



Millennium Ecosystem Assessment

The Scenarios of the Millennium Ecosystem Assessment: Process, Contents and Uptake

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MA: 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

MA Framework

GLOBAL

← short-term →

← long-term →

REGIONAL

LOCAL

Human well-being and poverty reduction

- BASIC MATERIAL FOR A GOOD LIFE
- HEALTH
- GOOD SOCIAL RELATIONS
- SECURITY
- FREEDOM OF CHOICE AND ACTION

Indirect drivers of change

- DEMOGRAPHIC
- ECONOMIC (e.g., globalization, trade, market, and policy framework)
- SOCIOPOLITICAL (e.g., governance, institutional and legal framework)
- SCIENCE AND TECHNOLOGY
- CULTURAL AND RELIGIOUS (e.g., beliefs, consumption choices)

Ecosystem services

- PROVISIONING (e.g., food, water, fiber, and fuel)
- REGULATING (e.g., climate regulation, water, and disease)
- CULTURAL (e.g., spiritual, aesthetic, recreation, and education)
- SUPPORTING (e.g., primary production, and soil formation)

LIFE ON EARTH - BIODIVERSITY

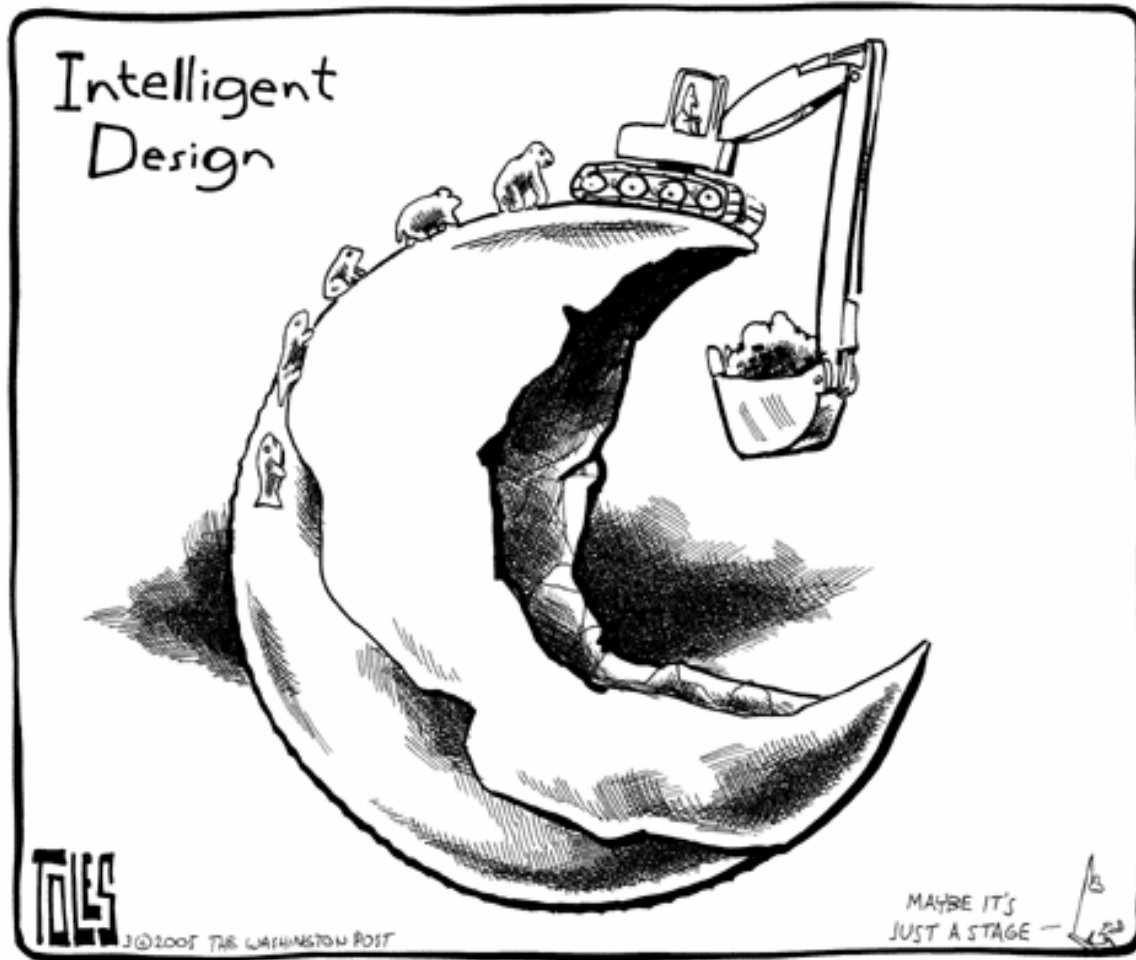
Direct drivers of change

- CHANGES IN LOCAL LAND USE AND COVER
- SPECIES INTRODUCTION OR REMOVAL
- TECHNOLOGY ADAPTATION AND USE
- EXTERNAL INPUTS (e.g., fertilizer use, pest control, and irrigation)
- HARVEST AND RESOURCE CONSUMPTION
- CLIMATE CHANGE
- NATURAL, PHYSICAL, AND BIOLOGICAL DRIVERS (e.g., evolution, volcanoes)

Four Working Groups

<p>Condition and Trends</p>	<p>Scenarios</p>	<p>Responses</p>
<ul style="list-style-type: none"> ▪ What is the current condition and historical trends of ecosystems and their services? ▪ What have been the consequences of changes in ecosystems for human well-being? 	<ul style="list-style-type: none"> ▪ Given plausible changes in direct and indirect drivers, what will be the consequences for ecosystems, their services, and human well-being? 	<ul style="list-style-type: none"> ▪ What can we do to enhance well-being and conserve ecosystems?
<p>Sub-Global</p>	<ul style="list-style-type: none"> ▪ All of the above, at regional, national, local scales 	

...the short version of the MA results



Looking into the future

Out of curiosity

For scientific exploration **MA *Global scenarios***

MA *Sub-Global scenarios*

For decision-making

- Decisions are based on expected outcomes and the trade-offs they imply
- Decisions involve uncertainty about how the future will unfold

For planning purposes/strategic planning exercise

Scenario Definitions

Plausible stories about how the future might unfold from existing patterns, new factors and alternative human choices. The stories can be told in the language of both **words** and **numbers** (Raskin et al. 2005).

Plausible descriptions of how the future may develop, based on a coherent and internally consistent set of **assumptions** about key relationships and **driving forces** (Nakicenovic 2000).

A **tool** for ordering one's perceptions about alternative future environments in which one's **decision** might be played out (Schwartz 1996).

Plausible alternative futures, each an example of what might happen under particular assumptions (MA).

Who was the MA *Global Scenarios* group?

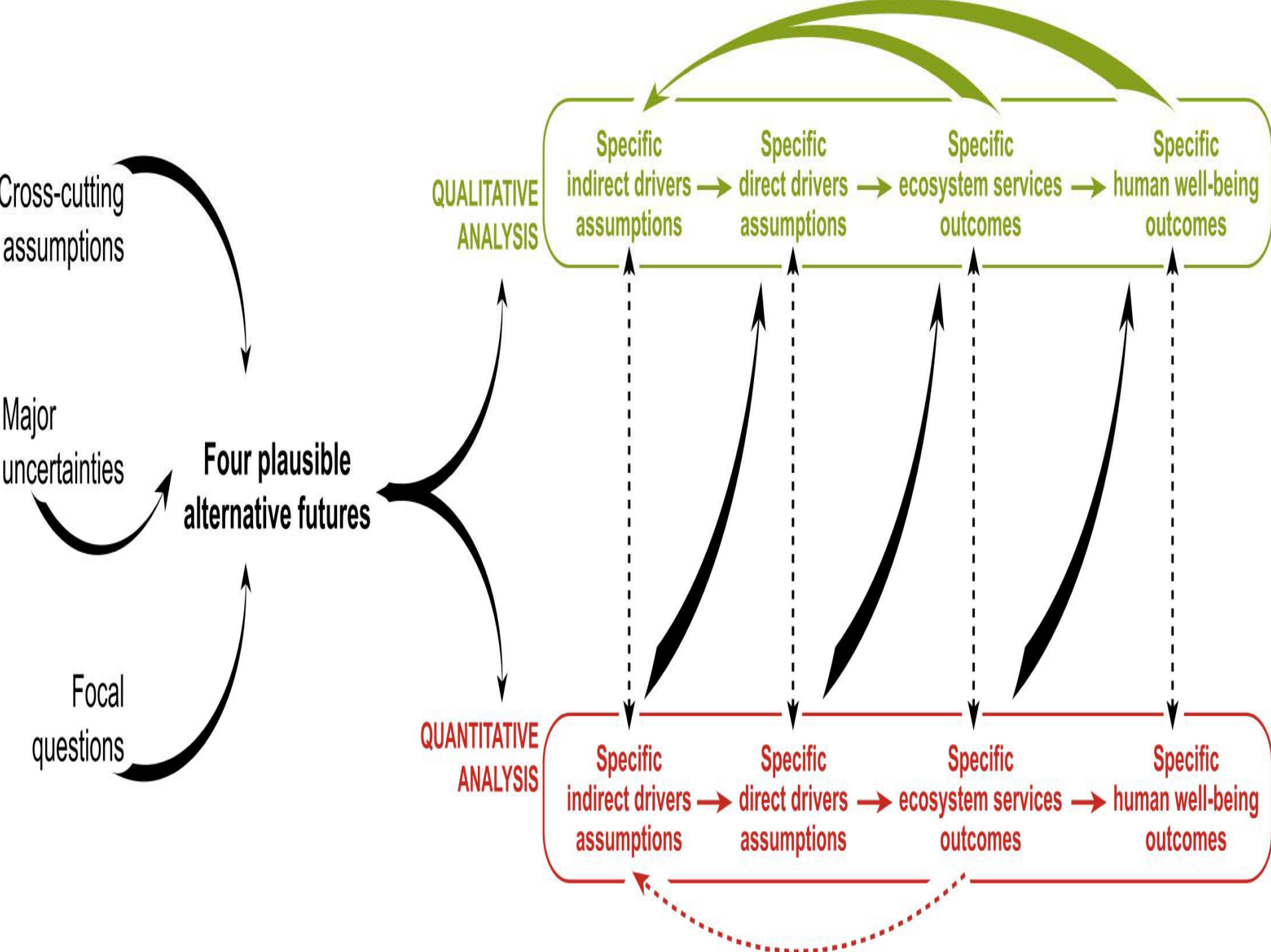
- mainly ecologists, economists, social scientists, modelers, etc. ⇒ scientific community
- some representatives of int'l org.s, NGOs, private sector

MA *global* scenario development process

2001

- User needs survey of the MA
- Survey of Scen. WG with ~100 'stakeholders' from scientific community, private sector, NGOs, int'l org.s, etc. about their hopes and fears for the future
- Scen. WG's develops main scenario building blocks and first set of 'embryo' storylines
- feedback from MA board, WBCSD, scientific community, etc.
- further refining of storylines -> first model runs
- iterations between qual. & quant. parts of scenarios
- finalization and dissemination

2005







Why use qualitative storylines?

- Can built a consistent set of assumptions
- Allows creativity (not bounded by formal models)
- Can fill in areas where modelling does not exist
- Stories allow for easy communication

Why use quantification?

- Brings in quantitative information in areas where knowledge exists
- Restricts outcomes to a possible realm
- Can illustrate messages / communicates well

The MA scenarios

		World Development	
		globalization	regionalization
Ecosystem Management	reactive	 <p>Global Orchestration</p>	 <p>Order from Strength</p>
	proactive	 <p>TechnoGarden</p>	 <p>Adapting Mosaic</p>



Global Orchestration

focus on macro-scale policy reform together with a socially conscious globalization, reactive approach to env. management

Millennium Ecosyst

Dominant Approach for Sustainability	Economic Approach	Social Policy Foci
<p>Create demand for environmental protection via economic growth and social improvements; public goods</p>	<p>Redefinition of the public and private sector roles; improving market performance; focus on global public good</p>	<p>Increase global equity; public health; global education</p>



Order from Strength

retreat from global institutions results in a fragmented world, focus on national security and protectionism, reactive approach to env. mgmt

Dominant Approach for Sustainability

Economic Approach

Social Policy Foci

Reactive problem-solving by individual nations; sectoral approaches, creation of parks and protected reserves

Regional trade blocs, mercantilism, self-sufficiency

Security and protection



Adapting Mosaic

retreat from global institutions, focus on strengthened local institutions and local learning, proactive approach to env. mgmt

Millennium Ecosyste

Dominant Approach for Sustainability	Economic Approach	Social Policy Foci
<p>Learning via management and monitoring, shared management responsibility, adjustment of governance structures to resource users, common-property institutions</p>	<p>Focus on local development; trade rules allow local flexibility/interpretation; local non-market rights</p>	<p>Local communities linked to global communities; local equity</p>



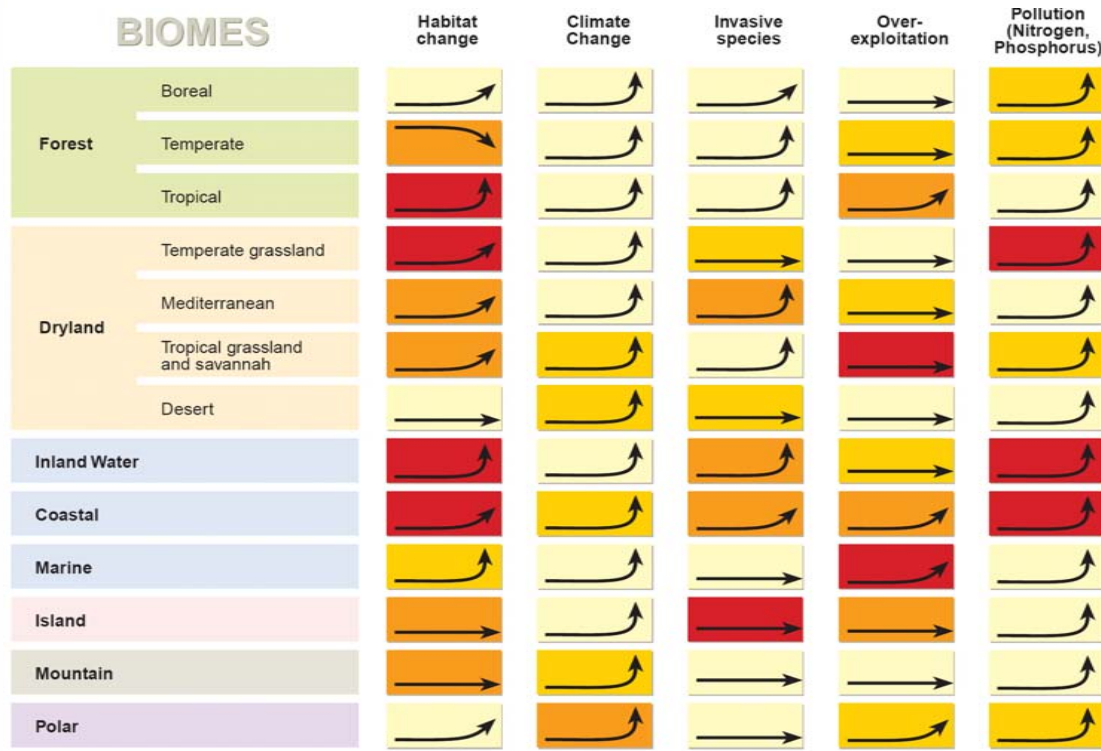
Techno Garden

emphasis on development of technologies to substitute for ecosystem services, globalized world, proactive approach to manage ES via technology

Millennium Ecosyst

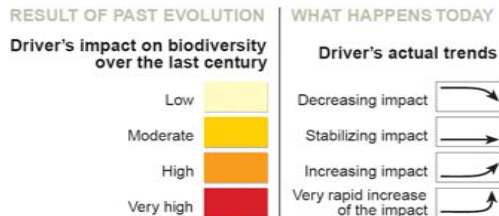
Dominant Approach for Sustainability	Economic Approach	Social Policy Foci
<p>Green technology, eco-efficiency, tradable ecological property rights</p>	<p>Global reduction of tariff boundaries, fairly free movement of goods, capital and people, global markets in ecological property</p>	<p>Improving individual and community technical expertise; policies follow opportunities ; competition</p>

Direct drivers growing in intensity



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

there are marked differences between scenarios in fast their intensity grows



Changes in direct drivers: Climate Change

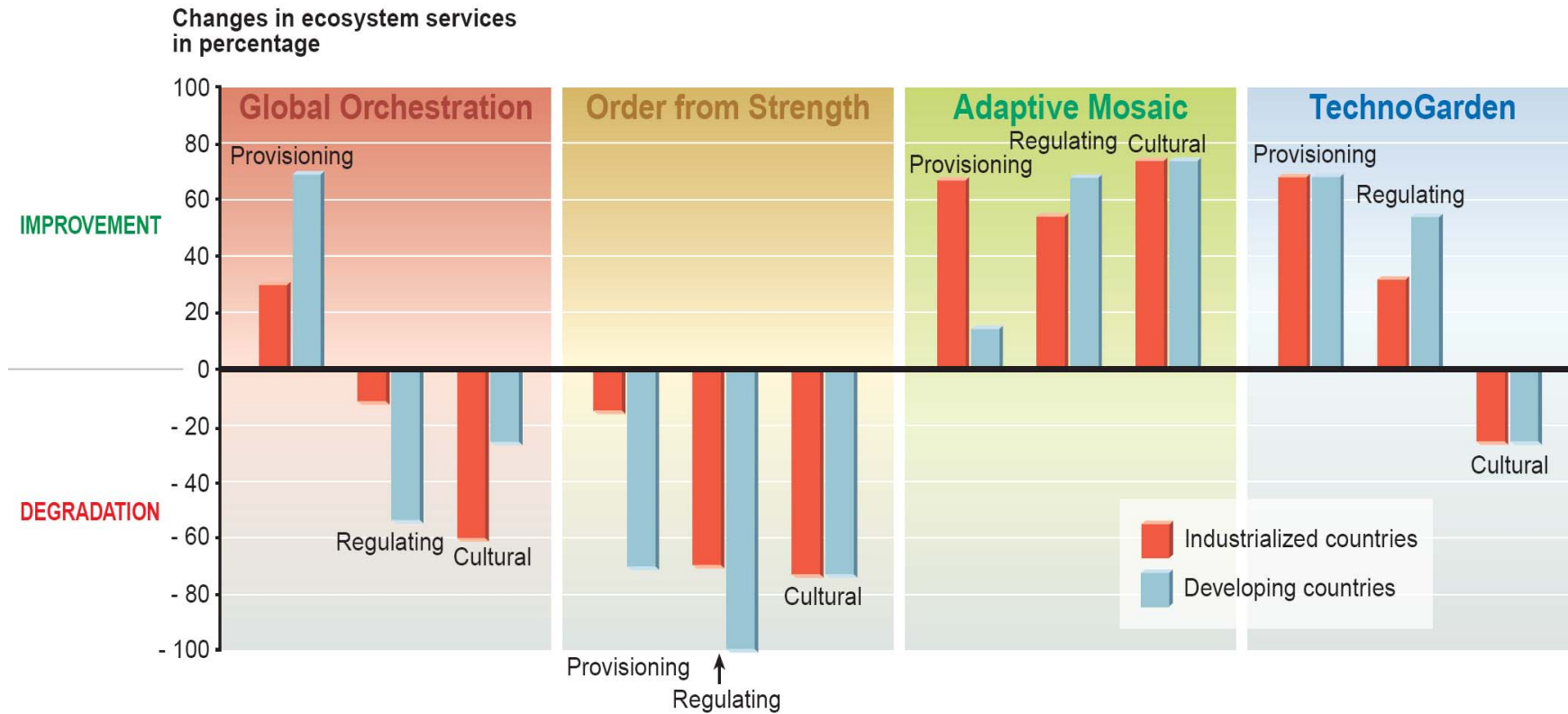
Potential future impacts

- 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
- Harm to biodiversity will grow worldwide with increasing rates of change in climate and increasing absolute amounts of change
- Some ecosystem services in some regions may initially be enhanced by projected changes in climate. As climate change becomes more severe the harmful impacts outweigh the benefits in most regions of the world

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° C above preindustrial levels (*medium certainty*). This would require CO₂ stabilization at less than 450 ppm.

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

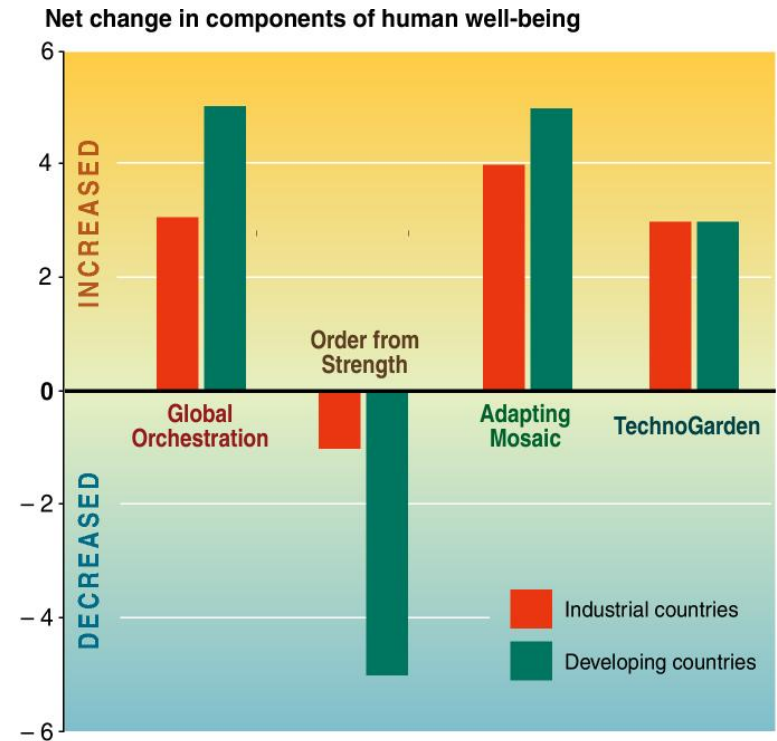
Outcomes of the scenarios analysis

Focus on increasing the flow of provisioning services often leads to reductions in supporting, regulating, and cultural ecosystem services. This may reduce the future capacity of ecosystems to provide services.

Monitoring ALL ecosystem services will increase society's capacity to avert large disturbances of ecosystem services, or adapt to them rapidly when they occur.

Changes in human well-being under MA scenarios

- In three of the four MA scenarios, between three and five of the components of well-being (material needs, health, security, social relations, freedom) improve between 2000 and 2050
- In one scenario (*Order from Strength*) conditions are projected to decline, particularly in developing countries



Source: Millennium Ecosystem Assessment

Examples of changes in policies and practices that yield positive outcomes

Global Orchestration

- Major investments in public goods (e.g., education, infrastructure) and poverty reduction
- Trade barriers and distorting subsidies eliminated

Adapting Mosaic

- Widespread use of active adaptive management
- Investment in education (countries spend 13% of GDP on education, compared to 3.5% today)

TechnoGarden

- Significant investment in development of technologies to increase efficiency of use of ecosystem services
- Widespread use of 'payments for ecosystem services' and development of market mechanisms

MA *sub-global* scenario exercises: main examples

- Southern African exercise: SAfMA (regional and local scen.)
 - Caribbean Sea: CARSEA
 - Portugal
 - Wisconsin, USA: NHLD scenarios
 - Tropical Forest Margins (ASB) exercise
 - India: 3 exercises
 - Western China.
 -
- ⇒ mixed input of decision makers in process, overall mainly scientists as scenario builders
- ⇒ various ways in how scenarios were linked across geographical scales

Uptake of the MA scenarios so far (based on W. Reid's survey 2006)

- used in other exercises
 - GECAFS food systems scenarios for the Caribbean
 - starting point for scenarios of Int'l Assessment of Ag. Science and Technology for Development (IAASTD)
- capacity building
 - ASB scenarios manual
 - in curricula of university courses
 - course for env. journalists in Italy
- scientific community
 - special journal issues, e.g. Ecology & Society
 - various journal articles
 - WRI handbook of mainstreaming ES considerations into development planning
- for decision making ???
 - CBD
 - other UN conventions
 - limited in other sectors???

...some lessons learned so far on how to better inform decision-making (-> saliency, credibility and legitimacy)

- important to decide on the purpose of the exercise (this also depends on geographical scale)
 - scientific exploration
 - direct decision support
- the process of scenario building is as important as the final scenarios, esp. if the exercise aims at direct use for policy making ⇒ degree stakeholder involvement
- stakeholder involvement likely to change with scale of exercise
- embedding of scenario building in on-going decision making processes to improve relevance

Scenario development stage	Steps *	Type of information resulting from each step	Possible applications of the generated information in decision-making processes
Discussion of main Uncertainties about the future, focal questions	1) Discussion of historical areas and developments that led to present situation 2) Identification of main uncertainties for the future 3) Identification of focal questions (main problems) to be addressed by the scenarios	<ul style="list-style-type: none"> - thorough analysis of current problems and their roots, based on stakeholder analysis - thorough analysis of key questions for the future - clear understanding of main assumptions for the future of the investigated system 	<ul style="list-style-type: none"> - issue identification - issue framing
Discussion of main driving forces of change	1) Listing of main driving forces that will change the future 2) Identification of possible driving force trajectories, thresholds and uncertainty about them 3) Identification of main interactions between driving forces	<ul style="list-style-type: none"> - thorough analysis of main factors shaping the future and their importance - voicing of different view points on drivers' trajectories and their importance - clear understanding of system's interactions, development of a system's perspective 	<ul style="list-style-type: none"> - issue framing
Developing the scenarios	1) Developing first drafts of scenario storylines 2) Translating storylines into model inputs and executing a modeling exercise (optional) 3) Finalizing scenarios based on critical assessment of storylines (qualitative) and modeling (quantitative) results, based also on stakeholder discussions	<ul style="list-style-type: none"> - creative, out-of-the-box ideas about the future and emerging changes - questioning of assumptions on drivers' interactions -> consistency checks - ground-truthing of qualitative knowledge thru modeling 	<ul style="list-style-type: none"> - identification of decision points - policy measure identification - ex ante policy assessment
Analysis of implications for main stakeholders across scenarios set	1) Analysis across the scenarios set 2) Discussion of scenarios analysis' results for various stakeholder groups 3) Final write-up and dissemination of the scenario exercise	<ul style="list-style-type: none"> - assessing trade-offs and synergies of various management options - providing information to different stakeholders on differing view points - awareness raising on emerging issues for the future 	<ul style="list-style-type: none"> - policy measure identification - ex ante policy assessment - strategy development for policy measure implementation