

Crise de la biodiversité, « Une Seule Santé » et « Santé Planétaire »

Serge Morand

Janvier 2020

News / Wuhan Coronavirus

17 January 2020 - Imperial College London

Estimating the potential total number of novel Coronavirus (2019-nCoV) cases in Wuhan City, China

Estimation 1,723 cases of 2019-nCoV at Wuhan
(95% CI: 427 – 4,471)

China locking down cities with 18 million to stop virus

23 January 2020, by Ken M



Une personne est conduite à l'hôpital de Wuhan où des patients atteints d'une pneumonie inconnue sont traités, le 18 janvier 2020. STR / AFP



Matère
à débattre • décider

Emergence of infectious diseases

Risks and issues for society

Serge Morand, Muriel Figuié, eds.



éditions
Quæ

An epidemic of epidemics

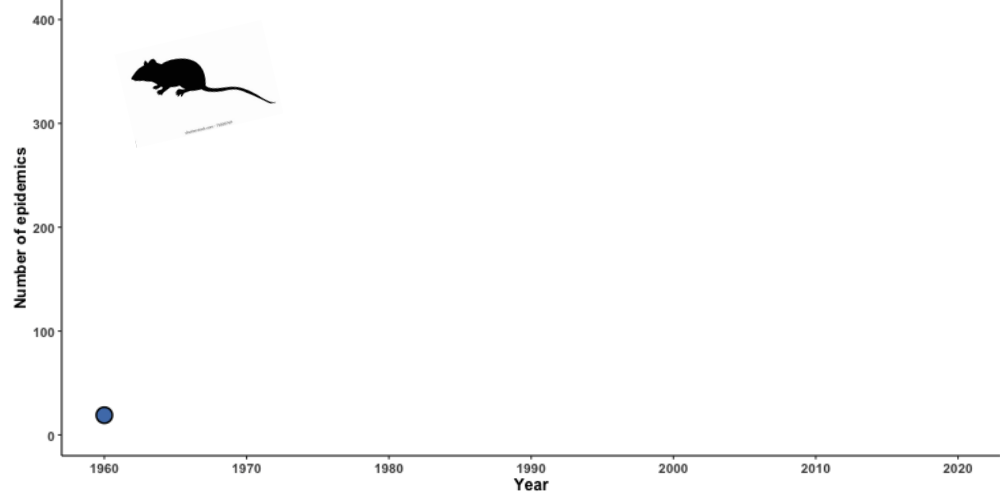
An increasing number of outbreaks



Humans

Outbreaks of zoonotic diseases

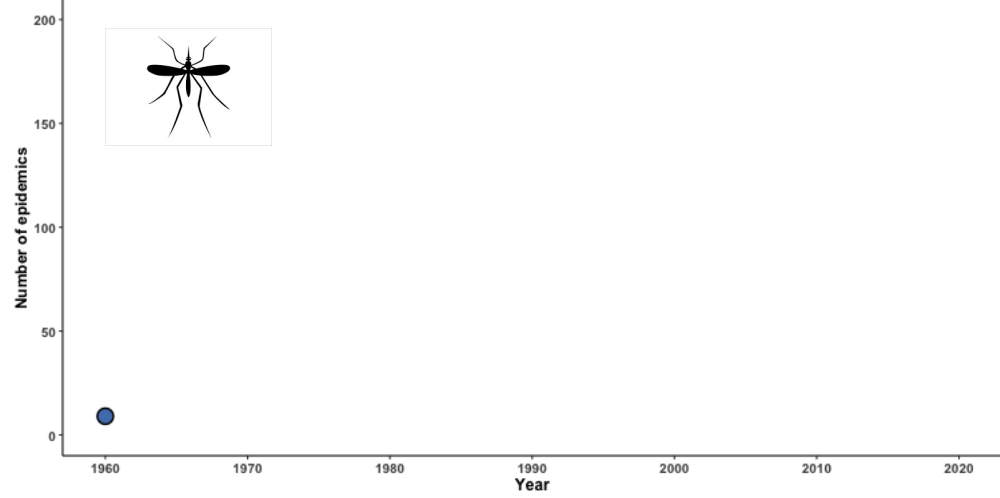
1960-2019



Data source: GIDEON

Outbreaks of vector-borne diseases

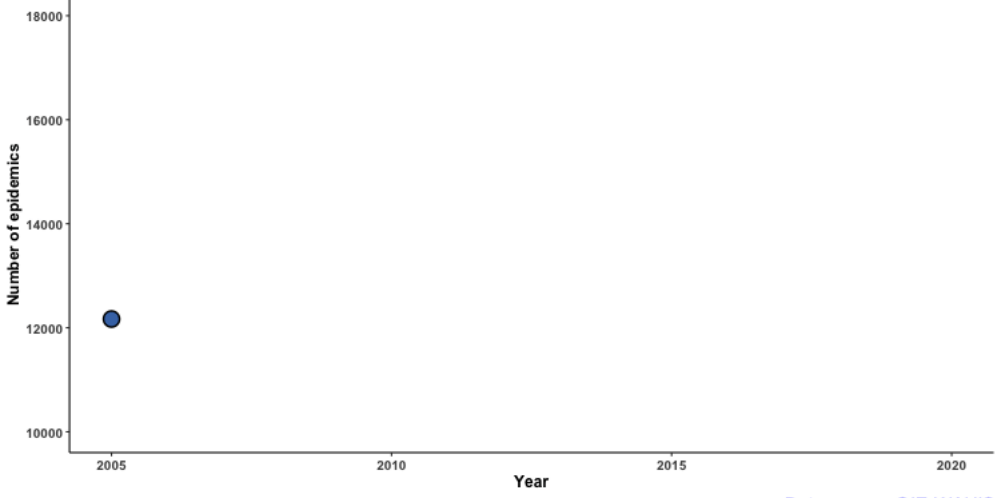
1960-2019



Data source: GIDEON

Outbreaks of livestock - poultry diseases

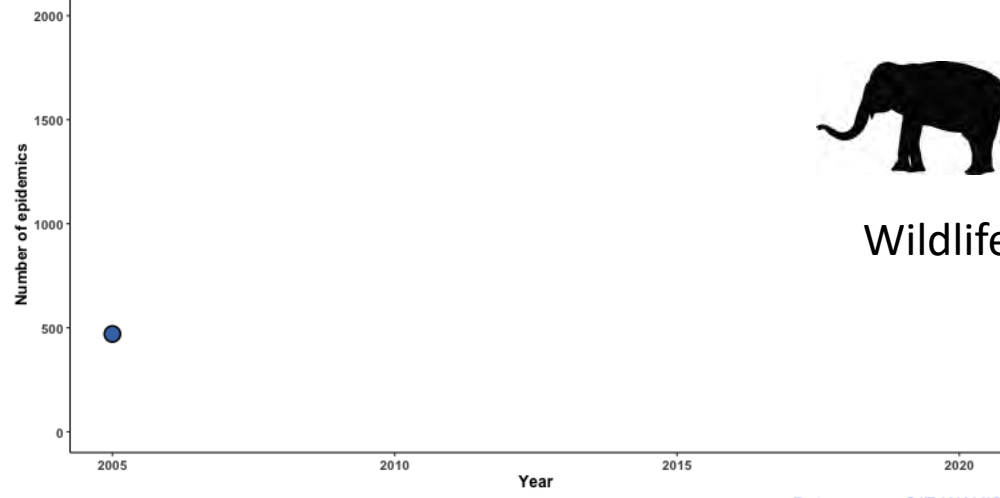
2005-2019



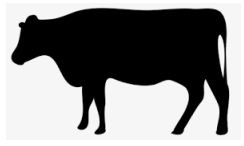
Data source: OIE-WAHIS

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



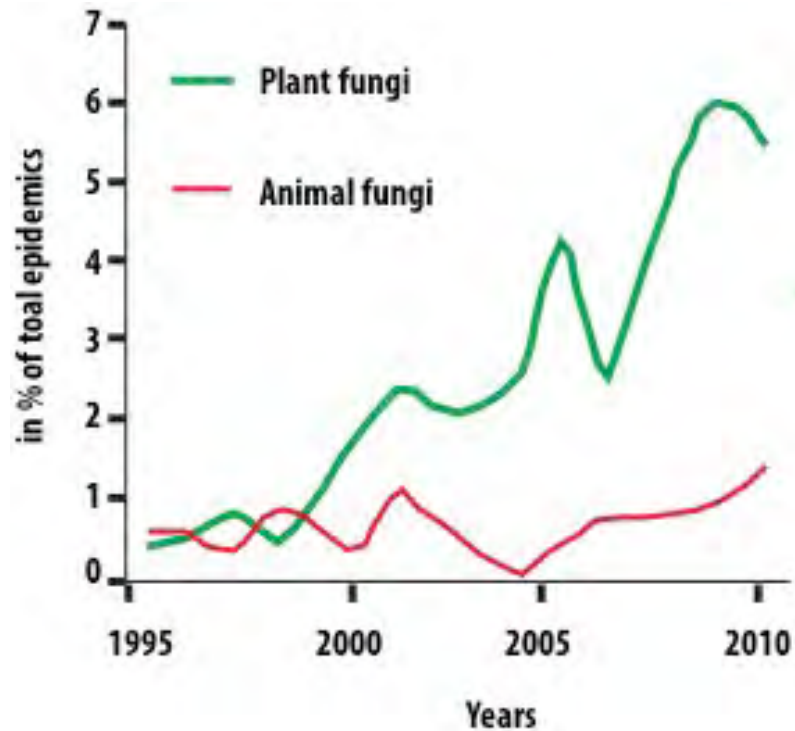
Bat white-nose syndrome



Amphibian chytrid



Plant fungal diseases



Climate Change and Global Health

Edited by Colin D. Butler

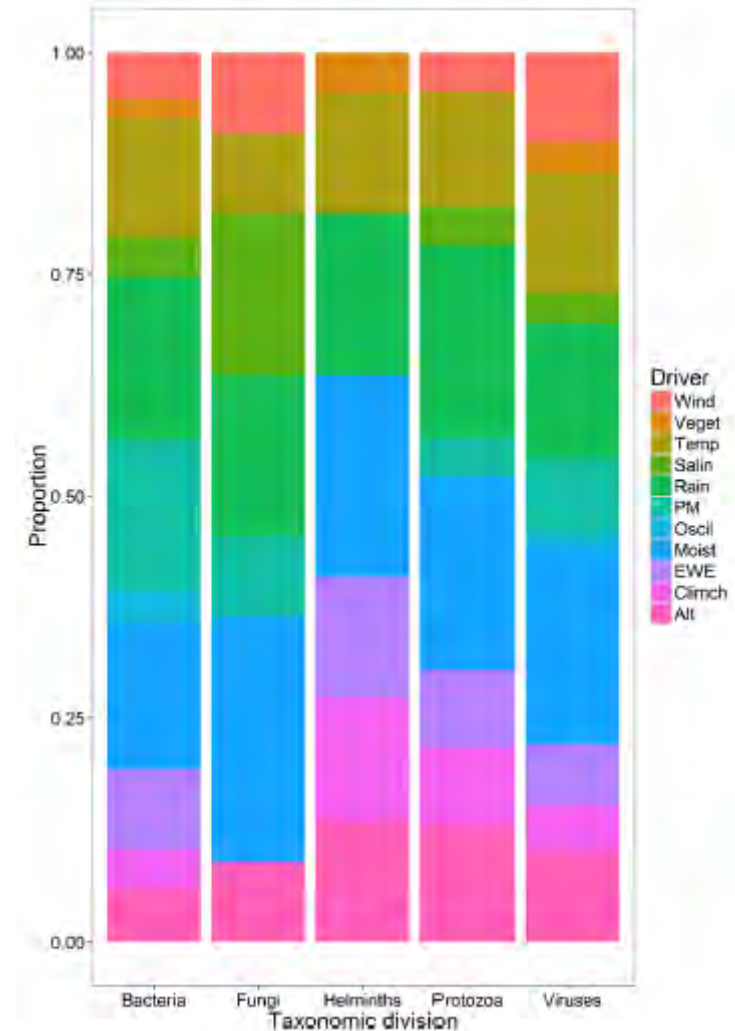
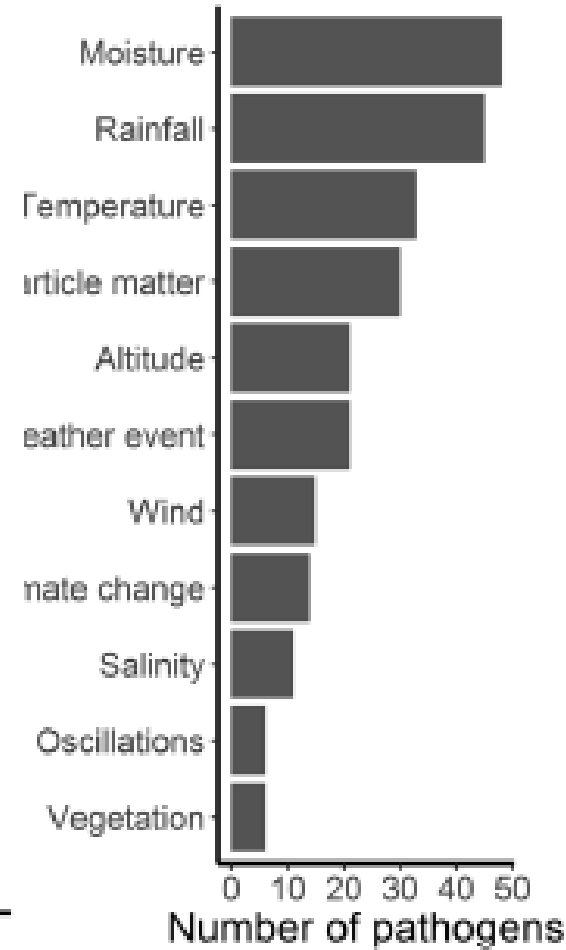
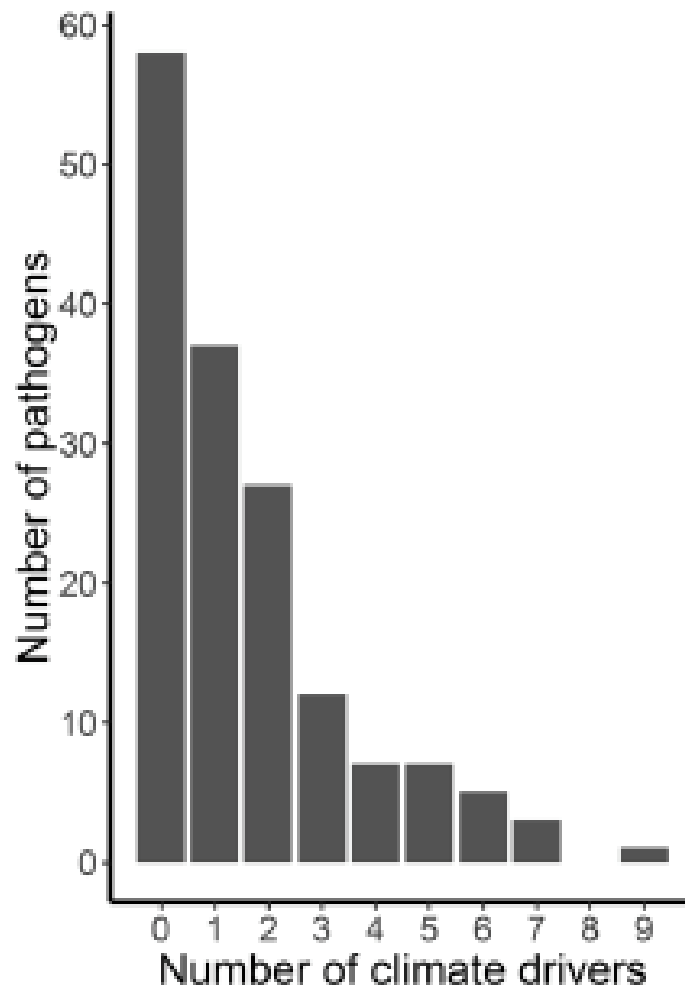


Climate change

Systematic Assessment of the Climate Sensitivity of Important Human and Domestic Animals Pathogens in Europe

K. Marie McIntyre^{1,2}, Christian Setzkorn³, Philip J. Hepworth¹, Serge Morand^{3,4}, Andrew P. Morse^{2,5} & Matthew Baylis^{1,2}

3,628 human and animal pathogen species
 Prioritisation using H Index (disease)
 Europe
 => 157 pathogen species



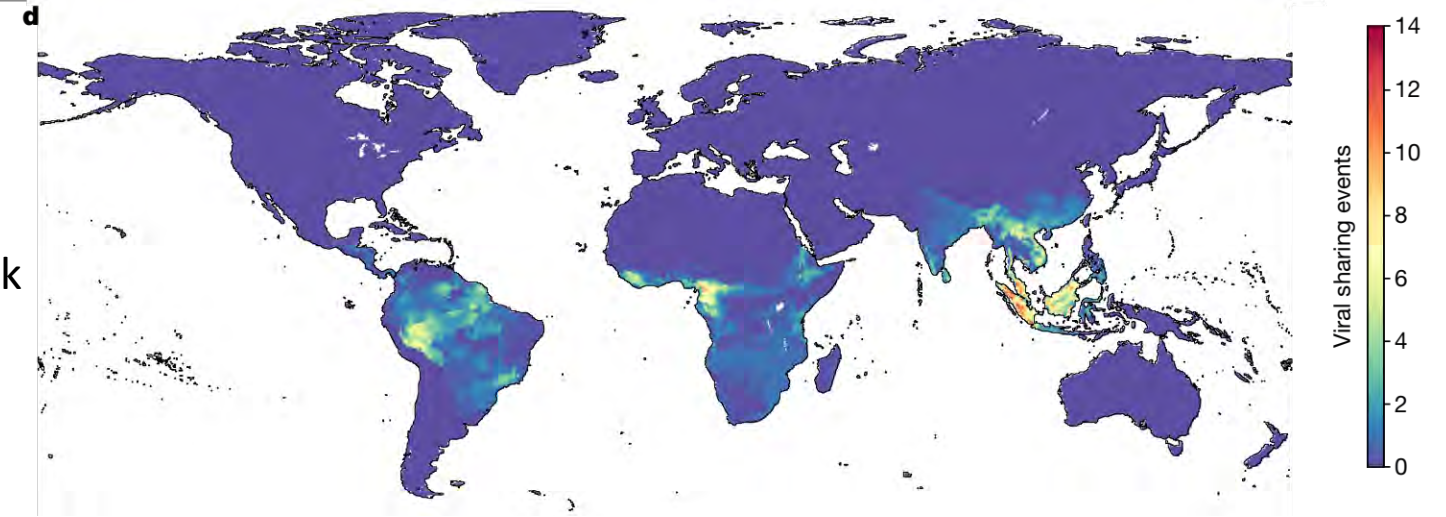
Climate change increases cross-species viral transmission risk

<https://doi.org/10.1038/s41586-022-04788-w>

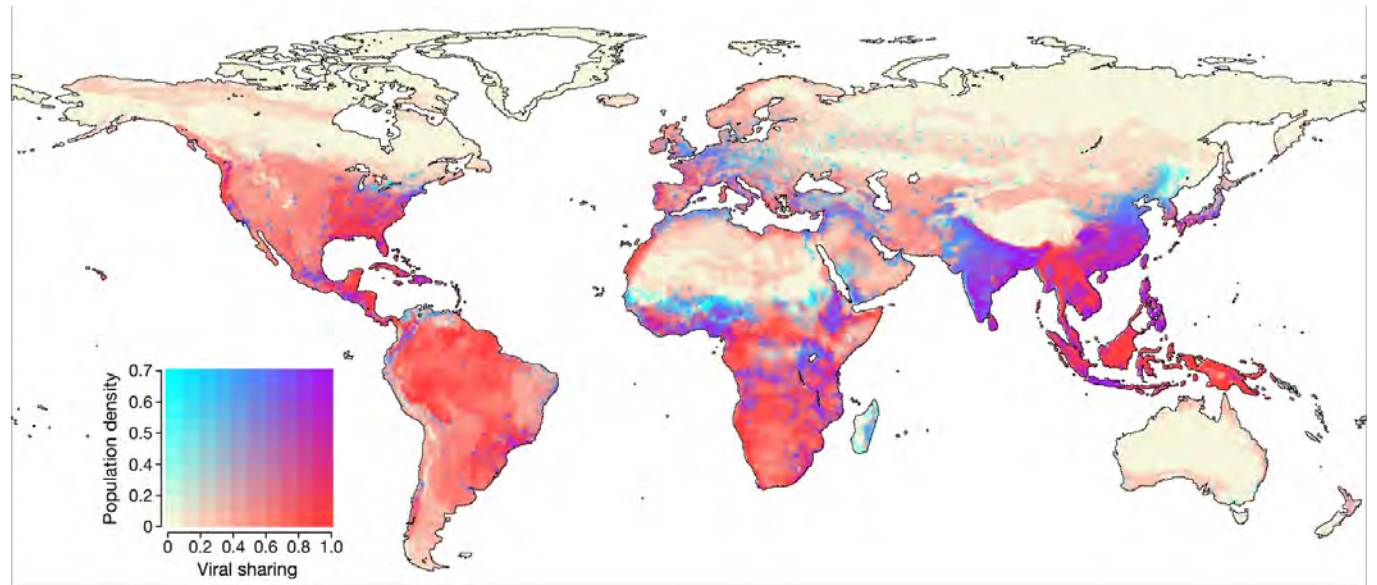
Colin J. Carlson^{1,2,7}, Gregory F. Albery^{1,3,7}, Cory Merow⁴, Christopher H. Trisos⁵, Casey M. Zipfel¹, Evan A. Eskew^{3,6}, Kevin J. Olival³, Noam Ross³ & Shweta Bansal¹

Received: 24 January 2020

Ranging expansion of naive hosts put them into risk



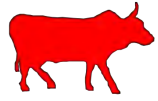
Novel viral sharing events and human population centres



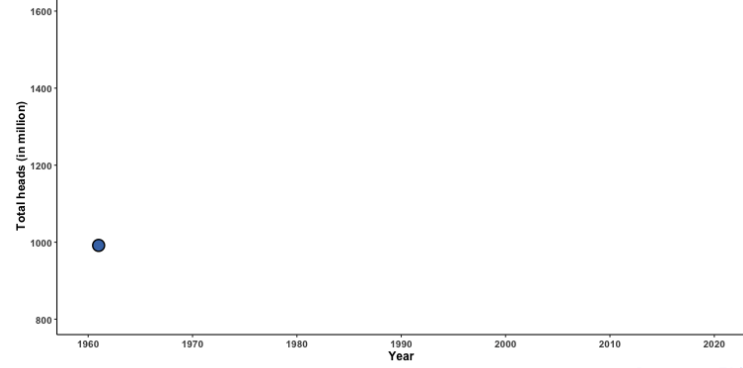
livestock's long shadow
environmental issues and options



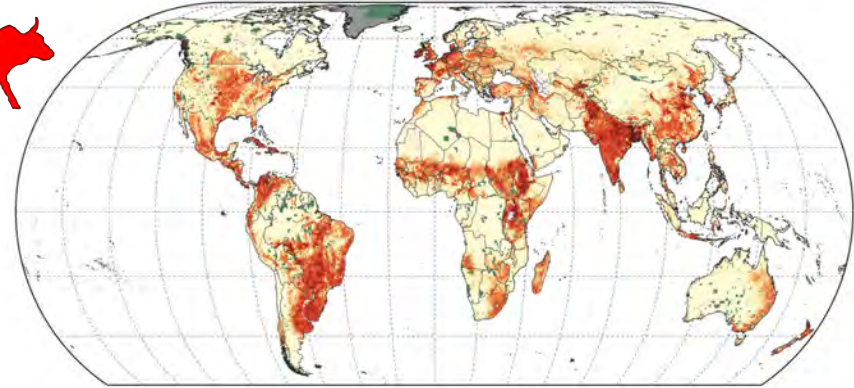
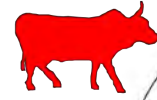
A rising livestock



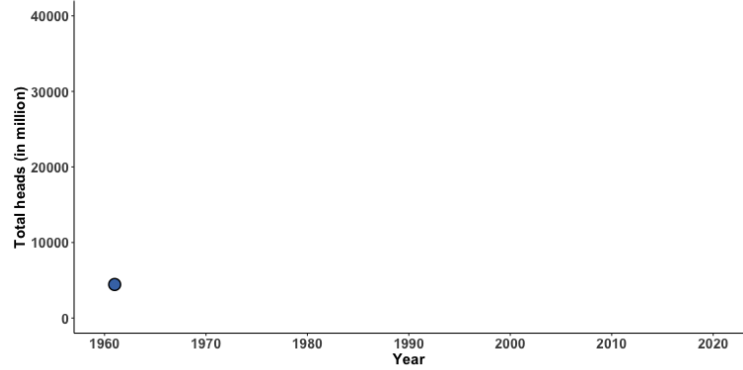
Total heads of cattle (in million) 1960-2020



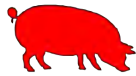
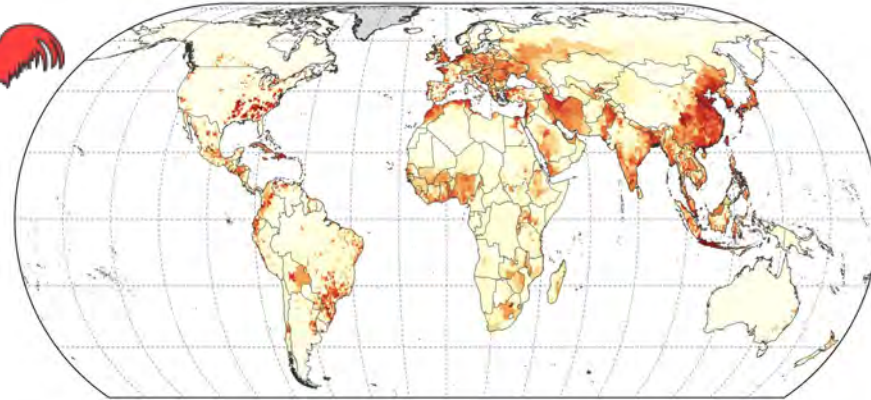
Data source: FAO



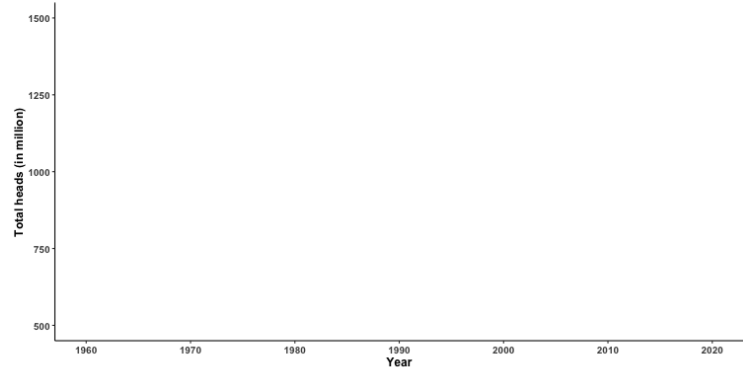
Total heads of chickens (in million) 1960-2020



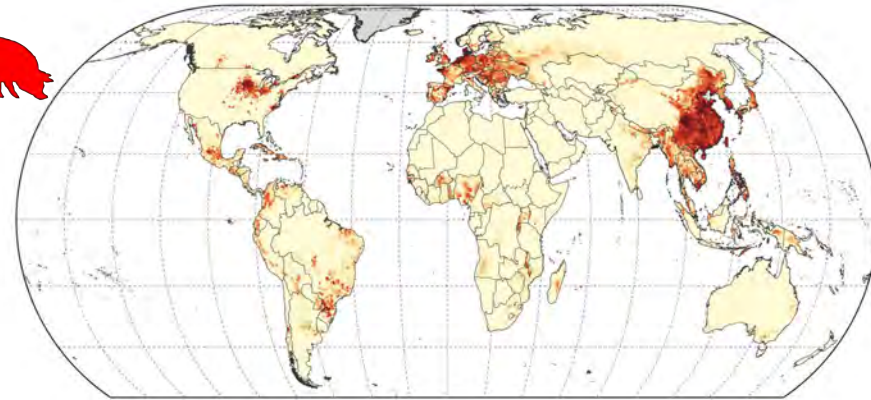
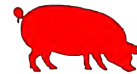
Data source: FAO



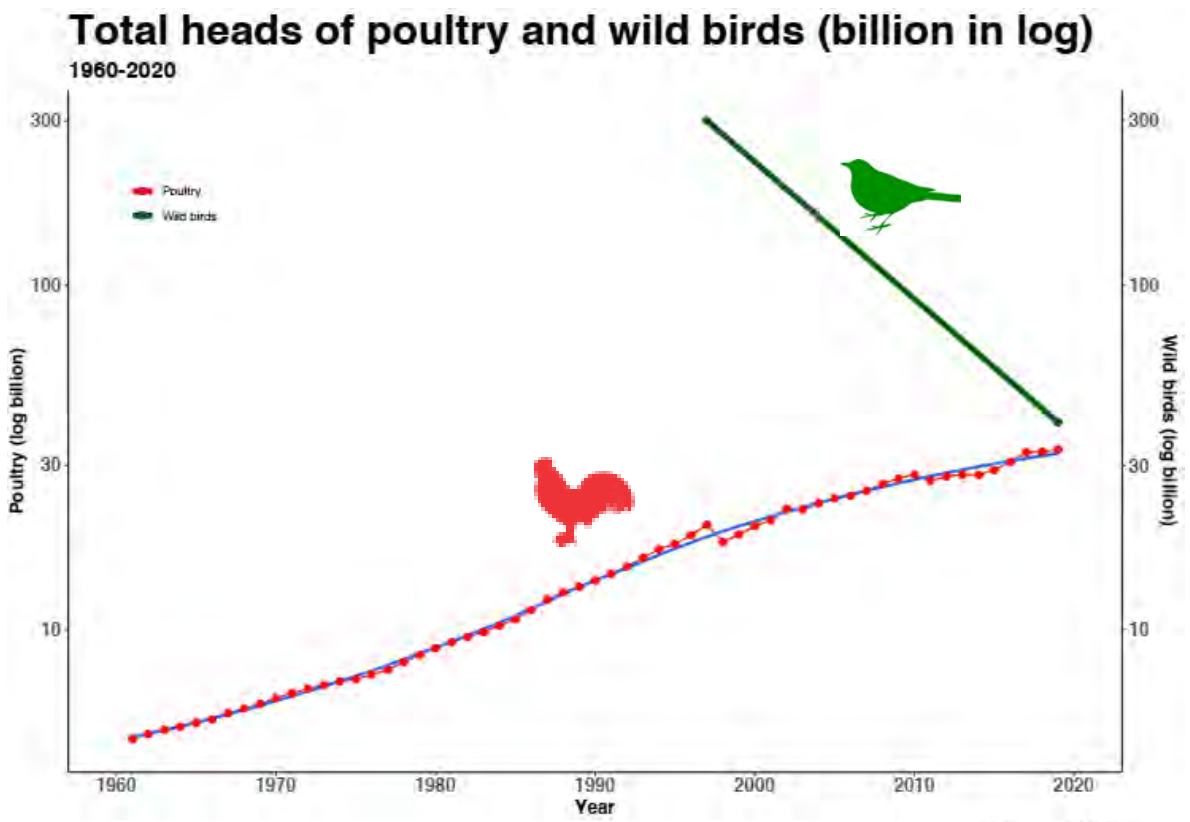
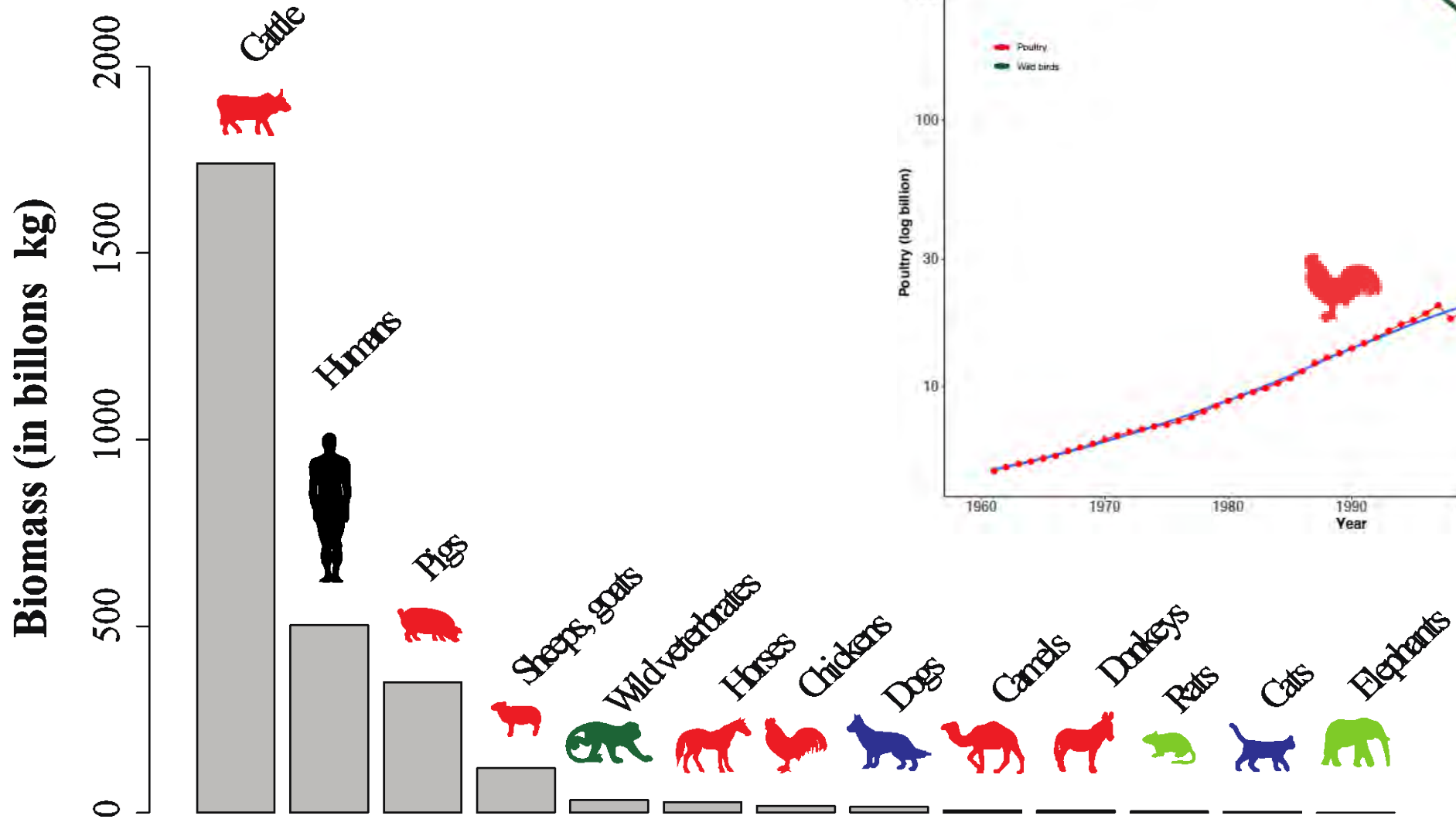
Total heads of pigs (in million) 1960-2020



Data source: FAO

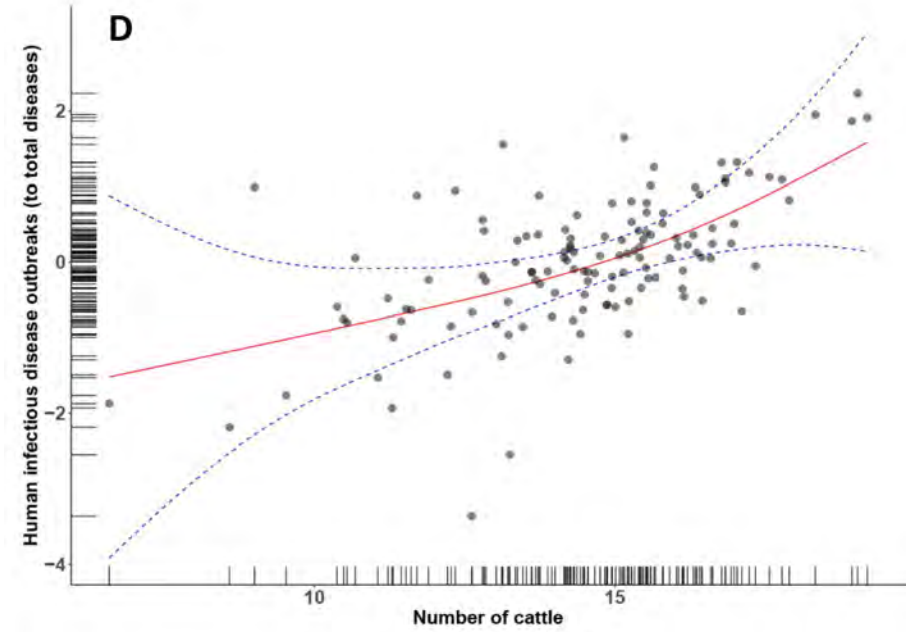
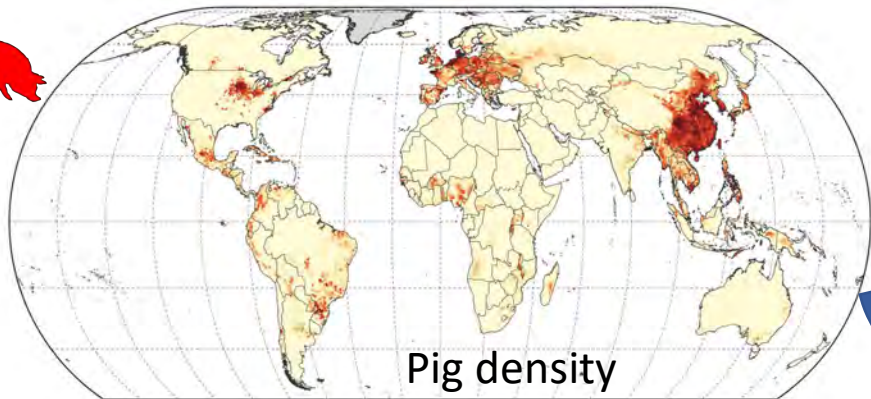
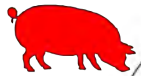
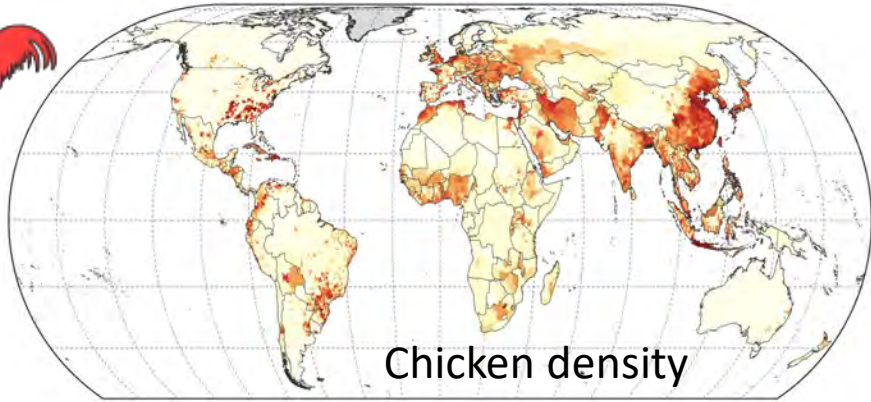
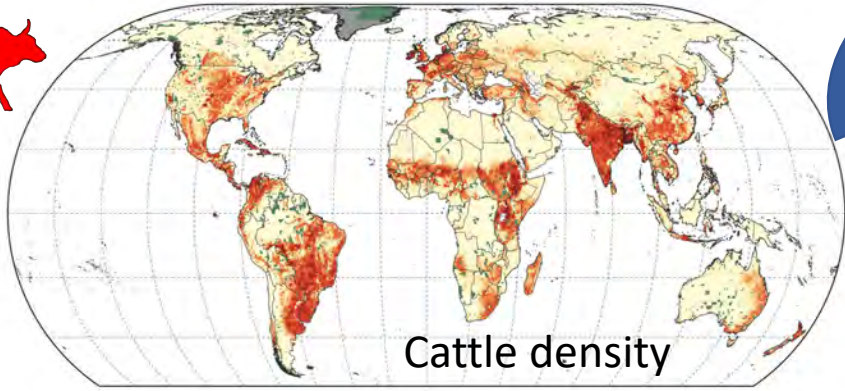
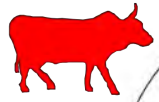


A planet dominated by livestock and poultry



(Morand & Lajaunie, 2017; données de Vaclav Smill, 2002)

Oubreaks of zoonoses



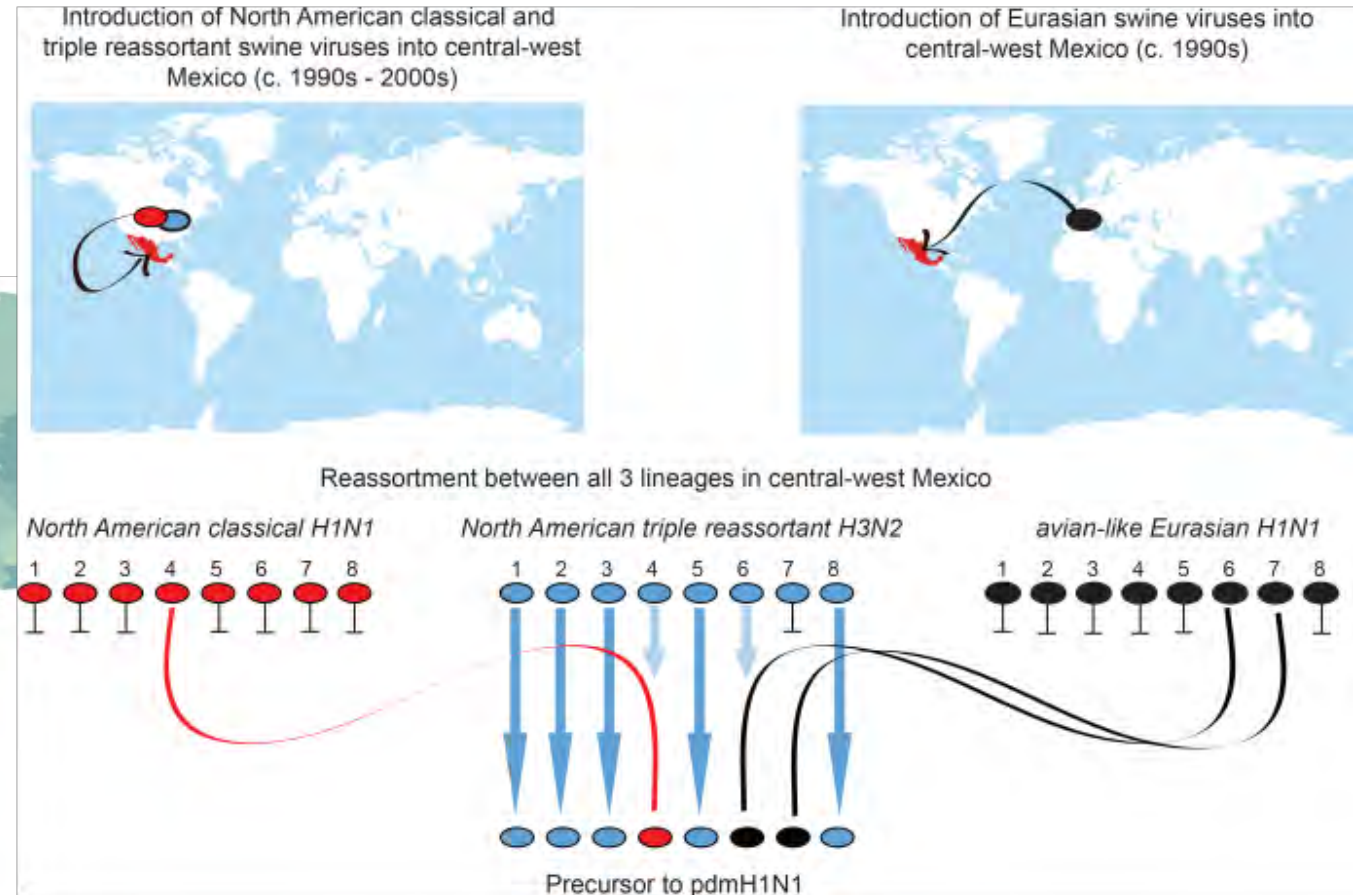
The spread of influenza A virus in a globalized world

Origins of the 2009 H1N1 influenza pandemic in swine in Mexico

Ignacio Mena^{1,2†}, Martha I Nelson^{3†}, Francisco Quezada-Monroy⁴, Jayeeta Dutta⁵, Refugio Cortes-Fernández⁴, J Horacio Lara-Puente⁴, Felipa Castro-Peralta⁴, Luis F Cunha⁵, Nidia S Trovão^{1,2,3,6}, Bernardo Lozano-Dubernard⁴, Andrew Rambaut^{3,7,8}, Harm van Bakel⁵, Adolfo García-Sastre^{1,2,9*}



Sources of live swine imports into Mexico

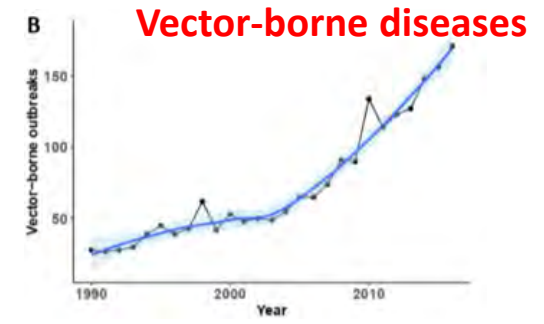
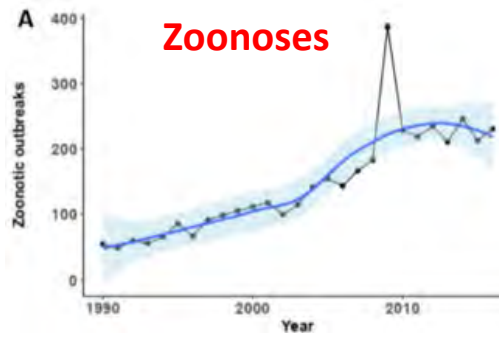


expansion of IAV diversity in swine was resulting from long-distance live swine trade



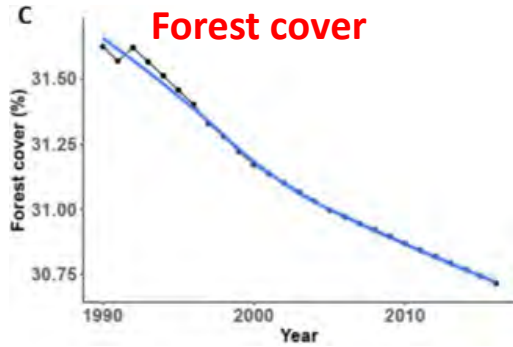
Deforestation, commercial plantations

Outbreaks of Vector-Borne and Zoonotic Diseases Are Associated With Changes in Forest Cover and Oil Palm Expansion at Global Scale



A Outbreaks of zoonotic diseases

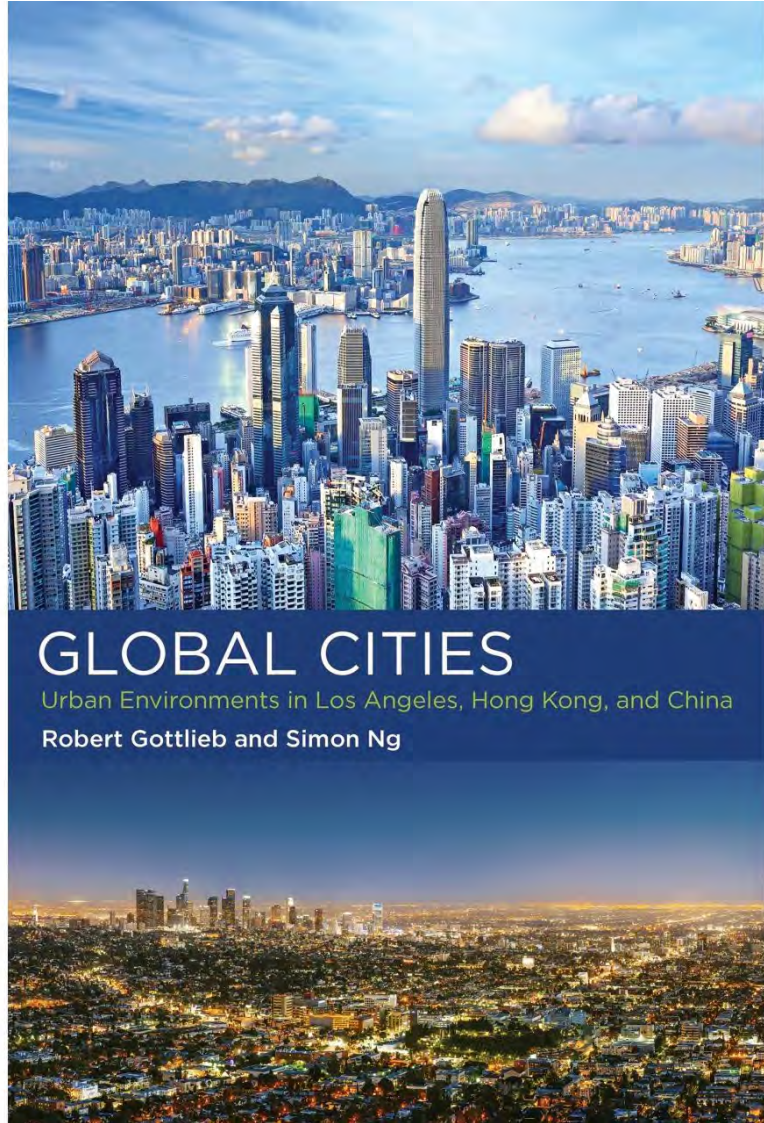
B Outbreaks of vector-borne diseases



C Outbreaks of zoonotic diseases

D Outbreaks of vector-borne diseases

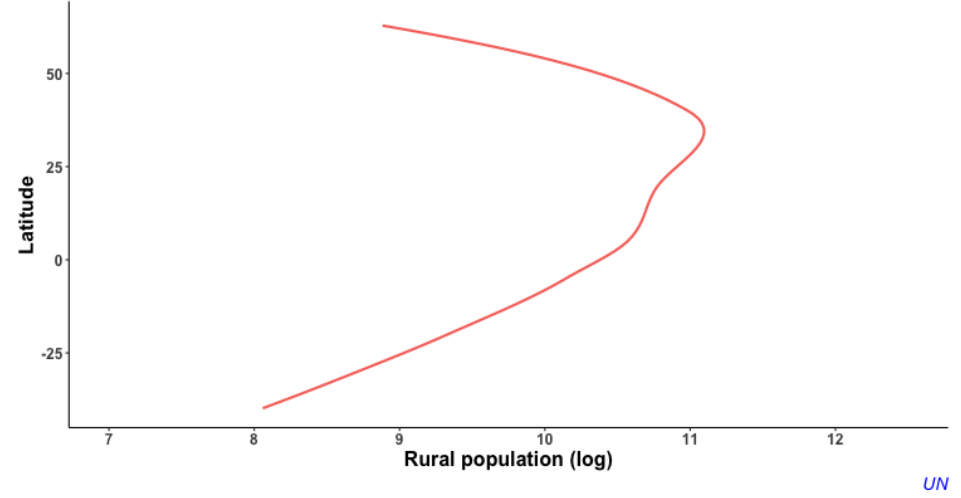




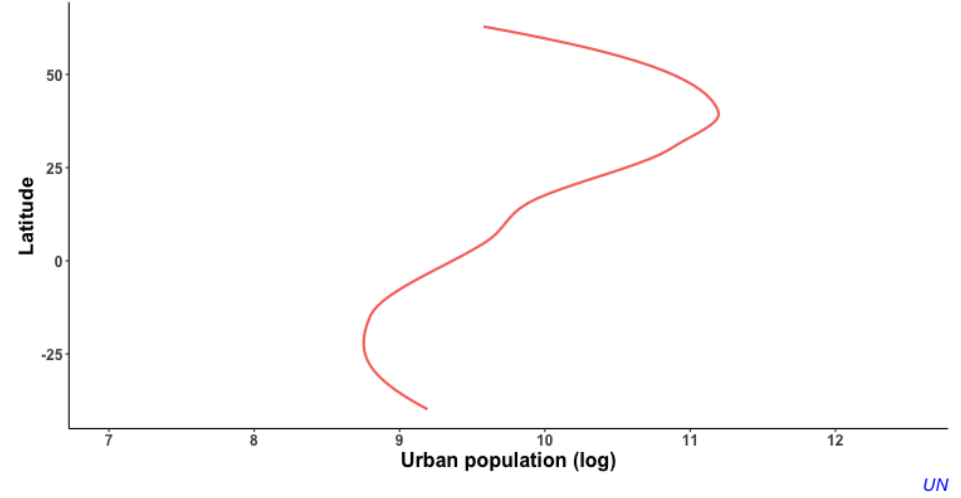
Urbanisation

A more urban dominated planet (intertropical region)

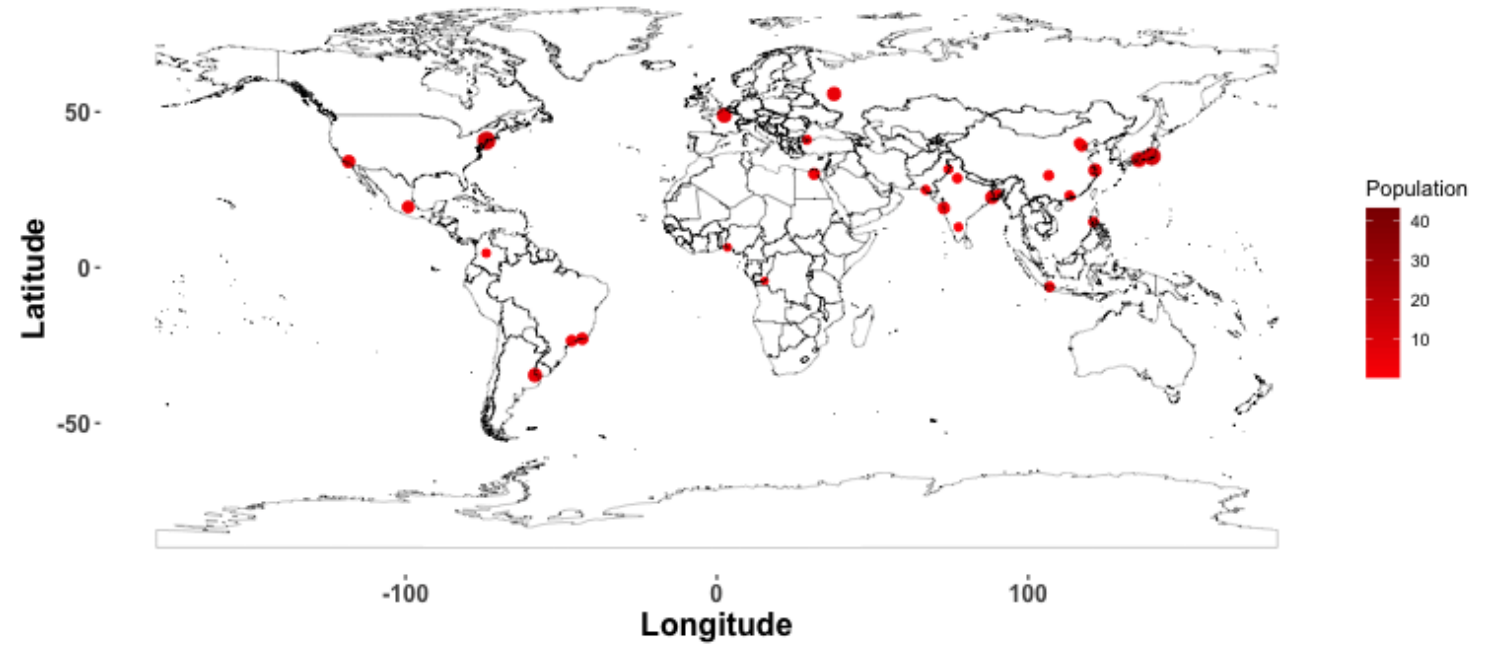
Latitudinal change in rural population
1960-2050



Latitudinal change in urban population
1960-2050



1950



Data source: UN

Expansion of world's cities creating 'new ecological niches' for infectious diseases

21 April 2020, by Elizabeth Allen

Disease hotspots flourish when the city meets the country

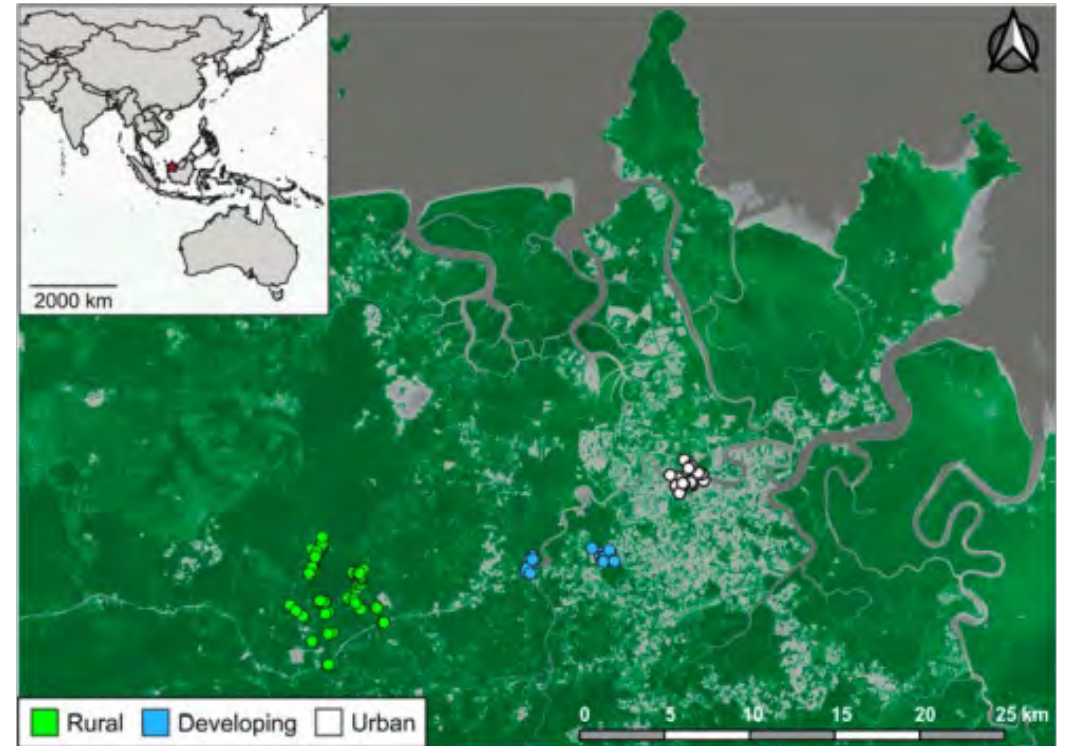
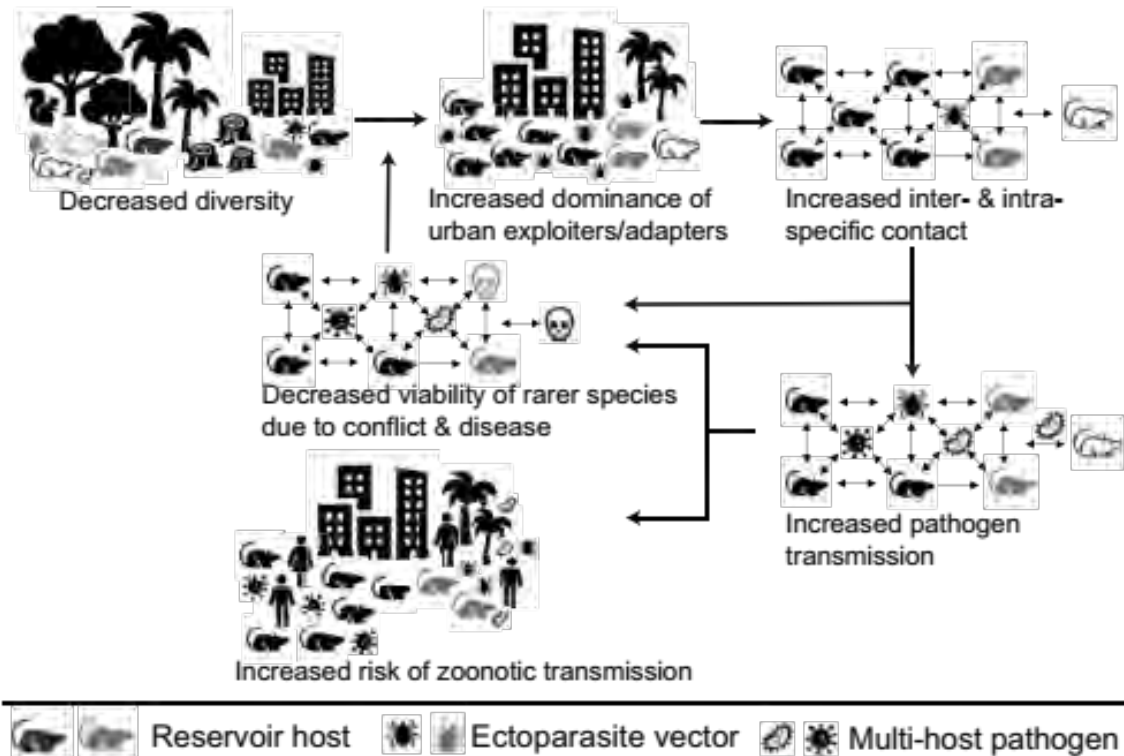
With global cities grinding to a halt in the Covid-19 pandemic, the ability of urban centres to cope with sudden infectious disease outbreaks has been brought under the microscope.



Aerial view of Makati City, Philippines. Population explosion is a major concern for urban planners and epidemiologists in light of changing landscapes in cities. Image: [GreenArcher04](#), CC BY-SA 2.0

Rats and the city: Implications of urbanization on zoonotic disease risk in Southeast Asia

Kim R. Blasdell^a, Serge Morand^{b,c}, Susan G. W. Laurance^d, Stephen L. Doggett^f, Amy Hahs^g, Kelly Trinh^{d,e}, David Perera^h, and Cadhla Firth^{i,1,2}





Biodiversity in crisis

Living Planet Index

Biodiversity is declining at different rates in different places

The global LPI does not give us the entire picture – there are differences in abundance trends between regions, with the largest declines in tropical areas.

In 2019, the landmark IPBES global assessment on the state of biodiversity divided the world into different geographic regions (Figure 3) in order to complete regular and timely assessments of biodiversity, ecosystem services, their linkages, threats, and the impacts of these at regional and sub-regional levels¹. Using a smaller spatial

scale of regions and sub-regions, rather than a global approach, also allows for a more focused way of monitoring progress towards targets developed under the Convention on Biological Diversity,

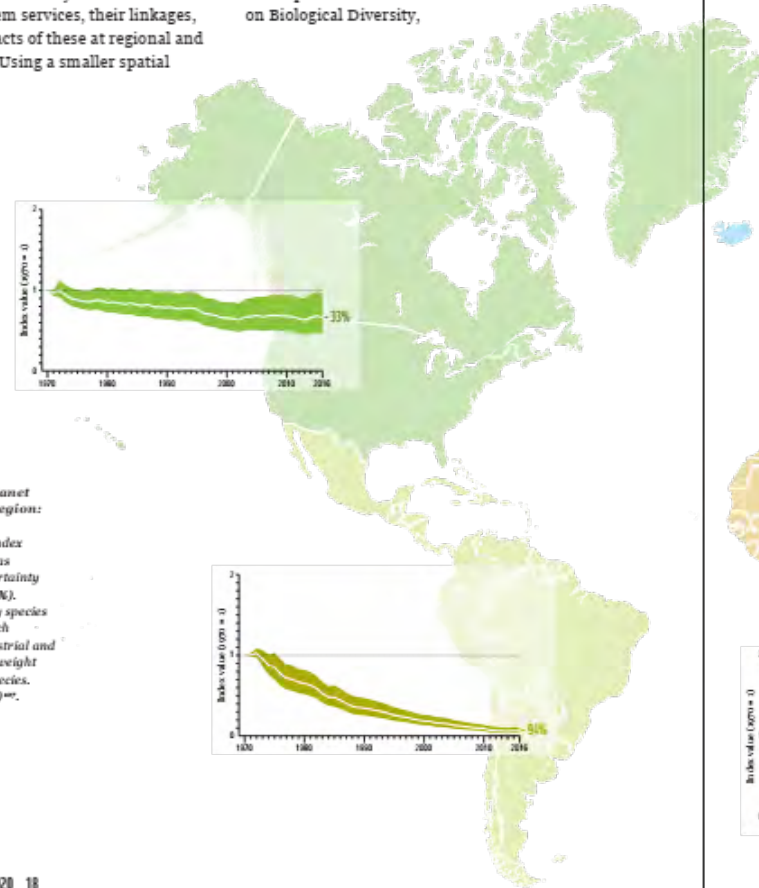
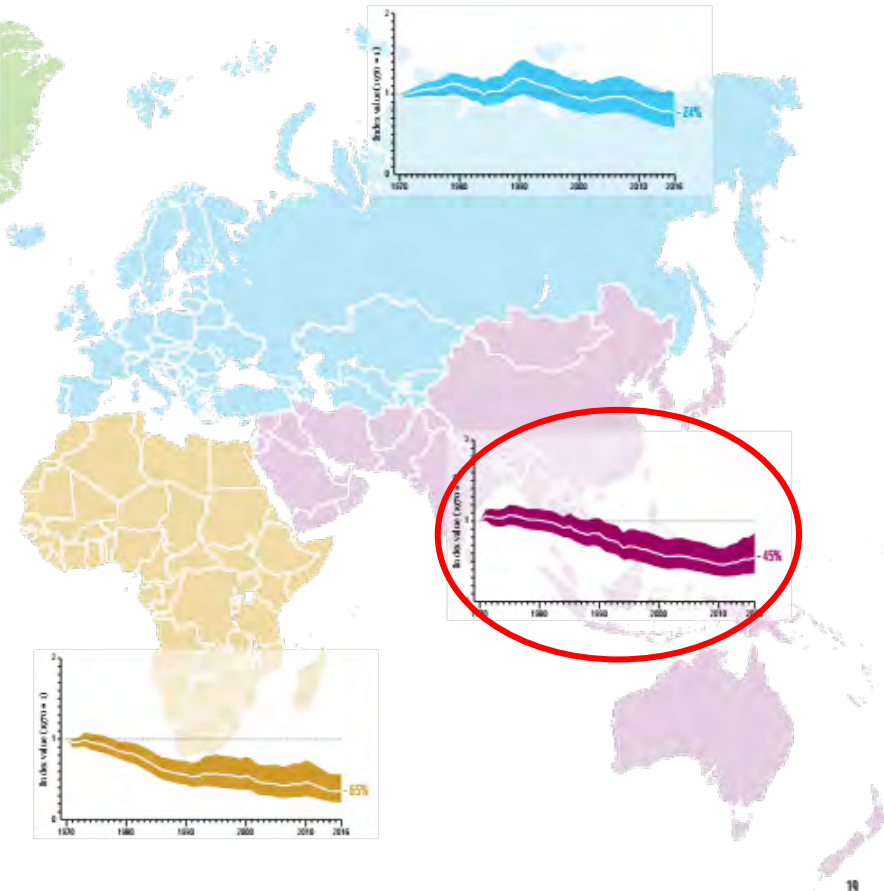


Figure 3: The Living Planet Index for each IPBES region: 1970 to 2016*
The white line shows the index values and the shaded areas represent the statistical certainty surrounding the trend (95%). All indices are weighted by species richness, giving species-rich taxonomic groups in terrestrial and freshwater systems more weight than groups with fewer species. Source - WWF/ZSL (2020)¹⁰⁰.

including the Aichi Biodiversity Targets, Sustainable Development Goals, and National Biodiversity Strategies and Action Plans. In 2020, in order to align with IPBES, regional Living Planet indices have been divided slightly differently to previous years. Following the regional classifications in Figure 3, all terrestrial and freshwater populations within a country were assigned to an IPBES region. In the case of

the Americas, this region was further subdivided in two: North America, and Latin America and the Caribbean (Mesoamerica, the Caribbean and South America combined). Trends for each species group are weighted according to how many species are found in each IPBES region. Threats to populations in each region are shown on page 21, and detail behind the trends can be found in the technical supplement.

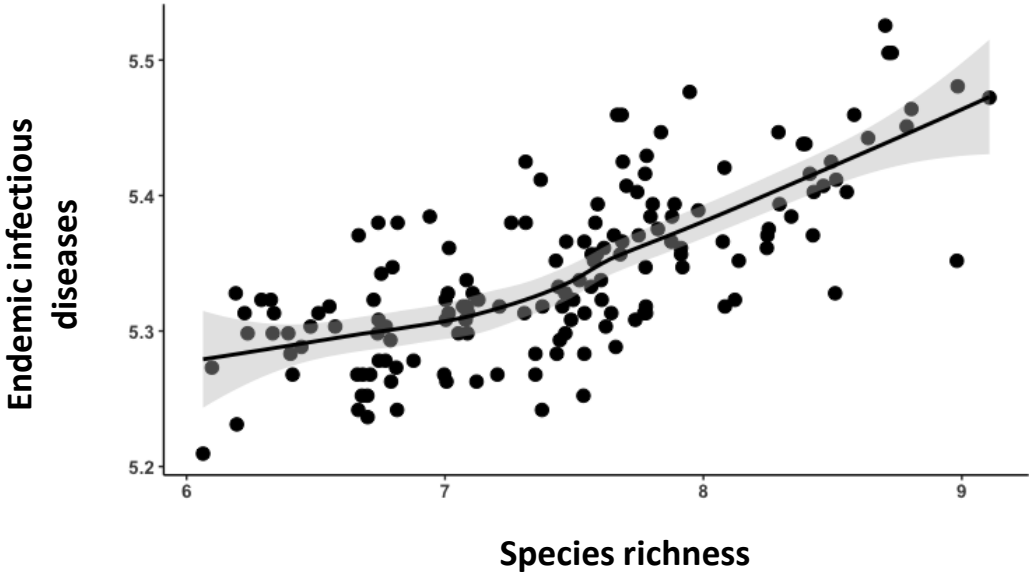
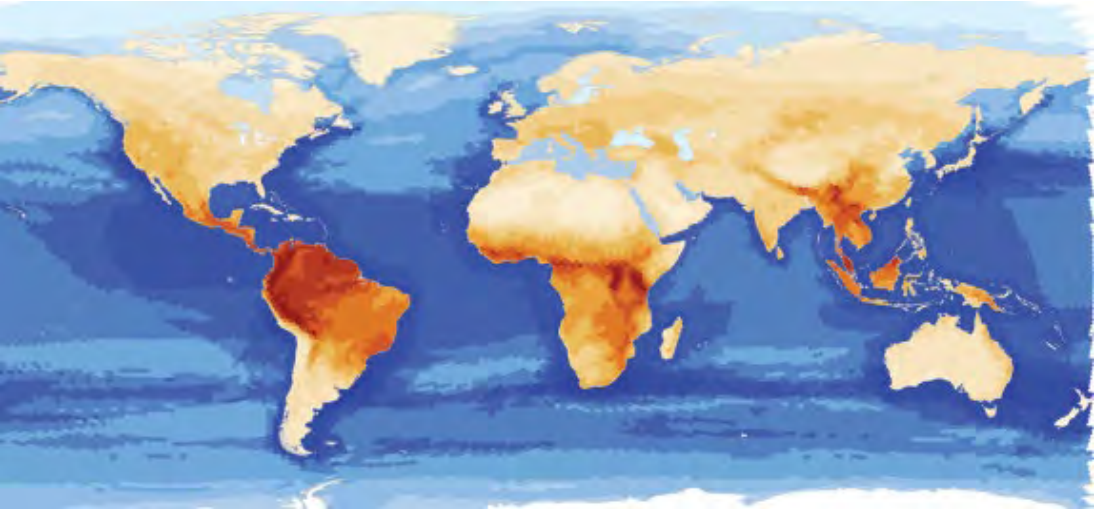


A positive biodiversity – disease richness

High biodiversity

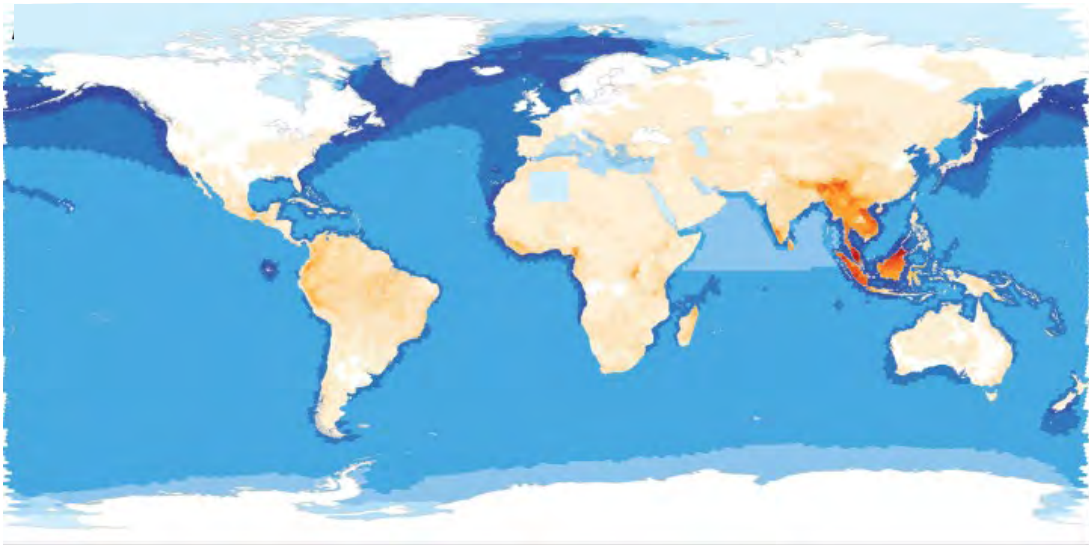


High endemicity of infectious diseases

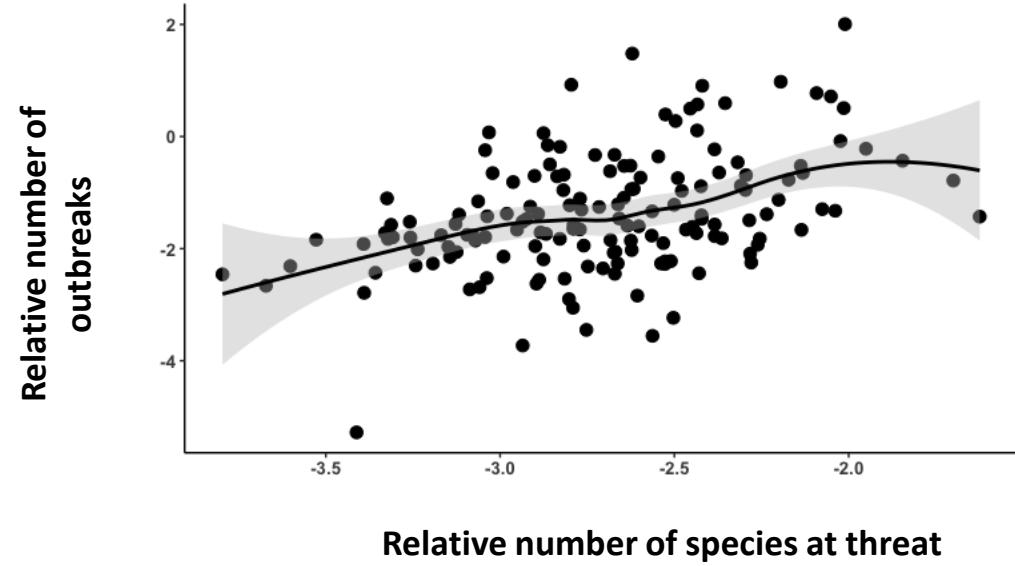


A negative biodiversity – disease transmission

High biodiversity at threat



Higher number of outbreaks!





Situation analysis on the roles and risks of wildlife in the emergence of human infectious diseases

Richard Kock and Hernan Caceres-Escobar



INTERNATIONAL UNION FOR CONSERVATION OF NATURE



Wildlife and disease risks

International socioeconomic inequality drives trade patterns in the global wildlife market

Jia Huan Liew^{1,2*}, Zi Yi Kho³, Rayson Bock Hing Lim⁴, Caroline Dingle¹, Timothy Carlton Bonebrake¹, Yik Hei Sung², David Dudgeon¹

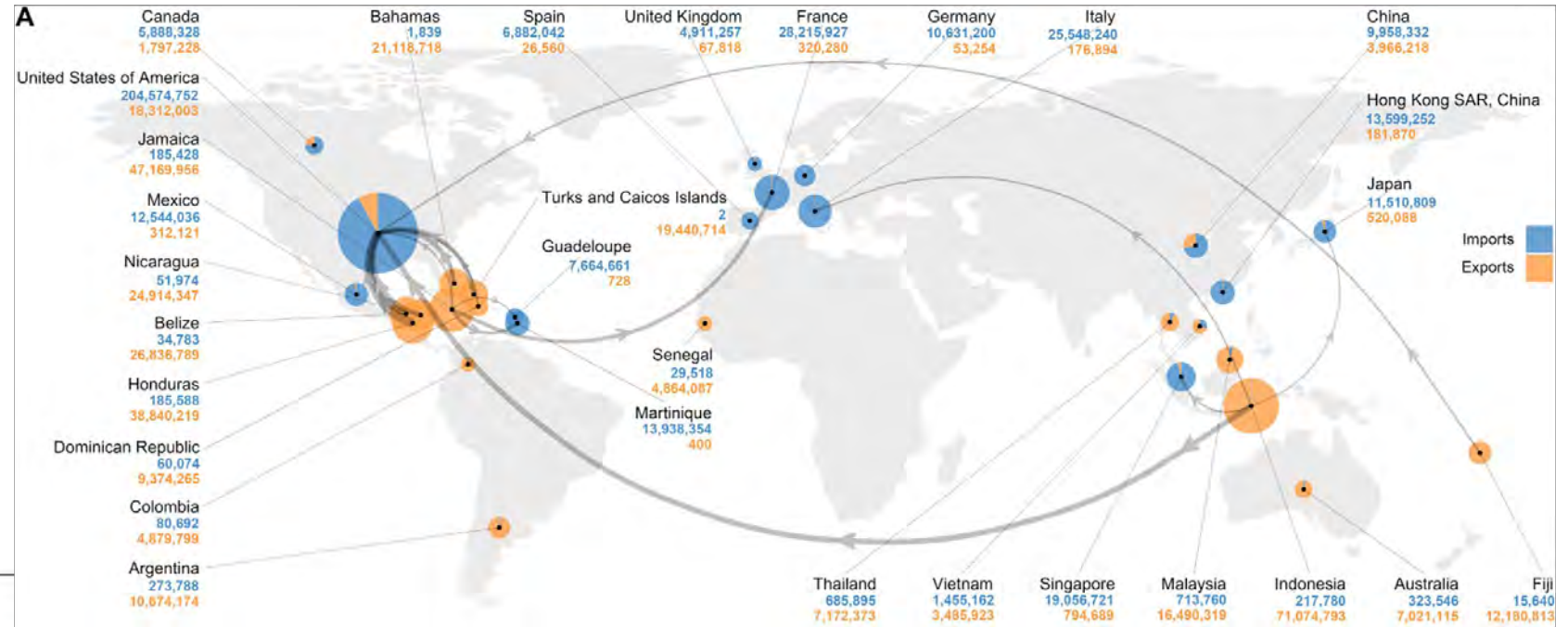
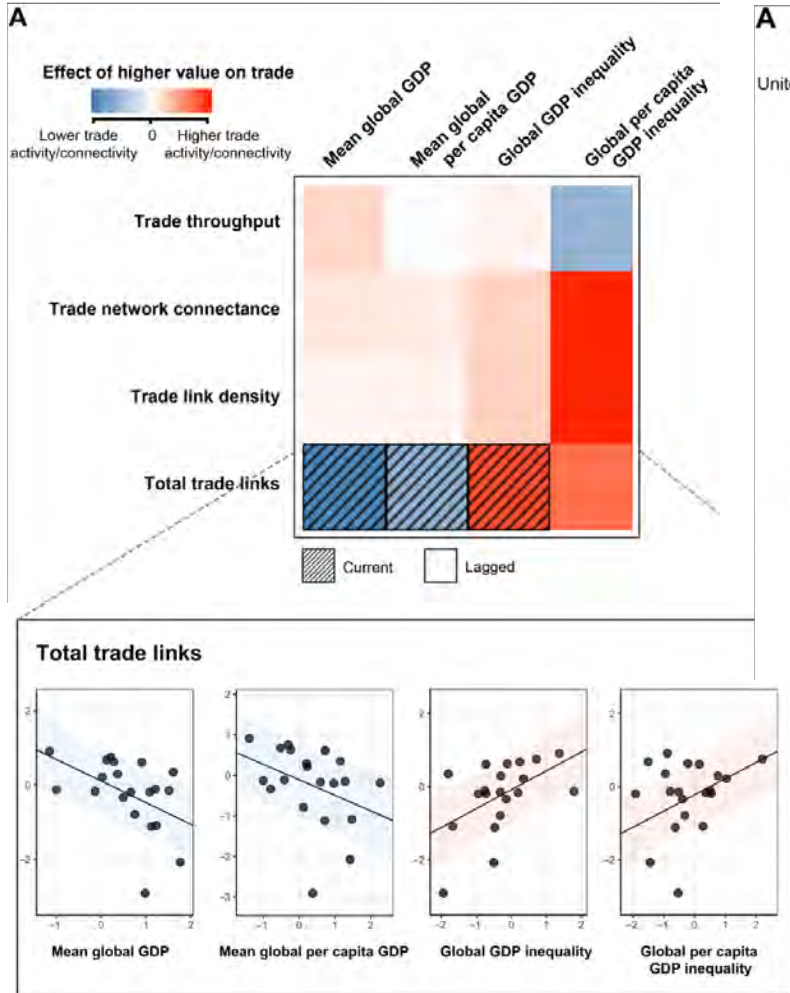


Table 8. Employment and direct output value of wild animal industry in China, 2016 (in a 2017 report by the Chinese Academy of Engineering on the development of the wildlife farming industry)

Industry	No. of Employment	Direct Output Value (Million CNY)
Fur Animal	7,600,000	398,483
Medicinal animal	210,800	5,027
Food animals	6,263,400	125,054
Exhibiting animals & pets	13,700	625
Experimental Animals	2,000	400
Total	14,089,900	520,616

Source: Prepared by the report authors.



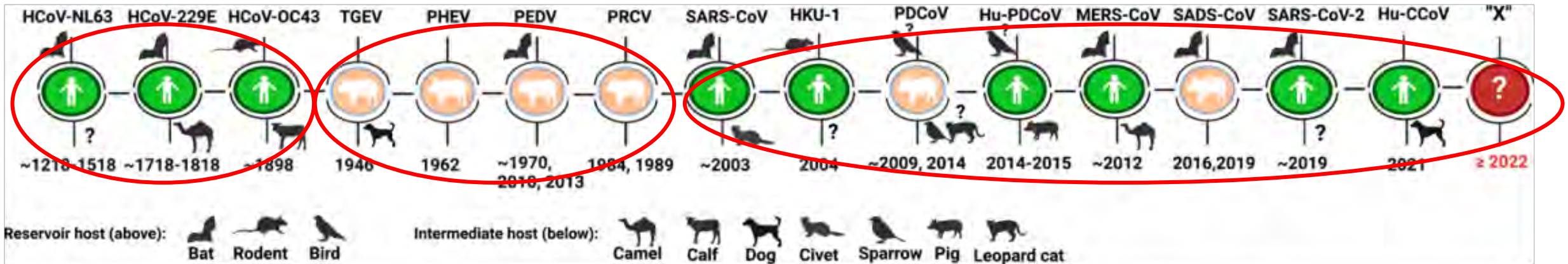
The interface



Pandemic origins and a One Health approach to preparedness and prevention: Solutions based on SARS-CoV-2 and other RNA viruses

Gerald T. Keusch^{a,1}, John H. Amuasi^{b,c,d}, Danielle E. Anderson^e, Peter Daszak^f, Isabella Eckerle^{g,h}, Hume Field^{i,j}, Marion Koopmans^l, Sai Kit Lam^k, Carlos G. Das Neves^{l,m}, Malik Peirisⁿ, Stanley Perlman^o, Supaporn Wacharapluesadee^p, Su Yadana^f, and Linda Saif^{q,1}

Time line of the emergence of CoVs in people or livestock over the past millennium.



Susceptibility of White-Tailed Deer (*Odocoileus virginianus*) to SARS-CoV-2

© Mitchell V. Palmer,^a © Mathias Martins,^b Shollie Falkenberg,^c Alexandra Buckley,^d Leonardo C. Caserta,^b Patrick K. Mitchell,^b Eric D. Cassmann,^d Alicia Rollins,^b Nancy C. Zylch,^b Randall W. Renshaw,^b Cassandra Guarino,^b Bettina Wagner,^b Kelly Lager,^d Diego G. Diehl^b



SARS-CoV-2
in animals
used for
fur farming

GLEWS+
Risk assessment



20 January 2021



Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

Confirmation of COVID-19 in Deer in Ohio



CORONAVIRUS

Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS-coronavirus 2

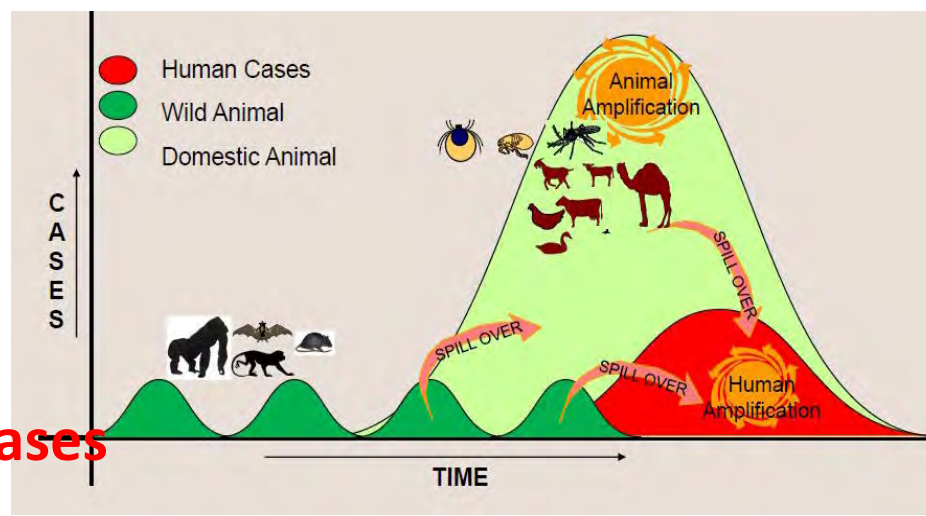
Jianzhong Shi^{1,*}, Zhiyuan Wen^{1,*}, Gongxun Zhong^{1,*}, Huanliang Yang^{1,*}, Chong Wang^{1,*}, Baoying Huang^{2,*}, Renqiang Liu¹, Xijun He³, Lei Shuai¹, Ziruo Sun¹, Yubo Zhao¹, Peipei Liu², Libin Liang¹, Pengfei Cui¹, Jinliang Wang¹, Xianfeng Zhang³, Yuntao Guan³, Wenjie Tan², Guizhen Wu^{2,†}, Hualan Chen^{1,†}, Zhigao Bu^{1,3,†}

Article

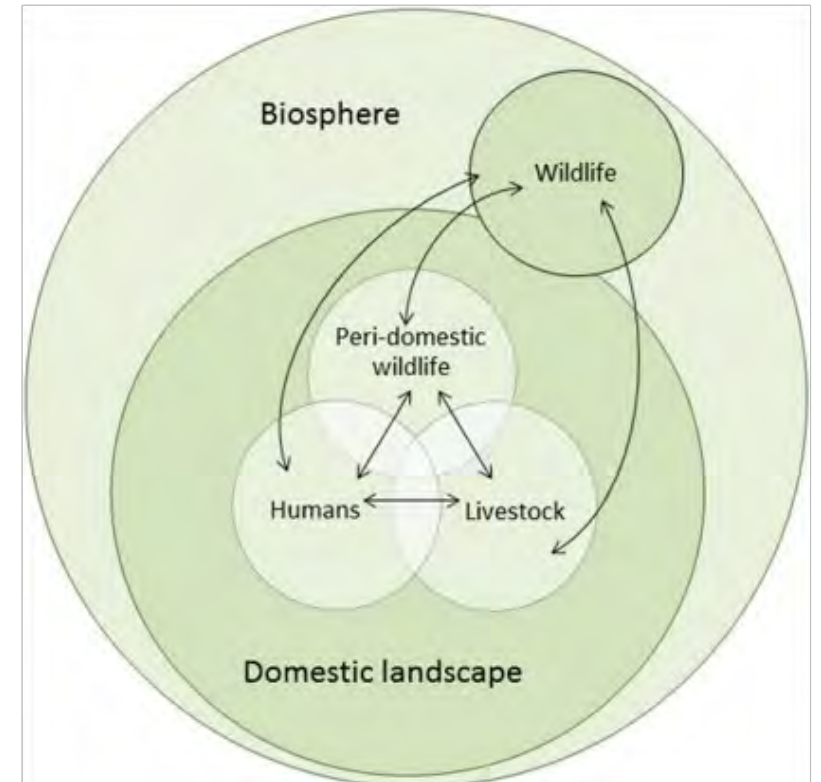
First Description of SARS-CoV-2 Infection in Two Feral American Mink (*Neovison vison*) Caught in the Wild

Jordi Aguiló-Gisbert^{1,†}, Miguel Padilla-Blanco^{2,†}, Victor Lizana^{1,3}, Elisa Maiques⁴, Marta Muñoz-Baquero¹, Eva Chillida-Martínez¹, Jesús Cardells^{1,3,*} and Consuelo Rubio-Guerri^{2,*}

Hot spots of emerging zoonotic diseases

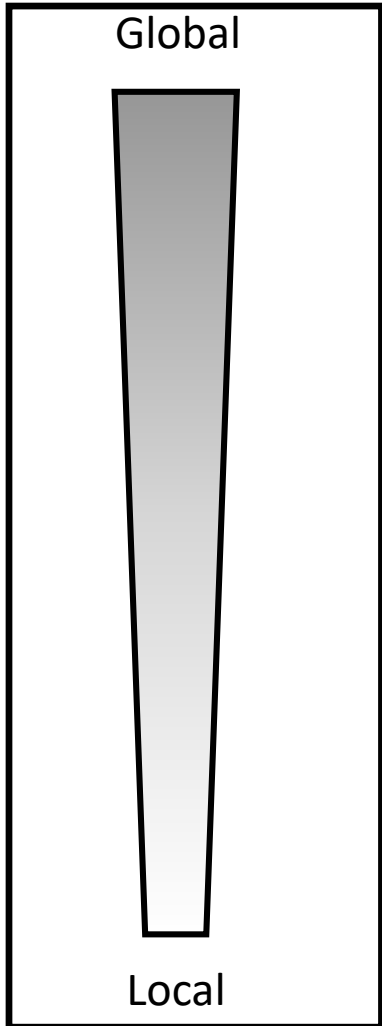


Hot Spots for Emerging Diseases



Scaling and connection effects

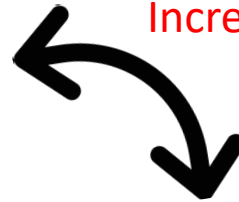
Global change



Globalization



Increasing trade

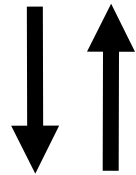


Land conversion



- Biodiversity loss
- Deforestation
- Agriculture intensification
- Livestock expansion
- Plantation expansion

mobility



Urbanization



mobility

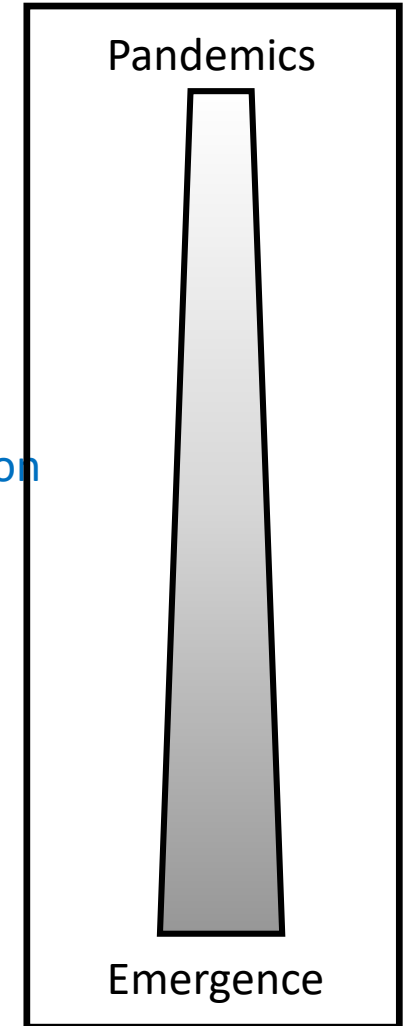


Infrastructure development



- Roads
- Dams
- Mining

Infectious diseases

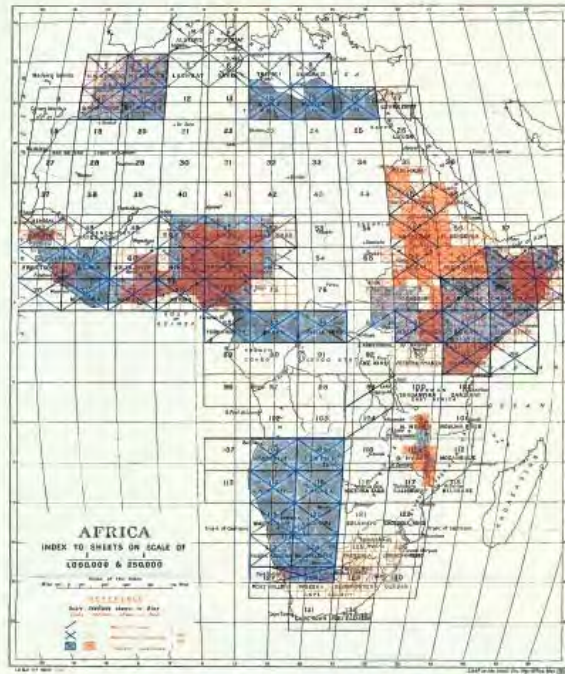


EMPIRE, DEVELOPMENT, AND THE
PROBLEM OF SCIENTIFIC KNOWLEDGE,

1870-1950

AFRICA

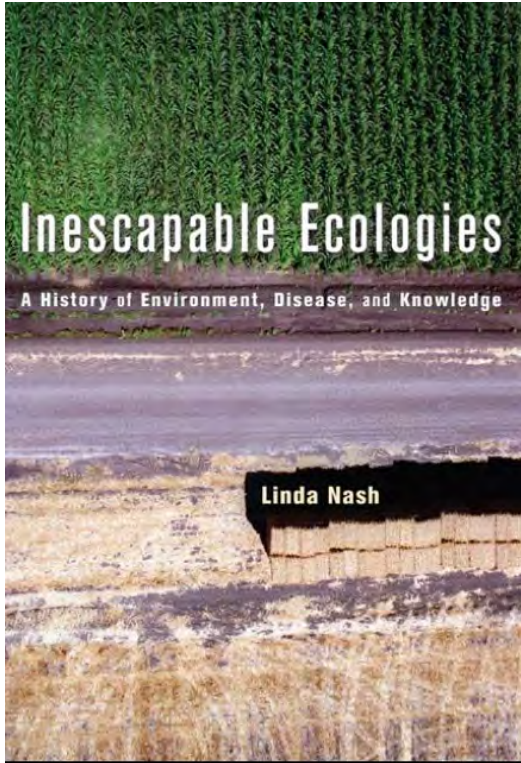
as a Living Laboratory



HELEN TILLEY

One Health

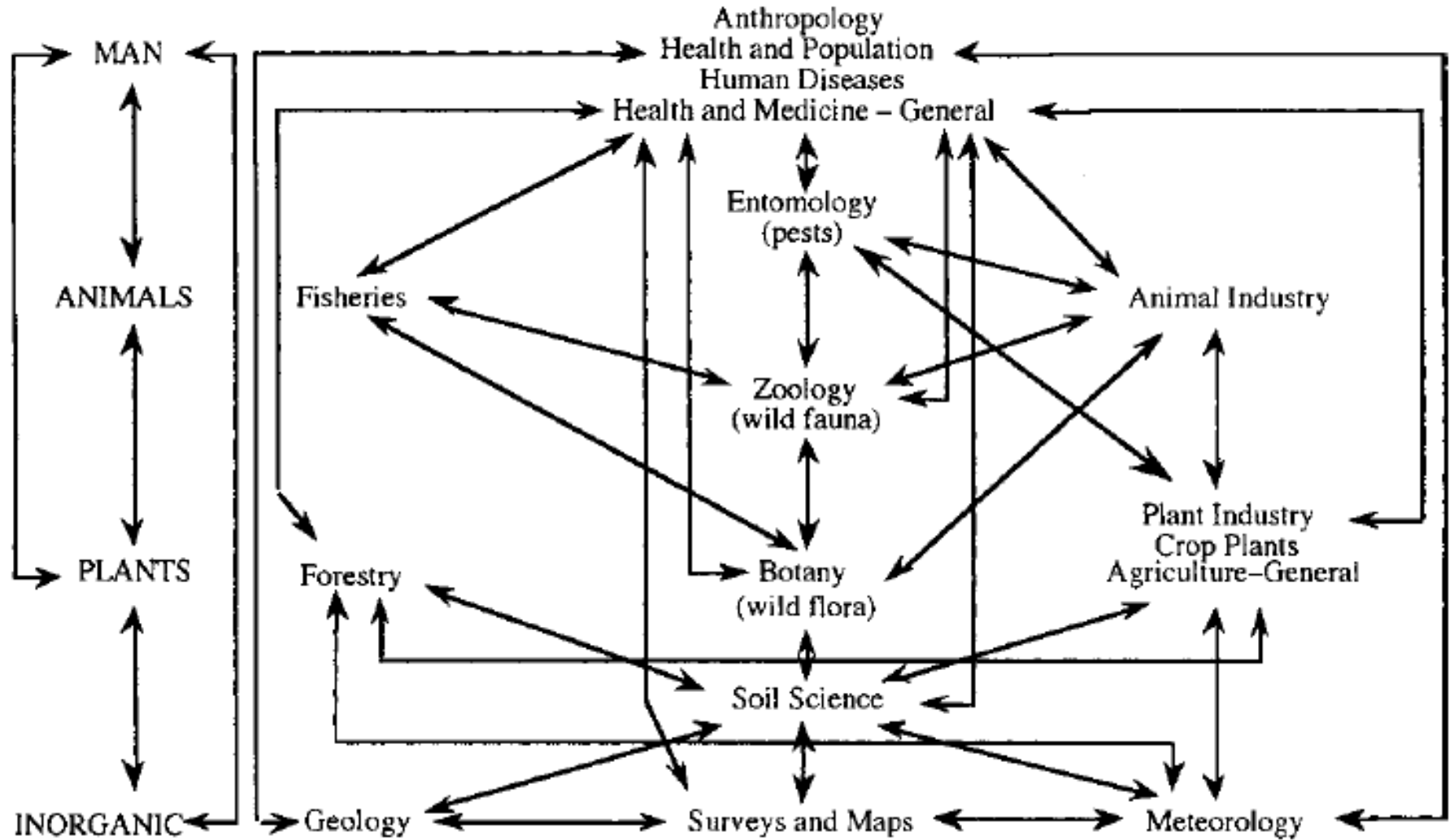
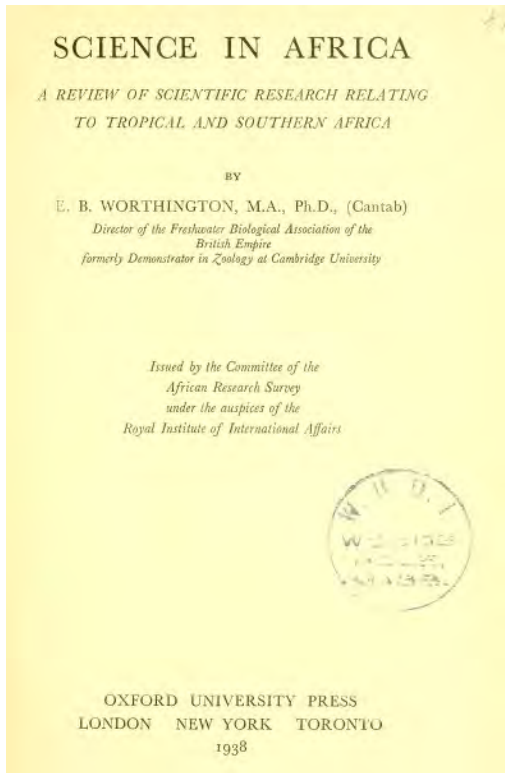
1859



Thomas Logan, un docteur de la « Nouvelle Frontière » en Californie, écrivait en 1859 :

*«A knowledge of the etiology of diseases can best be attained by studying **the affections of different localities in connections with every condition and circumstance calculated to operate prejudicially or otherwise upon the health of the inhabitants.** Such philosophical investigation is particularly useful in tracing the modifications diseases may undergo from the agency of causes of a local or special character; and being also calculated to elucidate **the relationships of diseases to climate, to the prevailing geological formations, the fauna, the vegetables, the minerals, the water,** which vary with the earth's crust, »*

(Thomas Logan, Transactions of the American Medical Association, 1859, Cited in Nash, 2006)



The colonial scientific network of environmental management (Worthington 1938, voir Tilley 2012).

Dans les années 1920,
Julian Huxley pour
Committee on Native Education in Tropical Africa



Trésorier
Zoological Society London
Co-fondateur du WWF
Président
British Eugenics Society
1er Directeur Général
Unesco
Initiateur de la création
IUCN

*“At the present moment, it is clear that many if not most problems of applied biology can only be satisfactorily solved by **reference to a background of ecological ideas**, by whose aid the interrelations of different branches of biological science can be studied.”*

*“it is often possible for the ecologist to point out to this or that specialist new lines of approach to his particular **problem—disease of man or of domestic animals** may prove to be correlated with a cycle of **abundance and scarcity in some wild animal** . . . game migrations or . . . **climatic cycles** or variations in mineral content of foodplants.”*

Intergovernmental
conference of experts on
the scientific basis
for rational use and
conservation of the resources
of the biosphere

Paris
4-13 September 1968

Unesco

UNESCO 1968

RECOMMENDATION 3 RESEARCH ON HUMAN ECOLOGY

The Conference,

Considering that man is an integral part of most ecosystems, not only influencing but being influenced by his environment; that his physical and mental health, now and in the future, are intimately linked with the dynamic system of natural objects, forces and processes that interact within the biosphere and including also those of man's culture,

Recommends to the Member States and their appropriate institutions, to Unesco, WHO and the international organizations concerned:

1. **That research be directed to man's basic ecology and to his social and physical adaptability to the changes of all kinds to which he is being subjected, whether in simple or in more complex societies, including those that are highly technological and urbanized.**
2. **That continuing and intensified research be undertaken on the ecology of human diseases, with special reference to those associated with environmental change and to the zoonotic diseases arising from interactions between man and animals.**
3. **That this research be directed at solving increasingly important problems of the establishment of the necessary balance between man and his environment in relation to the maintenance of his health and well-being in their broadest connotations.**



Home

29 September 2004
New York Symposium
*"Building Interdisciplinary
Bridges to Health in a
'Globalized World' "*

15 November 2004
Bangkok Workshop
*"Beyond Zoonoses: The
Threat of Emerging Diseases
to Human Security and
Conservation, and the Imp-
lications for Public Policy"*

15–17 November 2005
China Workshop
*"Beyond Zoonoses: The
Threat of Emerging Diseases
to Human Health, Agriculture
and Conservation: Imp-
lications for Public Policy"*

2–4 October 2007
Brazil Workshop
*"Healthy Ecosystems,
Livestock and Human
Livelihoods: An Innovative
Public-Private Partnership"
("Ecosystemas, Animais
Silvestres E Meio De Vida
Humano Saudáveis: Uma
Parceria Pública-Privada
Inovadora")*

One World – One Health: Brazil 2009 Meeting 22 October 2009

For information on the OWOH Brazil 2009 Meeting, please contact:

Fabiola Prioste

Flavia Miranda

owoh2009@gmail.com

fmiranda@wcs.org

55 (11) 9251-8041

55 (11) 9600-9739

[Visit our Brazil Workshop page](#)

2–4 October 2007

**All presentations, including video, audio, PDFs,
and slides are now online.**

View Press Release:

"Wildlife Conservation Society Announces
One World One Health Research Projects Funded by Cargill"
[English PDF](#) | [Portuguese PDF](#)

The Manhattan Principles on "One World, One Health"

Recent outbreaks of West Nile Virus, Ebola Hemorrhagic Fever, SARS, Monkeypox, Mad Cow Disease and Avian Influenza remind us that human and animal health are intimately connected. A broader understanding of health and disease demands a unity of approach achievable only through a consilience of human, domestic animal and wildlife health - **One Health**.

1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning ecosystems we all require.
2. Recognize that decisions regarding land and water use have real implications for health. Alterations in the resilience of ecosystems and shifts in patterns of disease emergence and spread manifest themselves when we fail to recognize this relationship.

Introduction to One Health

An Interdisciplinary Approach to Planetary Health

Sharon L. Deem • Kelly E. Lane-deGraaf • Elizabeth A. Rayhel



Insight and Innovation in International Development

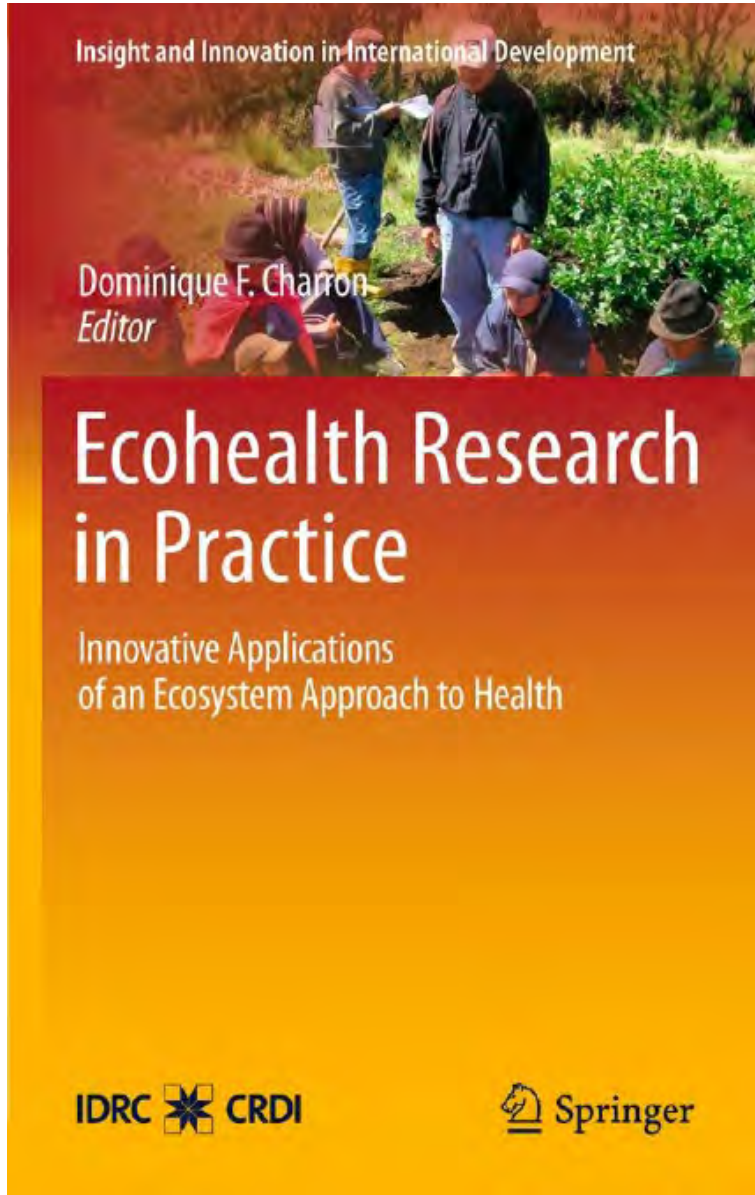
Dominique F. Charron
Editor

Ecohealth Research in Practice

Innovative Applications
of an Ecosystem Approach to Health

IDRC  CRDI

 Springer



Planetary Health

Protecting Nature to
Protect Ourselves

edited by Samuel Myers
and Howard Frumkin



Sortir des crises

One Health en pratiques

Sous la direction de
Sébastien Gardon, Amandine Gautier,
Gwenola Le Naour et Serge Morand



éditions
Quæ

One Health pour sortir des crises

One Health High Level Expert Panel (OHHLEP)

*In November 2020 at the Paris Peace Forum
FAO, OIE, UNEP and WHO create a multidisciplinary
One Health High-Level Expert Panel (OHHLEP)
with the support of **France** and **Germany***

Co-chairs



Wanda Markotter

Professor, Centre for Viral Zoonoses, University of Pretoria, South Africa

[Learn more >](#)



Thomas Mettenleiter

President of the Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Germany

[Learn more >](#)



Wiku Bakti Adisasmito >
Professor in Health Policy, University of Indonesia, Indonesia



Casey Barton-Beiravesh >
Personal capacity, United States of America



Salome Bukachi >
Associate Professor, Institute of Anthropology, University of Nairobi, Kenya



Natalia Cediel Becerra >
Lecturer and researcher, Universidad de la Salle Bogotá, Colombia



Janice Ciacci-Zanella >
Veterinarian researcher in the area of Animal Virology and Director General of Swine and Poultry Research Center, EMBRAPA, Brazil



Osman Dar >
Consultant in Global Public Health, Public Health England / Director - One Health Project, Chatham House, Royal Institute of International Affairs, United Kingdom of Great Britain and Northern Ireland, Pakistan



Baptiste Dzungu >
Chief Executive Officer, Onderstepoort Biological Products SOC (OBP), South Africa, Democratic Republic of the Congo



George Fu Gao >
Director-General, Chinese Center for Disease Control and Prevention, People's Republic of China



Margaret Khaitsa >
Professor of International Veterinary Epidemiology, Mississippi State University, Uganda



Catherina Machalaba >
Senior Policy Advisor and Senior Scientist, EcoHealth Alliance, United States of America



Serge Morand >
Director of Research, CNRS, Montpellier University, France



Salama Al Muhairi >
Director of Veterinary Laboratories Division, Abu Dhabi Agriculture and Food Safety Authority, United Arab Emirates



Pépé Billvogui >
Technical Consultant, Project REDISSE (World Bank/OOAS), Guinea



Natalia Casas >
National Zoonoses Coordinator, Ministry of Health of Argentina, Argentina



Abhishek Chaudhary >
Assistant Professor, Dept. of Civil Engineering, Indian Institute of Technology (IIT) Kanpur, India



Andrew Alexander Cunningham >
Deputy Director of Science, Zoological Society of London, United Kingdom of Great Britain and Northern Ireland



Nijah Dabnath >
Team Lead, Fleming Fund Country Grant to Bangladesh, DAI Global, LLC - National Coordinator One Health Bangladesh, Bangladesh



Elmoubasher Farag >
Senior Infectious Disease Epidemiologist, Head of Communicable Diseases Control Programs, Director-One Health Projects, Qatar Ministry of Public Health (MOPH), Sudan



David Hayman >
Professor of Infectious Disease Ecology, Massey University, New Zealand



Professor Marion Koopmans >
Director of the WHO Collaborating Centre for emerging infectious diseases at Erasmus Medical Centre, Netherlands



Professor John S. Mackenzie >
Emeritus Professor, Curtin University, Perth, Australia



Vyacheslav Smolenskiy >
Deputy Head, Russian Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing, Russian Federation



Lei Zhou >
Chief of Branch for Emerging Infectious Disease, China CDC, People's Republic of China



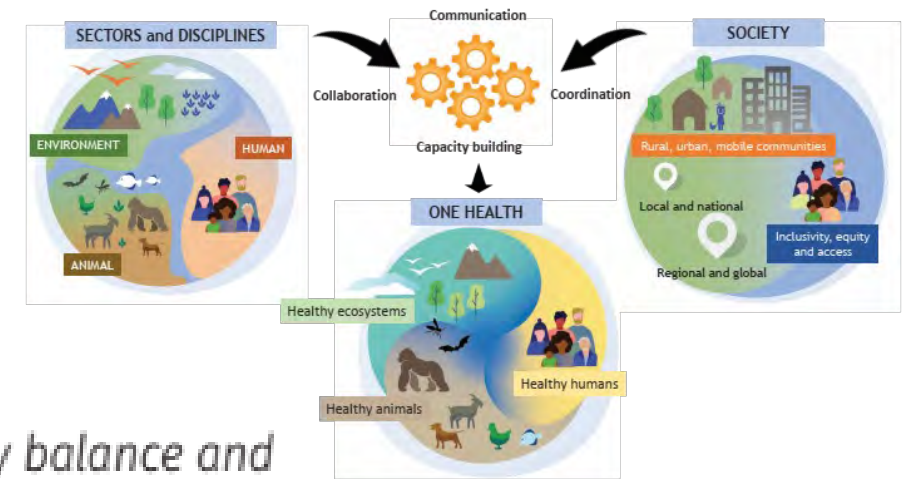
Tripartite and UNEP support OHHLEP's definition of "One Health"

Joint Tripartite (FAO, OIE, WHO) and UNEP Statement

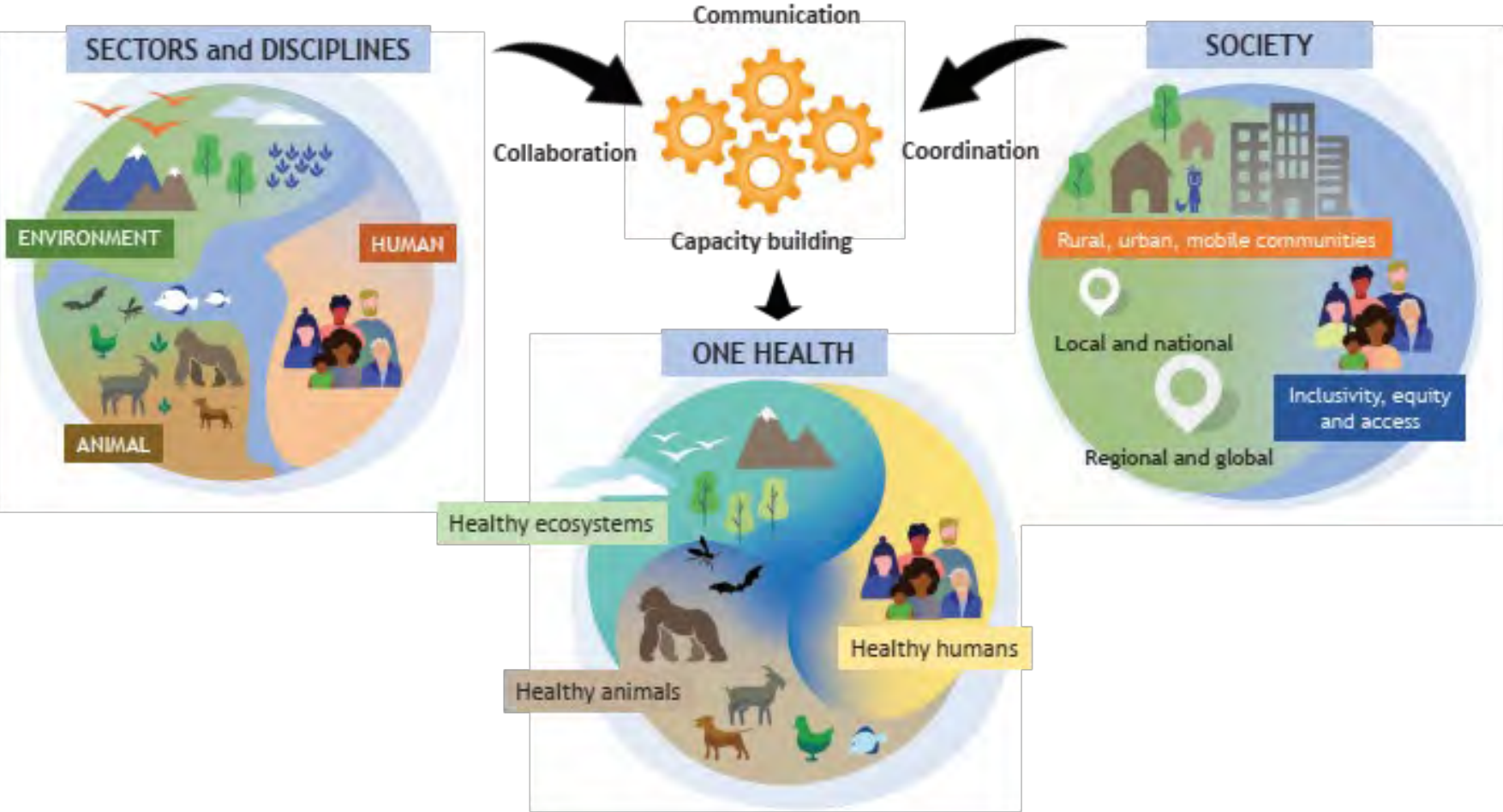
One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

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.



Enhancing collaboration, coordination, communication and capacity building



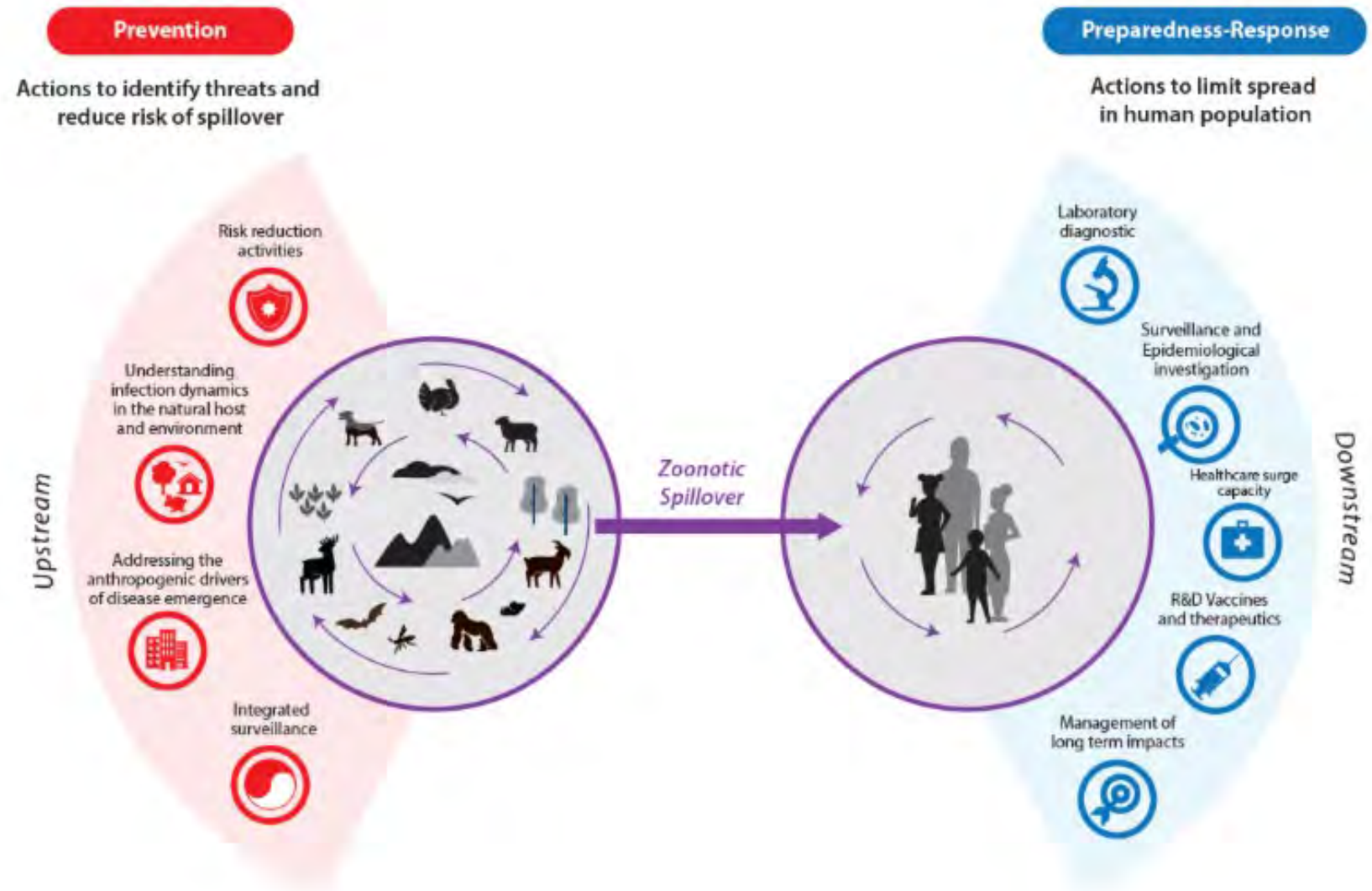
A definition of prevention of zoonotic spillover to humans

ONE HEALTH HIGH-LEVEL EXPERT PANEL

PREVENTION OF ZOOONOTIC SPILLOVER

FROM RELYING ON RESPONSE TO REDUCING THE RISK AT SOURCE

OHHLEP whitepaper/Opinion piece

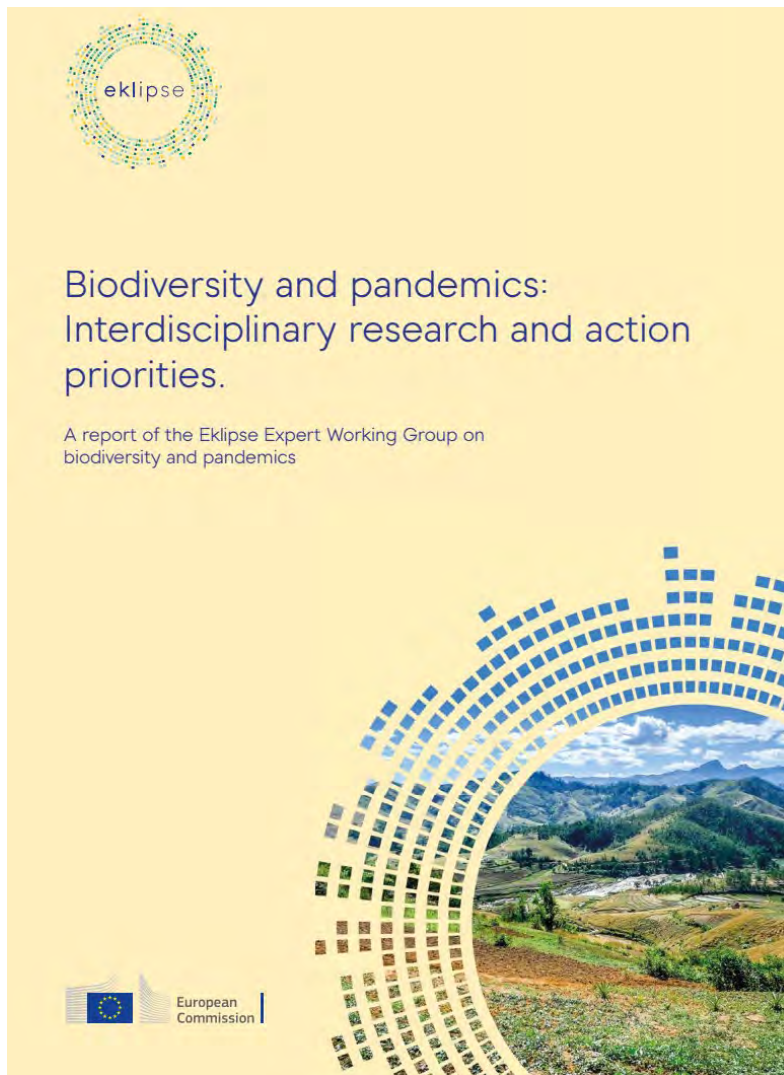


**Reducing
pandemic risks
at source**

Wildlife, environment
and One Health foundations
in East and South Asia



Prevention at the source



January 2023

Request of the European Commission

“

Building on existing relevant work on research agendas and knowledge gap analysis, identify interdisciplinary research and action priorities that contribute to a strategic research agenda on Biodiversity and Pandemics addressing the critical interlinkages between relevant sectors needed to make future actions more effective.

”

Recommendations



1 Promote the development of a science of the **wildlife/ domestic animal/human interface**.



2 Promote interdisciplinarity that **integrates the social sciences and humanities** into the science of the interface.



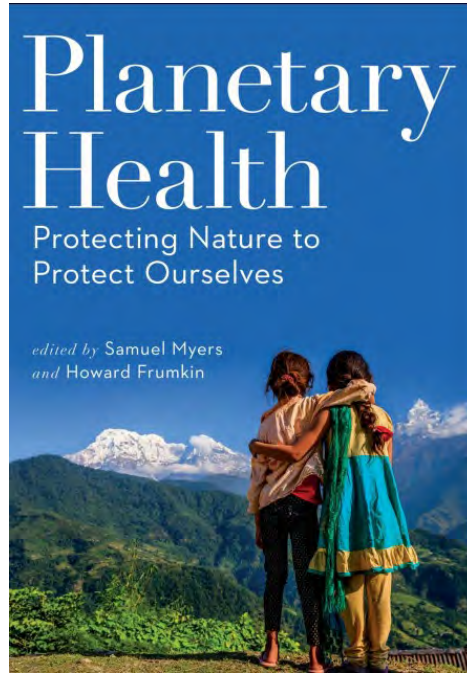
3 Promote transdisciplinarity **that involves local communities and civil society** in the science of the interface.



4 **Formulate problem-led** funding calls beyond the current standard 3-5 year project cycle.



United Nations
Educational, Scientific and
Cultural Organization

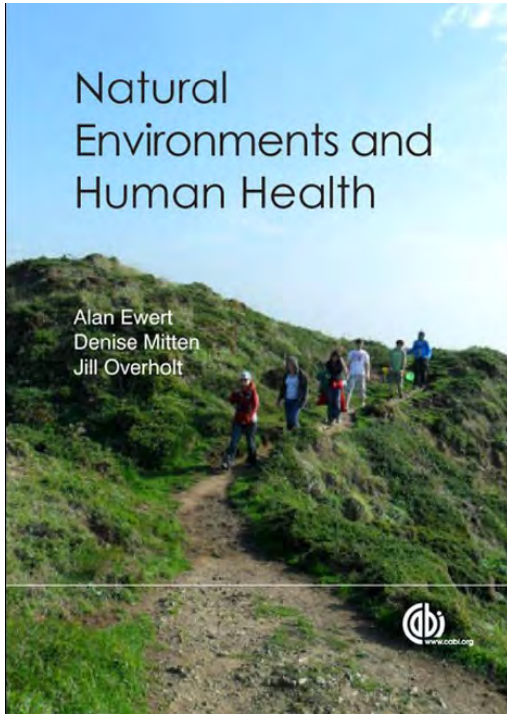
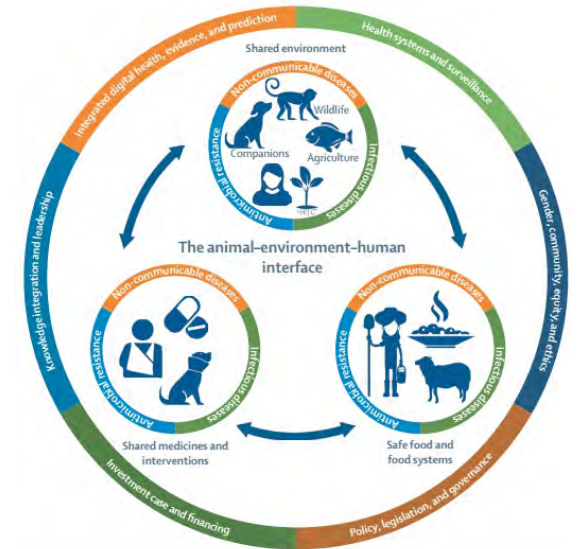
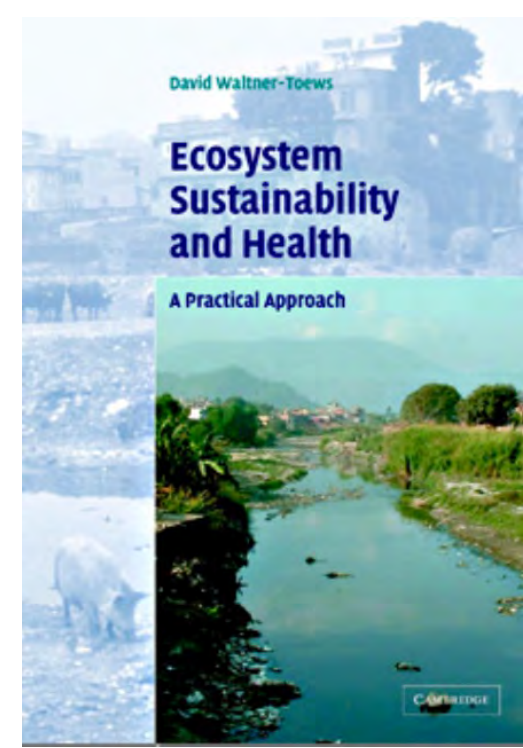
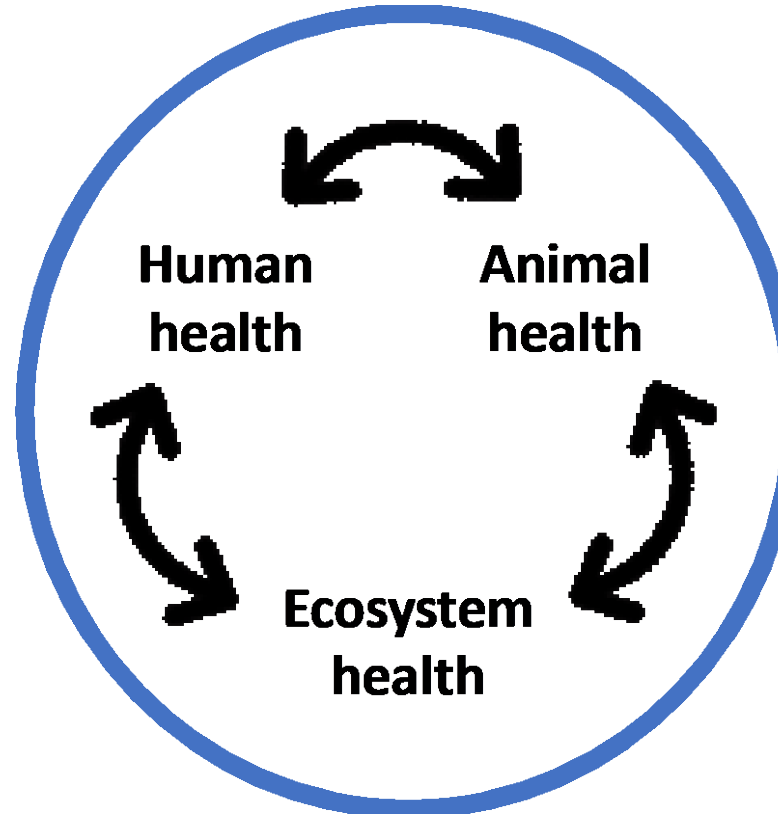


**FINDING
RESILIENCE**
CHANGE AND UNCERTAINTY IN NATURE AND SOCIETY



BRIAN WALKER

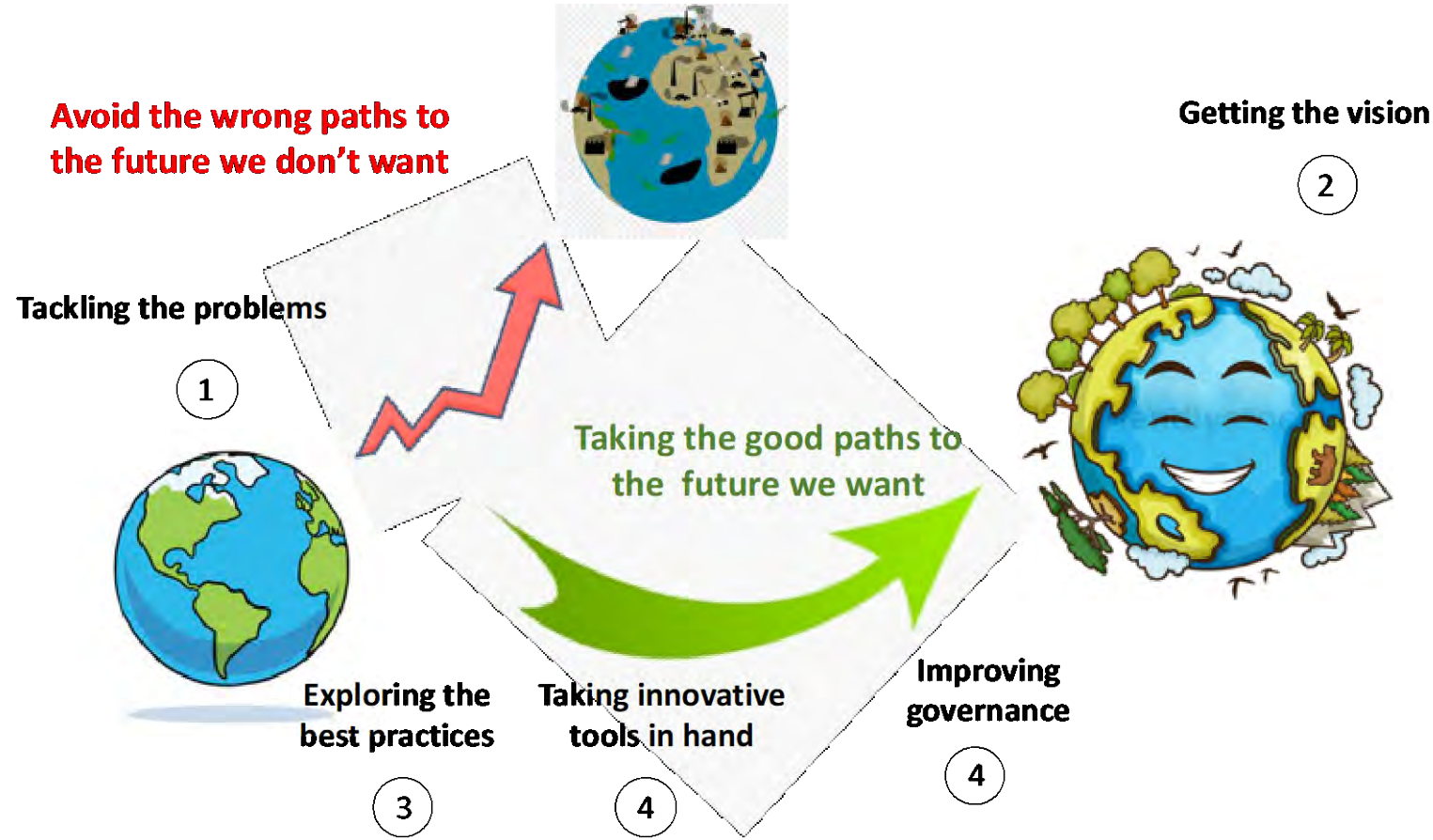
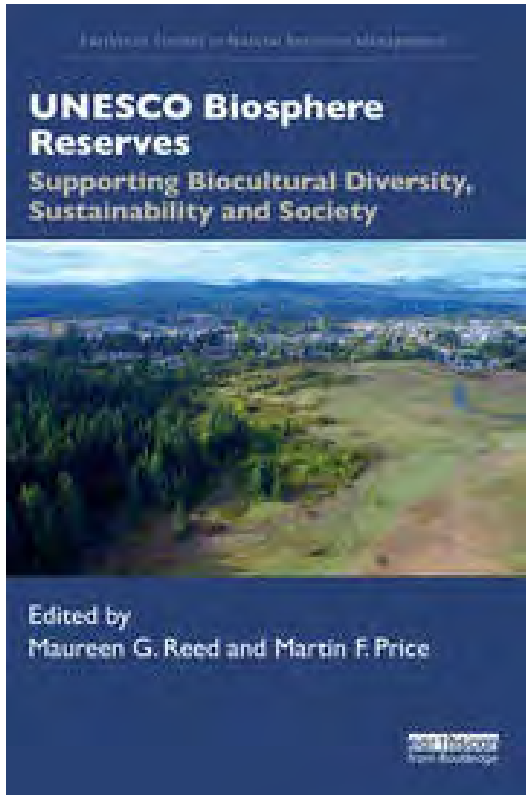
Getting the vision





United Nations
Educational, Scientific and
Cultural Organization

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



Nature-based solutions from rangeland to urban areas

Eco-pastoralism

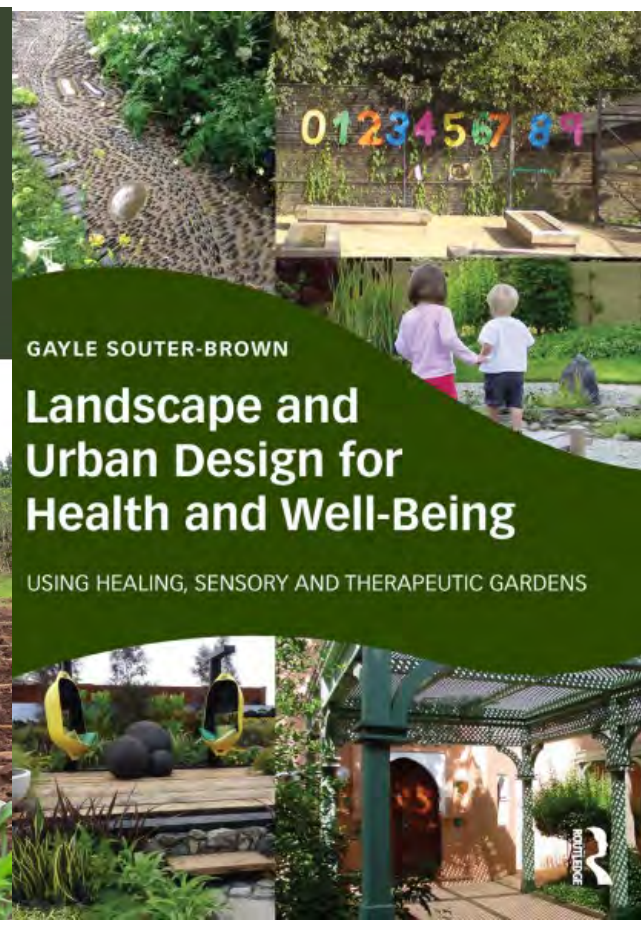
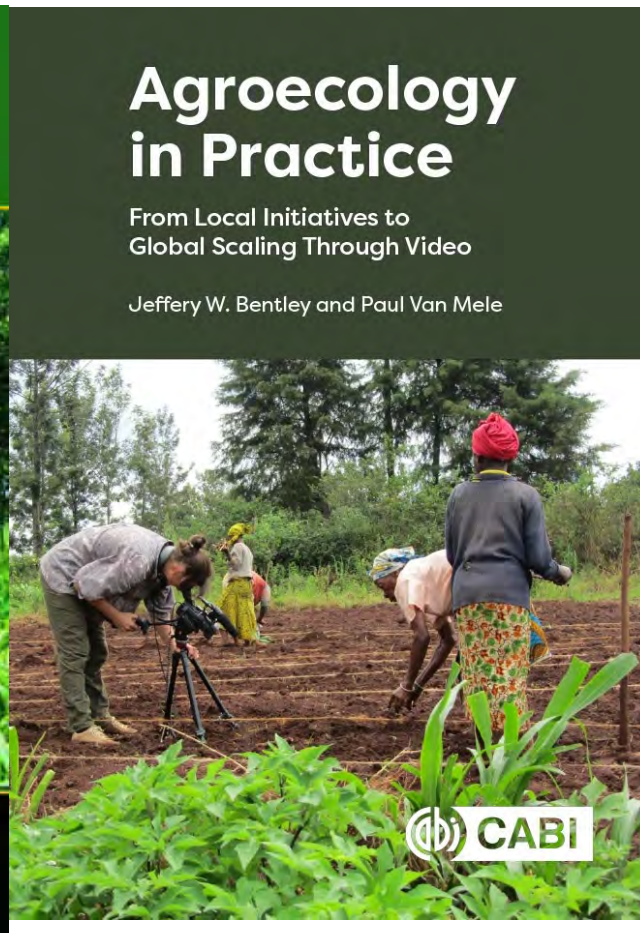
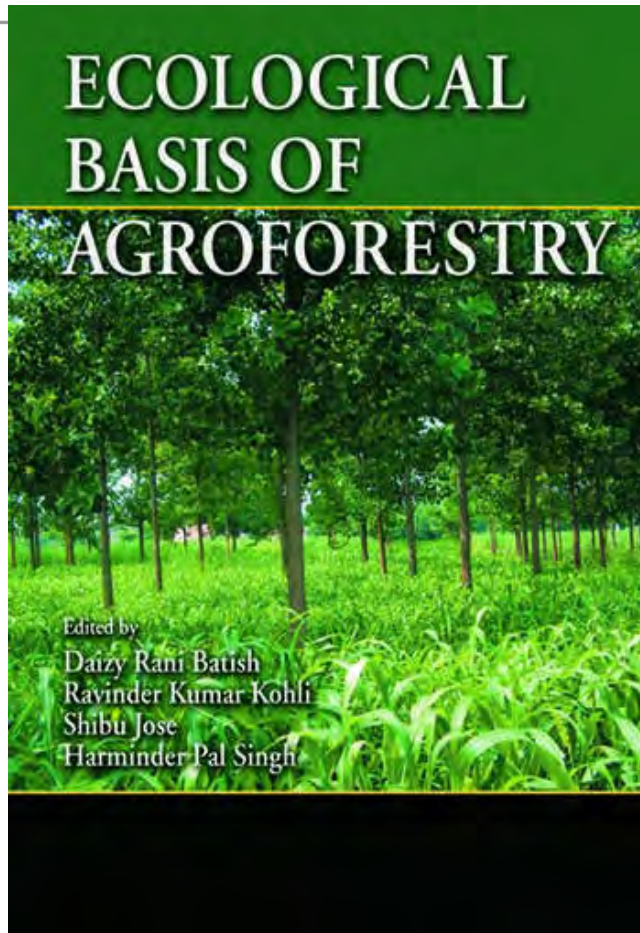
Agroforestry

Agroecology

Urban greening

A GOOD PRACTICE GUIDE

PASTORALISM, NATURE CONSERVATION AND DEVELOPMENT





Integrating Biodiversity and Health: Findings from the IPBES Nexus Report

Prof. Thijs Kuiken and Dr. Serge Morand

Chapter 5.4 Lead Authors

22 May 2025, UNEP Asia Pacific Office

www.ipbes.net

The Intergovernmental Science-Policy Platform on Biodiversity & Ecosystem Services

#NexusAssessment



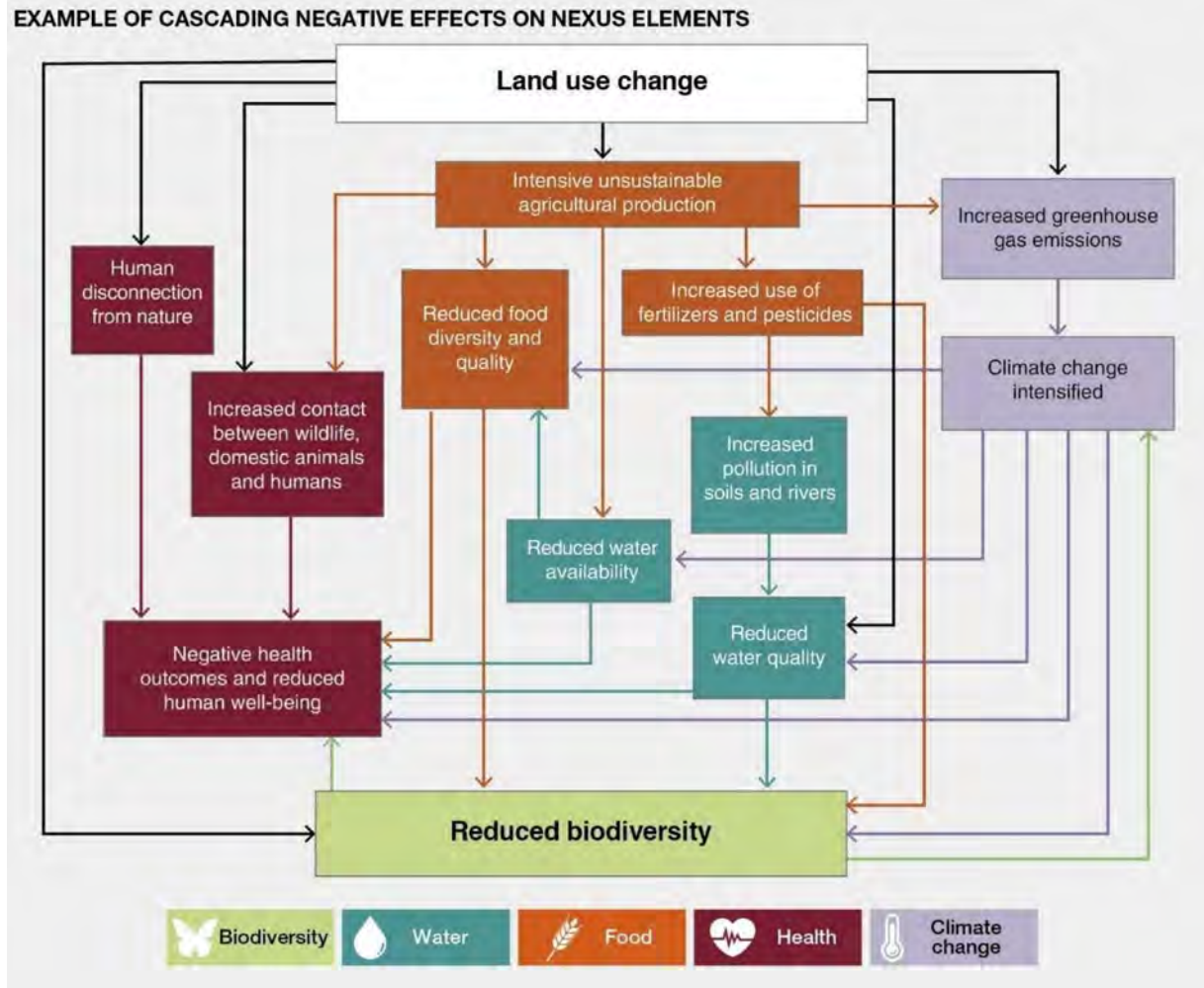
Food and Agriculture
Organization of the
United Nations





The thematic assessment report on
**INTERLINKAGES AMONG
 BIODIVERSITY, WATER,
 FOOD AND HEALTH**

SUMMARY FOR POLICYMAKERS



Nexus response options

- **Nexus response options** are **actions or policies** that support **effective, sustainable, synergistic governance and management** of the **nexus elements and their interlinkages**
- The options assessed represent a **range of solutions** available to **actors in multiple sectors**, including Indigenous Peoples and local communities – there is a **role for everyone**, **collaboration is key**
- The options can be applied at different **spatial** and **temporal scales** and in different **ecological, social, political, and economic contexts**
- **Many response options already exist** that address nexus interactions – over **70 response options** are assessed in the Chapter 5 sector-based subchapters of the report

Response options

Integrate planning and governance

Integrated watershed-health interventions

Managing risk

Biodiversity management for zoonoses

The *One Health approach*

Health Impact assessment

Urban green infrastructure

Conserve ecosystems

Forest conservation for health



Restore ecosystems






Mangrove conservation and restoration for health



Health response options positively impact all nexus elements

- Based on available evidence, **nearly all impacts** of health response options on the nexus elements **are positive**
 - **No negative impacts**
 - **No trade-offs** between elements for a given option
 - **Multiple nexus element benefits** for a given option

 **Blue dots = positive impacts**
 = no impact
 IC = inconclusive
 NE = no evidence

						
H01	Universal health coverage	IC/NE	•	•	●	•
H02	Intercultural health services	IC/NE	NE	●	●	NE
H03	Net-zero sustainable healthcare	●	●	●	●	●
H04	Sustainable use of medicinal plants	●	•	•	●	•
H05	Nature on prescription	—	—	•	●	•
H06	Reduce meat overconsumption	●	—	●	●	●
H07	Pollution prevention	●	●	●	●	●
H08	Mangrove conservation and restoration for health	●	●	●	●	●
H09	Urban green infrastructure	●	●	•	●	●
H10	Forest conservation for health	●	●	●	●	●
H11	Biodiversity management for zoonoses	●	●	●	●	●
H12	Integrated watershed-health interventions	●	●	●	●	•
H13	Health impact assessments	●	●	●	●	●
H14	The One Health approach	●	●	●	●	•
H15	Integrated health education	•	•	●	●	•



CPF GLOBAL FOREST EXPERT PANELS

GFEP ASSESSMENT ON FORESTS AND HUMAN HEALTH

Report published for the International Day of Forests 21st March 2023

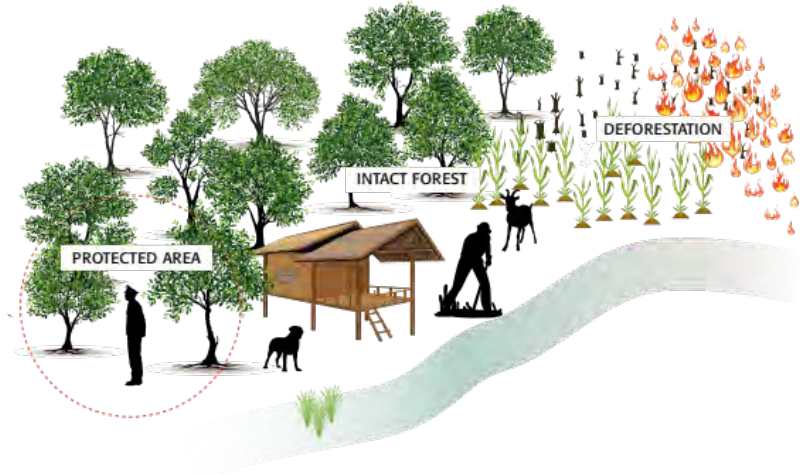
FORESTS AND TREES FOR HUMAN HEALTH: PATHWAYS, IMPACTS, CHALLENGES AND RESPONSE OPTIONS

A Global Assessment Report
 Editors: Cecil Konijnendijk, Dikshya Devkota, Stephanie Mansourian and Christoph Wildburger

IUFRO World Series Vol. 41



Examples of potential links between protected areas, forest cover, deforestation and health:



PROTECTED AREA	INTACT FOREST	DEFORESTATION
<ul style="list-style-type: none"> +) Safeguarding hydrological services that regulate microbial load, reduce flooding, and increase groundwater recharge, suppressing diarrhoea risk +) Restriction of human-wildlife contact, reducing risk of zoonotic disease transmission +) Amelioration of air pollution, restriction of access to domestic biomass fuel, and management of fire occurrence, reducing risk of acute respiratory infection +) Formalisation of sustainable access to natural resources within multiuse protected areas, which could stabilize access to forest products important for health 	<ul style="list-style-type: none"> +) Diverse host communities mitigate disease risk in individual species (the dilution effect) +) Provision of products, such as food and medicine, important for health +) Provision of social and cultural functions, such as recreation, that support mental, social, and physiological health +) Predator populations might suppress vector abundance, regulating disease risk 	<ul style="list-style-type: none"> +) Income from extractive activities, new employment opportunities, and agriculture, which can improve diets, and access to health care, and buffer against environmental risks +) Increase in dietary quality from agriculture in some cases +) Can be associated with the expansion of other industrial activities, which might reduce some disease risks



Synthesis Report

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





Assessing and Reducing Infectious Disease Risks in Protected and Conserved Areas: the MAP-ACT-CREATE for One Health Toolkit

xxxxxxxxxxxx
xxxxxxxxxxxx

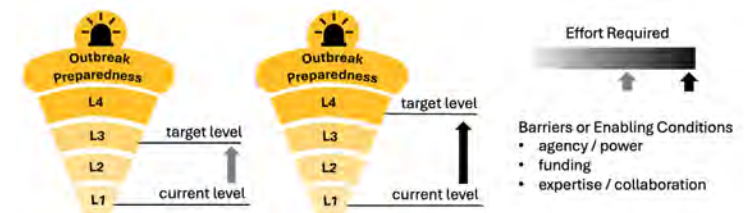
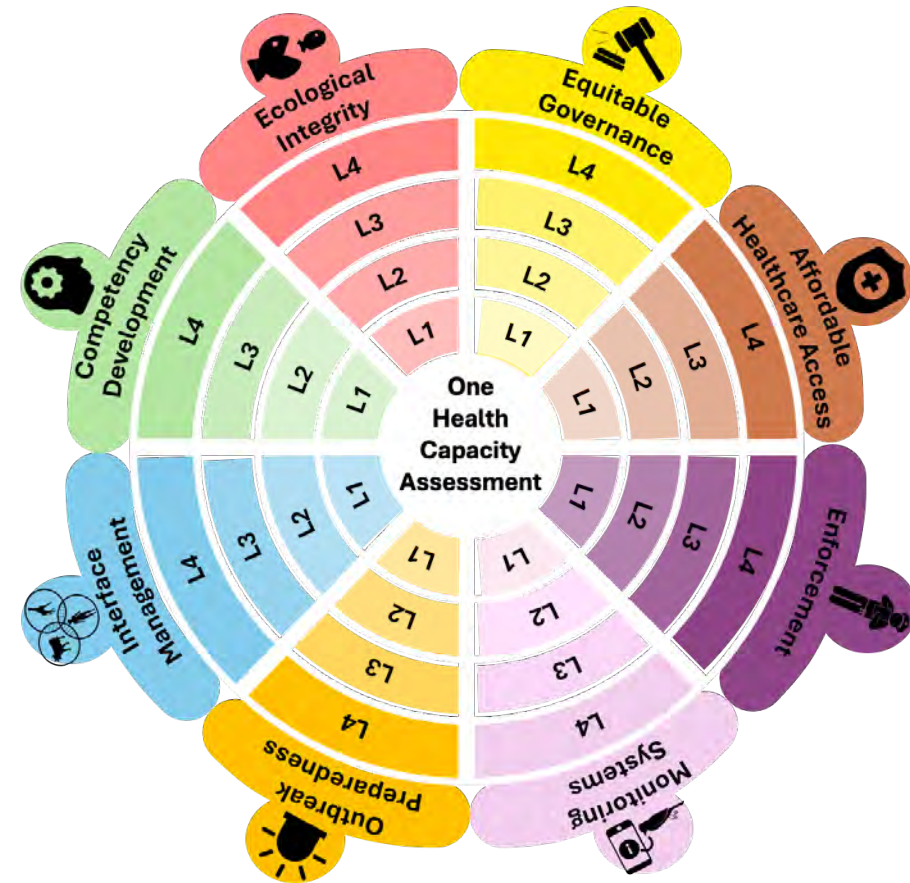


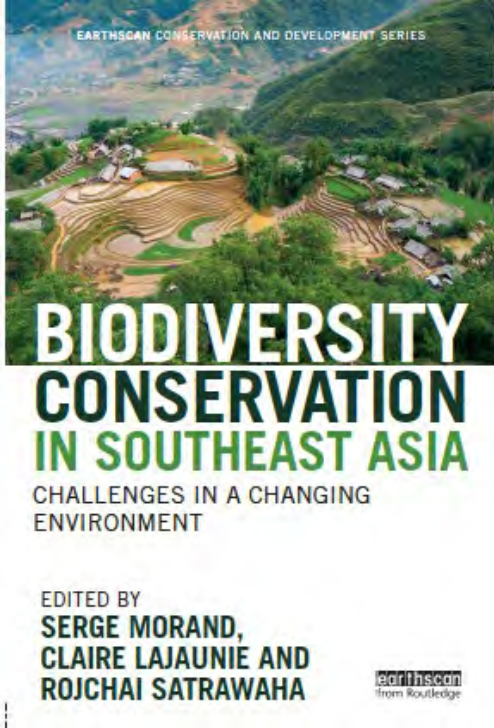
IUCN WCPA Technical Report Series No. ?



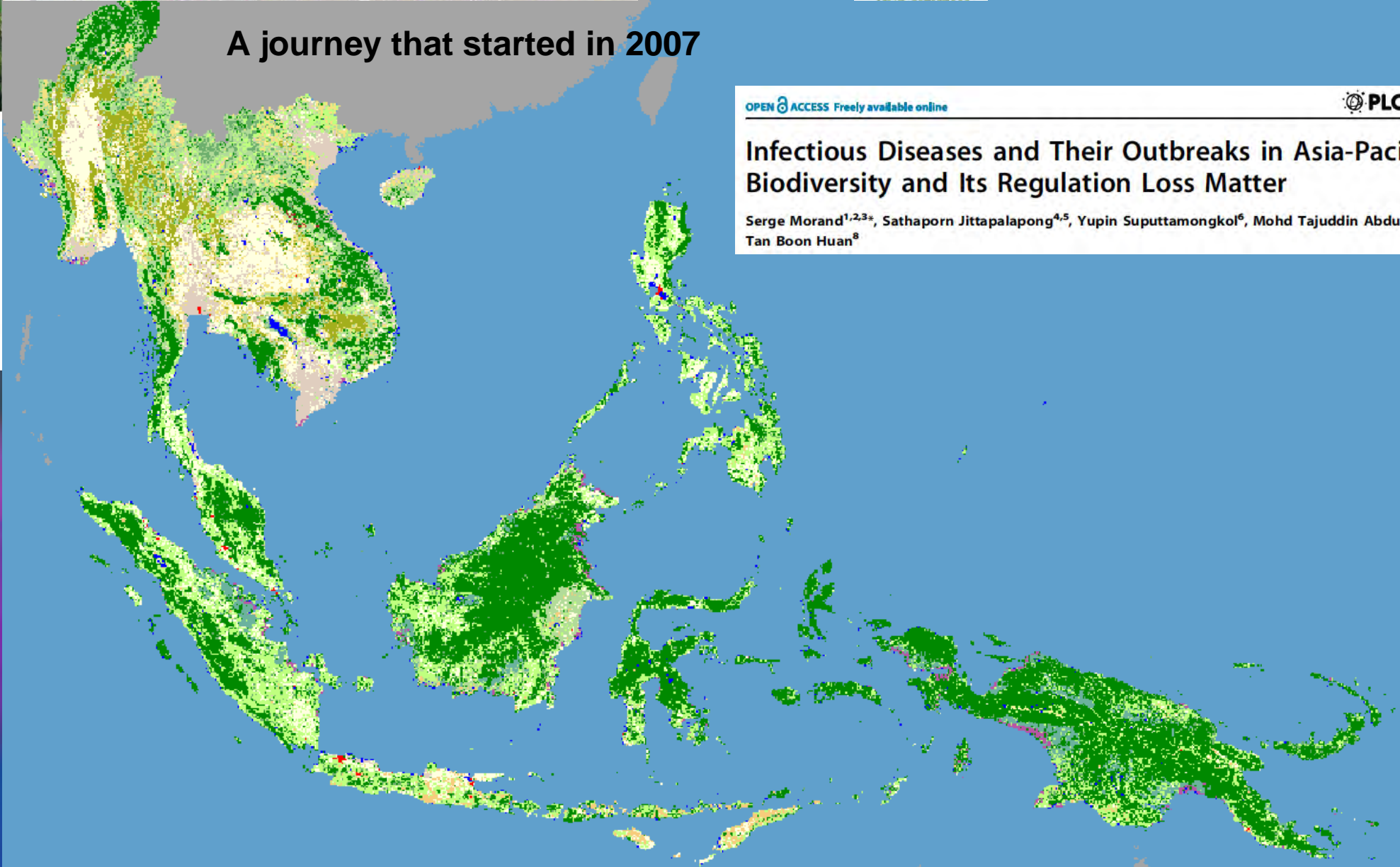
Soon to be released!

Protected Areas and One Health





A journey that started in 2007



OPEN ACCESS Freely available online

Infectious Diseases and Their Outbreaks in Asia-Pacific: Biodiversity and Its Regulation Loss Matter

Serge Morand^{1,2,3*}, Sathaporn Jittapalpong^{4,5}, Yupin Suputtamongkol⁶, Mohd Tajuddin Abdullah⁷, Tan Boon Huan⁸

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

Socio-Ecological Dimensions of Infectious Diseases in Southeast Asia

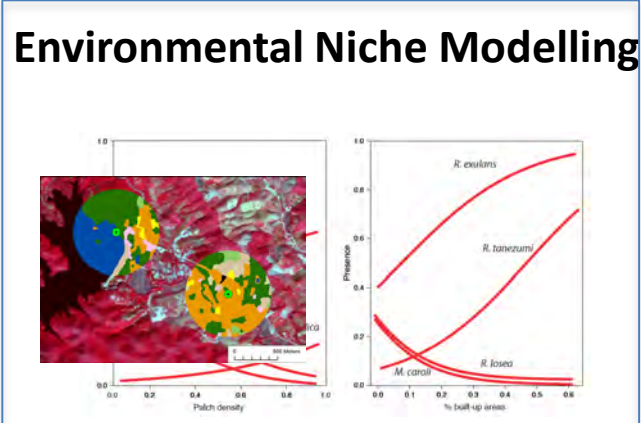
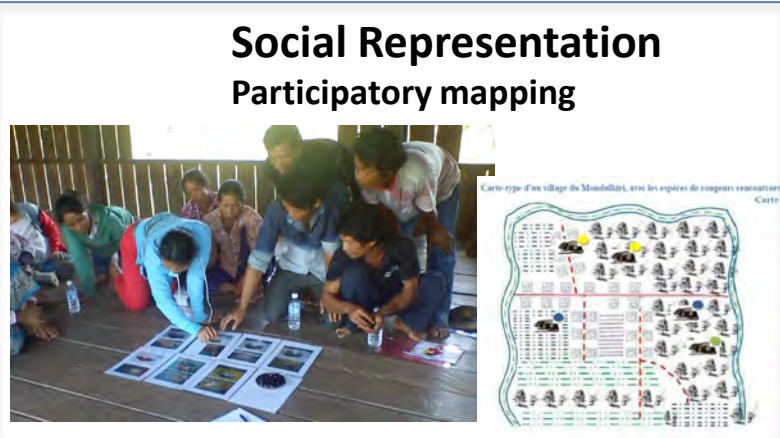
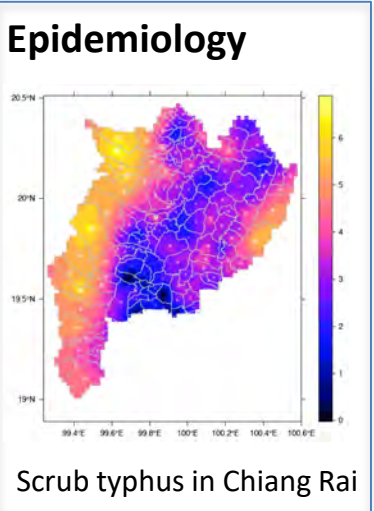
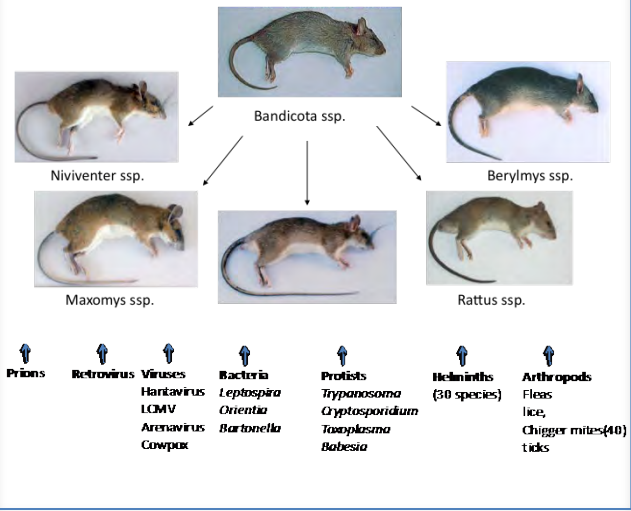
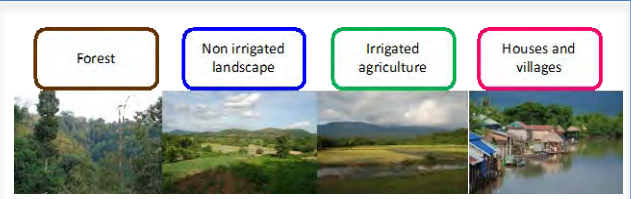
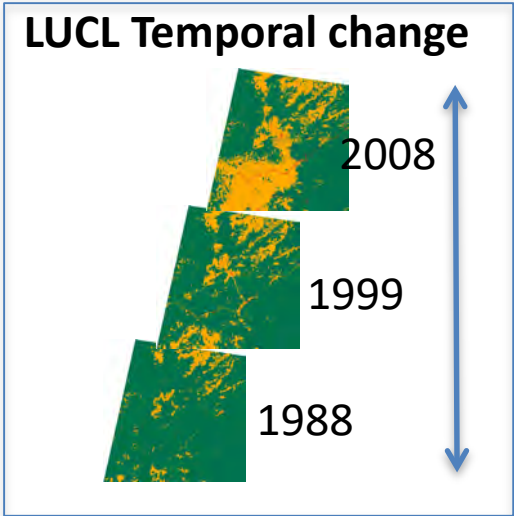
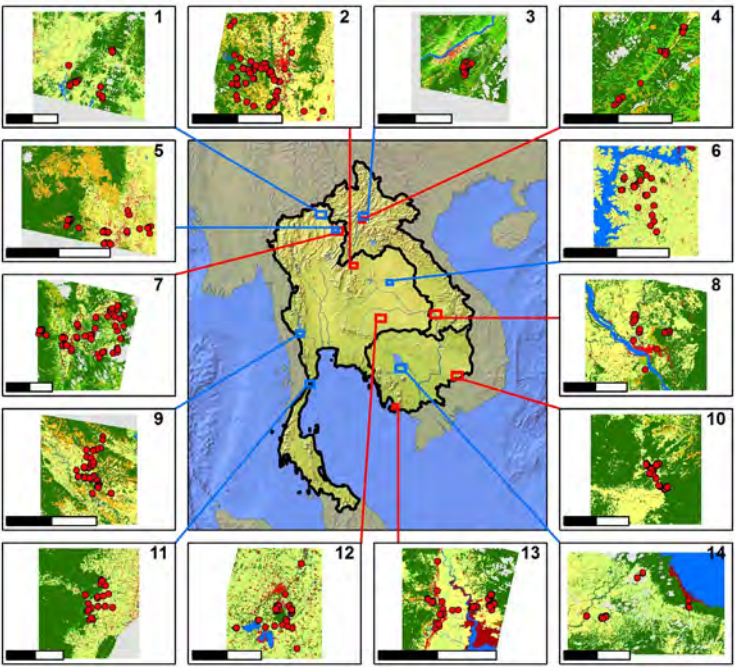
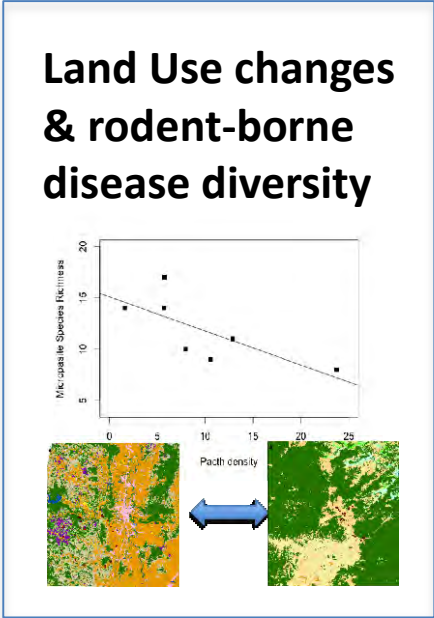
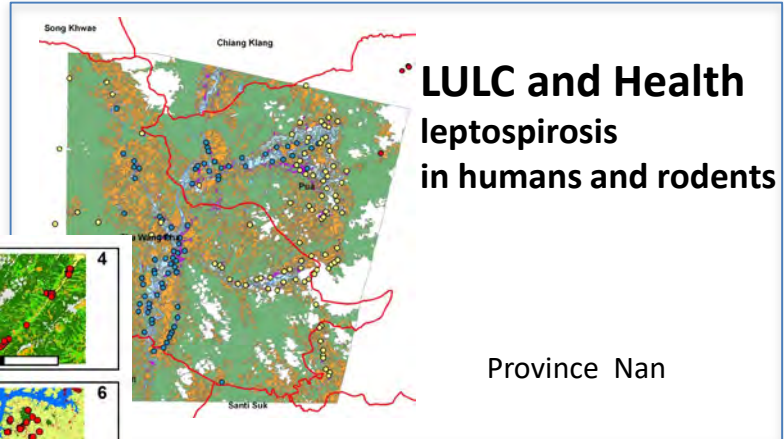
Springer

CERoPath 2008 ... 2022

BiodivHealthSEA

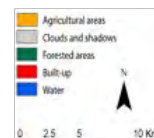
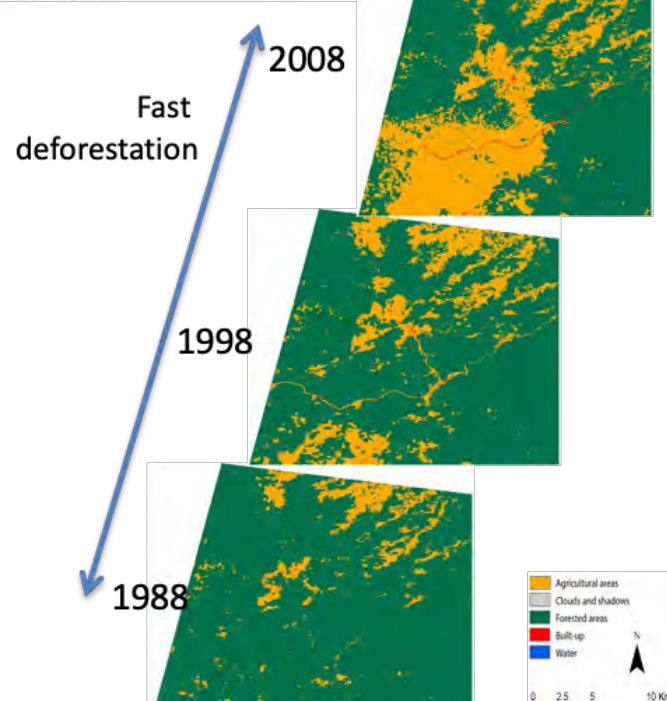
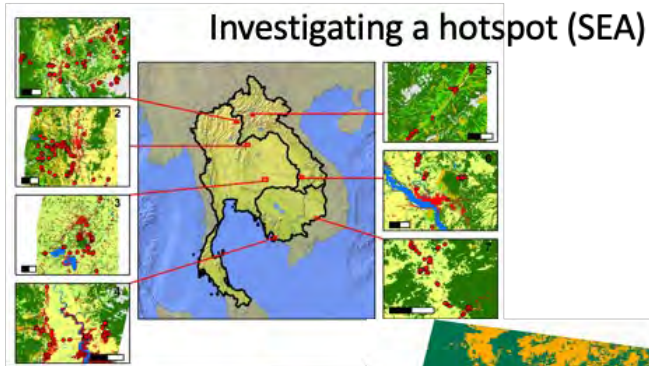
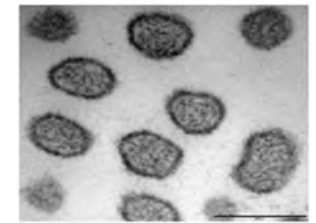
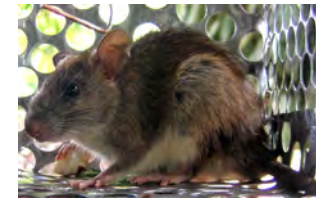
FutureHealthSEA

34 field trips
14 Land use developed
4,000 rodents & pathogens

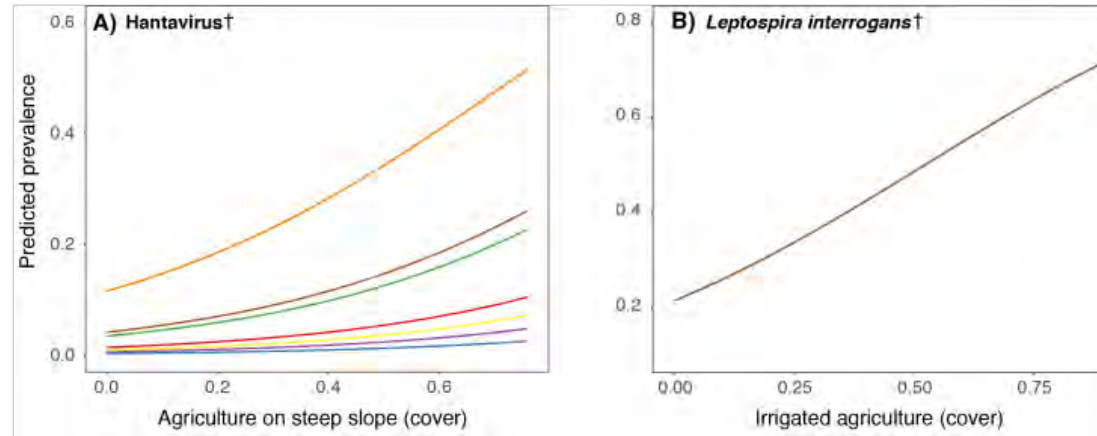


Changing landscapes of Southeast Asia and rodent-borne diseases: decreased diversity but increased transmission risks

SERGE MORAND,^{1,2,17} KIM BLASDELL,³ FRÉDÉRIC BORDES,⁴ PHILIPPE BUCHY,^{5,6} BERNARD CARCY,⁷ KITTIPONG CHAISIRI,²
YANNICK CHAVAL,⁸ JULIEN CLAUDE,⁴ JEAN-FRANÇOIS COSSON,⁹ MARC DESQUESNES,^{10,11} SATHAPORN JITTAPALAPONG,¹²
TAWISA JIYIPONG,^{10,13} ANAMIKA KARNCHANABANTHOEN,^{7,12} PUMHOM PORNPAN,^{10,14} JEAN-MARC ROLAIN,¹³ AND
ANNELISE TRAN^{15,16}



Linking changing landscape and Ro-Bo diseases



Increasing rodent-borne disease risks with agricultural extension and urbanisation

Saenthong, Thawangpha, Nan Province

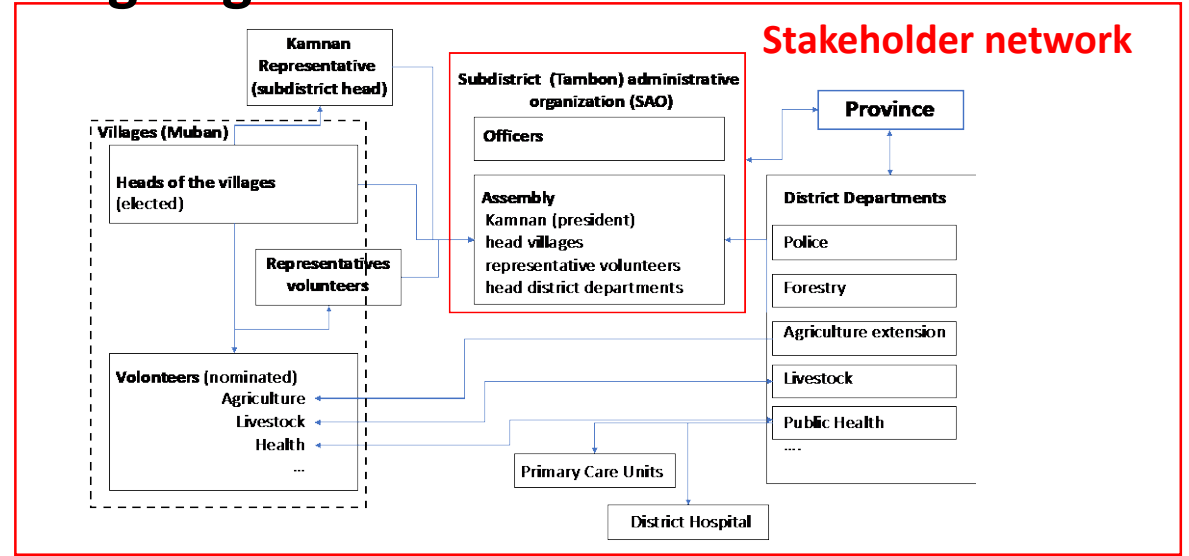
12 years of projects with local communities and administrations



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



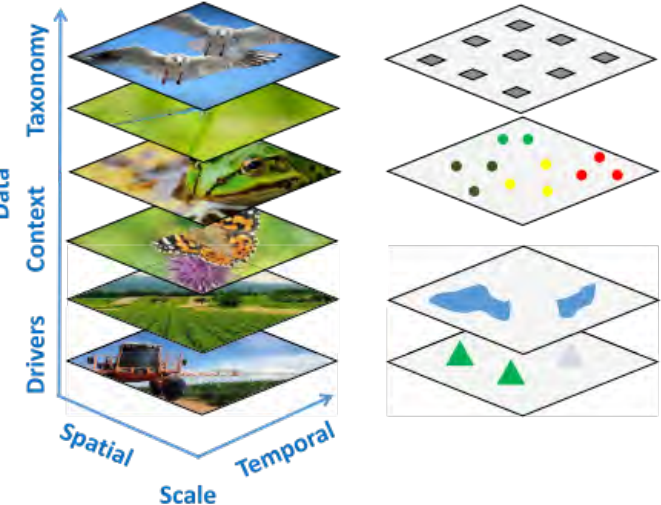
Community engagement



Studies (technical design)	Financial support	Date	Engagement
Rodent-borne zoonoses	ANR CERoPath, ANR BiodivHealthSEA	2008-2016	Animal ethics
Tick-borne diseases	métaprogramme INRA	2014-2015	Animal ethics, ethics, consents
Mosquito-borne diseases	FutureHealthSEA, MU Trop Med	2018-2021	Animal ethics, ethics, consents
Food-borne diseases	BiodivHealthSEA, FutureHealthSEA	2012-2021	Animal ethics, ethics, consents
Antimicrobial resistance	ANR FarmResist	2018-2021	Animal ethics, ethics, consents
Exposome pesticides,	FutureHealthSEA	2018-2021	Animal ethics, consents, community engagement
Animal traditional pharmacopea	DIM Santé, IRD-Collège de France	2020-2021	Nagoya Protocol, community engagement
Microbiota	FutureHealthSEA, FarmResist, MU TropMed	2018-2020	Animal ethics, ethics, consents
Rickettsial diseases	MOURU	2020-2021	Animal ethics, human ethics
Dog & community health	ANR SEAdogSEA	2019-2021	Animal ethics

Biodiversity Information

Technical Design





Kittipong Chaisiri

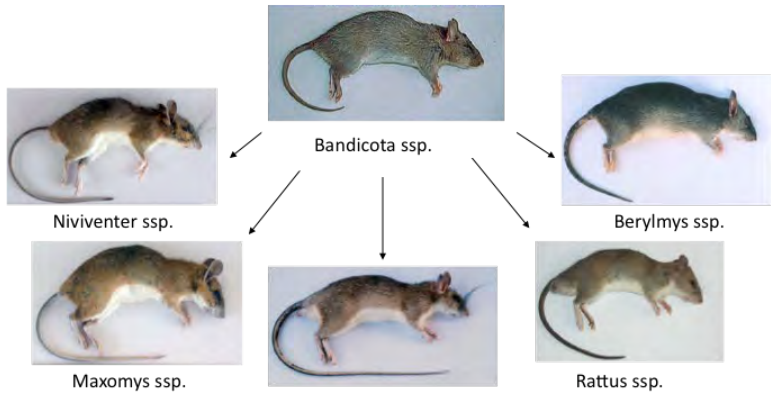


Anamika Kittiyakan



Chuanphot Thinphovong

Biodiversity



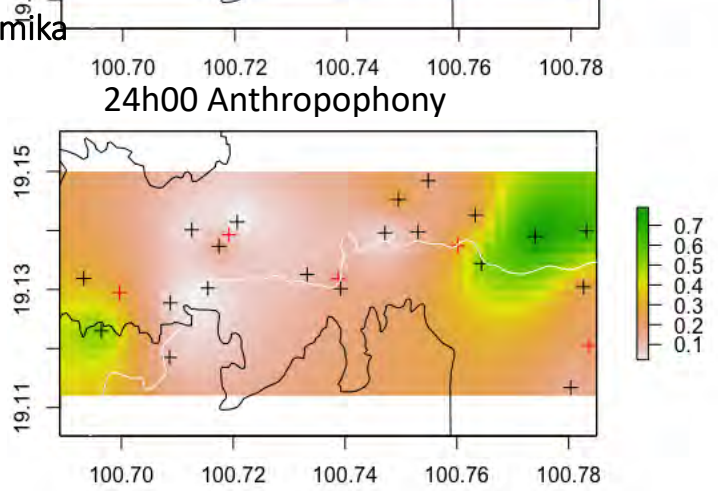
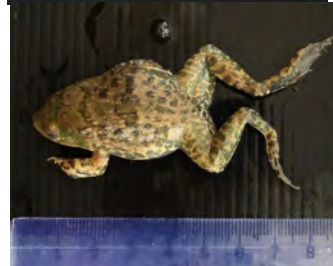
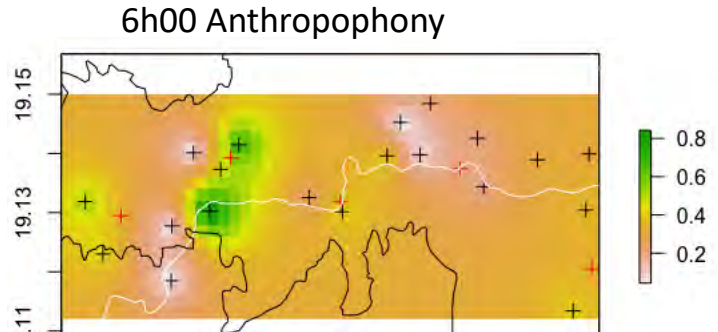
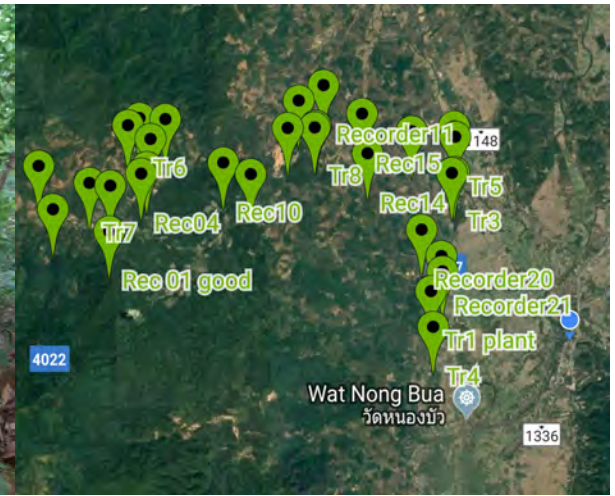
- Retrovirus**
- Viruses**
Hantavirus
LCMV
Arenavirus
Cowpox
- Bacteria**
Leptospira
Orientia
Bartonella
- Protists**
Trypanosoma
Cryptosporidium
Toxoplasma
Babesia
- Helminths (30 species)**
- Arthropods**
Fleas
lice
Chigger mites(40)
ticks



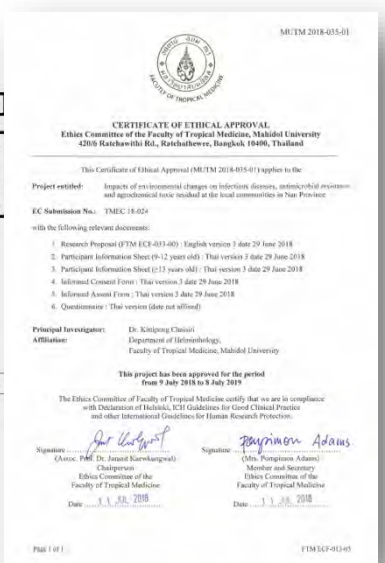
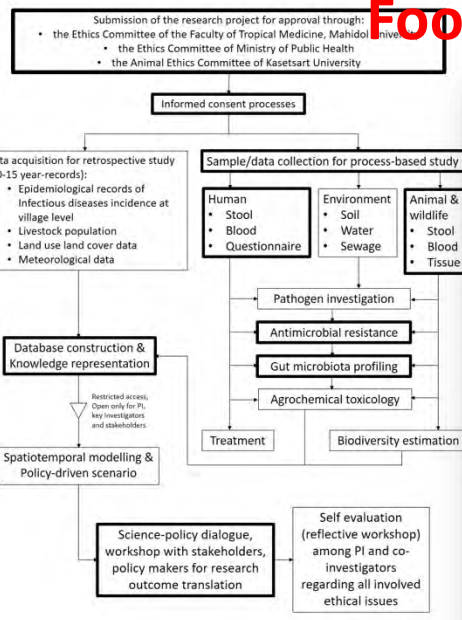
Domestics



Soundscape ecology



Food-borne diseases



Ajala Prommi

Kittipong



Technical design

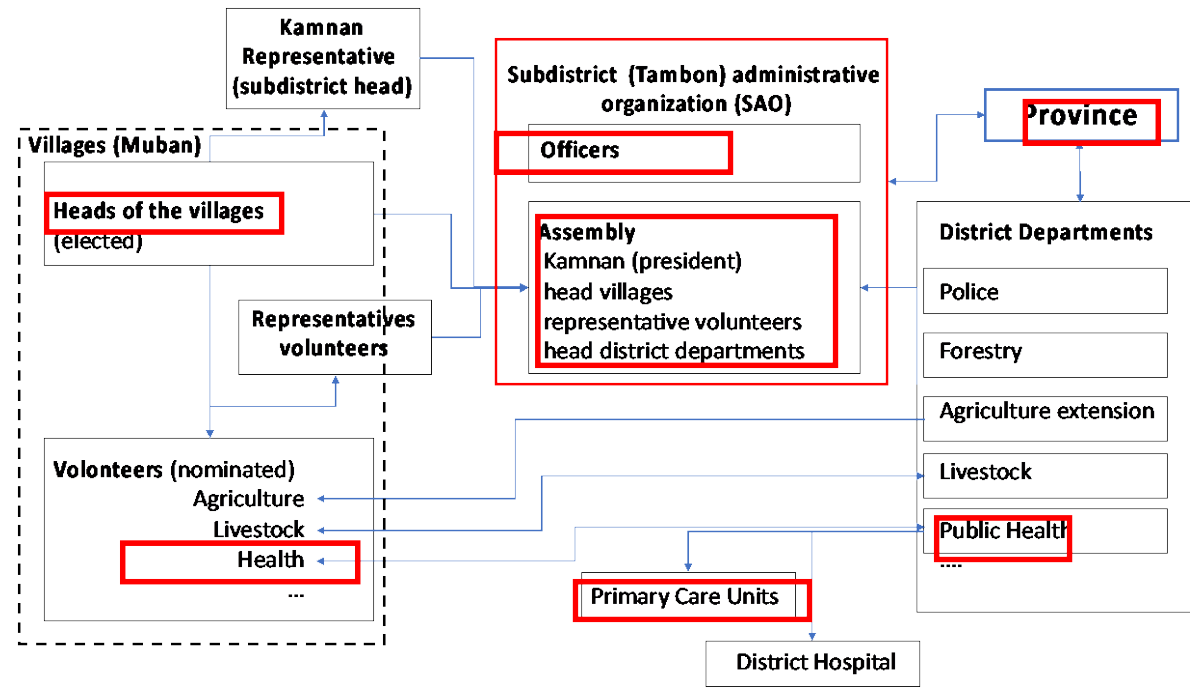
Ethics

Stakeholder network

Epidemiology / questionnaires



Food contest (health education)



A Social-Ecological and One Health Observatory: Ten Years of Collaborative Studies in Saen Thong (Nan, Thailand)

This One Health case reports ten years of collaborative projects between researchers of several institutions of France and Thailand and local communities, local authorities and administrations in Saen Thong sub-district (Nan Province, Thailand). Saen Thong's experience recognizes the role of the primary care unit (PCU) as a boundary spinner and the importance of ethics at the core of the community engagement.

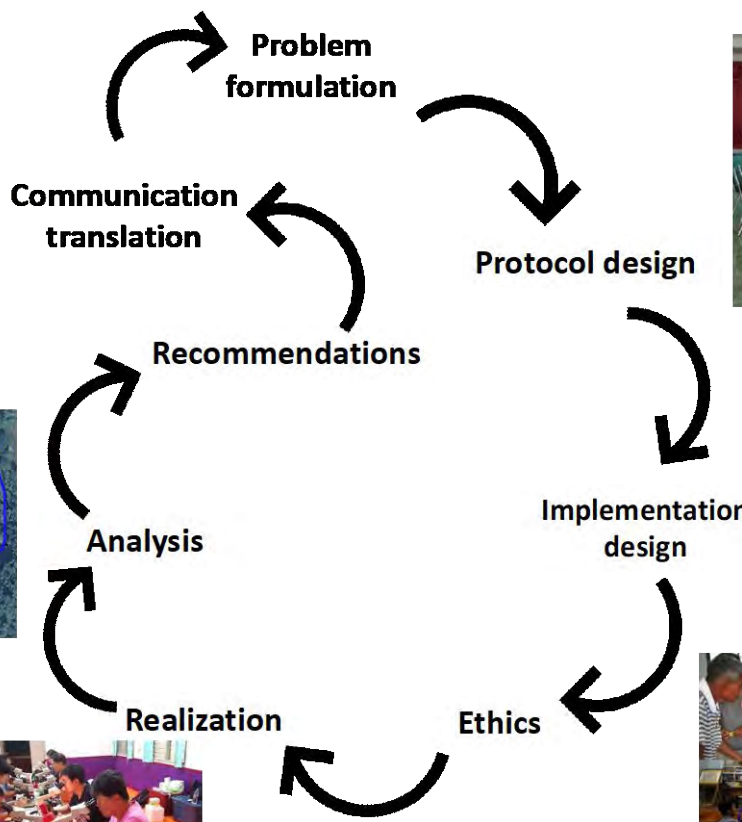
Authors: Kittipong Chaisiri¹, Anamika Kritiyakan², Rawadee Kumlert³, Claire Lajaunie⁴, Purin Makaew¹, Serge Morand⁵, Yossapong Paladsing², Malee Tanita⁶, and Chuanphot Thinphovong¹



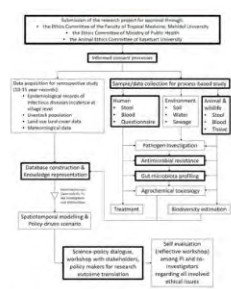
A healthy food contest



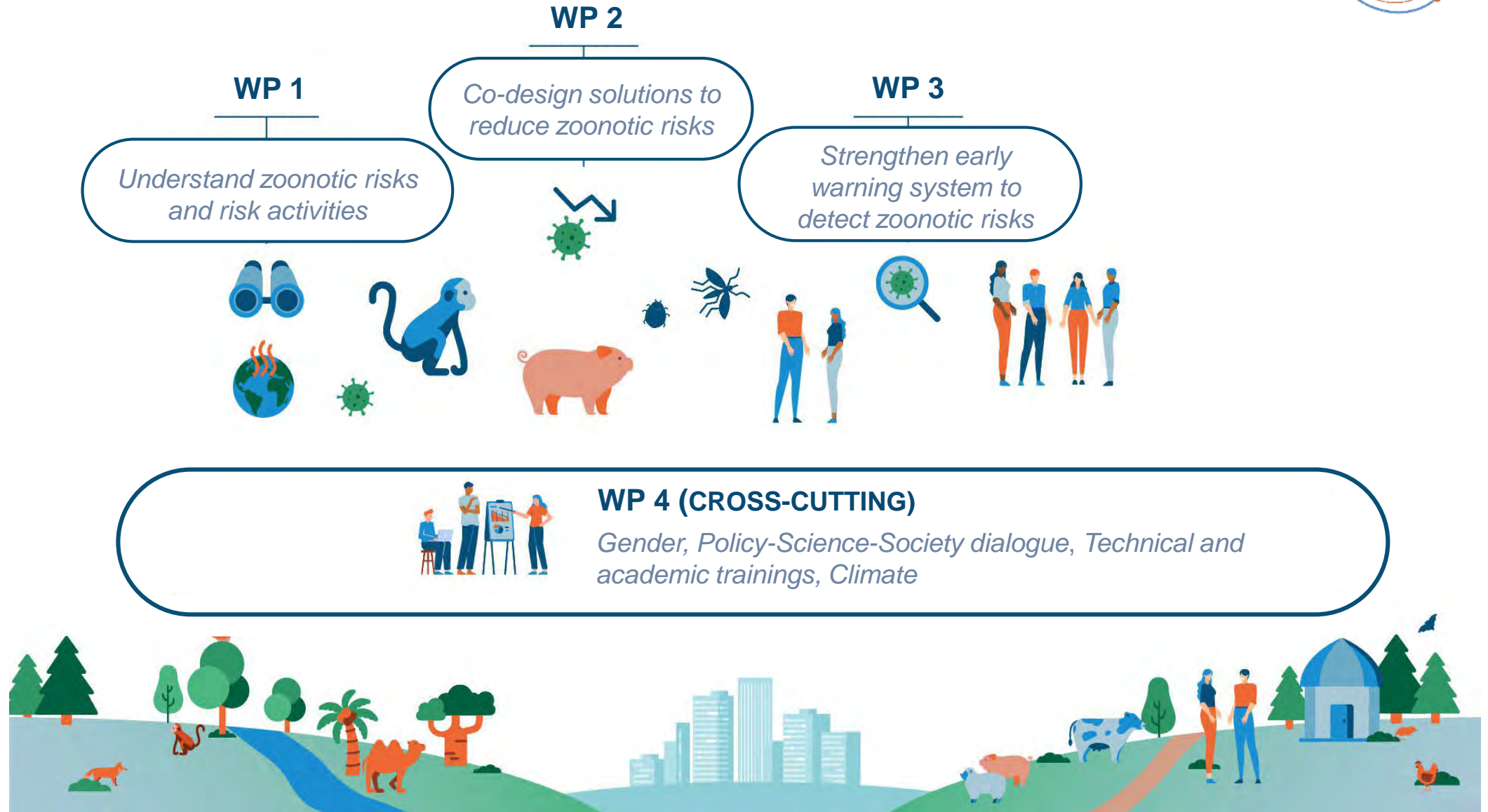
Mapping health issues



Community engagement



PREACTS : The first operational project of the PREZODE initiative in the global south



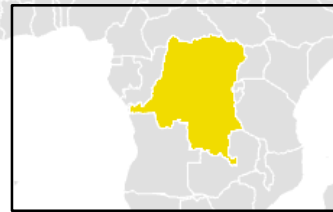
ASAMCO (PRACT 2), a regional approach



American and Caribbean Region:

Mexico, Haiti and Costa Rica

PIs: Audrey Arnal (IRD) & Gerardo Suzán (UNAM)



African Region :

Democratic Republic of the Congo (DRC)

PIs: Martine Peeters (IRD) & Steve Ahuka (INRB)



SouthEast Asia Region:

Lao + Thailand

PIs: Serge Morand (CNRS) & Soawapak Hinjoy (MoH Thailand)

ASAMCO Asia: Laos and Thailand

Boarder provinces, which will help to prevent zoonotic transboundary diseases.

- **Analyze wildlife interfaces:** Identify wildlife interaction points and analyze gaps in zoonotic disease prevention, focusing on ecosystems, land use changes, livestock proximity to protected areas, urbanization, and economic activities.
- **Synthesize existing knowledge:** Map past and ongoing projects to understand their objectives, methods, outcomes, and geographic focus.
- **Strengthen policies and legislation:** Highlight policy and legislative gaps related to wildlife and zoonotic disease management.
- **Develop a comprehensive framework:** Create a Theory of Change (ToC) to address zoonotic risks at the ecosystem level with clear targets, strategies, and indicators.
- **Foster local innovation:** Implement innovative, site-specific actions to prevent, mitigate, and monitor zoonotic diseases in collaboration with local communities and administrations.



CIM Laos



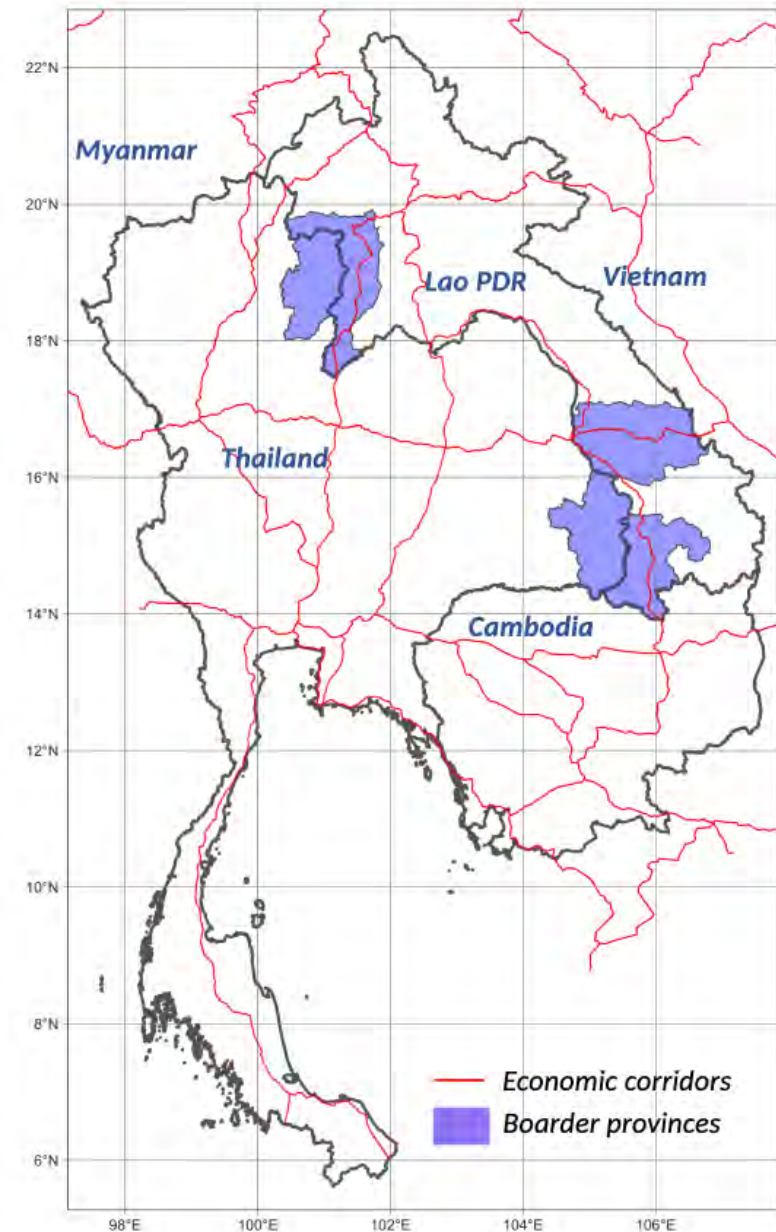
AVSF



WCS



WWF

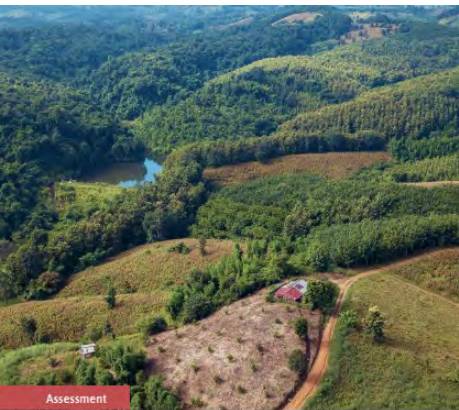


August 26, 2025

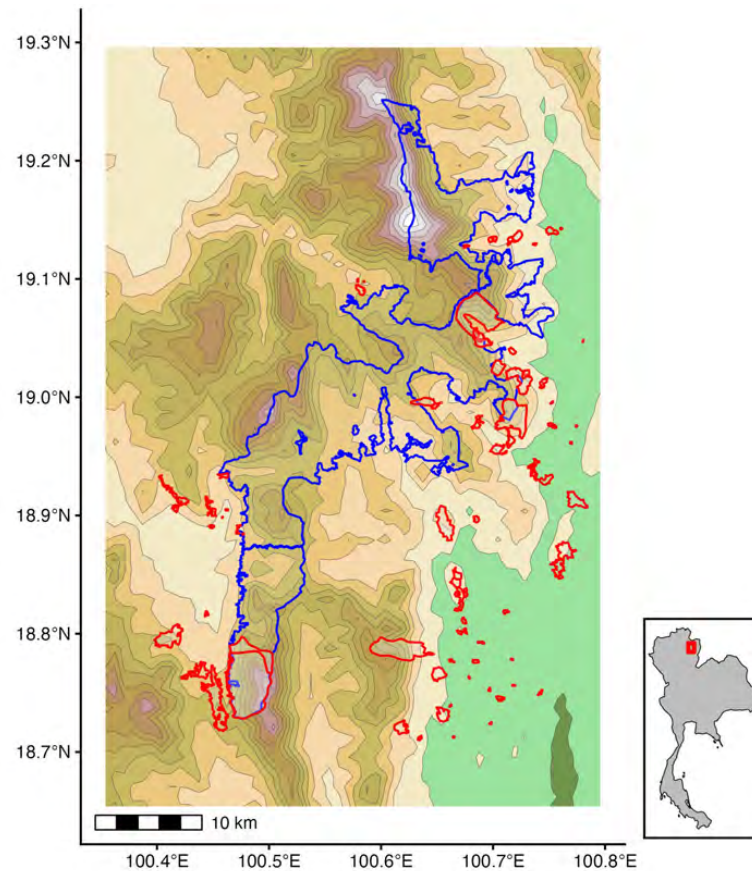
**The Local Kick off meeting at local level at Sob Khun School,
Sob Khun village,
Pha Ka subdistrict, Thawang pha district, Nan province**



REWILDING AND REFORESTATION-BASED SOLUTION FOR REDUCING ZONOTIC RISK USING A ONE HEALTH APPROACH



Thailand's Community Forest Act



Objectives:

- 1) To assess the **contribution of community reforestation to biodiversity** through **rewilding**;
- 2) To demonstrate that **reforestation and rewilding** are effective solutions **to reduce the risk of zoonotic disease transmission** in a One Health approach.



Participatory Mapping (Reforest Project)

Nan Province

Phurin Makaew

Focus group

16-22 / 05 / 2023

22-28 / 06 / 2023

Ban Huai Muang

Ban Nam Pak

Ban Nam Ngao

Ban Sai Thong

Ban Santiphap

Ban Phi Nueu

Ban Huai Tuem

Ban Khue

Ban Fa

Ban Pong Si

Reforest of Ban Huai Muang



Community forest rules

(If anyone disobeys the rules, there will be a penalty)

- Do not cut down trees
- Do not encroach on forest areas

Belief in forest preservation

August-October (every year) the villagers pay homage to the “Pee Khun Nam” (forest gods) They used pig and chickens as offerings to want the forest gods to protect all villagers, village, and agricultural crops including forests and water resources.

Reforest of Ban Huai Muang

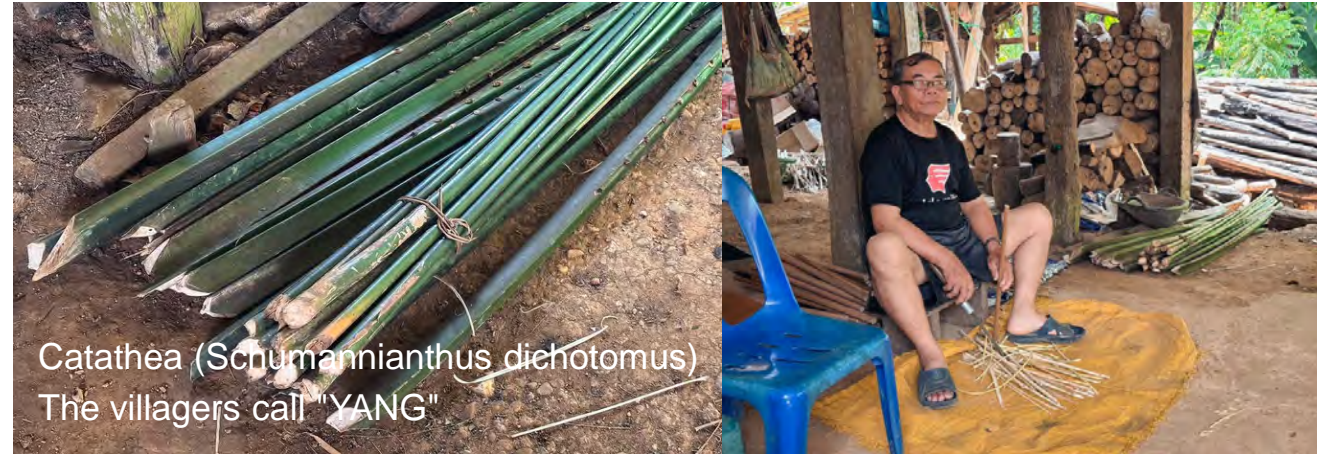
Benefits of villagers from reforestation

Villagers can collect non-wood products in the CF and other forests around the village (bamboo, bamboo shoot, sugar palm, rattan, banana blossom, catathea)



Product

- Catathea + Branches of sugar palm
37 Catathea can do KHAN TOKE
7 Pieces (1 piece / 65 THB)
- They use bamboo to weave hats
(8.5 THB / piece)

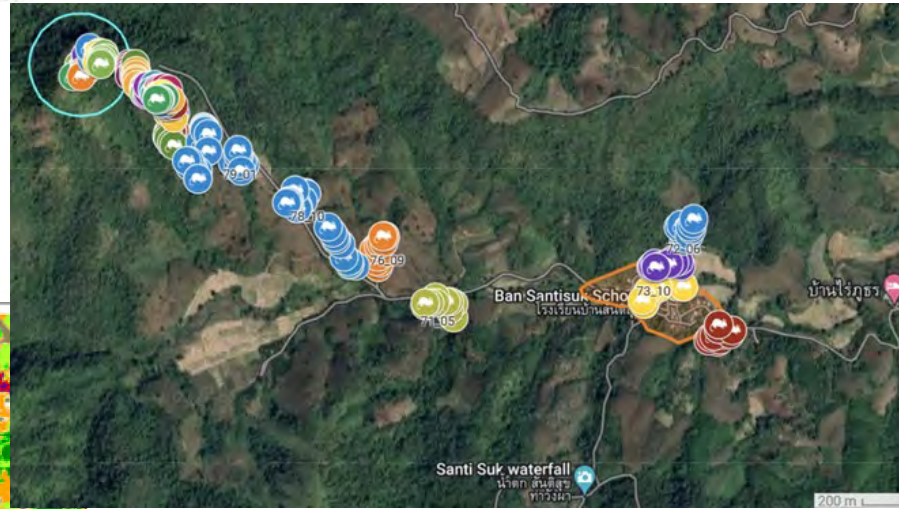
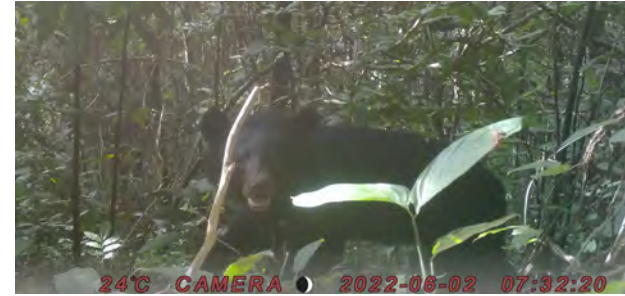


- Villagers can hunt the wildlife (wild boar, barking deer, squirrel, peacock, pheasant, bear, hawk, jungle fowl, bat).
- Villages have water for use in village and agricultural areas.
- Compensation for helping to maintain the forest.

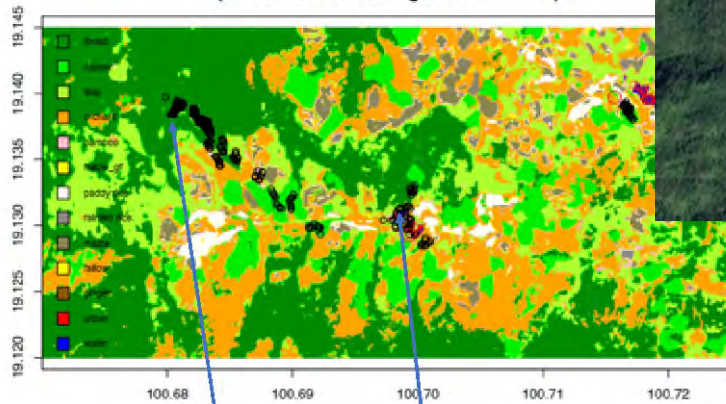
Does rewilding following reforestation mitigating zoonotic health risk?



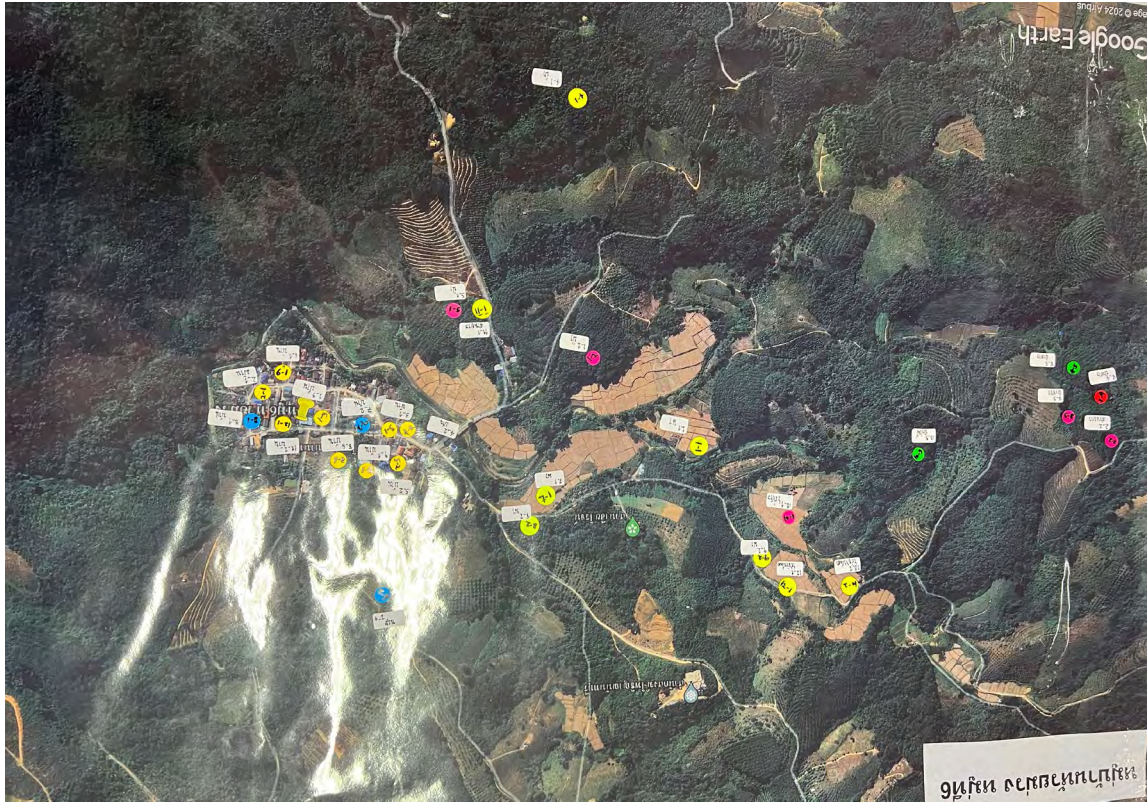
Camera traps



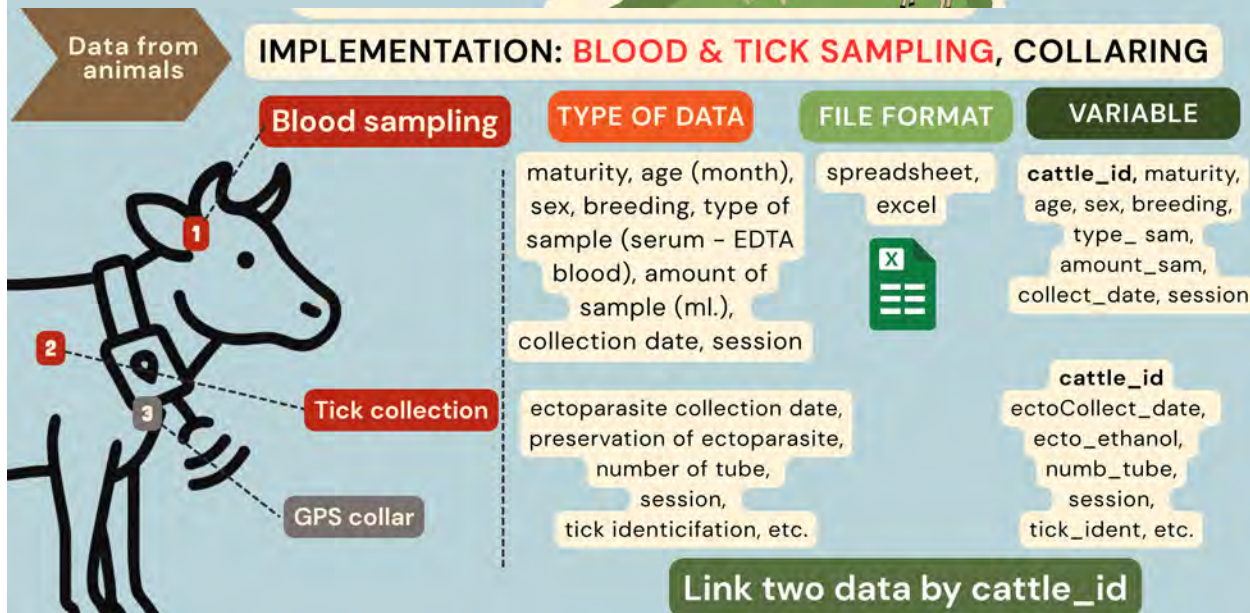
Classified Santisuk and Huay Muang
(with localisation of villages and rodent traps)



Participatory mapping Local Ecological Knowledge



CASE STUDY: LIVESTOCK MOVEMENT IN BUNTHARIK DISTRICT UBON RATCHATHANI THAILAND

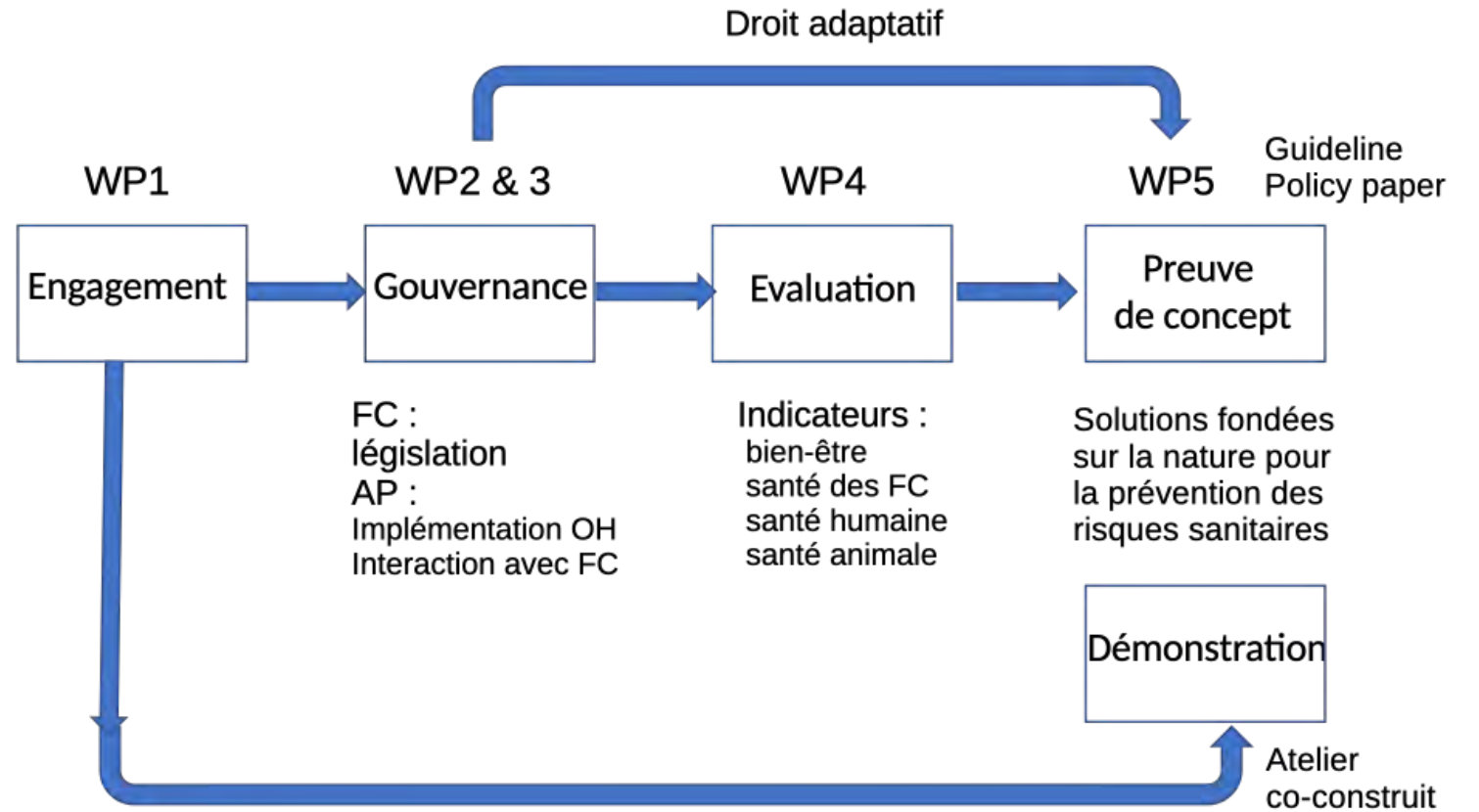
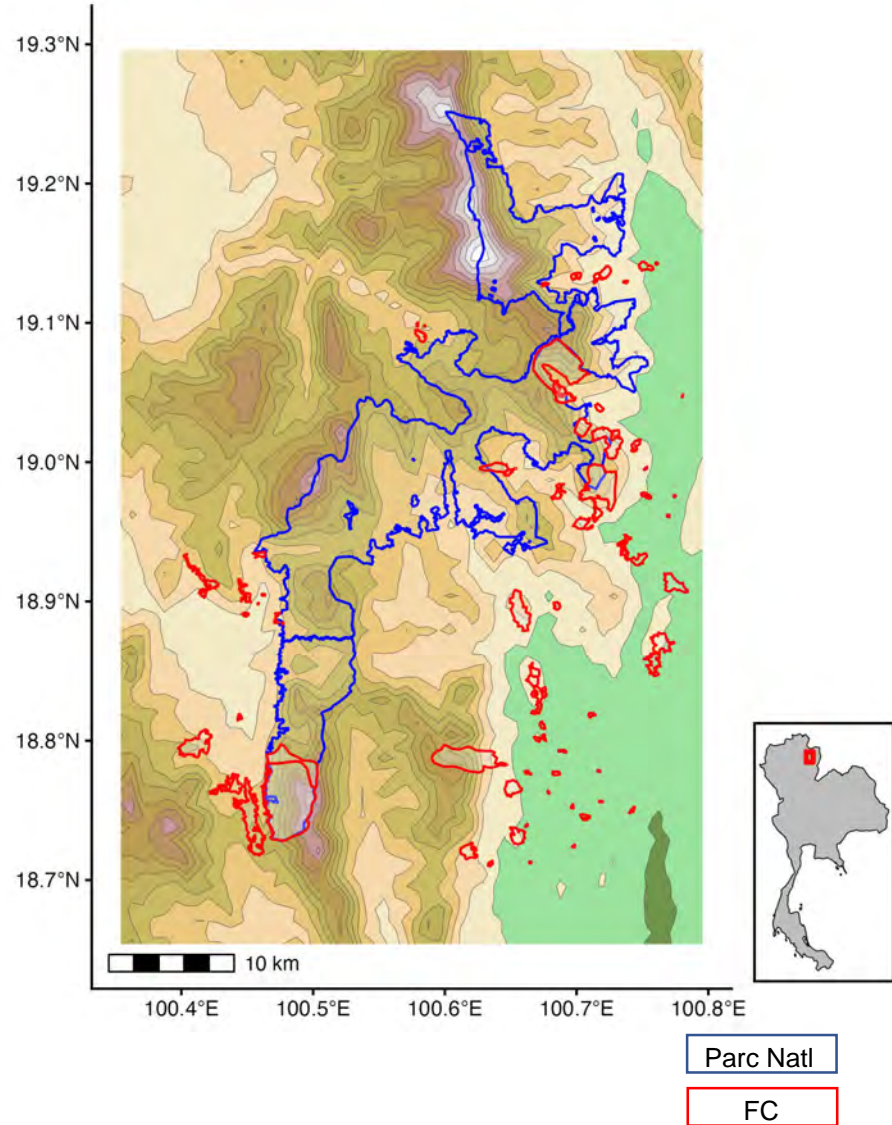


Eco-pastoralism:

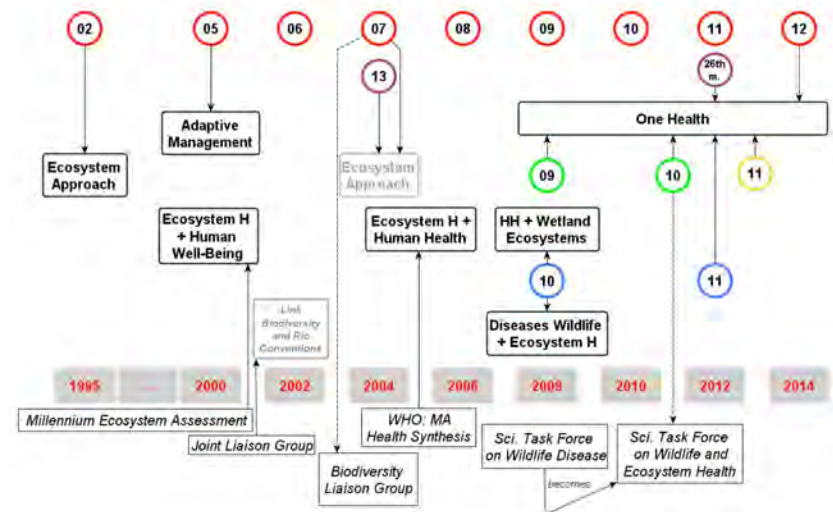
- 1) To assess the **zoonotic risk** at the livestock / wildlife / forest ecosystem
- 2) To demonstrate that **ecohealth pastoralism** is an effective solution to reduce the risk of zoonotic disease transmission



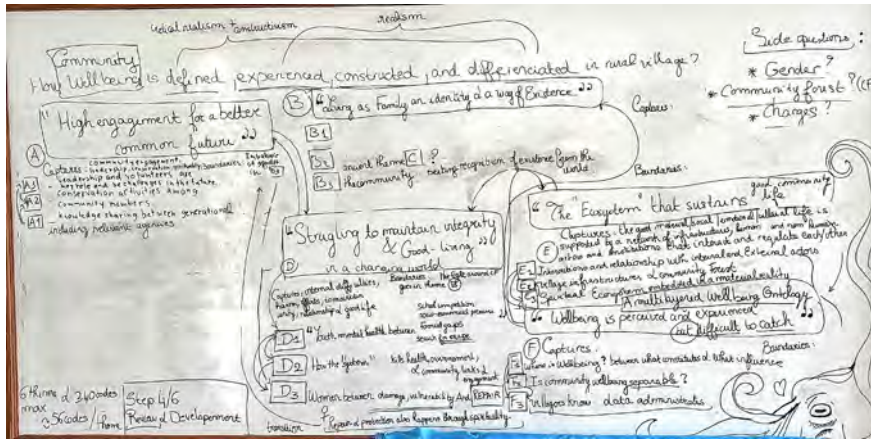
• Commons4Health



Gouvernance: historical, legal



- Méthodology « situation analysis »
 - scoping review, grey literature
- Méthodology « thematic analysis »
 - interviews in deep

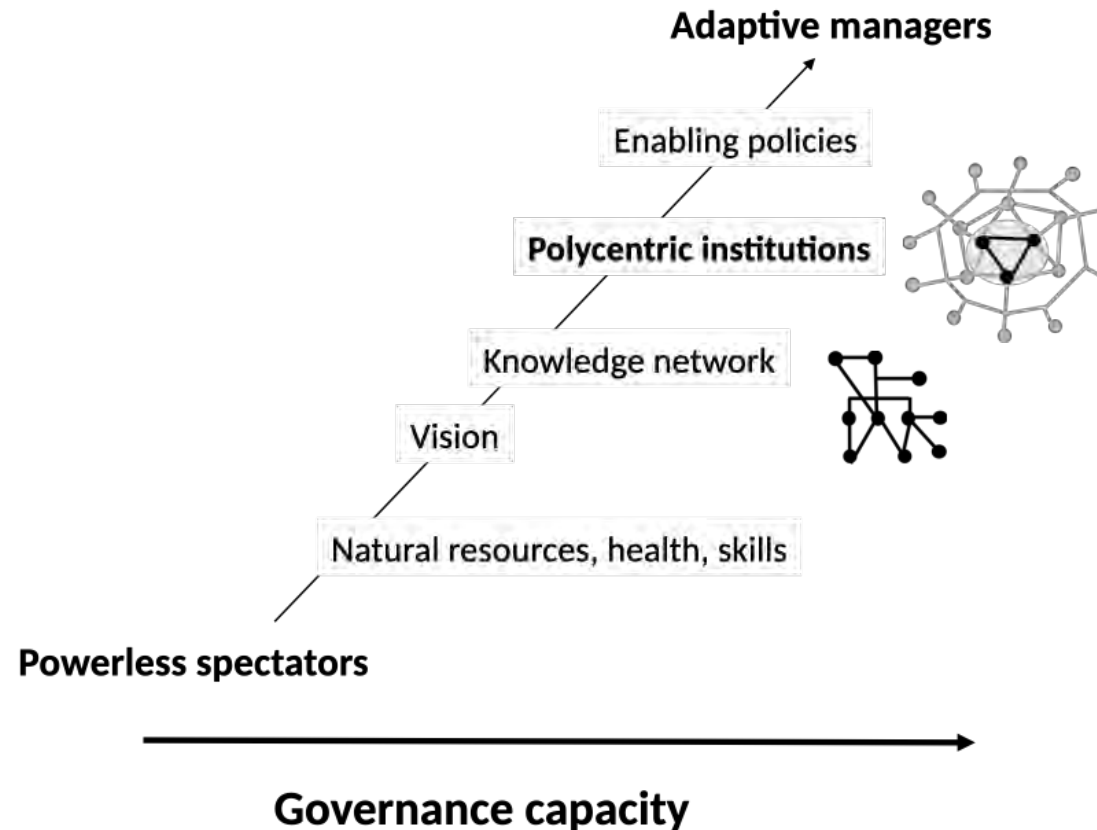


<https://link.springer.com/content/pdf/10.1186/s12982-025-00720-5.pdf>

• Adaptative law

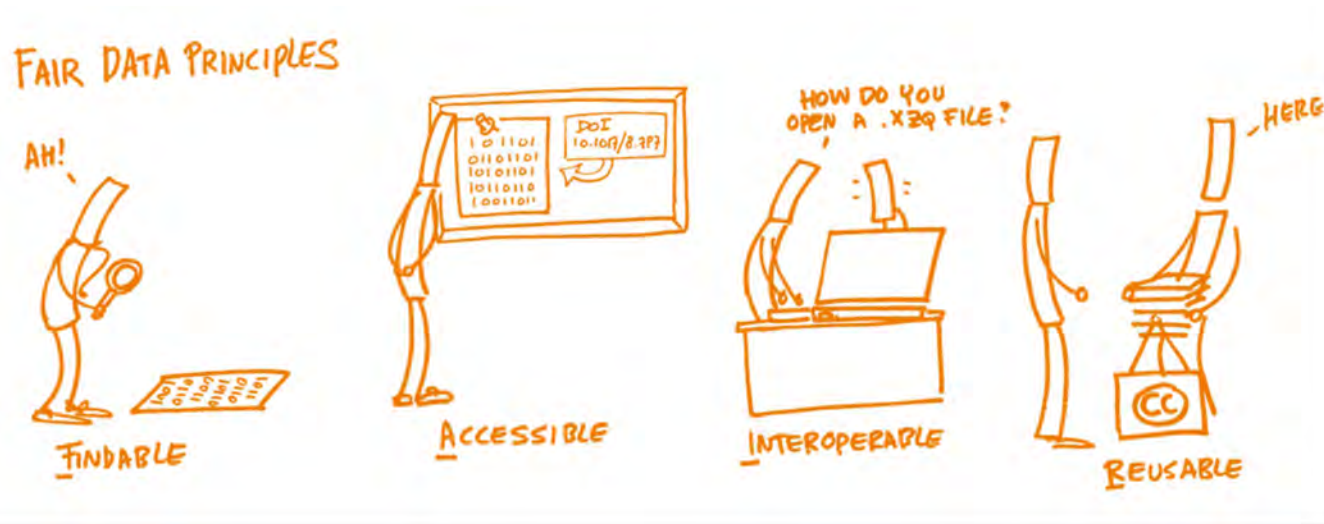
Le droit adaptatif (ou soft law) désigne un ensemble de règles non contraignantes qui s'adaptent aux situations pour guider les comportements sans créer de contraintes strictes.

Le droit adaptatif inclut des recommandations, des lignes directrices et des codes de conduite, influençant les pratiques sans la rigidité du droit dur (loi classique)



• Governance data

Les principes CARE déplacent l'attention de la gouvernance des données d'une approche consultative (FAIR) vers des relations fondées sur des valeurs et les droits collectifs que les communautés indigènes revendiquent en matière de données



Linking Biodiversity with Health and Well-being: Consequences of Scientific Pluralism for Ethics, Values and Responsibilities

Serge Morand^{1,2}  • Claire Lajaunie^{3,4}

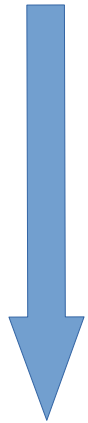
Interdisciparity and the ethical landscape

The categories of environmental ethics

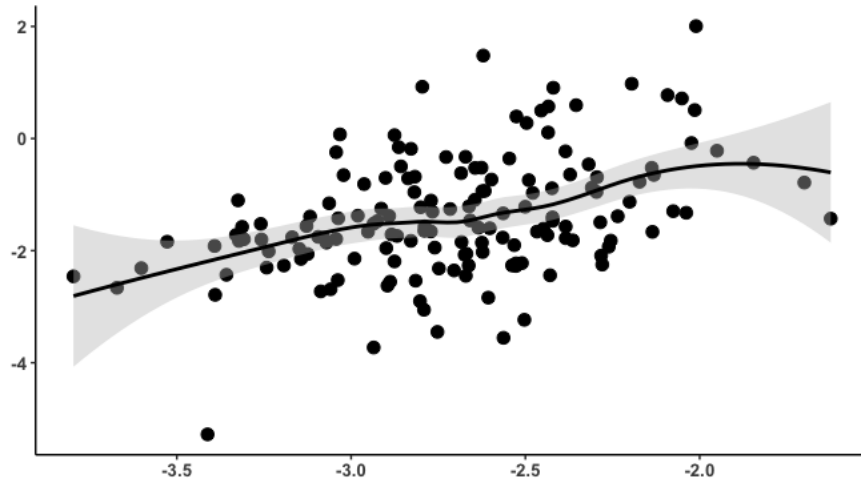
Point of view	Anthropocentrism	Ecocentrism
Individual	Liberal ecologism (market economy) (see Foster et al. 2010), rights of nature (see Nash 1989)	Animal rights* (Regan 2003; Donaldson and Kymlicka 2011)
Community	Cultural diversity (Maffi 2005), ecofeminism (Warren 1997), Marxist ecology (Foster et al. 2010), justice (Low and Gleeson 1998), rights of indigenous peoples (Low 1999)	Earth ethics (Leopold 1949; Callicott 2013), biophilia (Wilson 1984), deep ecology (Naess 1989), bioregionalism (Berg, in Glotfelty and Quesnel 2015)



Finally: We can act!



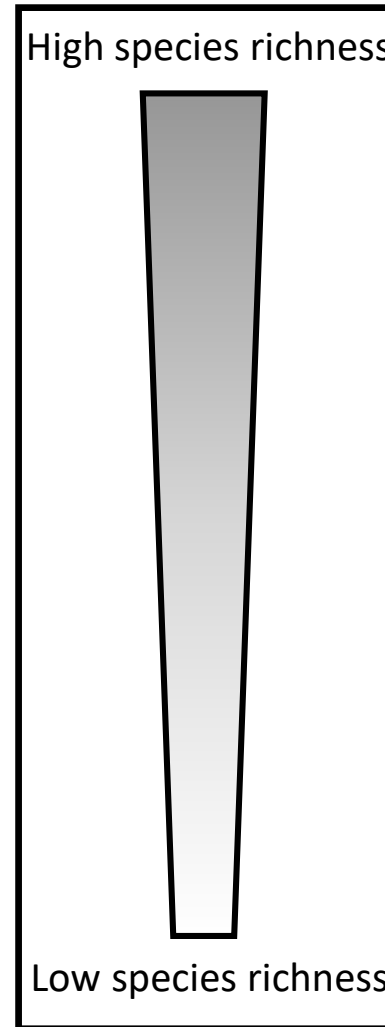
Relative number of outbreaks



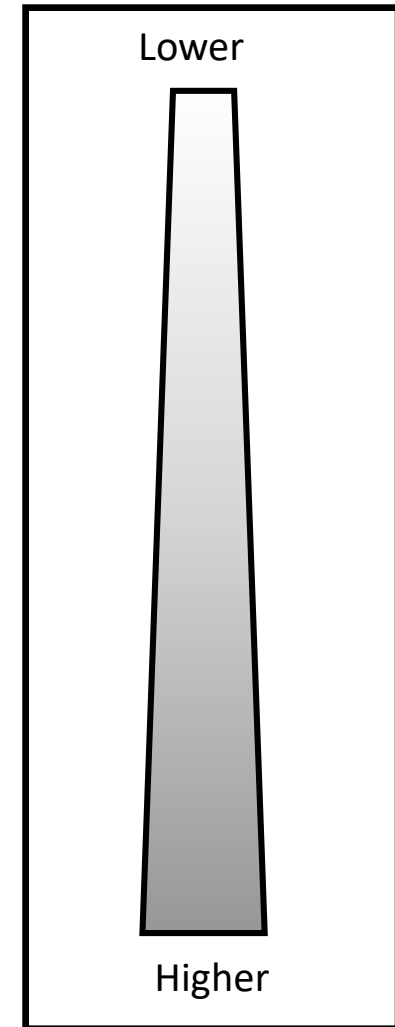
Relative number of species at threat



Rewilding



Health risk





HealthDEEP

Health, Disease Ecology, Environment and Policy

