E4WARNING
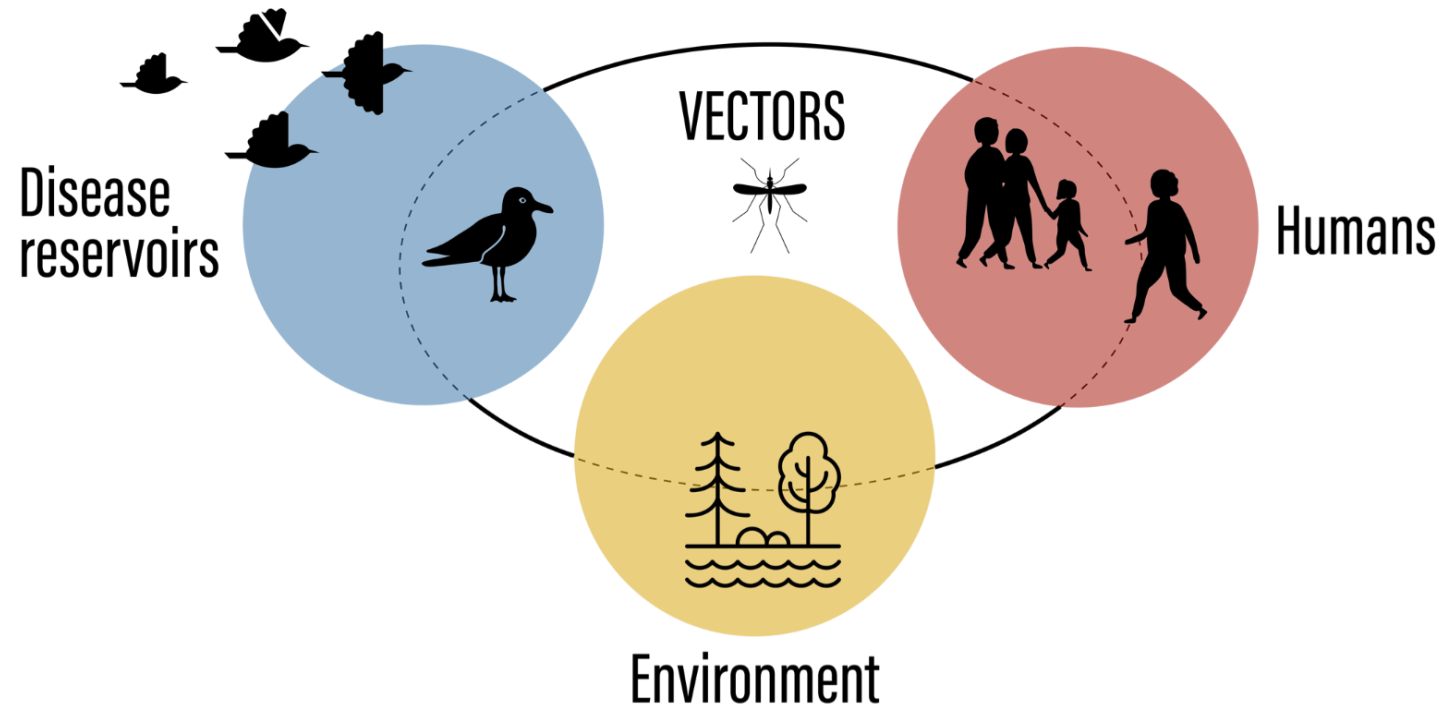
Eco-Epidemiological Intelligence for early Warning and response to mosquito-borne disease risk in Endemic and Emergence settings

Frederic Bartumeus

INTERDISCIPLINARY | INNOVATIVE | OPEN SCIENCE

- Entomology
- Movement ecology
- Epidemiology
- Earth Observation science
- Sensor engineering
- Citizen science expertise
- Sociodemography
- Spatial statistical modelling

Holistic ONE HEALTH approach to Improve our understanding of the interplay between humans, mosquitoes, reservoir species and the environment for a better disease intelligence capable of anticipating and identifying MBDs epidemic risk and outbreaks.
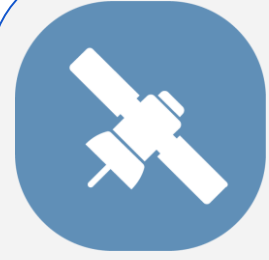
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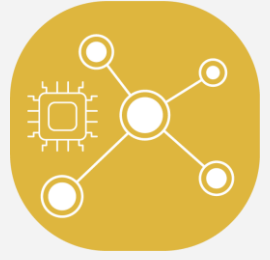
Citizen science   **IoT Smart traps**

High quality real-time information on vectors for a scalable and flexible "epidemic intelligence"

EO data
seasonal climate
water availability
land use

Human mobility

Estimate and anticipate mosquito prevalence and disease risk

How human activity produce differential disease exposure and contribute to the spreading of invasive mosquitoes and diseases

Ecosystem barriers to disease spreading

Host and vector dispersal capacities

Movement patterns in complex mosaic landscapes

Disease models in endemic settings   **Dengue importation**

Dengue forecasting in South Asia and endemic hotspots

Dengue prevalence in endemic areas and global traffic patterns will anticipate connectivity and importation risk

E4WARNING

Model water availability dynamics and build hydrometeorological indicators

EO data to develop vector and host distribution spatial models at different scales (regional, continental) and to enable climate-driven disease risk forecasting.

Introduce novel technologies (*ground sensors, mobile phones, Internet*) and citizen science, making citizens part of the solution.
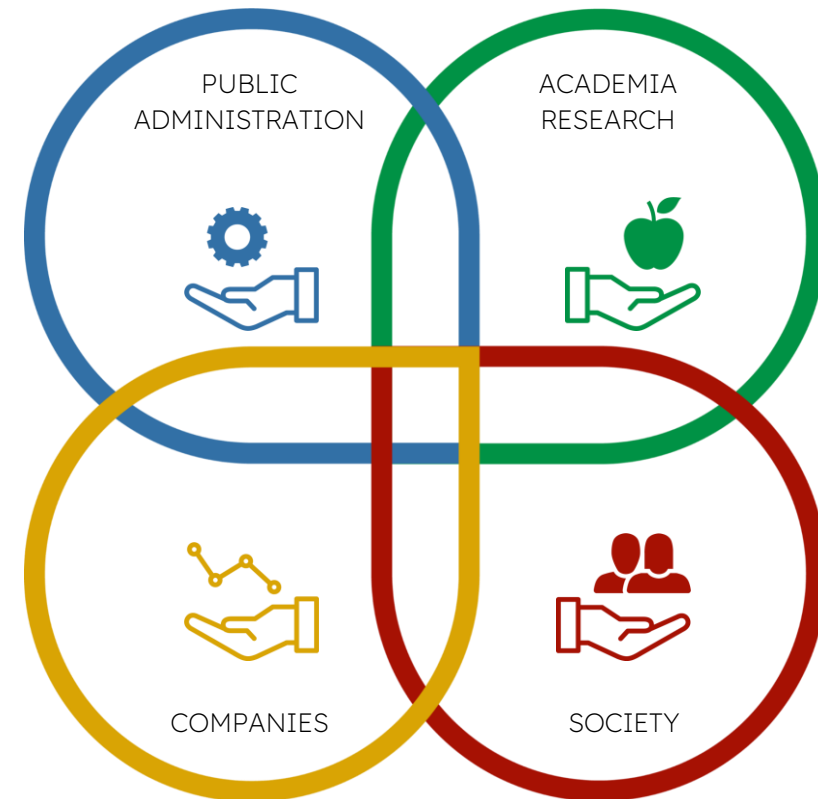
Quantify ecosystem barriers/connectivity to MBDs spreading in 4 wetland areas (WNV) and 5 urban areas (DNV)
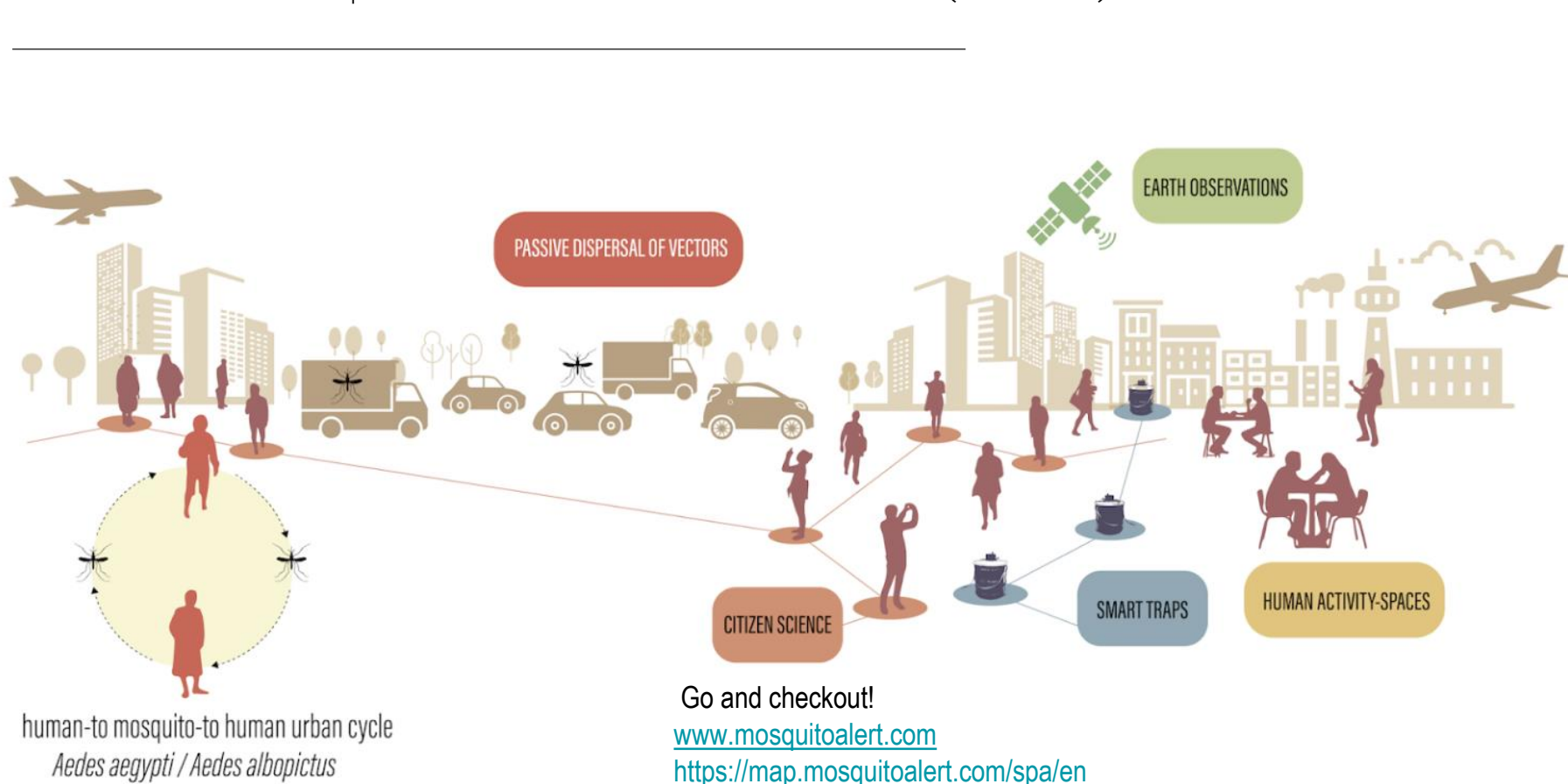
Explore risk factors, pathways and barriers for disease circulation. Identify strategies to make more resilient ecosystems in mosaic landscapes: urban and natural areas.

ACTIONABLE RESEARCH

All research & EW modelling will be integrated in operational frameworks following a QH open innovation model. Push the state-of-the-art of EWS and generate evidence-based and next-level knowledge to inform One Health management.

PUBLIC ADMINISTRATION

ACADEMIA RESEARCH

COMPANIES

SOCIETY

E4WARNING

Innovative mosquito surveillance in urban environments (FARSEER)

EARTH OBSERVATIONS

PASSIVE DISPERSAL OF VECTORS

CITIZEN SCIENCE

SMART TRAPS

HUMAN ACTIVITY-SPACES

human-to mosquito-to human urban cycle
Aedes aegypti / Aedes albopictus

Go and checkout!
www.mosquitoalert.com
https://map.mosquitoalert.com/spa/en

- Citizen science (Mosquito Alert)
- E2E trap data mapping
- IoT Smart traps
- Earth Observation data
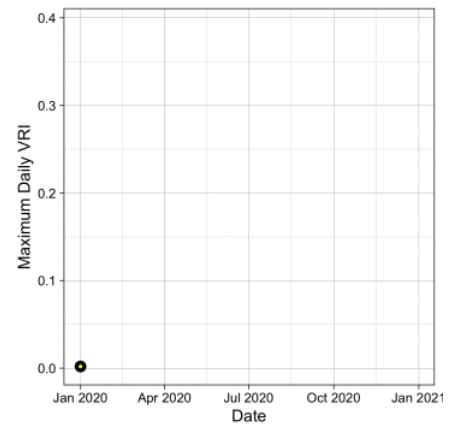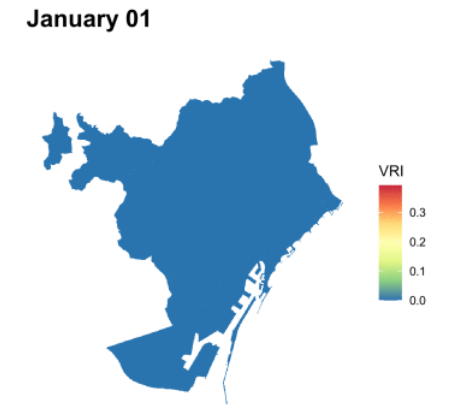- Climatological data
- Human activity-spaces
- Human mobility
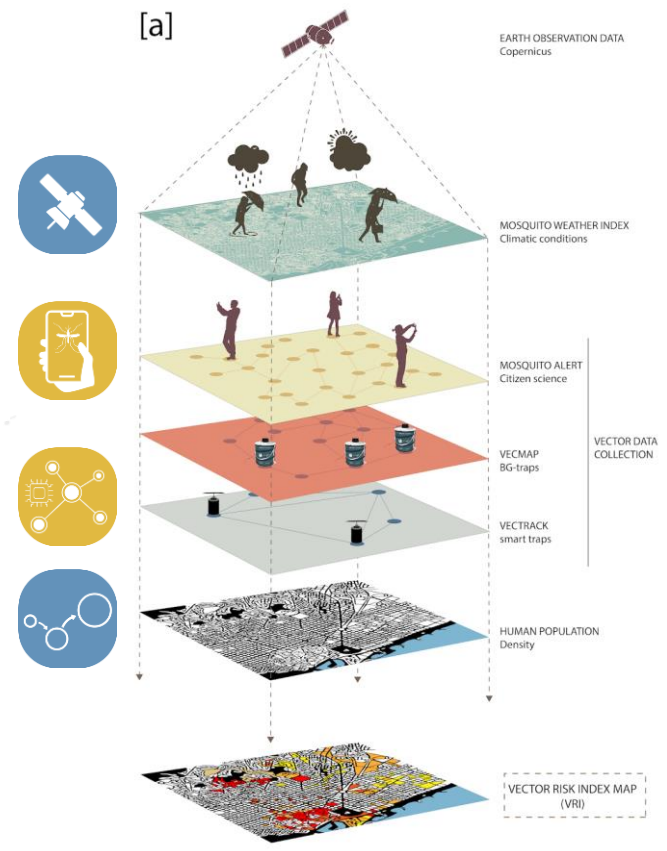
- Vector presence
- Vector phenology
- Vector abundance
- Vector activity
- Human-vector interaction
- Vector passive dispersal

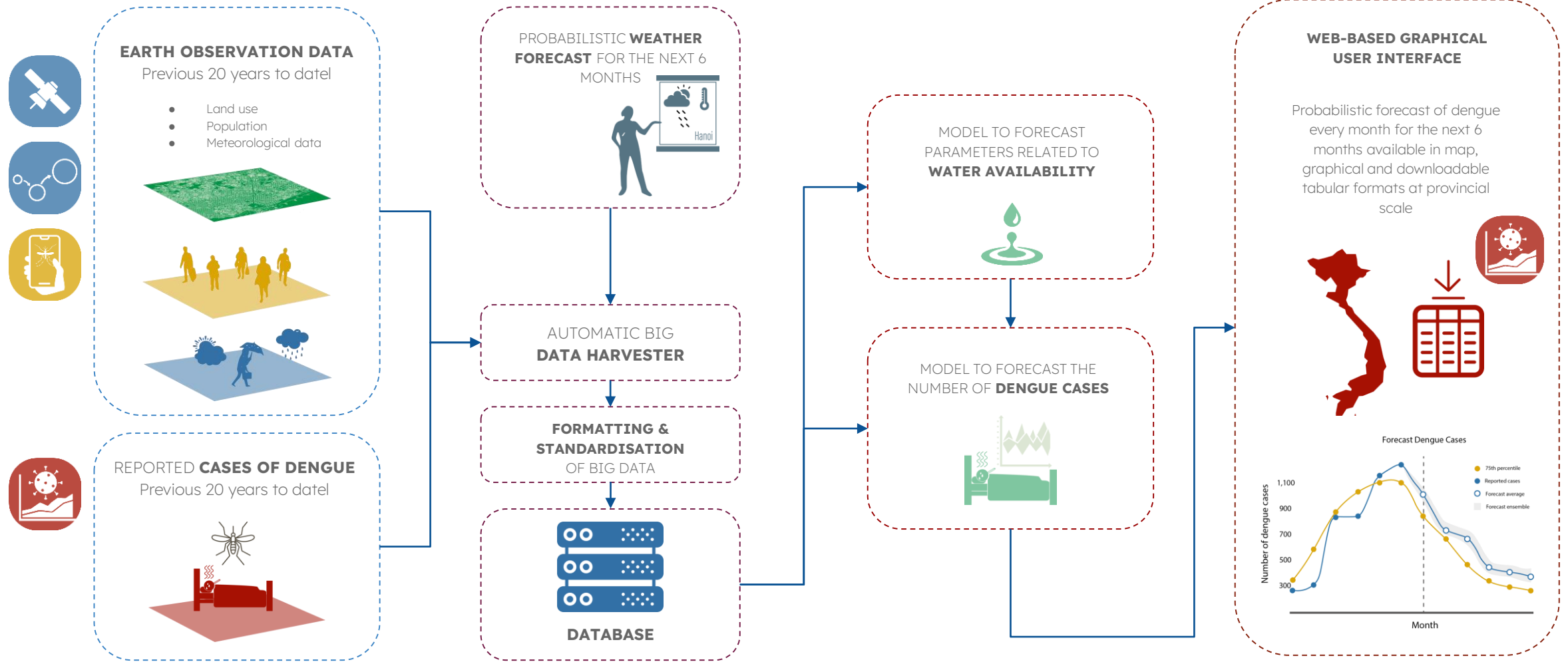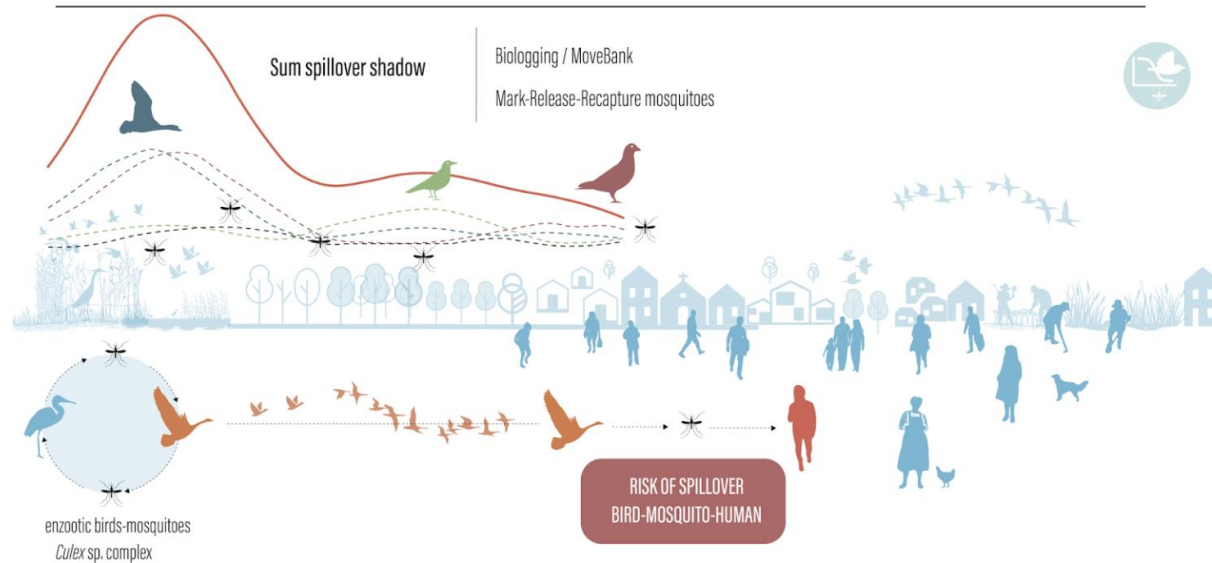Innovative mosquito surveillance in urban environments (FARSEER)
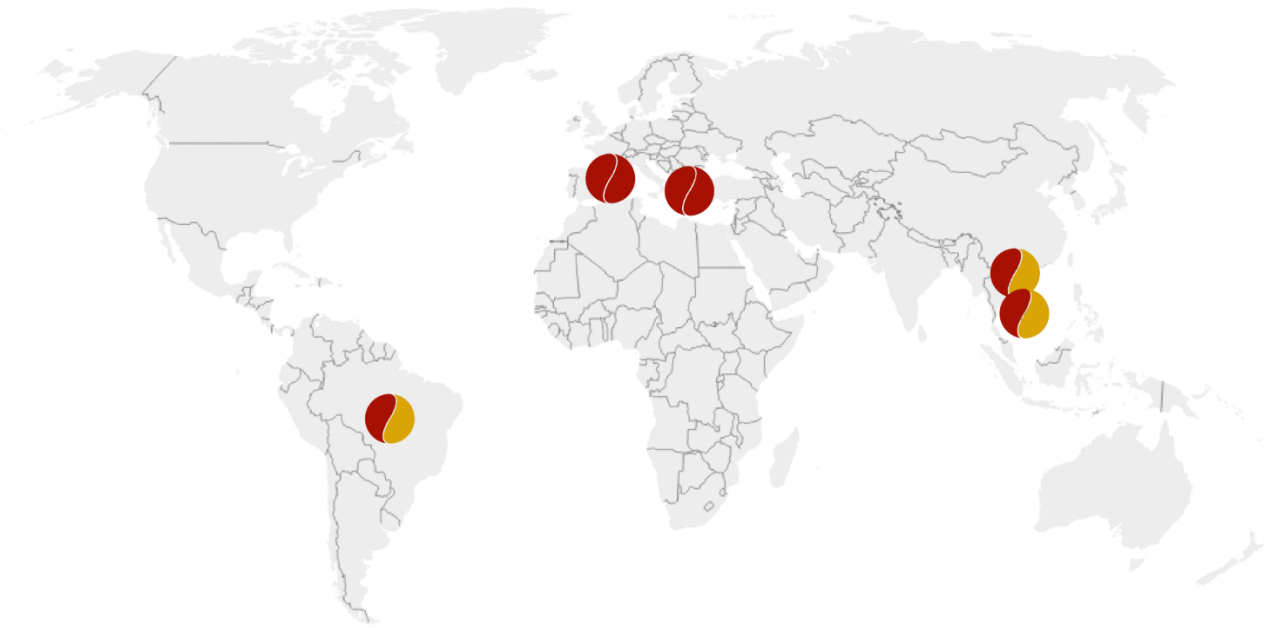
Extending the "smart city" model of Barcelona

Disease models in Endemic settings (DMOSS)

E4WARNING

Wetlands and urban areas connectivity: vectors, reservoirs, pathogens

Sum spillover shadow

Biologging / MoveBank

Mark-Release-Recapture mosquitoes

enzootic birds-mosquitoes
Culex sp. complex

RISK OF SPILLOVER
BIRD-MOSQUITO-HUMAN

DATA CONFIGURATION
ACTIVATION TIME

LIVE DATA

BIG DATA

WildFi

>100 m

WildFi

- self-Mark and Capture (*Culex*)
- Mark-Release-Recapture (*Aedes*)
- Biologging of birds in field
- Human-vector interaction
- Human mobility

❖ Vector dispersal capacity
❖ Reservoirs home ranges
❖ Reservoirs behaviour activity
❖ Vector activity
❖ Human-vector interaction
❖ Vector passive dispersal

🔴 *Aedes albopictus*
🔵 *Culex* sp.
- Aiguamolls de l'Emporda (Spain)
- Sichinia-Marathona (Greece)
- Bodanrück (Germany)
- Bolle di Magadino (Switzerland)

E4WARNING

E4WARNING
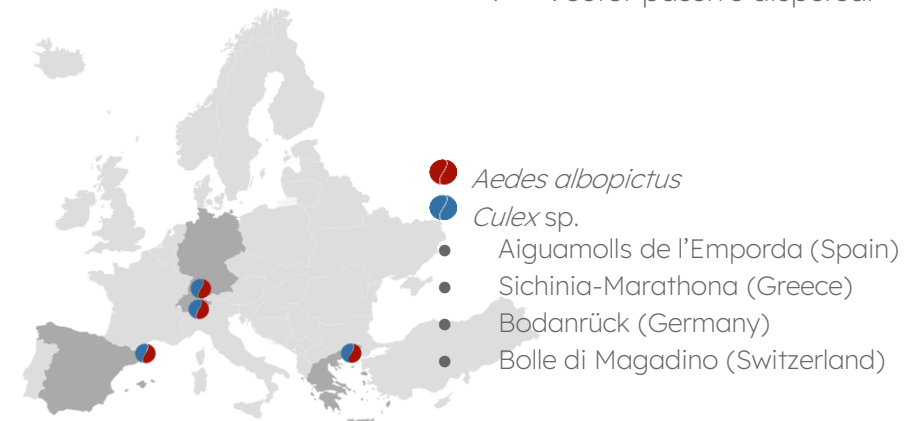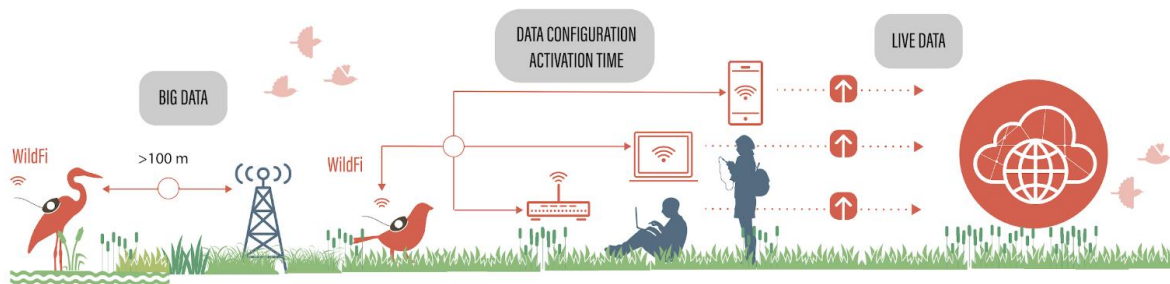
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Confederaziun svizra

CSIC | CEAB *exploring aquatic ecosystems*
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MAX PLANCK GESELLSCHAFT

BSC Barcelona Supercomputing Center Centro Nacional de Supercomputación

Scuola universitaria professionale della Svizzera italiana
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