

Surviving the Anthropocene



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Challenges for the 21st Century

Will Steffen

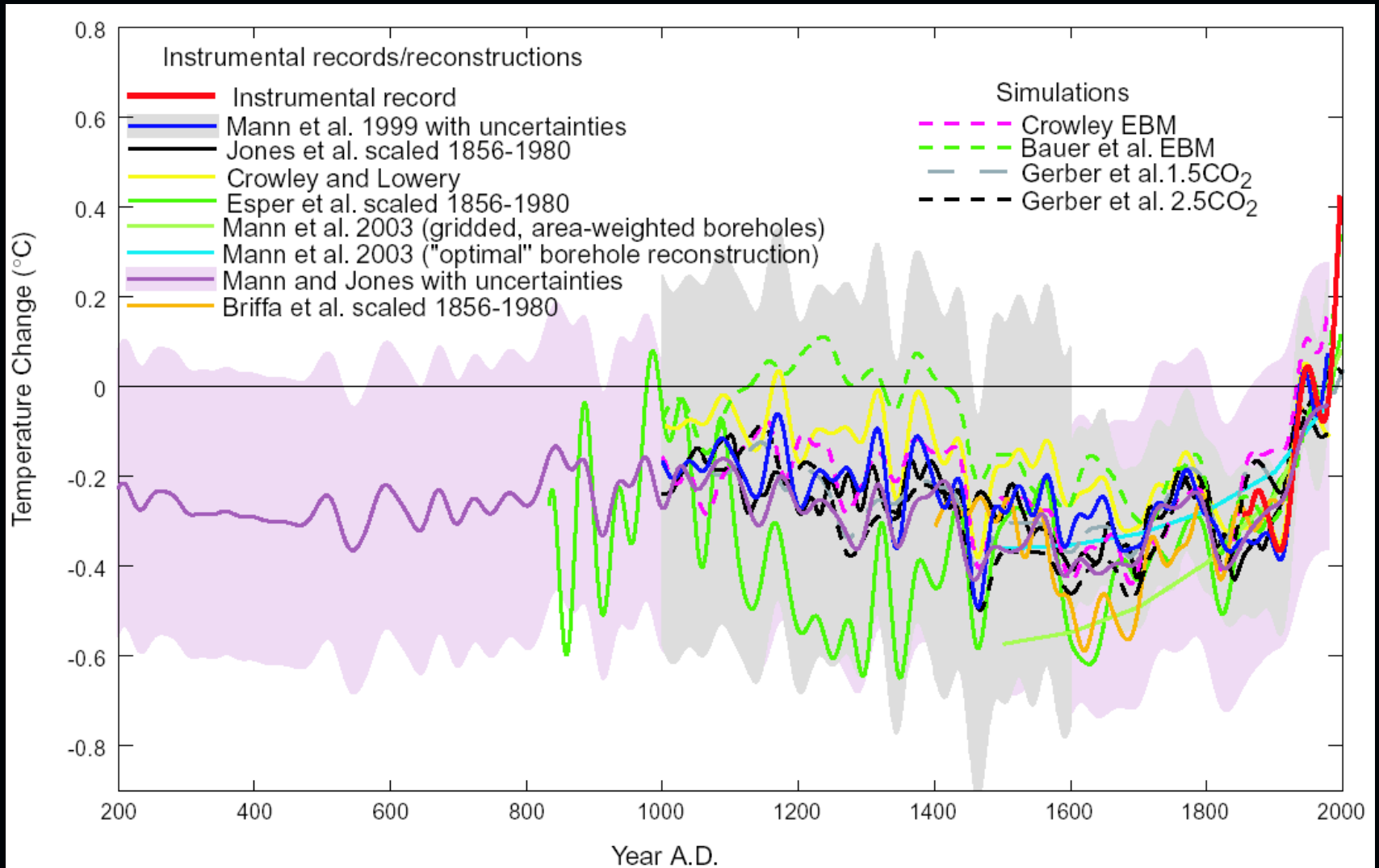
Executive Director, Climate Change Institute

The Australian National University

The Anthropocene Era



Northern Hemisphere Surface Temperature



Source: Mann et al. 2003 (EOS)

Observed sea ice September 1979



Observed sea ice September 2003

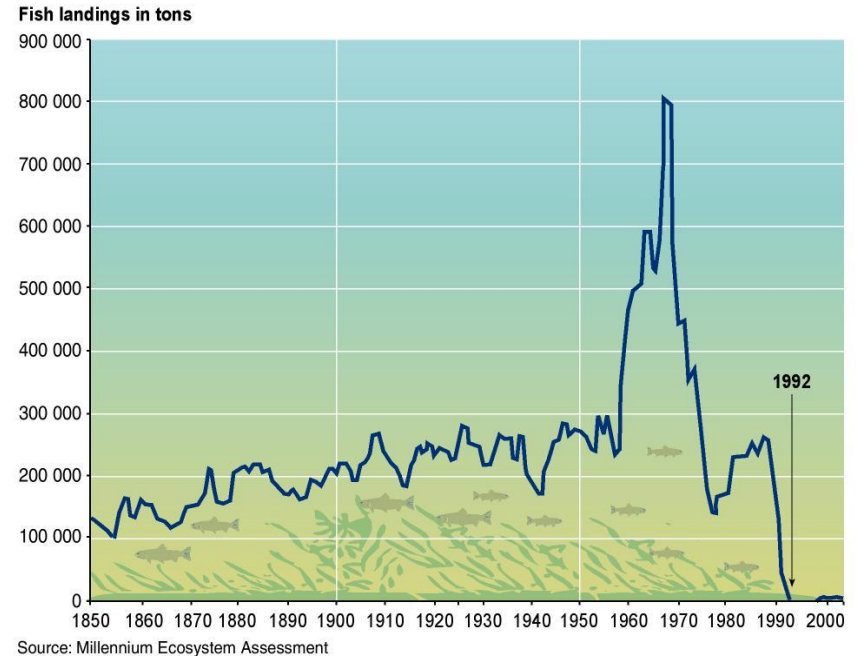


Source: Arctic Climate Impact Assessment (ACIA), 2004. Impacts of a Warming Arctic.

Human Imprint on Marine Ecosystems

Fisheries collapse

- The Atlantic cod stocks off the east coast of Newfoundland collapsed in 1992, forcing the closure of the fishery
- Depleted stocks may not recover even if harvesting is significantly reduced or eliminated entirely
- About 50% of all fish stocks are fully exploited, 15-18% are overexploited, and 9-10% have been depleted or are recovering from depletion



**Millennium Ecosystem Assessment 2005,
Steffen et al. 2004**

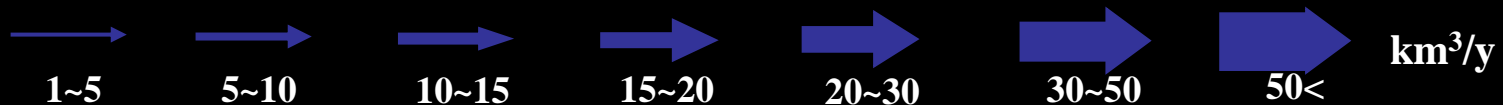
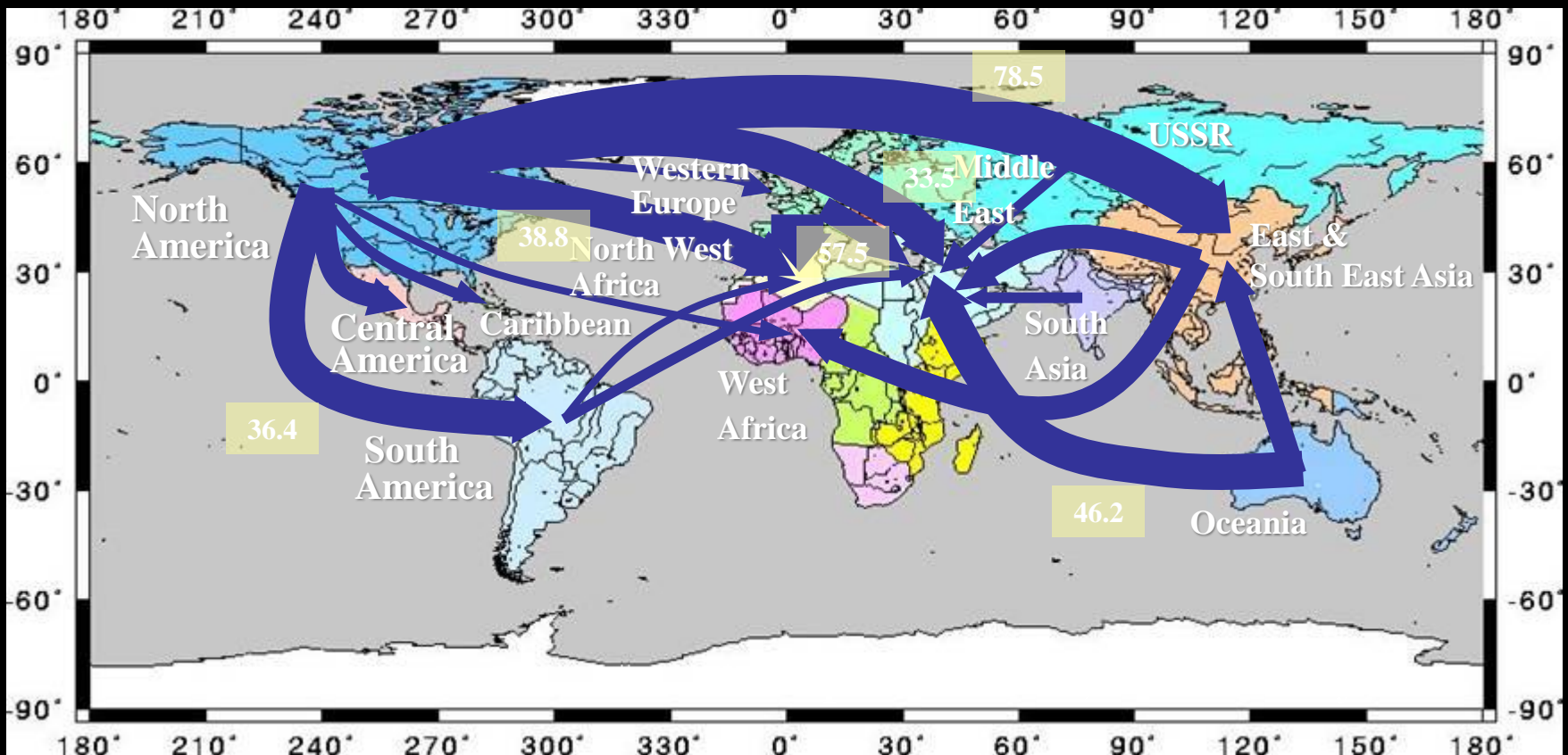
Human Imprint on the Terrestrial Biosphere



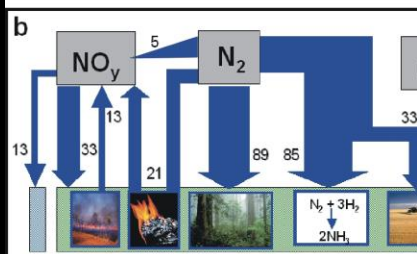
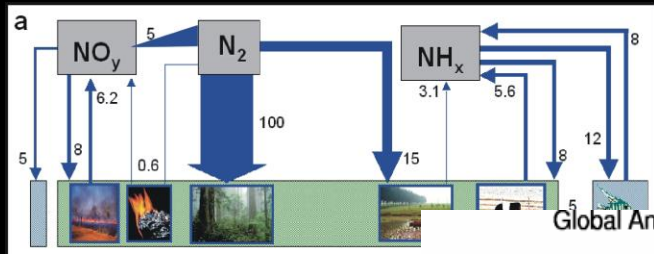
From landscapes to genes...



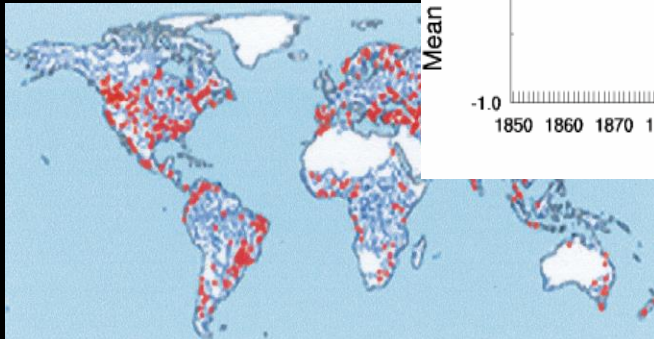
Economic Globalization: Virtual Water Flows (Cereals only)



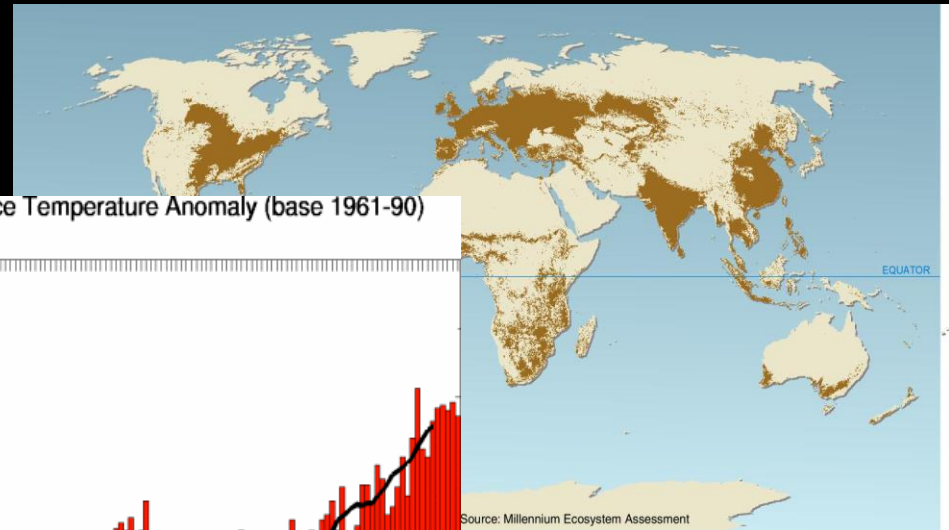
The multi-faceted nature of global change



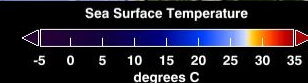
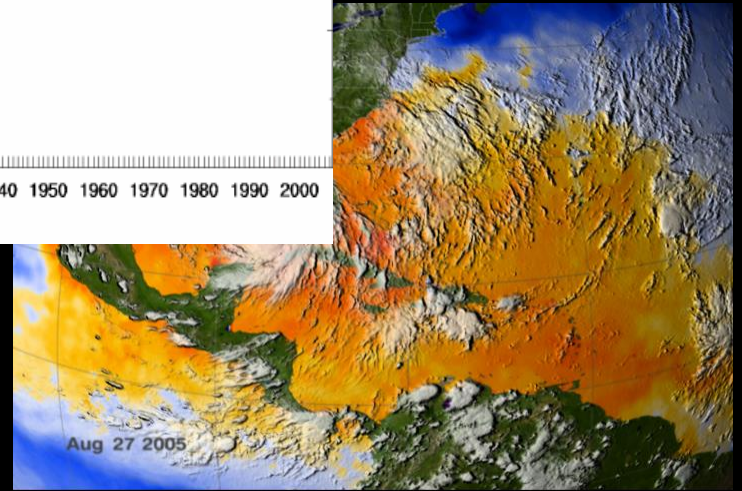
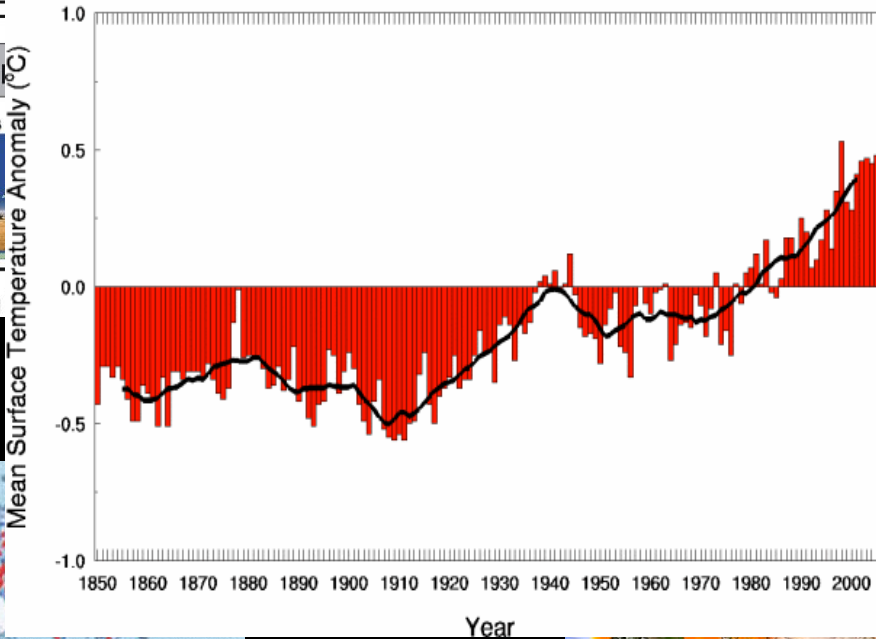
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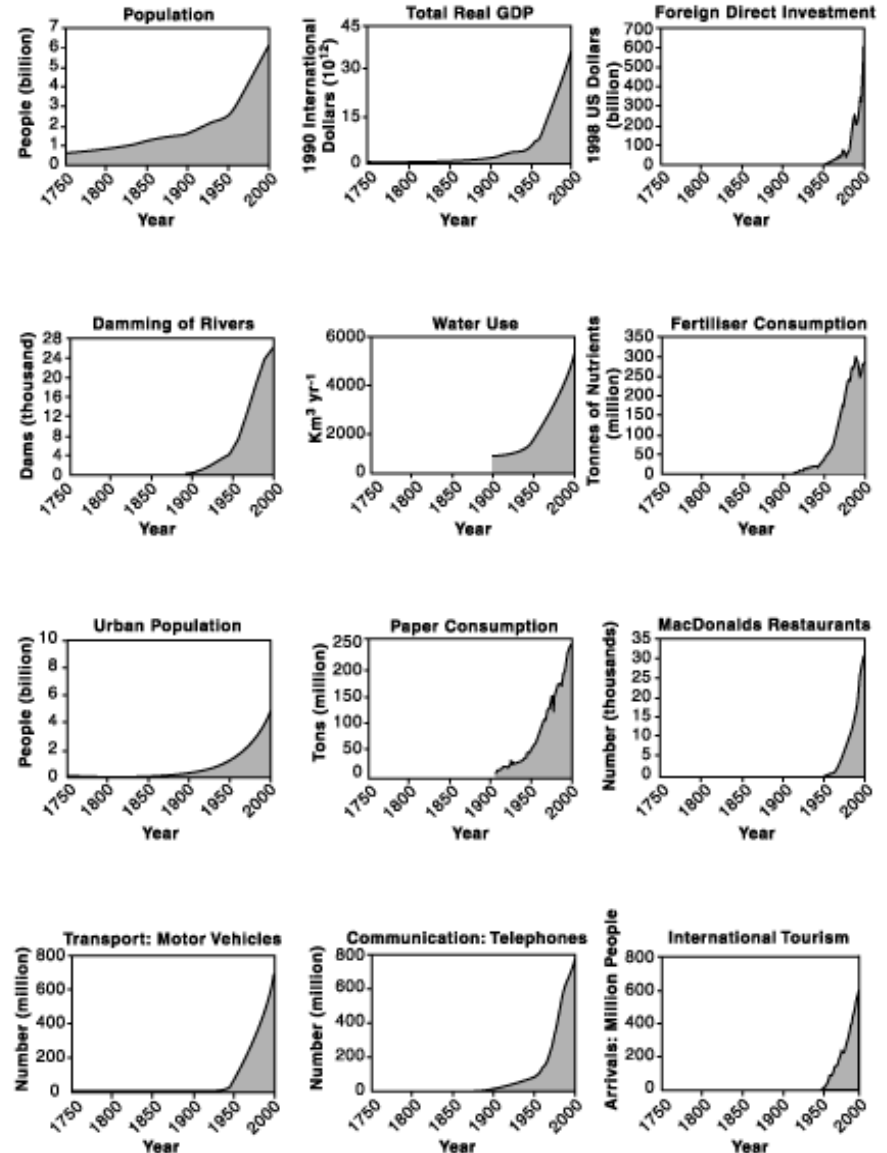
Source: Millennium Ecosystem Assessment



Anthropocene Stage 2 (1945 - 2010/2020)

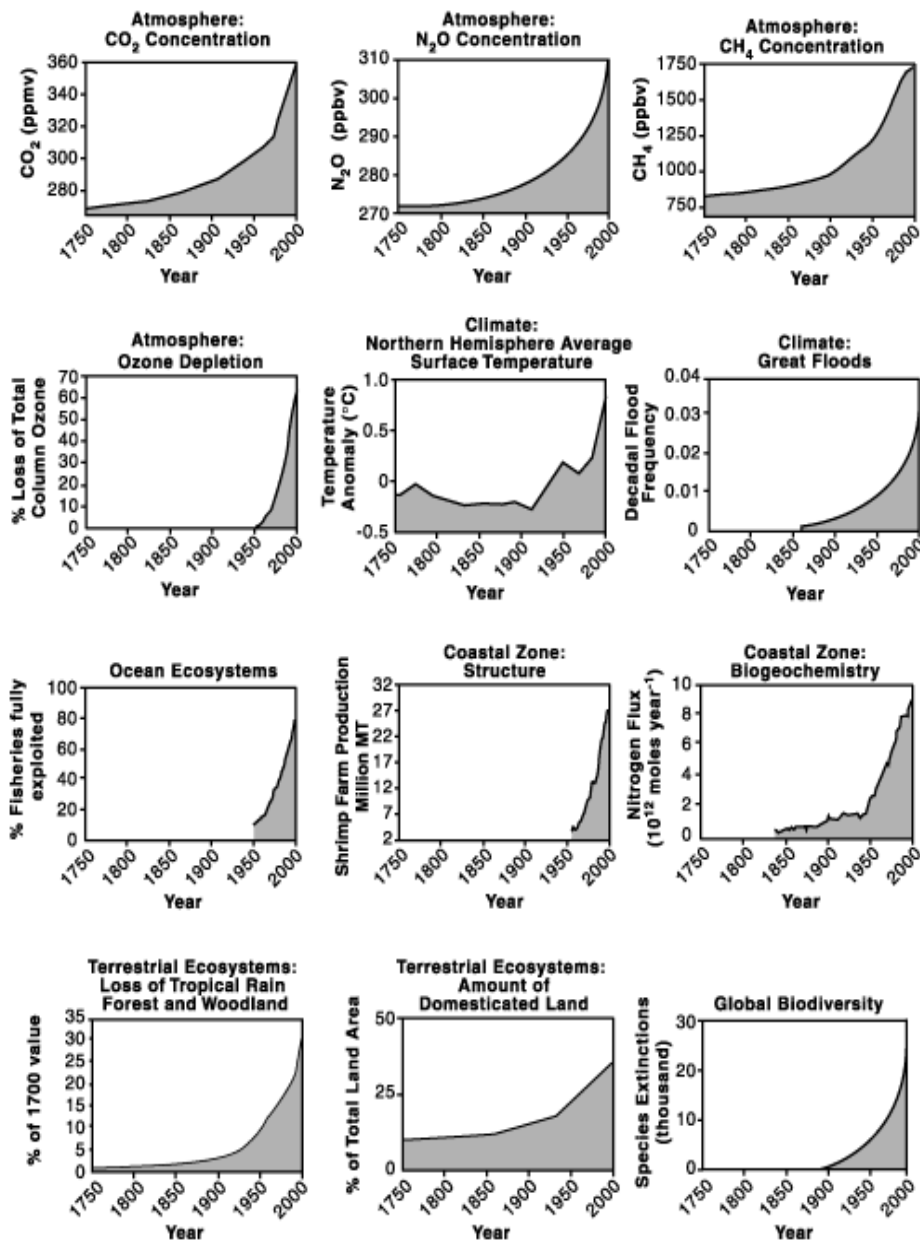
The changing 'human enterprise', from 1750 to 2000.

Note the start of the 'Great Acceleration' around 1950, when many activities began or accelerated sharply.

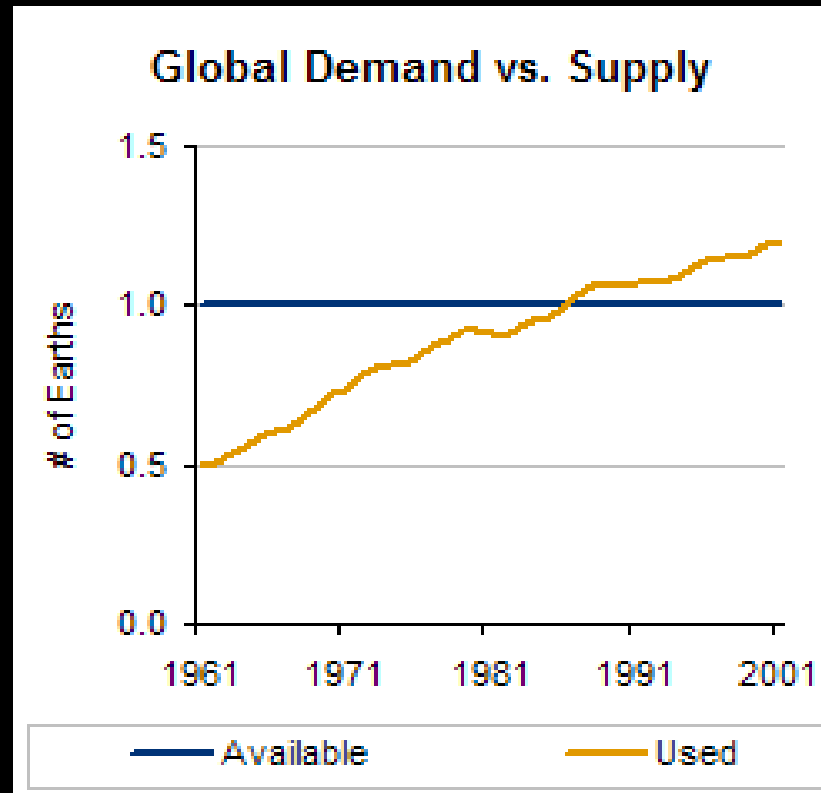


Responses of the biophysical Earth System to the accelerating 'human enterprise'.

The biophysical responses of the Earth System show many of the same features as the Great Acceleration in the human enterprise.

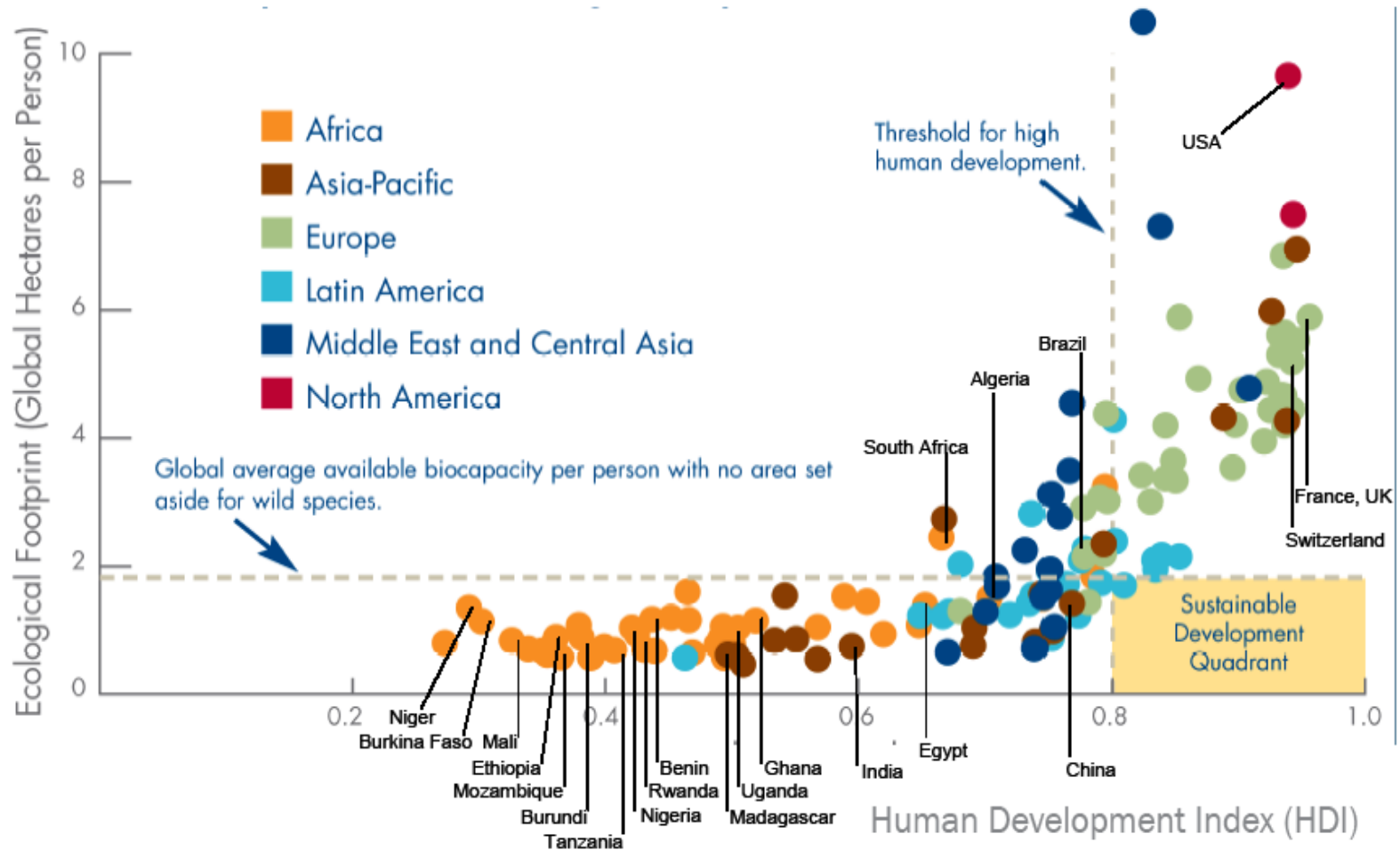


Global Footprint of the Human Enterprise



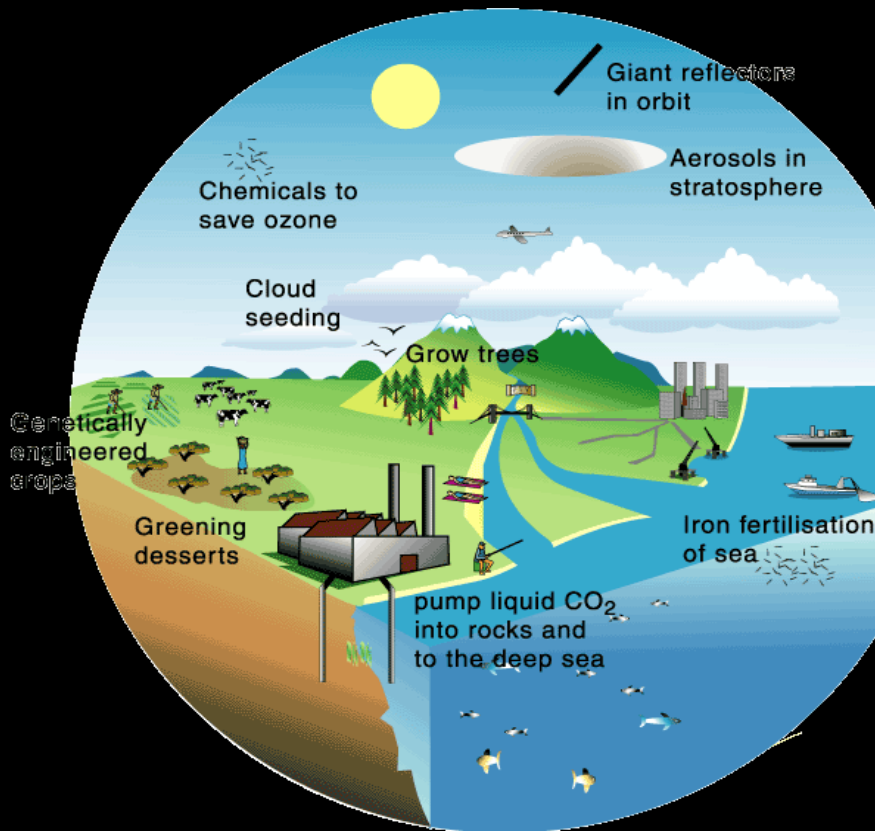
Source: Global Footprints Network 2005

Sustainable development quadrant



Source: Moran et al., Ecological Economics, 64, 470-474, 2008

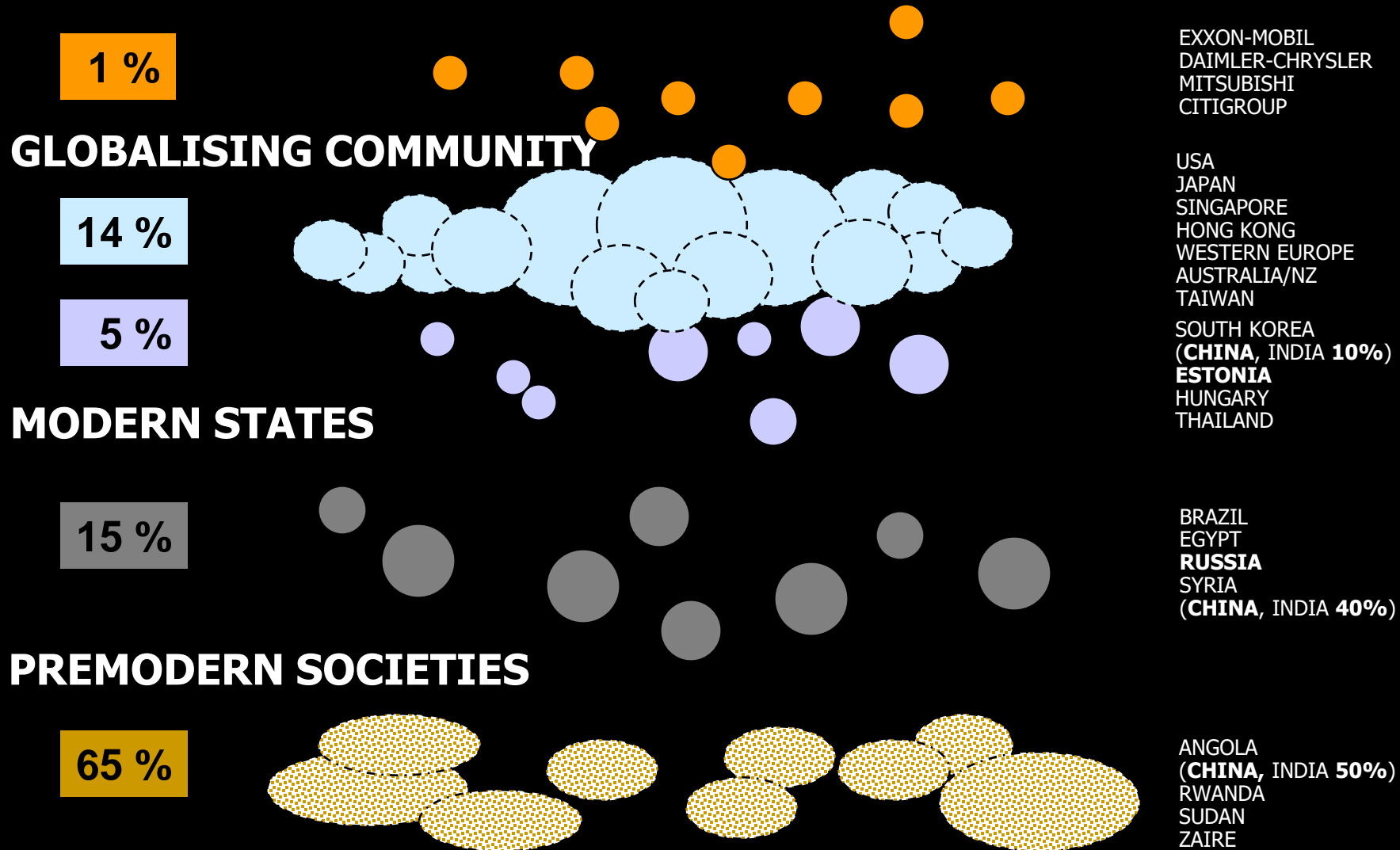
The Anthropocene Stage 3: Sustainability or Collapse



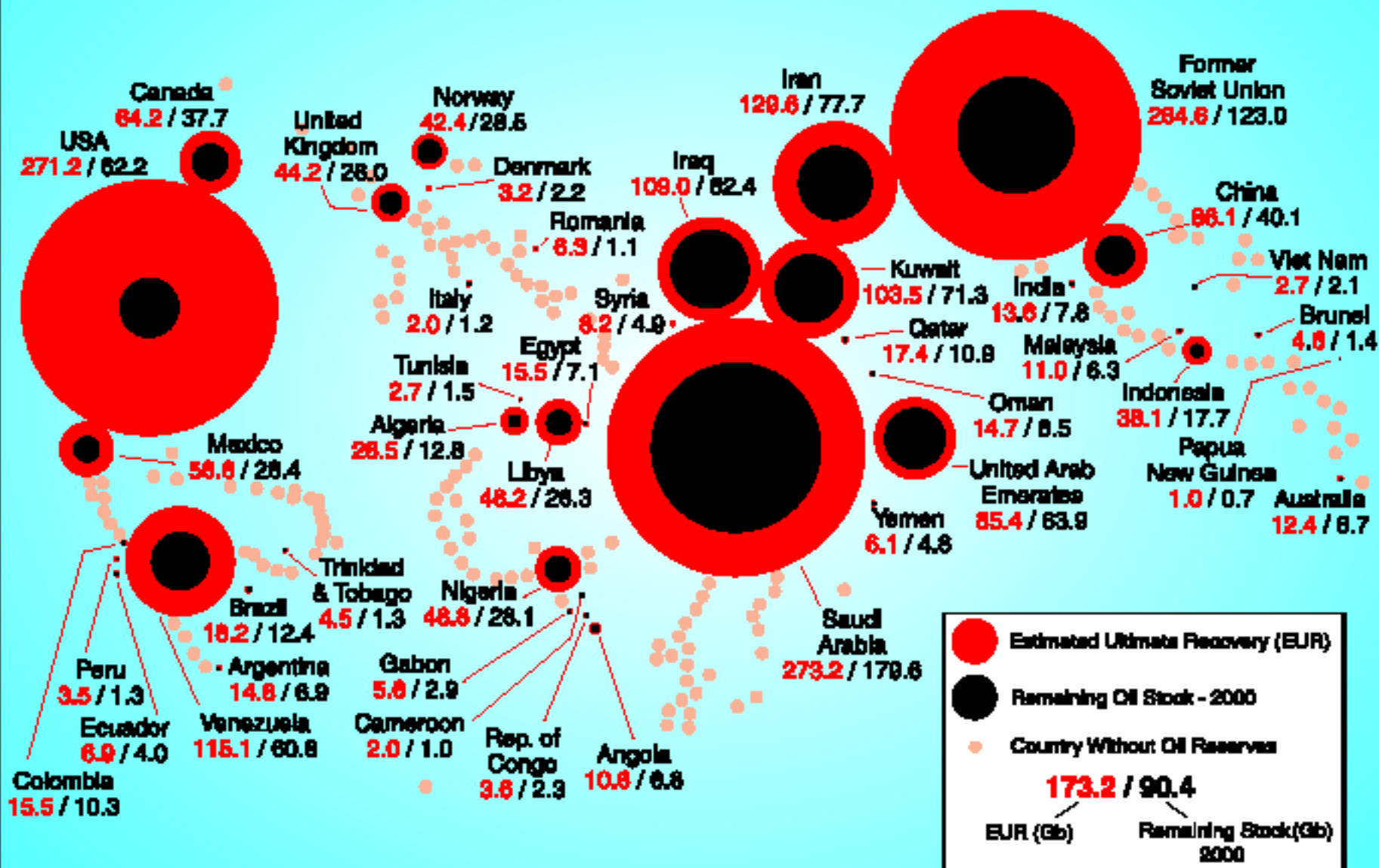
Where on Earth are We Going?



The Human Enterprise: Early Globalised

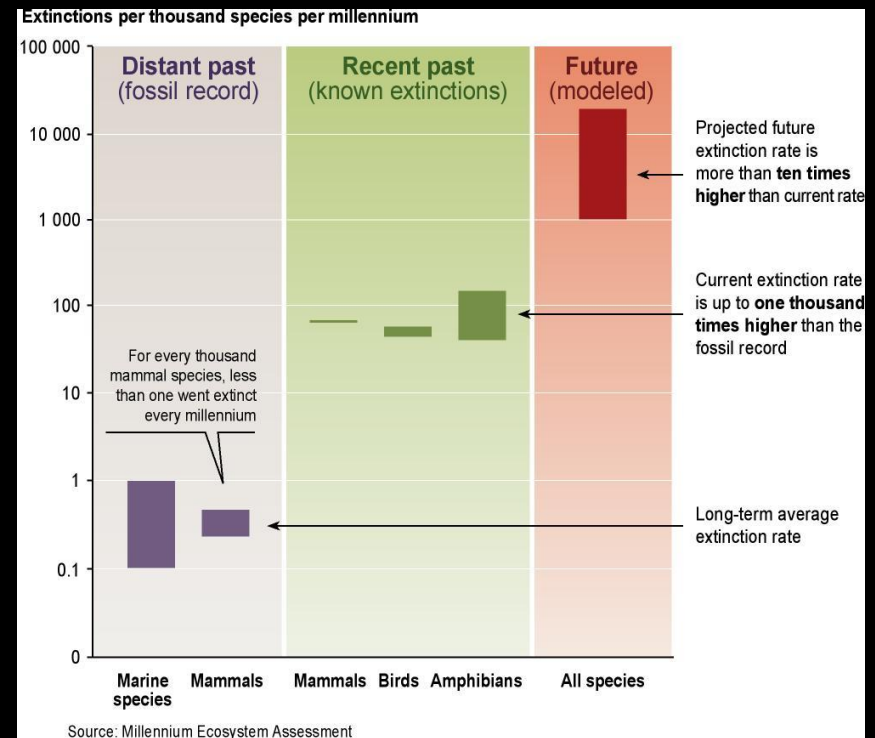


Estimated World Oil Ultimate Recovery (EUR) and Remaining Stocks - 2000



Significant and largely irreversible changes to species diversity

- Humans have increased the species extinction rate by as much as 1,000 times over background rates typical over the planet's history (*medium certainty*)
- 10–30% of mammal, bird, and amphibian species are currently threatened with extinction (*medium to high certainty*)



Observed sea ice September 1979

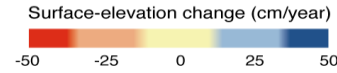
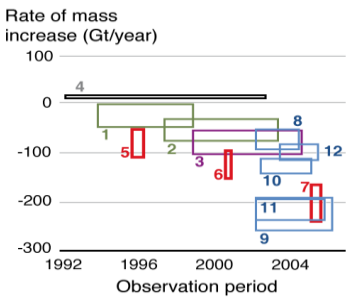
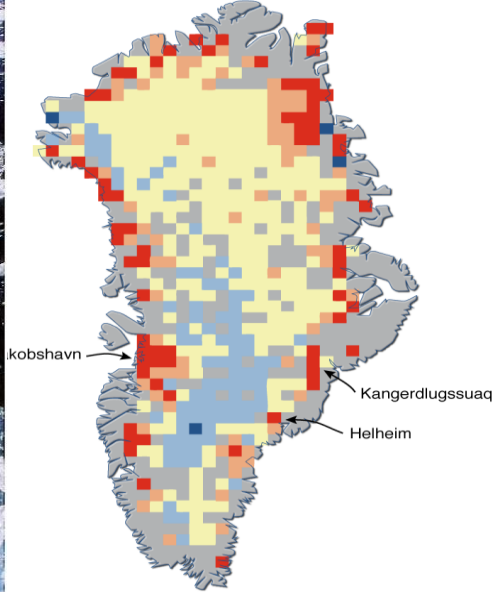
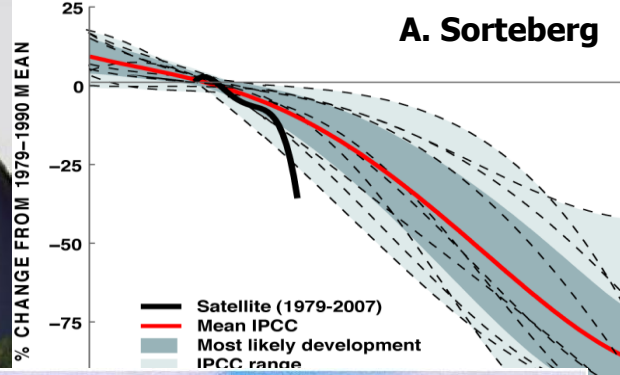


Observed sea ice September 2003



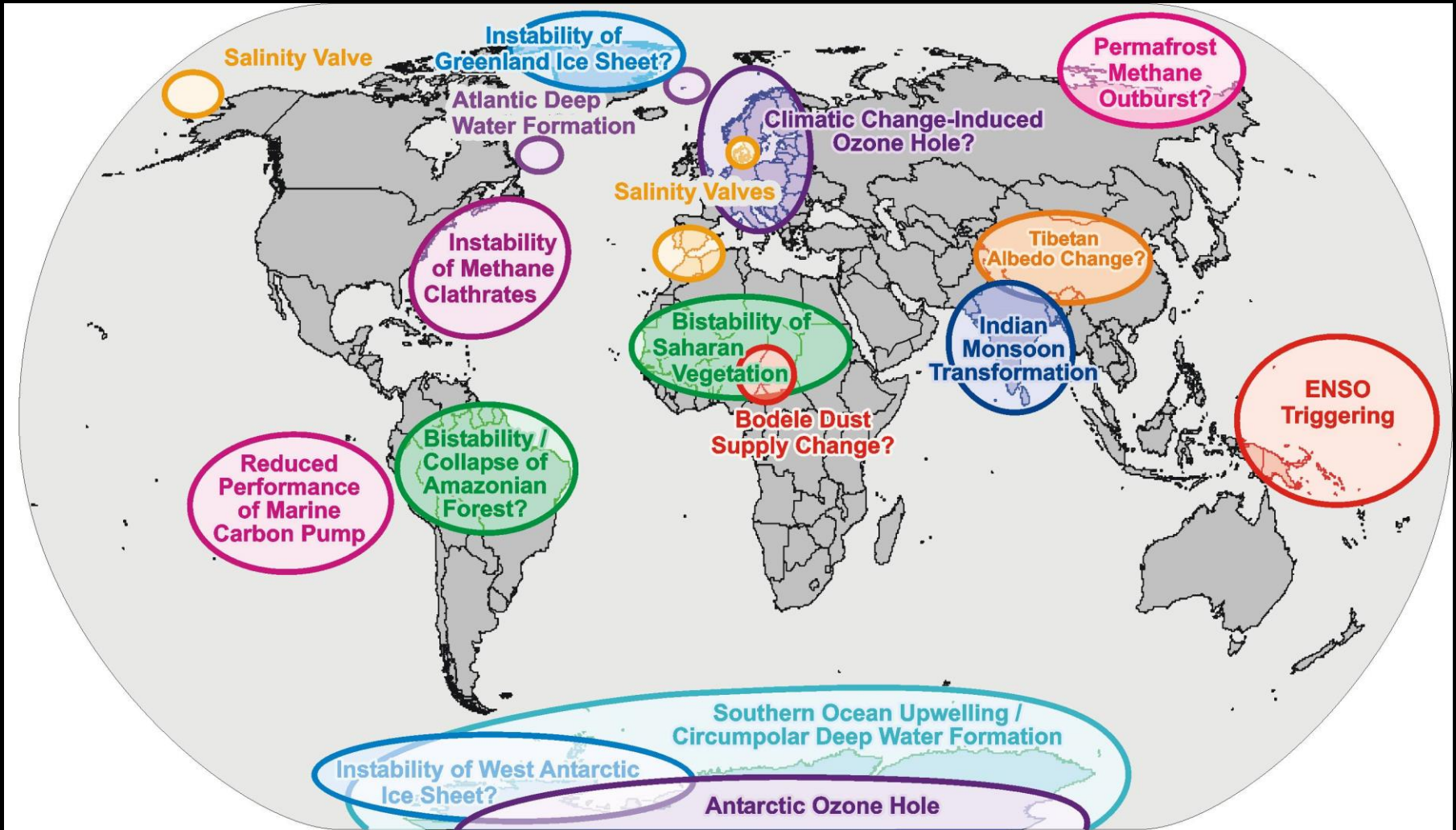
Source: Arctic Climate Impact Assessment (ACIA), 2004. Impacts of a Warm

A. Sorteberg



Have we underestimated how fast Arctic sea ice and the polar ice sheets can change?

Tipping Elements in the Earth System



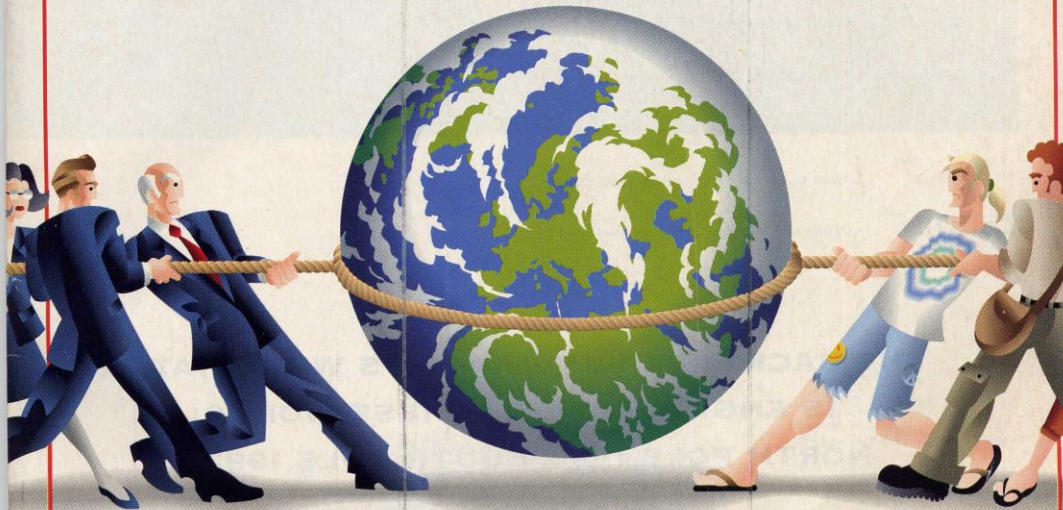
INSIDE CHECHNYA: EXCLUSIVE PHOTOS • MICROSOFT'S STRATEGY

Newsweek

THE INTERNATIONAL NEWSMAGAZINE

November 22, 1999

Whose World?



**Seattle Braces for Trade Talks—
And Noisy Protests Over Food,
Workers' Rights and the Environment**

A1

B1

Hyper individualism

Business class

Markets first

Creative societies

Global sustainability

Market World

Changing course

'The end of history'

New global age

'Our Common Future'

Cybertopia

Policy first

Just do it

The hundred flowers

Shared responsibilities

Have & have-nots

Ecologically driven

Over the edge

Sustainability first

New Empires

Regional stewardship

Security first



Provincial enterprise

Prism

Transformed World

'Clash of civilizations'

Cultural pluralism

'No Logo'

Great transitions

Turbulent neighbourhoods

Change without progress

Fortress World

Battlefield

Voluntary simplicity

B2

Barbarization

A2

Tribal society

Local stewardship

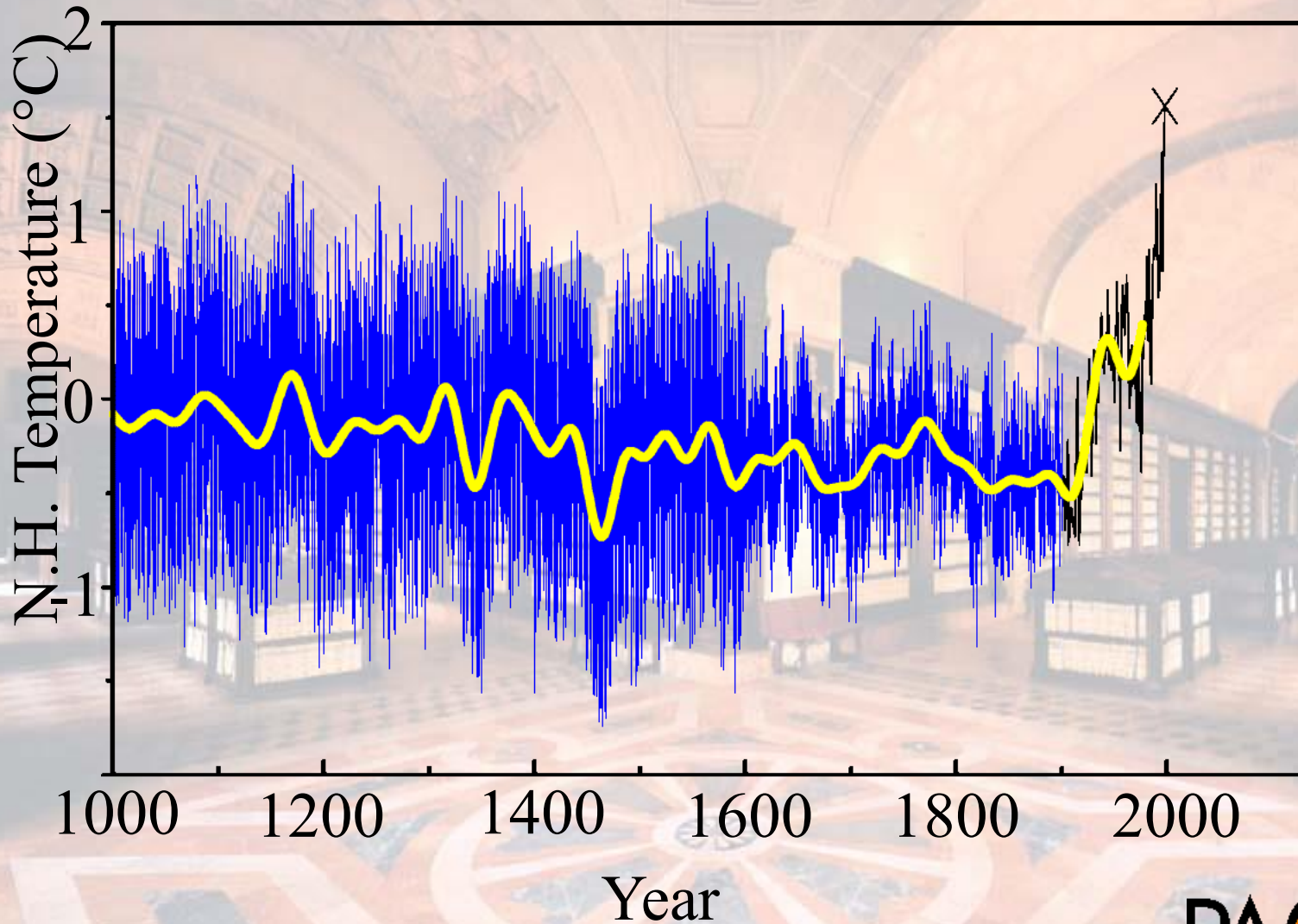
De Vries 2006

'Night Lights' of Earth

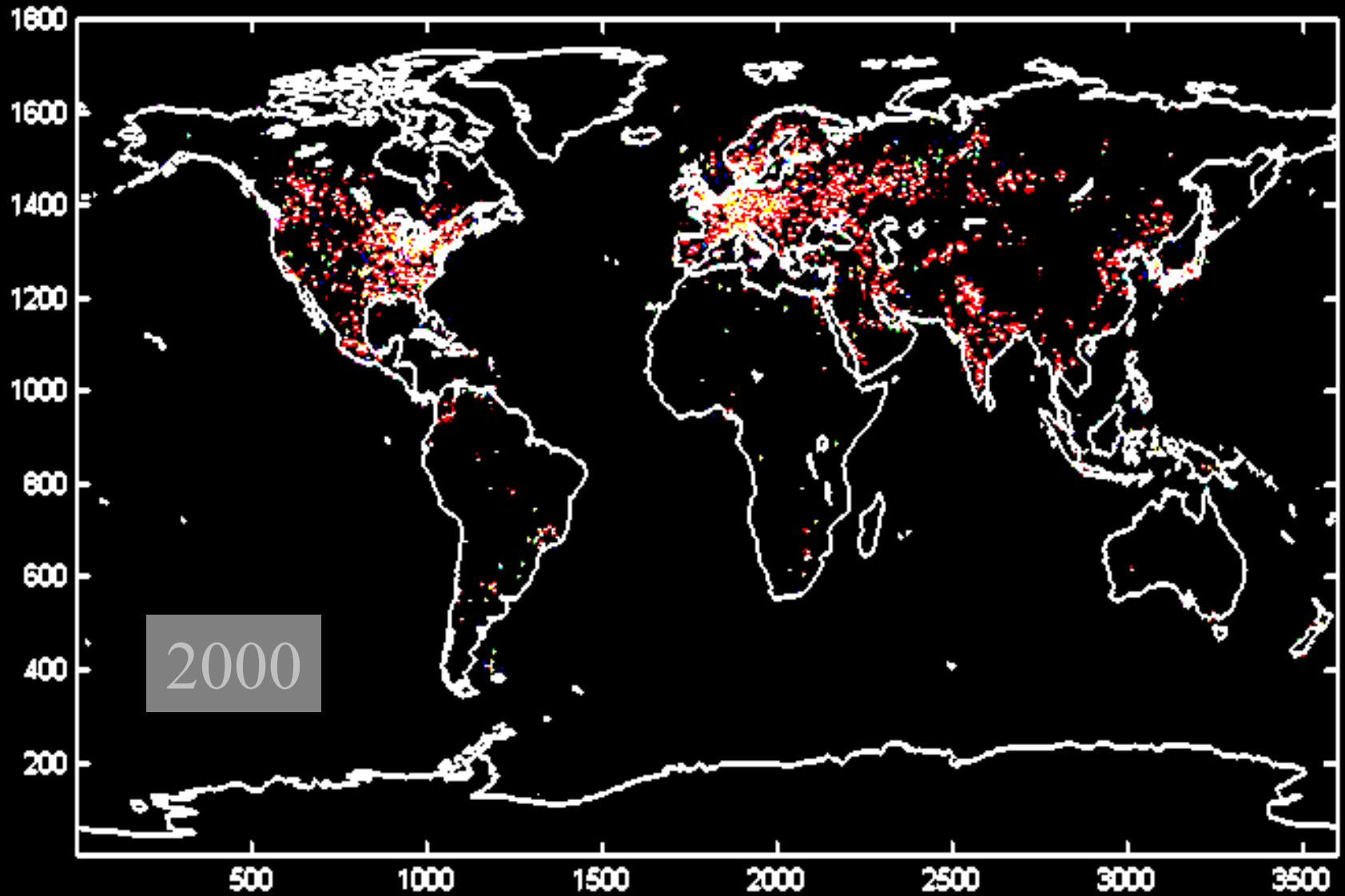


Image: NASA

A Millennium Scale Perspective ...

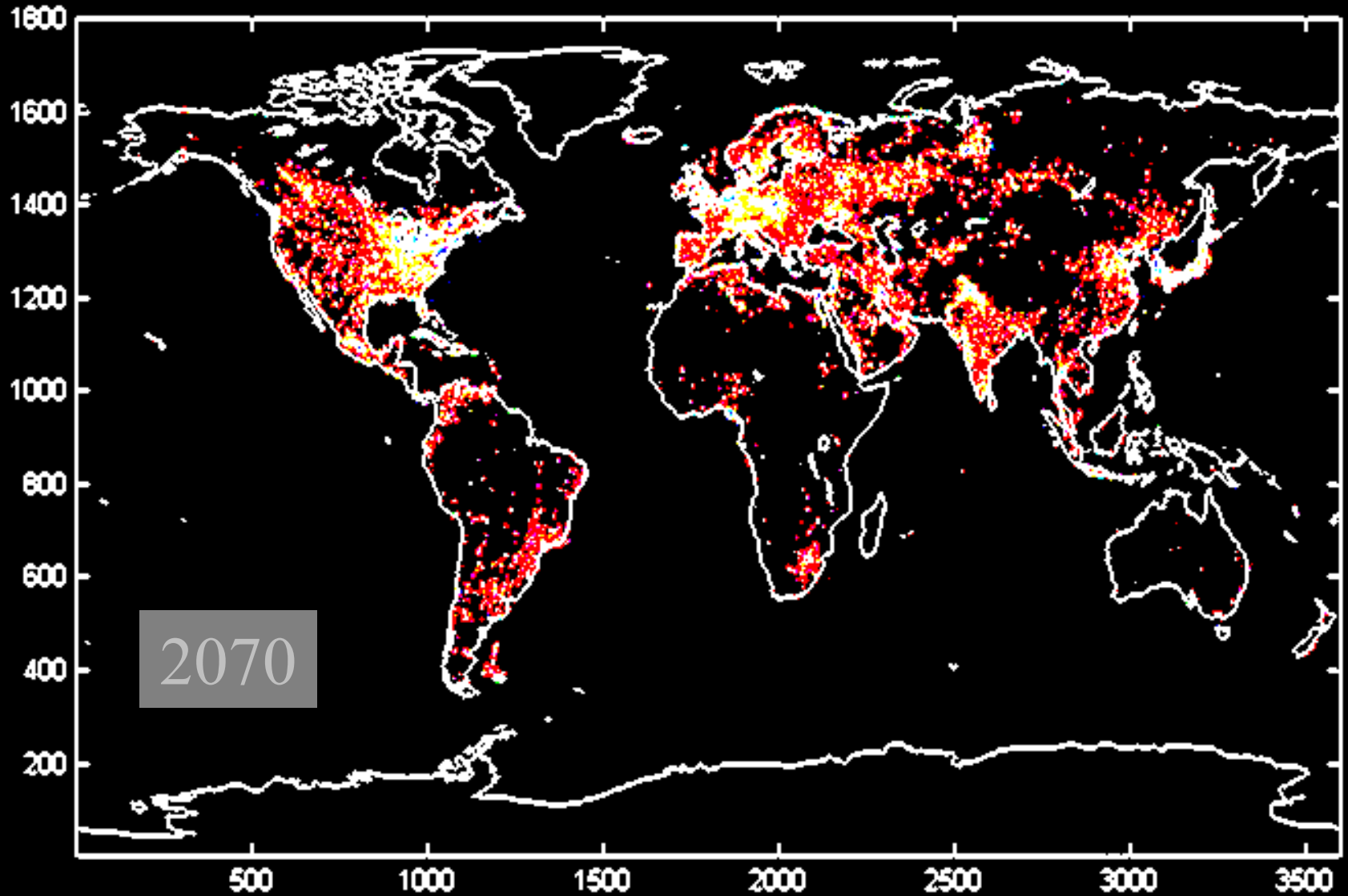


Simulated Night Lights



From: Nakicenovic 2002

Simulated Night Lights



From: Nakicenovic 2002

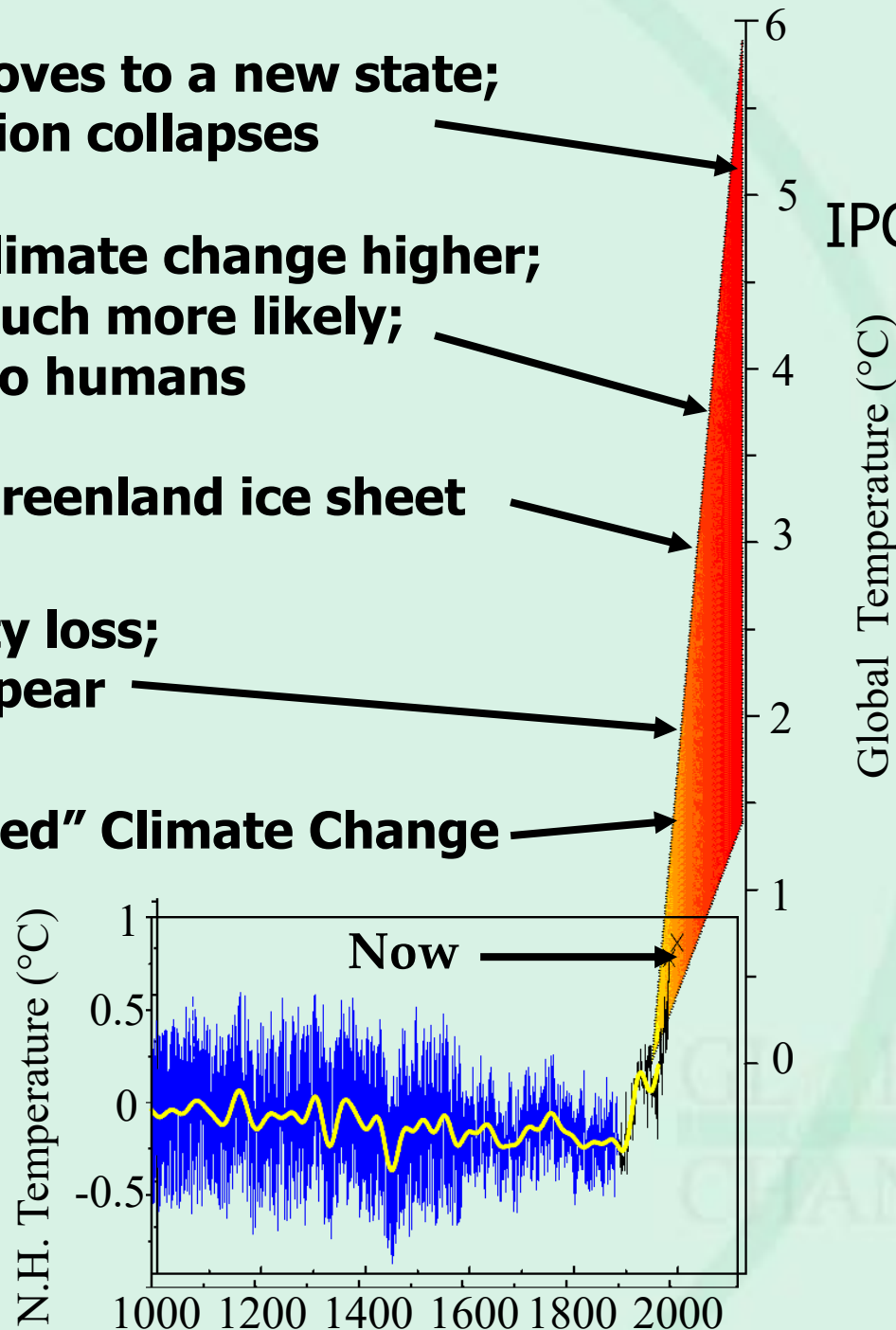
**Earth System moves to a new state;
modern civilisation collapses**

**Feedbacks push climate change higher;
abrupt changes much more likely;
massive impacts to humans**

Loss of Greenland ice sheet

**Large biodiversity loss;
coral reefs disappear**

"Committed" Climate Change



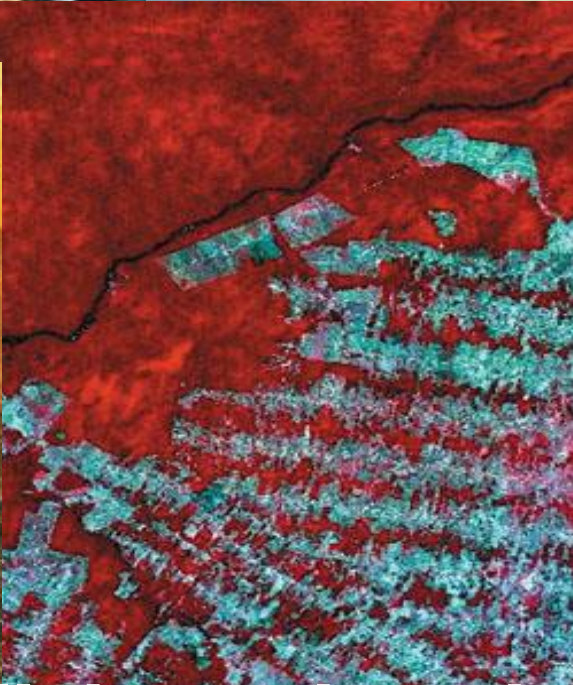
IPCC Projections
2100 AD

Global Temperature (°C)

N.H. Temperature (°C)

Now

Sustainability or Collapse?



...The future will depend on the nature of human aspirations, values, preferences and choices...



