EYWA- Early Warning System for Mosquito Borne Diseases

Summary

A prototype system addressing the critical public health need for prevention and protection against the Mosquito-Borne Diseases

Sponsor	Project	Soluti
 The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 82085		

Taxonomy

- Security & Safety
- Health

- Land
- Atmosphere & climate change

User profile

EYWA has created a service for private and public institutions. EYWA is engaging with the current stakeholders:

1. Greece, Region of Central Macedonia
2. Greece, Region of Thessaly
3. Greece, Region of West Greece
4. Greece, Region of Crete
5. Italy, Region of Veneto

Service description

EarlY WArning System for Mosquito borne Diseases EYWA, developed in the context of EuroGEO is a niche state-of-the-art tool that distils EO data, advanced epidemiological and entomological modelling, and ML big data analytics.

The uniqueness of the system can be summarised in the following distinguishing features. It delivers an operational solution, suggesting day to day prevention and door-to-door mitigation actions, as well as targeted surveillance and mosquito control operations that, undoubtedly, lead to the minimization of the entomological risk and the aversion of human cases in thousands of villages where the system has been already implemented.

The technological innovation of the system builds upon the development of standards for efficient handling of multiple entomological, epidemiological data and ancillary geospatial data, along with advanced dynamic and data driven models, to extract knowledge on the dynamics of mosquitoes' abundance and diseases' transmission. It is a generic, transferable and validated solution in support of the Public Health Authorities and citizens.

The common denominator of the different models is the use of big Earth Observation data from Copernicus missions and Core Services. They reliably depict and inform on the dynamics in biodiversity, climatic effects, habitats and breeding sites. Hence, EYWA exploits European innovation and investments and leverages European Exploitation platforms empowered by cloud storage and processing capacities as DIAS.

The system is already operational in 10 regions in 5 European countries at a TRL 9.

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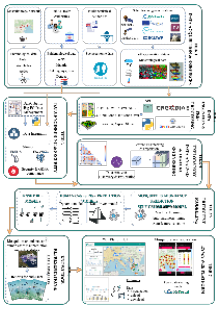

Customer experience

The EYWA initiative has been well received by various stakeholders in the Public Health domain as well as private companies and research institutions from countries around the Globe (Greece, Italy, Serbia, Germany, USA, Brazil, India) with 32 letters of intent/support having been received from them.

Here some of the feedbacks:

"*The region of Central Macedonia represents historically one of the most affected regions in terms of vector-borne diseases in Europe .... In 2010 the plain of Thessaloniki was again in the epicenter of the first most important human West Nile virus epidemic of lineage2. During the 2020 season, EYWA system provided the region of Central Macedonia with predictions for mosquito adult population and WNV epidemiological risk on different geographical and time scale (regional unit/ municipality/village, monthly/ weekly/ daily) from March to September 2020. These predictions were integrated in the operational planning of the mosquito control project of the region of Central Macedonia with very satisfactory results optimising the risk knowledge for our region, the deployment of our monitoring networks, the guidance of information campaigns and the implementations of the appropriate response actions.*

Early Warning Systems such as the EYWA should be integrated into the strategic and operational planning for the management of vector control programmes, as they contribute essentially to the prevention of outbreaks, mitigating their impact on local, regional, and international scales and provide su pport to existing control efforts". - Mr. Michalidis Konstantinos, Head of Directorate of Innovation and Entrepreneurship Support, Region of Macedonia, Thessaloniki, Greece.

"*In a whole, the predictions of the EYWA system seem to be reliable and valuable for the overall organisation and the optimisation of entomological surveillance and vector control actions in the frame of the Mosquito Control project of the Region of Western Greece. An interesting part of the system constitutes the "Mosquito Vision" application for the prediction of nuisance from mosquitoes which ran from late summer 2020 until October in the region of Western Greece...Based on the above, we declare our willingness to contribute to the EYWA initiative for the period 2021-2025 by sharing our monitoring and surveillance data concerning mosquito adult abundances and WNV circulation in sentinel chickens*". Nektarios Farmakis, Head of Region of Western Greece.

Need

More than 80% of the global population lives in areas at risk of at least one major Vector-Borne Disease (VBD), with more than 700.000 deaths at a global scale (WHO, 2020). Mosquitoes are the protagonists of these vectors, transmitting pathogens to living beings with the most important being the Mosquito-Borne Diseases (MBDs) in Europe, namely West Nile Fever linked to Culex mosquitoes, Malaria linked to Anopheles mosquitoes and Chikungunya, Dengue and Zika linked to Aedes mosquitoes.

There is a constantly increasing need to innovate on how the continuous threat of MBDs are confronted, treated but most of all foreseen. This gave birth to the idea of EYWA, an integrated and contemporary EarlY WArning System (EWS) for MBD.

Challenges

EYWA builds on a modular system architecture of 7 TIERS that allows federated access to global data repositories, exploits European infrastructure as Copernicus, Copernicus Core Services, and DIAS (CreoDIAS), uses advanced DataCube technology for the processing of big EO data in conjunction with in-situ trap and other environmental/epidemiological data, and invokes validated ML/DL entomological and deterministic (dynamic) epidemiological models. The challenges in the proposed action is to further develop and adapt the models to treat effectively non-European datasets, which in principle suffer from scarcity, data sharing incompatibility and standardization issues, the latter making the main challenge towards the implementation of EYWA globally.

Results

The EYWA system provides a number of benefits:

- Generates a combined database of entomological & epidemiological data.
- Creates standards around the entomological & epidemiological data.
- Provides mosquito population predictions on multiple spatiotemporal resolutions.
- Provides West Nile Virus risk forecast in multiple spatiotemporal resolutions.
- Raises the awareness around the issues and risks of Mosquito-borne diseases.

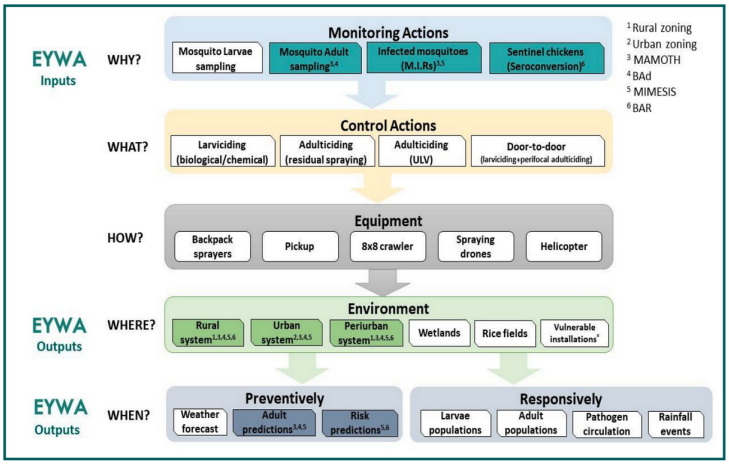

Figure 15. Decision making process of the mosquito control programmes.

References

Learn more about the service: http://epidemics.space.noa.gr:8081/

Learn more about e-shape: www.e-shape.eu

A question? Contact the Helpdesk: https://helpdesk.e-shape.eu