Natural disasters – impact on economy and financial stability

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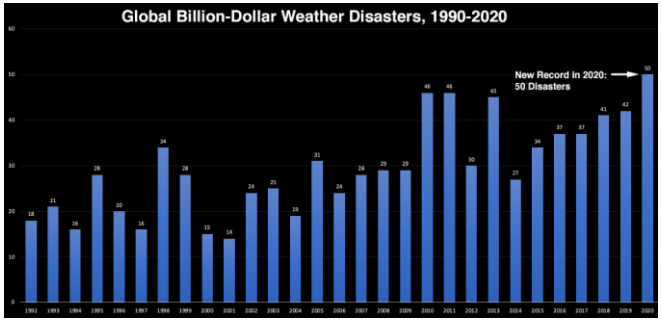
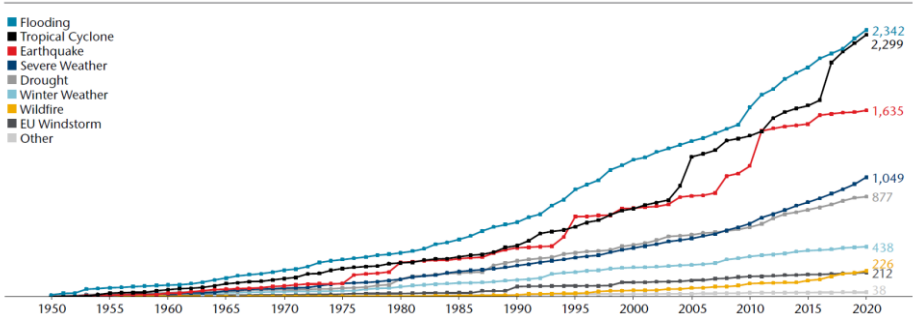
Climate crisis

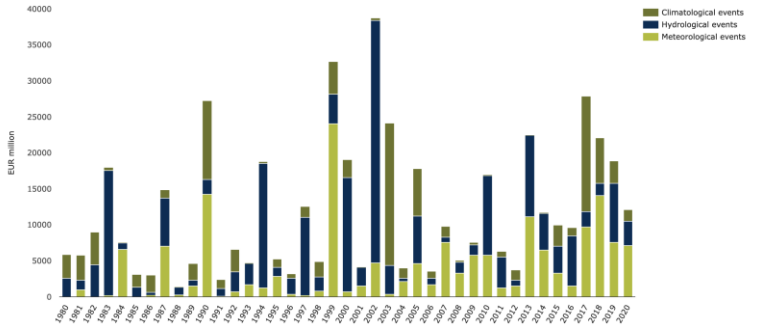
- Economical costs related to extreme weather events





Cumulative global economic losses by peril since 1950 (2020 USD)
(Aon 2020 annual report)

Figure 1. Annual economic damage caused by weather and climate-related extreme events in the EU Member States

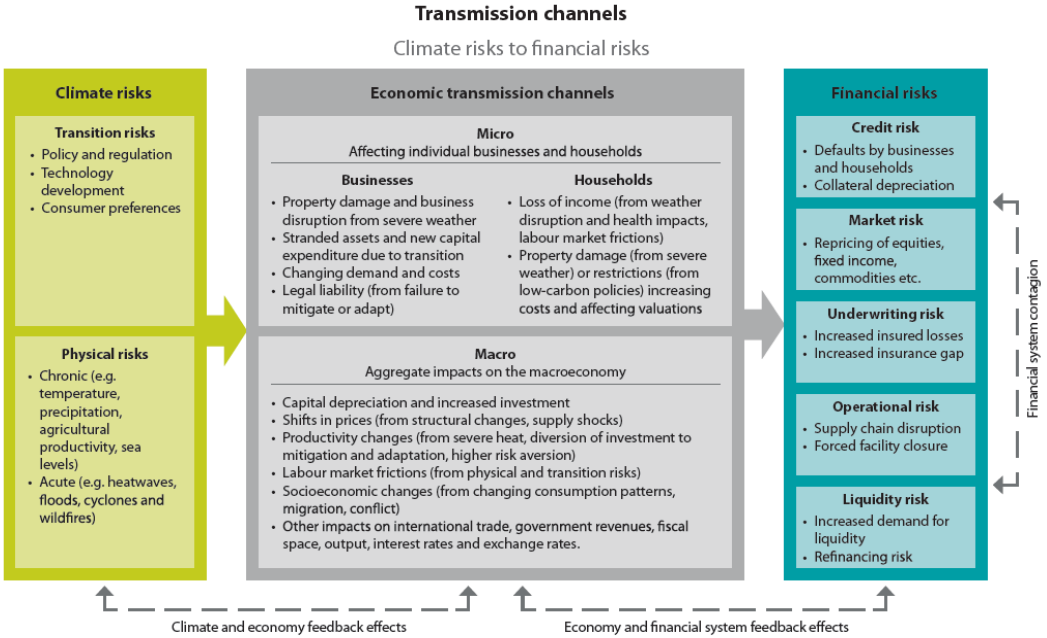


Source: European Environmental Agency

weather and climate-related extremes accounted for around 80% of total economic losses caused by natural hazards in the EEA Member States

Natural disasters and economy

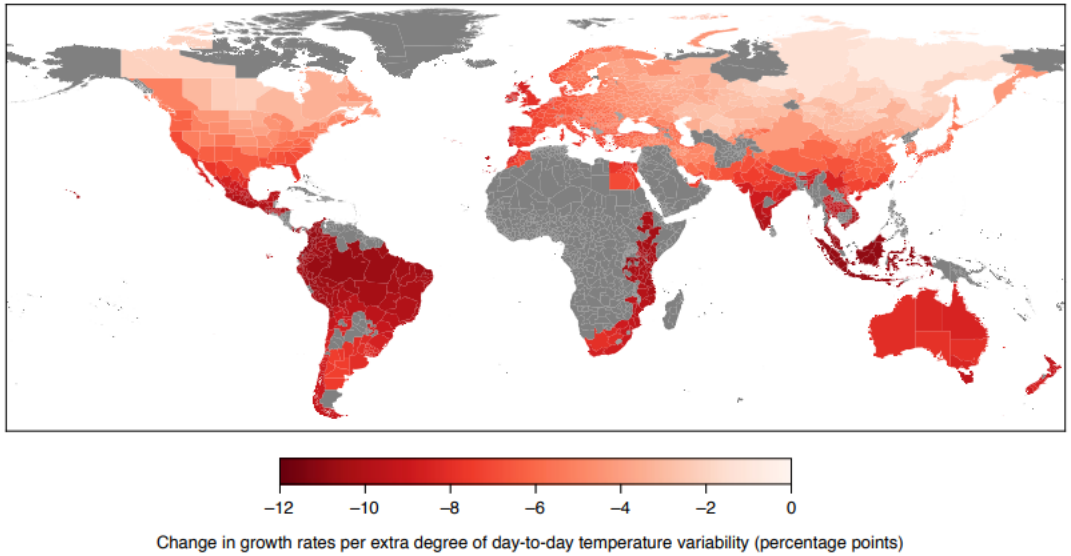
- Natural disasters can affect economy and financial systems through a range of transmission channels



NGFS, 2022

Climate crisis

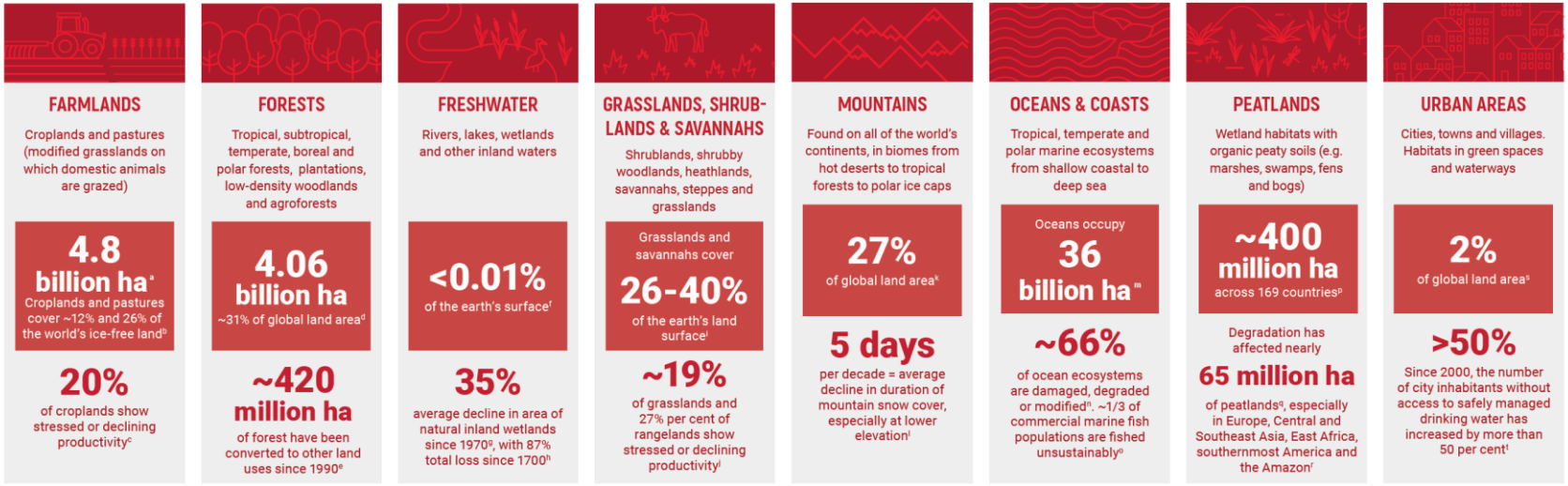
- Considerable economic losses and increasing global inequality as a result of historical and future climate change
- Most empirical assessments of the impacts of climate on macro-economic growth are subject to limitations, most studies only consider changes in annual averages of climate variables



Kotz et al., 2021. Day to day temperature variability reduces economic growth. Nature Climate Change.

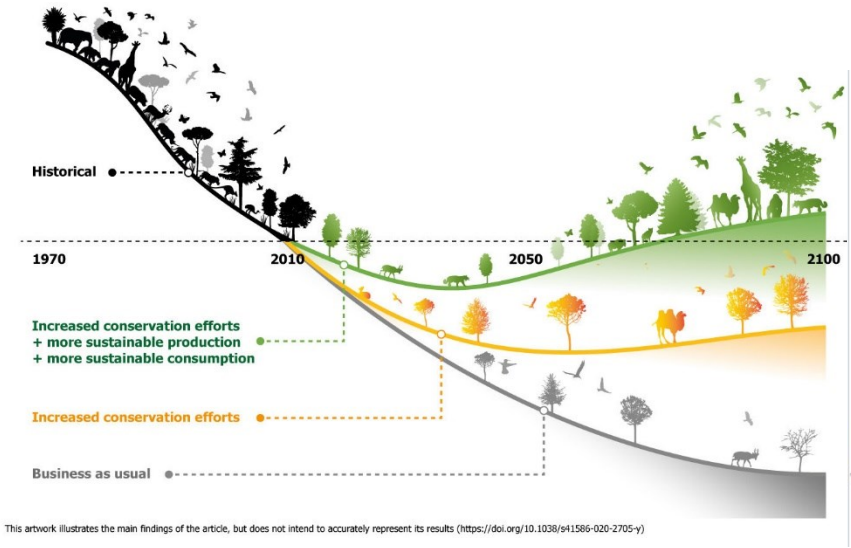
Nature crisis

- We are currently observing an **unprecedent decline** of natural ecosystems and their vital services
- **Drivers of nature loss**: climate change, invasive species, land use change, overexploitation of natural resources, pollution

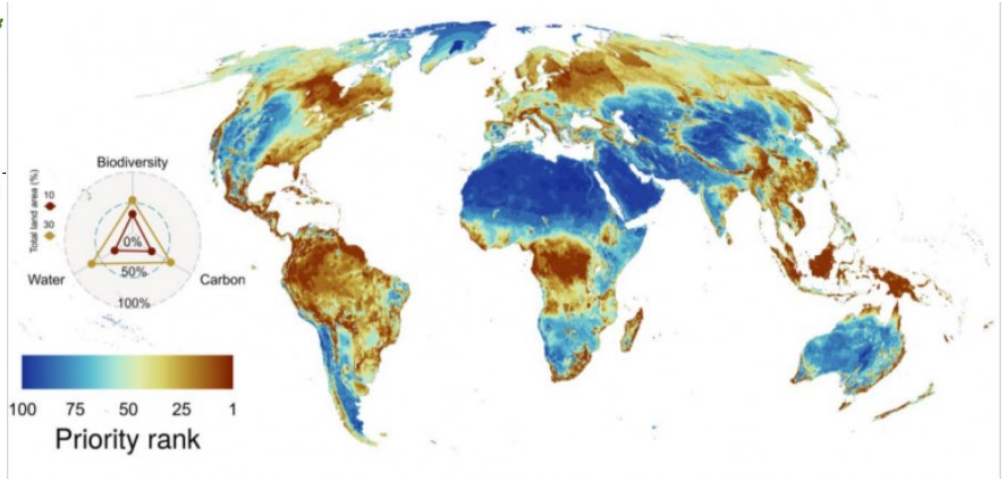


Source: UN Environmental Programme

Nature crisis



Expected trends in global biodiversity indicators pointing to the need for ambitious conservation and transformative change in the food systems (Leclere et al., 2020)

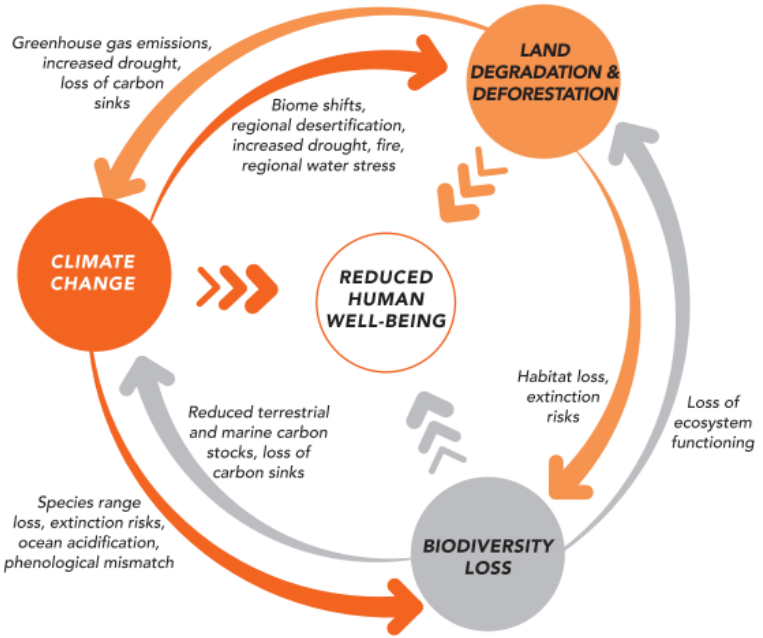


Global view of priority conservation areas when giving equal weight to biodiversity, carbon storage and water quality (Jung et al., 2021)

Climate and Nature

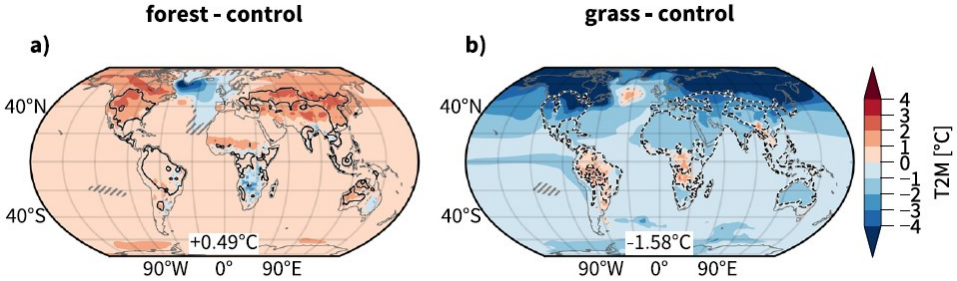
- Nature and climate related risks are **interconnected**
  - Biodiversity and ecosystem services play essential role for **climate regulation**
  - The **loss of biodiversity** will further **accelerate climate change** if ecosystems are not effectively protected
  - **Climate change** contributes to the **loss of biodiversity** and ecosystems (ecological regime shifts, disruption of critical ecosystem services, irreversible impacts)

Figure 1. Interactions between biodiversity, climate change and land use
Source: UNEP (2021b)

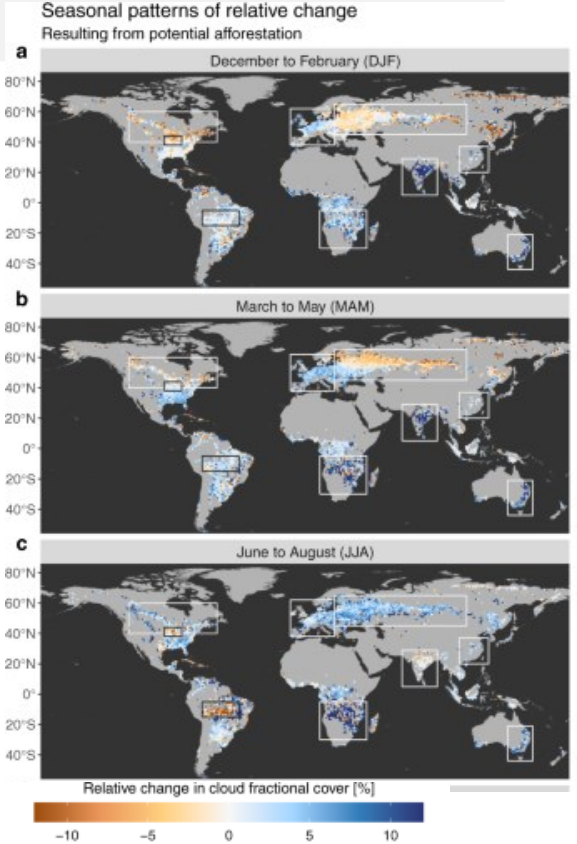


Climate and Nature

- **Example: forests**
  - Store large amount of carbon and provide essential ecosystem services
  - Forestation and deforestation changes the Earth's energy balance, affecting atmospheric and ocean circulation



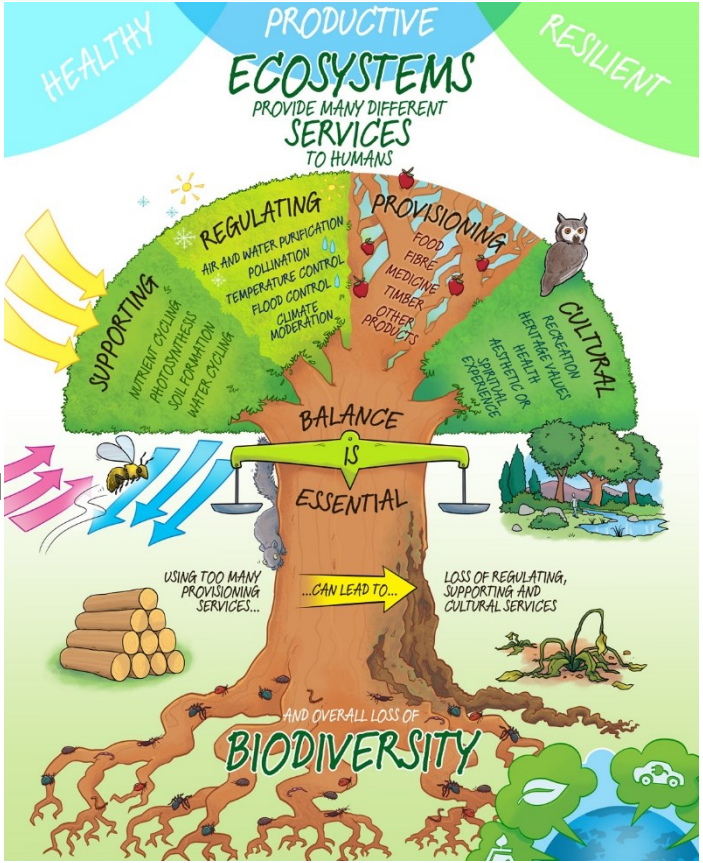
Change in annual mean temperature (shading) and number of days with maximum temperature above 30 deg. C (+15 days solid contour, -15 days dashed contour) (Portmann et al., 2022).



Changes in cloud fractional cover following potential afforestation as derived from satellite data (Duveiller et al., 2021)

Climate and Nature related risks

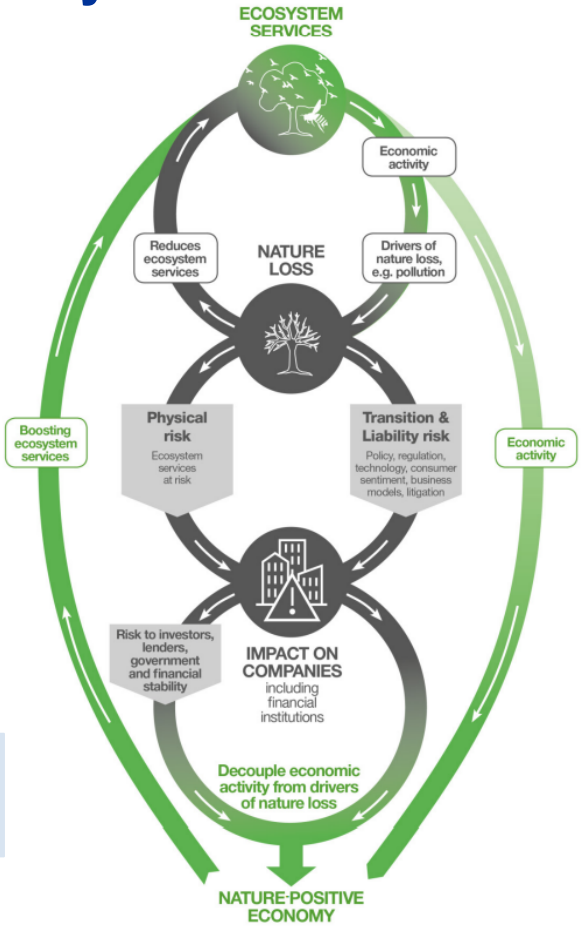
- The global economy and financial systems are **embedded in the biosphere**
- More than **half of global GDP** – some 40 trillion € - **depends on nature**
- **Nature related risk** encompasses **biodiversity loss** and **ecosystem degradation**
- **Double materiality**:
  - financial institutions are significantly exposed to nature and climate related risks
  - financial system can promote nature conservation, climate mitigation, sustainable use of natural resources and nature restoration



Increasing resilience of economic and financial systems

- Substantial threat to financial stability and the broader economy via both **transition** and **physical** risk
- **Nature-positive economy**: reduce and remove the drivers and pressures fuelling the degradation of nature, actively improving the state of nature and ecosystem services it provides
- Asses double materiality: (i) **exposures** to biodiversity loss, (ii) **impact** on biodiversity loss (biodiversity footprint)
  - Identify principal drivers of nature loss related to financial institutions

A nature-positive economy reduces risks for macroeconomy and financial stability



Source: Cambridge Institute for Sustainability Leadership

Increasing resilience of economic and financial systems

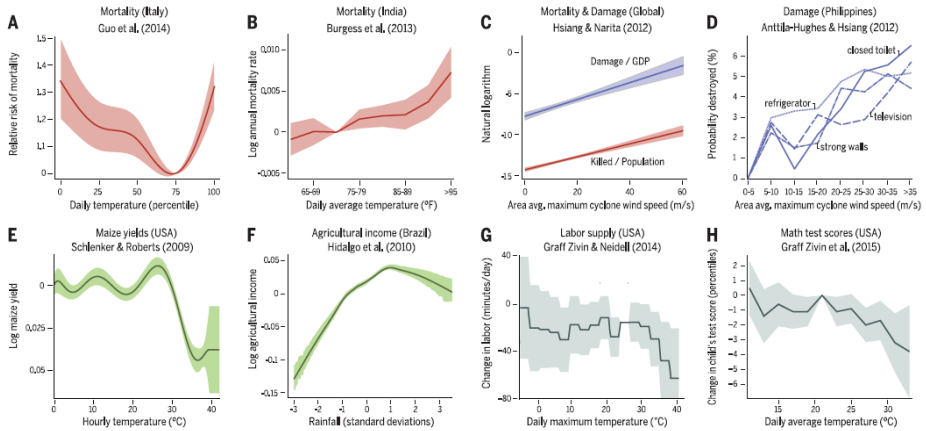
- Nature related risks in many ways more difficult problem to address than climate change
- Important role of data and models
  - Data availability and quality (climate and nature related data)
  - Nature/ecosystem modelling and financial/economic modelling
  - Expand **land use** and **biodiversity** models in climate scenarios to maximize interoperability and assessment of climate and nature related risks
  - **Supply chain consideration** – nature scenarios are more sector and geography specific
  - Explore possibilities of initiatives such as **Destination Earth** - an ambitious initiative of the European Union to create a digital twin – an interactive computer simulation – of our planet
  - **Tipping points** and **extreme scenarios**, irreversible changes

Increasing resilience of economic and financial systems

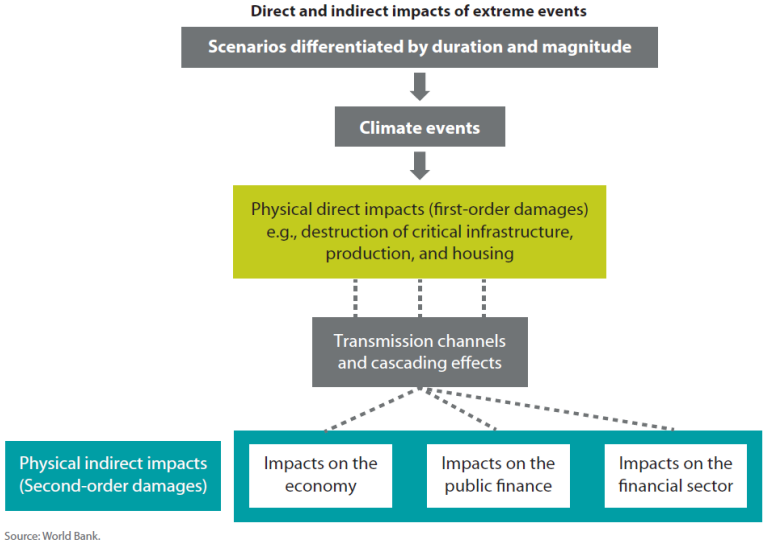
- Nature-climate nexus is required
  - Unintended consequences for nature when focus is exclusively on climate mitigation and adaptation
  - Compounding effects from interaction between climate change and nature loss, importance for disaster risk management
  - Synergies and cost efficiencies when addressing climate change and nature (avoid risk of building isolated strategies and funding solutions)
  - Better management of systemic risk of the broader financial sector

Natural disasters and economy – AI opportunities

- We need to work on better understanding of transmission channels (nature and climate related risks)
  - Underestimation of impacts, transmission channels not captured in entirety, limited assessment of cascading risks

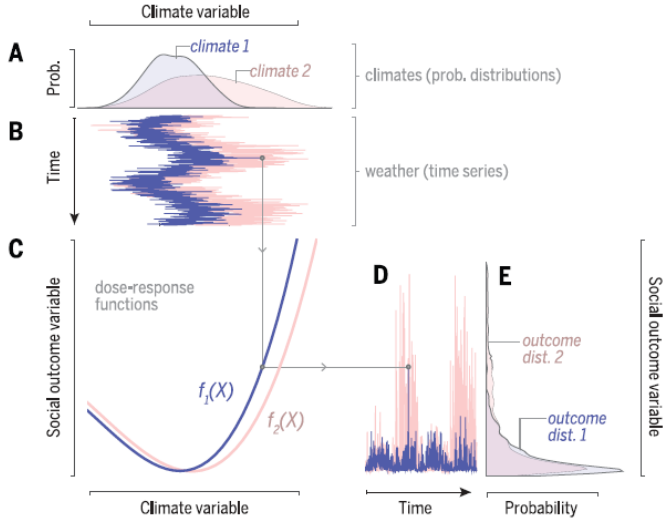


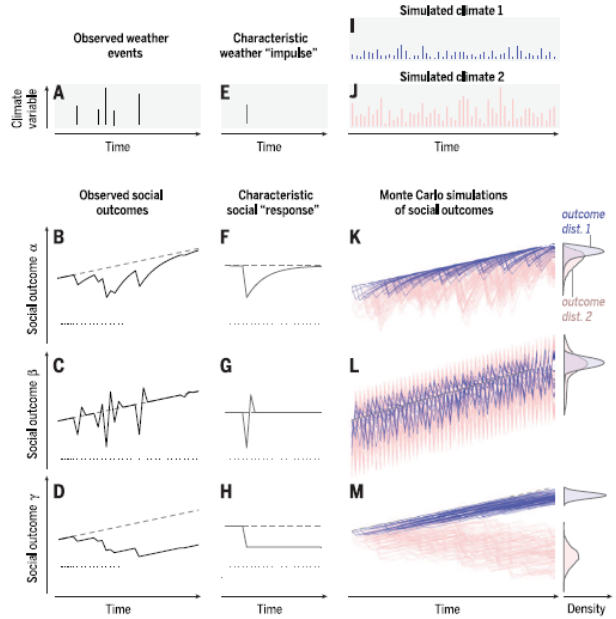
Source: Carleton and Hsiang (2016)



Natural disasters and economy – AI opportunities

- Modelling different structure of responses to climate shocks, also in terms of temporal evolution





Source: Carleton and Hsiang (2016)

Natural disasters and economy – AI opportunities

- Important role of AI in timeliness of risk identification and monitoring
- Explanatory modelling (evidence based policy decisions)
- Focus on predictive accuracy, but models need to be also trustworthy, interpretable, robust, accountable and secure
- AI can improve our ability to better assess the cascading risks from natural disasters to economy, but we must first recognize and overcome AI's limitations in order to reap its benefits
- AI implementation and adoption require interdisciplinary, multi-stakeholder and collaborative effort