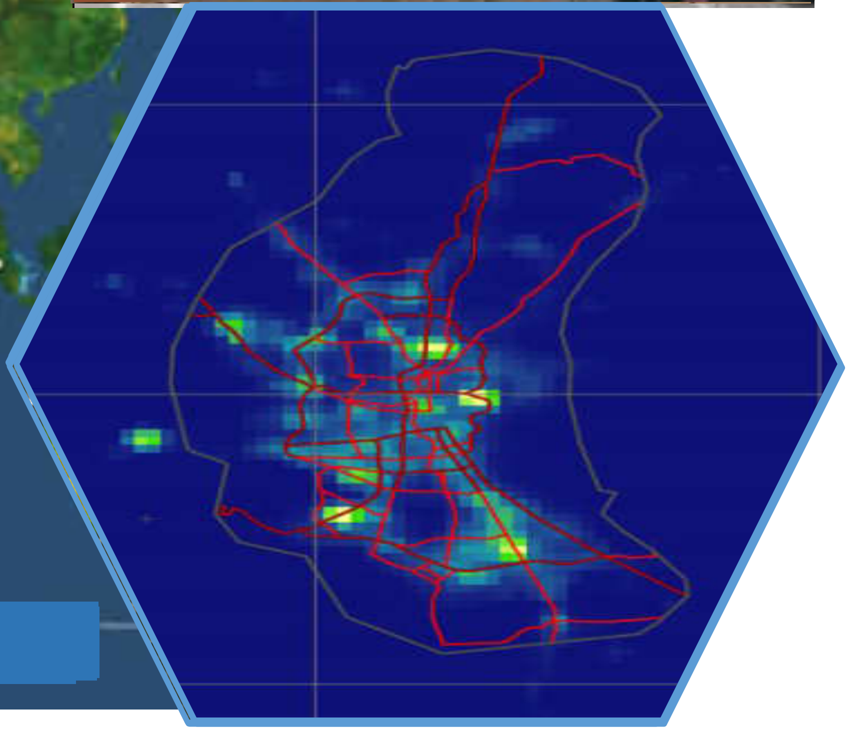
in-situ

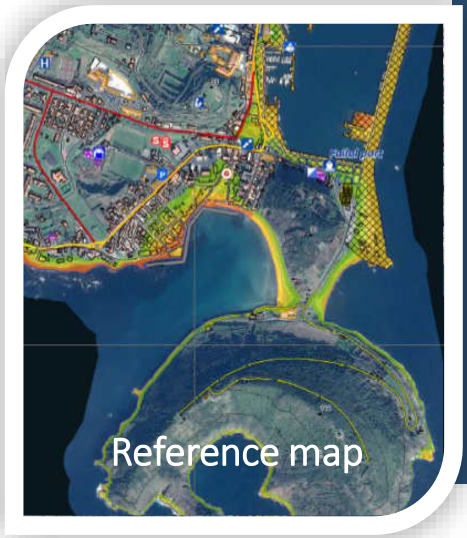
BEYOND activations in the Copernicus Emergency Management Service (EMS)

Prevention
Preparedness
Assessment
Response
Recovery

BEYOND activations in the Copernicus Emergency Management Service (EMS)

Prevention
Preparedness
Assessment
Response
Recovery





https://emergency.copernicus.eu/mapping

Firelogue project with Support Letter by UNSPIDER

UNITED NATIONS
Office for Outer Space Affairs

BEYOND
IAASARS

General Information about the Project

Firelogue

Nov 2021 - Octo 2025

Funding under **Horizon 2020**
Green Deal Call (LC-DG-1-1-2020)

Coordination and Support Action

Budget: **3,26 million**

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO [illegible]

UNITED NATIONS
Office for Outer Space Affairs

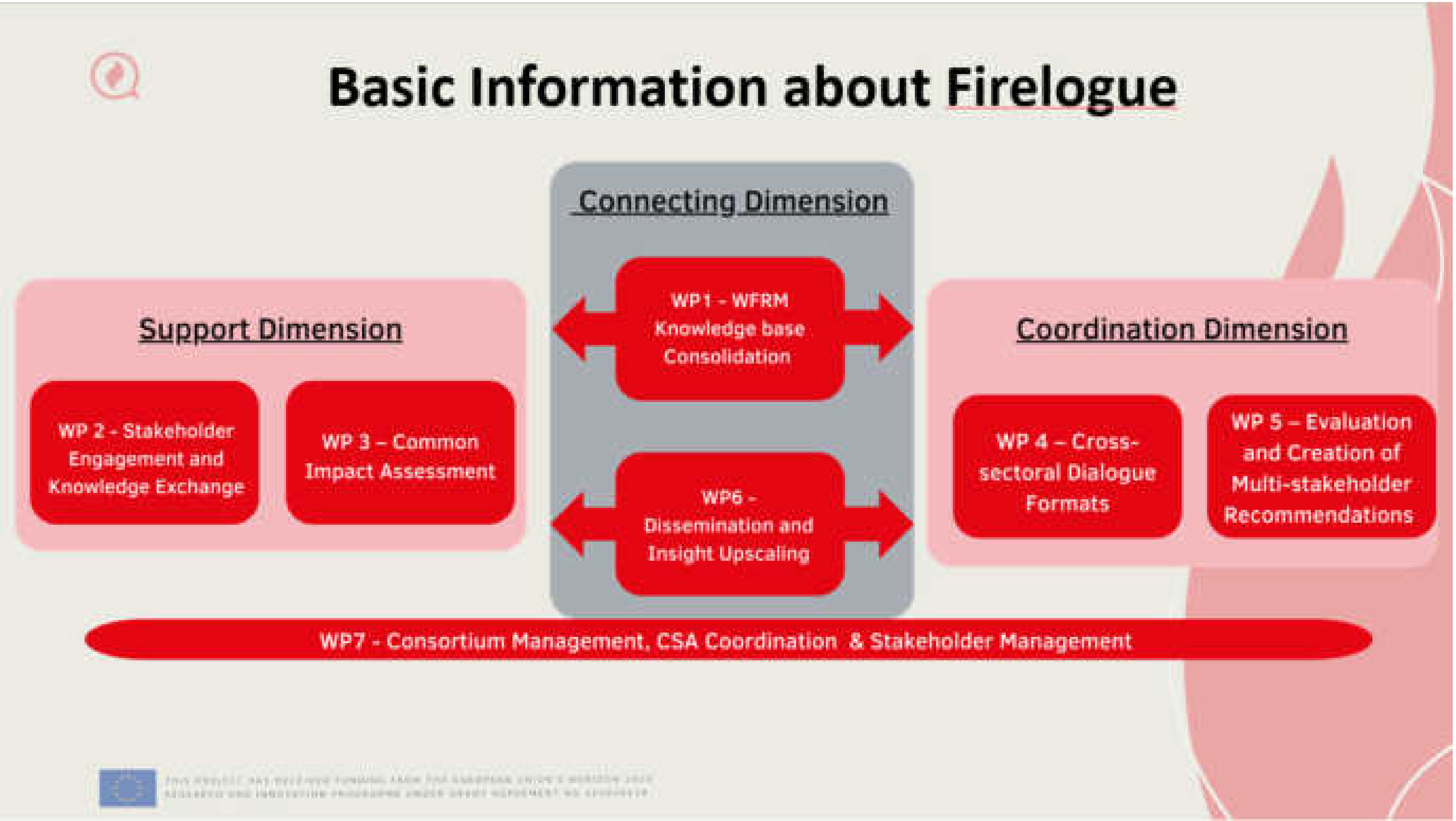
Firelogue project with Support Letter by UNSPIDER

BEYOND IAASARS

The Firelogue consortium

#	Participant organisation name	Country
1	Fraunhofer Gesellschaft für Angewandte Forschung e.V. (FhG)	Germany
2	Pau Costa Foundation (PCF)	Spain
3	National Observatory of Athens (NOA)	Greece
4	SAFE Cluster	France
5	Trilateral Research (TRI)	United Kingdom
6	EDGE in Earth Observation sciences Monoprosopi IKE (EDGE)	Greece
7	International Institute of Applied System Analysis (IIASA)	Austria
8	Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência (INESCTEC)	Portugal
9	The International Emergency Management Society (TIEMS)	Belgium
10	Virtual Operations Support Team (VOST) Portugal	Portugal
11	Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC)	Italy
12	Consorci Centre de Ciència i Tecnologia Forestal de Catalunya (CTFC)	Spain
13	Association for the Development of Industrial Aerodynamics (ADAI)	Portugal
14	Centre for Security Studies (KEMEA)	Greece
15	Universidad de Alcalá (UAH)	Spain

Firelogue project with Support Letter by UNSPIDER



UNITED NATIONS
Office for Outer Space Affairs

Firelogue project with Support Letter by UNSPIDER

BEYOND

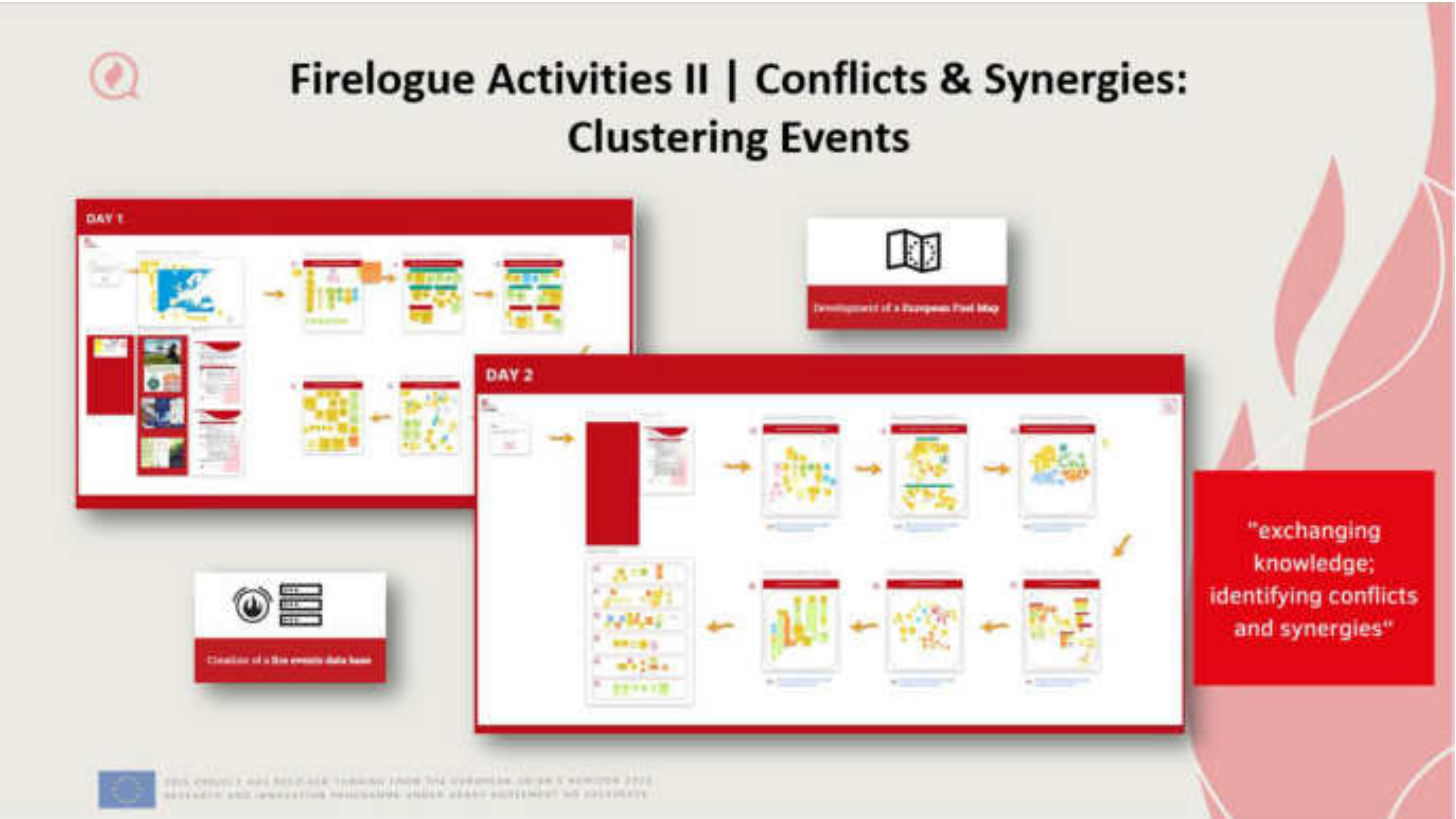
IAASARS

Firelogue Goals

- Gathering and disseminating known and new data on stakeholders, WFRM research results, experiences, existing and planned products
- Identifying real or perceived injustices linked to these uncovered conflicts
- Deconstructing conflicting (and synergies) aims, interests, mandates, policies and practices existing in WFRM
- Enabling WFRM community to address current and future challenges of forest fire
- Creating spaces for dialogue (dedicated knowledge, sharing formats) in order to co-develop intergrated strategies
- Linking experiences and best practices of a variety of stakeholders (from within and outside the WFRM - Community)

Firelogue project with Support Letter by UNSPIDER

Firelogue project with Support Letter by UNSPIDER



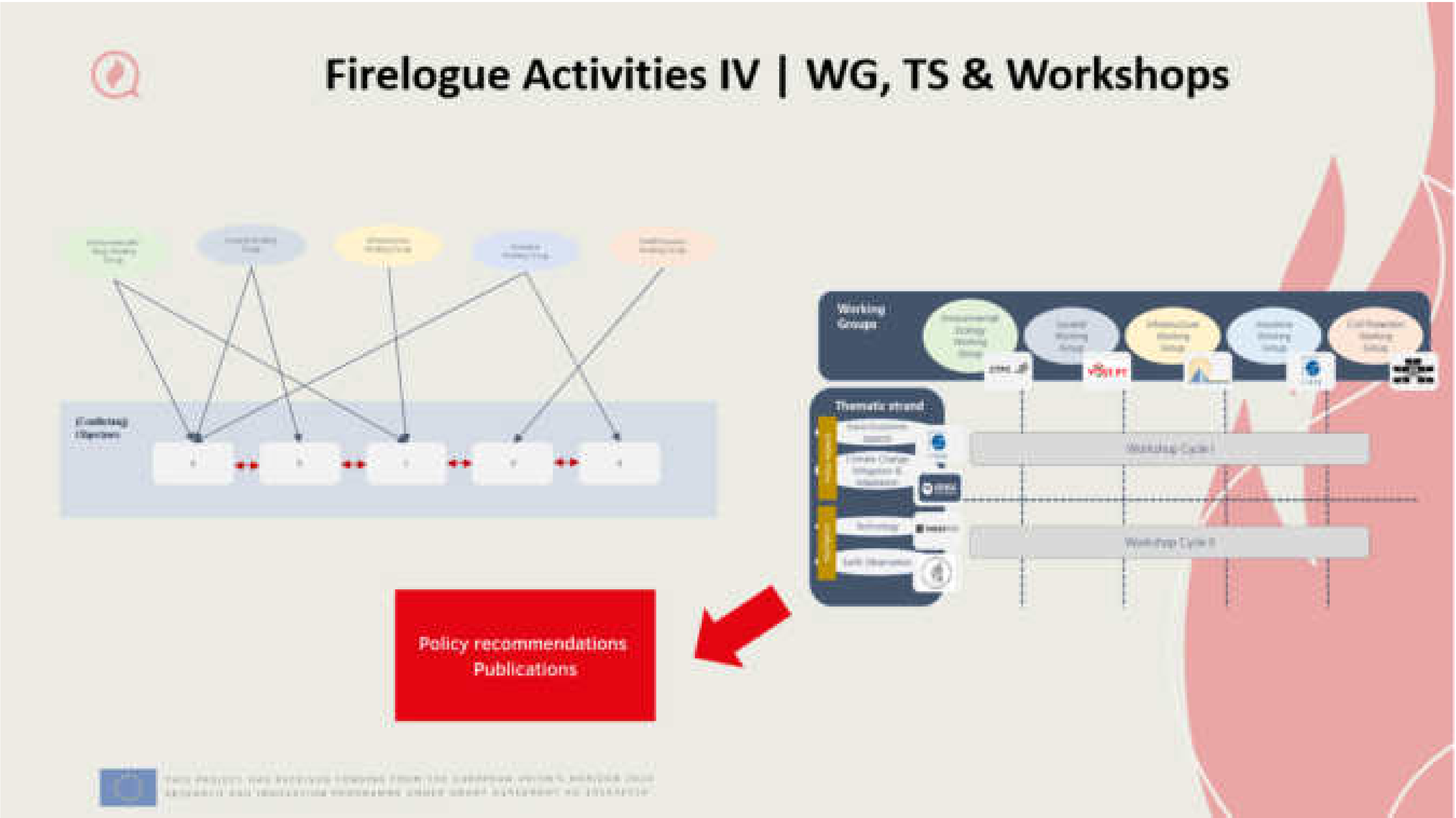
Firelogue project with Support Letter by UNSPIDER

UNITED NATIONS
Office for Outer Space Affairs

Firelogue project with Support Letter by UNSPIDER

BEYOND

IAASARS



UNITED NATIONS
Office for Outer Space Affairs

Firelogue project with Support Letter by UNSPIDER

BEYOND

IAASARS

Outlook

Use the initial findings of the Clustering Event to expand and evaluate key topics

Consolitate the existing Working Groups

Trust your commitment to engage in dialogue with us and each other

Firelogue

@firelogue
/firelogue
@firelogue
/firelogue
firelogue.eu

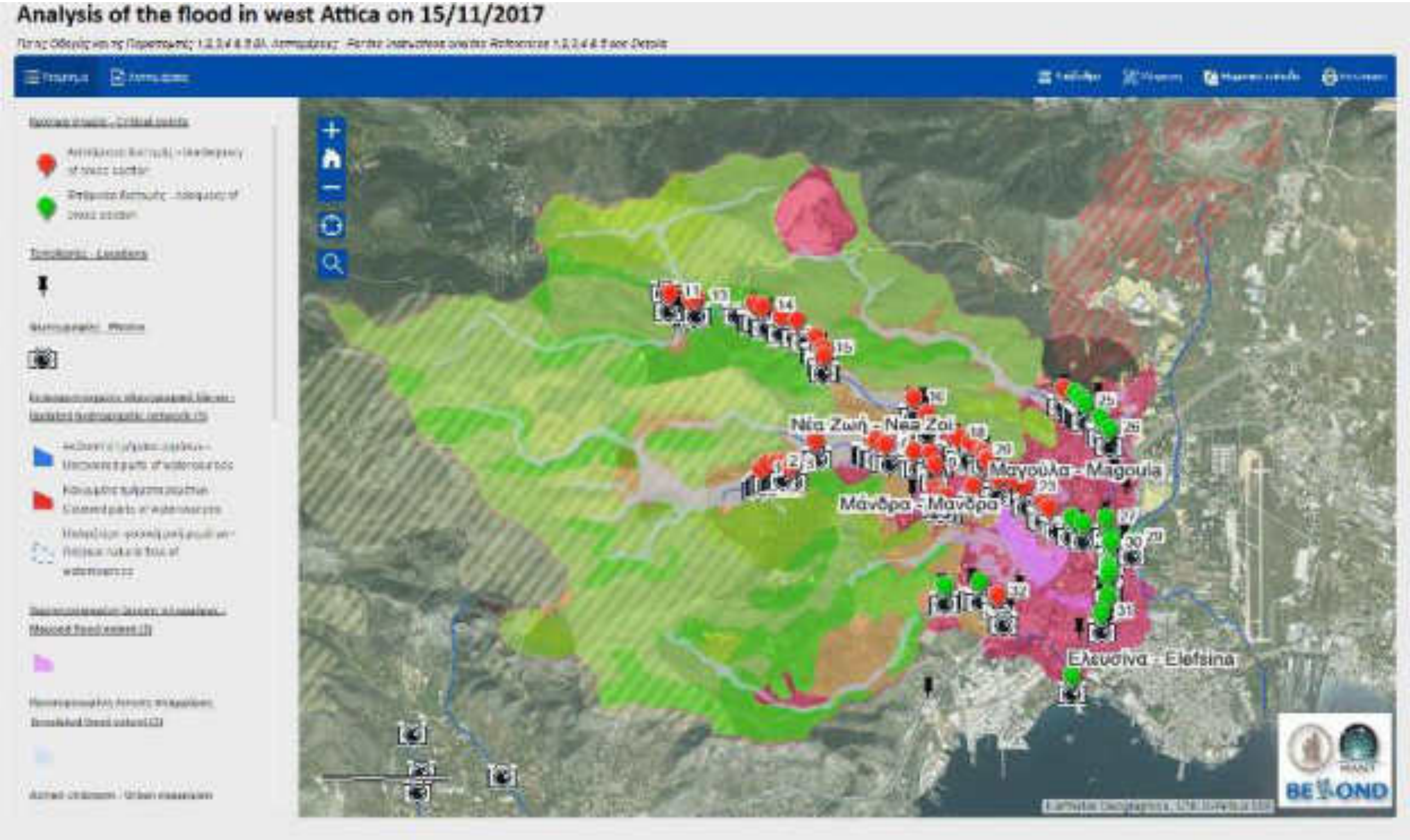
info@firelogue.eu

FloodHUB: Mandra 2017 (24 fatalities): Setup of an integrated web GIS platform

UNITED NATIONS
Office for Outer Space Affairs

BEYOND

FloodHUB



EuroGEO

Disaster Resilience Action Group

UNITED NATIONS
Office for Outer Space Affairs

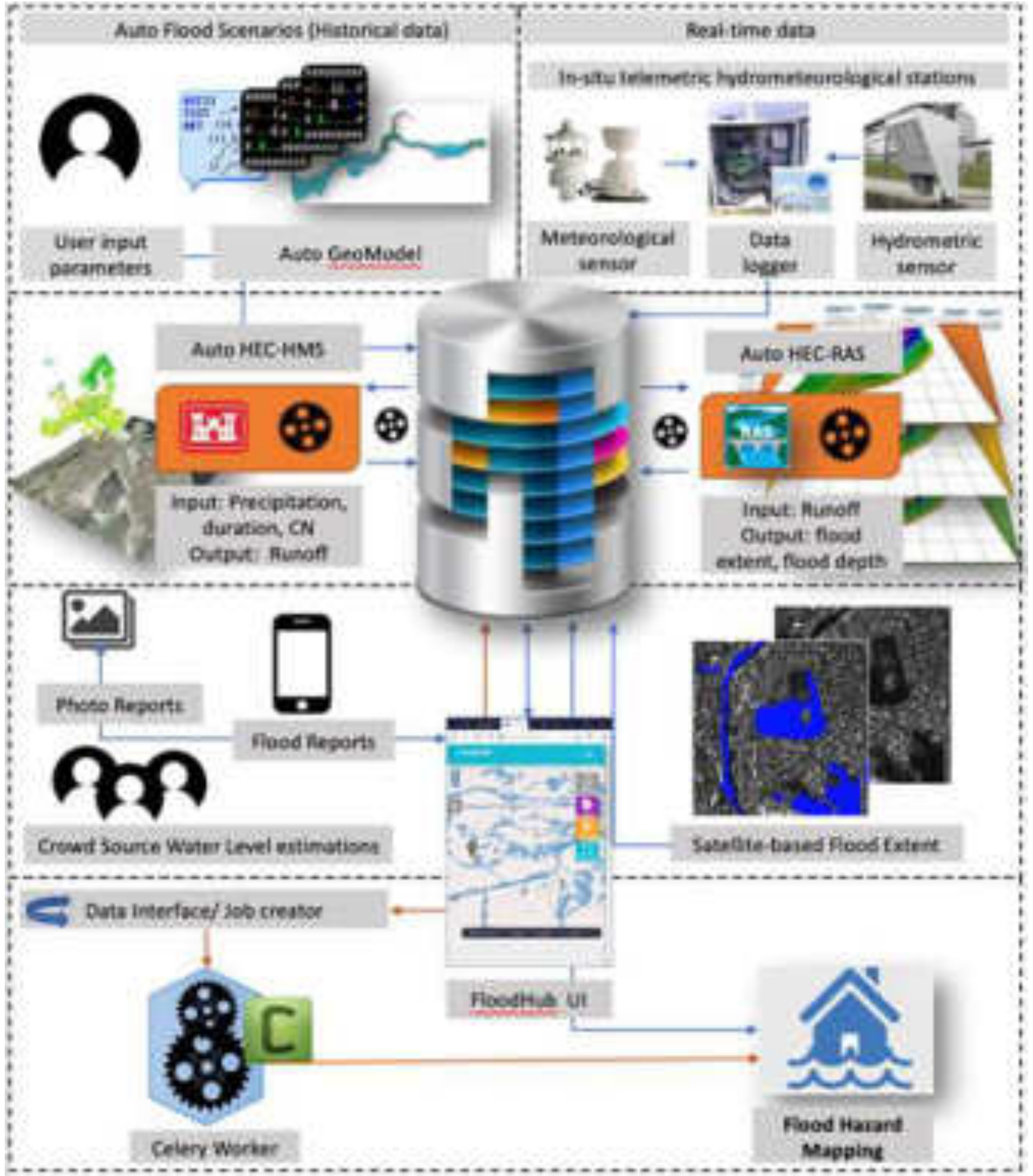
Mandra 2020:
Architecture of the FloodHUB system

BEYOND

FloodHUB

An integrated near-real-time flood monitoring system:

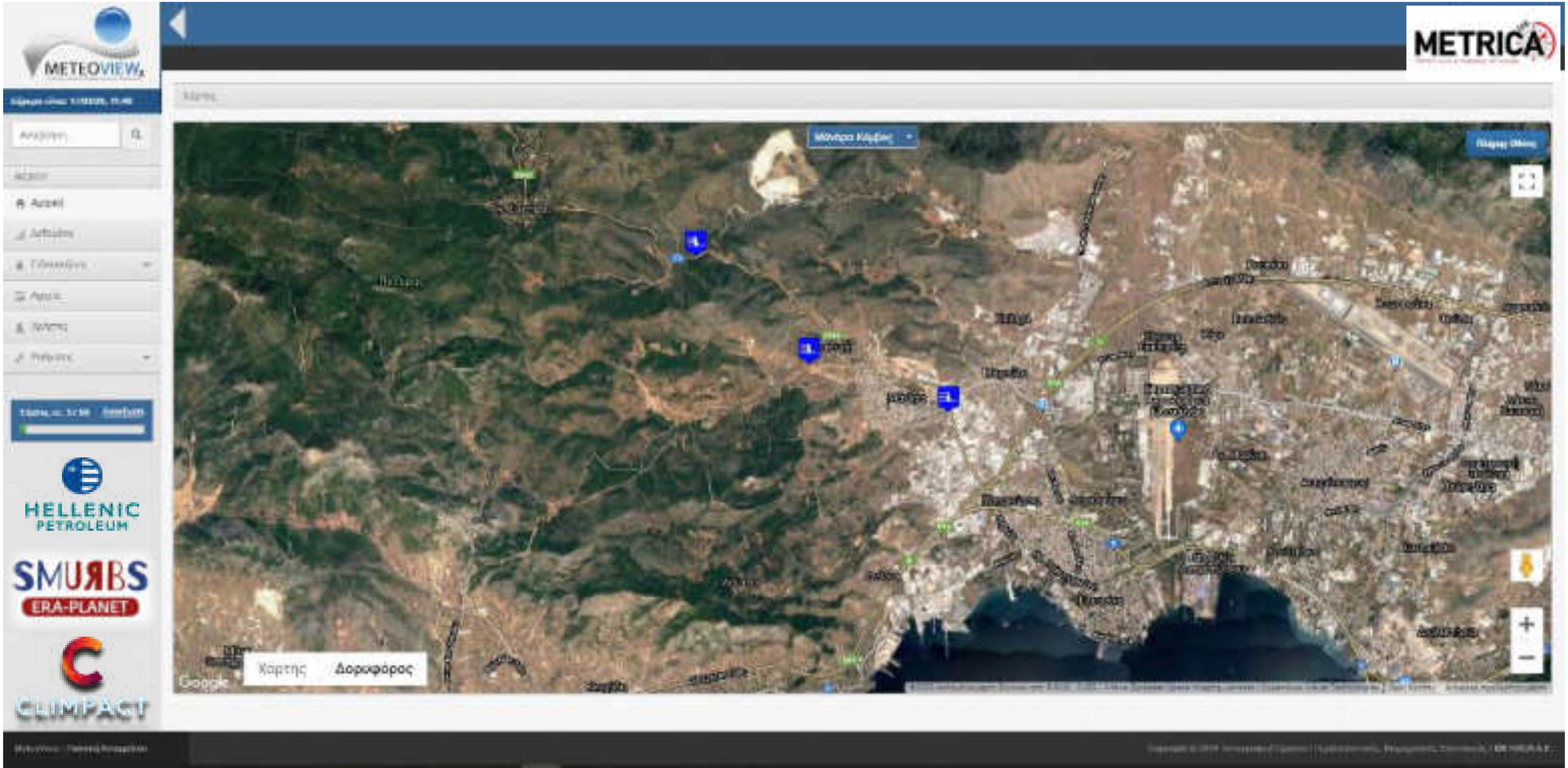
- based on modeling, multi-source EO and crowdsourced data
- with a fully scalable and transferable modular architecture
- delivering a reliable operational awareness picture of the crisis every 5 minutes to all the relevant authorities



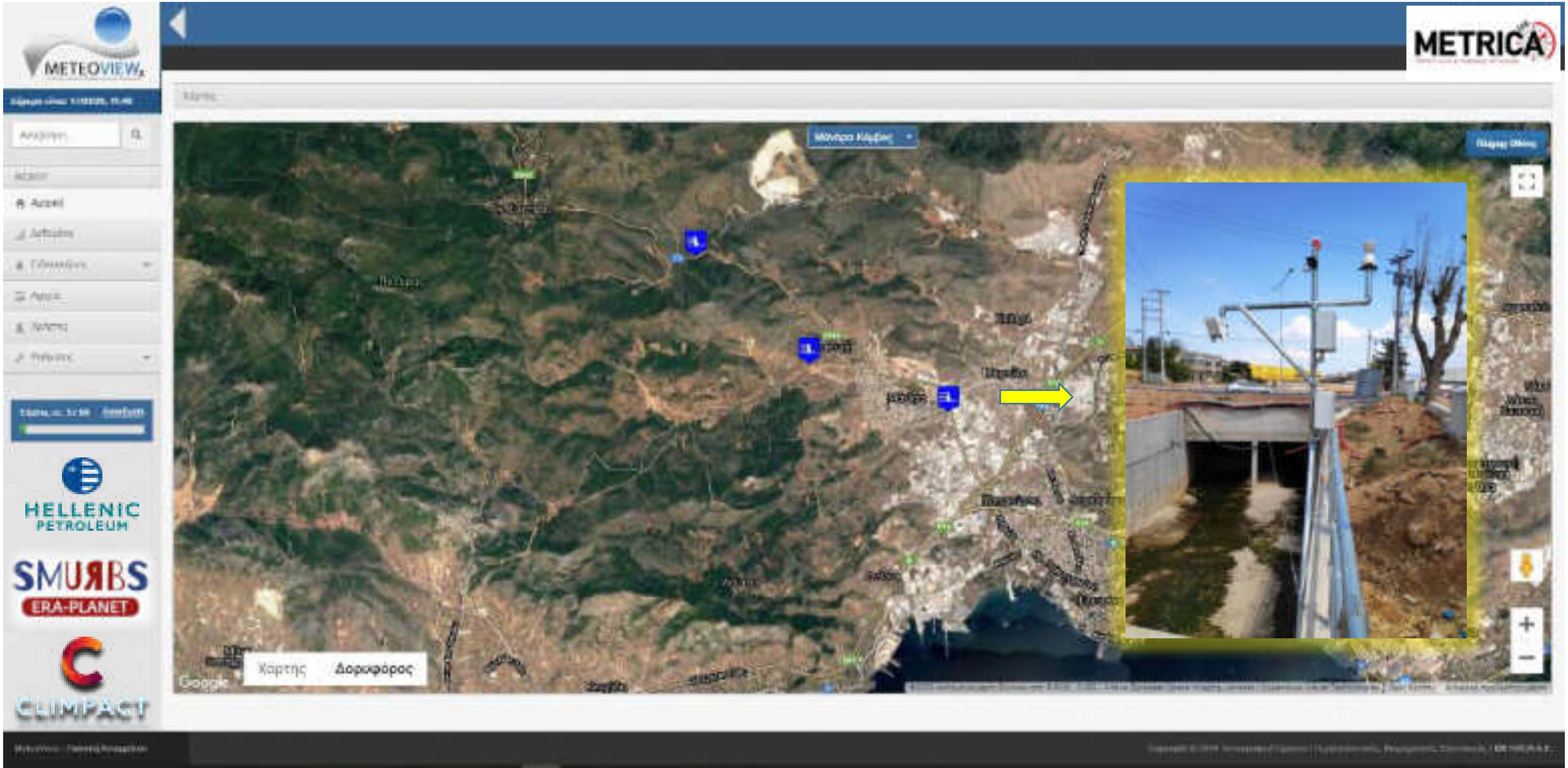
Near-real-time ingestion and assimilation of:

- hydrometeorological parameters measured at 3 in-situ telemetric stations (installed at 3 critical locations)
- satellite data (e.g. from high resolution Sentinels collected from the Hellenic Mirror Site)
- crowdsourced data (collected via the dedicated crowdsourcing platform).

Web platform of the 3 telemetric hydrometeorological stations



Web platform of the 3 telemetric hydrometeorological stations



UNITED NATIONS
Office for Outer Space Affairs

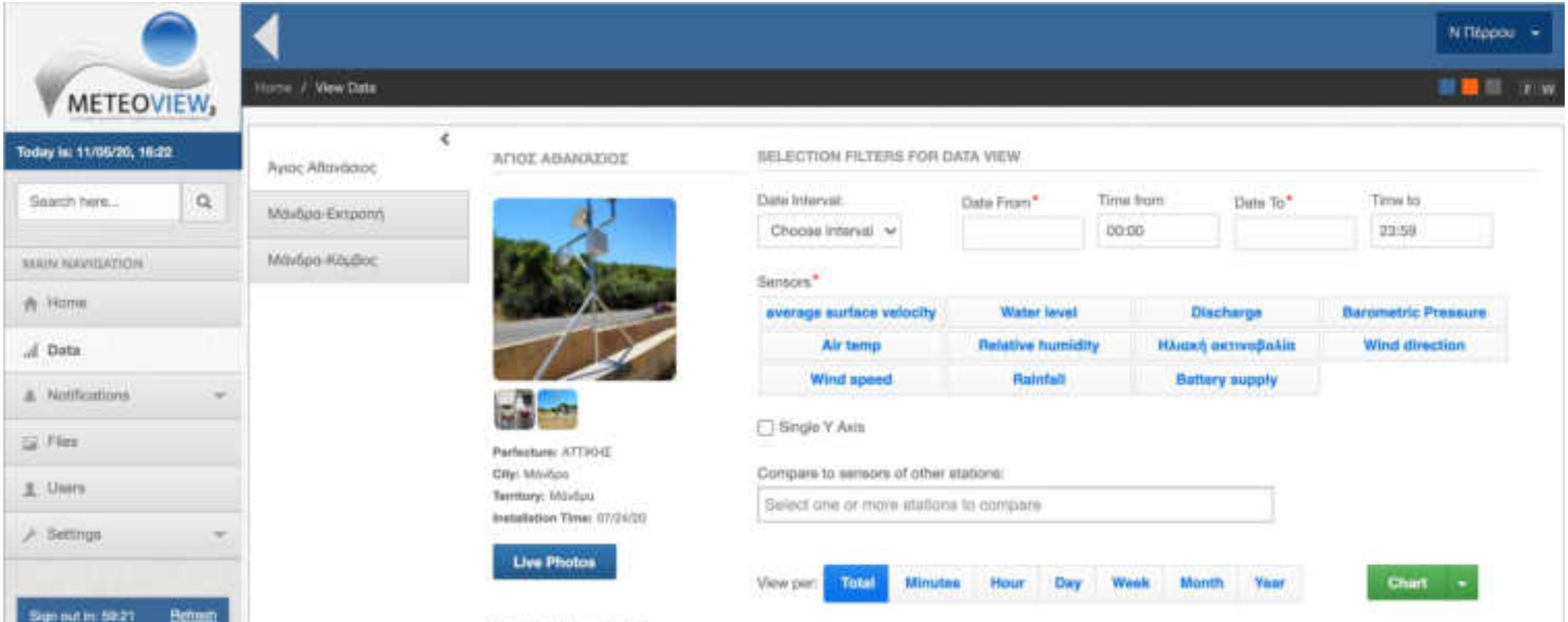
Web platform of the 3 telemetric hydrometeorological stations

BEYOND

FloodHUB

Web platform of the 3 telemetric hydrometeorological stations

Web platform of the 3 telemetric hydrometeorological stations

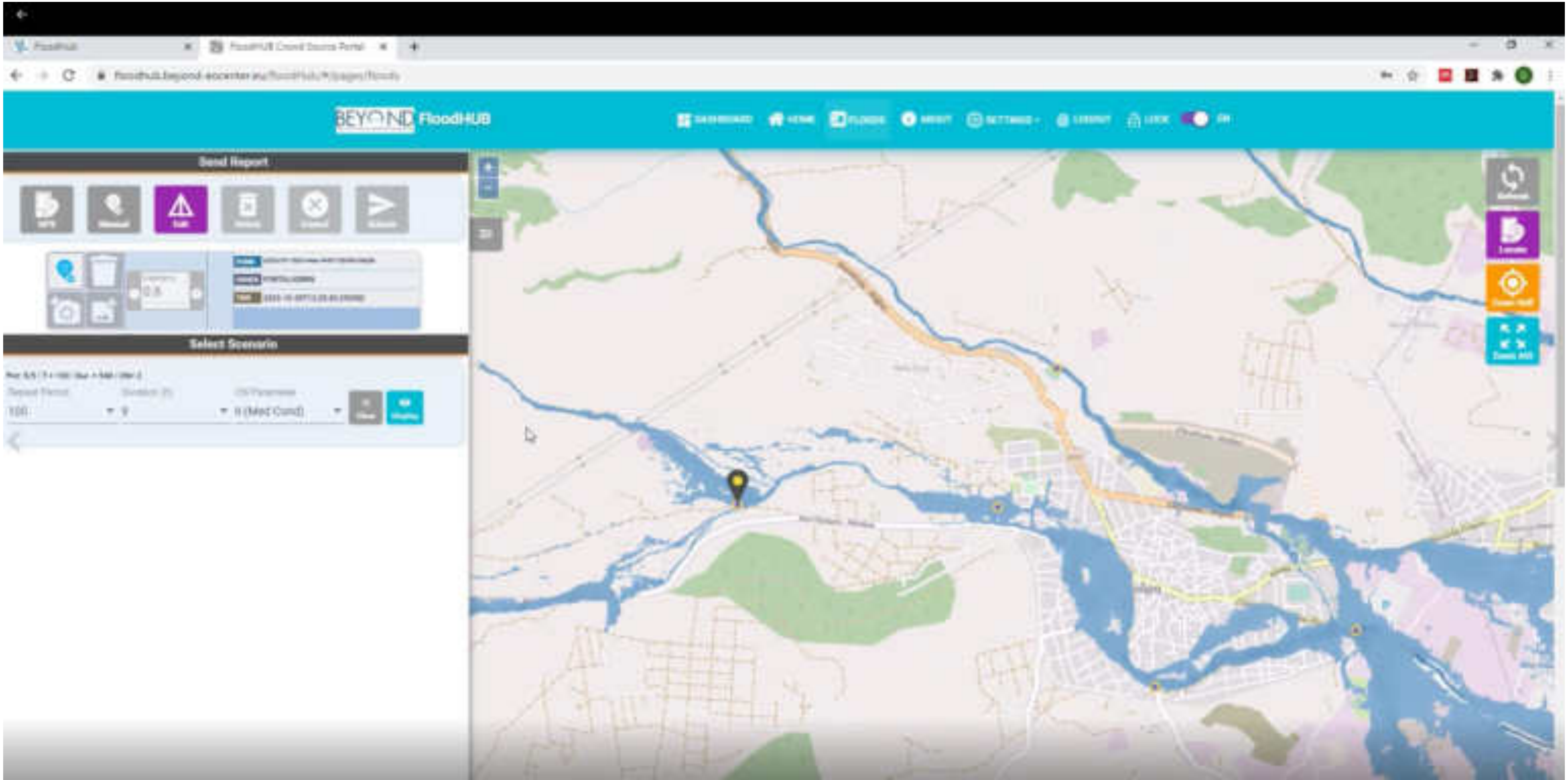


The BEYOND Center of Excellence can now provide **to the relevant operational bodies (e.g. civil protection and local authorities)** every **5 minutes** measurements for **10 parameters:** rainfall, water level, discharge, average surface water velocity, wind direction, wind speed, air temperature, barometric pressure, relative humidity and solar radiation.

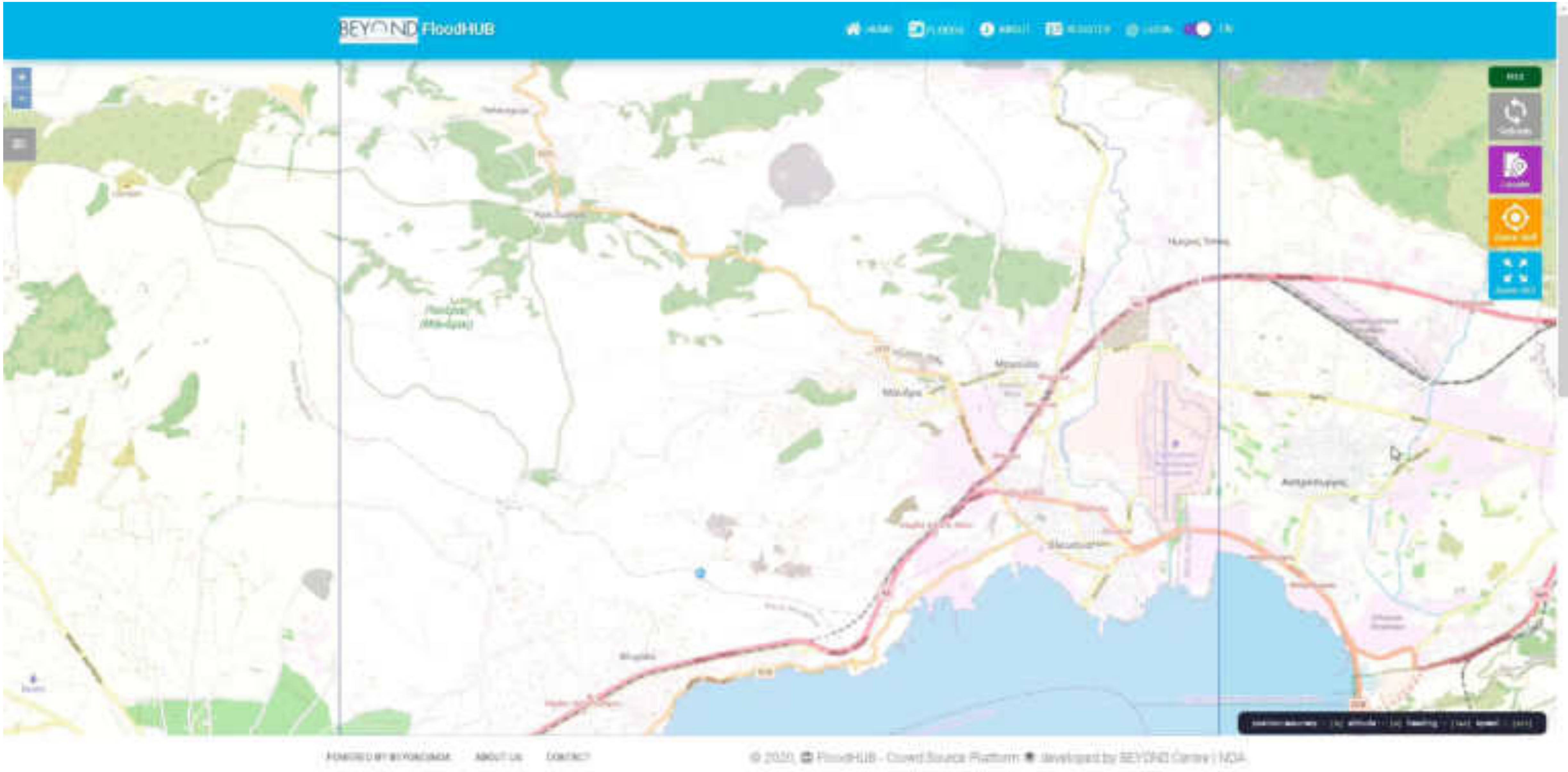
UNITED NATIONS
Office for Outer Space Affairs

Real-time crowdsourcing platform for staff and volunteers

BEYOND FloodHUB



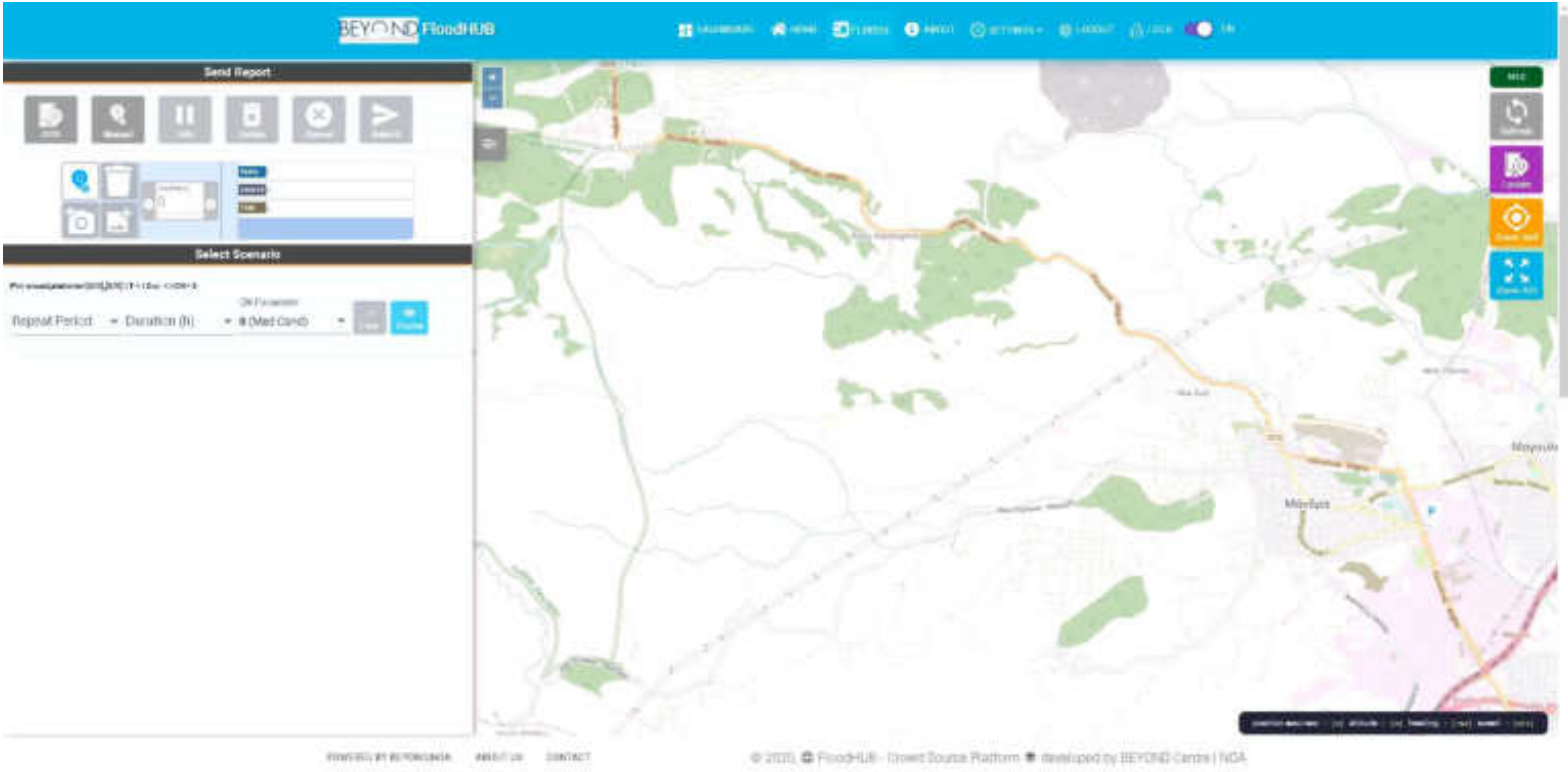
Integrated near-real-time flood monitoring system



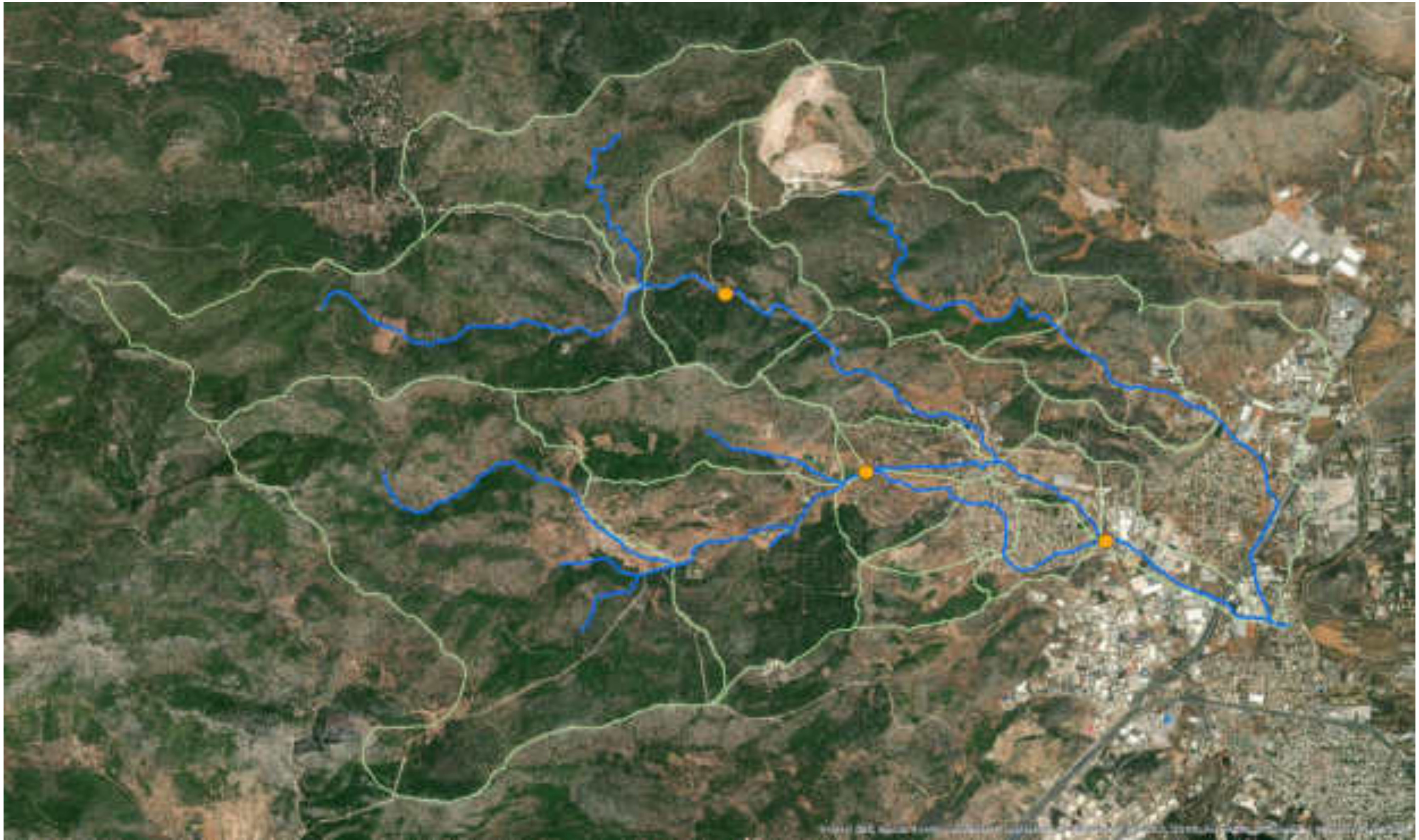
UNITED NATIONS
Office for Outer Space Affairs

Integrated near-real-time flood monitoring system

BEYOND FloodHUB



Hydrologic & hydraulic simulation



RIVER BASIN
57 km^2

SUBBASINS
19

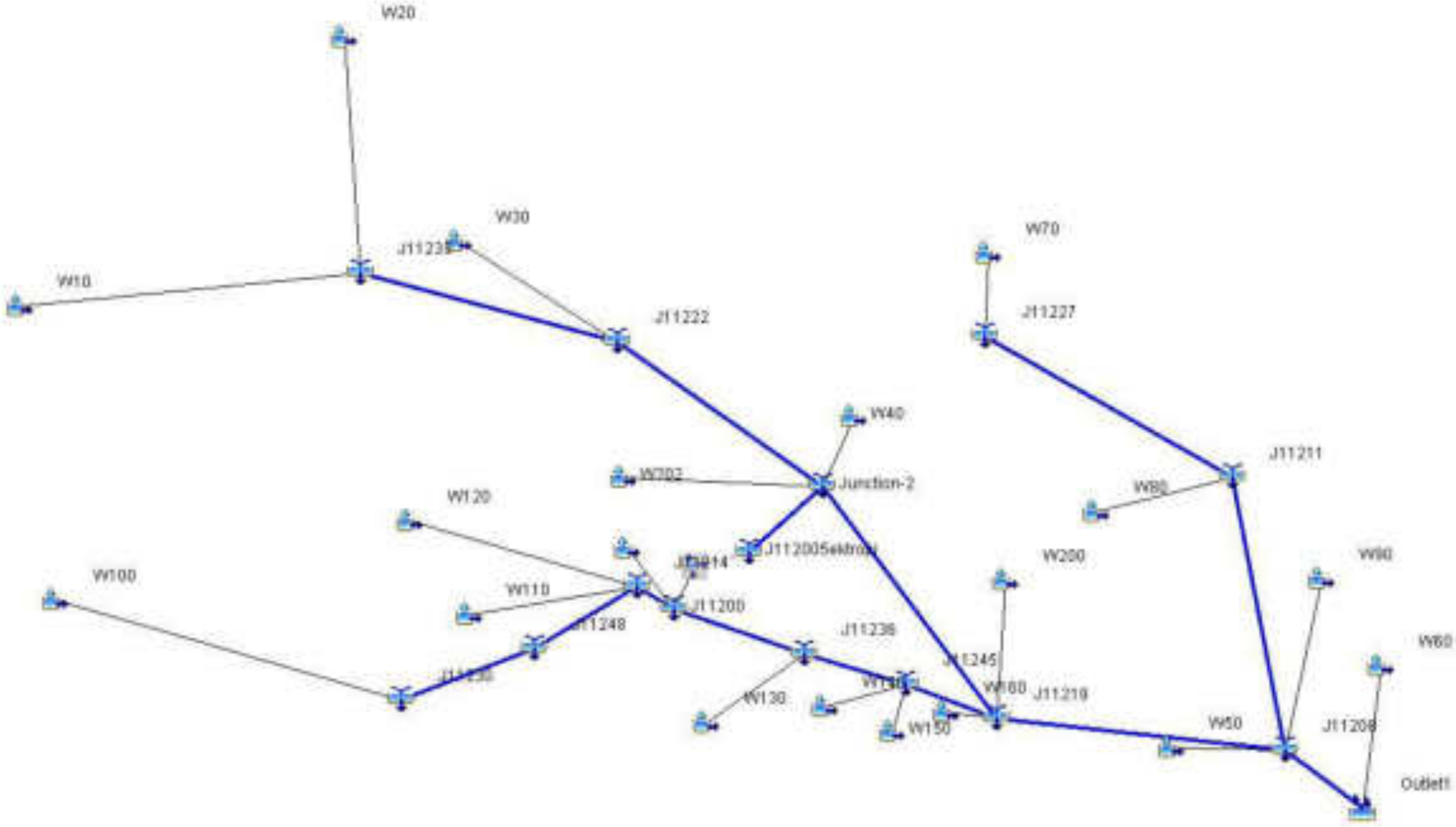
RAINFALL IDF CURVE
Koutsoyiannis & Baloutsos, 2000

$i(d,T) = 40.6\,(T^{0.185} - 0.45)/(d + 0.189)^{0.796}$

DISTRIBUTION
Worst profile method

TIME OF CONCENTRATION
Kirpich (SCS) method

Hydrologic & hydraulic simulation



HYDROLOGIC MODELING:
HEC-HMS
(free & open access)

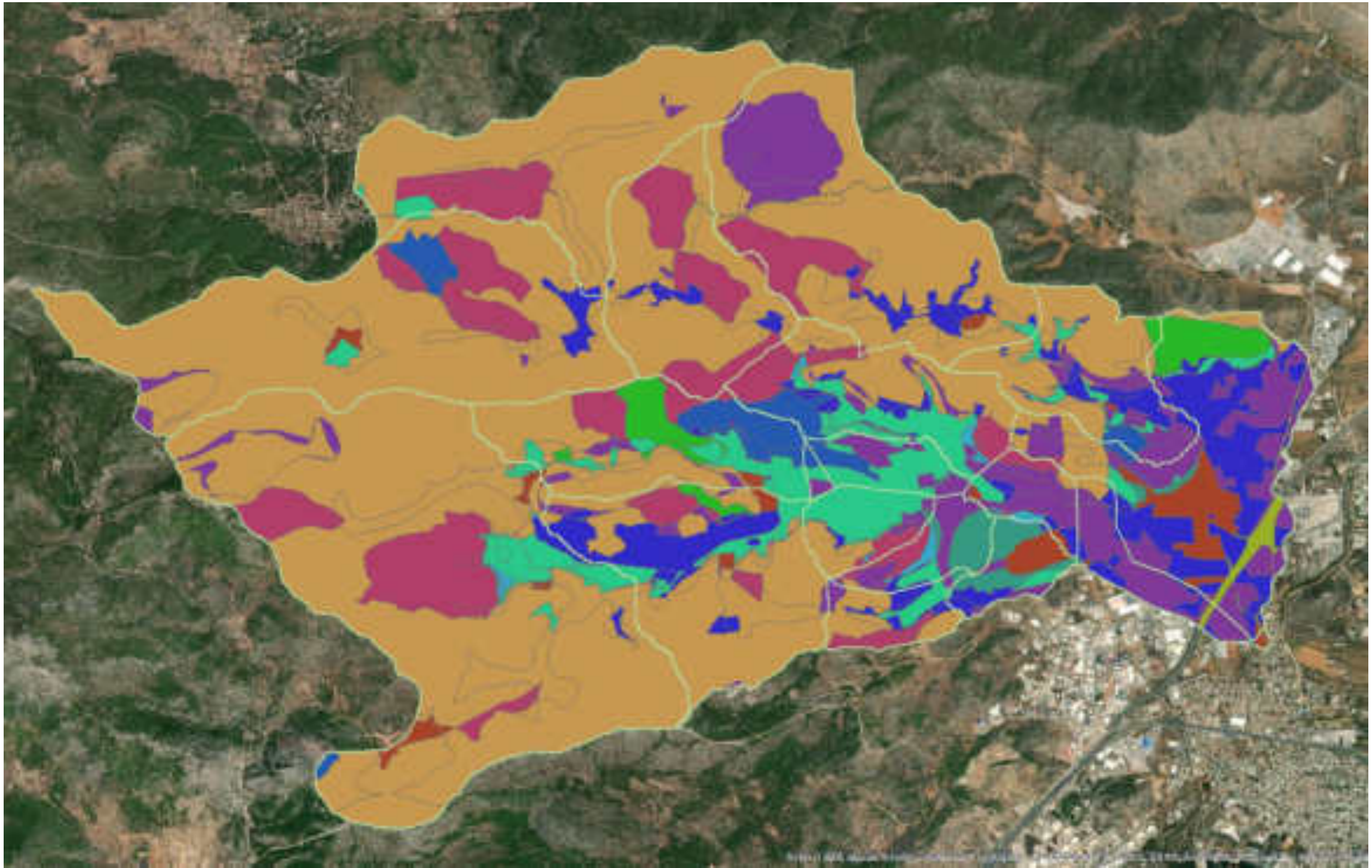
<u>Input</u>: rainfall data through HEC-DSS for various combinations of return periods T (years) and rainfall duration d (hours)

SCS-CN (Curve Number) method for extracting the excess from the gross rainfall, and the unit hydrograph, for propagating the surface runoff to the basin outlet

<u>Run</u>: all scenarios

<u>Output</u>: flow hydrographs

Hydrologic & hydraulic simulation



HYDROLOGIC MODELING:
HEC-HMS
(free & open access)

<u>Input</u>: rainfall data through HEC-DSS for various combinations of return periods T (years) and rainfall duration d (hours)

SCS-CN (Curve Number) method for extracting the excess from the gross rainfall, and the unit hydrograph, for propagating the surface runoff to the basin outlet

<u>Run</u>: all scenarios

<u>Output</u>: flow hydrographs

UNITED NATIONS
Office for Outer Space Affairs

Hydrologic & hydraulic simulation

BEYOND FloodHUB

Antecedent Soil Moisture Conditions	T = 50 years	T = 100 years	T = 200 years	T = 500 years	T = 1000 years
CN I Dry conditions	T50 CNI D3	T100 CNI D3	T200 CNI D3	T500 CNI D3	T1000 CNI D3
	T50 CNI D6	T100 CNI D6	T200 CNI D6	T500 CNI D6	T1000 CNI D6
	T50 CNI D9	T100 CNI D9	T200 CNI D9	T500 CNI D9	T1000 CNI D9
CN II Average conditions	T50 CNII D3	T100 CNII D3	T200 CNII D3	T500 CNII D3	T1000 CNII D3
	T50 CNII D6	T100 CNII D6	T200 CNII D6	T500 CNII D6	T1000 CNII D6
	T50 CNII D9	T100 CNII D9	T200 CNII D9	T500 CNII D9	T1000 CNII D9
CN III Wet conditions	T50 CNIII D3	T100 CNIII D3	T200 CNIII D3	T500 CNIII D3	T1000 CNIII D3
	T50 CNIII D6	T100 CNIII D6	T200 CNIII D6	T500 CNIII D6	T1000 CNIII D6
	T50 CNIII D9	T100 CNIII D9	T200 CNIII D9	T500 CNIII D9	T1000 CNIII D9

HYDRAULIC MODELING:
HEC-RAS
(free & open access)

Input:
* flow hydrographs for each stream of the hydrographic network
* banks and road network through breaklines
* DEM at 5m spatial resolution provided by the National Cadastre and Mapping Agency SA of Greece

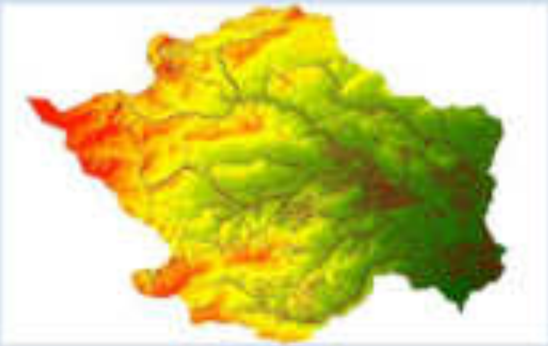
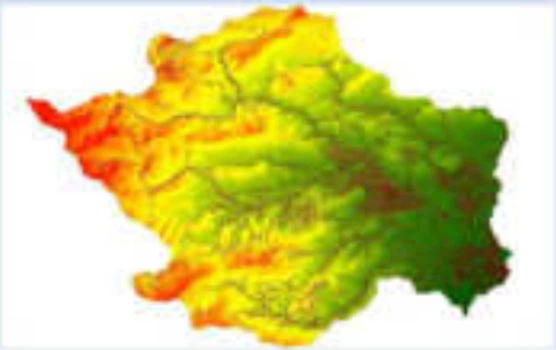
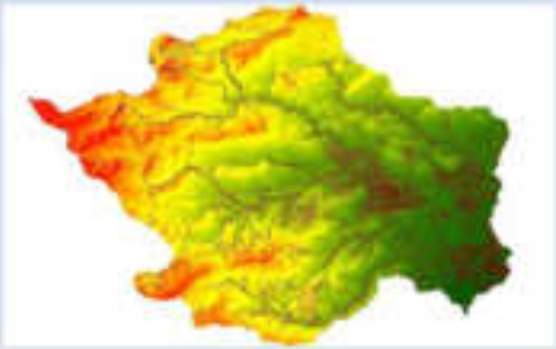
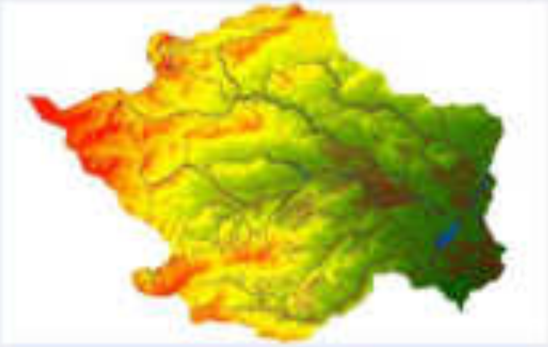
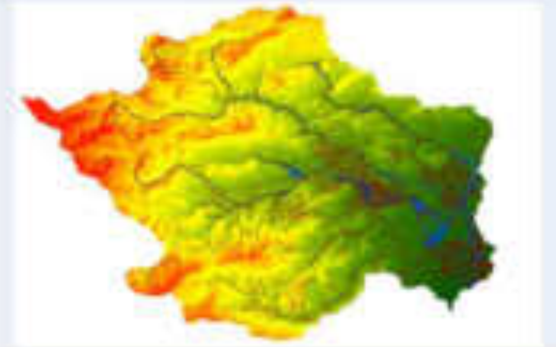
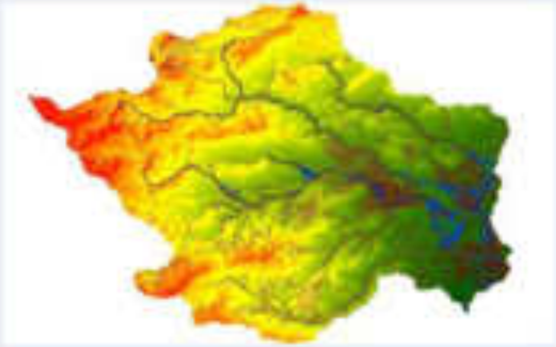
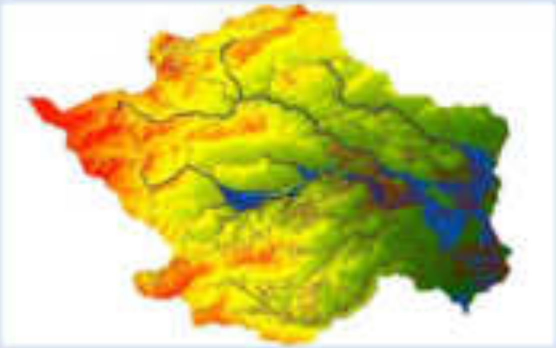
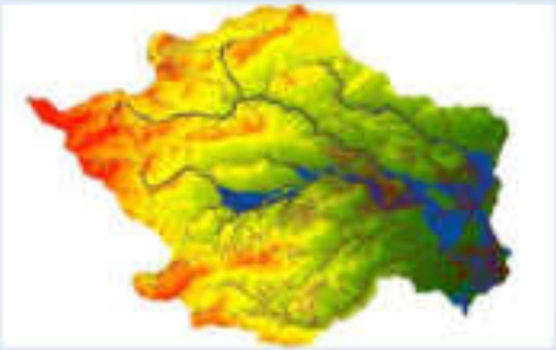
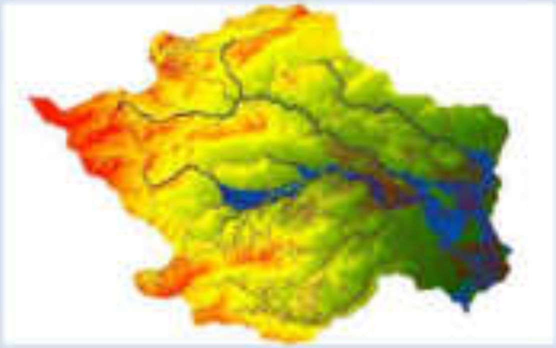
Run: All scenarios at 10m spatial resolution (2D mesh)

Output: flood extent

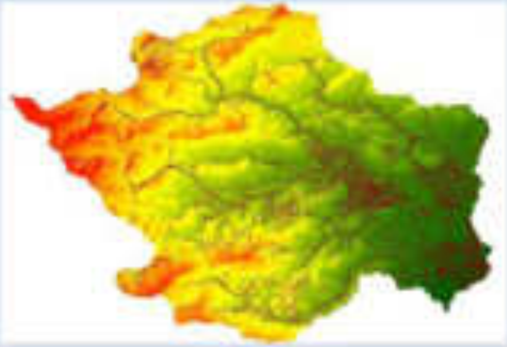
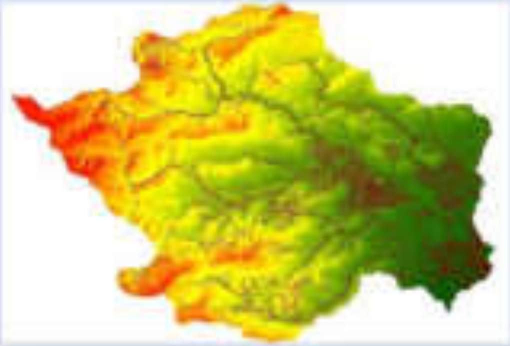
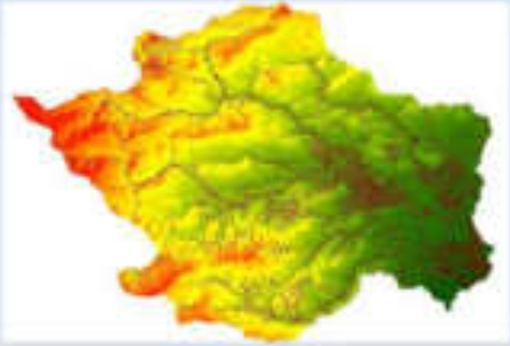
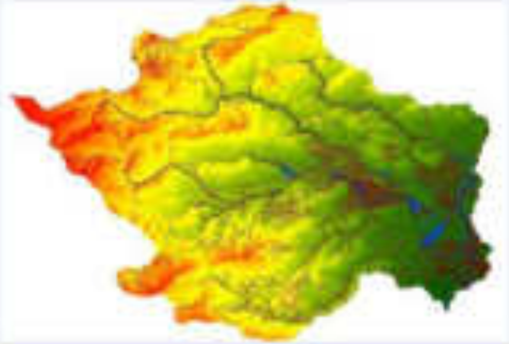
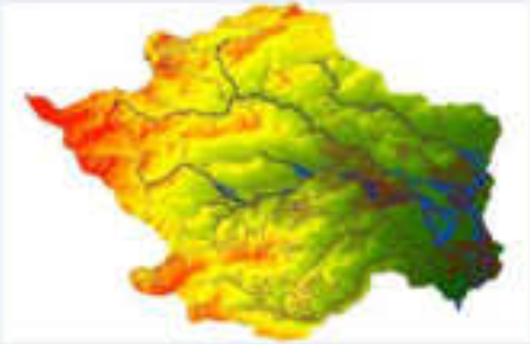
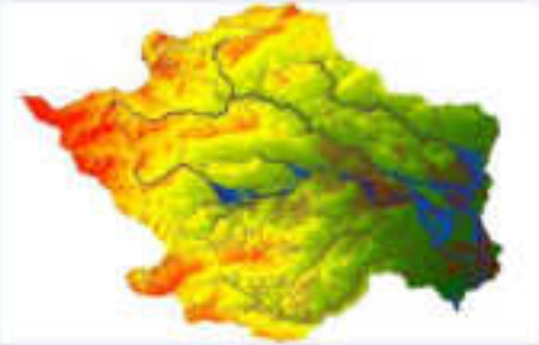
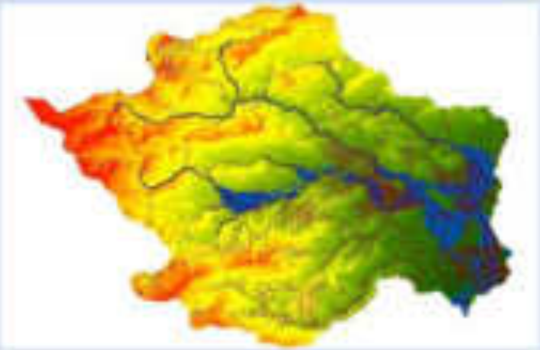
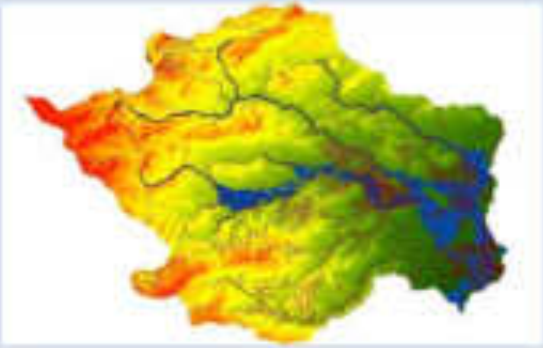
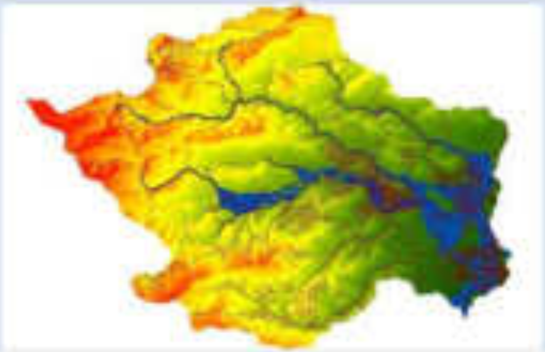
UNITED NATIONS
Office for Outer Space Affairs

Flood mapping results
T = 50 years

BEYOND FloodHUB

T = 50 years	d = 3 hours	d = 6 hours	d = 9 hours
CN I Dry conditions			
CN II Average conditions			
CN III Wet conditions			

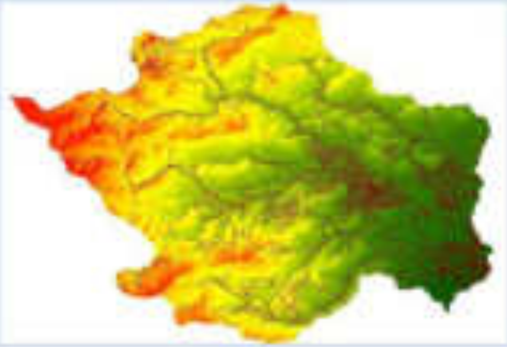
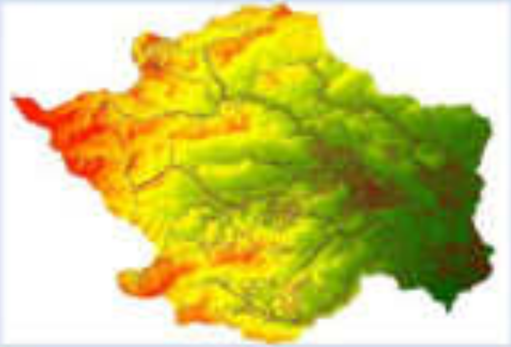
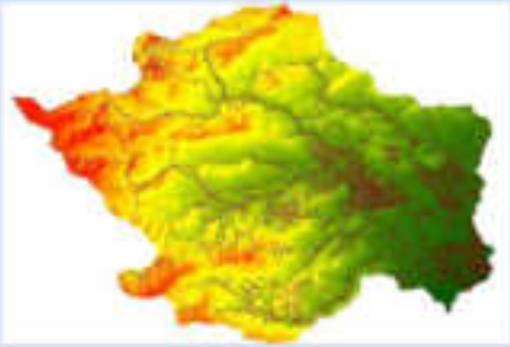
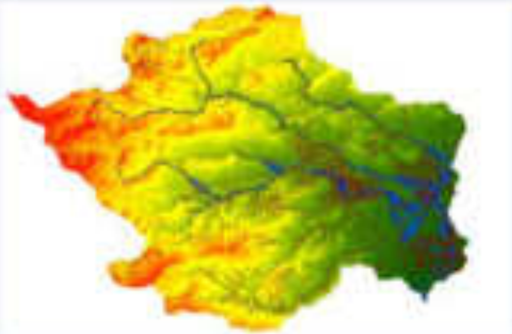
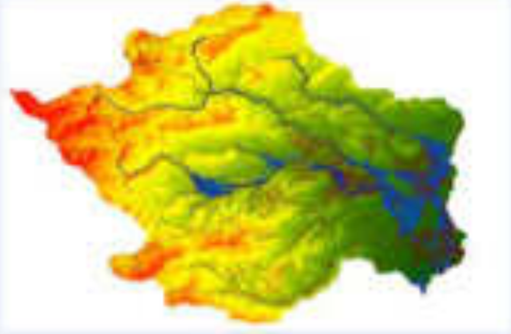
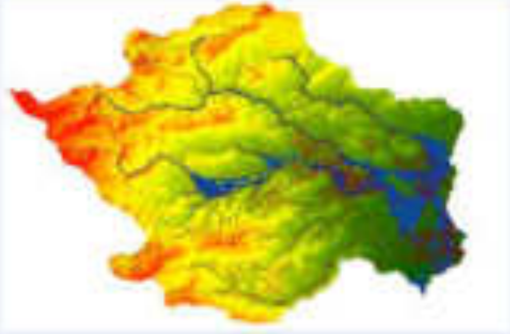
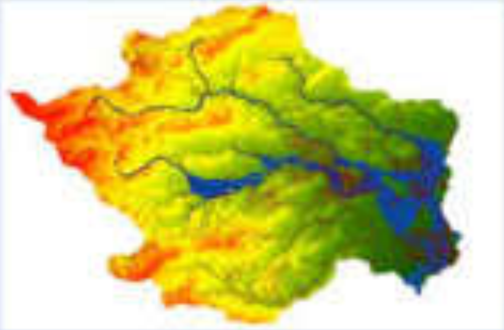
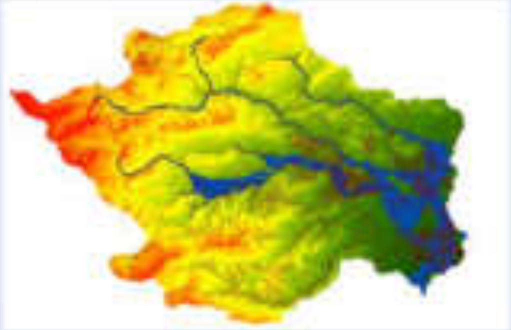
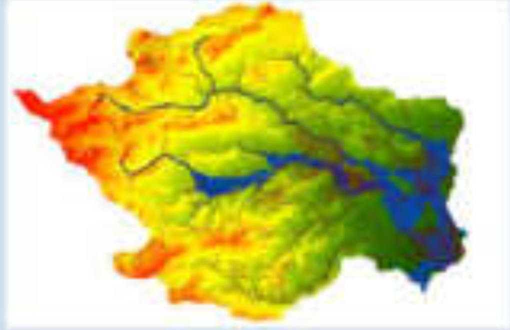
Flood mapping results
T = 100 years

T = 100 years	d = 3 hours	d = 6 hours	d = 9 hours
CN I Dry conditions			
CN II Average conditions			
CN III Wet conditions			

UNITED NATIONS
Office for Outer Space Affairs

Flood mapping results
T = 200 years

BEYOND FloodHUB

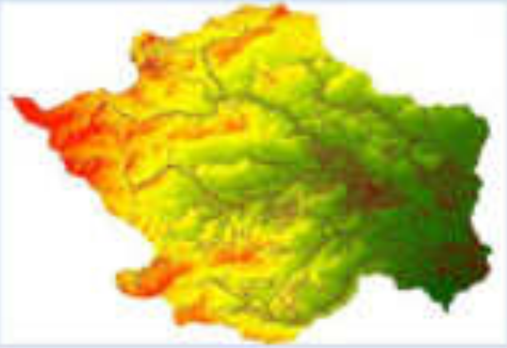
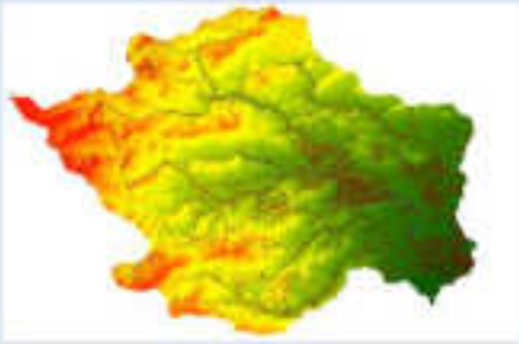
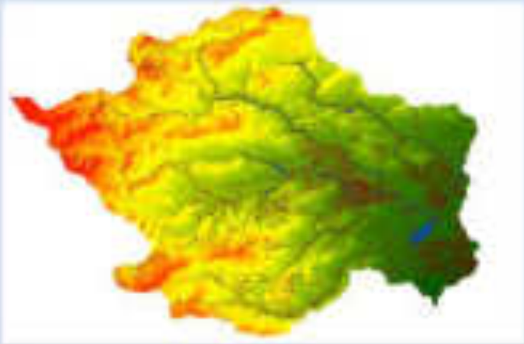
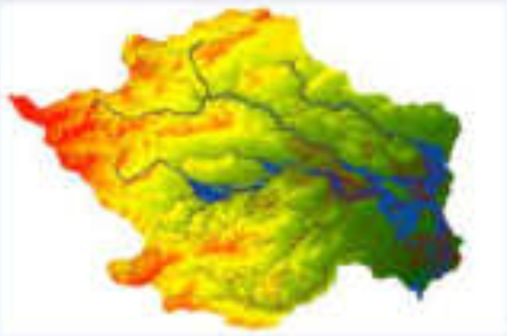
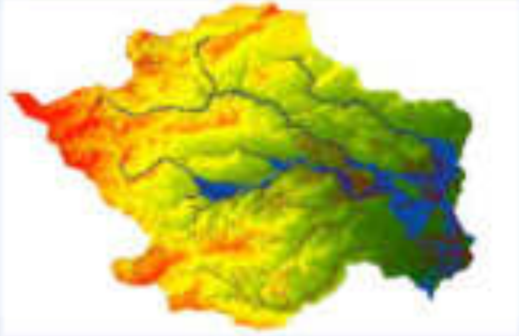
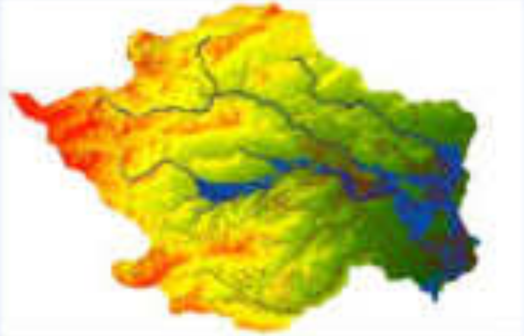
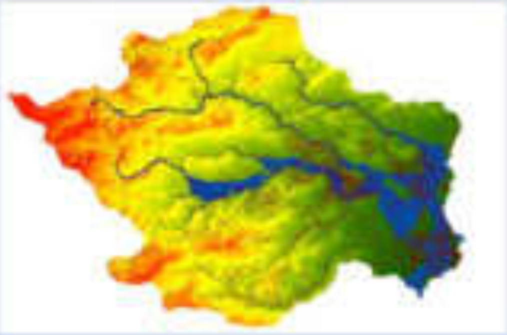
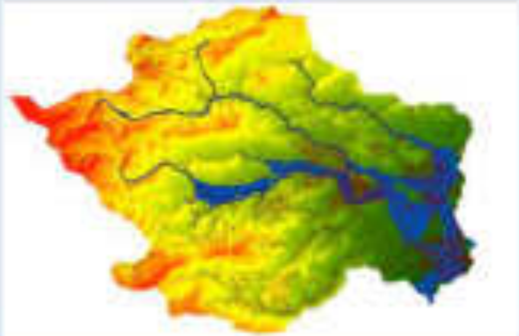
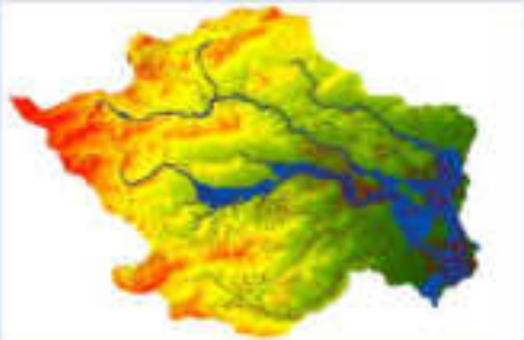
T = 200 years	d = 3 hours	d = 6 hours	d = 9 hours
CN I Dry conditions			
CN II Average conditions			
CN III Wet conditions			

UNITED NATIONS
Office for Outer Space Affairs

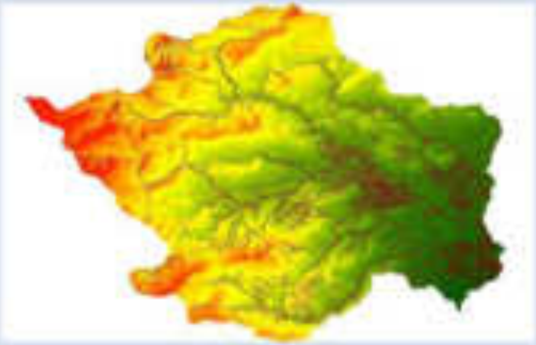
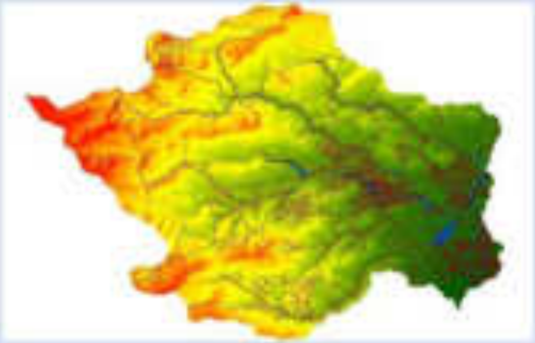
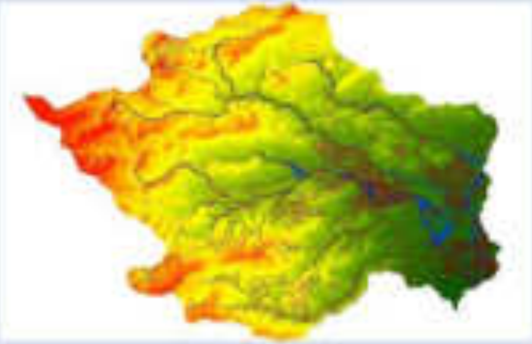
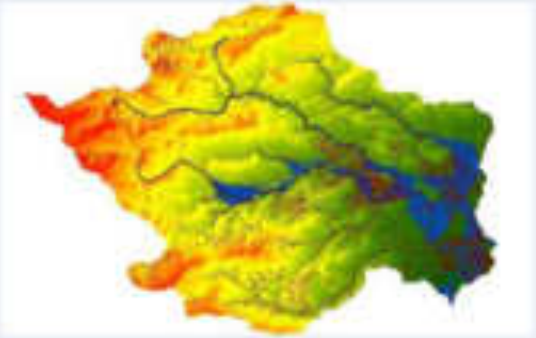
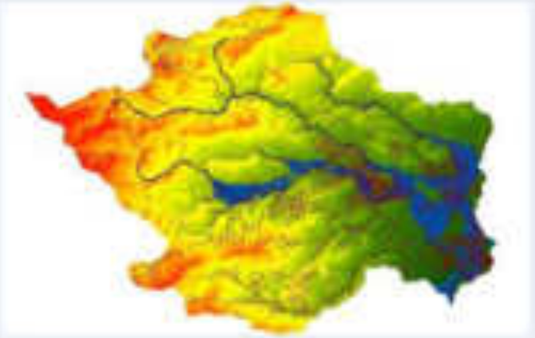
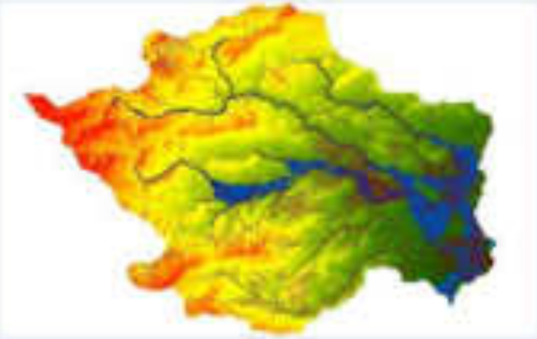
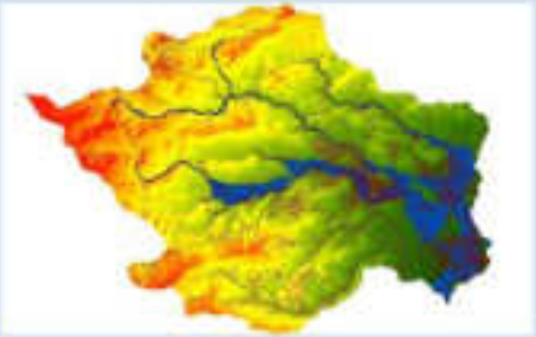
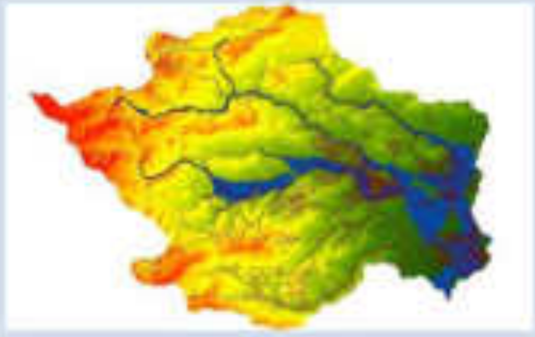
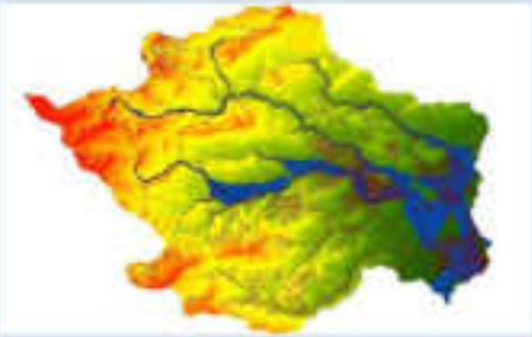
Flood mapping results
T = 500 years

BEYOND

FloodHUB

T = 500 years	d = 3 hours	d = 6 hours	d = 9 hours
CN I Dry conditions			
CN II Average conditions			
CN III Wet conditions			

Flood mapping results
T = 1000 years

T = 1000 years	d = 3 hours	d = 6 hours	d = 9 hours
CN I Dry conditions			
CN II Average conditions			
CN III Wet conditions			

Mandra flood 2017: modelling (blue) vs EO mapping (pink)

Blue: Simulation of flood scenario T1000 CNIII d6

Pink: VHR satellite-based mapping (Meteoview)

FloodHUB system
in support of the decision makers

In line with the requirements for the implementation of the:

- ✓ **EU Floods Directive 2007/60/EC "on the assessment and management of flood risks"**
- ✓ **Sendai Framework for Disaster Risk Reduction**
- ✓ **UN SDGs:**

- ✓ **GEO's Societal Benefit Areas:**
  - Disaster Resilience
  - Sustainable Urban Development
  - Water Resources Management
  - Public Health Surveillance
  - Food Security and Sustainable Agriculture
  - Infrastructure and Transportation Management

UNITED NATIONS
Office for Outer Space Affairs

Stakeholders' trainings in the operational FloodHUB system

BEYOND

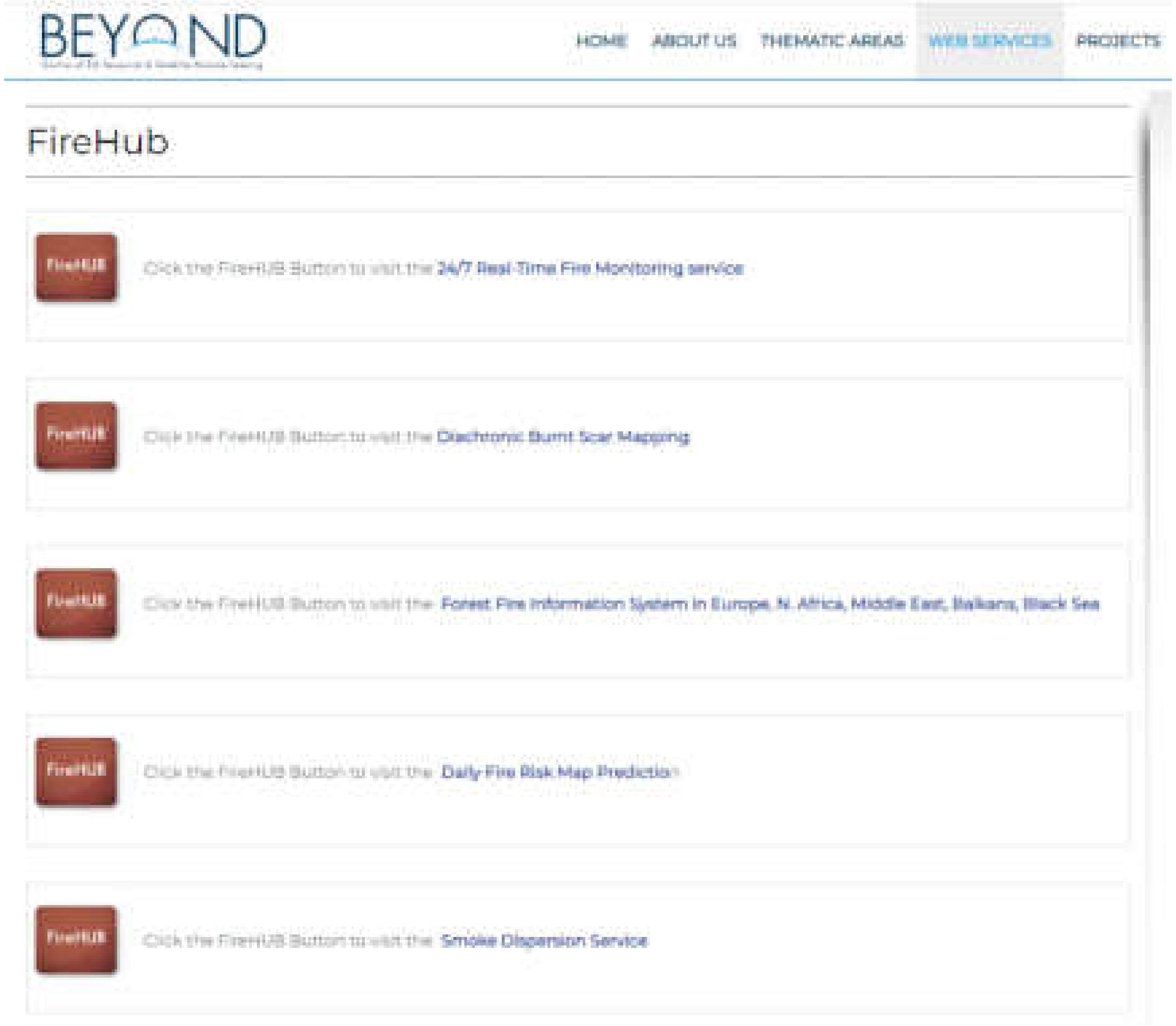
FloodHUB

UNITED NATIONS
Office for Outer Space Affairs

http://beyond-eocenter.eu/index.php/web-services/firehub

BEYOND

FireHUB



UNITED NATIONS
Office for Outer Space Affairs

BEYOND

FireHUB

Kalamos fire 2017

First fire detection in10’

Meteosat SG –SEVIRI

Day #1 NPP-VIIRS MR=375m
20170817
11:14

Day #2 MODIS-Terra MR=250m
20170818_1055

Day#3 NPP-VIIRS MR=375m
20170819_1057

Day #4 Sentinel-2 HR-10 m

P1 Detection - Fire Monitoring - Resolution 500 m/5 minute

P2 Rapid daily Mapping at Medium Resolution - 2-3 times /day

P3 Rapid Mapping at High Resolution/ 5 days

T0 minute – Beginning of fire

KALAMOS 13/08/2017 2953 hectare

T10 minutes – Detection of active sources of fire from FireHUB system

T1 Day – Burned area extent Medium resolution (375m)

T2 Day – Burned area extent Medium resolution (250m)

T3 Day – Burned area extent Medium resolution (375m)

T4 Day – Burned area extent High resolution (10m)

UNITED NATIONS
Office for Outer Space Affairs

Mati fire 2018 (103 fatalities)

BEYOND FireHUB

24/7 Real-Time Fire Monitoring service

- **This screen shows the first alert that was sent by the FireHub system of BEYOND at 17:05 local time, that is 5-7 minutes later than the official start of the fire (between 16.55-17:00).** The FireHub web site is open and accessible at that time by all and the authorities of Fire Brigades at http://195.251.203.238/seviri/
- The system provided the starting area (red rectangle - 500mx500m wide) at 17:05 local time and was updating the situational picture every five minutes. The more reddish the cell the higher the active fire occurrence in it. The masked out area is what FireHub considers as urban. FireHub does not update the fire occurrence picture inside the urban zones. The urban area fringe is also apparent by looking at the background Google Earth map.

Forest Fire Information System

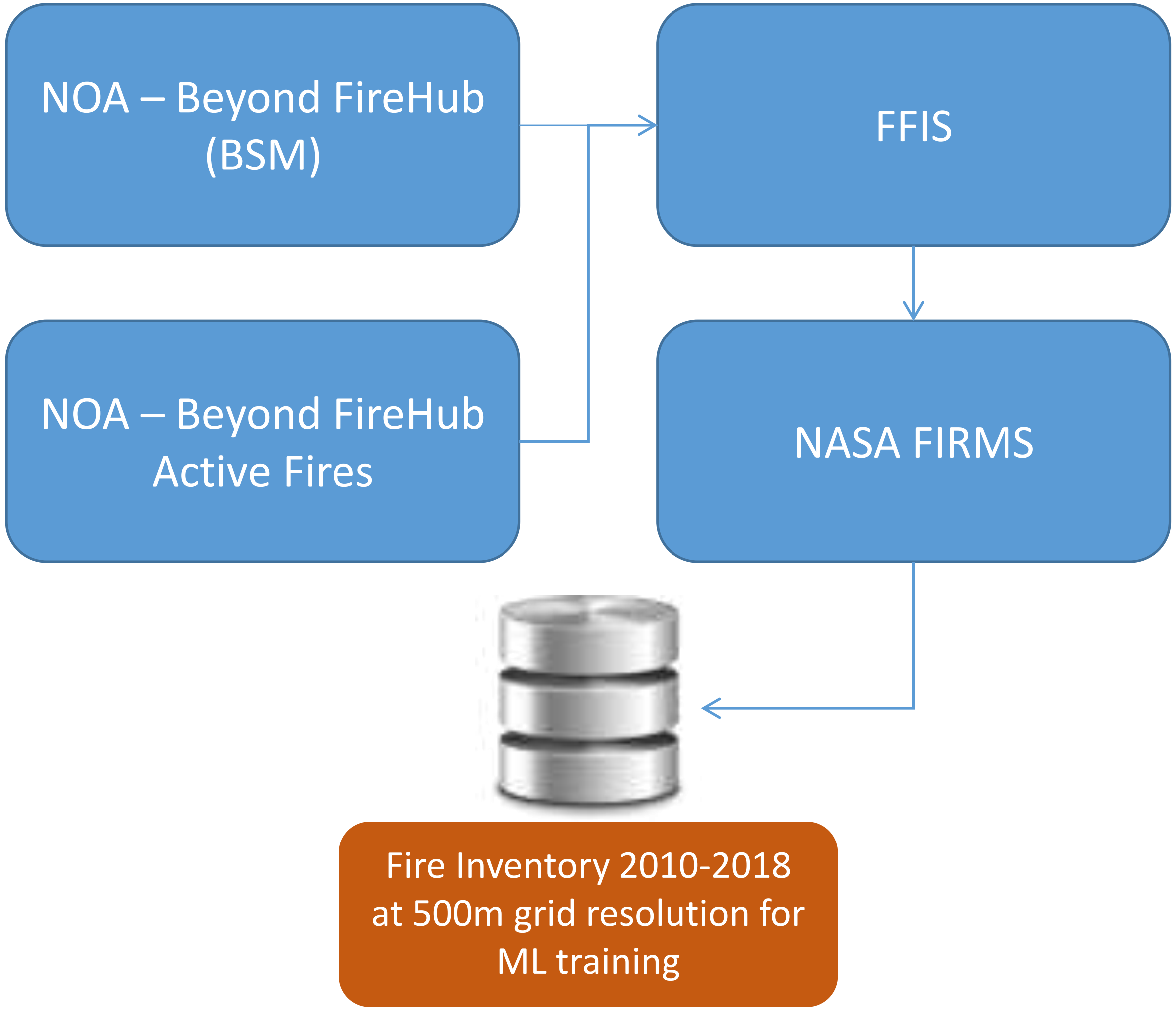
A new service has been developed, known as **Forest Fire Information System** in Europe, North Africa, Middle East, Balkans, Black Sea and provides daily near real time information on active fires and burned areas, as well as statistics on the affected areas per time period and country over the large area covering Europe, North Africa, Middle East, Balkans, and Black Sea.

Processing in Real Time of SUOMI-NPP-VIIRS, NOAA-20, MODIS, and Sentinel-2 data

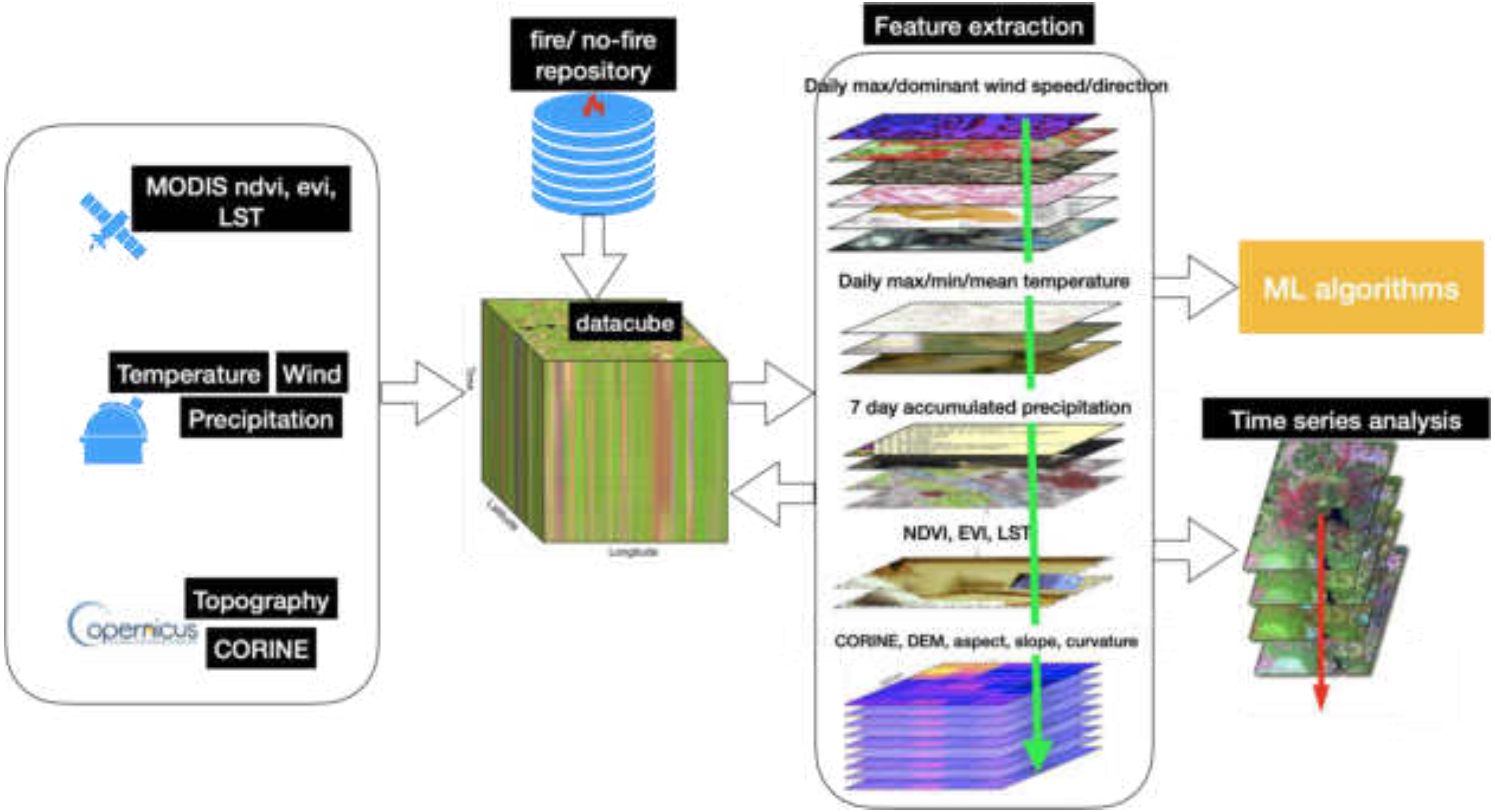
http://ffis.beyond-eocenter.eu/

Forest Fire Prediction System

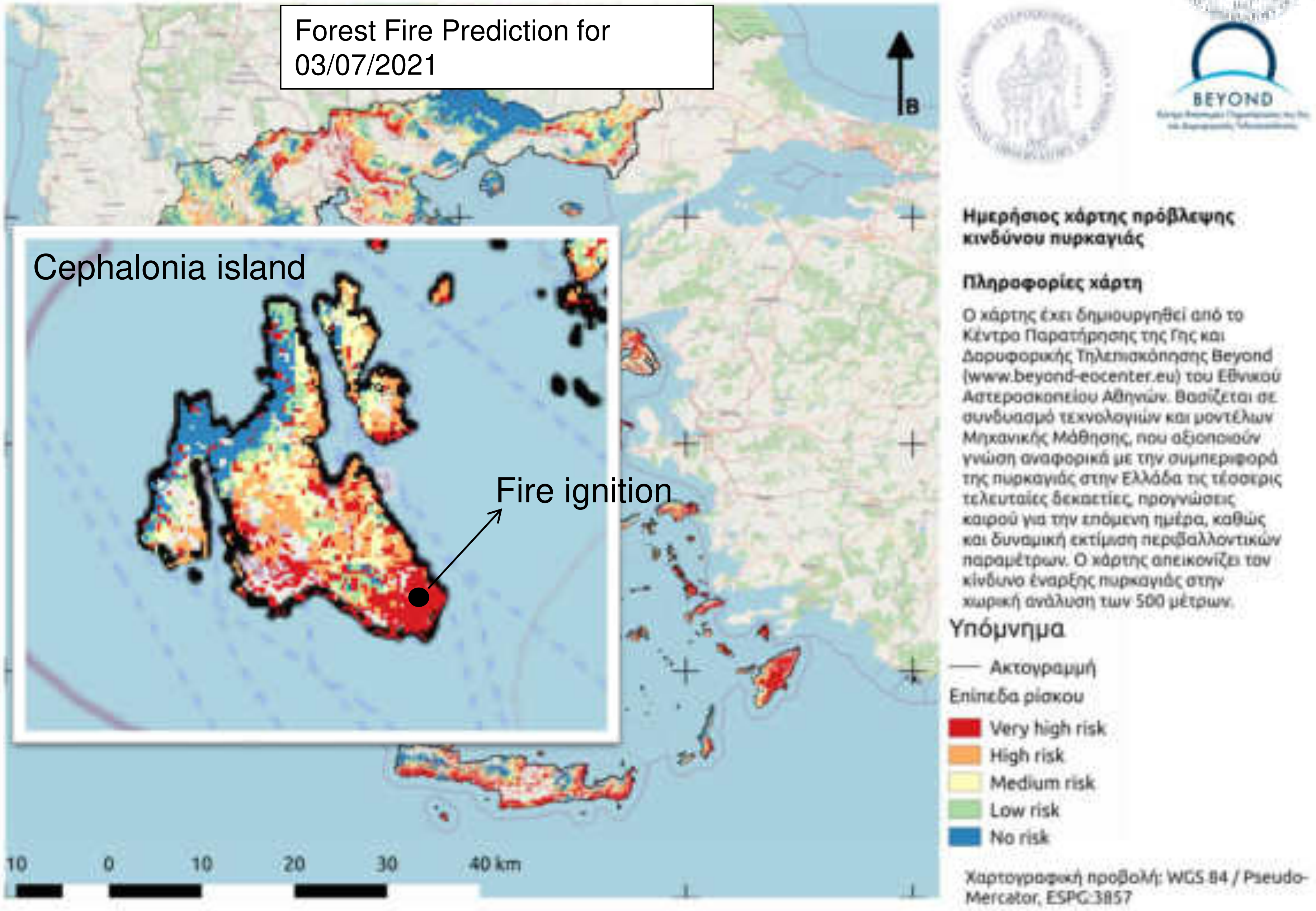
- Theoretical models (i.e. FWI) are entirely based on equations that describe the physics of the related to the fire ignition physical phenomena
- Machine Learning algorithms are designed to automatically formulate the complex mathematical relations between the input parameters.
- A forest fire inventory was compiled from the diachronic records of the FIREHUB systems and NASA firms and was related to a range of Earth observation, meteorological and observational data.



Forest Fire Prediction System architecture and processing steps

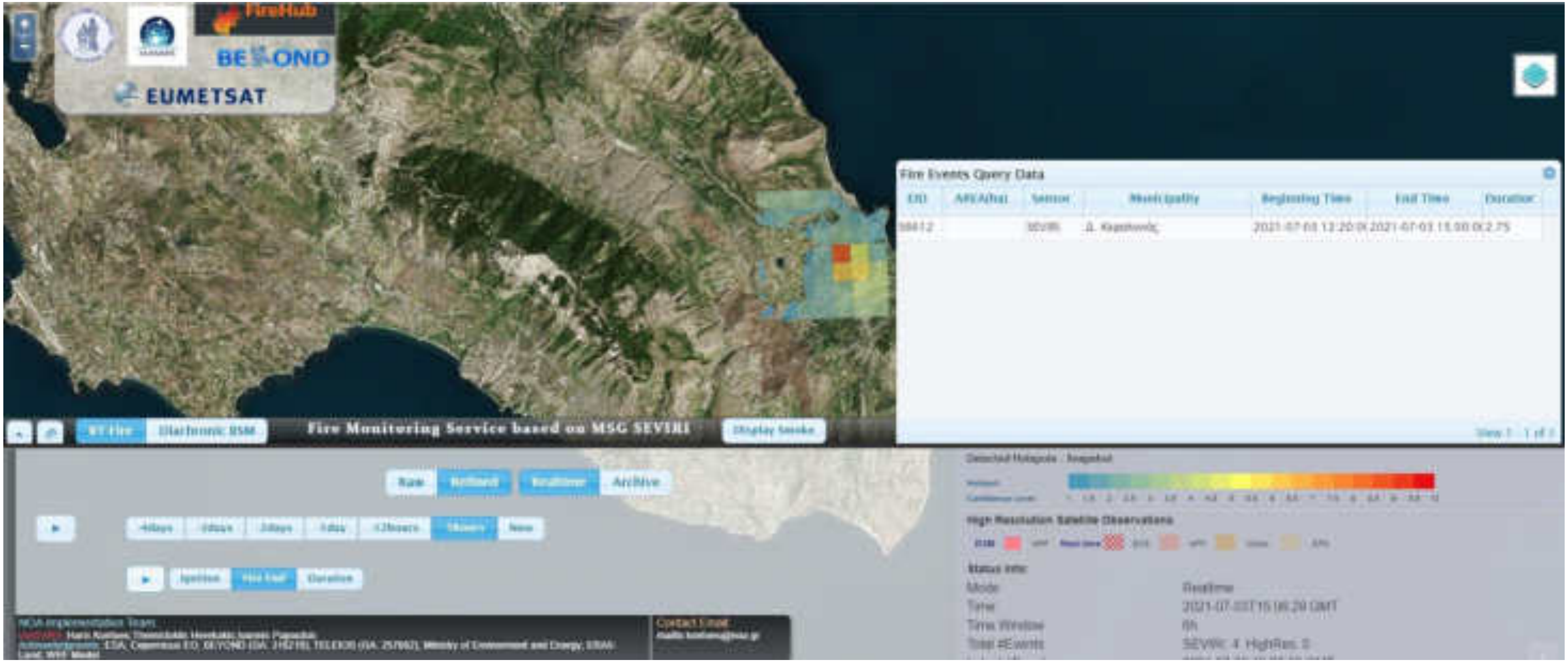


Forest Fire Prediction System



24/7 Real-Time Fire Monitoring service

Fire in Cephalonia – 03/07/2021: The 24/7 Real-Time Fire Monitoring service detected the fire in the first five minutes and continued monitoring the evolution every five minutes in the spatial resolution of 500m.



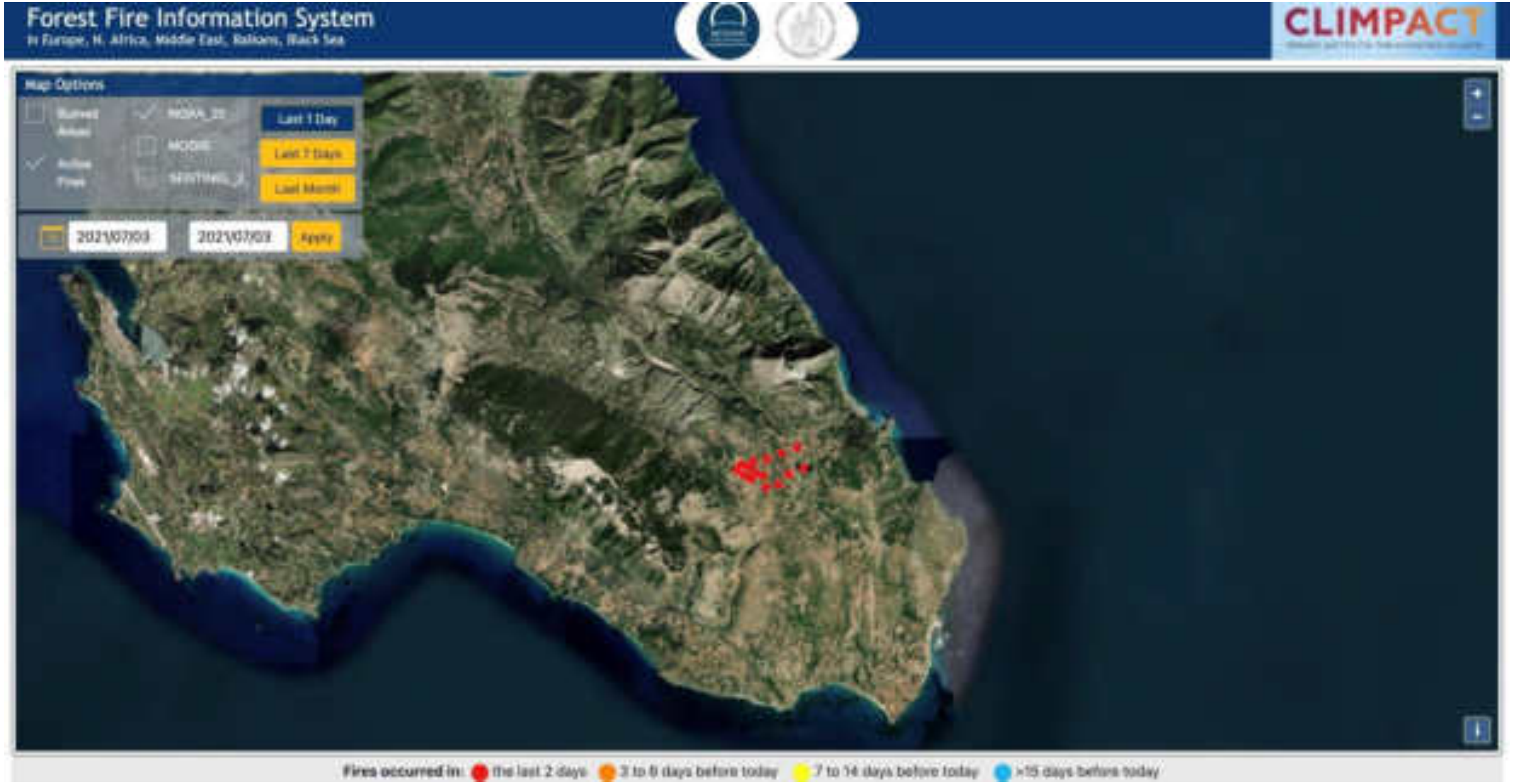
UNITED NATIONS
Office for Outer Space Affairs

Forest Fire Information System

Active Fires

BEYOND FireHUB

Fire in Cephalonia – 03/07/2021: With the first acquisition of NOAA satellites the active fires were produced in the spatial resolution of 375 m.

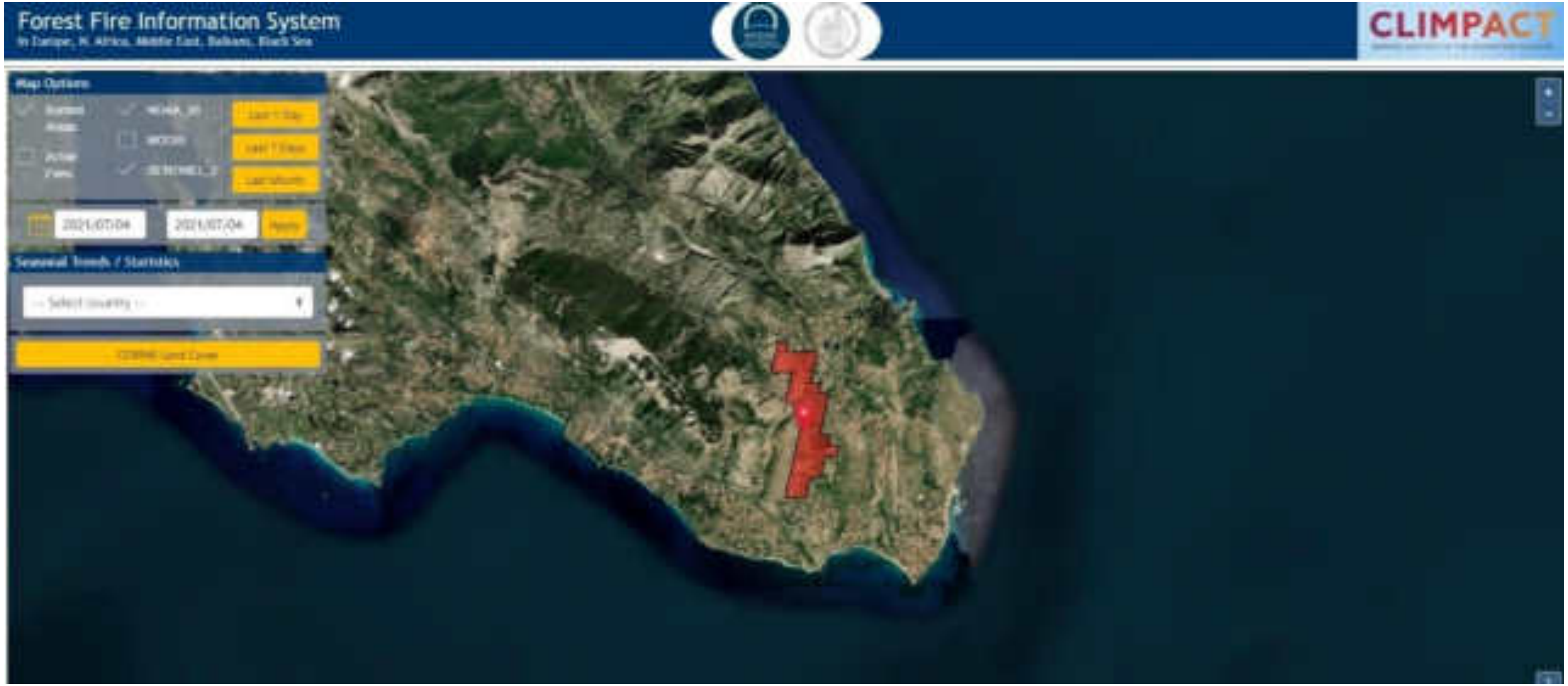


UNITED NATIONS
Office for Outer Space Affairs

Forest Fire Information System
VIIRS Burned Scar Map

BEYOND FireHUB

Fire in Cephalonia – 03/07/2021: The next day the first burned area estimation was produced by the Forest Fire Information System from VIIRS images.



UNITED NATIONS
Office for Outer Space Affairs

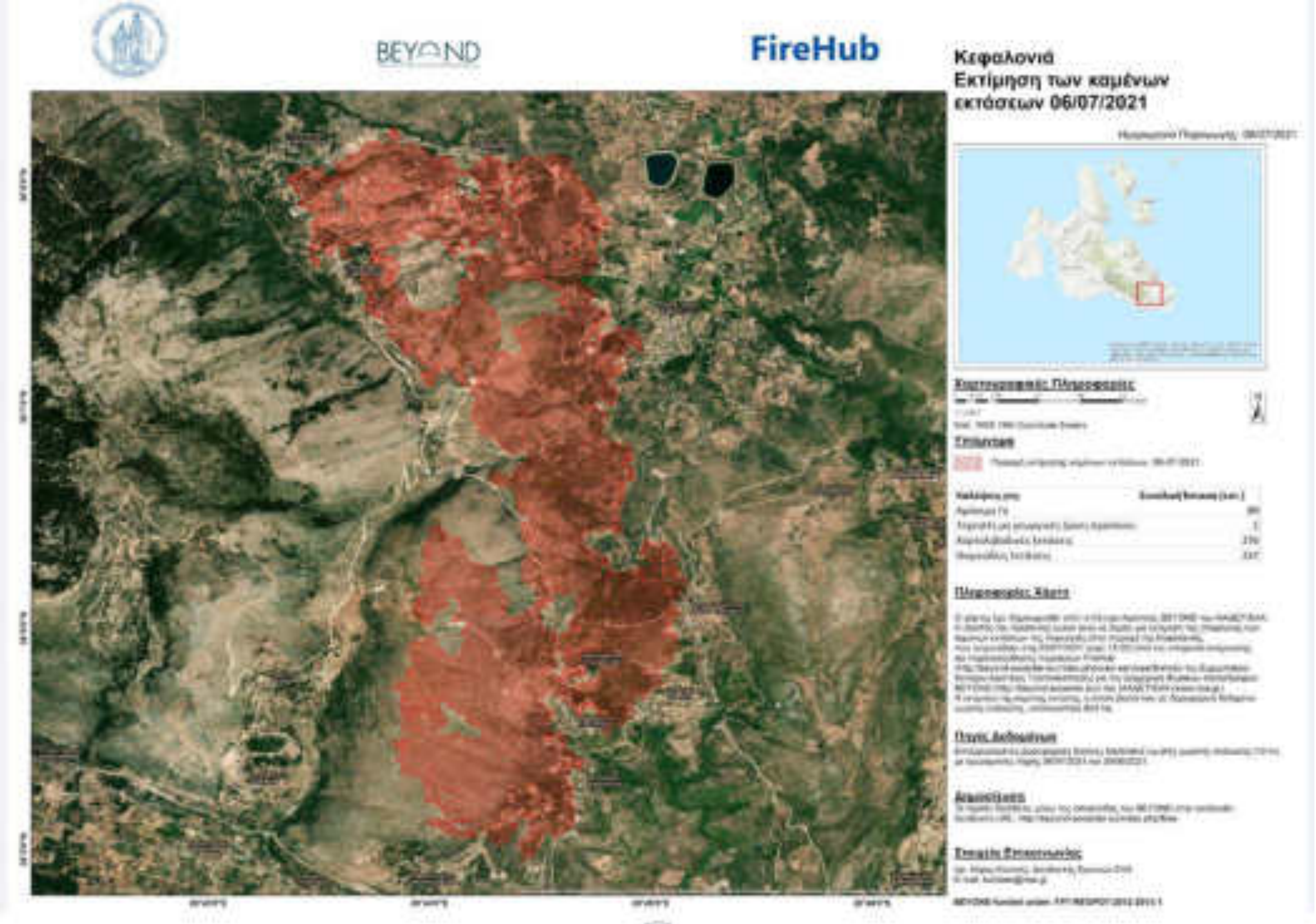
Forest Fire Information System

Sentinel-2 burned Scar Map

BEYOND

FireHUB

Fire in Cephalonia – 03/07/2021: Finally with the first Sentinel-2 acquisition a detailed burned scar map was delivered.



RSO Greece, Haris Kontoes, Alexia Tsouni, Stella Girtsou

National Observatory of Athens – IAASARS – Operational Unit BEYOND

FLOOD RISK ASSESSMENT IN THE REGION OF ATTICA

In the framework of the **Programming Agreement** of 03/03/2021 between the **Prefecture of Attica** and the **National Observatory of Athens – Part A:** «***Earthquake, fire and flood risk assessment in the region of Attica***»

Stavroula Sigourou[1], Vassiliki Pagana[1], Panayiotis Dimitriadis[2], Alexia Tsouni[1], Theano Iliopoulou[2], G.-Fivos Sargentis[2], Romanos Ioannidis[2], Efthymios Chardavellas[2], Dimitra Dimitrakopoulou[2], Nikos Mamasis[2], Demetris Koutsoyiannis[2] and Charalampos (Haris) Kontoes[1]

1. Operational Unit "BEYOND Centre of EO Research & Satellite Remote Sensing", Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing - National Observatory of Athens (NOA/IAASARS), (Greece). (E-mails: alexiatsouni@noa.gr, sigourou@noa.gr, v.pagana@noa.gr, kontoes@noa.gr)

2. Research Group ITIA, Department of Water Resources and Environmental Engineering, School of Civil Engineering, National Technical University of Athens (NTUA) (E-mails: pandim@itia.ntua.gr, theano_any@hotmail.com, fivos.sargentis@gmail.com, romanos.ioannidis@gmail.com, ef.hardvlls@yahoo.gr, dimitrakopoulou.dimitra@gmail.com, nikos@itia.ntua.gr, dk@itia.ntua.gr)

1. INTRODUCTION

- The Prefecture of Attica constitutes a region with special features, such as **long coastline, large inland area, various geoenvironmental units, high population density** (3.792.469 residents, 36,4% of the country’s population according to the Hellenic Statistical Authority [1], **critical infrastructures** and **social economic activities**.

[1] Hellenic statistical Authority. (2021, November 5). 2021 Population-Housing Census. https://www.statistics.gr/2021-census-pop-hous

1. INTRODUCTION

- In March 2021, a **Programming Agreement** was signed between the **Prefecture of Attica and the NOA** – Part A – to conduct the study entitled «**Earthquake, fire and flood risk assessment in the region of Attica**» funded by the Prefecture of Attica [2].

- A **new methodology for flood risk assessment** is introduced and implemented at **the most high-risk river basins** in Attica, by analyzing the **vulnerability** and the **exposure** of the river basin to **flood risk,** in conjunction with the actual physical and socioeconomic parameters in order to propose mitigation measures.

[2] Operational Unit "BEYOND Centre of EO Research & Remote Sensing" / IAASARS / NOA. (2021, March 2). A Programming Agreement was signed with the Prefecture of Attica. http://beyond-eocenter.eu/index.php/news-events/375-ypografi-trimeris-programmatikis-symvasis-me-tin-periferia-attikis

2. METHOD AND DATA

2.1. Selection of the study areas

Aiming to select the study areas, the following spatial information were taken under consideration:

- the **Areas of Potentially Significant Flood Risk** in the Water Department of Attica according to the 1st Revision of the Preliminary Flood Risk Assessment [3];
- the **Spatial Distribution of Flood Risk from fluvial flows in Attica for return period T=1000 years** [4] according to the Approved Flood Risk Management Plan in the Water Department of Attica for the implementation of the EU Floods Directive [5].

[3] Special Secretariat for Water. (2019). 1st Revision of the Preliminary Flood Risk Assessment of Attica (EL06). Ministry of Environment and climate change. https://floods.ypeka.gr/index.php?option=com_content&view=article&id=1113&Itemid=1154
[4] Special Secretariat for Water. (2018). Flood Risk Management Plans of Attica (EL06). Ministry of Environment and climate change. https://floods.ypeka.gr/index.php?option=com_content&view=article&id=272&Itemid=782
[5] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Text with EEA relevance) OJ L 288, 06/11/2007, p. 27–34.

2. METHOD AND DATA

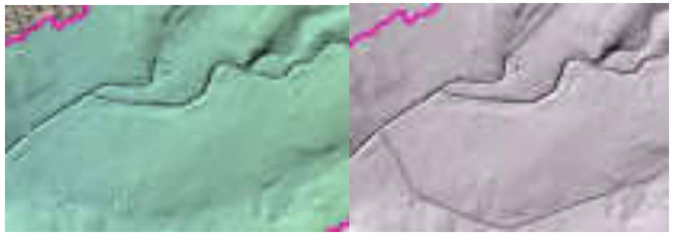
2.1. Selection of the study areas

Given the above, the **Operational Unit BEYOND / IAASARS / NOA** in cooperation with the **Research Group ITIA/ School of Civil Engineering/ NTUA** study **five river basins** (Pikrodafni, Giorgis, Sourres and Agia Aikaterini streams and Sarantapotamos and Kifisos rivers) in the Region of Attica, which are included in **23 Municipalities**.

The five river basins in the Region of Attica

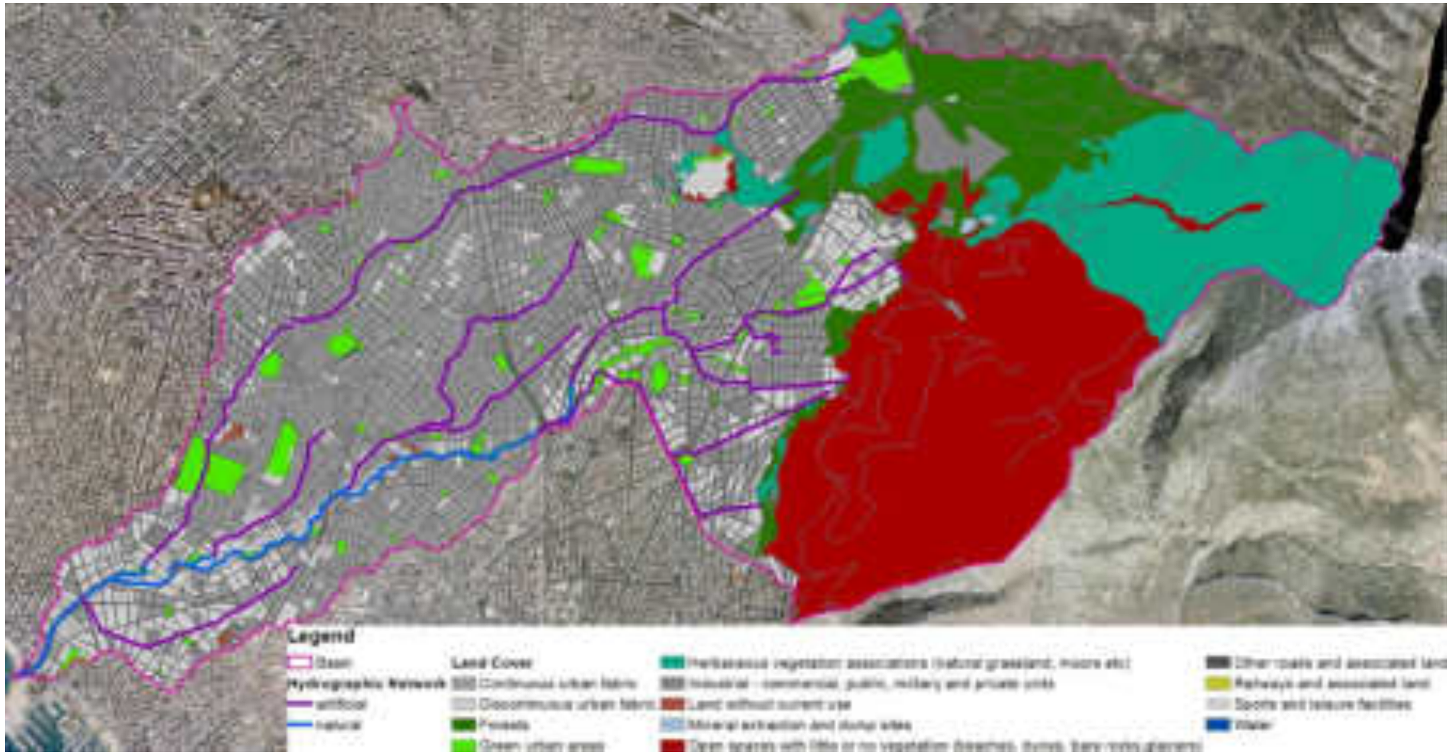
2. METHOD AND DATA

2.2. Data collection & modifications



Terrain modifications with buried substreams in Pikrodafni river basin

- relevant studies from competent services & historic floods;
- terrain modification (DEM 2m provided by Hellenic Cadastre) with buried substreams and hydraulic works;
- land cover layer based on Urban Atlas [6] & burnt scar mapping from 1958-2021 provided by FireHub Service of the BEYOND Centre of IAASARS/NOA [7] using Sentinel-2 satellite images;
- population data [1], building type [1], land values [8].



[6] Urban Atlas (2018). Copernicus Land monitoring services. https://land.copernicus.eu/local/urban-atlas

[7] Operational Unit "BEYOND Centre of EO Research & Remote Sensing" / IAASARS / NOA. (2022). FireHub A Space based Fire Management Hub. IAASARS/NOA http://beyond-eocenter.eu/images/docs/publications/other/NOA-FireHub.pdf

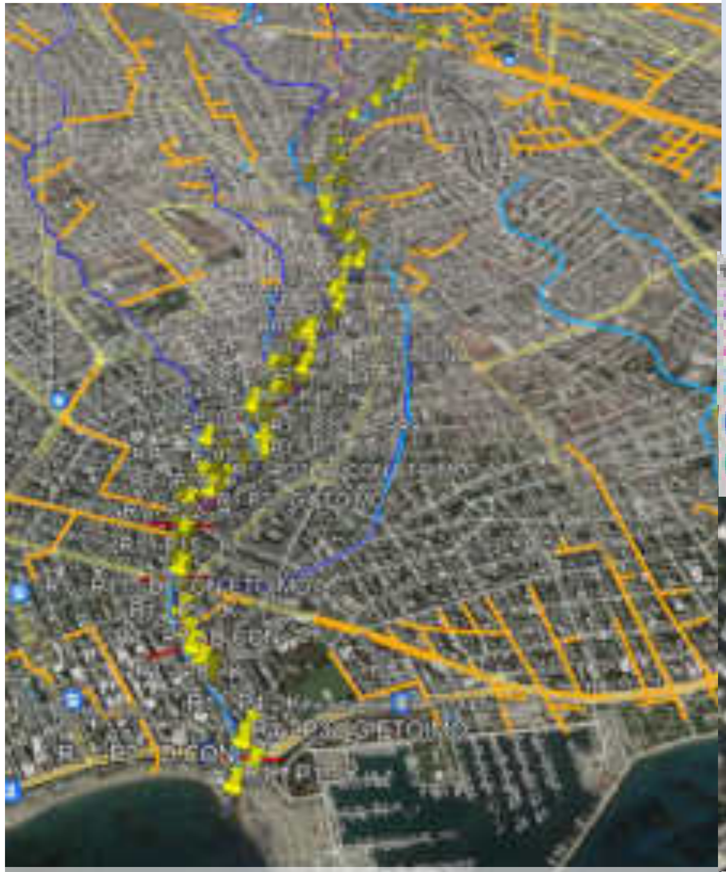
[8] Ministry of Finance. (2021, November 5). 2021

2. METHOD AND DATA

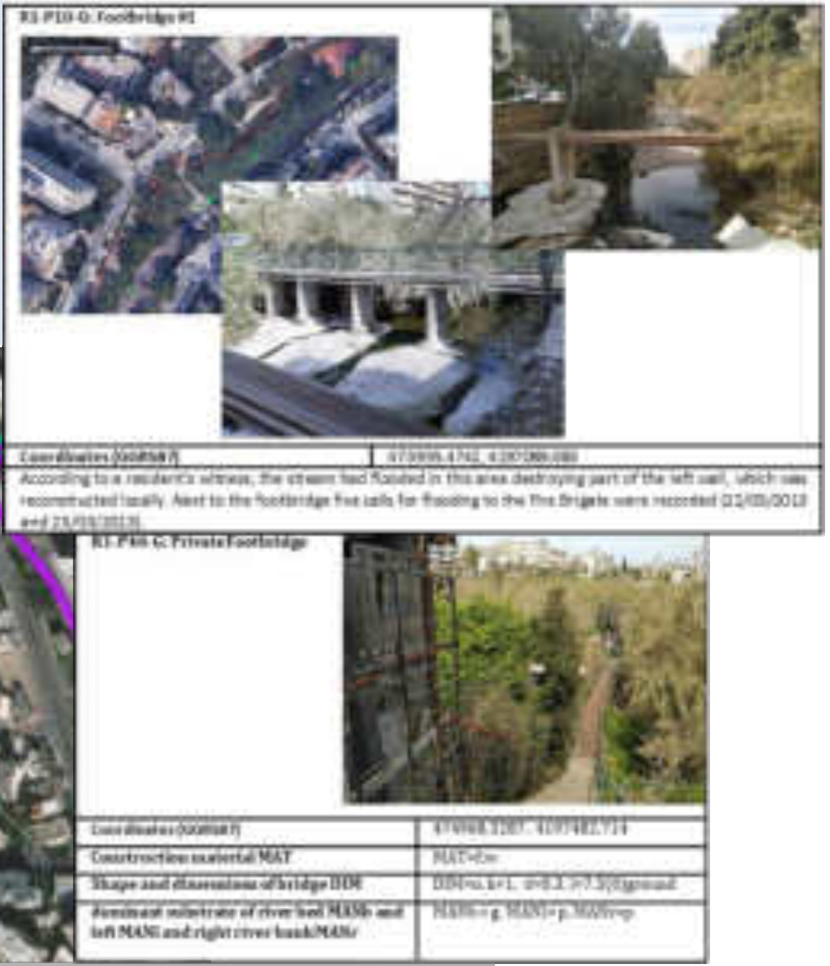
2.3. Methodology of field visits

- Detailed technical report for each critical point.
- Classification of critical points according to the prioritization level.

Many high-risk points in residential areas, road networks and other critical infrastructure



Pre-process



After the field visits

2. METHOD AND DATA

2.4. Precipitation from ombrian curves

Precipitation derived from **ombrian curves** [9] for **50, 100, 1000 years return periods** according to the EU Flood Directive [10] using rainfall data from meteorological stations

General equation of ombrian curves,
rainfall intensity x (mm/h) for time scale k (h) and return period T (years):

$$x = \lambda \frac{(T/\beta)^{\xi} - 1}{(1 + k/\alpha)^{\eta}}, \qquad \xi > 0$$

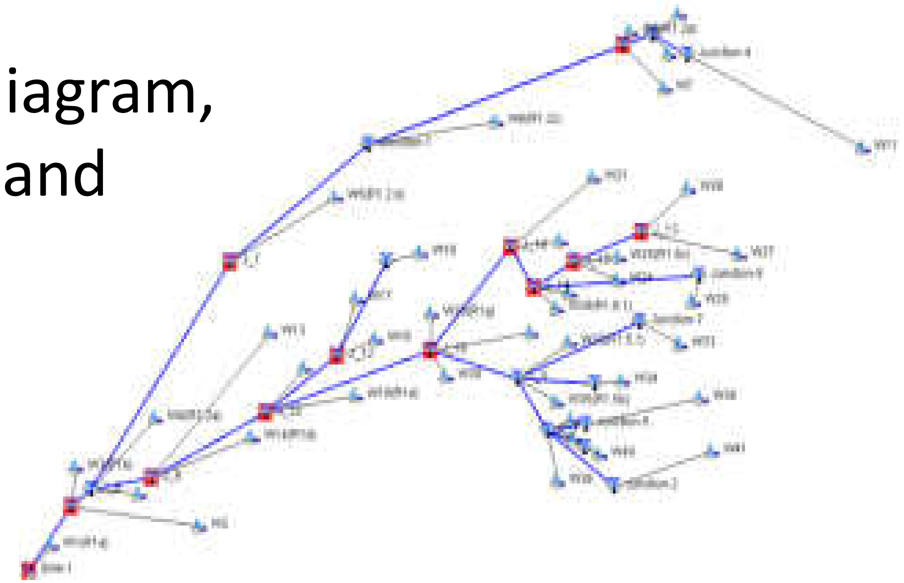
The parameters α (h), η (-), ξ (-) and β (years) are estimated for Attica, while the scale parameter λ (mm/h) is estimated based on the spatial distribution of elevation in the river basin

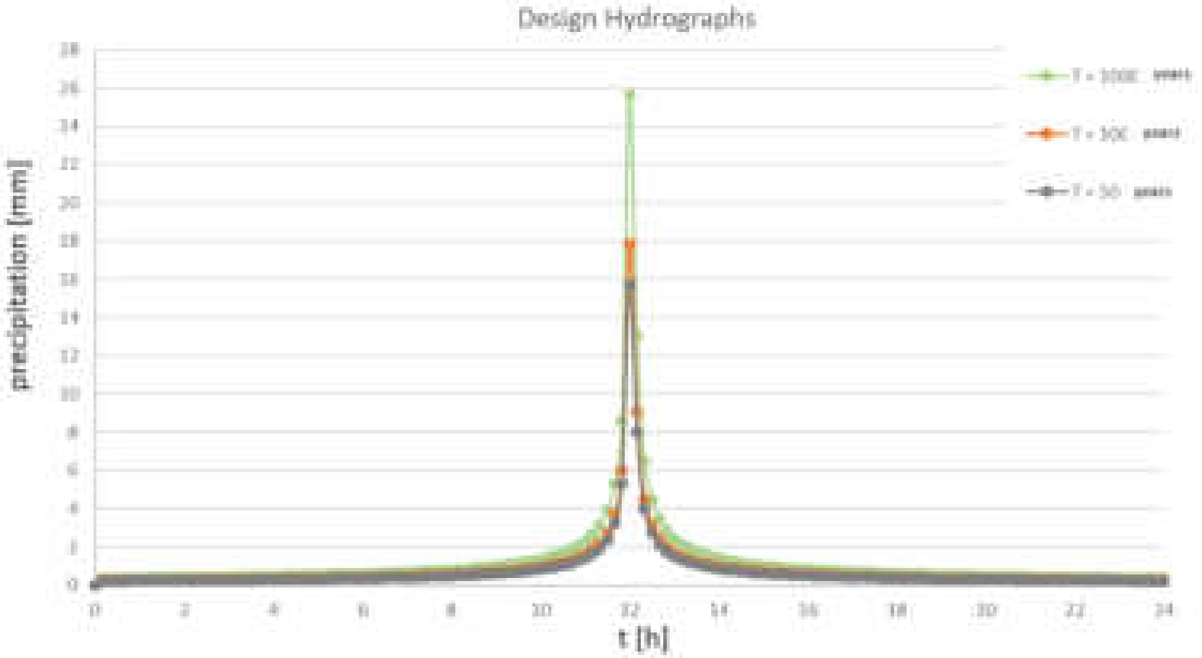
[9] D. Koutsoyiannis (2021). Stochastics of Hydroclimatic Extremes - A Cool Look at Risk, ISBN: 978-618-85370-0-2, Kallipos, Athens
[10] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks. (2007). OJ L 288, 06/11/2007.

2. METHOD AND DATA

2.5. Hydrologic analysis of river basin-Rainfall-runoff model (HEC-HMS)

✓ Schematic diagram, substreams and subbasins





1. Estimation of precipitation excess

Soil Conservation Service (SCS) Curve Number (CN) [11]

2. “Transformation" of precipitation excess into runoff

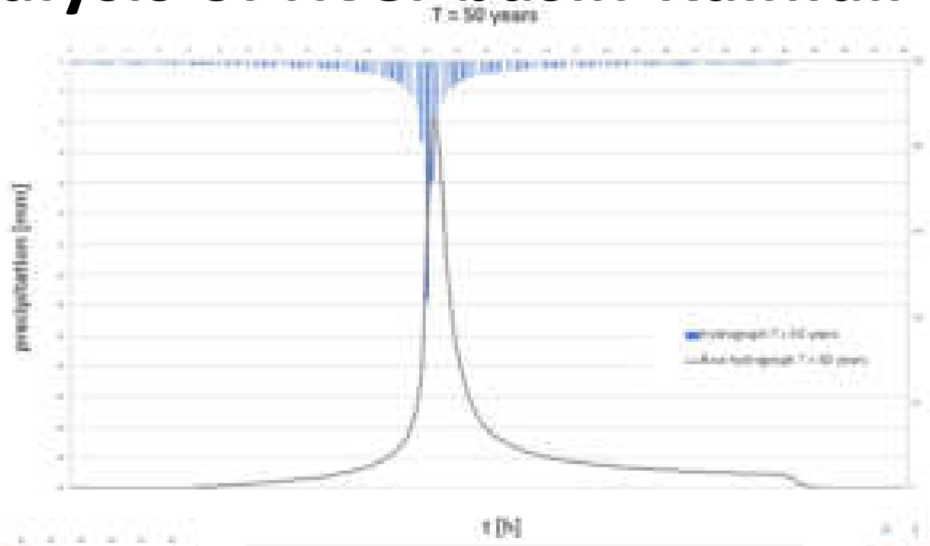
Unit Hydrograph method of Soil Conservation Service [11]

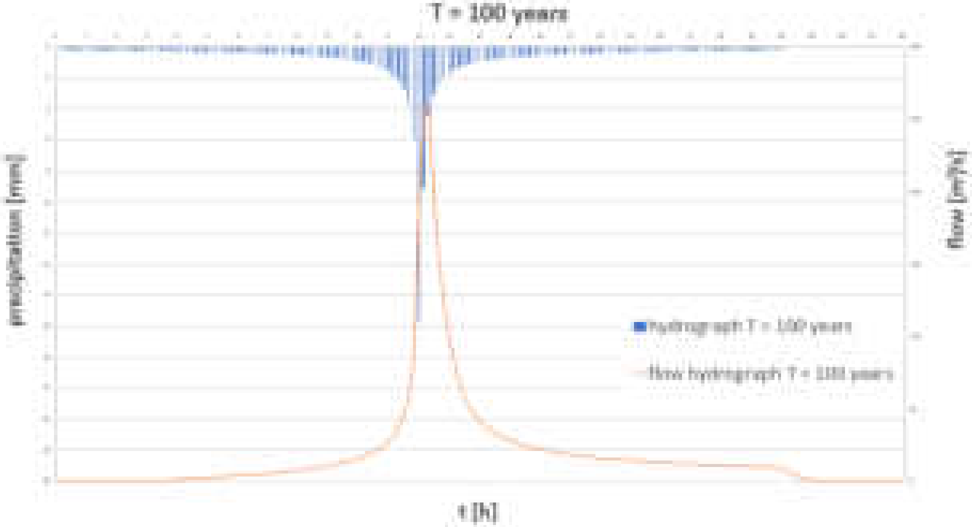
[11] Soil Conservation Service (SCS) (1972). National Engineering Handbook, Section 4: Hydrology. Department of Agriculture, Washington DC.

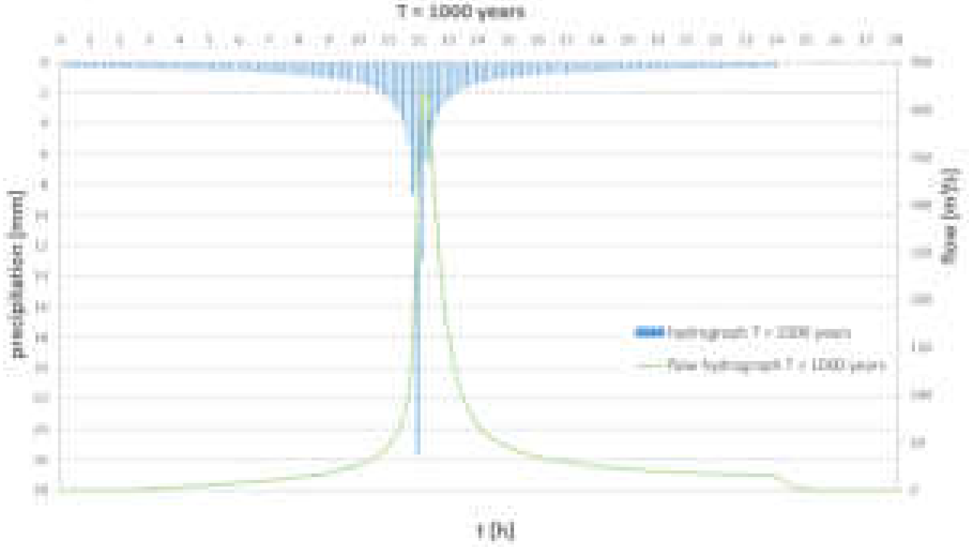
2. METHOD AND DATA

2.5. Hydrologic analysis of river basin-Rainfall-runoff model (HEC-HMS)

Outlet of basin







2. METHOD AND DATA

2.6. Hazard – 2D Hydraulic models

HEC-RAS

- Updated land cover layer
- Design hydrographs
- Updated terrain (terrain modifications included)
- Geometry (2d flow area, boundary condition lines)
- Updated Manning's coefficient layer for each land cover class

Rain on Grid

uniform spatially distributed rainfall method

→

Hydraulic calculations (achieve model stability)

- ✓ time step
- ✓ Time of simulation
- ✓ Courant condition

LISFLOOD – FP

- ➢ quasi-2D
- ➢ kinematic wave
- ➢ Courant condition

Water Depth map

Velocity map

2. METHOD AND DATA

2.7. Risk assessment

Vulnerability

- Age;
- Population Density;
- Building Type (construction materials and the presence of pilotis)

Exposure

- Land values

Vulnerability (Age, Population Density and Buiding type)	Flood Hazard 1	2	3	4	5
1	1	1	1	2	3
2	1	2	2	3	4
3	1	2	4	4	5
4	2	3	4	5	5
5	3	4	5	5	5

Vulnerability & Flood Hazard	Exposure 1	2	3	4	5
1	1	1	1	1	1
2	2	2	2	2	3
3	3	3	3	4	4
4	4	4	5	5	5
5	5	5	5	5	5

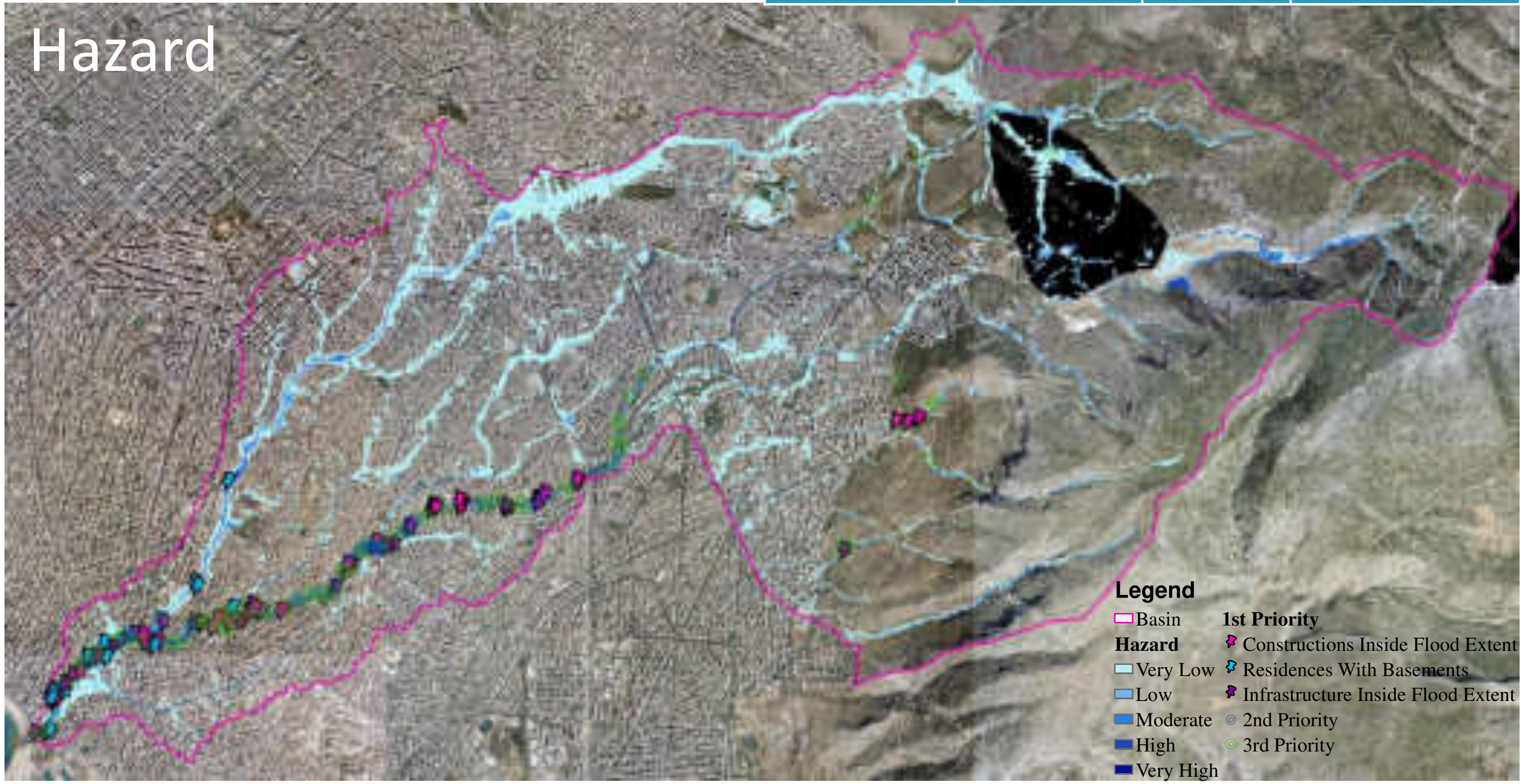
3. RESULTS

Flood modelling
(maximum water depth map)

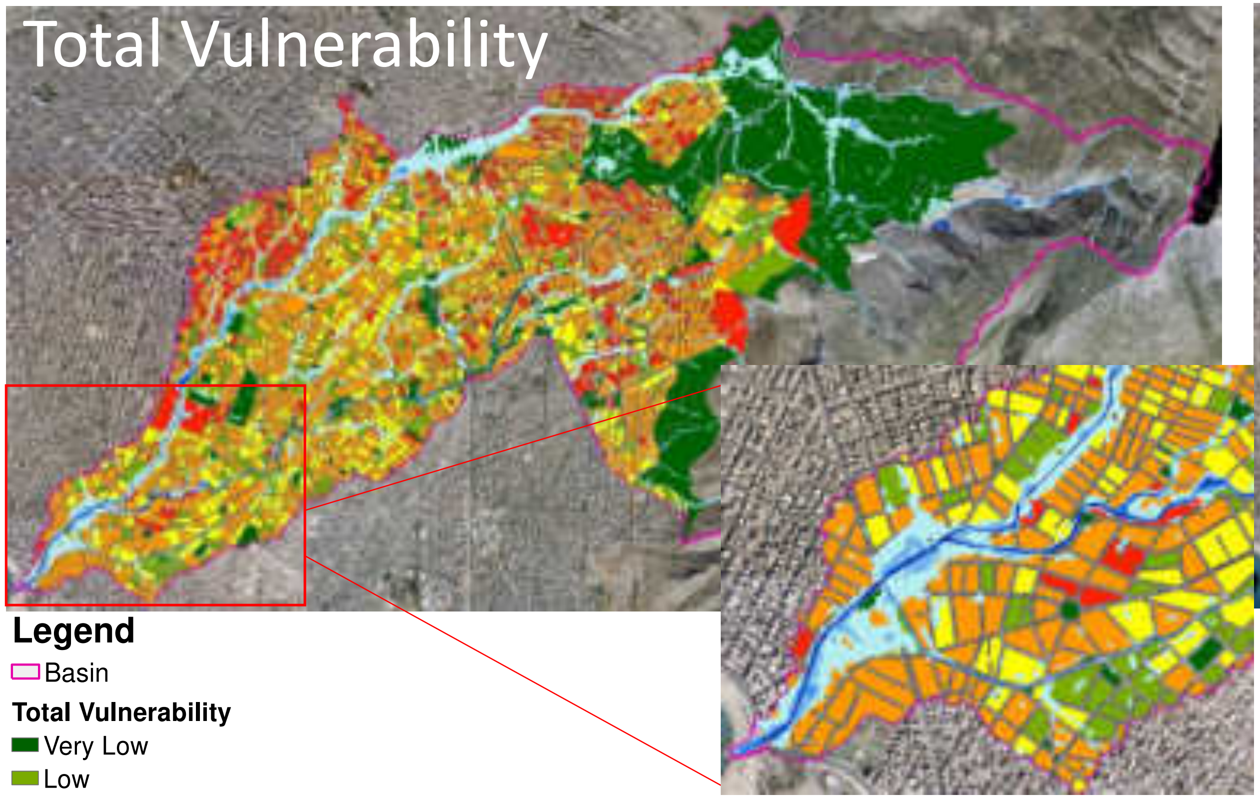
Critical points in Pikrodafni river basin			
1st	2nd	3rd	ALL
79	50	90	219

Legend
Basin
Depth (scenario T 50 LISFLOOD)
Very Low
Low
Moderate
High
Very High
Depth (scenario T 100 LISFLOOD)
Very Low
Low
Moderate
High
Very High
Depth (scenario T 1000 LISFLOOD)
Very Low
Low
Moderate
High
Very High

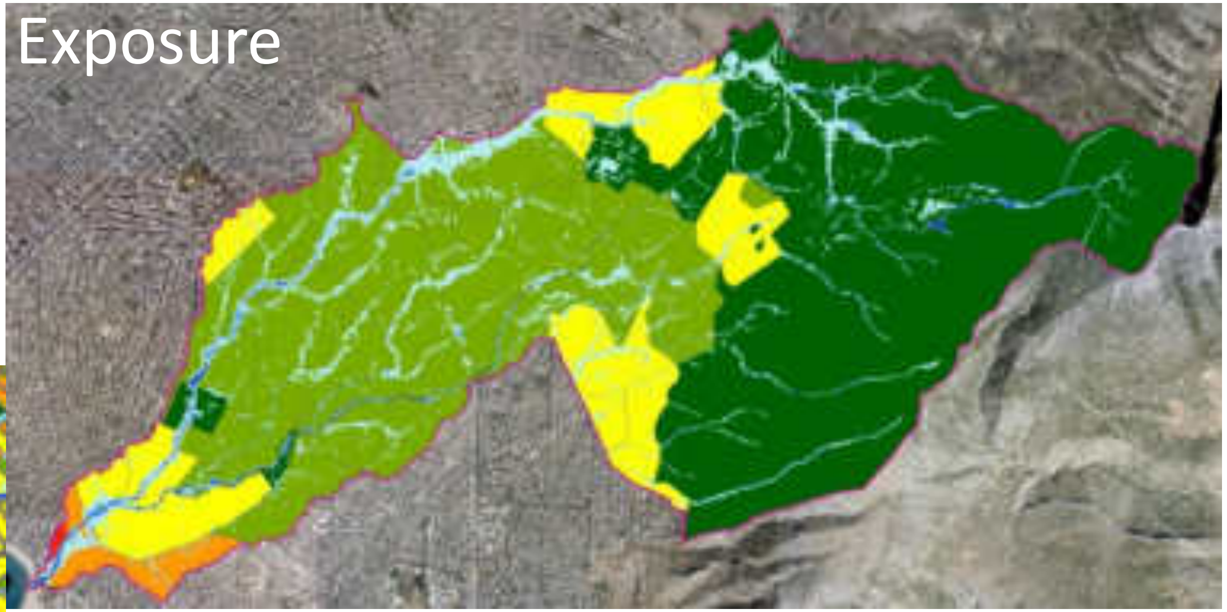
HEC-RAS scenario T 1000 years



3. RESULTS

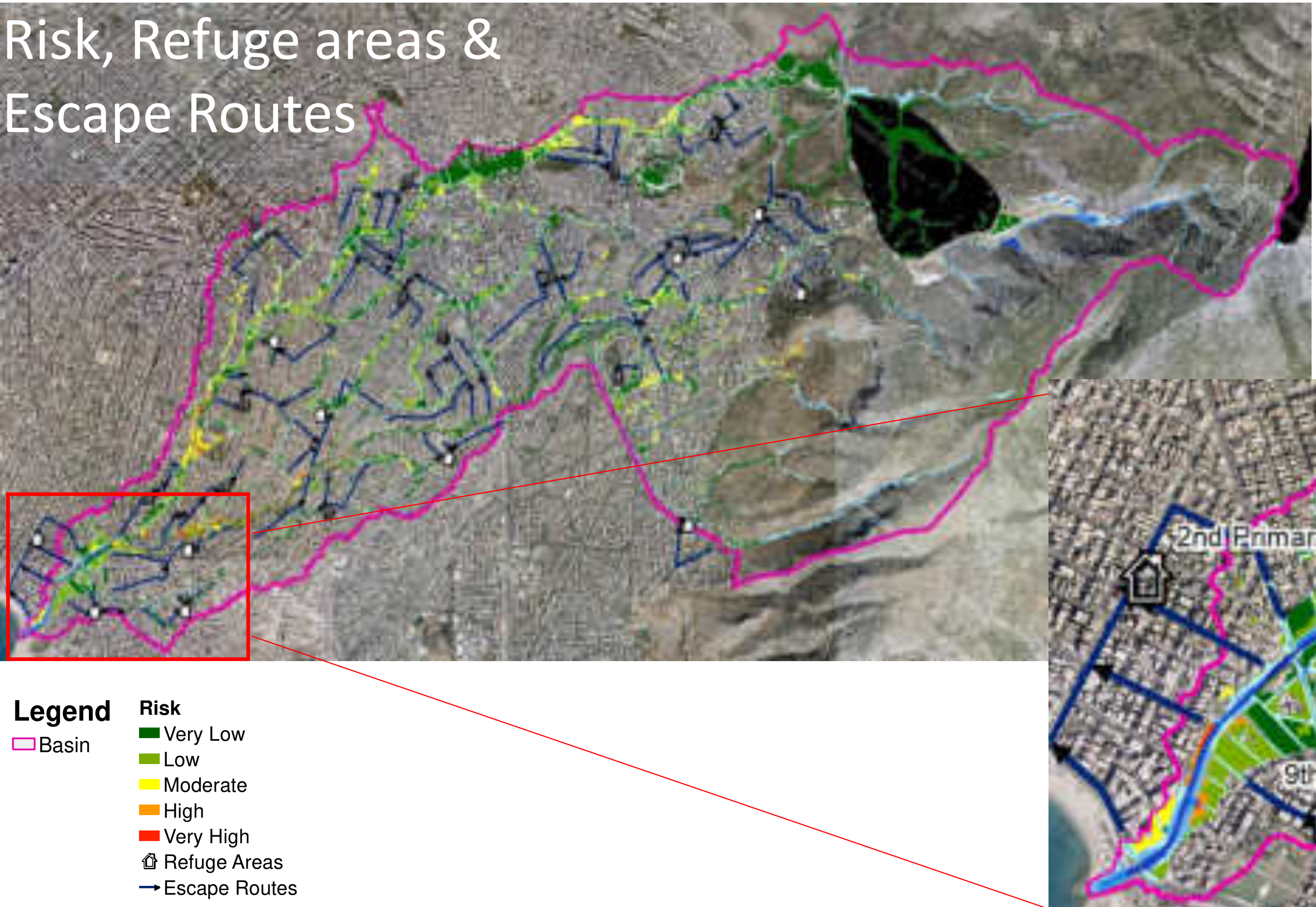


Legend
Basin
Total Vulnerability
Very Low
Low
Moderate
High
Very High



Legend
Basin
Exposure
Very Low
Low
Moderate
High
Very High

3. RESULTS



- ✓ Safe covered refuge areas.
- ✓ Design of proposed escape routes in order to evacuate the residents safely.

4. DİSCUSSİON

Proposed mitigations measures both short-term and long-term:

- **structural measures**, e.g. delimitation of streams/rivers, river bed arrangement using up-to-date environmental terms, removal of constructions inside the river beds, small mountain hydro-distribution works, stream daylighting.
- **non-structural measures**, e.g. special signs at high risk points, cleaning of the river bed, cleaning and maintenance of flood protection works on a regular and ad-hoc basis after each flood event, tree planting, promoting rainwater harvesting, training and raising awareness of the population, flood management exploiting the output of the projects (web platform).

5. CONCLUSİON

- First, it is very important that **for the first time all the pre-existing, collected and produced data along with the scientific analysis, are properly organised and stored on a user-friendly web platform**, becoming available to all Prefecture's and Municipalities' services.
- This supports the **operational needs** during the crisis, as well as the **preparedness** and the **strategic decision making** towards **disaster resilience**.

5. CONCLUSİON

Moreover, it’s the first time that such a **holistic approach** for flood risk assessment is implemented on **building block level** in Greece.

The prototype knowledge created through the project supports the Prefecture of Attica in the optimum implementation of the **National Civil Protection Plan** and the work of **Civil Protection Coordination Bodies**.

5. CONCLUSİON

- All the above-mentioned were **confirmed and evaluated positively** according to the stakeholders' feedback.

UNITED NATIONS
Office for Outer Space Affairs

12th Annual UN-SPIDER Regional Support Offices Coordination Meeting
Vienna, Austria, 14 – 16 November 2022

RSO Greece, Haris Kontoes, Alexia Tsouni, Stella Girtsou

National Observatory of Athens – IAASARS – Operational Unit BEYOND

Fire Risk Assessment and Management Planning at a Building Block Level: The Case of Kaki Thallasa, Attica Region, Greece.

In the framework of the **Programming Agreement** of 03/03/2021 between the **Prefecture of Attica** and the **National Observatory of Athens – Part A:** «***Earthquake, fire and flood risk assessment in the region of Attica***»

Charalampos (Haris) Kontoes[1], Melpomeni Zoka[1], Anastasia Yfantidou[1], Martha Kokkalidou[1], Michail-Christos Tsoutsos[1], Stella Girtsou[1], Nikolaos Stathopoulos[1]

1. Operational Unit "BEYOND Centre of EO Research & Satellite Remote Sensing", Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing - National Observatory of Athens (NOA/IAASARS), (Greece).

(E-mails: kontoes@noa.gr, zoka@noa.gr, yfantidou@noa.gr, m.kokkalidou@noa.gr, mtsoutsos@noa.gr, sgirtsou@noa.gr, n.stathopoulos@noa.gr)

1. INTRODUCTION

- The Prefecture of Attica constitutes a region with special features, such as **long coastline, large inland area, various geoenvironmental units, high population density** (3.792.469 residents, 36,4% of the country's population according to the Hellenic Statistical Authority [1], **critical infrastructures** and **social economic activities**.

[1] Hellenic statistical Authority. (2021, November 5). 2021 Population-Housing Census. https://www.statistics.gr/2021-census-pop-hous

1. INTRODUCTION

- In March 2021, a **Programming Agreement** was signed between the **Prefecture of Attica and the NOA** – Part A – to conduct the study entitled «**Earthquake, fire and flood risk assessment in the region of Attica**» funded by the Prefecture of Attica [2].
- Forest fires have **negative consequences** on the **environment, animal species, infrastructure and properties.** This scenery is further escalated by the impact of **climate change** due to the increase in the intensity and frequency of summer droughts [3]. Thenceforth, it stands to reason that fire risk assessments and mitigation plans should be a crucial priority to encounter impending challenges and support decision-making processes (e.g., emergency evacuation strategies and prevention measures).

BEYOND/FireHub burnt scar mapping in the broader area of Kaki Thalassa and Keratea, Attica Region.

[2] Operational Unit “BEYOND Centre of EO Research & Remote Sensing” / IAASARS / NOA. (2021, March 2). A Programming Agreement was signed with the Prefecture of Attica. http://beyond-eocenter.eu/index.php/news-events/375-ypografi-trimeris-programmatikis-symvasis-me-tin-periferia-attikis
[3] M. Prodromou, A. Yfantidou, C. Theocharidis, M. Miltiadou, C. Danezis (2020). Analysis of radar and thermal satellite data time-series for understanding the long-term impact on land surface temperature changes on forests. In EGU General Assembly Conference Abstracts, p.10582.

2. METHODS

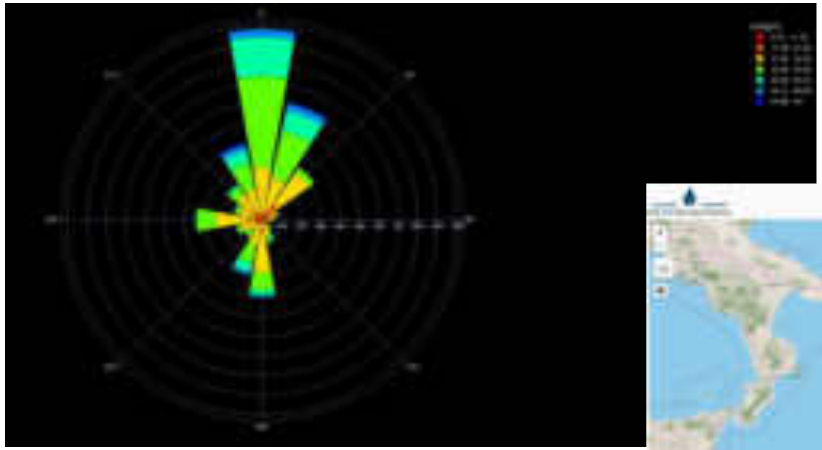
Flowchart of the integrated methodological approach.

Integrated approach that combines:
i) **Fire Hazard Simulations**,
ii) **Vulnerability estimation** (based on population age and density along with the infrastructure material information), iii) **Exposure (land zone value)** assessment and
iv) **Extensive field work** which supports the **evacuation and mitigation planning** and highlights the high-risk points and areas of the study site.

The aforementioned approach is **circular** and refers to **office-to-field and field-to-office** procedures. The outcomes (risk maps, management plans, etc.) of this operational-research project feed **a web platform** that is designed to reinforce civil protection stakeholders as a support tool against forest-fire outbreaks in high-risk peri-urban and urban areas of the Attika region.

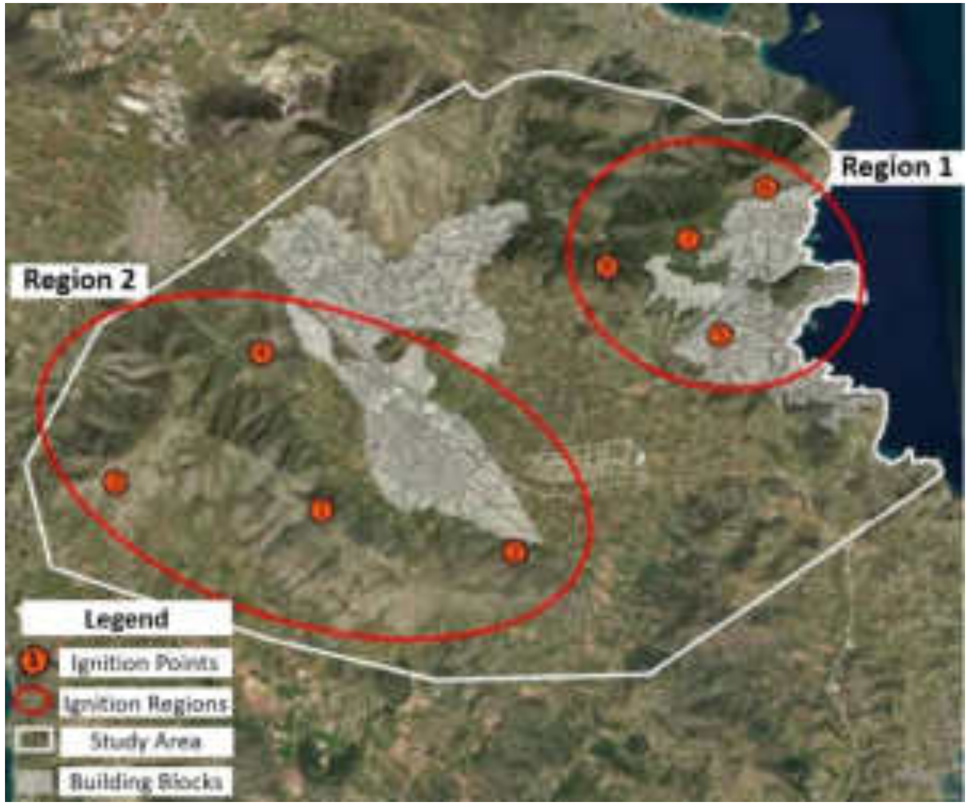
2. METHODS

2.1. Fire Hazard Simulations



Wind Conditions Analysis

BEYOND'S Daily Fire Risk Forecasting ML Model

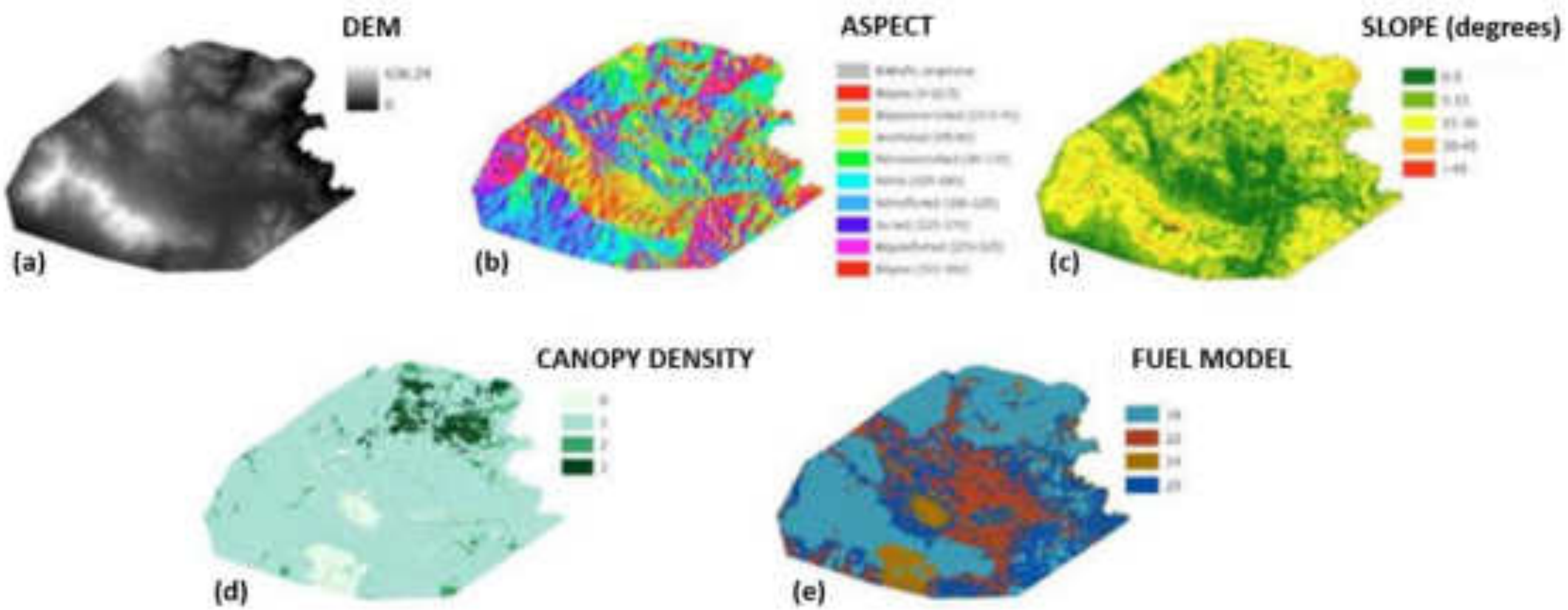


Determination of the Ignition Points

[4] A. Apostolakis, S. Girtsou, C. Kontoes, I. Papoutsis, M. Tsoutsos (2021). Implementation of a Random Forest Classifier to Examine Wildfire Predictive Modelling in Greece Using Diachronically Collected Fire Occurrence and Fire Mapping Data. Lecture Notes in Computer Science, 12573.
[5] S. Girtsou, A. Apostolakis, G. Giannopoulos, C. Kontoes (2021). A machine learning methodology for next day wildfire prediction. In IGARSS.
[6] A. Apostolakis, S. Girtsou, G. Giannopoulos, N. S. Bartsotas, C. Kontoes (2022). Estimating next day's forest fire risk via a complete machine learning methodology. Remote Sensing 14(5), 1222.

2. METHODS

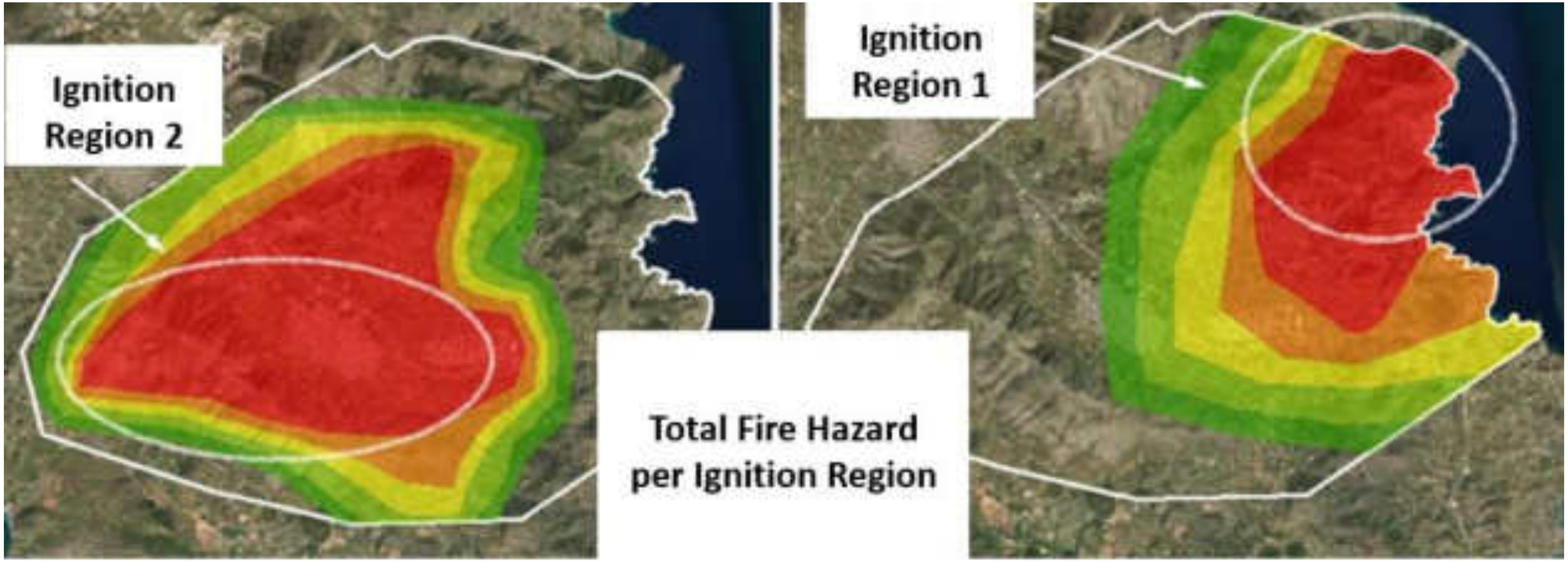
2.1. Fire Hazard Simulations



https://www.firelab.org/project/flammap

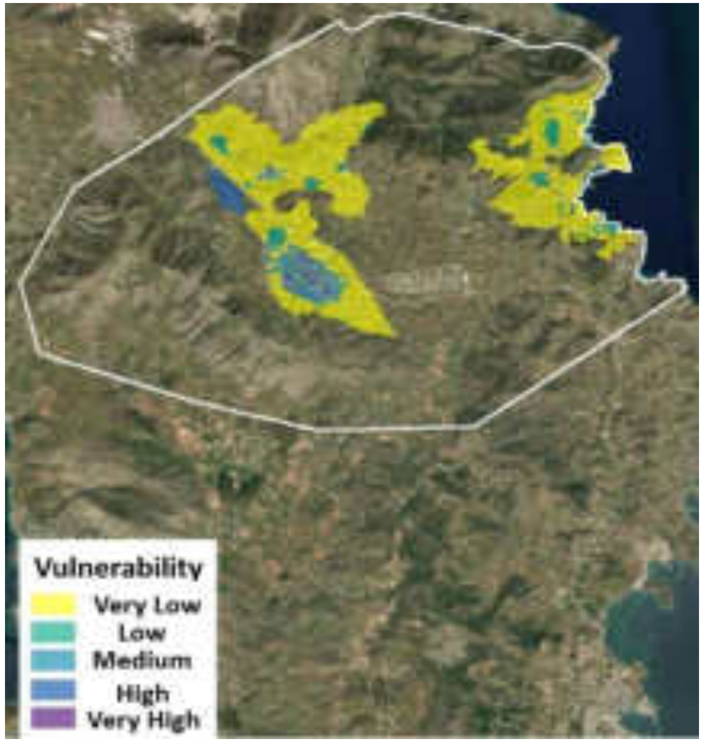
2. METHODS

2.1. Fire Hazard Simulations

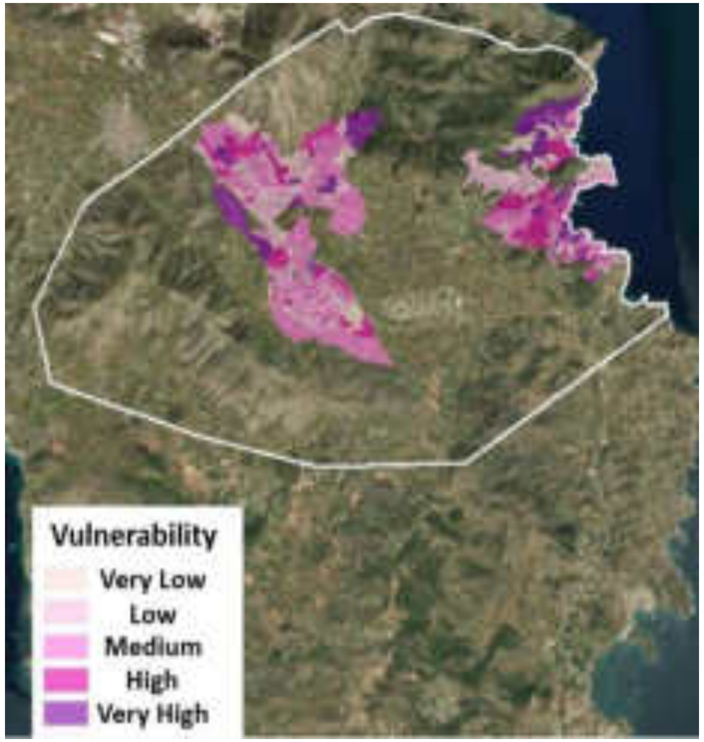


2. METHODS

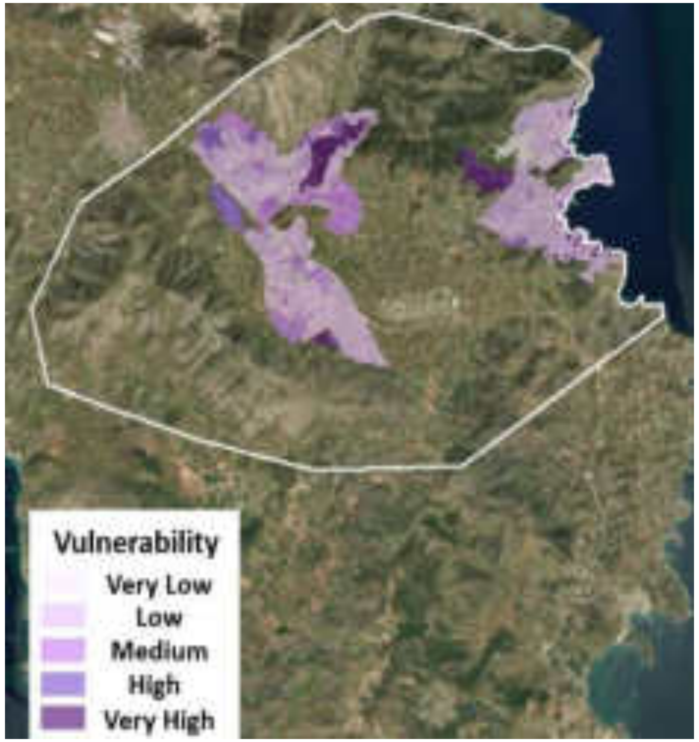
2.2. Total Vulnerability



Population Density



Population Age

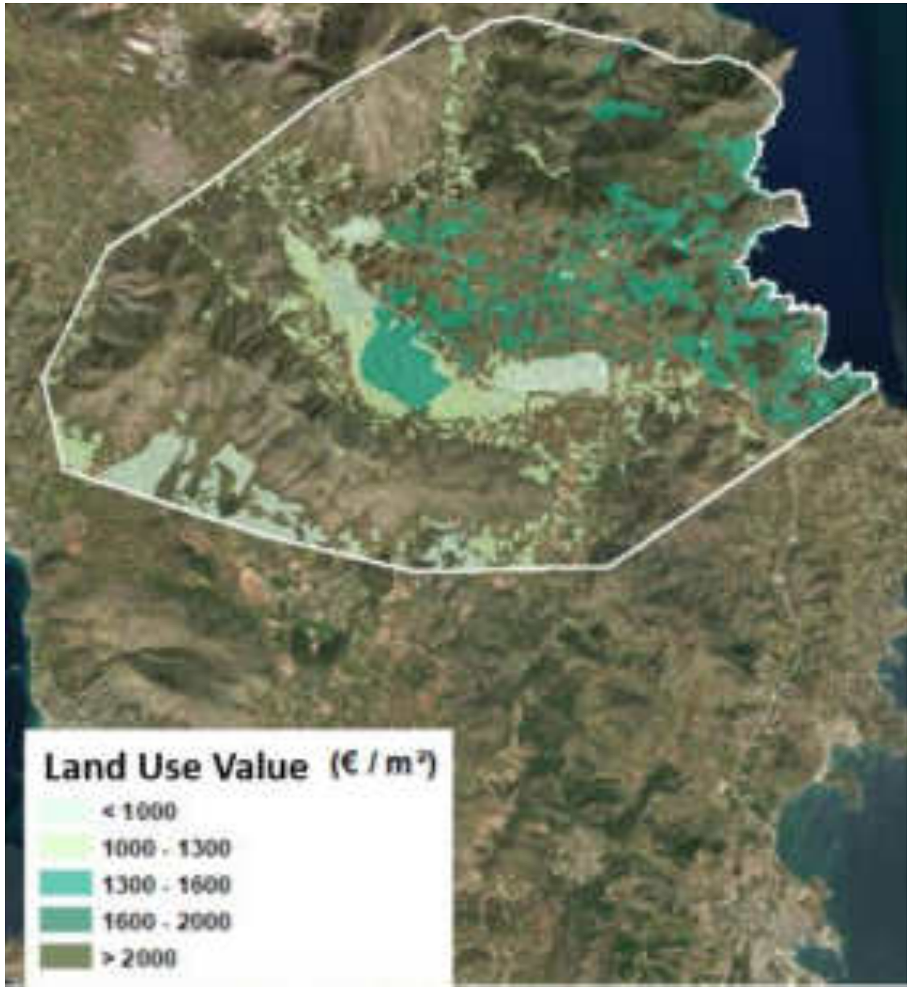


Building Characteristics

[7] P. Palaiologou, A. A. Ager, M. Nielsen-Pincus, C. R. Evers, M. A. Day (2019). Social vulnerability to large wildfires in the western USA. Landscape and Urban Planning, 189, 99–116.

2. METHODS

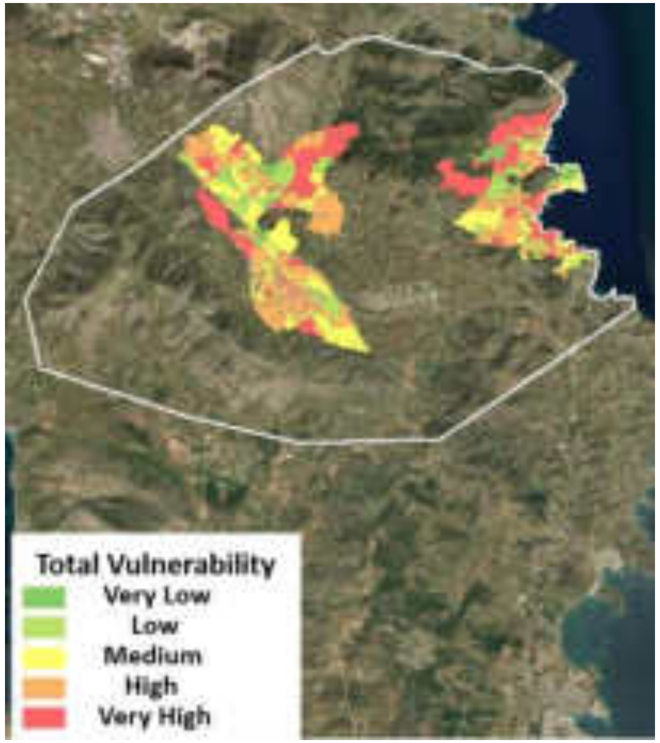
2.3. Exposure



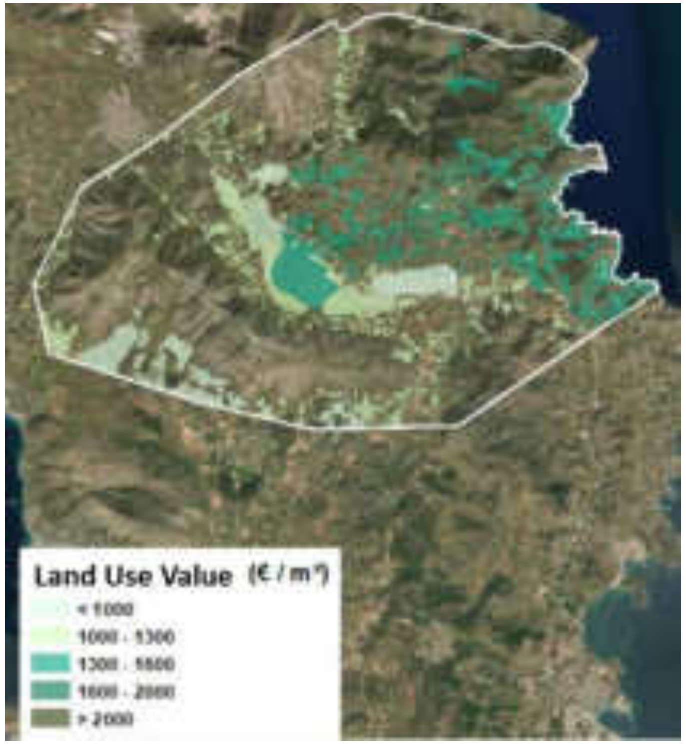
2. METHODS

2.4. Fire Risk

Fire Hazard



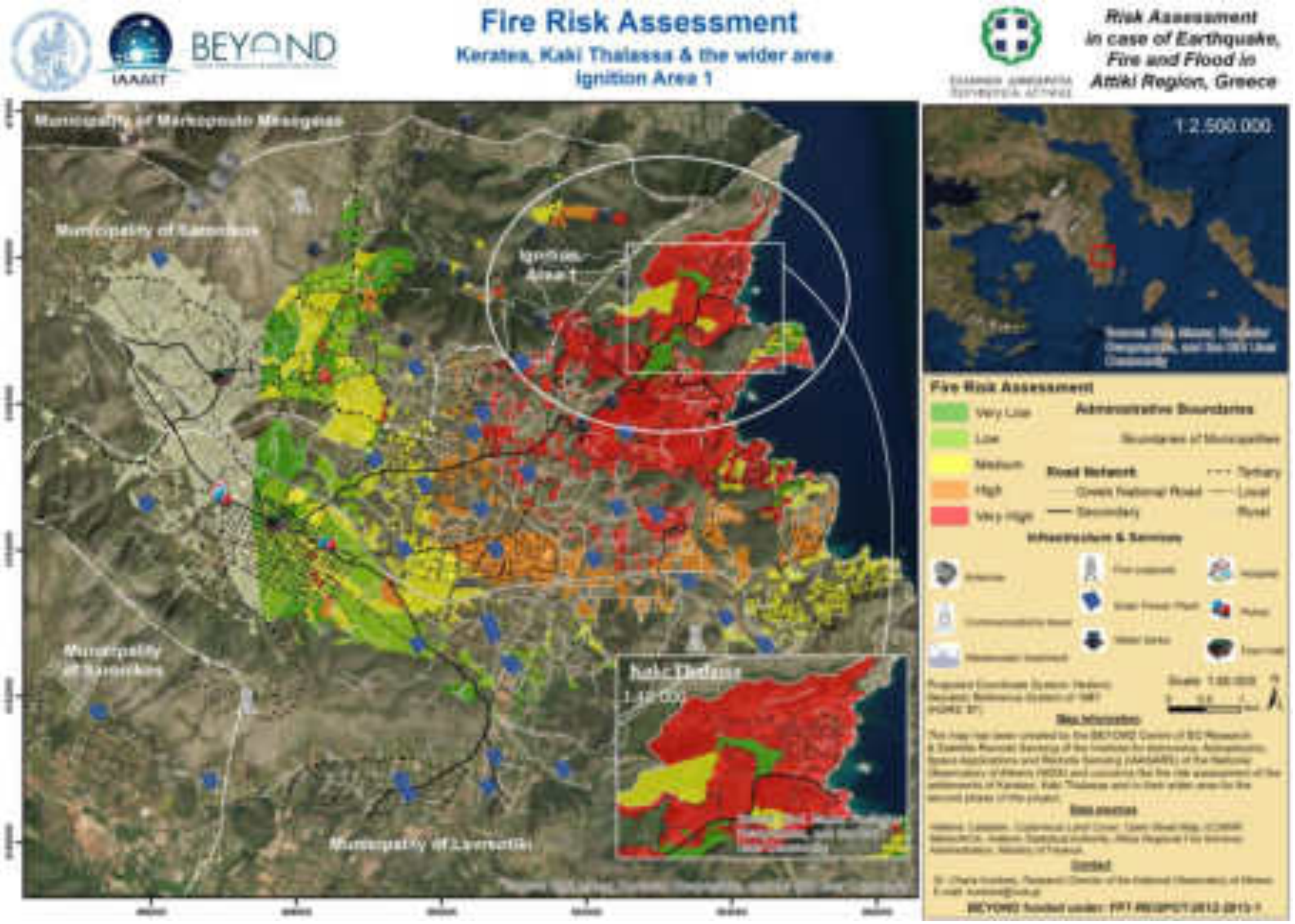
Total Vulnerability



Exposure

3. RESULTS

- **For each ignition area the risk was estimated** and a detailed illustration of the existing infrastructure and services is provided.

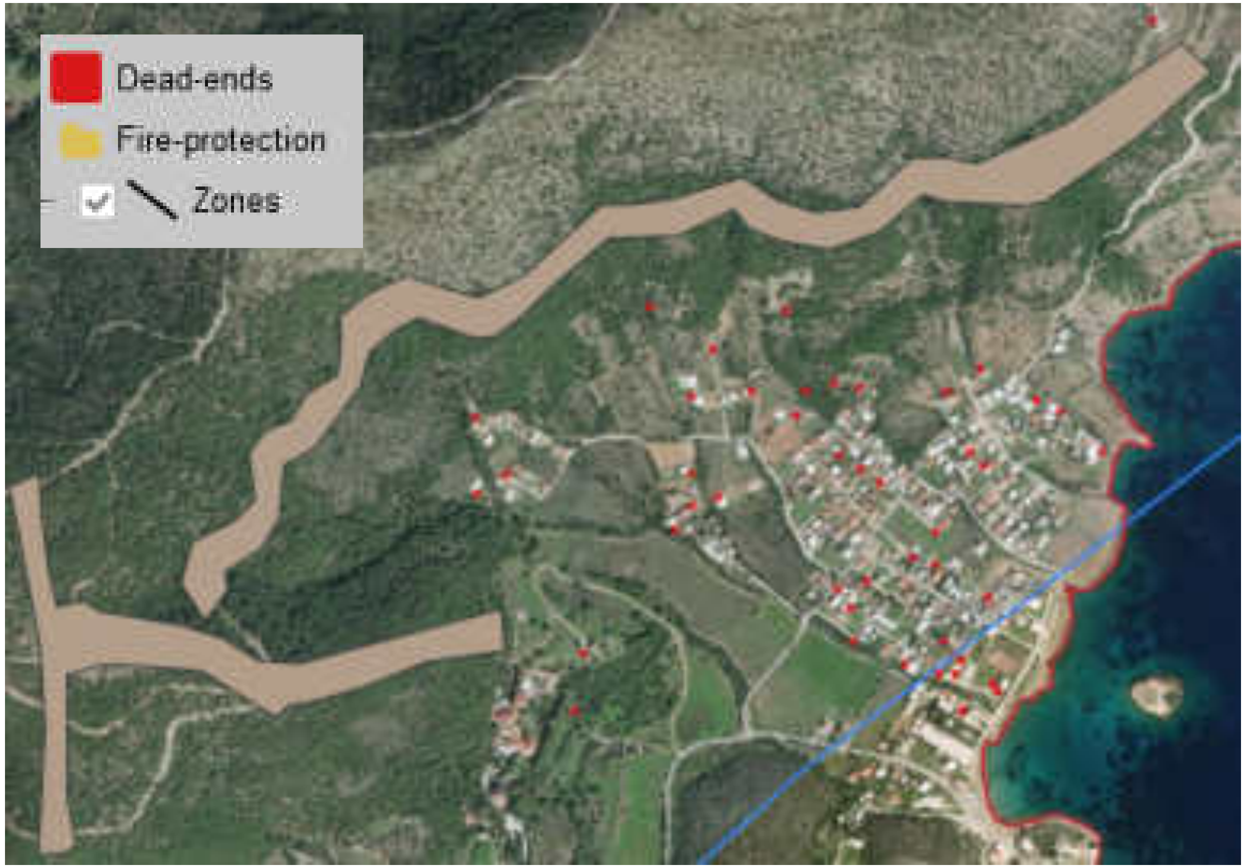


3. RESULTS

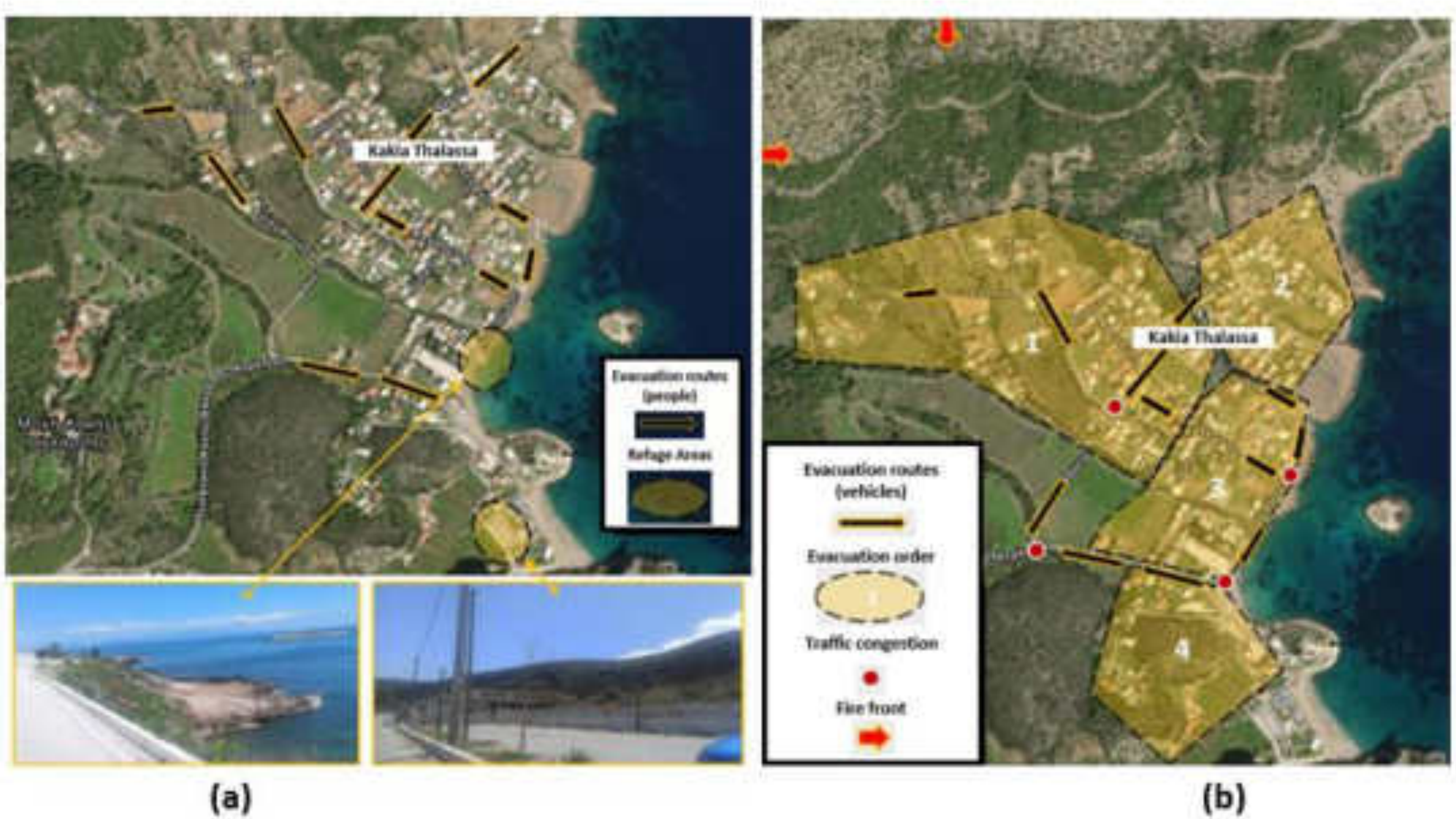
- **For each ignition region** the high risk areas (8) and roads (23), the critical points (33), the support sites & infrastructure (3) along with the places of refuge (4) were detected and recorded.

3. RESULTS

- Also, **dead-ends were identified and fire-protection zones** were produced for each ignition region.



3. RESULTS



Evacuation routes **(a)** on foot and **(b)** for vehicles along with **(a)** refuge areas.

4. DİSCUSSİON

- **Kaki Thalassa** was identified and **highlighted as a high-risk settlement**, as it is characterized by various **dead-ends**, **poorly constructed roads**, several **houses surrounded by dense vegetation** etc.





5. CONCLUSİON

- It is very important that **for the first time all the pre-existing, collected and produced data along with the scientific analysis, are properly organised and stored on a user-friendly web platform**, becoming available to all Prefecture’s and Municipalities’ services.
- This supports the **operational needs** during the crisis, as well as the **preparedness** and the **strategic decision making** towards **disaster resilience**.

5. CONCLUSİON

- The utilized methodology of this work consists of **state-of-the-art techniques** that spotlight a fire risk assessment and management planning at a high analysis level (**building block level**).
- It is noteworthy that during the following steps, **updated census data** (data for 2021 instead of 2011) **will be utilized to reduce the time inconsistency.**
- Lastly, yet importantly, the **mitigation planning** will be **further enhanced** by the implementation of the **Network Analyst routing** extension in GIS software.

5. CONCLUSİON

- All the above-mentioned were **discussed and evaluated positively** according to the stakeholders’ feedback.






12th Annual UN-SPIDER Regional Support Offices Coordination Meeting
Vienna, Austria, 14 – 16 November 2022

RSO Greece, Haris Kontoes, Alexia Tsouni, Stella Girtsou

National Observatory of Athens – IAASARS – Operational Unit BEYOND

FAST-TRACK ASSESSMENT OF FLOOD-EROSION-LANDSLIDE RISKS IN FIRE-STRICKEN RIVER BASINS OF THE REGION OF ATTICA

In the framework of the **Programming Agreement** of 03/03/2021 between the **Prefecture of Attica** and the **National Observatory of Athens – Part A:** «***Earthquake, fire and flood risk assessment in the region of Attica***»

Charalampos (Haris) Kontoes[1], Alexia Tsouni[1], Constantinos Loupasakis[2], Stavroula Sigourou[1], Vassiliki Pagana[1], Paraskevas Tsangaratos[2]

1. Operational Unit "BEYOND Centre of EO Research & Satellite Remote Sensing", Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing - National Observatory of Athens (NOA/IAASARS), (Greece).

(E-mails: alexiatsouni@noa.gr, sigourou@noa.gr, v.pagana@noa.gr, kontoes@noa.gr)

2. Laboratory of Engineering Geology and Hydrogeology, Department of Geological Sciences, School of Mining and Metallurgical Engineering, National Technical University of Athens, (Greece).

(E-mails: cloupasakis@metal.ntua.gr, ptsag@metal.ntua.gr)

1. INTRODUCTION

- The Prefecture of Attica constitutes a region with special features, such as **long coastline, large inland area, various geoenvironmental units, high population density** (3.792.469 residents, 36,4% of the country's population according to the Hellenic Statistical Authority [1], **critical infrastructures** and **social economic activities**.

[1] Hellenic statistical Authority. (2021, November 5). 2021 Population-Housing Census. https://www.statistics.gr/2021-census-pop-hous

1. INTRODUCTION

- In March 2021, a **Programming Agreement** was signed between the **Prefecture of Attica and the NOA** – Part A – to conduct the study entitled «**Earthquake, fire and flood risk assessment in the region of Attica**» funded by the Prefecture of Attica [2].
- Moreover, due to the **large forest fires of 2021**, it was urgently deemed necessary to conduct a **fast-track assessment of flood-erosion-landslide risks in the fire-stricken river basins of the region of Attica**, with a view to prioritizing the required interventions.

BEYOND/FireHub burnt scar mapping in Attica Region 2021

[2] Operational Unit "BEYOND Centre of EO Research & Remote Sensing" / IAASARS / NOA. (2021, March 2). A Programming Agreement was signed with the Prefecture of Attica. http://beyond-eocenter.eu/index.php/news-events/375-ypografi-trimeris-programmatikis-symvasis-me-tin-periferia-attikis

2. METHOD AND DATA

2.1. Selection of the study areas

Aiming to select the study areas, the following spatial information were taken under consideration:

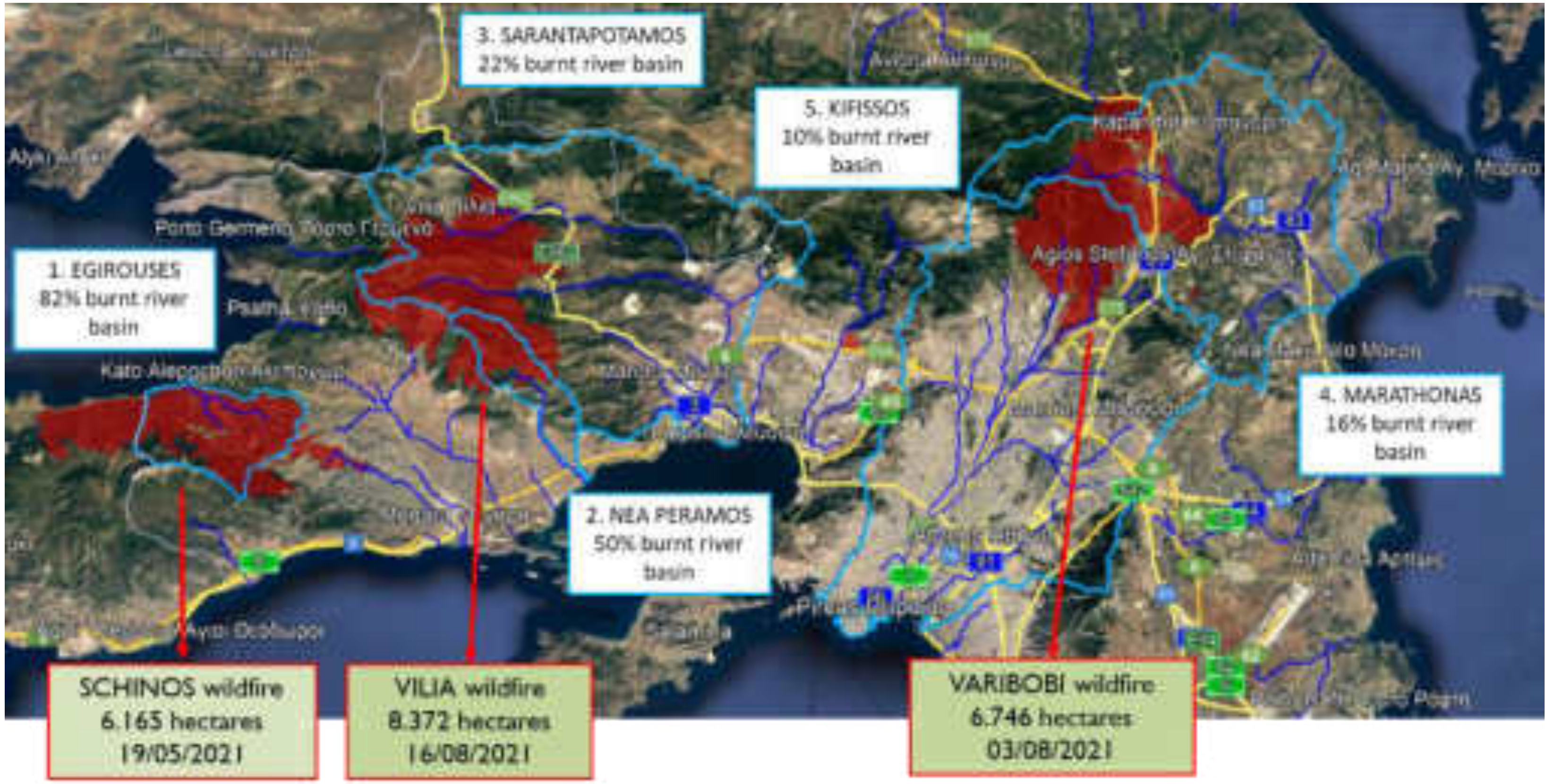
- **the river basins of Attica affected the most by the forest fires of 2021**, as they were mapped by the FireHub Service of the BEYOND Centre of IAASARS/NOA [3] using high resolution Sentinel-2 satellite images;
- the **Areas of Potentially Significant Flood Risk** in the Water Department of Attica according to the 1st Revision of the Preliminary Flood Risk Assessment [4];
- the **Spatial Distribution of Flood Risk from fluvial flows in Attica for return period T=1000 years** [5] according to the Approved Flood Risk Management Plan in the Water Department of Attica for the implementation of the EU Floods Directive [6].

[3] Operational Unit “BEYOND Centre of EO Research & Remote Sensing” / IAASARS / NOA. (2022). *FireHub A Space based Fire Management Hub.* IAASARS/NOA http://beyond-eocenter.eu/images/docs/publications/other/NOA-FireHub.pdf
[4] Special Secretariat for Water. (2019). 1st Revision of the Preliminary Flood Risk Assessment of Attica (EL06). Ministry of Environment and climate change. https://floods.ypeka.gr/index.php?option=com_content&view=article&id=1113&Itemid=1154
[5] Special Secretariat for Water. (2018). Flood Risk Management Plans of Attica (EL06). Ministry of Environment and climate change. https://floods.ypeka.gr/index.php?option=com_content&view=article&id=272&Itemid=782
[6] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Text with EEA relevance) OJ L 288, 06/11/2007, p. 27–34.

2. METHOD AND DATA

2.1. Selection of the study areas

- Given the above, the **Operational Unit BEYOND / IAASARS / NOA** in cooperation with the **Laboratory of Engineering Geology and Hydrogeology / NTUA** studied **five river basins** in the Prefecture of Attica, which are included in **11 Municipalities**.
- Both research groups collected and studied all available **geospatial data**, and conducted **field visits** in the areas of interest for on-site observation and collection of additional data, emphasizing at residential areas, road network and other critical infrastructures.



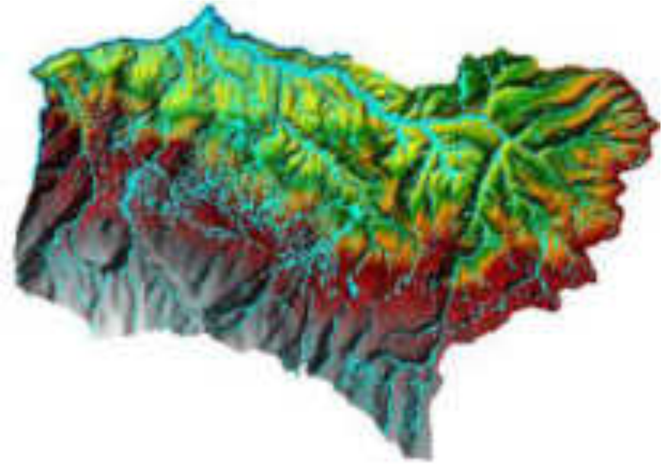
The five river basins (in light blue color) in the region of Attica, which were mostly affected by the forest fires during 2021 (in red color)

2. METHOD AND DATA

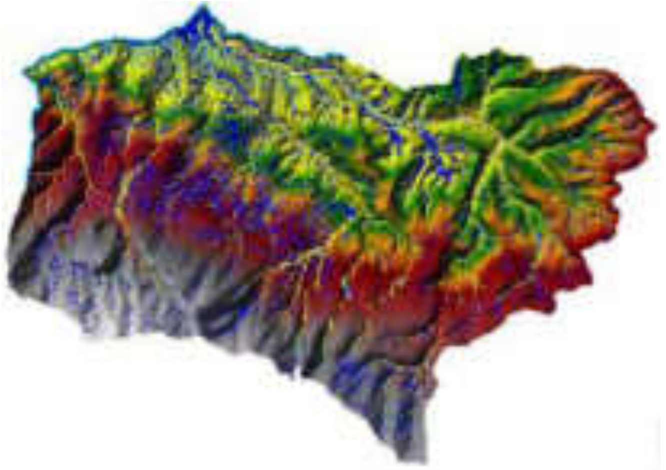
2.2. Urgent assessment of flood risk

- A **general ombrian curve** for the Attica region was implemented [7].
- The HEC-RAS model was used to perform **two-dimensional unsteady flow** calculations in **10 m resolution**, using rain-on-grid method, a uniform spatially distributed rainfall method within the river basin and Digital Elevation Model provided by Hellenic Cadastre in **2 m resolution**.
- The **burnt scar mapping** was used to update the Curve Numbers polygons and the Manning's roughness coefficient polygons.
- After having analysed model-simulated **maximum water depth**, **flood extent** and **velocity** maps, the **field visits** were planned.

Maximum water extent and depth estimation



Water velocity estimation

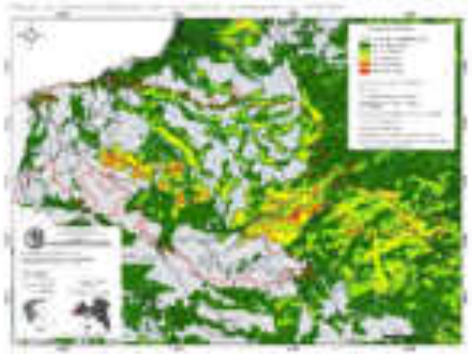


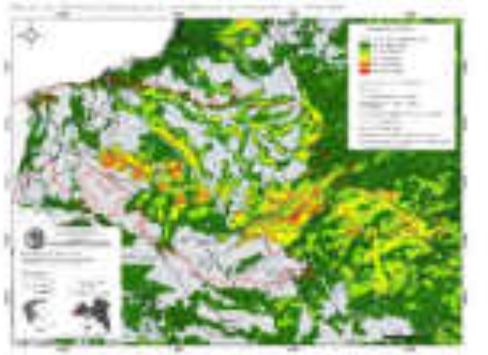
[7] Koutsoyiannis, D. and Baloutsos, G. (2000) Analysis of a Long Record of Annual Maximum Rainfall in Athens, Greece, and Design Rainfall Inferences. Environmental Science, Natural Hazards, 1, 29-48.

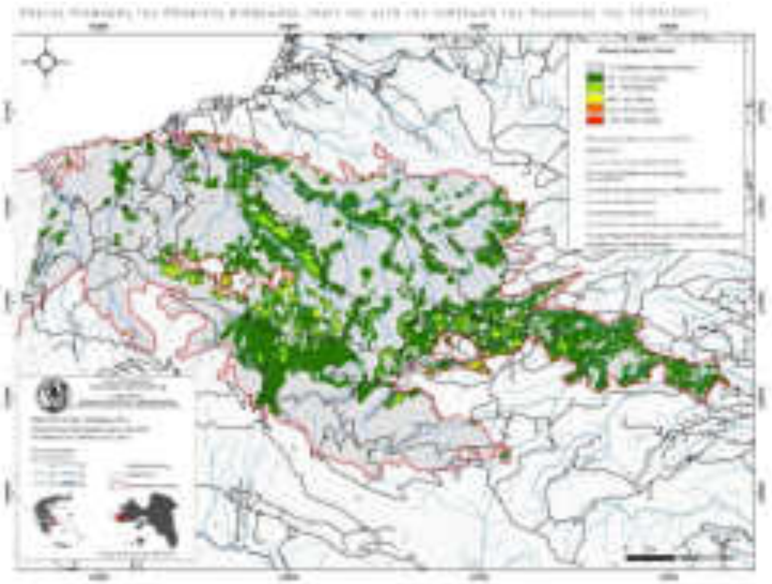
2. METHOD AND DATA

2.3. Urgent assessment of erosion risk

- **Three cartographic products** were developed, corresponding to: **a**) the assessment of the spatial distribution of soil loss in the period before the fire, **b**) the assessment of the spatial distribution of soil loss in the period immediately after the fire, as well as **c**) a map showing the difference in soil loss between the two periods. In both periods the Revised Universal Soil Loss Equation method, known as the **RUSLE model** [8], was applied.
- Cartographic data from RUSLE model solutions were correlated with the inundation extent and depth and flow velocity maps, and qualitative inferences were drawn about the **risk of increased transportation of sediments loads as a result of the occurrence of fires**.





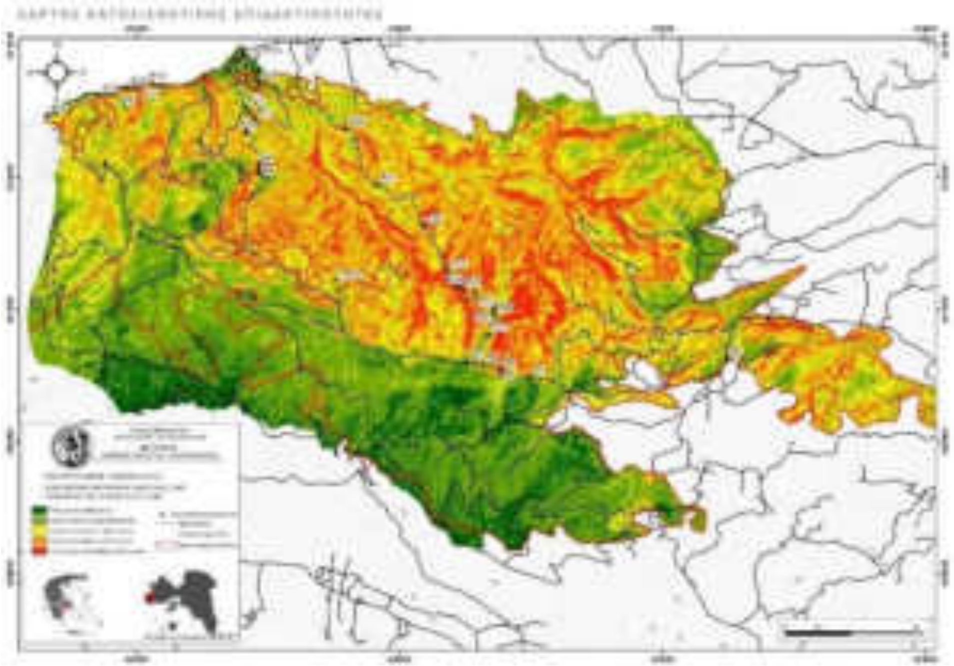


[8] Renard, et al. (1997). Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE) (Agricultural Handbook 703), US Department of Agriculture, Washington, DC, 404.

2. METHOD AND DATA

2.4. Urgent assessment of landslide risk

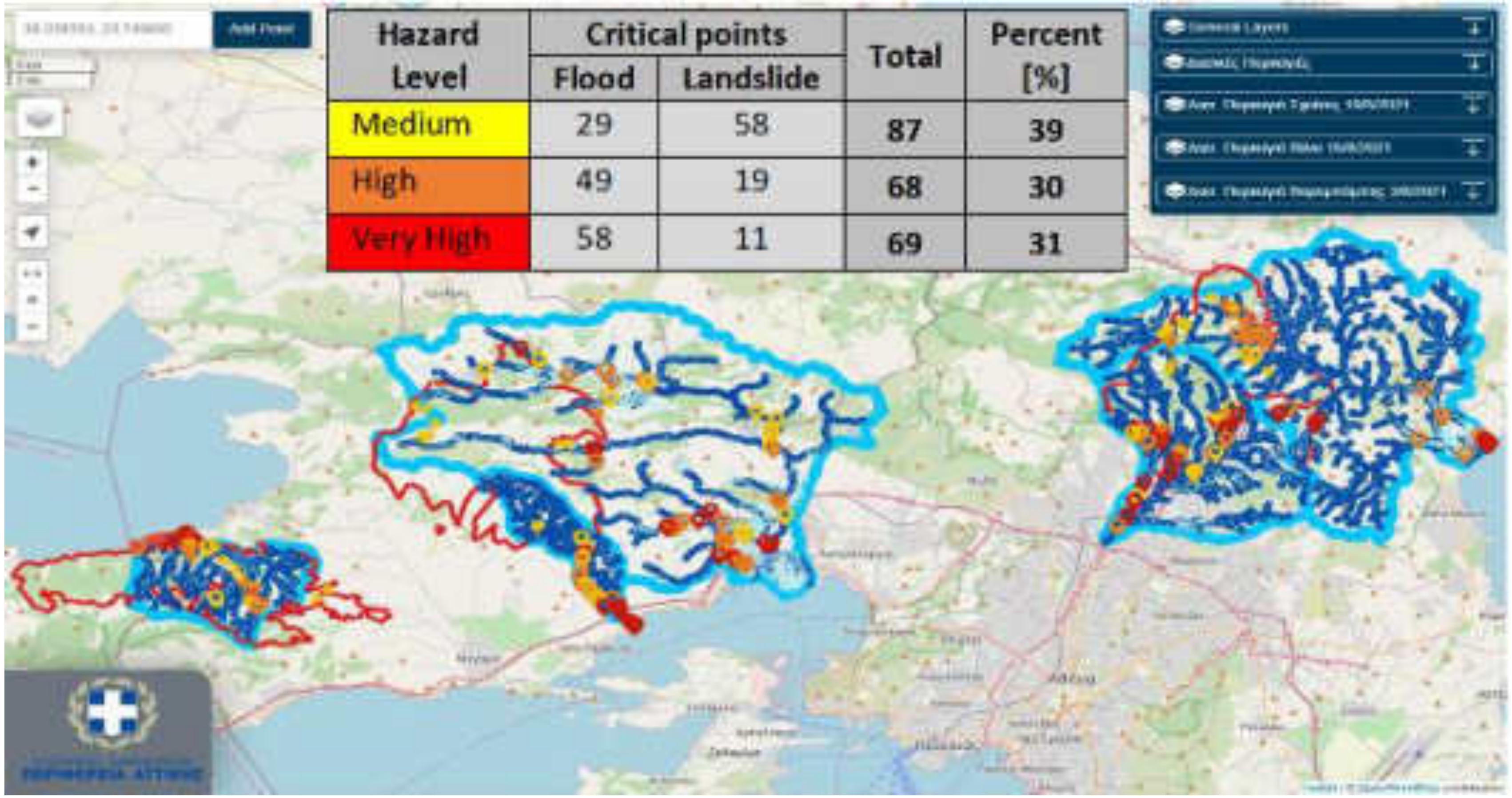
- A cartographic product was developed which captures the spatial distribution of landslide susceptibility, as defined according to Fell et al. [9]. The method followed is an empirical landslide susceptibility assessment model based on "**expert knowledge**". The control and validation of the produced map was carried out by comparing it with the **locations of past landslides** as well as by using **statistical indices** and the ROC - Receiver Operating Characteristic curves [10].
- Based on the elements of the produced **landslide susceptibility map**, the **field visits** were planned.



[9] Fell R., Corominas J., Bonnard C., Cascini L., Leroi E., Savage W.Z. (2008). Guidelines for landslide susceptibility, hazard and risk zoning for land use planning, Engineering Geology, 102 (3–4), 85–98.
[10] Chung, C.F., Fabbri, A.G. (2003). Validation of Spatial Prediction Models for Landslide Hazard Mapping. Natural Hazards, 30, 451-472.

3. RESULTS

- The **geospatial data**, **modelling results**, **critical points** from the field visits, and the proposed **mitigation measures** were delivered to the Prefecture of Attica and to the fire-stricken Municipalities both in **hard copy** and in **digital format** by developing a user-friendly **web GIS platform** designed for the needs of the specific project by the Operational Unit BEYOND/IAASARS/NOA.



Hazard Level	Critical points		Total	Percent [%]
	Flood	Landslide		
Medium	29	58	87	39
High	49	19	68	30
Very High	58	11	69	31

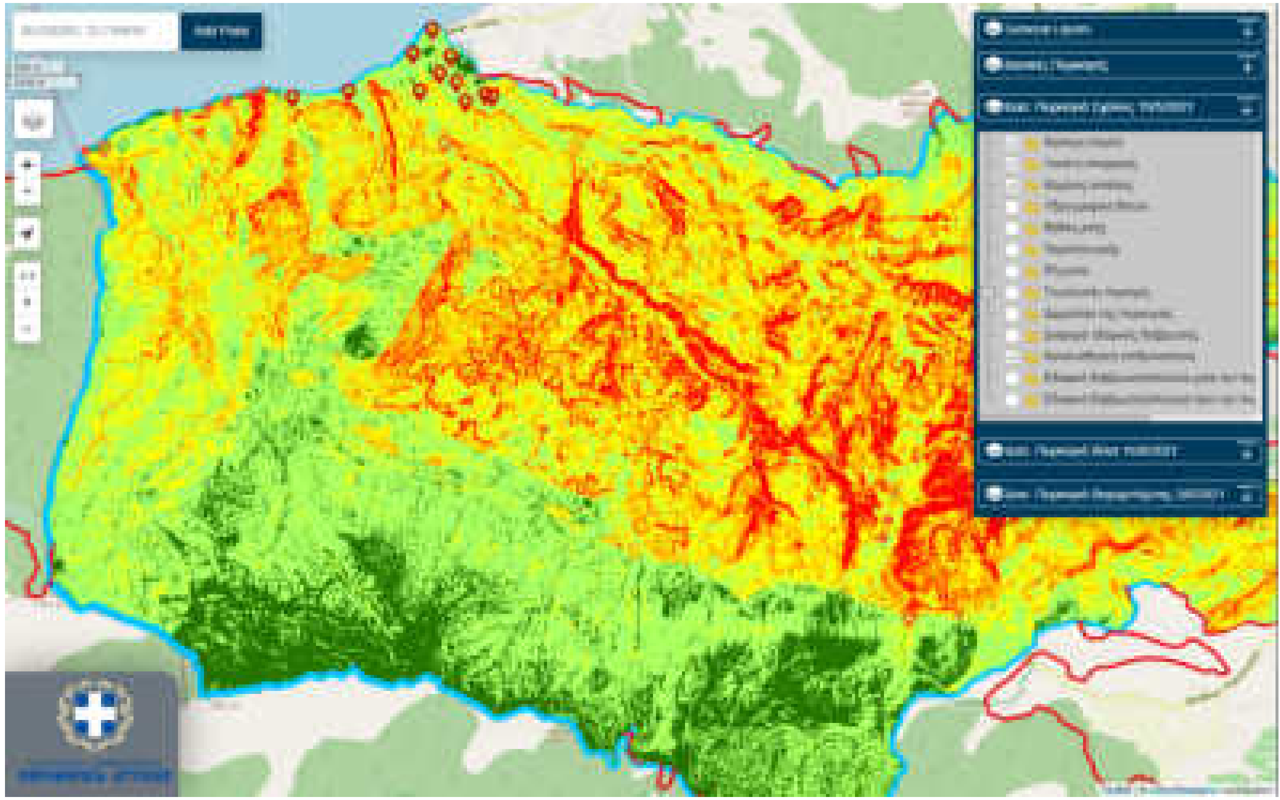
- Overall, **224 critical points** were identified, **136 for flood** and **88 for landslide** risks.

3. RESULTS

- **For each critical point, the hazard level was estimated** and a detailed technical report, containing coordinates, map preview, photos, documentation and proposed mitigation measures (both short-term and long-term), was delivered.

3. RESULTS

- Also, **flood hazard and landslide susceptibility maps** were produced for each impacted river basin.



4. DİSCUSSİON

- Given that the impact of the fire due to the land cover change in the burnt areas is severe, as it increases the risks of flood, landslide and soil erosion, **the research groups identified many high-risk points in residential areas, road network and other critical infrastructures**.
- Some of these points became critical because of the fire. However, some others were already critical, but they became **even more dangerous following the disaster**.
- All these required **immediate interventions** in order to **mitigate the risks** and **avoid further damage**, including loss of lives and property.

5. CONCLUSİON

- First, it is very important that **for the first time all the pre-existing, collected and produced data along with the scientific analysis, are properly organised and stored on a user-friendly web platform**, becoming available to all Prefecture's and Municipalities' services.
- This supports the **operational needs** during the crisis, as well as the **preparedness** and the **strategic decision making** towards **disaster resilience**.

5. CONCLUSİON

- Moreover, it is of crucial importance that **these fast-track studies identified the critical points and proposed mitigation measures, both short-term and long-term**.
- This allowed the authorities to **respond quickly** and **prioritise the recommended short-term measures in the critical points of highest risk,** with fast and low budget solutions for most of the cases (such as cleaning the riverbed and the culverts and stabilising the steep slopes along the road network).

5. CONCLUSİON

- All the above-mentioned were **confirmed and evaluated positively** according to the stakeholders' feedback.

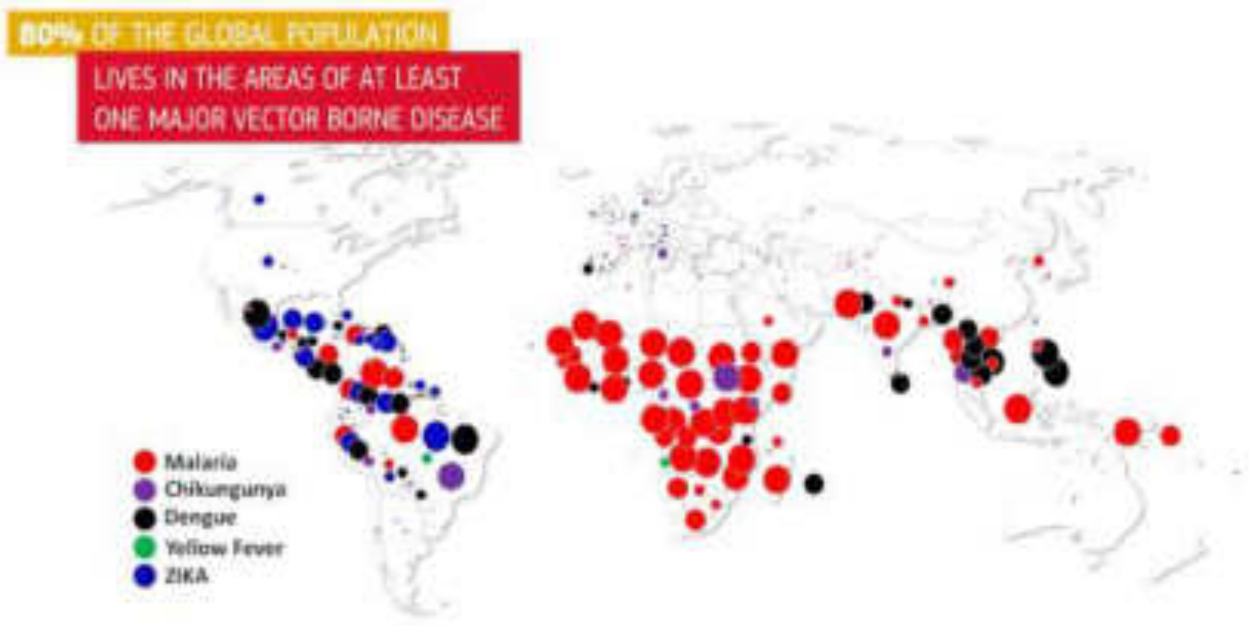





Introduction | MBDs A global problem to be addressed

EYWA
Early Warning System
for Mosquito Borne Diseases

EO creates opportunities for Health & Epidemics



Re-emergence of significant mosquito born disease, including outbreaks, reported native and imported cases (2017-2019)

Earth Observation for Epidemics of Vector-borne Diseases / EuroGEO Action Group

EuroGEO

prize

European Commission

Winner of the first "EIC Horizon Prize on Early Warning for Epidemics"

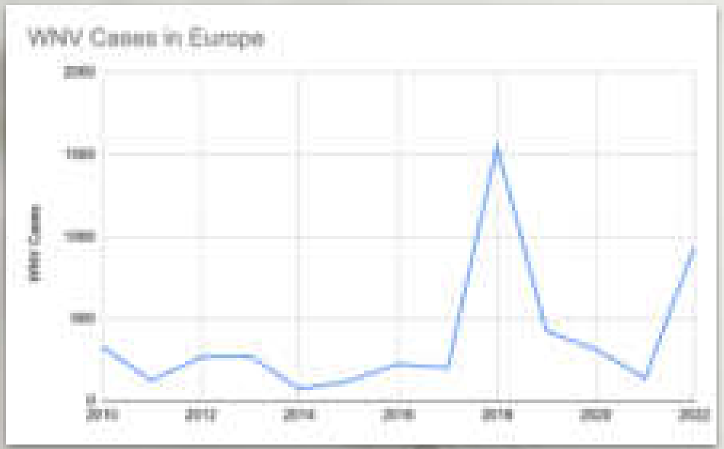
- **Climate Change**, **globalisation** and other drivers are altering ecological conditions for **mosquitoes**.
- Mosquito-Borne Diseases (MBDs) are present in **over 100 countries**.
- 700,000 deaths per year.
- **Malaria**, most lethal for kids aged under five in the sub-Saharan regions.
- **Europe** a "hot spot" of **West Nile Virus**.
- **Chikungunya** and **dengue fever** increased 40% over 1950[1].

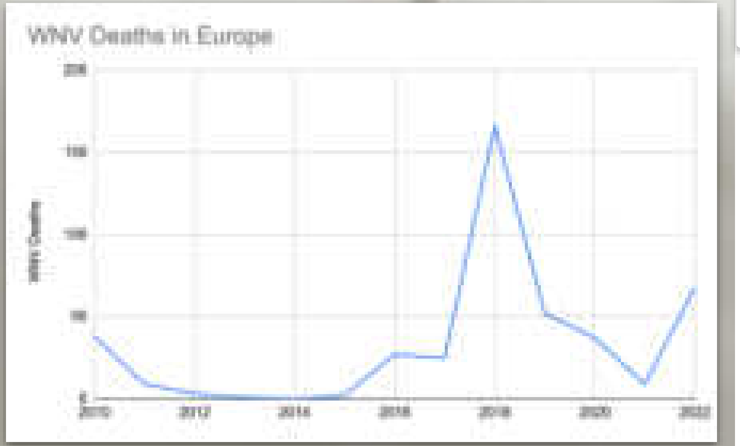
1. https://www.thelancet.com/action/showPdf?pii=S0140-6736(20)32290-X

EYWA
Early Warning System
for Mosquito Borne Diseases

EYWA & West Nile Virus in Europe

EO creates opportunities for Health & Epidemics





- **West Nile Virus** outbreaks have been registered in all of **southern Europe**.
- Starting to register cases in 2010, the disease had extreme outbreaks in multiple countries in **2018** with **1549** cases and **166** deaths in a year.
- In 2022 there is another outbreak ongoing in cases with **939** cases and **68** deaths so far.
- Overall **4989 cases and 437 deaths** in the past **12 years**.
- EYWA supports 11 regions in Europe for a total of **10.909 municipalities** and more than **34M people** living in them.

Country	Region	Municipalities	Population
Italy	Veneto	581	4,865,380
Italy	Trentino	176	541,098
Serbia	Vojvodina	37	1,931,809
Germany	Baden-Württemberg	74	11,111,496
France	Occitania	4,454	5,933,185
France	Grand-Est	5,121	5,556,219
France	Corsica	360	349,465
Greece	Central Macedonia	38	1,792,069
Greece	Thessaly	25	687,527
Greece	Western Greece	19	679,796
Greece	Crete	24	617,360
Total		10,909	34,065,404

EYWA supported regions

EYWA
Early Warning System
for Mosquito Borne Diseases

Working towards a solution

EO creates opportunities for Health & Epidemics

- After three years of developments the system started its operation in **2020.**
- Predictions were provided for **4 regions** in **Greece** and **1 region** in **Italy.**
- **In 2021** the system **expanded** to a total of **10 regions** in **5 European** countries **(France, Germany, Greece, Italy, Serbia)**.
- Joining the e-shape Horizon 2020 project, EYWA expanded to **Cote d'Ivoire** and **Thailand**.
- Following up on this in **2022** the system expanded to provide predictions in **Ivory Coast** in **Africa** and **Thailand** in **Asia**.
- Additionally the **Trento** region in **Italy** was integrated bring the total number of regions to 17.

What EYWA offers?

A couple of weeks/one month earlier it informs on mosquito abundance and pathogen transmission and suggests preventive and awareness door-to-door actions in the villages at risk

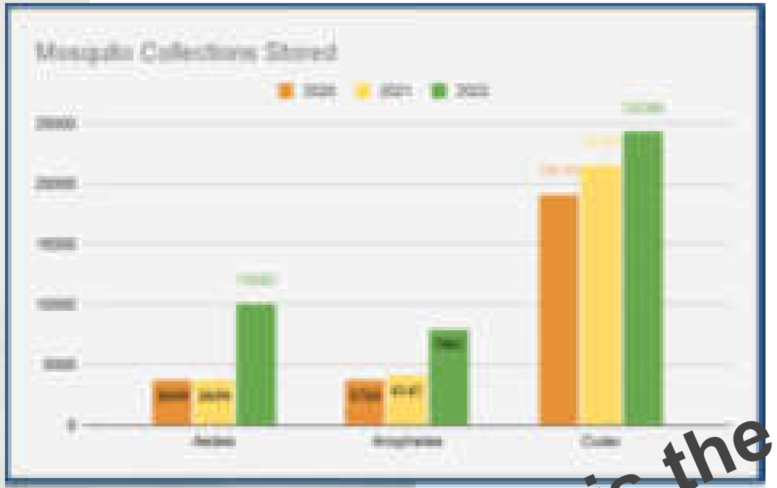
EYWA
Early Warning System for Mosquito Borne Diseases

A fragmented landscape

EO creates opportunities for Health & Epidemics

Before EYWA:

- Siloed collections Entomological & epidemiological records
- Lack of data providing dynamics:
  - Environment, weather, landscapes hosting areas mosquitoes
- No Standardization in feature engineering to feed AI/Dynamic forecasting models
- No robust/transferable solutions

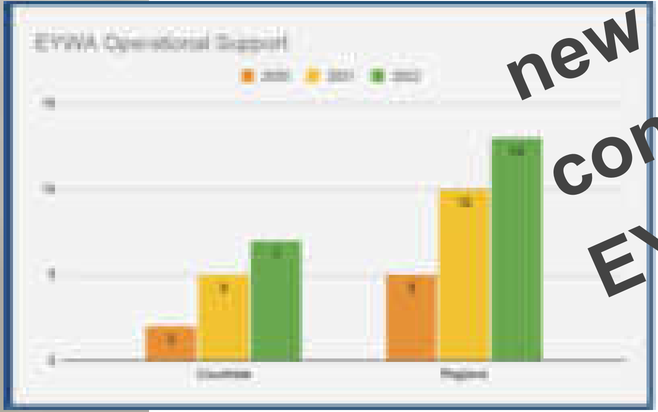


What is the new in the concept of EYWA ?

After EYWA

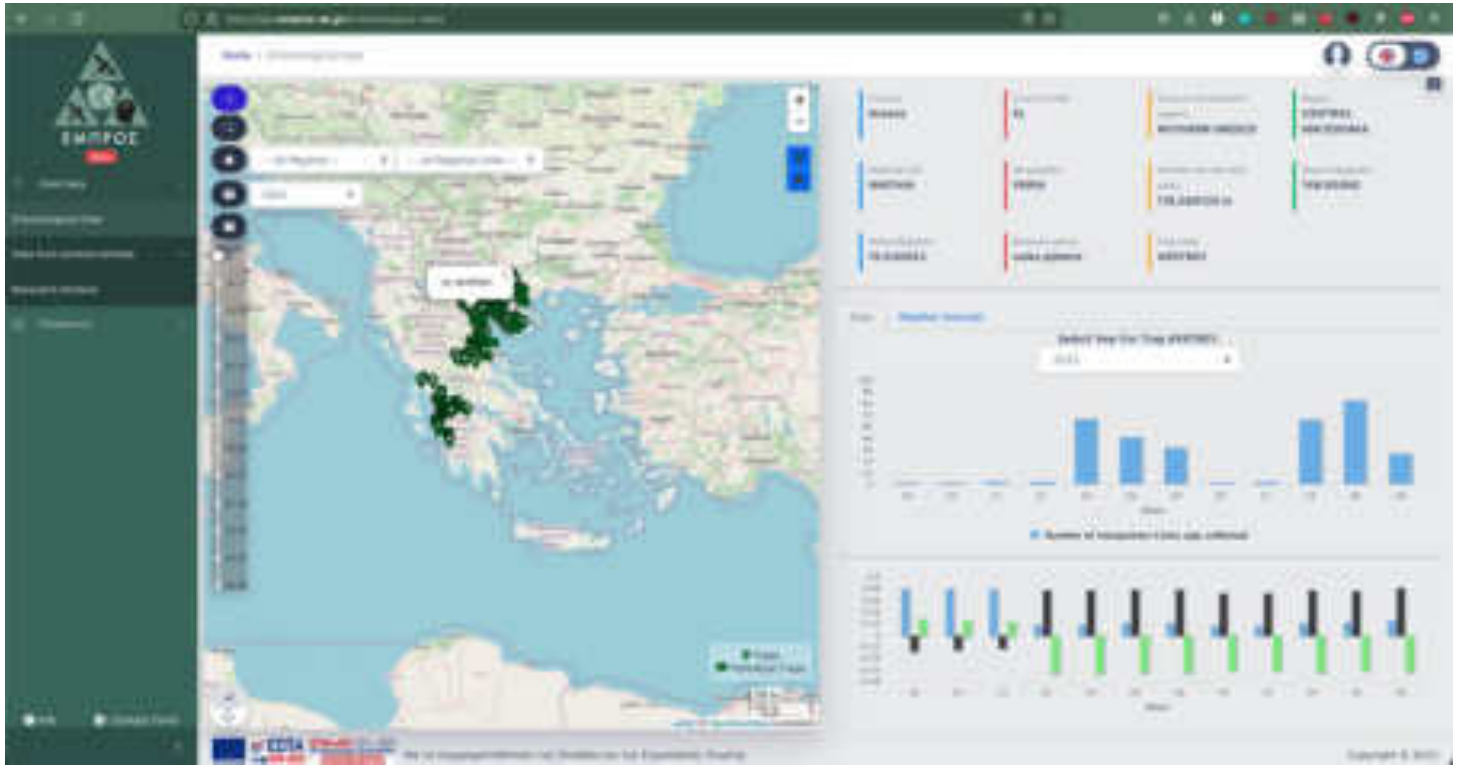
EYWA set the stage for:

- Data centralization in a common database
- Big features spaces of environmental, entomological, health, socio-economic, climatic data
- Validated Transfer Learning models



EMPROS (Advanced Earth Observation and Information Technology Techniques for Early Investigation/ Analysis and Warning of Mosquito-Borne Diseases)

EMPROS



- **EMPROS** is a greek research program with national funding that develops and provides support to **EYWA.**
- **5 partners from academia & private sector.**
- The goal is to **deepen the research** in the **West Nile Virus** problem in **Greece**.
- **Research actions** develop statistical analyses to further develop, augment and improve the **entomological & epidemiological risk models**.
- Working with data from **3 regions** in **Greece**
- **Ultimate goal** is to create a **unified standardized database** for all data from **public health authorities** and all **stakeholders** involved directly or indirectly with **combating West Nile Virus in Greece**
- **Promotes the research and innovation** into combating **mosquito-borne diseases**.

Acknowledgments. This research has been co‑financed by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation, under the call RESEARCH – CREATE – INNOVATE (project code: T2EΔK-02070).

UNITED NATIONS
Office for Outer Space Affairs

The BEYOND Center of EO Research & Satellite Remote Sensing

BEYOND

IAASARS

Thank you for your attention!