Millennium Ecosystem Assessment Findings

Millennium Ecosystem Assessment

Largest assessment of the health of the planet's ecosystems

Experts and Review Process

- Prepared by 1360 experts from 95 countries
- 80-person independent board of review editors
- Review comments from 850 experts and governments
- In addition to global assessment, includes information from 33 sub-global assessments

Governance

- Called for by UN Secretary General in 2000
- Authorized by governments through 4 conventions
- Partnership of UN agencies, conventions, business, non-governmental organizations with a multi-stakeholder board of directors

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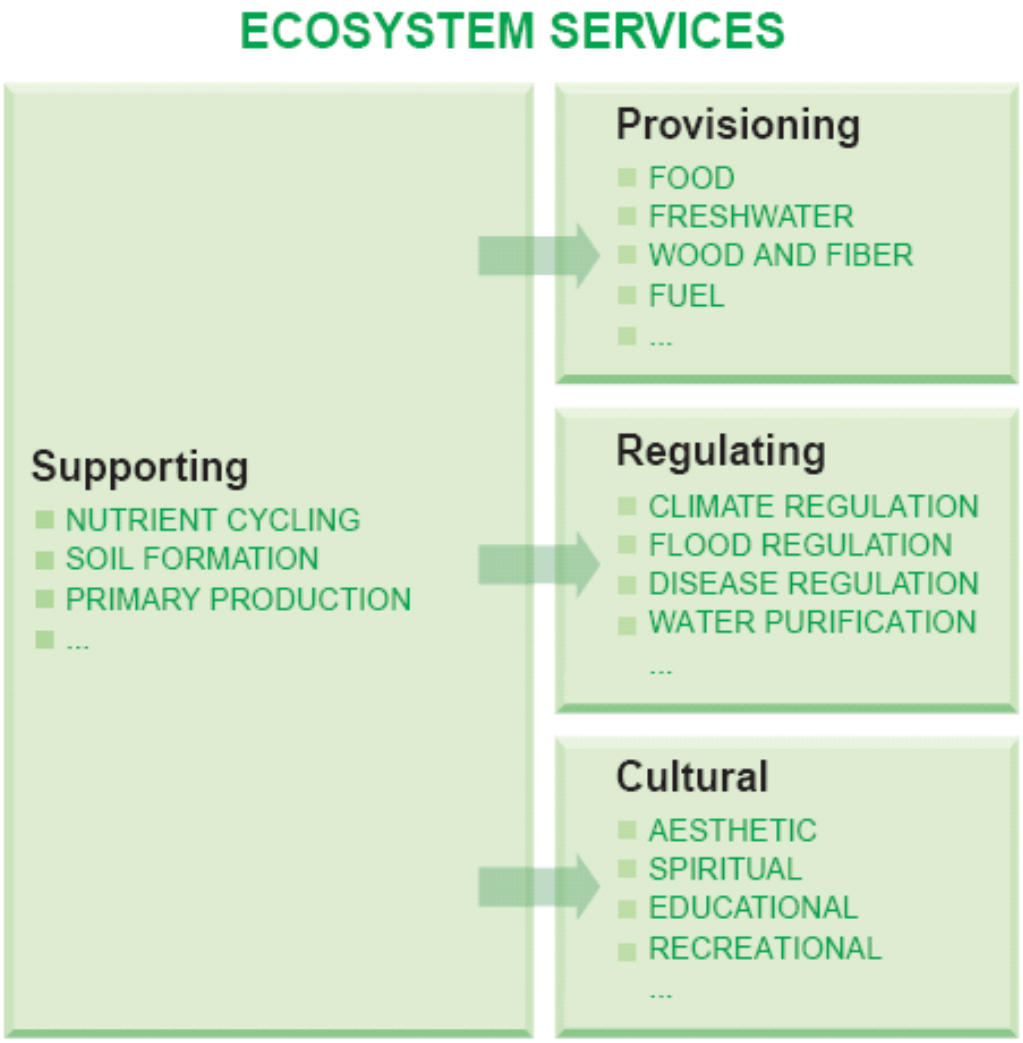
Focus: Ecosystem Services

The benefits people obtain from ecosystems



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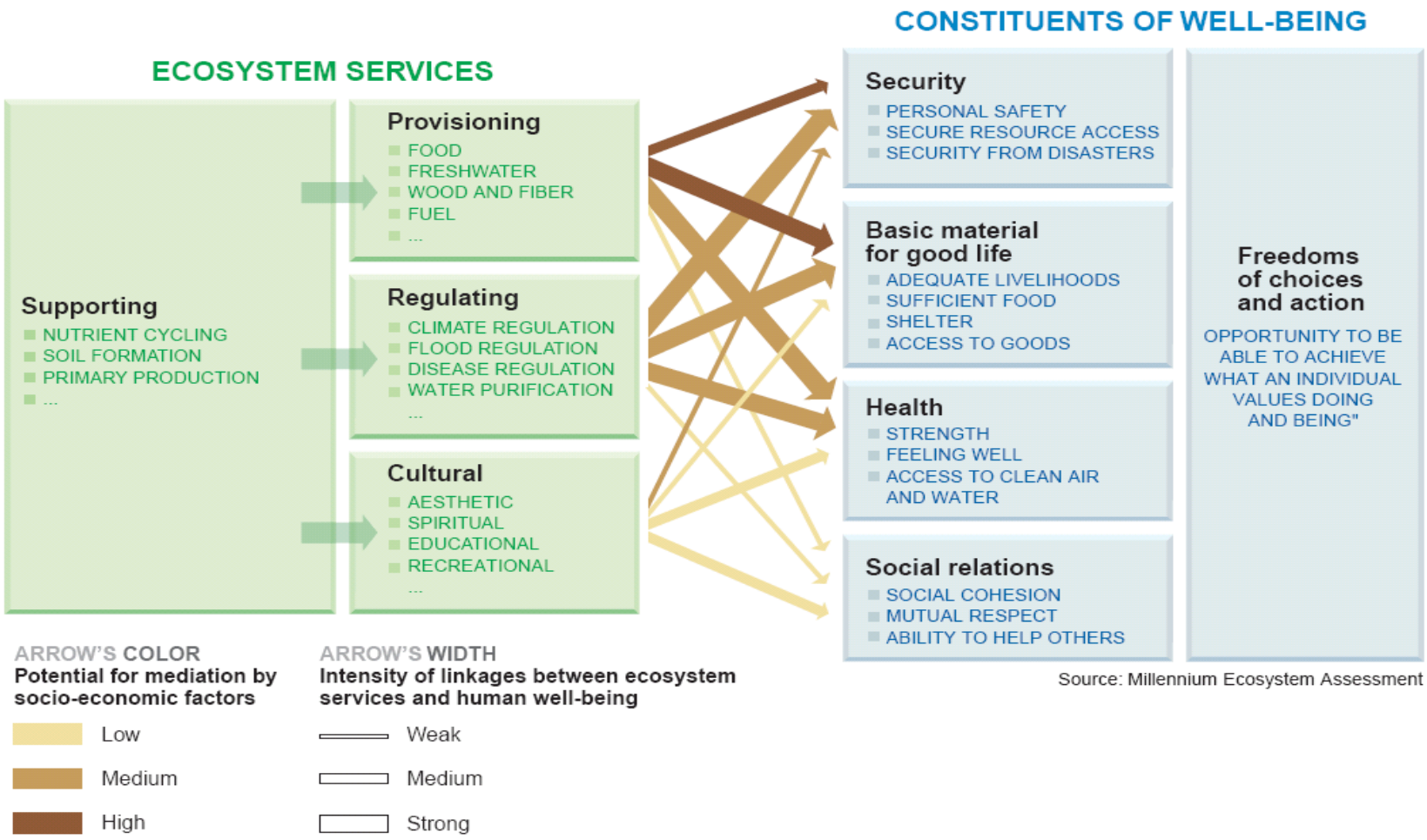
Focus: Consequences of Ecosystem Change for Human Well-being



Source: Millennium Ecosystem Assessment

MA Findings - Outline

1. **Ecosystem Changes in Last 50 Years**
2. **Gains and Losses from Ecosystem Change**

   Three major problems will decrease long-term benefits
   - Degradation of Ecosystem Services
   - Increased Likelihood of Nonlinear Changes
   - Exacerbation of Poverty for Some People
3. **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

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Unprecedented change: Ecosystems

- **More land was converted to cropland since 1945 than in the 18th and 19th centuries combined**
- **25% of the world's coral reefs were badly degraded or destroyed in the last several decades**
- **35% of mangrove area has been lost in this time**
- **Amount of water in reservoirs quadrupled since 1960**
- **Withdrawals from rivers and lakes doubled since 1960**

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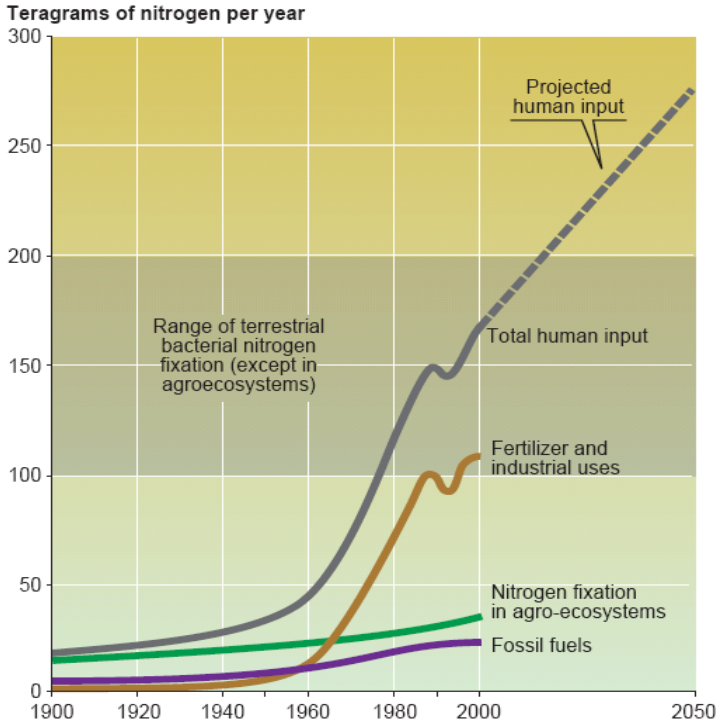
Unprecedented change: Biogeochemical Cycles

Since 1960:

- Flows of biologically available nitrogen in terrestrial ecosystems doubled
- Flows of phosphorus tripled

> 50% of all the synthetic nitrogen fertilizer ever used has been used since 1985

60% of the increase in the atmospheric concentration of CO^2 since 1750 has taken place since 1959



Human-produced Reactive Nitrogen

Humans produce as much biologically available N as all natural pathways and this may grow a further 65% by 2050

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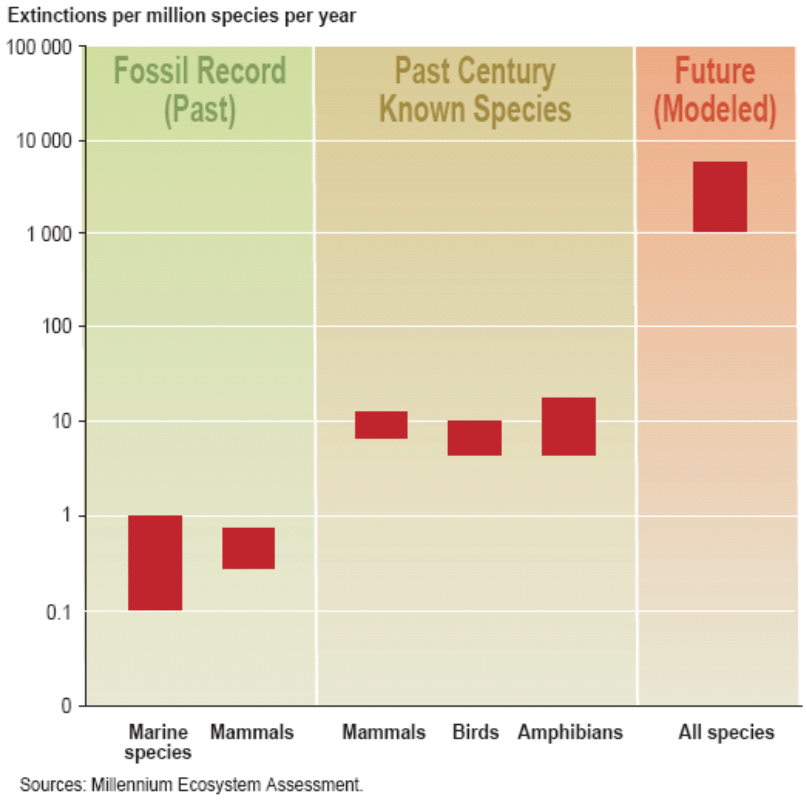
Significant and largely irreversible changes to species diversity

The distribution of species on Earth is becoming more homogenous

Humans have increased the species extinction rate by between 50 and 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)*



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Finding #2

The changes that have been made to ecosystems have contributed to substantial net gains in human well-being and economic development, but these gains have been achieved at growing costs

These problems will substantially diminish the benefits that future generations obtain from ecosystems.

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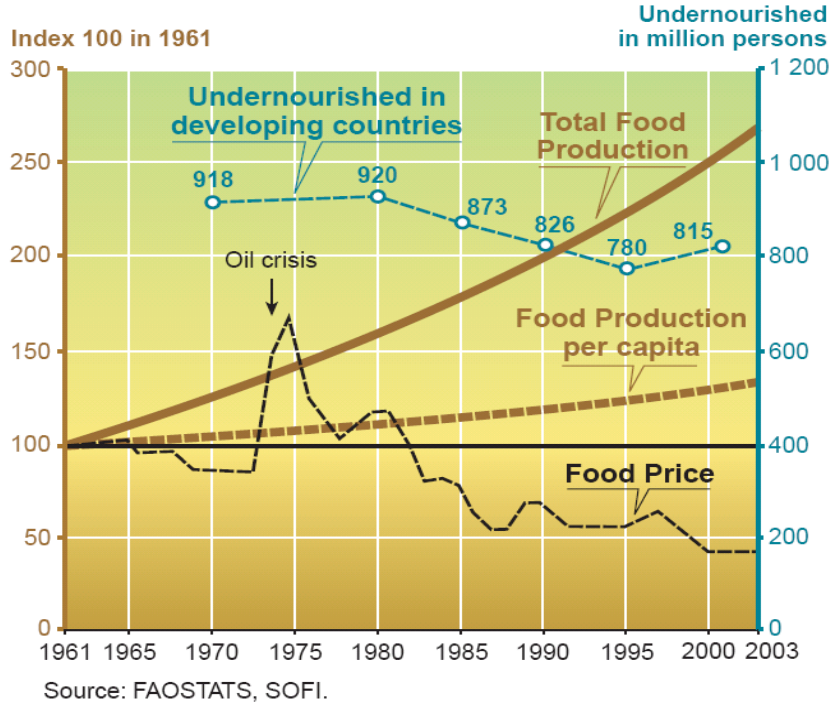
Changes to ecosystems have provided substantial benefits

Since 1960, while population doubled and economic activity increased 6-fold:

- food production increased 2 ½ times; food production per capita has grown and food price has fallen
- water use doubled
- wood harvests for pulp and paper production tripled
- timber production increased by more than half
- installed hydropower capacity doubled



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Degradation and unsustainable use of ecosystem services

Approximately 60% (15 out of 24) of the ecosystem services evaluated in this assessment 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

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Status of Provisioning Services

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

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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	+/–

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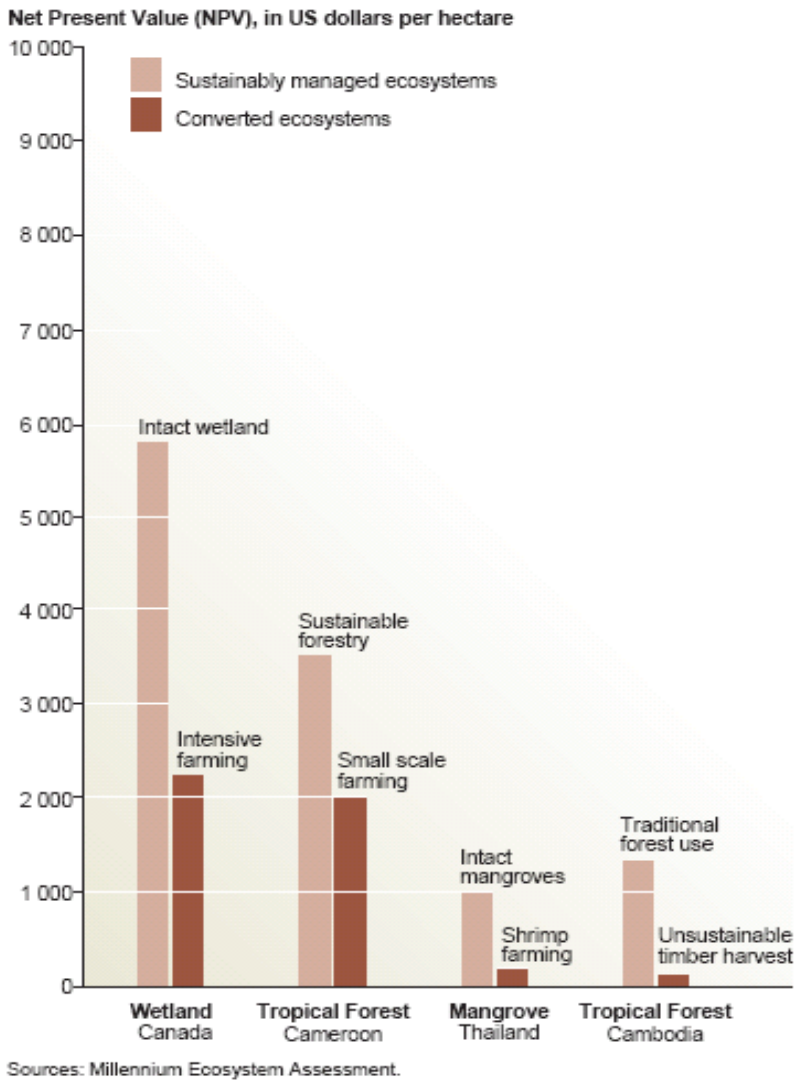
Degradation of ecosystem services often causes significant harm to human well-being

The total economic value associated with managing ecosystems more sustainably is often higher than the value associated with conversion

Conversion often still takes place because private economic benefits are often greater for the converted system



The degradation of ecosystem services represents loss of a capital asset

Loss of wealth due to ecosystem degradation is not reflected in economic accounts

- Ecosystem services, as well as resources such as mineral deposits, soil nutrients, and fossil fuels are capital assets
- Traditional national accounts do not include measures of resource depletion or of the degradation of these resources
- A country could cut its forests and deplete its fisheries, and this would show only as a positive gain in GDP without registering the corresponding decline in assets (wealth)
- A number of countries that appeared to have positive growth in net savings (wealth) in 2001 actually experienced a loss in wealth when degradation of natural resources were factored into the accounts

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Increased likelihood of nonlinear changes

There is *established but incomplete* evidence that changes being made in ecosystems are increasing the likelihood of nonlinear and potentially abrupt changes in ecosystems, with important consequences for human well-being

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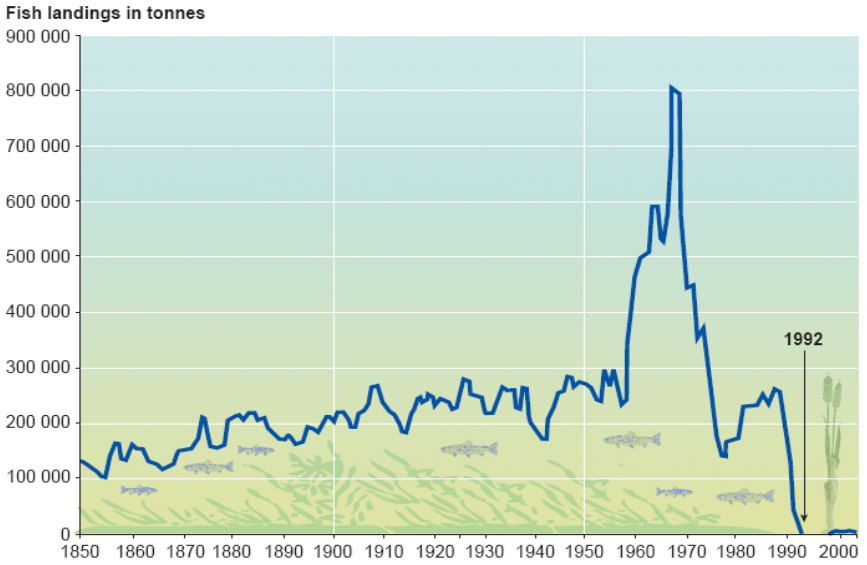
Examples of nonlinear change

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



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Level of poverty remains high and inequities are growing

Economics and Human Development

- 1.1 billion people surviving on less than $1 per day of income.
- During the 1990s, 21 countries experienced declines in their rankings in the Human Development Index

Access to Ecosystem Services

- An estimated 856 million people were undernourished in 2000–2002, up 32 million from 1995–97
- Per capita food production has declined in sub-Saharan Africa
- Some 1.1 billion people still lack access to improved water supply, and more than 2.6 billion lack access to improved sanitation
- Water scarcity affects roughly 1–2 billion people worldwide

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. Per capita fish consumption in developing countries, excluding China, declined between 1985 and 1997

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

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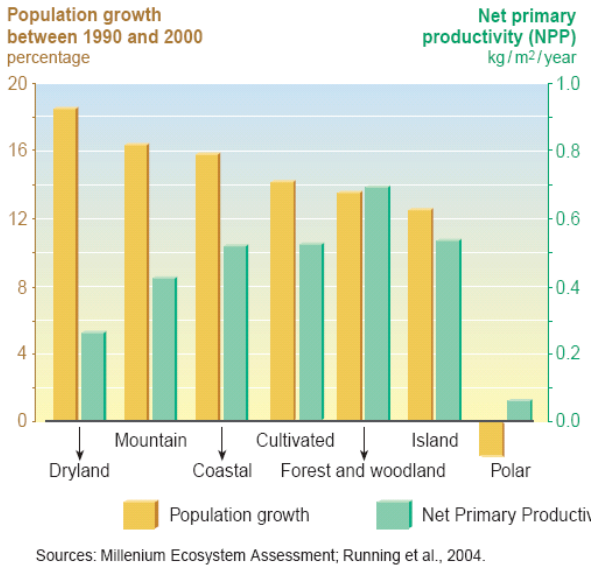
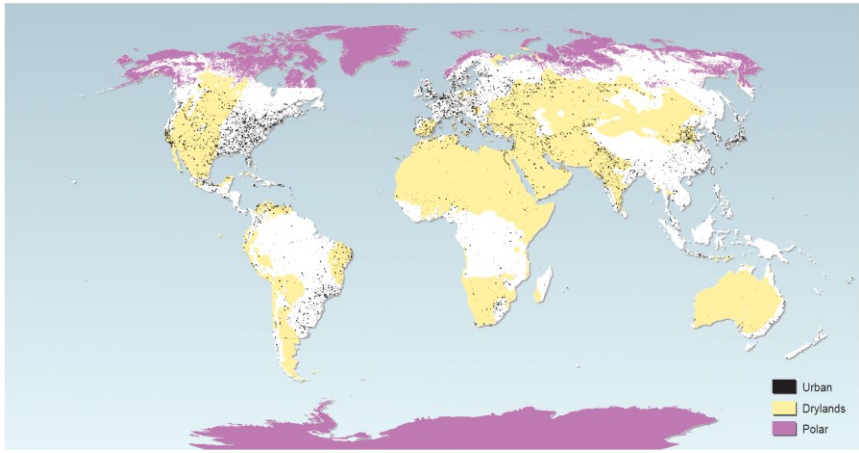
Ecosystem services and poverty reduction

Critical concern: Dryland systems

- Lowest levels of human well-being
- Only 8% of the world's renewable water supply
- Per capita water availability is two thirds of the level required for minimum levels of human well-being
- Approximately 10–20% of drylands are degraded
- Experienced the highest population growth rate in the 1990s
- Cover 41% of Earth's land surface and more than 2 billion people inhabit them



Sources: Millenium Ecosystem Assessment; Running et al., 2004.



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Finding #3:

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

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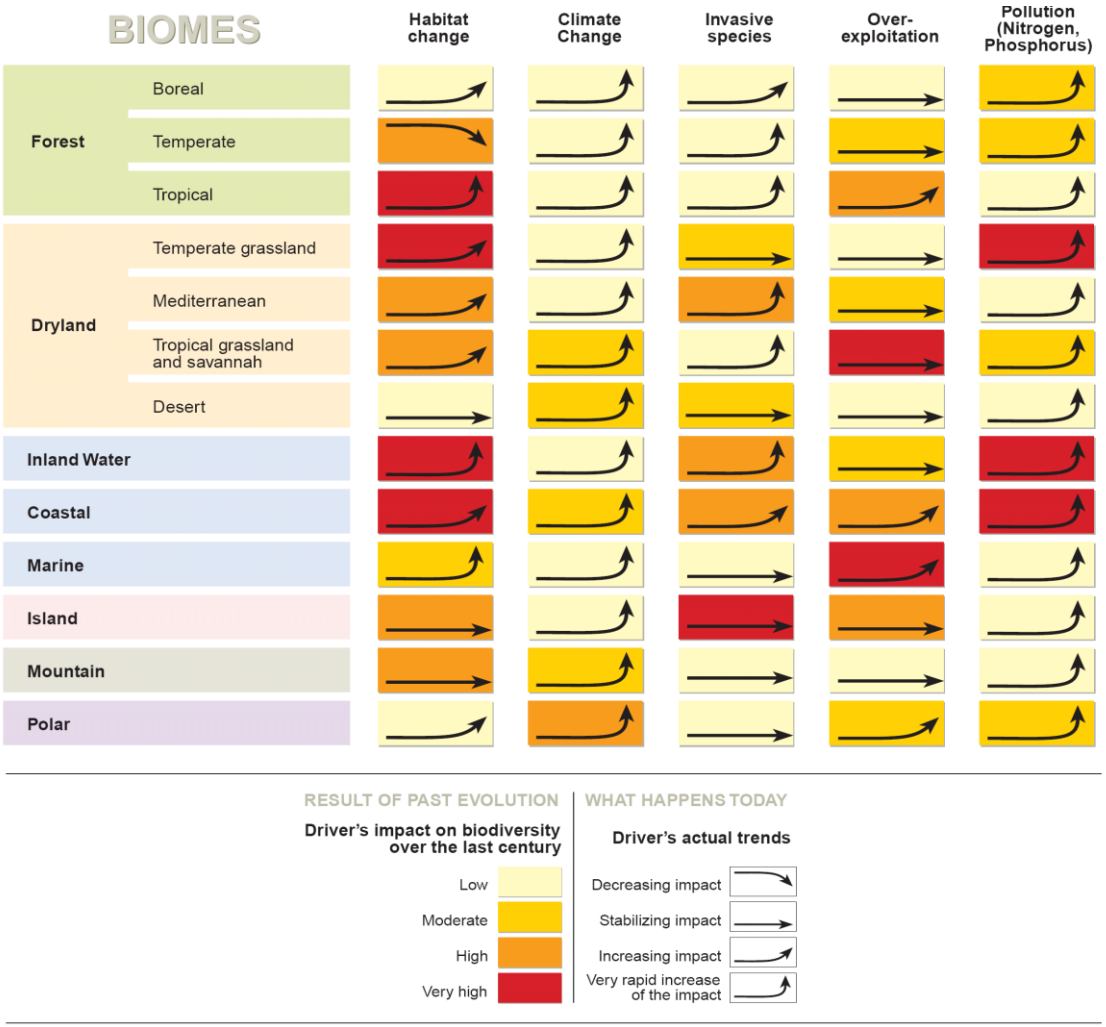
Direct drivers growing in intensity

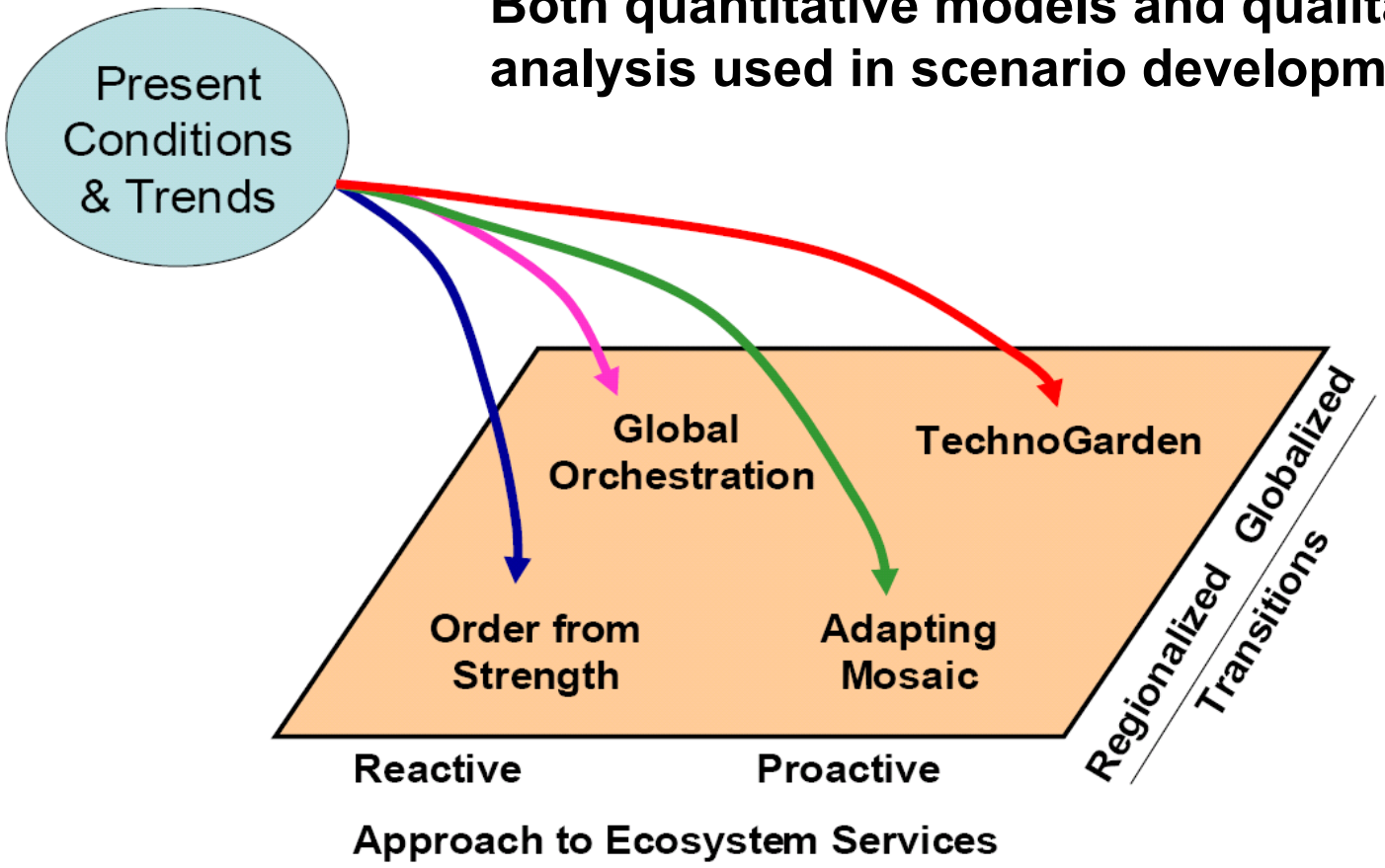


Most direct drivers of degradation in ecosystem services remain constant or are growing in intensity in most ecosystems

MA Scenarios

Not predictions – scenarios are plausible futures

Both quantitative models and qualitative analysis used in scenario development



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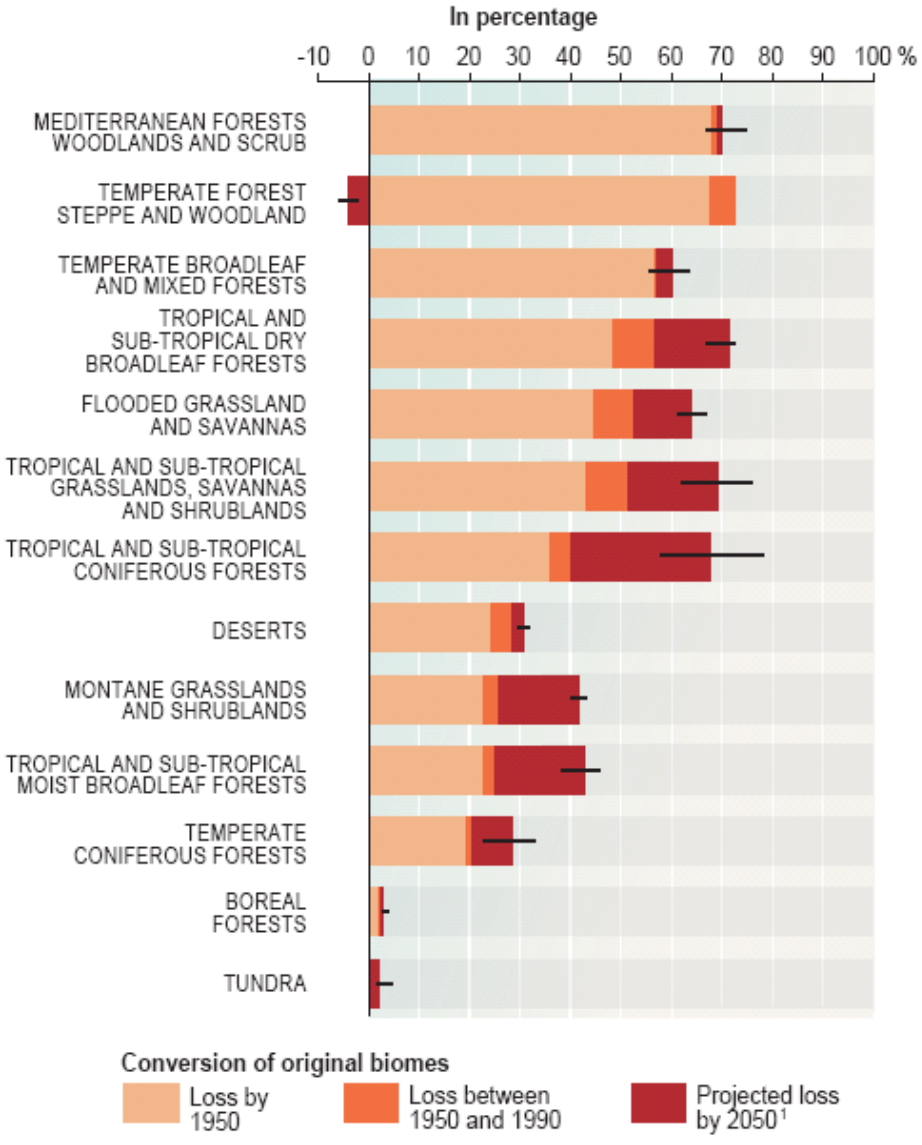
Changes in direct drivers

Habitat transformation:
Further 10–20% of grassland and forestland is projected to be converted by 2050

Overexploitation, overfishing:
Pressures continue to grow in all scenarios

Invasive alien species:
Spread continues to increase



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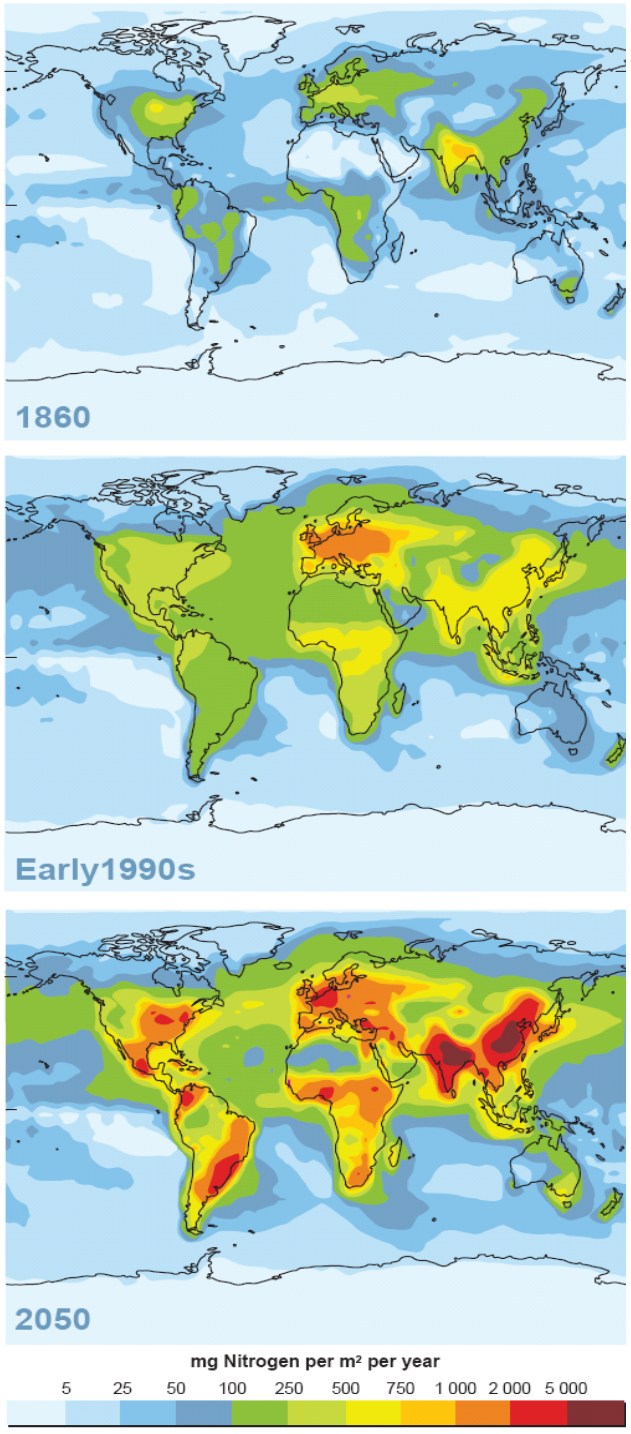
Changes in direct drivers: Nutrient loading

Humans have already doubled the flow of reactive nitrogen on the continents, and some projections suggest that this may increase by roughly a further two thirds by 2050.

The MA scenarios project that the global flux of nitrogen to coastal ecosystems will increase by a further 10–20% by 2030, with almost all of this increase occurring in developing countries.



Changes in direct drivers: Climate Change

Potential future impacts

- By the end of the century, climate change and its impacts may be the dominant direct driver of biodiversity loss and changes in ecosystem services globally

Net harmful impact on ecosystem services

- The balance of scientific evidence suggests that there will be a significant net harmful impact on ecosystem services worldwide if global mean surface temperature increases more than 2^{o} C above preindustrial levels (*medium certainty)*

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Degradation of ecosystem services is a significant barrier to achievement of MDGs

Regional concerns

- Regions facing the greatest challenges in achieving the 2015 targets coincide with regions facing the greatest problems of ecosystem degradation: sub-Saharan Africa, Central Asia, parts of South and Southeast Asia, and some regions in Latin America

Strong linkages with ecosystem condition

- Although socioeconomic factors will play a primary role in achieving many of the MDGs, targets are unlikely to be met without improvement in ecosystem management for goals such as:
  - *Poverty Reduction*
  - *Hunger*
  - *Disease*
  - *Environmental Sustainability including access to water*

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Finding #4:

The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be met under some scenarios involving significant policy and institutional changes, but these changes are large and not currently under way

Many options exist to conserve or enhance specific ecosystem services in ways that reduce negative trade-offs or that provide positive synergies with other ecosystem services

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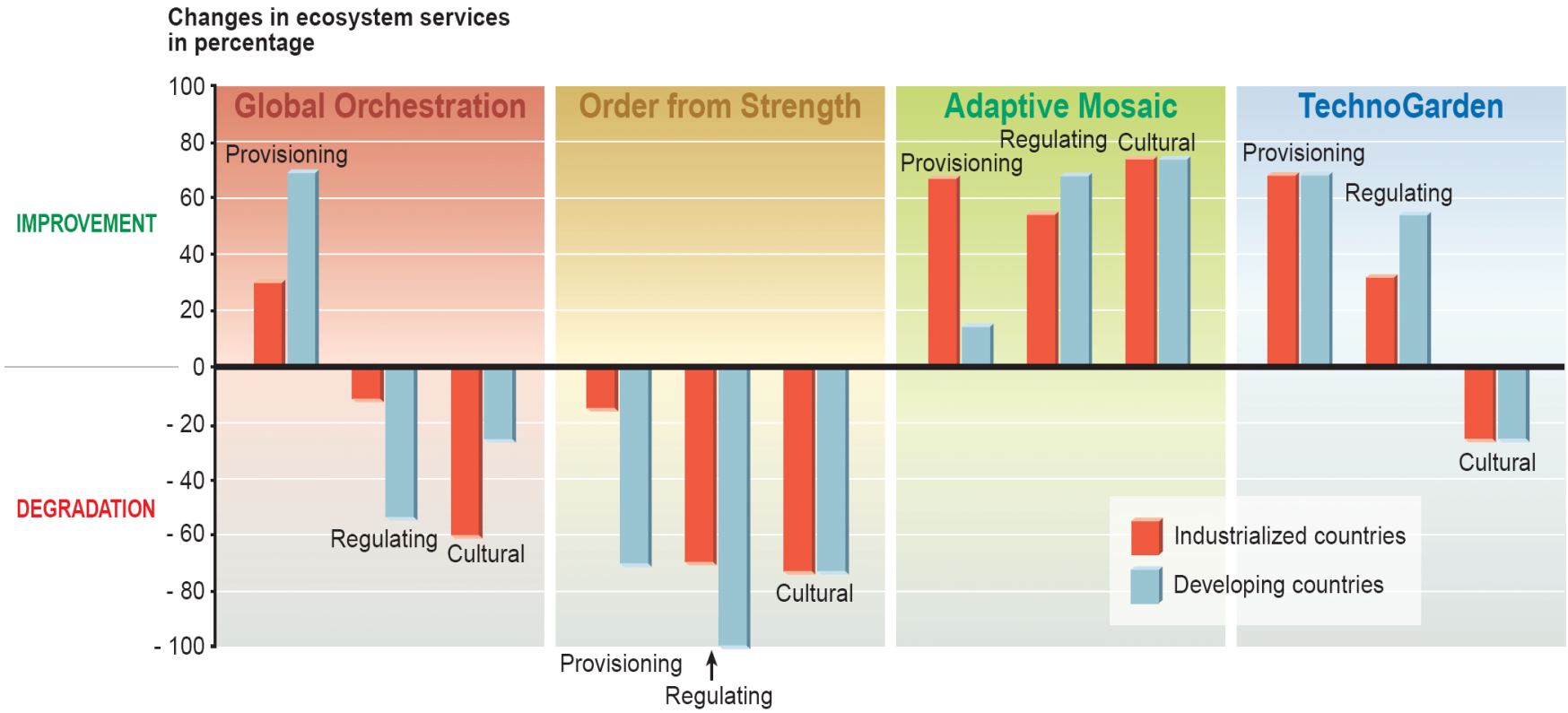
Improvements in services can be achieved by 2050



Three of the four scenarios show that significant changes in policy can mitigate many of the negative consequences of growing pressures on ecosystems, although the changes required are large and not currently under way

Responses – Importance of Indirect Drivers

Ecosystem degradation can rarely be reversed without actions that address one or more indirect drivers of change:

- population change (including growth and migration)
- change in economic activity (including economic growth, disparities in wealth, and trade patterns)
- sociopolitical factors (including factors ranging from the presence of conflict to public participation in decision-making)
- cultural factors
- technological change

Collectively these factors influence the level of production and consumption of ecosystem services and the sustainability of the production.

Promising Responses

Institutions

- **Increased transparency and accountability of government and private-sector performance**

Economics

- **Elimination of subsidies** that promote excessive use of ecosystem services (and, where possible, 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**

Social and Behavioral

- Changes in **consumption**
- 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**

Summary

- **Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history.**
- **The changes that have been made to ecosystems have contributed to substantial net gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes, and the exacerbation of poverty for some groups of people.**
- **The degradation of ecosystem services could grow significantly worse during the first half of this century and is a barrier to achieving the Millennium Development Goals.**
- **The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be met under some scenarios involving significant policy and institutional changes, but these changes are large and not currently under way.**

Visit the MA Website: www.MAweb.org

All MA reports available to download

Access to core data

MA 'outreach' kit

- Slides
- Communication tools