5th Veterinary Big Data Stakeholder Forum
10th November 2025
Virtual meeting / EMA, Amsterdam

Data for environment, climate, and animal health – an example from the PLANET4HEALTH project

Carla Maia[1] and **Suzana Blesic**[2,3]
[1]Global Health and Tropical Medicine. Instituto de Higiene e Medicina Tropical. Universidade NOVA de Lisboa, Portugal
[2]University of Belgrade, Belgrade, Serbia
[3]CRTA – Center for Research, Transparency, and Accountability, Belgrade, Serbia

Phlebotomine sand flies

Diptera: Psychodidae, Phlebotominae

Size
small
(1-3 mm)

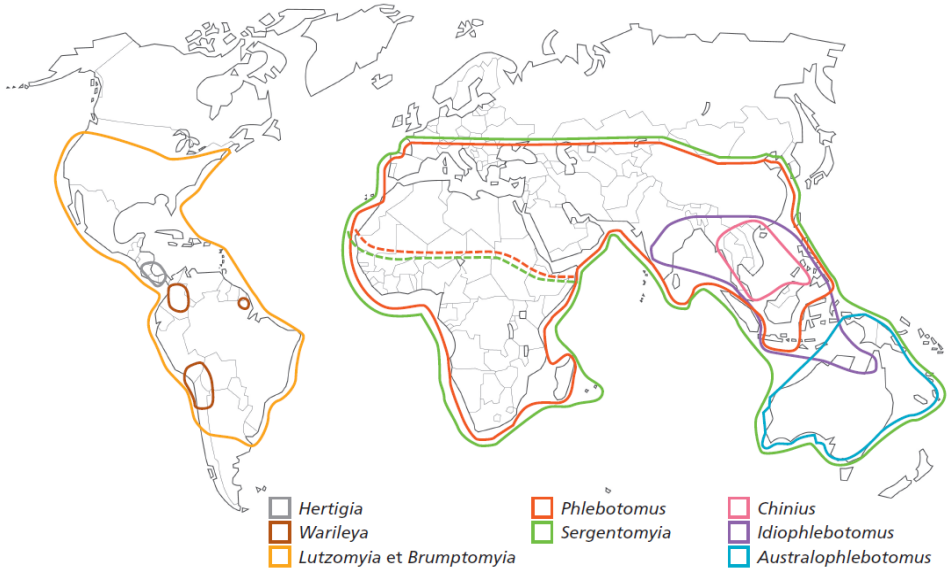
Wings
long & narrow
hairy
V-angle

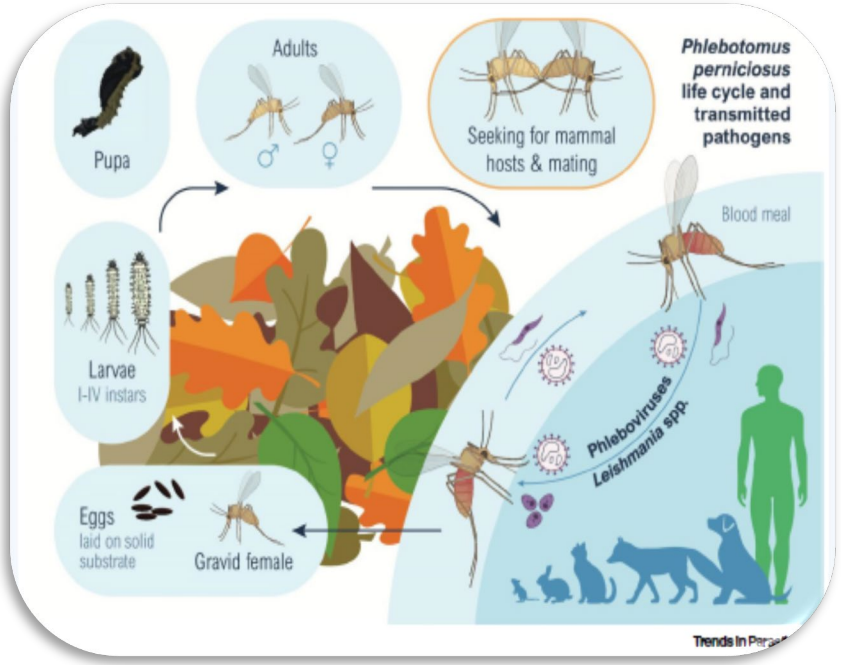
Colour
light brown (sandy)
to dark grey

Body
hairy, delicate, with
humped thorax

Legs
long & slender

Distribution: **tropical**, **subtropical**, **temperate** zones

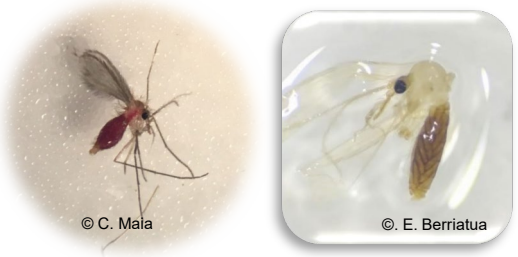




Terrestrial
(breeding in soil,
organic matter)

Crepuscular or **nocturnal activity**
Weak flyers: **Short flight range** (≈ 300m)

Females: hematophagous



(Killick-Kendrick, 1999; WHO, 2010; Depaquit & Léger, 2017; Milagres & Maia, 2023)

Sand flies: Vectors of human and animal leishmaniases

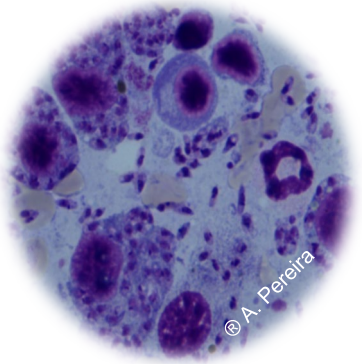
Clinical forms of Human Leishmaniases

Visceral leishmaniasis (VL)

- Parasitic dissemination in macrophage-rich tissues
- Irregular fever, substantial weight loss, hepatosplenomegaly, anemia, leukopenia, thrombocytopenia
- Fatal in > 95% cases if untreated


Aronson & Magill, 2020


Gradoni et al. 2017



Involvement of the skin and/or mucous membranes

Cutaneous leishmaniasis (CL)

- Skin lesions (mainly ulcers)
- Benign, spontaneous healing
- Life-long disfiguring scars


Boelaert & Sundar, 2014

Mucosal leishmaniasis (ML)

Oral, laryngeal, and pharyngeal mucosal lesions


Lawn et al. 2004

Mucocutaneous leishmaniasis (MCL)

Partial/total destruction of the mucous membranes of the nose, mouth, and throat


Burza et al. 2018

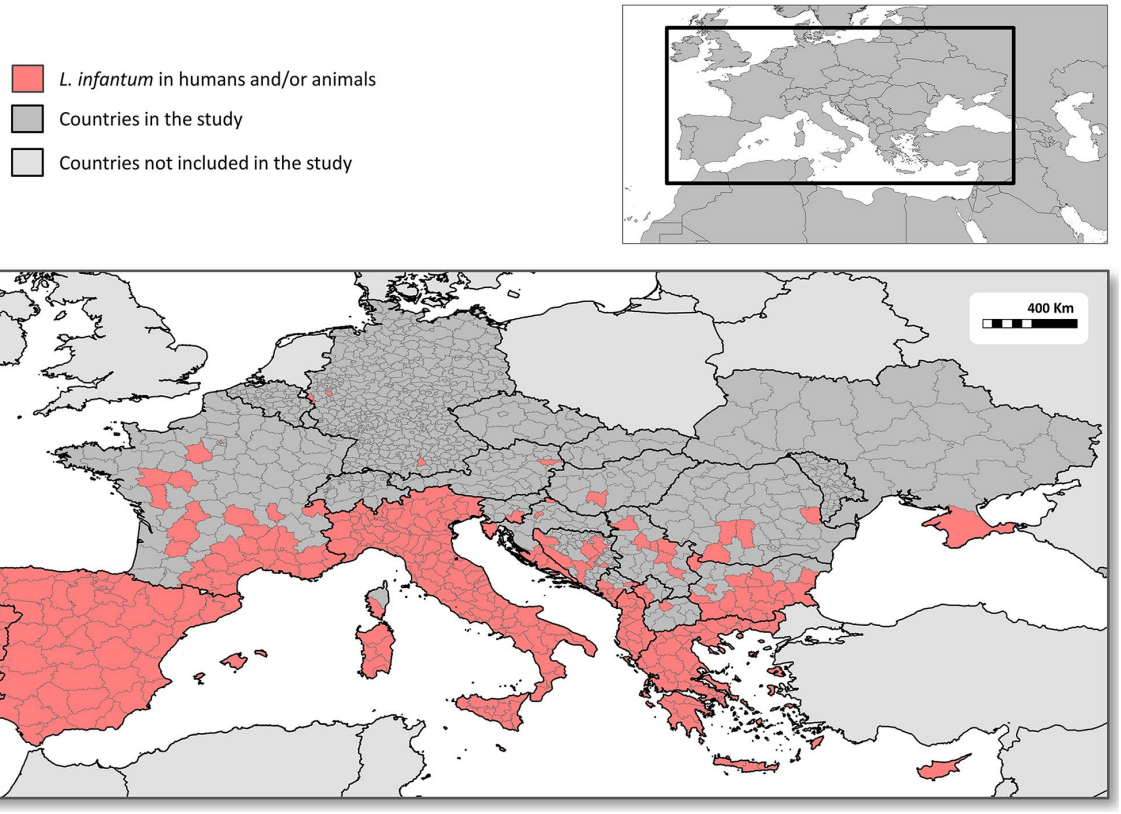

Gradoni et al. 2017

Post-kala-azar dermal leishmaniasis (PKDL)

Macular, papular or nodular rash


Burza et al. 2018

Leishmaniases in Europe



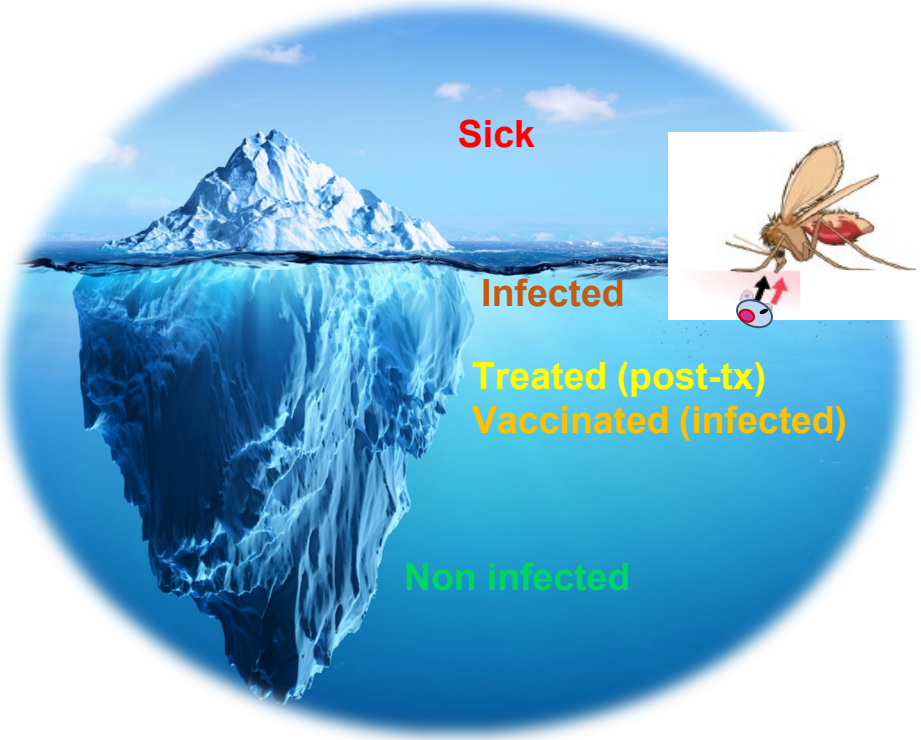
- **Visceral, cutaneous** and **mucosal leishmaniasis** caused by ***Leishmania infantum***
- Domestic **dogs: reservoirs** of **human infection**
- **Vectors: *Phlebotomus*** (*Larroussius*) **spp.**

(Maia et al. 2023)

Canine *Leishmania infantum* infection and leishmaniasis (CanL)

- **Chronic infection without** clinical **signs**
- Self-limiting disease
- **Severe illness** → death

Dog population in **endemic areas**



(Campino & Maia, 2018; Maia et al. 2023)

Treatment (monotherapy or combined therapy)

Leishmanicidal drugs: miltefosine; meglumine antimoniate

Leishmaniostatic: allopurinol “off-label”

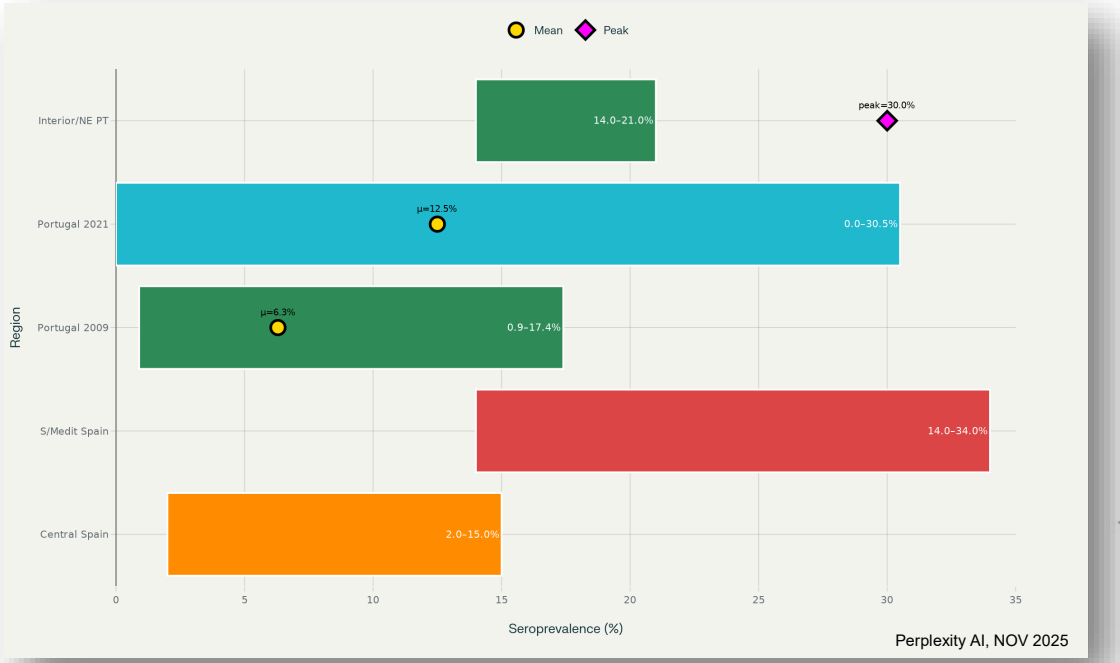
Clinical cure, **no parasitological clearance**

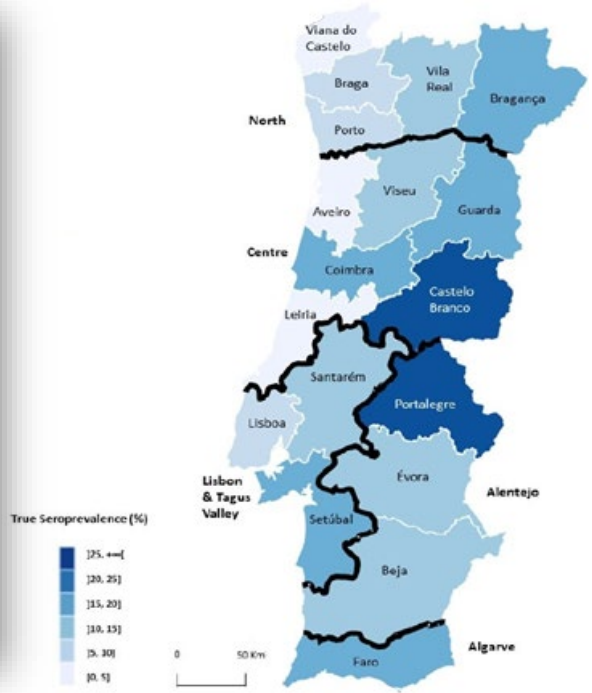
Before and after treatment

Incorrect/repeated use ⇒ **AMR** (Public Health risk)

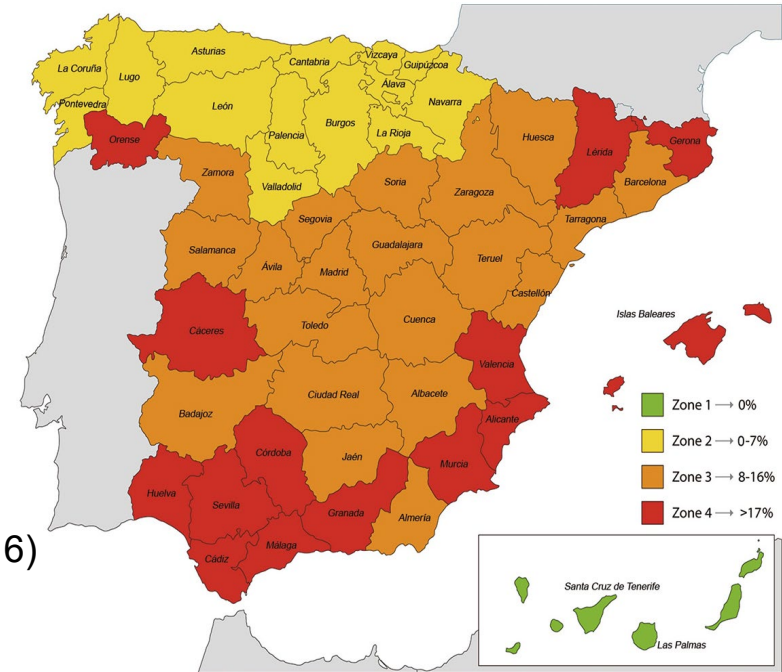
Seroprevalence of canine *Leishmania* infection in the Iberian Peninsula

Seroprevalence range **from 0% up to 35%** depending on the region





National seroprevalence (2021**: 12.5%**, range 0%–30.5%, ⇒ **increase ~2X***
(2009**: 6.3%**, range 0.9–17.4%)
*Same canine population; same serological technique and same cut-off

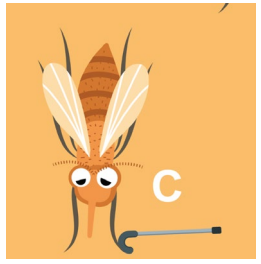


Peer-reviewed surveys (1985–2019)
National cross-sectional survey (2011–2016)
Regional seroprevalence: **1%** (north) **to >30%** (southern/Mediterranean areas)

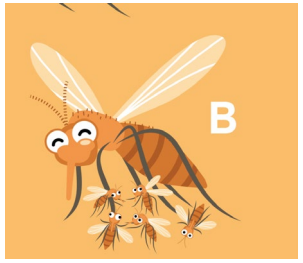
(Cortes et al. 2012; Gálvez et al. 2020; Almeida et al. 2022)

Climate Change and Leishmaniasis: Longer Seasons, Faster Transmission, Wider Spread

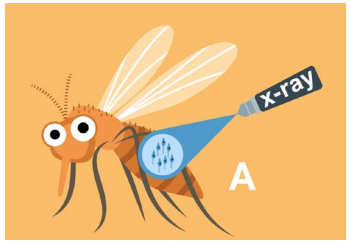
Increase in average annual **temperature** (longer summers, milder winters):



Increase in the **period for vector presence**

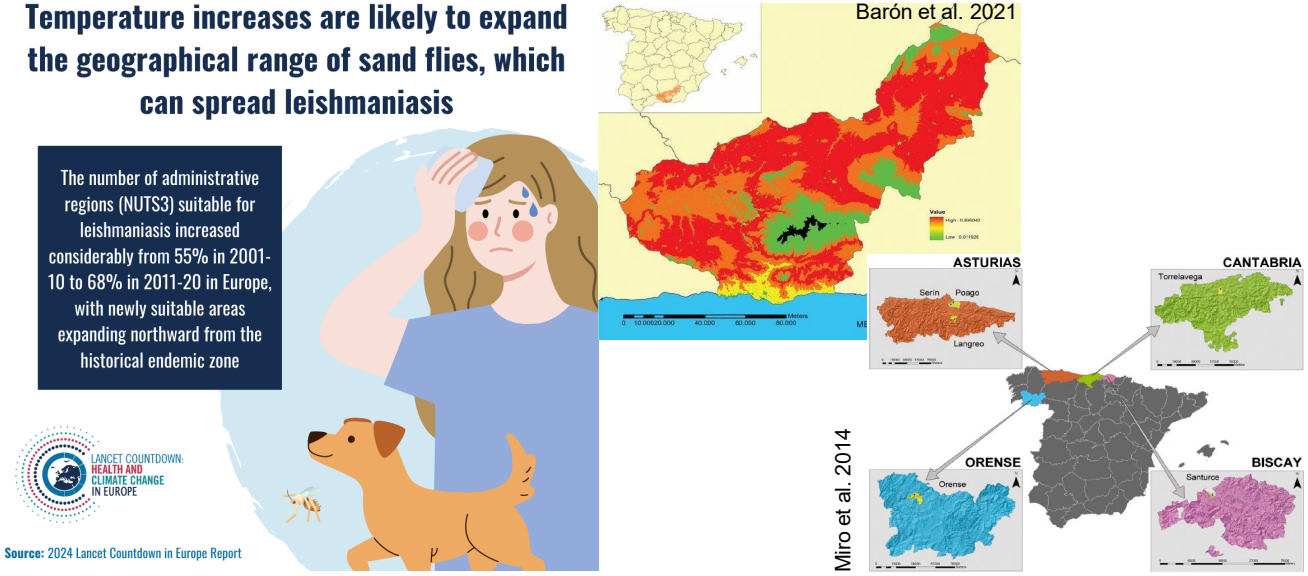


Increase the **number** of annual **generations** and in the **seasonal density** of vectors



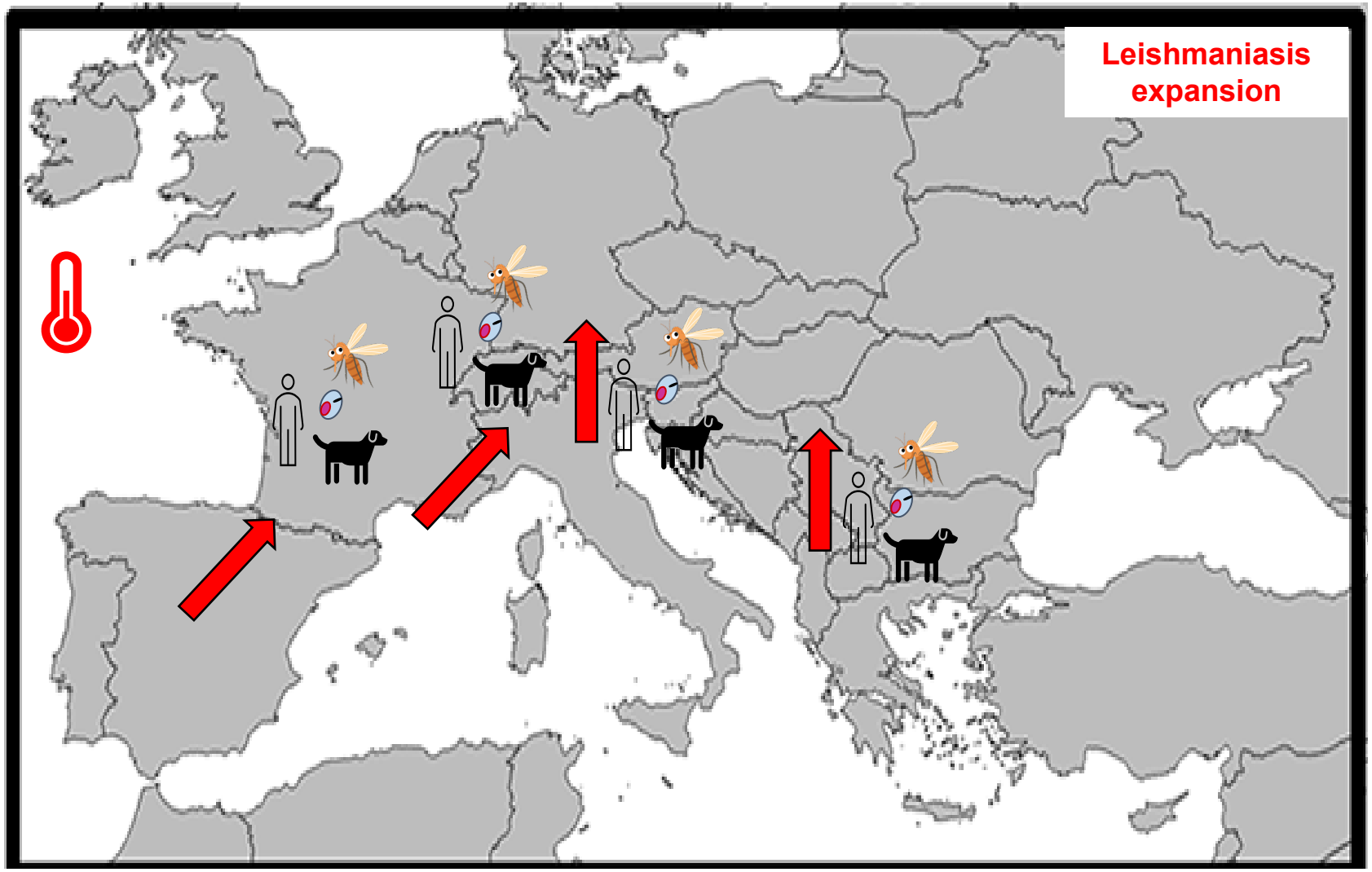
Reduction in the **extrinsic incubation period**

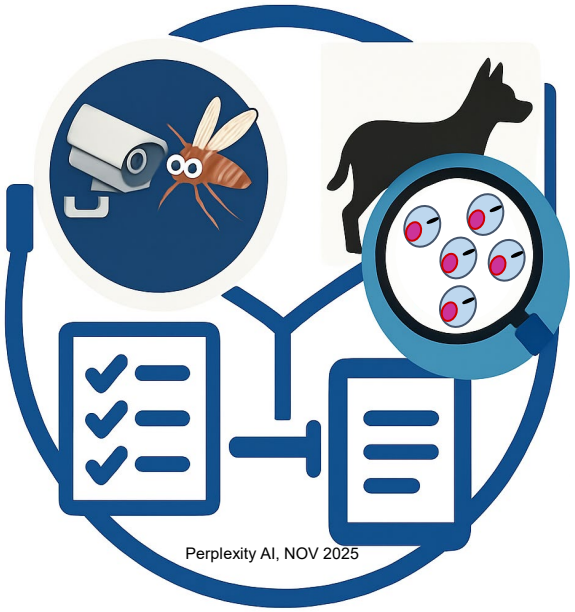
Expansion to northern latitudes and **higher altitudes**



(Maia et al. 2023; Carvalho et al. 2024; Milagres & Maia, 2024)

Expanding Risk: a call for One Health framework





Critical need for early identification of high-risk transmission zones

- **Growing vulnerable populations** to *L. infantum* infection
- Dogs sustain transmission in endemic and newly affected areas

PLANET 4HEALTH

What is our mission?

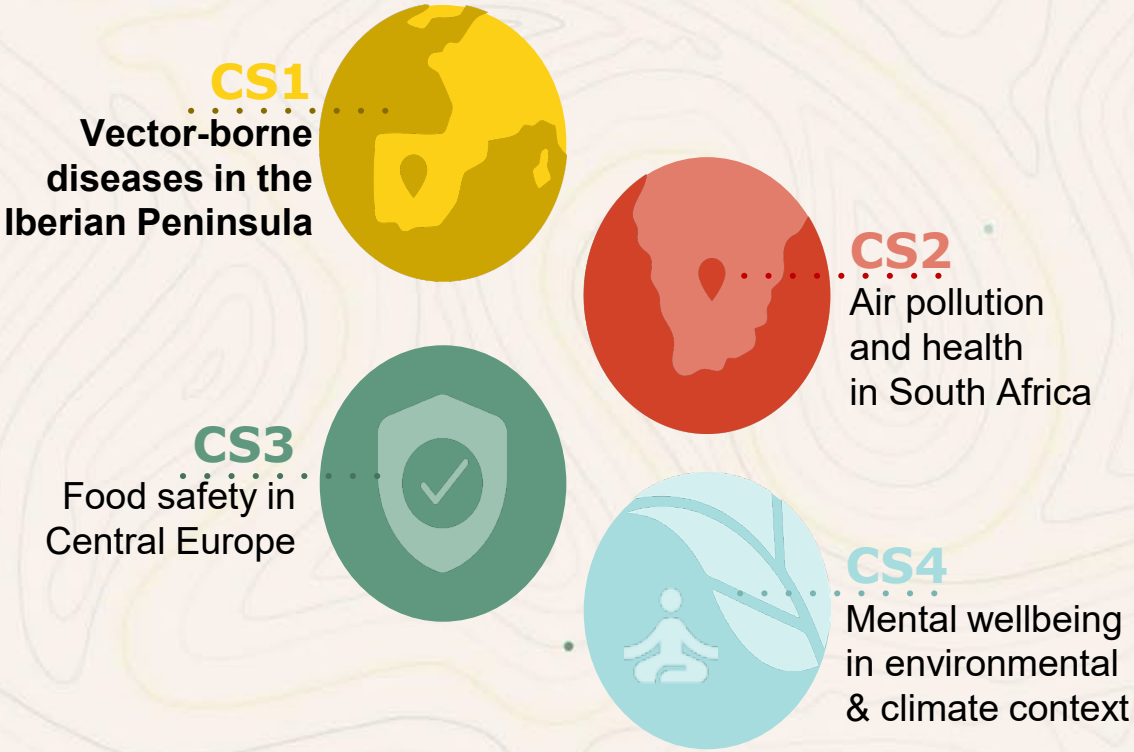
- Provide **new knowledge** and **tools** addressing **environmental degradation impacts** on **human**, **animal** & **ecosystem health**

Translating Science into Policy: A Multisectoral Approach to Adaptation and Mitigation of Adverse Effects of Vector-Borne Diseases, Environmental Pollution and Climate Change on Planetary Health

48 Months

4 Case Studies

17 Partners



Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Health and Digital Executive Agency (HADEA). Neither the European Union nor the granting authority can be held responsible for them.

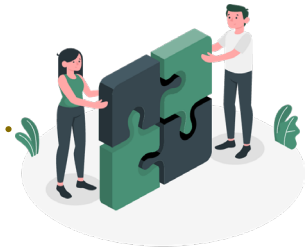
PLANETARY Health Cluster

PLANET4HEALTH is one of five Horizon Europe projects—GoGreen Next, MOSAIC, PLANET4HEALTH, SPRINGS, and TULIP—that together form the Planetary Health Cluster.

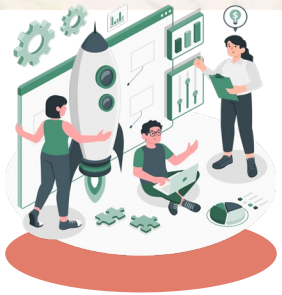
PLANET 4HEALTH

Case study 1

CanL in the **Iberian Peninsula**



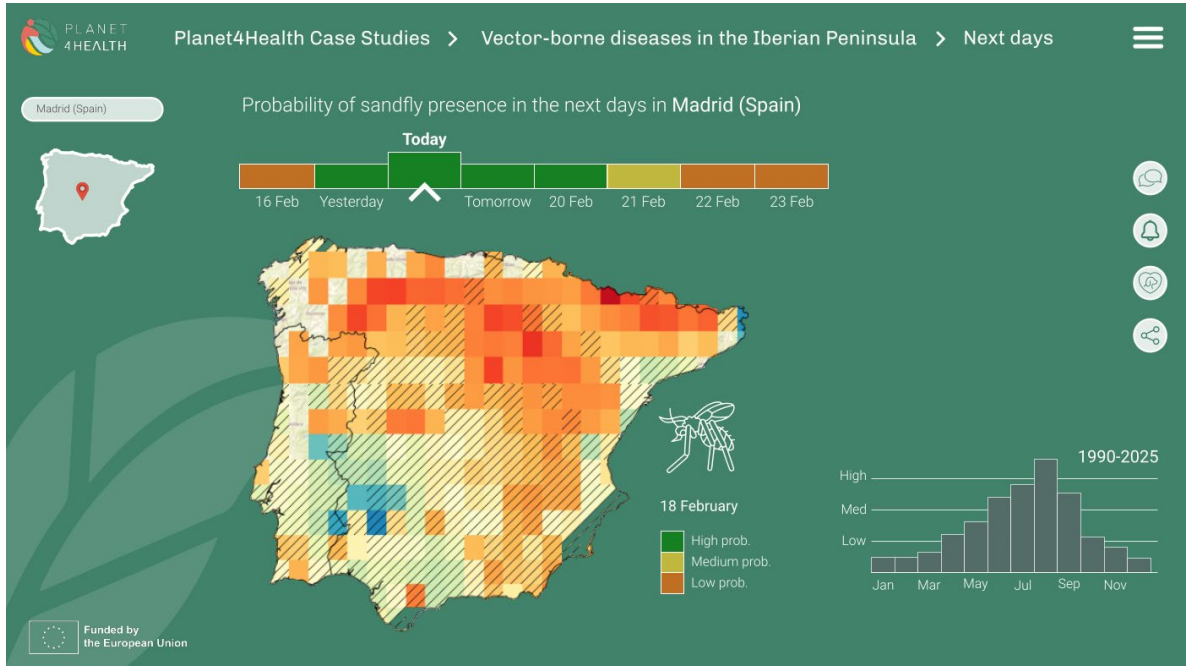
Interdisciplinary Collaboration (modellers, data scientists, researchers)



Veterinary community Engagement & Raising Awareness

Tools & Strategies

Aim: **Early Warning System** to identify **spatial and temporal hotspots** of **CanL transmission**



Mockup - short range forecast
@PREDICTIA

Funded by the European Union

NOVA UNIVERSIDADE NOVA DE LISBOA
INSTITUTO DE HIGIENE E MEDICINA TROPICAL DESDE 1902
GHTM
APMVEAC

CS1: Climate, environmental, and One Health data

Vector data:

- **Historical sand fly** surveillance **datasets**
- CLIMOS data (sand flies collected in 2023 and 2024) from **Portugal** and **Spain**

Access to datasets**:** written request by PLANET4HEALTH (P4H) coordinator (historical) and signed DSA between Portuguese and Spanish universities with PLANET4HEALTH partners (Oct 25)

CanL data:

- P4H Proposal (2022): Pharmaceutical data (2018-2022): **nº** of **treated dogs** (**200 PT** + **500 SP veterinary clinics**). No formal agreement for data sharing
- P4H Granted (**2024**): After several contacts we learned (**summer 2025**) that the company that performed the work for the pharmaceutical company holds the **data**, but it **needs to be purchased**
- The pharmaceutical company will cover part of the cost, but P4H partners (CS1) must fund the rest.
  - This expense is not included in the budget and costs cannot be split among partners
  - Is there sufficient budget to cover the additional expense?

Funded by
the European Union

Plan A

CS1: CanL data

- **Plan B**

  Summer 24: Contact **pharmaceutical companies selling leishmanicidal drugs** requesting data on the number of packages of medications* sold (2015-2024) in Portugal and Spain

  *Nº of medication packages sold used as a proxy to estimate the number of medium-size dogs treated

  One pharmaceutical company **agreed to share sales data** (country level, after DSA signature); **no data available by region/NUTS3**

- **Plan B1**

  April 25: Contact **EMA** to determine the **availability of CanL drugs sales** data and, if so, how it could be shared. The requested **data is not available** in the required format for CS1

- **Plan B2**

  Summer 24: APMVEAC (P4H partner) contacted associates, private clinics/hospitals, and veterinary corporations to check availability to share data on **treated dogs (2015–2024)**

  ✓ **2 corporations** and **several veterinarians** agreed to share data

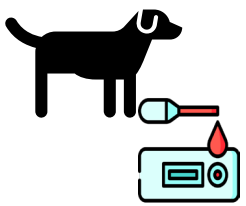
  ✓ To simplify data governance: APMVEAC will act as the sole data provider for CS1**: only one DSA** needed — between **APMVEAC and P4H** (signed Nov 2025)

  Available **data: limited to Portugal** and **incomplete for all NUTS3** regions

Funded by
the European Union

CS1: CanL data

Plan C



January 25: Contacted **private diagnostic laboratory** to request **data on dogs tested for *Leishmania* antibodies** (2011-2024) in **Portugal**

*Testing used as a proxy for suspected leishmaniasis cases

October 25: **DSA signed** between laboratory and P4H CS1 partners

✅ **First veterinary records** with **good spatial** and **temporal coverage**

Plan C1

Summer 25: contacted private **diagnostic laboratory working in the Iberian Peninsula** to request equivalent data

Laboratory **agreed to share data** from Spain (2020-25) and Portugal (2022-25) ; DSA is being prepared

Plan C2

September 25: Another **private laboratory (Spain-only) contacted**; initial interaction suggests they will share requested data with CS1

Funded by
the European Union

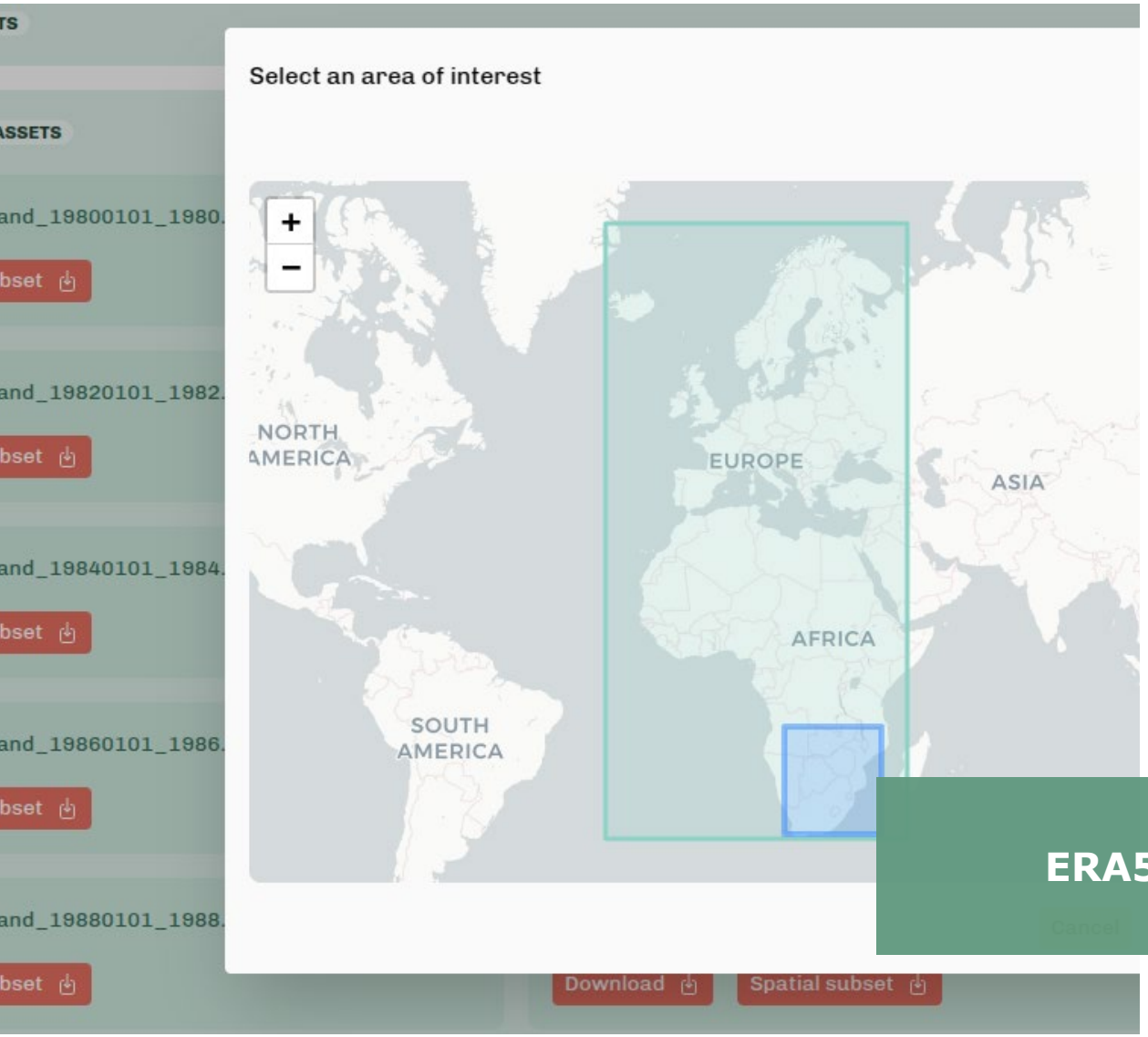
Datasets for analysis and modelling for One Health

Case Study 1 – vector borne diseases in the Iberian Peninsula

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Health and Digital Executive Agency (HADEA). Neither the European Union nor the granting authority can be held responsible for them.

Climate data



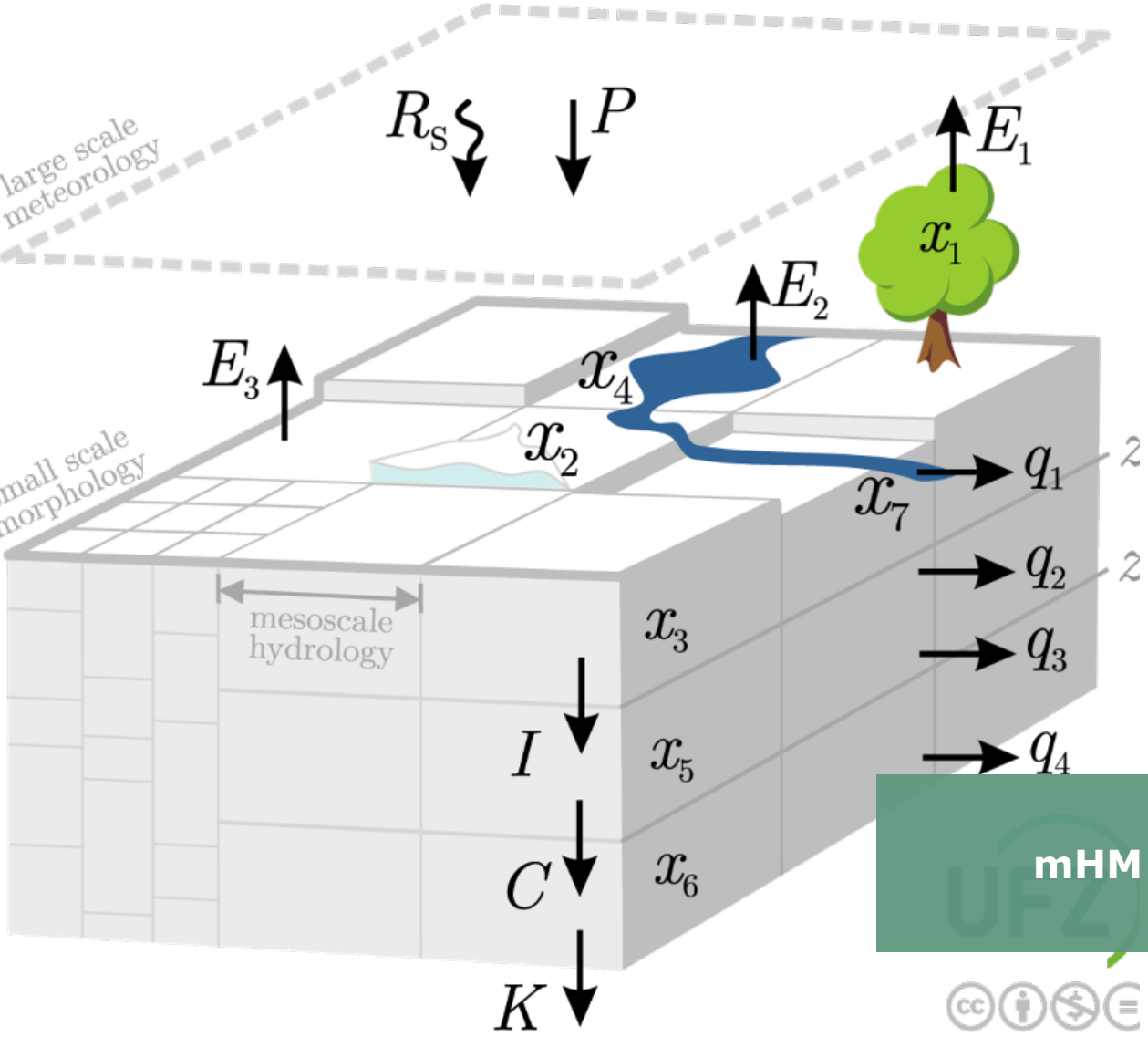
ERA5 Land

Hourly records, from 1950, with spatial resolution of 0.1º x 0.1º (9km), standardized, harmonized, and downscaled by P4H to 1km x 1km. Open data.

10m u-component of wind, 10m v-component of wind, 2m dewpoint temperature, 2m temperature, evaporation from the top of canopy, evaporation from vegetation transpiration, forecast albedo, lake bottom tempearature, lake ice depth, lake ice temperature, lake mix-layer depth, lake mix-layer temperature, lake shape factor, lake total layer temperature, leaf area index (high vegetation), leaf area index (low vegetation), potential evaporation, runoff, skin reservoir content, skin temperature, snow albedo, snow cover, snow density, snow depth, snow depth water equivalent, snow evaporation, snowfall, snowmelt, soil temperature, sub-surface runoff, surface latent heat flux, surface net solar radiation, surface net thermal radiation, surface pressure, surface runoff, surface sensible heat flux, surface solar radiation downwards, surface thermal radiation downwards, temperature of snow layer, total evaporation, total precipitation, volumetric soil water layer.

Funded by the European Union

Hydrological data



Daily records, from 1958, with spatial resolution of 1km x 1km. Global dataset, open.

Simulates: canopy interception, snow accumulation and melting, soil moisture dynamics, infiltration and surface runoff, evapotranspiration, subsurface storage, deep percolation and baseflow, discharge attenuation and flood routing.

Level-0: Capturing the main features of the terrain, primary soil characteristics, and land cover.

Level-1: Dominating hydrological processes at the mesoscale and the basin's key geological formations.

Level-2: Describing the variability of meteorological forcings at the mesoscale.

mHM model

Funded by the European Union

Sand fly monitoring data

UNL monitoring

Funded by
the European Union

What it entails for data analysts and modellers?

The veterinary datasets available for Case Study 1 (CS1) are highly heterogeneous and often lack the temporal and spatial consistency required for reliable analysis.

They originate from diverse sources, trap monitoring systems, research studies and clinical veterinary records, each collected with different objectives, methodologies, and levels of precision.

This diversity leads to irregular sampling frequencies, uneven spatial coverage and incomplete records, making it difficult to construct continuous and harmonized time series suitable for robust model training.

A major challenge is the limited historical depth. Many time series span only a few months or years, restricting detection of long-term trends, seasonal cycles or rare events. This scarcity of historical information undermines the generalization capacity of models.

Differences in data collection practices across sources introduce strong spatial and temporal biases, as well as additional noise and inconsistencies arising from measurement errors or varying collection protocols.

Clinical and veterinary health records face related challenges. The recorded cases often fail to represent the broader animal population, since participation and reporting are influenced by factors such as clinic size, geographic location and access to veterinary services.

Funded by
the European Union

Direct use is difficult

Preprocessing and cleaning is required.

Harmonization across sources needed for continuity.

Auxiliary datasets (environmental, demographic, etc.) need to be included to improve feature space and model reliability.

Funded by
the European Union

THANK YOU!

PLANET 4HEALTH

Carla Maia
Principal Researcher with Habilitation
DVM, MSc, PhD, DipEVPC, EBVS® European Veterinary Specialist in Parasitology
CarlaMaia@ihmt.unl.pt

Suzana Blesic
Associate Professor of Research
Theoretical statistical physicist, Data scientist
blesic.Suzana@gmail.com

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Health and Digital Executive Agency (HADEA). Neither the European Union nor the granting authority can be held responsible for them.

PLANETARY Health Cluster

PLANET4HEALTH is one of five Horizon Europe projects—GoGreen Next, MOSAIC, PLANET4HEALTH, SPRINGS, and TULIP—that together form the Planetary Health Cluster.