The Global Scenarios of the Millennium Ecosystem Assessment

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Monika Zurek
MA Scenarios Group TSU
FAO, Rome

Overview of the talk

- Questions about the future
- What are scenarios and why use them?
- The approach of the MA scenarios group
- The global MA scenarios up to date and some preliminary results

Questions for the future (user survey and interviews)

- What are the **plausible future changes in ecosystems,** and in the supply of and demand for ecosystem services and the consequent changes in the constituents of well-being?

  - **Role of biodiversity loss**
  - **Consequences of desertification and wetlands loss**
  - **Costs, benefits and risks of possible development pathways**
  - **Irreversible changes**
  - **Vulnerability of different groups in society**
  - **Role of technology**

Sources of Uncertainty when thinking about the Future

Ignorance

Understanding is limited

Surprise

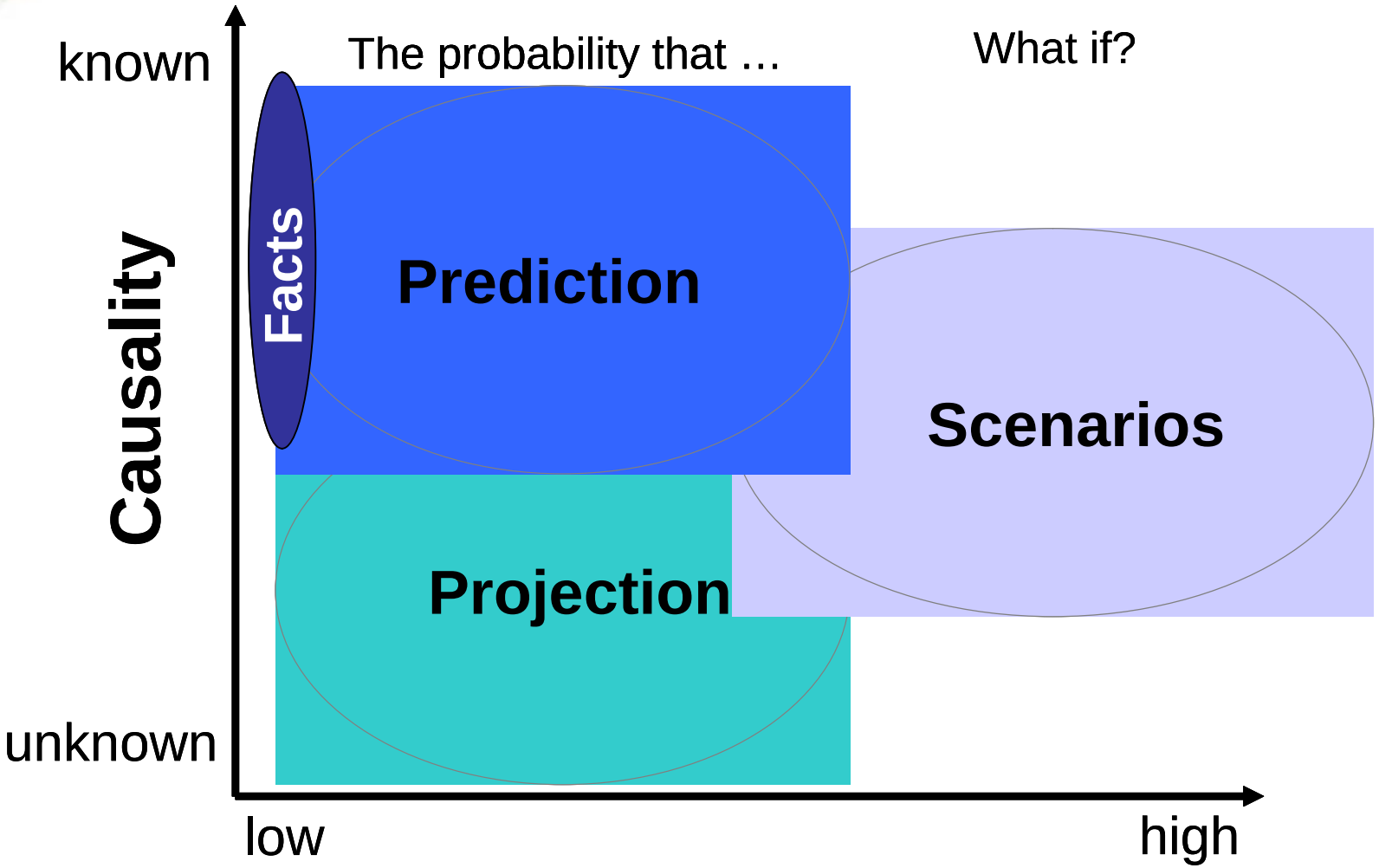
The unexpected and the novel can alter directions

Volition

Human choice matters

Source: P. Raskin

Scenarios, predictions & projections?



Source: modified after R. Leemans 2003

Scenarios are stories about the future with a logical plot and narrative governing the manner in which events unfold

TIME

What are scenarios and why use them?

- Purpose of scenarios:
  - Information dissemination
  - Scientific exploration
  - Decision-making tool

  ⇨ Different process of stakeholder involvement in scenario development

- Types of scenarios
  - Exploratory vs. anticipatory scenarios
  - Baseline vs. policy scenarios
  - Qualitative vs. quantitative scenarios, or a combination

The MA approach to scenarios

- Structured accounts of **possible futures**.
- Describe futures that **could** be, rather than futures that will be.
- Alternative, dynamic **stories** that capture key ingredients of our **uncertainty** about the future of our study system.
- Constructed to provide insight into **drivers** of change, reveal the **implications** of current trajectories, and illuminate **options** for action.
- Encompass quantitative models and realistic projections, but much of their value lies in incorporating both **qualitative and quantitative understandings of the system** and in forcing people to evaluate and reassess their beliefs and **assumptions** about the system.

The focal questions of the MA scenarios

- What are the consequences of plausible changes in development paths for ecosystems and their services over the next 50 years and what will be the consequences of those changes for human well-being?

- What are the consequences for ecosystem services (ES) and human well-being (HWB) of strategies that emphasize **economic policy reform** as the primary means of environmental management?

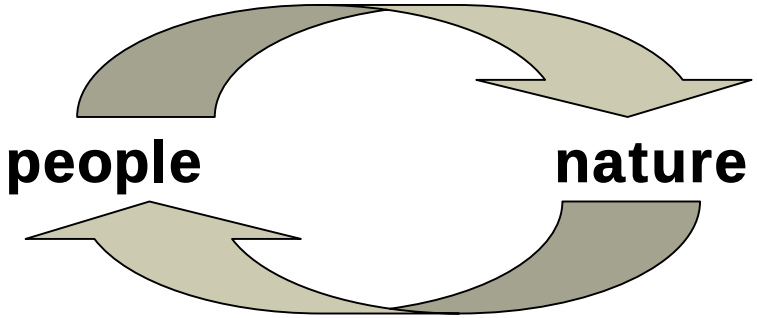
- What are the consequences for ES and HWB of strategies where individual countries and regions given primary **emphasis to their local and regional environment** and far less emphasis to cross-border and global environmental issues?

- What are the consequences for ES and HWB of strategies that emphasize the **development and use of technologies** allowing greater eco-efficiency and adaptive control?

- What are the consequences for ES and HWB of strategies emphasizing **adaptive management or local learning**?

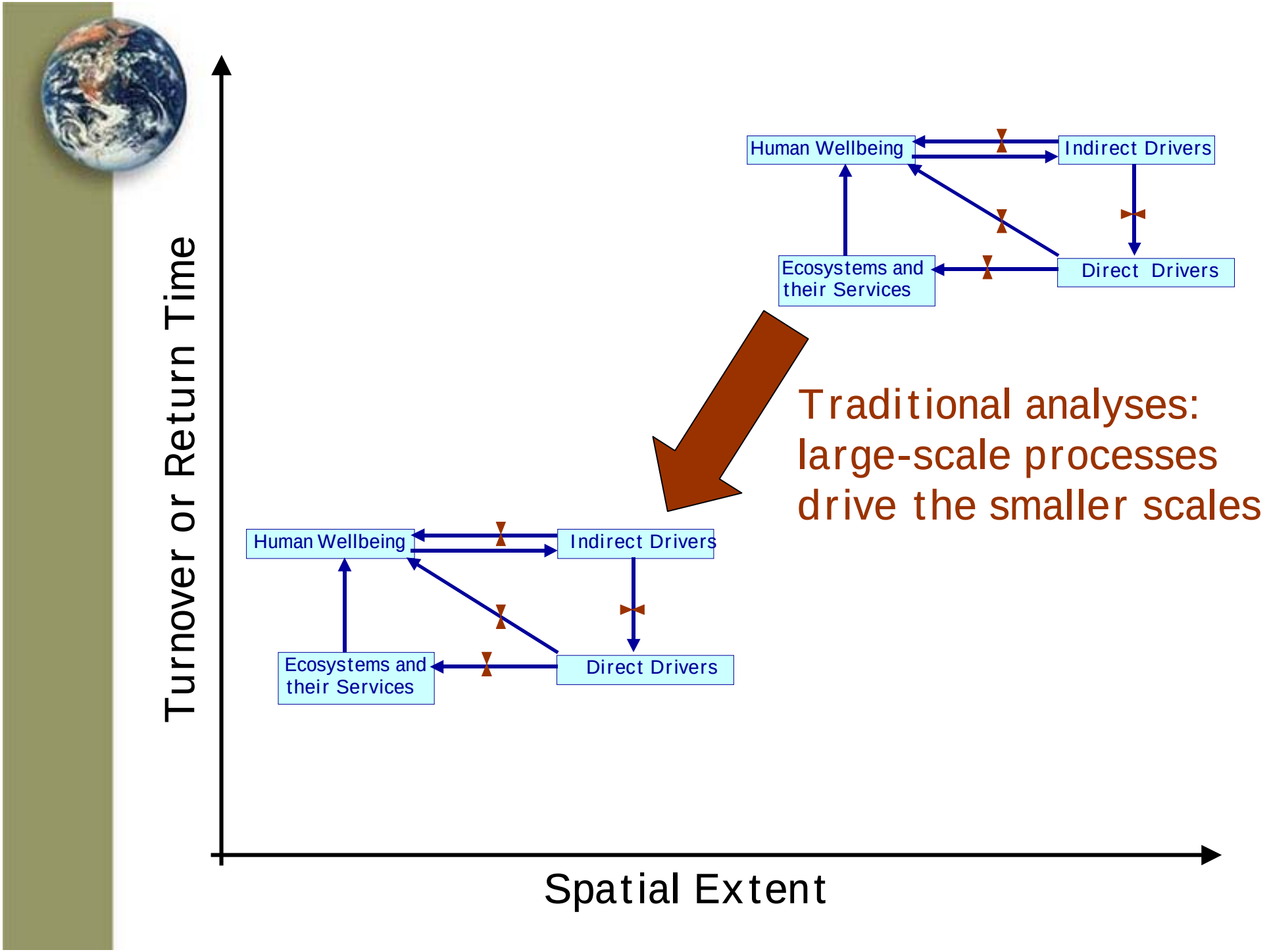
Consequences of cross-scale feedbacks

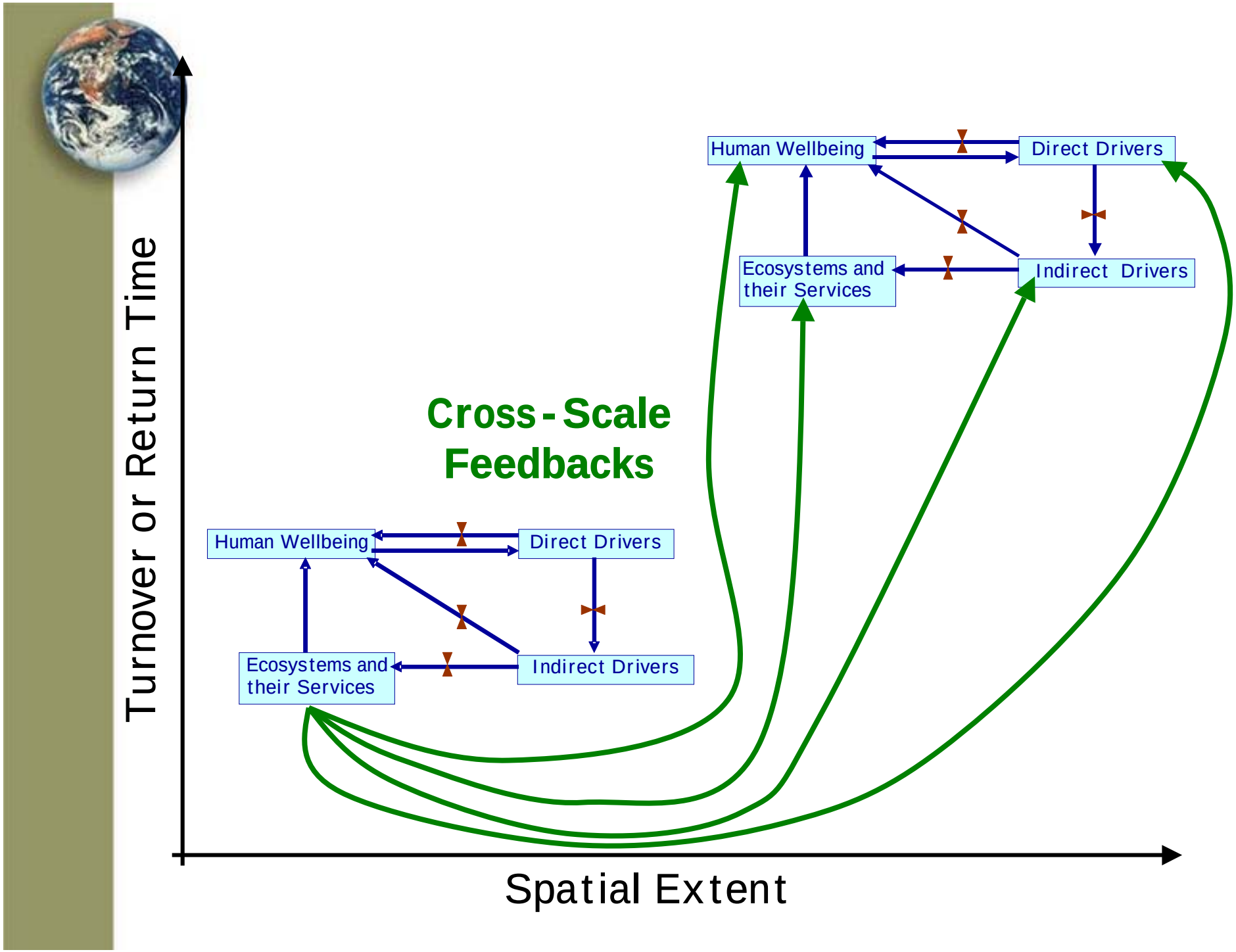
Continual and reciprocal feedbacks between humans and other components of ecosystems



Ecosystems develop in different ways in the different scenarios, because of the different events and decisions in society (including social response to ecosystem change).

* These differences occur even though the basic ecological assumptions are the same in all scenarios.


Turnover or Return Time
Spatial Extent
Human Wellbeing
Indirect Drivers
Ecosystems and their Services
Direct Drivers
Human Wellbeing
Indirect Drivers
Ecosystems and their Services
Direct Drivers
Traditional analyses: large-scale processes drive the smaller scales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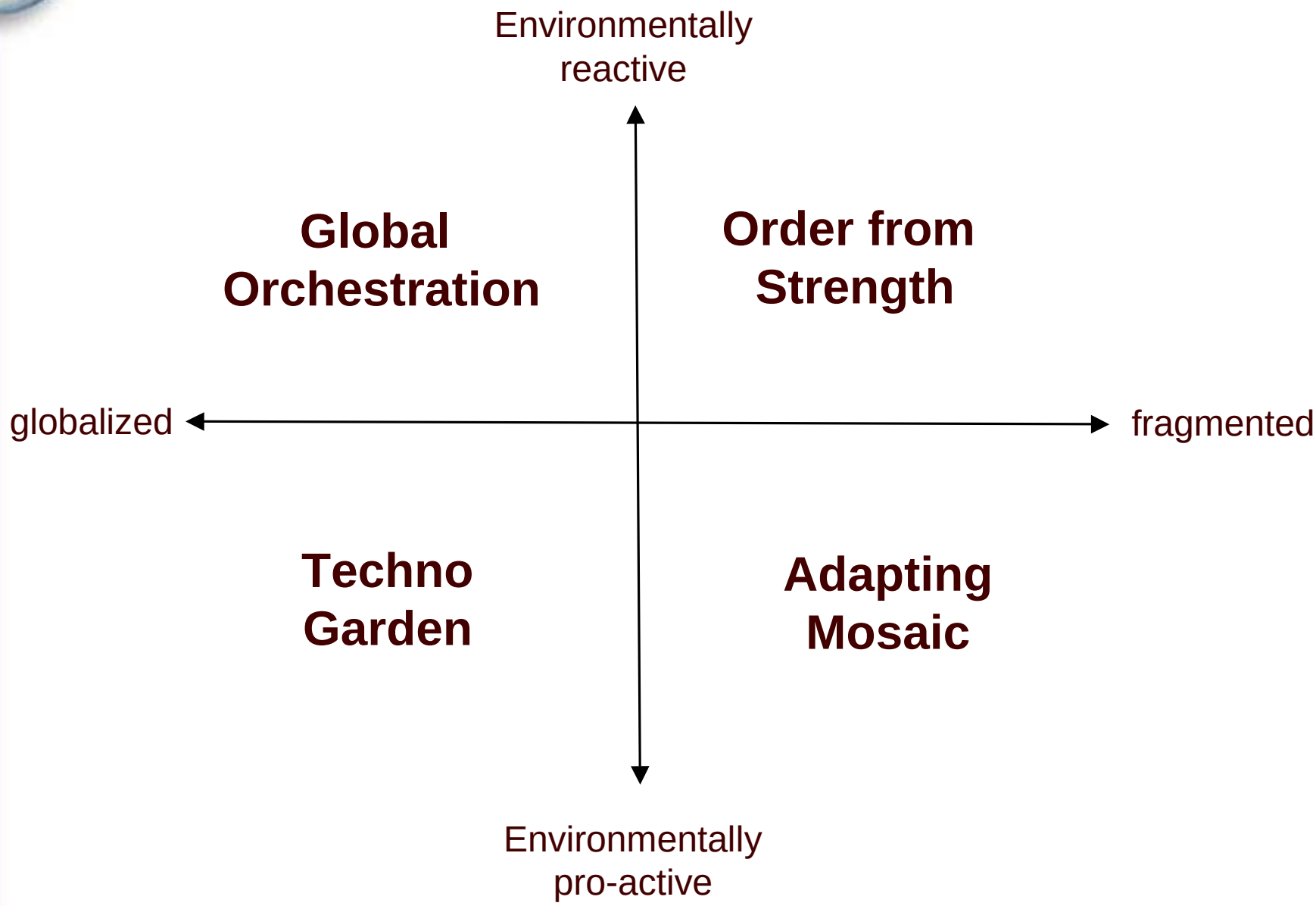
Indirect Drivers

Four forward-looking scenarios



Global Orchestration

focus on macro-scale policy reform for environmental sustainability

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

Order from Strength

retreat from global institutions, focus on national regulation and protectionism

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

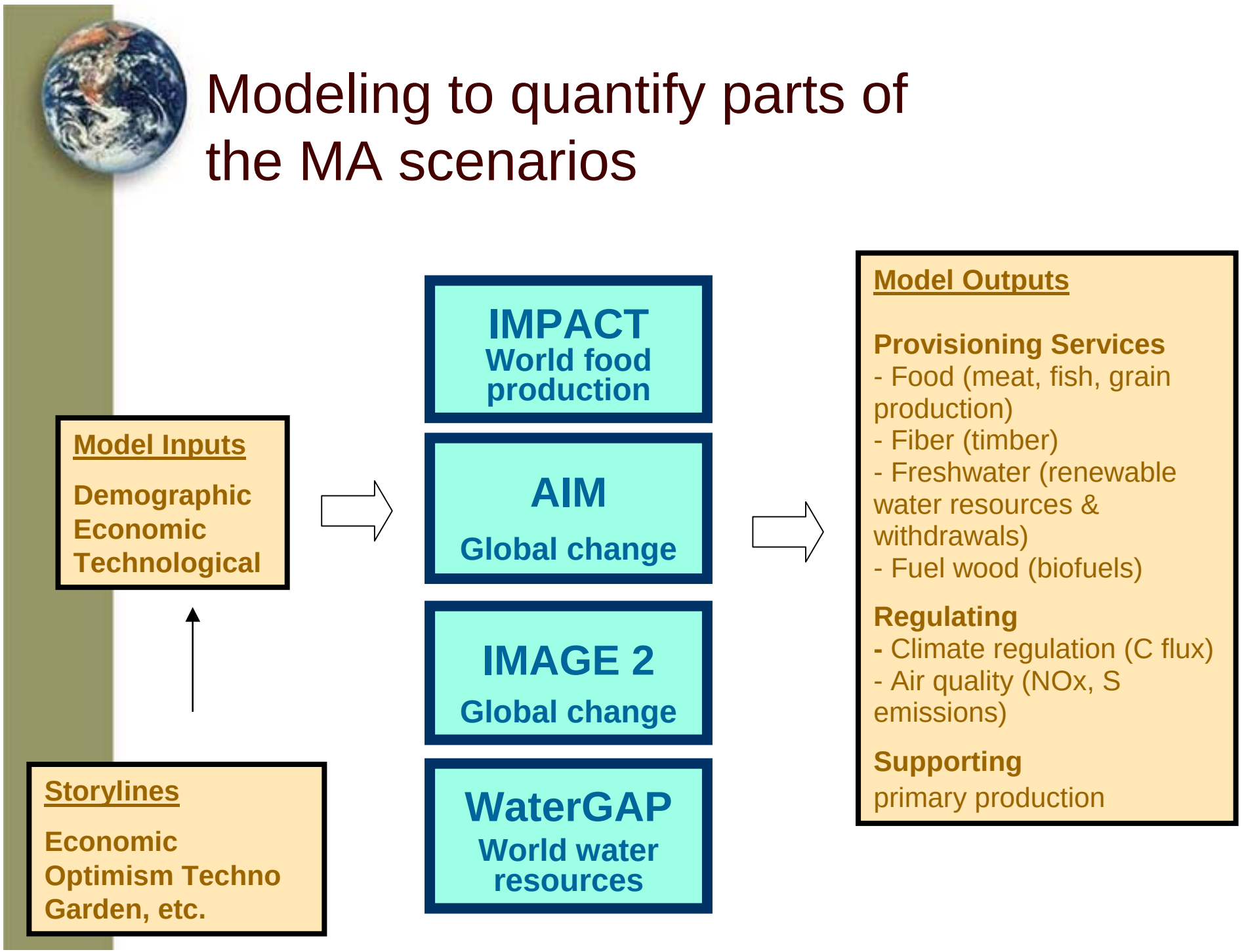
Dominant Approach for Sustainability	Economic Approach	Social Policy Foci
Learning via management and monitoring, shared management responsibility, adjustment of governance structures to resource users, common-property institutions	Focus on local development; trade rules allow local flexibility/interpretation;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

Techno Garden

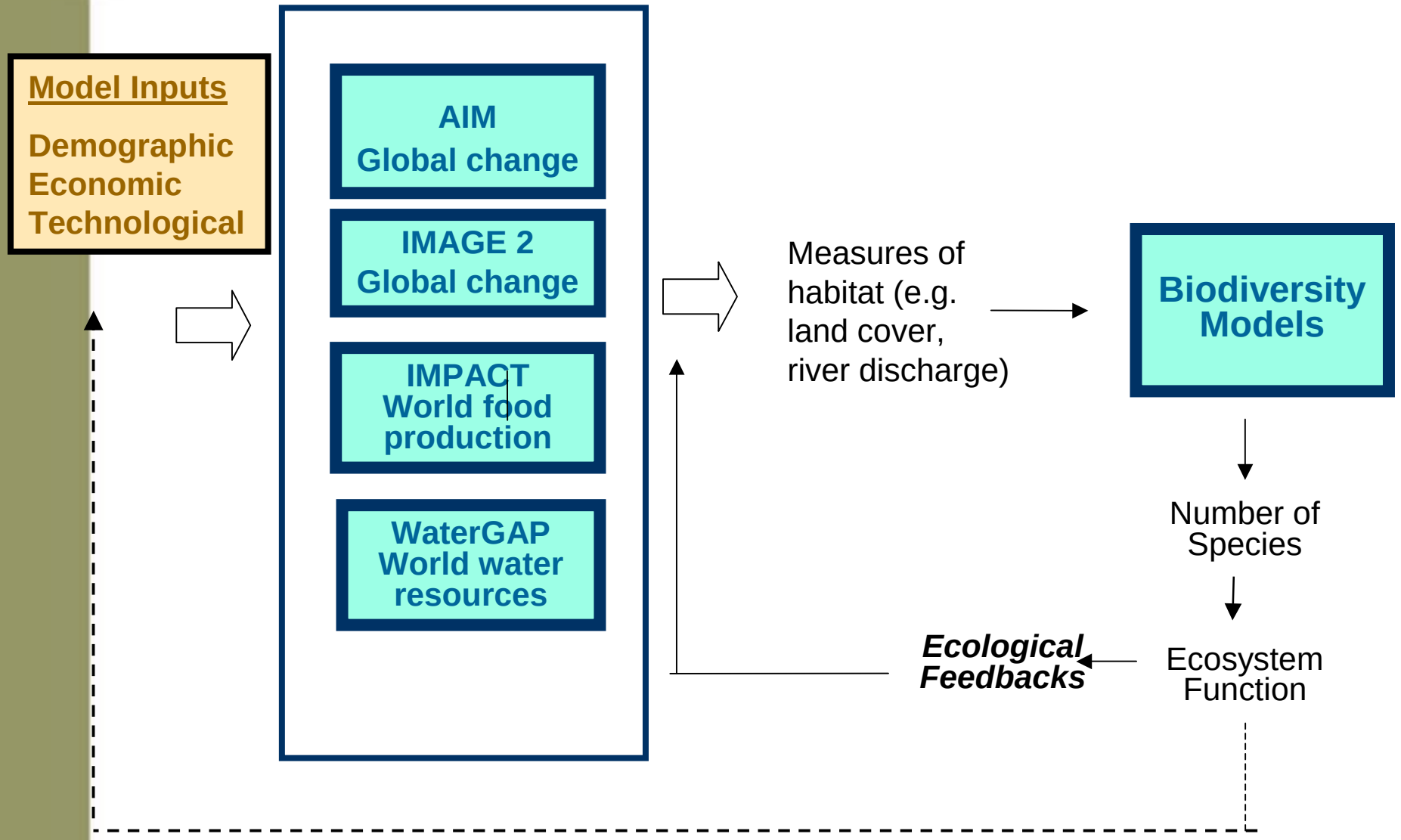
emphasis on development of technologies to substitute for ecosystem services

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

Modeling to quantify parts of the MA scenarios

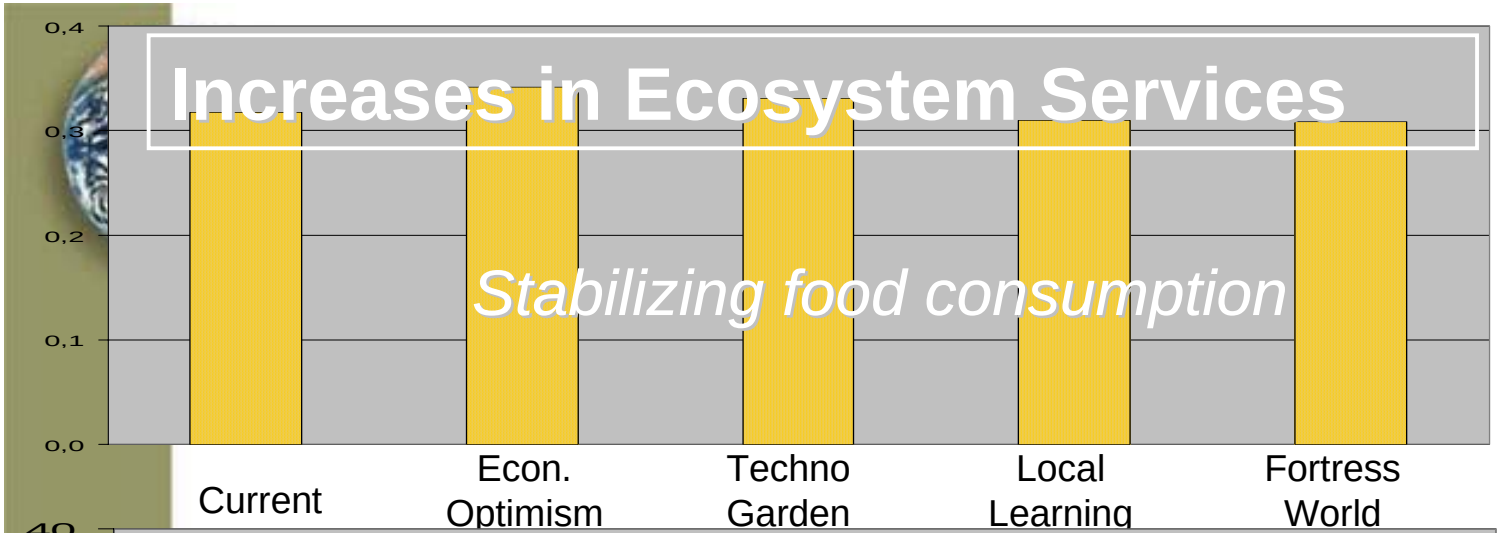


…and to make it more complicated: Ecological Feedbacks

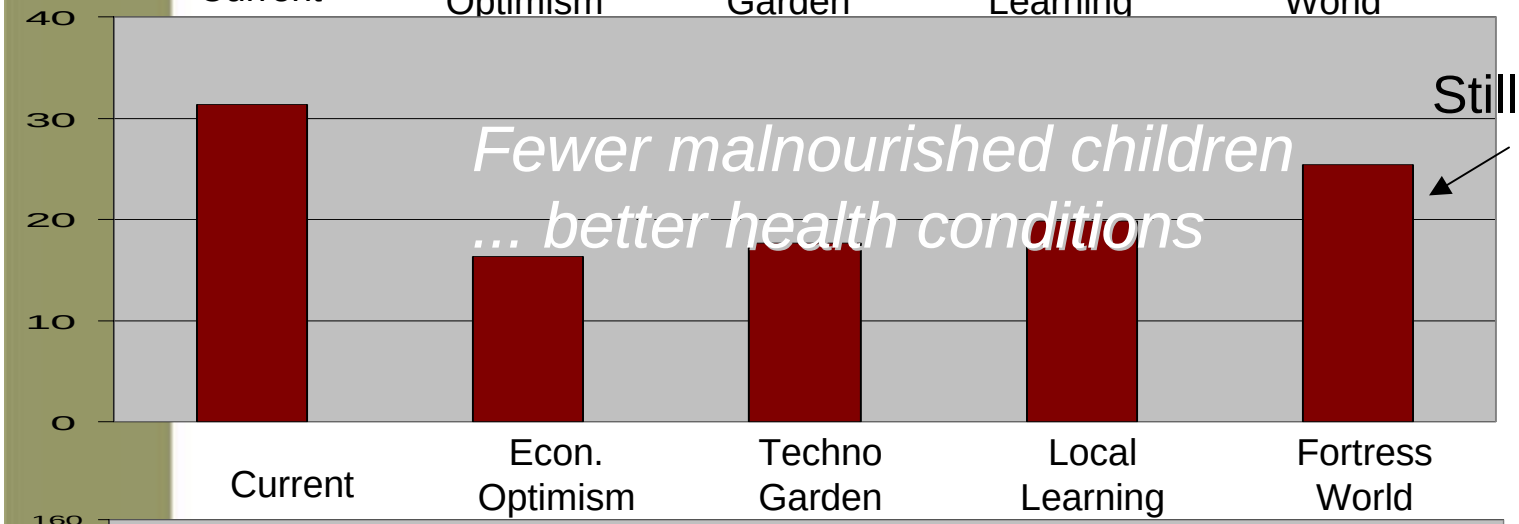


Increases in Ecosystem Services

World (2050)

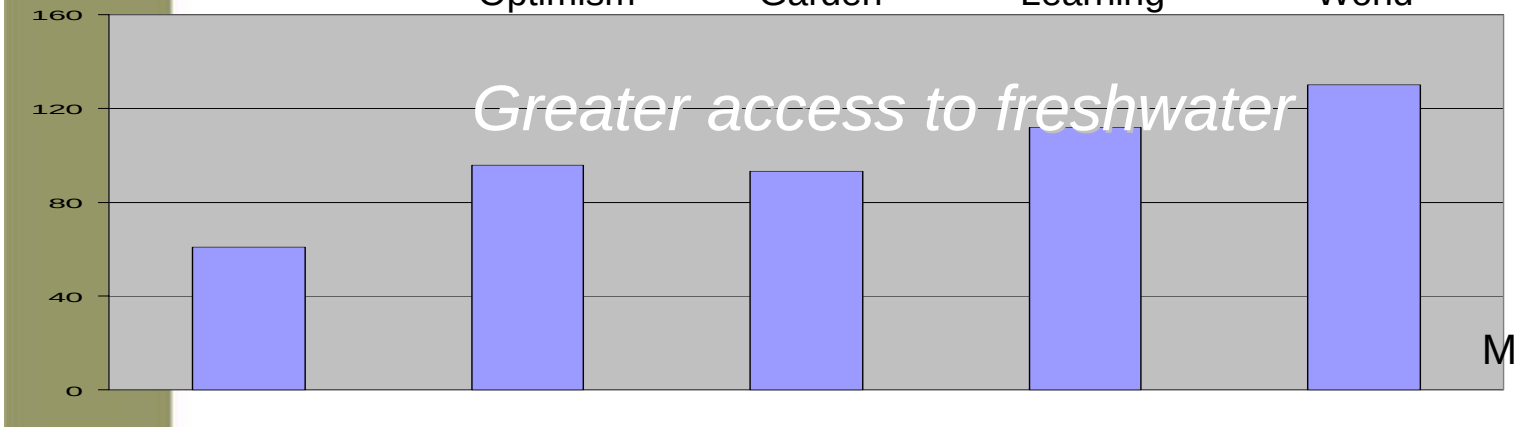


Grain Consumption per capita [t/cap* a]



Still high

Malnourished Children [%]



Domestic water use [m^3/cap*a]

Maln, H20, fem enroll

Some selected preliminary results

Demand for provisioning services (food, fiber, water, etc.) increases in all scenarios. This increases stress on the ecosystems that provide these services.

By 2050, 10% to 20% of current grassland and forest land will be lost, mostly due to expansion of agriculture.

By 2050, water stress increases in arid regions of Africa and Asia. The number of people living in water-stressed areas increases 200% to 300%. Globally, the volume of polluted fresh water increases. Water availability declines, mostly due to changes in climate and water withdrawal.

Ecosystems currently sequester CO_2, but the future of this service is in doubt. The CO_2 sink decreases in the Order from Strength scenario

Some selected preliminary results (2)

Diversity (vascular plants) declines in all scenarios (most in Order from Strength, least in TechnoGarden and Adapting Mosaic). Greatest losses in warm mixed forest, savanna, scrub, tropical forest & woodland.

Fish species are lost due to declining water availability. Differences among scenarios are minor. Most losses of fishes occur in poor tropical and subtropical countries.

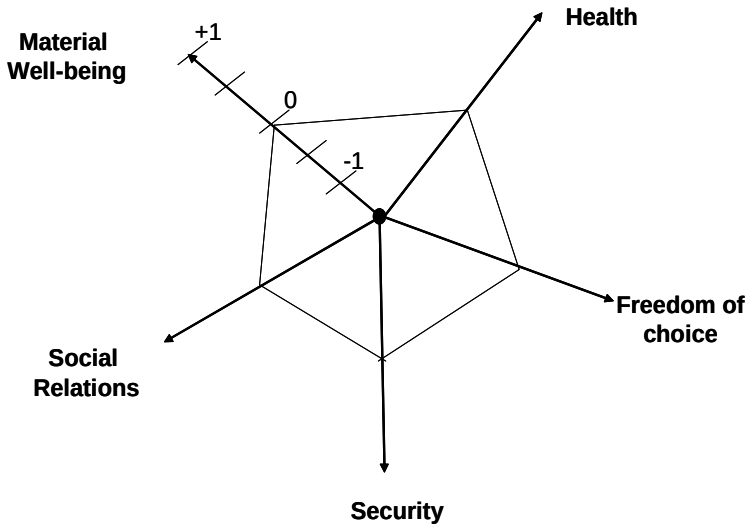
Our ability to reduce the rate of loss of species' populations by 2010 is in doubt. Two scenarios (Order from Strength and Global Orchestration) fail to meet the target. The other two may, at best, barely meet the target.

Each scenario exhibits a different package of benefits, risks and adverse impacts for human well-being.

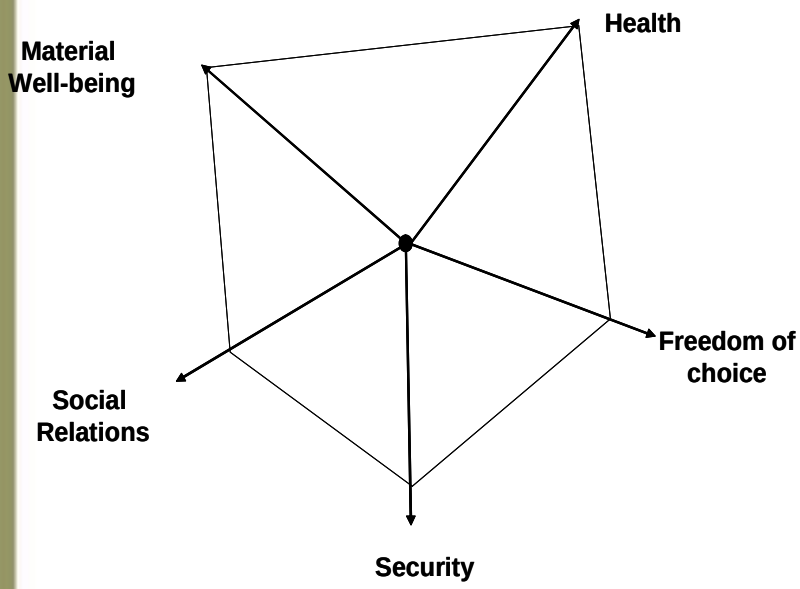
	Material Goods	Health	Social Relations	Security	Freedom/ Choice
Order from Strength					
Global Orchestration					
Adapting Mosaic					
Techno-Garden					

Improving Uncertain Deteriorating

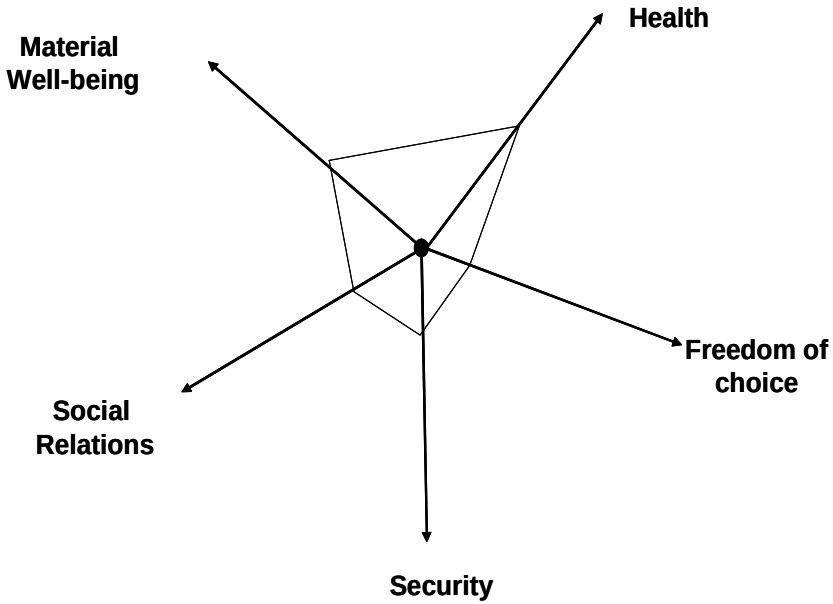
Baseline for HWB components – year 2000



Global Orchestration (2050)



Order from Strength (2050)



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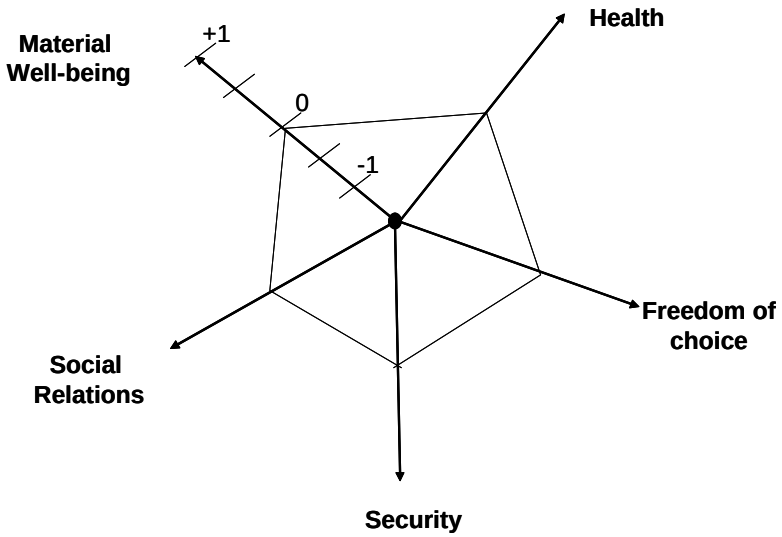
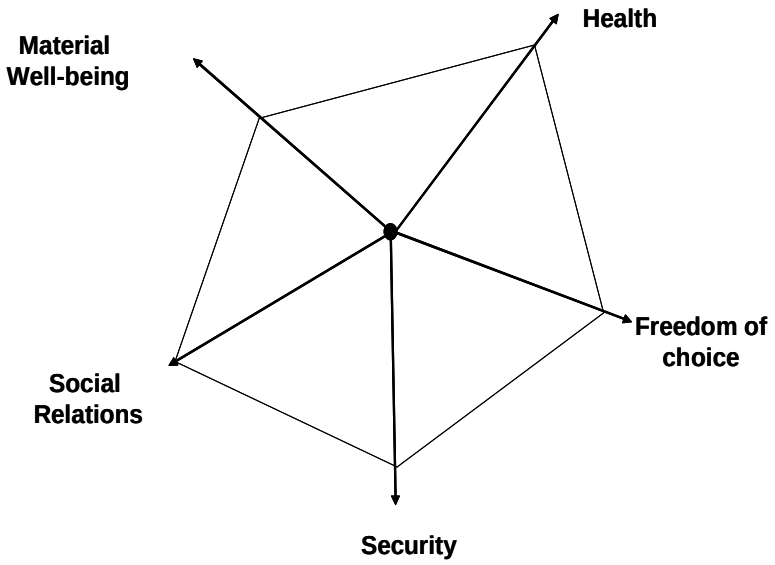
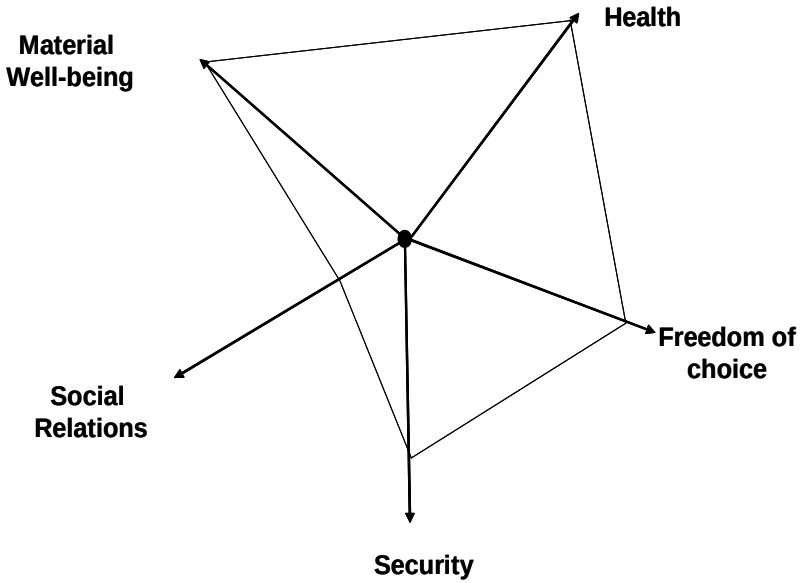


Adapting Mosaic (2050)



TechnoGarden (2050)



Some selected preliminary results (3)

Adverse effects on human well-being occur when losses of ecosystem services pass certain thresholds

Each scenario exhibits a different package of benefits, risks, vulnerabilites and adverse impacts for human well-being.

While basic human conditions generally improve across three scenarios and decline in one scenario for certain parts of the human population, they all result, to a varying extent, in perilous paths of ecosystems change and lower per capita ES. This illustrates complex linkages and feedbacks of ES changes on HWB.

In summary….

The future will be a mix of approaches and consequences described in the scenarios, plus events and innovations that have not been imagined at the time of writing.

None of the scenarios is a “best” path or “worst” path. Significantly better or worse outcomes could be developed using different mixes of the policies and practices addressed in the scenarios.

The scenarios are a menu of choices and their consequences. Decision-makers may use this menu to consider their priorities, preferences and choices.