



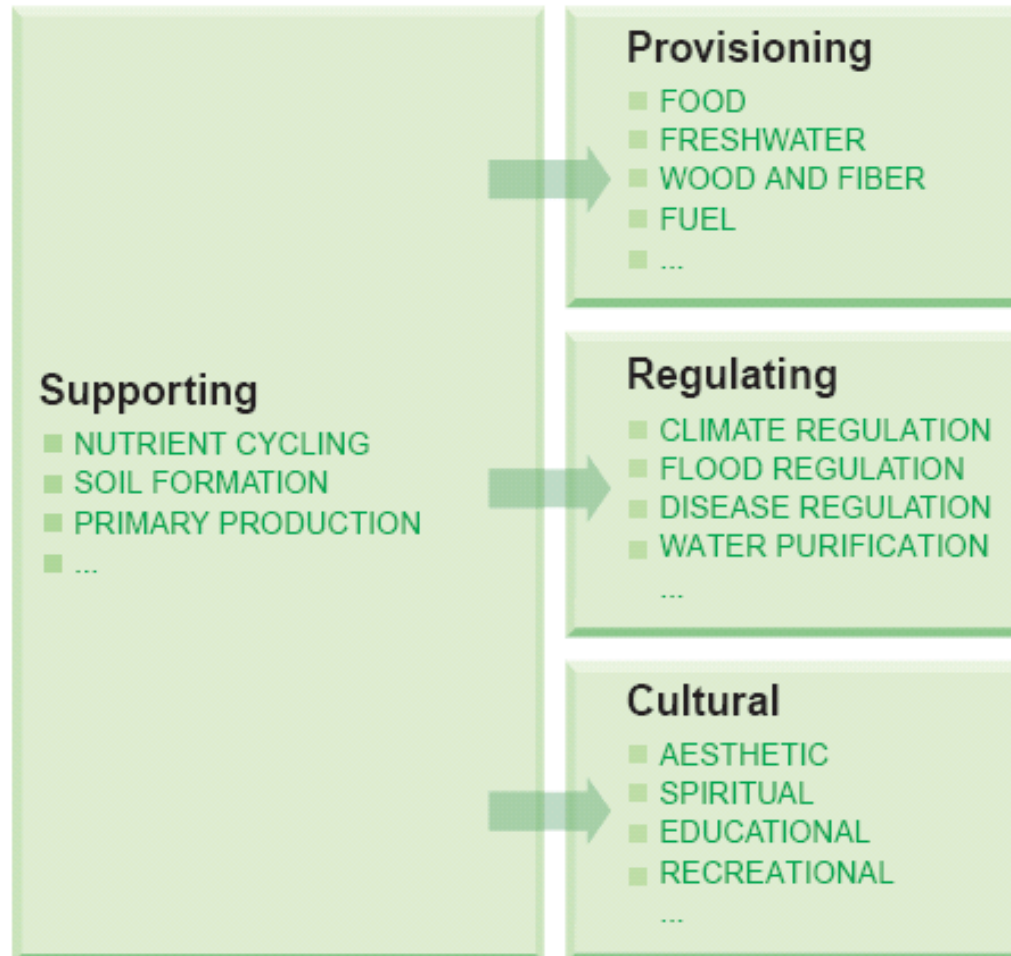
Millennium Ecosystem Assessment

Millennium Ecosystem Assessment Findings

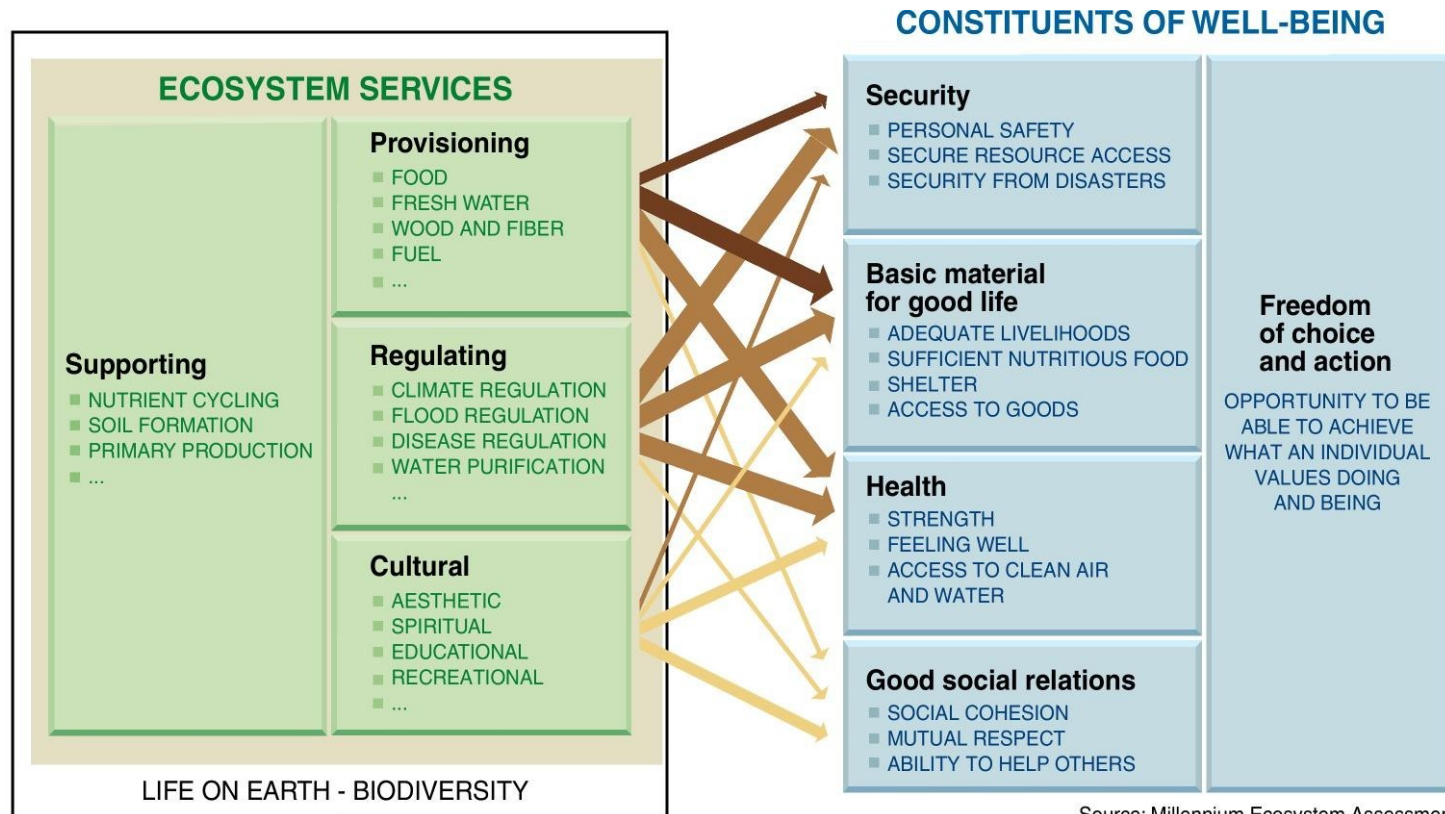
Focus: Ecosystem Services

The benefits people obtain from ecosystems

ECOSYSTEM SERVICES



Focus: Consequences of Ecosystem Change for Human Well-being



Source: Millennium Ecosystem Assessment

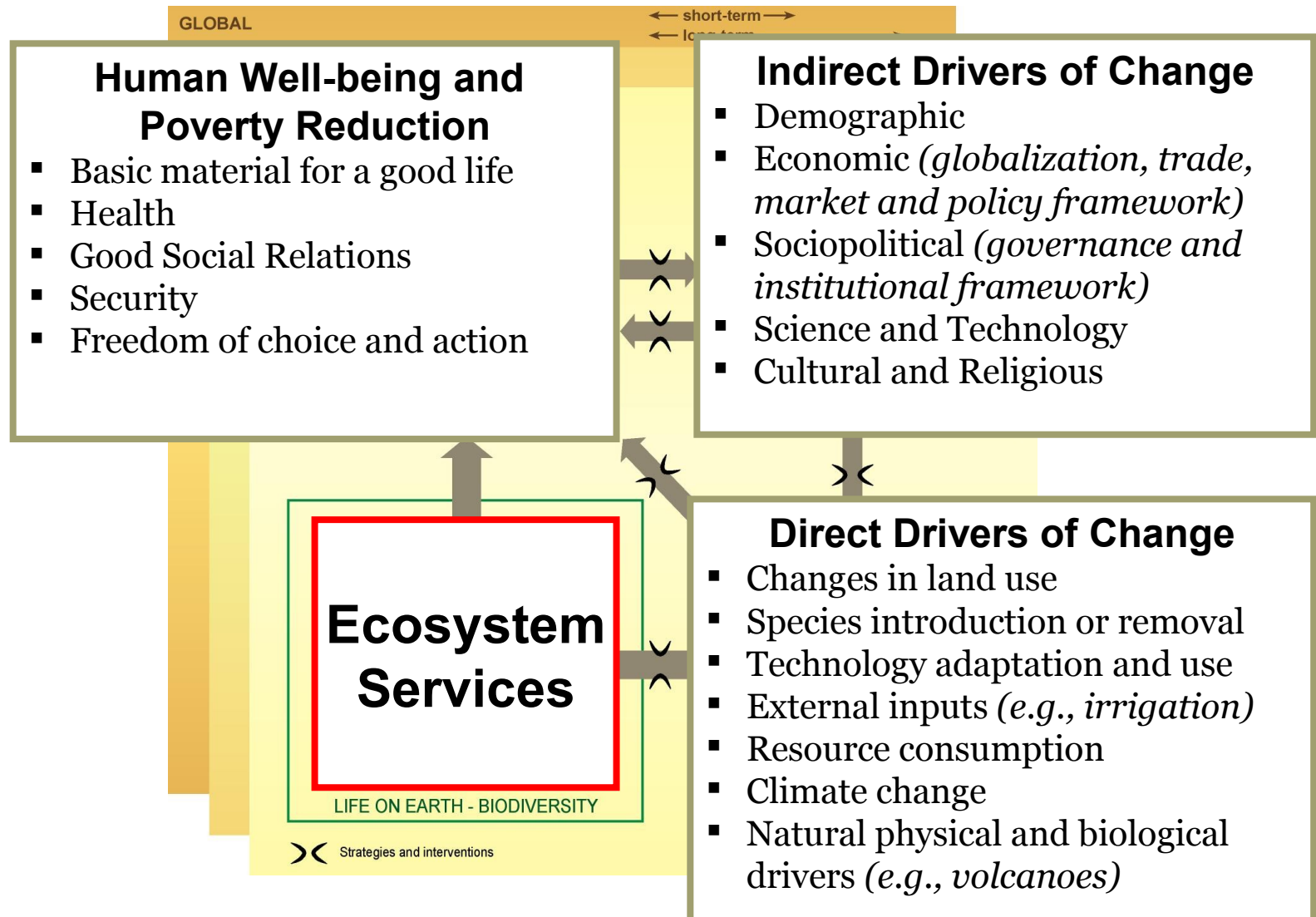
ARROW'S COLOR
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong

MA Framework



MA Findings - Outline

- 1. Ecosystem Changes in Last 50 Years**
- 2. Gains and Losses from Ecosystem Change**
- 4. Ecosystem Prospects for Next 50 Years**
- 4. Reversing Ecosystem Degradation**

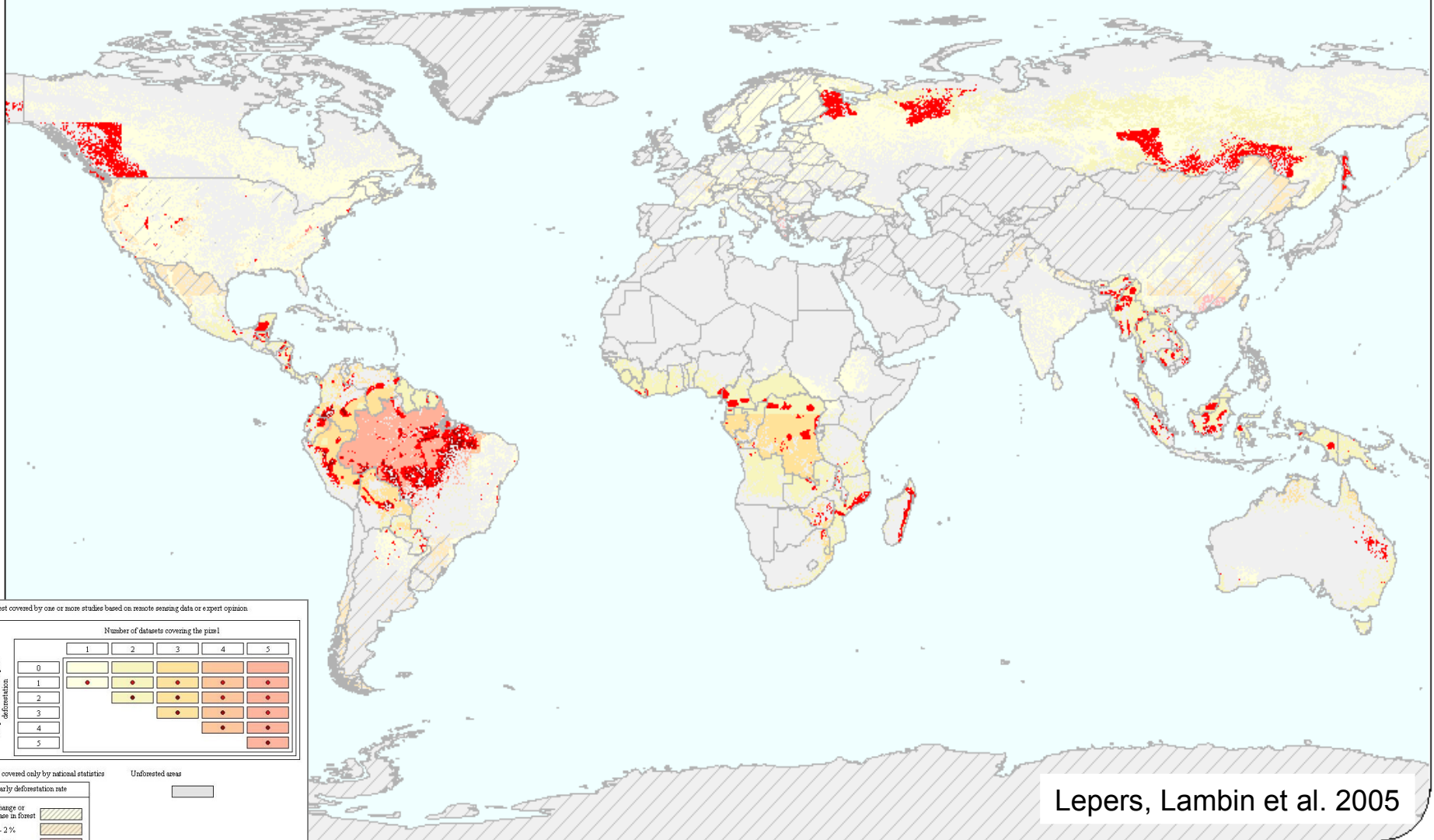
Finding #1

- Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history
- This has resulted in a substantial and largely irreversible loss in the diversity of life on Earth

Unprecedented change: Ecosystems

- More land was converted to **cropland** in the 30 years after 1950 than in the 150 years between 1700 and 1850
- 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
- **Water withdrawals** from rivers and lakes doubled since 1960

Areas of rapid deforestation, world 1980-1995



Forest covered by one or more studies based on remote sensing data or expert opinion

Number of datasets identifying the area as rapid deforestation	Number of datasets covering the pixel				
	1	2	3	4	5
0	Light Yellow	Light Yellow	Light Yellow	Light Yellow	Light Yellow
1	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot
2	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot
3	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot
4	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot
5	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot	Light Yellow with red dot

Forest covered only by national statistics

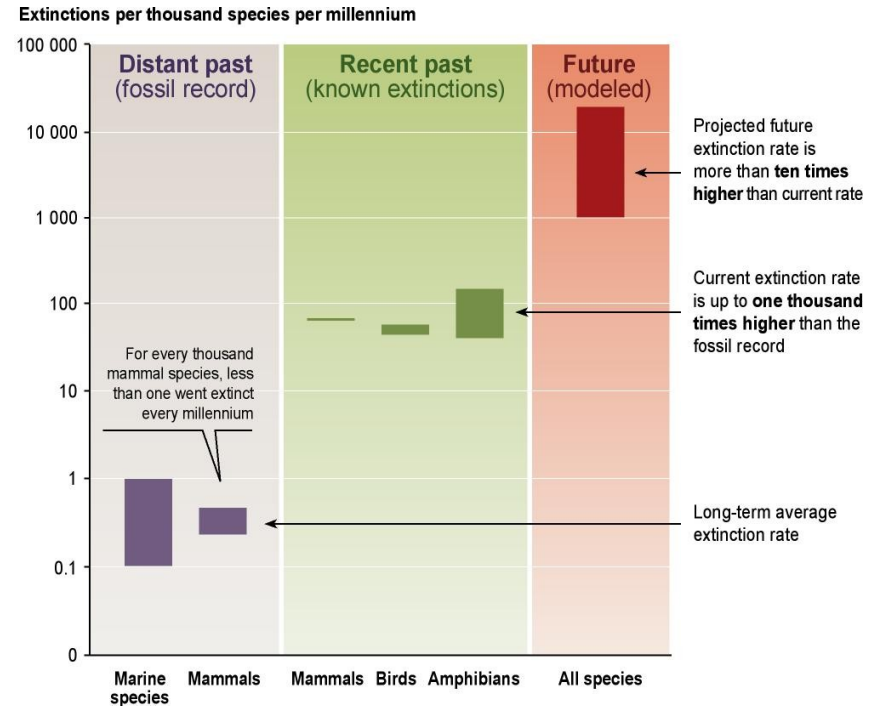
Unforested areas

Yearly deforestation rate	Symbol
No change or increase in forest	Hatched pattern
0.01 - 2%	Light Yellow
2.01 - 3%	Light Orange
> 3%	Dark Red

Lepers, Lambin et al. 2005

Significant and largely irreversible changes to species diversity

- Distribution of species on Earth is more **homogenous**
- Humans have increased the species **extinction rate** by as much as 1,000 times over background rates (*medium certainty*)
- 10–30% of mammal, bird, and amphibian species are currently **threatened with extinction** (*medium to high certainty*)



Source: Millennium Ecosystem Assessment

MA Findings - Outline

1. Ecosystem Changes in Last 50 Years

2. Gains and Losses from Ecosystem Change

- Degradation of Ecosystem Services
- Increased Likelihood of Nonlinear Changes
- Exacerbation of Poverty for Some People

4. Ecosystem Prospects for Next 50 Years

4. Reversing Ecosystem Degradation

Finding #2

- Changes to ecosystems have contributed to substantial net gains in human well-being and economic development
 - *Since 1960, while population doubled, **food production** increased 2 1/2 times, **food price** has declined, **water use** doubled, **wood harvest** for pulp tripled, **hydropower** doubled.*
- But these gains have been achieved at growing costs that, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems

Degradation and unsustainable use of ecosystem services

- 60% of the ecosystem services are being degraded or used unsustainably
- The degradation of ecosystem services often causes significant harm to human well-being and represents a loss of a natural asset or wealth of a country

Status of Provisioning Services

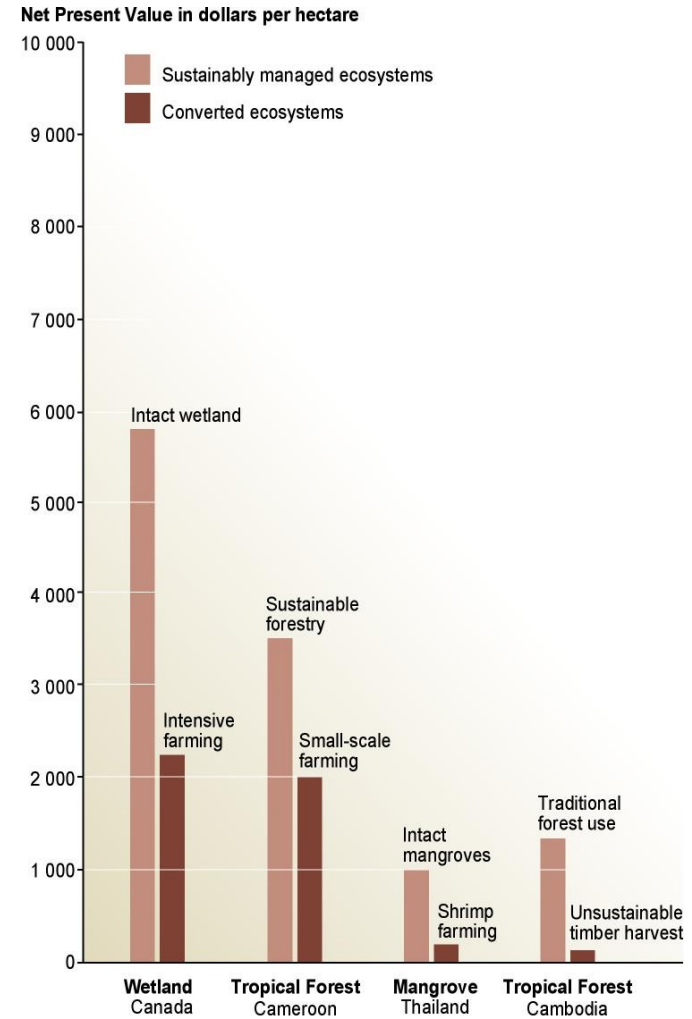
Service		Status
Food	crops	↑
	livestock	↑
	capture fisheries	↓
	aquaculture	↑
	wild foods	↓
Fiber	timber	+/-
	cotton, silk	+/-
	wood fuel	↓
Genetic resources		↓
Biochemicals, medicines		↓
Fresh water		↓

Status of Regulating and Cultural Services

	Status
Regulating Services	
Air quality regulation	↓
Climate regulation – global	↑
Climate regulation – regional and local	↓
Water regulation	+/-
Erosion regulation	↓
Water purification and waste treatment	↓
Disease regulation	+/-
Pest regulation	↓
Pollination	↓
Natural hazard regulation	↓
Cultural Services	
Spiritual and religious values	↓
Aesthetic values	↓
Recreation and ecotourism	+/-

Degradation of ecosystem services often causes significant harm to human well-being

- Total economic value associated with managing ecosystems more sustainably > value associated with conversion
- Conversion may still occur because private economic benefits are often greater for the converted system



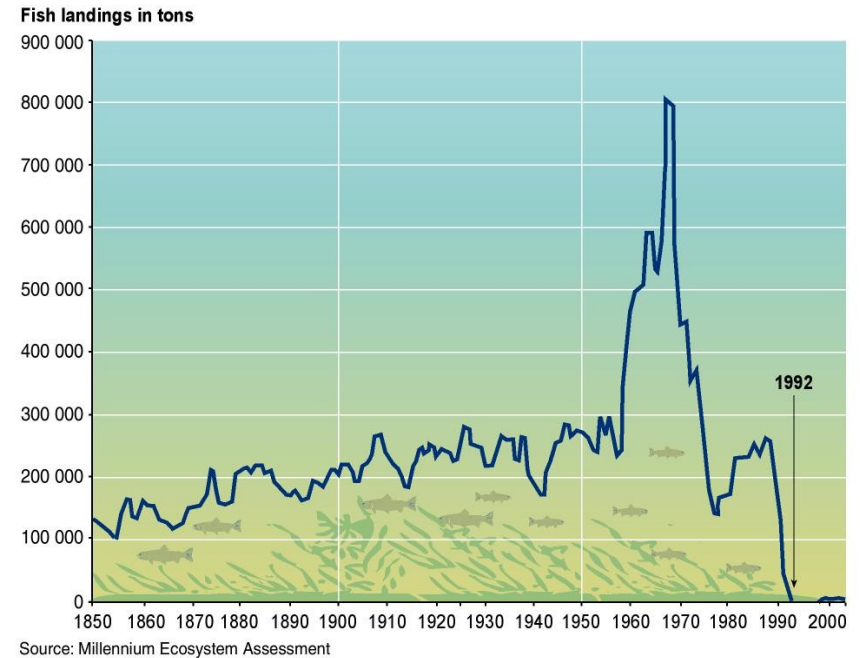
Source: Millennium Ecosystem Assessment

Increased likelihood of nonlinear changes

- There is *established but incomplete* evidence that changes being made in ecosystems are increasing the likelihood of nonlinear changes in ecosystems
 - *i.e.*, accelerating, abrupt, and potentially irreversible changes

Examples of nonlinear change

- Fisheries collapse
- Eutrophication
- Disease emergence
- Species introductions and losses
- Regional climate change



Ecosystem services and poverty reduction

Degradation of ecosystem services harms poor people

- Half the **urban population** in Africa, Asia, Latin America, and the Caribbean suffers from one or more diseases associated with inadequate water and sanitation
- The declining state of capture **fisheries** is reducing an inexpensive source of protein in developing countries.
- Desertification affects the livelihoods of millions of people, including a large portion of the poor in **drylands**

Pattern of winners and losers not taken into account in management decisions

MA Findings - Outline

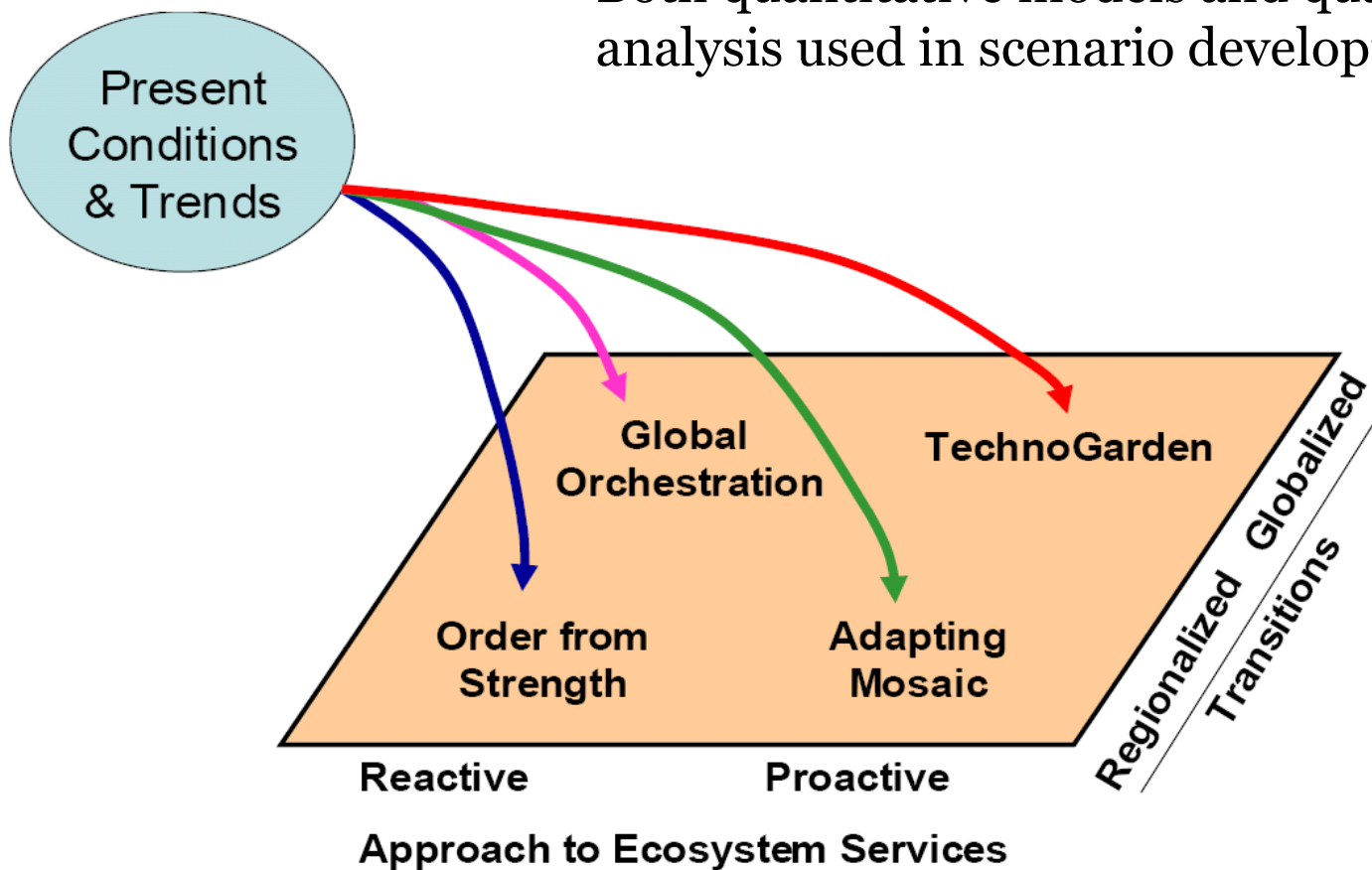
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Finding #3:

- The degradation of ecosystem services could grow significantly worse during the first half of this century
- It is a barrier to achieving the Millennium Development Goals

MA Scenarios

- Not predictions – scenarios are plausible futures
- Both quantitative models and qualitative analysis used in scenario development



Scenario Storylines



Global Orchestration

- globally connected society
- focus on global trade and economic liberalization
- reactive approach to ecosystem problems
- strong steps to reduce poverty and inequality
- invest in public goods (infrastructure, education)



Order from Strength

- regionalized and fragmented world
- concern with security and protection
- emphasis on regional markets
- little attention to public goods
- reactive approach to ecosystem problems.

Scenario Storylines



Adapting Mosaic

- focus on regional, watershed-scale ecosystems
- local institutions strengthened
- local ecosystem management strategies
- proactive approach to ecosystem management



TechnoGarden

- globally connected world
- environmentally sound technology,
- highly managed, often engineered, ecosystems to deliver ecosystem services
- proactive approach to the management of ecosystems to avoid problems

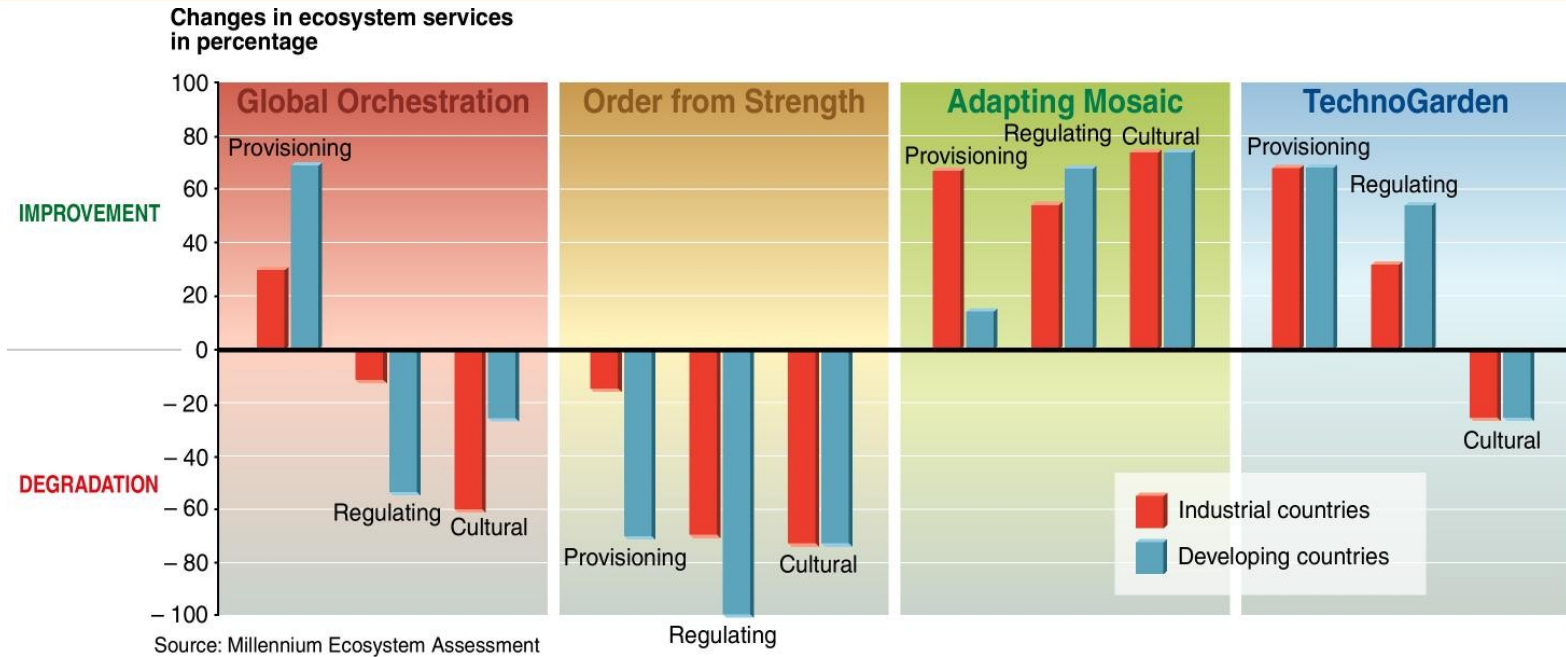
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Finding #4:

- The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios
- But these involve significant changes in policies, institutions and practices
- Many options exist to conserve or enhance specific ecosystem services
 - reduce negative trade-offs or provide positive synergies with other ecosystem services

Improvements in services can be achieved by 2050



Three of the four scenarios show that significant changes in policy can partially mitigate the negative consequences of growing pressures on ecosystems

Promising Responses

Institutions

- Integration of ecosystem management goals within **other sectors** and within broader development planning frameworks
- Increased **transparency** and **accountability** of government and private-sector performance

Economics

- Elimination of **subsidies** that promote excessive use of ecosystem services. Transfer these subsidies to payments for non-marketed ecosystem services.
- Greater use of economic instruments and **market-based** approaches in the management of ecosystem services (where enabling conditions exist)

Promising Responses

Technology

- Promotion of technologies that enable increased **crop yields** without harmful impacts
- **Restoration** of ecosystem services
- Promotion of technologies to increase **energy efficiency** and reduce greenhouse gas emissions

Social and Behavioral

- Measures to reduce aggregate **consumption** of unsustainably managed ecosystem services; Communication and education
- **Empowerment** of groups dependent on ecosystem services

Knowledge

- Incorporation of **nonmarket values** of ecosystems in resource management decisions
- Enhancement of human and institutional **capacity**

Visit the MA Website

www.MAweb.org

All MA reports available to download

Access to core data

MA 'outreach' kit

- Slides
- Communication tools

