Do we need to worry about the Planet?

Megatrends in global natural resource use
KSLA
8th June 2011

Prof. Johan Rockström
Stockholm Resilience Centre
Stockholm Environment Institute

MISTRA
THE FOUNDATION FOR STRATEGIC ENVIROMENTAL RESEARCH

Stockholm Resilience Centre
Research for Governance of Social-Ecological Systems

Stockholm University

A centre with:

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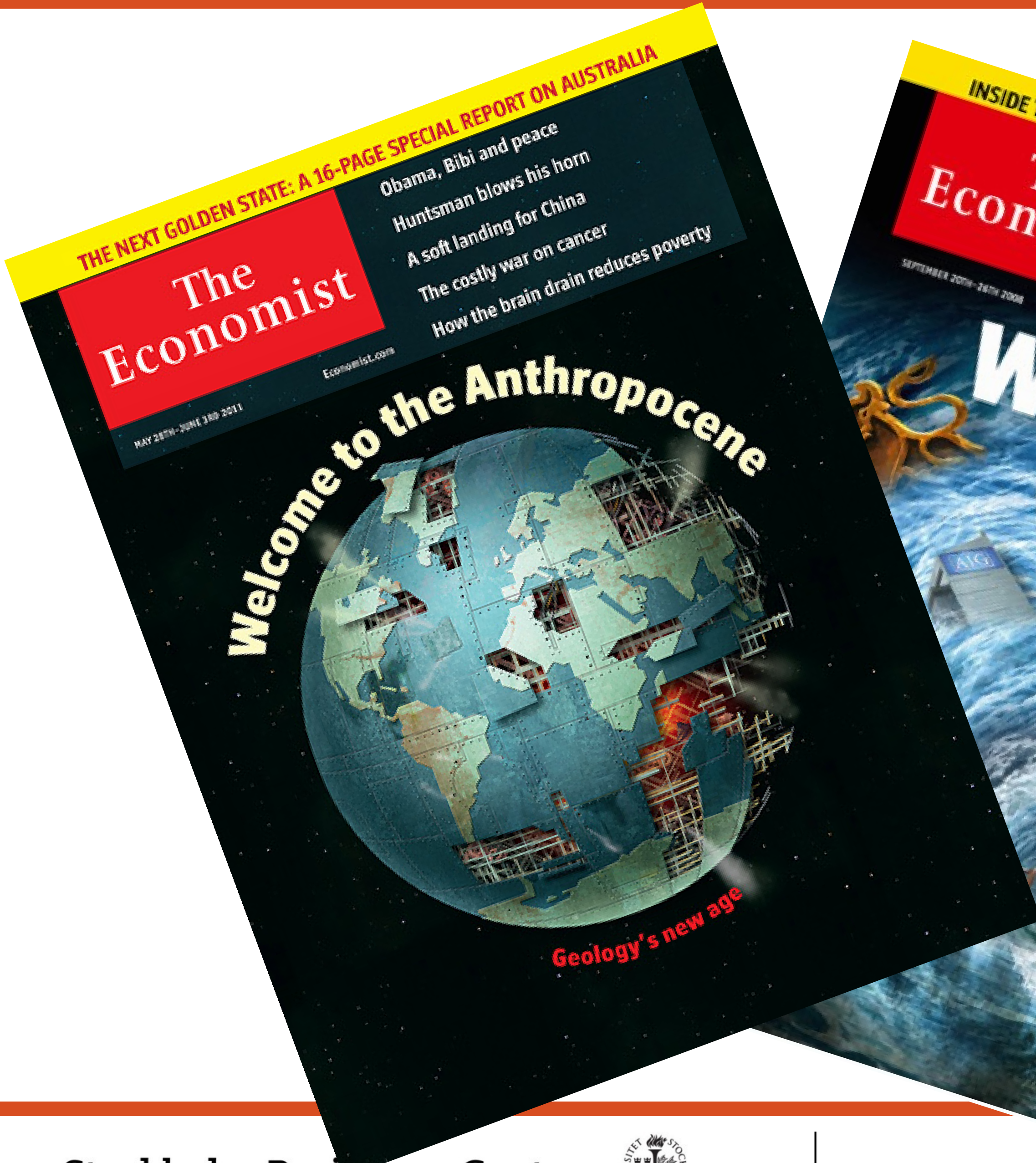
THE BEIJER INSTITUTE OF ECOLOGICAL ECONOMICS


Growing
Human Pressure
Climate
change
Ecosystem
decline
Surprise


THE NEXT GOLDEN STATE: A 16-PAGE SPECIAL REPORT ON AUSTRALIA
The Economist
Obama, Bibi and peace
Huntsman blows his horn
A soft landing for China
The costly war on cancer
How the brain drain reduces poverty
Economist.com
MAY 28TH–JUNE 3RD 2011
Welcome to the Anthropocene
Geology's new age


INSIDE THIS WEEK: A 14-PAGE SPECIAL REPORT ON GLOBALISATION
The Economist
Who killed New Labour?
The war in Pakistan's tribal areas
America's unending culture wars
How to save fish
The last typewriter-repair man
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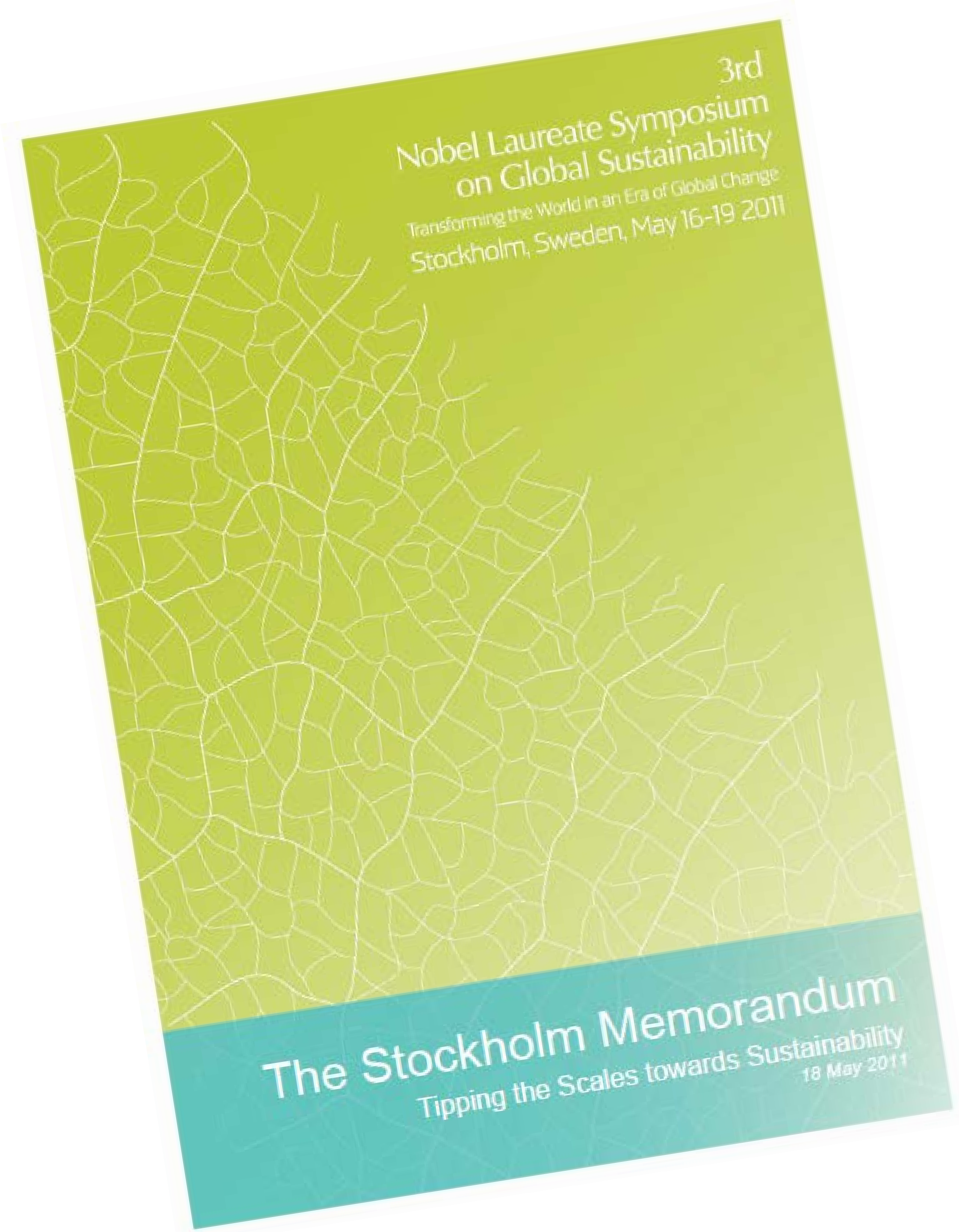
What next?
AIG



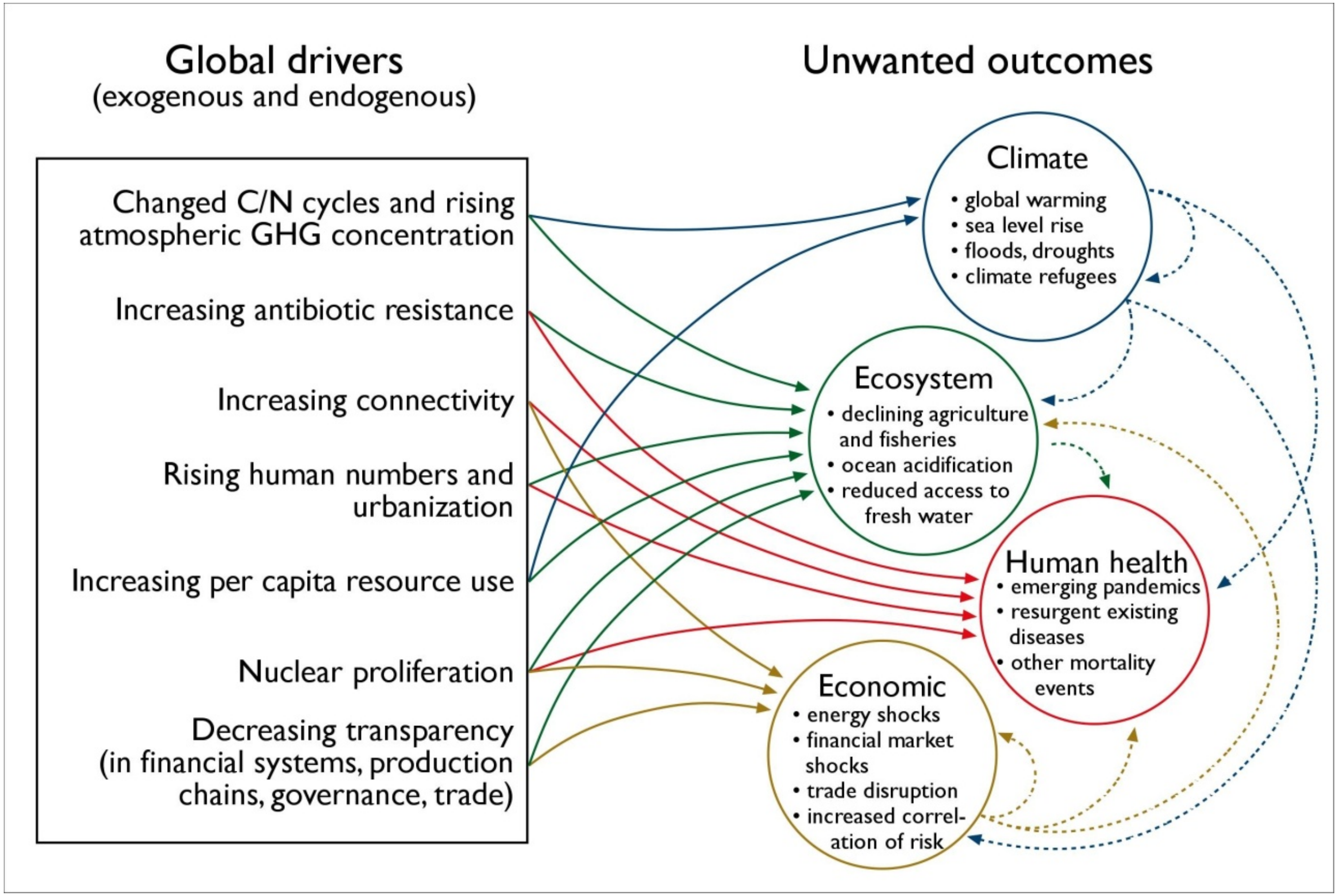
Humanity has reached a planetary saturation point

A resilient biosphere the basis for humen development

It is not only about climate change

A great transformation to global sustainability necessary, possible, and desirable

Looming global scale failures and missing institutions



Walker, B. et al., 2009. Science, 325: 1345-1346

POLICYFORUM

ENVIRONMENT AND DEVELOPMENT

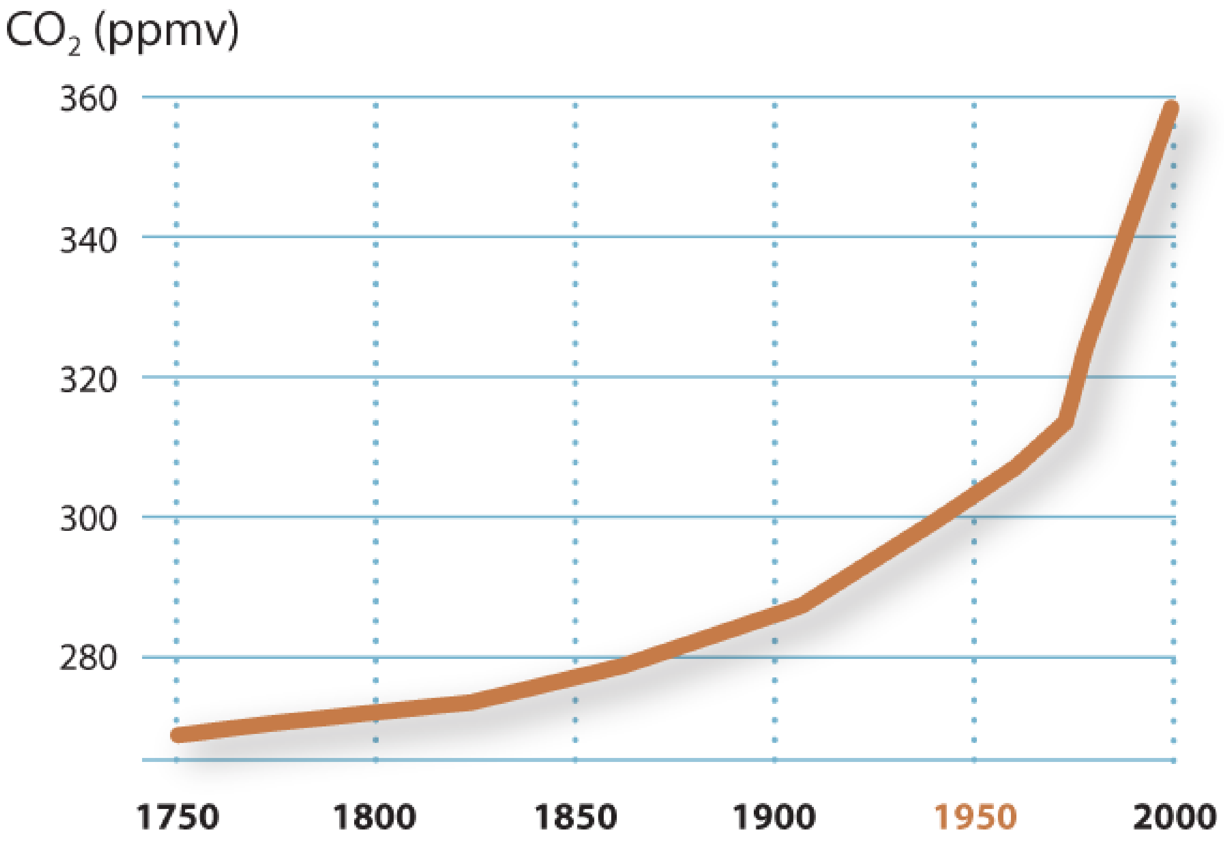
Earth System Science for Global Sustainability: Grand Challenges

Progress in understanding and addressing both global environmental change and sustainable development requires better integration of social science research.

W. V. Reid,[1]* D. Chen,[2] L. Goldfarb,[2] H. Hackmann,[3] Y. T. Lee,[2] K. Mokhele,[4] E. Ostrom,[5] K. Raivio,[2] J. Rockström,[6] H. J. Schellnhuber,[7] A. Whyte[8]

12 NOVEMBER 2010 VOL 330 SCIENCE www.sciencemag.org
Published by AAAS

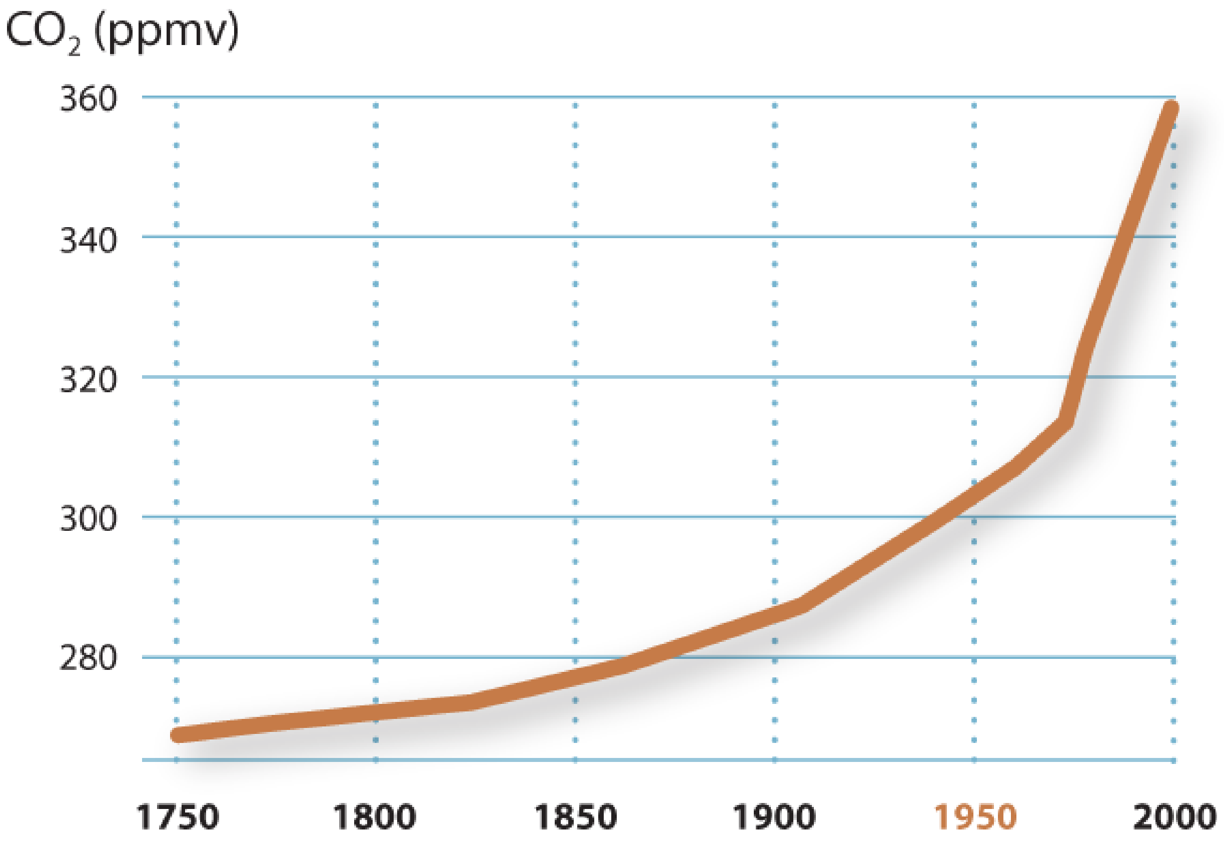
Atmospheric CO_2 concentration



Etheridge et al. Geophys Res 101: 4115-4128

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

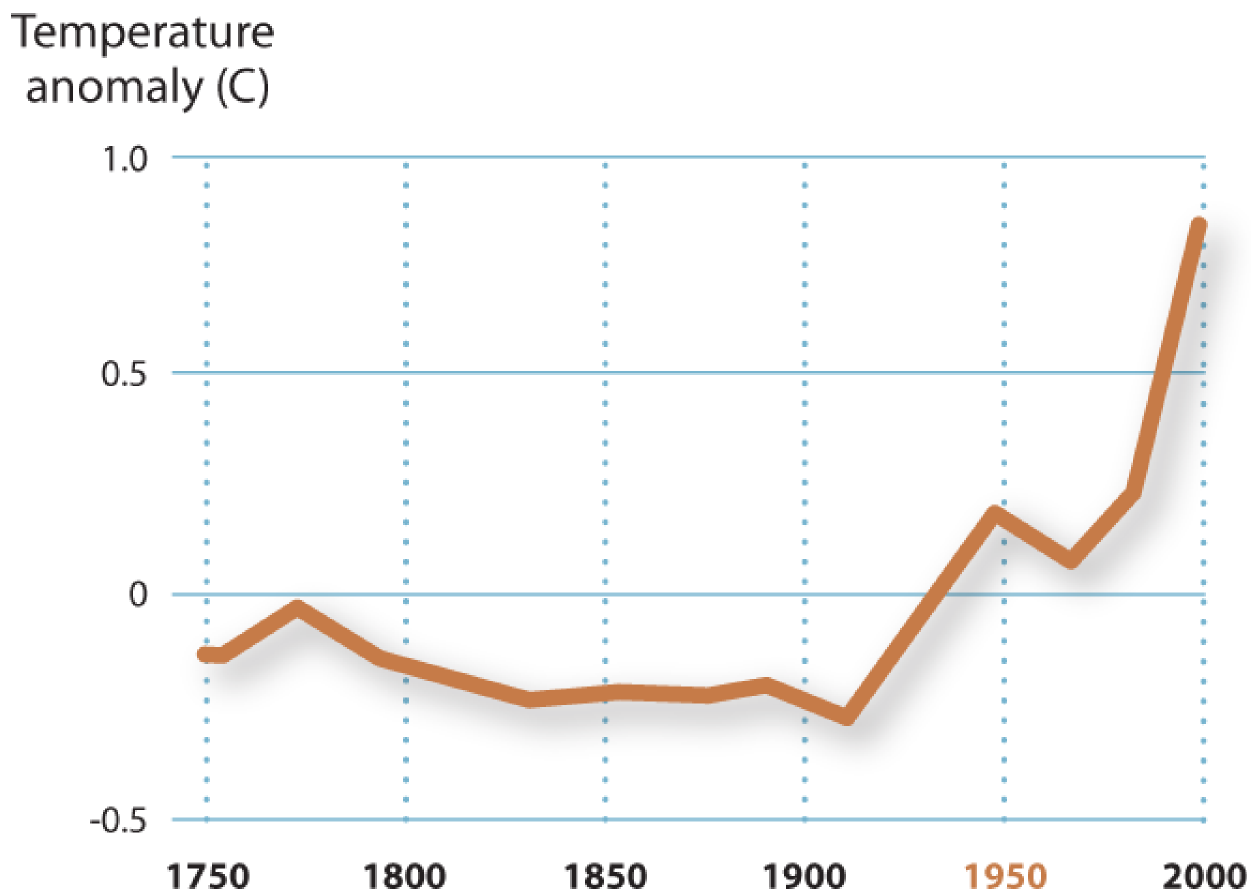
Atmospheric CO_2 concentration



Etheridge et al. Geophys Res 101: 4115-4128

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

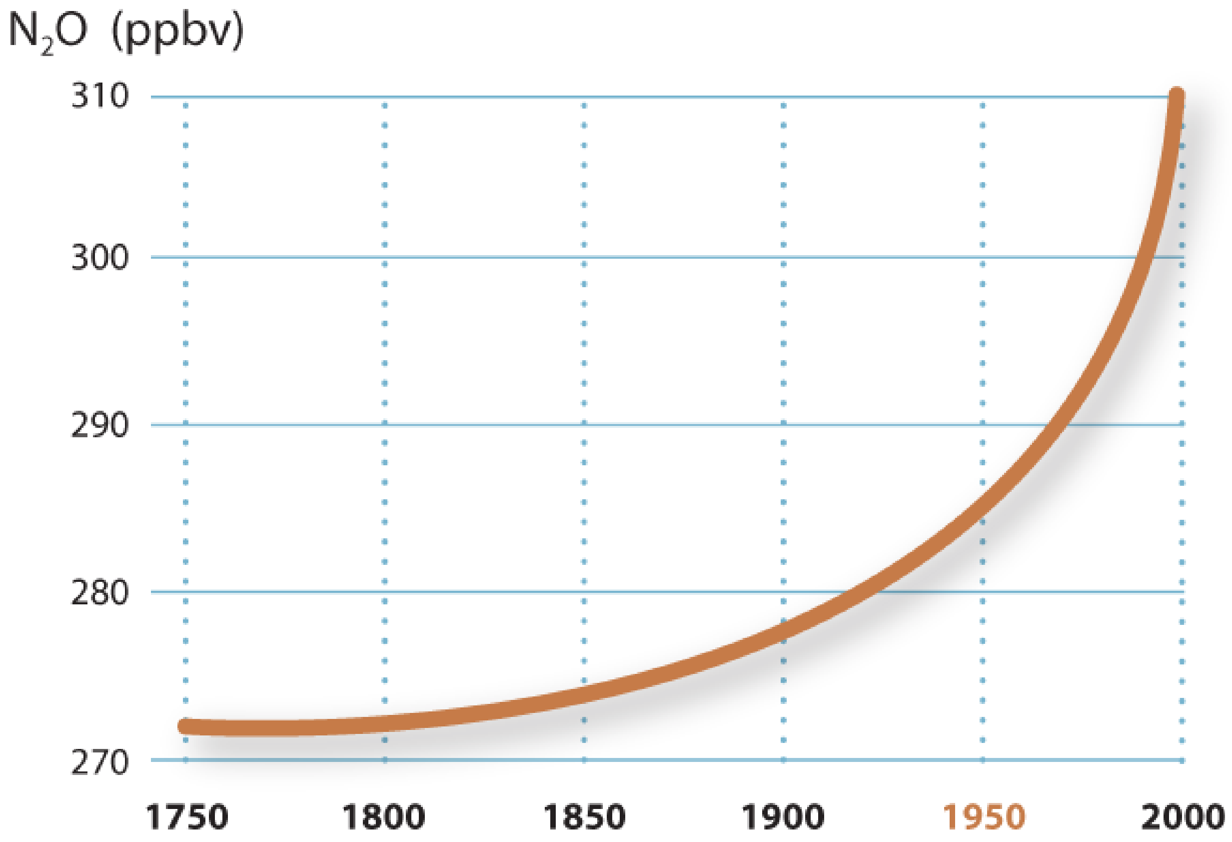
Northern hemisphere average surface temperature



Mann et al Geophys Res Lett 26(6): 759-762

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

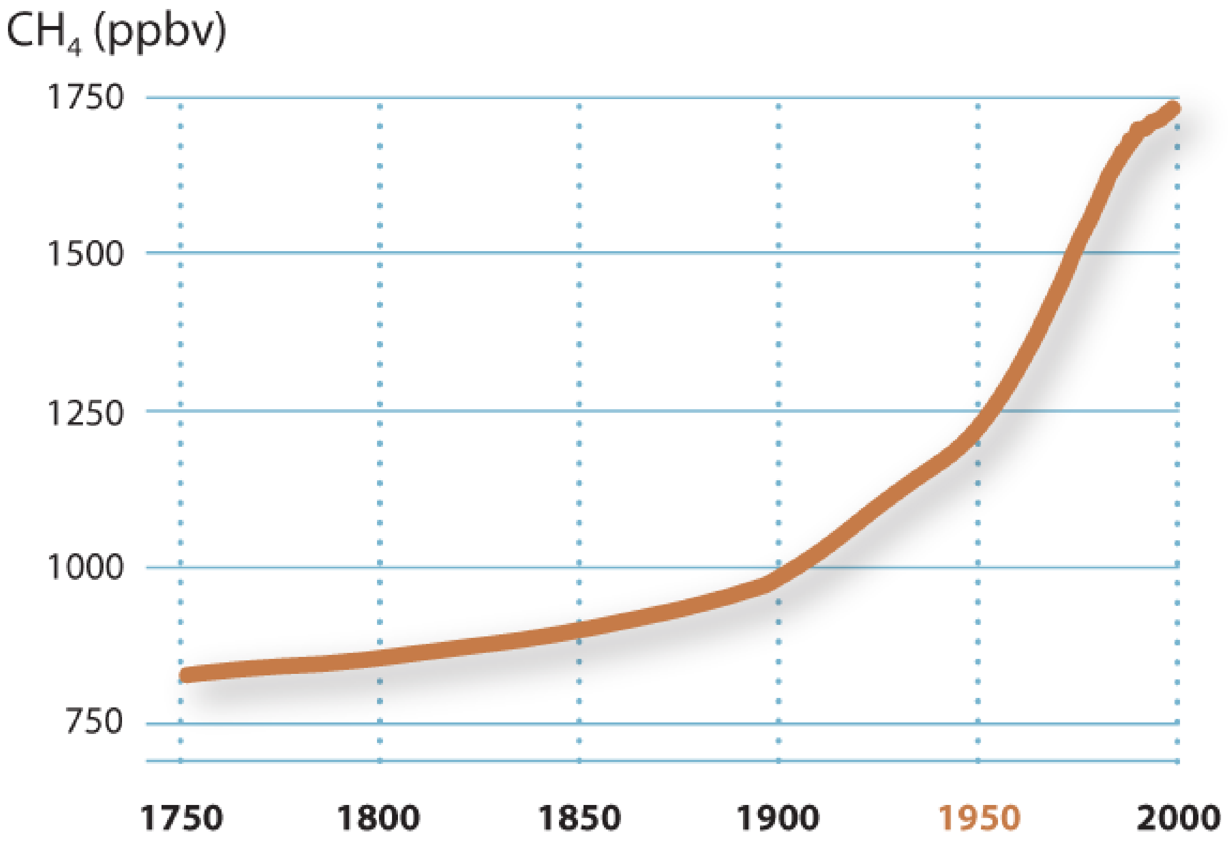
Atmospheric N_2O concentration



Machida et al Geophys Res Lett 22:2921-2925

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

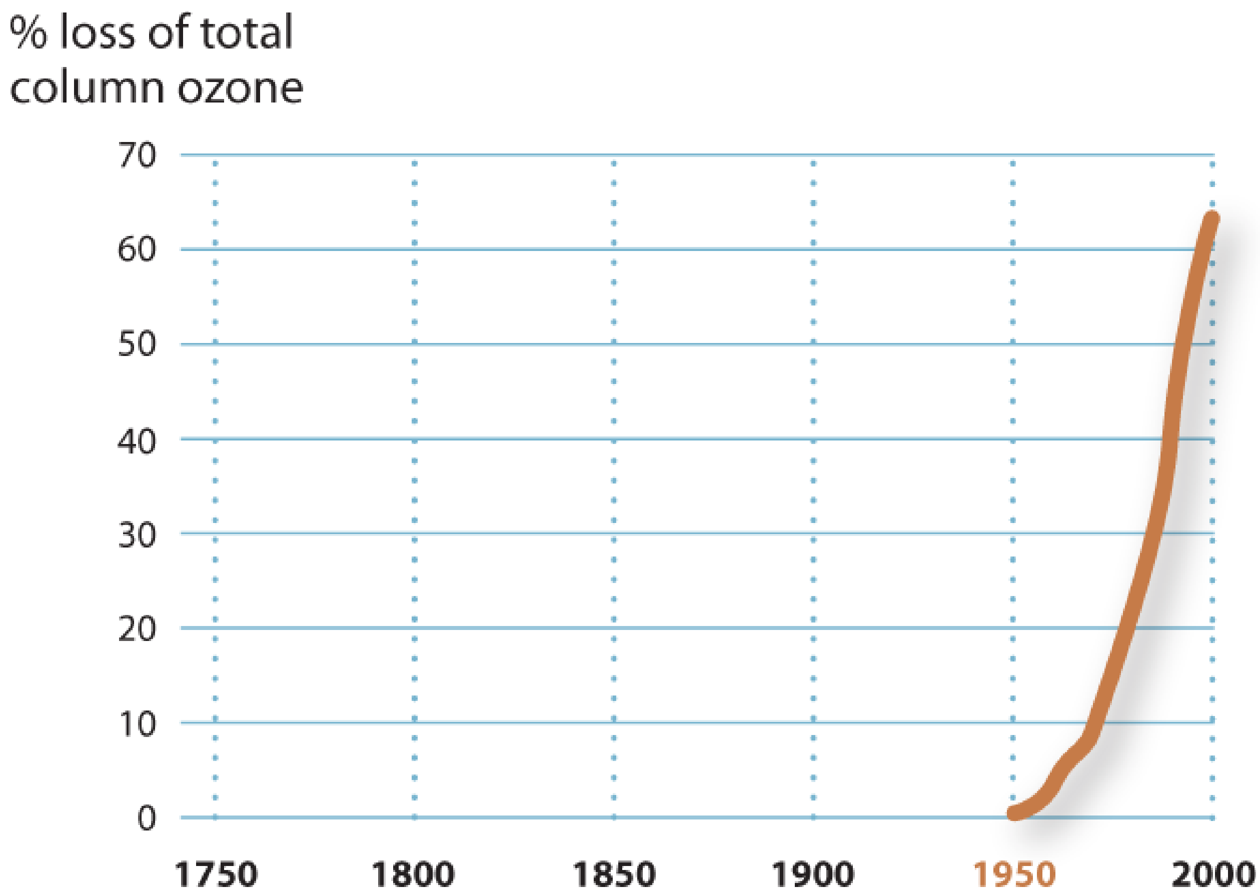
Atmospheric CH_4 concentration



Blunier et al J Geophy Res 20: 2219-2222

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

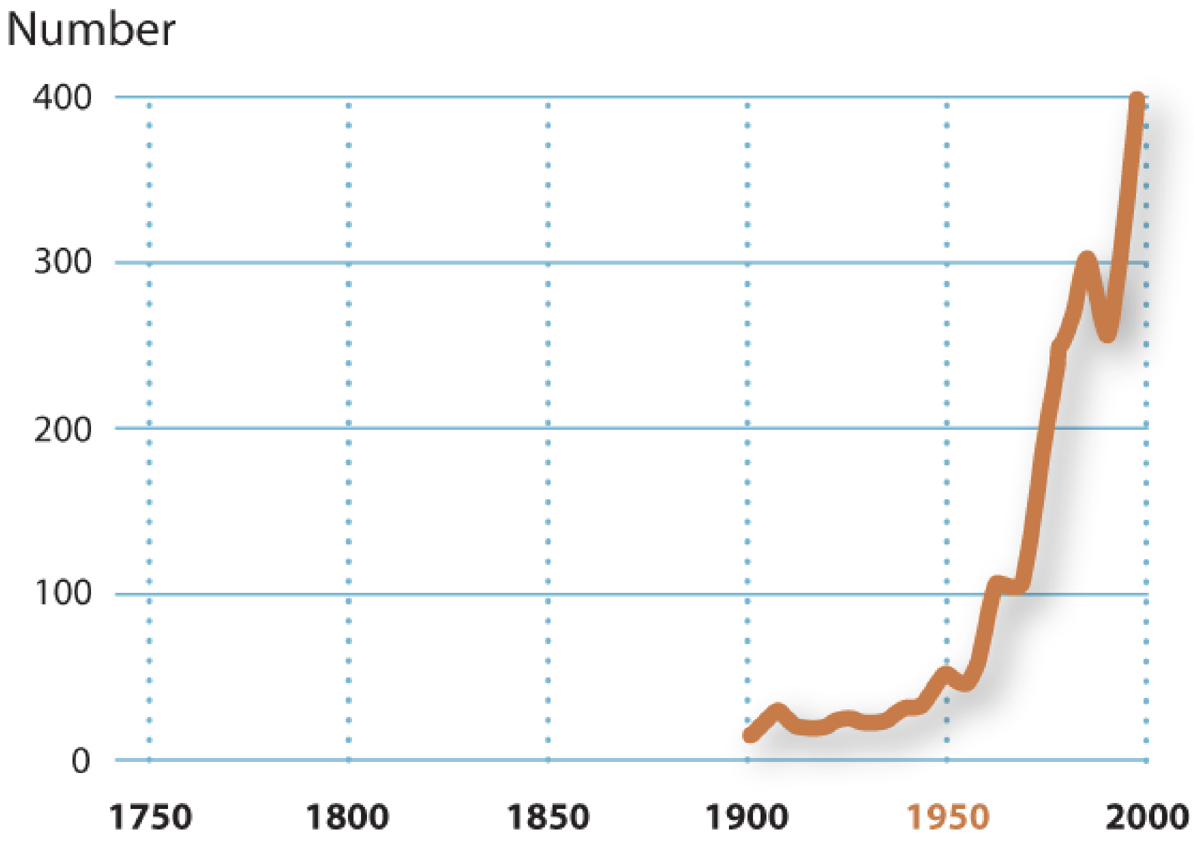
Ozone depletion



JD Shanklin British Antarctic Survey

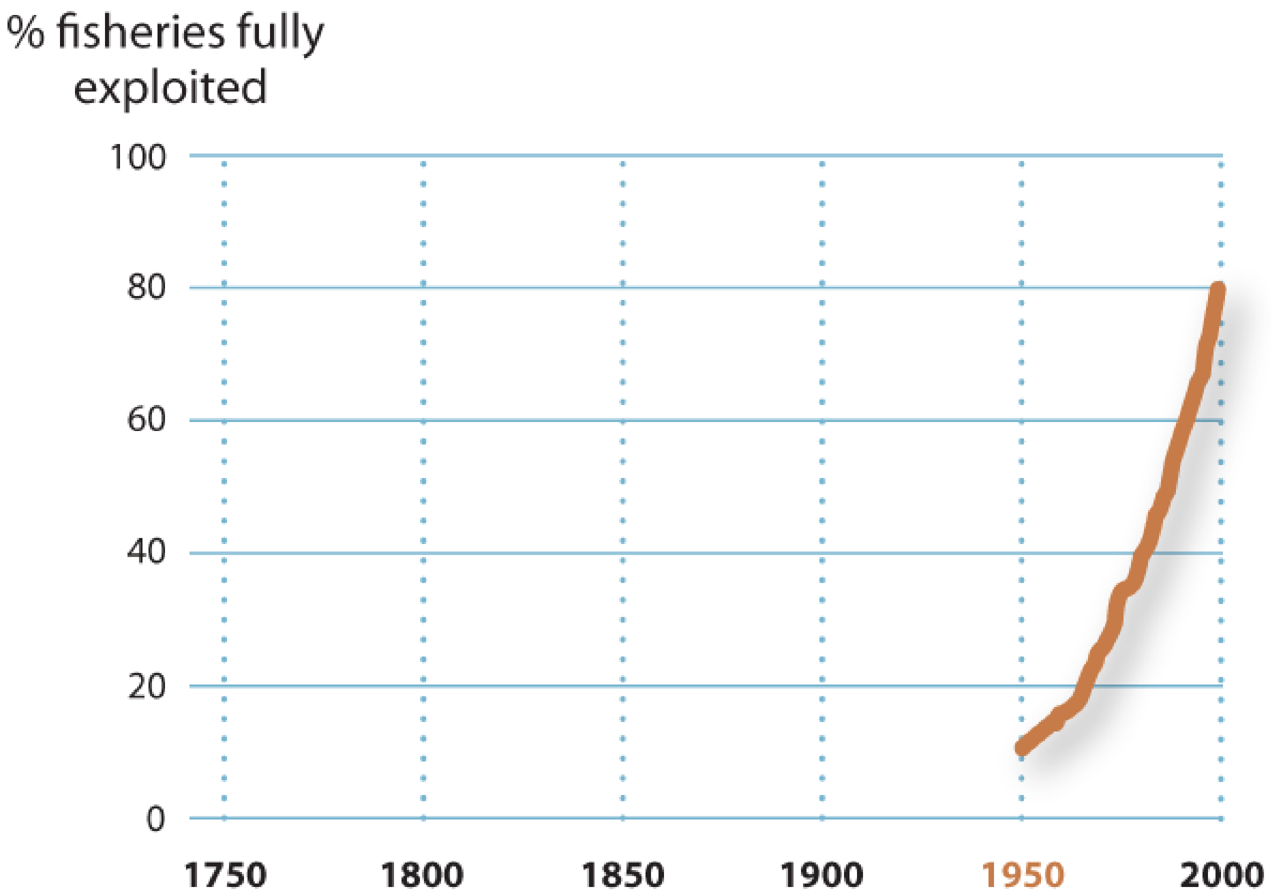
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Natural climactic disasters



IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

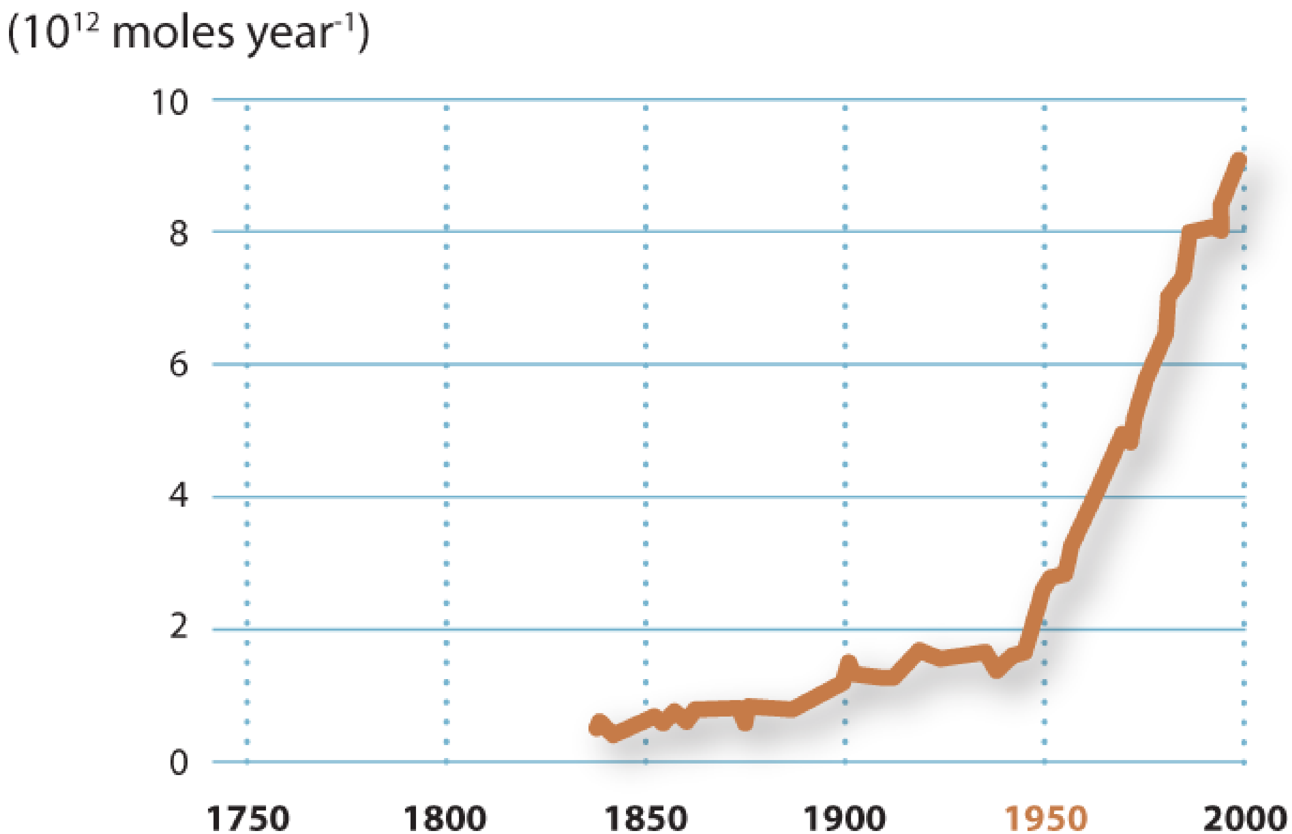
Ocean ecosystems



FAOSTAT 2002 Statistical database

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

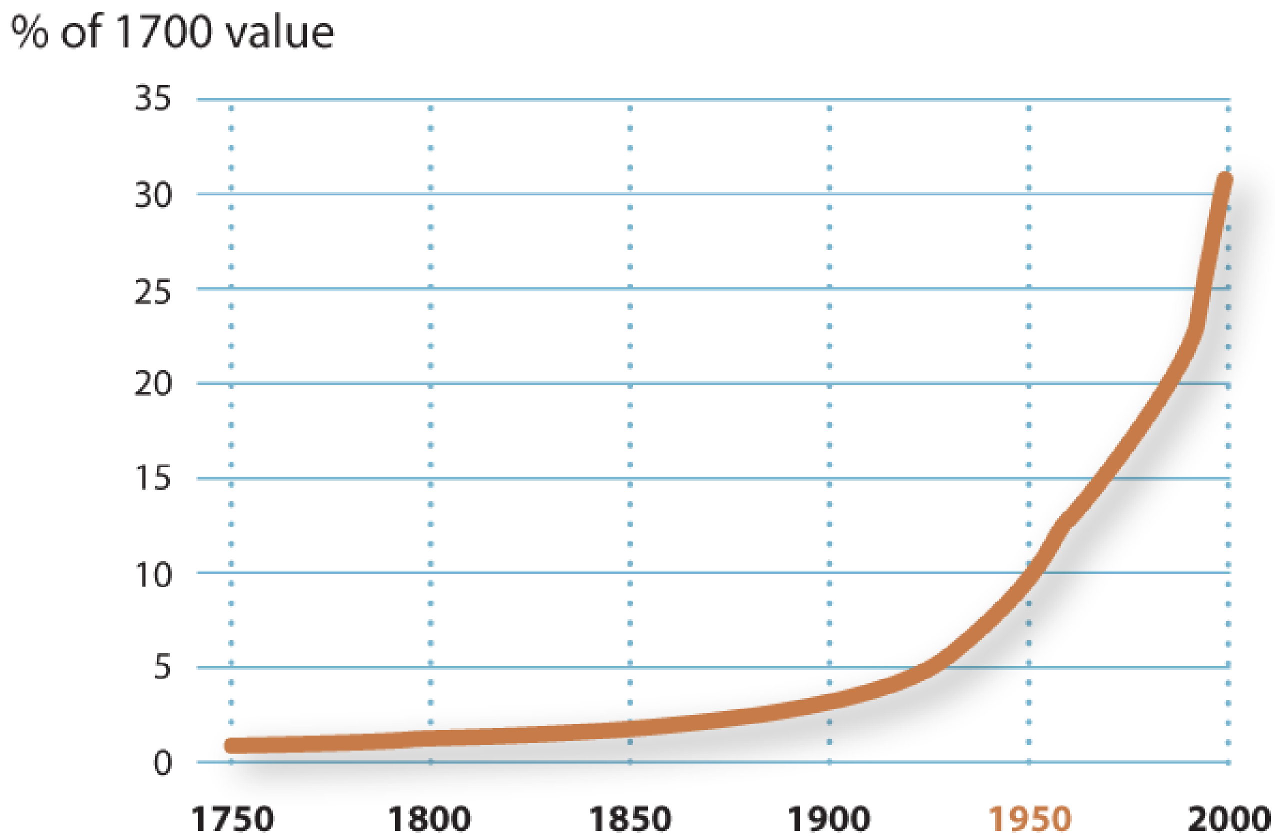
Coastal zone nitrogen flux



Mackenzie et al 2002.

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

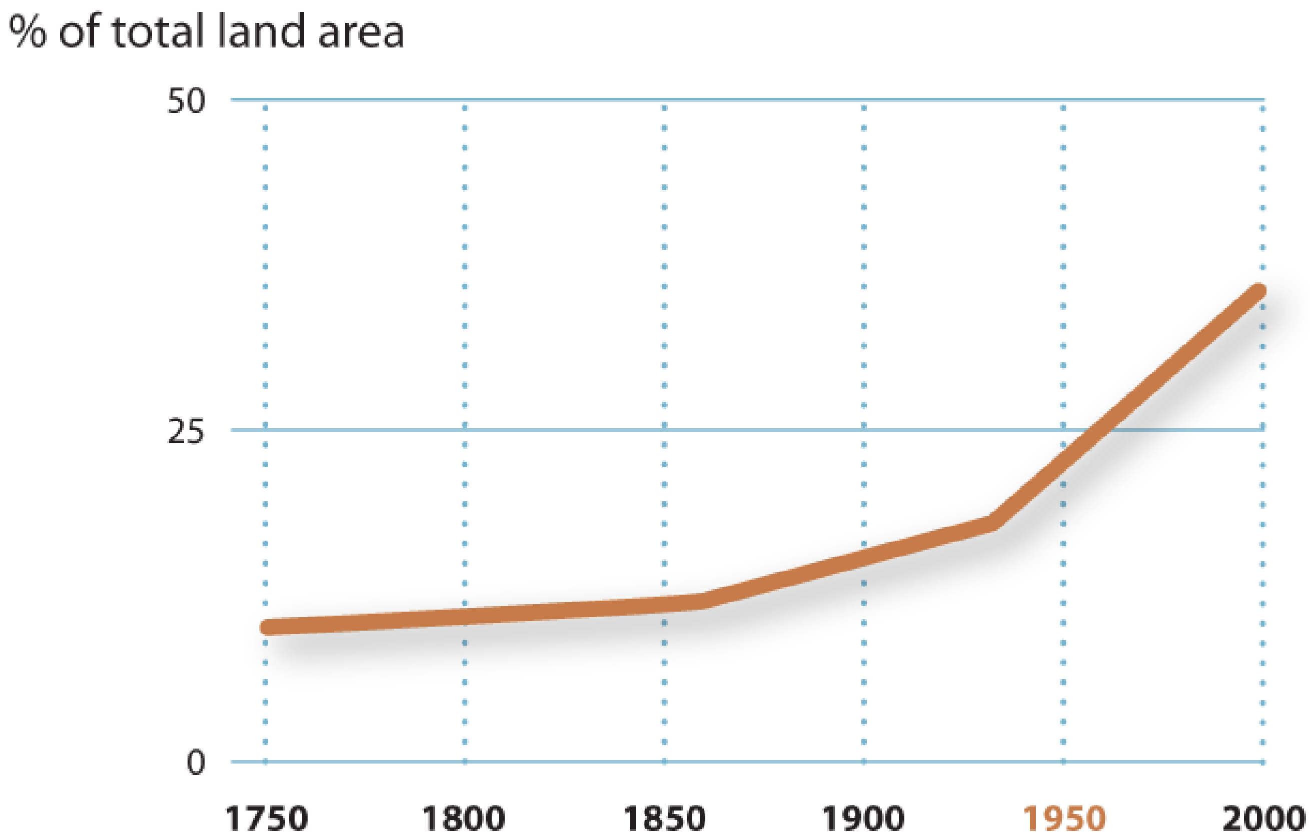
Tropical rainforest and woodland loss



Richards, the Earth as transformed by human action, Cambridge University Press

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

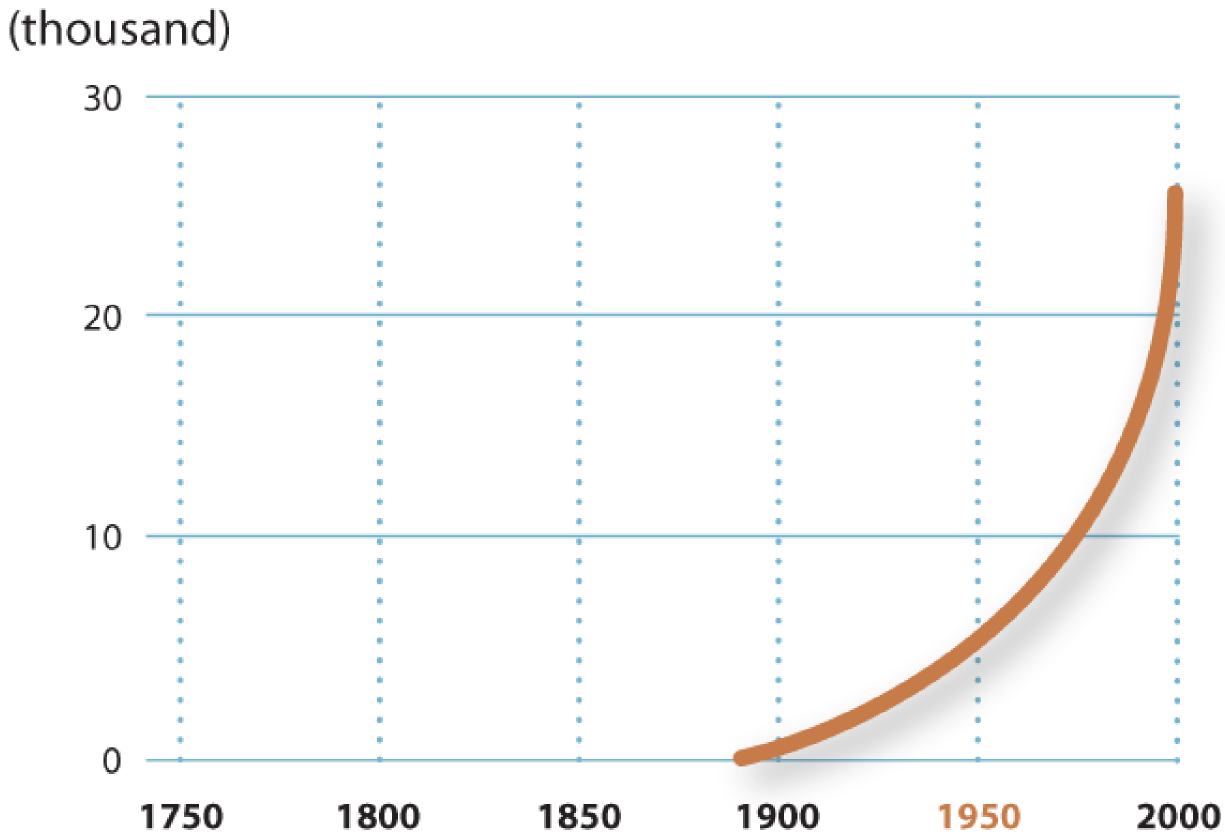
Domesticated land



Klein Goldewijk and Batties

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

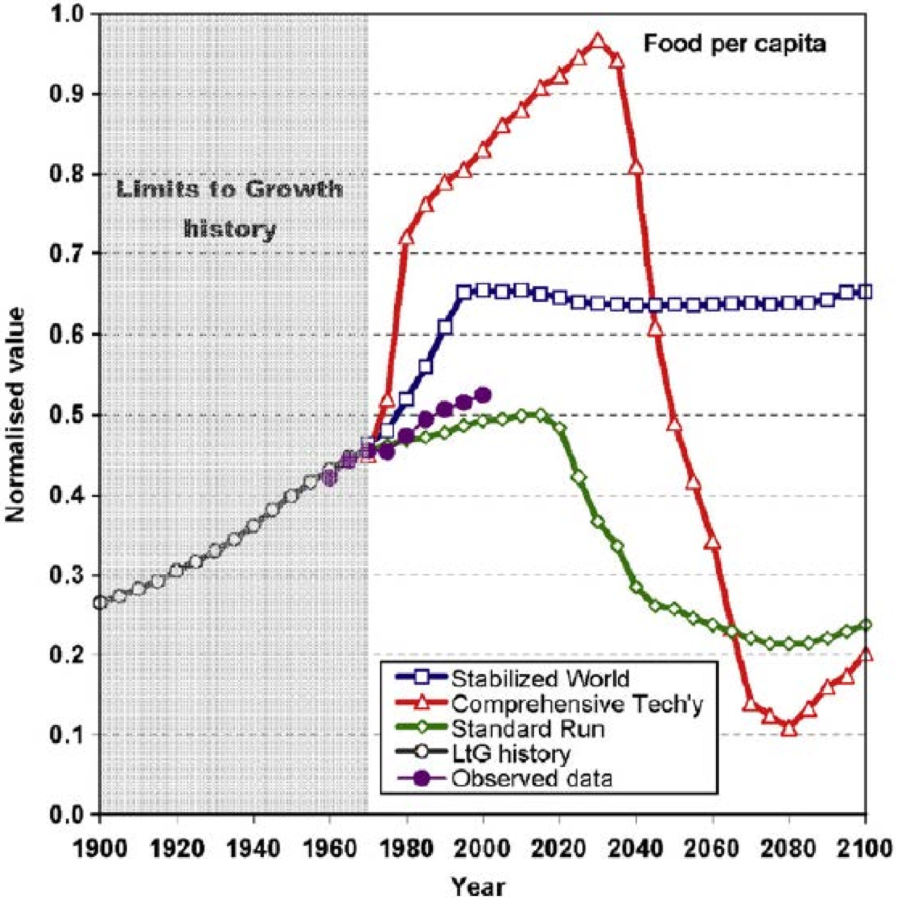
Species extinctions

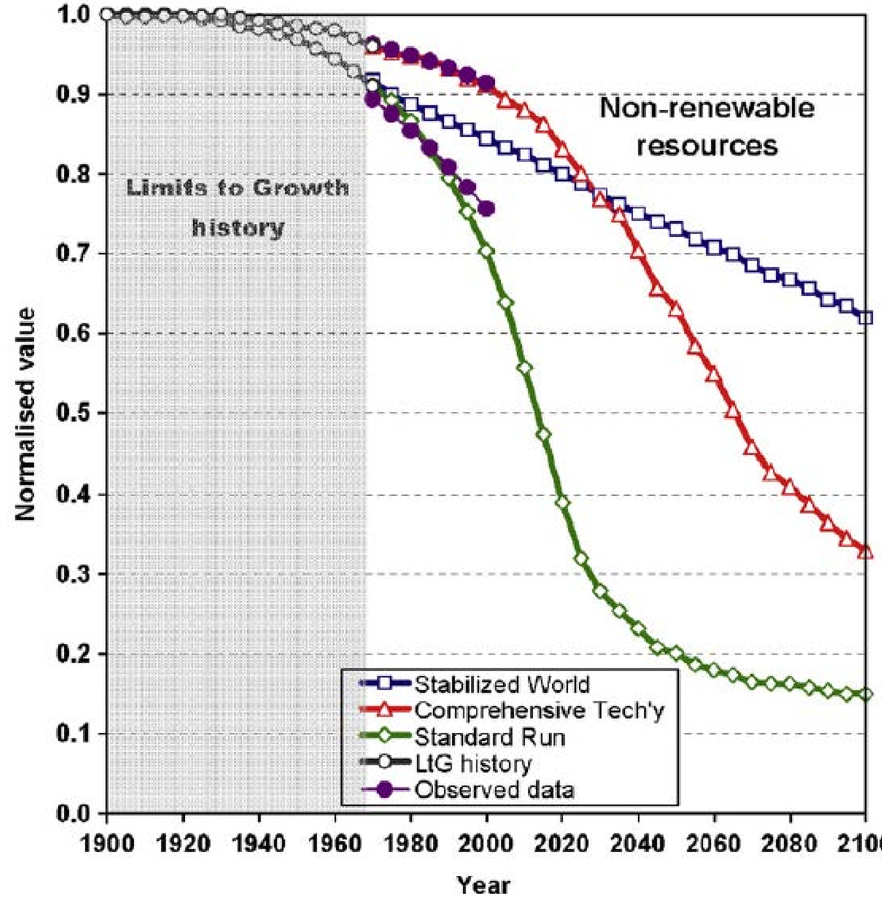


Wilson, the Diversity of Life.

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Limits to Growth – Scenarios versus Reality





Global Environmental Change 18 (2008) 397–411

Contents lists available at ScienceDirect

Global Environmental Change

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journal homepage: www.elsevier.com/locate/gloenvcha

A comparison of *The Limits to Growth* with 30 years of reality

Graham M. Turner *

CSIRO Sustainable Ecosystems, GPO Box 284, Canberra City, ACT 2601, Australia

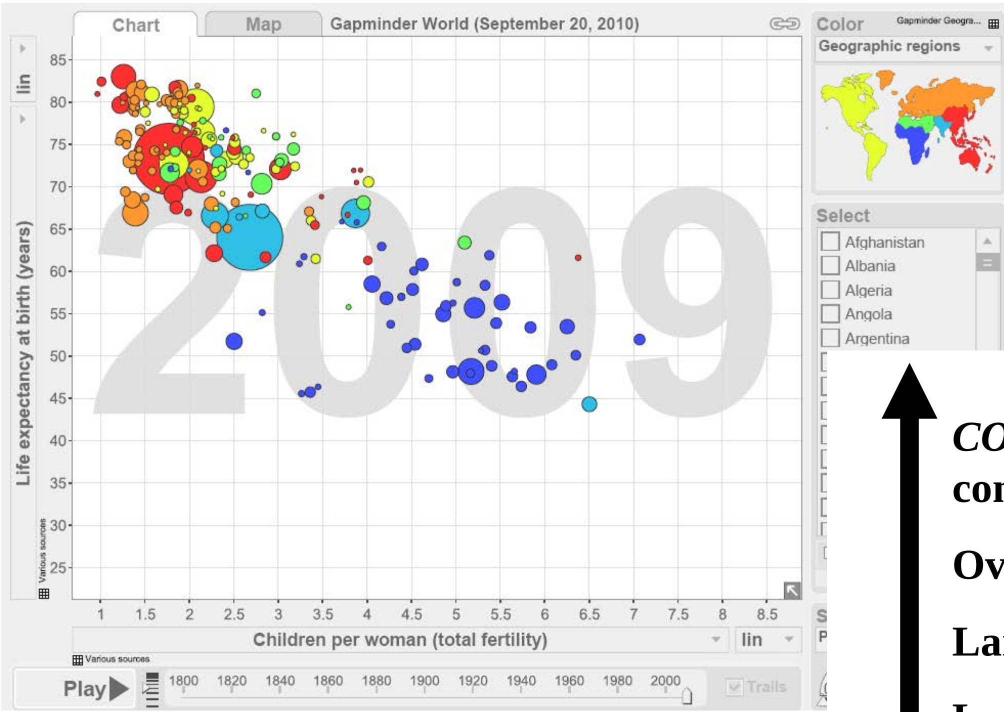
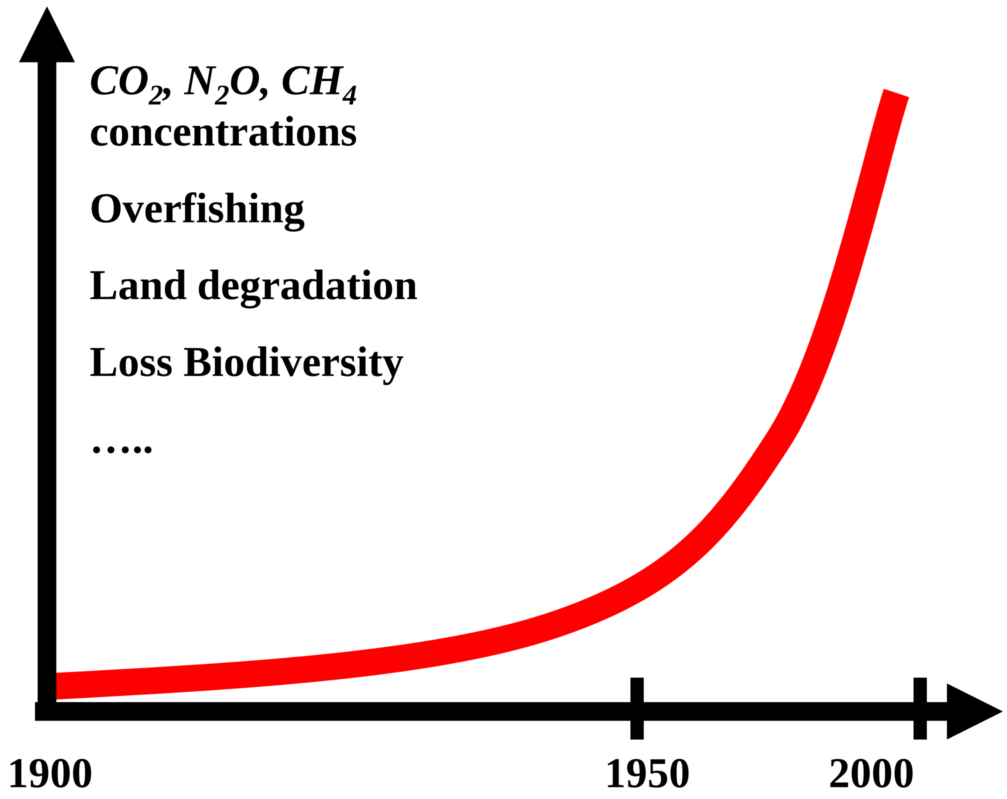
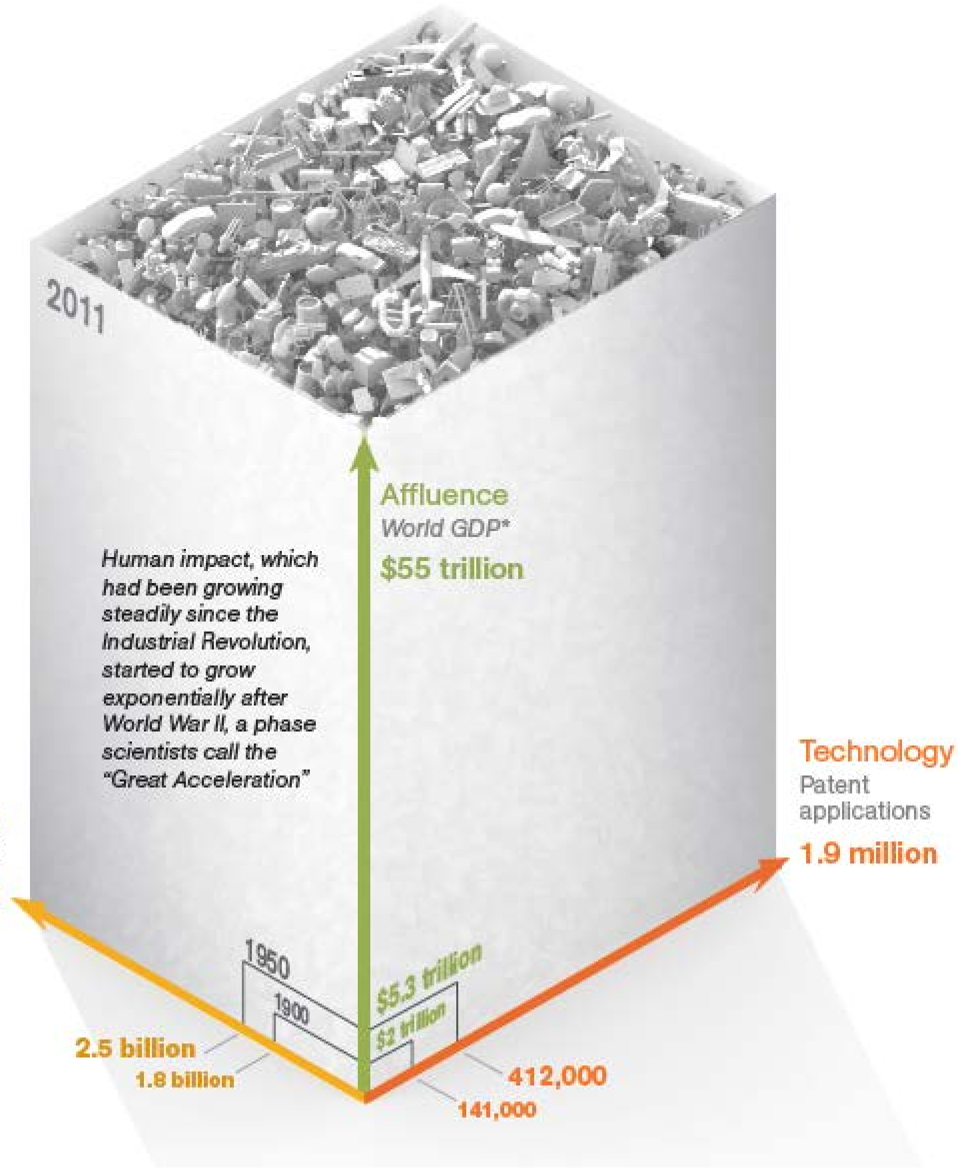
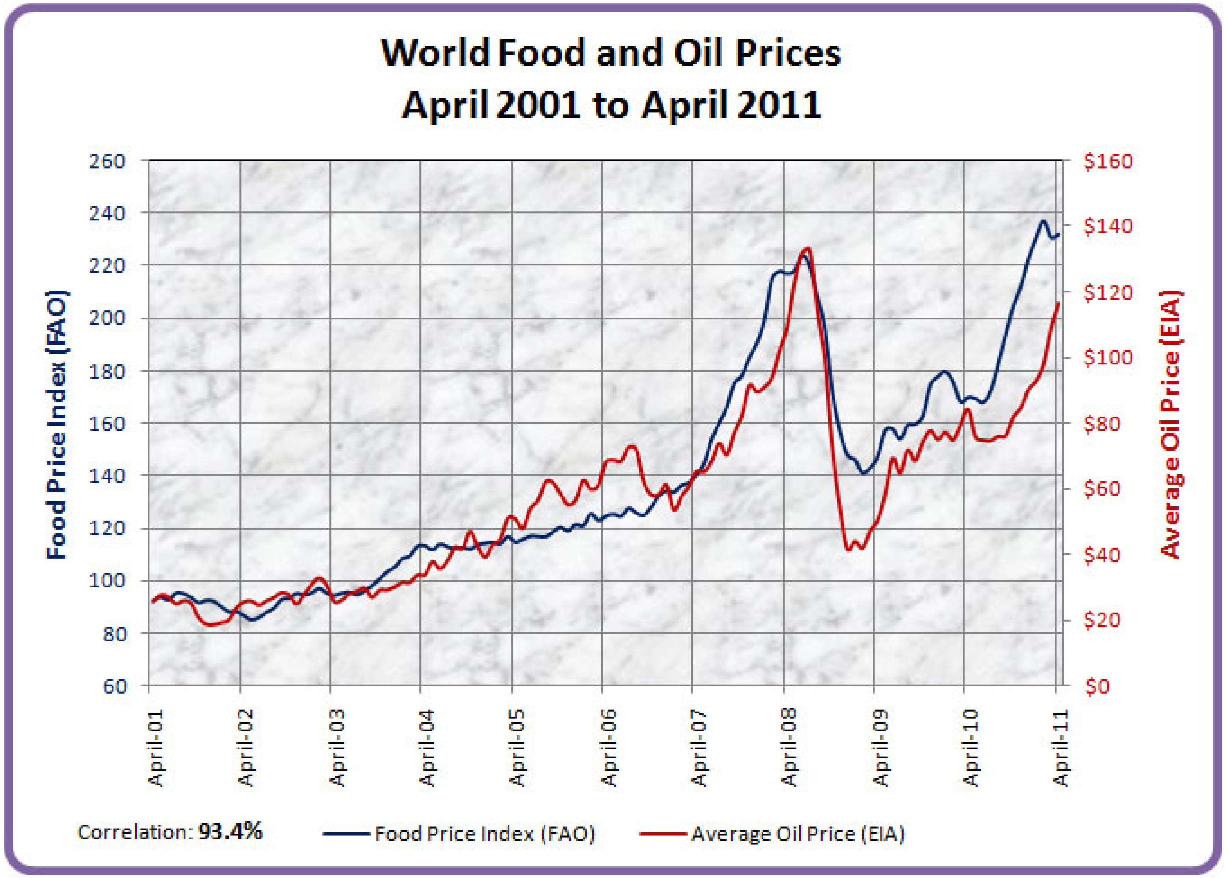


Chart
Map
Gapminder World (September 20, 2010)
Color
Geographic regions
Select
Afghanistan
Albania
Algeria
Angola
Argentina
Life expectancy at birth (years)
lin
Children per woman (total fertility)
lin
2009
Play
1800 1820 1840 1860 1880 1900 1920 1940 1960 1980 2000
Trails


CO_2, N_2O, CH_4 concentrations
Overfishing
Land degradation
Loss Biodiversity
…..
1900
1950
2000

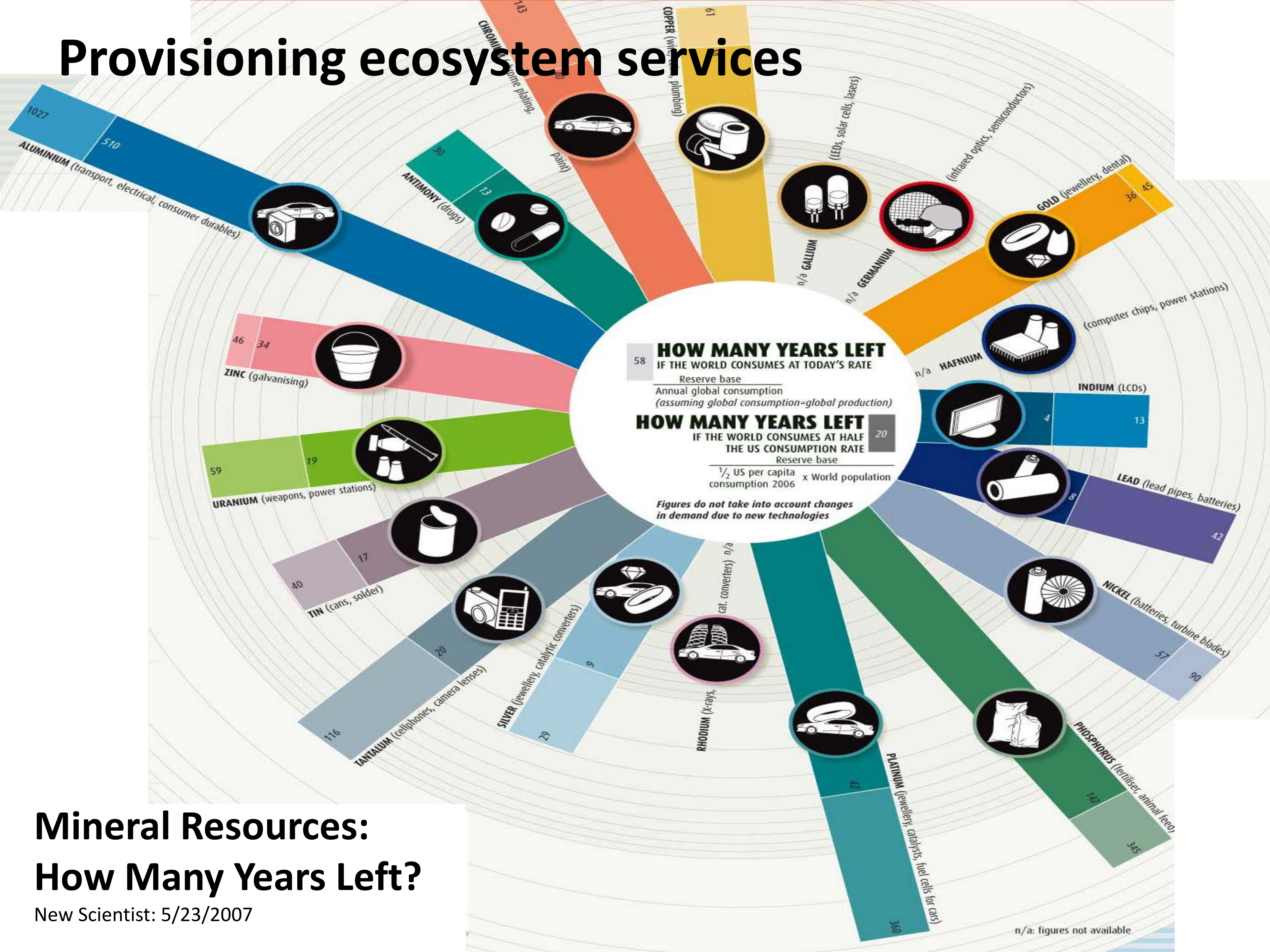
P x A x T = width times height times length of three boxes representing human impact in 1900, 1950 and 2011.





www.paulchefurka .ca; FAO, IEA

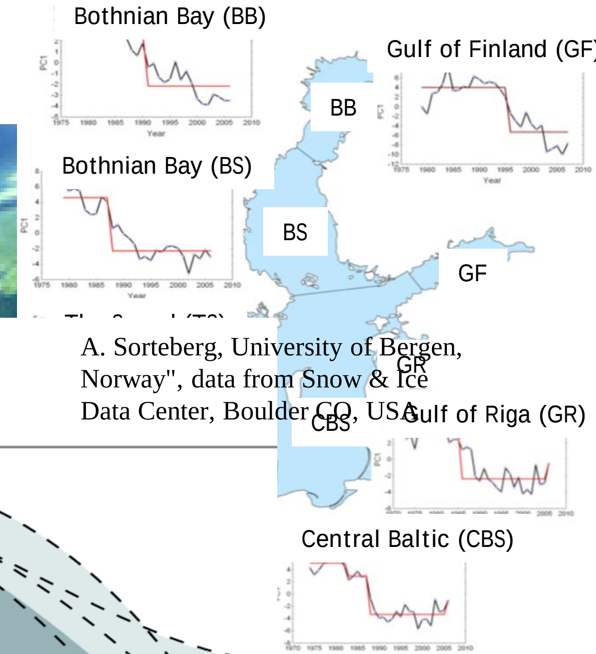
Provisioning ecosystem services



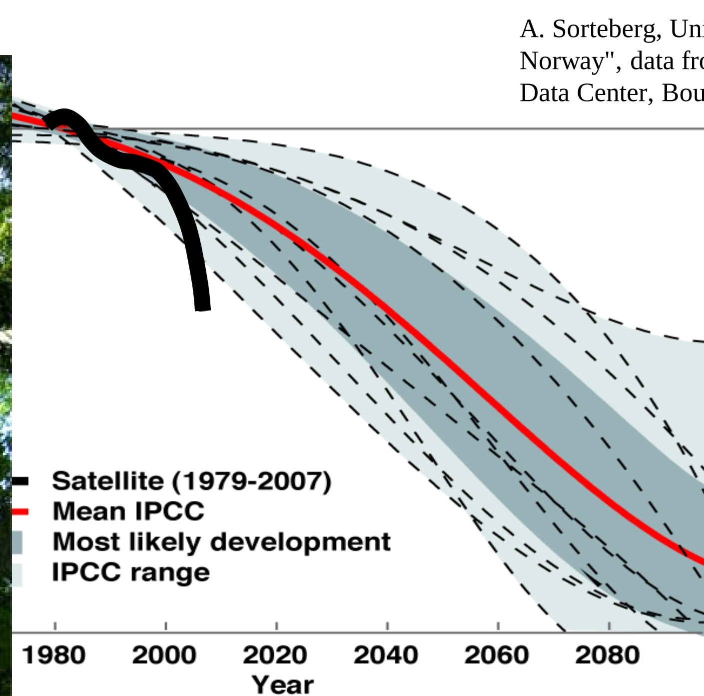
Mineral Resources:
How Many Years Left?

New Scientist: 5/23/2007

Regime shifts in all systems

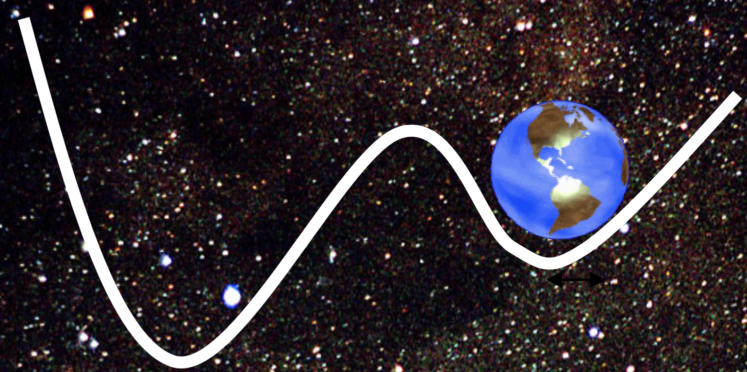


A. Sorteberg, University of Bergen, Norway", data from Snow & Ice Data Center, Boulder CO, USA

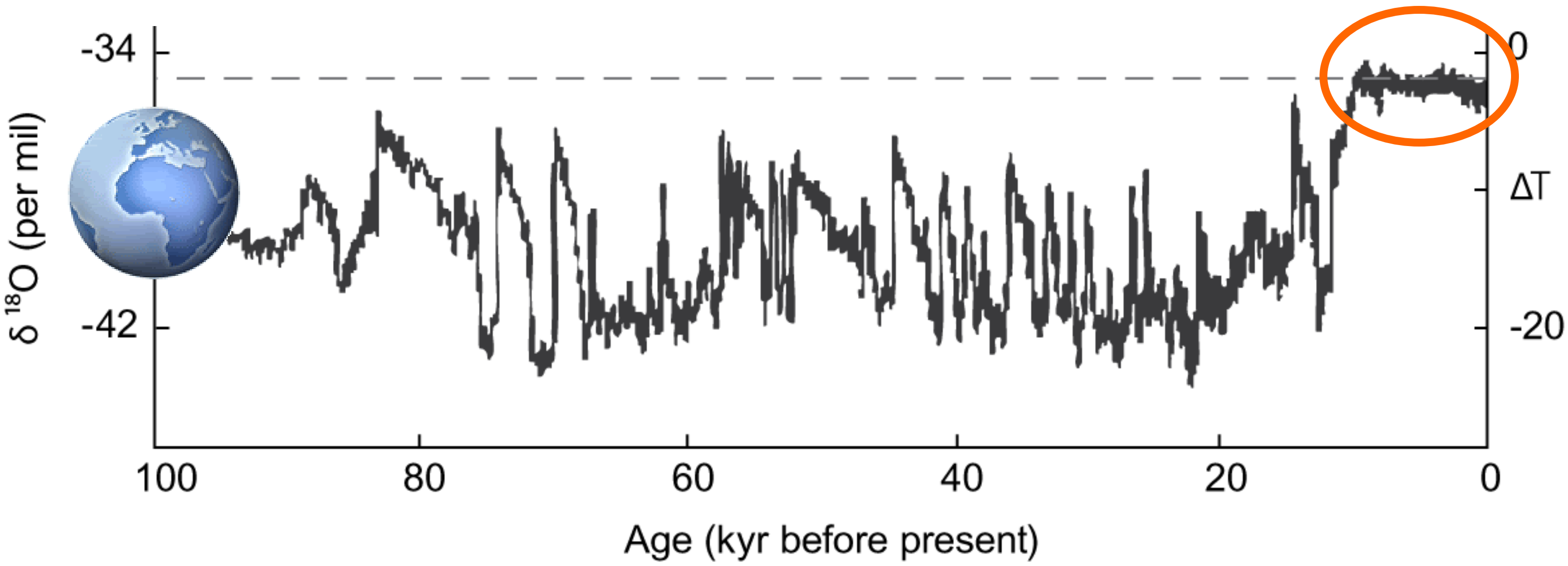


al., 2009

The Resilience of the Earth System



Humanity’s 10,000 years of grace



Transgressing safe boundaries


nature

Vol 461|24 September 2009

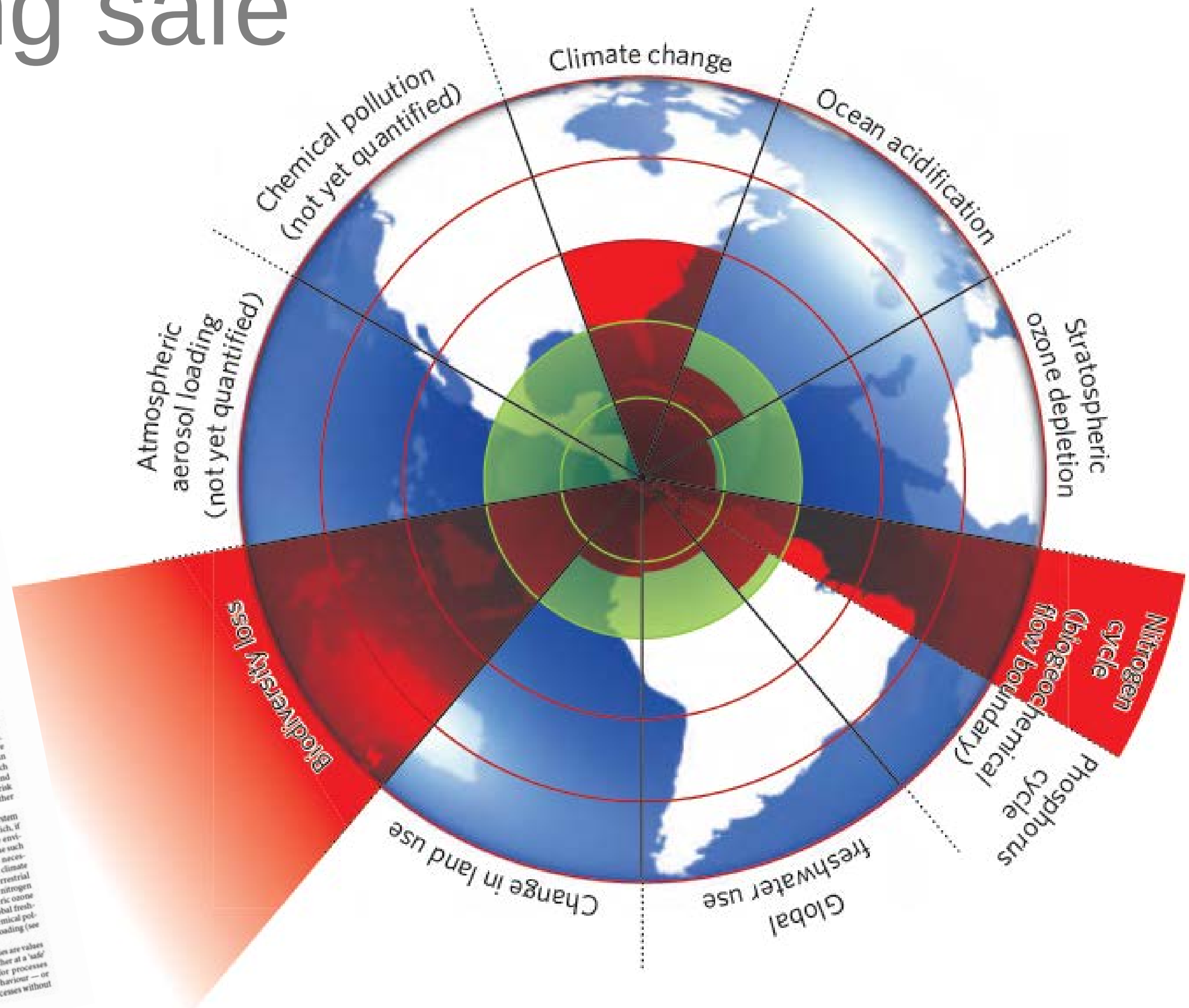
FEATURE

A safe operating space for humanity

Identifying and quantifying planetary boundaries that must not be transgressed could help prevent human activities from causing unacceptable environmental change, argue Johan Rockström and colleagues.

SUMMARY
- New approach proposed for defining preconditions for human development
- Crossing certain biophysical thresholds could have disastrous consequences for humanity
- Three of nine interlinked planetary boundaries have already been overstepped

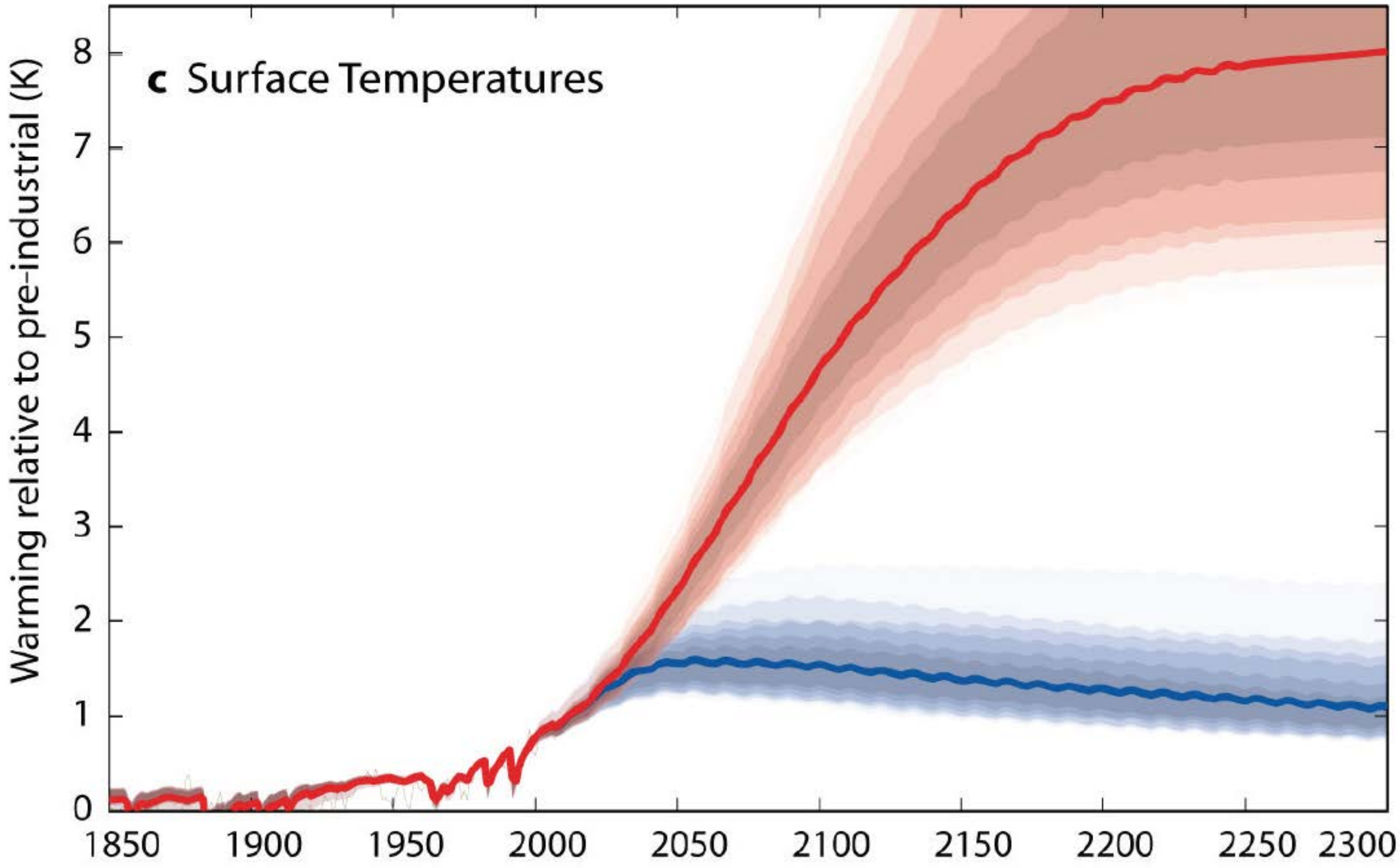
Planetary boundaries



Rockström et al. 2009 Nature, 461 (24): 472-475

A new ”global spec” for world food production

1. Stay within 350 ppm, an agricultural system that goes from being a source to a global sink
2. Essentially a green revolution on current cropland (expansion from 12 % to 15 %)
3. Keep global consumptive use of blue water < 4000 km^3/yr, we are at 2,600 km^3/yr today and rushing fast towards 4000 km^3/yr
4. Reduce to 25 % of current N extraction from atmosphere
5. Not increase P inflow to oceans
6. Reduce loss of biodiversity to < 10 E/MSY from current 100-1000 E/MSY


c Surface Temperatures
Warming relative to pre-industrial (K)
8
7
6
5
4
3
2
1
0
1850
1900
1950
2000
2050
2100
2150
2200
2250
2300

ipcc

INTERGOVERNMENTAL PANEL ON climate change

Final Plenary | Special Report Renewable Energy Sources (SRREN)

Summary for Policy Makers

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