Preliminary Results for MA

AIM Project Team

National Institute for Environmental Studies

and

Kyoto University

Background

- MA scenarios are much different from IPCC scenarios from the following viewpoints:
  - ✓ Drivers of ecosystem changes are much broader than those of climate change
  - ✓ Feed back mechanism of ecosystem to socioeconomic system is much more complex and intensive than that of climate

Necessity of new model for MA scenario quantification

Purpose for AIM/Ecosystem Development

- **Consistency check between ecosystem changes and socioeconomic behaviors as well as among drivers of ecosystem change**
- **Integrated quantification of MA scenarios**

⬇

- ➤ **To prepare and defend MA scenario quantification**
- ➤ **To reflect to MA qualitative scenarios**
- ➤ **To reflect to MA Drivers Cross-Cut Report**

Structure of AIM/Ecosystem
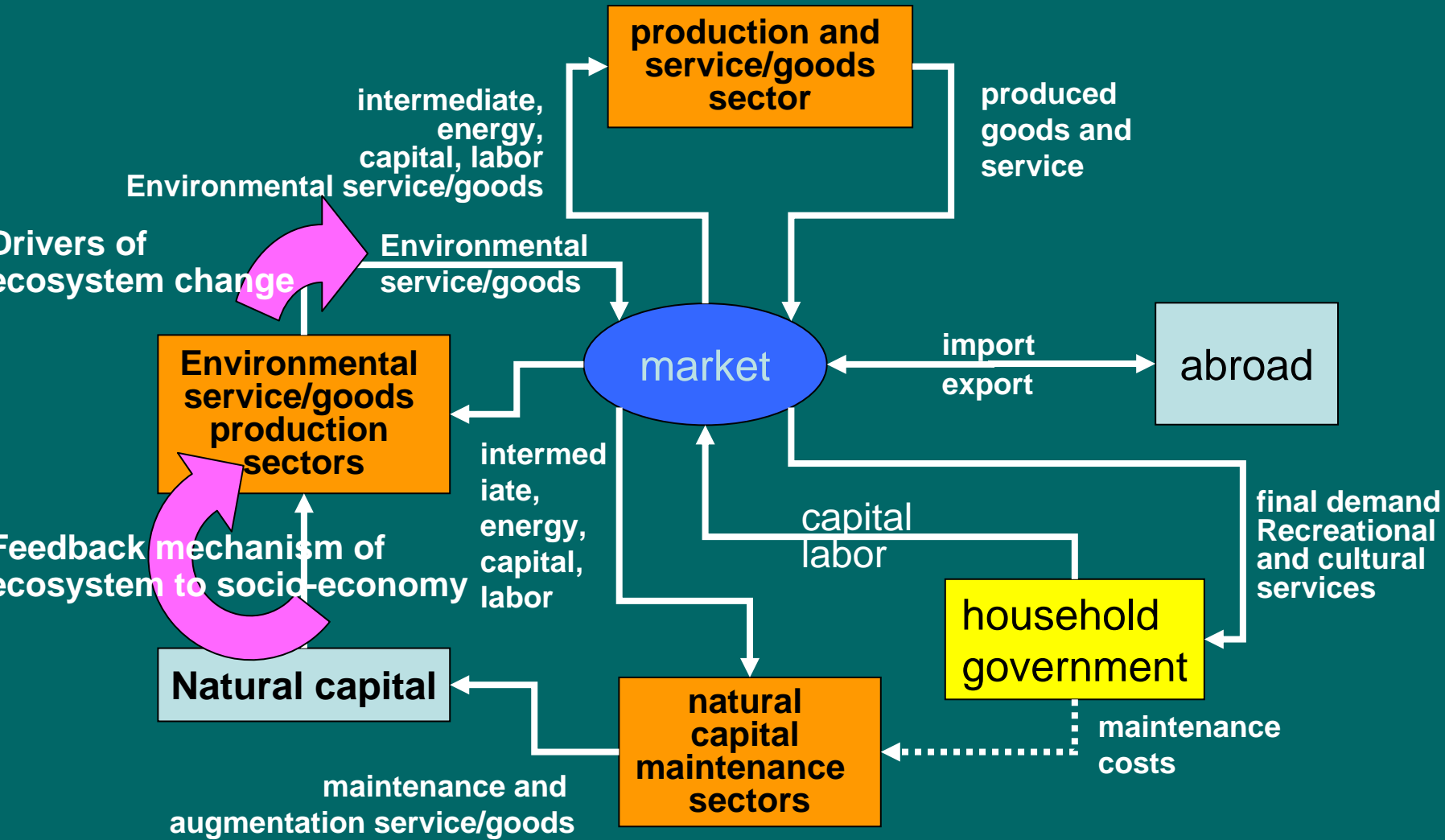
- **Socio-economic drivers**
  - Economic growth, Population, Technological improvement, Energy efficiency, Energy mix, Globalization, Regionalization, Households preference (Food demand, Preference of investment)

Impacts ⬇   ⬆ **Feedback**

- **Land Use Change**
- **Environmental Pollution**
  - ✓ Air Pollution: Global warming, Energy consumption and pollutant emission, Pollutant Abatment and environmental investment, Ecosystem assessment on SOx and NOx emission
  - ✓ Water Pollution: Economic Activity and water pollutant (BOD, N, P) effluents, Pollutant abatment and environmental investment, BOD load and degradation of freshwater resource, N and P load and economic damage
- **Water demand and supply**
  - ✓ Spectral economic activity and regional water demand, water demand, climate change and water pollution
- **Land degradation**
- **Biodiversity**
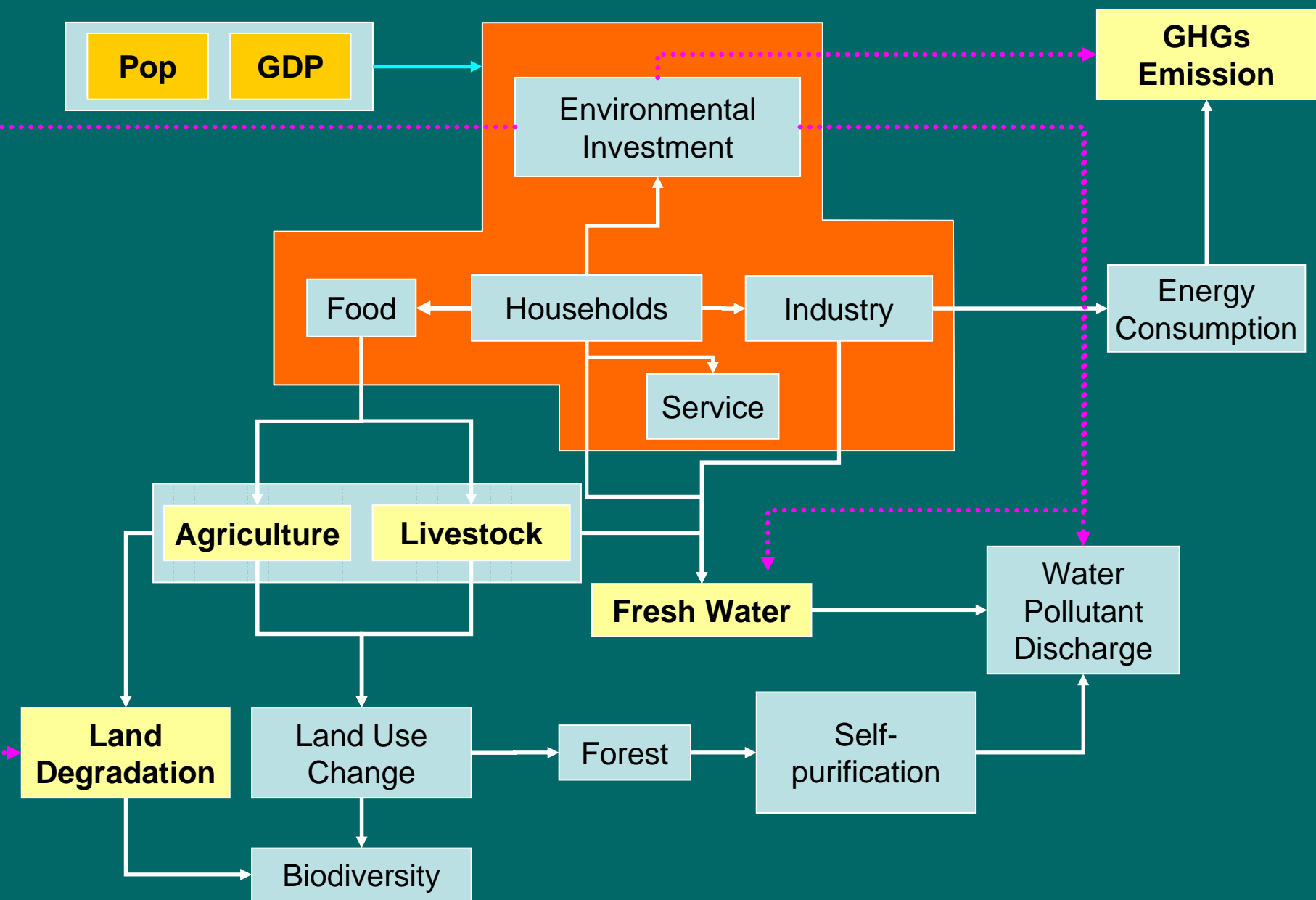
Ecosystem Impact/feedback proces

The MA will focus on:

Ecosystem services (the conditions and processes supported by biodiversity through which ecosystems sustain and fulfil human life, including through the provision of goods)

- **Provisioning:** e.g. Food, Water, Fibre, Fuel, Other biological products
- **Supporting:** e.g. Biodiversity, Pollination, Waste Treatment
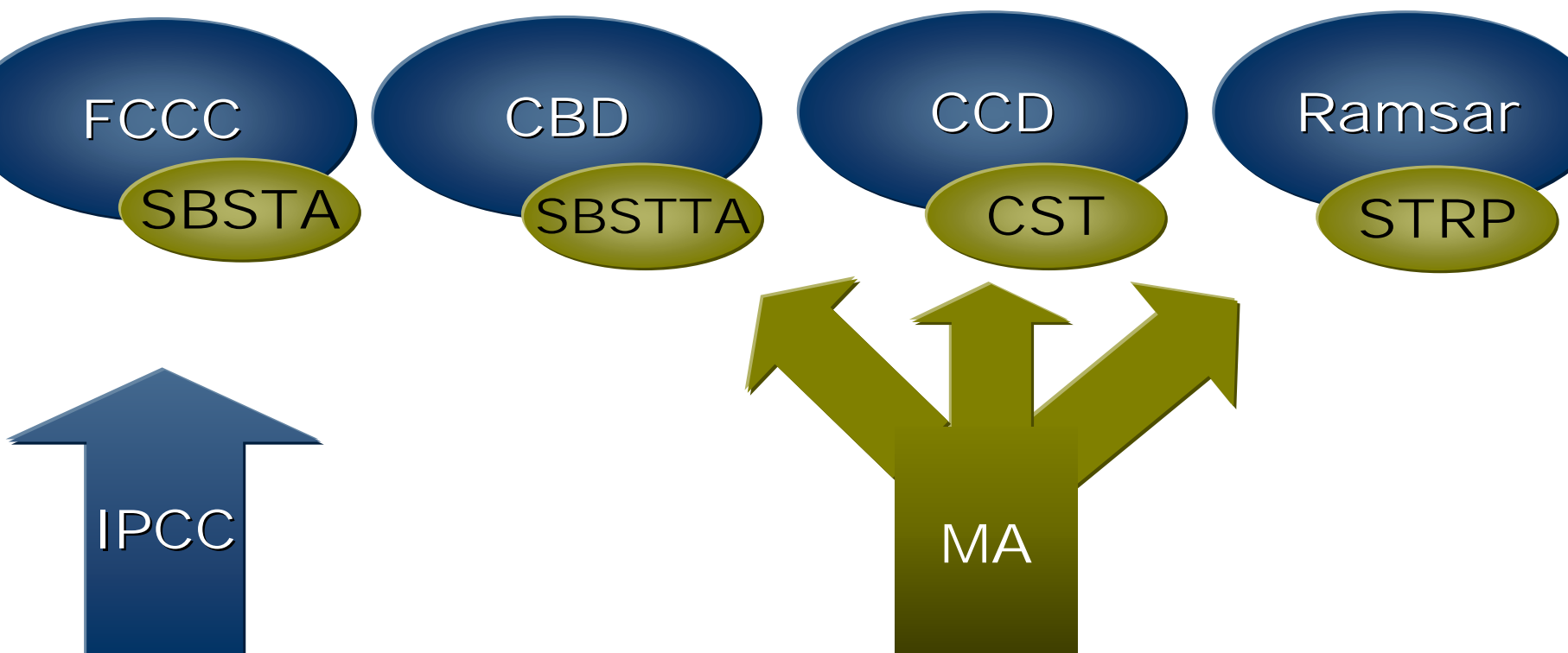- **Cultural:** e.g. Cultural, Aesthetic, Social relations

The consequences of changes in ecosystems for **human well being.**

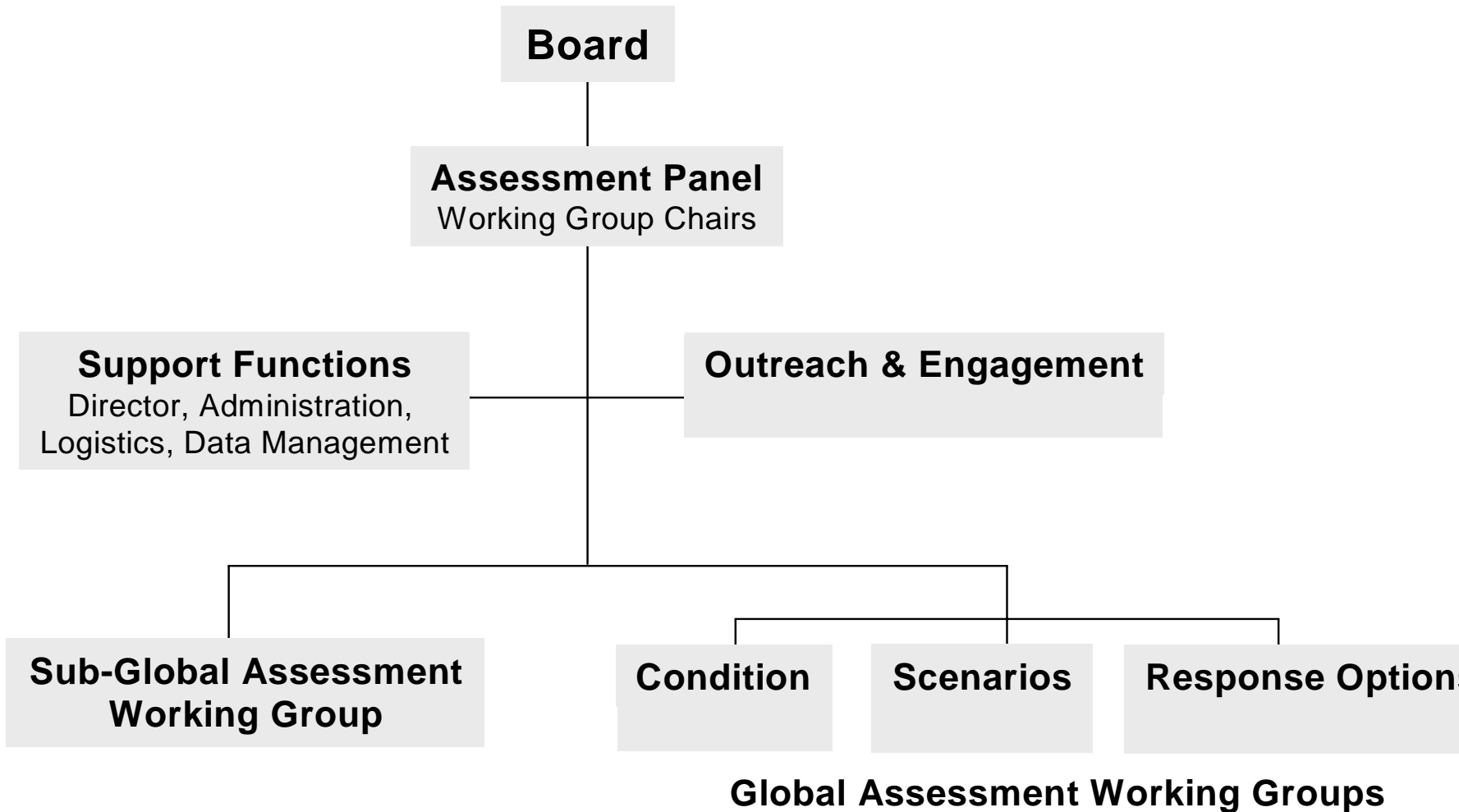The consequences of changes in ecosystems for **other life on earth**

Multiple Users Among Conventions

FCCC
SBSTA

CBD
SBSTTA

CCD
CST

Ramsar
STRP

IPCC

MA

Research, UN Data, National and International Assessments

Organization

Board

Assessment Panel
Working Group Chairs

Support Functions
Director, Administration,
Logistics, Data Management

Outreach & Engagement

Sub-Global Assessment Working Group

Condition

Scenarios

Response Options

Global Assessment Working Groups

Millennium Ecosystem Assessment (MA)
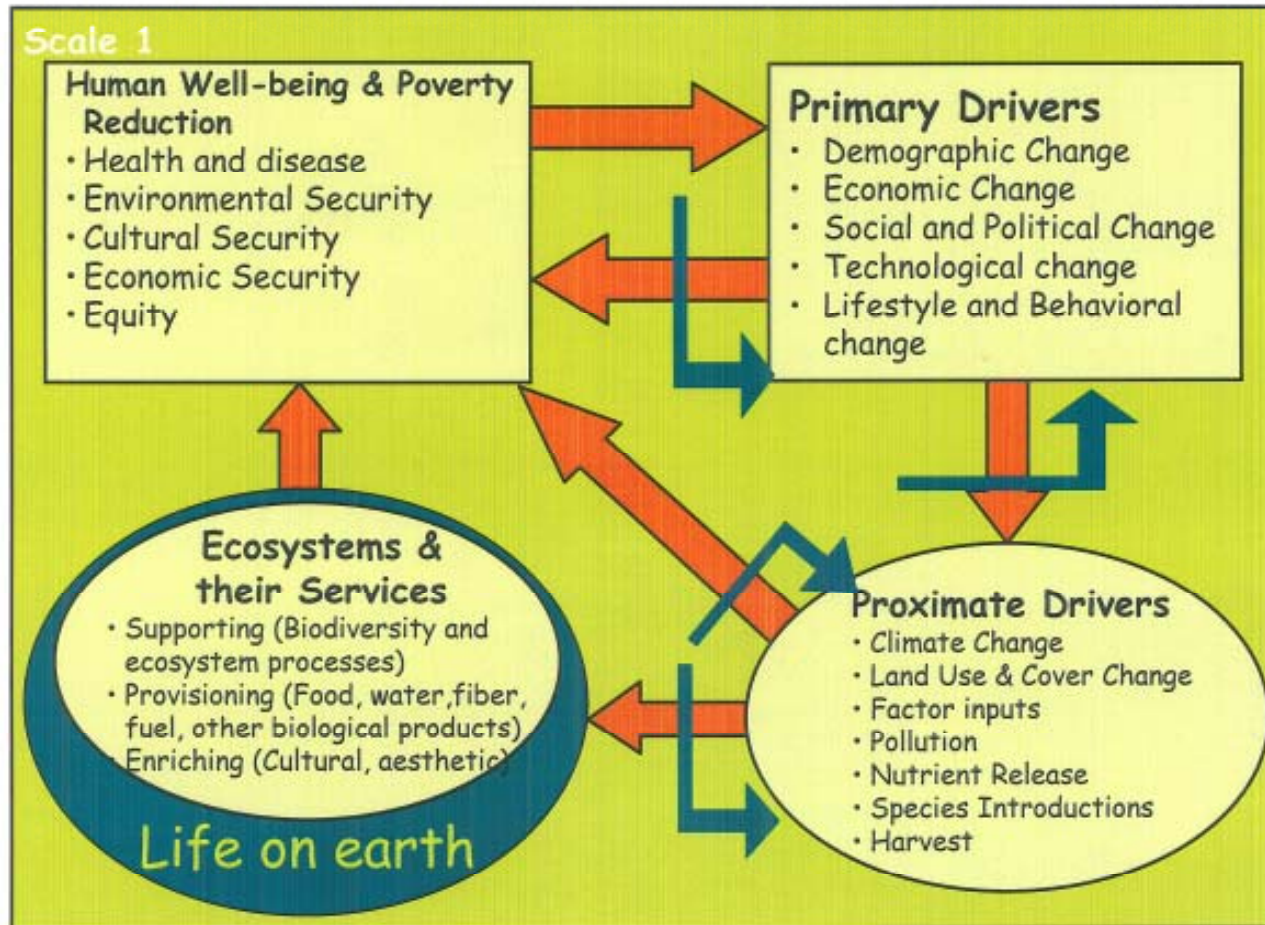
cenario (Def. @ Workshop Material)

cenario 1: Economic Optimism

(A1B, Global policy focus, Development focus, Development fix)

cenario 2: Global bridges, local barrier

(A2, Fortress, Compartmentalize, Security focus)
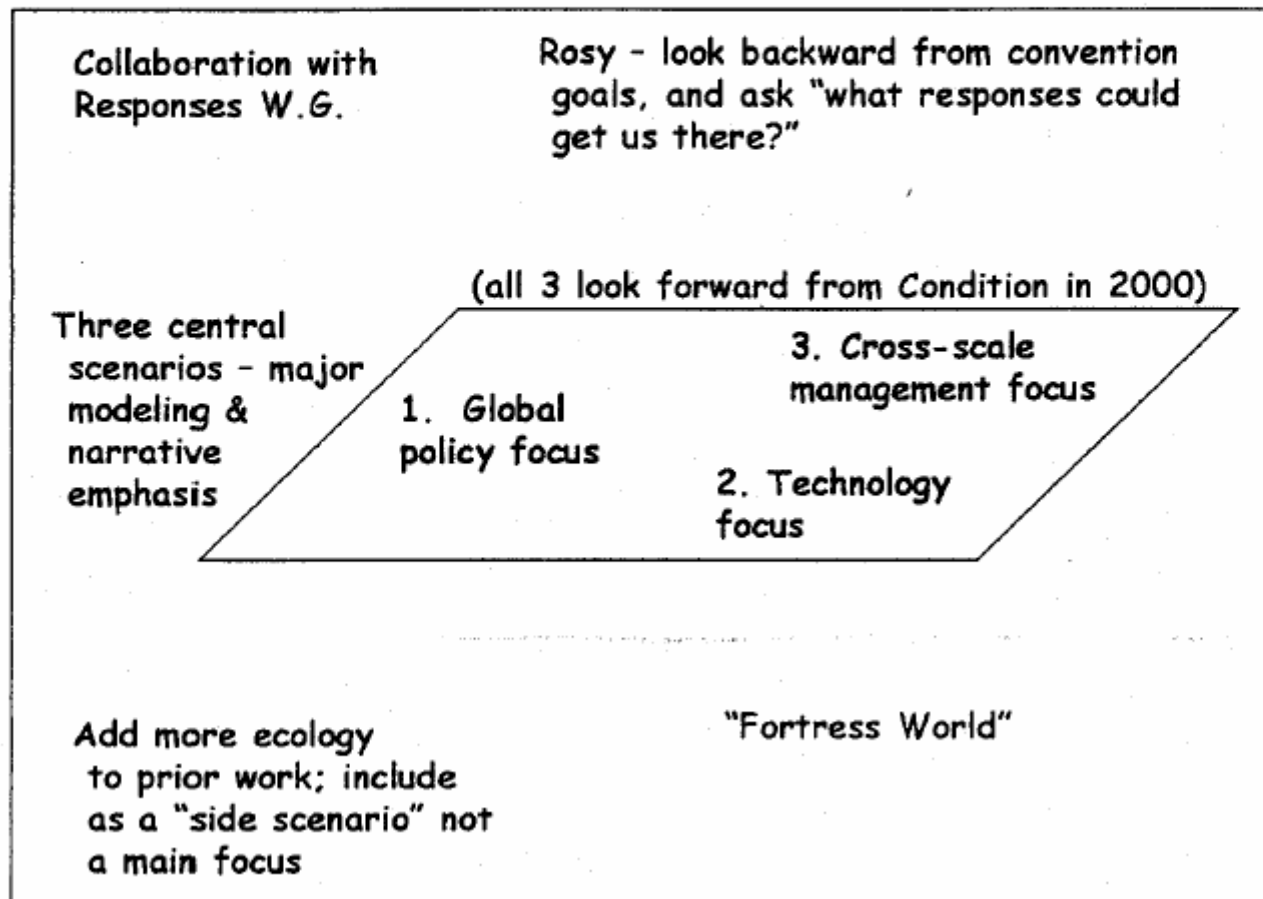
cenario 3: Engineered Ecosystem: Technogarden

(B1, Technology focus, Technology fix)

cenario 4: Local Learning

(B2, Cross-scale focus, Varied experiments, Multi-scale focus)

cenario 5: Rosy

Figure 1. The five scenarios (red), showing the three central scenarios. Some comment on the approach are in black on the left. The Rosy scenario is most positive, the "Fortress" scenario is most negative. The three central scenarios are roughly equal mixes of positive and negative, but each offers a different bundle of positive and negative features.

Collaboration with
Responses W.G.

Rosy – look backward from convention
goals, and ask "what responses could
get us there?"

Three central
scenarios – major
modeling &
narrative
emphasis

(all 3 look forward from Condition in 2000)

3. Cross-scale
management focus

1. Global
policy focus

2. Technology
focus

Add more ecology
to prior work; include
as a "side scenario" not
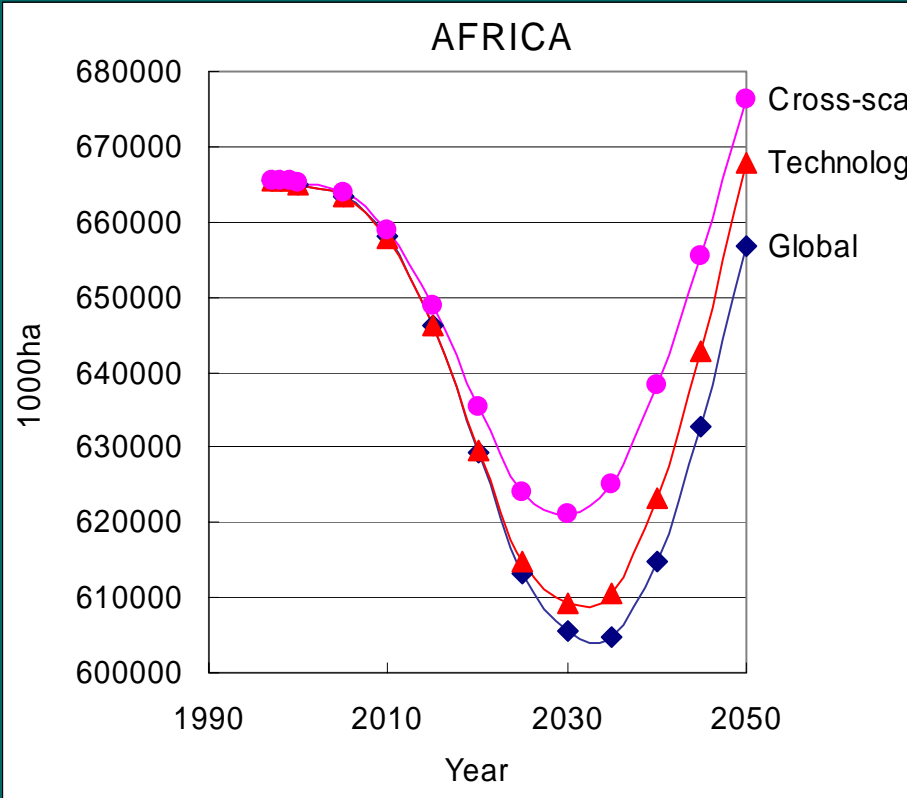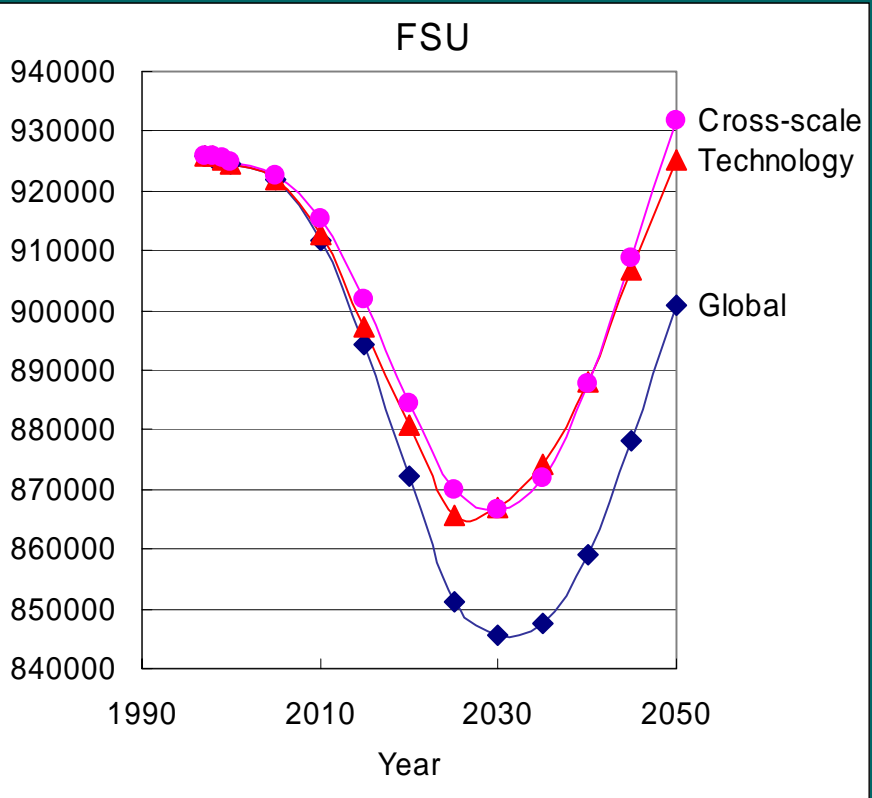a main focus

"Fortress World"

Simulation case

- **Global**: Global Policy focus (economic optimism) scenario

- **Technology**: Technology focus (techno-garden) scenario

- **Cross-scale** : Cross-scale management focus (learning) scenario

Forest area (World)
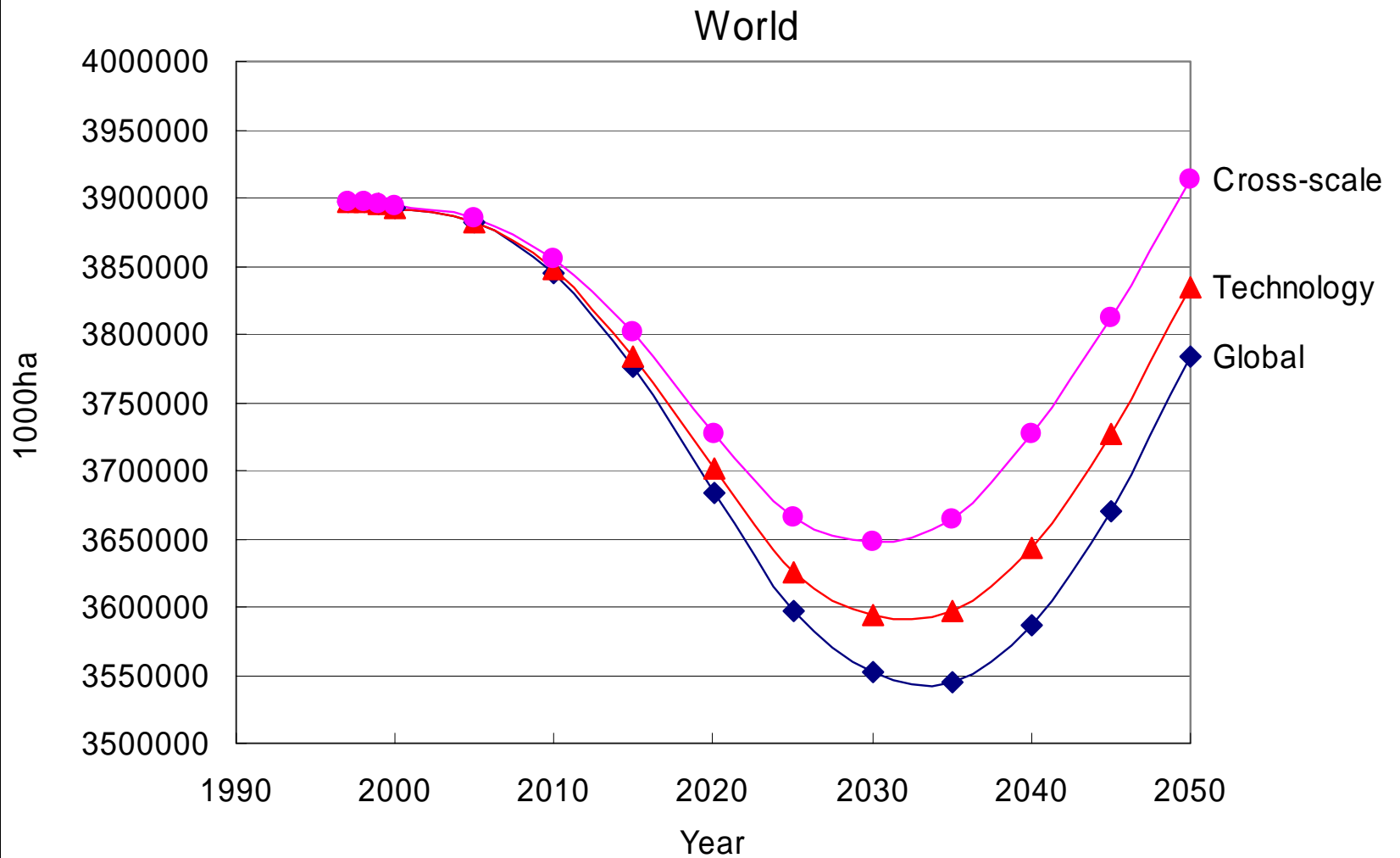
Forest area

Emission (CO$_2$, SO$_2$)
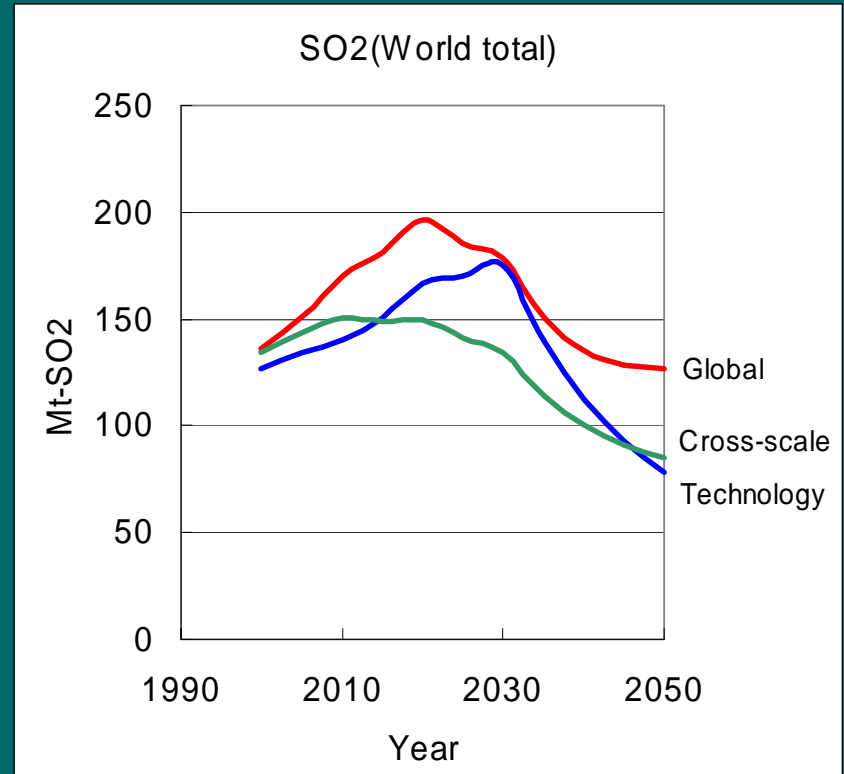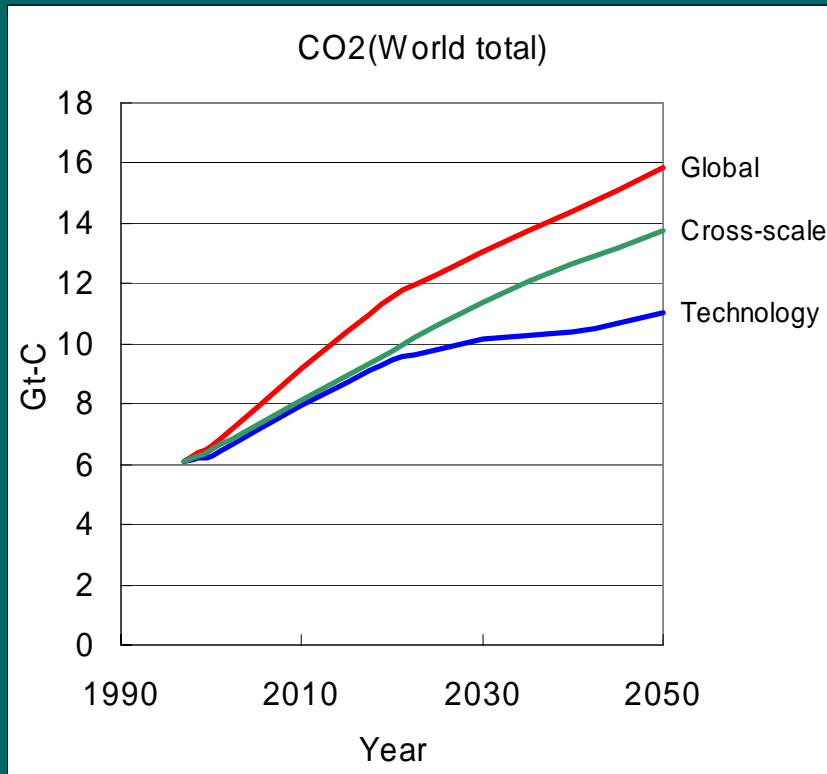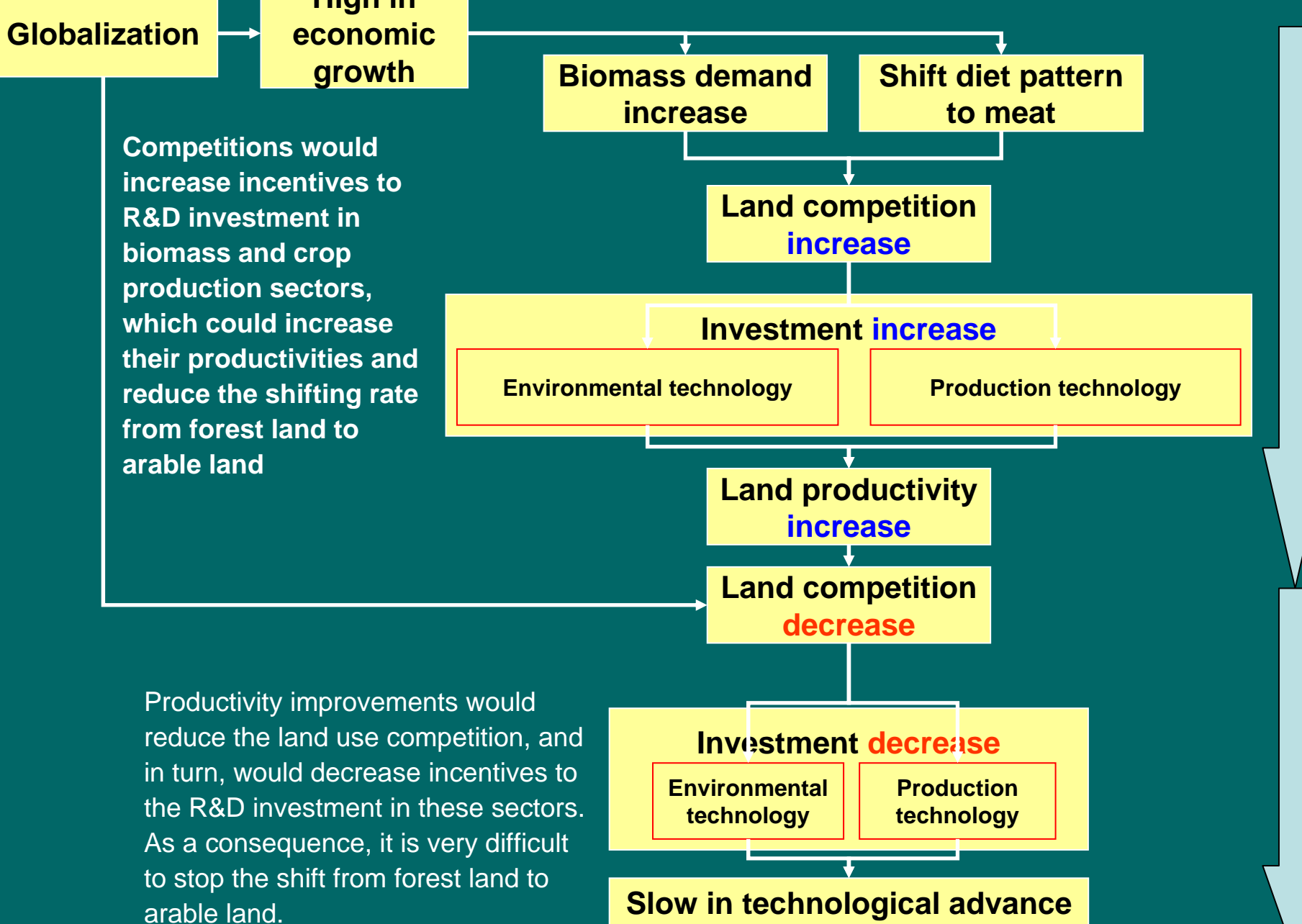
Suggestions based on the preliminary AIM/Ecosystem run

I. **"Global Policy focus (economic optimism) scenario"** would protract ecosystem degradation

II. **"Technology focus (techno-garden) scenario"** would polarize regional ecosystem conditions into two extreme

III. **"Cross-scale management focus (learning) scenario"** would sustain high regional incentives for ecosystem conservation

Globalization → **High in economic growth**

Biomass demand increase   **Shift diet pattern to meet**

Competitions would increase incentives to R&D investment in biomass and crop production sectors, which could increase their productivities and reduce the shifting rate from forest land to arable land

Land competition increase

Investment increase

| Environmental technology | Production technology |

Land productivity increase

Land competition decrease

Productivity improvements would reduce the land use competition, and in turn, would decrease incentives to the R&D investment in these sectors. As a consequence, it is very difficult to stop the shift from forest land to arable land.

Investment decrease

| Environmental technology | Production technology |

Slow in technological advance

Global policy focus

Globalization → **High in economic growth** → **Adoption of substitution strategy of natural ecosystem with artificial systems**

Necessity of huge investment

Select investment into profit-earning ecosystem

Face to acute shortage of funds because of so wide ecosystem area to be invested, and then, fund would be selectively invested into profit-earning ecosystems. This situation could polarize regional ecosystem conditions into two extremes, those are, rapid environmental degradations in poor regions as well as in low profit-earning ecosystem, and adequate ecosystem conservation in developed countries and urban areas.

Less Investment

| Environmental technology | Production technology |

Large Investment

| Environmental technology | Production technology |

Small progress in technological advance

Large progress in technological advance

Land productivity decrease

Land productivity increase

Technology focus

Regionalization → **Domestic supply of biomass and crops**

Restricted international trade increase the regional land use competitions between biomass/crop productions and ecosystem conservation

Land competition increase

Huge R&D investment for the productivity improvements could be decreased by regional market reform as well as regional production reform toward environmental friendly systems, because this scenario assumes cross-scale learning in a world where regional markets and production systems reform more rapidly than global ones. As a consequence, this scenario could sustain regional ecosystem conservation.

Sustaining regional incentives to R&D investment and social reforms

Regional market reform

Regional investment in R&D

Regional production process reform

Cost effective management of regional ecosystem

Cross scale management system

Consistency check of previous assumptions
(e.g. Technological change)

- **"Global Policy focus"**

  high ▶▶▶ **high then low**

- **"Technology focus"**

  high ▶▶▶ **regional divergent**

- **"Cross-scale management focus"**

  intermediate ▶▶▶ **high**

Filed Trip to La Selva
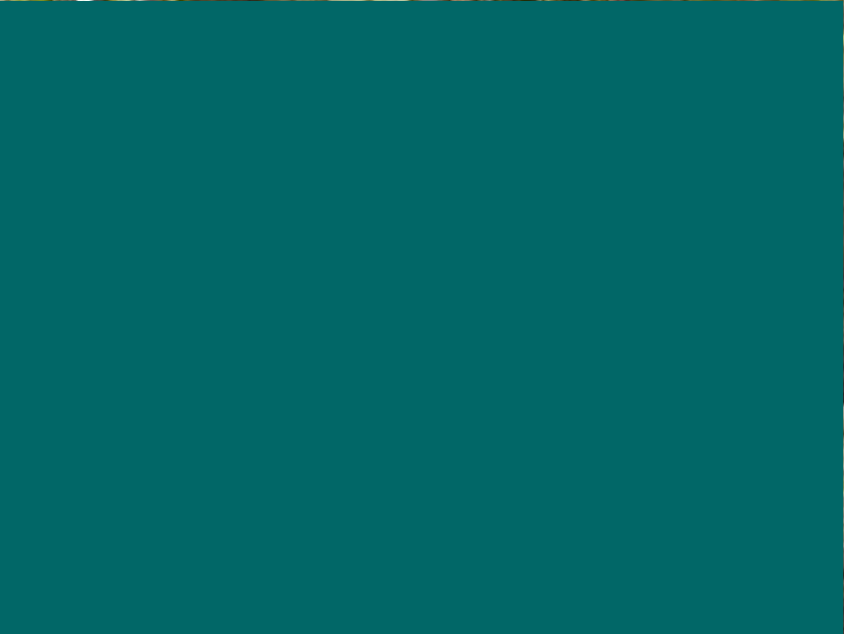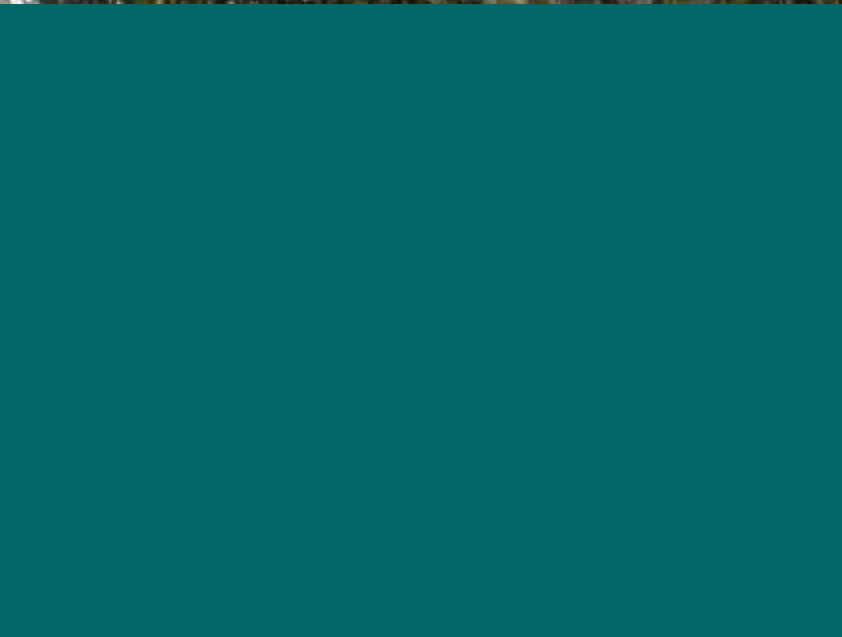
Time Table

Mid, April	Harmonization (Drivers, Climate)
End, June	First Calculation
End, Aug.	Model Group Meeting
Sep.	Drafting Report
Oct.	MA Plenary (Plague)
Dec. -	Review (Governments, Experts)