



Biosecurity @ BHI

Box Hill Institute



What is Biosecurity?

- ✓ What does biosecurity mean?
- ✓ How does biosecurity impact us?
- ✓ Why is biosecurity a global issue?

Biosecurity

“Protecting from the entry and spread of pests and diseases”

Nature makes Australia
unique – Biosecurity
keeps it that way

National Biosecurity Statement



What is Biosecurity?

- What words have been used to make this term?
- What do these words mean?
- How would you describe biosecurity?
- Apart from applying for this course, when have you heard the term used?
- Who is responsible for biosecurity?



Biosecurity

- **Biosecurity** is a critical part of the government's efforts:
 - To Prevent...
 - Respond to...
 - Recover from...
- Pests and diseases that threaten the **economy**, **environment** and **human health**
- Government biosecurity programs help ensure:
 - Continued market access
 - Rapid and relevant emergency response standards

Biosecurity is a partnership between governments, industry and the community.



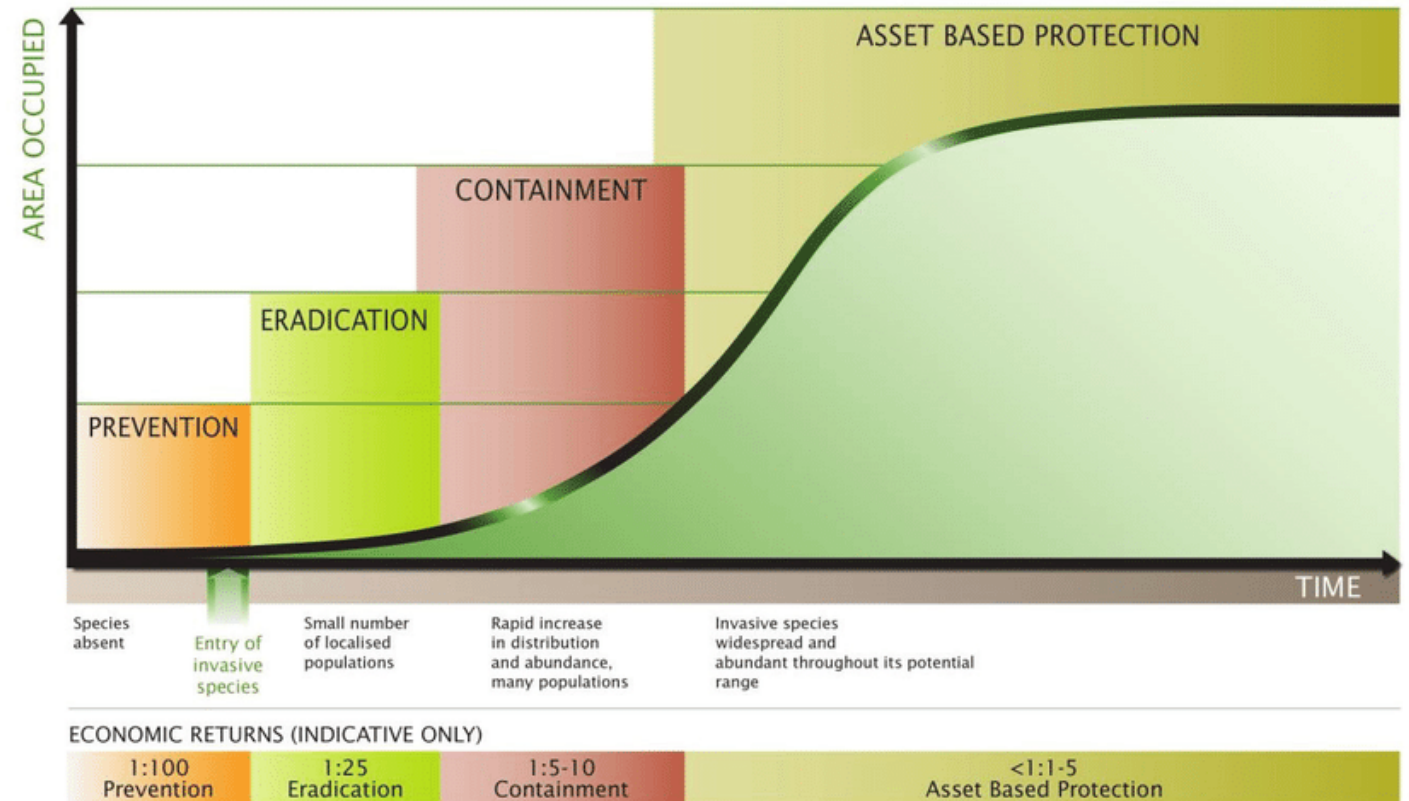
Biosecurity

An fast and effective response to a biosecurity threat can save governments and industry money

- Prevention is better than...
- Eradication which is better than...
- Containment which is better than...
- Managing the pest and it impact.

GENERALISED INVASION CURVE SHOWING ACTIONS APPROPRIATE TO EACH STAGE

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What do these terms mean?

What is a pest?

- What might be considered pests?

What is a disease?

- Is there any difference between a pest and disease?

Myrtle Rust threatens many Australian native species including our Eucalyptus forests.



Pests & Diseases

- **Pest:**

- A pest can be a plant (weed), vertebrate (bird, rodent or other mammal), invertebrate (insect, tick, mite or snail), nematode, pathogen (bacteria, virus or fungus) that cause disease, or other unwanted organism that may cause harm.

- **Disease:**

- Diseases is a condition of abnormal physiology.
- Disease is a malfunctioning process that is caused by continuous irritation.
- Disease is a significant departure from normal metabolism (growth & development).

*The giant African snail (*Lissachatina fulica*) is the worlds most destructive pest of fruit and vegetables*



Unique Biodiversity Threatened

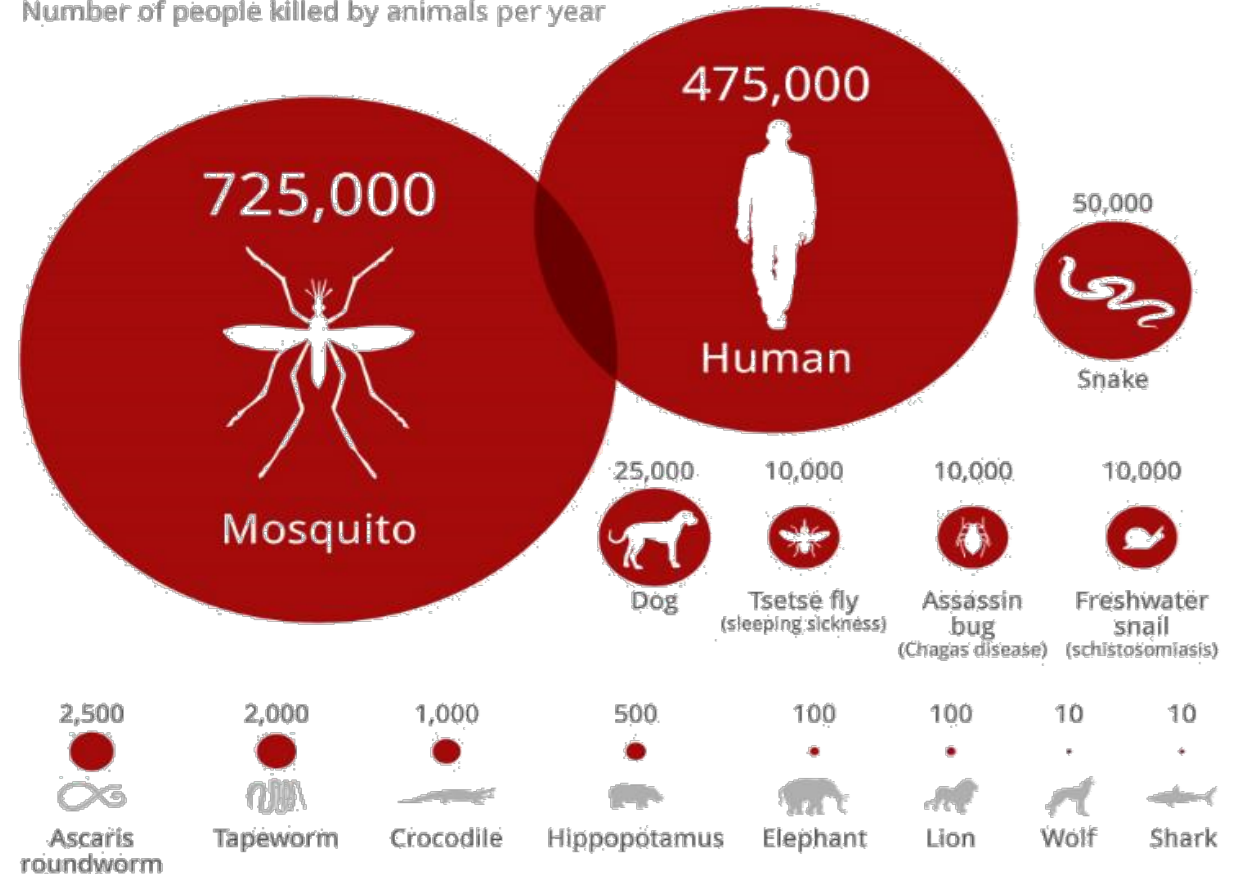
- Invasive species have a ***major impact on Australia's environment***, threatening our unique biodiversity and reducing overall species abundance and diversity.
- What is an example of how invasive species have impacted Australia's environment and/or threatened biodiversity?



Interesting fact: Most deadly animal

- The world's most deadly animal measured by the number of people killed each year is NOT the shark, snake or even human.
- The mosquito, a vector of several of the world's most deadly diseases (such as Malaria), is responsible for the most deaths each year.

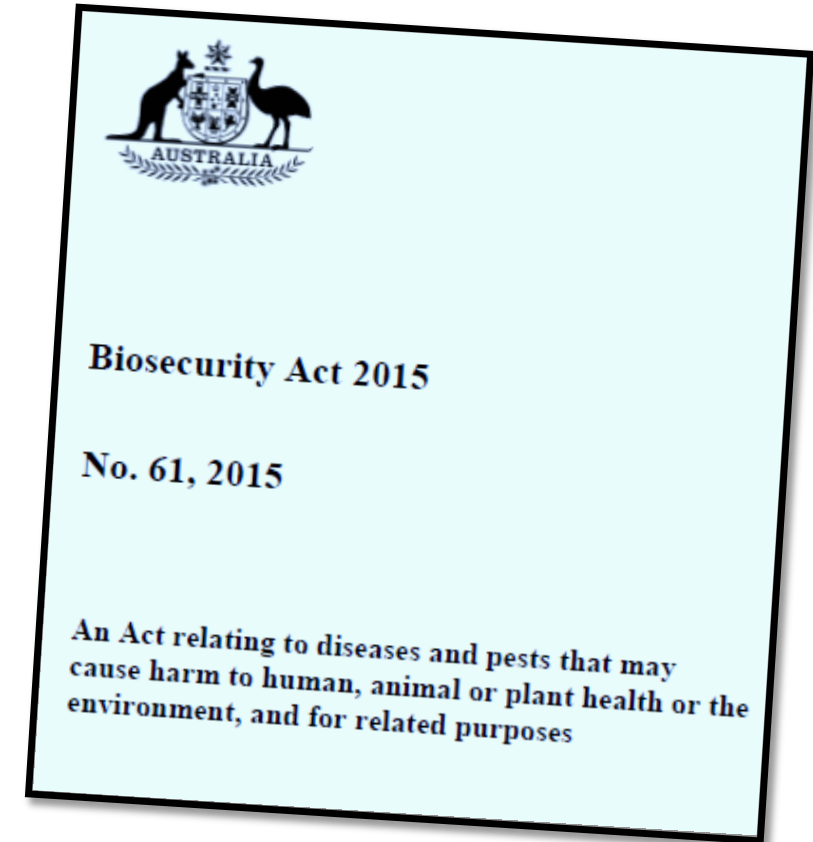
The World's Deadliest Animals
Number of people killed by animals per year



Biosecurity in Agriculture

A strategic and integrated approach that comprises:

- Policy and regulatory frameworks
 - That analyse and manage risks in the sectors of:
 - Food safety
 - Animal life and health
 - Plant life and health
 - Environmental risks (including biodiversity)



Biosecurity in Agriculture

- Biosecurity in agriculture includes:
 - Plant pests: including diseases and pests
 - Animal pests and diseases
 - Zoonoses (diseases which can be transmitted to humans from animals)
 - Introduction and release of genetically modified organisms (GMOs) and their products
 - Management of invasive species

Brown Marmorated Stink Bugs are a recurring seasonal threat that gets harder each year to keep out of Australia.



Biosecurity is more important than ever: Australian biosecurity risk drivers

AN APPETITE FOR CHANGE

Megatrend Overview

- Growing global food demands are creating opportunities for growth in Australian agriculture
- Rising agricultural pressures (e.g. water scarcity, pesticide resistance) are challenging the productivity of the sector
- In order to remain competitive in a growing global market, we are seeing greater agricultural intensification, vertical integration and expansion into new areas
- At the same time, we are continuing to see growth in niche markets (e.g. organic and bioproducts)

THE URBAN MINDSET

Megatrend Overview

- We are continuing to see growth in urban populations, particularly in developing countries
- Australian 'urban dwellers' are increasingly disconnected from primary industries
- We are seeing growing consumer expectations relating to food production (e.g. organic, free-range, locally-sourced)
- Our cities continue to encroach upon new areas of land
- Peri-urban producers are a diverse group and are generally disconnected from traditional agricultural networks

A DIVERSITY DILEMMA?

Megatrend Overview

- We have experienced biodiversity loss in recent centuries, globally and in Australia, with many species on the brink of extinction
- Many of the drivers of biodiversity loss are related to human activity (e.g. land clearing, invasive species)
- Efforts are being made by a number of countries to preserve biodiversity and limit further losses
- A changing climate is causing shifts in ecosystem diversity
- We are continuing to see a loss of species and genetic diversity within agriculture

ON THE MOVE

Megatrend Overview

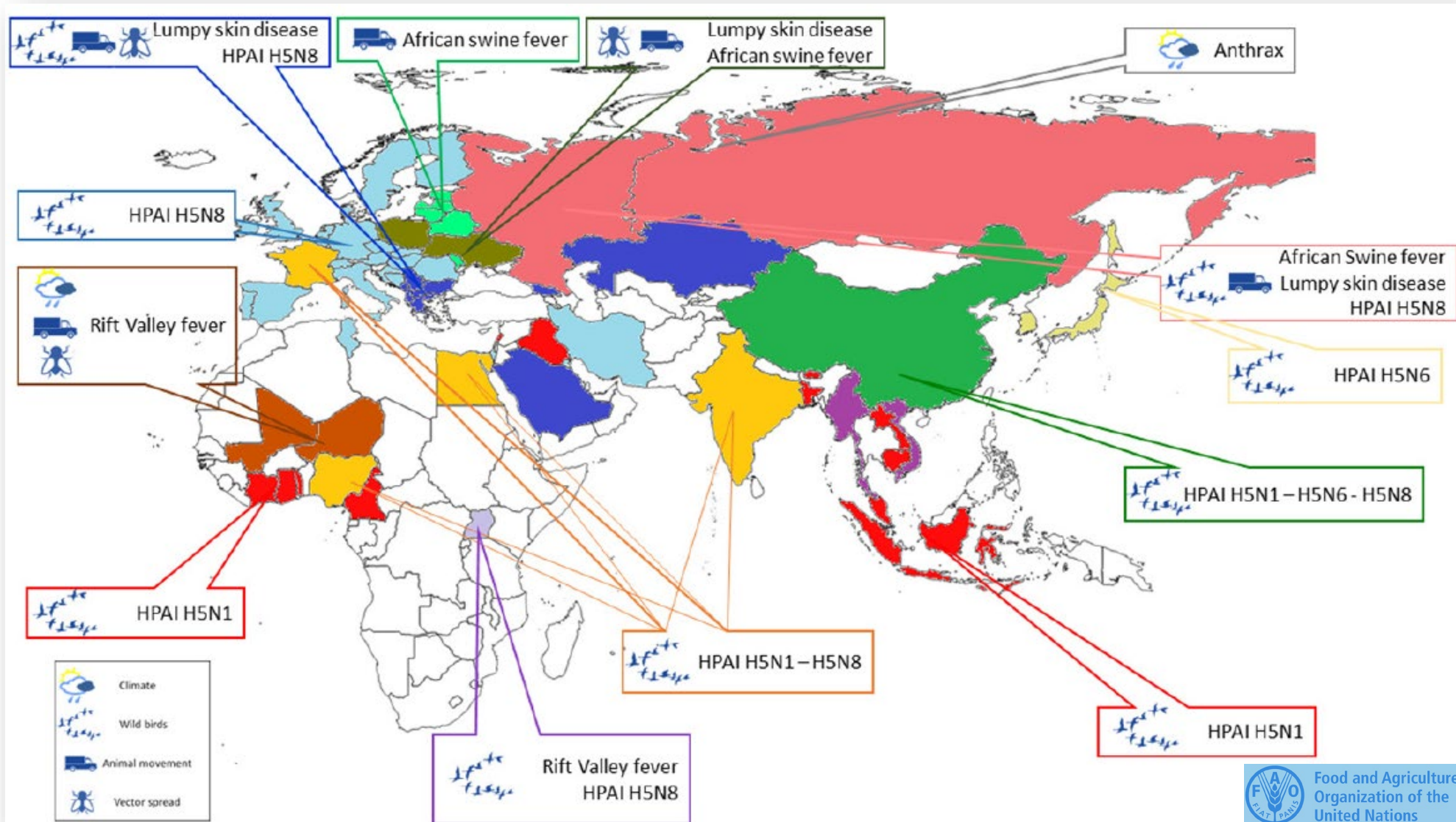
- The number of international tourist arrivals for Australia continues to increase
- We continue to see an increase in the movement of goods and vessels around the world, in line with growing global trade
- In a globalised world, bioterrorism (including agroterrorism) is a potential threat
- We are also seeing greater movement of goods across our interstate borders

THE EFFICIENCY ERA

Megatrend Overview

- An ageing population is leading to a decline in biosecurity specialists and experienced farmers, with a lack of younger talent to fill the gaps created
- Biosecurity investment does not appear to be keeping pace with the growing challenges we face
- Technology and innovation across surveillance and monitoring; data and analytics; communication and engagement; genetics; and smaller, smarter devices will play an important role in addressing future biosecurity challenges
- It is important to identify and address the barriers that could prevent technological innovation from delivering the efficiencies required

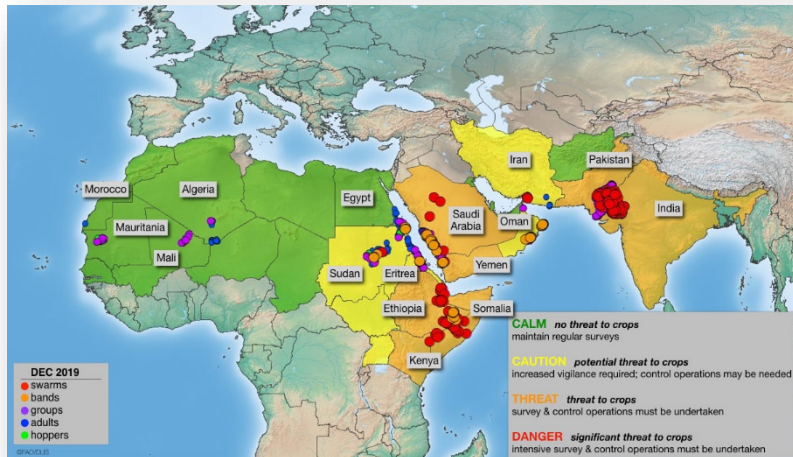
Biosecurity Risks: Global Animal Disease & Drivers 2016



Biosecurity Risks: Climate: Indian Ocean Dipole - 2019-20

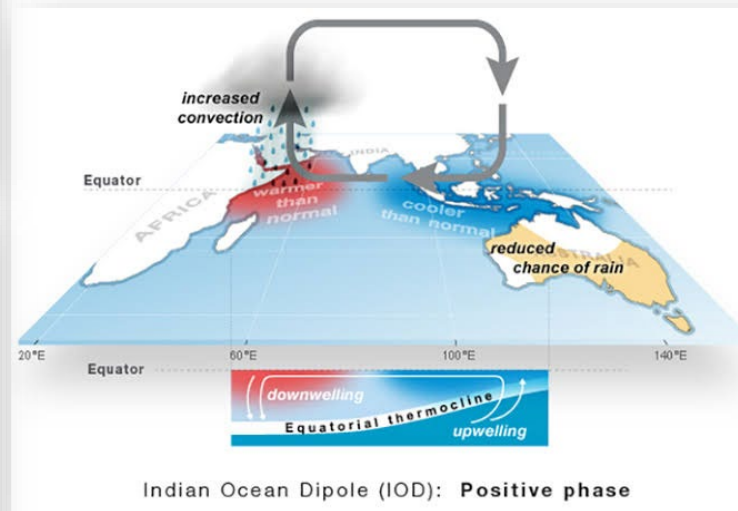
Horn of Africa

- Floods and locust plagues



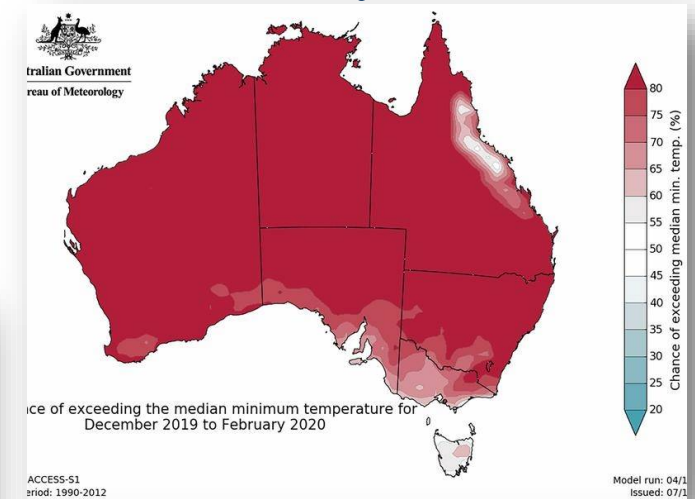
The extreme 2019 Indian Ocean Dipole caused severe dry conditions in Australia and floods and plagues in the horn of Africa

2019 Record Positive Dipole



Australia

- Extreme dry conditions + fires



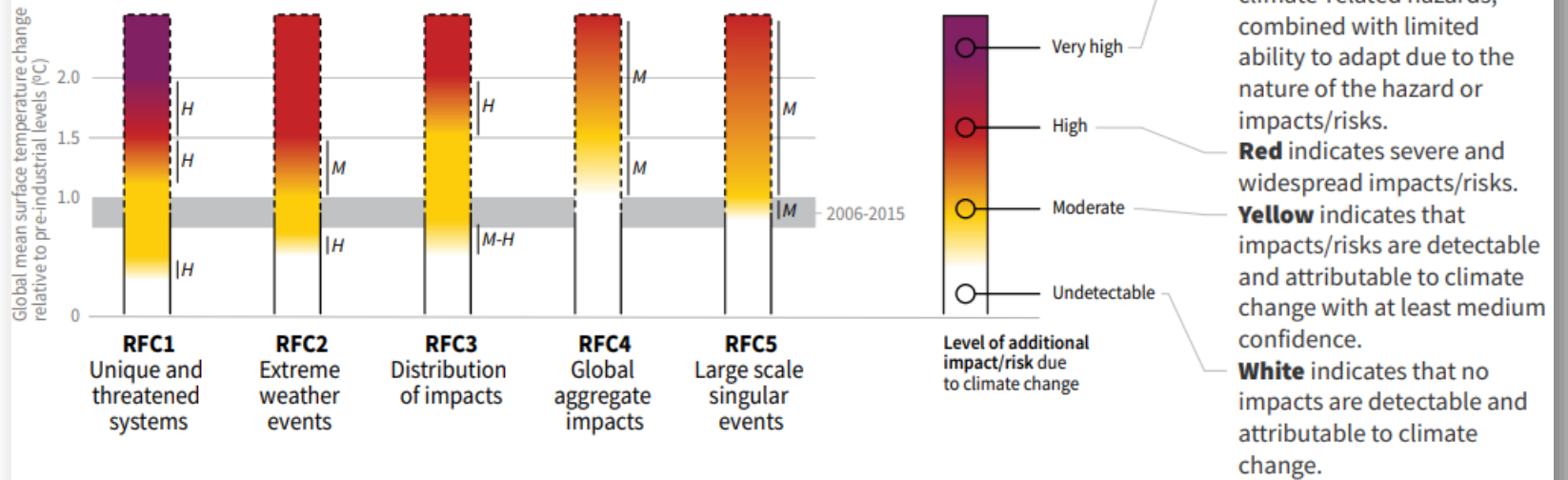
Biosecurity Risks: Climate Change

Current risk mitigation activity modelling = +2-3°C

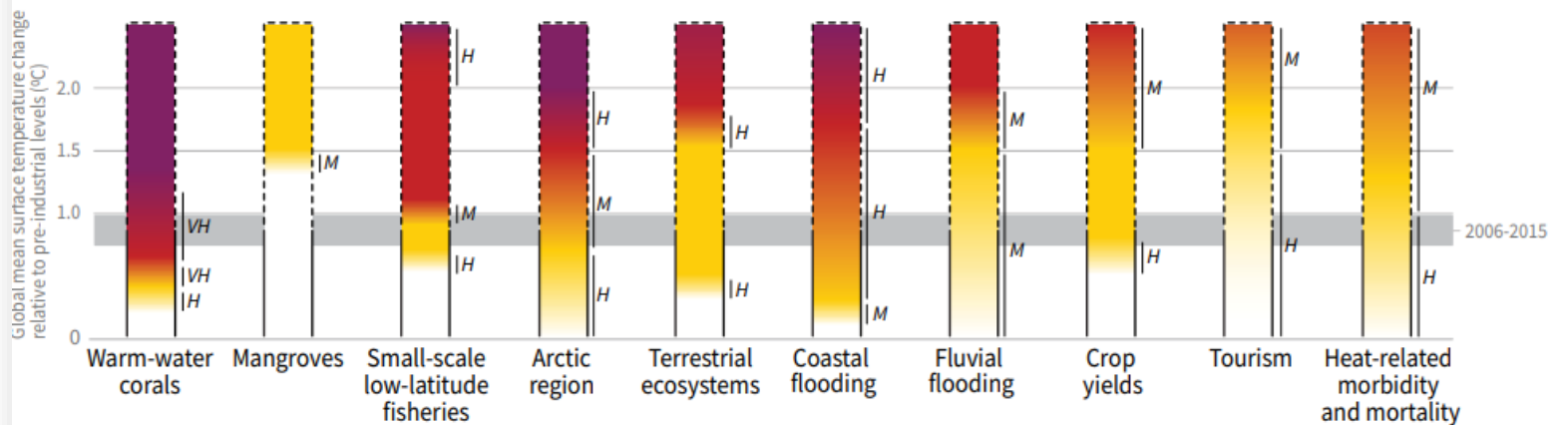
- High risk of Ext Weather events
- Moderate risk of Large-scale singular events
- V. High risk to biodiversity

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)



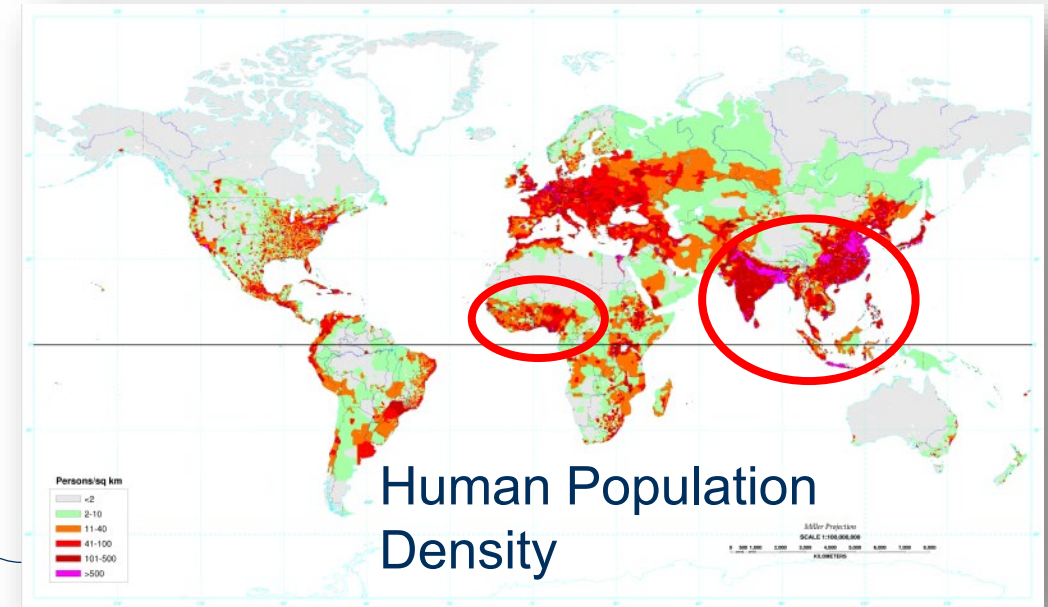
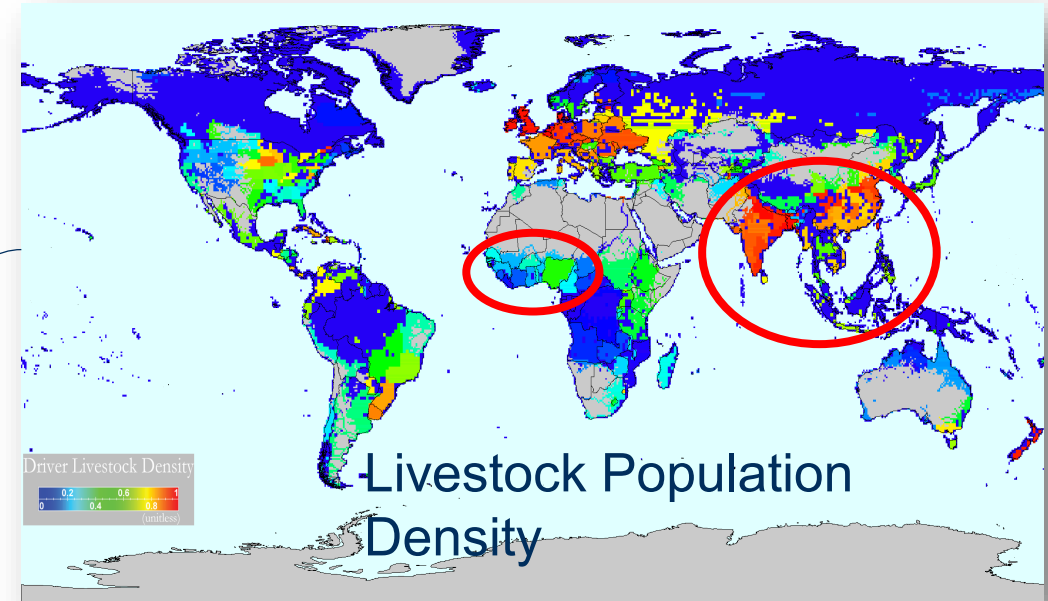
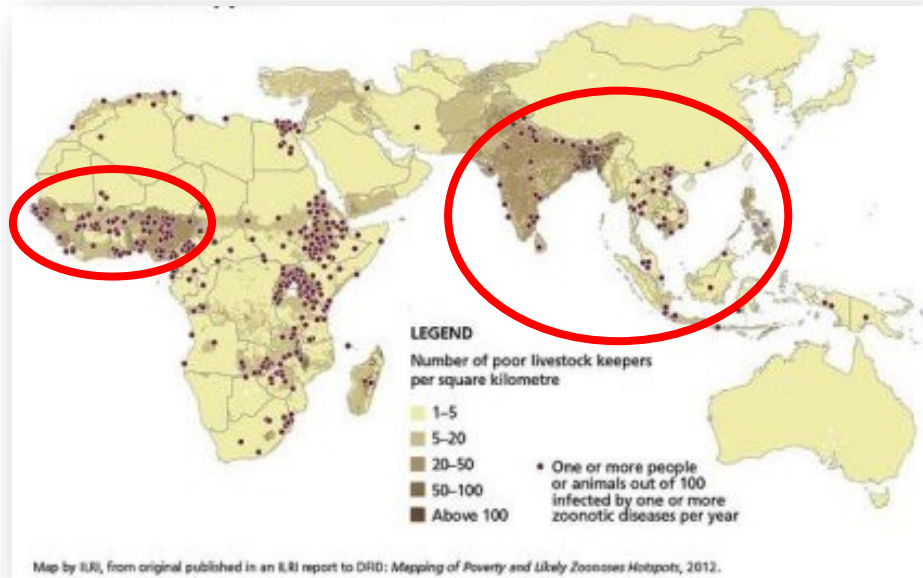
Impacts and risks for selected natural, managed and human systems



Biosecurity Risks: Animal-Human interactions

Population density of animals and humans are concentrated in key biosecurity hotspots in our region present opportunities for zoonotic diseases to spread from animal to humans

Zoonoses hotspots



Biosecurity Risks: Human movement

The most effective non-pharma interventions (NPI) for COVID-19 related to the restriction of movement of people

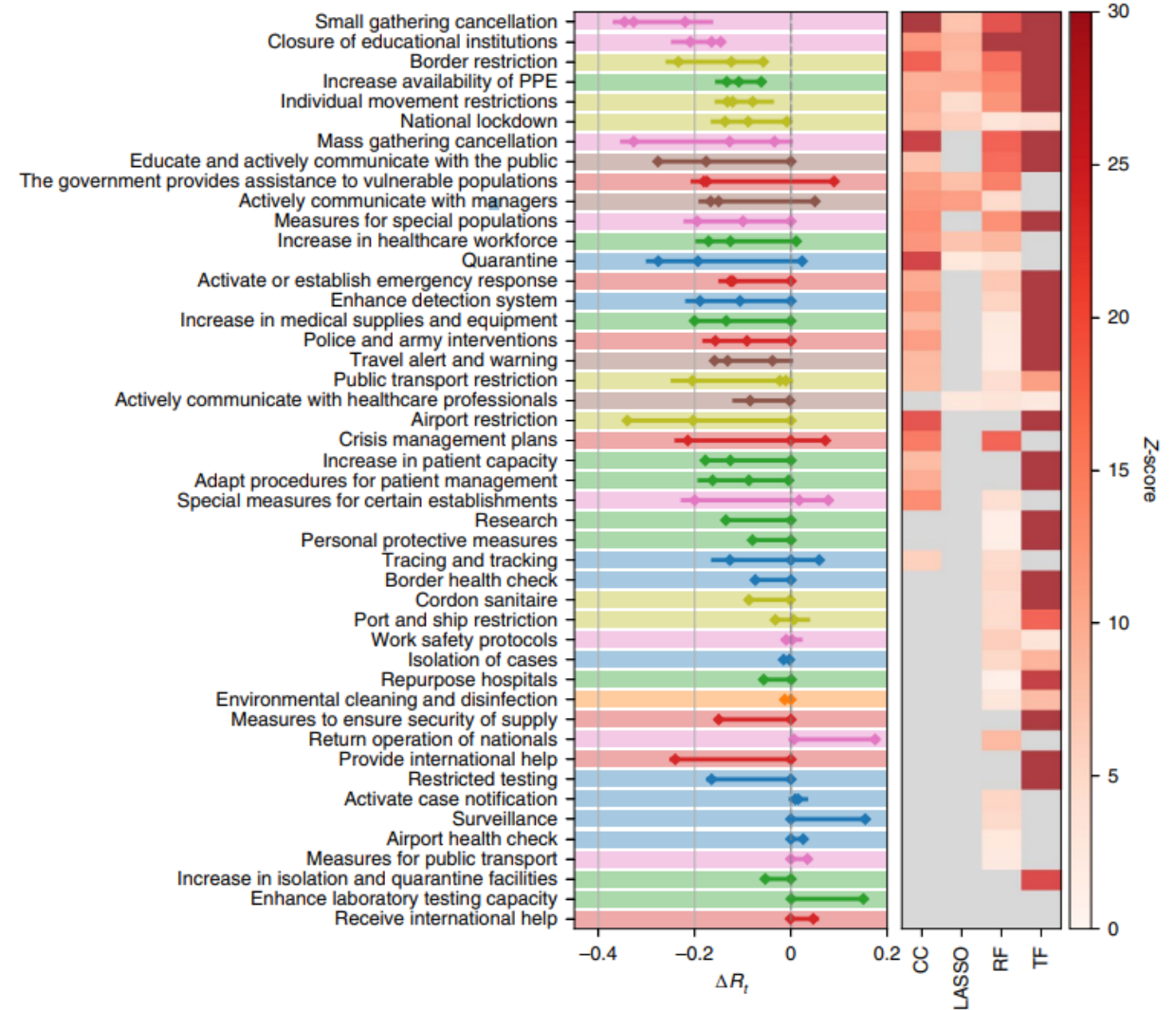


Fig. 1 | Change in R_t (ΔR_t) for 46 NPIs at L2, as quantified by CC analysis, LASSO and TF regression. The left-hand panel shows the combined 95% confidence intervals of ΔR_t for the most effective interventions across all included territories. The heatmap in the right-hand panel shows the corresponding Z-scores of measure effectiveness as determined by the four different methods. Grey indicates no significantly positive effect. NPIs are ranked according to the number of methods agreeing on their impacts, from top (significant in all methods) to bottom (ineffective in all analyses). L1 themes are colour-coded as in Supplementary Fig. 1.

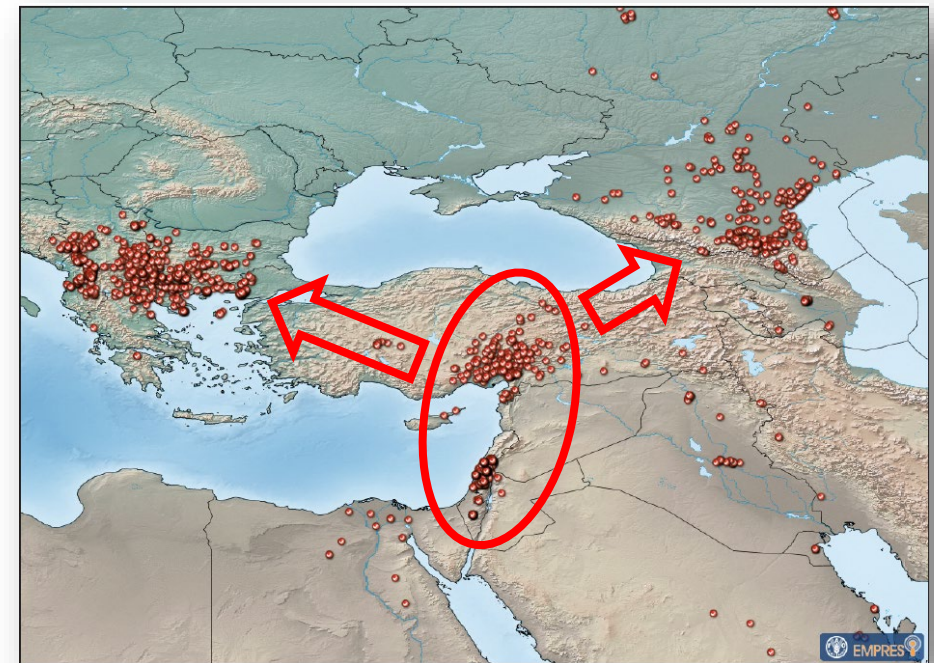
Biosecurity Risks: Human Migration & Livestock

- Lumpy Skin Disease in Cattle (particularly Holstein Friesian) confined to Middle East & Turkey till 2014
- Civil War causes disease spread through migration to Greece & Russia as people and stock flee wars

LSD Outbreaks 2010-2014



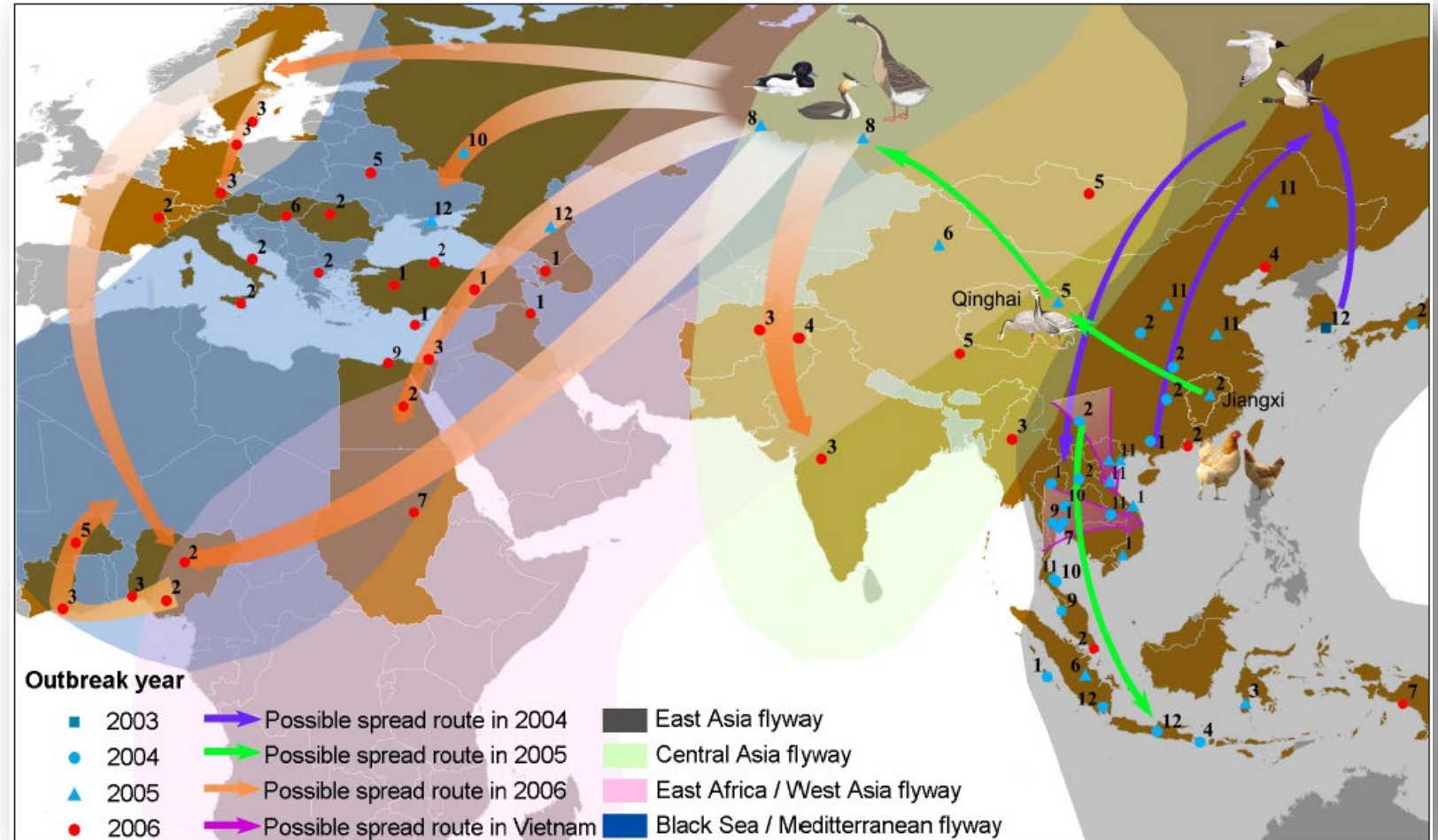
LSD Outbreaks 2010-2016



Biosecurity Risks: Animal movement

Migratory birds

- Avian influenza H5N1 HPAI spread along wildfowl long-distance migration routes

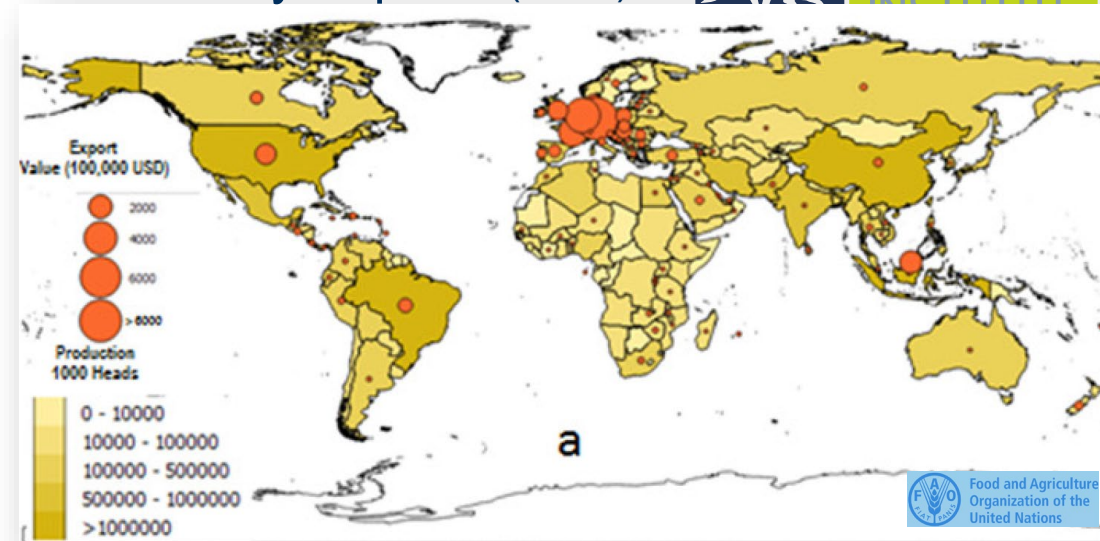


Biosecurity Risks: Animal movement

Animal Exports

- Australia is mainly an exporter of livestock (Cattle almost exclusively)
- Globally movement of livestock is a major trade including
 - Cattle (100 countries)
 - Small ruminants (90 countries)
 - Poultry (70 countries)
 - Pigs (70 countries)
 - Camels (6 major countries)

Live Poultry Exports (2015)



Live Cattle Exports (2015)

