Millennium Ecosystem Assessment Findings

Millennium Ecosystem Assessment

Largest assessment of the health of Earth'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

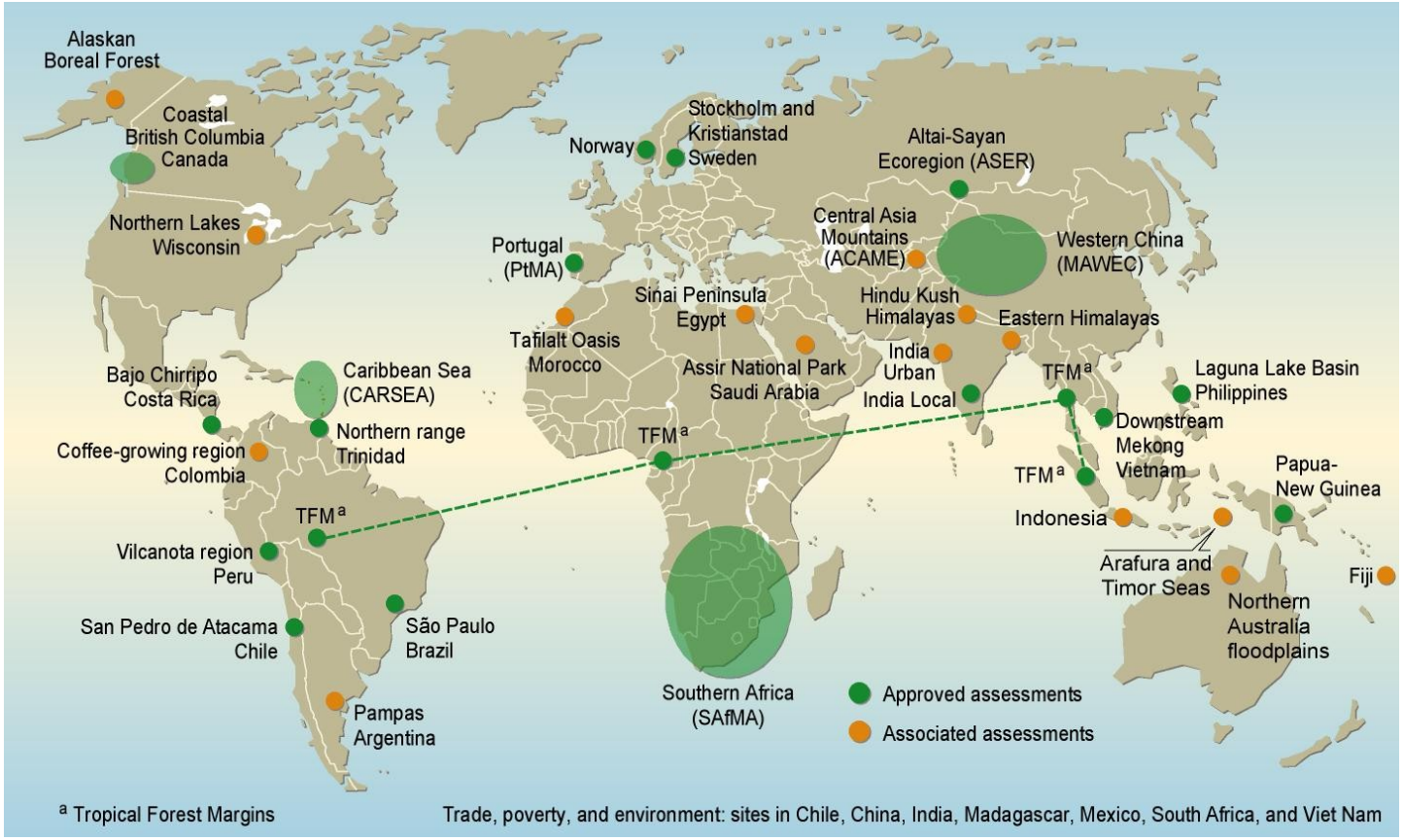
Governance

- 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

Defining Features

Multi-scale assessment

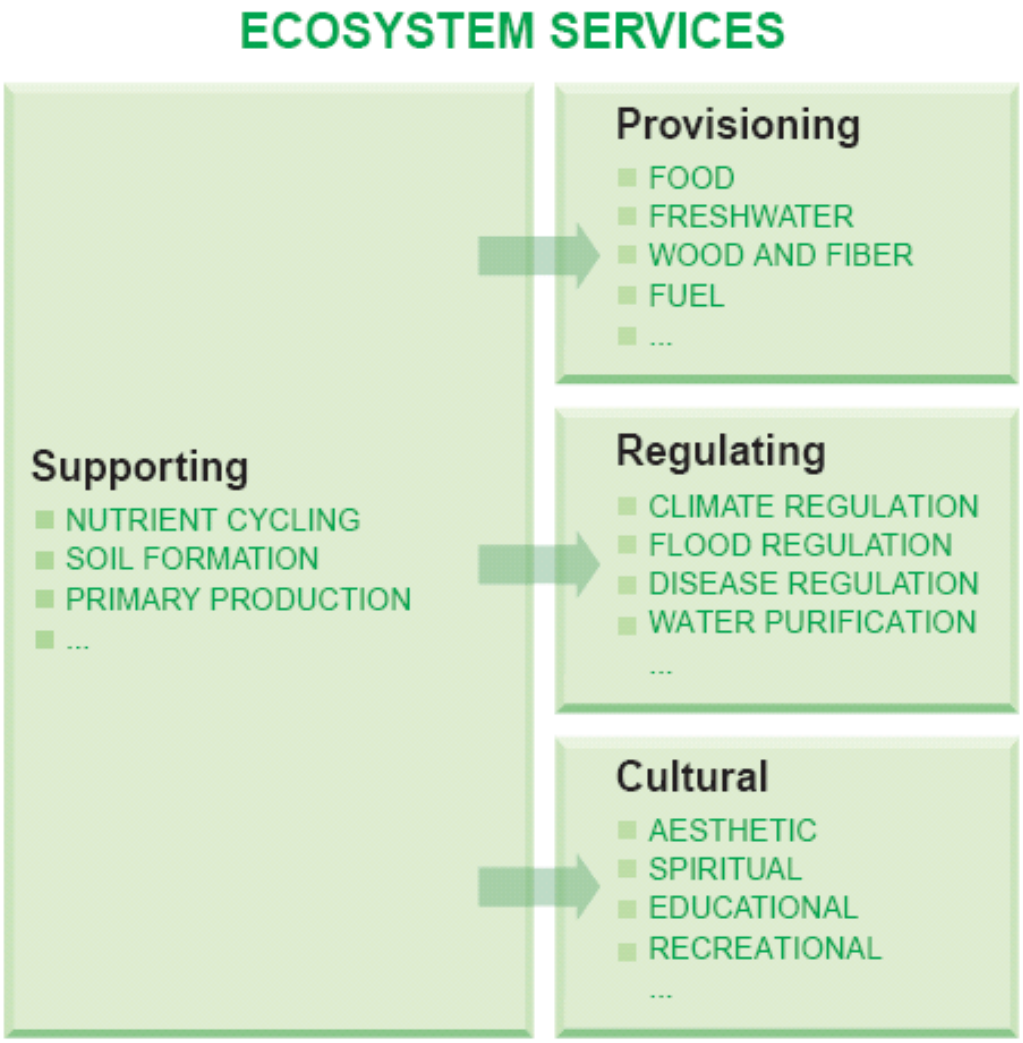
- Includes information from 33 sub-global assessments



Millennium Ecosystem Assessment

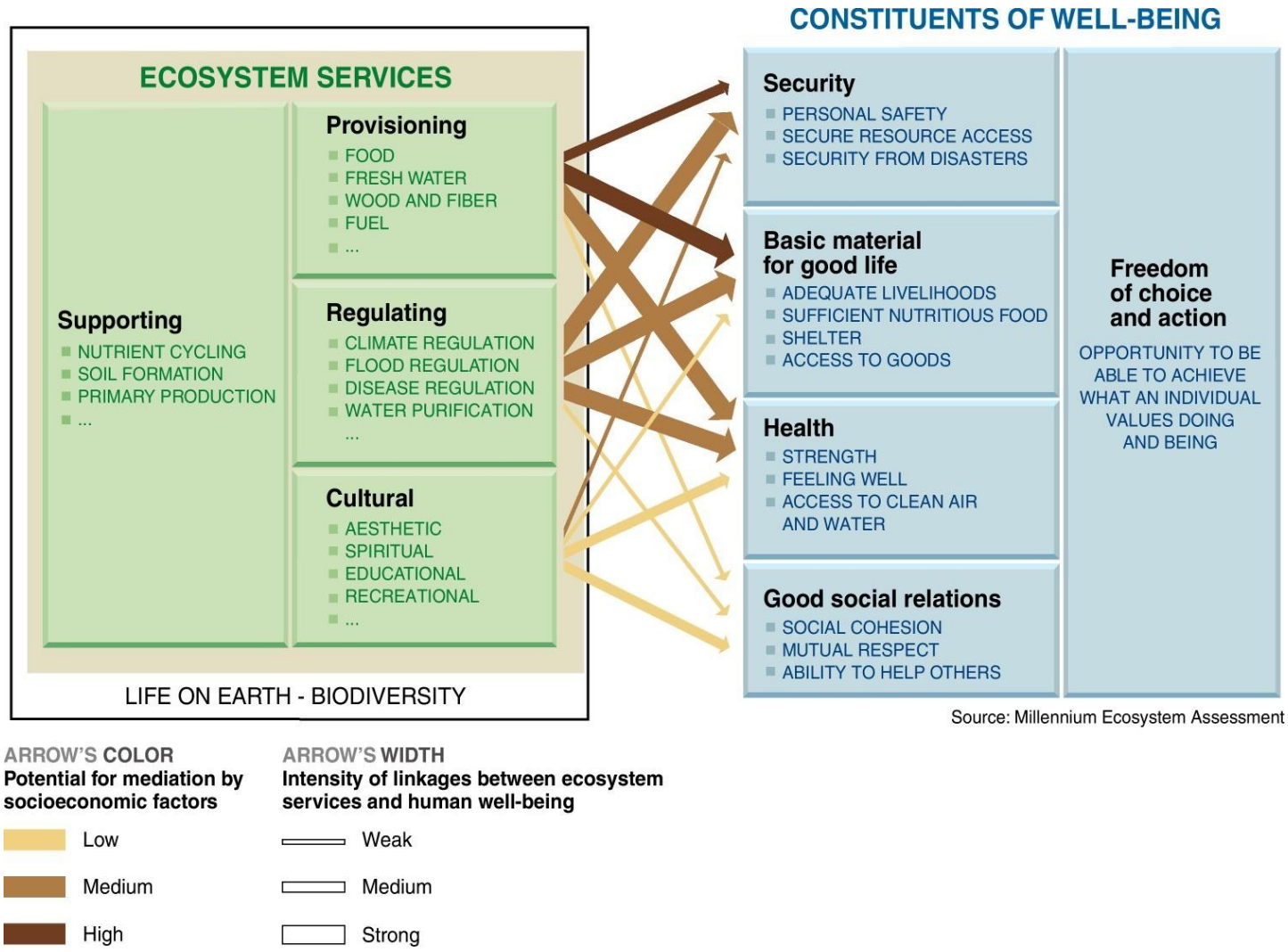
Focus: Ecosystem Services

The benefits people obtain from ecosystems



Millennium Ecosystem Assessment

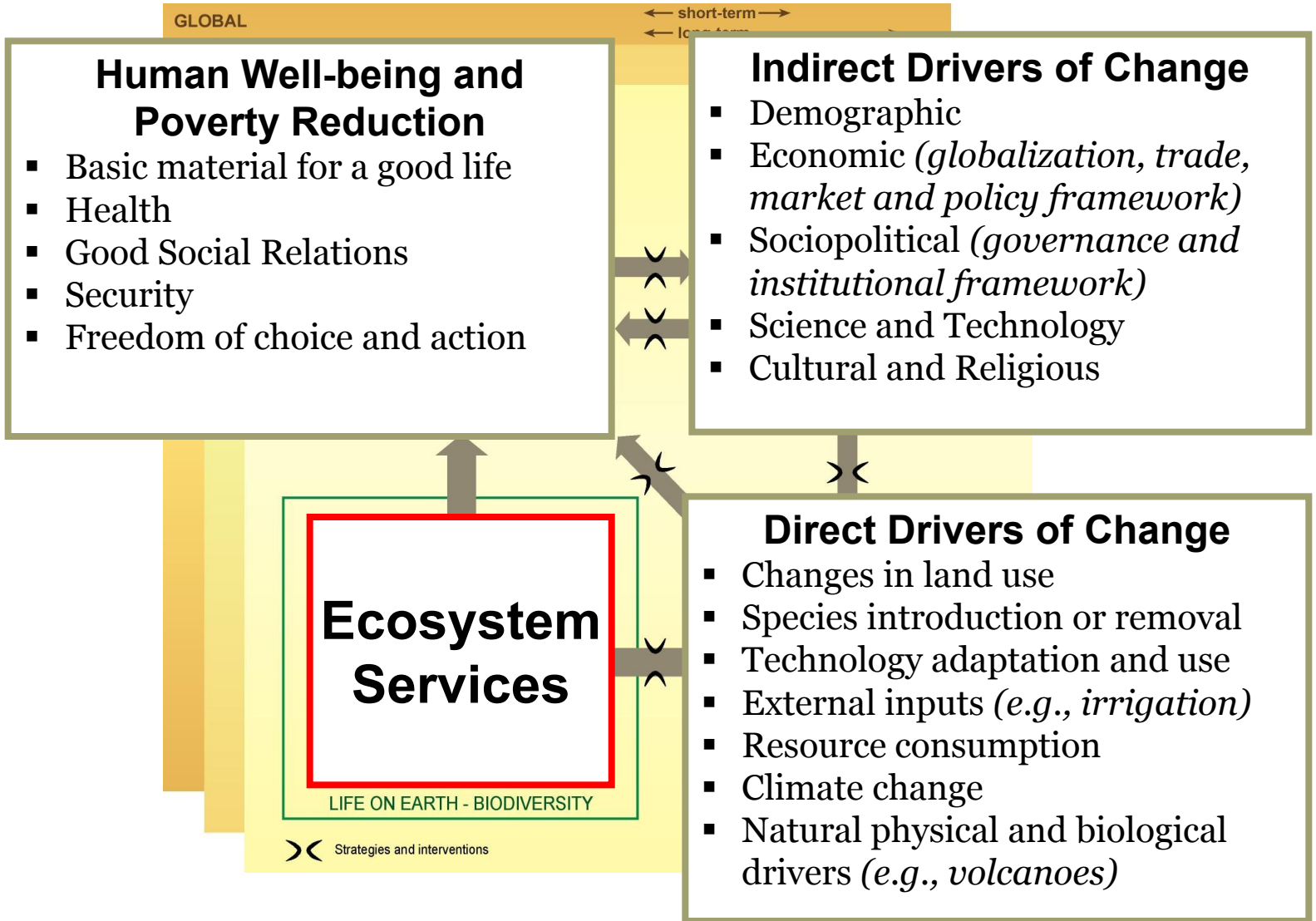
Focus: Consequences of Ecosystem Change for Human Well-being



Source: Millennium Ecosystem Assessment

Millennium Ecosystem Assessment

MA Framework



MA Findings - Outline

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

   Three major problems may 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**

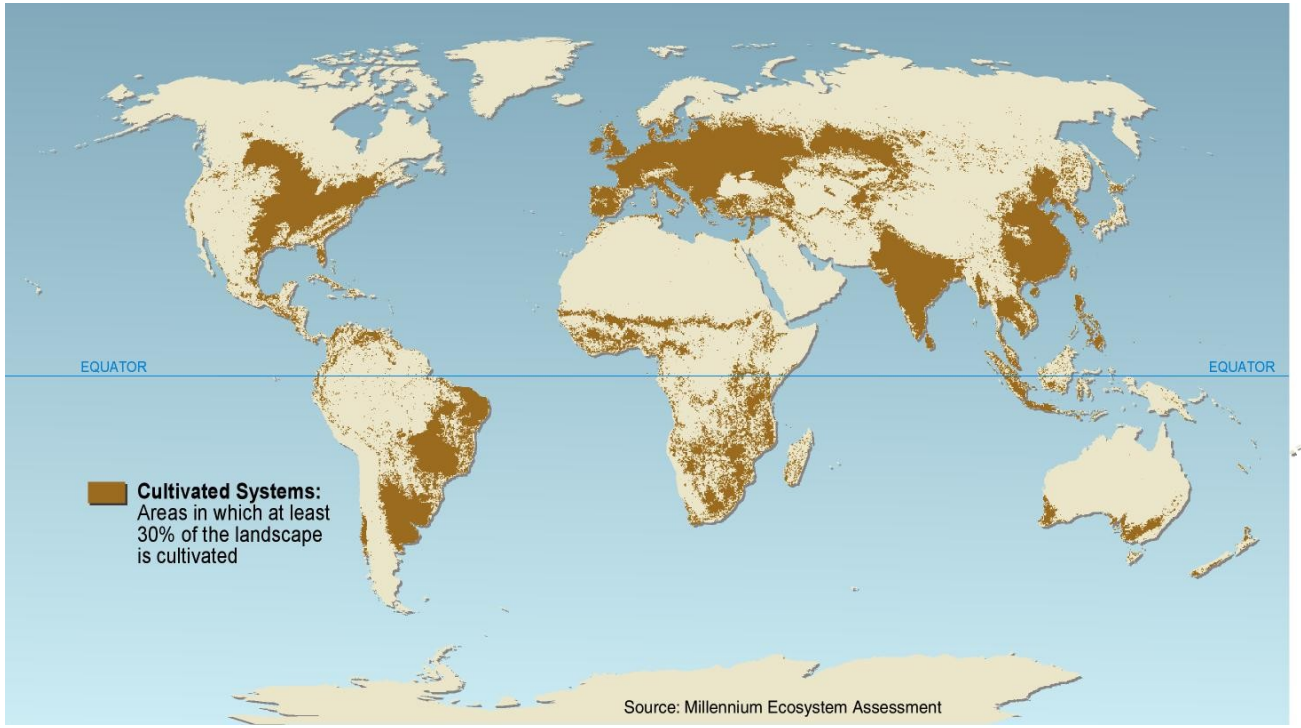
Finding #1

- 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

Millennium Ecosystem Assessment

Unprecedented change in structure and function of ecosystems

More land was converted to cropland in the 30 years after 1950 than in the 150 years between 1700 and 1850.



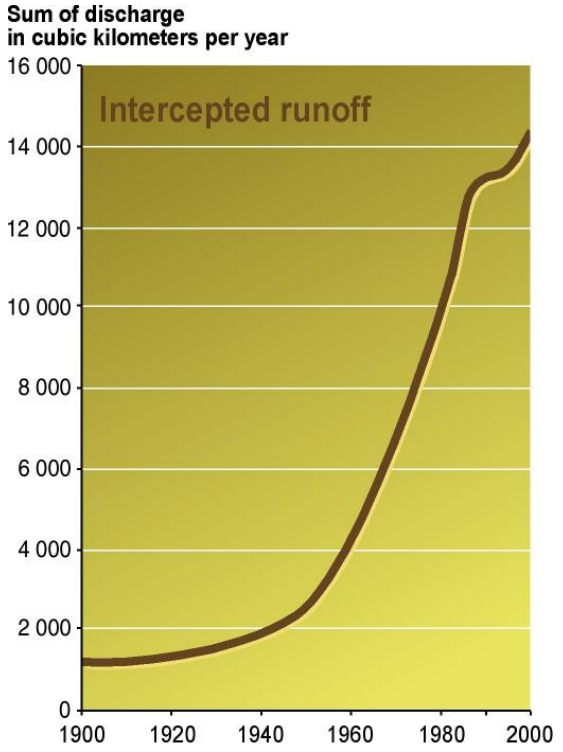
Cultivated Systems in 2000 cover 25% of Earth's terrestrial surface

(Defined as areas where at least 30% of the landscape is in croplands, shifting cultivation, confined livestock production, or freshwater aquaculture)

Millennium Ecosystem Assessment

Unprecedented change: 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



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)

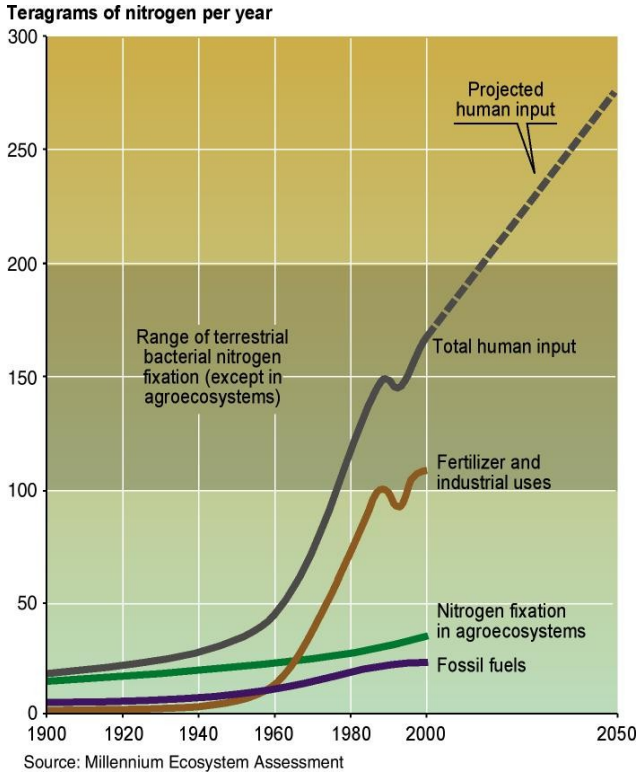
Unprecedented change: Biogeochemical Cycles

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



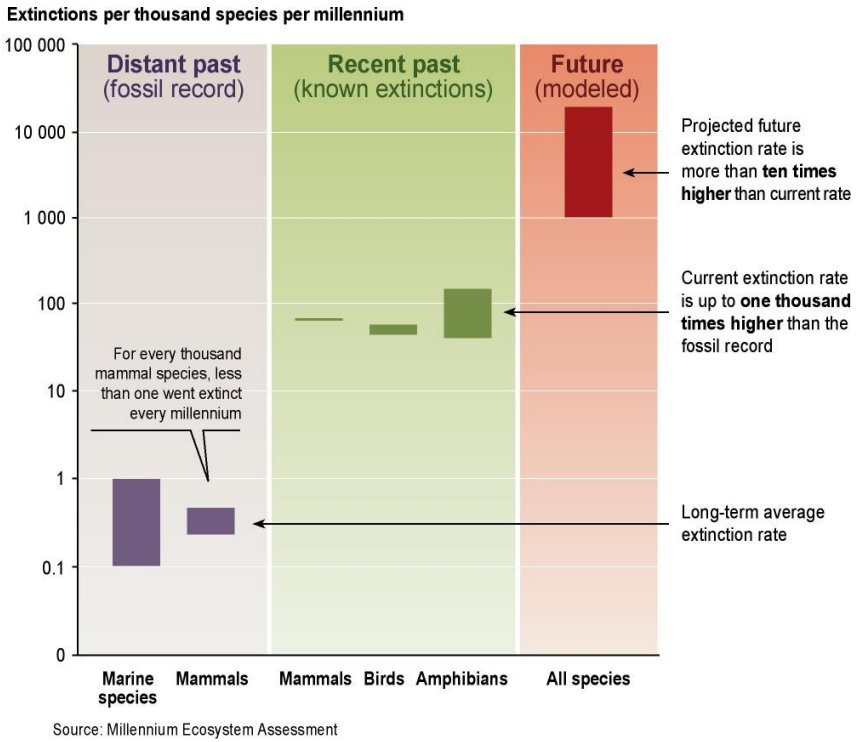
Human-produced Reactive Nitrogen

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

Millennium Ecosystem Assessment

Significant and largely irreversible changes to species diversity

- Humans have increased the species extinction rate by as much as 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)*



MA Findings - Outline

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

   Three major problems may 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 #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, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems

Changes to ecosystems have provided substantial benefits

Rapid growth in demand for ecosystem services between 1960 and 2000:

- world population doubled from 3 to 6 billion people
- global economy increased more than sixfold

To meet this demand:

- food production increased 2 ½ times
- water use doubled
- wood harvests for pulp and paper production tripled
- timber production increased by more than half
- installed hydropower capacity doubled

MA Findings - Outline

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

   Three major problems may 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**

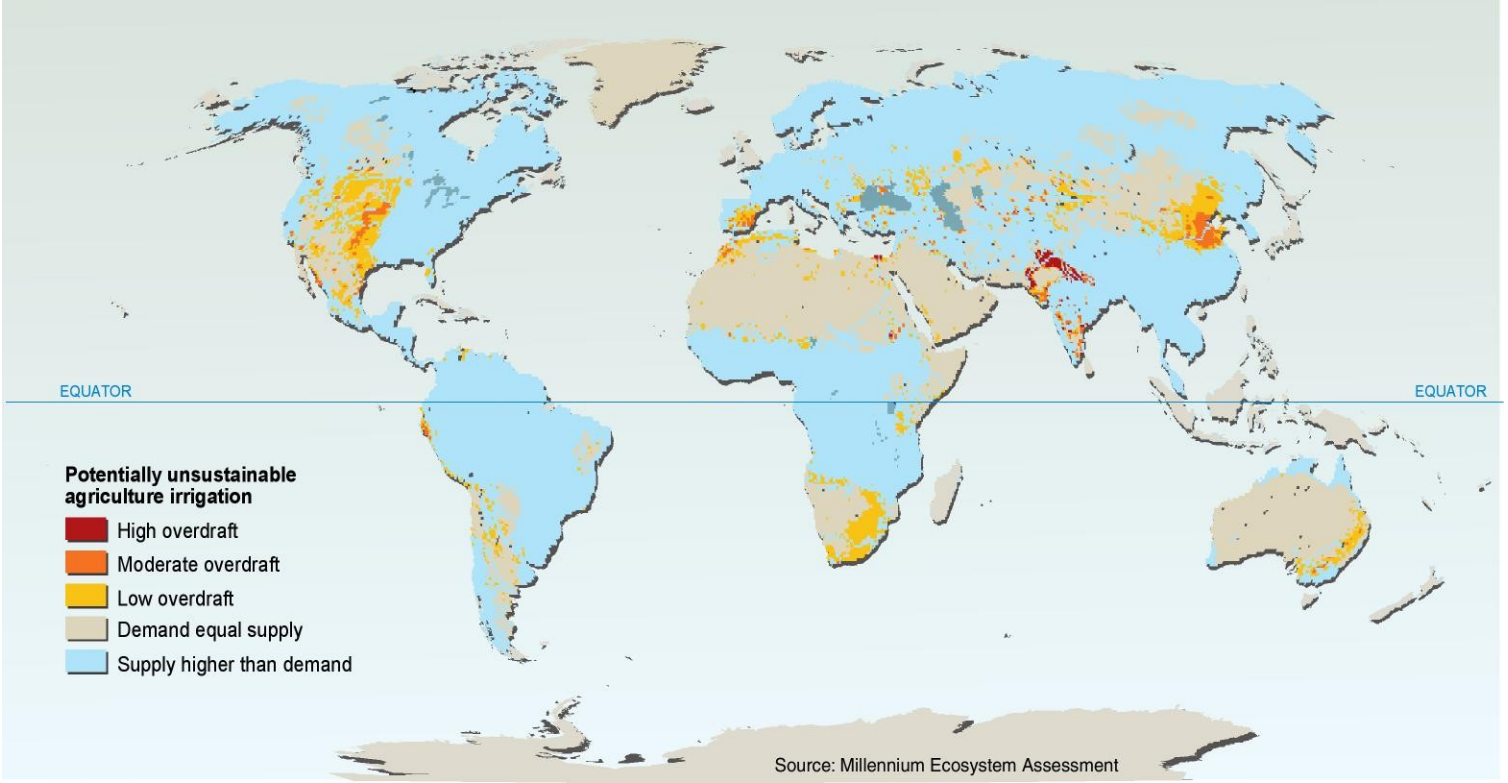
Degradation and unsustainable use of ecosystem services

- 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

Millennium Ecosystem Assessment

Water

- 5 to possibly 25% of global freshwater use exceeds long-term accessible supplies (*low to medium certainty)*
- 15 - 35% of irrigation withdrawals exceed supply rates and are therefore unsustainable (*low to medium certainty)*



Regulating Services

Air quality regulation

- Ability of the atmosphere to cleanse itself of pollutants has declined since pre-industrial times but not by more than 10%

Regional and local climate regulation

- Changes in land cover have affected regional and local climates both positively and negatively, but there is a preponderance of negative impacts ; for example, tropical deforestation and desertification have tended to reduce local rainfall

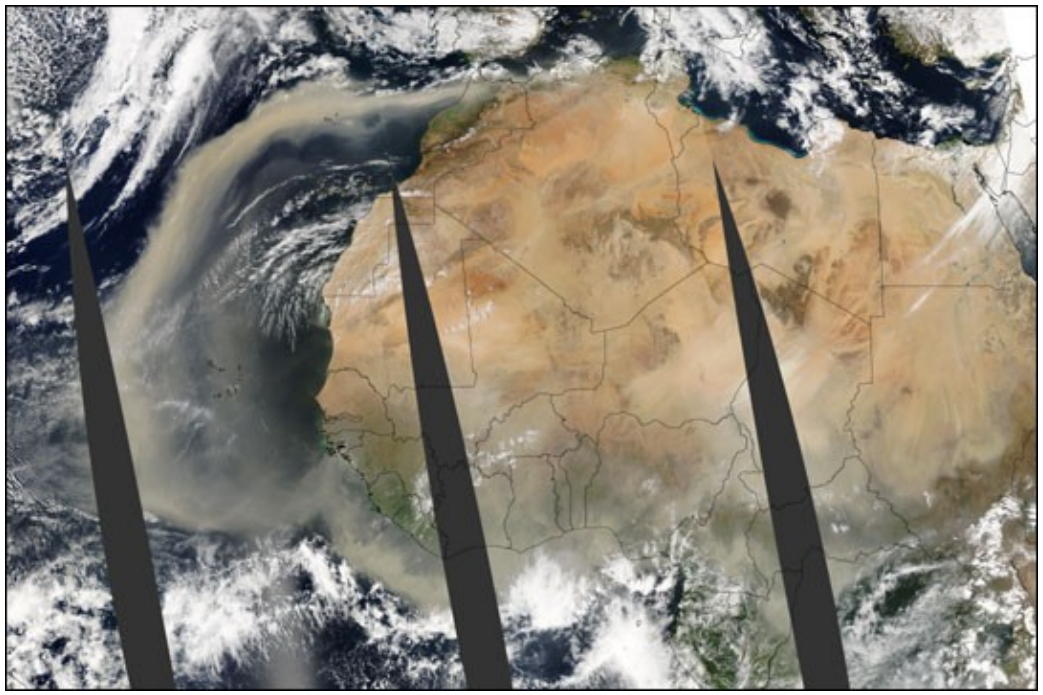
Water purification and waste treatment

- Globally, water quality is declining, although in most industrial countries pathogen and organic pollution of surface waters has decreased over the last 20 years
- Nitrate concentration has grown rapidly in the last 30 years

Millennium Ecosystem Assessment

Wealthy populations cannot be insulated from ecosystem degradation

- The physical, economic, or social impacts of ecosystem service degradation may cross boundaries
- Many sectors of industrial countries still depend directly on ecosystem services.
- Wealth cannot buffer people from changes in all ecosystem services (e.g., cultural services, air quality)
- Changes in ecosystems that contribute to climate change affect all people



Source: NASA Earth Observatory

Dust Cloud Off the Northwest Coast of Africa extending to South America

MA Findings - Outline

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

   Three major problems may 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 #4:

- The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the MA considered but these involve significant changes in policies, institutions and practices, that are 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

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.

Responses – Key Barriers

- Inappropriate institutional and governance arrangements, including the presence of corruption and weak systems of regulation and accountability.
- Market failures and the misalignment of economic incentives.
- Social and behavioral factors, including the lack of political and economic power of some groups that are particularly dependent on ecosystem services or harmed by their degradation.
- Underinvestment in the development and diffusion of technologies
- Insufficient knowledge (as well as the poor use of existing knowledge) concerning ecosystem services and responses that could enhance benefits from these services while conserving resources.
- Weak human and institutional capacity related to the assessment and management of ecosystem services.

Responses: Institutions

Changes in institutional and environmental governance frameworks are sometimes required to create the enabling conditions for effective management of ecosystems, while in other cases existing institutions could meet these needs but face significant barriers.

Promising Responses

- Integration of ecosystem management goals within other sectors and within broader development planning frameworks
- Increased coordination among multilateral environmental agreements and between environmental agreements and other international economic and social institutions
- Increased transparency and accountability of government and private-sector performance on decisions that have an impact on ecosystems, including through greater involvement of concerned stakeholders in decision-making

Responses: Economics

Economic and financial interventions provide powerful instruments to regulate the use of ecosystem goods and services

Promising Responses

- Elimination of subsidies that promote excessive use of ecosystem services (and, where possible, transfer these subsidies to payments for non-marketed ecosystem services)
  - *Subsidies paid to the agricultural sectors of OECD countries between 2001 and 2003 averaged over $324 billion annually, or one third the global value of agricultural products in 2000*
  - *Compensatory mechanisms may be needed for poor people who are adversely affected by the removal of subsidies*
  - *removal of agricultural production subsidies within the OECD would need to be accompanied by actions to minimize adverse impacts on ecosystem services in developing countries*

Responses: Economics

Promising Responses

- Greater use of economic instruments and market-based approaches in the management of ecosystem services (where enabling conditions exist):
  - *Taxes or user fees for activities with "external" costs (e.g. include taxes on excessive application of nutrients)*
  - *Payment for ecosystem services*

    For example, in 1996 Costa Rica established a nationwide system of conservation payments under which Costa Rica brokers contracts between international and domestic "buyers" and local "sellers" of sequestered carbon, biodiversity, watershed services, and scenic beauty
  - *Mechanisms to enable consumer preferences to be expressed through markets such as existing certification schemes for sustainable fisheries and forest practices*

Responses: Social & Behavioral

These are generally interventions that stakeholders initiate and execute through exercising their procedural or democratic rights in efforts to improve ecosystems and human well-being

Promising Responses

- Measures to reduce aggregate consumption of unsustainably managed ecosystem services
  - *Behavioral changes that could reduce demand for threatened ecosystem services can be encouraged through actions such as education and public awareness programs, promotion of demand-side management, commitments by industry to use raw materials that are from sources certified as being sustainable, and improved product labeling*
- Communication and education
- Empowerment of groups particularly dependent on ecosystem services or affected by their degradation, including women, indigenous peoples, and young people

Responses: Technological

Development and diffusion of technologies designed to increase the efficiency of resource use or reduce the impacts of drivers such as climate change and nutrient loading are essential

Promising Responses

- Promotion of technologies that enable increased crop yields without harmful impacts related to water, nutrient, and pesticide use
- Restoration of ecosystem services
- Promotion of technologies to increase energy efficiency and reduce greenhouse gas emissions

Responses: Knowledge

Effective management of ecosystems is constrained both by the lack of knowledge and information about ecosystems and by the failure to use adequately the information that does exist

Promising Responses

- Incorporation of nonmarket values of ecosystems in resource management decisions
- Use of all relevant forms of knowledge and information in assessments and decision-making, including traditional and practitioners' knowledge
- Enhancement of human and institutional capacity for assessing the consequences of ecosystem change for human well-being and acting on such assessments

Summary

- Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel
- 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 partially met under some scenarios that the MA has considered but these involve significant changes in policies, institutions and practices, that are not currently under way

Millennium Ecosystem Assessment

Visit the MA Website

www.millenniumassessment.org

All MA reports available to download

Access to core data

MA 'outreach' kit

- Slides
- Communication tools