# Preventing the emergence of zoonoses: from exploring pathogen transmission to implementation of public policies

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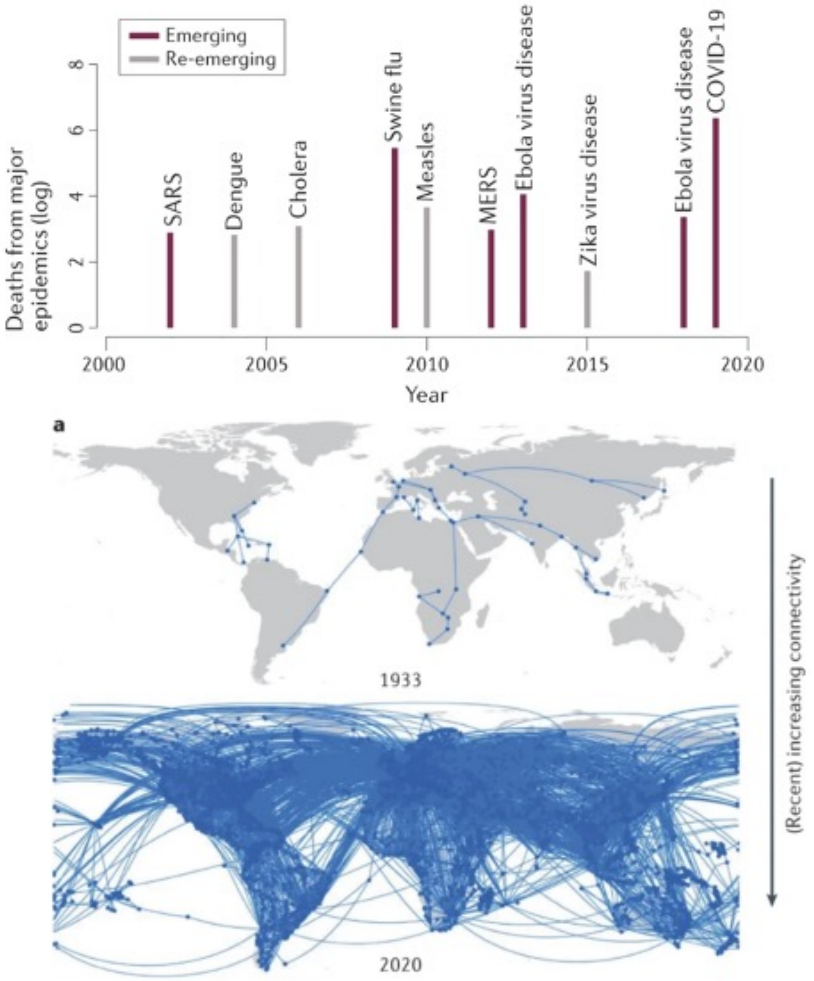
France

# Era of emergence: Infectious diseases in an era of global change

- Number of emerging disease outbreaks is increasing since decades
- Human mobility is also increasing since decades
- All ingredients are here to observe new pandemics during the next years

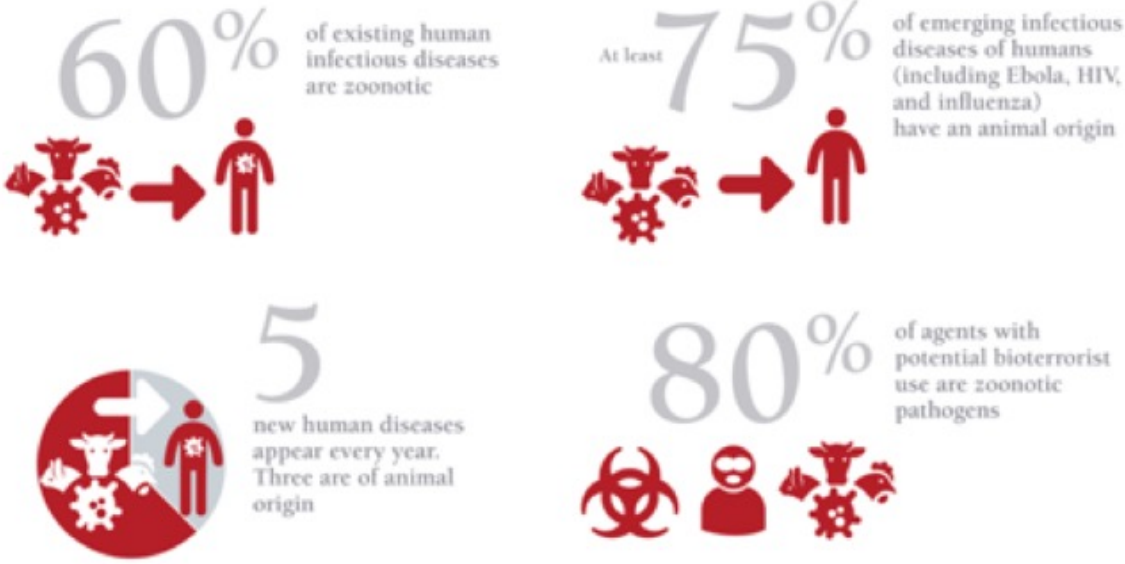


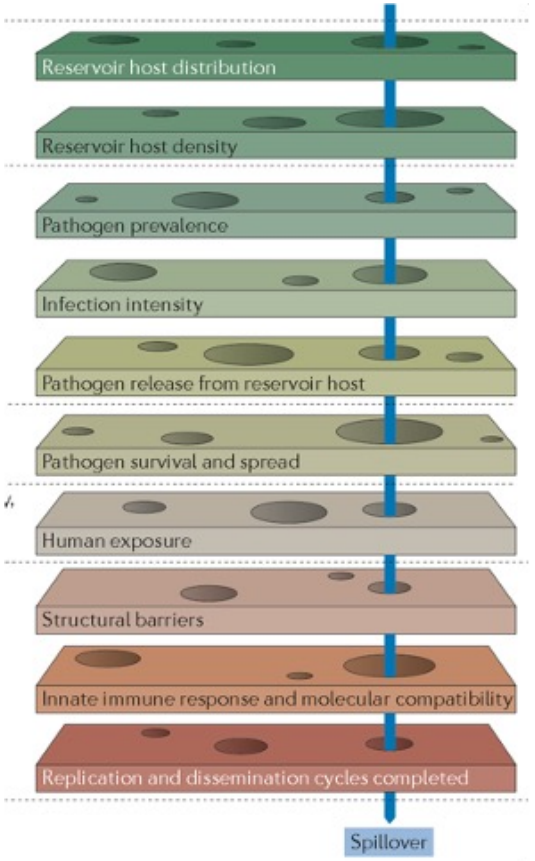





Baker, R.E., et al. Infectious disease in an era of global change. Nat Rev Microbiol 20, 193–205 (2022)

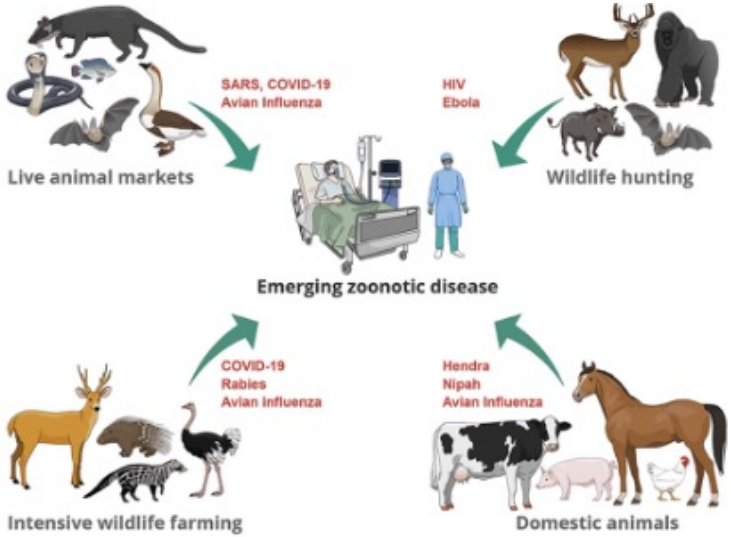
# Era of emergence: Most of them are zoonotic diseases




Plowright et al, Nat. Rev. Mic. 2017

# Increased human-animal interface : some well known drivers



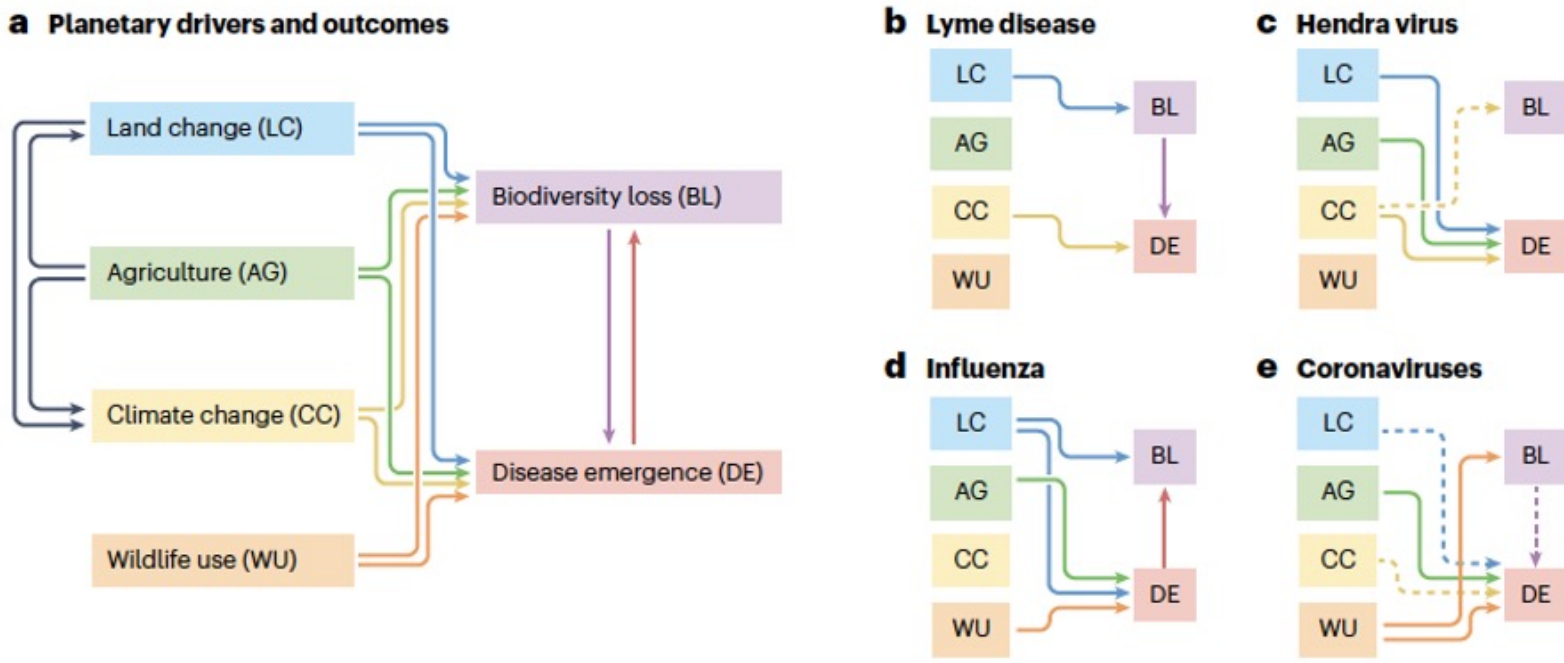

**Deforestation**

**Animal markets**

**Urbanisation**

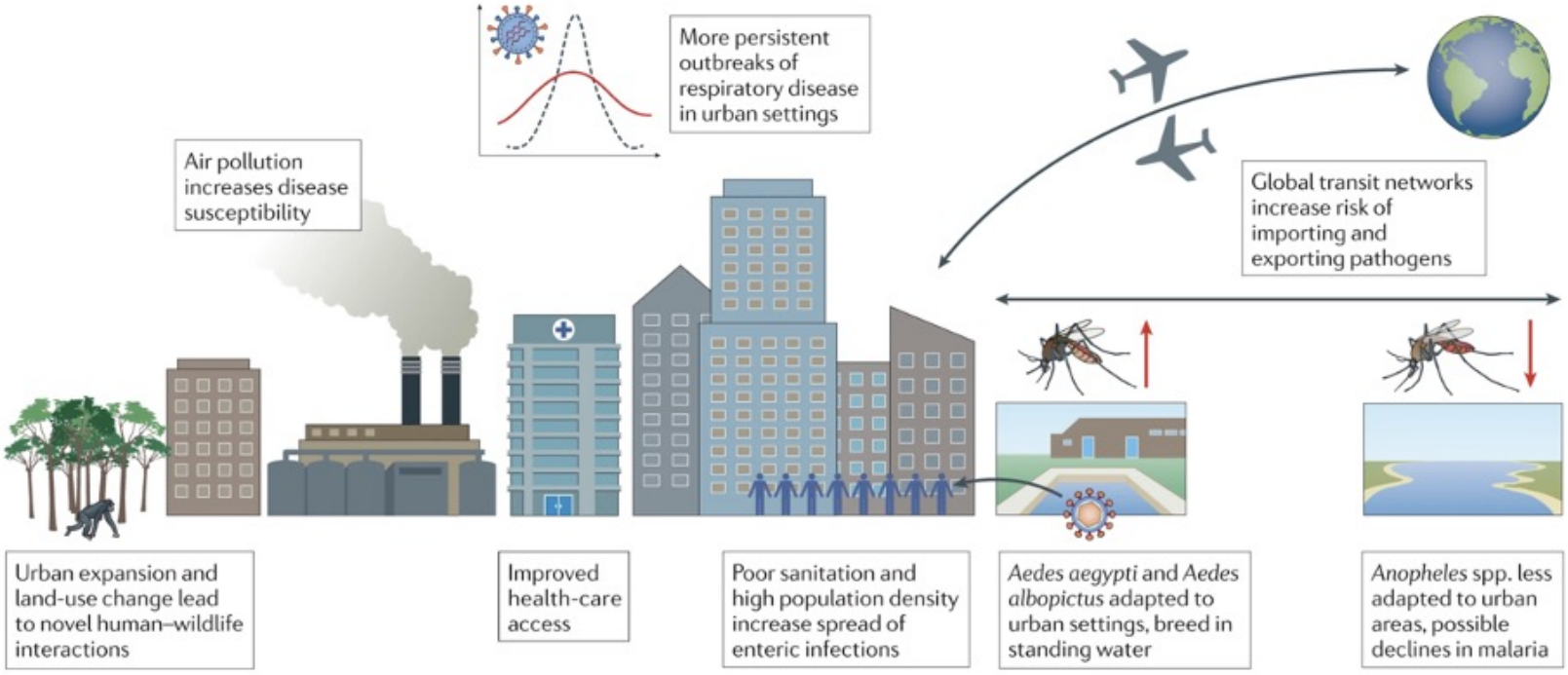
Magouras et al., 2020

# Biodiversity loss and disease emergence: shared drivers




*Carlson et al. Pathogens and planetary change, Nature reviews, 2025*

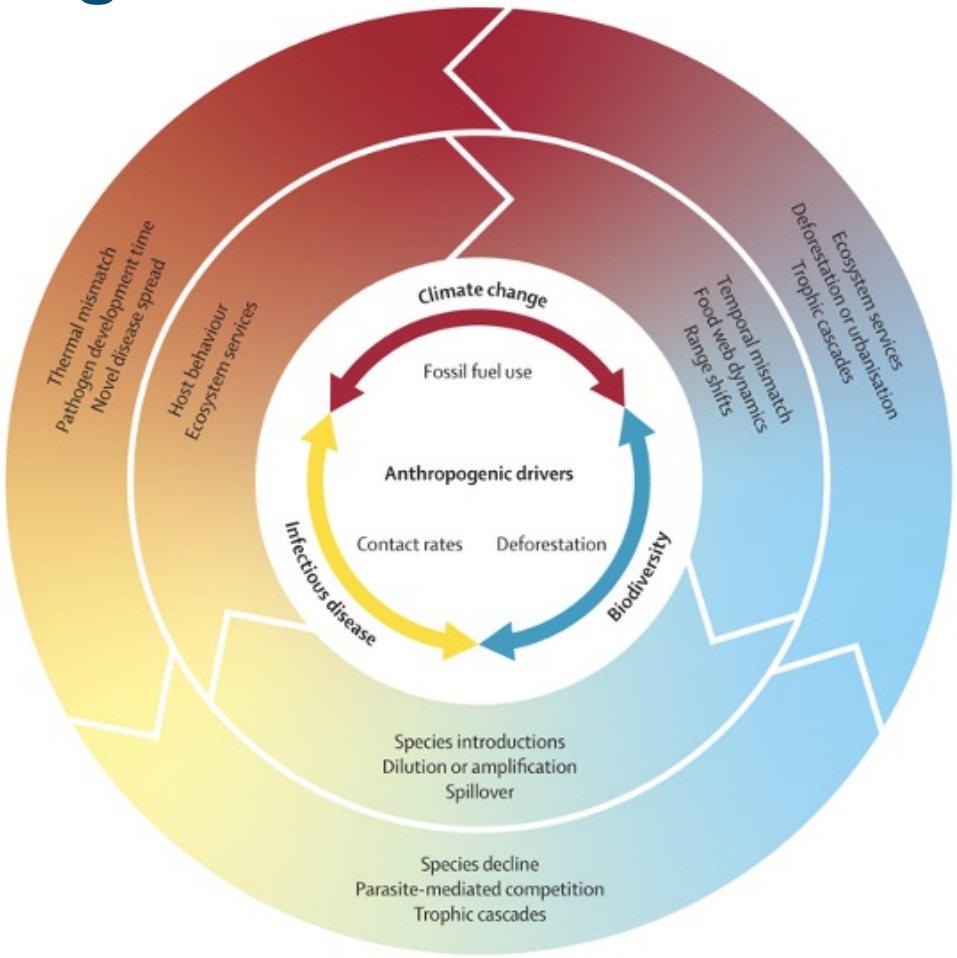
# Complex interactions and interconnecting global threat




**Interactions between urbanization and infectious disease are complex, with increased urbanization driving both positive and negative changes to global disease burden.**

*Baker, R.E., et al. Infectious disease in an era of global change. Nat Rev Microbiol 20, 193–205 (2022)*

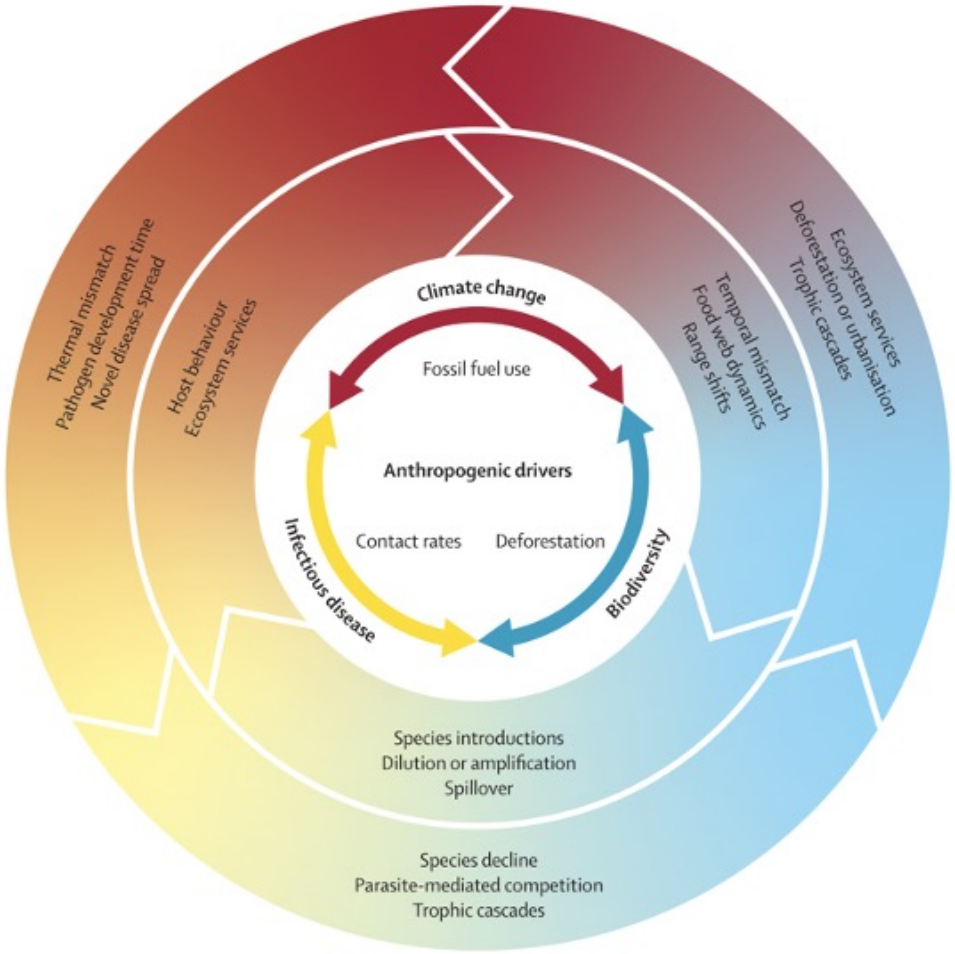
# Complex interactions and interconnecting global threat




The full triad of interactions is rarely considered.

*Pfenning-Butterworth et al. 2024*

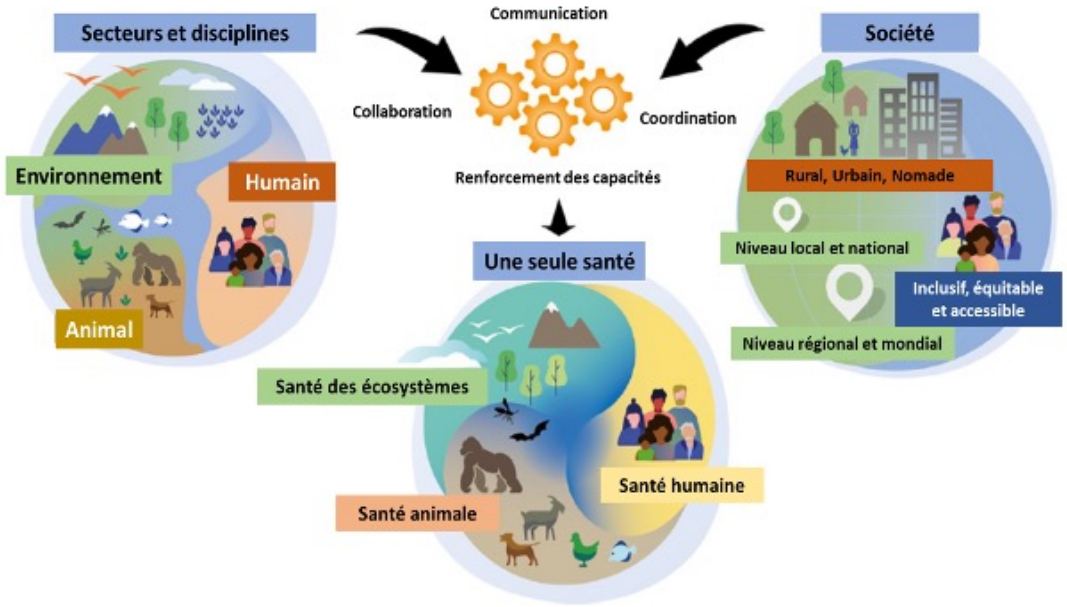
# Complex interactions and interconnecting global threat




*Considering the full suite of connections within the whole ecosystem to prevent zoonotic disease emergence in a sustainable way*

*Pfenning-Butterworth et al. 2024*

# The rise of One Health approach: A common and shared definition since 2022

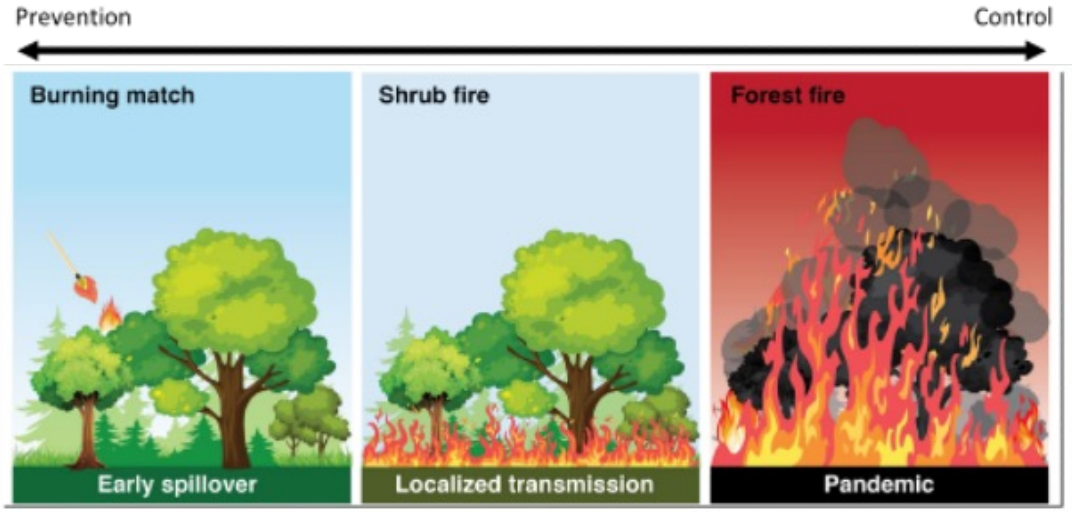



***One Health*** *is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.*
*It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.*

*The approach mobilizes* ***multiple sectors***, ***disciplines*** *and* ***communities*** *at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.*

*One Health High-Level Expert Panel (OHHLEP), Adisasmito WB, Almuhairi S, Behravesh CB, Bilivogui P, Bukachi SA, et al. (2022) One Health: A new definition for a sustainable and healthy future. PLoS Pathog 18(6): e1010537.*

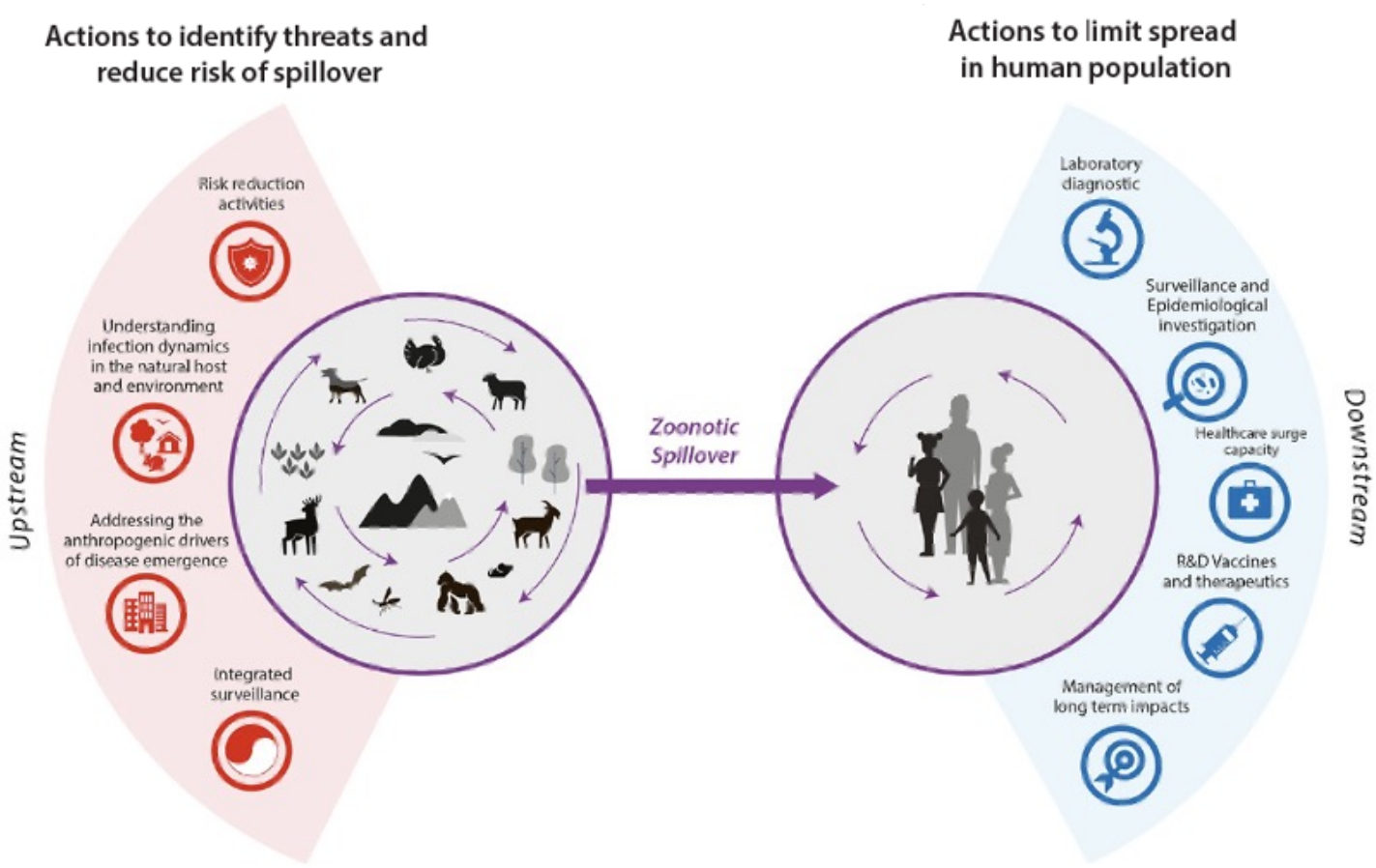
# From panic and neglect to sustainable pandemic prevention through One Health approaches


IPBES, 2020

# From panic and neglect to sustainable pandemic prevention through One Health approaches

- Integrated One Health surveillance to detect and monitor threats/ inform risk assessment.
- Addressing drivers of disease emergence, including human behaviors and activities that increase risk (e.g., certain conditions and practices associated with climate change, land use change, wildlife trade, food systems).




*Markotter et al. 2023*


Preventing zoonotic
disease emergence

# PREZODE: A common framework to foster collaboration and impact

To take up the challenge of preventing pandemics, the initiative was launched in January 2021 during the One Planet Summit, with the support of the European Commission and the Quadripartite (FAO, WHO, WOAH and UNEP).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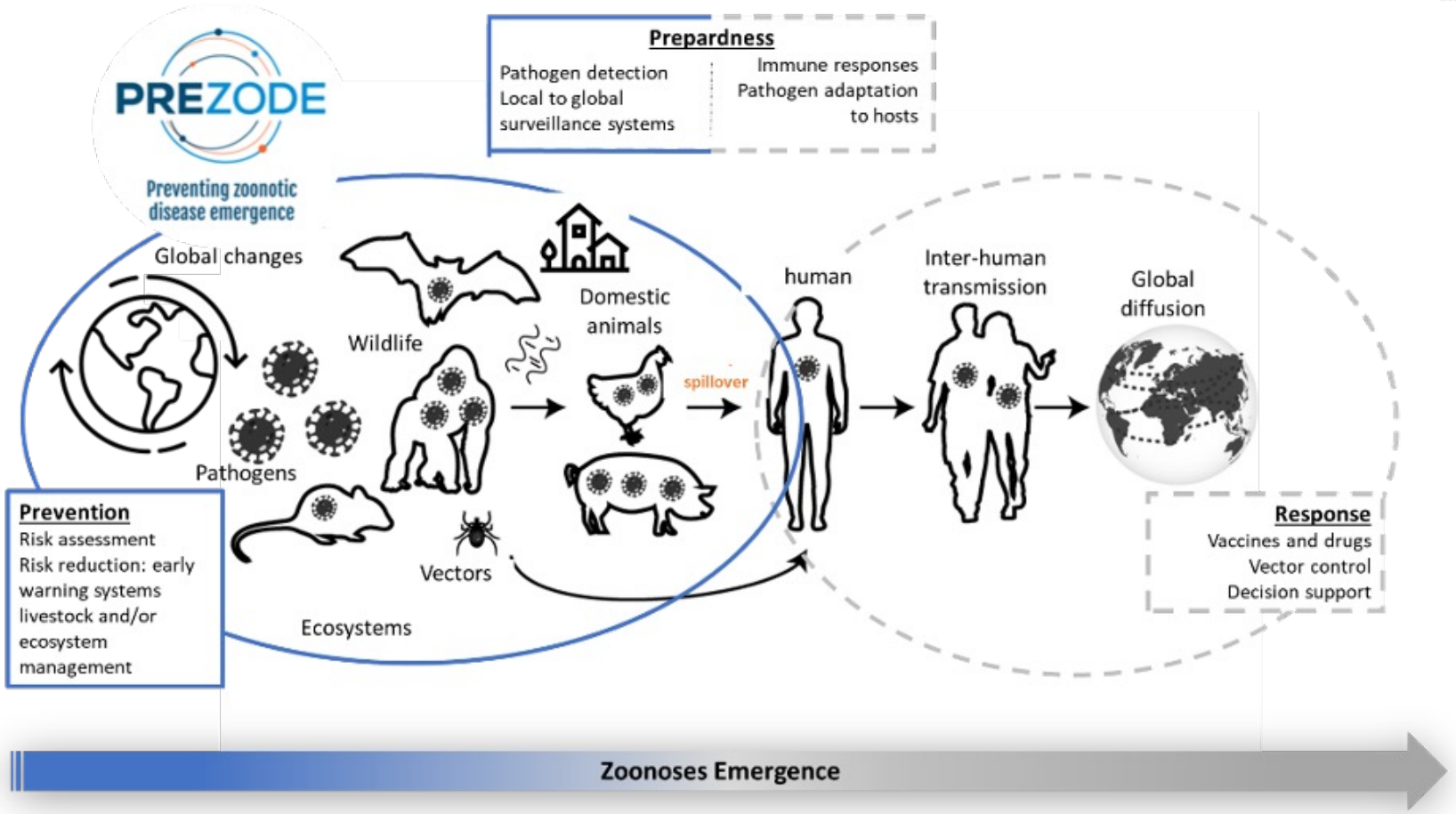
## PREZODE: preventing zoonotic disease emergence

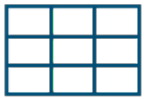
Marisa Peyre • Gwenaël Vourc'h • Thierry Lefrançois • Yves Martin-Prevel • Jean-François Soussana • Benjamin Roche


PREZODE
Preventing zoonotic disease emergence
Prepardness
Pathogen detection
Local to global surveillance systems
Immune responses
Pathogen adaptation to hosts
Global changes
Wildlife
Domestic animals
human
Inter-human transmission
Global diffusion
spillover
Pathogens
Vectors
Ecosystems
Prevention
Risk assessment
Risk reduction: early warning systems livestock and/or ecosystem management
Response
Vaccines and drugs
Vector control
Decision support
Zoonoses Emergence

# PREZODE aims

- **A common framework to implement and coordinate** research projects, surveillance systems, operational projects to maximize their impact

- **A platform for data sharing**



- **A resource center for decision making,** to support evidence based choices and policies to implement to reduce the risk of emerging zoonosis

# PREZODE members

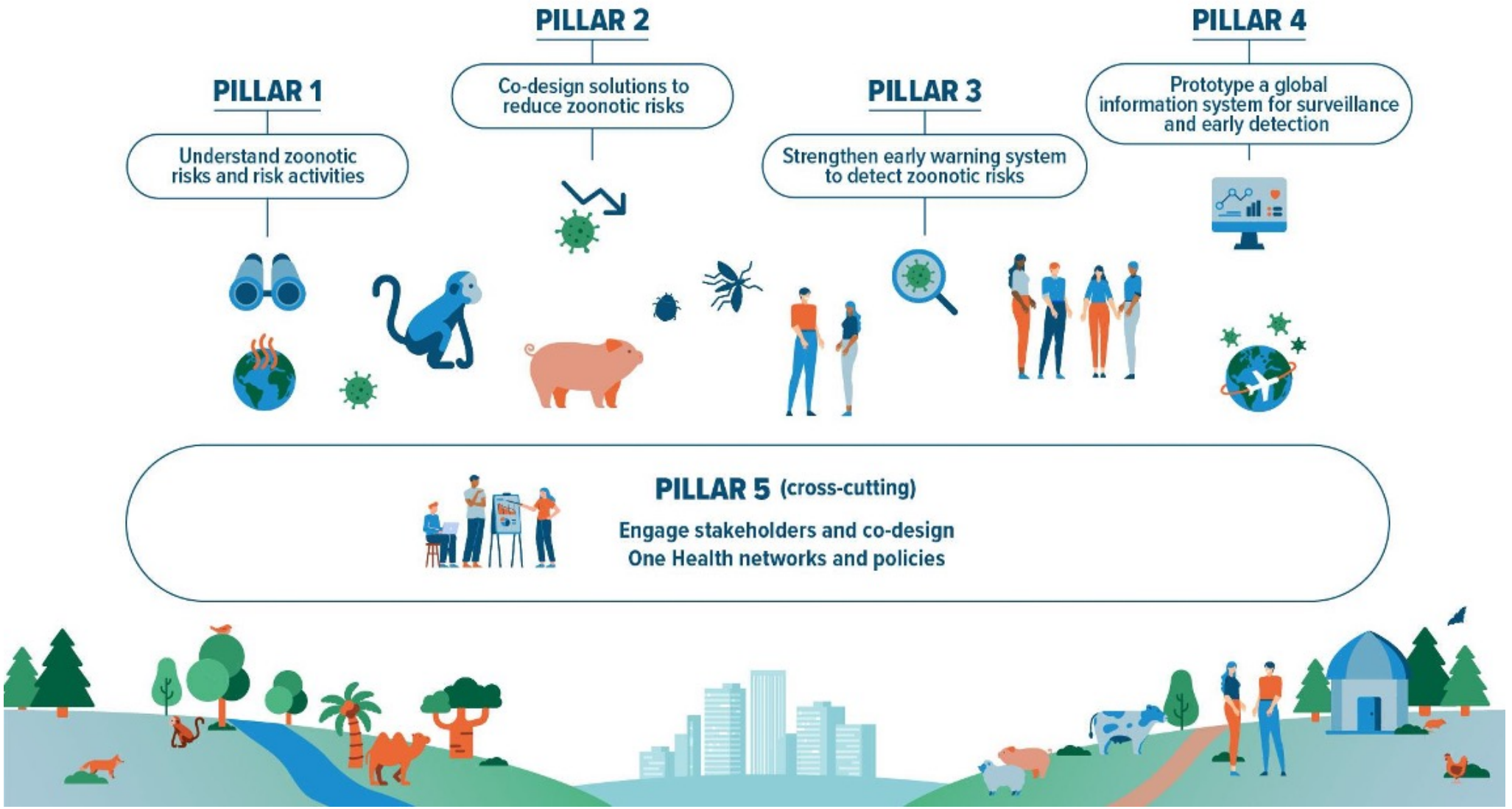
28 governments


>250 members




https://prezode.org/Who-we-are/Members

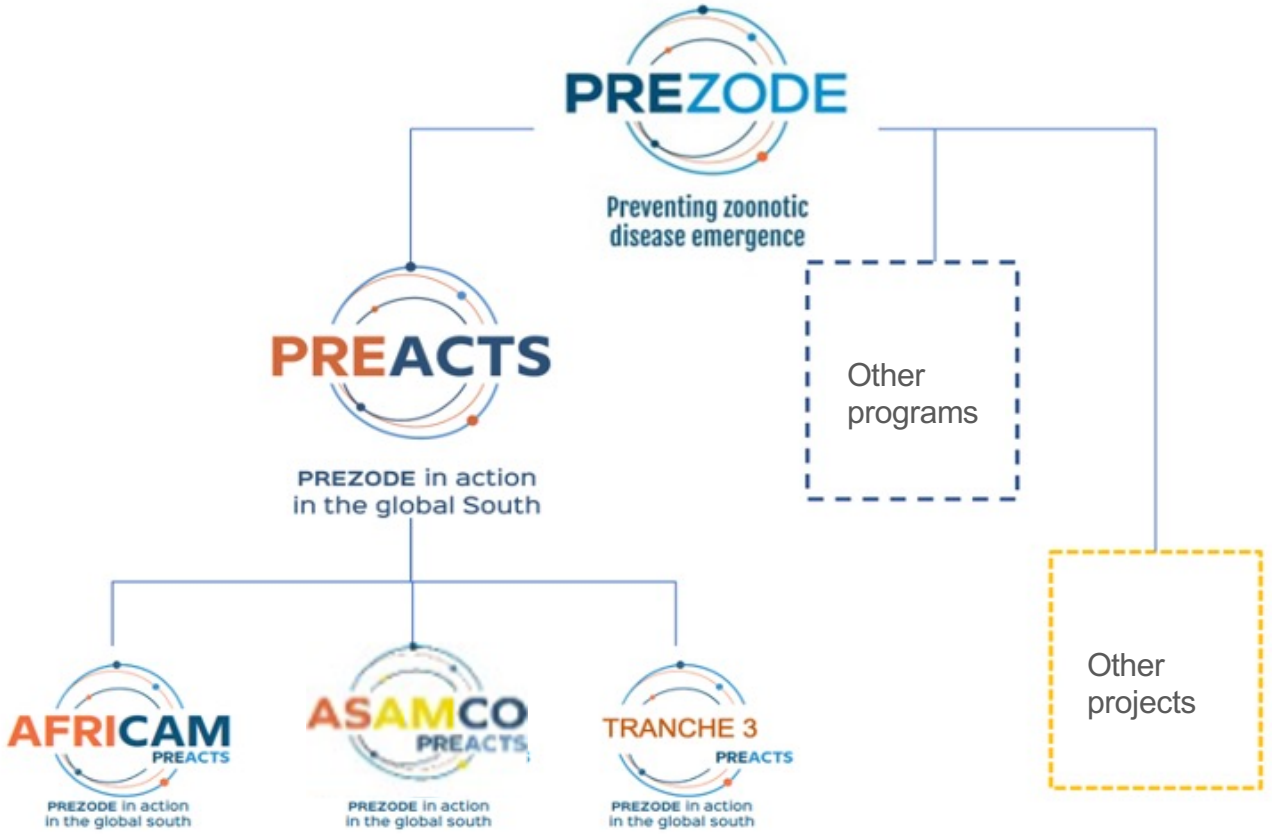
# Structure


PILLAR 1
Understand zoonotic risks and risk activities
PILLAR 2
Co-design solutions to reduce zoonotic risks
PILLAR 3
Strengthen early warning system to detect zoonotic risks
PILLAR 4
Prototype a global information system for surveillance and early detection
PILLAR 5 (cross-cutting)
Engage stakeholders and co-design
One Health networks and policies

# PREZODE first concrete actions

# Two examples of PREZODE action: from data to operational field activities


# The first operational project of the PREZODE initiative in the global south

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# The first operational project of the PREZODE initiative in the global south

PREACTS

PREZODE in action in the global South

**PREACTS: PREZODE in action in the global South**

- First operational project of PREZODE within countries in Global South
- Current funding from AFD: 20M€, in 2 fundings of 10M€
- Implementation: Cirad-IRD

# The first operational project of the PREZODE initiative in the global south

## PREACTS: PREZODE in action in the global South

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PREZODE in action in the global South

**OBJECTIVE**: contribute to reducing the risk of the emergence of zoonotic pathogens with epidemic potential, by strengthening the implementation of sustainable prevention solutions adapted to local contexts and environmental, climatic and social changes through a One Health approach.

# The first operational project of the PREZODE initiative in the global south

## PREACTS: PREZODE in action in the global South

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PREZODE in action in the global South

**OBJECTIVE**: contribute to reducing the risk of the emergence of zoonotic pathogens with epidemic potential, by strengthening the implementation of sustainable prevention solutions adapted to local contexts and environmental, climatic and social changes through a One Health approach.

**Application of the pillars of PREZODE**

**Support PREZODE signatory countries in the South**

**Operationalization through local research and development actions**

**Support public policies and State-Science-Society dialogue**

**Consideration of gender and climate dimensions**

# PREACTs geography

- Senegal
- Guinea
- Cameroon
- Madagascar
- Cambodia

- Mexico/Costa Rica/Haïti
- Democratic Republic of Congo
- Lao/Thailand

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# Guinea

## Support to the development of community-based surveillance systems

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# Guinea: development of CBS systems

Tab. 2: Summary of the proposals made by the participants, categorized by surveillance goals. This table was adapted from the multiple workshops conducted in December 2023.

| Goal | Modality | N° | Associated requests |
|---|---|---|---|
| Early detection | Training | 1 | Training adapted to local knowledge, practices and concepts. Useful for surveillance and for health in general |
| | Communication | 2 | Phones and/or credit |
| | | 3 | Discussion forums on community health and/or good practice and/or knowledge |
| Carrying out surveillance all year long and "everywhere" | Equipment | 4 | Boots; Raincoats; Lamps |
| | Financial assistance | 5 | Compensation and/or bonuses |
| Agent legitimacy | Recognition symbols | 6 | Badges; Recognition jackets; Membership cards |
| Reducing risk (practices) | Sensibilization | 7 | Picture boxes; Megaphones |
| | | 8 | Awareness training |
| | Income-generating activities | 9 | *Not specifically indicated* |
| | Hygiene | 10 | Hygiene kits for the community: soap, chlorine, etc. |

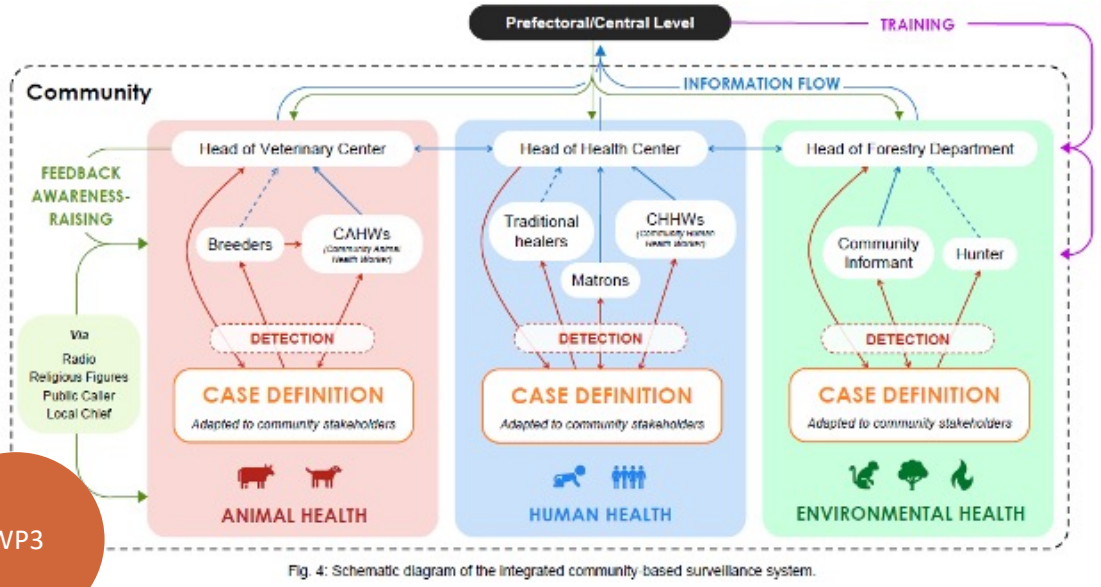


Fig. 4: Schematic diagram of the integrated community based surveillance system.

WP3

→ **Co-designing** with local stakeholders and cooperation with national One Health platforms and surveillance systems

WP4

→ **Inclusion of gender aspects** : qualitative study on local gender systems in Guinea in the context of epidemiological surveillance and contribution to the development of dedicated trainings on gender.

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# Madagascar

## Support to the development of integrated surveillance systems

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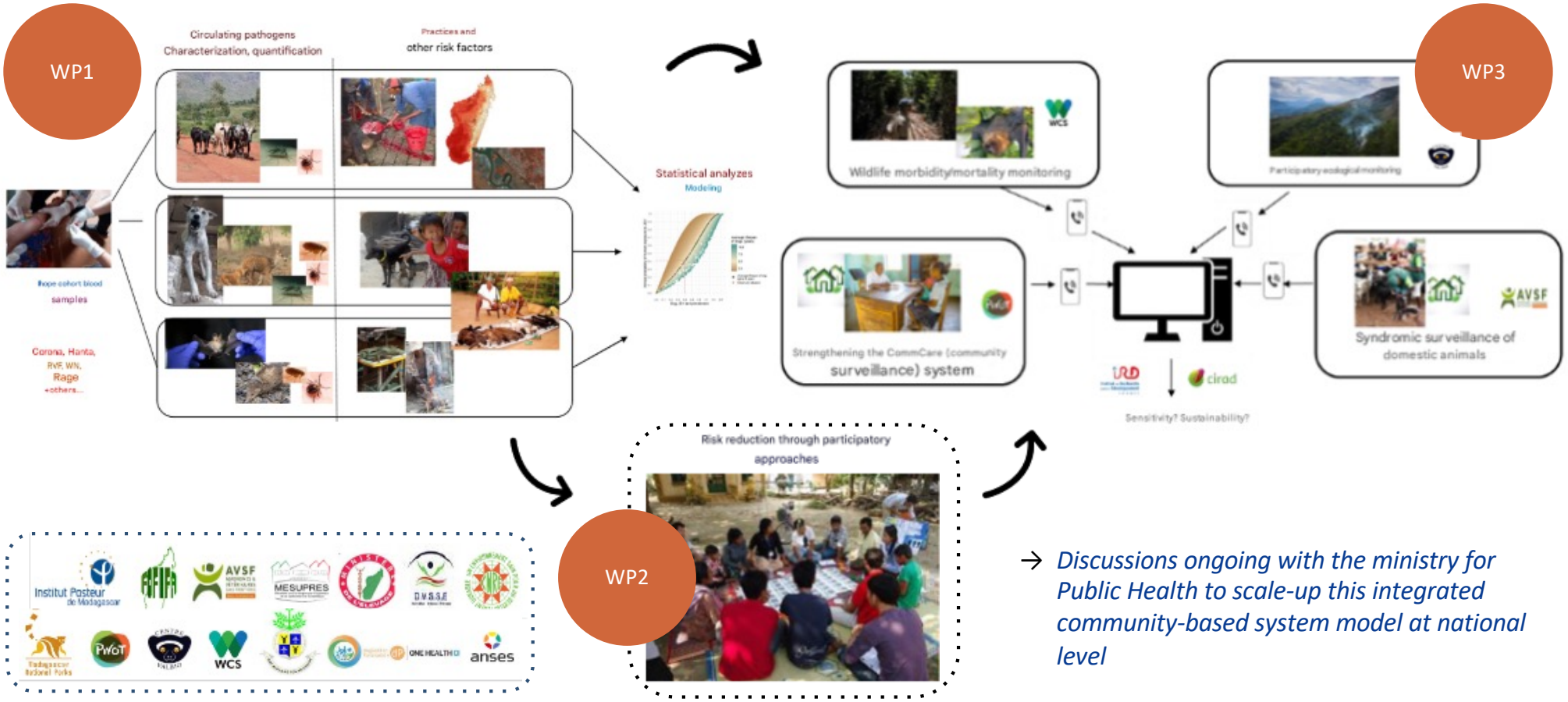
# Madagascar: development of integrated SS




→ *Discussions ongoing with the ministry for Public Health to scale-up this integrated community-based system model at national level*

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# Cameroon

## Enhancing education and civil society awareness

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# Cameroon: enhancing education and awareness

**Academic sector**

Creation of a One Health Master's degree in cooperation between Dschang University and the University of Montpellier

Trainings for PhD and Master's degree students

**Civil society and local stakeholders**

Organization of workshops at national and local levels on different topics (ex : One Health, risk characterization, sampling)

Collaboration with and support to the national OH platform

# Quantitative indicators for risk of zoonotic disease emergence

- Prevention strategies against zoonoses (including improved surveillance for faster response and ecosystem management) are challenging to implement because funders and authorities do not have a visibility on their efficiency

- One way to address this issue is to quantify the risk reduction

- Goal of the joint working-group: Defining indicator(s) able to characterize this risk reduction

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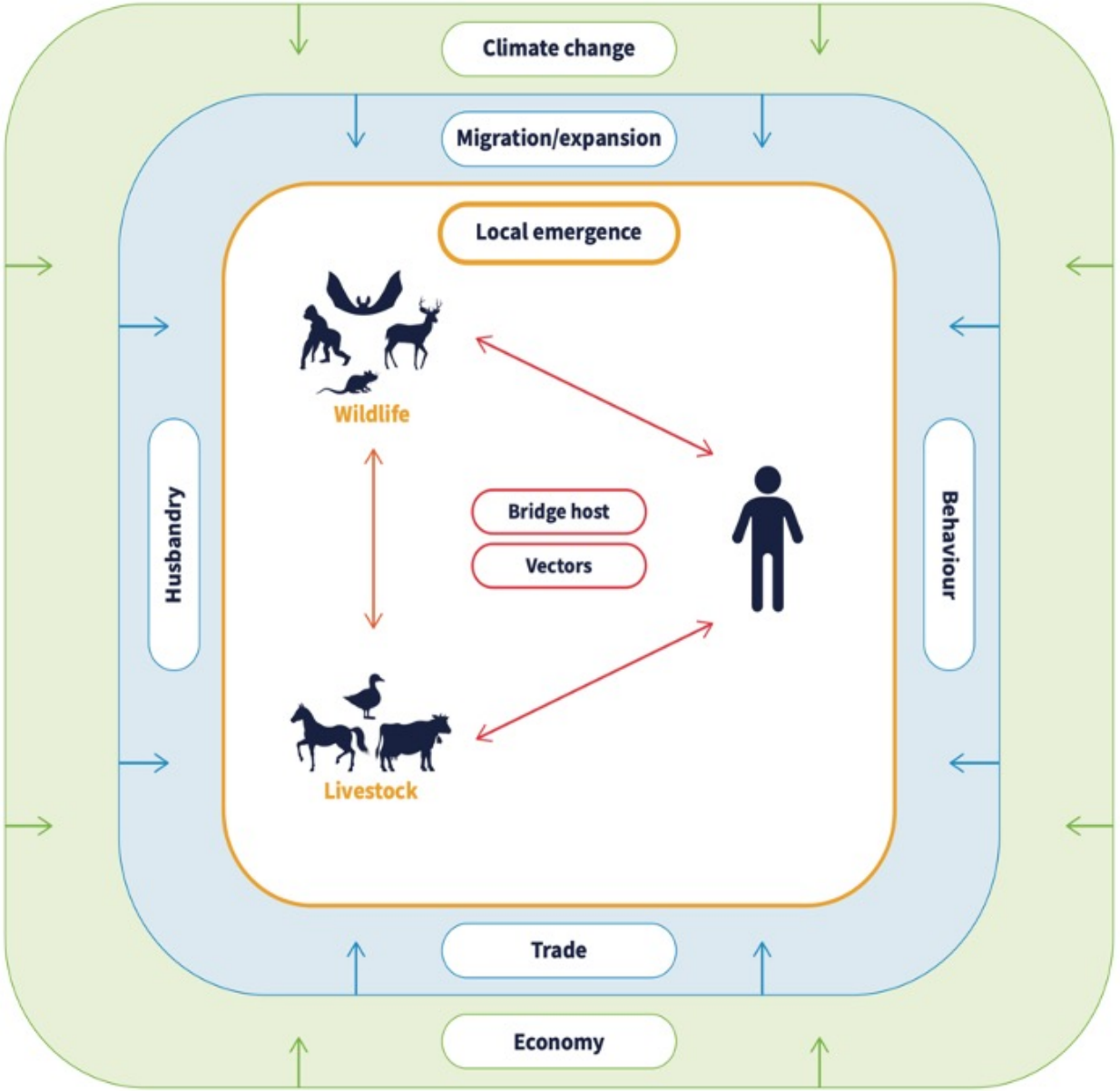
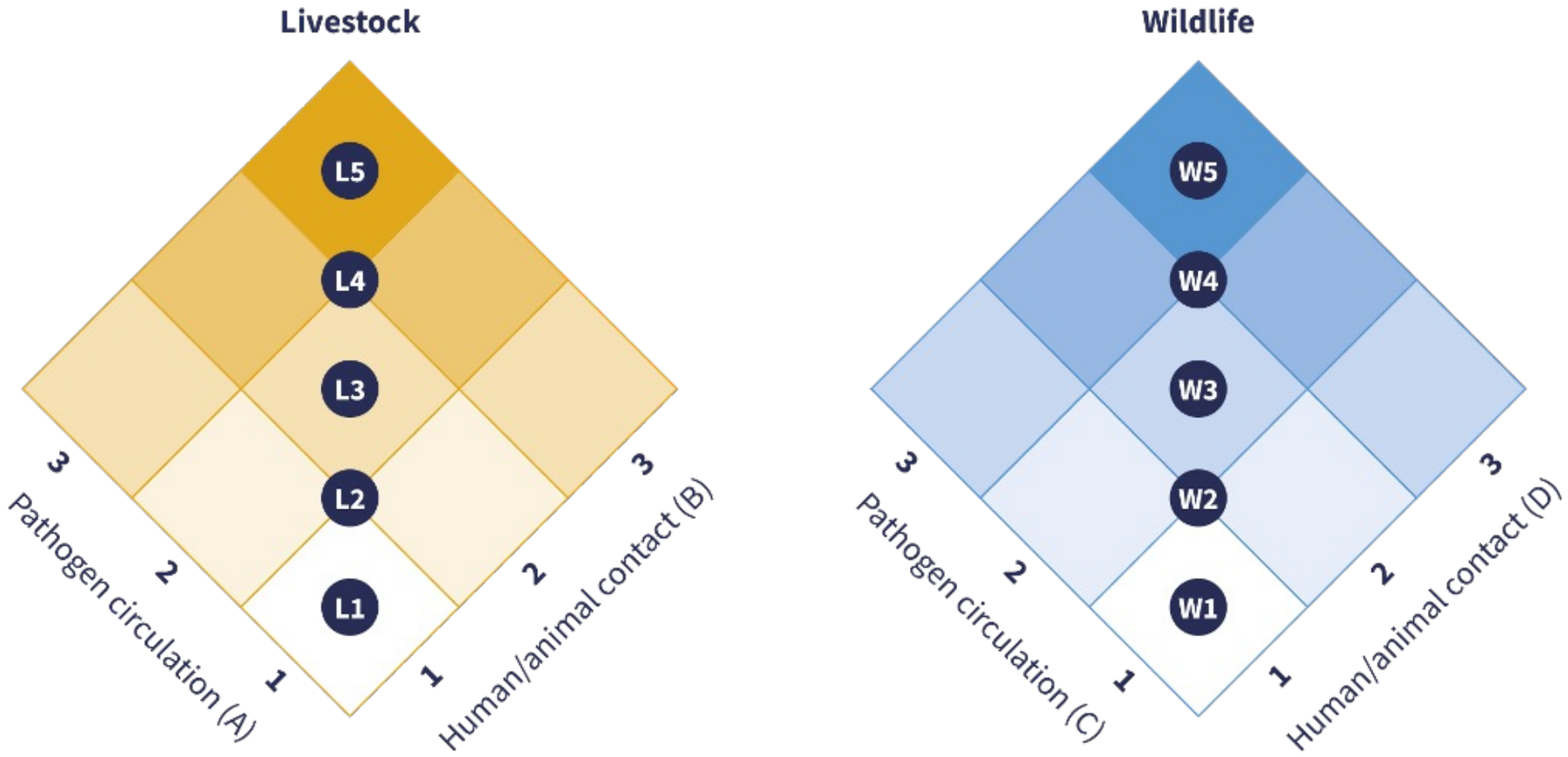
# Global framework

There are different forms of transmission and
the transmission dynamics is influenced by a lot of factors.
The WG focused on the core mechanism of this spillover event.

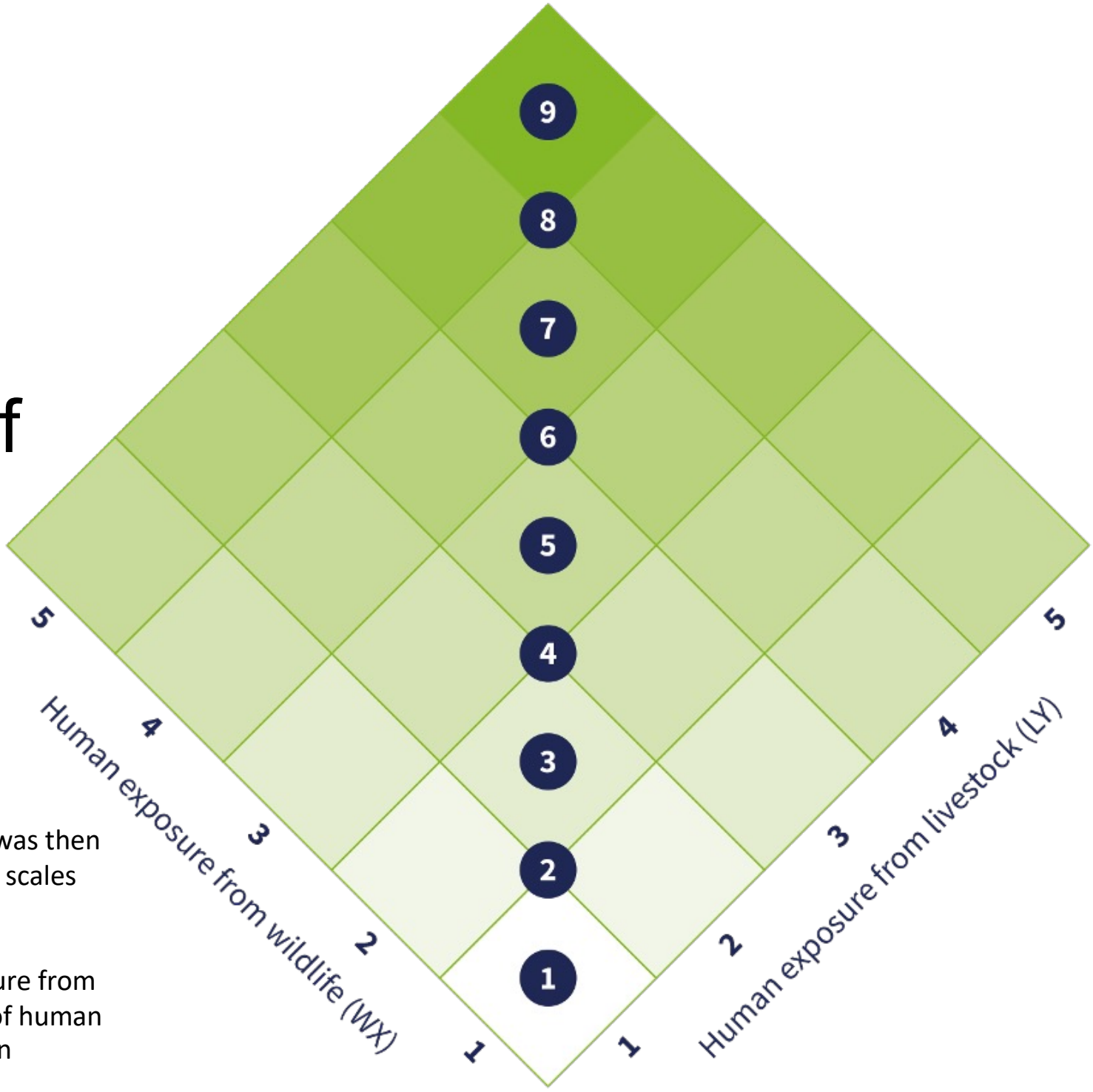


# Indicator composition




The indicators was composed by the level of pathogen circulation from 1 to 3 and the level of human/animal contact.

# Indicator of human exposure




The level of human exposure was then categorize through 5 different scales for livestock and wildlife

=

the indicator of human exposure from 1 to 9 which is the likelihood of human exposure to zoonotic pathogen

# First application of the indicators

- Elicitation study to identify the risk at a national scale:
  - Pathogen circulation within each animal populations (wildlife and livestock)
  - Contact intensity between animal populations (wildlife and livestock) and humans

- Tested on four pathogens
  - Avian Influenza Viruses (AIV)
  - Middle East Respiratory Syndrome Coronavirus (MERS-Cov)
  - Crimean Congo Hemorrhagic Fever (CCHF)
  - West Nile Virus (WNV)

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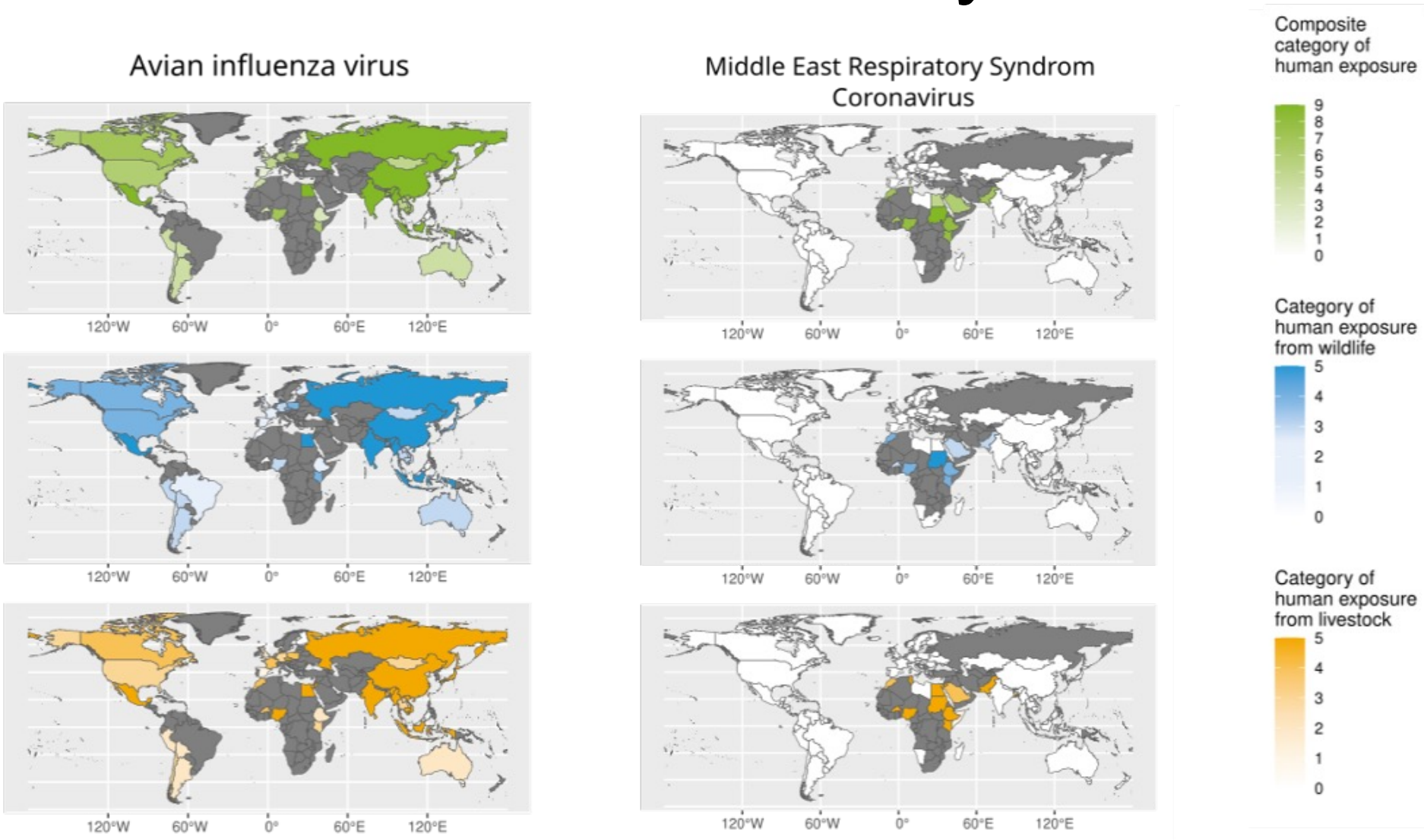
World Health Organization

# Mapping the indicators from the elicitation study



# Conclusions

- Increase of zoonose emergence poses a global threat

- Solutions need a local implementation, and being science-driven

- Local solutions need to be connected to have a global impact

- Hugely important to cover the whole spectrum of knowledge gaps (such as an indicator) to make actionable prevention strategies

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**Developing primary prevention to escape the “panic and neglect cycle”**

Thank you for your attention