Millennium Ecosystem Assessment

State of Ecosystem Services:

Findings of the Millennium Ecosystem Assessment

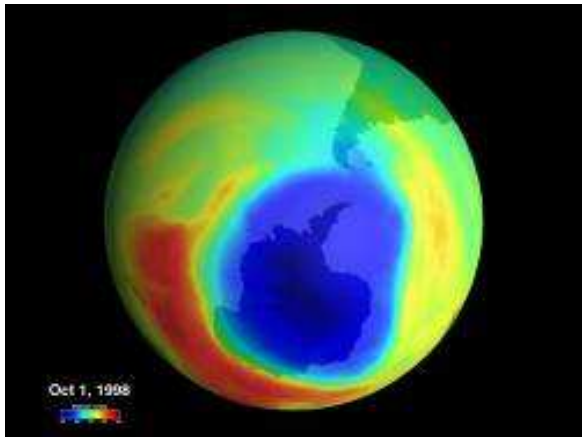
Walter Reid
Director, Millennium Ecosystem Assessment
Director, Conservation and Science Program, The Packard Foundation

Millennium Ecosystem Assessment

Why the MA?

Scientific information concerning biodiversity and ecosystems has not been an effective 'driver' of policy change

Why the MA?



Ozone Assessment

Intergovernmental Panel on Climate Change (IPCC)

Millennium Ecosystem Assessment

What is the Millennium Ecosystem Assessment?





- **Largest assessment ever undertaken of the health of ecosystems**
  - Prepared by 1360 experts from 95 countries; extensive peer review
  - Consensus of the world's scientists
- **Designed to meet needs of decision-makers among government, business, civil society**
  - Information requested through 4 international conventions

Millennium Ecosystem Assessment

What was unique?

Ecosystem services

Provisioning

Goo or

Regulating

Benefit

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Cultural

Non

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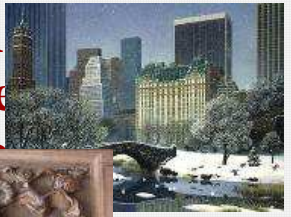

Supporting

Services ne for other ervices

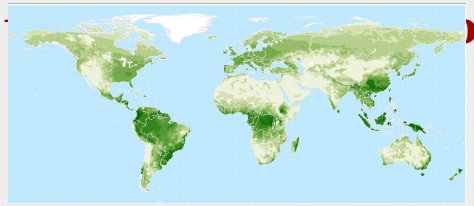

Photo credits (left to right, top to bottom): Purdue University, WomenAid.org, LSUP, NASA, unknown, CEH Wallingford, unknown, W. Reid, Staffan Widstrand, E.A. Fitzpatrick, University of Wisconsin

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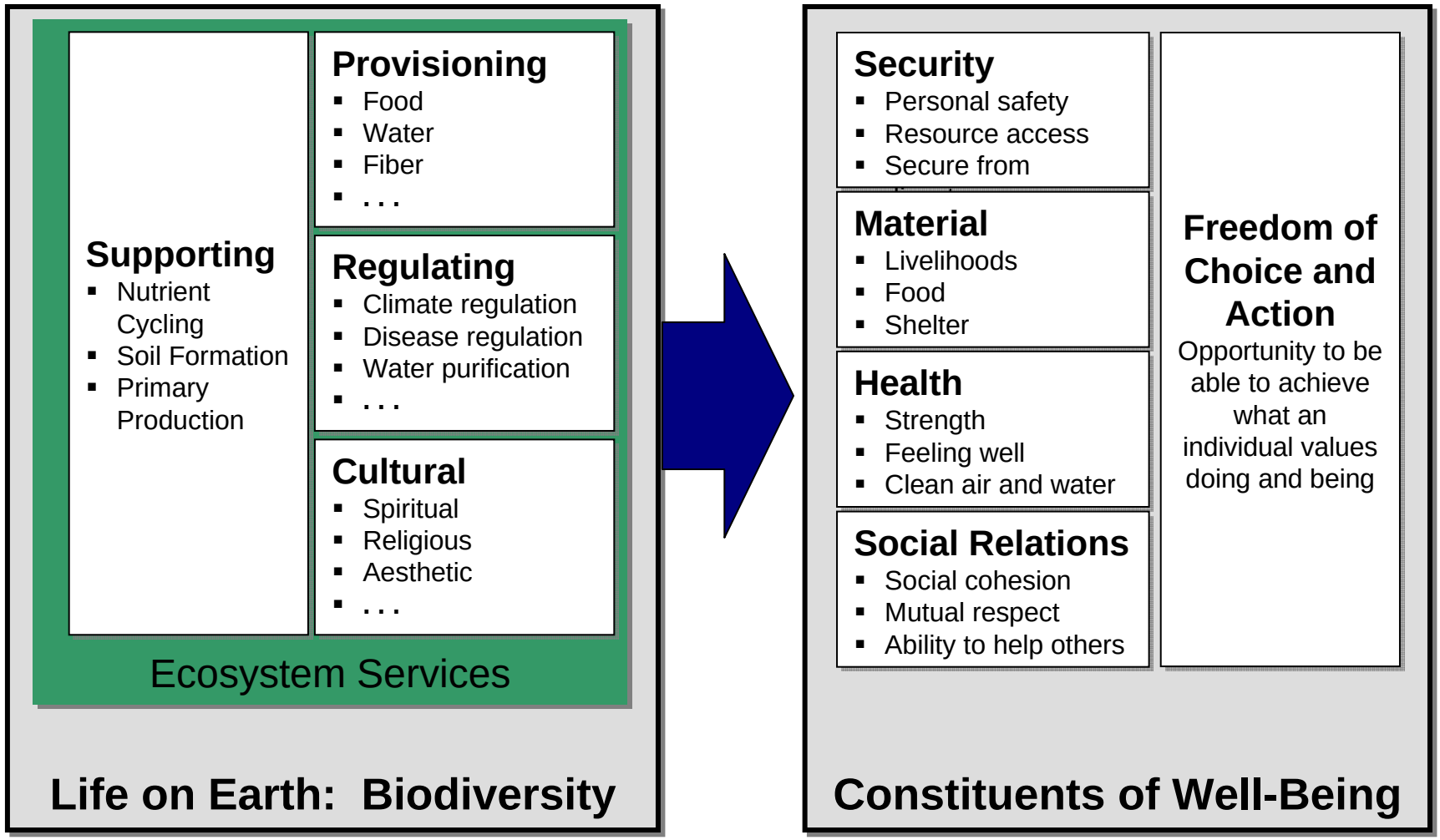
What was unique?

Consequences for People



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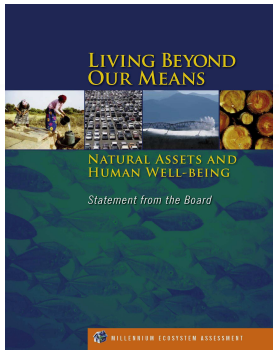
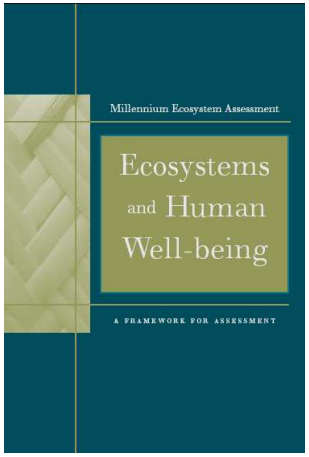
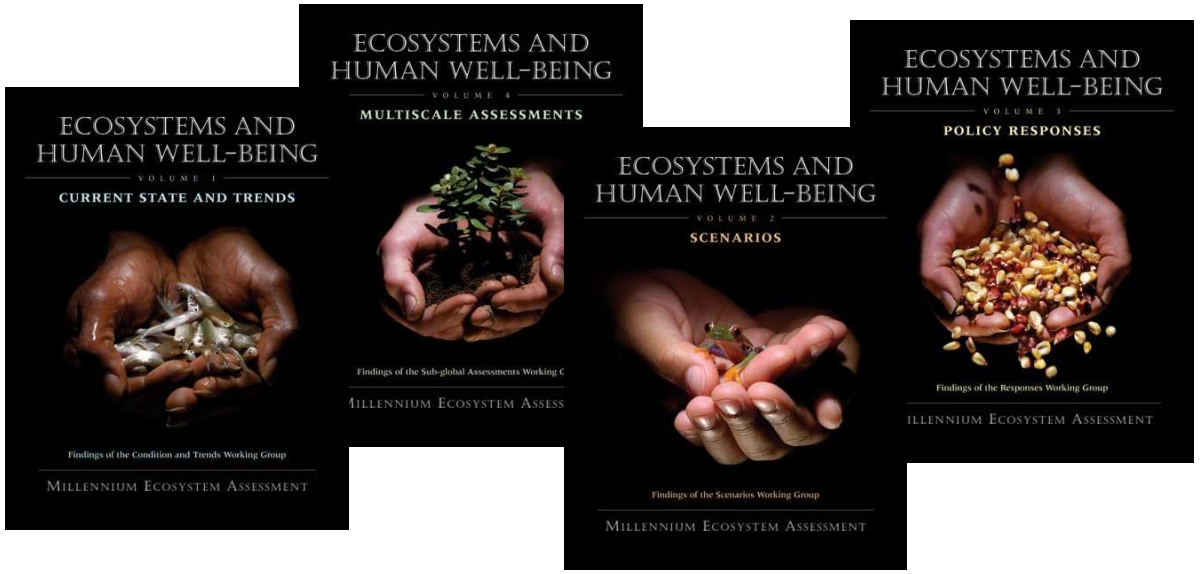
Synthesis Reports



Board Statement



MA Conceptual Framework

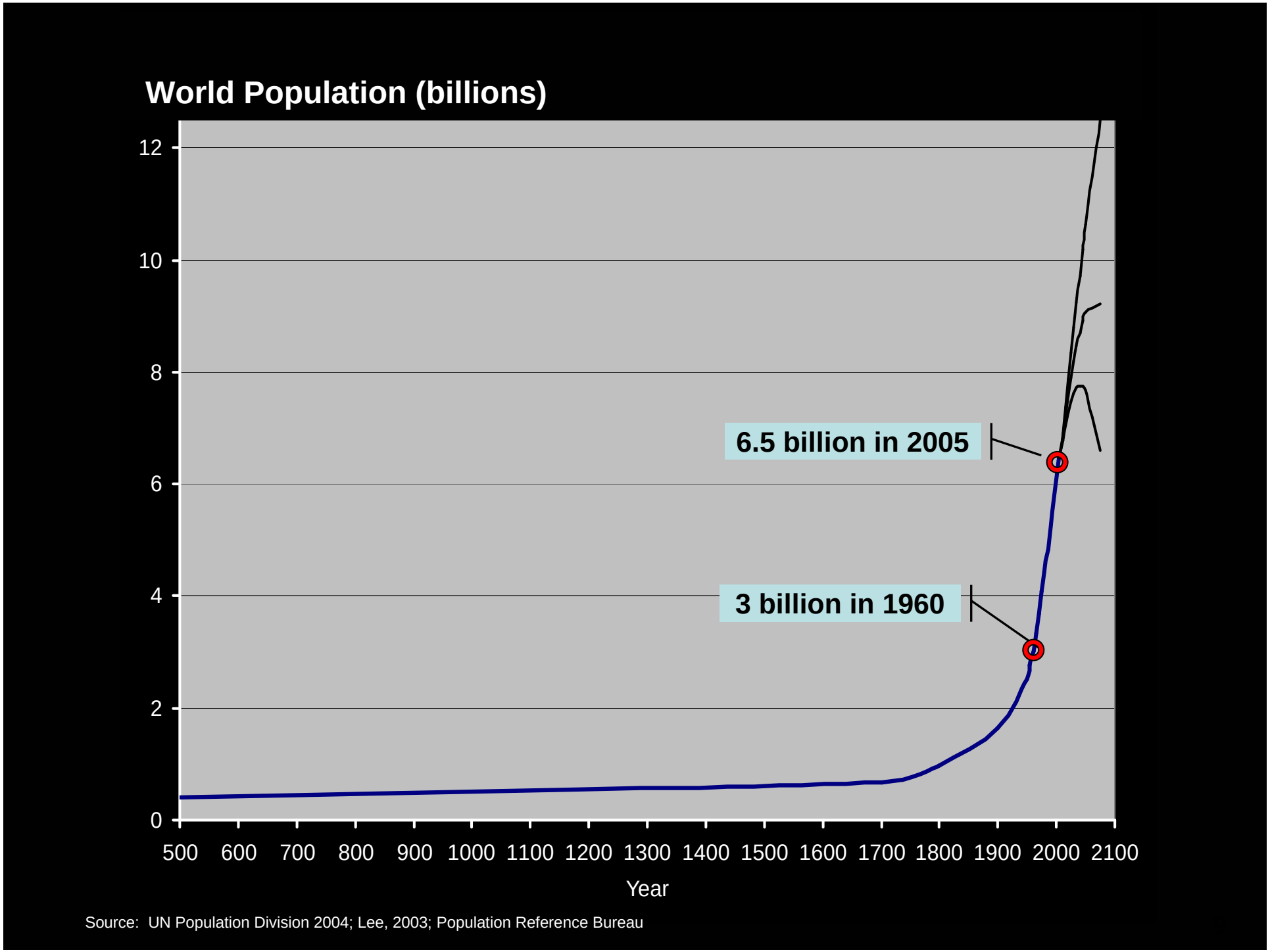


Technical Assessment Volumes

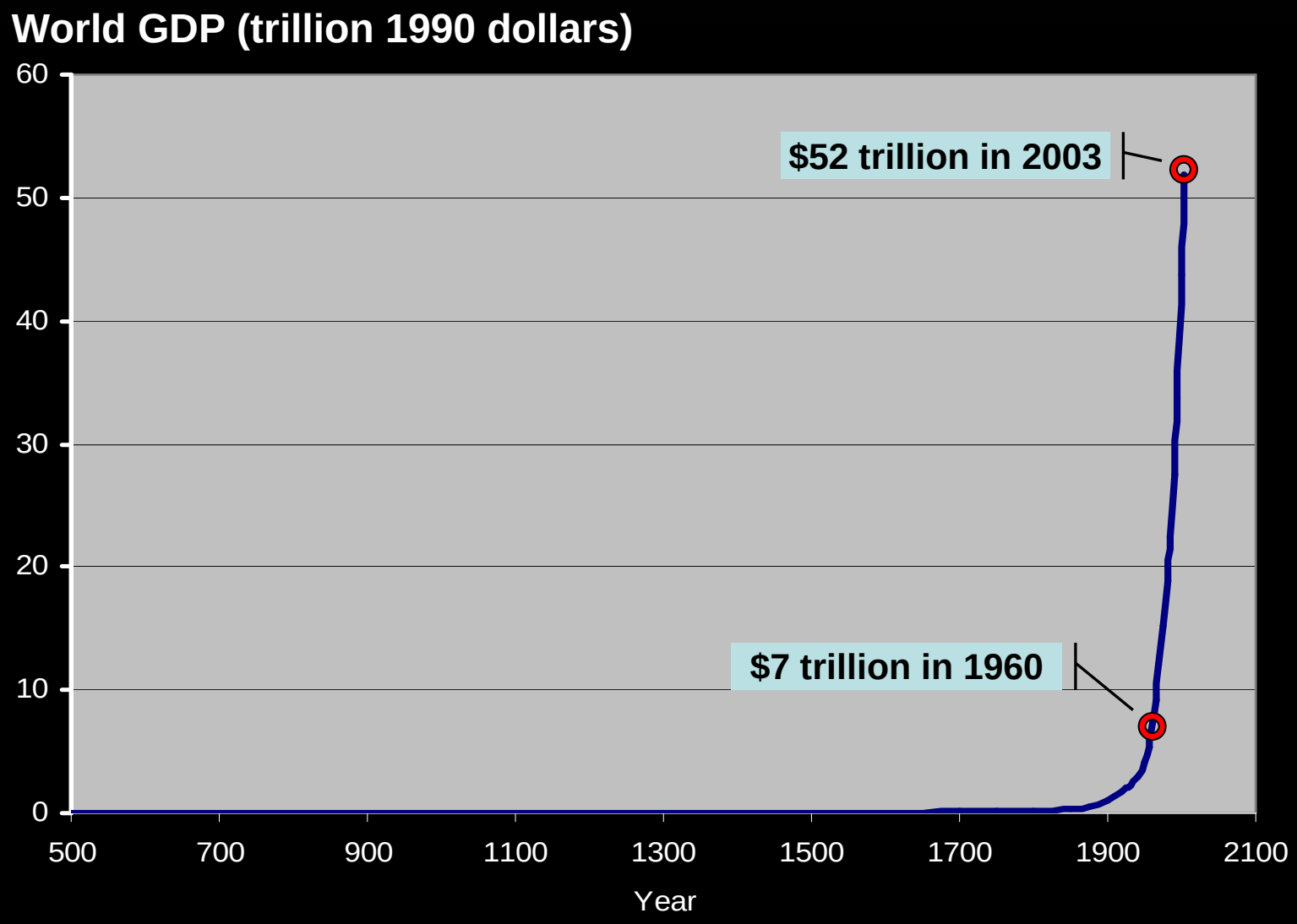
Millennium Ecosystem Assessment

Main Findings

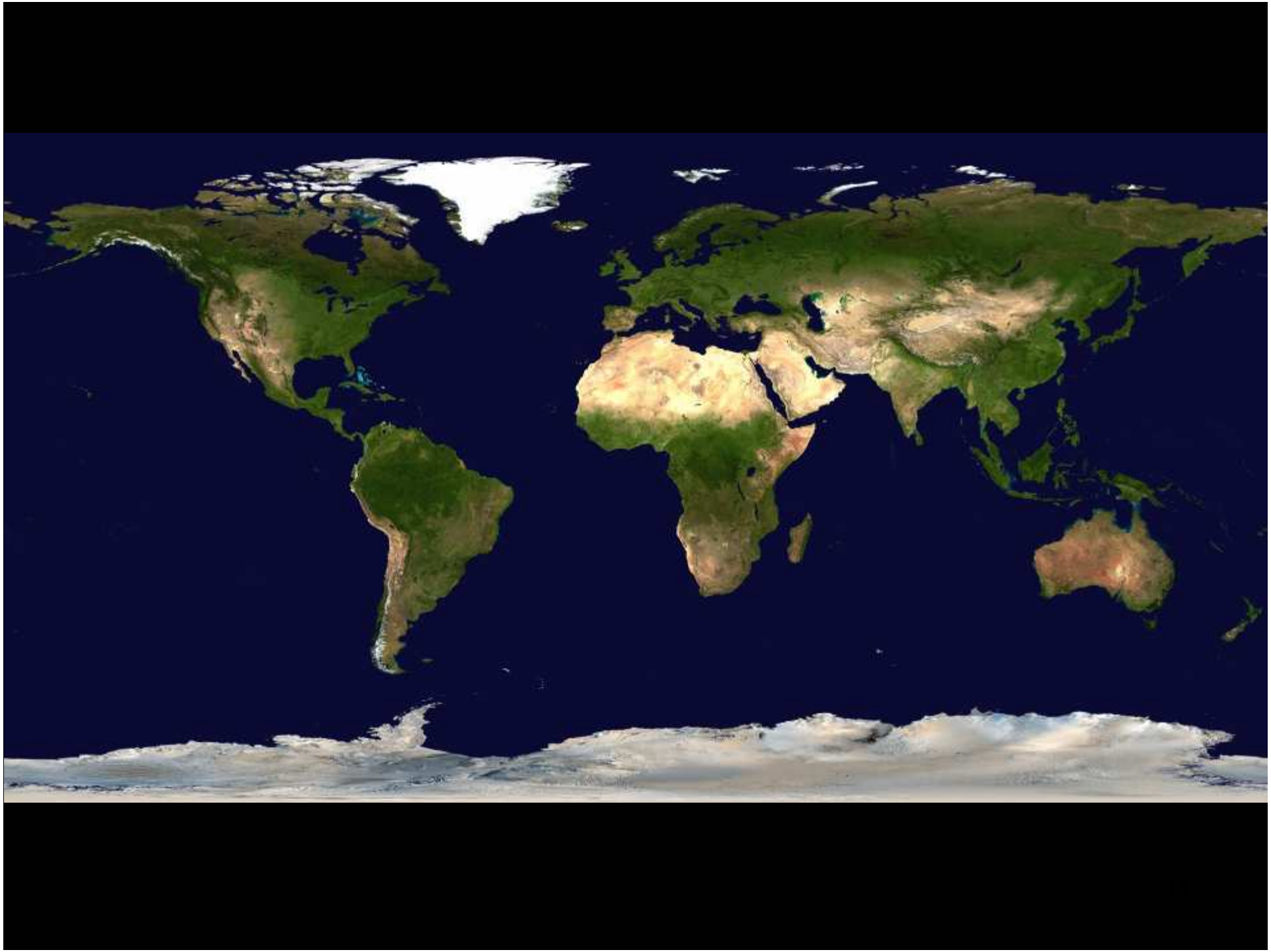
1. **Humans have radically altered ecosystems in last 50 years.**

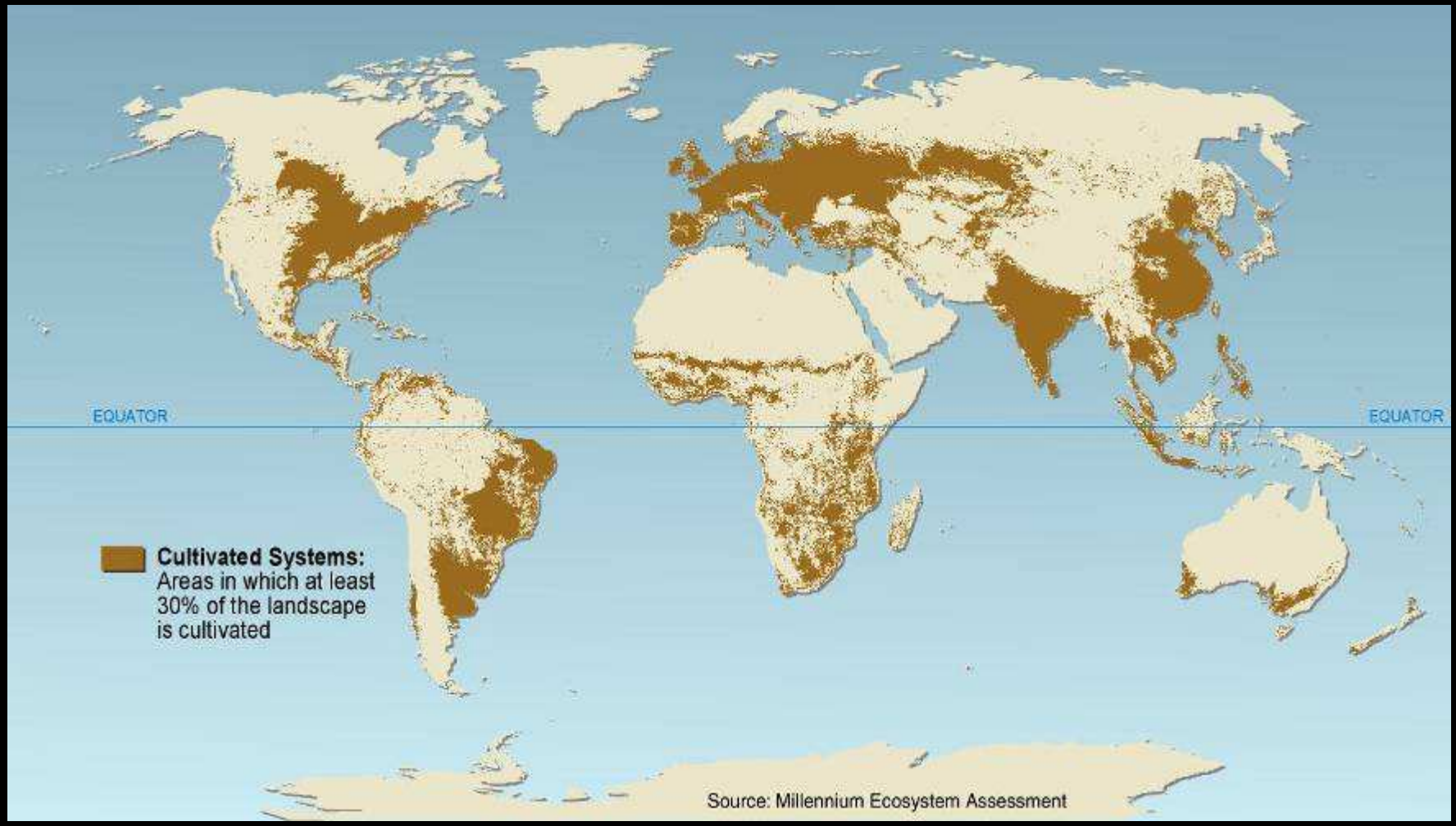


Source: UN Population Division 2004; Lee, 2003; Population Reference Bureau

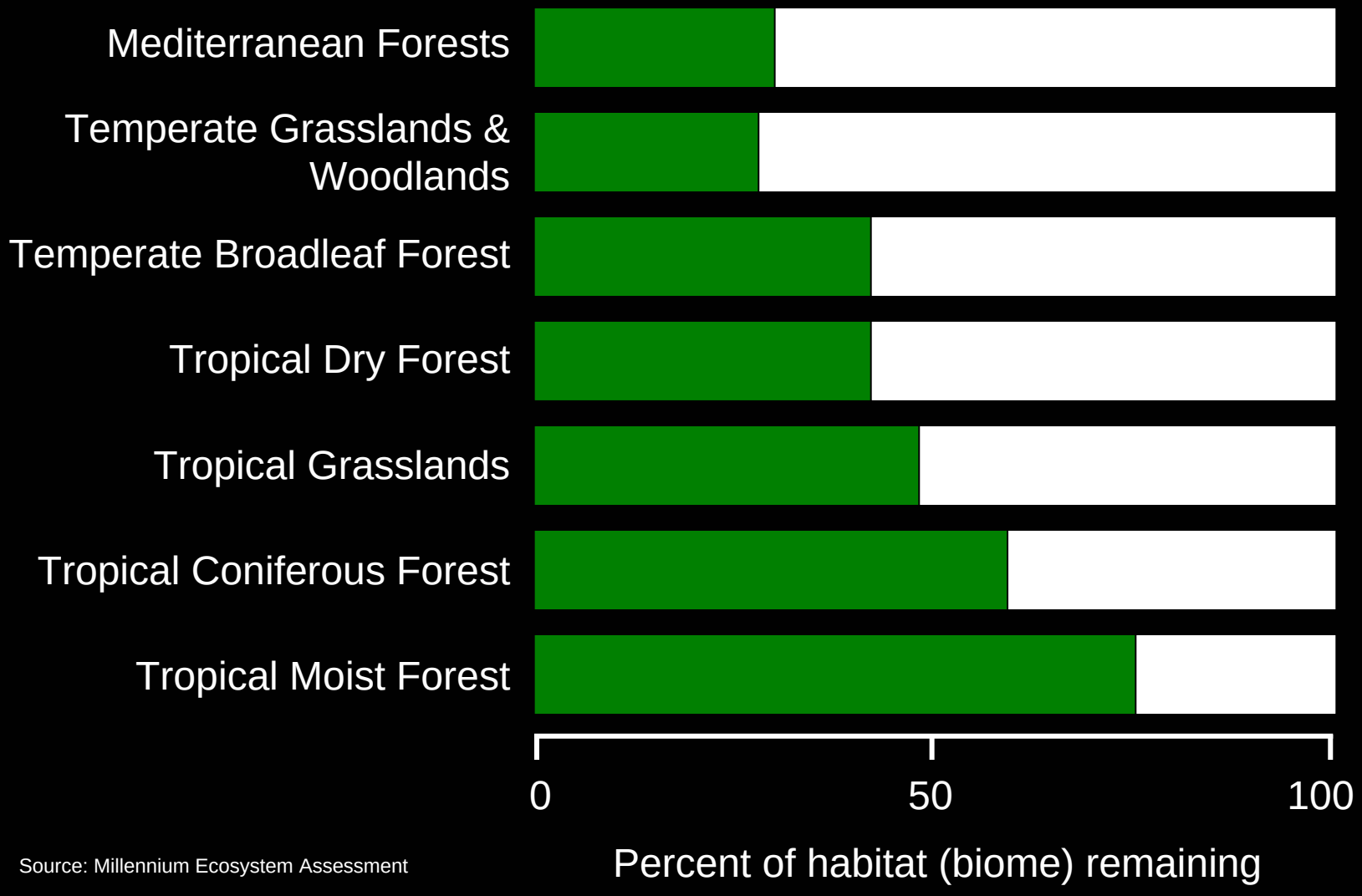


Source: DeLong 1998

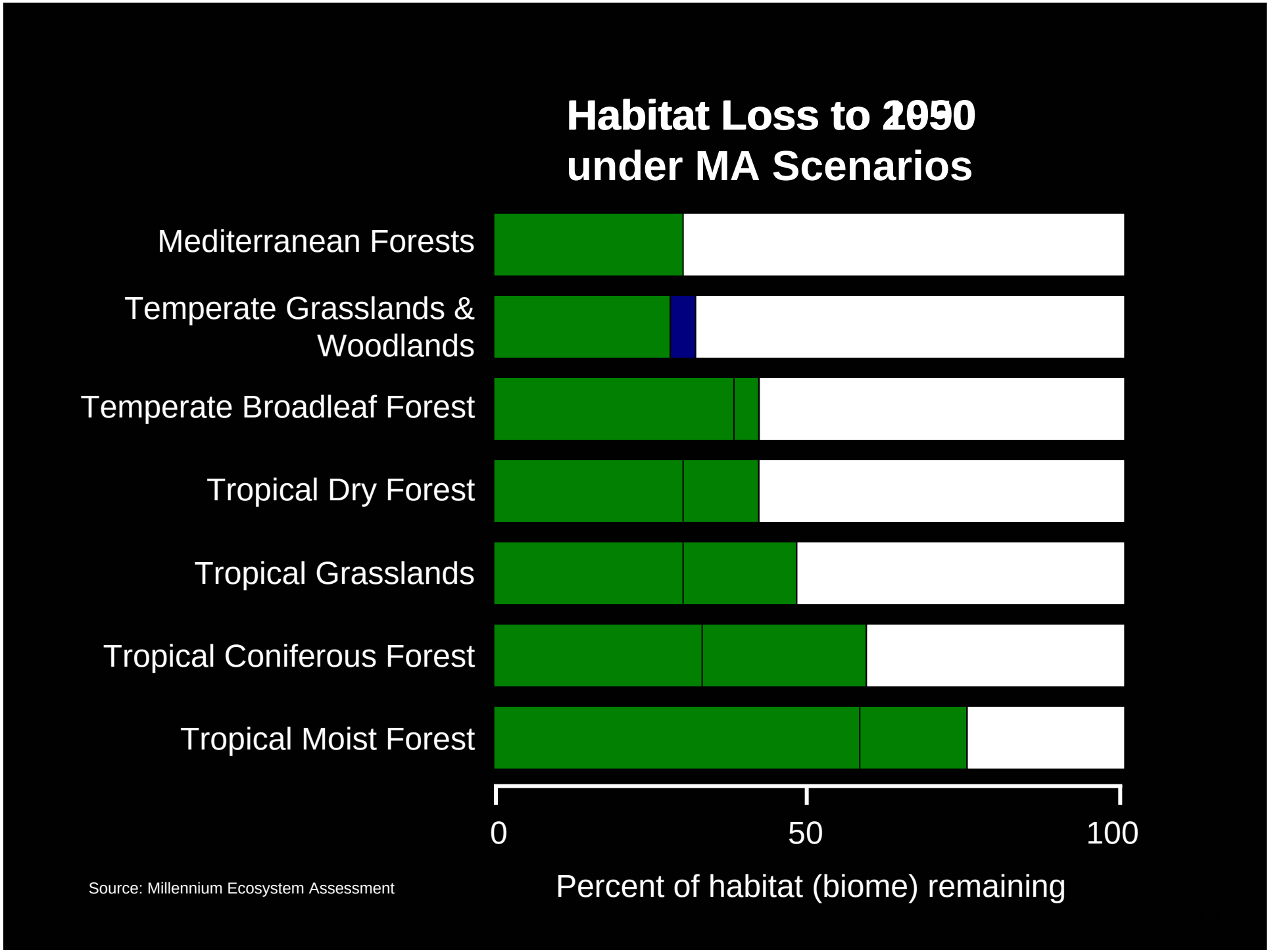


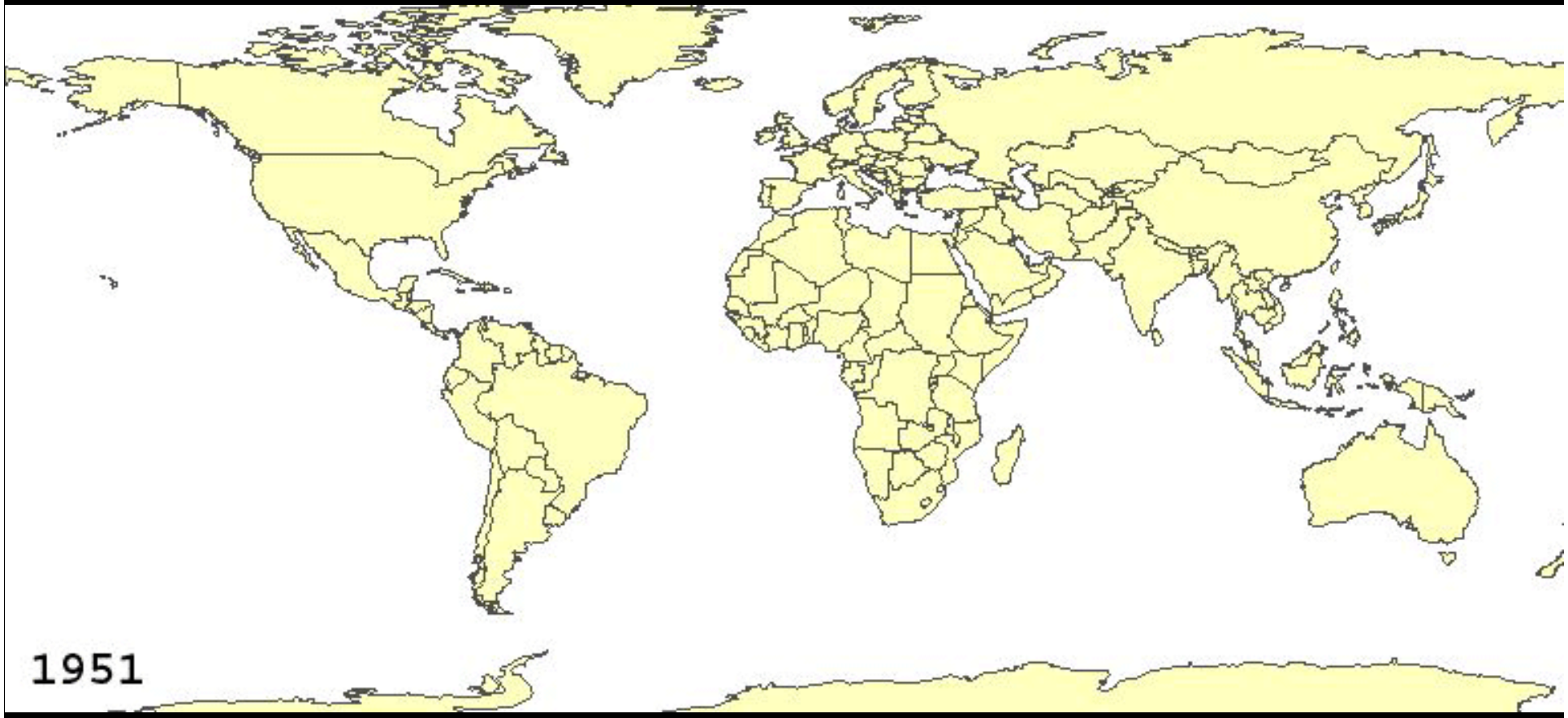

EQUATOR
EQUATOR
Cultivated Systems:
Areas in which at least
30% of the landscape
is cultivated
Source: Millennium Ecosystem Assessment

Habitat Loss to 1990



Source: Millennium Ecosystem Assessment


Habitat Loss to 2050
under MA Scenarios
Mediterranean Forests
Temperate Grasslands & Woodlands
Temperate Broadleaf Forest
Tropical Dry Forest
Tropical Grasslands
Tropical Coniferous Forest
Tropical Moist Forest
0
50
100
Percent of habitat (biome) remaining
Source: Millennium Ecosystem Assessment



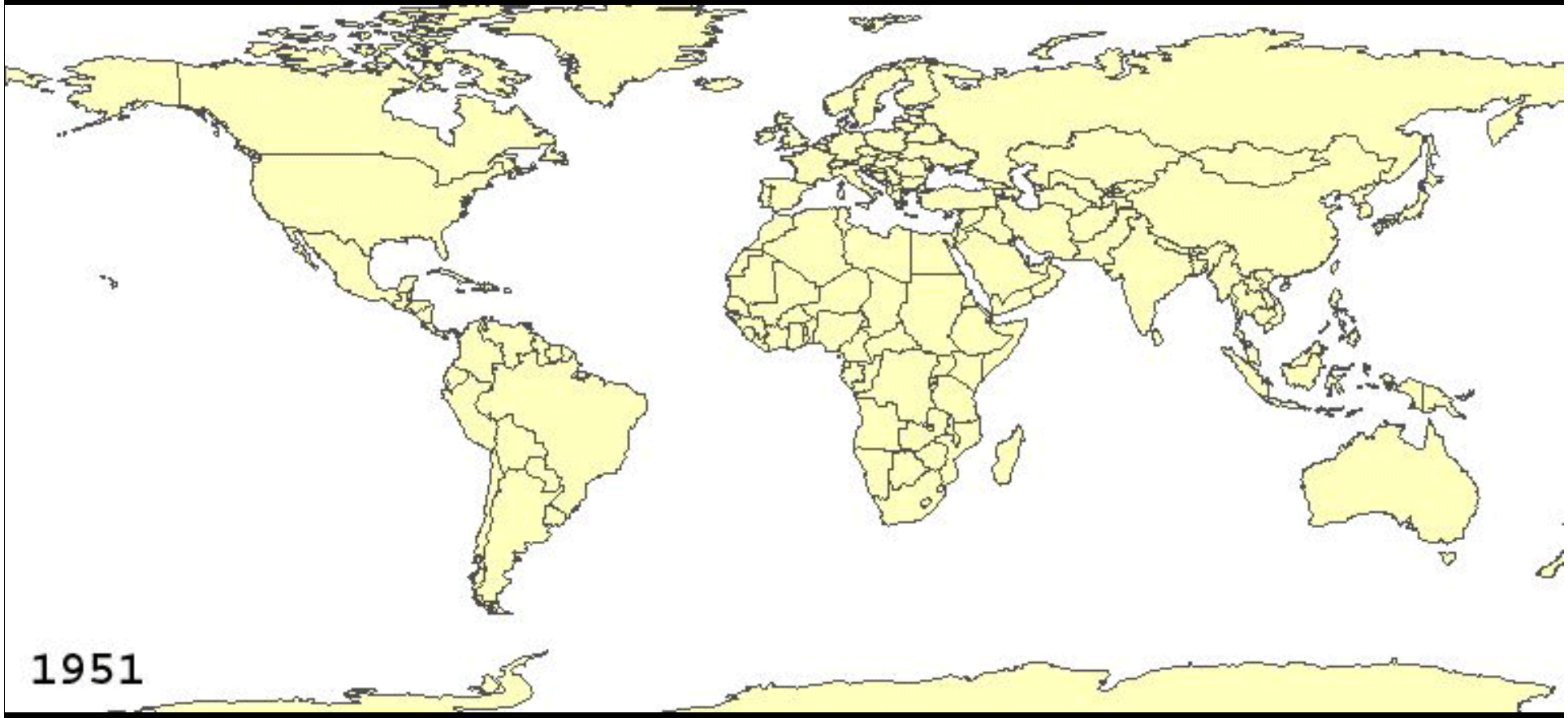
Year of Peak Fish Harvest

Pre-peak

Harvest peak

Post-peak

Source: Millennium Ecosystem Assessment and Sea Around Us project



Year of Peak Fish Harvest

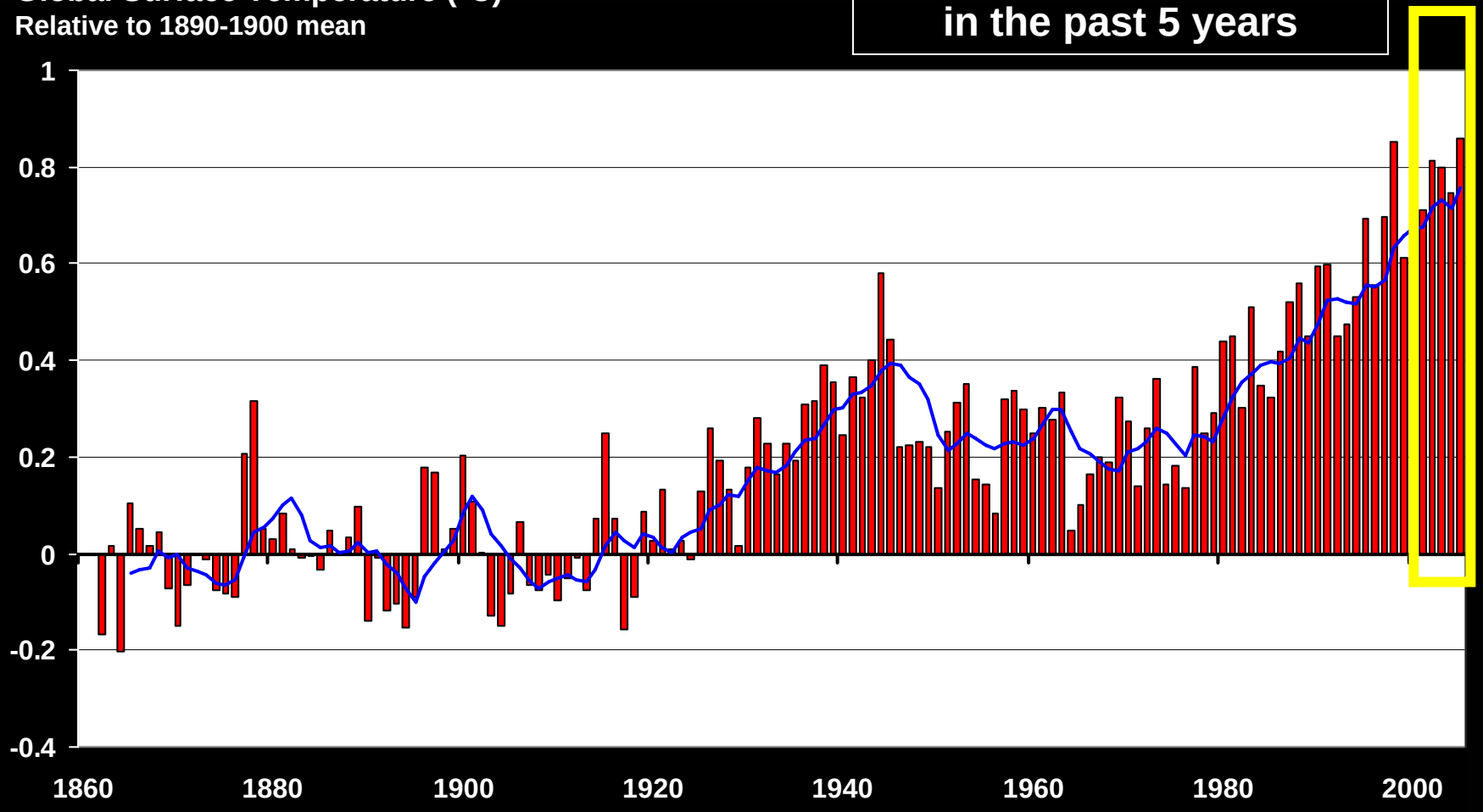
Pre-peak

Harvest peak

Post-peak

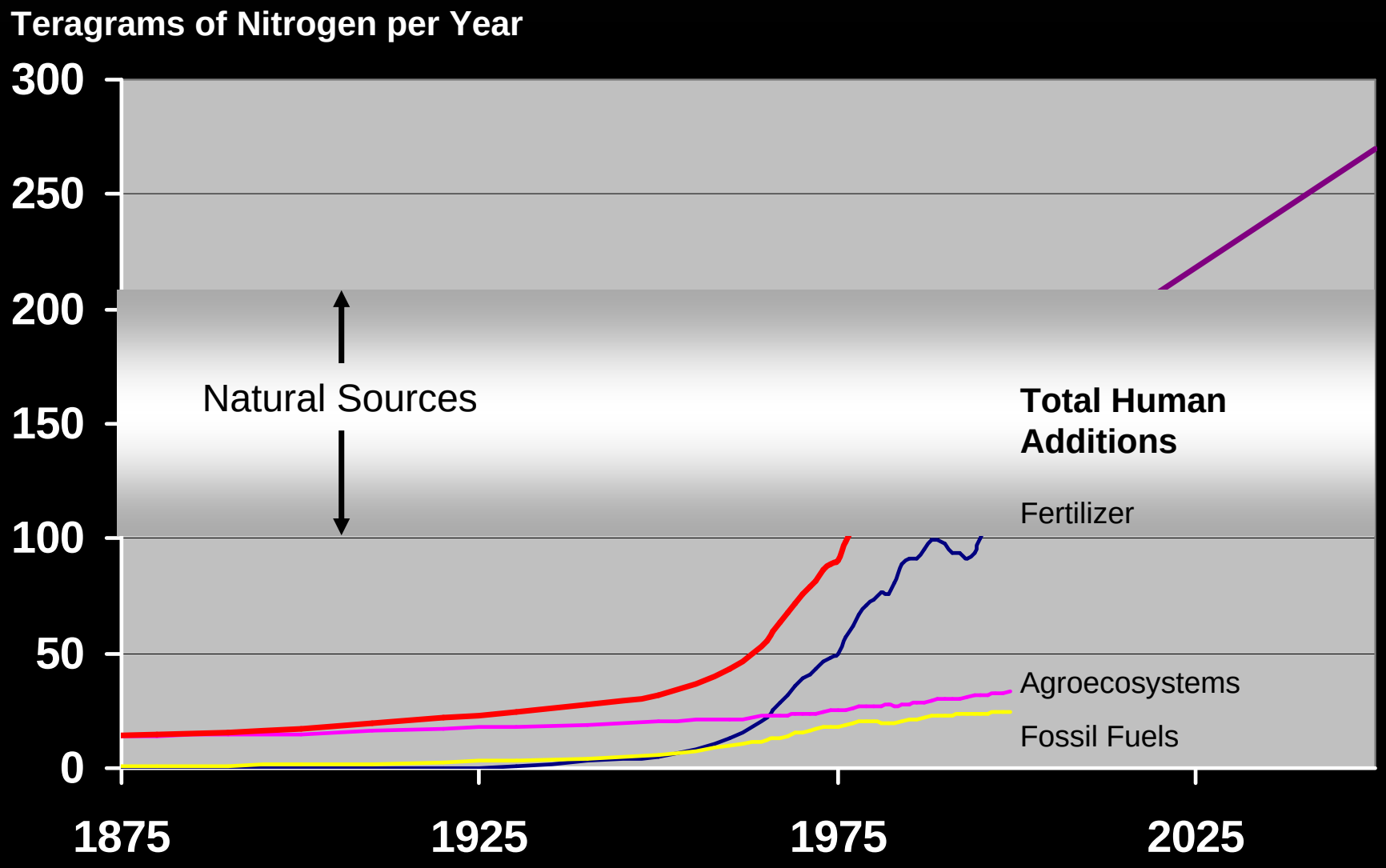
Source: Millennium Ecosystem Assessment and Sea Around Us project

5 of the 6 warmest years on record have occurred in the past 5 years



Source: Hadley Centre for Climate Prediction and Research

Nutrient Loading



Source: Millennium Ecosystem Assessment

Millennium Ecosystem Assessment

Main Findings

1. Humans have radically altered ecosystems in last 50 years.
2. **Changes have brought gains but at growing costs that threaten achievement of development goals.**
   - Degradation of 60% of ecosystem services

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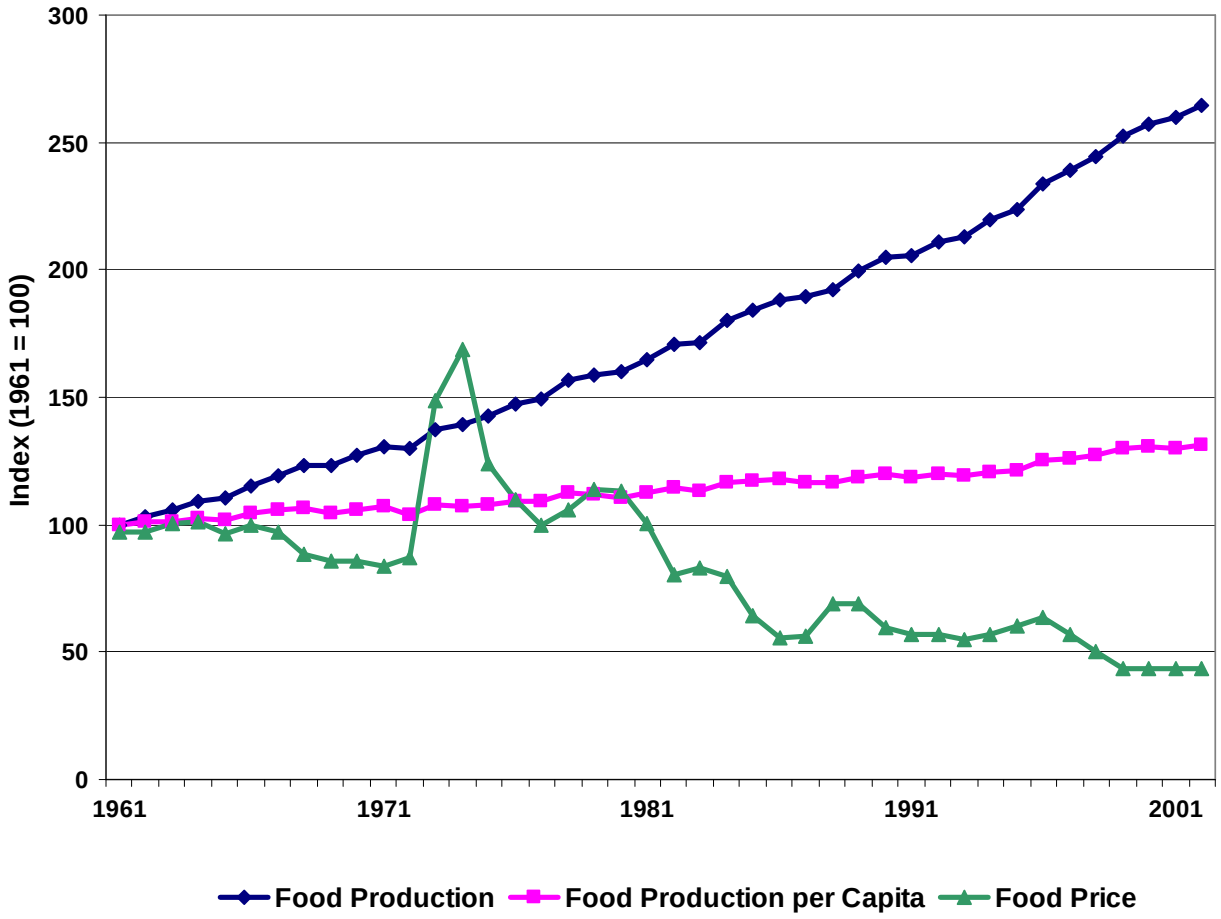
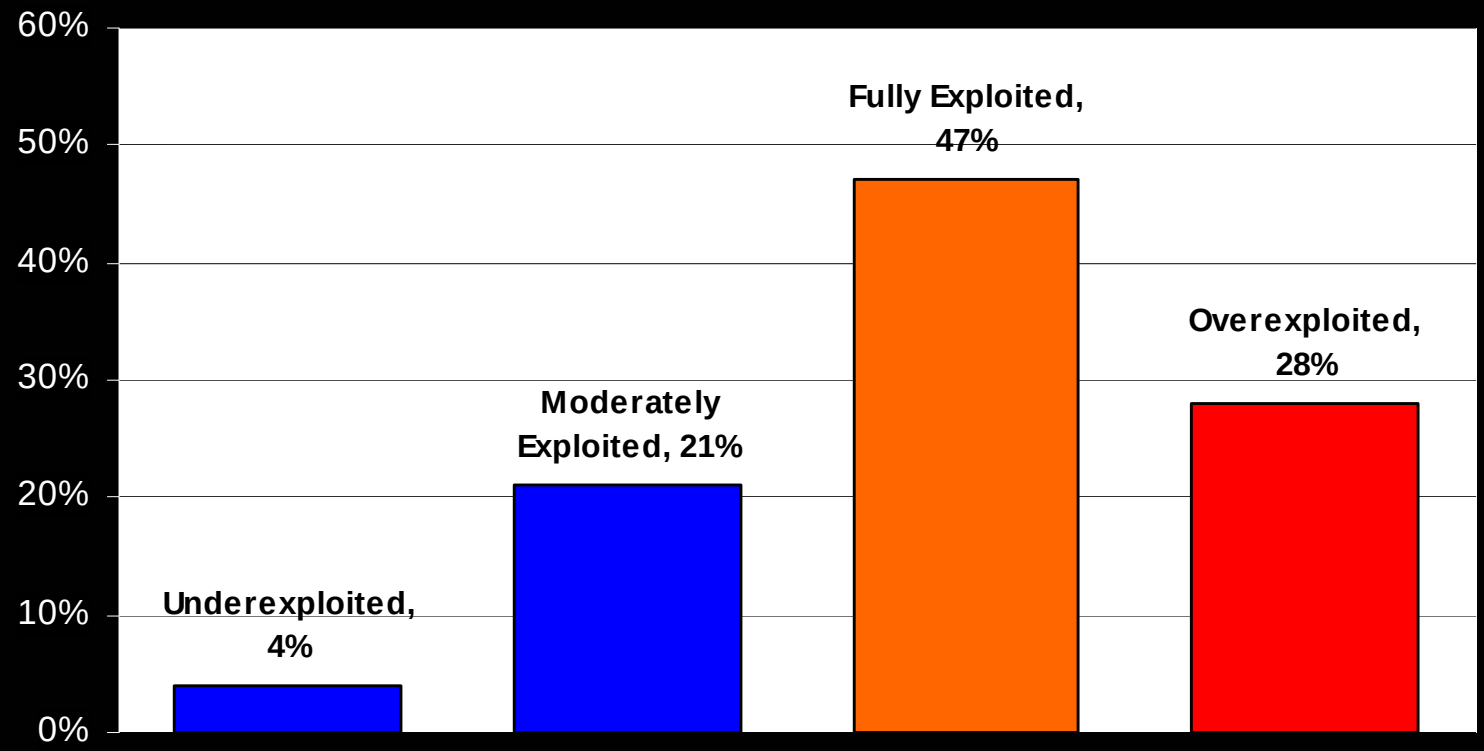
Crops

Status: Enhanced



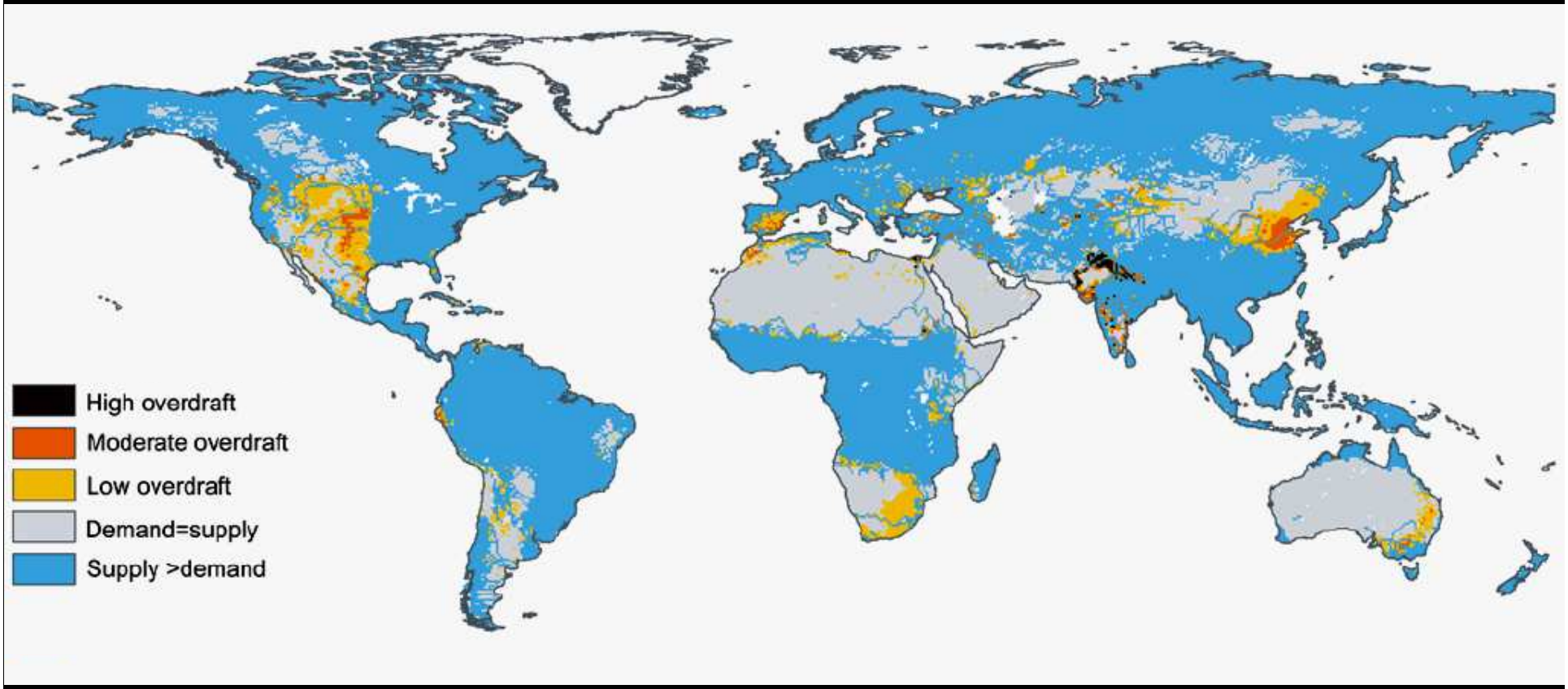
Source: Millennium Ecosystem Assessment

Status of Marine Fish Stocks



Source: FAO 2000

Potentially Unsustainable Irrigation Withdrawals



Source: Millennium Ecosystem Assessment

15–35% of Irrigation Withdrawals Locally Unsustainable
(low to medium certainty)

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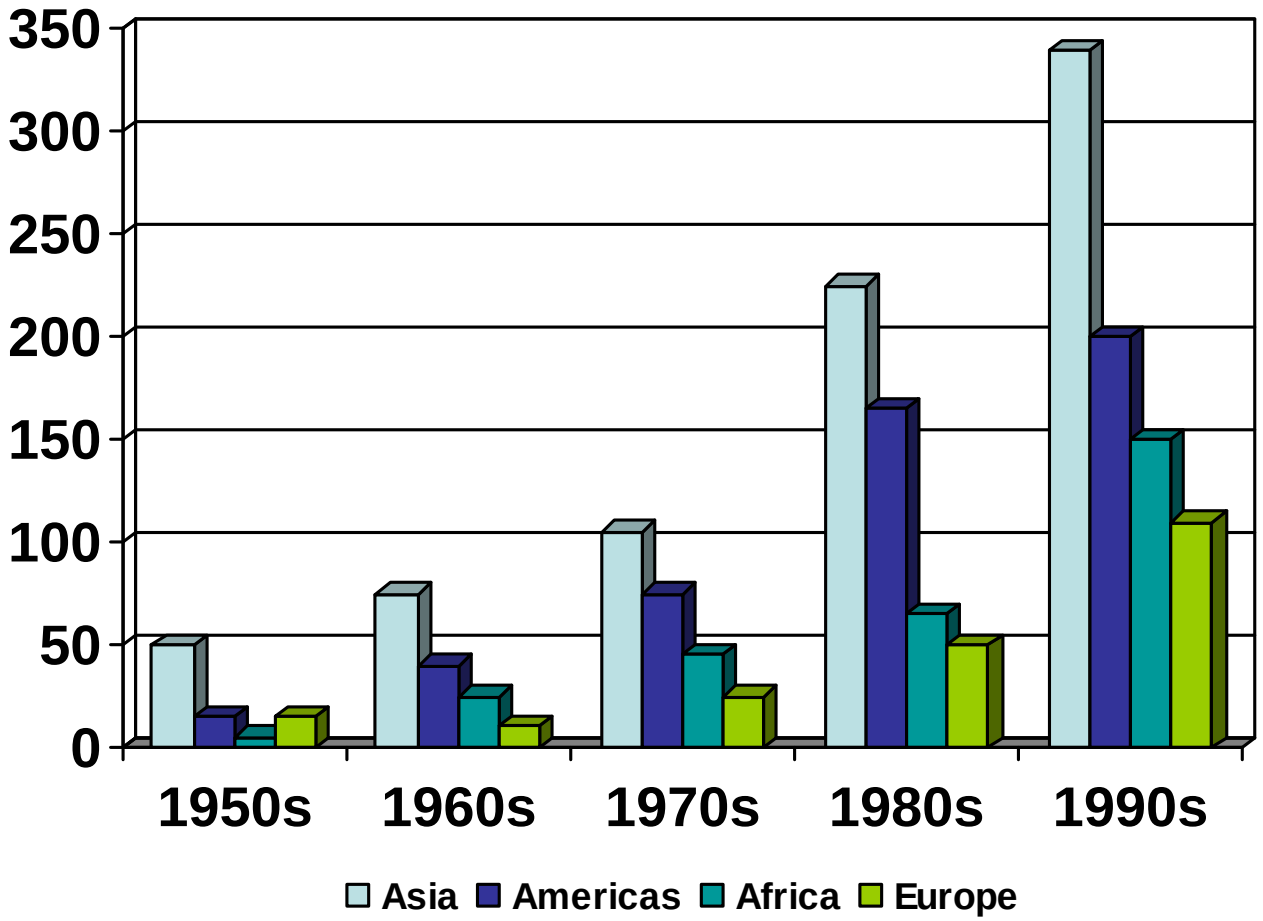
Natural Hazard Regulation

Status: Degraded

Flood events per decade



Source: Millennium Ecosystem Assessment

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The Balance Sheet

Change in benefits over last 50 years

Enhanced	Degraded	Mixed
Crops	Capture fisheries	Timber
Livestock	Wild foods	Fiber
Aquaculture	Wood fuel	Water regulation
Carbon sequestration	Genetic resources	Disease regulation
	Biochemicals	Recreation & ecotourism
	Fresh Water	
	Air quality regulation	
	Regional & local climate regulation	
	Erosion regulation	
	Water purification	
	Pest regulation	
	Pollination	
	Natural Hazard regulation	
	Spiritual & religious	
	Aesthetic values	

Bottom Line: 60% of Ecosystem Services are Degraded

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Trade-offs among ecosystem services

Mangrove Services:

- nursery and adult fishery habitat
- fuelwood & timber
- carbon sequestration
- traps sediment
- detoxifies pollutants
- protection from erosion & disaster

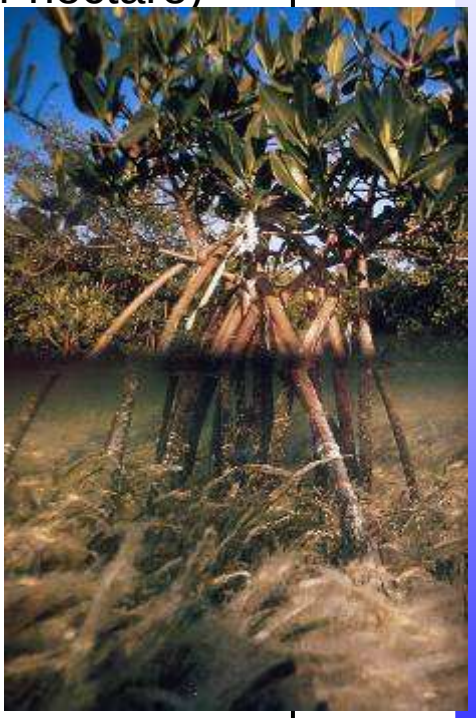
[redacted] shrimp

crops

Mangrove ecosystem

$4000

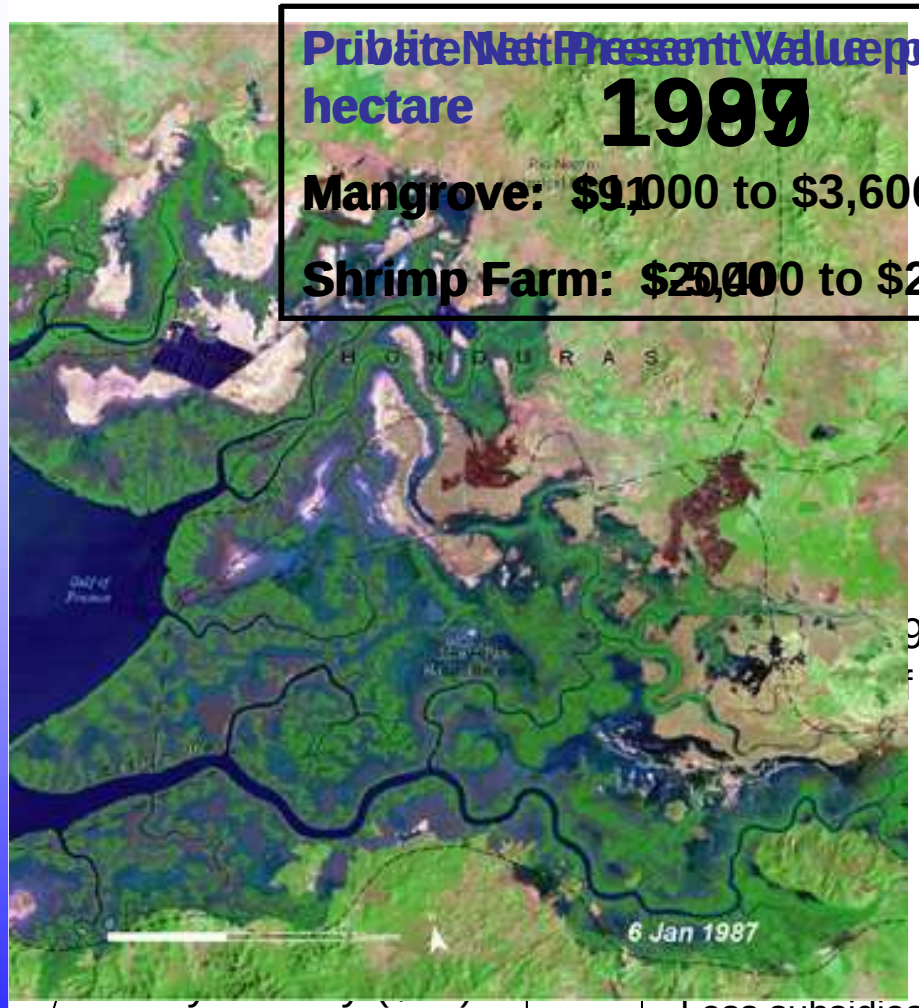
Value
(per hectare)



Private Net Present Value per hectare 1985

Mangrove: $1,000 to $3,600

Shrimp Farm: $25,000 to $200



900

Less subsidies (-$1,700)

Timber and Non-timber products ($90)

Mangrove Conversion

Pollution Costs (-$230)

Restoration (-$8,240)

0

Mangrove

Shrimp Farm

Source: Millennium Ecosystem Assessment; Sathirathai and Barbier 2001

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Main Findings

1. Humans have radically altered ecosystems in last 50 years.
2. **Changes have brought gains but at growing costs that threaten achievement of development goals.**
   - Degradation of 60% of ecosystem services
   - Significant economic costs and growing harm to poor people
   - Increased risk of abrupt changes in ecosystems

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Increasing likelihood of abrupt change

Fisheries Collapse

Eutrophication

- Hypoxia – Dead zones
- Coral reef regime shifts

Disease emergence

- Cholera epidemics
- SARs
- Emergence of new diseases (bushmeat trade)

Abrupt change caused by species introductions

- Zebra mussel – annual cost of $100 million

Regional climate change

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Main Findings

1. Humans have radically altered ecosystems in last 50 years.
2. Changes have brought gains but at growing costs that threaten achievement of development goals.
3. **Degradation of ecosystems could grow worse but can be reversed with appropriate policies and technologies.**

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MA Scenarios

Environmental Management	World Development: Globalization	World Development: Regionalization
Reactive	 **Global Orchestration**	 **Order from Strength**
Proactive	 **TechnoGarden**	 **Adapting Mosaic**

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Degradation of ecosystems could grow worse but can be reversed

- **Most direct drivers of ecosystem degradation are remaining constant or growing in intensity**
  - Climate Change
  - Habitat Change
  - Invasive Species
  - Overexploitation
  - Pollution (esp. Nitrogen, Phosphorus)

- **For many ecosystem services, degradation can be slowed or reversed with appropriate changes in policies and technologies**

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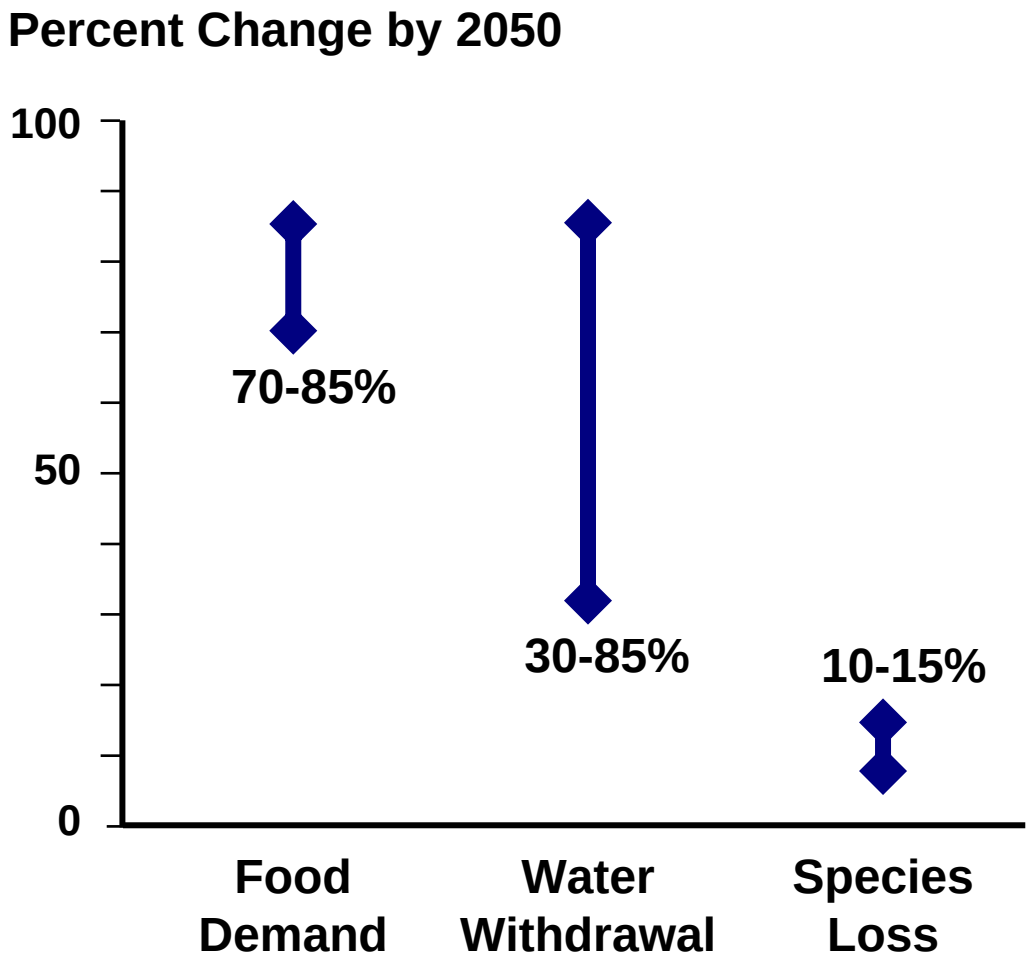
MA Scenarios



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Workable solutions will require significant changes in policy

- Economic incentives
- Institutions/Governance
- Technologies
- Planning/Management
- Human Behavior
- Knowledge and Information

Promising Options: Change the economic incentives

Problem can't be solved so long as ecosystem services are treated as free and limitless

- Determine change in economic value of ecosystem services
- Incorporate in cost-benefit analyses
- Maintain valuable services
  - *Planning and Regulations*
  - *Payments for Ecosystem Services*
  - *Markets (when possible)*

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Ecosystem Services and Business Opportunities

New markets

- *carbon market, …*

New incentives

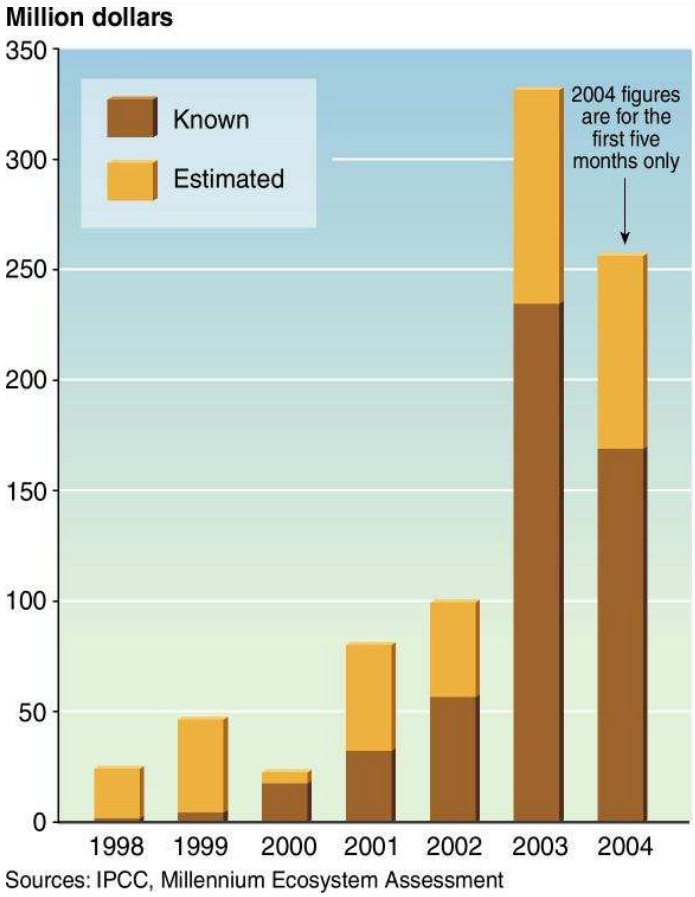
- *payments for ecosystem services*

New businesses and business models

- *ecosystem restoration, …*

New technologies

- *water & nutrient conservation technologies, …*



Growth in Carbon Market

Scale of opportunity

Ecosystem service market size (estimated by Ecosystem Marketplace):

- some up to $10 billion in 2010 *(Conservation easements)*
- some up to $20 billion in 2050 *(Watershed payments, conservation easements)*

Global Carbon market:

- $10-40 billion in 2010

OECD Agriculture Subsidies

- $324 billion in 2003

Global Environment Facility: Biodiversity Grants

- $4.2 billion total invested since 1991

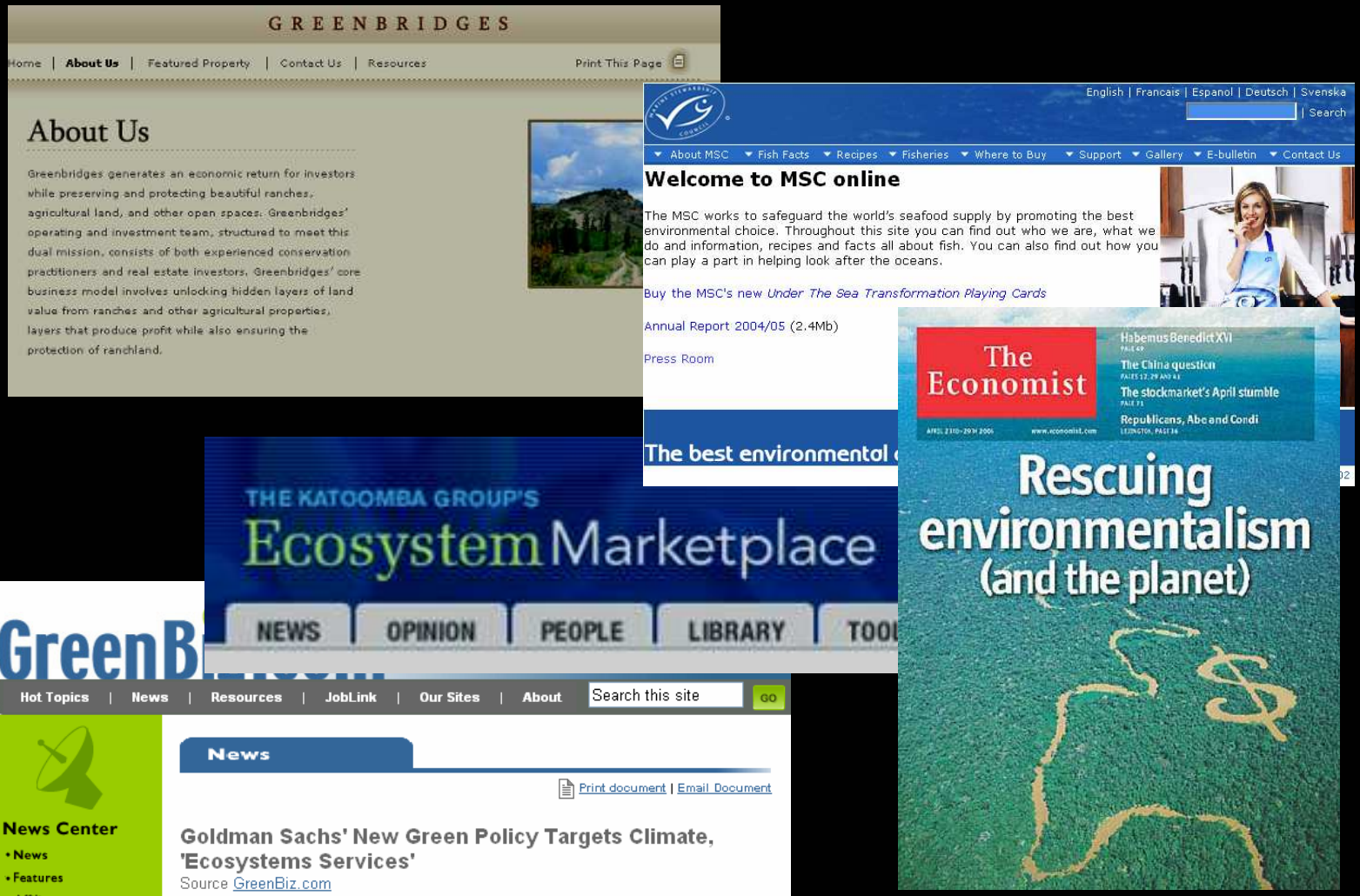
Constraints on market approaches

PES:

- Source of funding (esp. in developing countries)
- Measurement uncertainty

Markets:

- Limited number of services
- Strong regulatory systems and institutional arrangements required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Goldman Sachs' New Green Policy Targets Climate, 'Ecosystems Services'
Source GreenBiz.com
NEW YORK, Nov. 23, 2005 - Global investment bank Goldman Sachs has adopted a comprehensive environmental policy, acknowledging the scientific consensus on climate change and calling for urgent action by public policy makers and federal regulators to reduce greenhouse gas emissions.

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MA Findings: www.MAweb.org & Island Press

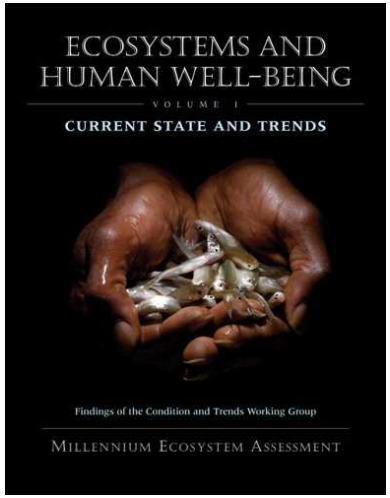
Publications

Synthesis Reports

- Synthesis
- Board Statement
- Biodiversity Synthesis
- Wetlands Synthesis
- Health Synthesis
- Desertification Synthesis
- Business Synthesis

Technical Volumes and MA Conceptual Framework (Island Press)

- Ecosystems and Human Well-being: A Framework for Assessment
- State and Trends
- Scenarios
- Multi-Scale Assessments
- Responses



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Financial and in-kind support

(full list available at www.MAweb.org)

Global Environment Facility
United Nations Foundation
David and Lucile Packard Foundation
World Bank
Consultative Group on International Agricultural Research
United Nations Environment Programme
Government of China
Government of Norway
Kingdom of Saudi Arabia
Swedish International Biodiversity Programme
Asia Pacific Network for Global Change Research
Association of Caribbean States
British High Commission, Trinidad & Tobago
Caixa Geral de Depósitos, Portugal
Canadian International Development Agency
Christensen Fund
Cropper Foundation
Environmental Management Authority of Trinidad and Tobago
Ford Foundation
Government of India
International Council for Science
International Development Research Centre
Island Resources Foundation
Japan Ministry of Environment
Laguna Lake Development Authority
Philippine Department of Environment and Natural Resources
Rockefeller Foundation
U.N. Educational, Scientific and Cultural Organization;
UNEP Division of Early Warning and Assessment
United Kingdom Department for Environment, Food and Rural Affairs
United States National Aeronautic and Space Administration
Universidade de Coimbra, Portugal

Millennium Ecosystem Assessment

Report Card

Conventions

National Govt.

Business

Donors

NGOs

Intl. Agencies

Capacity Building

Education

Scientific Research

Significant:

Decisions taken by CBD and Ramsar incorporating MA findings

Report Card

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Significant/Mixed:

- Policy impacts in UK, Sweden, Norway, Netherlands, Philippines, South Africa
- National MA assessment to be launched in France
- National assessments likely to be launched in China, Portugal, Mexico, Costa Rica
- No impact apparent in US, Brazil, India

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Limited thus far:

- Goldman Sachs Environmental Policy
- World Business Council on Sustainable Development

Report Card

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Scientific Research

Significant:

- Significant influence on the GEF
- Influence on European Bilaterals
- New grant program by MISTRA in Sweden

Report Card

- Conventions
- National Govt.
- Business
- Donors
- **NGOs**
- Intl. Agencies
- Capacity Building
- Education
- Scientific Research

Mixed:

- Significant for international environmental NGOs (TNC, WWF, IUCN, WRI)
- Little impact on national NGOs or development-focused NGOs