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and Faculty  
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# **Sessional meeting: Climate models have a fatal flaw – actuarial risk management does not have to**

Dr Jimena Alvarez  
Mary Goldman  
Michael Sher  
Nick Spencer

# Climate, Biodiversity, Change, and Us

- **Climate change affects:**

- Our physical space
- Our financial and economic health
- Our quality of life
- BIODIVERSITY

- **Biodiversity affects:**

- Our physical space
- Our financial and economic health
- Our quality of life
- THE IMPACTS OF CLIMATE CHANGE

**BUT: current climate change models don't reflect this adequately**

➤ **Decisions informed by these models are flawed**

**What can we do about it?**

- Improve biodiversity data
- Increase our modelling suites and tools, e.g. to include qualitative scenarios
- Encourage regulators, policy-makers and decision-takers to require inclusion of biodiversity



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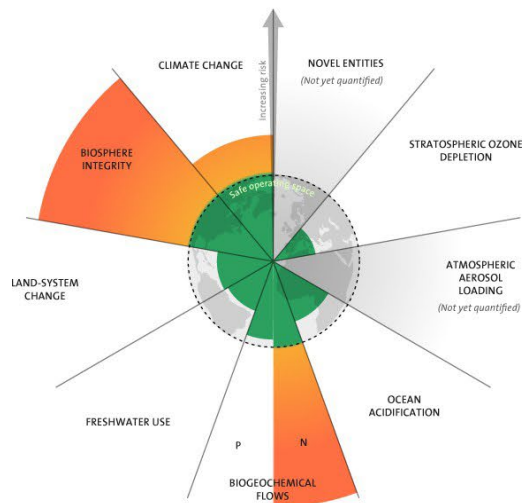
# Nature risk rising: the case for systems thinking

Dr Jimena Alvarez



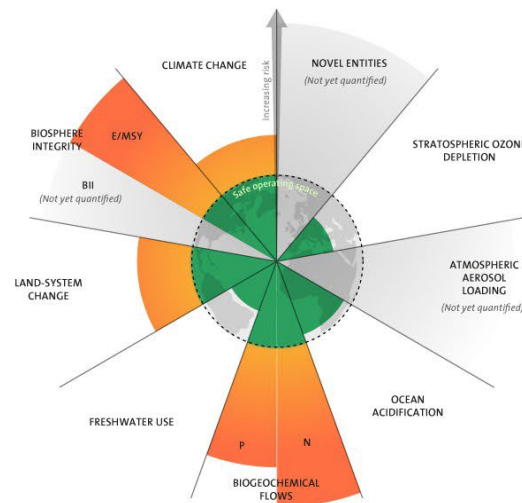
# Seven of nine planetary boundaries have been breached

2009



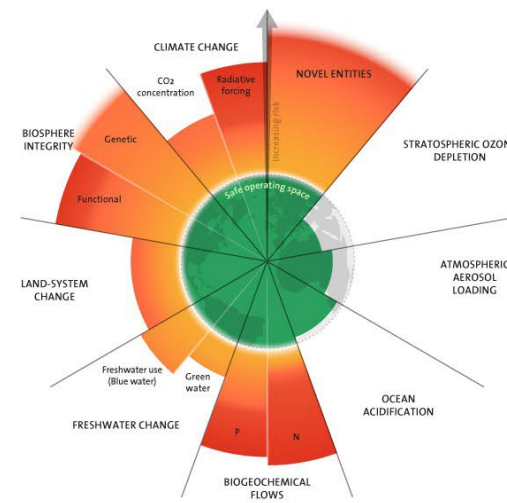
7 boundaries assessed,  
3 crossed

2015



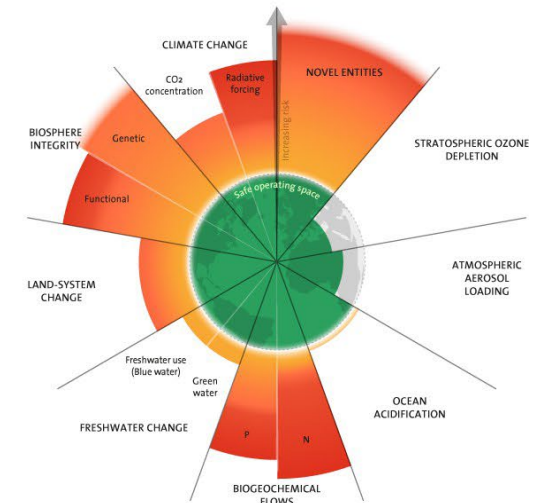
7 boundaries assessed,  
4 crossed

2023

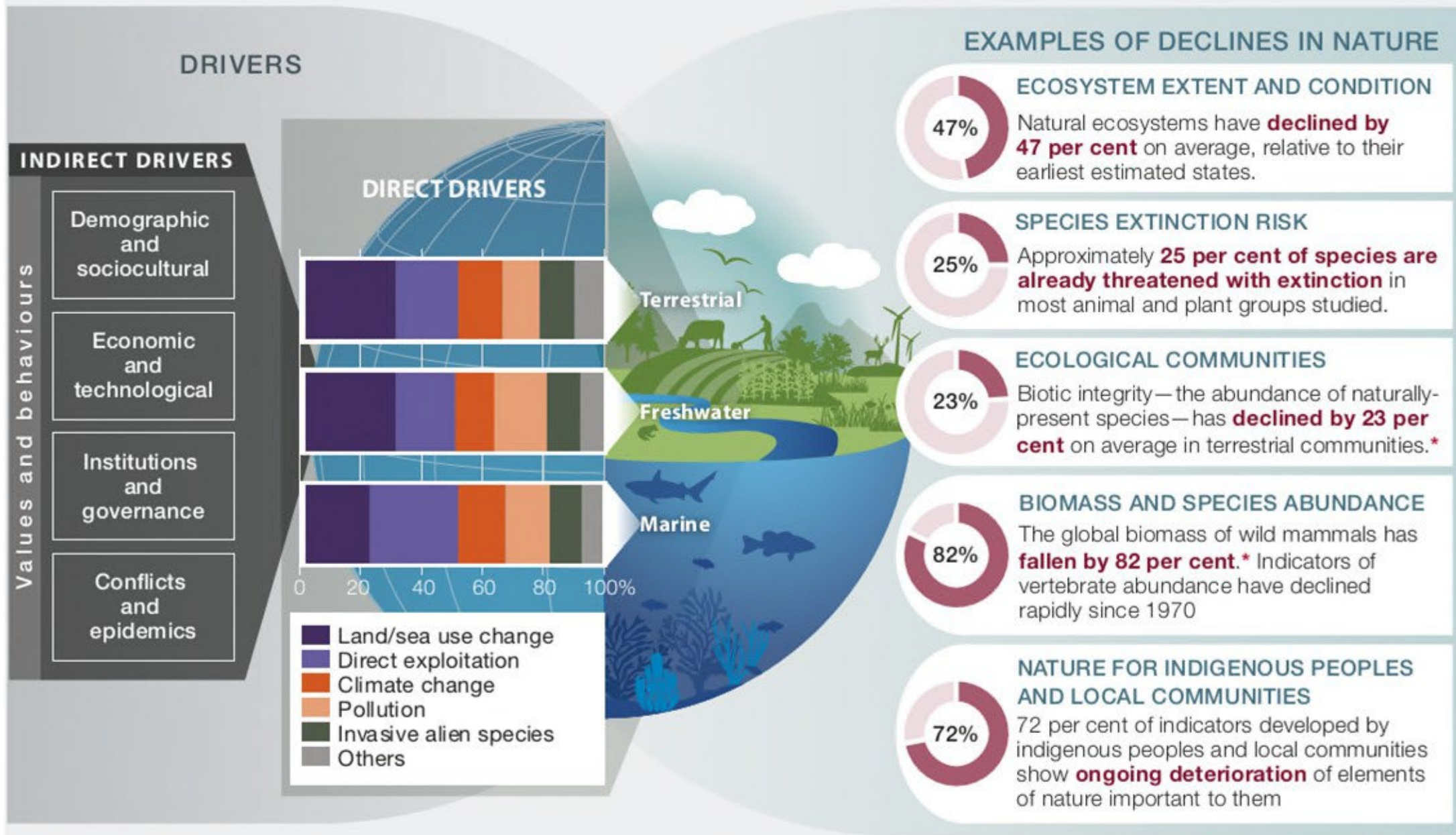
















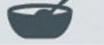



9 boundaries assessed,  
6 crossed

2025



9 boundaries assessed,  
7 crossed



	Nature's contribution to people	50-year global trend	Directional trend across regions	Selected indicator
REGULATION OF ENVIRONMENTAL PROCESSES	 1 Habitat creation and maintenance	↓	○	• Extent of suitable habitat • Biodiversity intactness
	 2 Pollination and dispersal of seeds and other propagules	↓	○	• Pollinator diversity • Extent of natural habitat in agricultural areas
	 3 Regulation of air quality	↘	↕	• Retention and prevented emissions of air pollutants by ecosystems
	 4 Regulation of climate	↘	↕	• Prevented emissions and uptake of greenhouse gases by ecosystems
	 5 Regulation of ocean acidification	→	↕	• Capacity to sequester carbon by marine and terrestrial environments
	 6 Regulation of freshwater quantity, location and timing	↘	↕	• Ecosystem impact on air-surface-ground water partitioning
	 7 Regulation of freshwater and coastal water quality	↘	○	• Extent of ecosystems that filter or add constituent components to water
	 8 Formation, protection and decontamination of soils and sediments	↘	↕	• Soil organic carbon
	 9 Regulation of hazards and extreme events	↘	↕	• Ability of ecosystems to absorb and buffer hazards
	 10 Regulation of detrimental organisms and biological processes	↓	○	• Extent of natural habitat in agricultural areas • Diversity of competent hosts of vector-borne diseases
MATERIALS AND ASSISTANCE	 11 Energy	↘	↕	• Extent of agricultural land—potential land for bioenergy production • Extent of forested land
	 12 Food and feed	↓	↕	• Extent of agricultural land—potential land for food and feed production • Abundance of marine fish stocks
	 13 Materials and assistance	↘	↕	• Extent of agricultural land—potential land for material production • Extent of forested land
	 14 Medicinal, biochemical and genetic resources	↓	○	• Fraction of species locally known and used medicinally • Phylogenetic diversity
NON-MATERIAL	 15 Learning and inspiration	↓	○	• Number of people in close proximity to nature • Diversity of life from which to learn
	 16 Physical and psychological experiences	↘	○	• Area of natural and traditional landscapes and seascapes
	 17 Supporting identities	↘	○	• Stability of land use and land cover
	 18 Maintenance of options	↓	○	• Species' survival probability • Phylogenetic diversity

## Five drivers of nature degradation

The 2019 Global Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) concluded that fourteen of Nature's contribution of people (NCP) that were assessed had declined since the 1970s, while outputs of food and other products had risen.

Trade-off between increase in food and materials at the expense of regulating NCPs

Source: IPBES 2019



# Tipping points & Connectivity

## RAISING THE ALARM

Evidence that tipping points are under way has mounted in the past decade. Domino effects have also been proposed.



**A. Amazon rainforest**  
Frequent droughts

**B. Arctic sea ice**  
Reduction in area

**C. Atlantic circulation**  
In slowdown since 1950s

**D. Boreal forest**  
Fires and pests changing

**F. Coral reefs**  
Large-scale die-offs

**G. Greenland ice sheet**  
Ice loss accelerating

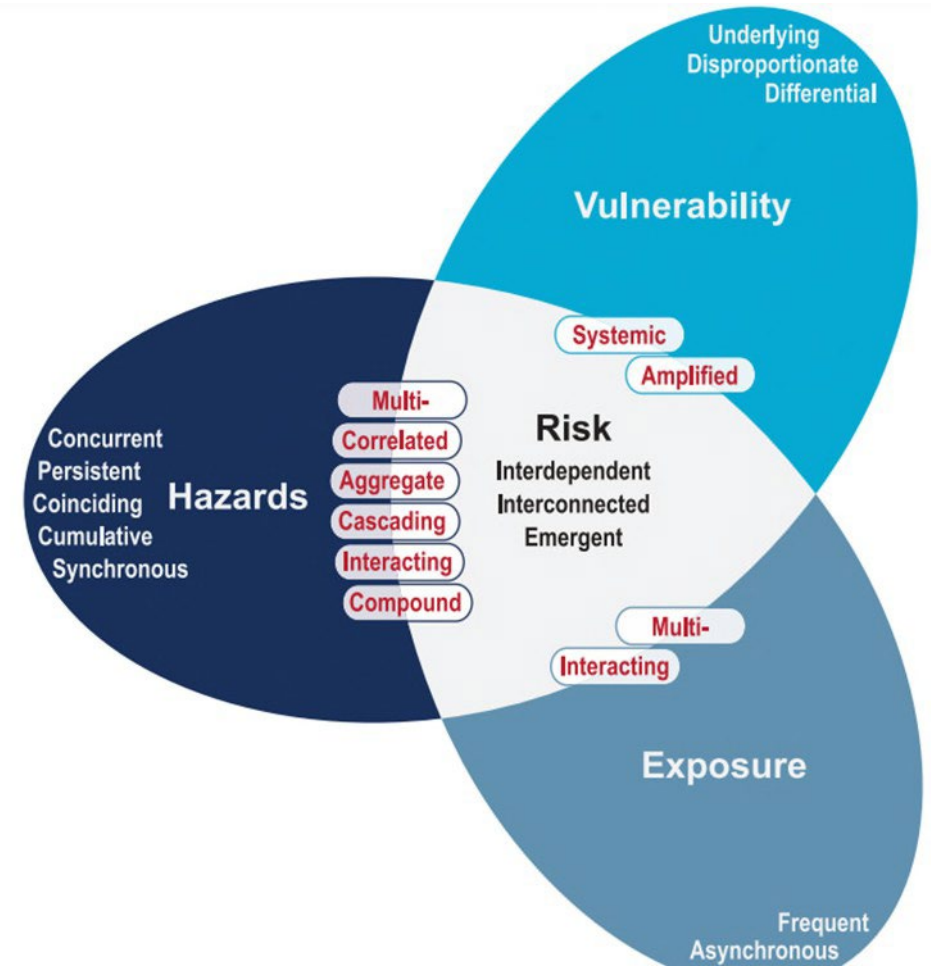
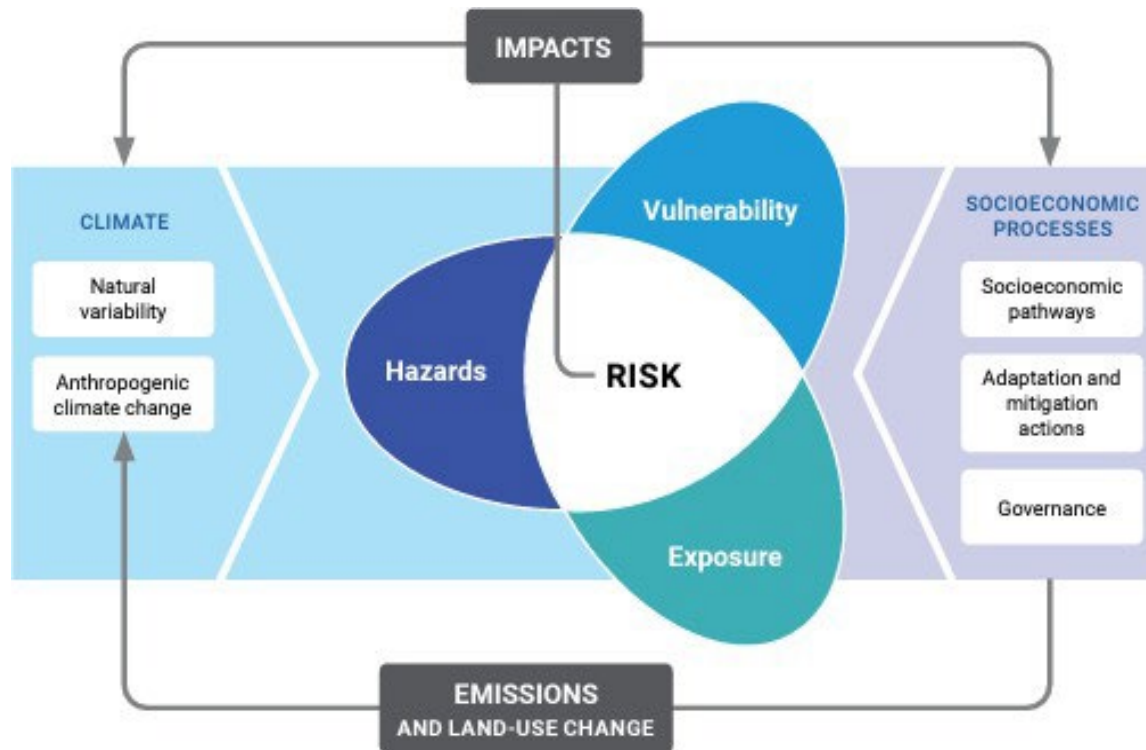
**H. Permafrost**  
Thawing

**I. West Antarctic ice sheet**  
Ice loss accelerating

**J. Wilkes Basin, East Antarctica**  
Ice loss accelerating

©nature

# Risk assessment approach



# GLOBAL

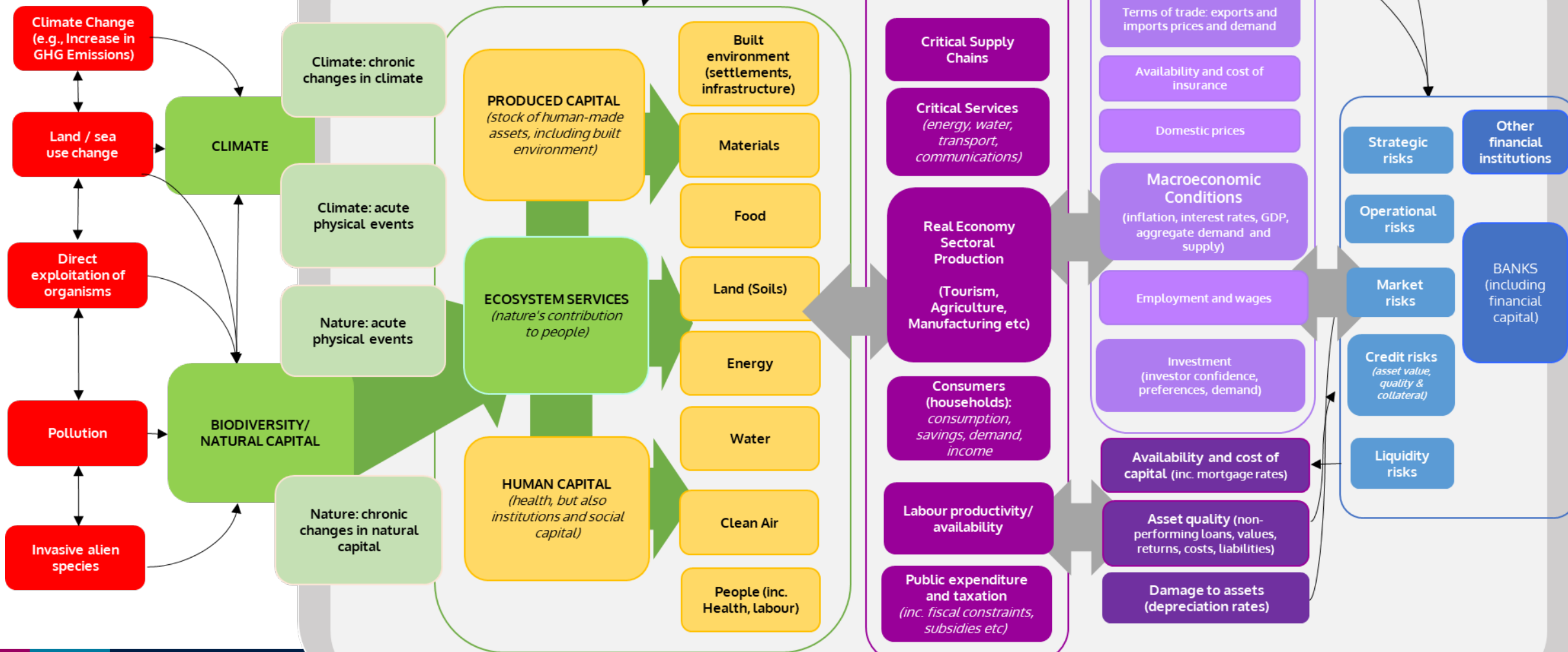
GLOBAL STOCKS OF HUMAN, NATURAL AND PRODUCED CAPITAL AND RELATED FLOWS

Global financial system including banks overseas portfolios (Investment, Risk Premia)

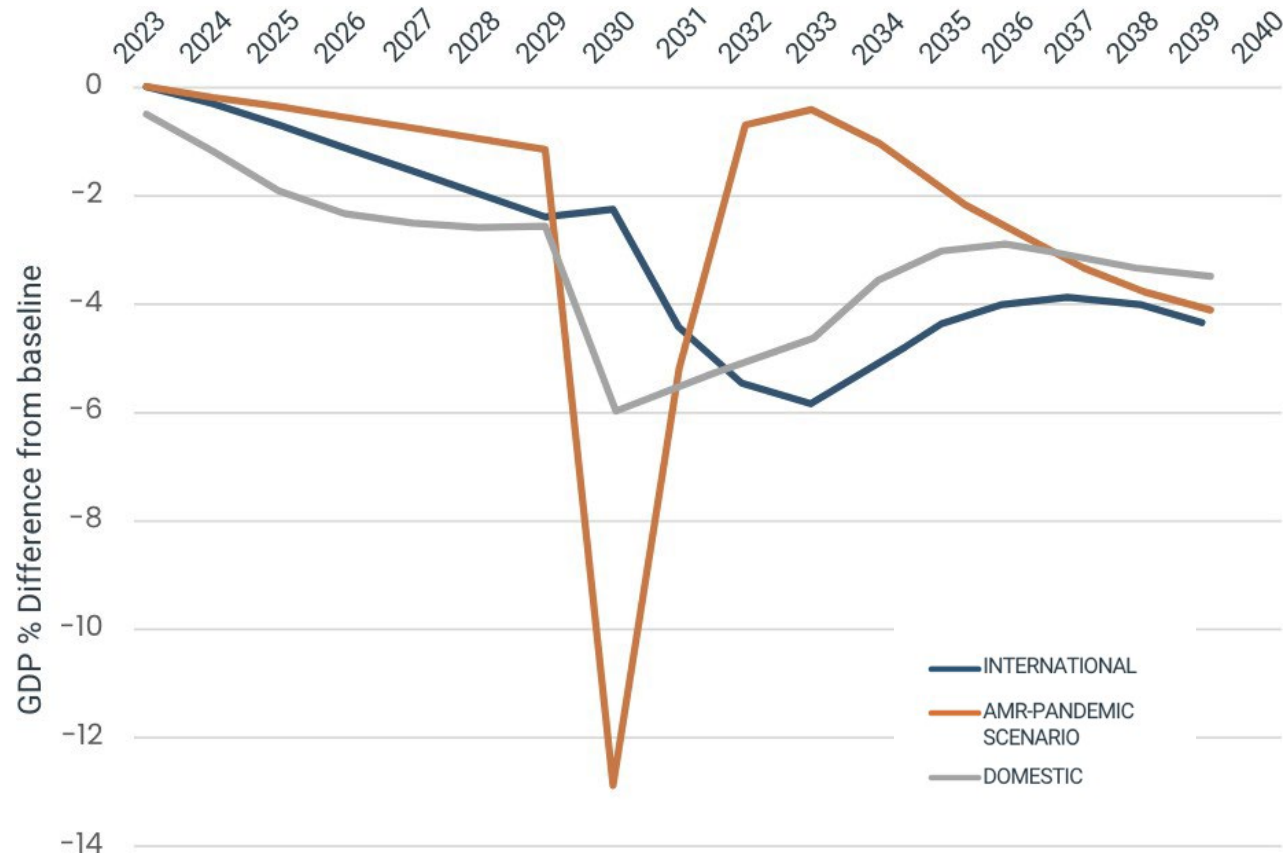
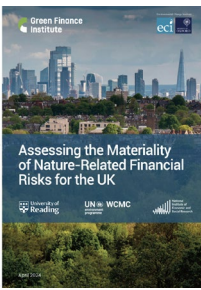
Global economy (trade and supply chains) and macroeconomic conditions (inc. sovereign bond yields, public debt, inflation rates etc)

Global geopolitical environment inc. migration, conflict

# LOCAL



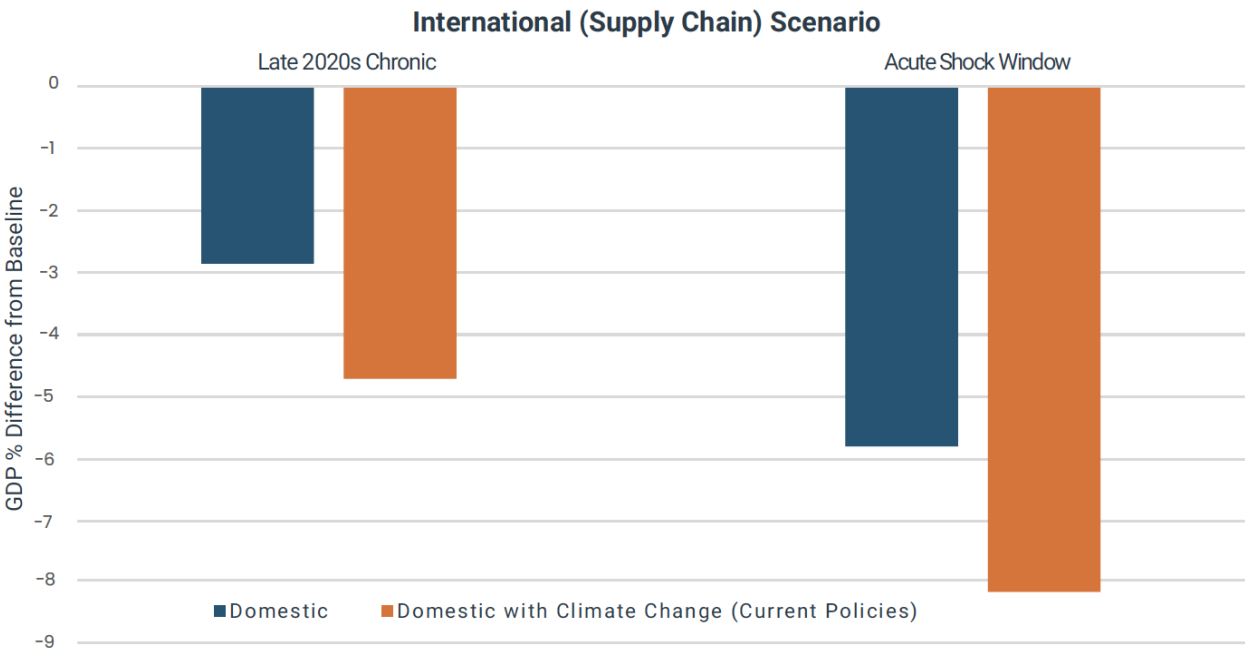
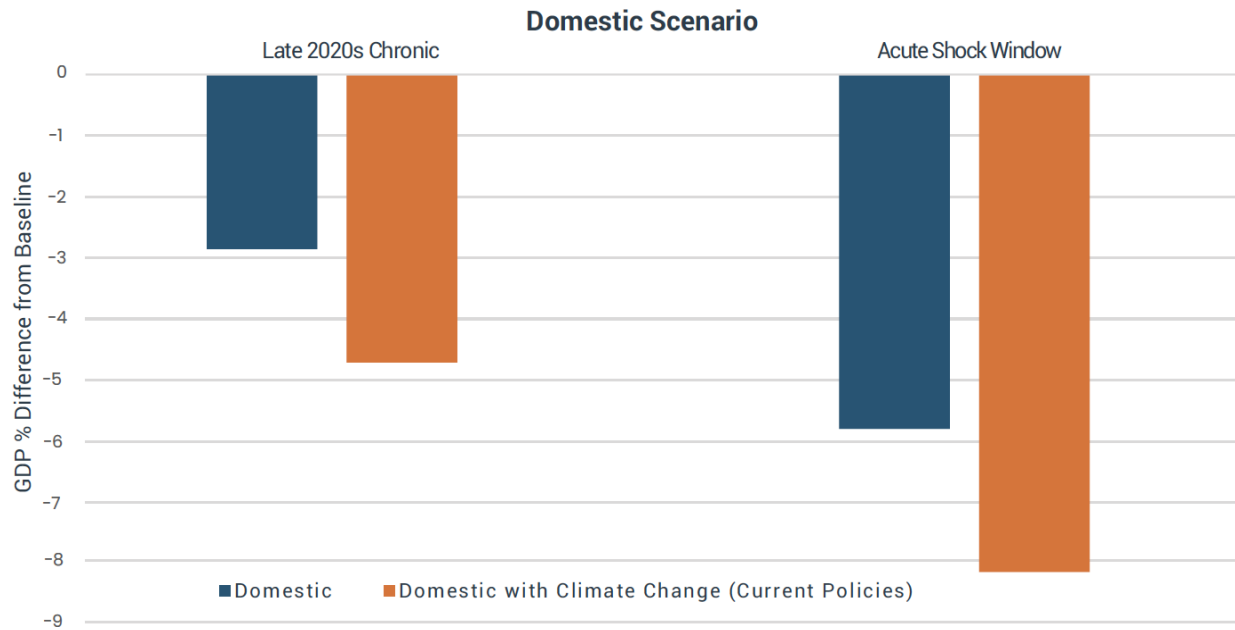
# Nature-related risks are macro-critical



The deterioration of the natural environment in the UK and around the world could slow economic growth and lead to major shocks that could result in GDP being 6% lower than it would have been otherwise by the 2030s under two scenarios and 12% lower under an AMR-pandemic scenario

These are greater than the impact on GDP experienced in the Global Financial Crisis, (-4%-6% UK GDP) , and - for the AMR-pandemic scenario - greater than the GDP impact of the COVID-19 pandemic (-11% UK GDP).

Environmental degradation increases the chance and impacts of an acute climate or health shock, and the combined effect would have a very material impact on the economy



Gradual (chronic) year-to-year environmental degradation is as detrimental or more so than climate change; nature doubles climate losses

Nature-related risks amplify climate risks

Environmental degradation increases the severity and likelihood of acute shocks related to climate change

The compounding impacts of climate and nature are macro-critical

Implications for Adaptation:

- Adaptation and nature are aligned
- Consider nature-climate feedbacks in risk assessment and disclosure
- Don't forget indirect risks!
- Integrate adaptation and nature within transition plans
- Engage with clients and investees
- Seek co-benefits from investments

Source: Ranger et al. (2024)

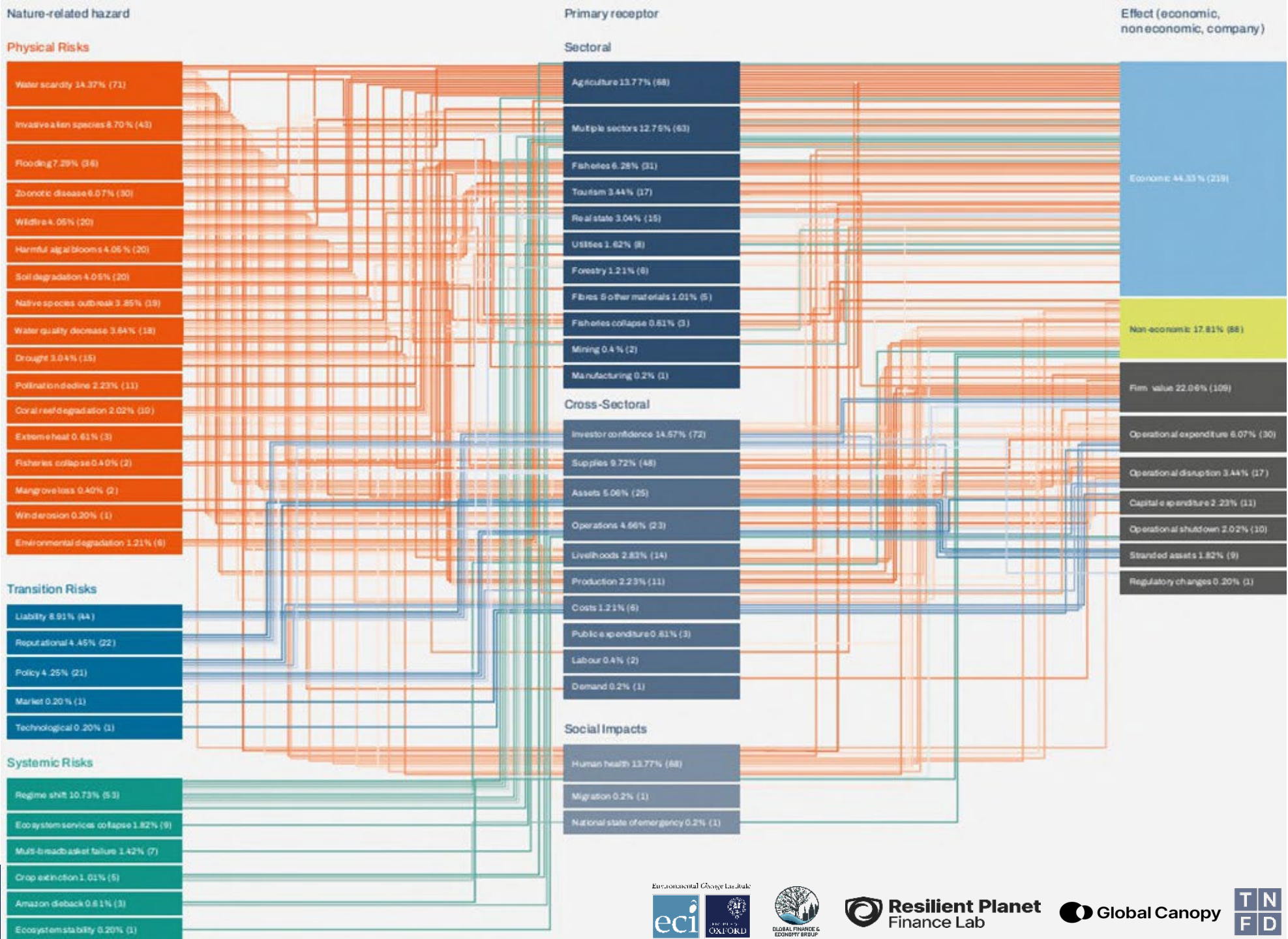
# Nature risk: rising to the top



# Sources and transmission channels of nature-related risks leading to different effects



Source: Alvarez, Postel- Vinay, Melis, McKenzie and Ranger (2025).



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# Thank you

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