From the Holocene to the Anthropocene: Changing Relations Between the Earth and Humankind

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Nat. Network on Water Research
Hamburg, 22-9-2011

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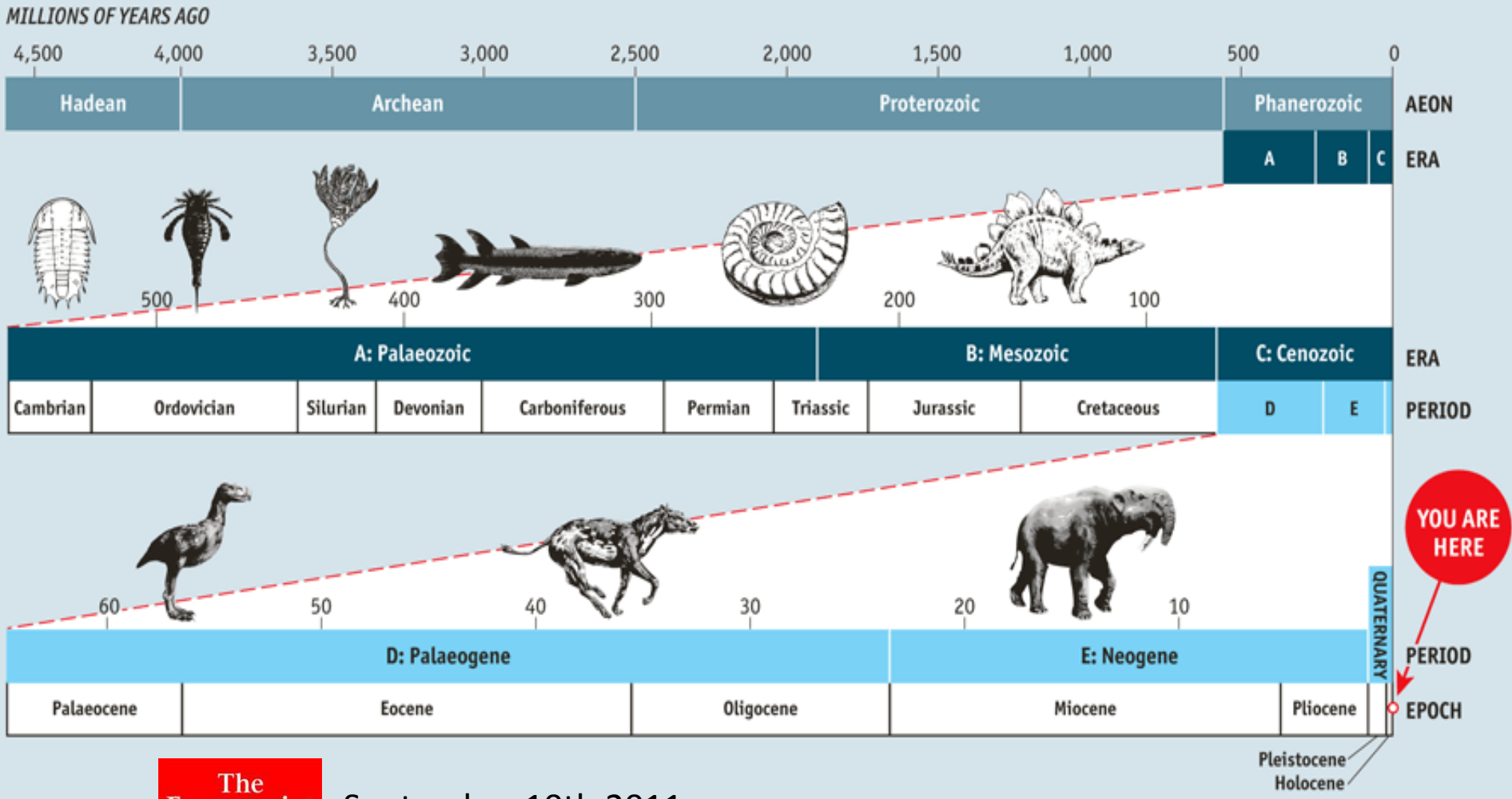
1. Earth History and Humans

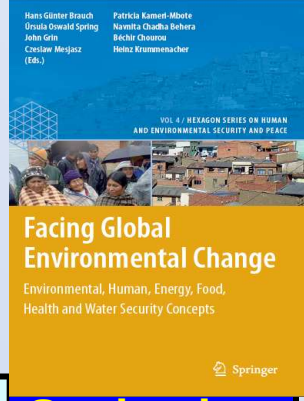


The Economist September 10th 2011

2. Climate paradox & security implications

1. Global environmental change and climate change are increasing biodiversity loss, risks and hazards, creating dangerous feedbacks and potential tipping points.
2. On the one hand we have declaratory goals by the G-8 to reduce greenhouse gases by 50% to 80% by 2050; on the other hand real emissions are rising at the highest level of established scenarios by IPCC and the commitments of UNFCCC (1992) and the Kyoto protocol (1997) are uncertain.
3. Recent financial and economic crises are delaying further a legally binding post-Kyoto regime and business-as-usual will never achieve these declared goals by 2050. Thus we need an alternative paradigm of sustainability.
4. To avoid dangerous climate change and tipping points of the climate system we need a Fourth Sustainability Revolution (after the agricultural, the industrial and the communication/IT revolutions), which implies a deep cultural change in productive processes and consumptive behaviour and a new Cosmovision to relate to nature.

Widening, Deepening and Sectorialization of Security Threats and Risks

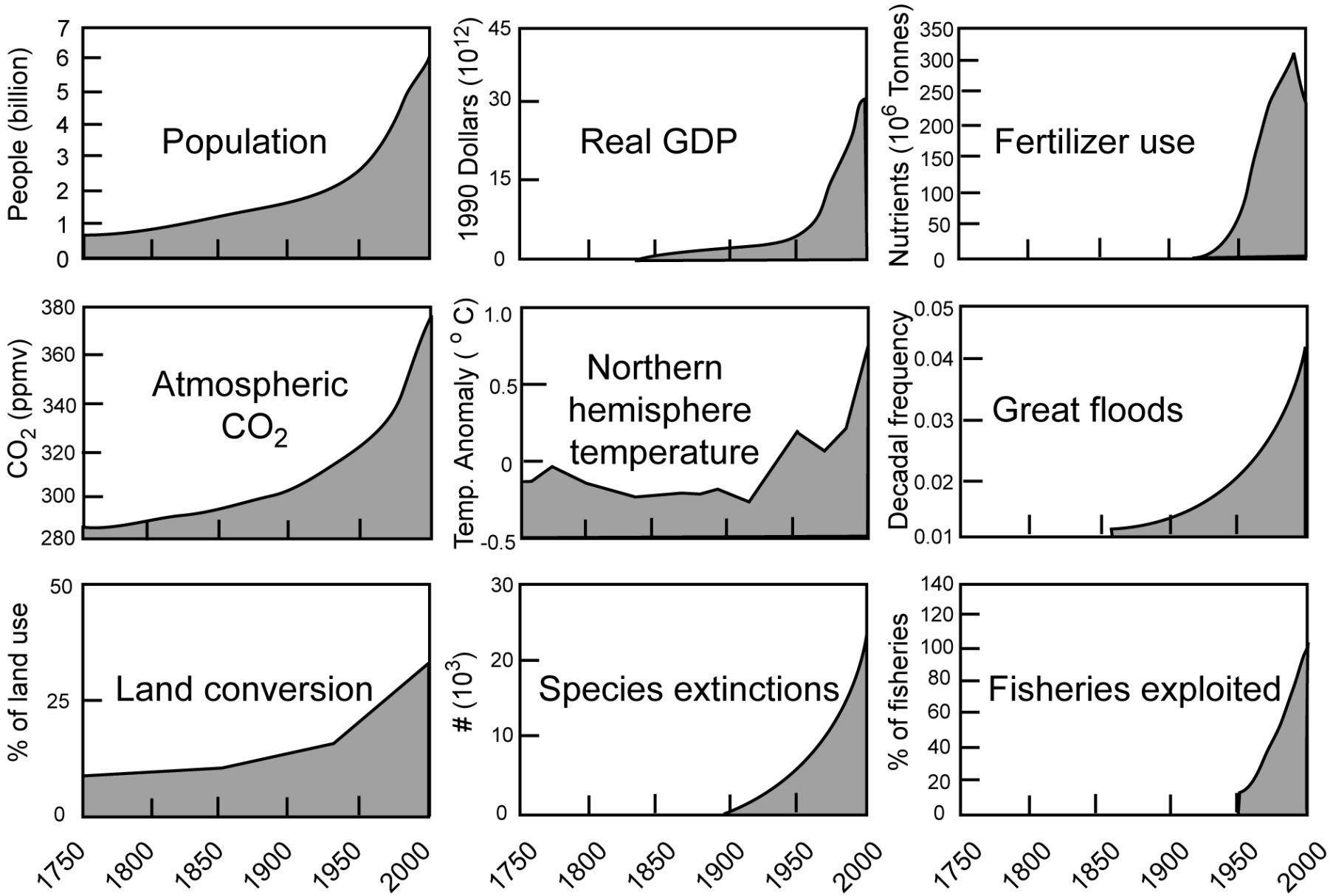


Security dimension⇒ ⇓ Level of interaction	Mili-tary	Politi-cal	Economic	Environ-mental ⇓	Societal
Human individual Human security ⇒	Land mines	Failed state	Food & Health security	Cause & victim	Food & Health security
Societal, community security	Border control	Public security	Water, Food & Health sec.	↓↑	↓↑
National security	During Cold War shrinking (in USA since 2001 ↑ & since 2009 ↓)		Energy security	↓↑	Energy Food, Water & Health security
International and Regional security			Water security	↓↑	Water security
Global and planetary security ⇒	Terro-rism	Intern. migration	Financial crisis	CC; GEC; biodiversi-ty loss	Health security

3. Impacts of Industrial & Communication/IT Revolutions

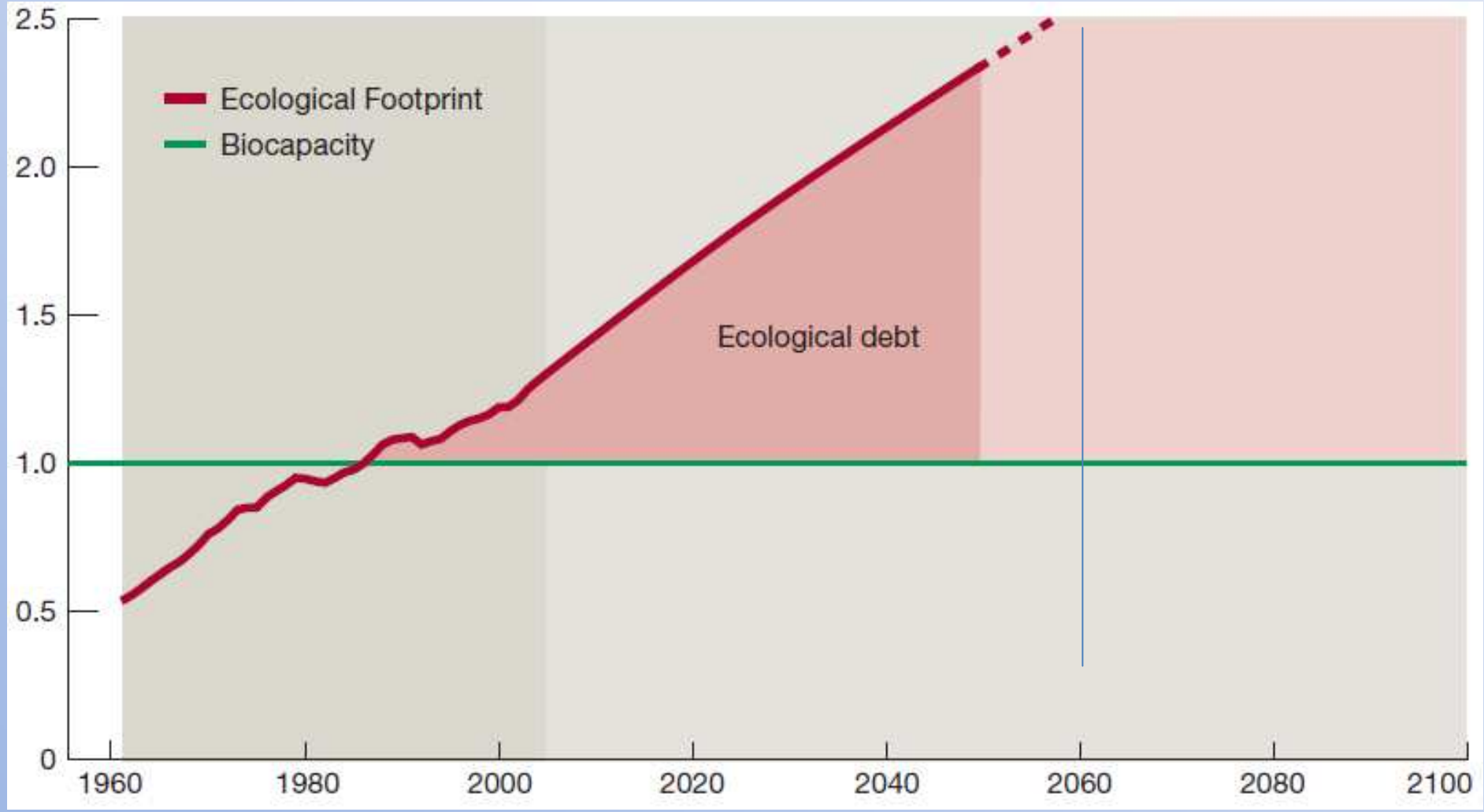
1. Economic growth is degrading natural resources
2. Population growth and consumerism
3. Land use change, urbanization, slum development
4. Industrial agriculture, chemical fertilizers and pesticides
5. Fossil energy, greenhouse gases and global warming
6. Overexploitation of fishery
7. Hunting and species extinction
8. Marine, water, air and soil pollution
9. Freshwater overuse
10. Resource efficiency is not enough
11. Outcome: Ecological footprint and biodebt with habitat loss, invasive species, overexploitation of resources, climate change, disasters, and tipping points

4. Global Environmental Change

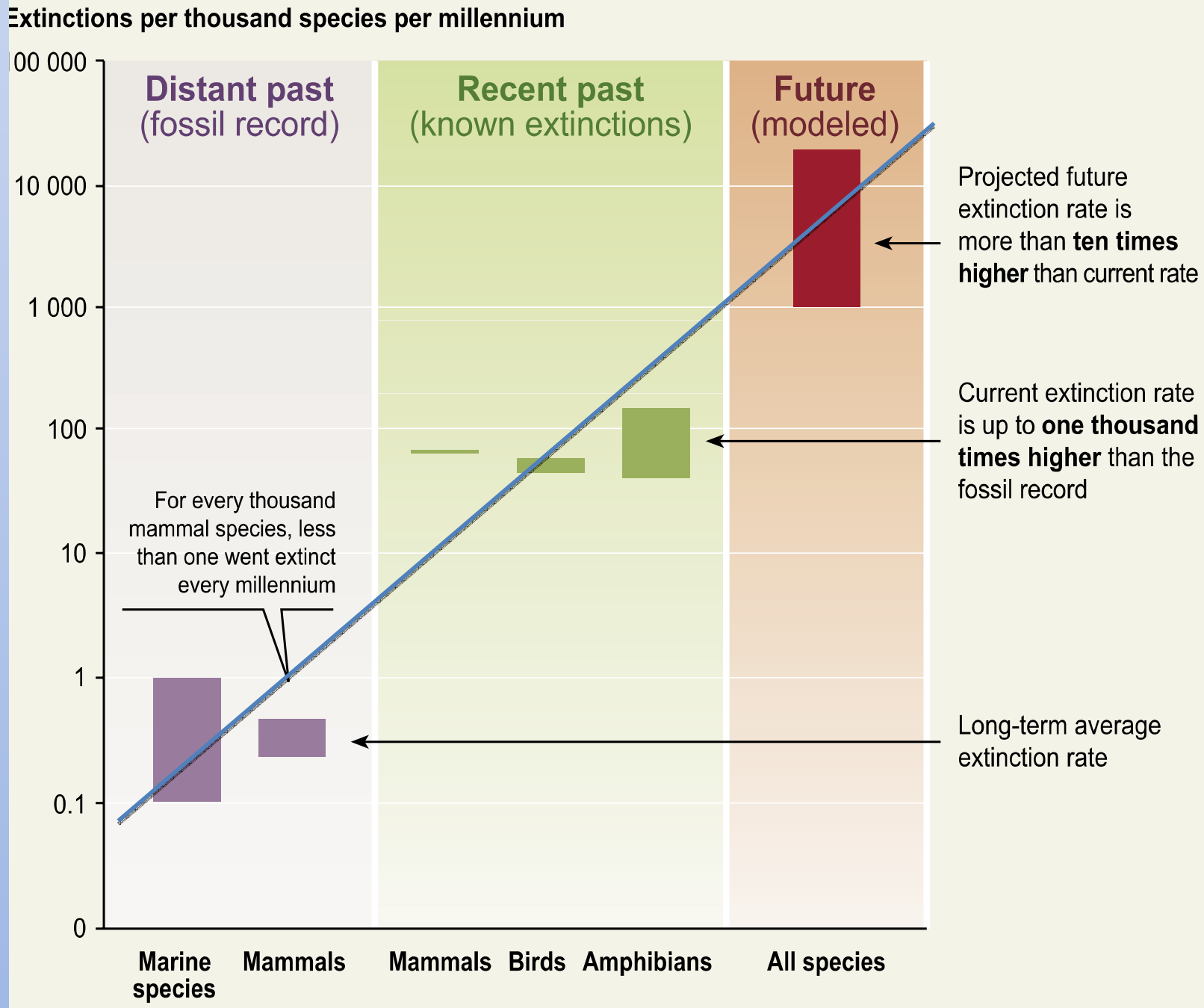


Source: MA (2005)

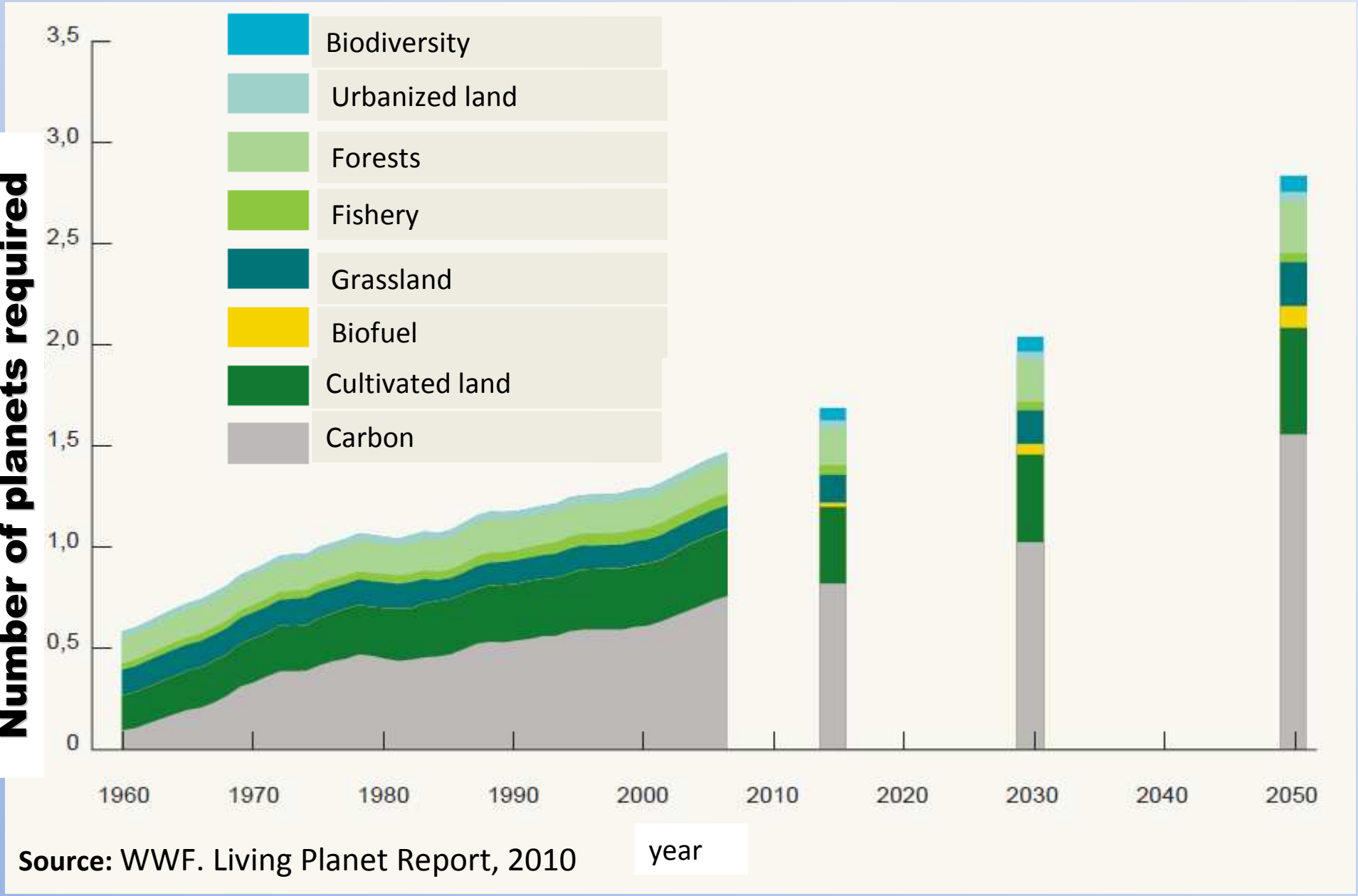
5. Ecological Footprint: with present consumerism in 2060 we require 2.5 planets



http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/

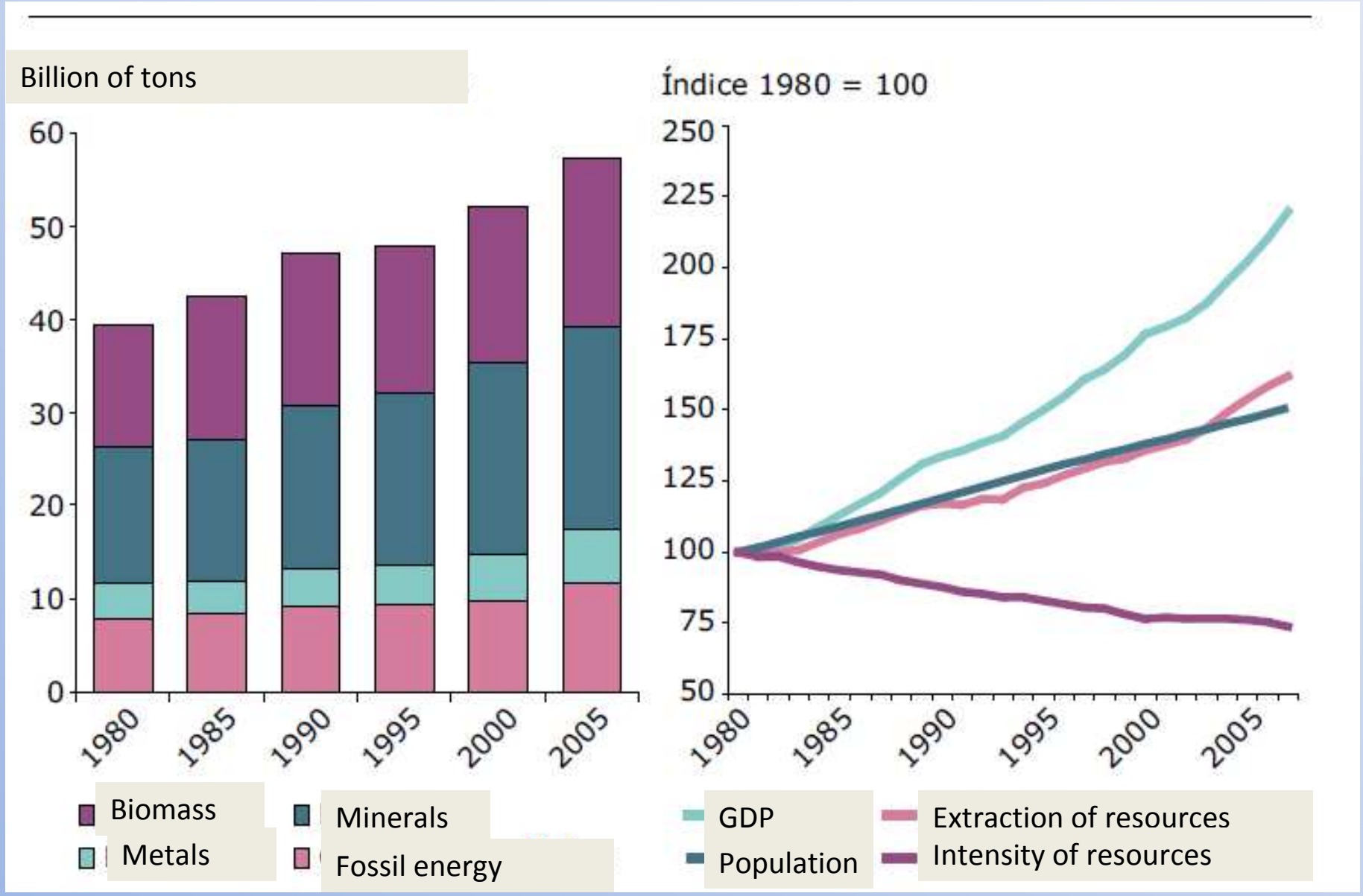

Extinctions per thousand species per millennium
00 000
10 000
1 000
100
10
1
0.1
0
Distant past
(fossil record)
Recent past
(known extinctions)
Future
(modeled)
Projected future extinction rate is more than ten times higher than current rate
Current extinction rate is up to one thousand times higher than the fossil record
For every thousand mammal species, less than one went extinct every millennium
Long-term average extinction rate
Marine species
Mammals
Mammals
Birds
Amphibians
All species
Source: Millennium Ecosystem Assessment

Projections of anthropogenic impacts on the planet



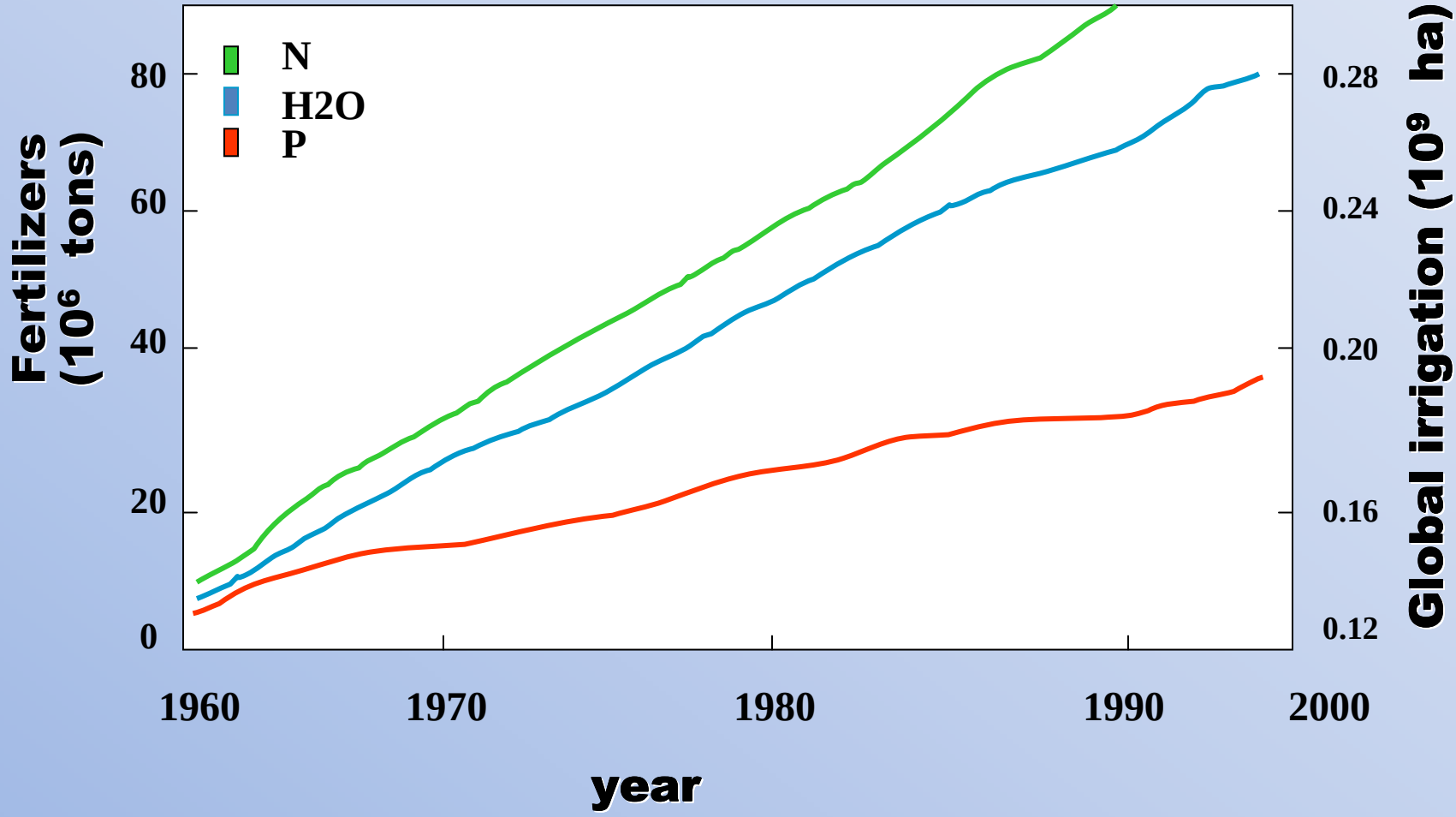
Source: WWF. Living Planet Report, 2010

Extraction of natural resources, ecosystems and mining between 1980 y 2005/2007



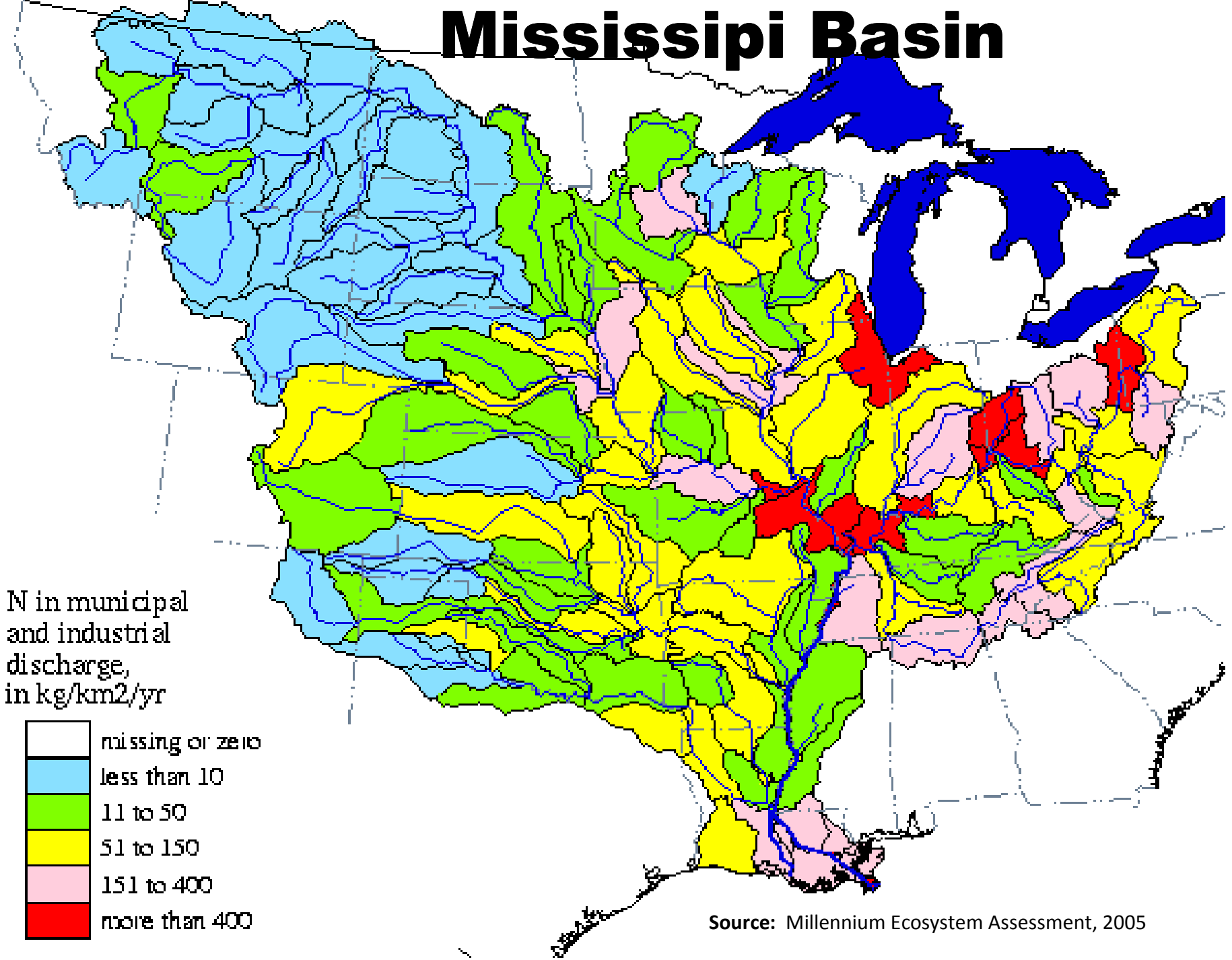
SERI Global Material Flow Database, 2010

Global Use of Water and Fertilizers (H2O, N, P)



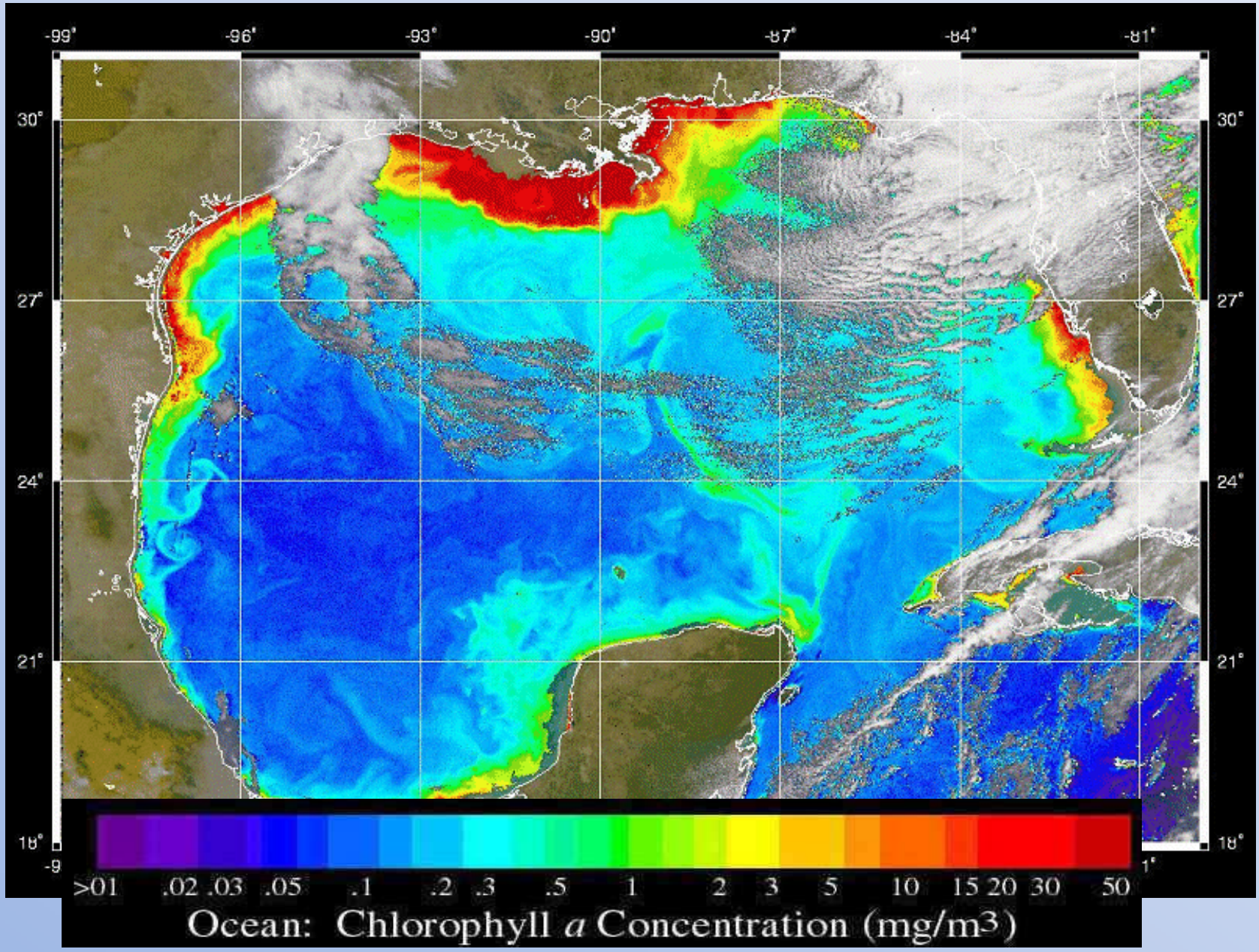
Tilman et al. (2001)

Mississipi Basin



Source: Millennium Ecosystem Assessment, 2005

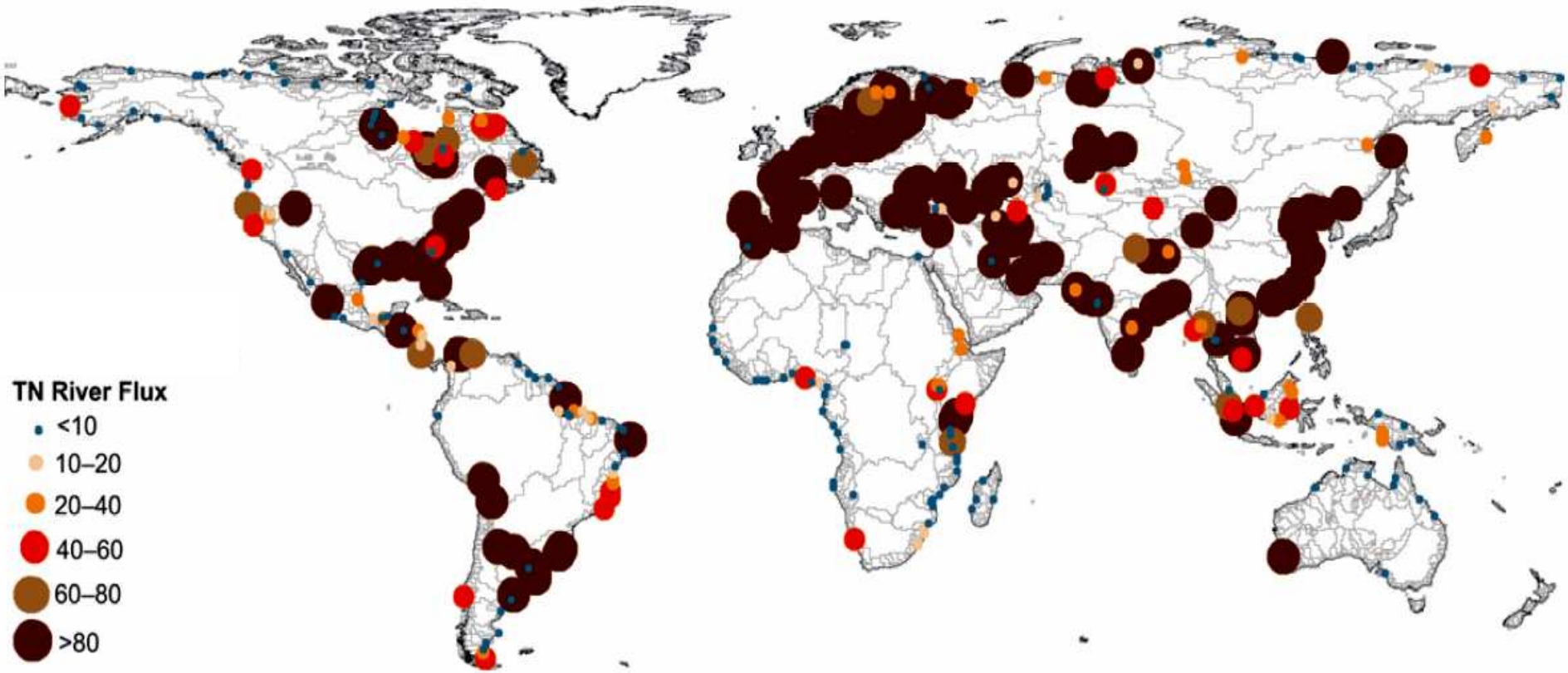
“Dead zone” in the Gulf of Mexico (23 Feb 1998)



Source: Millennium Ecosystem Assessment, 2005

Eutrophication—percent increase in nitrogen flows in rivers since mid 1990's

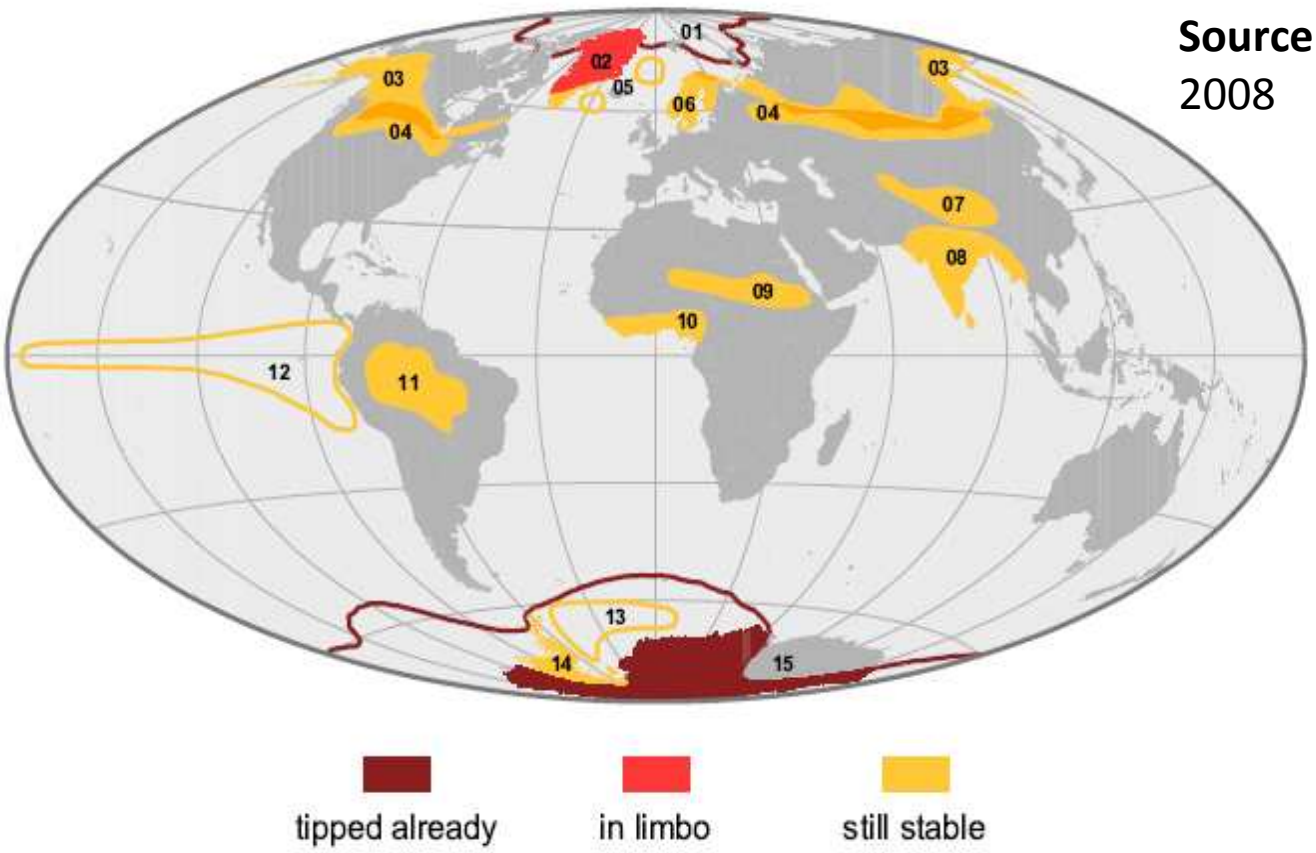
Dead zones



Source: Millennium Ecosystem Assessment, 2005

6. (Potential) anthropogenic tipping points in earth system

Source: Schellnhuber, 2008



01 Arctic Sea Ice Loss

02 Greenland Ice Sheet

03 Thawing Permafrost / Methan Escape

04 Boreal Forest Dieback

05 Suppression of Atlantic Deep Water Formation

06 Climatic Change-Induced Ozon Hole over Northern Europe

07 Albedo Tibetan Plateau

08 Indian Monsoon

09 Re-Greening Sahara / Sealing of Dust Sources

10 West African Monsoon

11 Dieback of Amazon Rainforest

12 Southern Pacific Climate Oscillation

13 Antarctic Deep Water Formation / Nutrients Upwelling

14 Westantarctic Ice Sheet

15 Antarctic Ozone Hole

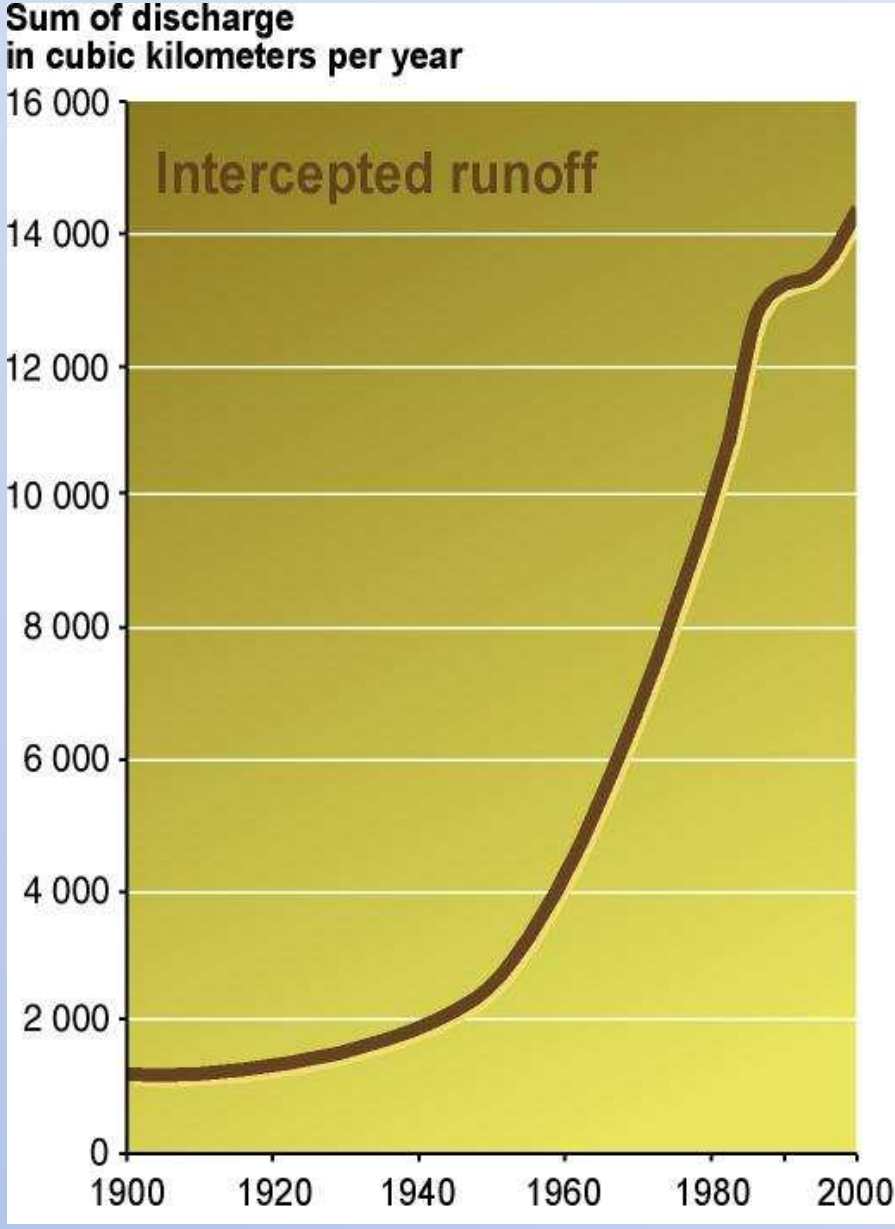
7. Unprecedented changes in Ecosystems

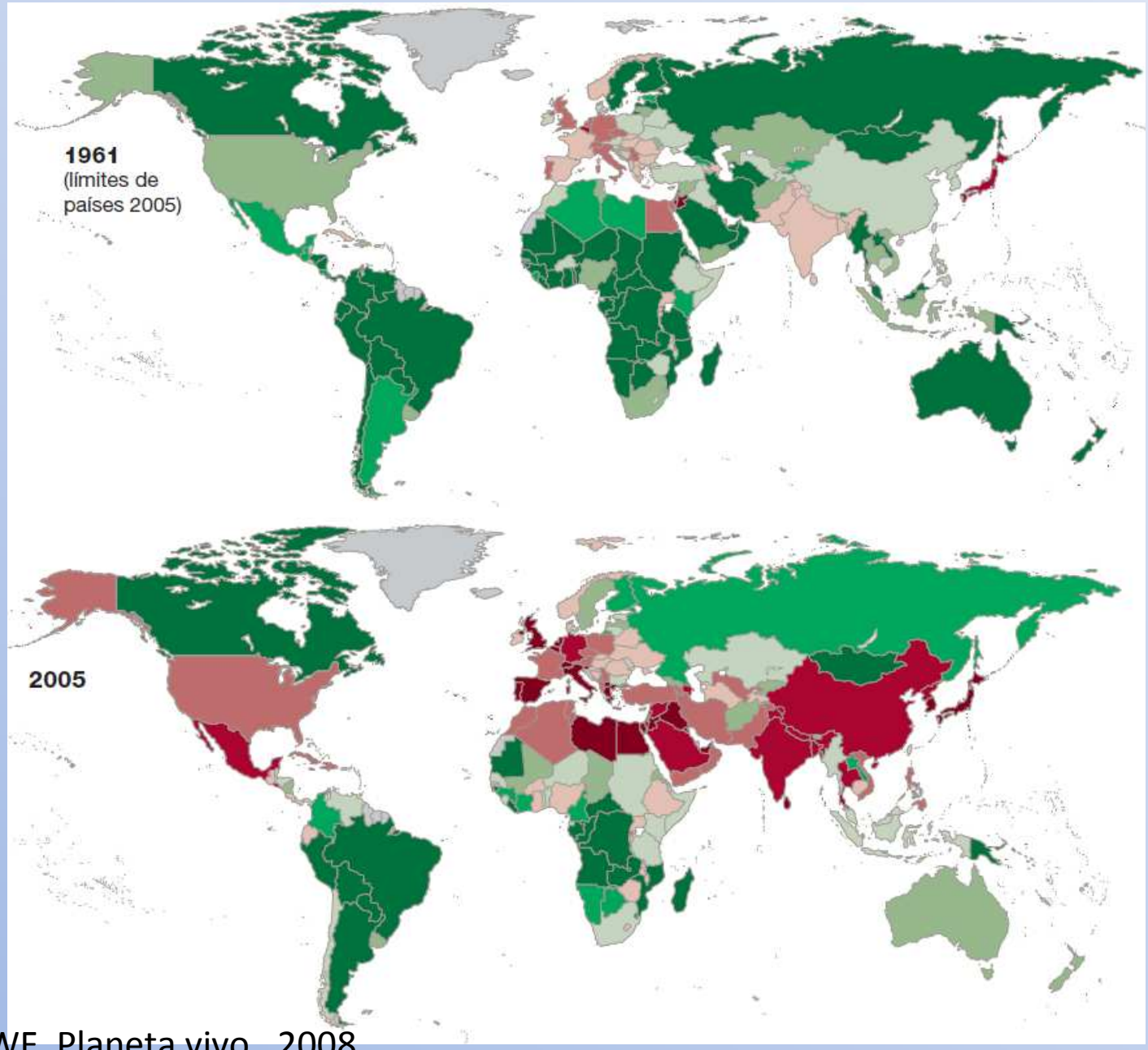
- 20% of the world's coral reefs were lost and 20% degraded in the last several decades
- 35% of mangrove area has been lost in the last several decades
- Amount of water in reservoirs quadrupled since 1960
- Withdrawals from rivers and lakes doubled since 1960; most water use (70% worldwide) is for agriculture.

Intercepted Continental Runoff:
3-6 times as much water in reservoirs as in natural rivers

(Data from a subset of large reservoirs totaling ~65% of the global total storage)

Source: MA (2005)

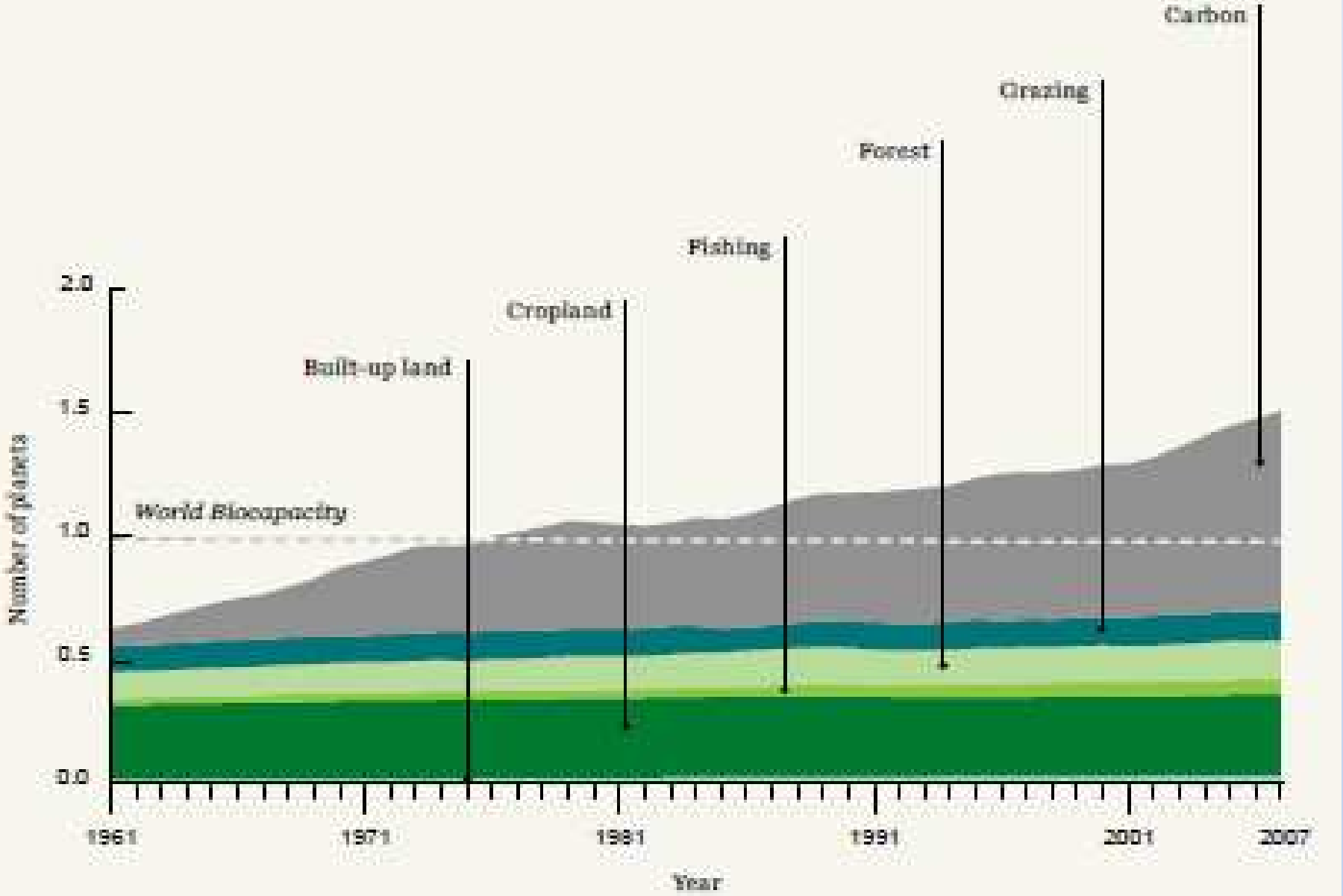




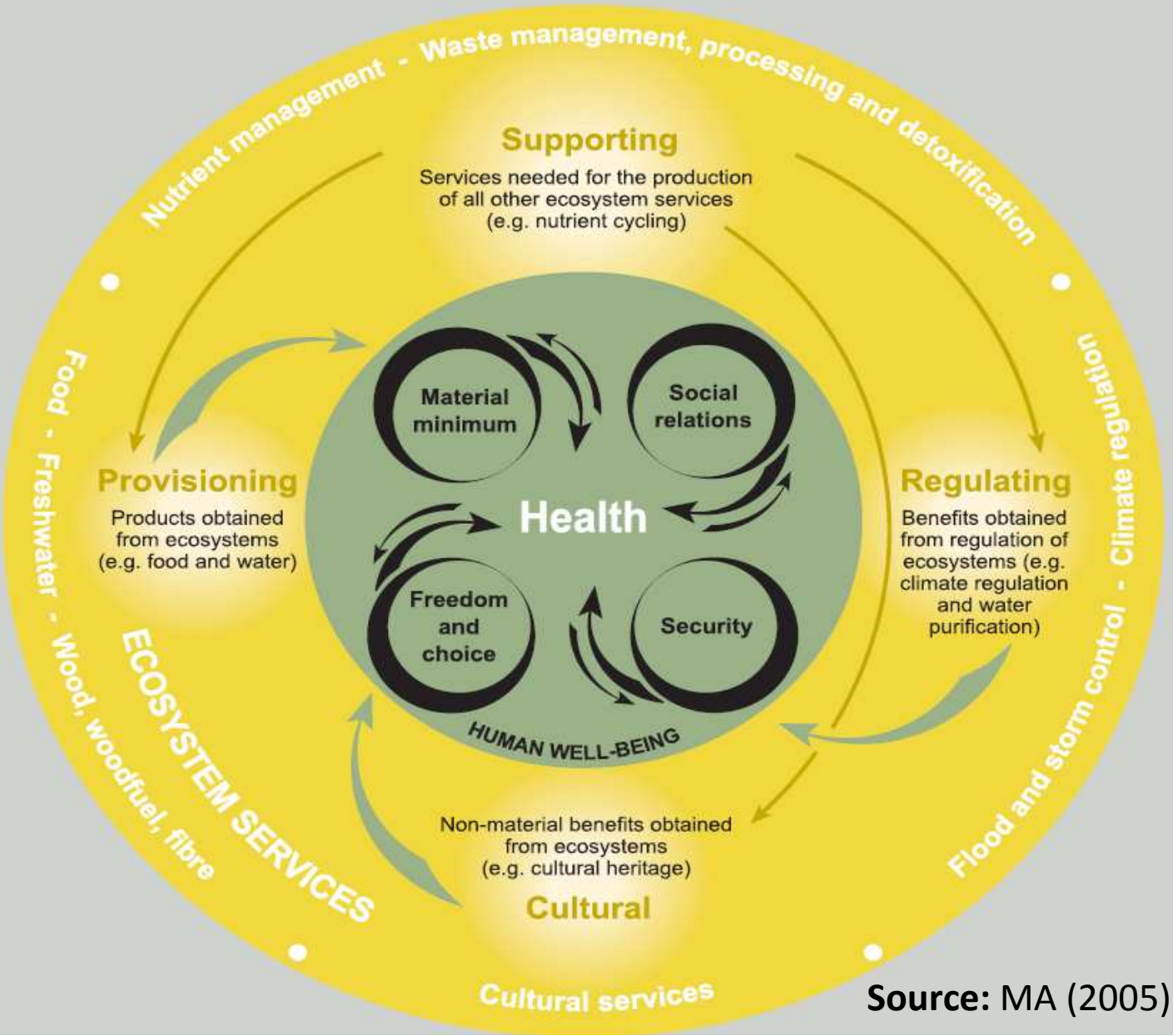
Source: WWF. Planeta vivo, 2008
http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/

Impacts of humans on resources

http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/2010: 35



Ecosystem services in danger



Source: MA (2005)

8. Elements of the FSRevolution

1. A 'Fourth Sustainability Revolution' is a **cultural change**, a **new cosmovision**, where worldview and mindset promote a **post-carbon & dematerialized society**.
2. ***Worldview*** refers to a world perception, ideas and beliefs (neoliberalism, realism, pragmatism, idealism) through which people interpret and interacts with the world.
3. ***Mindset*** includes fixed mental attitudes or 'cultural lenses' (Washington Consensus, business-as-usual, market first) pre-determining person's or group's responses to interpretations of situations by referring to different patterns of perceiving and reasoning.
4. ***Governance:*** includes "the complex of formal and informal institutions, mechanisms, relationships, and processes between and among states, markets, citizens and organizations, both inter- and non-governmental, through which collective interests on the global plane are articulated, rights and obligations are established, and differences are mediated". (Weiss and Thakur, 2010)

- Transformation from the dominant vision of business-as-usual towards a **sustainable vision in a multilateral cooperative** world.
- **Solidarity, equity, social justice and energy efficiency** are key drivers.
- Instead of maximization of profits and overexploitation of natural resources the **next generations** and the consolidation of **ecosystem services** are in the centre.
- Climate change poses primarily challenges for **human and international security** that can only be overcome by human ingenuity and change of Cosmovision. However, COP 15 & 16 have shown that **key mental, economic and political obstacles** must be overthrown to prevent security dangers often triggering violent conflicts on scarce and polluted resources.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