Introduction to Describing the problem and prioritising hazards.

Steve Unwin (WHA, IUCN CPSG/WHSG), Fabiana Rocha (IUCN CPSG), Simone Vitali, Andrea Reiss, Erin Davis (WHA), Jamie Copsey, Richard Jakob-Hoff (IUCN CPSG), Fransiska Sulistyo (OVAG), Julie Sherman (Wildlife Impact), Dominic Travis (Marine Mammal Centre)

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IUCN SSC Species Survival Commission

CONSERVATION PLANNING SPECIALIST GROUP

Changing the Future for Wildlife

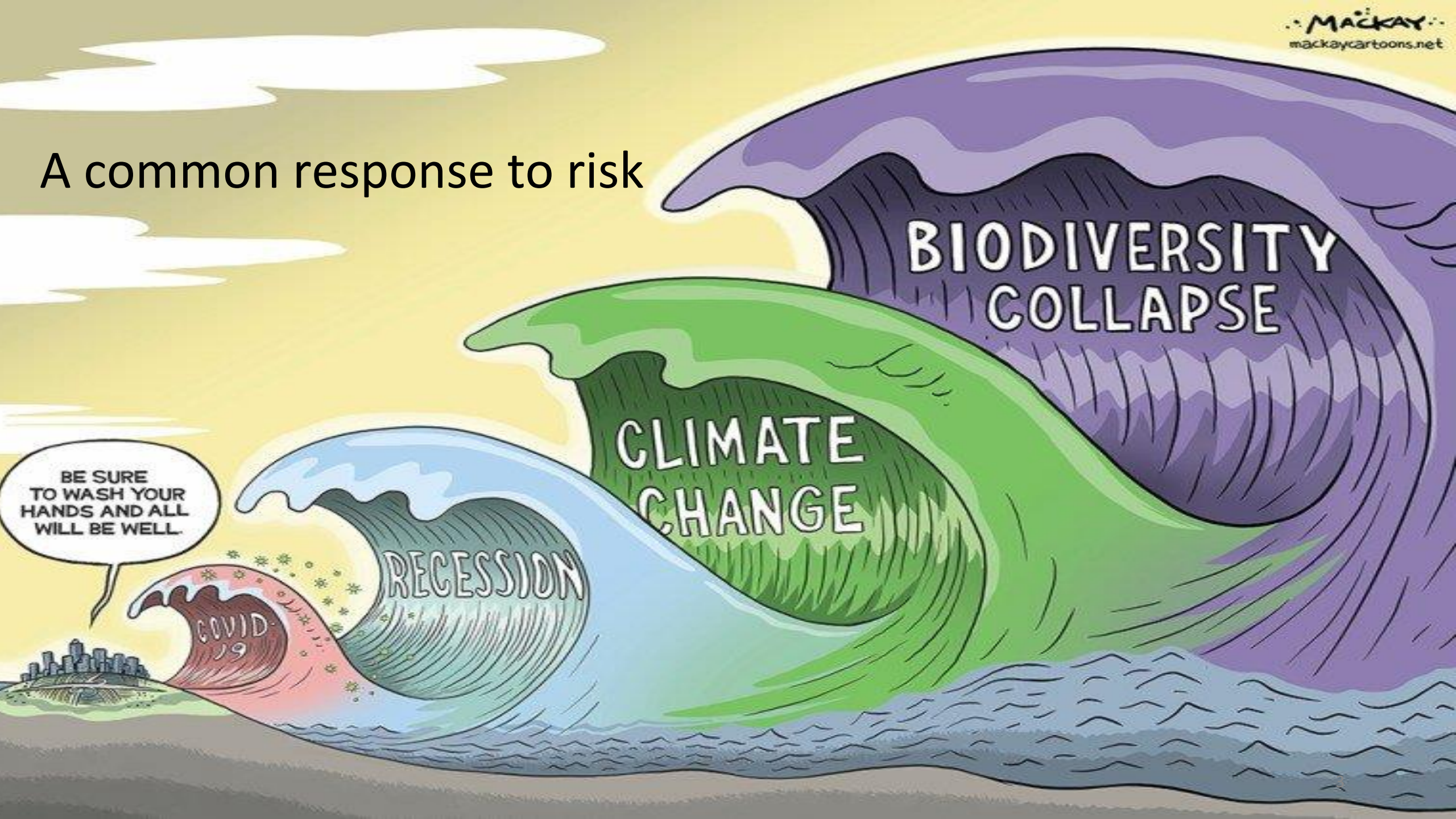
WILDLIFE IMPACT

OVAG

Perspective

There is perhaps no better demonstration of the folly of human conceits than this distant image of our tiny world. To me, it underscores our responsibility to deal more kindly with one another, and to preserve and cherish the pale blue dot, the only home we've ever known.
Carl Sagan.

A common response to risk



Response to risk

- Repeated, poor responses
- Unintended consequences
- Overcoming our primate brains' psychological discomfort and confronting decision-making and uncertainty

https://www.ilri.org/news/seven-deadly-drivers-zoonotic-disease-pandemics

September 11's indirect toll: road deaths linked to fearful flyers

German professor estimates an extra 1,595 Americans died in car accidents in year after September 11 attacks

https://www.theguardian.com/world/2011/sep/05/september-11-road-deaths Poor decision-making skills as a species in a crisis

https://www.thelancet.com/article/S0140-6736%2811%2960393-0/fulltext- systems approach to priority assessment of non communicable diseases in humans

Biodiversity = good for health

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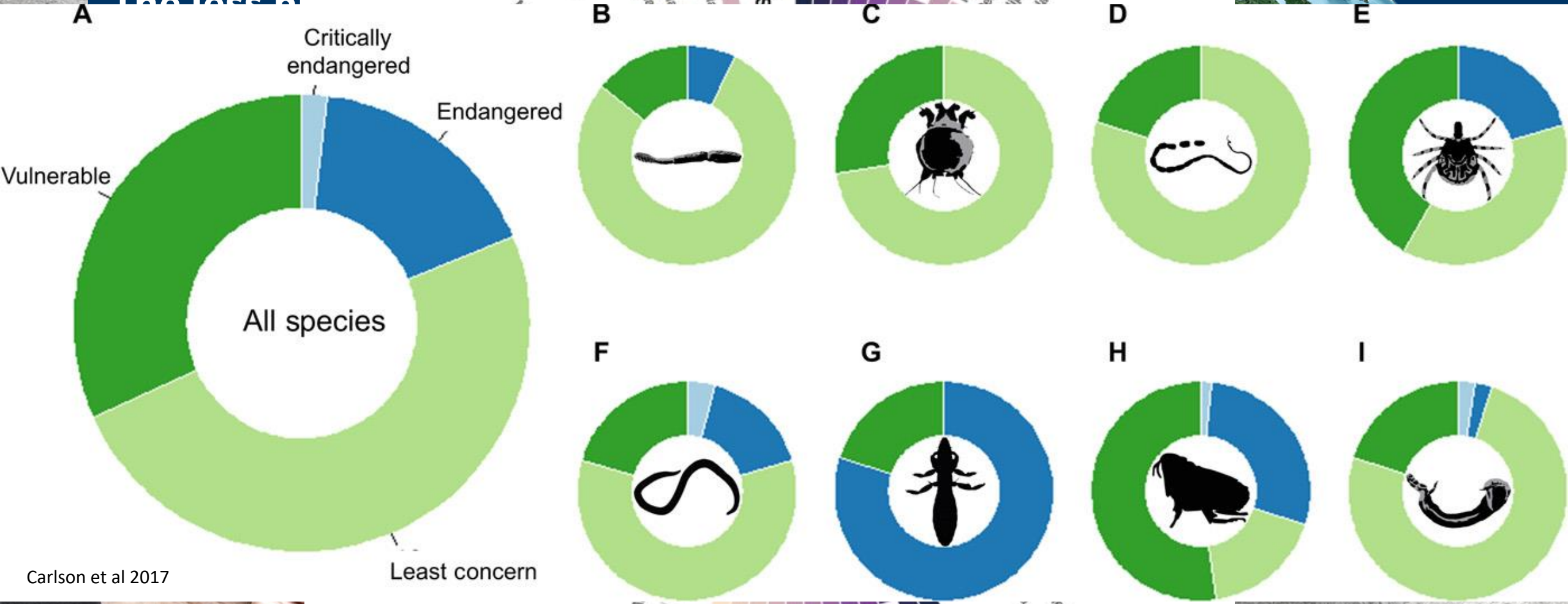
- **Ecosystem services vs. ecological processes**
- **Intrinsic value**
- **Health benefits**
- **Natural products as medicines**

Ecosystem Services:

The less bi



Carlson et al 2017

Ureta et al 2022

Disease emergence is an ecological process

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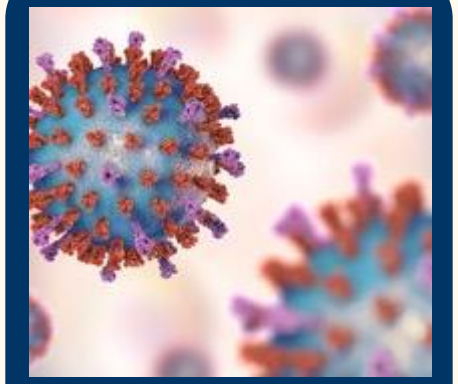
Human-induced environmental degradation

Changes in interactions between host, disease agents, and their environment



Natural selection - disease agents adaptations

Global transport of people, animals, and goods

Severe impacts on global health, conservation and socioeconomics

Urbanization

Population density

Poor social and sanitary conditions

Encroaching into new environments

Disease emergence

Human-Livestock-Domestic - Wildlife interactions

Climate change

One Health – systems thinking

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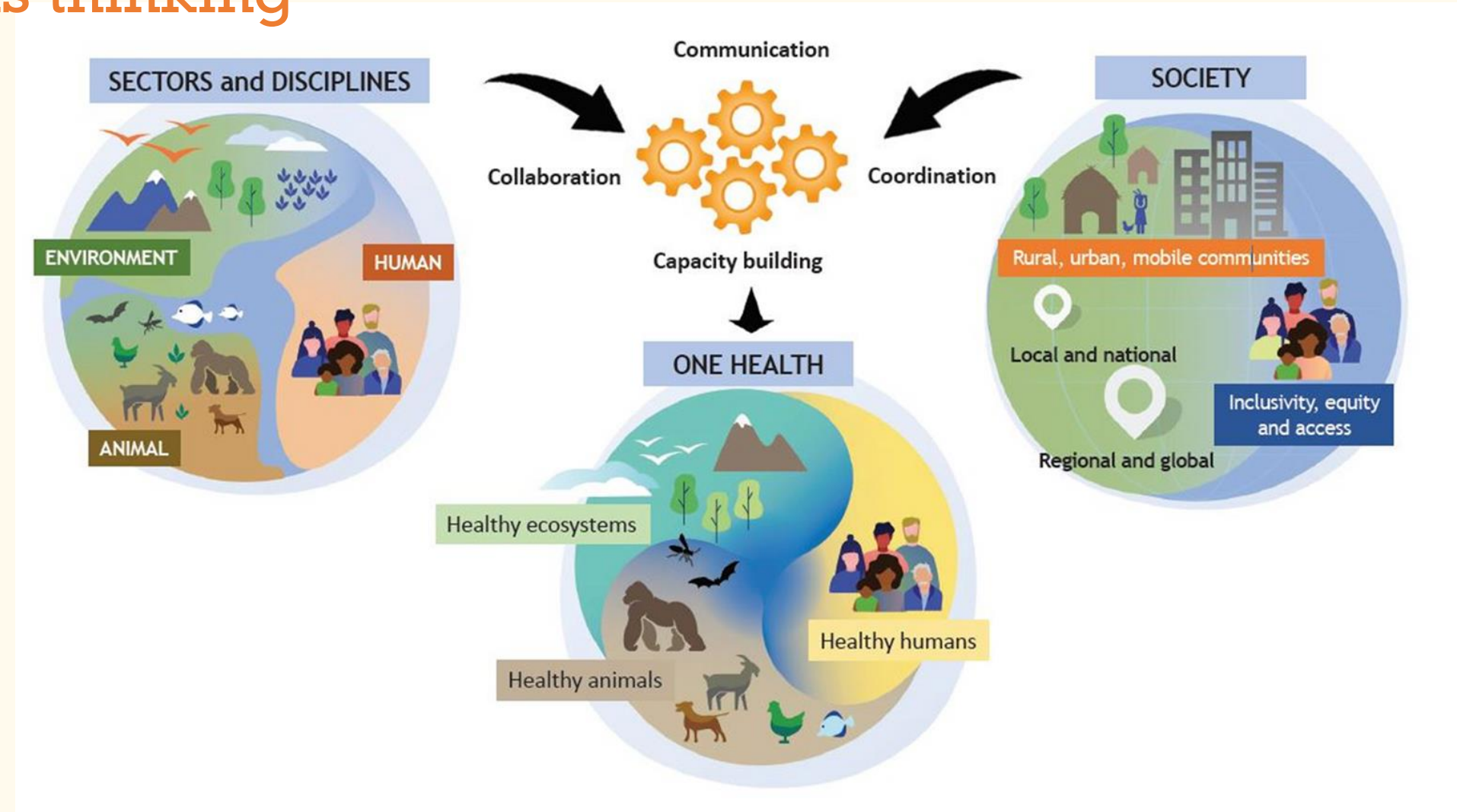

C… k… neither

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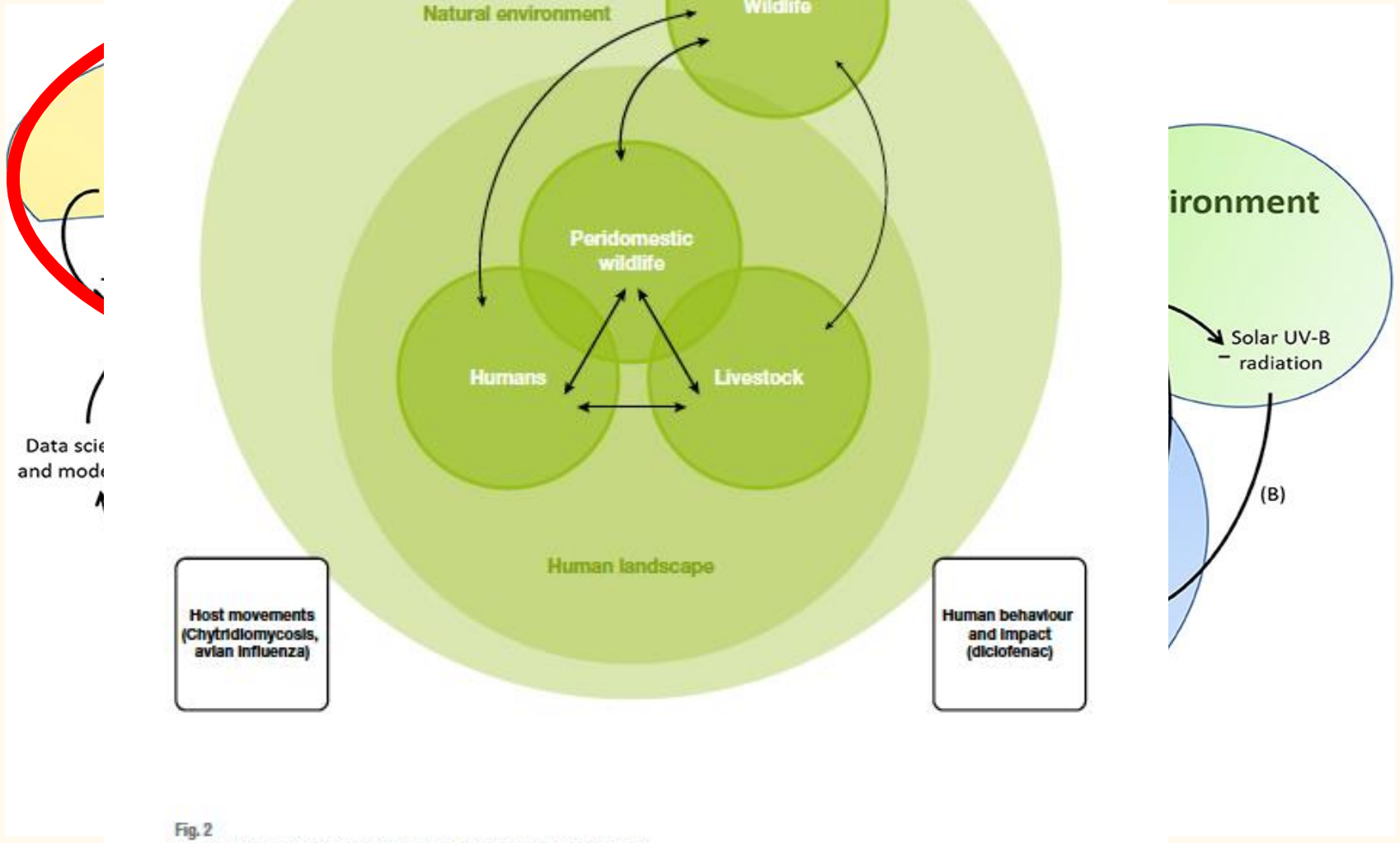
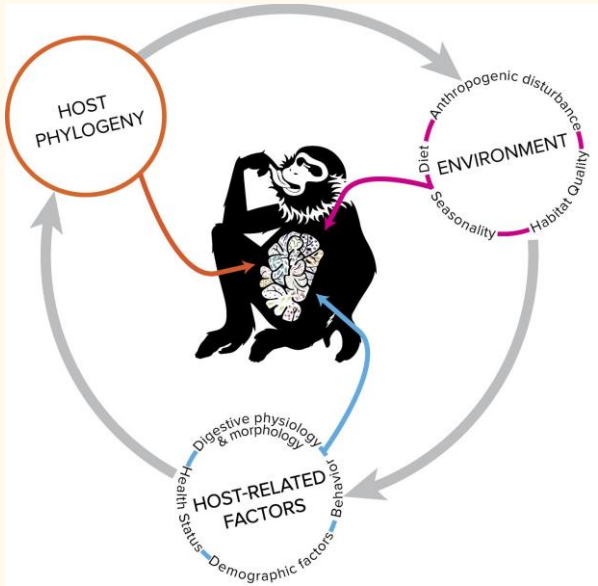


Fig. 2
Pathogen flow and drivers at the human–livestock–wildlife interface
The arrows in Figure 2 indicate direct, indirect or vector-borne pathogen flow
Each box represents a driver for which a case study is provided in the text

Klement RJ (2020) Systems Thinking About SARS-CoV-2. *Front. Public Health* 8:585229. doi: 10.3389/fpubh.2020.585229



Risk

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Two components:

the **likelihood**, or probability, of something happening and, if it does happen

the **consequences**, of the deleterious activity

Wildlife Disease Risk Analysis (WDRA)

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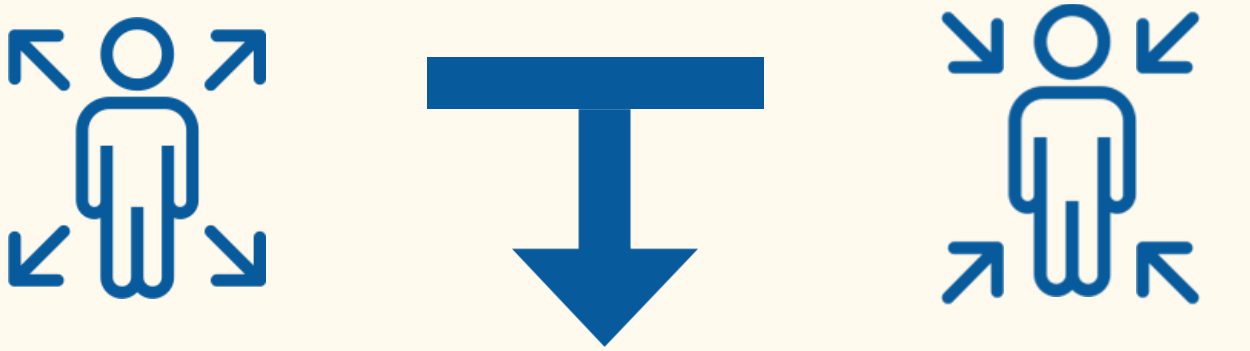
WDRA - collaborative process to



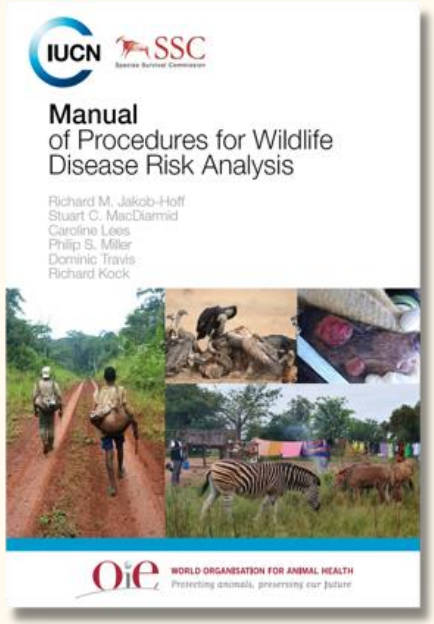
Those that could have an **impact**

Those that could be **impacted**

Support any disease **management decisions**

Agree on how to best **respond**

WDRA Process Overview and Examples

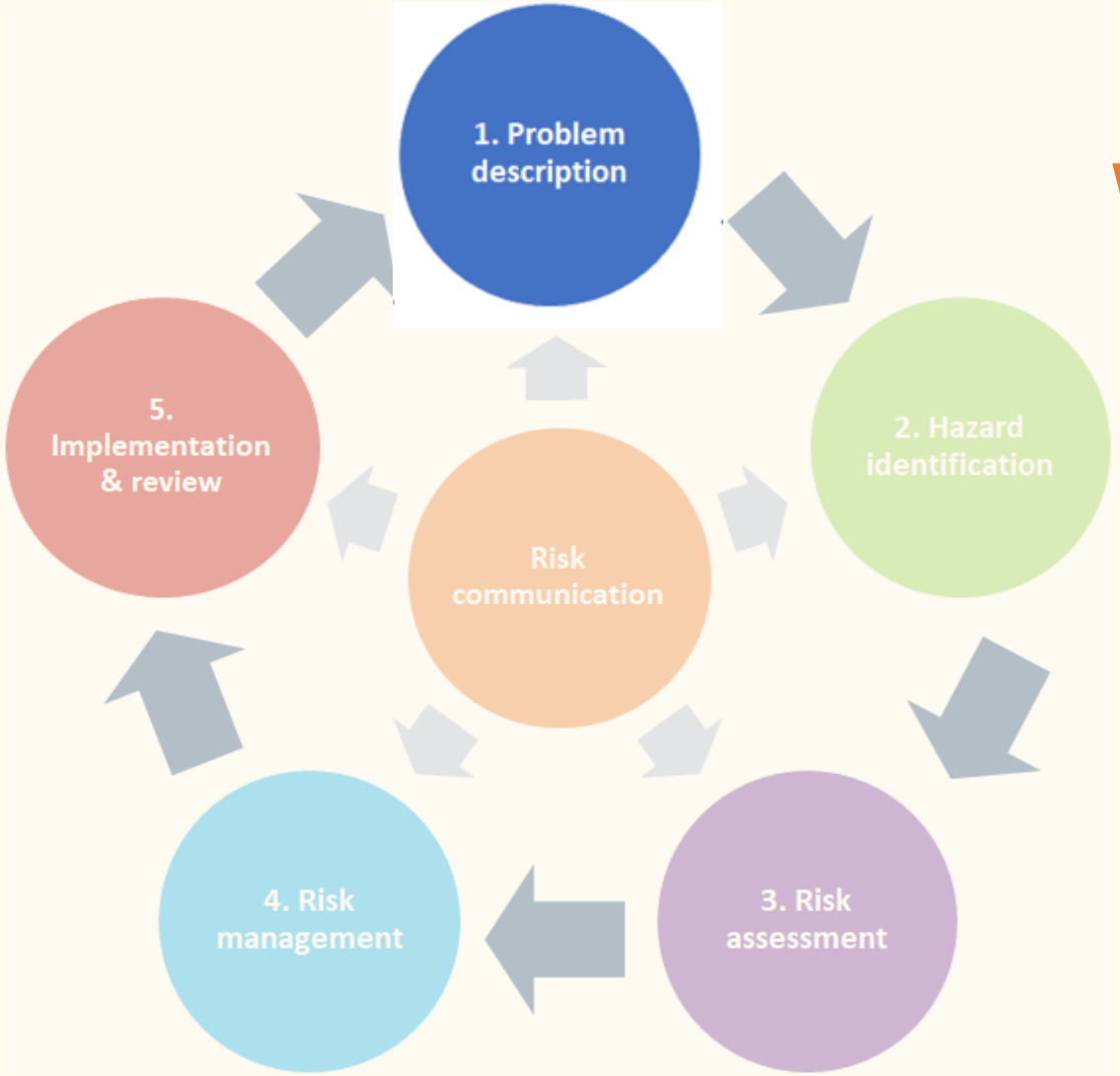


LEARNING OUTCOMES

This course is designed to equip participants with an understanding of how to put the IUCN Guidelines for Wildlife Disease Risk Analysis into practice.

By the end participants will be able to:

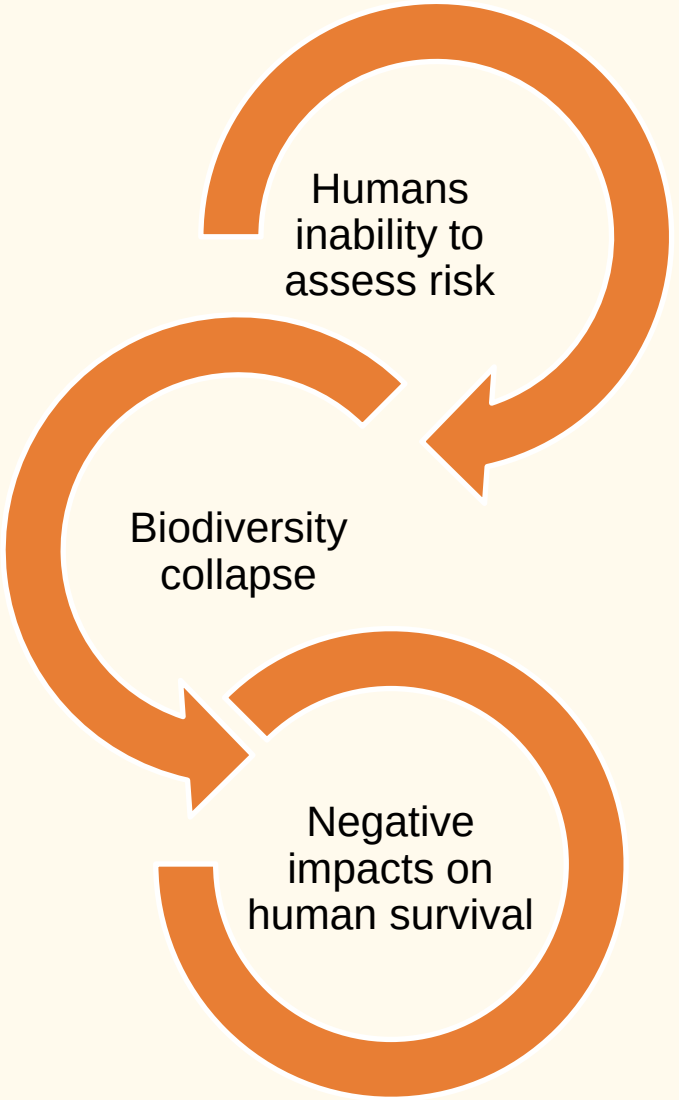
- Recognize and justify situations where a WDRA process can contribute to a) wildlife conservation, b) domestic animal health care, and c) public health protection
- Explain how the principle of One Health and the science of epidemiology are applied to a WDRA
- Design a workshop to effectively engage multiple stakeholders in completing a WDRA



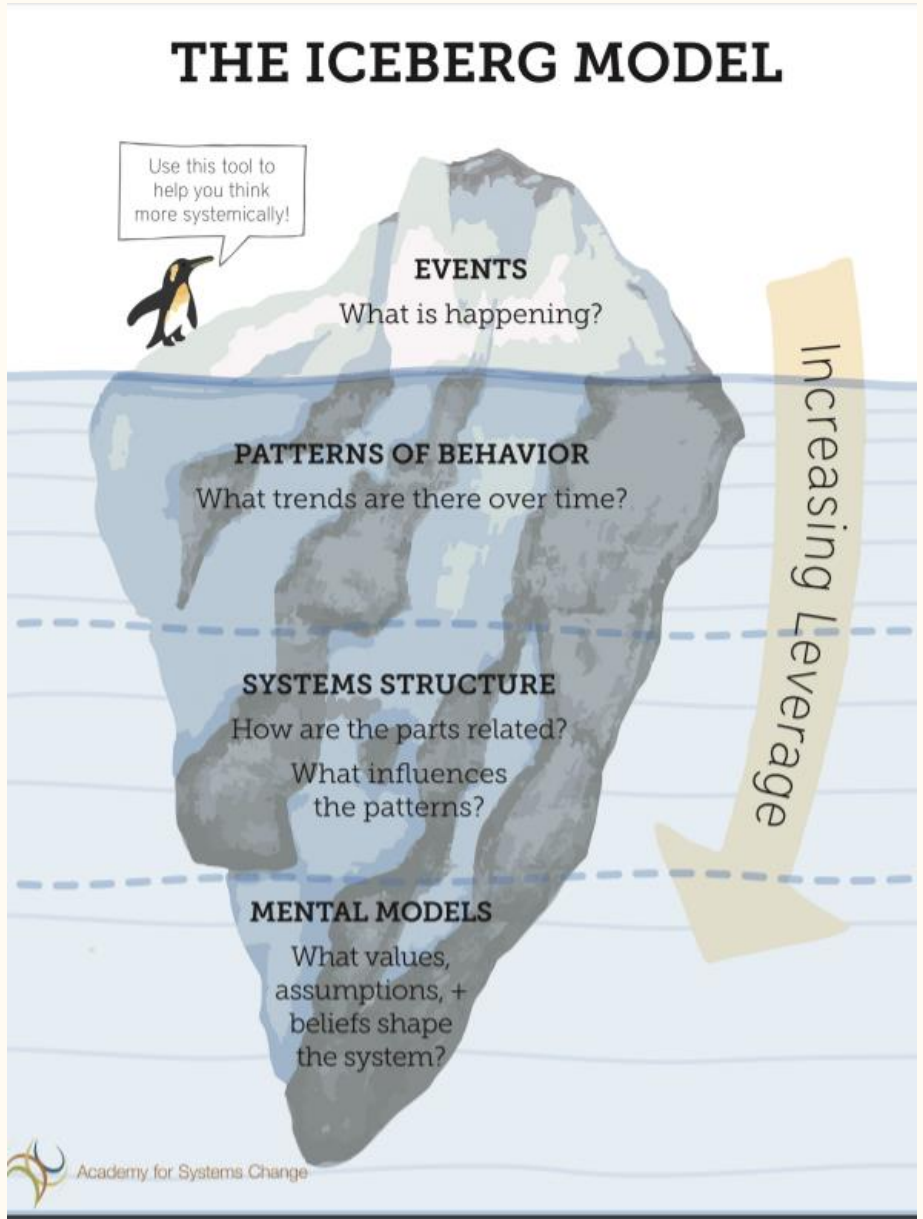
WDRA Step 1

- Outline the **background and context** of the problem
- Identify the **goal, scope**, and **focus** of the WDRA
- Formulate the DRA **question(s)**
- State assumptions and limitations
- Specify the acceptable level of risk

Prioritising Risks to prevent disaster



Governance

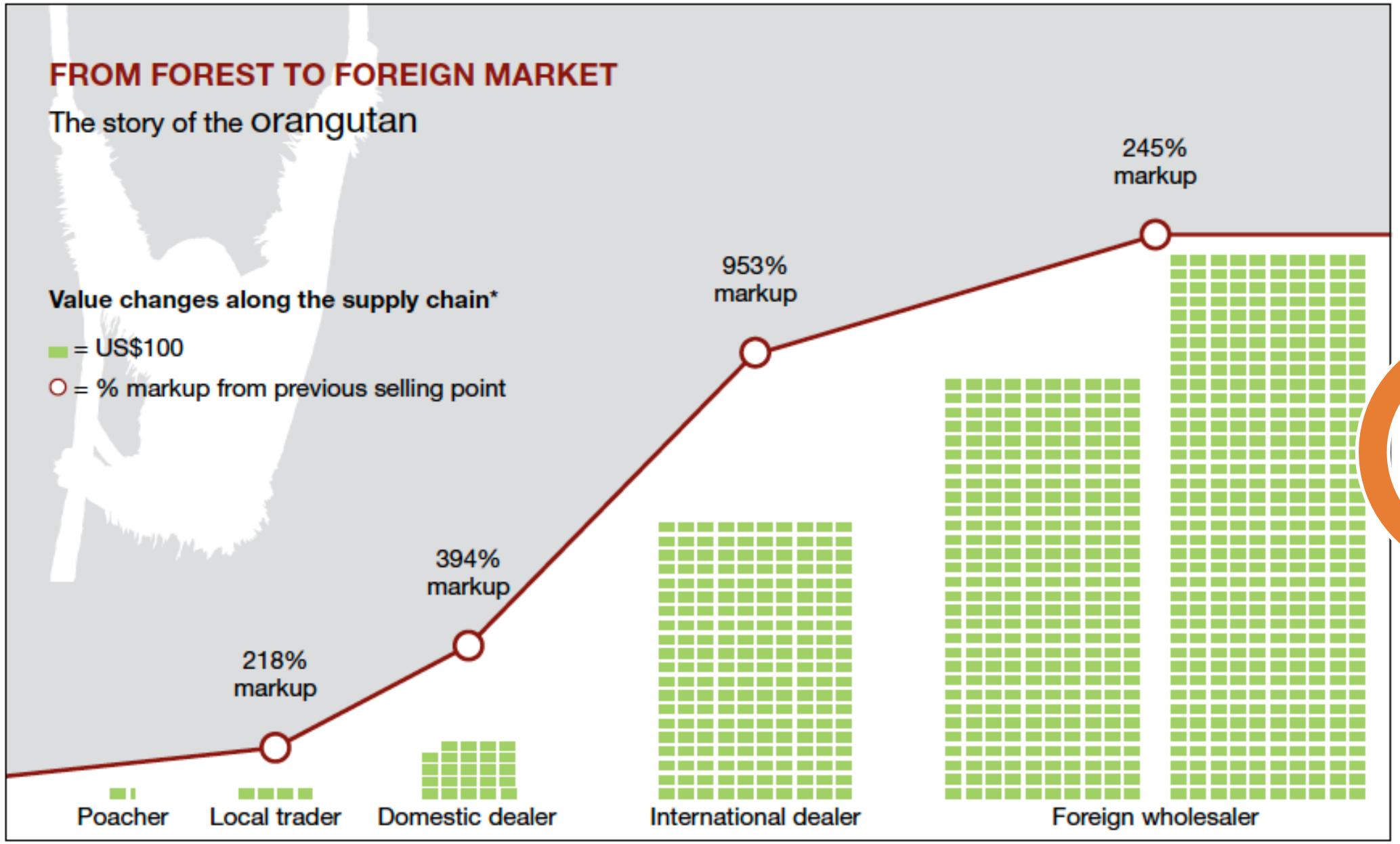


Event: Disease transmission from and between traded wildlife

Wildlife trafficker and trader behaviour

Poor wildlife welfare, poor biosecurity along trade route

Understand stakeholder motivations and mitigate accordingly



Note: * The original research uncovered a range of prices at each point in the supply chain. For graphical purposes, the study utilized the upper value for each segment of the supply chain.

Source: Clough and May (2018, pp. 8, 9, 25). © Global Financial Integrity 2018

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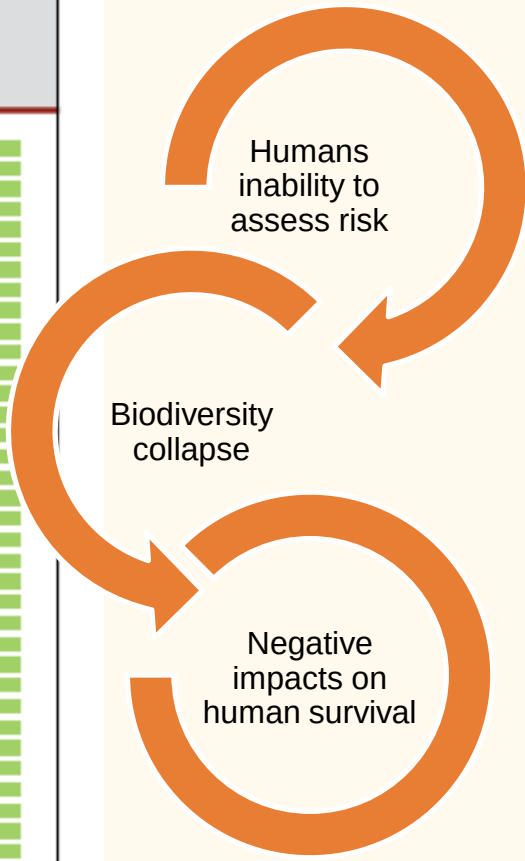
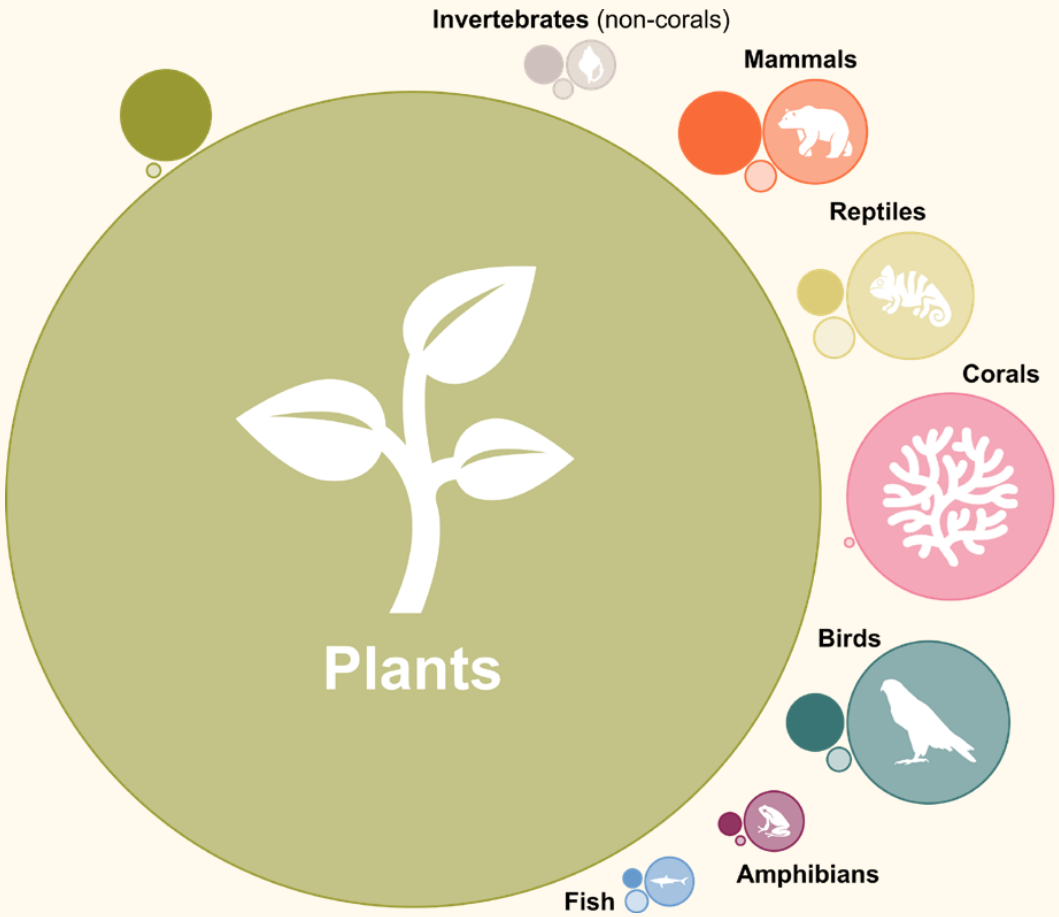


State of the Apes Volume 4

23 million
trade records

184
Parties to
the Convention

~38,700
species listed in the
CITES Appendices



Mammals		Fish	
I	325	I	16
II	523	II	114
III	46	III	24
Birds		**Invertebrates** (non-corals)	
I	155	I	69
II	1,279	II	114
III	27	III	18
Reptiles		**Corals**	
I	98	I	0
II	777	II	2,076
III	79	III	4
Amphibians		**Plants**	
I	24	I	395
II	173	II	32,364
III	4	III	9

CITES World Wildlife Trade Report 2022

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Global direct trade, 2011-2020

3.5 MILLION shipments of CITES-listed species

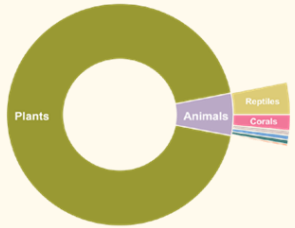
12,028 species reported in trade

30% of species traded as wild-sourced

Trade by number of **individuals**:

1.3 BILLION individuals

18% traded as wild-sourced



477 million orchid hybrids
Phalaenopsis hybrid
Appendix II
0% wild-sourced

4 million stony corals
Acropora species
Appendix II
24% wild-sourced

267 million snowdrops
Galanthus species
Appendix II
69% wild-sourced

5 million brown spectacled caiman
Caiman crocodilus fuscus
Appendix II
0.04% wild-sourced

Trade by **volume:**

5.0 MILLION cubic metres

90% traded as wild-sourced

1.8 million m³
Mongolian oak
Quercus mongolica
Appendix III
100% wild-sourced

1.1 million m³
African rosewood
Pterocarpus erinaceus
Appendix II
98% wild-sourced

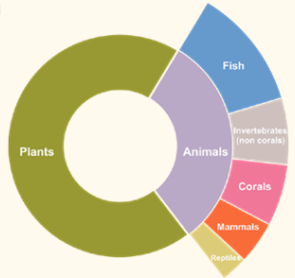
0.9 million m³
Manchurian ash
Fraxinus mandshurica
Appendix III
100% wild-sourced

0.3 million m³
Indian rosewood
Dalbergia latifolia
Appendix II
100% artificially propagated

Trade by **weight**:

279 MILLION kilograms

55% traded as wild-sourced



52 million kg orchids
Orchidaceae species
Appendix I / II
0.05% wild-sourced

18 million kg Queen conch
Strombus gigas
Appendix II
100% wild-sourced

52 million kg holy wood
Bulnesia sarmientoi
Appendix II
100% wild-sourced

17 million kg stony corals
Scleractinia species
Appendix II
100% wild-sourced

Trade in **parts** and **derivatives:**

290 MILLION items

8% traded as wild-sourced

39 million cactus stems
Cactaceae species
Appendix I / II
0.02% wild-sourced

35 million sago palm leaves
Cycas revoluta
Appendix II
0.07% wild-sourced

20 million live sturgeon eggs
Acipenseridae species
Appendix I / II
11% wild-sourced

19 million orchid extract
Orchidaceae species
Appendix I / II
0.01% wild-sourced

17 million aloe stems
Liliaceae species
Appendix I / II
1% wild-sourced

12 million sturgeon caviar
Acipenseridae species
Appendix I / II
0.26% wild-sourced

CITES World Wildlife Trade Report 2022

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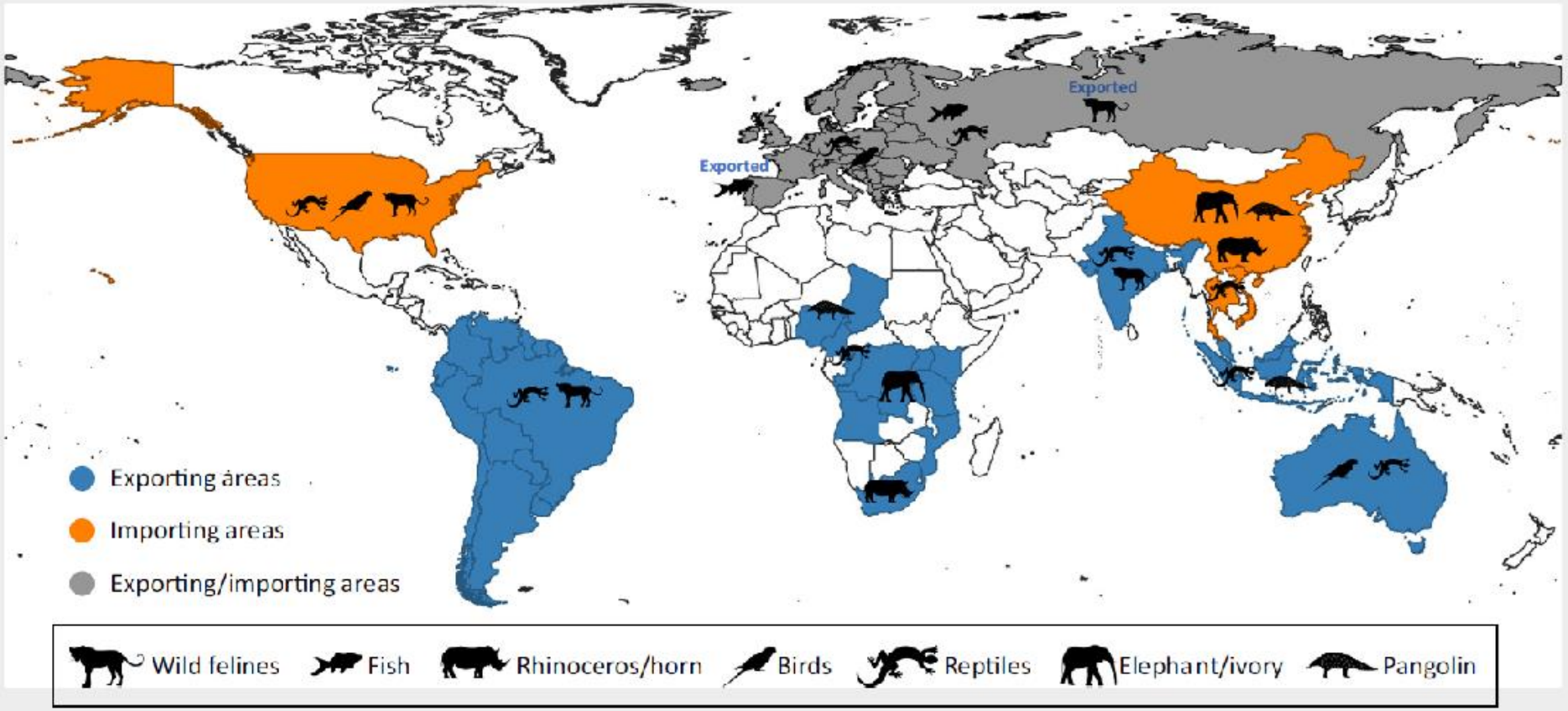
Box 1. IWT: Drivers and Consequences

The IWT is a global trend phenomenon (Figure I) due to the attractive prices, the low effort made by poachers to acquire wildlife, and the more lenient legal penalties applied for people involved in this activity[ii]. This criminal network is composed of people from several socioeconomic levels, from local subsistence poachers to transnational organized crime. People from local communities in developing countries highly influence the IWT due to factors such as low income, poverty, and illiteracy [14]. This trend has been observed on the illegal trade of pangolins in Nepal, where the low socioeconomic status of locals associated with the growing demand for this animal, particularly in China, facilitated its trading, directly impacting on its conservation [14]. In popular markets, several wildlife species are in contact with each other before being sold or shipped to other regions, this being a driver for the interspecies transmission of pathogens [2]. A study conducted in Laos assessed the potential transmission of zoonotic pathogens from wildlife traded in local markets, identifying 36 zoonotic agents being potentially transmitted. Increased human–wildlife contact, poor biosafety measures, and high-risk taxa for zoonoses were also accounted as risk factors for the presence and dissemination of pathogens in these markets [2].



Trends in Parasitology

Figure I. The Main Source and Destination Areas of Endangered Wildlife Species Involved in the Illegal Trade Worldwide[ii–v]. Europe and Russia are mainly importing areas, but for some animal groups, such as fish (*Anguilla anguilla*) in Europe and wild felines in Russia, exportation is also recorded.

Bezerra-Santos et al. 2021

Table 1. Pathogens of Public Health Concern Reported in Wildlife Illegally Traded Worldwide

Pathogen	Wildlife involved	Wildlife products	Trade type	Public health issues	Refs
Viruses					
Simian foamy virus (retrovirus)	Non-human primates	Bushmeat	International	Increase in pathogenicity following cross-species transmission	[11]
Cytomegalovirus (herpesvirus)	Non-human primates	Bushmeat	International	Concern for immunocompromised people	[11]
Lymphocryptovirus (herpesvirus)	Non-human primates	Bushmeat	International	B-cell tumors in immunocompromised individuals	[11]
Bacteria					
Escherichia coli	Birds, duiker	Live animals, bushmeat	National, international	Urinary-tract infection, meningitis, septicemia	[4,12]
Klebsiella pneumoniae	Birds	Live animals	National	Pneumonia, urinary-tract infection, septicemia	[4]
Salmonella enterica serovar Typhimurium	Birds	Live animals	National	Gastrointestinal infection	[4]
Listeria monocytogenes	Pangolin, red hog	Bushmeat	International	Meningitis, septicemia, and abortion in immunocompromised people	[12]
Staphylococcus aureus	Pangolin, duiker, red hog, fish	Smoked fish, bushmeat	International	Osteomyelitis, endocarditis, pneumonia, bacteremia, toxic shock syndrome	[12]
Parasites					
Baylisascaris procyonis (nematode)	Raccoons	Live animals	International	Neurological signs, visceral larva migrans	[7]
Toxocara sp. (nematode)	Raccoons	Live animals	National, international	Neurological signs, visceral larva migrans	[7]
Trichinella spp. (nematode)	Black bear, grizzly bear	Meat products	International	Intestinal, muscle, and neurological clinical signs	[1]
Cryptosporidium spp. (protozoan)	Non-human primates	Live animals	National	Intestinal clinical signs	[15]
Hyalomma aegyptium (tick)	Turtles	Live animals	International	Potential vector of zoonoses (e.g., *Borrelia turcica*; Crimean–Congo hemorrhagic fever virus)	[3]

Bezerra-Santos et al. 2021

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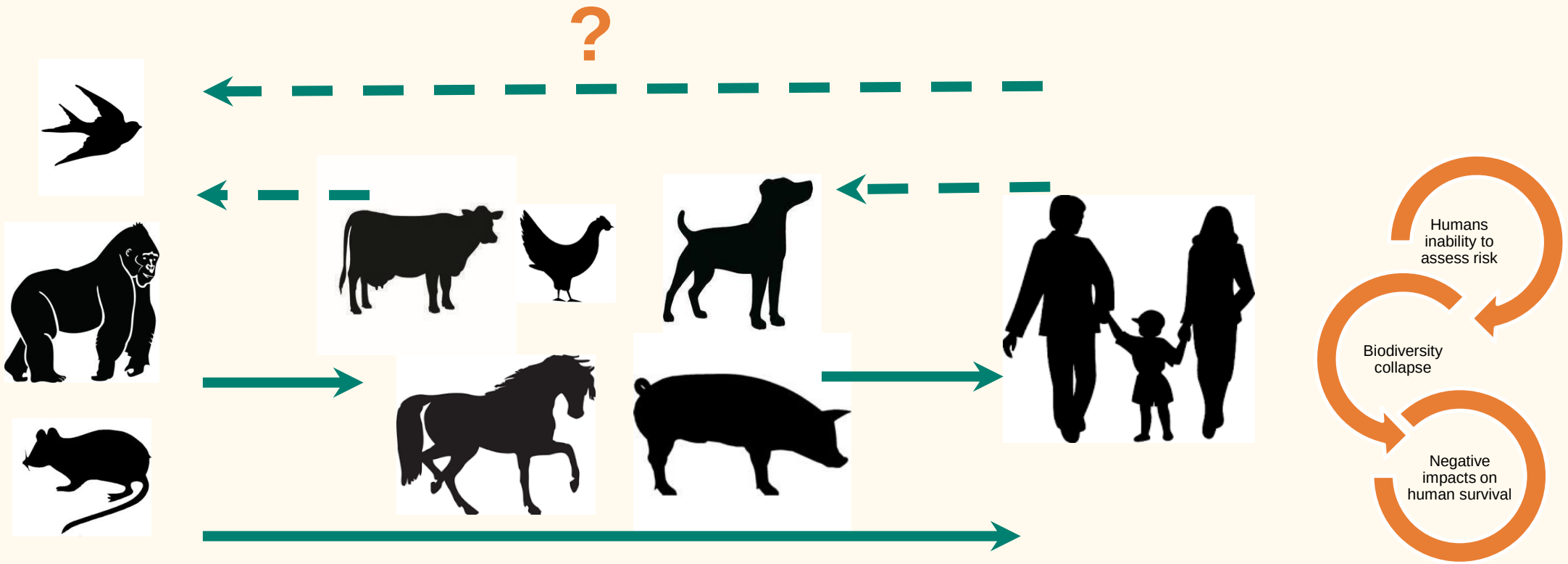
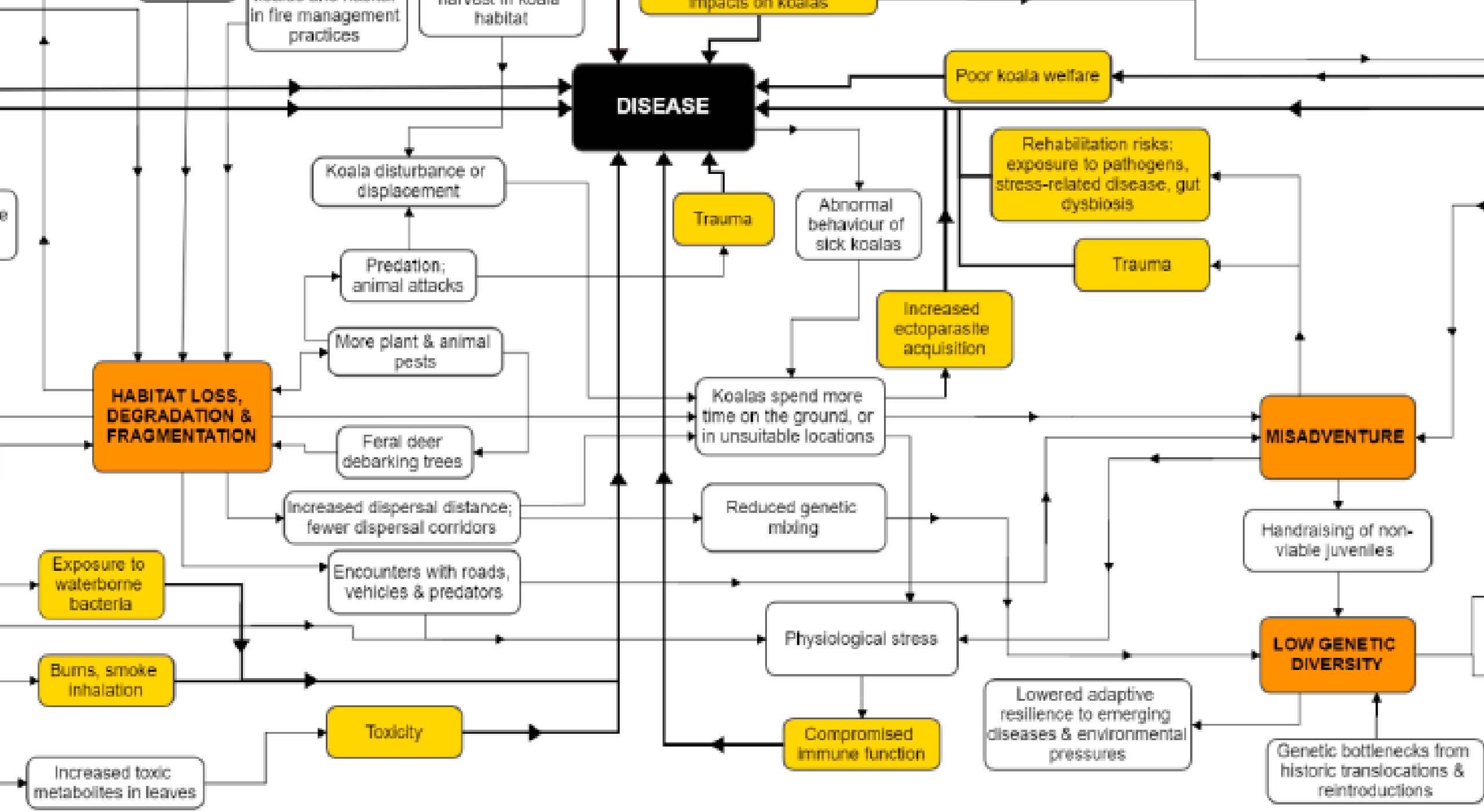
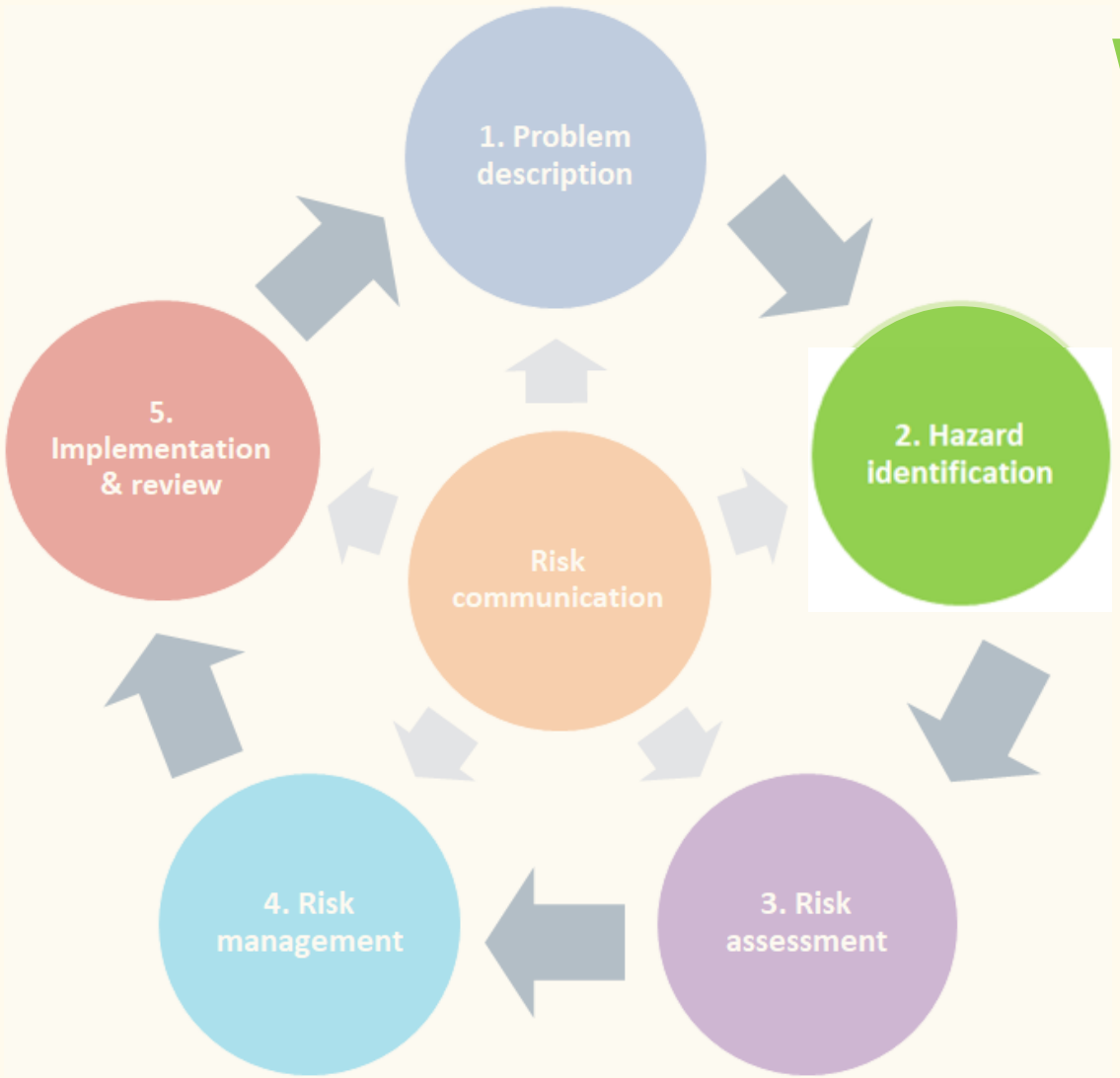
Pathogens do not know directions



Every new host encountered is an opportunity for pathogen adaptation

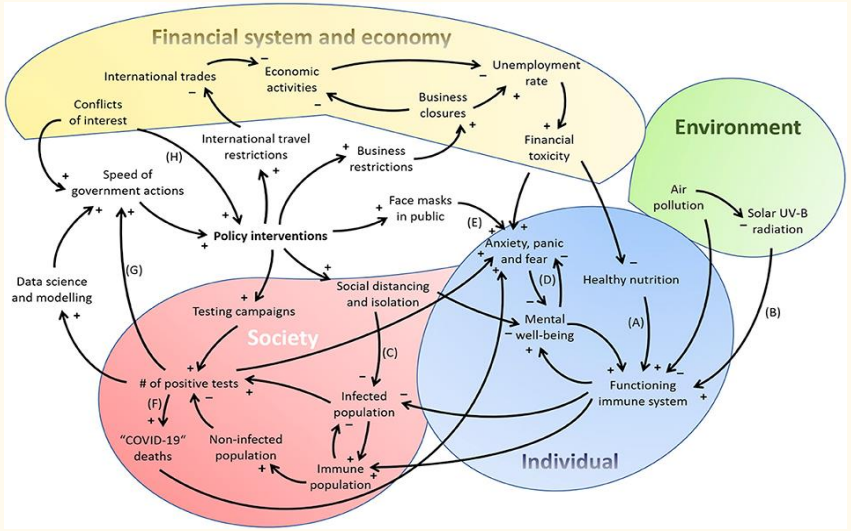

in fire management practices
habitat
impacts on koalas
DISEASE
Poor koala welfare
Koala disturbance or displacement
Trauma
Abnormal behaviour of sick koalas
Rehabilitation risks: exposure to pathogens, stress-related disease, gut dysbiosis
Trauma
Predation; animal attacks
Increased ectoparasite acquisition
More plant & animal pests
HABITAT LOSS, DEGRADATION & FRAGMENTATION
Koalas spend more time on the ground, or in unsuitable locations
MISADVENTURE
Feral deer debarking trees
Increased dispersal distance; fewer dispersal corridors
Reduced genetic mixing
Handraising of non-viable juveniles
Exposure to waterborne bacteria
Encounters with roads, vehicles & predators
Physiological stress
LOW GENETIC DIVERSITY
Burns, smoke inhalation
Toxicity
Compromised immune function
Lowered adaptive resilience to emerging diseases & environmental pressures
Increased toxic metabolites in leaves
Genetic bottlenecks from historic translocations & reintroductions

WDRA Step 2



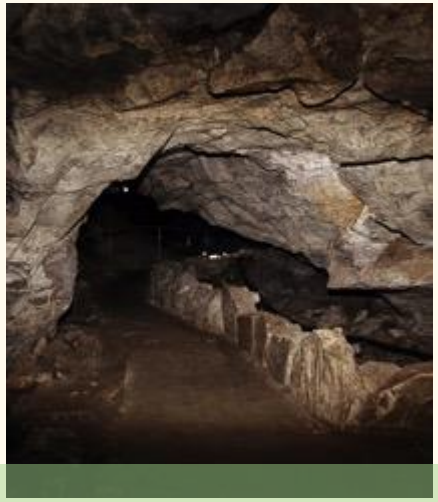
- Identify **all possible health hazards** of concern
- Establish criteria for **ranking the importance** of each hazard within the bounds of the defined problem

An example of an ALL HAZARDS approach.



(Council of Canadian Academies, 2011)

For each selected hazard take into account:



Specific circumstances

Risky activities

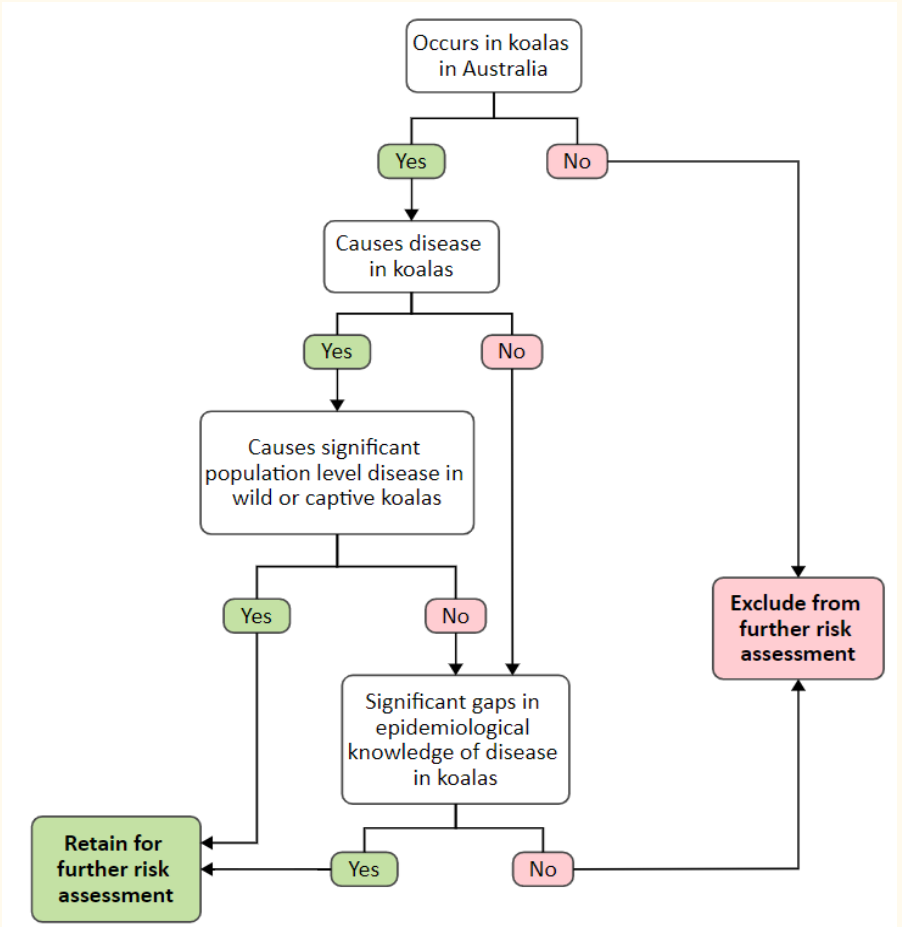
Population at risk

Geographical location

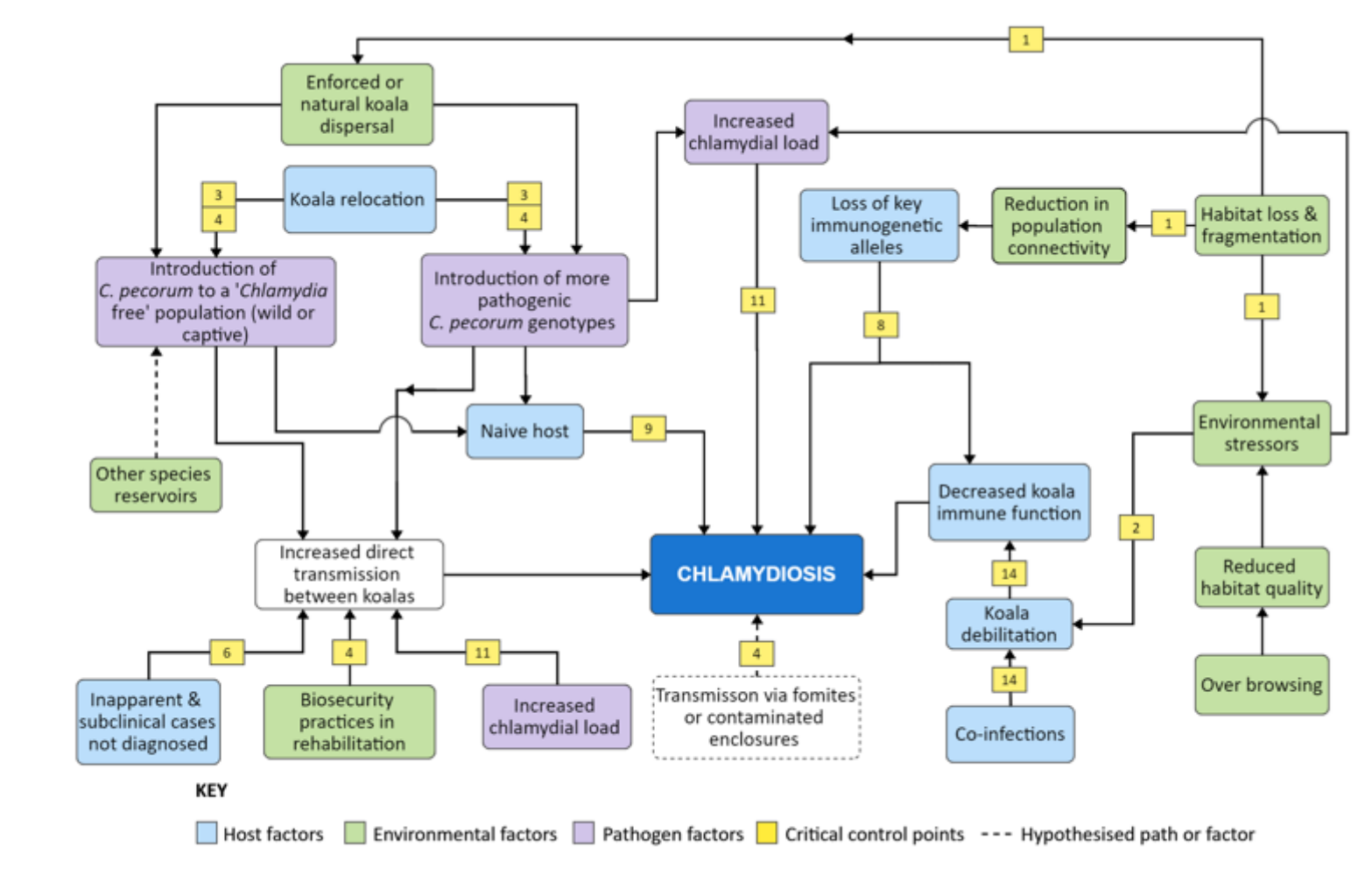
Socio-environmental context

KDRA - hazard identification and refinement

- Disease = any disturbance in the health or function of an animal or human
- Hazard identification
  91 disease hazards
  - 56 Infectious diseases
  - 35 Non-infectious diseases
- 13 disease hazards identified as requiring detailed risk assessment



KDRA: For each hazard…



- Detailed literature review
- Hazard pathway
- Critical control points
- Risk assessment
- Risk mitigation options
- Recommendations

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WDRA – collaboration, co-ordination, communication to capacity build One Health.

Thank you for your attention

Task 1.

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Task	
What question(s) are you trying to answer?	
What is the goal or aim you are trying to achieve?	
What's the scope?	Setting boundaries. E.g. the analysis will be confined to relevant published and unpublished information on disease agent or process X and the population biology of species Y, combined with the input of relevant experts and stakeholders
What's the focus?	E.g. the long-term sustainability of species Y.
What level of risk is acceptable?	

Task 2.

https://padlet.com/cpsgbrasil/orangutan-wdra-brainstorming-what-are-the-main-drivers-of-di-kmrb0nzw8nmzr80v

https://padlet.com/sunwin401/describing-the-problem-what-are-the-main-drivers-of-disease--gh6hrx2kxr9jkstg

Don’t forget to discuss and input ASSUMPTIONS and LIMITATIONS