

Fundamentals of Resilience in the Anthropocene Biosphere

Henrik Österblom

Stockholm Resilience Centre

Resilience and Family Business workshop

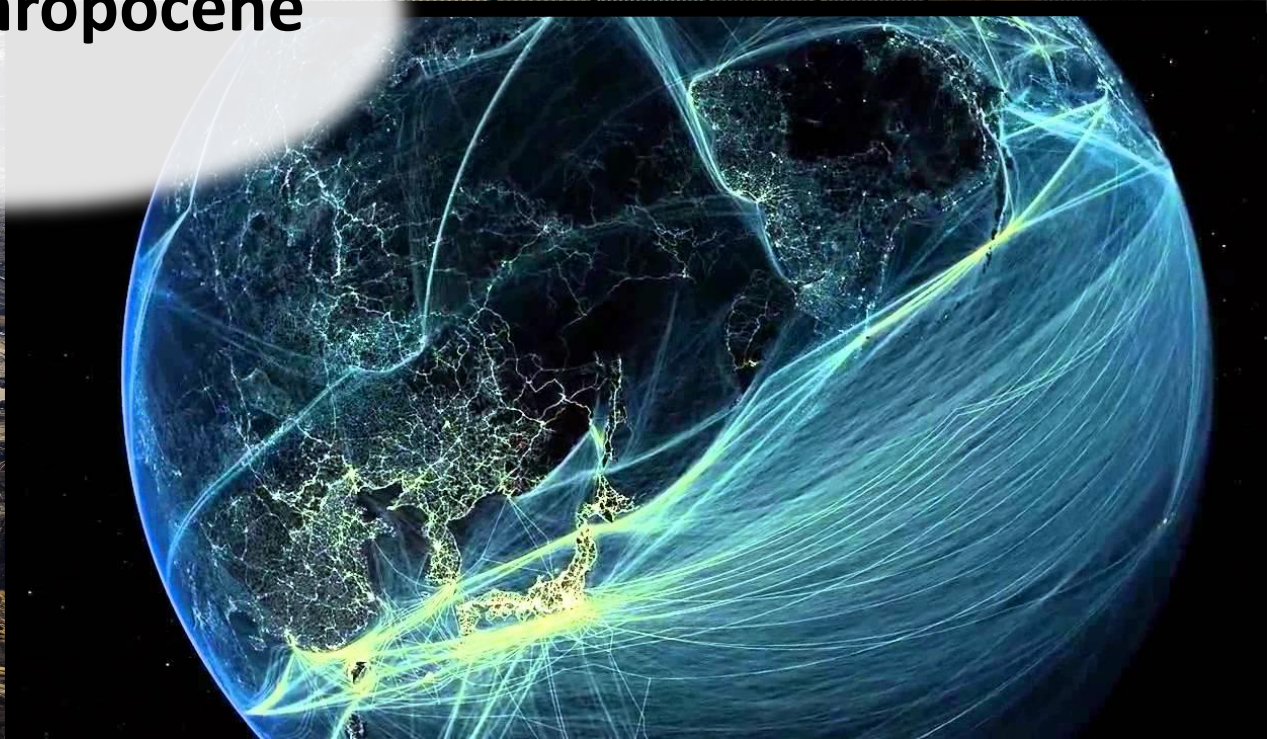
April 28th-29th 2022



Human actions are deeply intertwined with the functions
of the biosphere



The Anthropocene





A resilient biosphere provide food, material, suitable living conditions, spiritual, mental, and emotional support

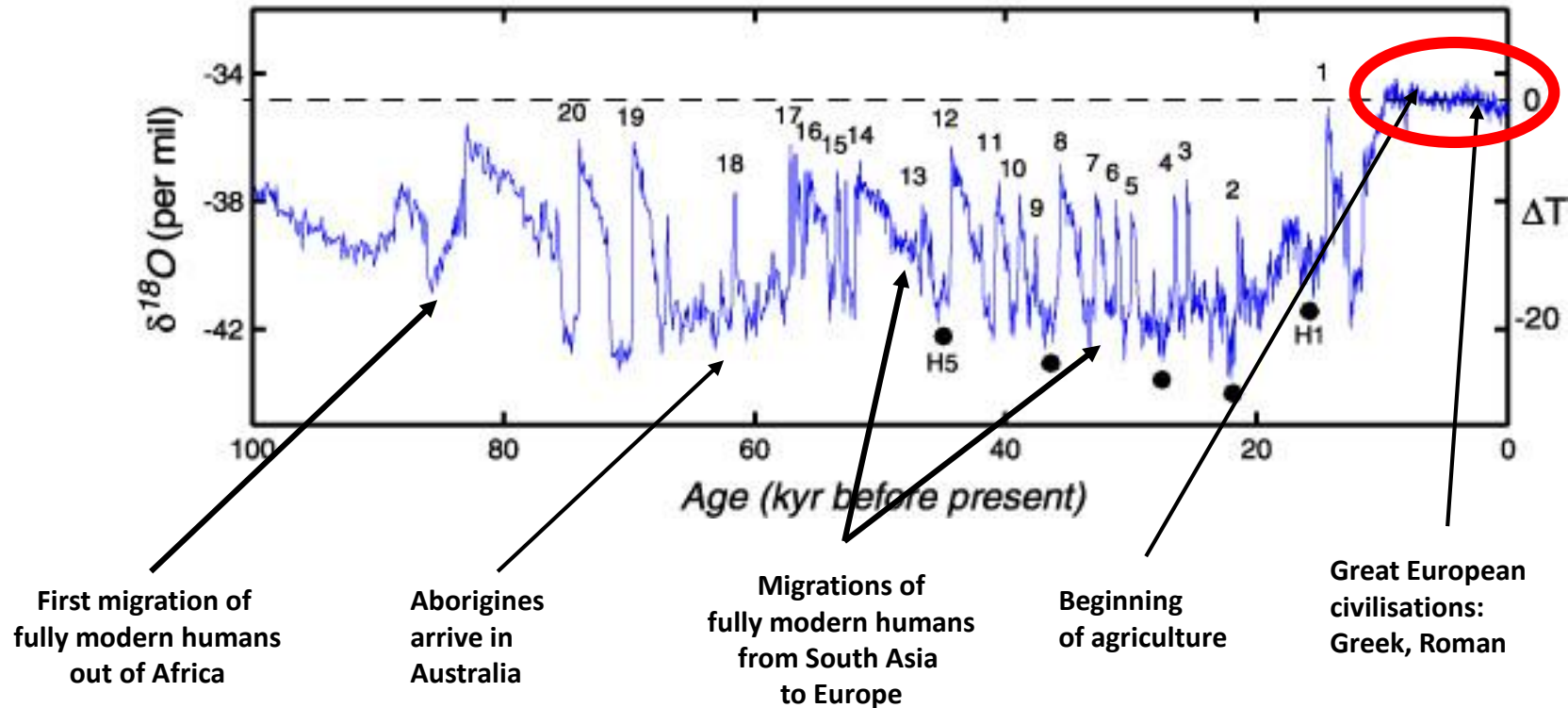




Resilience

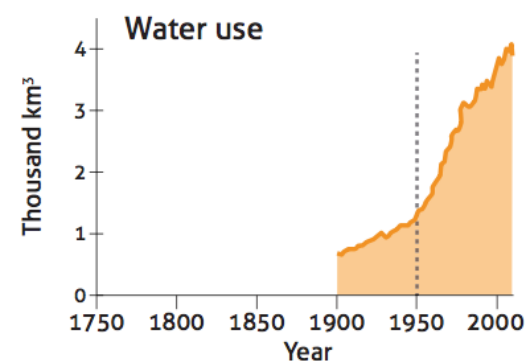
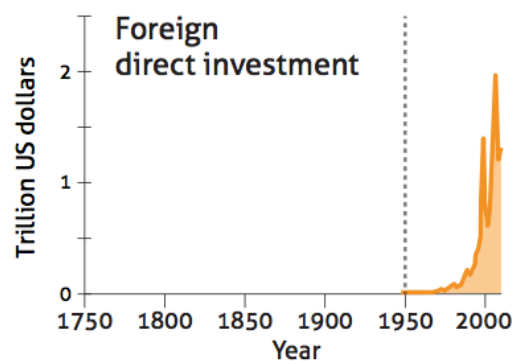
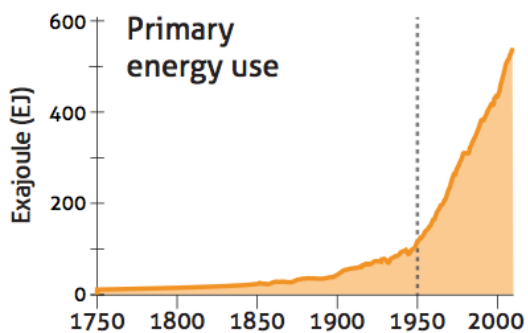
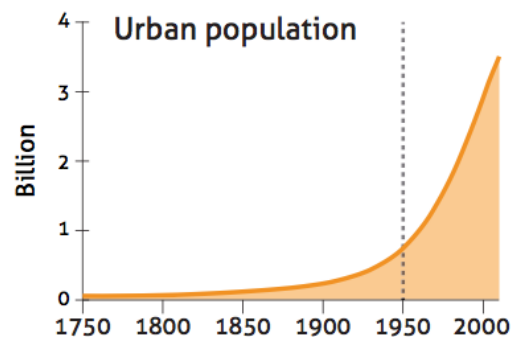
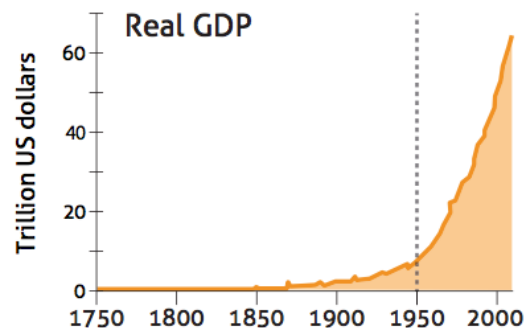
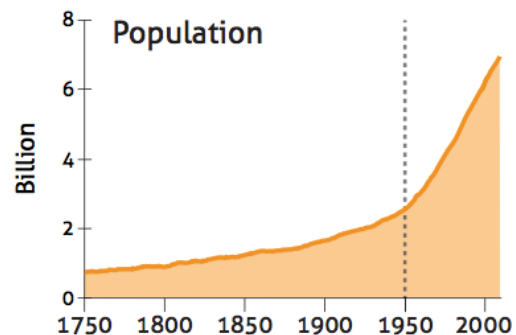
- The capacity to live with (incremental and abrupt) change, and continue to develop
 - Ability to live with complexity, uncertainty, surprise
 - Turning crises into opportunities
 - Learning and innovating
- 
- 

Humankind – 10 000 years of grace

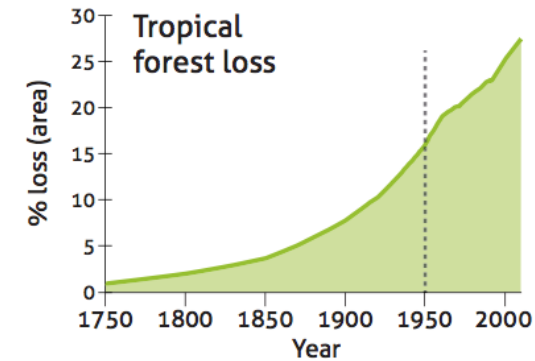
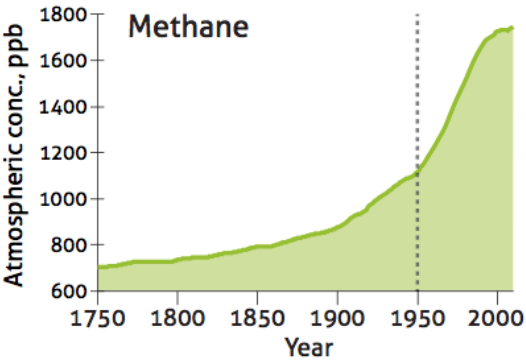
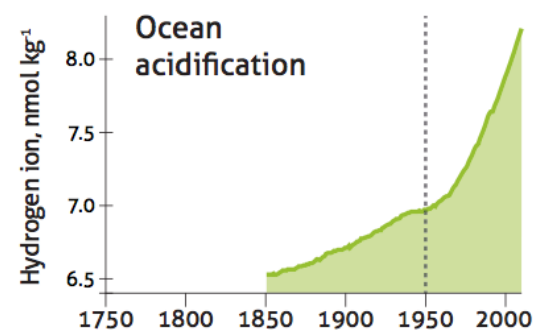
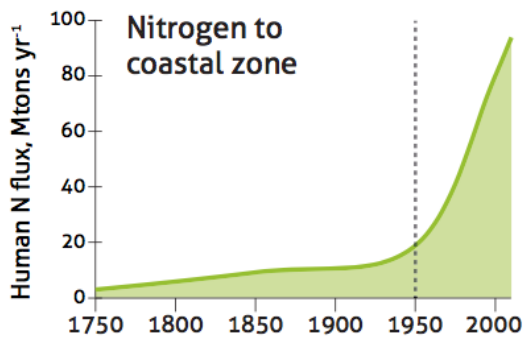
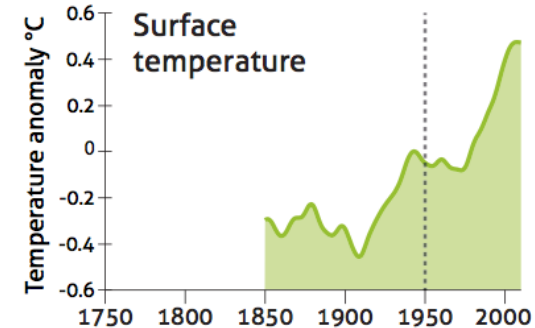
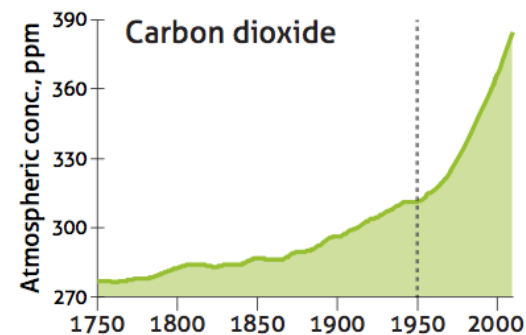


The Great Acceleration

SOCIO-ECONOMIC TRENDS



EARTH SYSTEM TRENDS

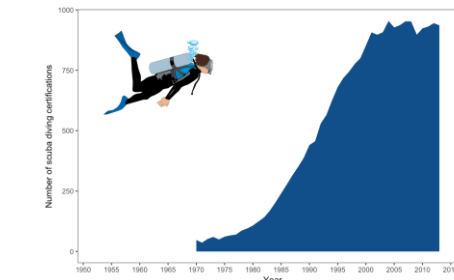
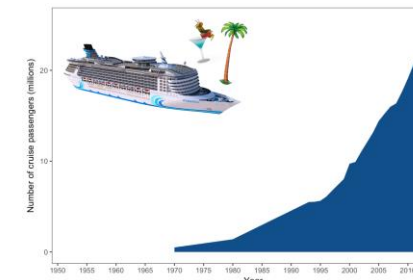
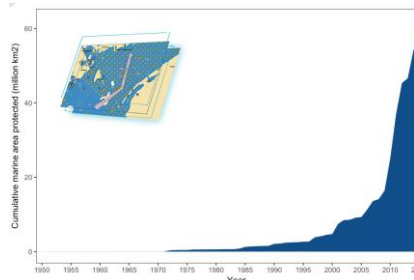
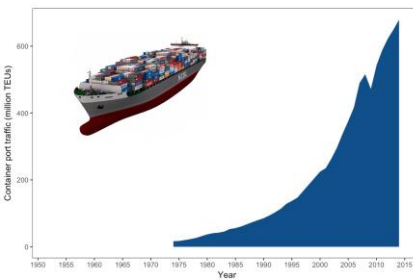
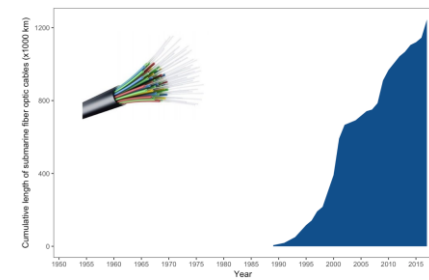
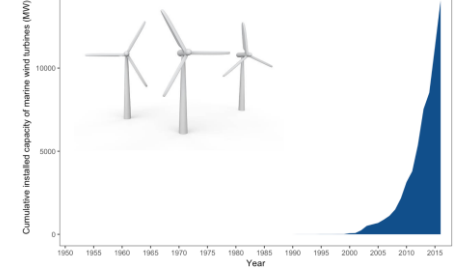
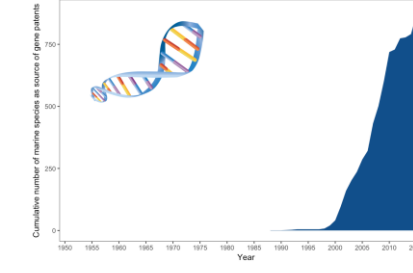
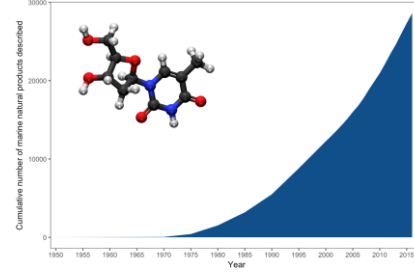
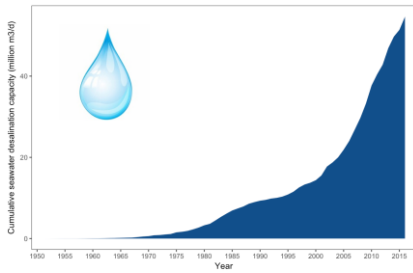
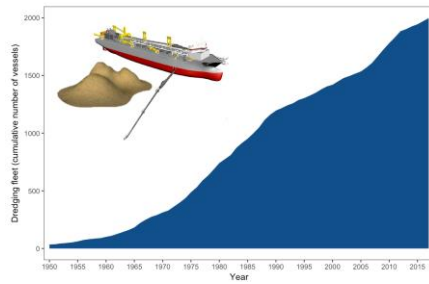
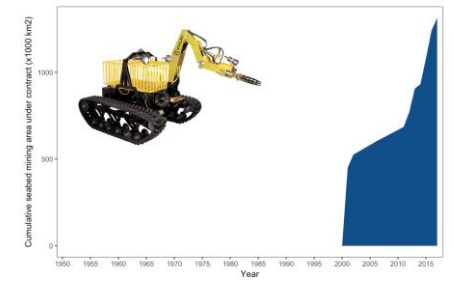
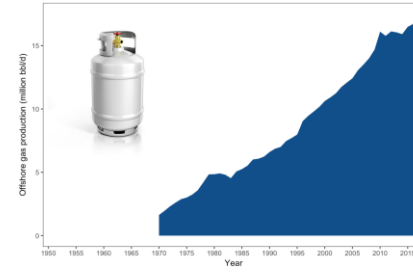
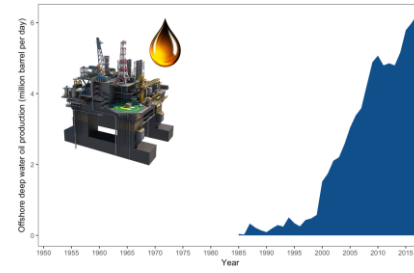
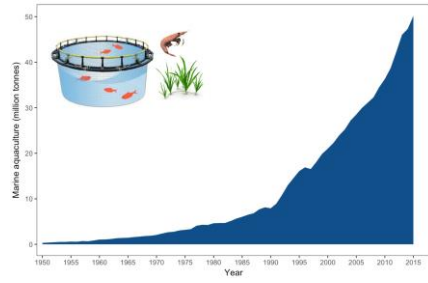
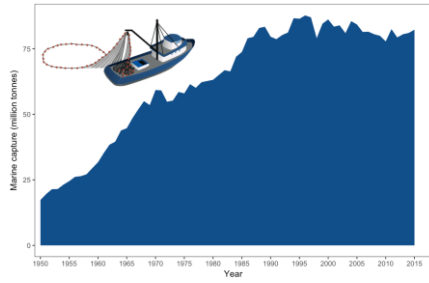




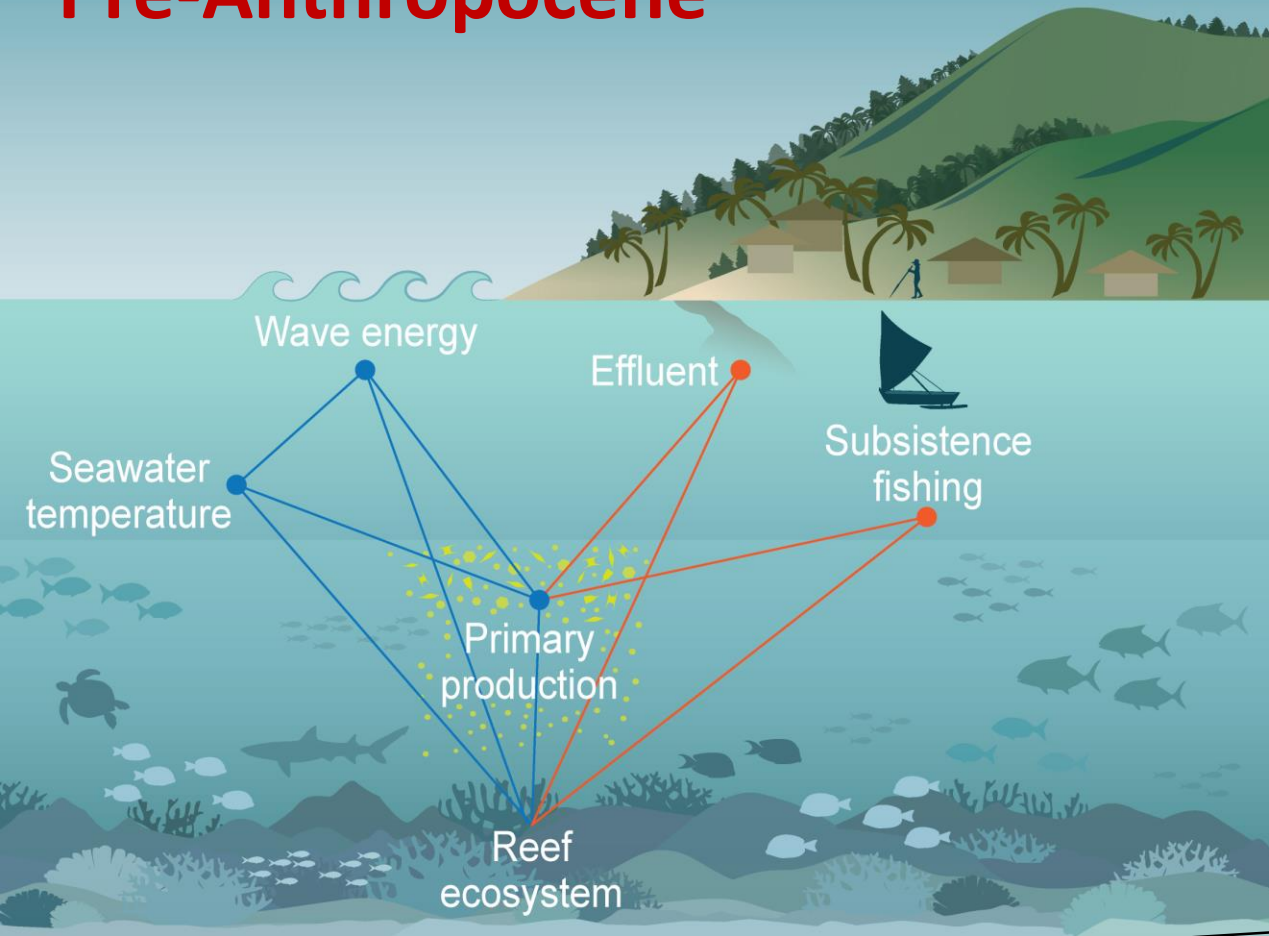
Global inequality is growing



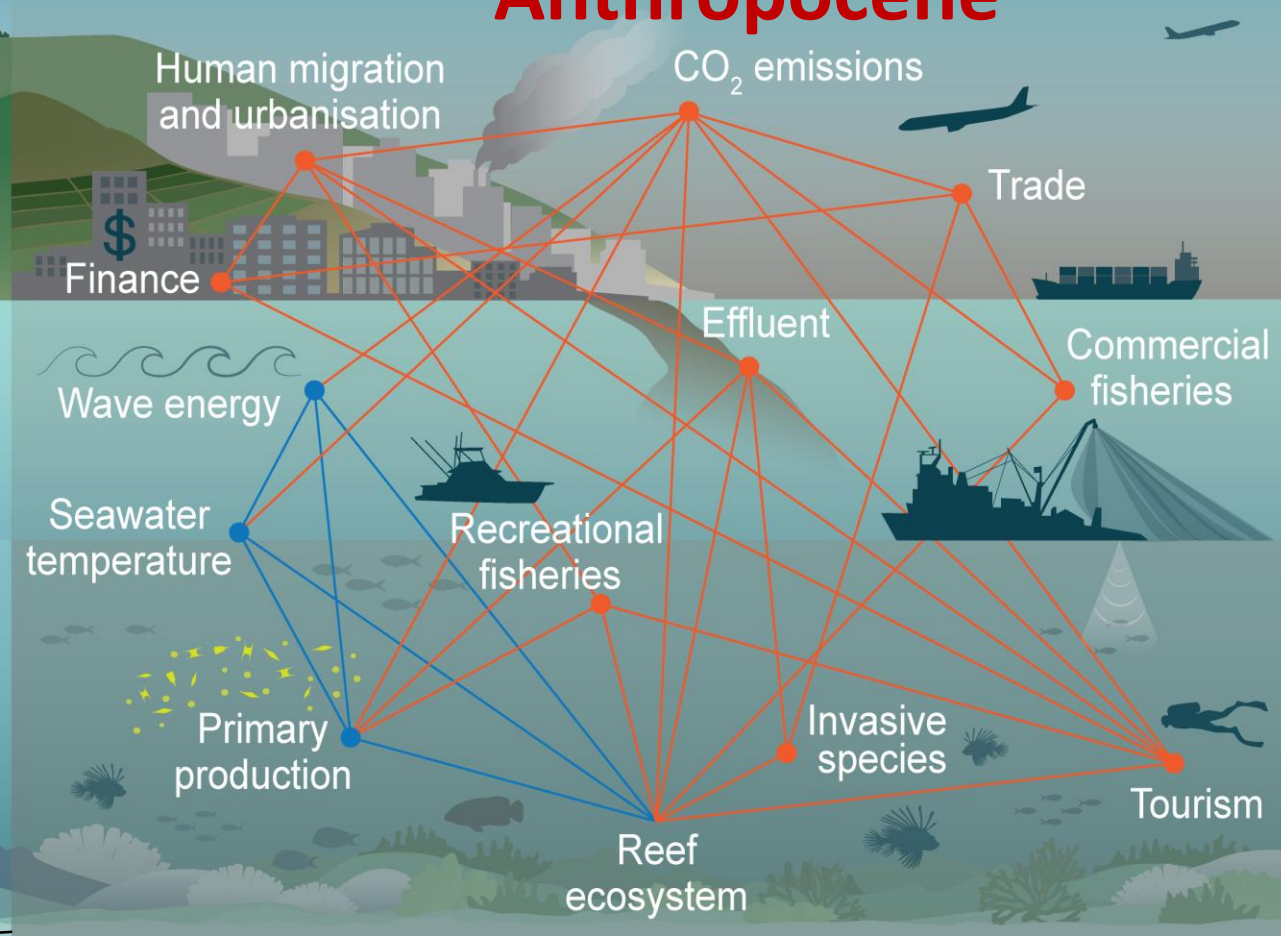
A Blue Acceleration for food, materials, space



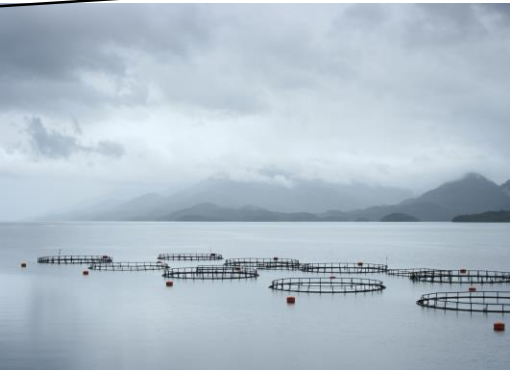
Pre-Anthropocene



Anthropocene

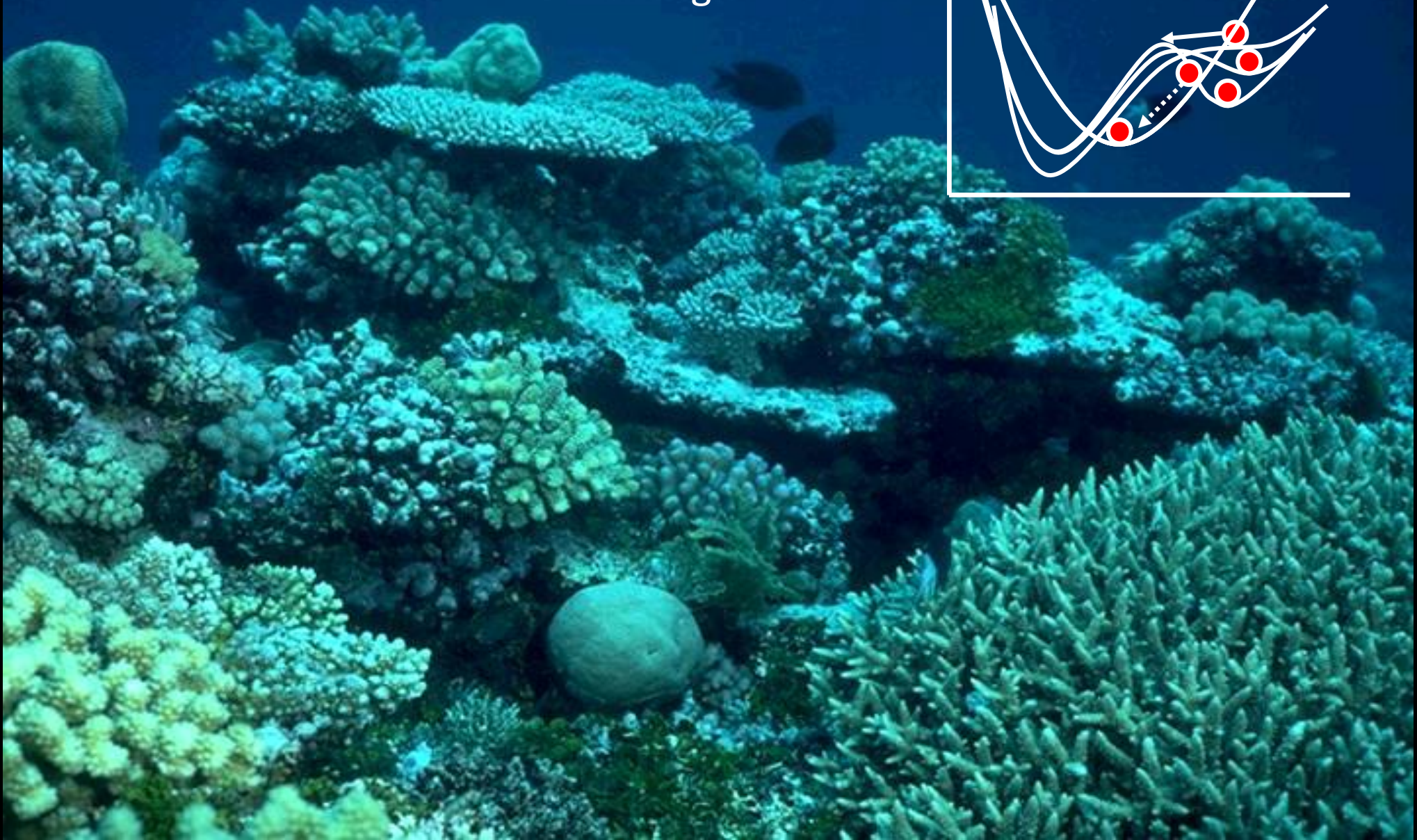
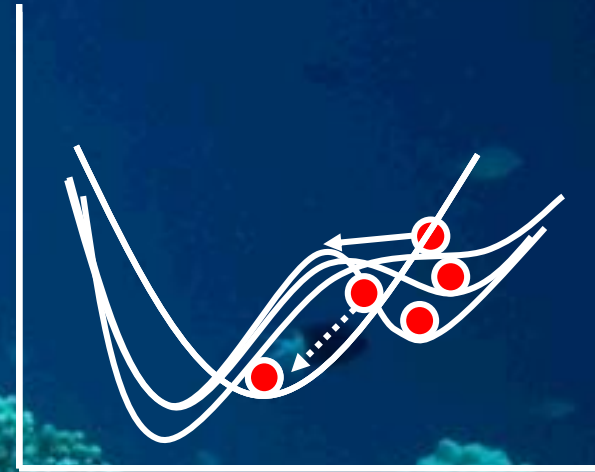


Williams et al. 2019, *Funct Ecol*

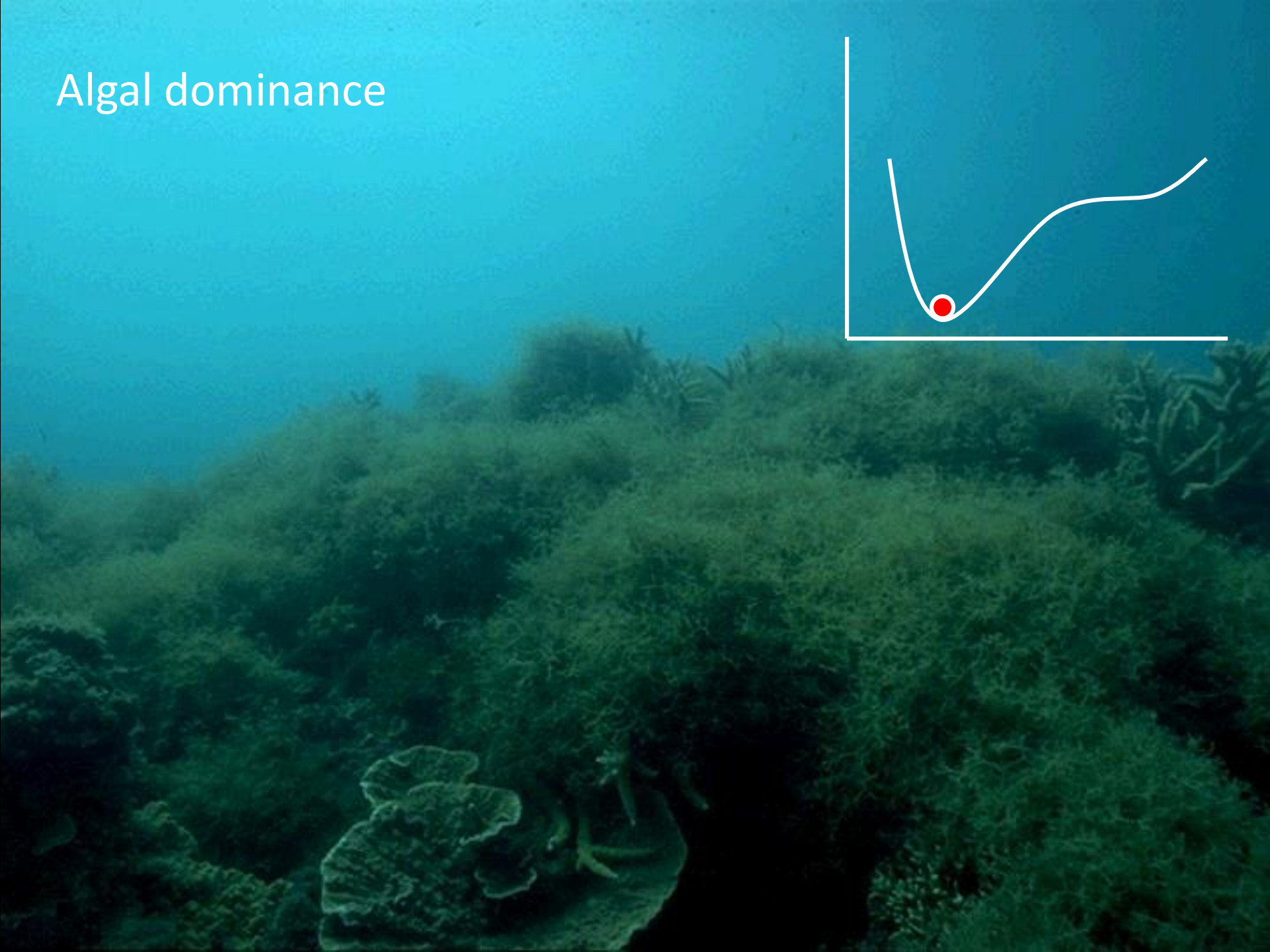
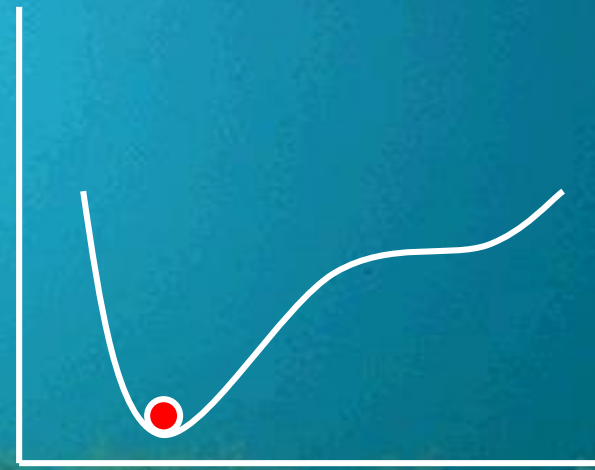


Coral dominance

Regime shift



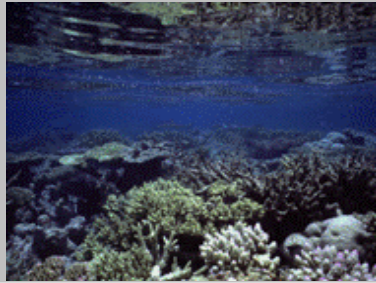
Algal dominance



Examples of regime shifts in ecosystems

• CORAL REEFS

Corals to algae



• KELP FORESTS

Kelp to sea urchin barrens



• LAKES

Oligotrophic (clear) to eutrophic (turbid)



• TROPICAL FORESTS

Forest to savanna



Linking biodiversity to resilience



Species



Resilience



Linking biodiversity to resilience



Species



Ecosystem processes



Resilience



Linking biodiversity to resilience



Species



Functional groups



Ecosystem processes



Resilience



Functional groups – a metaphor



whole sector...



...citizens
certain group of



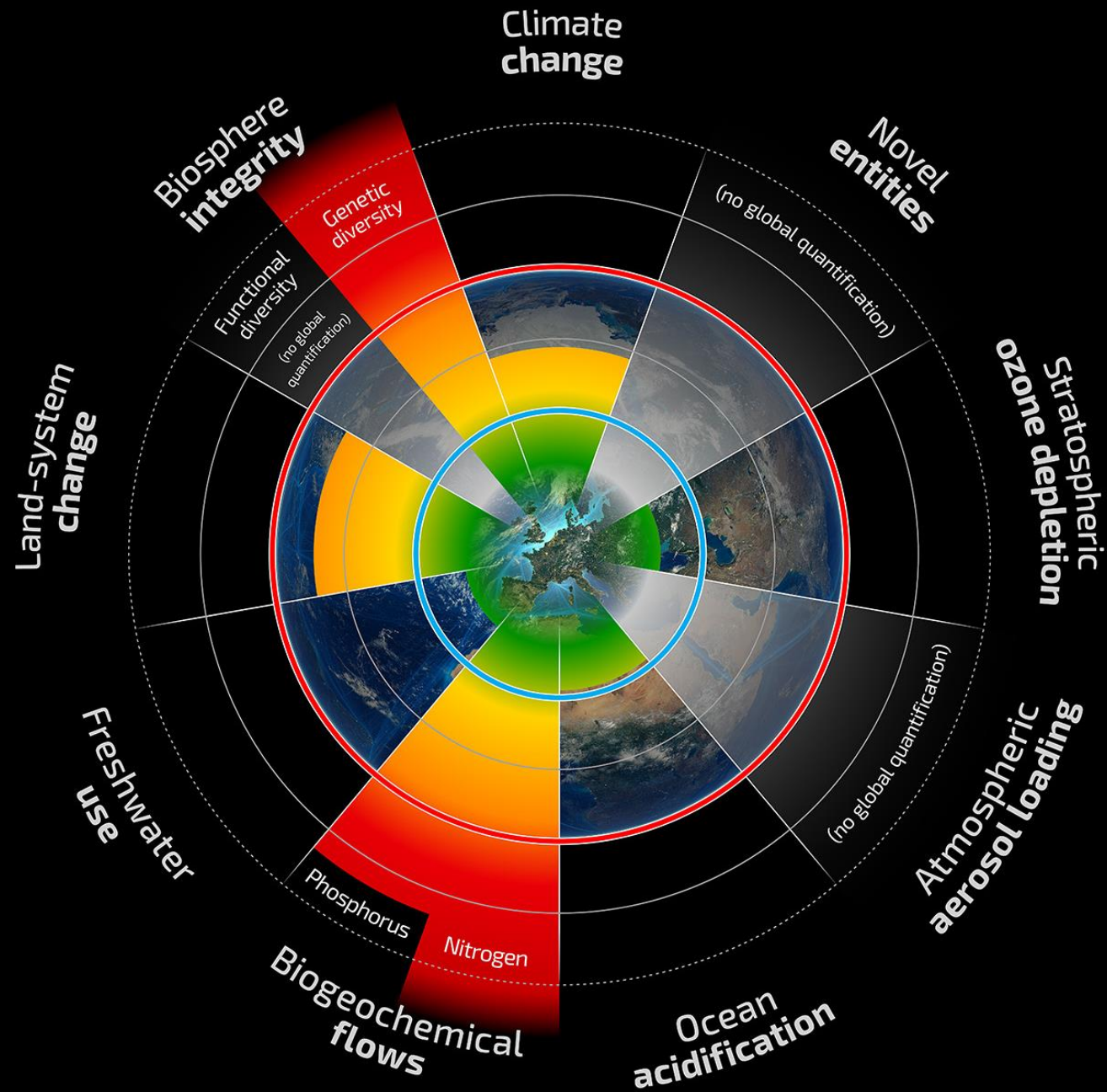
...species

-10%

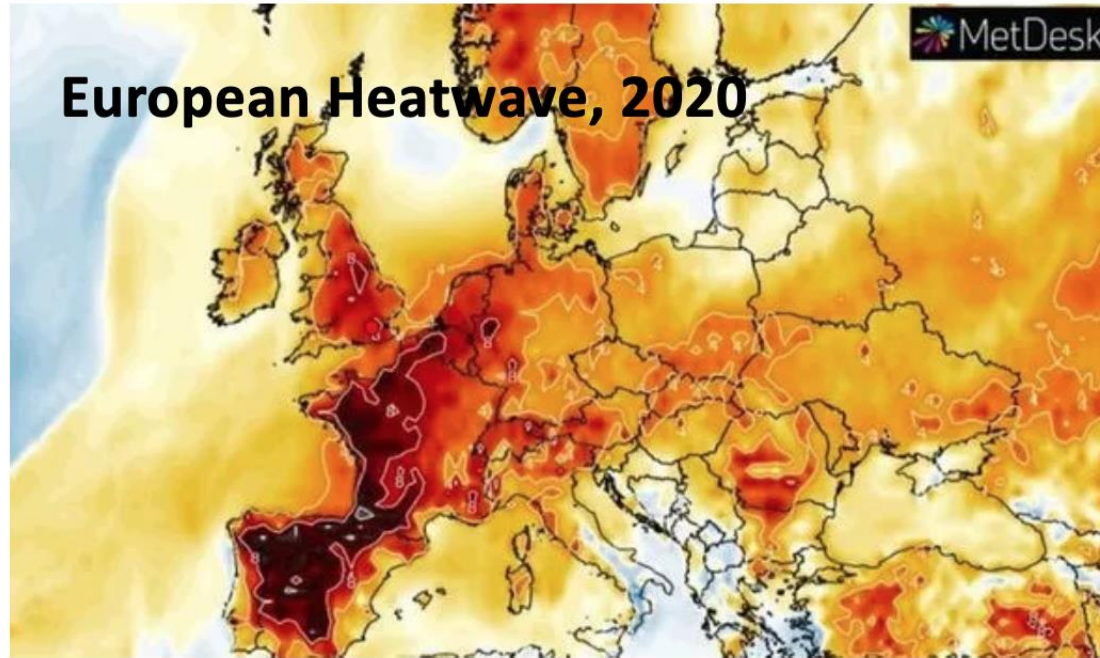


System functioning

?

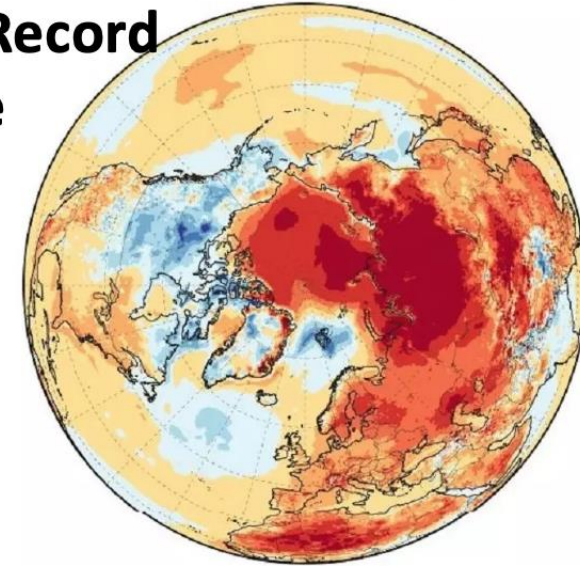


Unsafe territory: Extreme events in 2020



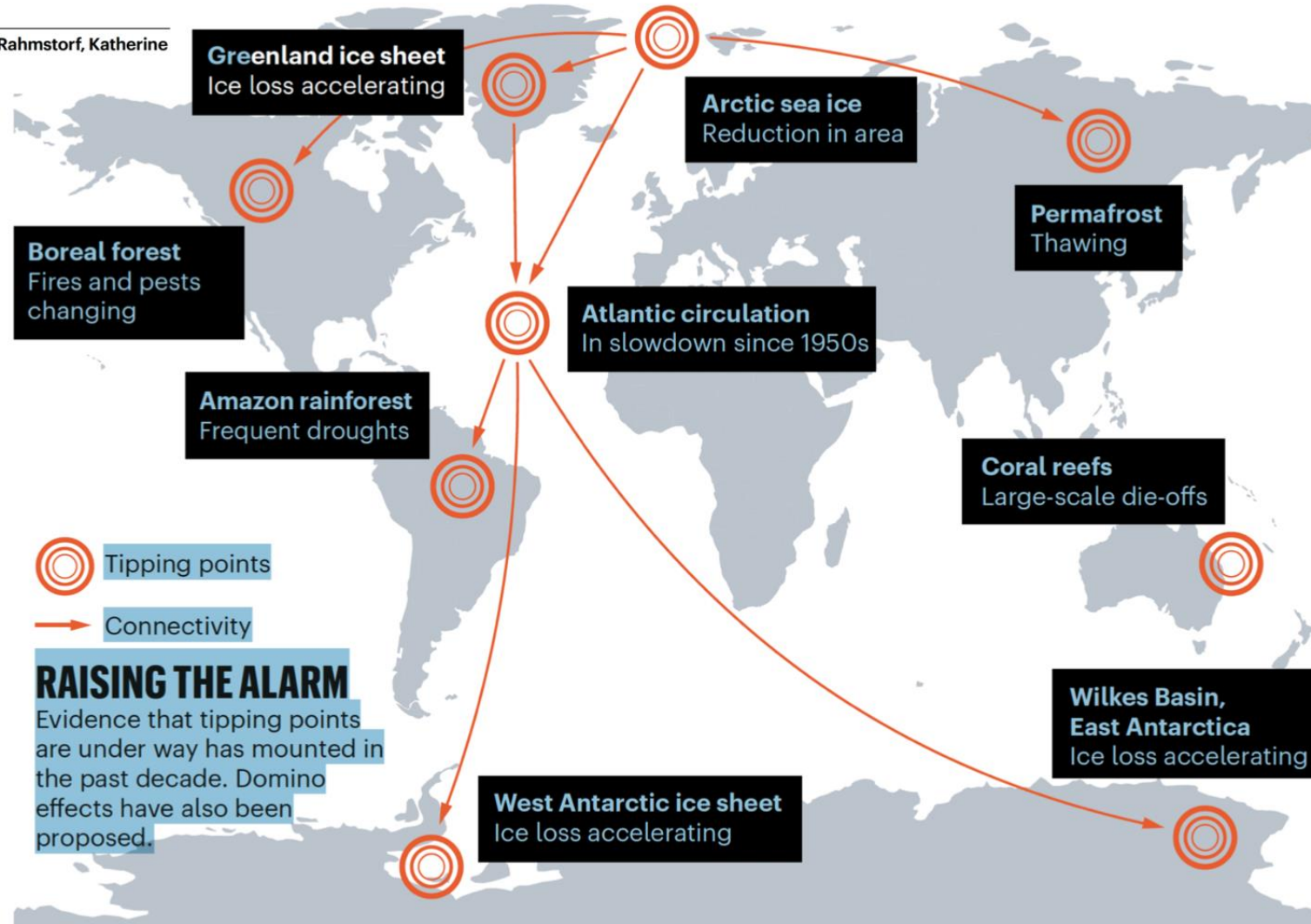
Siberia's Record Heatwave

Global near-surface temperature anomaly January - June 2020 (°C)
NCEP GFS analysis relative to CFRS climatology 1981-2010



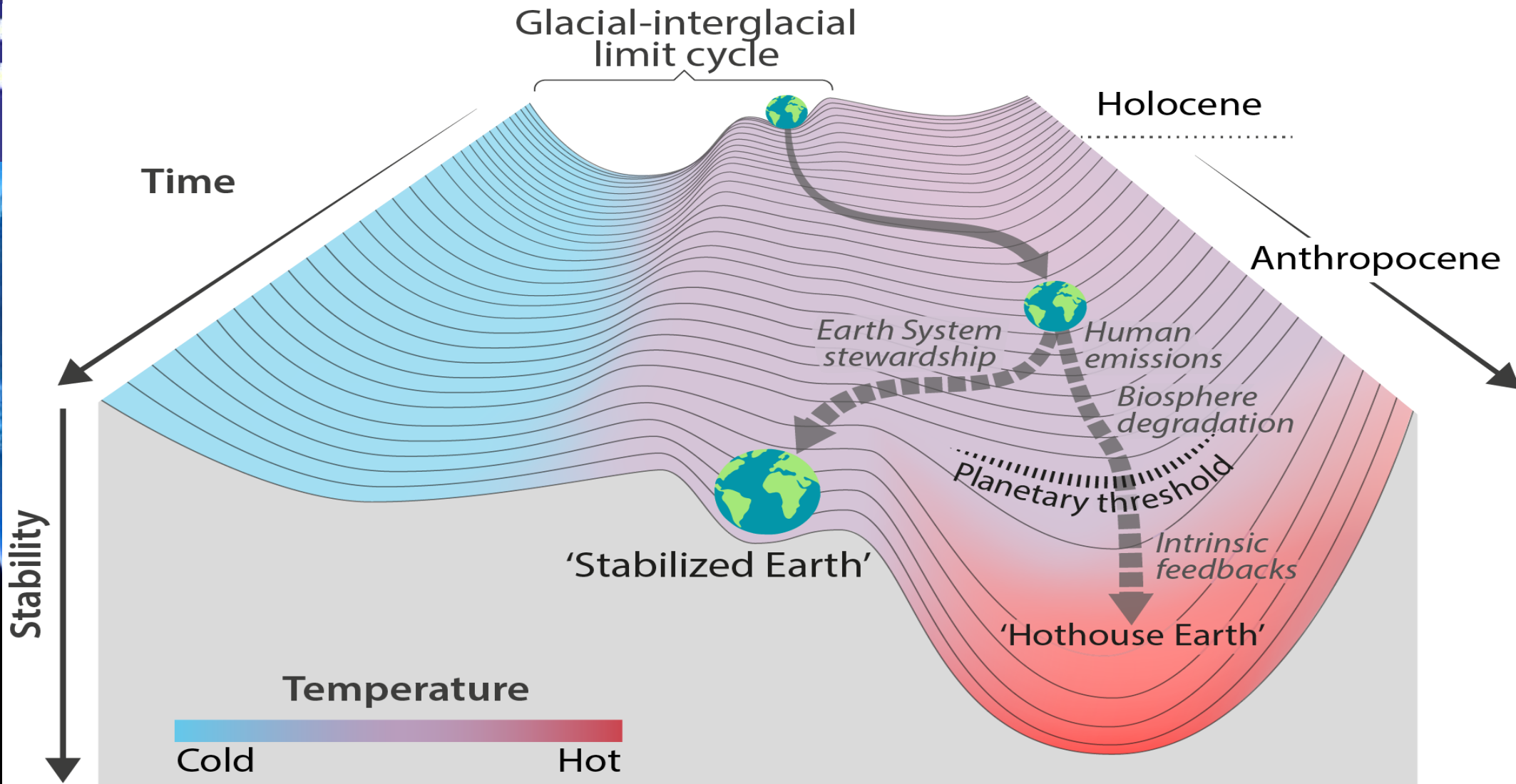
Climate tipping points – too risky to bet against

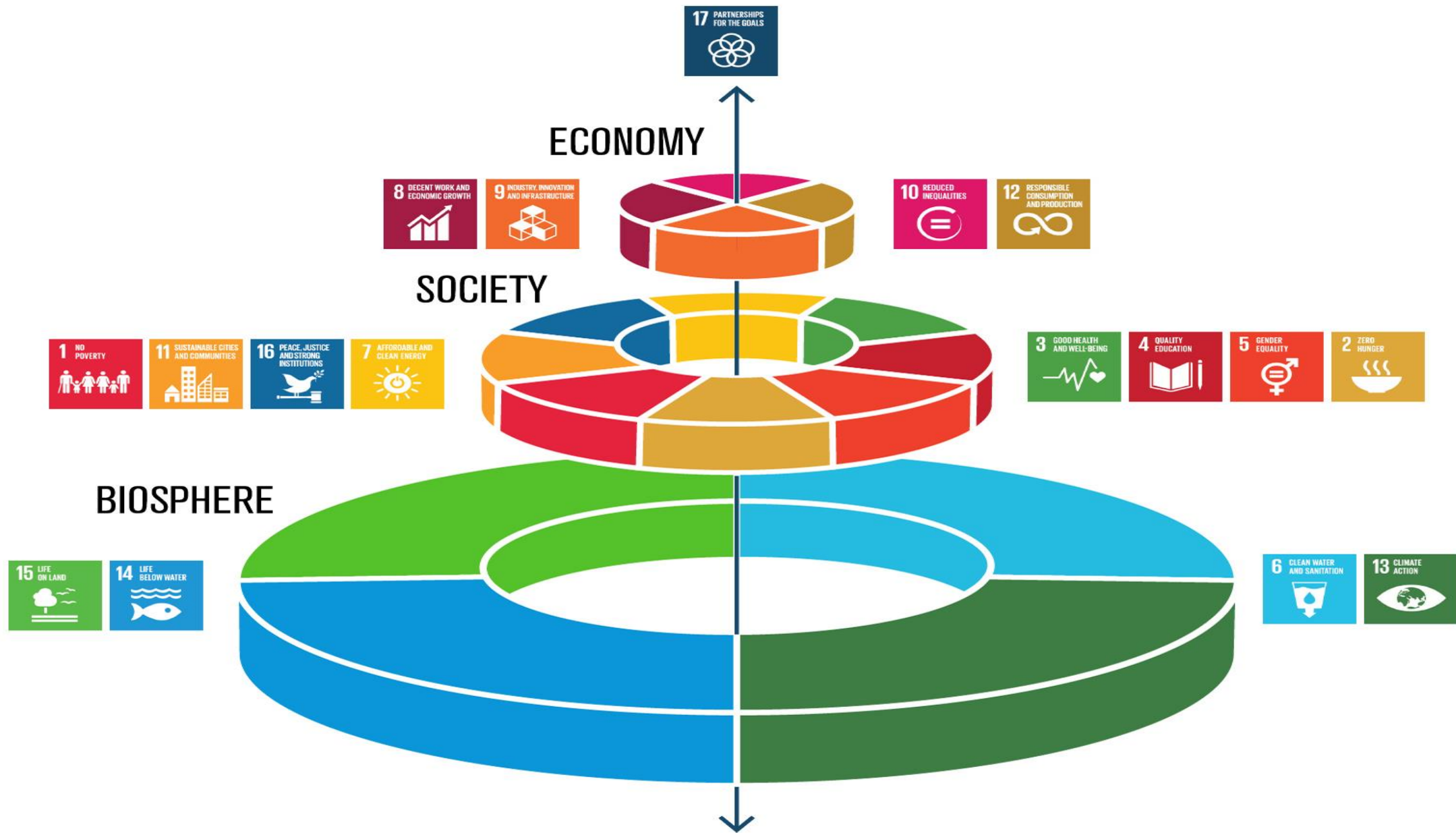
Timothy M. Lenton, Johan Rockström, Owen Gaffney, Stefan Rahmstorf, Katherine Richardson, Will Steffen & Hans Joachim Schellnhuber



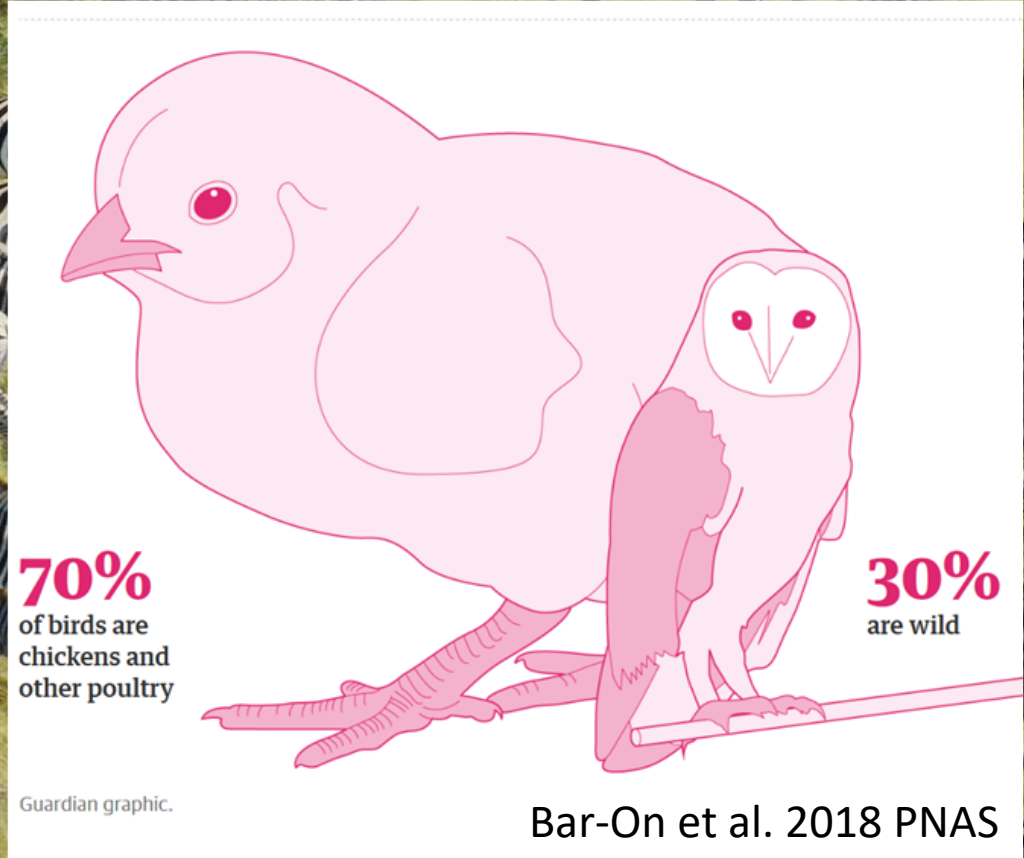
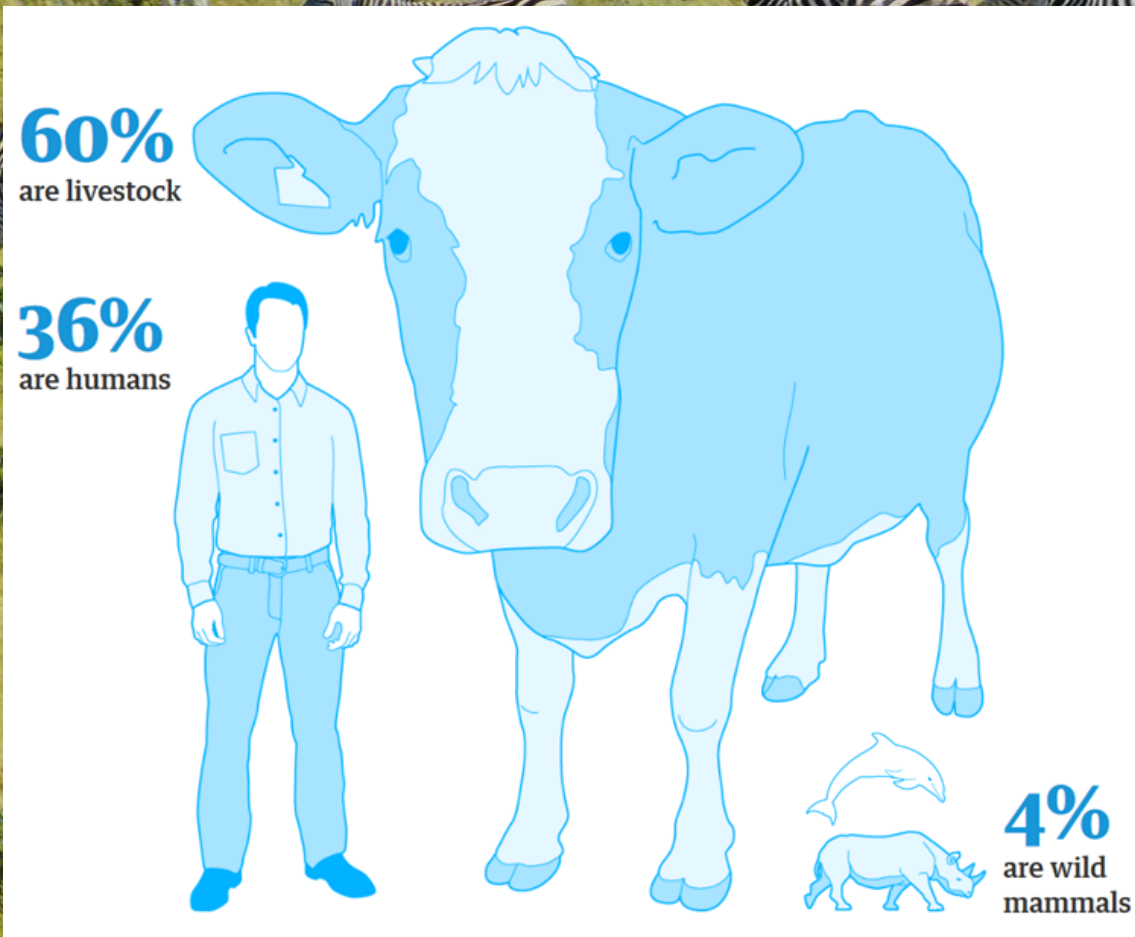
SOURCE: T. M. LENTON ET AL.

Trajectories of the Earth System in the Anthropocene





Human mass - an order of magnitude higher than all wild mammals

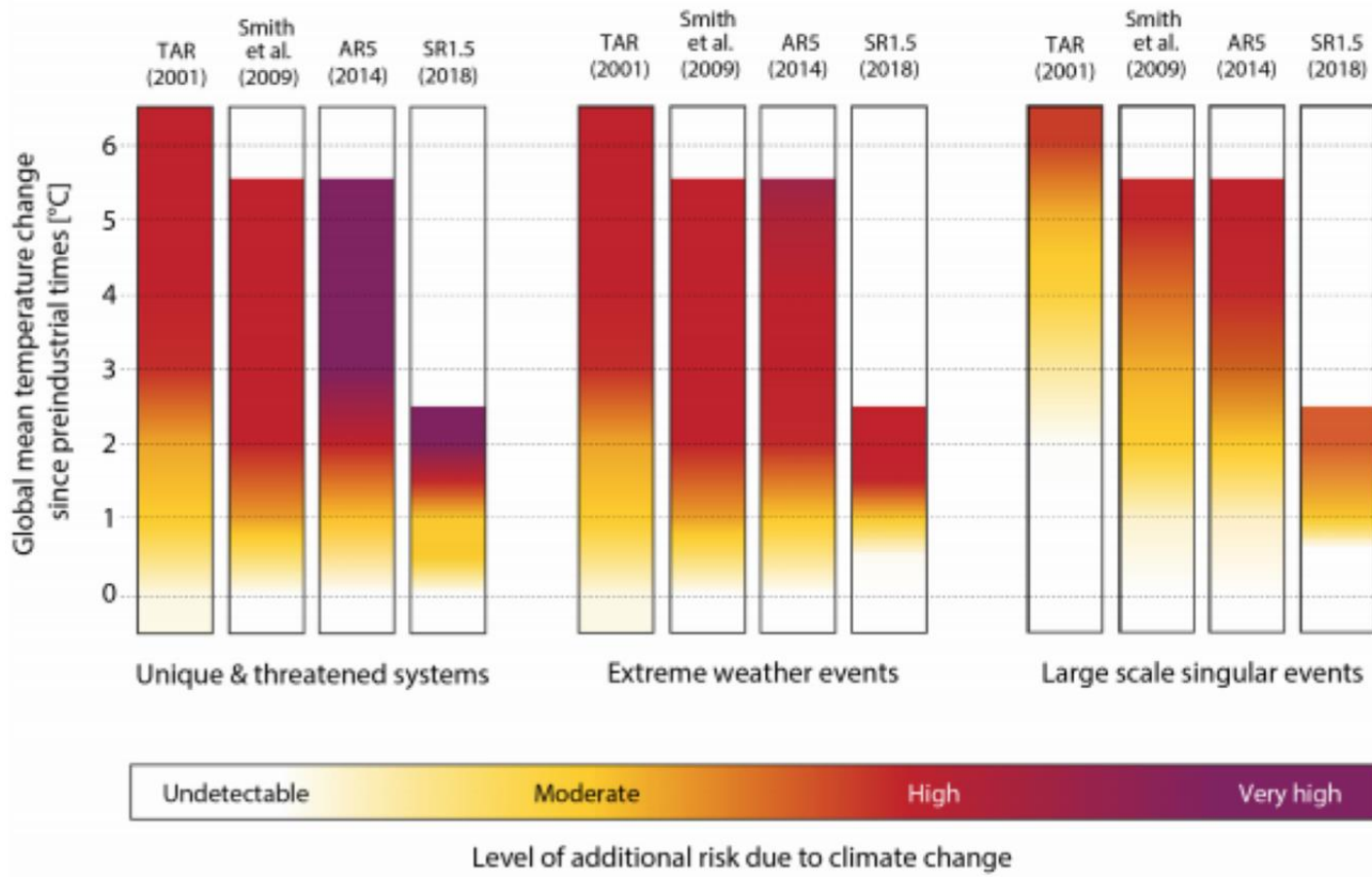


Guardian graphic.

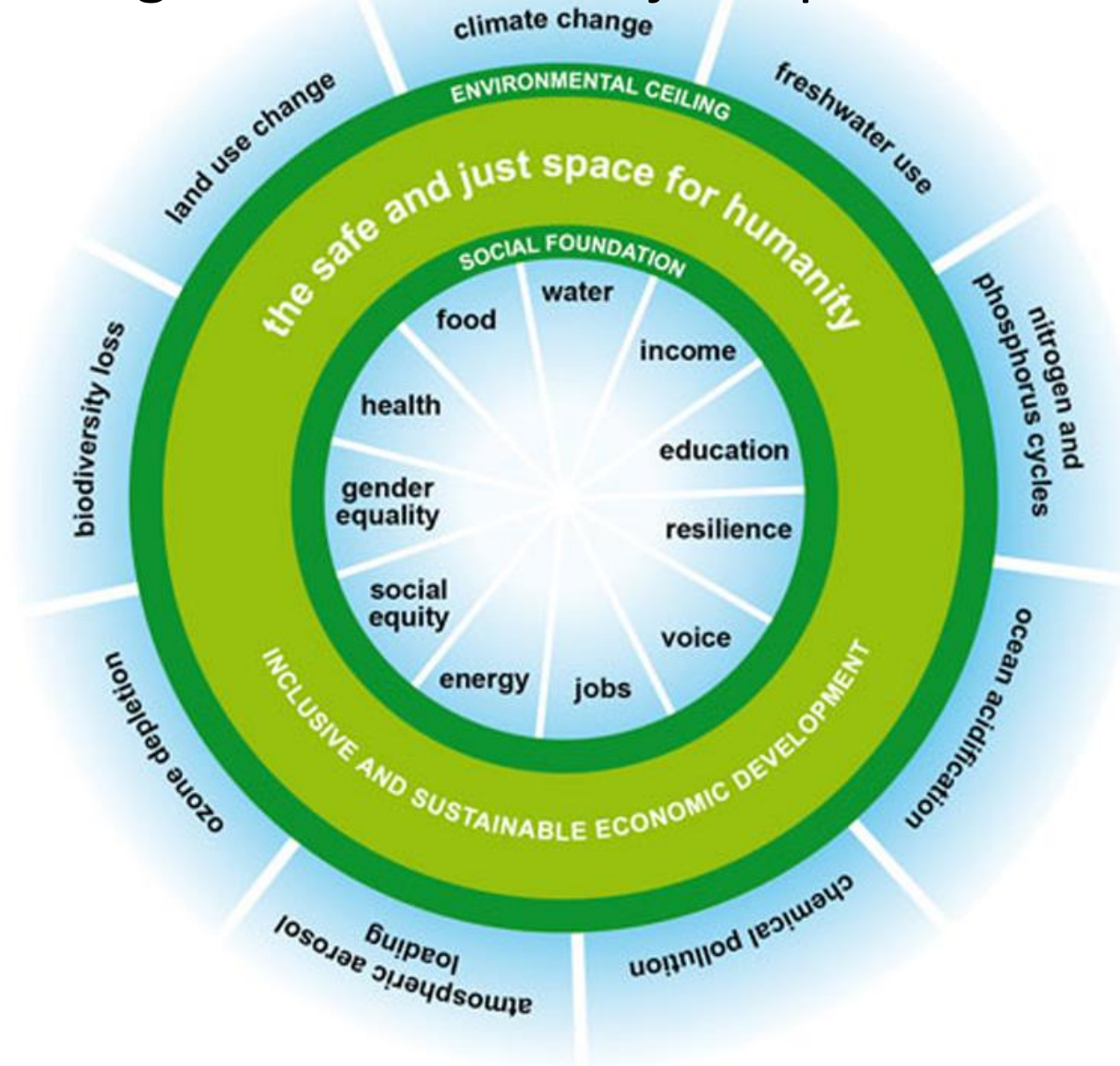
Bar-On et al. 2018 PNAS



Change over time of the science-based risk assessments of IPCC's *Reasons for Concern*



The Doughnut: A safe and just space for humanity





In the Anthropocene, people have the power, knowledge and responsibility for stewardship of our planet in ways that nurture human well-being





It also requires new ways for academia to
engage with society

A new understanding



Humanity part of the **biosphere** – not just linked but **intertwined**

The **future** of people as part of Earth – not just the environment

Global change – not only climate change

A **resilient** biosphere the basis for development, wellbeing, health

Transformations to **global sustainability** necessary, possible, desirable