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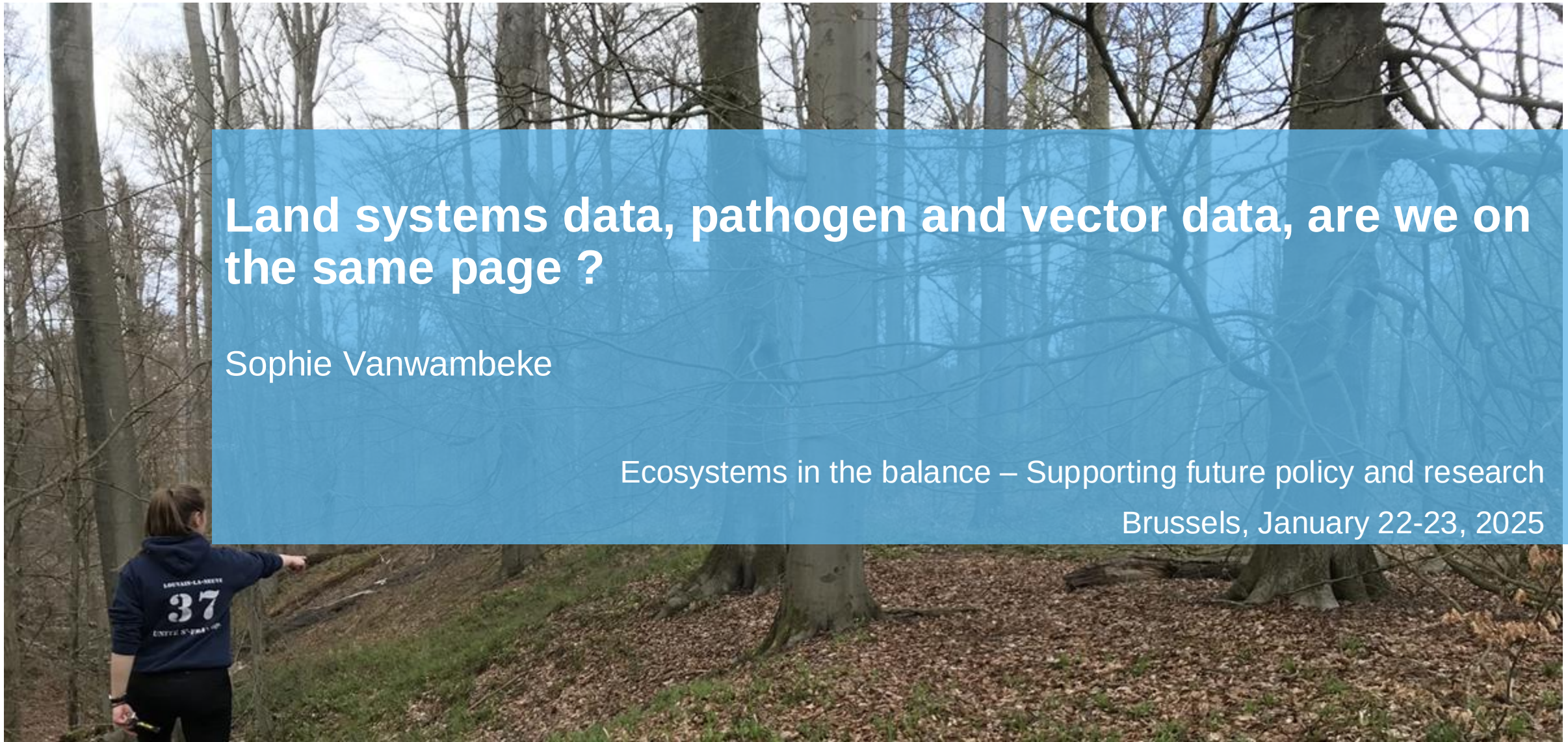

Land systems data, pathogen and vector data, are we on the same page ?

Sophie Vanwambeke

Ecosystems in the balance – Supporting future policy and research

Brussels, January 22-23, 2025

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One Health recognizes…

- The role of interfaces animal/human/ecosystems
- The importance of land use in shaping them
- The multiplicity of stakeholders in these issues

Yet, land use/land use change often portrayed very simply (eg: deforestation)

⍰ land systems offer a useful complement to characterise and understand land use in the context of OH

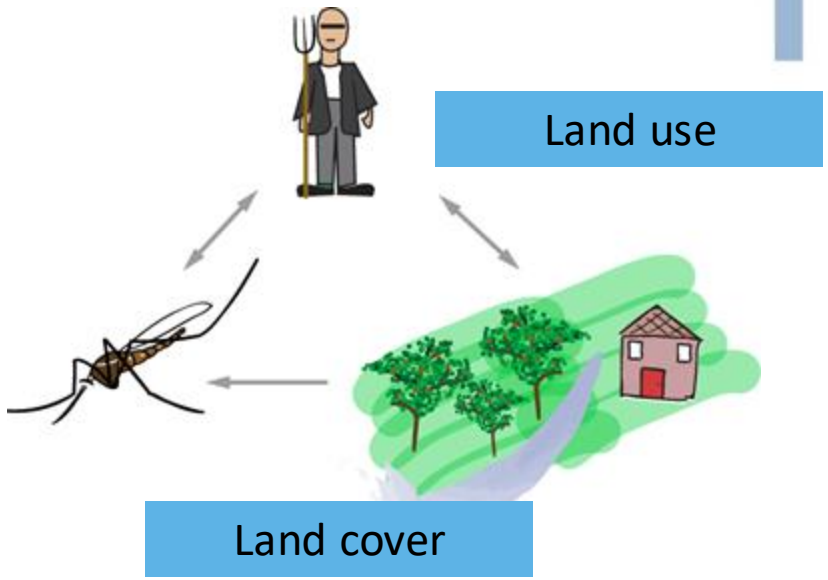
Land use/land cover/landscape conceptualised in various forms:

« Natural nidality of disease (Pavlovsky, 1966)

« Landscape epidemiology » (eg Kitron, 1998; Reisen, 2010)

« Pathogenic landscapes » (eg Lambin et al., 2010)
– accounting for land ownership

« Landscape immunity » (eg Reaser et al., 2022)
– considering landscape's resistance



Introducing distinctions related to risk: hazard, exposure (eg Diuk-Wasser et al., 2021), coping capacity (Vanwambeke & Schimit, 2021)

Looking into functional ecology and management as a mean of control (Hartemink et al., 2015)

Land systems: « *a system composed of **sustained** interactions between human **societies** and terrestrial **ecosystems**, i.e., a terrestrial social-ecological system* » (Ellis, 2021; emphasis added)

Considering:

- Long term trajectories
- Broad context (« beyond the farm »)
- Environmental, social, cultural dimensions

Excellent summary of the major stakes at the global level:

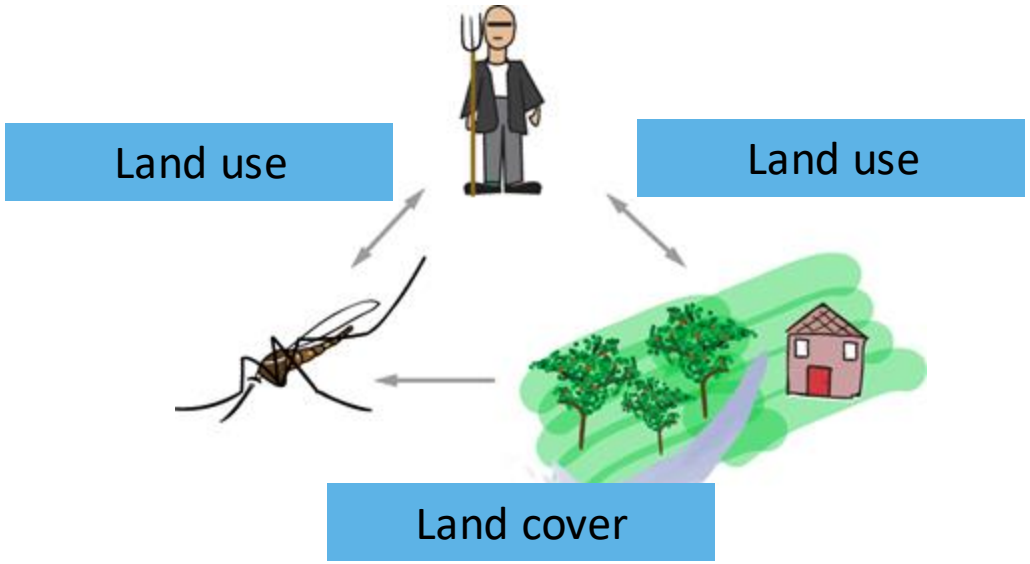
Meyfroidt et al., 2022, Ten facts about land systems for sustainability. *PNAS*, *119*(7), e2109217118. doi: 10.1073/pnas.2109217118

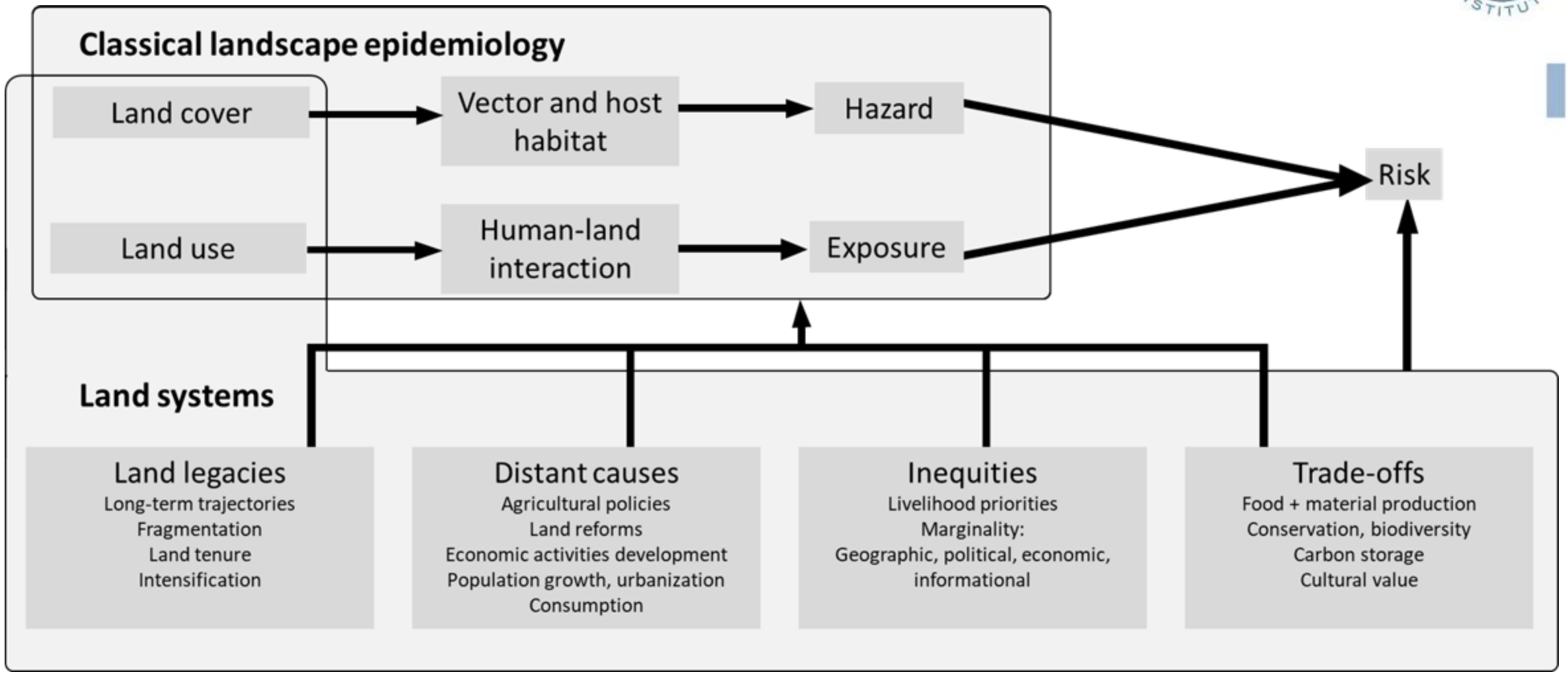
Classical landscape epidemiology

Land cover → Vector and host habitat → Hazard

Land use → Human-land interaction → Exposure

Hazard + Exposure → Risk





Vanwambeke et al., 2024
10.1080/1747423X.2024.2330379

Land legacies

Long-term trajectories
Fragmentation
Land tenure
Intensification

Land cover/use now results from decisions that can go back decades (especially for forests)

Path dependency : choices today are constrained by choices made in the past

Distant causes

Agricultural policies
Land reforms
Economic activities development
Population growth, urbanization
Consumption

Proximate factors affect land use

But they do not occur in a void: they operate in a broader context of e.g. policies, economic opportunities, societal pressure

« consumption » of forest through recreation is a major factor for exposure

Inequities

Livelihood priorities
Marginality:
Geographic, political, economic, informational

Not everyone or everywhere or all times is the same when it comes to managing land

Forests: administrations can afford to look at the long term
Vs. small owners (91% of forest owners in Wallonia own <5ha, equivalent to 24% of forests)

Trade-offs

Food + material production
Conservation, biodiversity
Carbon storage
Cultural value

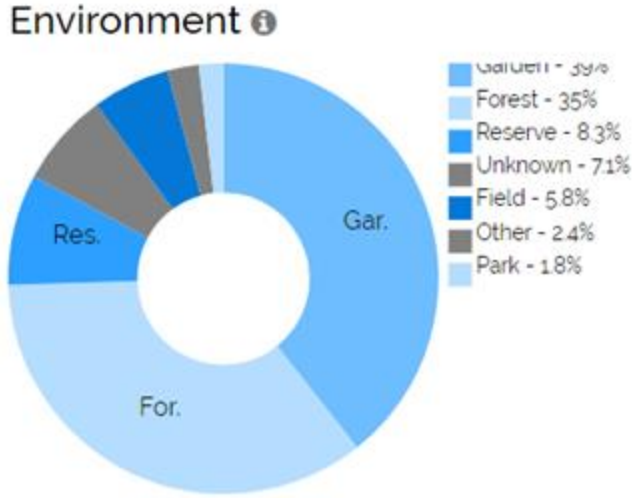
From the perspective of tick-focused management, the greatest bottleneck?

Landscapes have a lot of different jobs. What do societies and individuals prioritize?

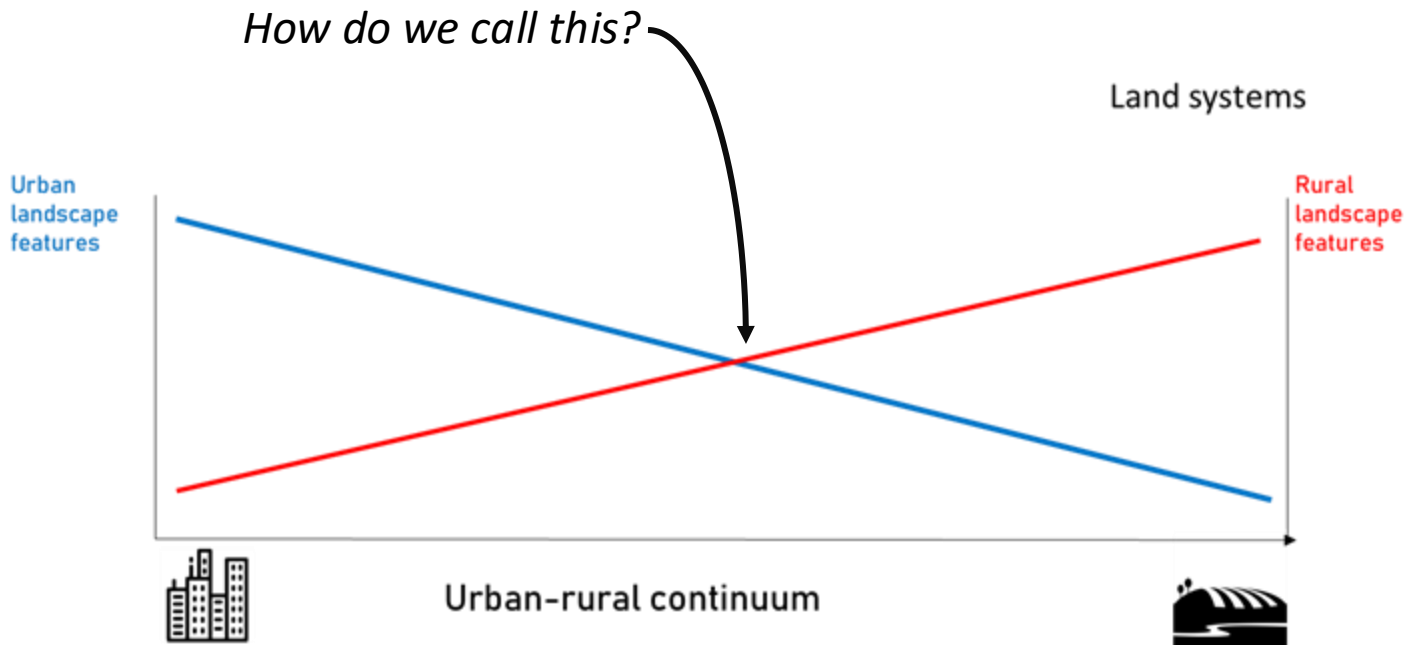
How can we reconcile them? → also looking for better health outcomes – including unintended consequences

OH data in the context of land systems: characterizing land use

The case of ticks and tick-borne diseases in urban/periurban/suburban areas



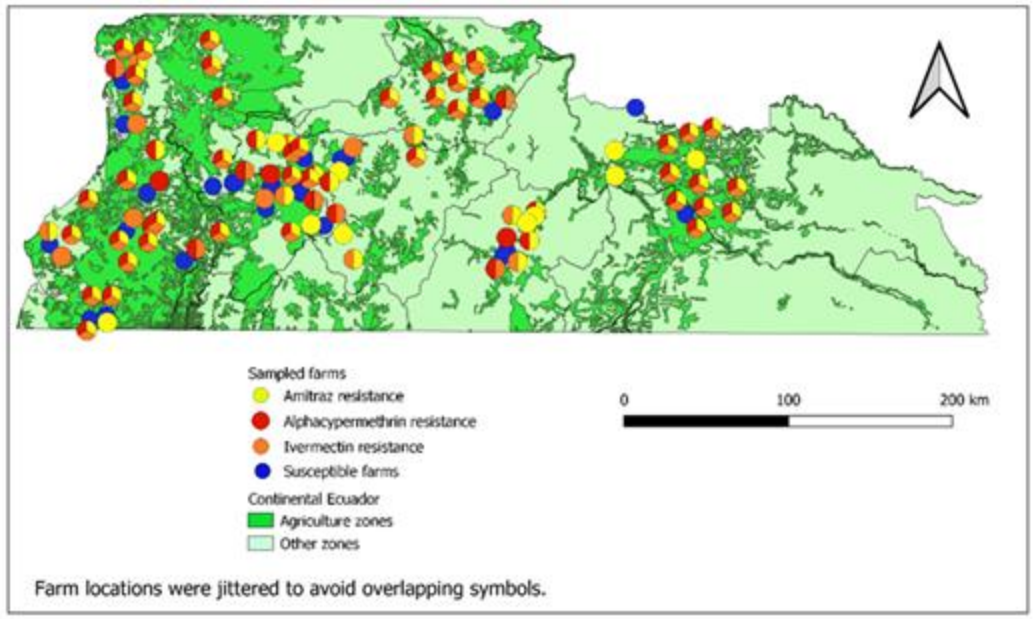
Epistat.be, tekennet data



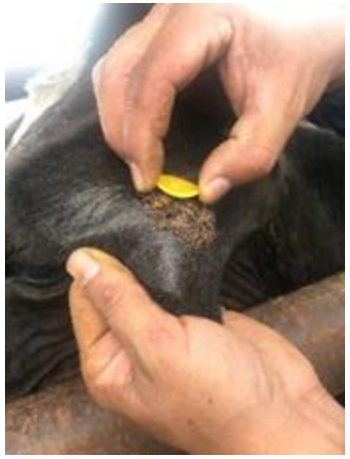
- Connectivity?
- Exposure?
- Source/sink habitats?

OH data in the context of land systems: land use legacies

Current landscapes result from developments spanning decades

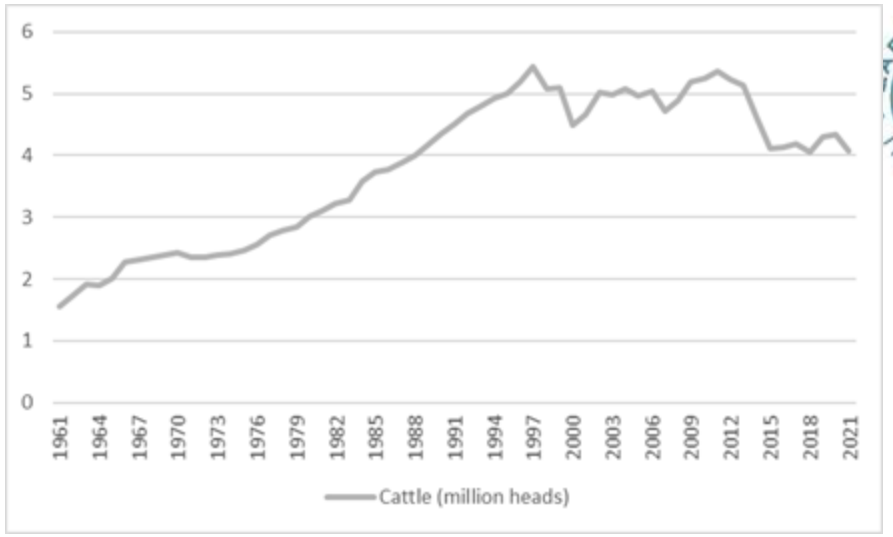


Pérez-Otáñez et al., 2024

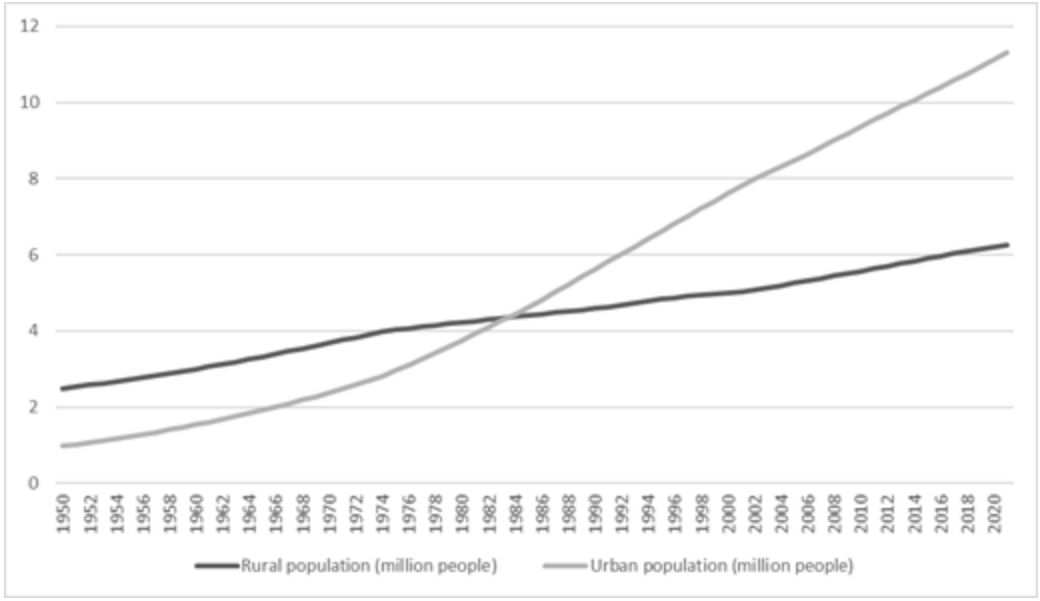


Landscape scale

- Increase in need for pasture and in cattle numbers since the 1950s
- Incentive to clear for pasture and increase stock
- Institutional focus on certain aspects of productivity: eg breed types (that are more susceptible)
- Arrival of corporate buyers (eg Nestlé) with requirement
- Search for improved pastures – with effects on tick suitability



Total cattle heads (millions) in Ecuador 1961-2021. Source:FAOSTAT



Share of urban and rural populations 1950-2021 (million inhabitant). Source: FAOSTAT

OH data in the context of land systems: diversity in stakeholders

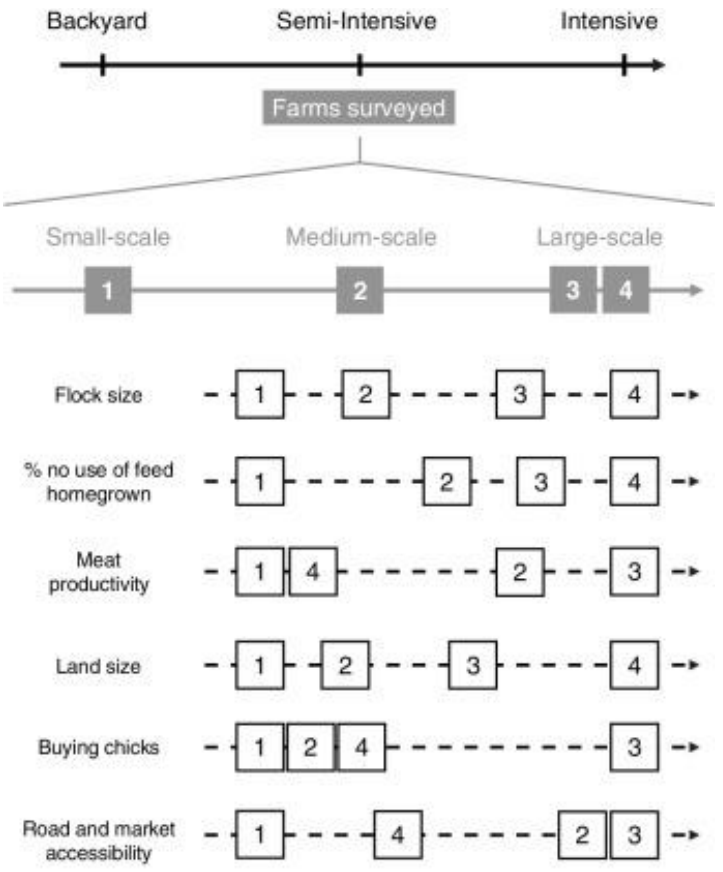
Farming intensity has multiple dimensions

Intensifying production is <u>poorly characterised</u> but <u>very diverse</u>

Transitioning production systems have had more influenza reassortment events

! Smallholders poorly trained and monitored

! Role of surveillance and reporting systems



Characteristics of semi-intensive chicken farms in Kenya

Vanwambeke et al., 2019; Chaiban et al., 2020

OH data in the context of land systems: land management, proximate and distant causes

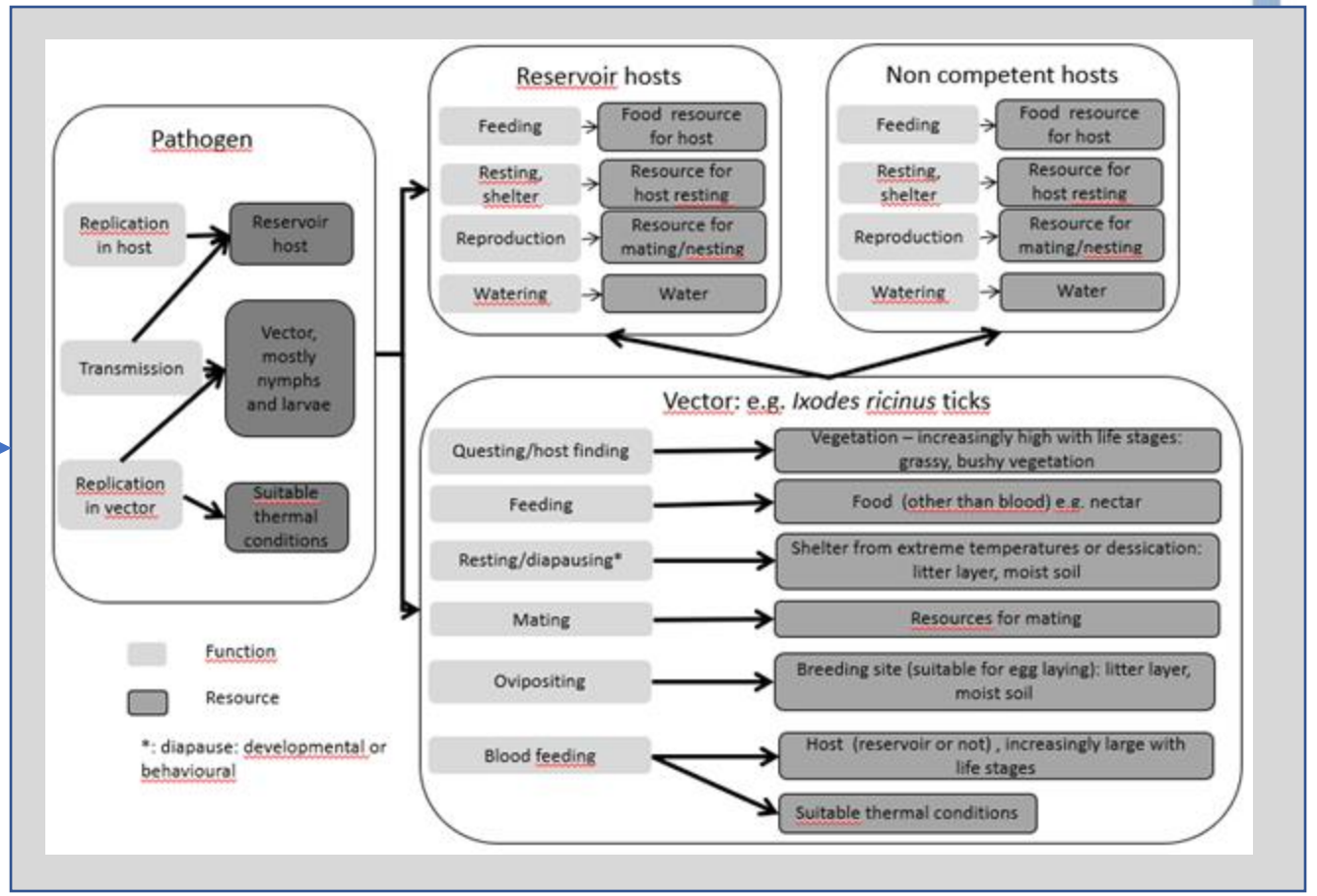
Forest management

Tree species mix

Stand age mix

Understorey management

Biodiversity



A resource-based habitat view on *Ixodes ricinus*
In the context of forest management

Vanwambeke et al., 2016; Hartemink et al. 2015

The most One Health of all… land use decisions result from <u>trade offs</u>

Nature restauration law?

Urban greening?

Climate-resilient land management?

 both will likely embody trade offs we make health-wise

Data allowing to study drivers in a diversity of context
Surveillance data could contribute (but mostly don't so far OHHLEP et al., 2023 10.1016/j.onehlt.2023.100617)

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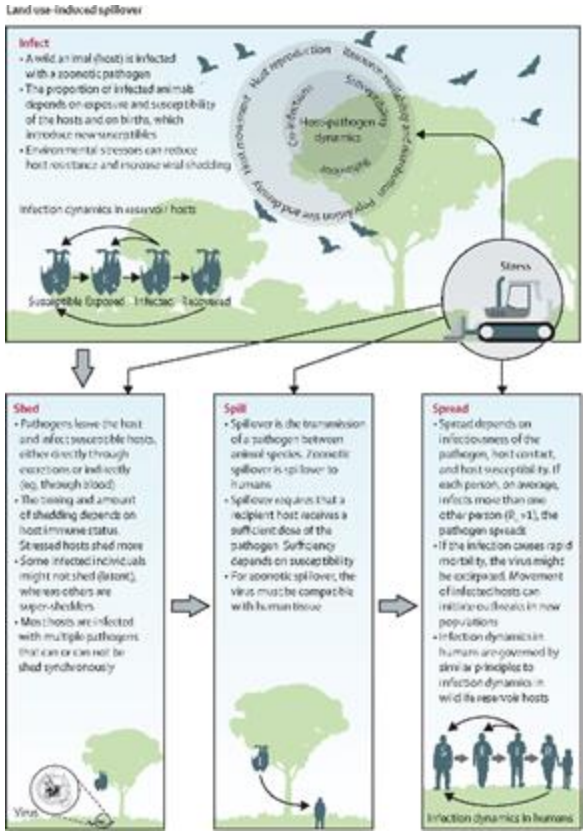
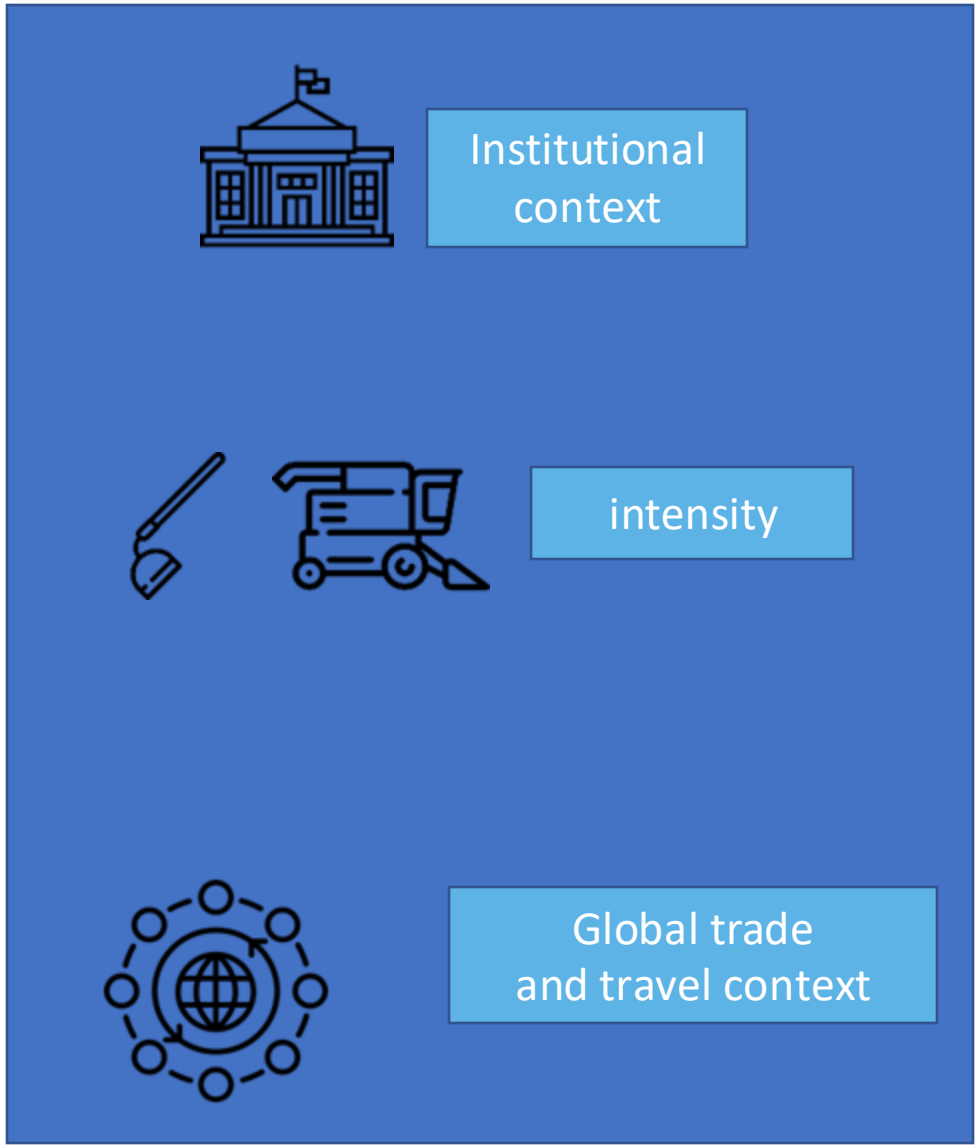


Plowright et al., 2021
https://doi.org/10.1016/S2542-5196(21)00031-0



Thank you!

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Read more about ticks as features of land systems here:

JOURNAL OF LAND USE SCIENCE
2024, VOL. 19, NO. 1, 78–96
https://doi.org/10.1080/1747423X.2024.2330379

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Land system governance shapes tick-related public and animal health risks

S.O Vanwambeke[a], E.F Lambin[a], P Meyfroidt[a,b], F.A Asaaga[c], C Millins[d] and B.V Purse[c]