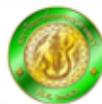


# ***Enhancing wildlife health through environmental management***

Serge Morand

[serge.morand@umontpellier.fr](mailto:serge.morand@umontpellier.fr)

[serge.morand@cnr.fr](mailto:serge.morand@cnr.fr)



มหาวิทยาลัยเกษตรศาสตร์  
**KASETSART UNIVERSITY**



MAHIDOL UNIVERSITY *Wisdom of the Land*  
Faculty of Tropical Medicine



Matère  
à débattre • décider

# Emergence of infectious diseases

Risks and issues for society

Serge Morand, Muriel Figuié, eds.



éditions  
Quæ

## *An epidemic of epidemics*

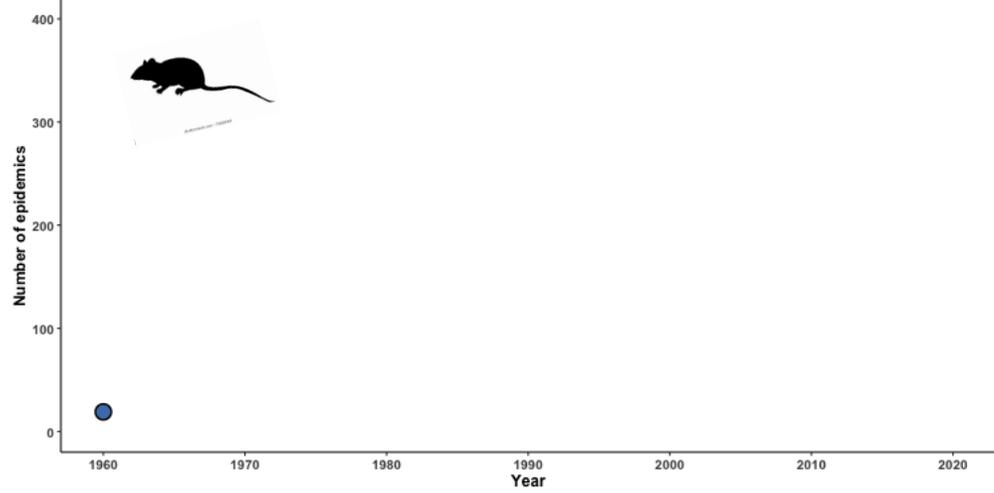
# An increasing number of outbreaks



Humans

## Outbreaks of zoonotic diseases

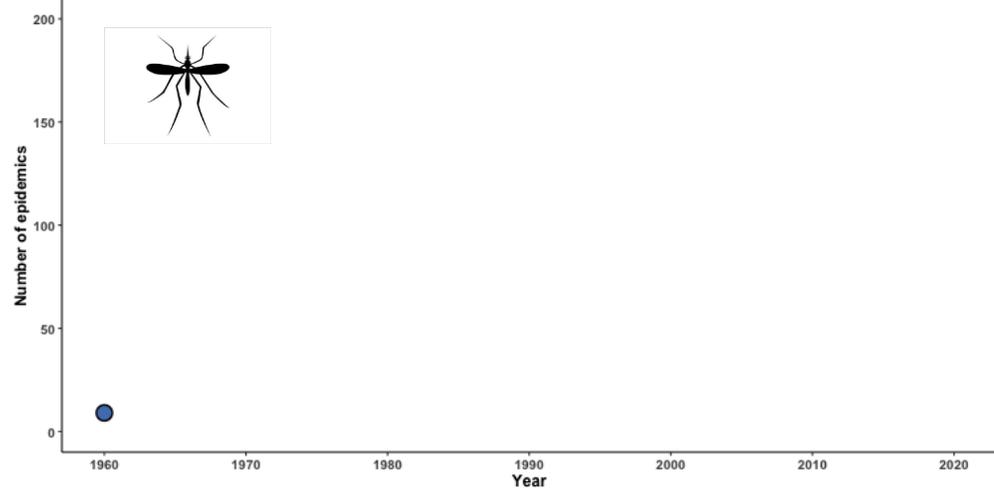
1960-2019



Data source: GIDEON

## Outbreaks of vector-borne diseases

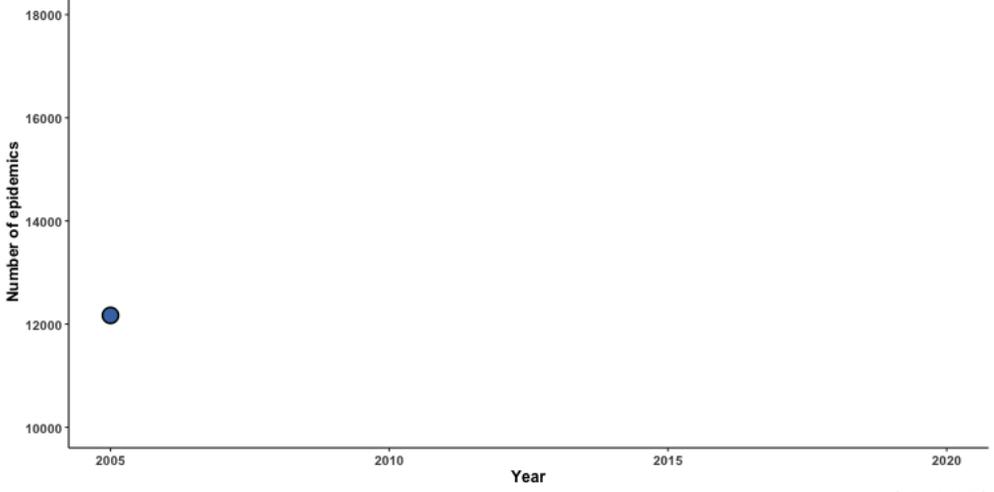
1960-2019



Data source: GIDEON

## Outbreaks of livestock - poultry diseases

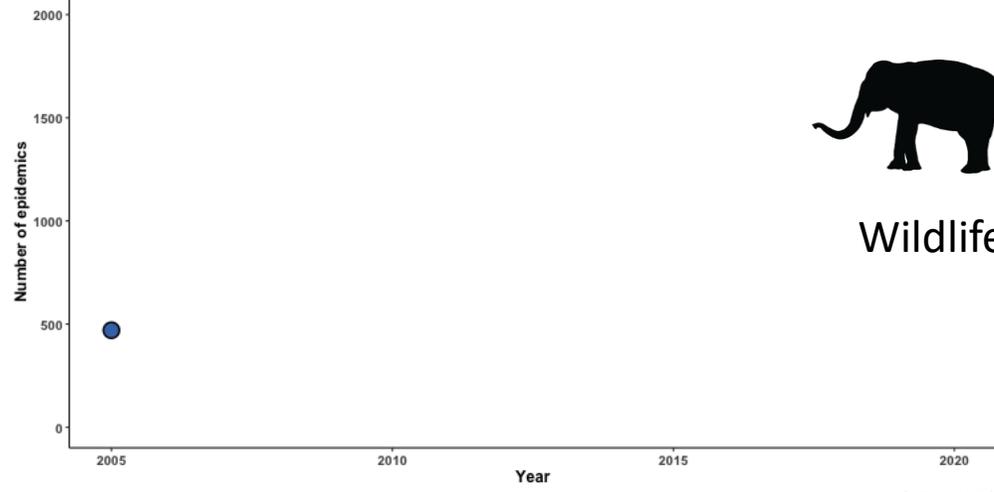
2005-2019



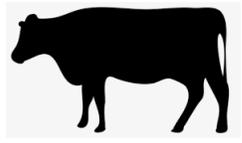
Data source: OIE-WAHIS

## Outbreaks of wildlife diseases

2005-2019



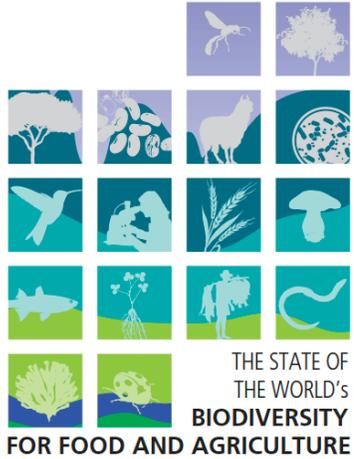
Data source: OIE-WAHIS



Livestock



Wildlife



THE STATE OF THE WORLD'S BIODIVERSITY FOR FOOD AND AGRICULTURE

# Increase of fungal diseases in plants and animals



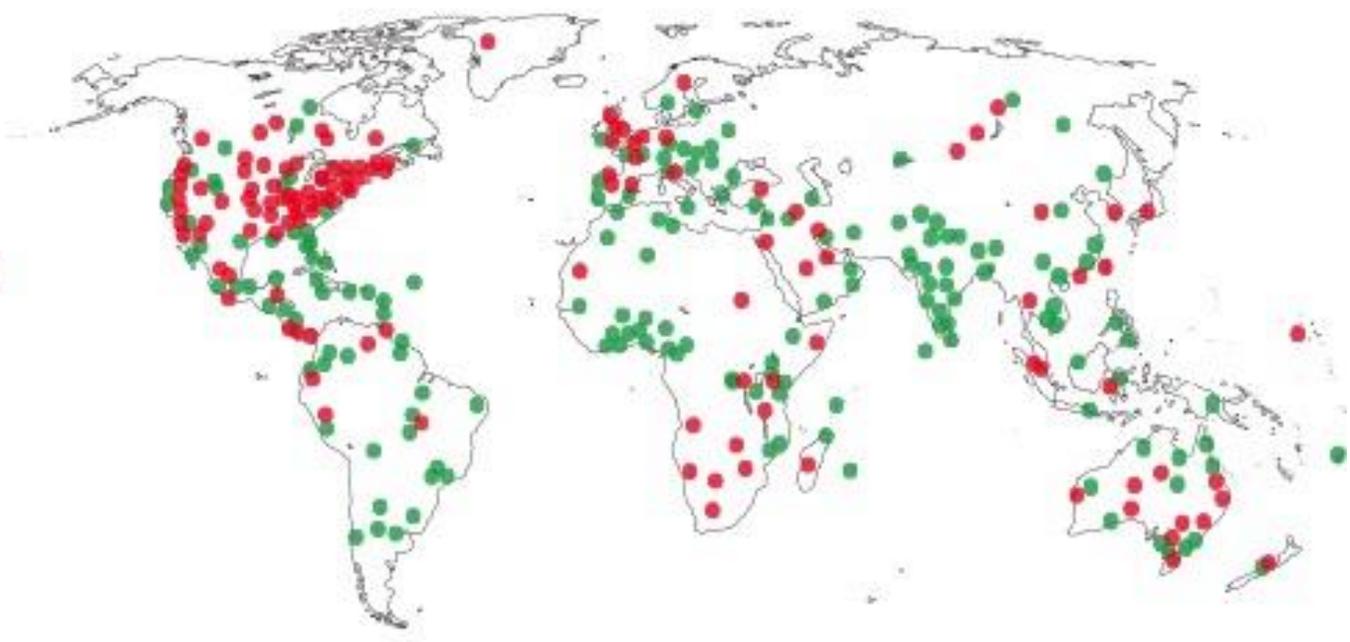
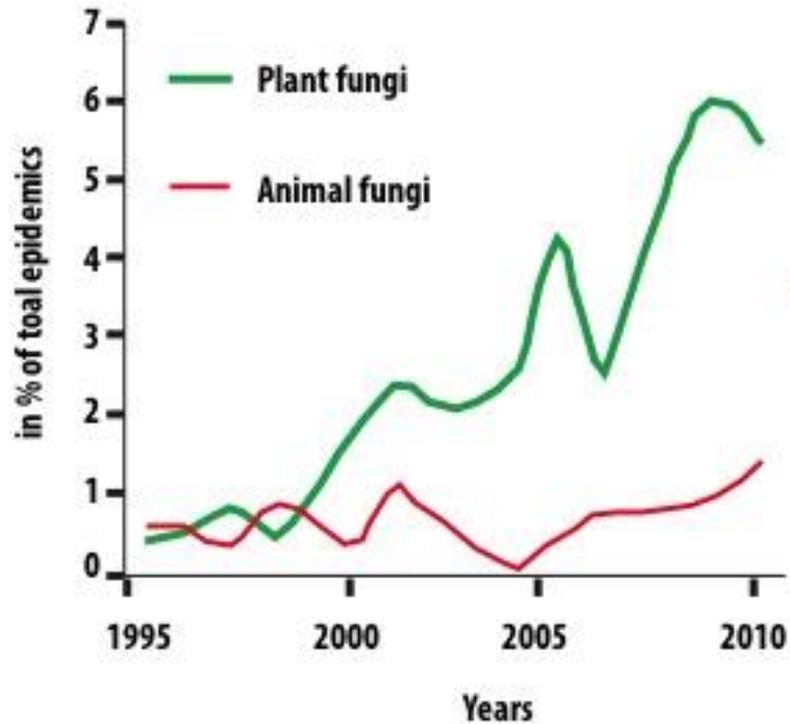
Bat white-nose syndrome



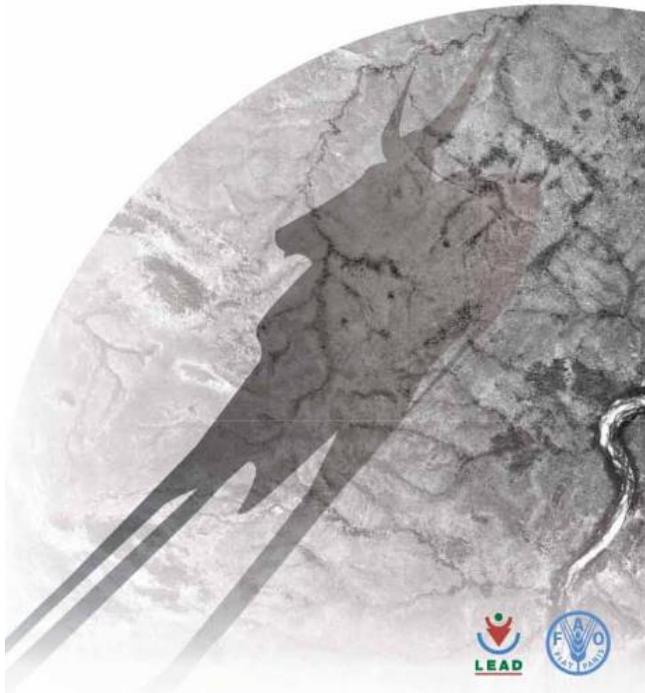
Amphibian chytrid



Plant fungal diseases

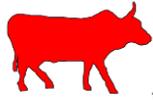


livestock's long shadow  
environmental issues and options

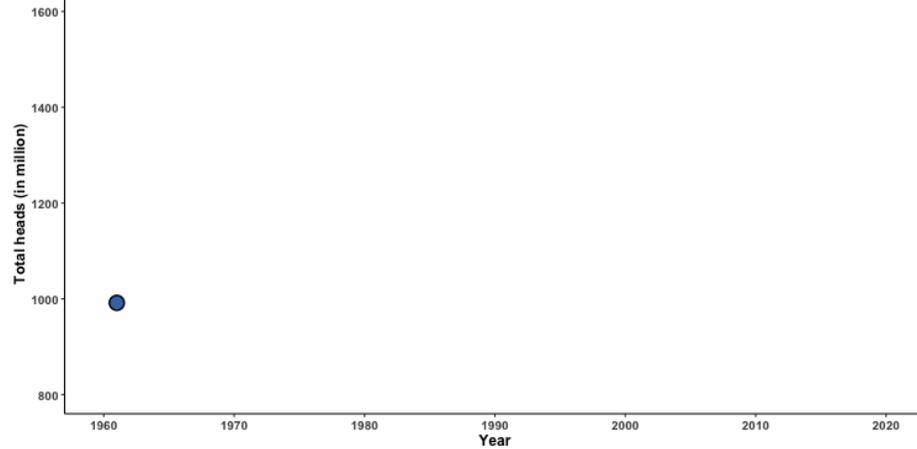


## ***The increasing livestock footprint***

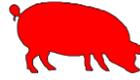
# Livestock and poultry increase



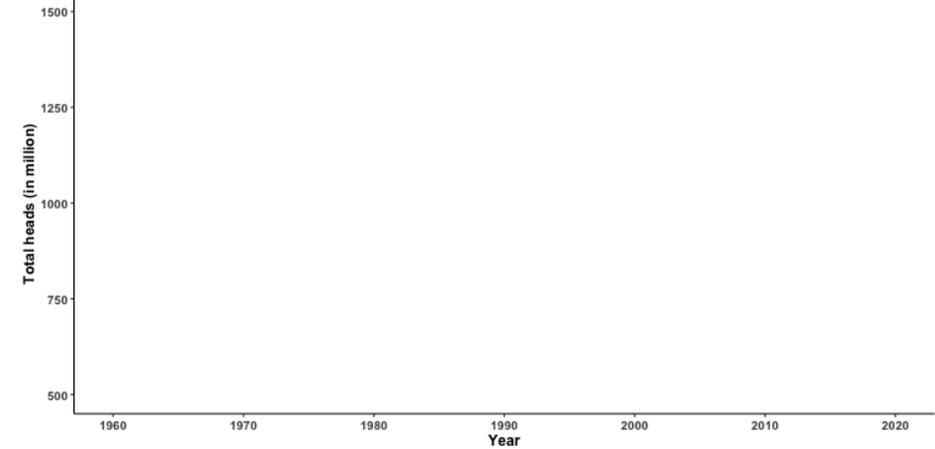
**Total heads of cattle (in million)**  
1960-2020



Data source: FAO



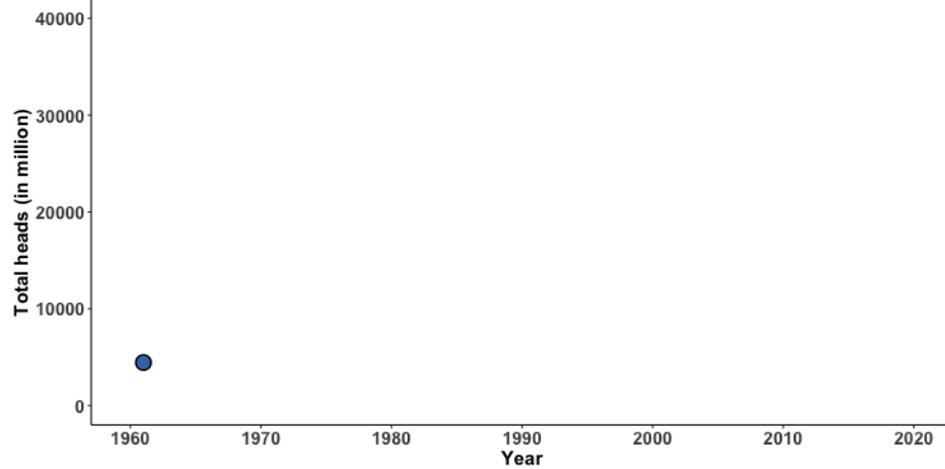
**Total heads of pigs (in million)**  
1960-2020



Data source: FAO



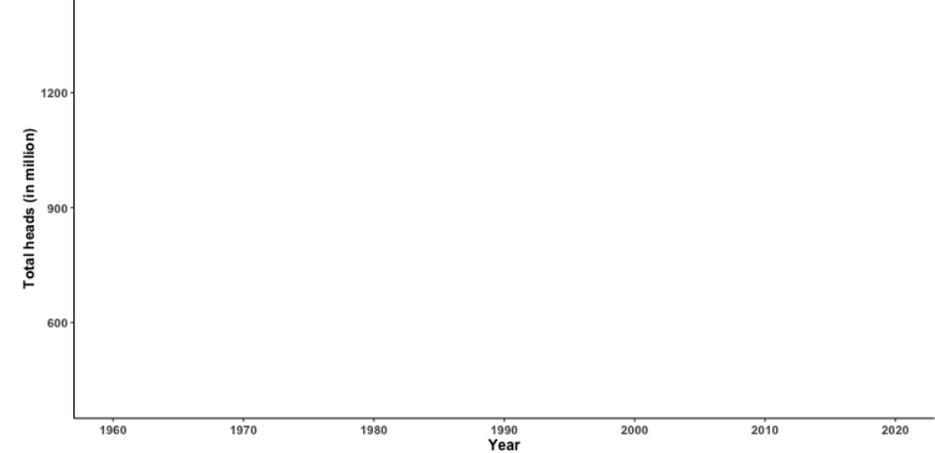
**Total heads of chickens (in million)**  
1960-2020



Data source: FAO

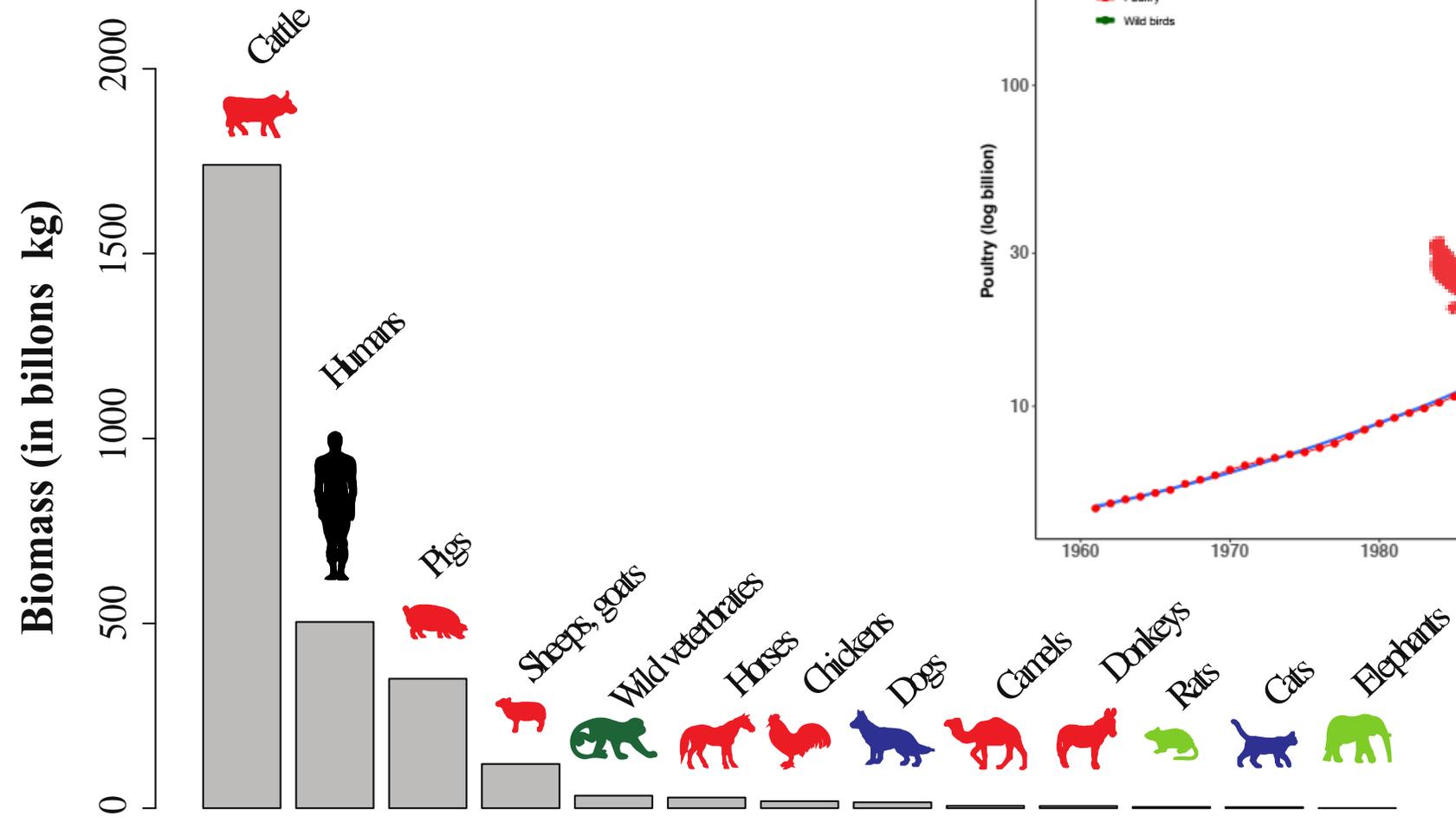


**Total heads of goats (in million)**  
1960-2020

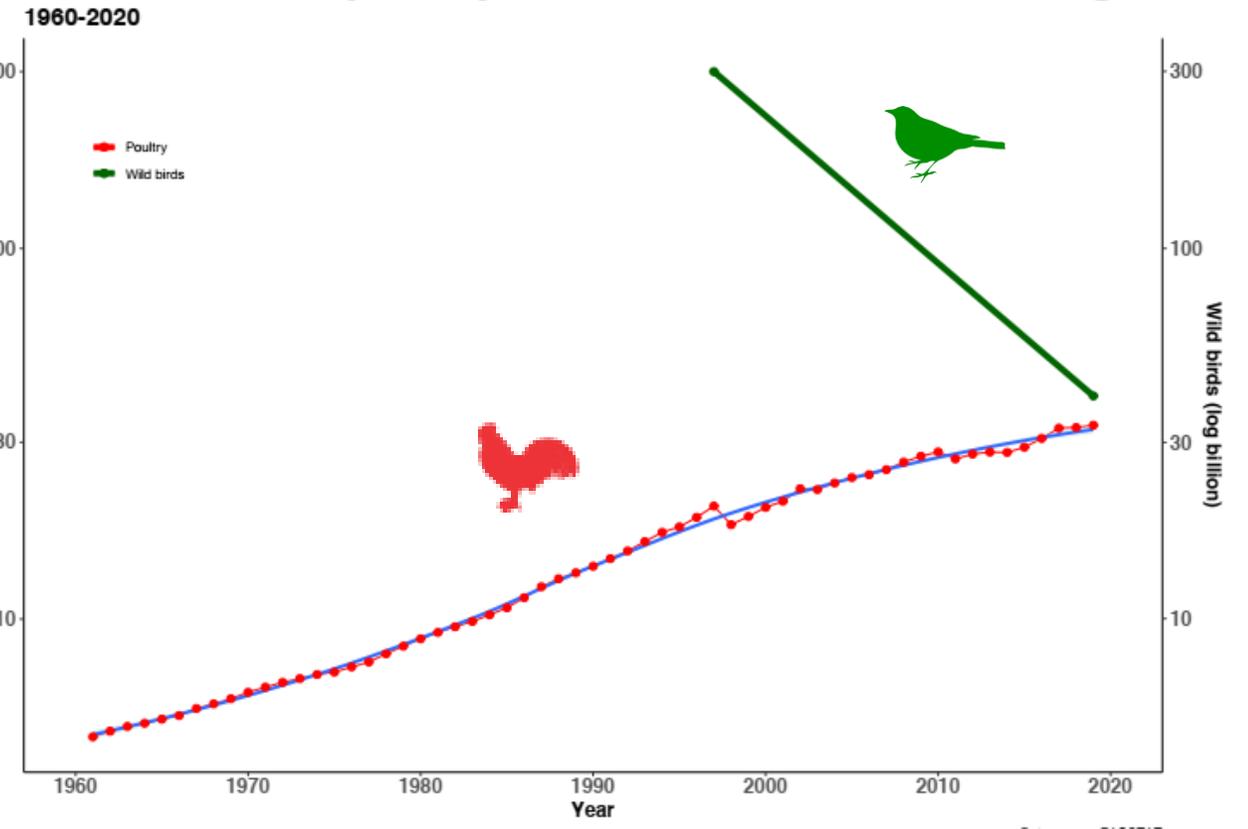


Data source: FAO

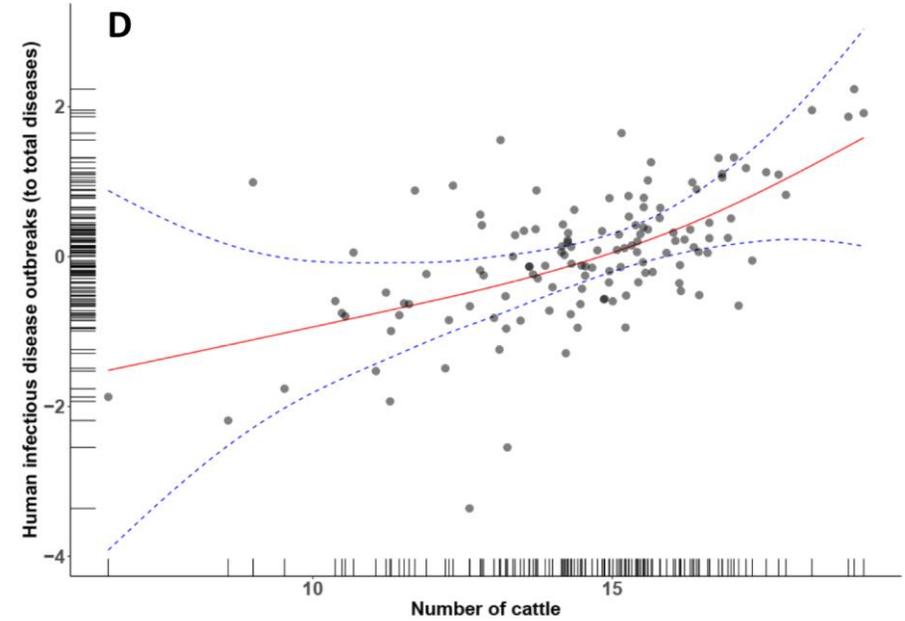
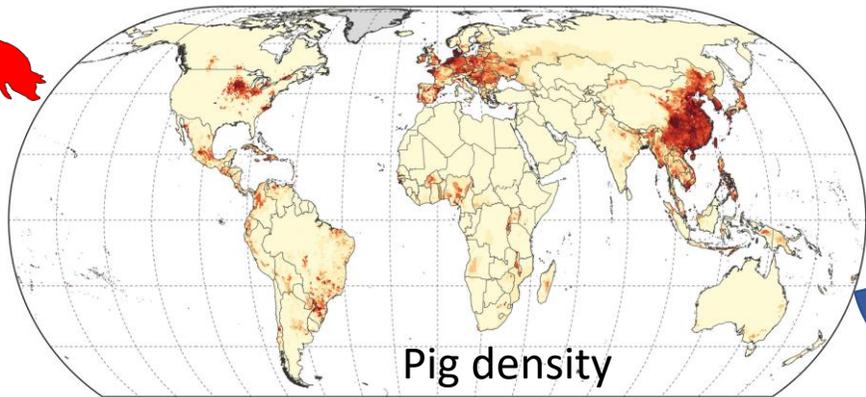
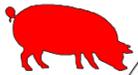
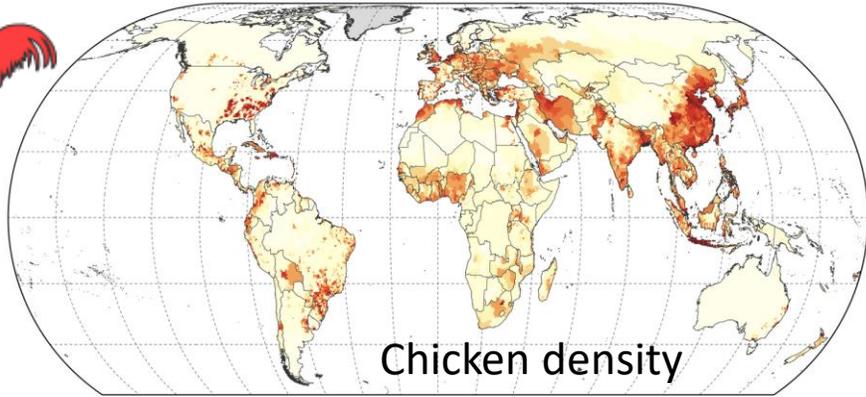
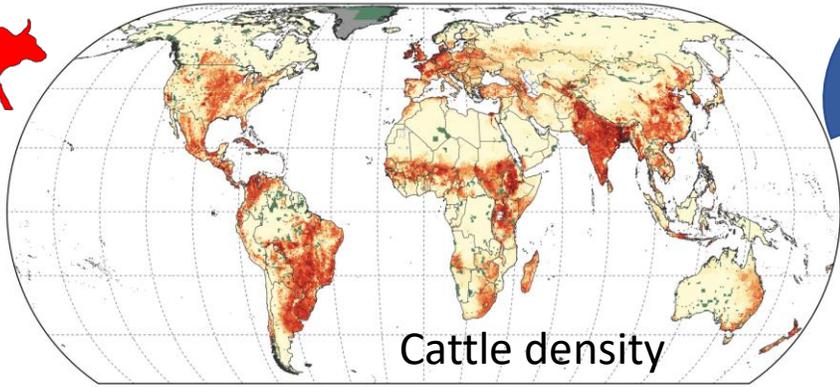
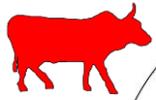
# A planet dominated by livestock and poultry



### Total heads of poultry and wild birds (billion in log)



# Oubreaks of zoonoses

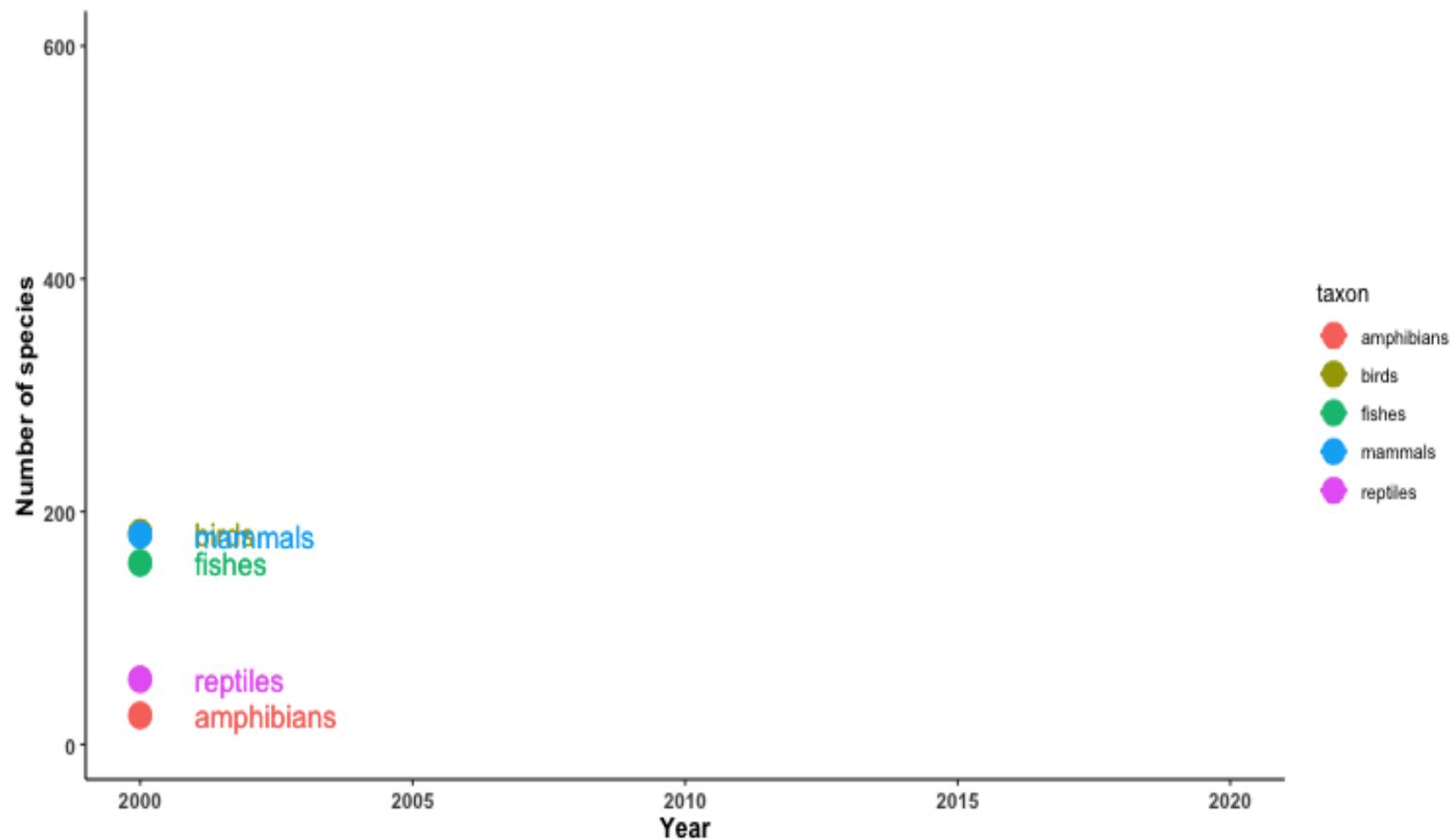




## ***A biodiversity in crisis***

# IUCN number of critically endangered species

2000-2020



Data source: IUCN



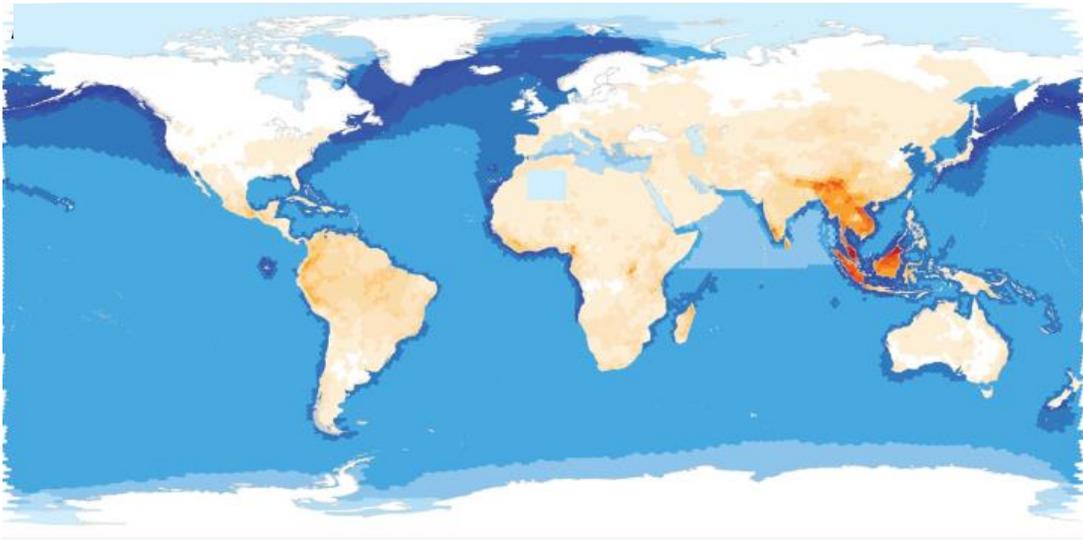
THE IUCN RED LIST  
OF THREATENED SPECIES™

# A negative biodiversity – disease transmission

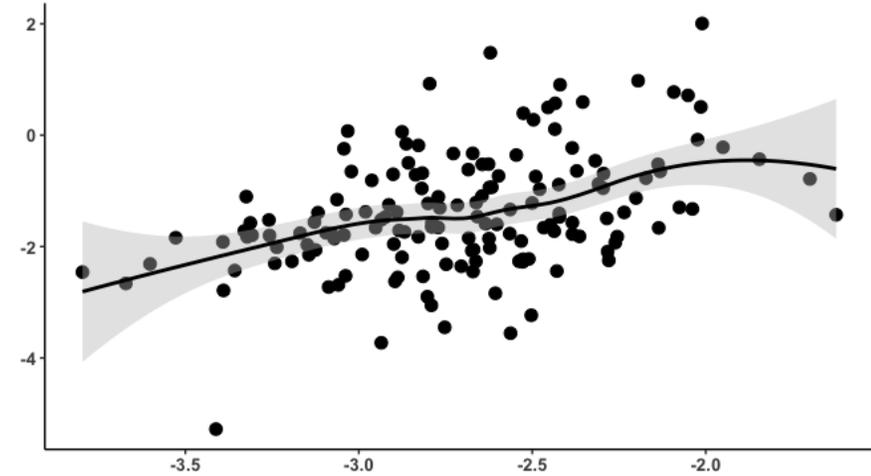
High biodiversity at threat



Higher number of outbreaks!



Relative number of outbreaks



Relative number of species at threat

=> Hot spots linked to interlinkages of multiple drivers

## Hot spots of emerging zoonotic diseases

### Hot Spots for Emerging Diseases

Map shows an analysis of the future likelihood of infectious diseases originating in wildlife that have the potential to infect humans.

KEY: GREATER RISK

Factors in the analysis included population density, proximity to and variety of wildlife, and climate.



**West Nile virus** A mosquito-borne illness that causes symptoms in about a fifth of those exposed. One in 150 becomes severely ill with encephalitis.

**ANIMAL RESERVOIR** Various birds, especially robins in the U.S.

**FIRST HUMAN CASE** West Nile district of Uganda, 1937; first U.S. case was in Queens in 1999.

**WHY IT EMERGED** International air travel.

**SUSCEPTIBLE HOSTS** Humans; birds, especially crows; horses.



**SARS** A severe viral respiratory infection that quickly spread from China to more than two dozen countries. The outbreak was contained, and since 2004 no new cases have been reported.

**ANIMAL RESERVOIR** Horseshoe bats.

**FIRST HUMAN CASE** Guangdong Province, China, 2003.

**WHY** Wildlife markets and trade; global travel.

**SUSCEPTIBLE** Humans, civets (inset, left).



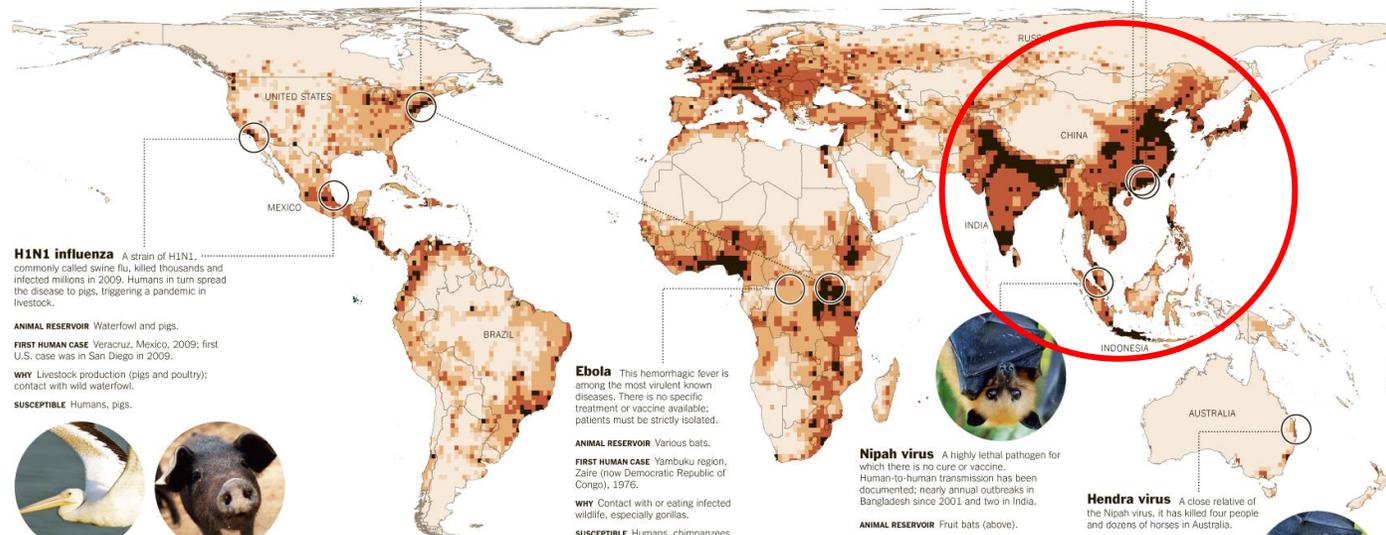
**Bird flu** A deadly strain of the avian influenza virus called H5N1 has spread to humans via contact with live or dead poultry.

**ANIMAL RESERVOIR** Wild waterfowl.

**FIRST HUMAN CASE** Hong Kong, 1997. It re-emerged widely in 2003 and 2004.

**WHY** Global expansion of intensive poultry farming; contact with infected birds.

**SUSCEPTIBLE** Humans, poultry, cats.



**H1N1 influenza** A strain of H1N1, commonly called swine flu, killed thousands and infected millions in 2009. Humans in turn spread the disease to pigs, triggering a pandemic in livestock.

**ANIMAL RESERVOIR** Waterfowl and pigs.

**FIRST HUMAN CASE** Veracruz, Mexico, 2009; first U.S. case was in San Diego in 2009.

**WHY** Livestock production (pigs and poultry); contact with wild waterfowl.

**SUSCEPTIBLE** Humans, pigs.



**Ebola** This hemorrhagic fever is among the most virulent known diseases. There is no specific treatment or vaccine available; patients must be strictly isolated.

**ANIMAL RESERVOIR** Various bats.

**FIRST HUMAN CASE** Yambuku region, Zaire (now Democratic Republic of Congo), 1976.

**WHY** Contact with or eating infected wildlife, especially gorillas.

**SUSCEPTIBLE** Humans, chimpanzees, gorillas, duikers (small African antelopes, below right).



**Nipah virus** A highly lethal pathogen for which there is no cure or vaccine. Human-to-human transmission has been documented; nearly annual outbreaks in Bangladesh since 2001 and two in India.

**ANIMAL RESERVOIR** Fruit bats (above).

**FIRST HUMAN CASE** Sungai Nipah, Negri Sembilan, Malaysia, 1998.

**WHY** Large-scale livestock production; presence of orchards on pig farms; date palm sap harvest (eating contaminated sap is a significant cause of infection).

**SUSCEPTIBLE** Humans, pigs, horses, dogs, cats.



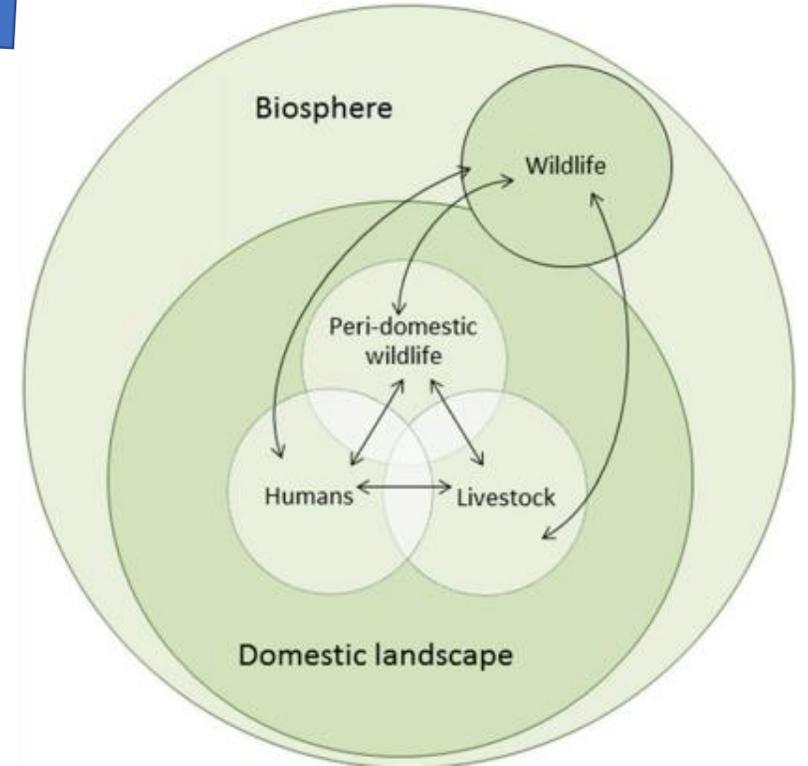
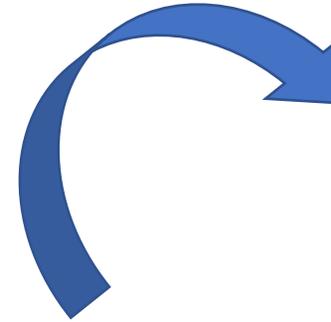
**Hendra virus** A close relative of the Nipah virus, it has killed four people and dozens of horses in Australia.

**ANIMAL RESERVOIR** Fruit bats.

**FIRST HUMAN CASE** Hendra, a suburb of Brisbane, Australia, 1994.

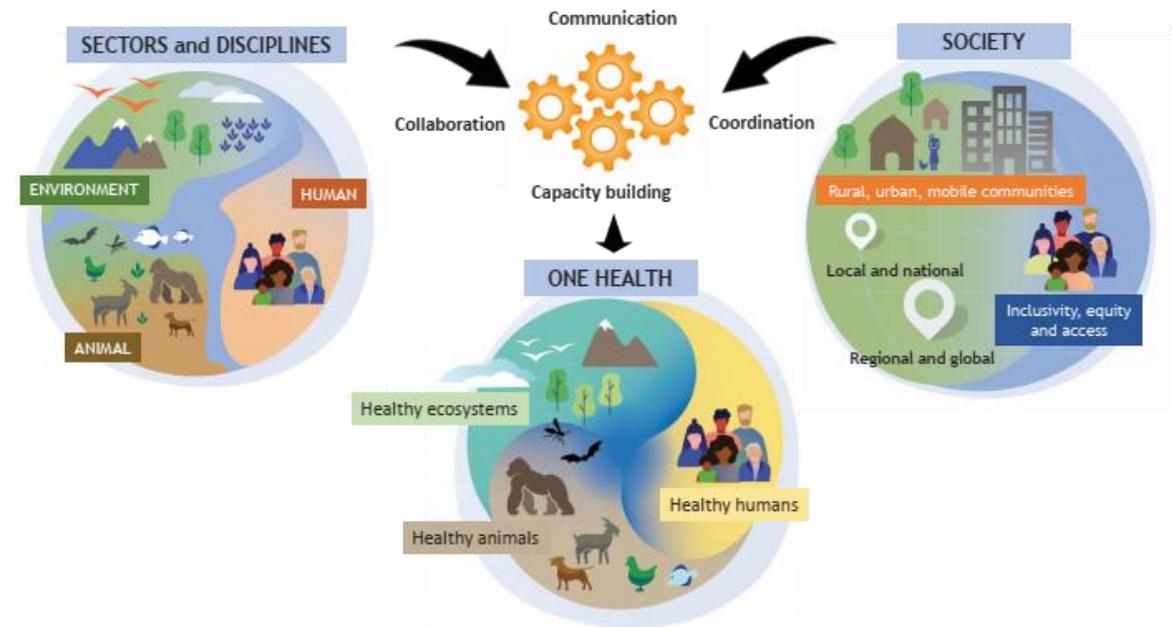
**WHY** Urban encroachment of wild habitats.

**SUSCEPTIBLE** Humans, horses, dogs.



# Accelerating One Health in Asia and the Pacific

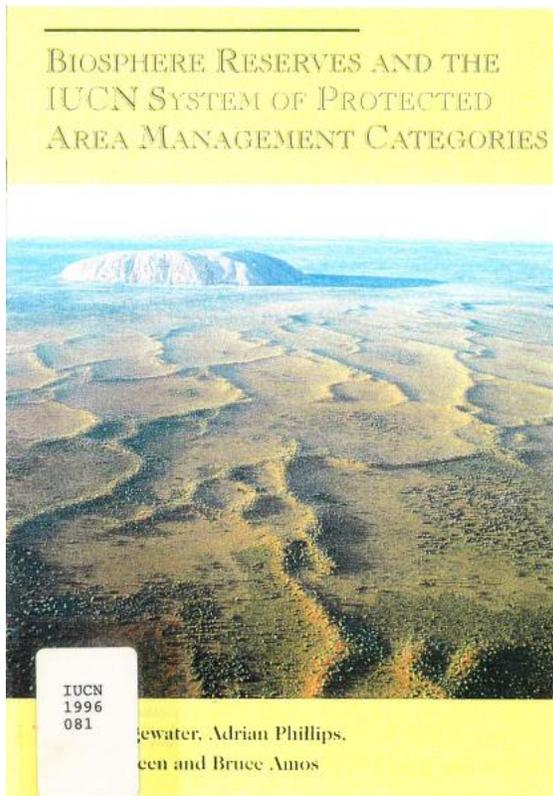
# ONE HEALTH





United Nations  
Educational, Scientific and  
Cultural Organization

# Succeeding One Health through resilient territories: healthy ecosystems for healthy people



**Avoid the wrong paths to the future we don't want**



**Getting the vision**

2

**Tackling the problems**

1



**Exploring the best practices**

3

**Taking the good paths to the future we want**



**Improving governance**

4

**Taking innovative tools in hand**

4





United Nations  
Educational, Scientific and  
Cultural Organization

# Succeeding One Health through resilient territories: healthy ecosystems for healthy people

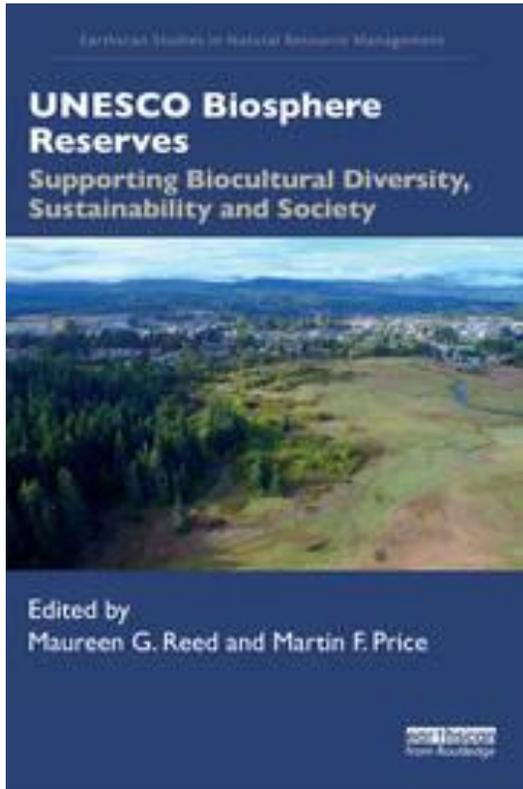


FIGURE 1

Planning thinking

Learning system

Scenario thinking

Theory of change

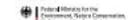


Science-based ecosystem restoration for the 2020s and beyond

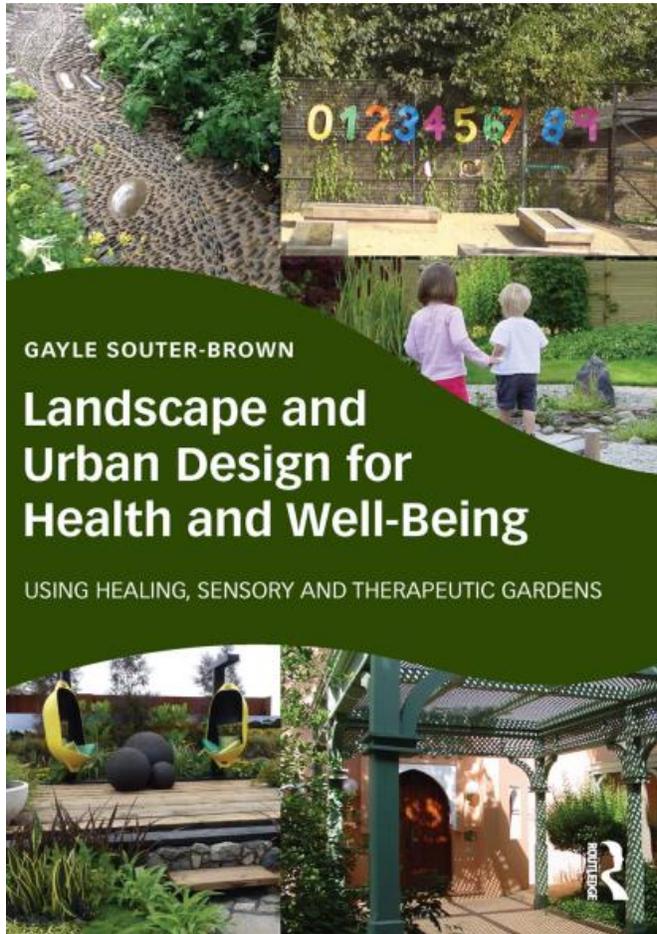
Science Task Force for the UN Decade on Ecosystem Restoration



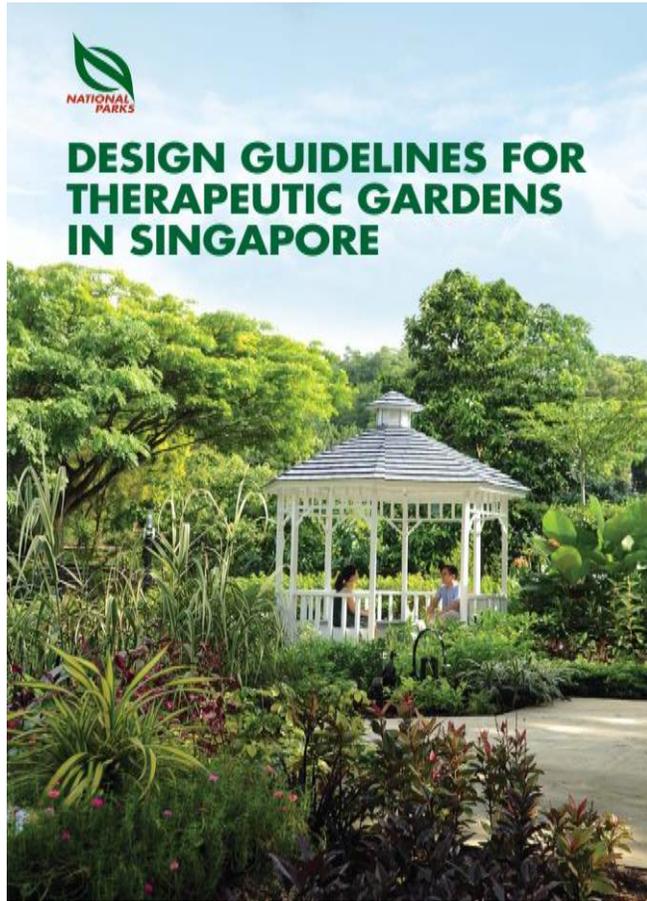
Supported by:



Based on a decision of the German Bundestag

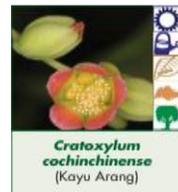


# *Urban forests and therapeutic gardens*



Stakeholders of therapeutic gardens

### EXAMPLES OF PLANTS FOR ATTRACTING FAUNA



Participants and volunteers enjoying gardening activities from the therapeutic horticulture programme

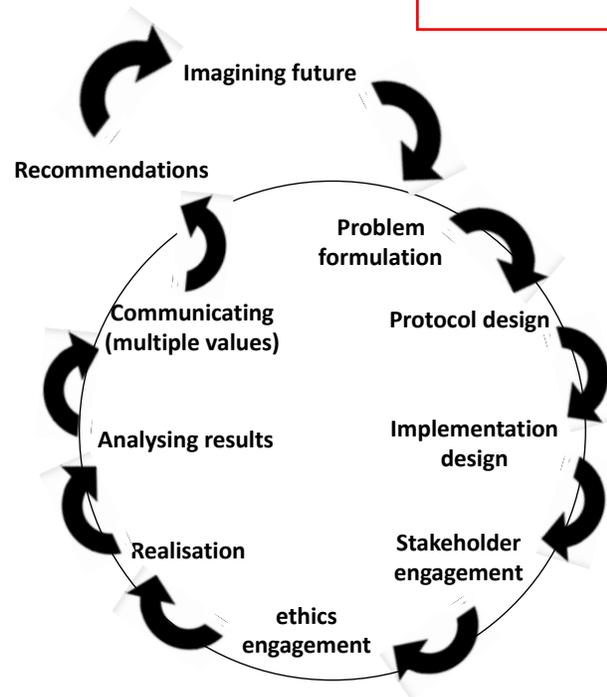
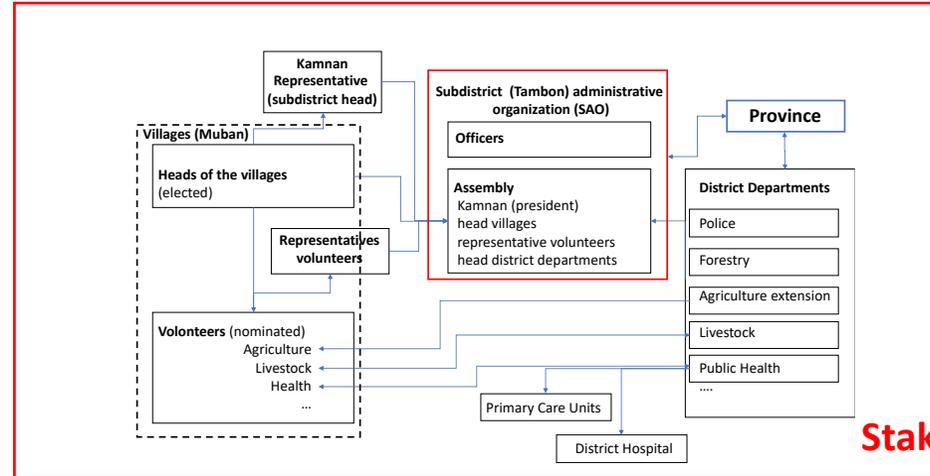


# *Reforestation*

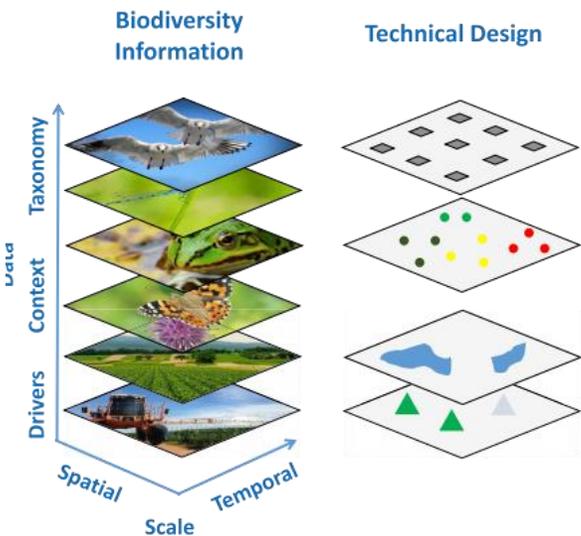
**Contributions of community  
forestry to COVID-19 response and  
recovery in seven Asian countries**



# Social-ecological observatory of biodiversity & health of Saenthong (Nan, Thailand) since 2008



**Community engagement**



# Is rewilding (refaunation) following reforestation a health risk?

Reforestation area



- Stakeholder**
- PCU & Dpt Public Health
  - Sub-district Administration
  - Nonthaburi Nat Park & Dpt National Park
  - Community Ban Santisuk
  - Volunteers Health, Livestock, wildlife
  - Trop Med MU, Vet Tech KU, PSU, KMU



Sound recorders

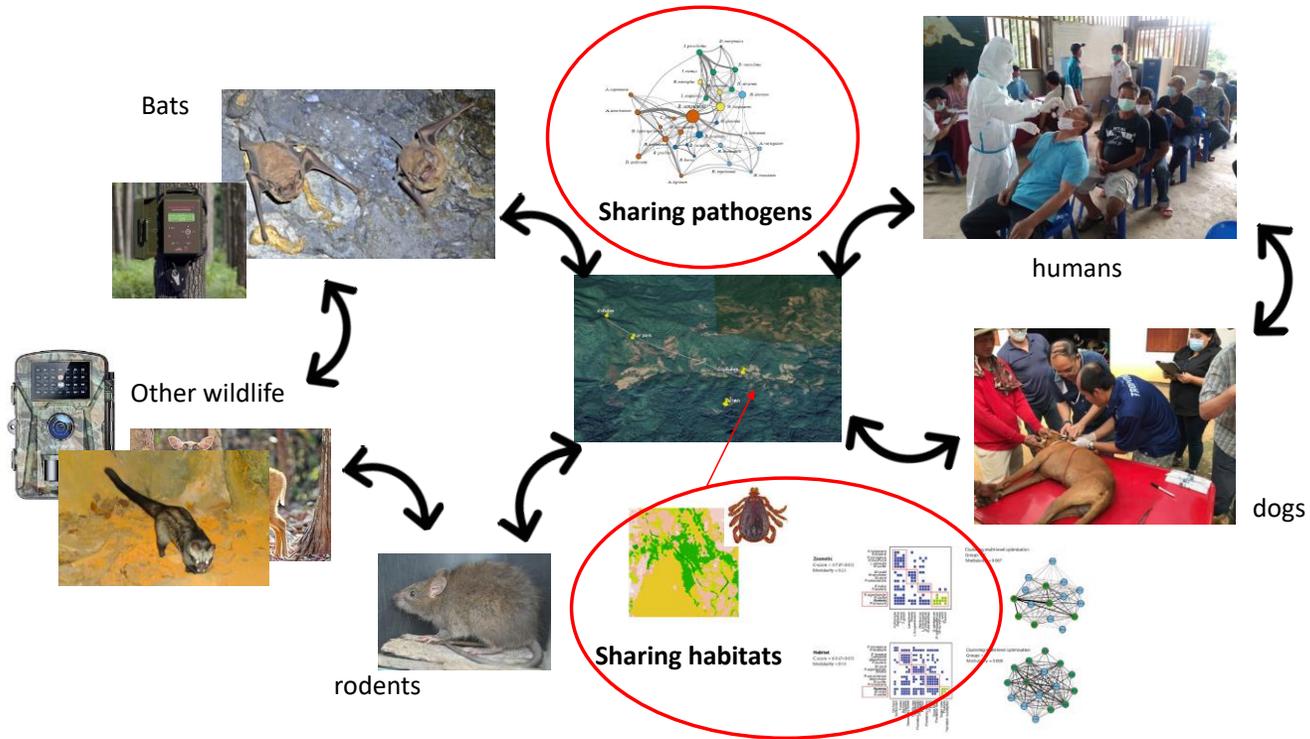


Camera traps



Live trapping

# A protocol to follow reforestation / rewilding / human health



## Rewilding

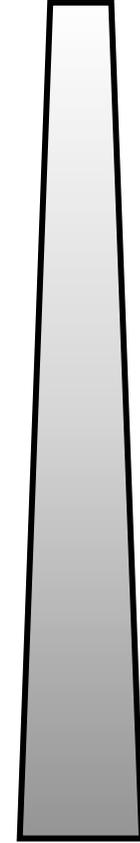
High species richness



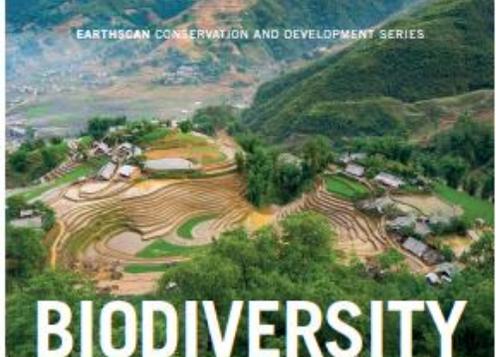
Low species richness

## Health risk

Lower



Higher



# BIODIVERSITY CONSERVATION IN SOUTHEAST ASIA

CHALLENGES IN A CHANGING  
ENVIRONMENT

EDITED BY  
**SERGE MORAND,  
CLAIRE LAJAUNIE AND  
ROJCHAI SATRAWAHA**



Serge Morand  
Jean-Pierre Dujardin  
Régine Lefait-Robin  
Chamnarn Apiwathnasorn *Editors*

## Socio-Ecological Dimensions of Infectious Diseases in Southeast Asia

