



PROVNA – Outcomes of the ad-hoc bilateral online meetings

WOAH workshop on PROVNA project and Foresight

Lisbon, 2-3 July 2024

Laura AMATO (IZS-Teramo)



PROVNA - Objectives

- To define the “ecoregions” of the North African territory (Mauritania, Morocco, Algeria, Tunisia, Libya and Egypt), characterized by distinct environmental and climatic factors, **on the assumption that similar areas (in space and / or time) are subject to similar diseases (especially vector-borne diseases);**
- To build a **customised prototype application (PROVNA)** in the North Africa region for monitoring vector-borne diseases



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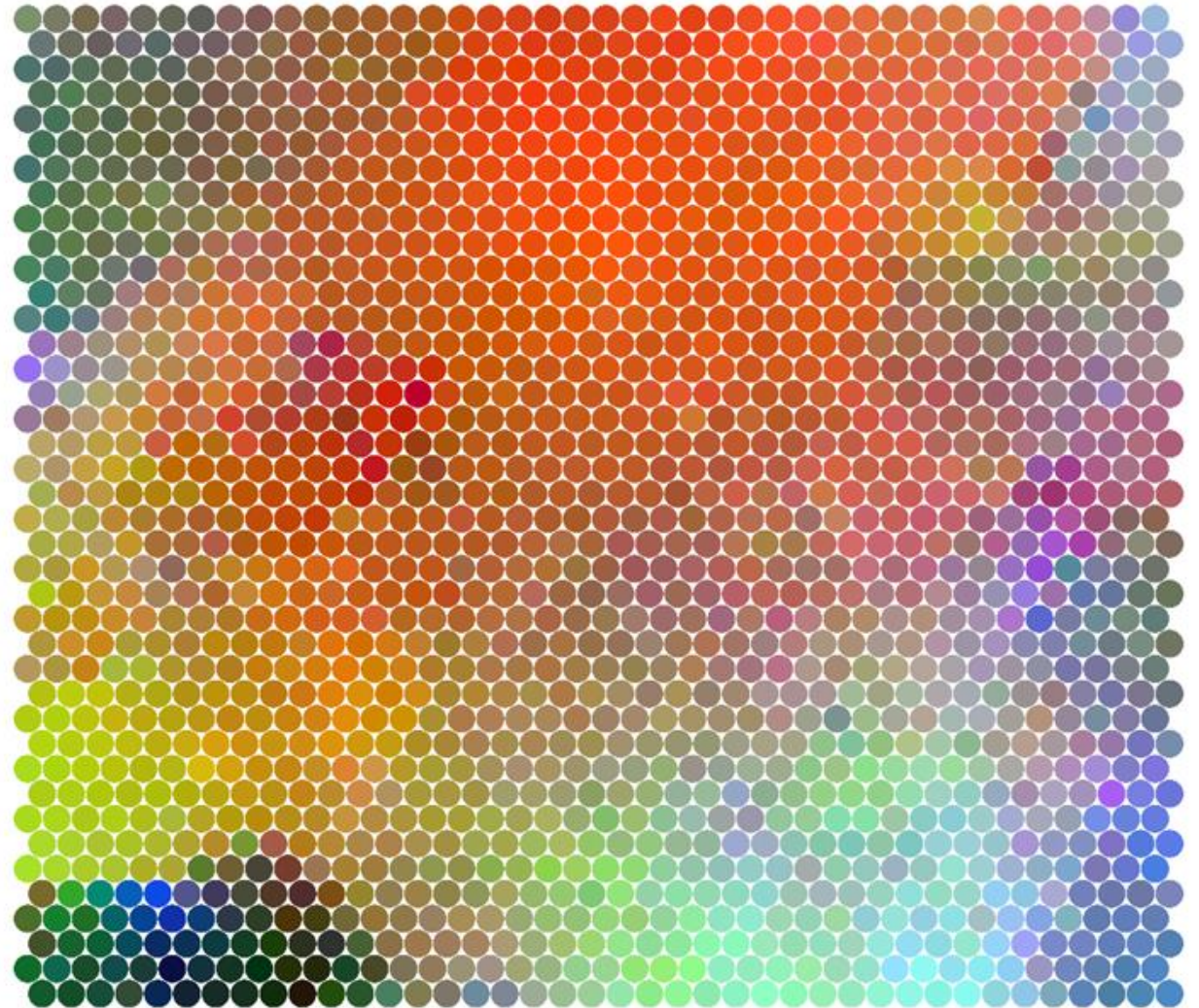
ECOREGIONALIZATION in North Africa

Ecoregions

→ areas “within which there are associations of interacting biotic and abiotic features”.

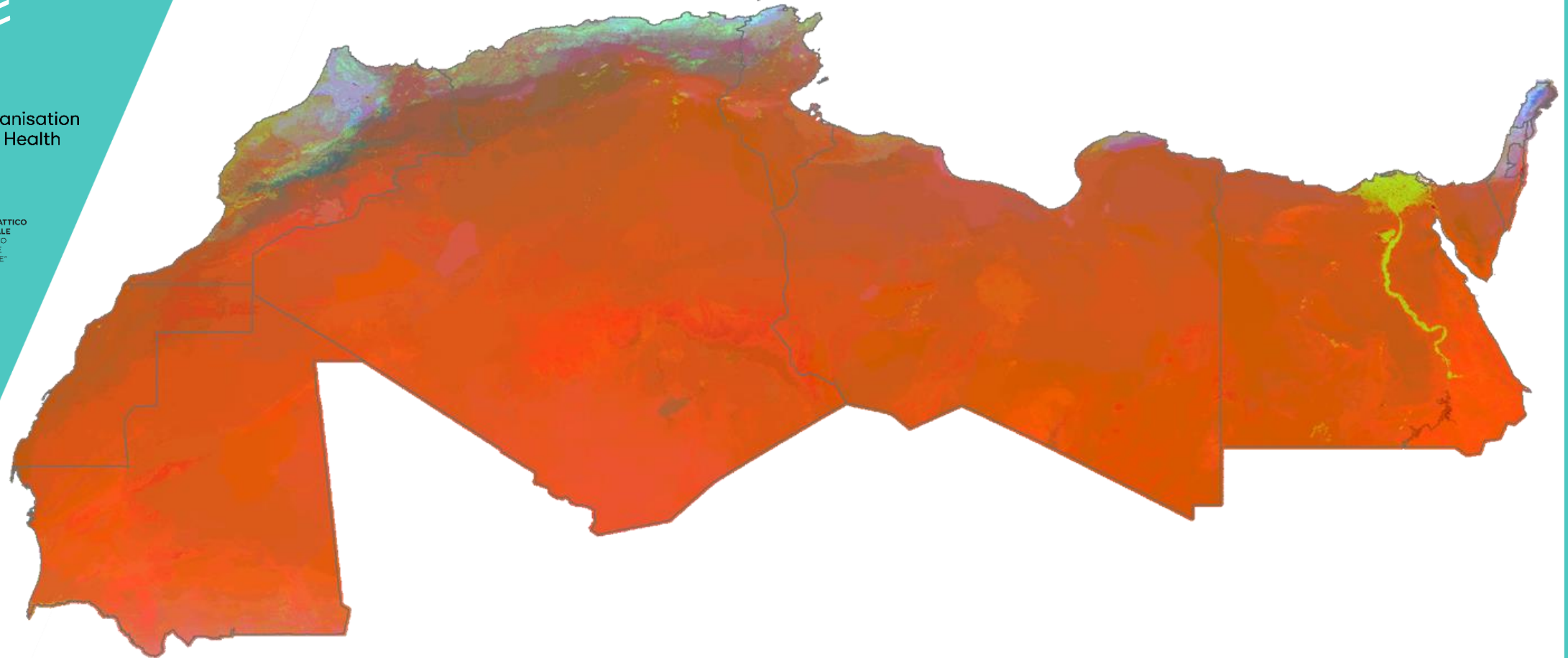
Ecoregionalization

→ a territory is classified into similar areas according to specific environmental and climatic factors.





ECOREGIONALIZATION in North Africa





Project phases

26/04/2022

Phase 1. Definition of the requirements

Activity 1.1: literature review

Activity 1.2: definition of EO data

Activity 1.3: definition of system architecture and statistical analysis

Phase 2: EO data preparation

Activity 2.1: Data retrieval

Activity 2.2: Manipulation and processing of EO data

Phase 3: Statistical model/analyses

Activity 3.1: Super SOM (Unsupervised Neural Network)

Phase 4: Ecoregion map evaluation/validation/application and prototype development

Activity 4.1: disease data/risk areas and ecoregions comparison

Activity 4.2: Web Based Prototype Application Development

Phase 5: Communication and dissemination

31/06/2024



Vector borne diseases

Ecoregionalization approach can be of interest for VBDs because the triangle vectors-host-pathogen is linked to the environment.

*Suitable conditions influence:
proliferation of vectors,
rest and breeding sites,*

*facilitating contacts between vectors and hosts and
therefore facilitating the transmission of VBDs.*



Vector borne diseases

Climate and environment strongly influence the presence and distribution of vectors responsible for VBDs.

Assumptions:

- Given the presence of
- Susceptible hosts
 - Competent vectors

→ areas with similar climatic and environmental conditions are potentially exposed to similar disease risk – even if geographically very distant from each other.





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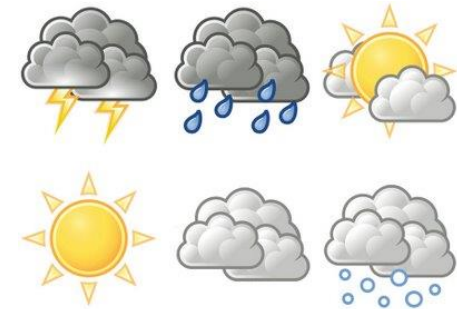


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Vector borne diseases

Climate and environment strongly influence the presence and distribution of vectors responsible for VBDs.



Identifying similar areas DO NOT AIM at linking a specific vector to specific conditions, but rather to highlight where the same characteristics are present

→ and identify a priori where a possible vector may spread.

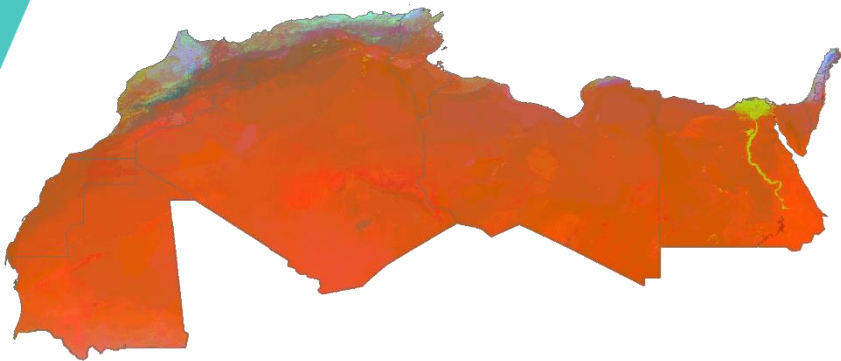


Vector borne diseases

Emerging VBDs could benefit from the approach:

- Definition of ecoregions
- Mapping the climatic and environmental similarity
- Inform in which areas a specific VBD can potentially spread/persist

→ How can we identify these areas?



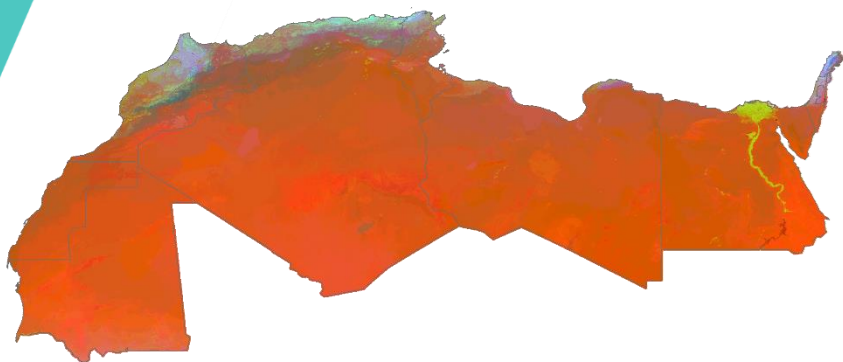


Vector borne diseases

→ How can we identify these areas?

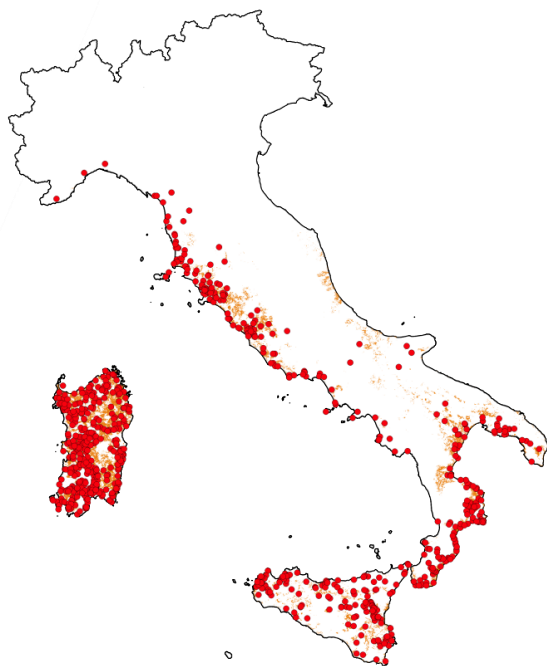
With **reliable dataset** to feed the model and produce accurate predictions:

Vector distribution, outbreaks & surveillance results, ...

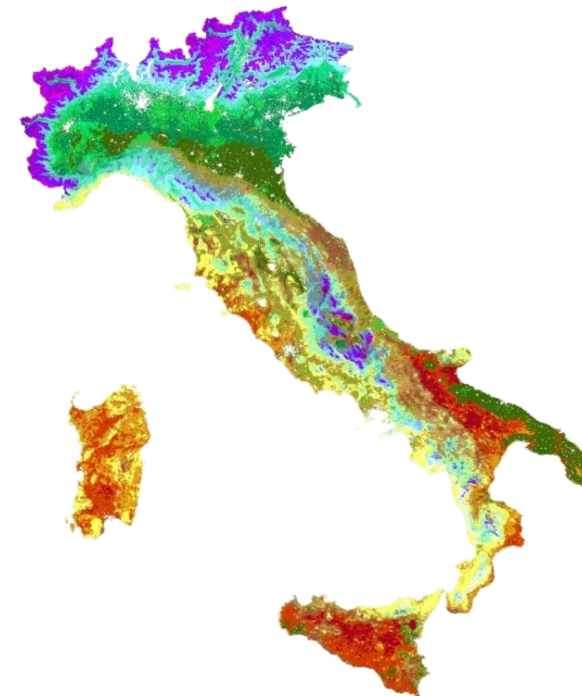
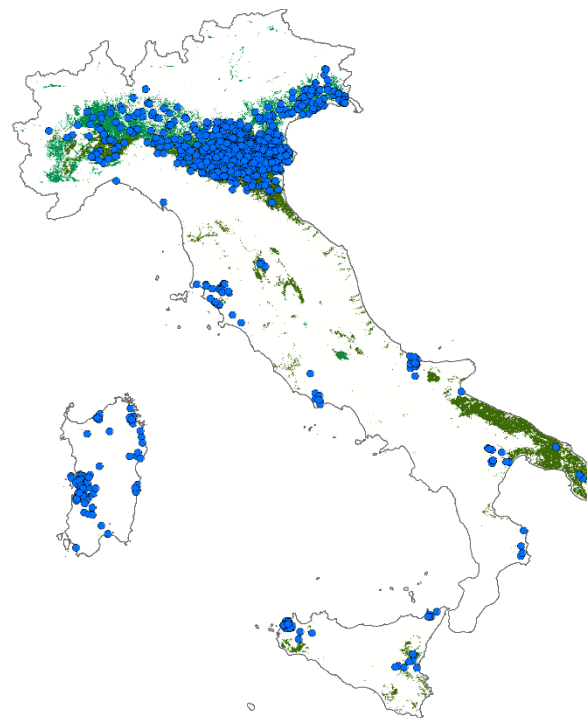


The Italian experience

C. imicola



WNV circulation



Compared the resulting ecoregion maps with two datasets: 1) the distribution of Bluetongue vectors and 2) West Nile Disease (WNV) outbreaks in Italy.



Study area





Target disease

The disease selected for the project is
Rift Valley Fever (RVF)

Among the vector borne diseases, RVF is one of the most important zoonoses currently present in countries bordering Europe and has potential for globalization.

The distribution of specific RVF vectors and other potential vectors is largely unknown.

Therefore if the virus is introduced into RVF free areas, suitable environmental conditions can trigger a new transmission cycle or sustained endemicity.

Target disease

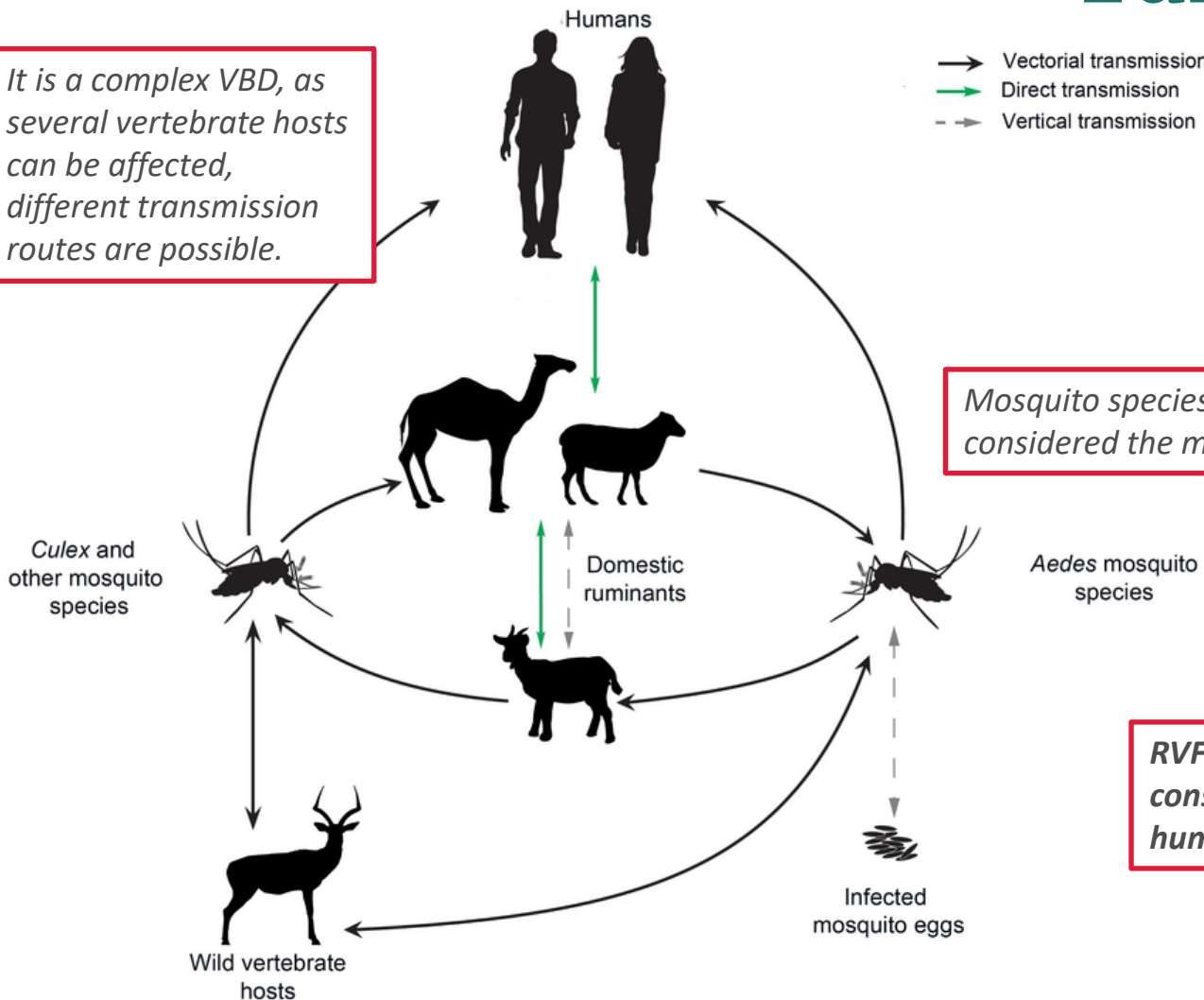
Rift Valley Fever (RVF)

It is a complex VBD, as several vertebrate hosts can be affected, different transmission routes are possible.

- Vectorial transmission
- Direct transmission
- - - Vertical transmission

Mosquito species (Culex and Aedes) genus are considered the most competent vectors.

RVFV emergence may have a considerable impact on both humans and livestock.





Preliminary outcomes

Preliminary outcomes have been shared with the national competent authorities:

- **Surveillance activities** carried out by the countries have been discussed during two webinars.
- Bilateral meetings are in progress, two hours each, investigating and **discussing the ecoregions** of specific countries with their representatives.



Bilateral meetings

1. Investigating and discussing the ecoregions of specific countries with their representatives.



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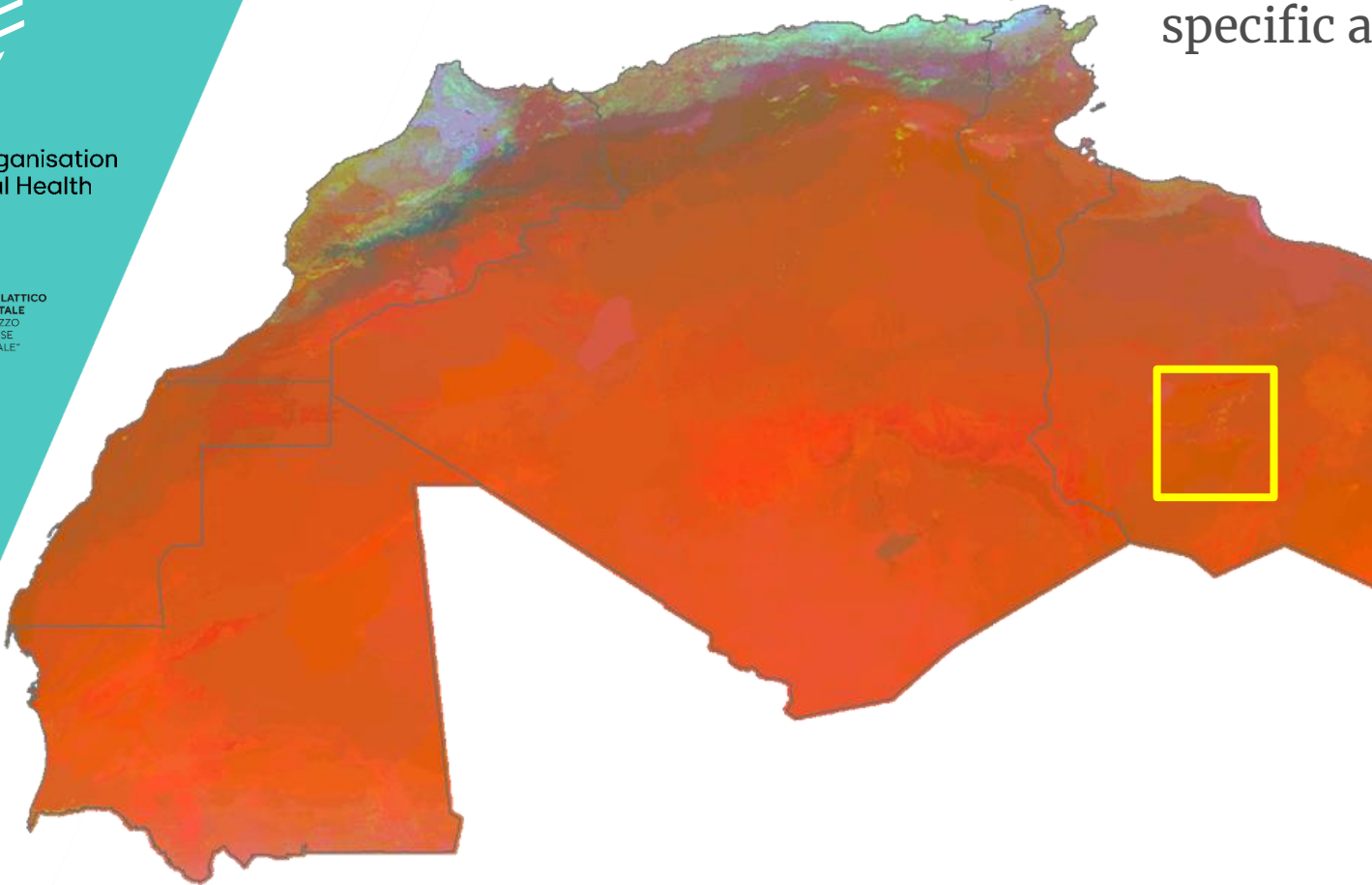
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ECOREGIONALIZATION in North Africa

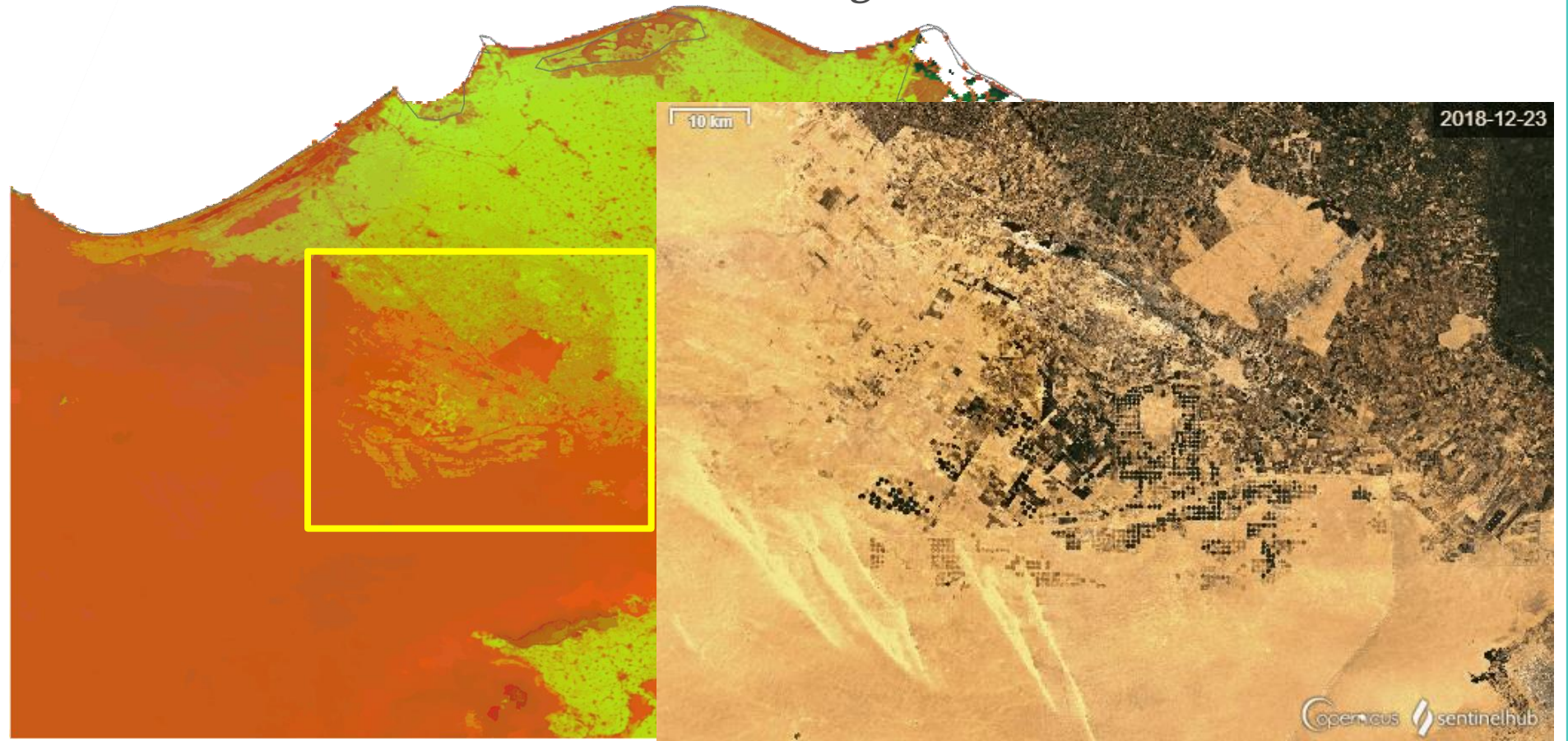
Zoom-in: what color/ecoregion is a specific area?



ECOREGIONALIZATION in North Africa

2022

Zoom-in: is it possible to detect changes over time?





Bilateral meetings

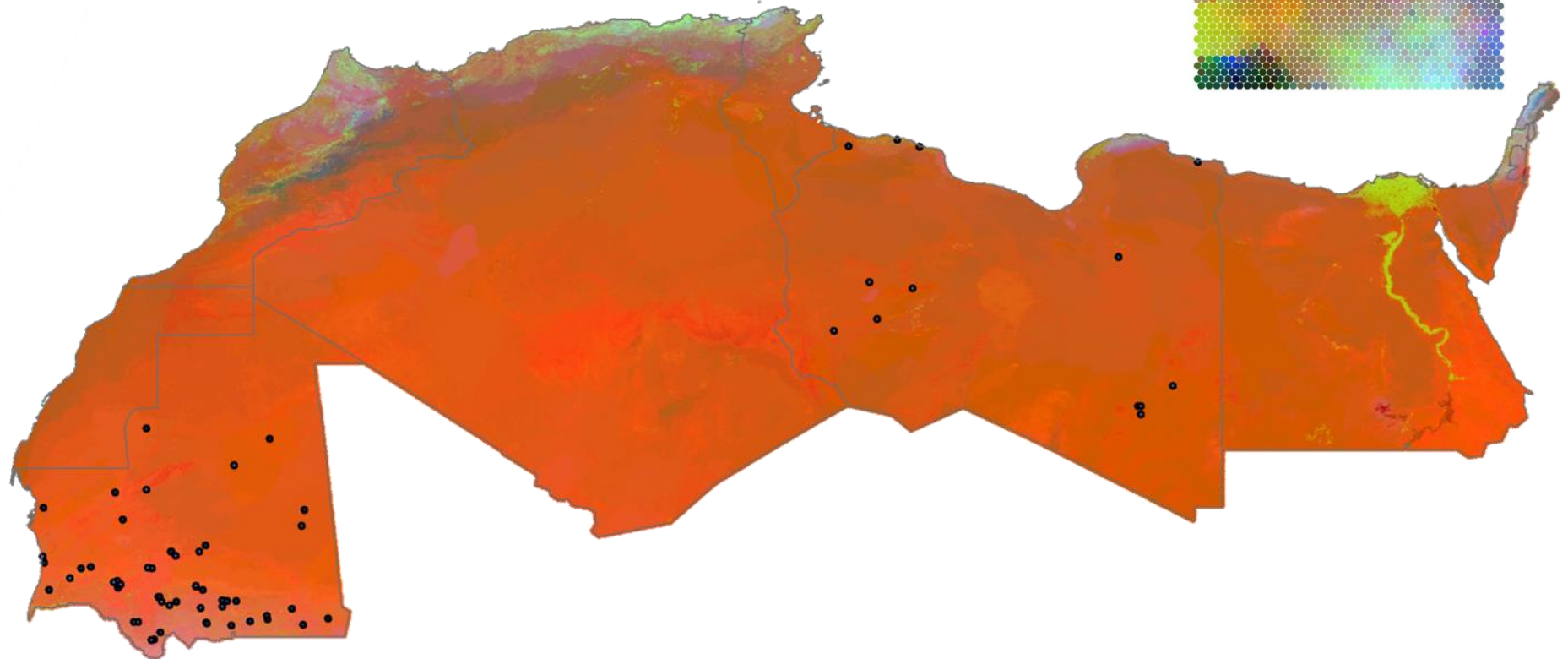
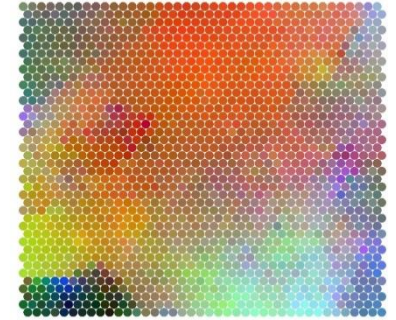
1. Investigating and discussing the ecoregions of specific countries with their representatives.
2. Identifying reliable datasets to be used to feed the model and produce accurate predictions.



APPLICATION of ECOREGIONS in North Africa

RVF outbreaks 2018-2022
(WOAH, FAO, WHO)

- with
ecoregions map



Reliable datasets ?

RVF outbreaks 2018–2022 (WOAH, FAO, WHO)



Geo-referenced locations of outbreaks in Libya and Mauritania

- Serological positive animal cases (timing of the infection?)
- Animal sampled in places after (possibly) long movements (location of the infection?)



Bilateral meetings

1. Investigating and discussing the ecoregions of specific countries with their representatives.
2. Identifying reliable datasets to be used to feed the model and produce accurate predictions.



Bilateral meetings

Identifying reliable datasets to be used to feed the model and produce accurate predictions.

DATASET AVAILABILITY - ANIMAL SURVEILLANCE

Data on disease **absence**

- Sentinel herds tested periodically
- Ad-hoc large scale surveys
- Passive surveillance in place (abortions)

→ Serological tests vs timing of the infection

→ Animal movements vs sampling location



Bilateral meetings

Identifying reliable datasets to be used to feed the model and produce accurate predictions.

DATASET AVAILABILITY - ANIMAL SURVEILLANCE

Data on disease **presence**

- Sampling locations: slaughterhouses → gathering animals from very distant areas
- Importance of illegal and uncontrolled animal movements

→ Serological tests vs timing of the infection

→ Animal movements vs sampling location



Bilateral meetings

Identifying reliable datasets to be used to feed the model and produce accurate predictions.

DATASET AVAILABILITY – ENTOMOLOGICAL SURV.

- Performed in case of outbreaks (event-based)
- Recent collection and revisions of all entomological findings in the country
- Not systemic, but depending on research/specific projects
- In place since recently, well organized, waiting for 1st year data, to be adjusted yearly



Bilateral meetings

Identifying reliable datasets to be used to feed the model and produce accurate predictions.

DATASET AVAILABILITY

- Risk-maps produced previously in the context of other projects (but not updated recently)
- Risk-maps produced by the VS, basing on selected risk factors (host presence, vegetation, water, ...)



Bilateral meetings

Identifying reliable datasets to be used to feed the model and produce accurate predictions.

DATASET AVAILABILITY

Very heterogeneous situation: although there are not many datasets across the whole study area, many useful information are being collected by the countries

→ Might be useful to feed the model and investigate suitability ecoregions for RVF





Conclusion

Through the application of **innovative approaches** in the use and analysis of EO data, PROVNA can provide **relevant support to the Veterinary Services in implementing and/or improving risk-based targeted surveillance of VBDs**, optimising financial and human resources through strategic planning.

→ WOAHA's approach to a **common regional strategy for vector-borne and transboundary animal disease control** would also be fulfilled.



What next for ECOREGIONS in North Africa

To be fully investigated, we should

1. better define the level of similarity/difference between ecoregions with the help of Countries

2. Integrate field data for vector-borne diseases to better test and compare with, where possible

→ PROVNA phase 2



Thank you
Questions?