EYWA
Early Warning System
of Mosquito Borne Diseases

EO creates opportunities for Health & Epidemics

EYWA

Early Warning System for Mosquito-borne Diseases

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

EuroGEO

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EYWA provides a scalable, reliable, and cost-effective early-warning system to forecast and monitor vector-borne diseases. It aims to the prevention of outbreaks, mitigating their impact on local, regional and global scales, and provision of support to decision makers.

EYWA was initiated as action under the EuroGEO Action Group for Epidemics. For the time being it includes five countries, namely Greece, Italy, Srbia, France and Germany., with the prospect to expand to entire Europe. More countries and stakeholders are expected to join in the following years.

The users include a multi-purpose and multi-disciplinary community of stakeholders including Health Organizations, Private Sector, Regional and State Authorities combating the control of disease outbreak e.g. National Public Health Organisation of Greece, Hellenic Ministry of Health, Regional authorities of Central Macedonia, West Greece, Thessaly, and Crete, Regions of Veneto (IT), Vojvodina (Serbia), South France, and Germany, etc

The EYWA Consortium

Greece : (1) National Observatory of Athens (NOA) – BEYOND Centre of EO Research & Satellite Remote Sensing,

(2) Ecodevelopment S.A

University of Patras – Physics Department - Laboratory of Atmospheric Physics (LapUP)

Dimitrios Vallianatos (IDCOM)

Aristotle University of Thessaloniki, Medical School

University of Thessaly, Medical School. Laboratory of Hygiene and Epidemiology

Serbia : University of "Novi Sad" Faculty of Agriculture, Laboratory for Medical and Veterinary Entomology

Scientific Veterinary Institute "Novi Sad"

Germany: German Mosquito Control Association (KABS)

Bernhard Nocht Institute for Tropical Medicine

France: EID Méditerranée

Italy: Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe)

Edmund Mach Foundation

University of Trento

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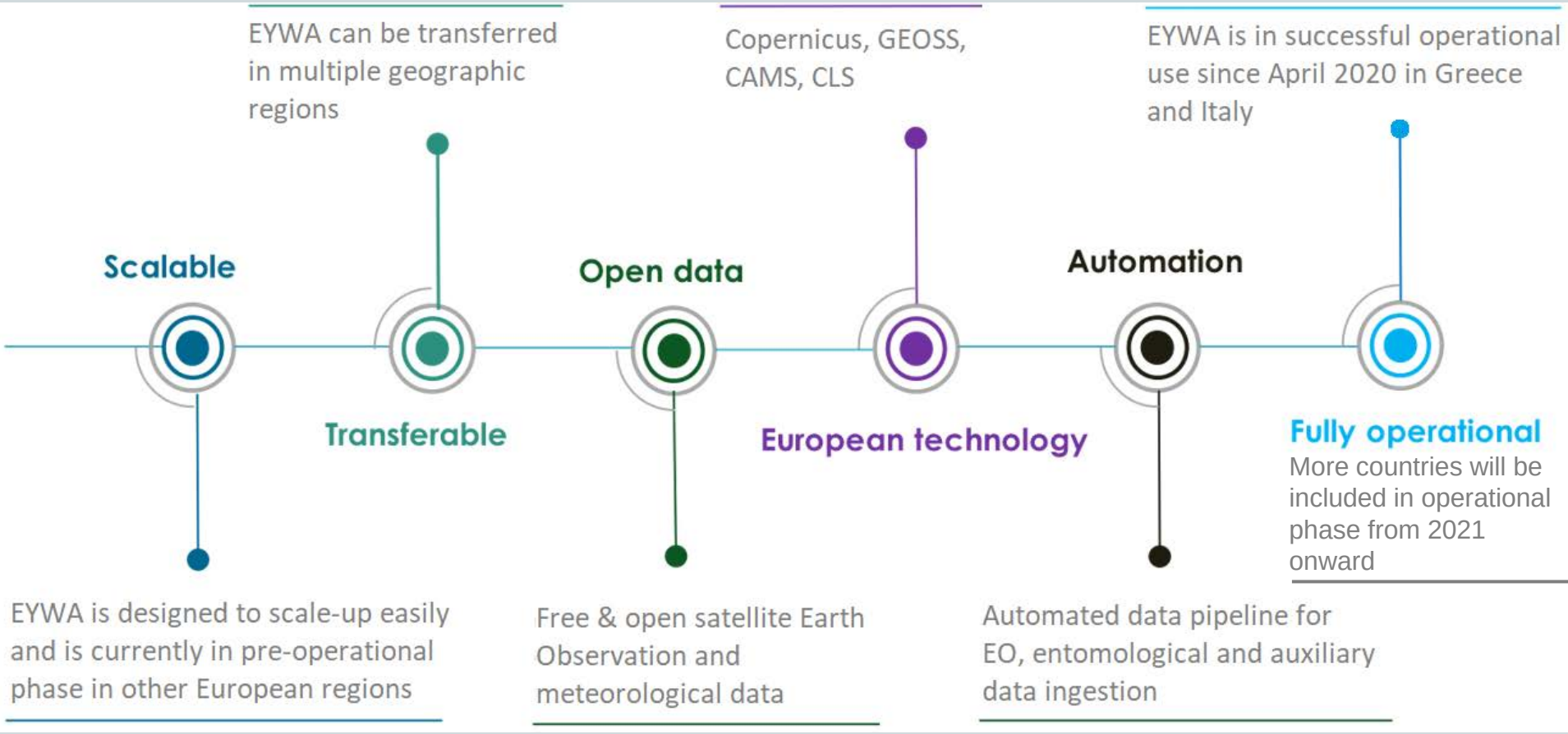
How EYWA competes



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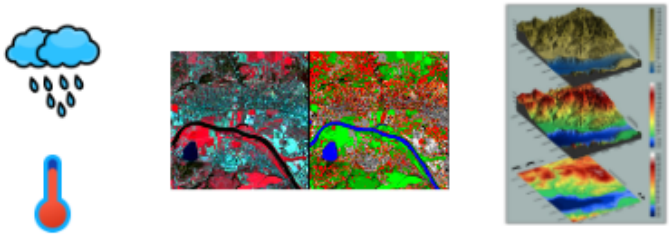
EYWA's Data Resources & Acquisitions

Full series of Entomological and Epidemiological Data from five countries namely Greece, Italy, France, Germany, and Serbia are integrated so far plus Environmental Essential Parameters , time series Meteo, GEOSS portal data e.g. Administrative and Socioeconomic data, Topographic data, Copernicus Core Service data (C3S, ERA5, IMERG, CLMS, etc), Copernicus, and Copernicus contributing missions EO derived proxies from Sentinels, Landsat TM, EOS, SUOMI NPP, NOAA/AVHRR, etc

Data Resources

Earth Observation data



Entomological data

Culex

Anopheles

Aedes

Epidemiological data

WNV

Malaria

Chikungunya, ZIKA,

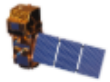
Dengue

Socioeconomic data

Data Acquisition

Satellites and ground stations

Near Real-Time acquisition



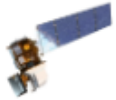
Sentinel-2

GEOSS Portal

Copernicus

SENTINELS GREEK HUB

HELLENIC MirrorSite



Landsat 7 & 8

Climate Change Service

Atmosphere Monitoring Service

ECMWF

MODIS

X/L Band Antenna

Mosquito traps Network

Public Health Authorities

Public Statistical Authorities

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EYWA's models in Operational phase since April 2020
Data Driven and Dynamic modelling

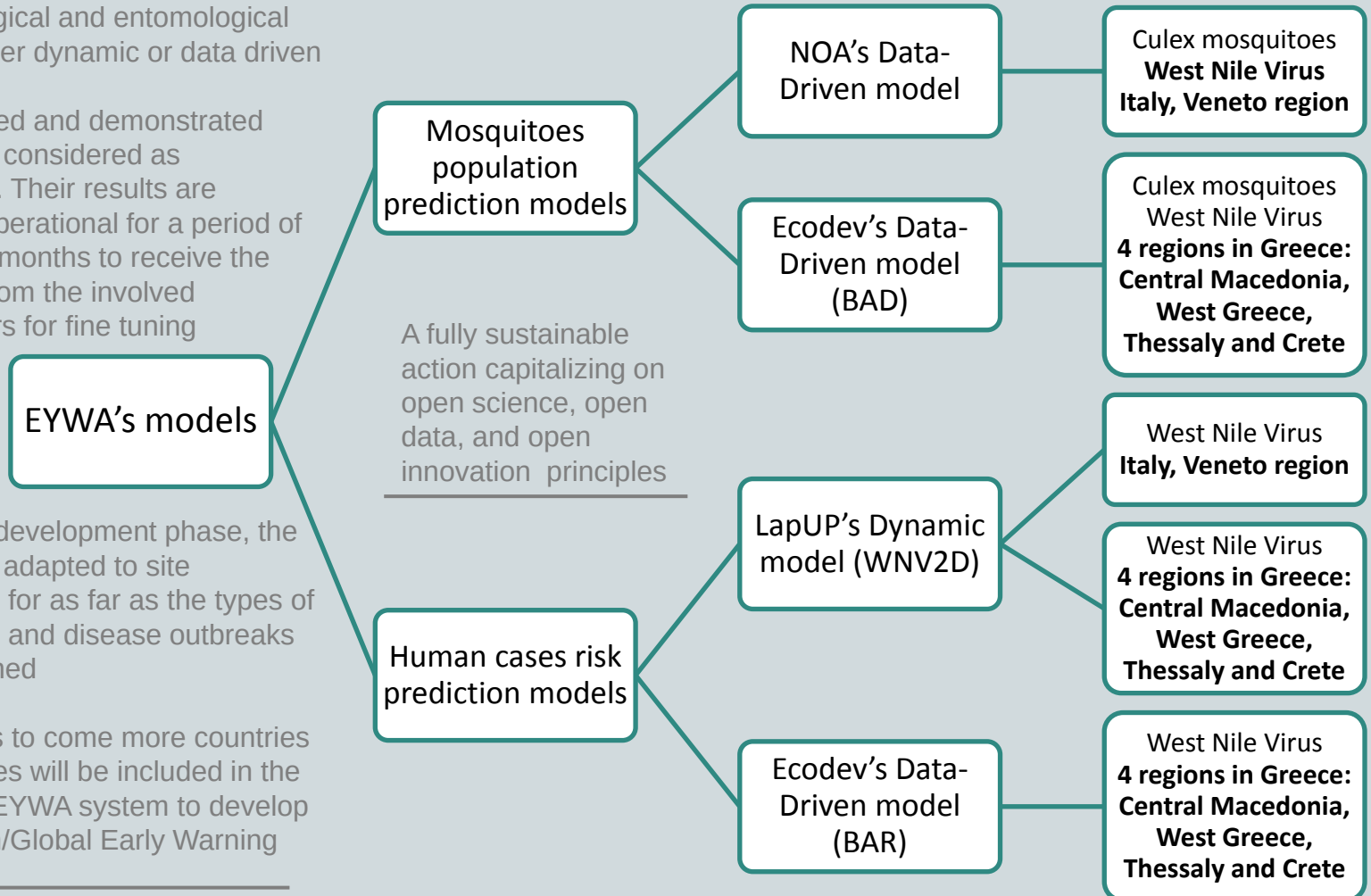
EYWA is a suit of validated epidemiological and entomological models either dynamic or data driven

The validated and demonstrated models are considered as operational. Their results are delivered operational for a period of at least six months to receive the feedback from the involved stakeholders for fine tuning

During the development phase, the models are adapted to site specificities for as far as the types of mosquitoes and disease outbreaks are concerned

In the years to come more countries and diseases will be included in the integrated EYWA system to develop a European/Global Early Warning System

A fully sustainable action capitalizing on open science, open data, and open innovation principles



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EYWA's results during the operational phase | April – October 2020

EYWA produced knowledge in the form of reports, statistics, validated assessments, and web GIS information layers.

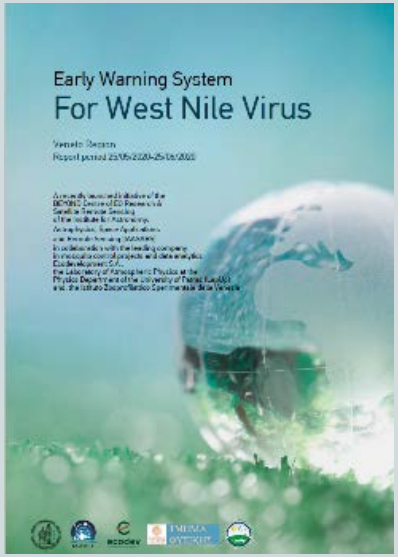
It opens data and scientific results which are published through a dedicated Web GIS platform.

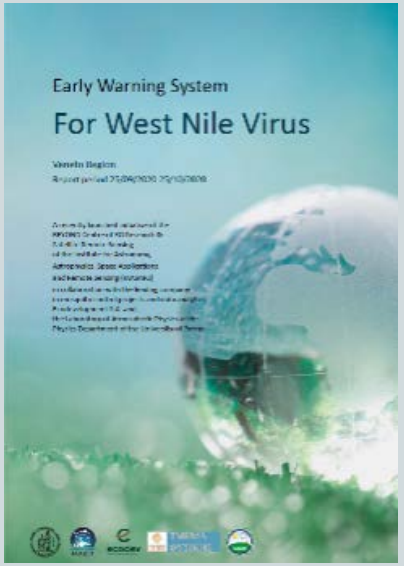
EYWA contributes with open data and derived knowledge by registering results, data and meta-data to widely known portals e.g. GEOSS, NectGEOSS, etcusing open data standards.

User specific reports including model forecasts for mosquito ambulance and expected cases for the West Nile Virus disease were delivered operationally for the period May – October 2020 to the involved end-user authorities belonging to the public health sector in five regions:

Italy - Veneto | Greece - Central Macedonia | Greece - West Greece | Greece - Thessaly | Greece - Crete

Weekly/monthly reports were delivered systematically, helping the authorities to anticipate preventive measures and organize mosquito combating operations. Measurable performance indicators are used to evaluate the level of EYWA's effectiveness towards the protection of the engaged communities against the disease outbreak





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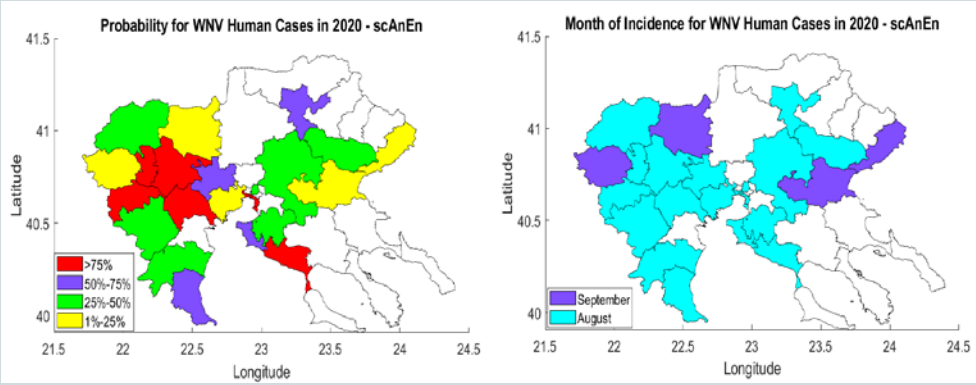
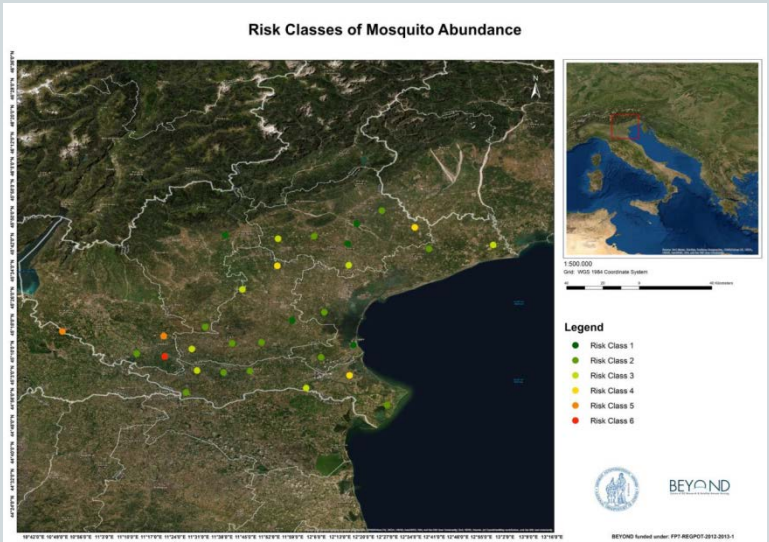
Indicative EYWA operational results during the period | April – October 2020

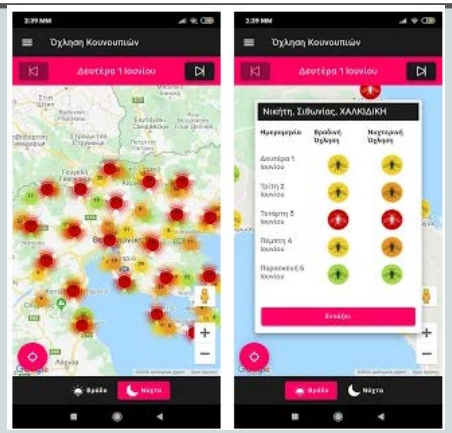
Human case risk forecast – Region of Central Macedonia - Dynamic modelling – Issued on 25/07/2020



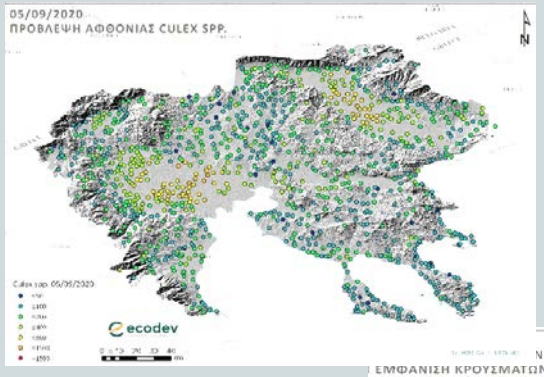
Human case probability map (left) and probable month of human cases incidence (right)



Mosquitoes population risk map - Data Driven Model - Region of Veneto (Italy) Period 25/08/2020-25/09/2020

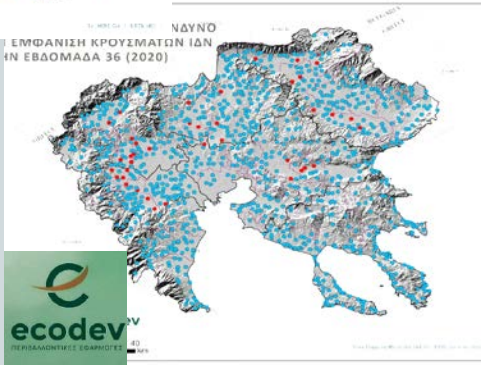


Mosquito Vision: Smartphone application for 5-day predictions of evening and night nuisance from mosquitoes



Mosquito abundance forecasts in the 1040 municipalities of Central Macedonia for the week 02/09 έως 06/09/2020

Human case risk forecasts for WNV incidence calculated over the 1040 municipalities in Central Macedonia for the week 31/08-06/09/2020



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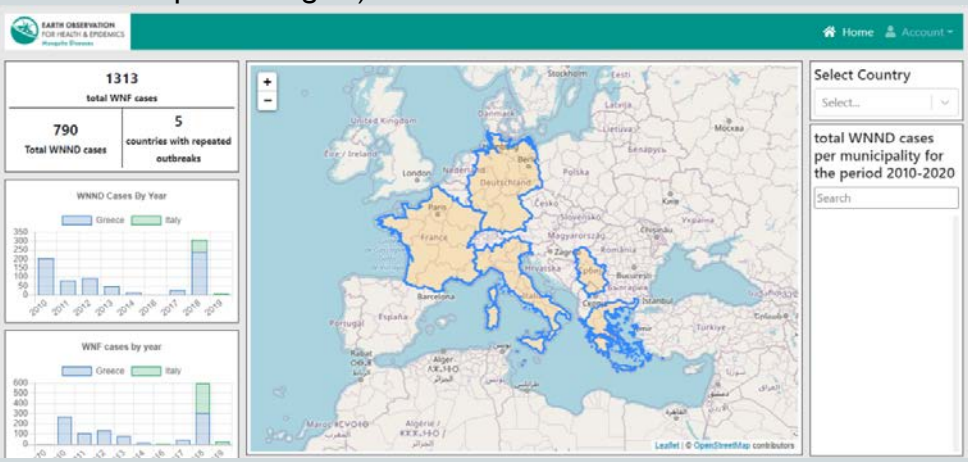
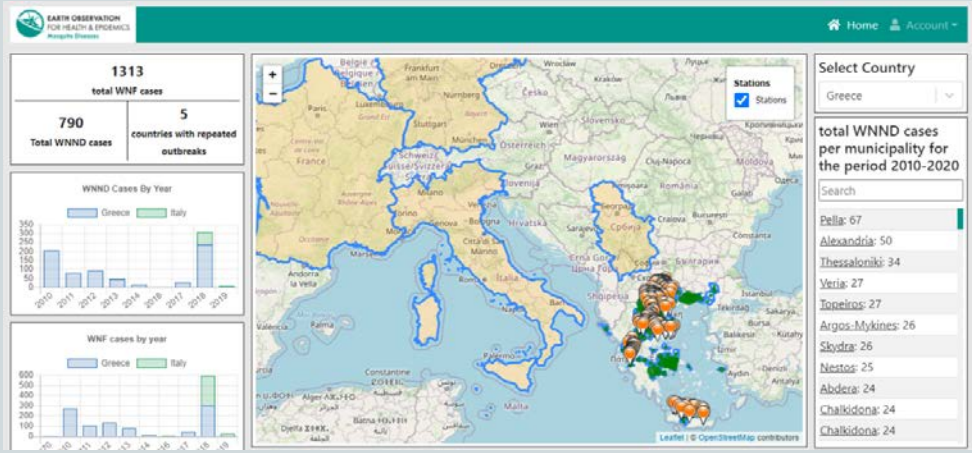
EYWA Web GIS Platform – Indicative Functionalities

Authenticated end users are able to upload data and get the results (entomological/ epidemiological)

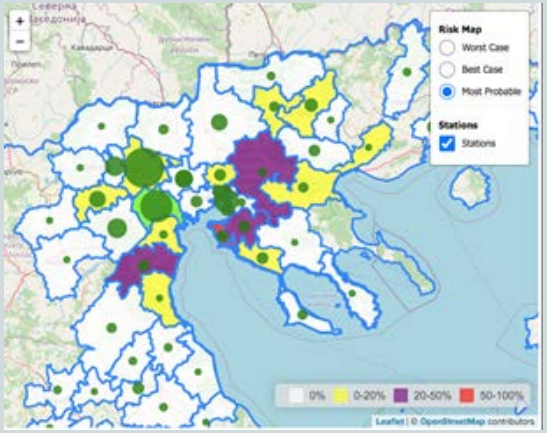




Visualise the areas of application and the number of MBDs historical human cases published by ECDC and National Health Organisations

Select any country and visualise the mosquito traps networks

For any selected trap visualise time-series, statistics, and data analysis and trends of calculated and recorded meteo, societal, and environmental parameters (NDVI, NDMI, NDWI, temperature, rainfall, population)



Visualise and report on the human cases risk forecasts produced from the various predictive models (dynamic – data driven)

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EWYA SUMMARY

- A **sustainable and cost-effective** Early Warning System (EWS) that is seamlessly integrating detailed data from different countries leveraging on the use of open and multi-source data encompassing long time series of collected, cleaned, harmonised and standardised at local/regional/country level of exhaustive entomological, epidemiological, meteorological, Earth Observation data and value added products

- Relies on the advancements of **big EO and ICT and AI sciences** and leverages on the use of the **EU investments** in the domains of Copernicus, GEO/EuroGEO, Space based / in-situ / citizen observatories, and relevant infrastructures such as satellite data hubs and repositories, DIAS platforms, Cloud HPC, Open DataCubes, etc)

- Lies with the open science and open innovation principles and contributes to EuroGEO and Copernicus by providing an **innovative scalable, reliable, transferable, and integrated solution** at various spatio-temporal scales (municipality → regional → country→ continent level), while delivering open data sets and open information and forecasts on risks for different disease outbreaks

- EYWA comprises of fully operational modules and radically new technique for modelling and predicting mosquito–borne outbreaks across different temporal and spatial scales in Europe with the **Technology Readiness Level ranging from 7 – 9** (system prototype demonstration in operational environment).

- EYWA intends to become a **state-of-the-art tool**, in the hands of National Health Organizations and Public Authorities developed through a continuous co-design and co-creation approach. When fully developed and operational, EYWA, attempts to become **a European standard**.

Thank you!

Partners

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Scientific Veterinary Institute "Novi Sad"

Germany

German Mosquito Control Association (KABS)

Bernhard Nocht Institute for Tropical Medicine

France

EID Méditerranée

Contact us
Kontoes@noa.gr
(Coordinator of EuroGEO Action Group for Epidemics)
(Lead Partner of EYWA)

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

EuroGEO