

Why care about biodiversity?

SWESIF Webinar on Biodiversity and Finance

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GLOBAL ECONOMIC DYNAMICS
AND THE BIOSPHERE
THE ROYAL SWEDISH ACADEMY OF SCIENCES

Stockholm Resilience Centre
Research for Governance of Social-Ecological Systems



Stockholm
University

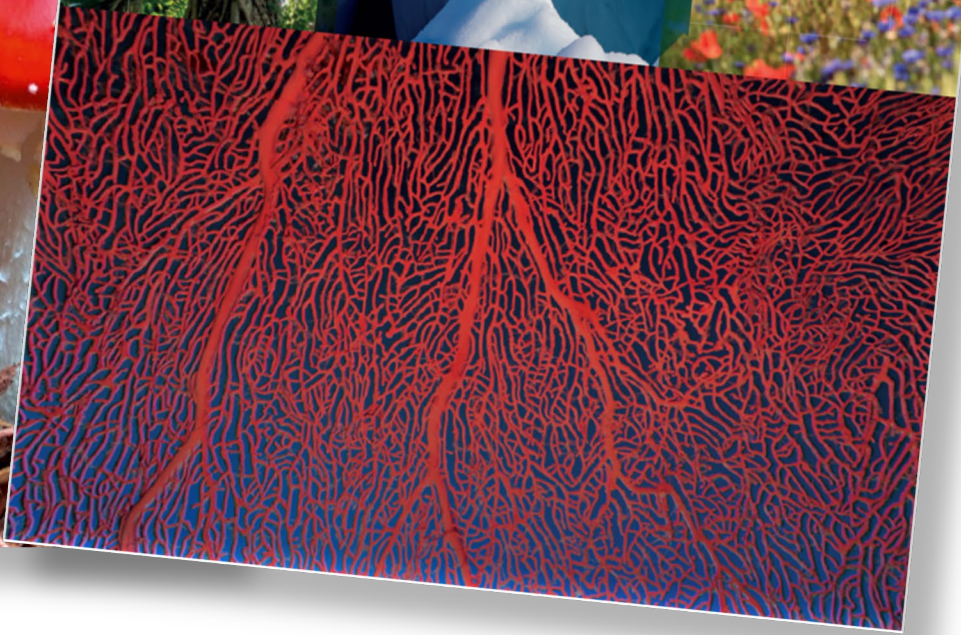
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The Economics of Biodiversity: The Dasgupta Review



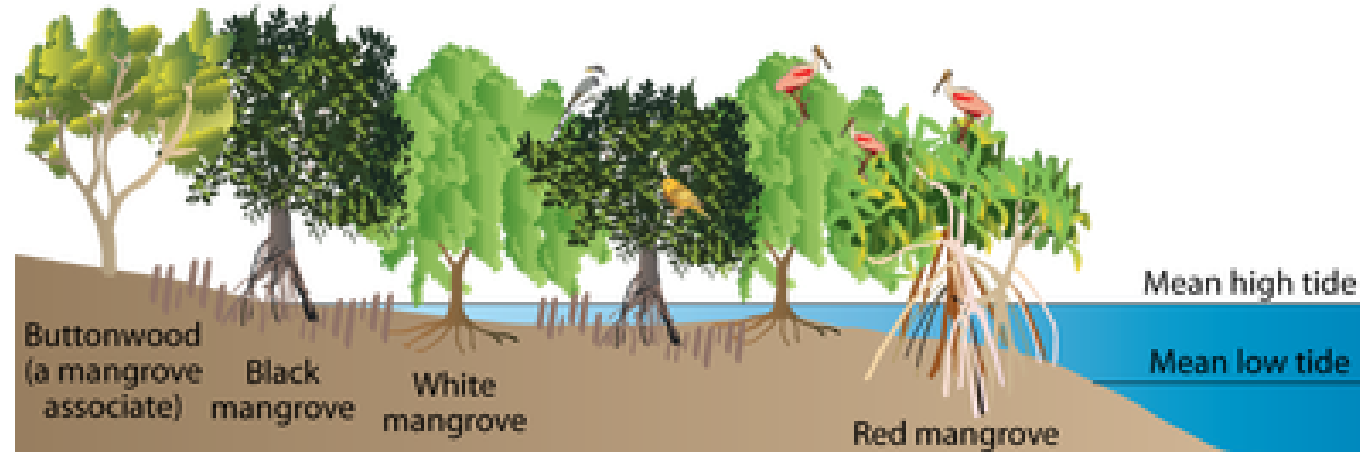
IPBES-IPCC CO-SPONSORED WORKSHOP **BIODIVERSITY AND CLIMATE CHANGE** Scientific outcome



Diversity within species



Diversity between species



Diversity between (types of) ecosystems



What is the problem with having a few high-performing species in a system?

Or similar ecosystems across an entire region?





Main reason: homogenization (low diversity)



712mSEK in costs
>100mSEK above 10 year average
(610mSEK)

news.cision.com / Länsförsäkringar / Skogsbränder slår rekord i kostnader

Skogsbränder slår rekord i kostnader



TOR, FEB 21, 2019 06:30 CET

När Länsförsäkringar summerar 2018 års kostnader för naturskador sticker sommarens skogsbränder ut. Normalt står stormskador, översvämningar, åska, snötryck och frysskador för de största kostnaderna.

– 2018 års nota för extrema väderhändelser landar på 712 miljoner, att jämföra med ett snitt på 610 miljoner för de senaste tio åren, säger Johan Litsmark, naturskadespecialist på Länsförsäkringar.

Samhällets totala kostnader för skogsbränderna 2018 är ännu inte sammanställda. Bränderna i Västmanland 2014 där drygt 14 000 hektar eldhärjades slutade på en miljardnota, sommaren 2018 brann 25 000 hektar. En större andel skog var försäkrad i Länsförsäkringar i de områden som brann 2014 och kostnaderna för länsförsäkringsgruppen var därför större än för 2018 års skogsbränder.



U.S. FOREST SERVICE
Caring for the land and serving people

United States Department of Agriculture

CLIMATE CHANGE RESOURCE CENTER



EDUCATION



TOPICS



ADAPTATION



TOOLS



LIBRARY

Establish natural or artificial fuel breaks to slow the spread of catastrophic fire

Approach

Increased warming and drying driven by climate change has increased fire-season fuel aridity to accelerate forest fire activity in many parts of the U.S. (Abatzoglou & Williams 2016; Westerling et al. 2006). Under these conditions, wildfire can expand quickly affecting large areas in a short duration of time. Establishing fuel breaks can constrain fire spread or reduce fire intensity by reducing flame lengths, which may enhance fire suppression efforts and limit the extent of carbon losses during wildfire. Establishing fuel breaks are often complimentary to management actions that reduce fuel loads (Agee et al. 2000).

Tactics

Search CCRC

RELATED TO THIS APPROACH:

Regions

Midwest
Northeast

REDUNDANCY IN FUNTION



Birch

Fire resistant
Susceptible to drought



Spruce

Burns easily
Susceptible to bark beetles
Susceptible to storms + drought

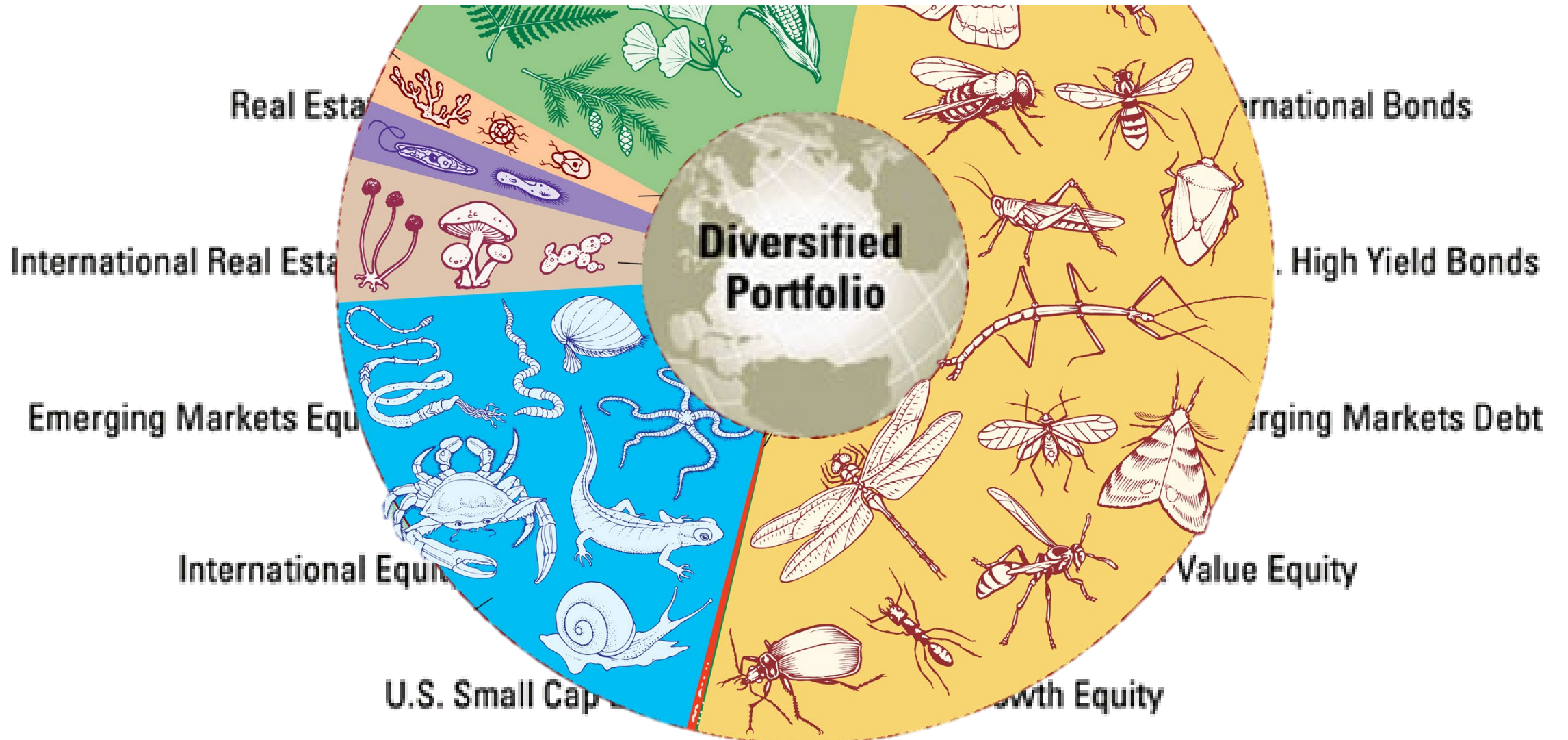


Pine

Fire resistant
Resilient to storms
Susceptible to moose grazing

INSURANCE POLICY

Risk management for an uncertain future



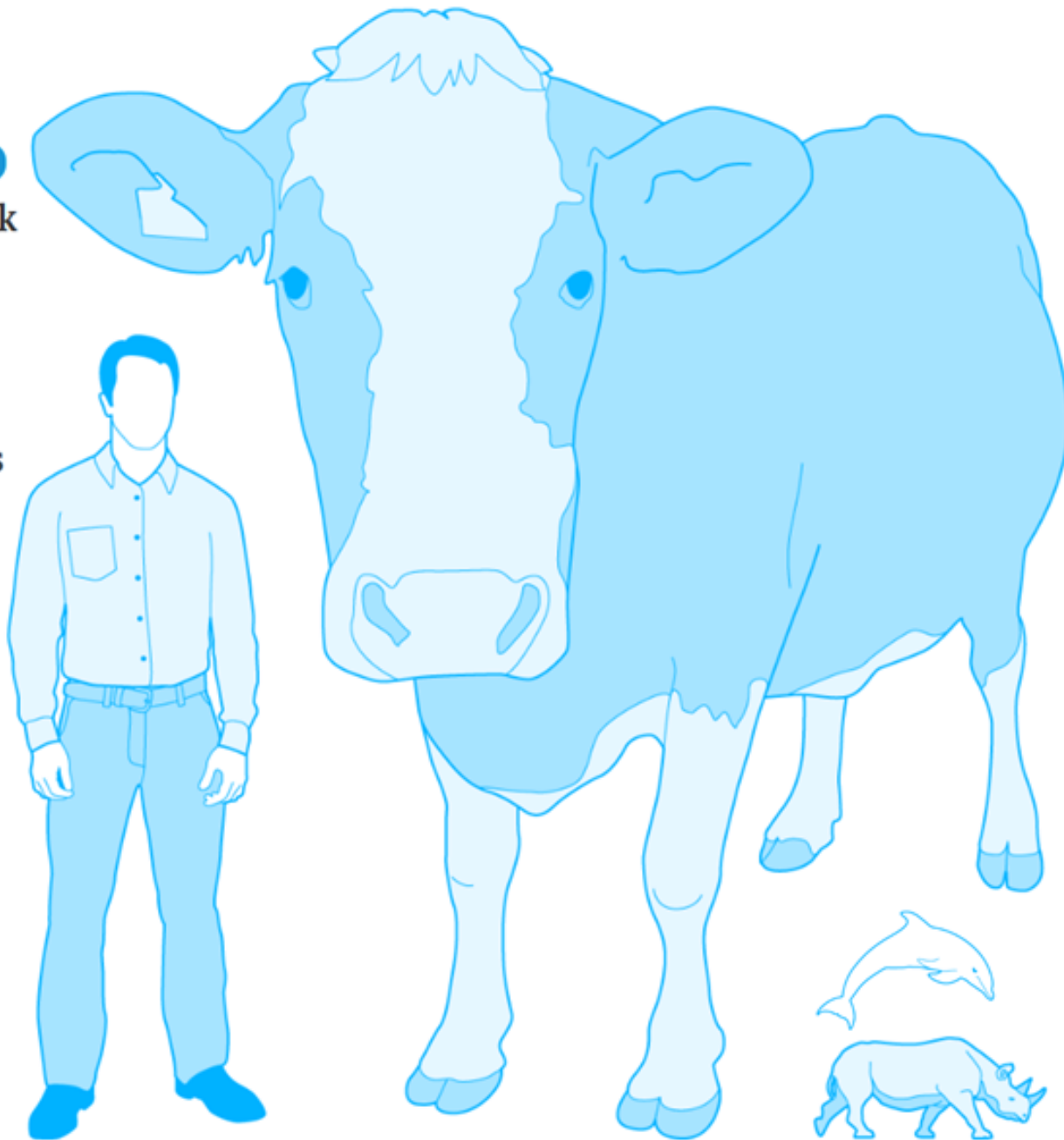
CURRENT TRENDS

- ~1 million species (animals/plants/fungi) are currently threatened with extinction – on land and in water
- Across species groups and habitats – ~25% of species are threatened
- The biomass of the world's vegetation has declined by 50%
- Forests span only 68% of preindustrial extent
- Global biomass of wild mammals <25% of numbers before latest mass extinction



60%
are livestock

36%
are humans



4%
are wild
mammals

	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

Nature's contribution to people

- Materials and assistance
- Regulation of environmental processes
- Non-material contributions

Since 1970, production of bioenergy, food, feed, fiber, and other materials have increased

~80% of these other contributions nature makes to humans have declined



**>75% of global food crop types rely on animal
pollination**

Insects are also fundamental to crop pest control



More than 75% decline in total flying insect biomass over the last ~30 years

“Windshield phenomenon”

\$235 – \$577 billion in annual global crop output is at risk as a result of pollinator loss (*IPBES 2019*)



Hallman et al (2017) More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PLoS One*

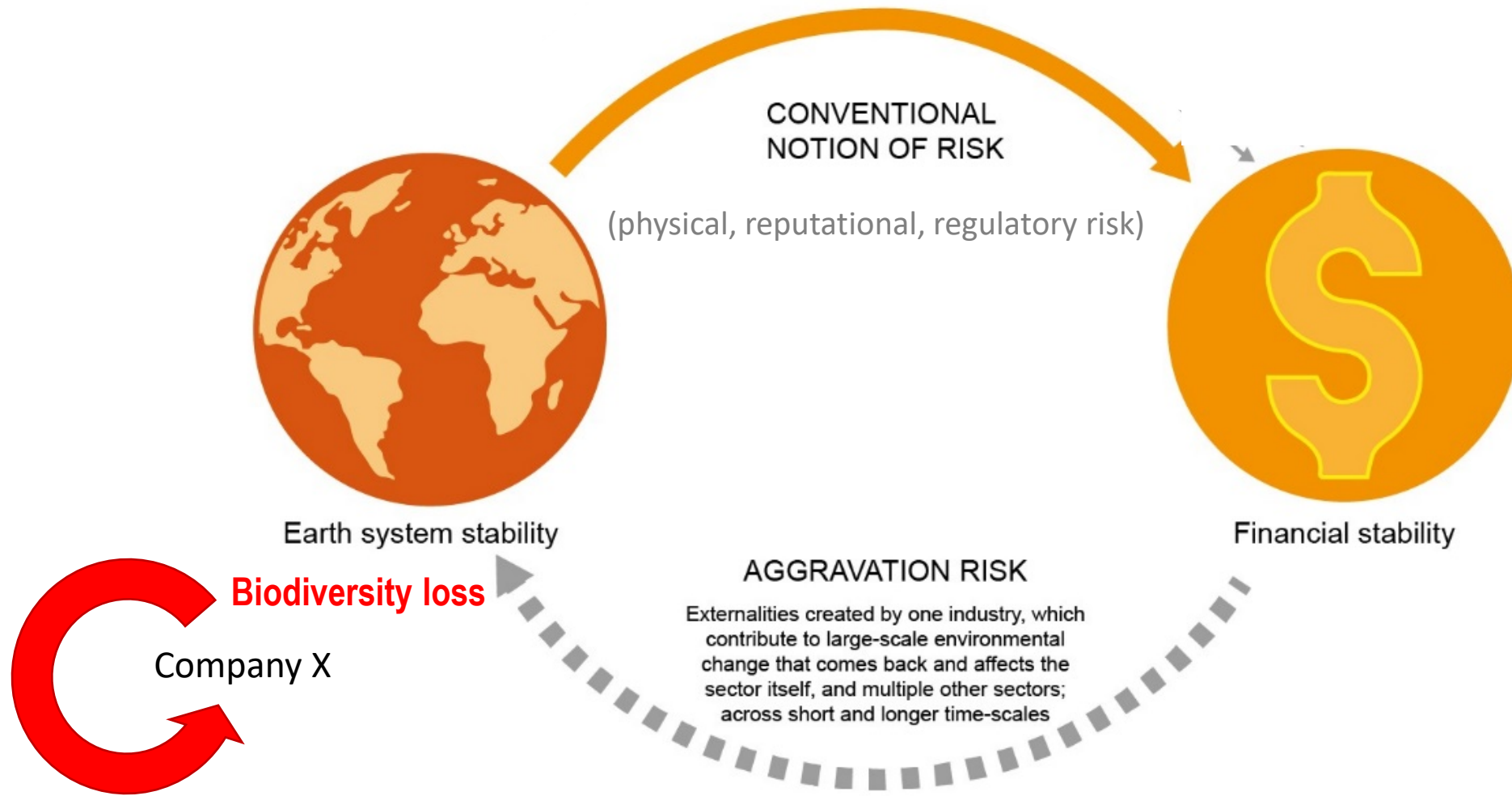
DRIVERS OF BIODIVERSITY DECLINE

- Lack of internalization of externalities
Manufacturing and service sectors have embedded biodiversity loss in their supply chains – because of the resources used in input technology or material

As investors, what are the risks of large-scale biodiversity loss?

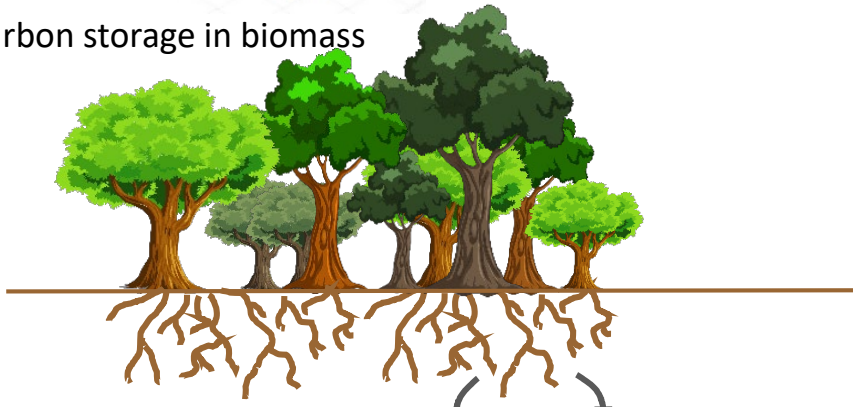
RISK MANAGEMENT



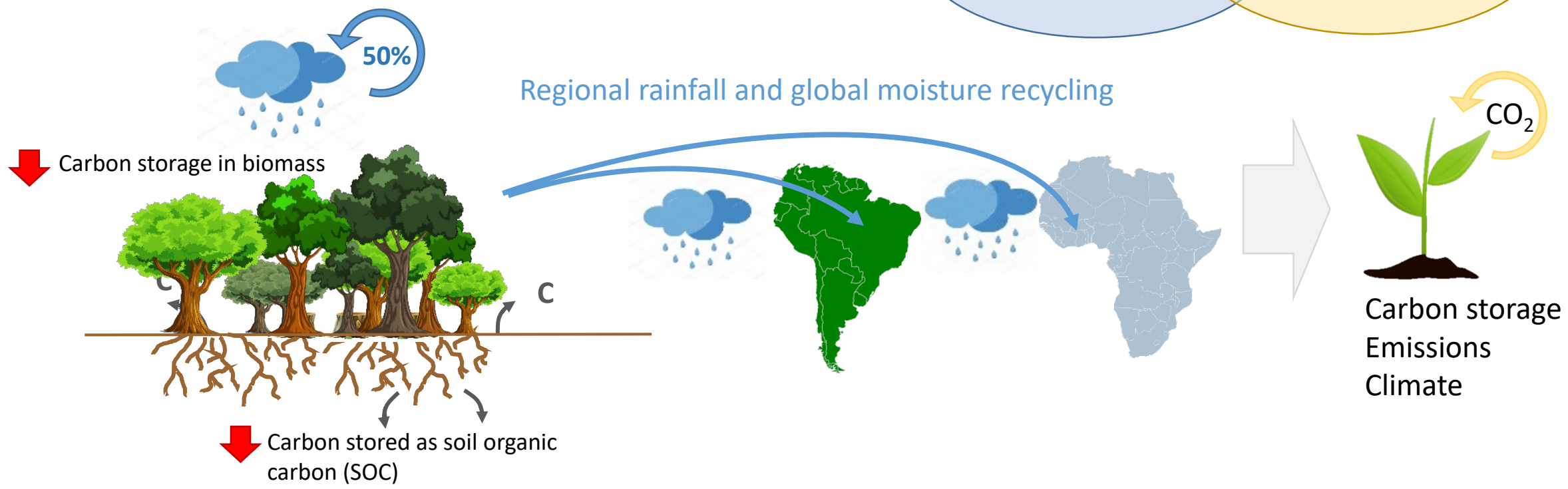
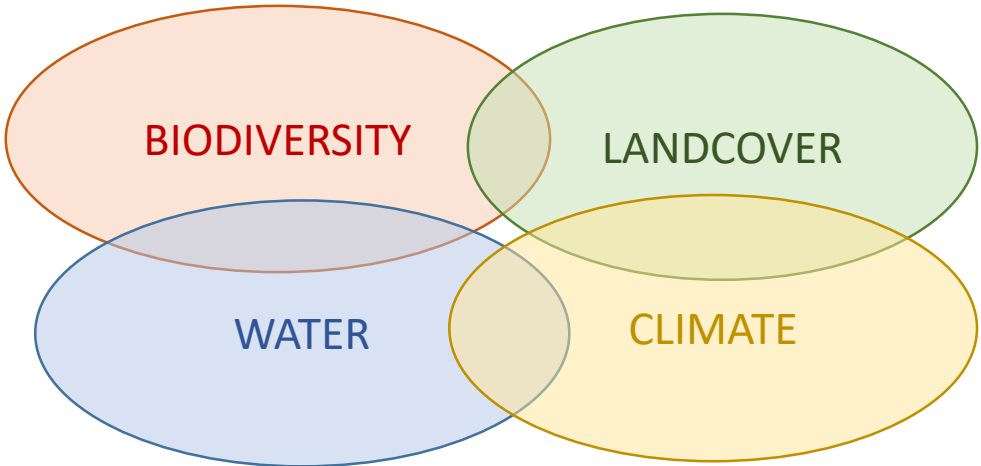


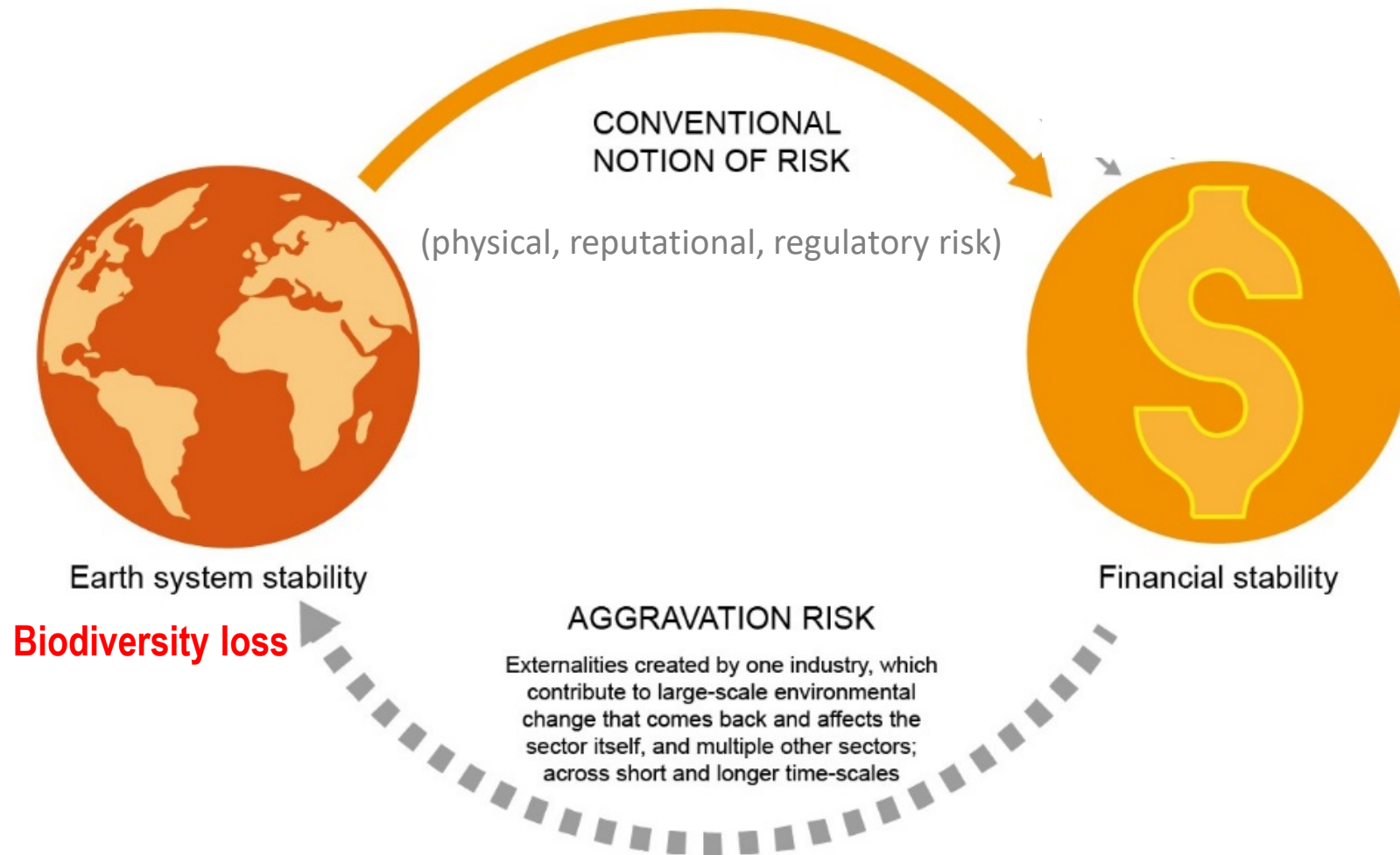


Carbon storage in biomass



Carbon stored as soil organic carbon (SOC)





WALRAS



Gustav Engström (PhD)
Researchers, Beijer Institute of
Ecological Economics



Johan Gars (PhD)
Researchers, Beijer Institute of
Ecological Economics

Economics of global environmental problems

We are (macro) economists researching the interaction between the global economy and the environment

Typical economic modeling:

- how market forces determine the use of inputs such as labor and capital (and energy and land)
- what types of interventions can improve on the market outcome (e.g., due to external effects)

For instance, the study of climate economics gives support for implementing carbon taxes or tradable emission permits

General equilibrium modeling

The effects of any change ripples through the economy and the total effect is the net of many different changes

General equilibrium modeling is commonly used in this context (e.g. EMEC developed and used by The National Institute of Economic Research)

To make this method of analysis more accessible, we are developing a modeling and visualization tool: Walras

Here:

- analyze the issue of climate change and biodiversity
- consider an increased cost of capital in the fossil energy sector

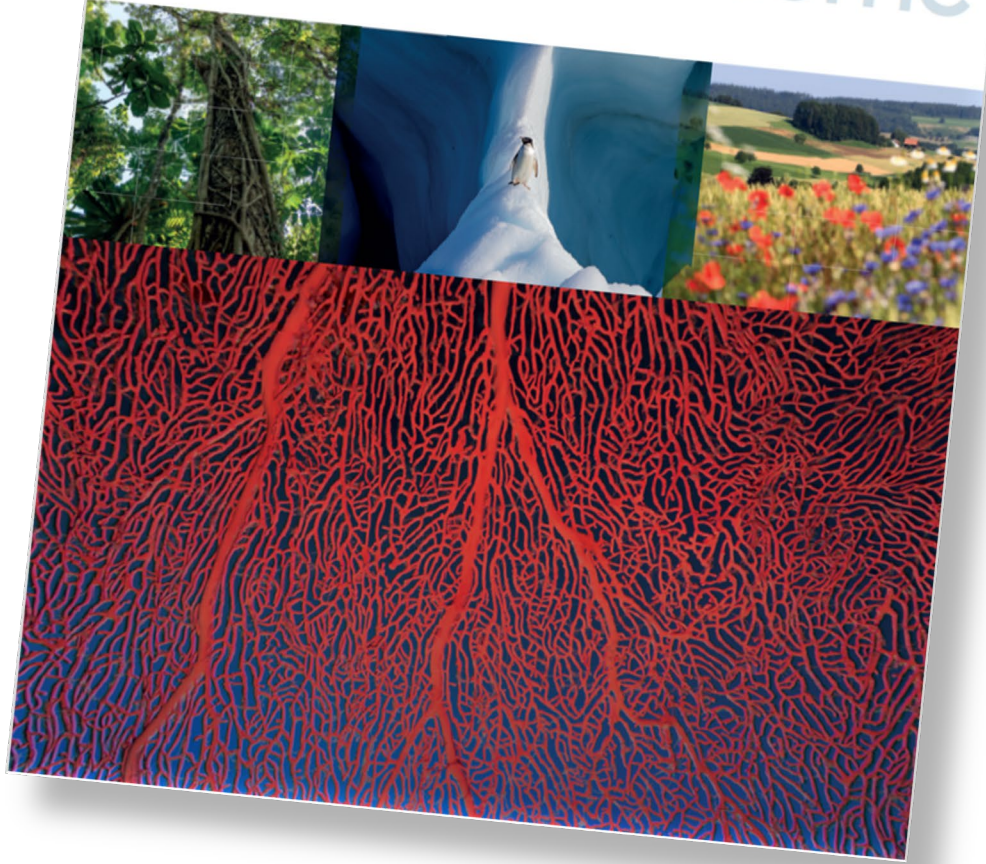
A simplified model but the main conclusions are robust to more detailed settings

(Closely related to Engström et al. “Carbon pricing and planetary boundaries”, *Nature Communications*, 2020)

IPBES-IPCC CO-SPONSORED WORKSHOP

**BIODIVERSITY AND
CLIMATE CHANGE**

Scientific outcome



SCANNING THE HORIZON

- ESG investments are rising – \$35.3 trillion in 2020
15% increase in sustainably invested assets 2018-2020
(compared to 34% 2016-2018)



Global Sustainable Investment Alliance (biannual report 2020)

2020 - Global Sustainable Investments reached **\$35.3 trillion**
(in in five major markets)

**Without a clear benchmark – relative measures
will not be enough to reduce the harm and shift
unsustainable trajectories**

(GLOBAL SUSTAINABLE INVESTEMENT ALLIANCE 2020)