

Let the environment guide our development



Kevin Noone

CLIMMAR Congress

17 October 2015, Stockholm, Sweden

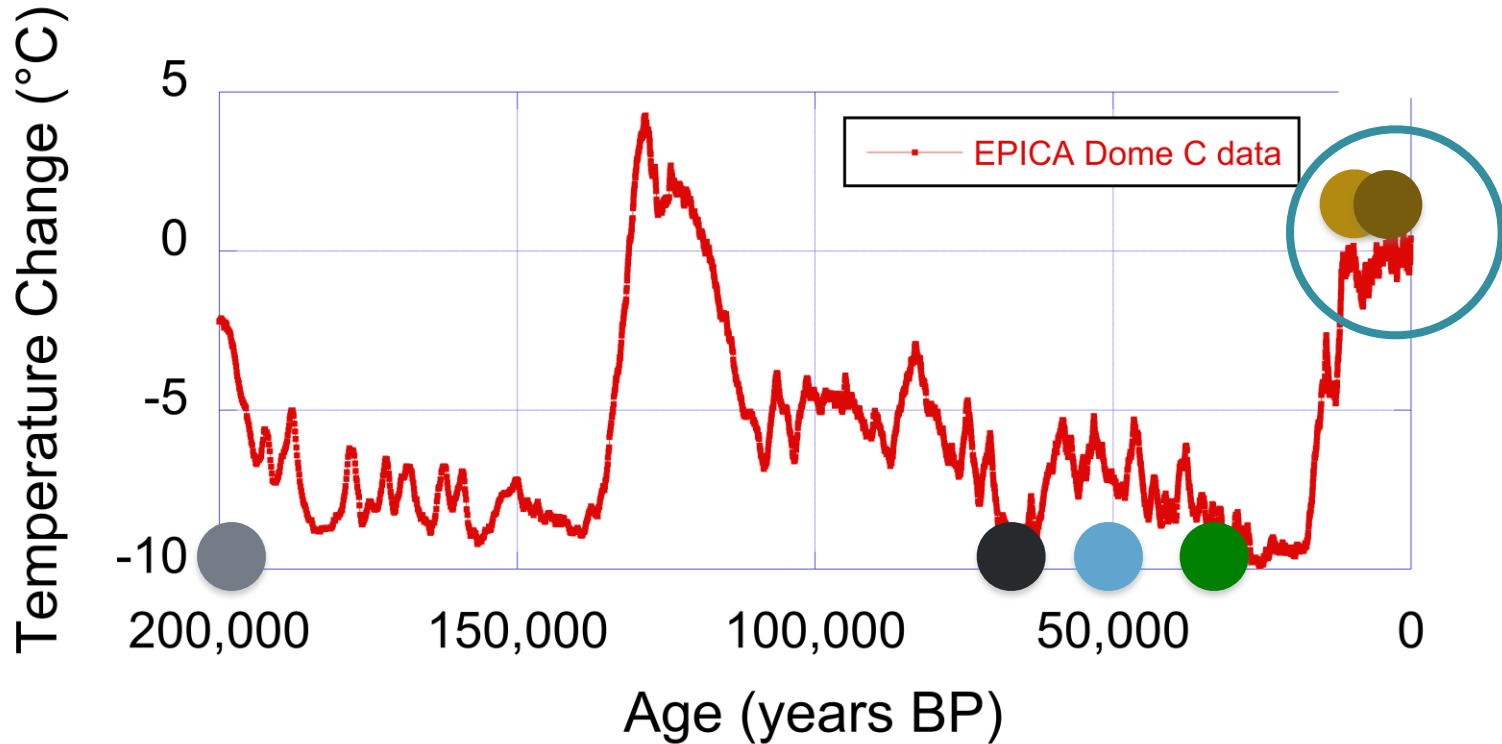
What will we talk about this morning?

- What's with the *Anthropocene*?
- Peering into the future: Risk, uncertainty and surprise
- Planetary Boundaries framed as decision support
 - The Policy Sector: UN High-level Panel on Global Sustainability: Feeding 9 billion neighbors
- Final thoughts

Our new epoch – the Anthropocene



Our modern human history



Oldest modern human skeletal remains

Erik's ancestors reach West Asia

Beginning of agriculture

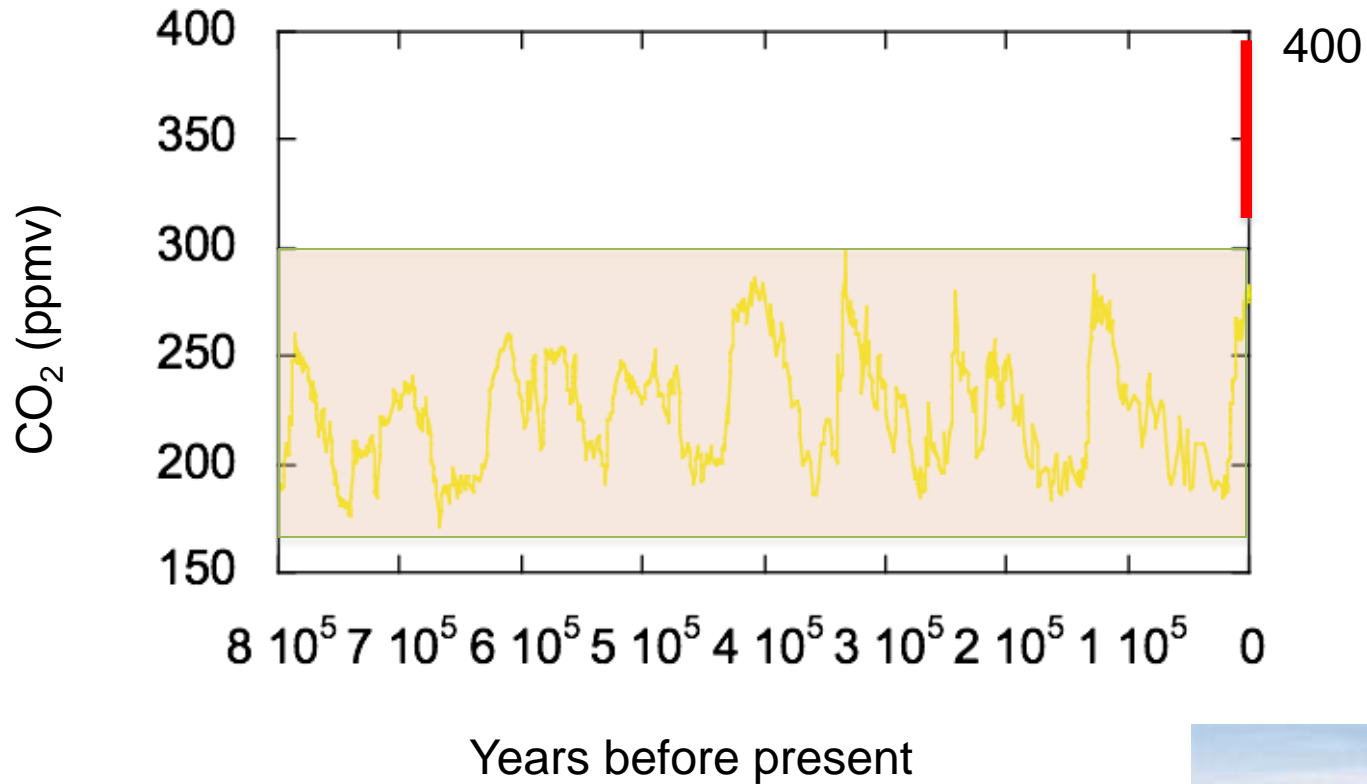
Great civilisations

Erik's ancestors leave Africa

Erik's ancestors reach Europe

Sources: Jouzel, et al. Science 317 (2007)
National Geographic Genographic Project

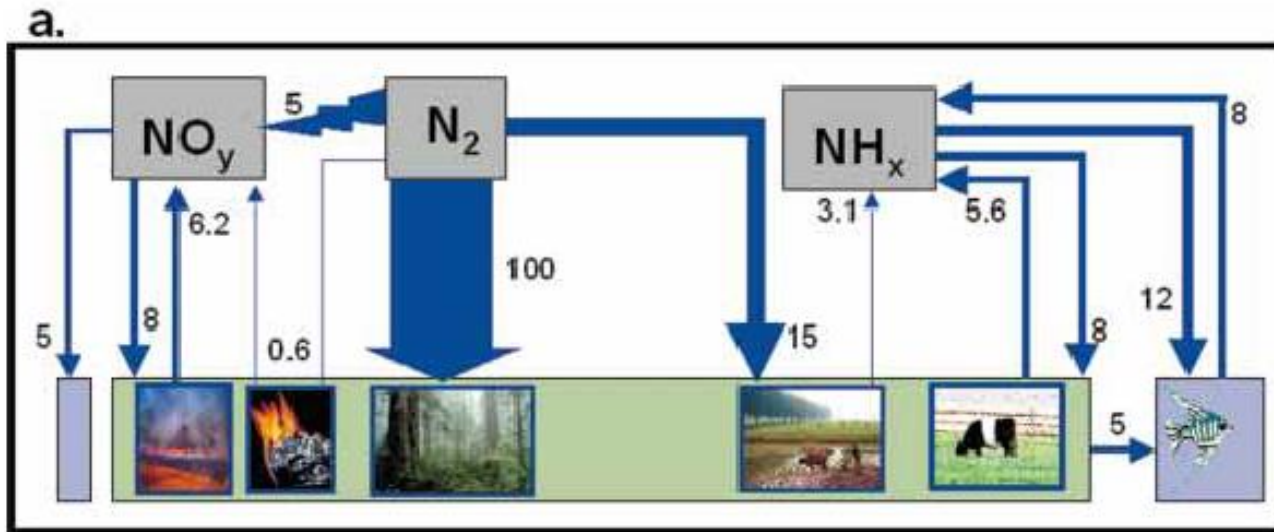
A look *further* back in time



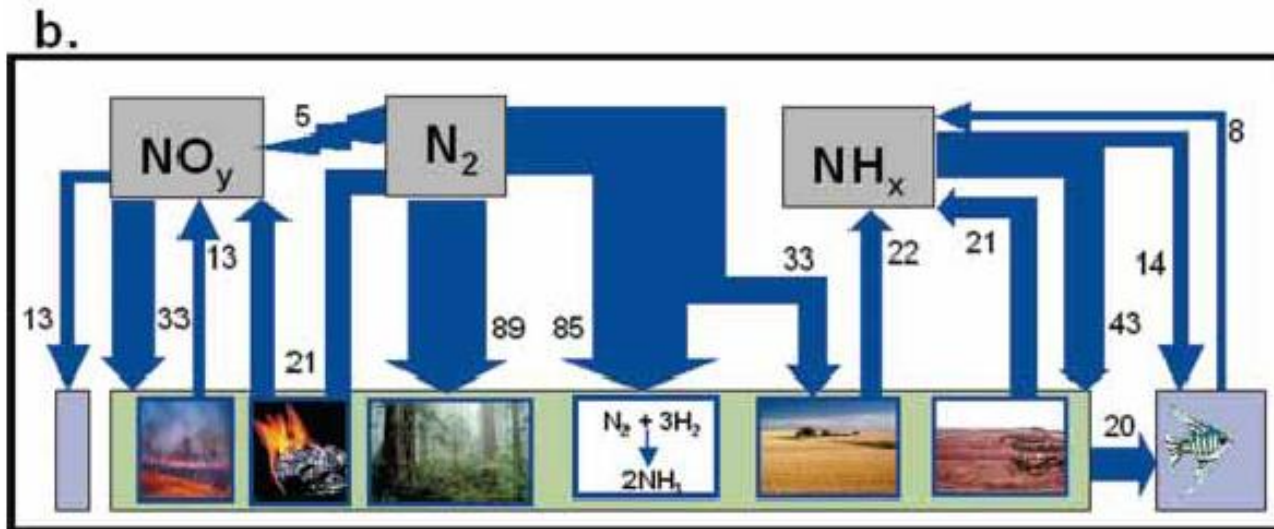
Lüthi, D., et al.. 2008. EPICA Dome C Ice Core
800KYr Carbon Dioxide Data.
IGBP PAGES/World Data Center for Paleoclimatology
Data Contribution Series # 2008-055

Changes in the nitrogen cycle

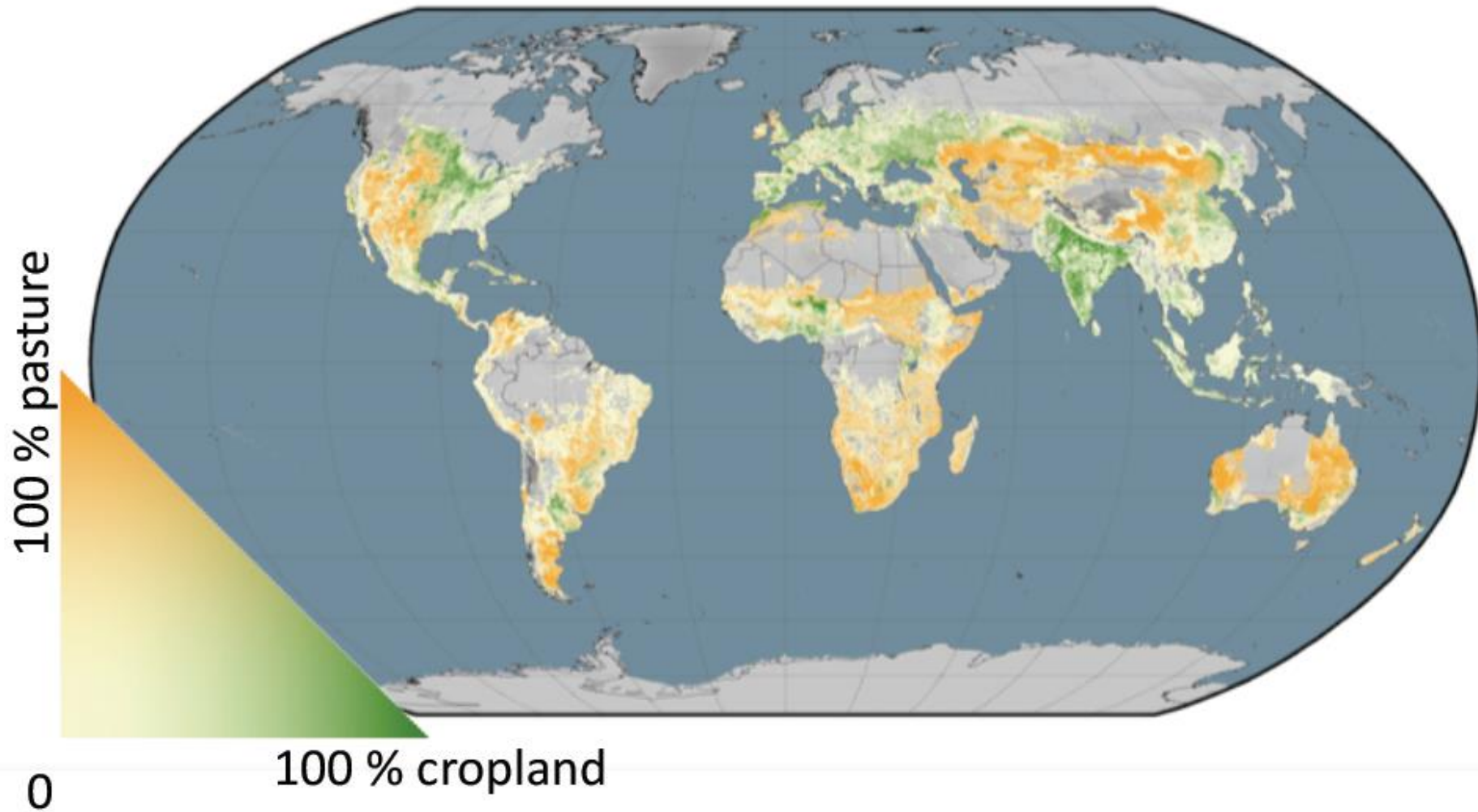
1890



1990

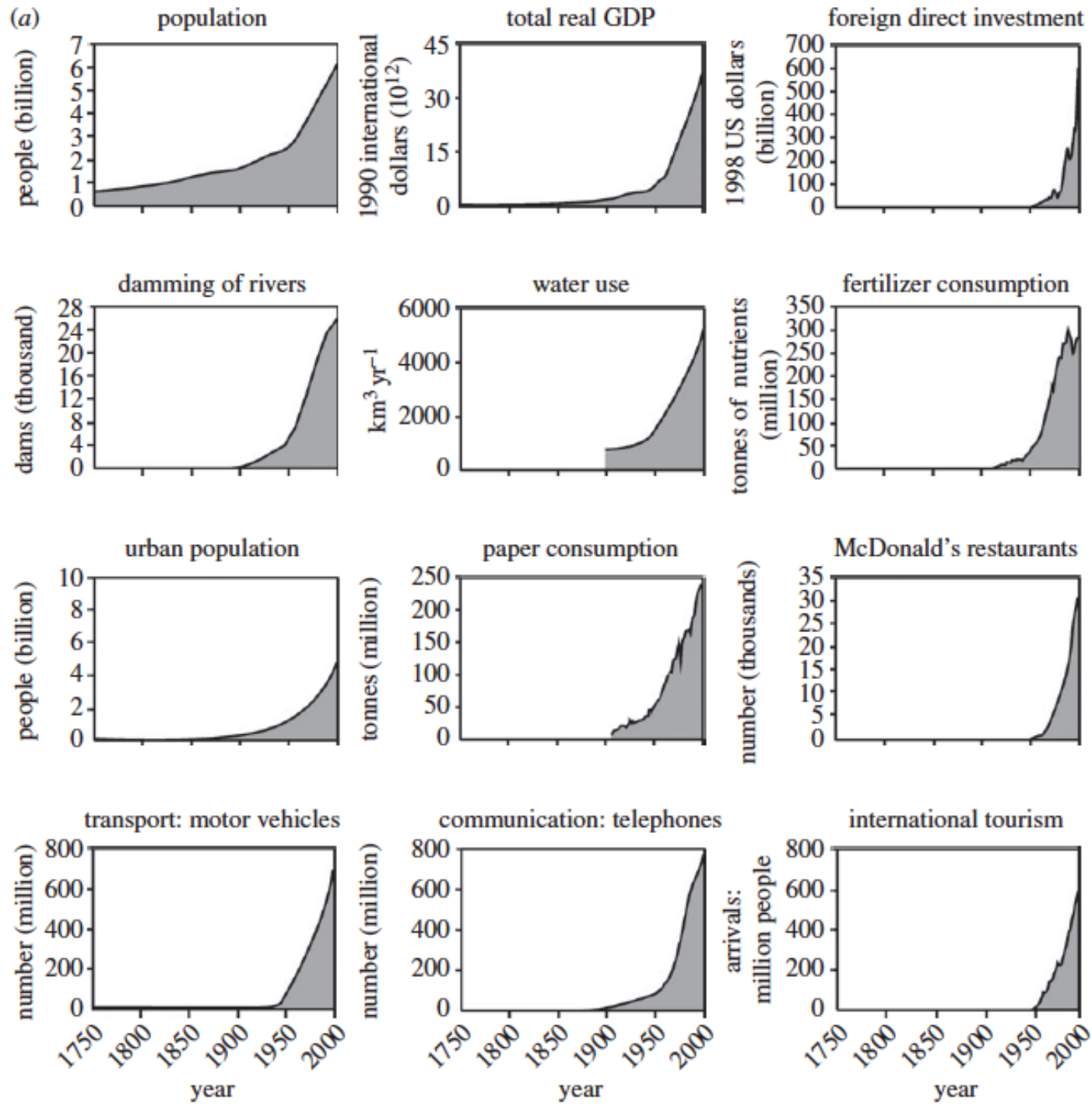


Global agricultural land use



Foley et al., Nature 478, 337-342, 20 October 2011

When did the Anthropocene start?



Steffen, W., et al.,
(2007) *AMBIO* 36,
614-621.

We can be seen from space



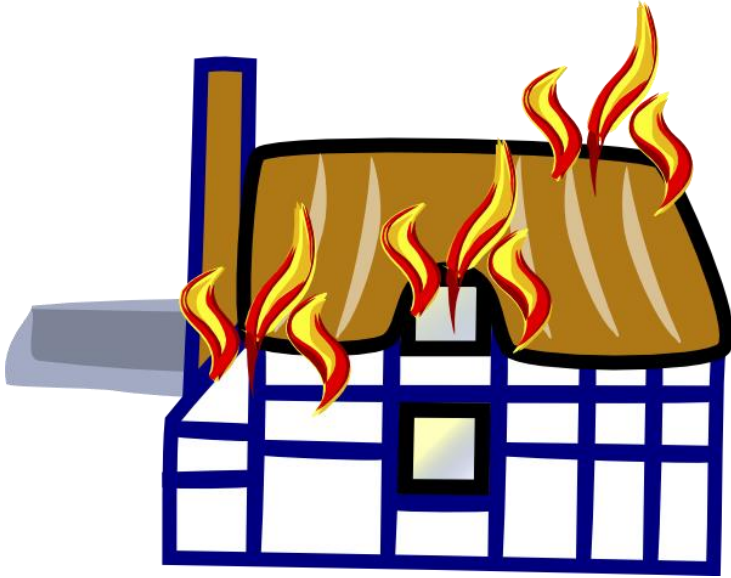
<http://visibleearth.nasa.gov>



Risk, uncertainty and surprise



Fire insurance and a standing army



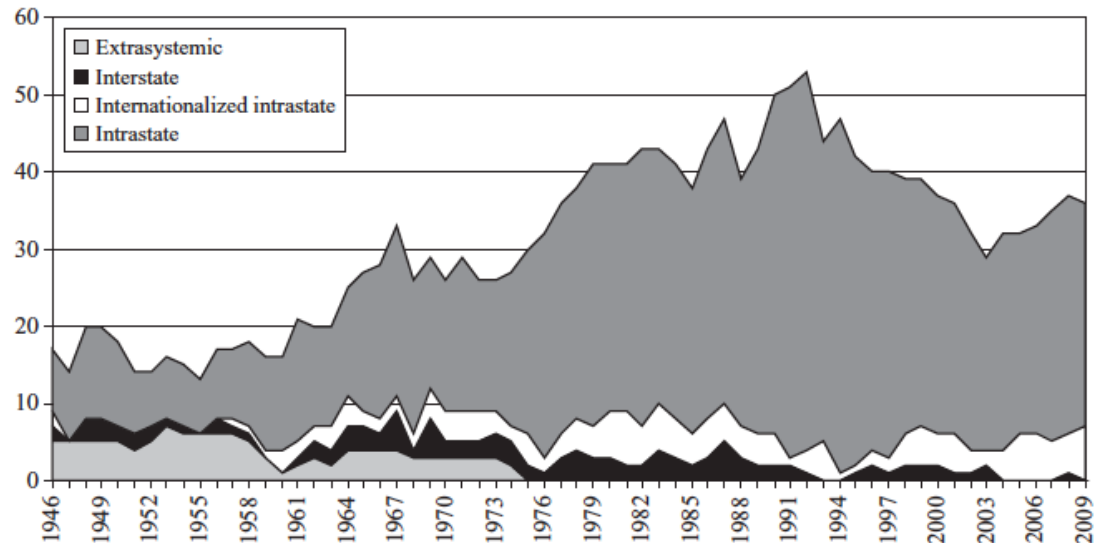
USA in 2010:

$$\frac{369,500 \text{ residential fires}}{130,600,000 \text{ housing units}} = 0.28\%$$

→ One fire every 350 years



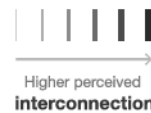
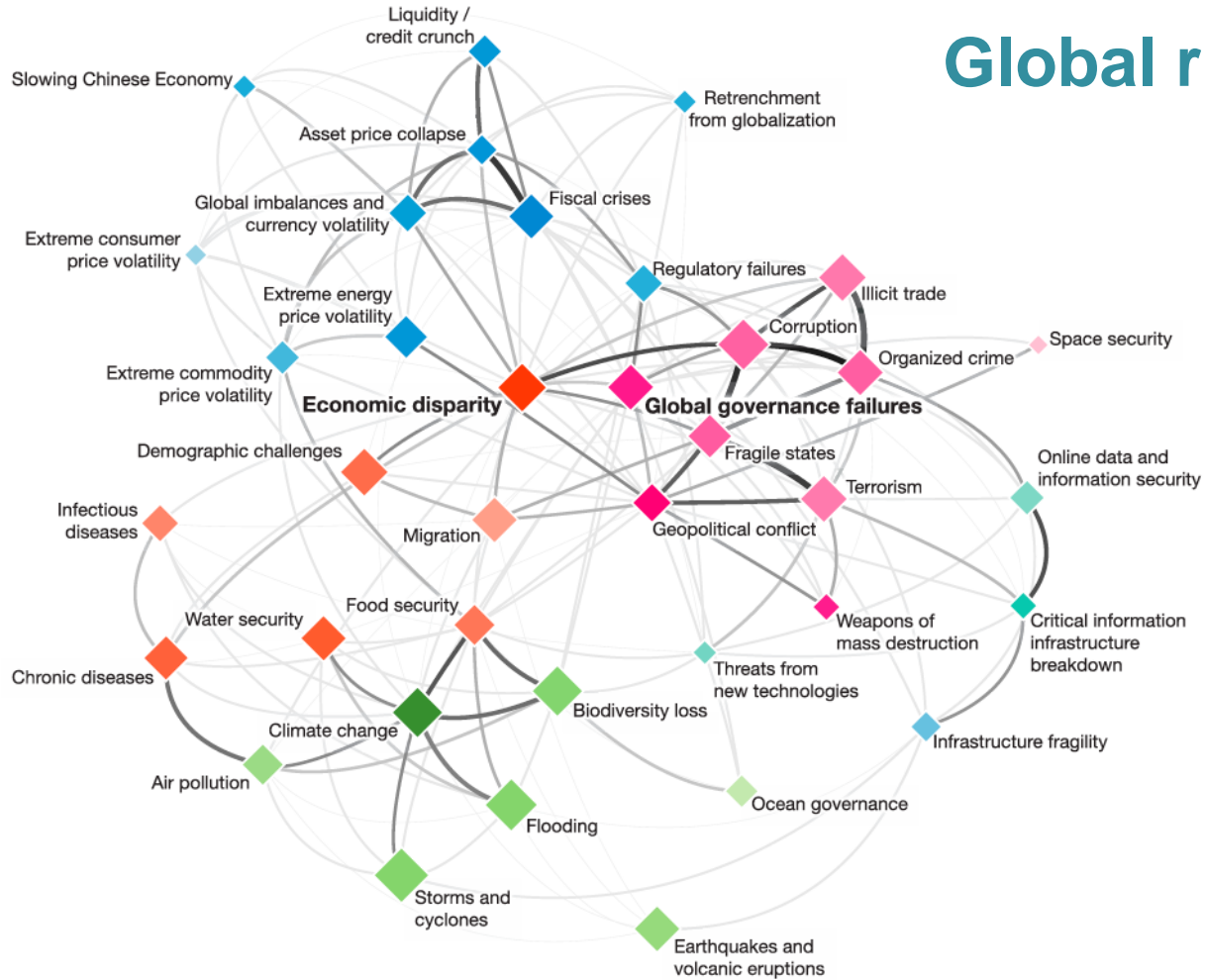
Harbom, L., Wallensteen, P.
(2010) Journal of Peace
Research 47, 501-509.



Risk, uncertainty and surprise

- **Risk** is the condition in which the set of possible events or outcomes, and the probability that each will occur, is known;
- **Uncertainty** is the condition in which the possible events or outcomes are known (factually or hypothetically), but the probabilities that each will occur are not known or are highly subjective estimates;
- **Surprise** is the condition in which the event or outcome is not known or expected.

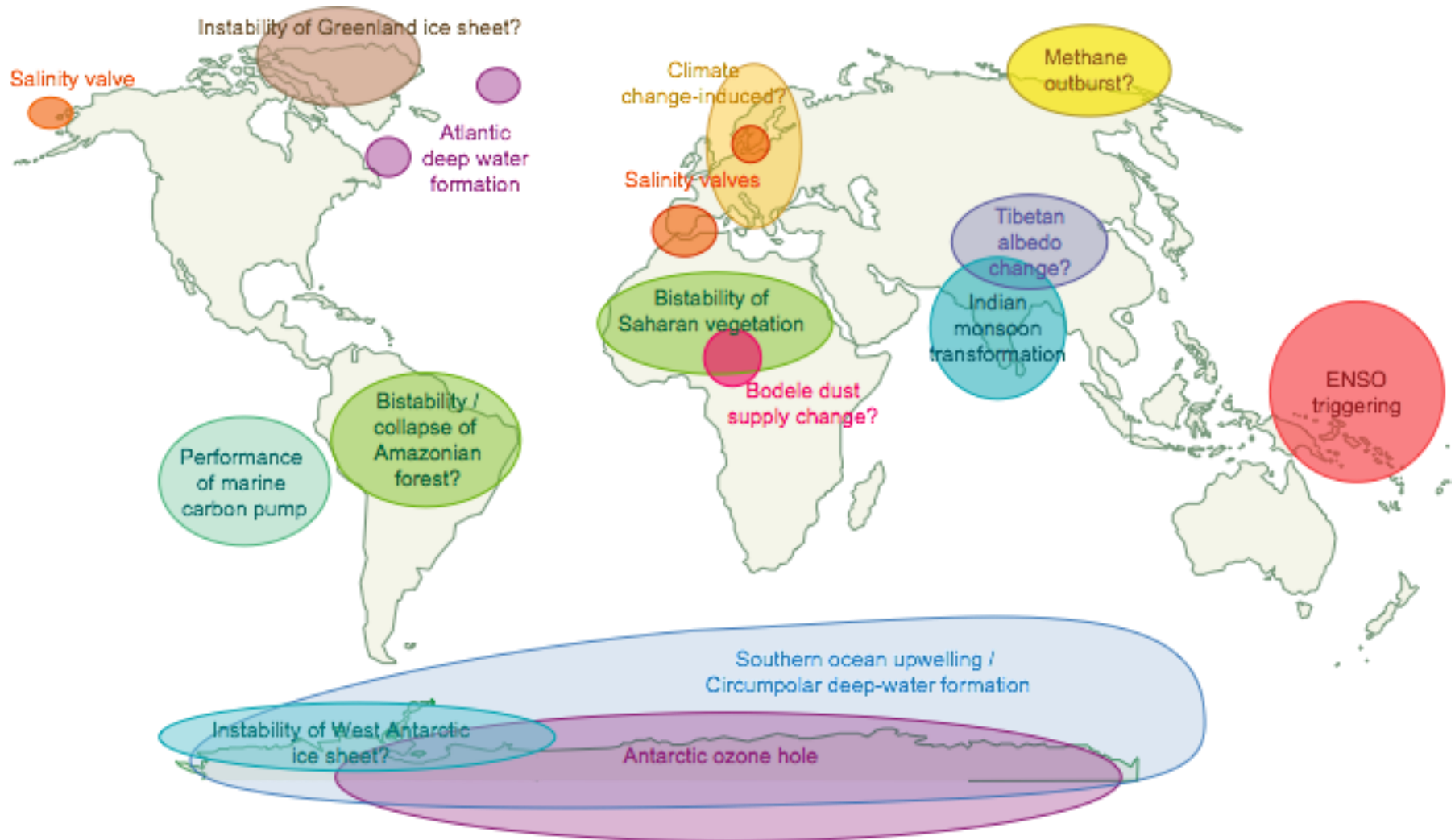
Global risks



Planetary Boundaries as decision support



Tipping points



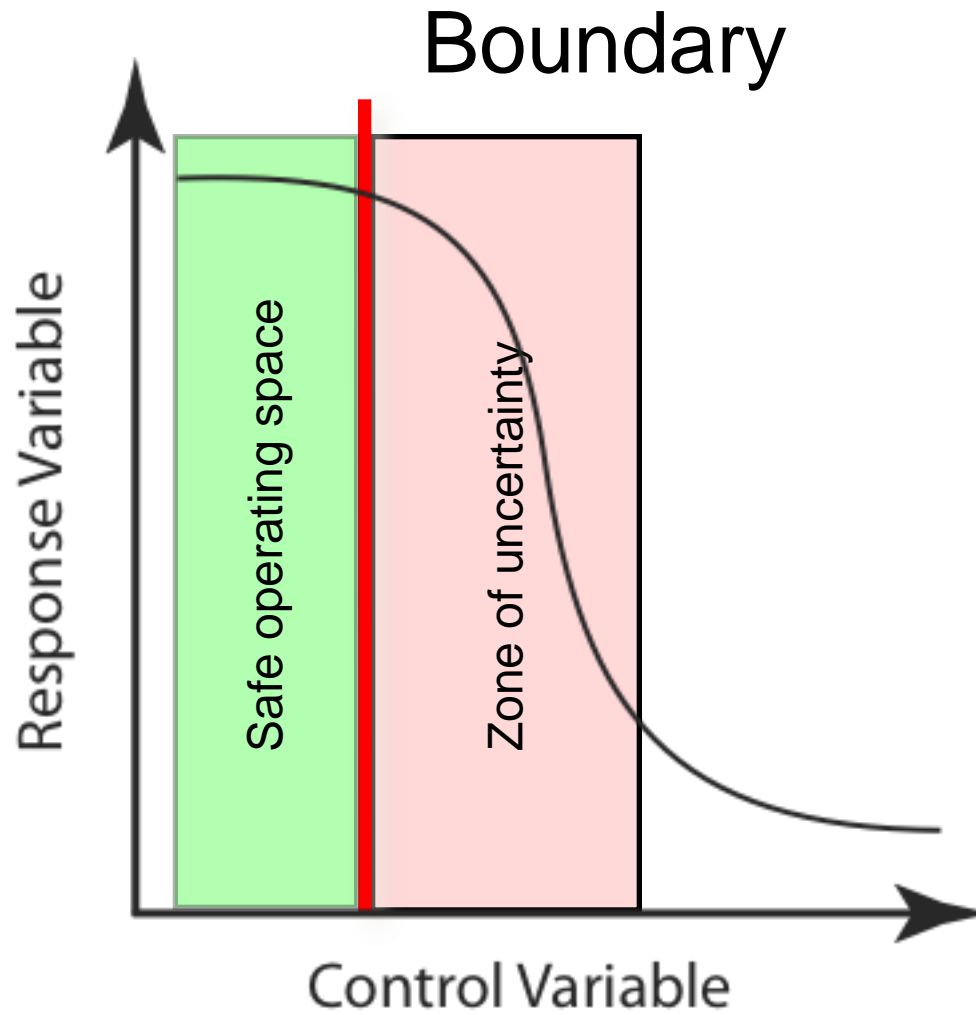
Some properties of PBs

- Associated with a large-scale change in how planetary systems function (often a threshold or “tipping point”); these are non-negotiable
- Have some “control” variable
- Include normative aspects of defining preferred states - holocene stability

Some properties of PBs

- Operate on time scales over which ethics and political action are relevant
- A “safe operating space” can be created within the boundaries

Planetary Boundaries

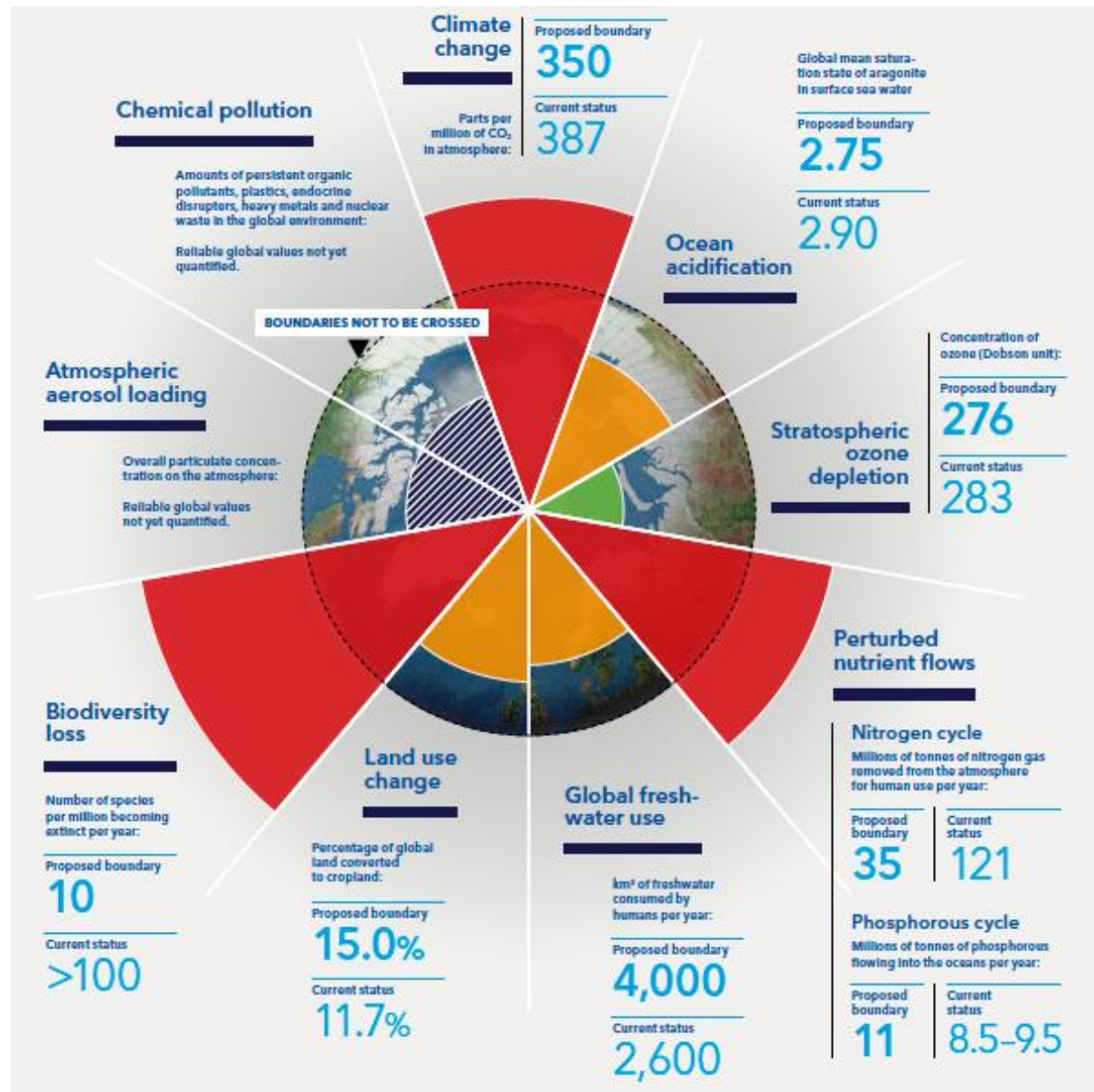


● Areas where we have exceeded the boundaries and are continuing to move further beyond them.

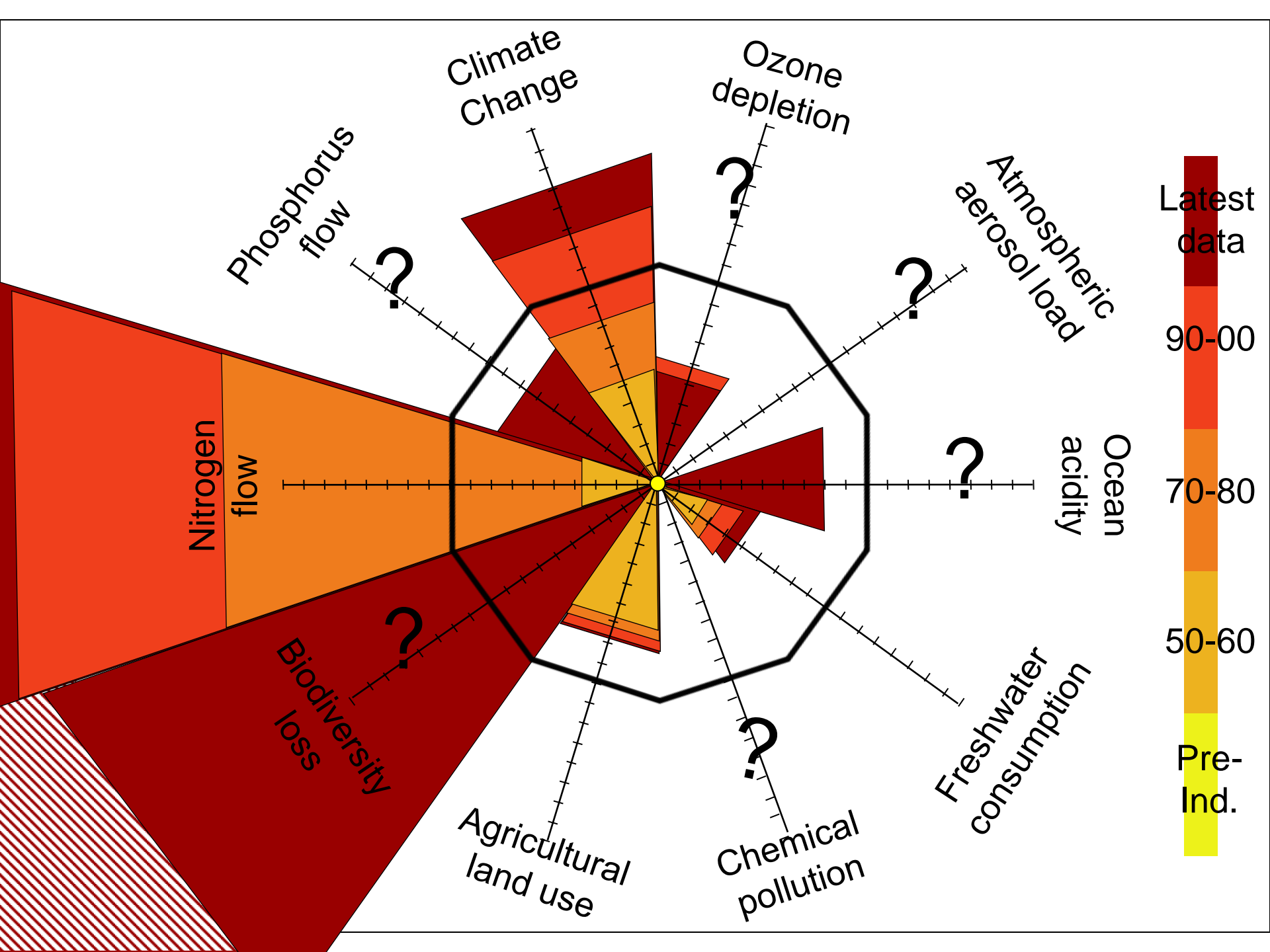
● Areas where we are still below the boundary values, but are moving towards them.

● Area where international political agreements have allowed us to start moving away from a boundary - in the correct direction.

● Areas where no boundary values were established.



Rockström, et al., Nature, 2009
 DNV GL Report 2014



UN High-level Panel on Global Sustainability



UN High-level Panel on Global Sustainability



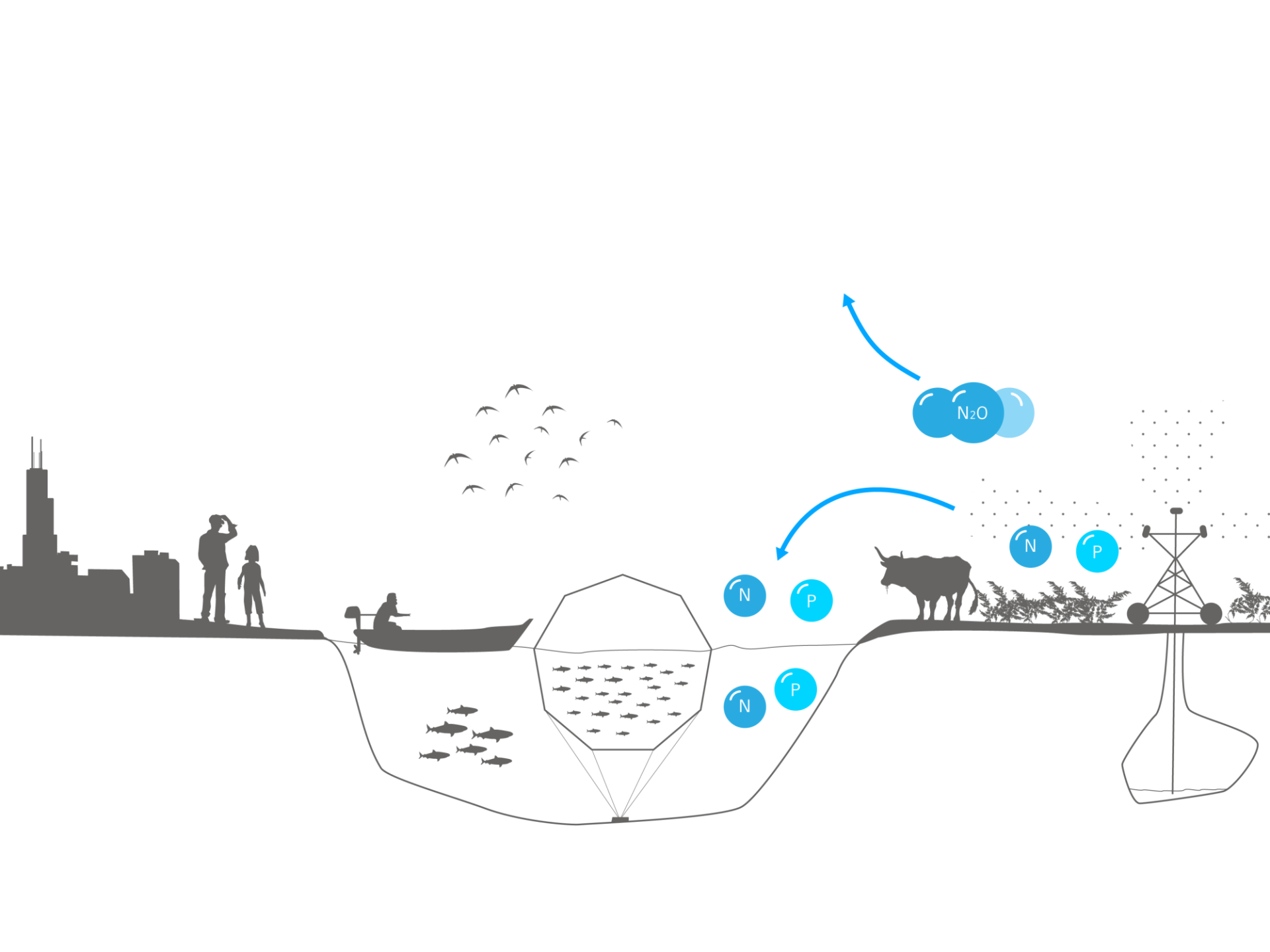
Global Sustainability Panel members meeting in Helsinki, Finland, 16-17 May.

Focus on energy, water and food

- We are treading too close to planetary boundaries
- Rapid growth is often accompanied by rising inequality
- The drivers of change are different today than they were 20 years ago
- We live in a globalized and interconnected world
- Business-as-usual is not an option

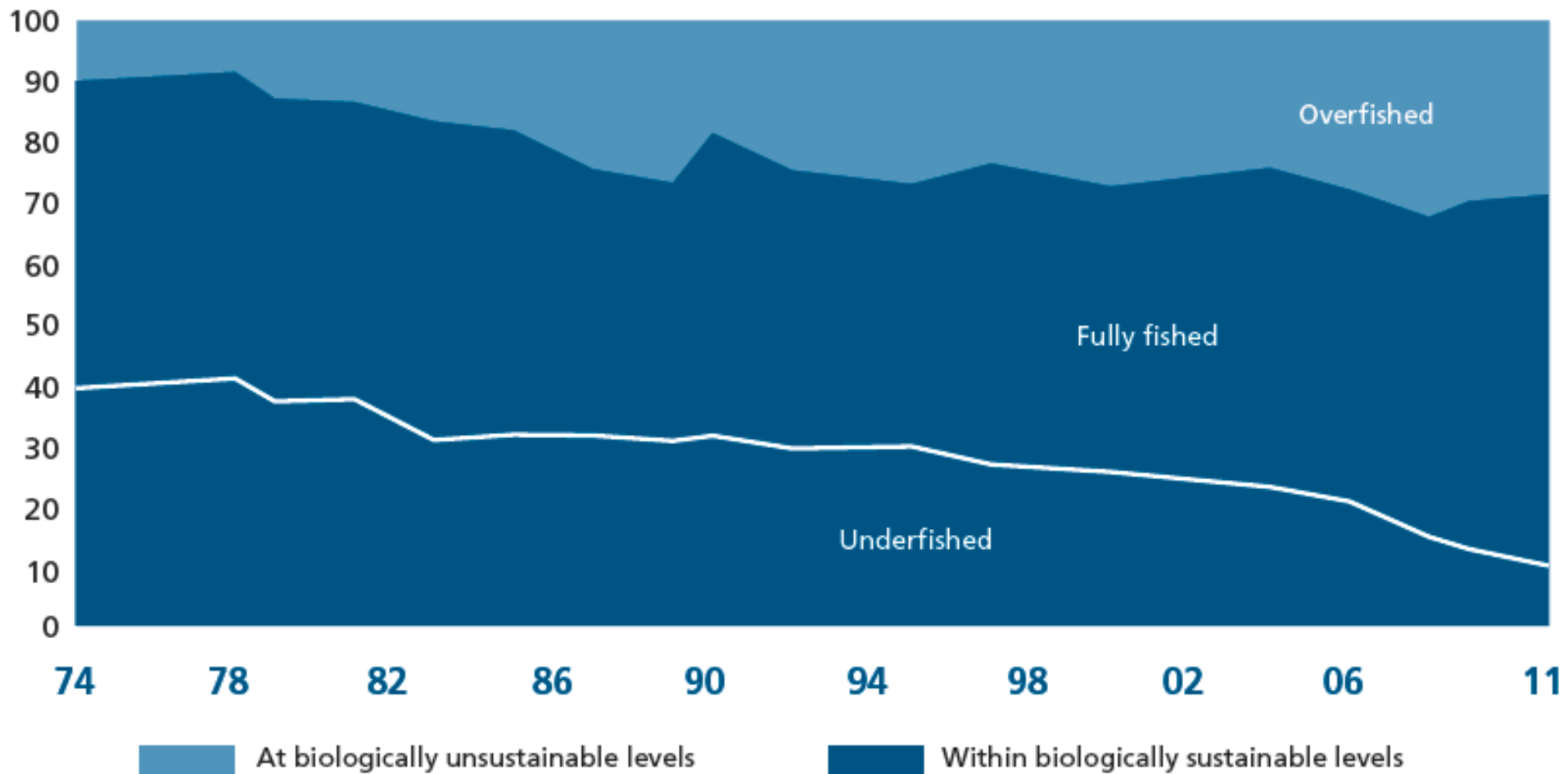
Example 1: Feeding 9 billion people





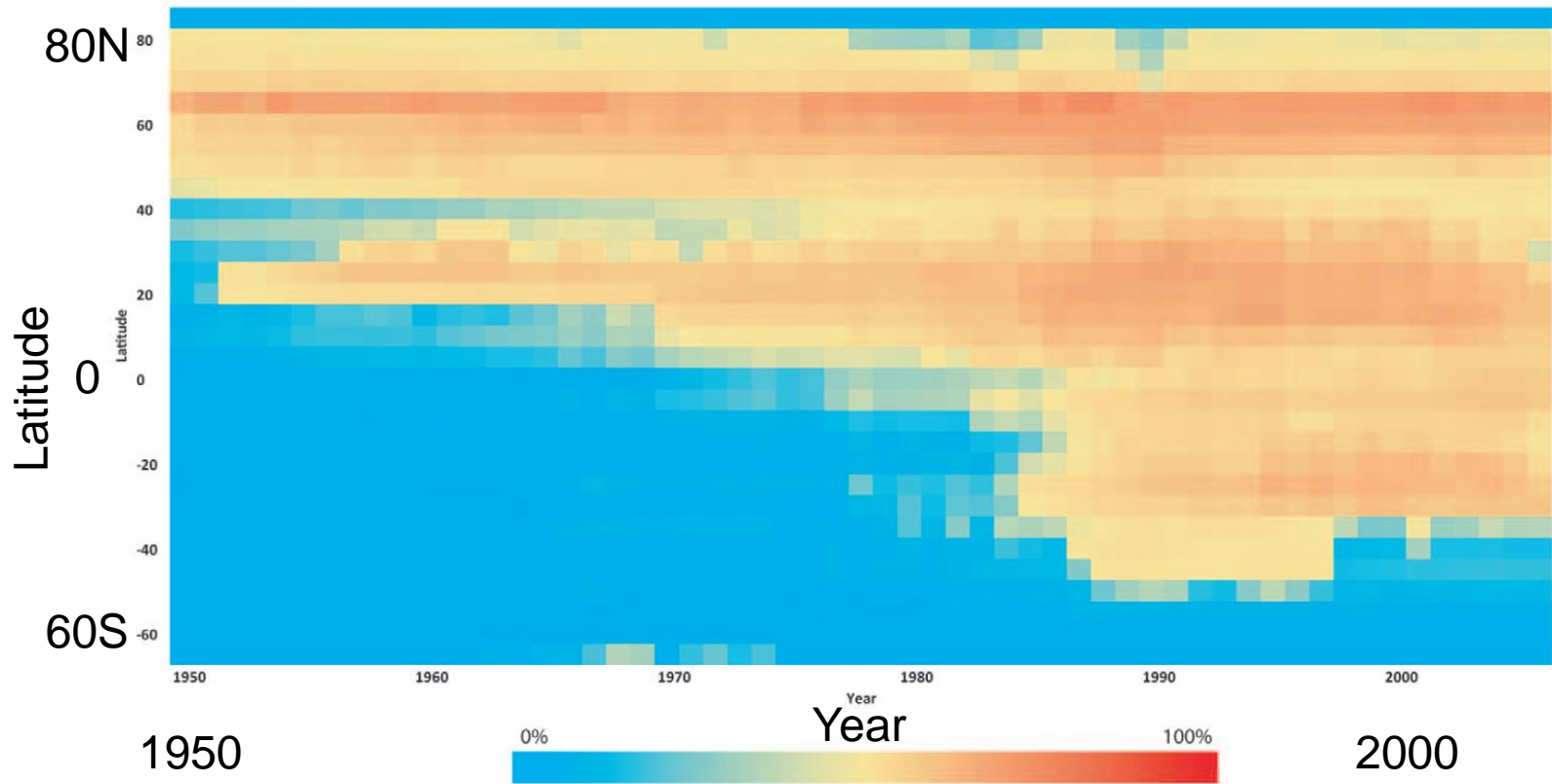
Global marine stocks

Percentage of stocks assessed



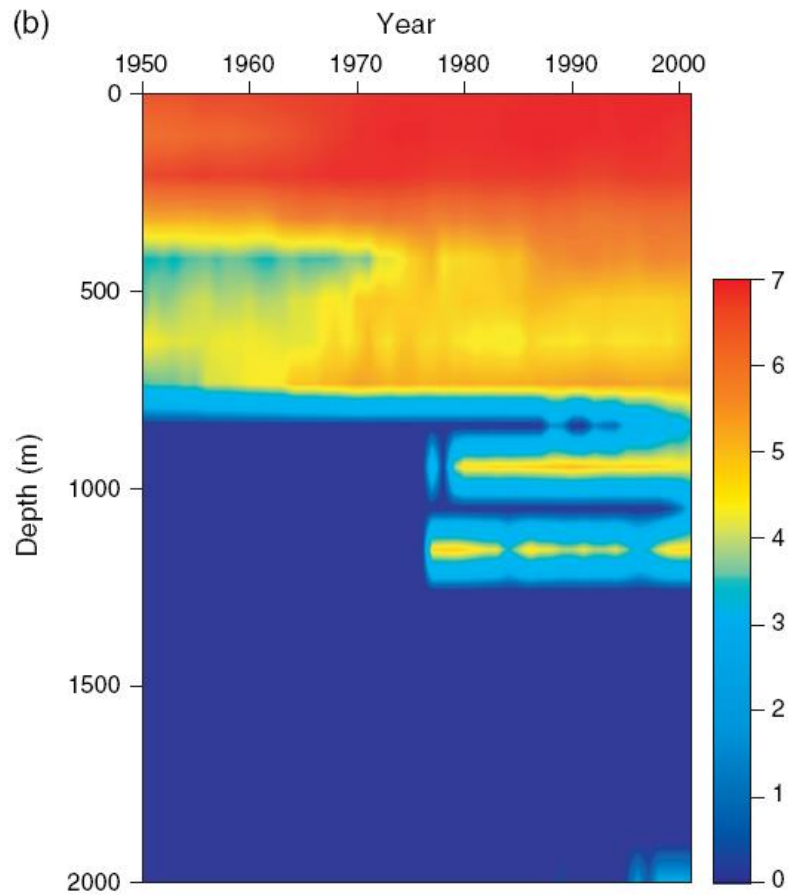
FAO 2014: The State of World Fisheries and Aquaculture

Expansion of fishing over time by latitude



Schwartz et al. 2010 PLoS ONE 5: e15143

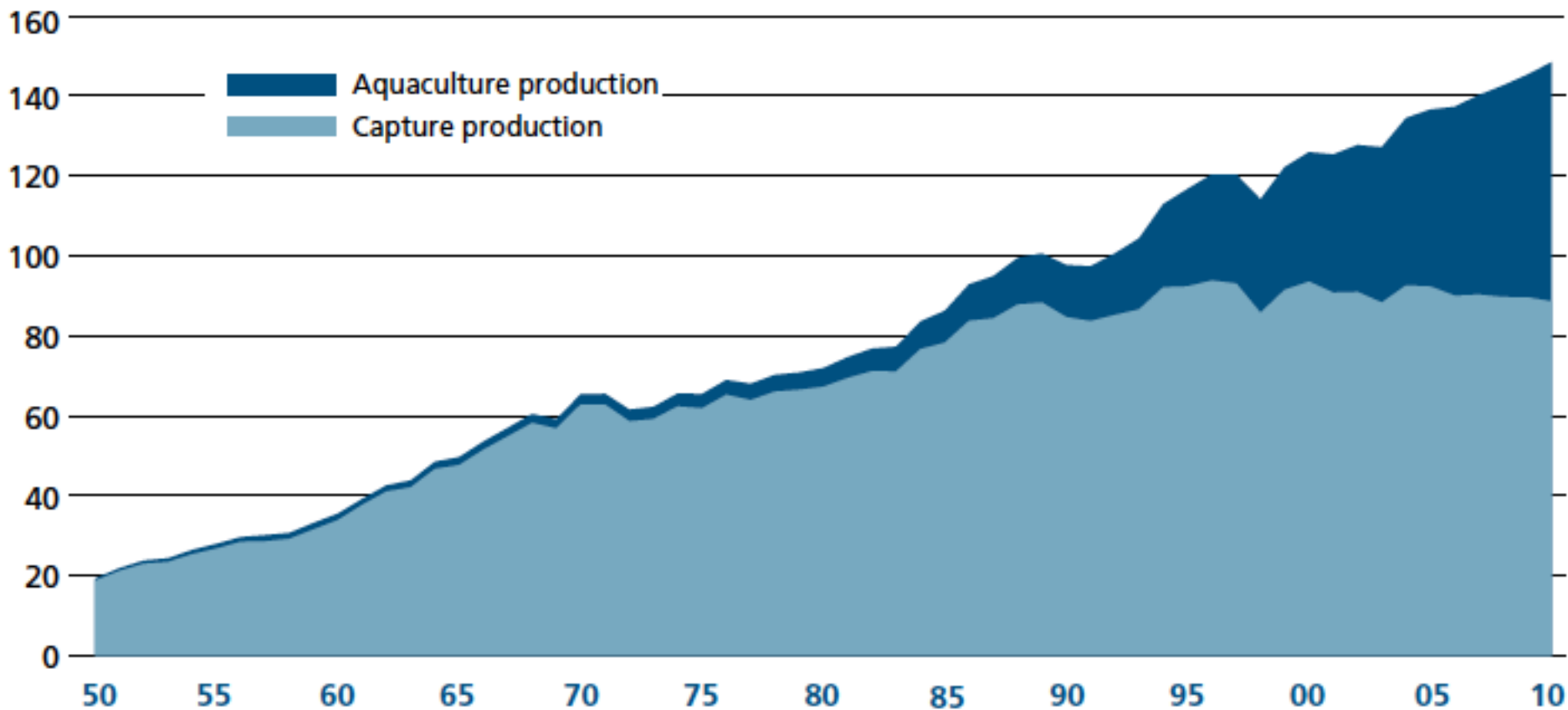
Fishing the deep



Time series of bottom fisheries catches by depth (Morato et al. 2006
Fish & Fisheries 7: 24-34)

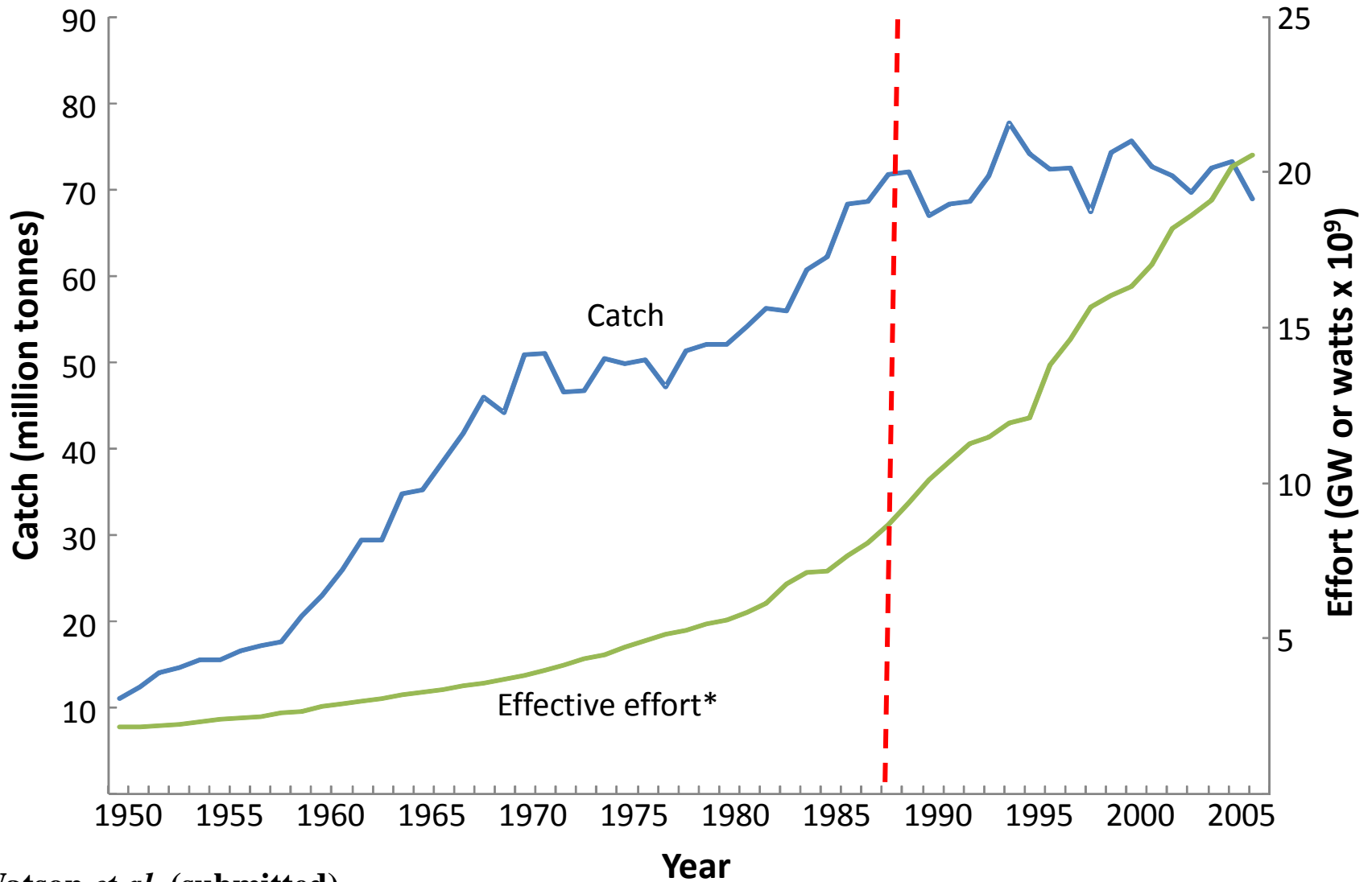
Global catches for capture fisheries

Million tonnes



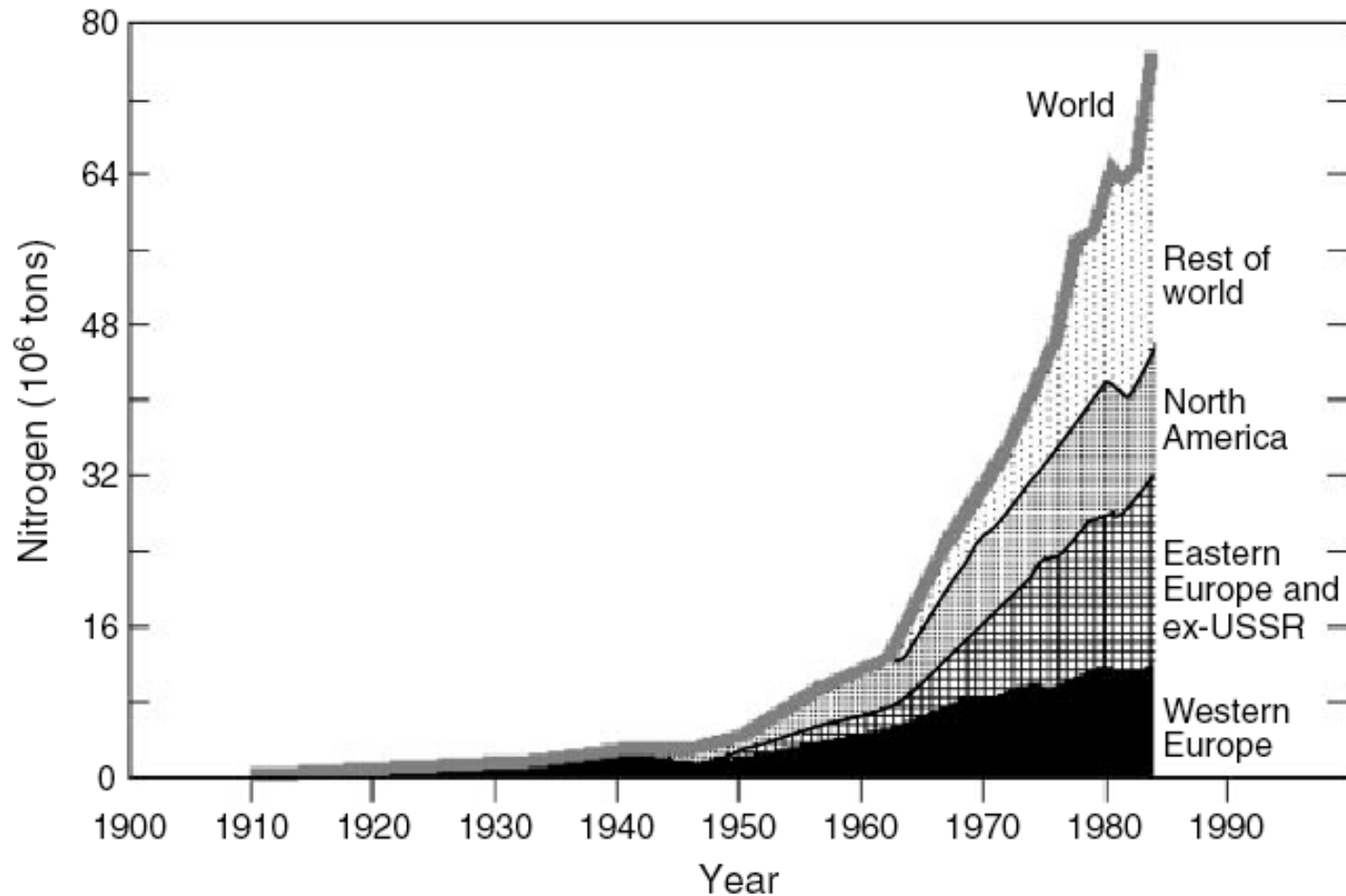
FAO: The State of World Fisheries and Aquaculture 2012

Global catch and effort



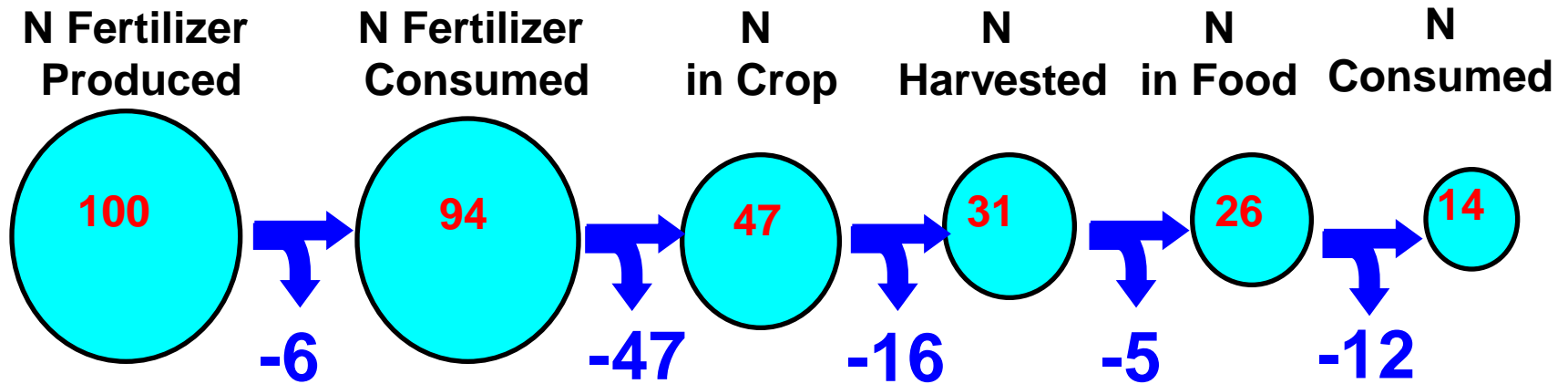
Watson *et al.* (submitted)

N fertilizer use

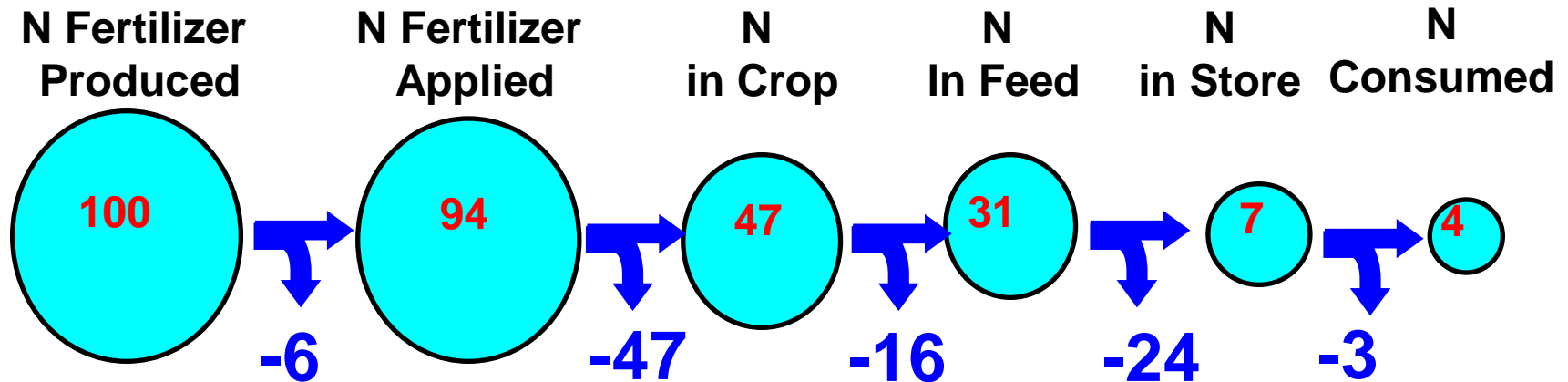


A. Grübler, Encyclopedia of Global Env. Change

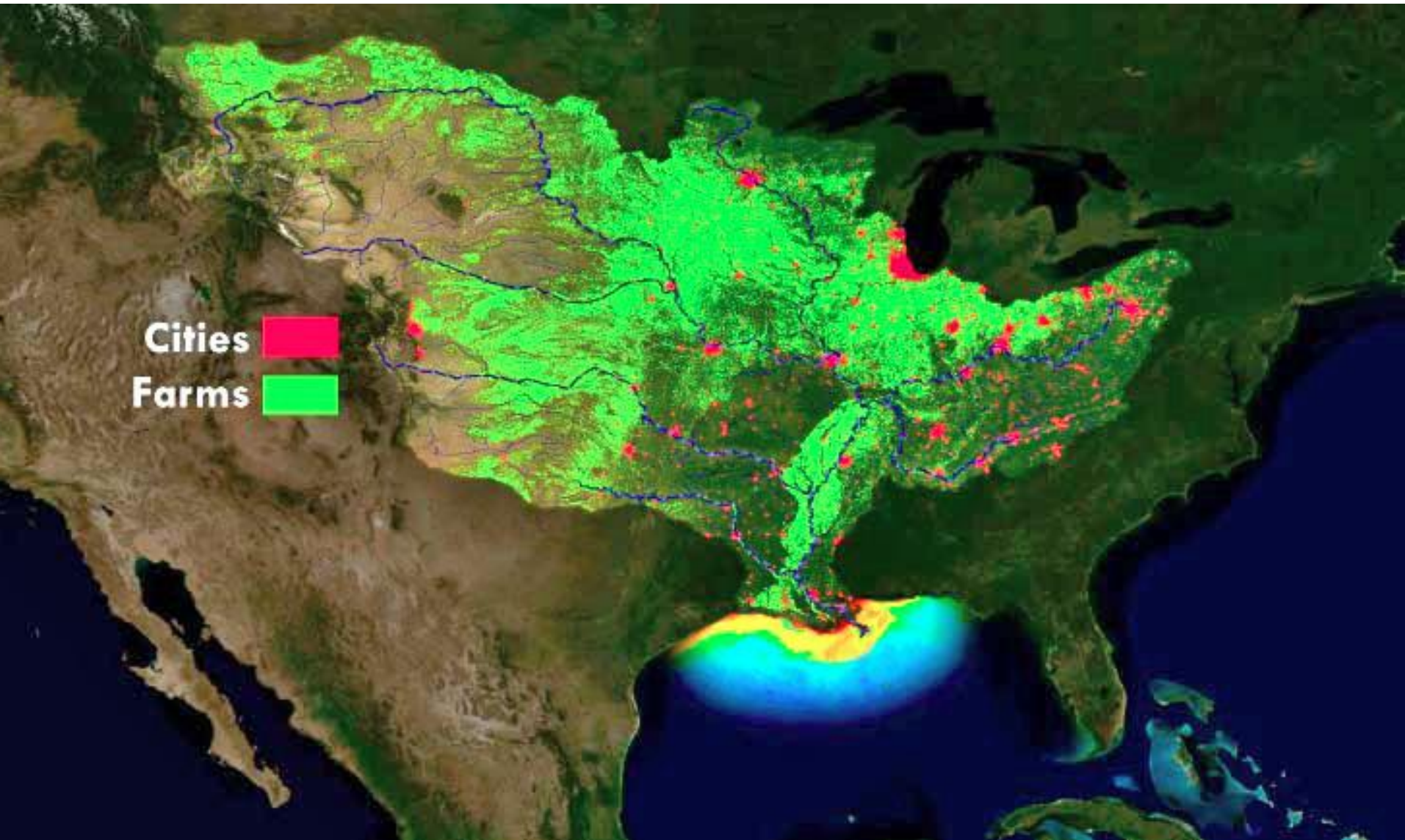
The Fate of Haber-Bosch Nitrogen



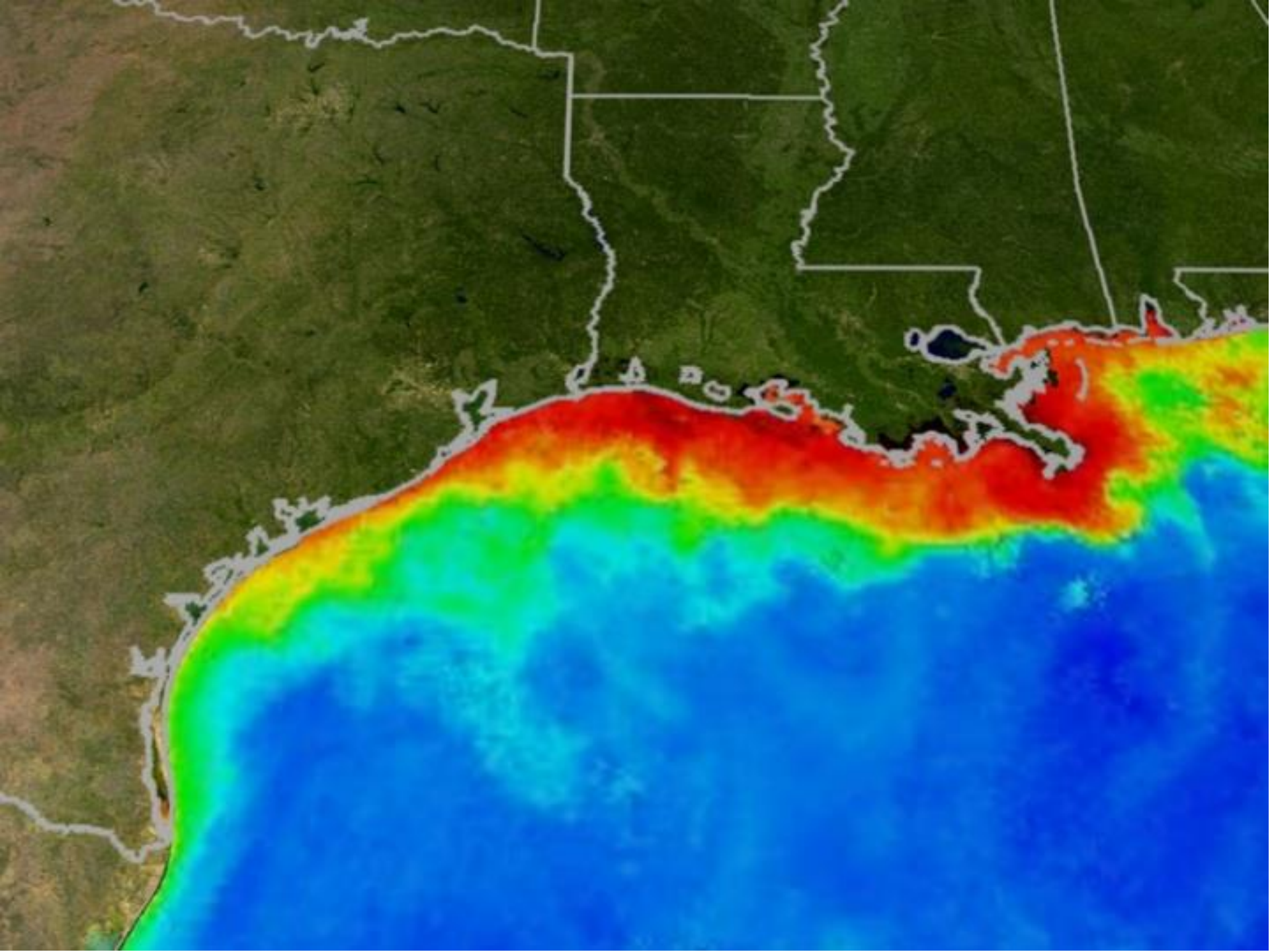
If you are a vegetarian...



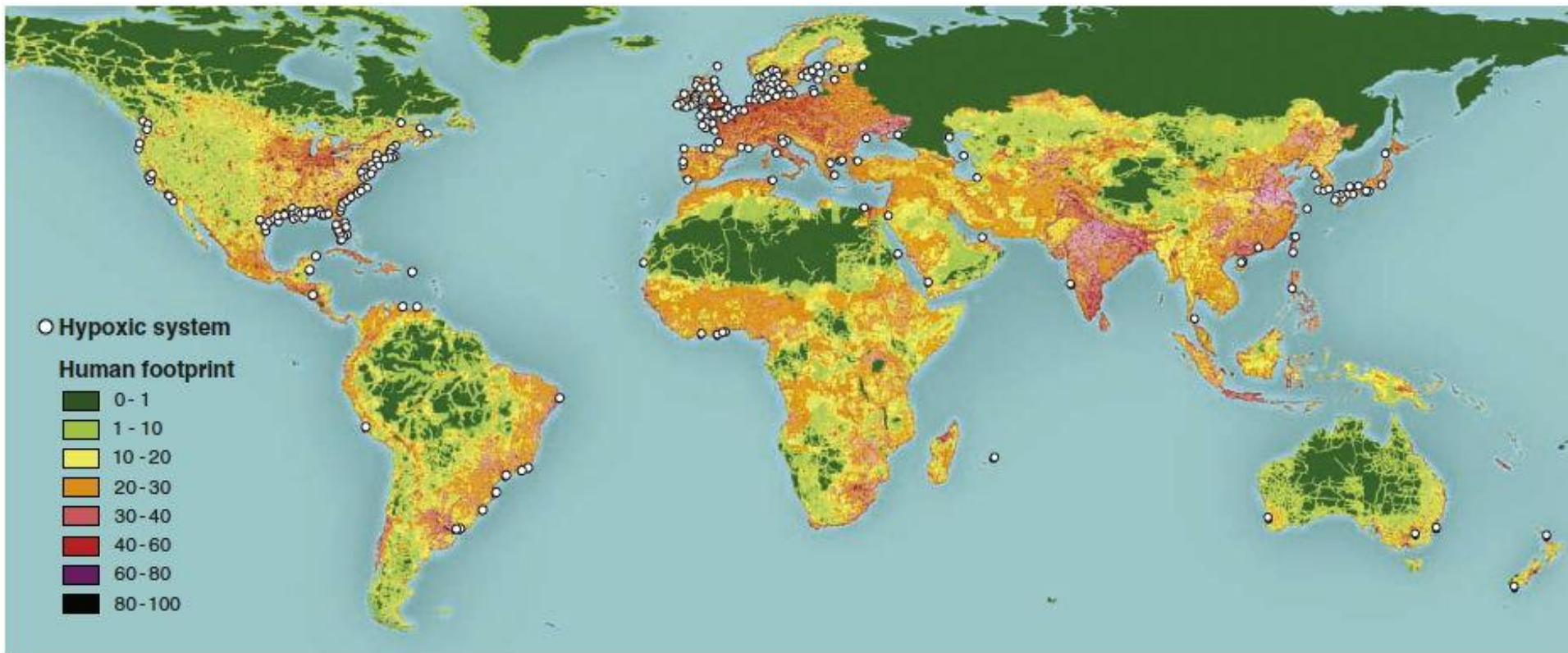
If you are a carnivore...



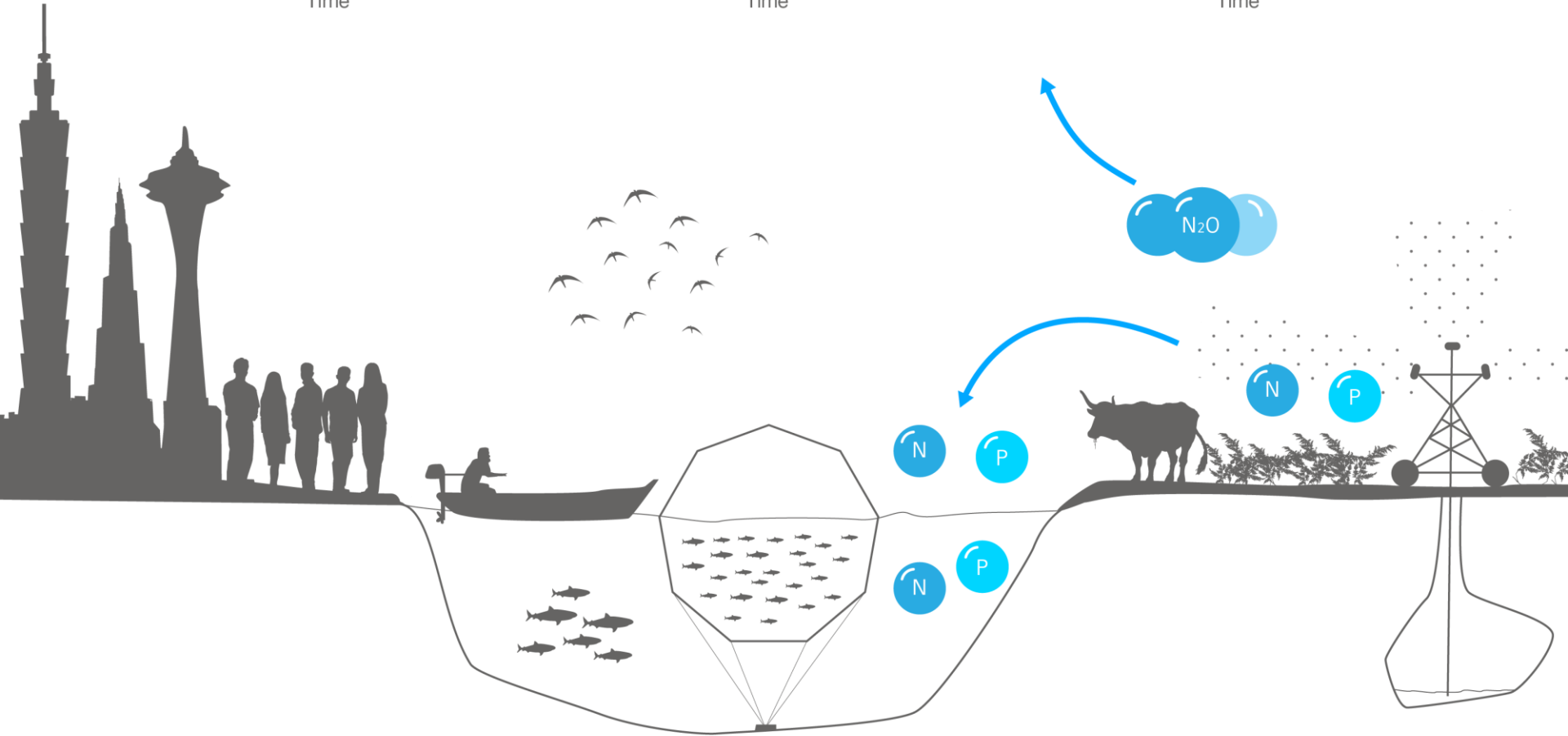
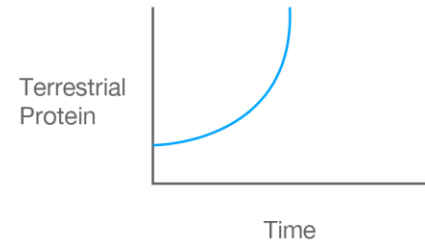
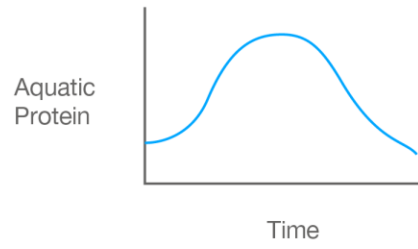
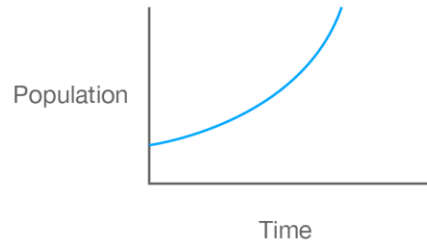
http://www.noaanews.noaa.gov/stories2011/20110728_sullivan.html



We can't breathe...



Diaz, R. J. and R. Rosenberg, 2008. *Science*, 321, 926-929.



Conclusions & recommendations

- Applying the same technology that gave us the green revolution will not work to sustainably produce food for 9B people
- Invest in R&D for more efficient use of fertilizer and irrigation water; novel farming techniques
- Promote less resource-intensive diets
- Concentrate on optimizing food *systems*; diet, production, distribution, marketing, disposal
- Re-examine agricultural subsidies; support sustainable food systems

Some final thoughts



We tend to think that the way things are now is the way they always have been.

This is untrue. In two generations we have transformed our transportation, energy and agriculture sectors. We need to do this again – and be faster and smarter about doing it.



From the Albert R. Stone Negative Collection, Rochester Museum & Science Center, Rochester, N.Y.

No single person is sufficient to resolve today's complex, connected issues.

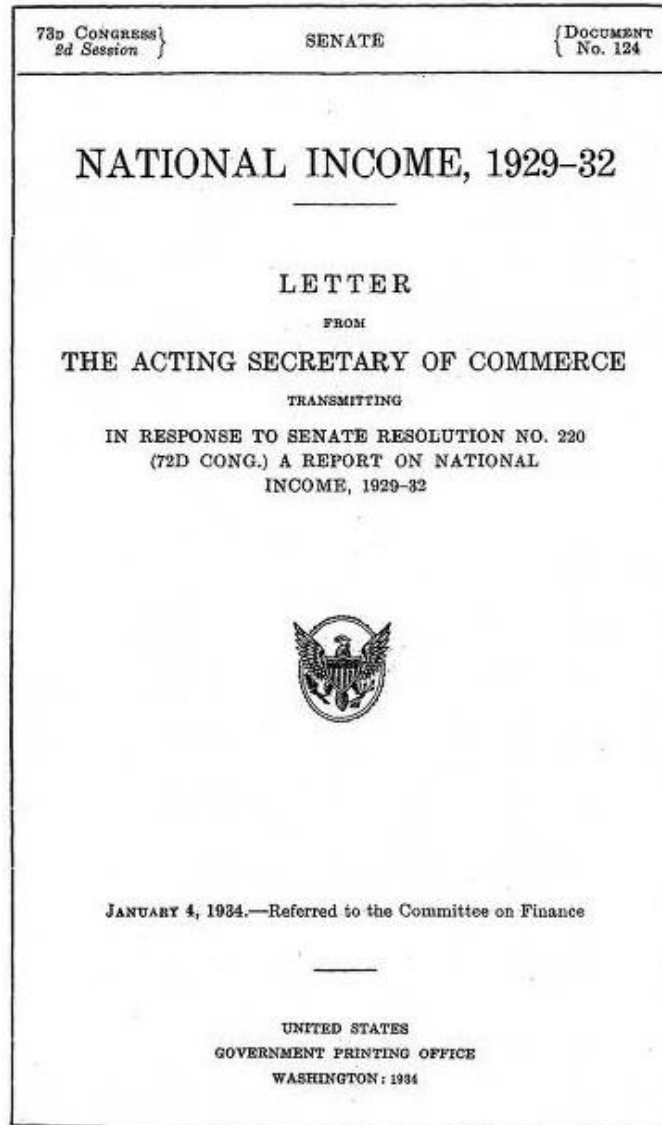
We need each other. We need to create forums for true dialog between the private, policy, research, religious sectors to let us think differently. We need artists, poets and musicians to help us feel differently.



Malala then participated in the Act Four discussion on 'Revolutionising trust'

We need good measures of socio-ecological wellbeing

We need to shift emphasis from measuring economic production (GDP) to measuring wellbeing. This needs to include human dignity and the health of the ecosystems that contribute to it.



Dr. John Talberth, Clifford Cobb,
and Noah Slattery

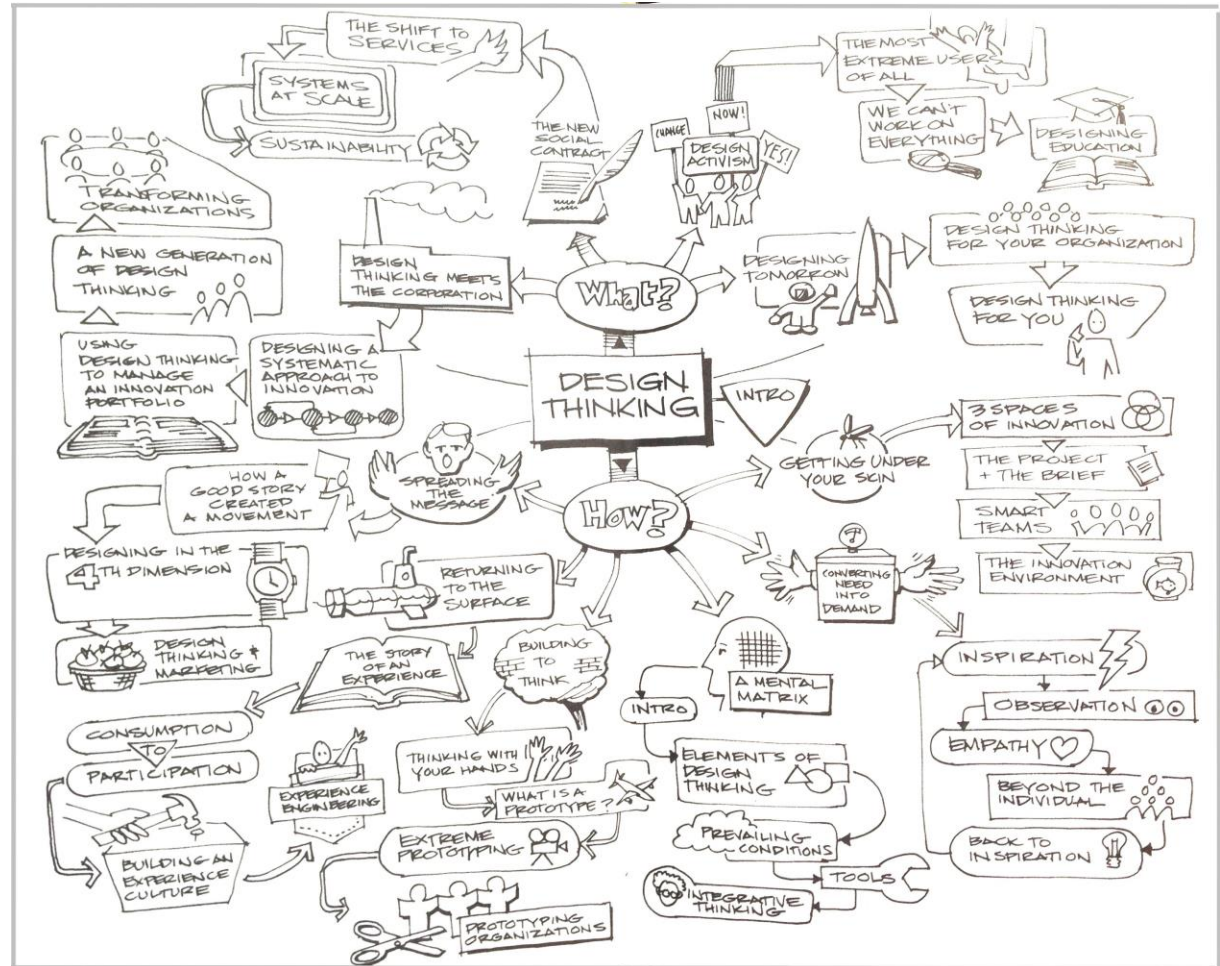
The Genuine Progress Indicator 2006
A Tool for Sustainable Development

REDEFINING
progress
The Nature of Economics

1504 FRANKLIN STREET SUITE 600 / OAKLAND, CA 94612
T (510) 444-3041 F (510) 444-3191 E info@progress.org www.progress.org

Innovation needs to be more than just making cooler gizmos

Innovation is more revolution than incremental change. It requires fostering a creative environment, taking risks, and allowing failure. Prototype, fail often and fast. Learn from these failures.



Tim Brown, *Change by Design* (2009)

We don't have time for pessimism

Global changes are now happening on generational time scales. We need to create a better world, not abdicate the responsibility to our children.

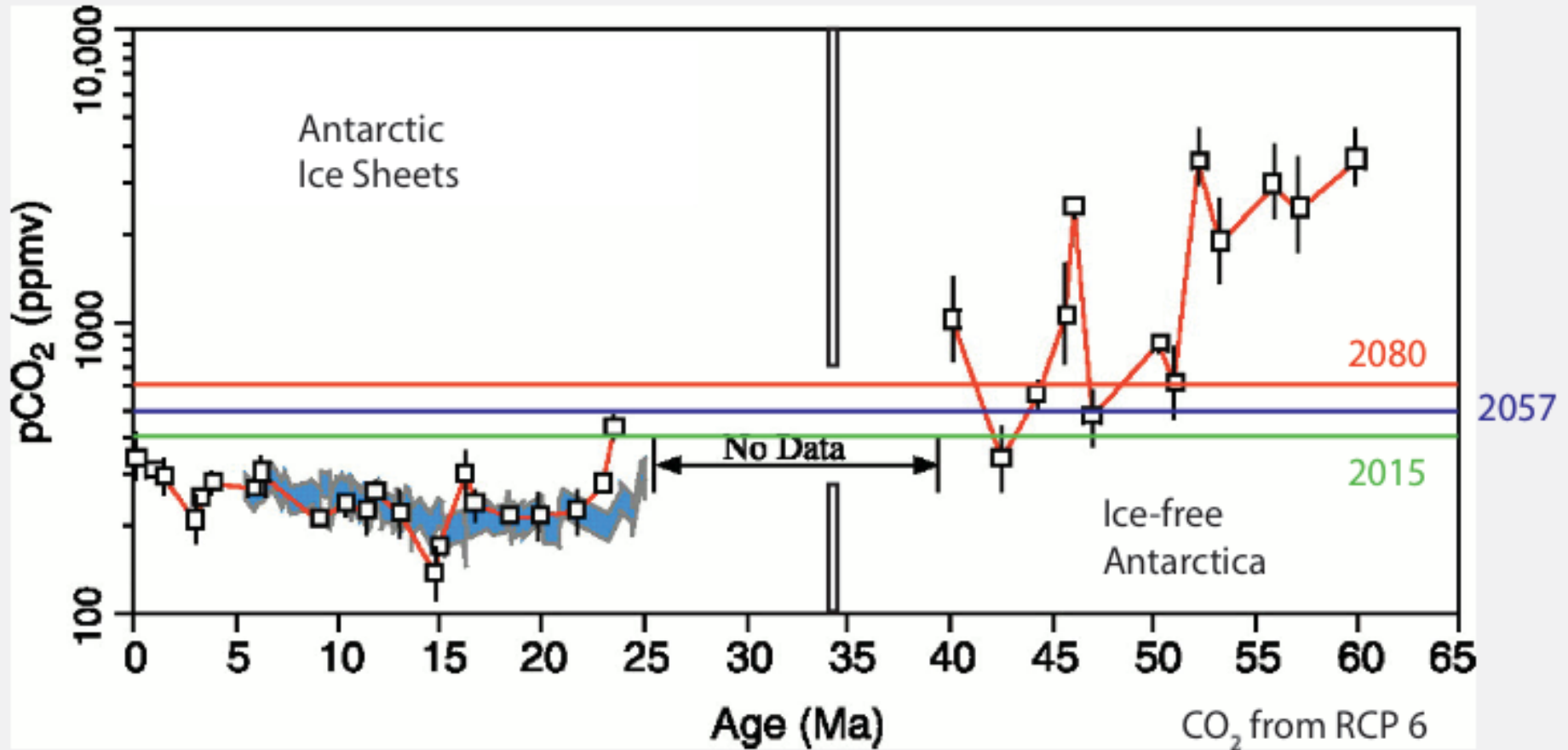
Why not get started?





Thanks for your attention!

Boundary choice: Major ice sheets – or not?



Source: Zachos, J., et al. (2001), Science, 292, 686.