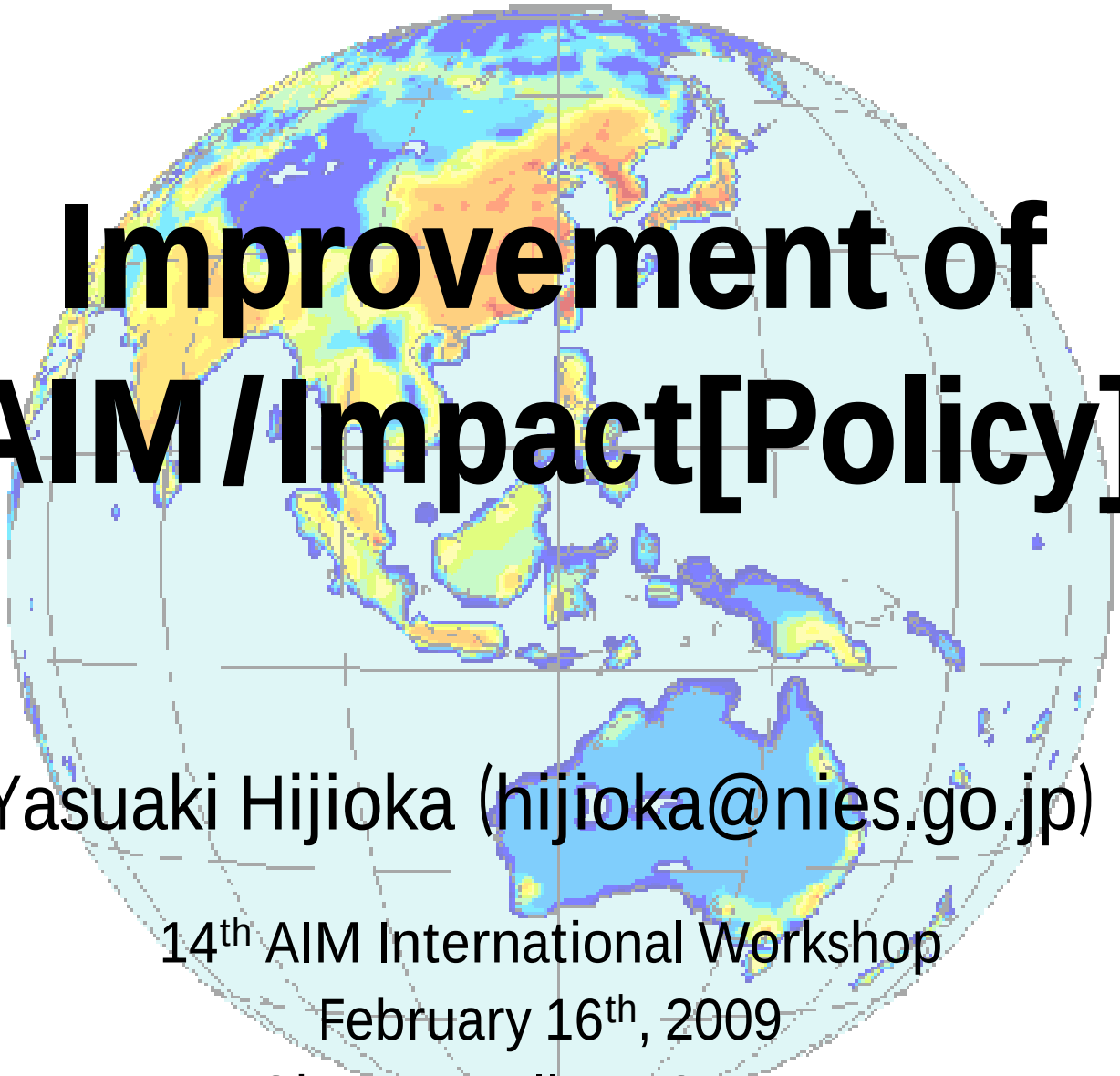


Improvement of AIM/Impact[Policy]

Yasuaki Hijioka (hijioka@nies.go.jp)

14th AIM International Workshop

February 16th, 2009

Ohyama Hall, NIES, Japan

Presentation Outline

1. Objectives
2. Overview of AIM/Impact[Policy]
3. Improvement of AIM/Impact[Policy]
   - The Project for Comprehensive Projection of Climate Change Impacts [S-4 project]
4. Future plan

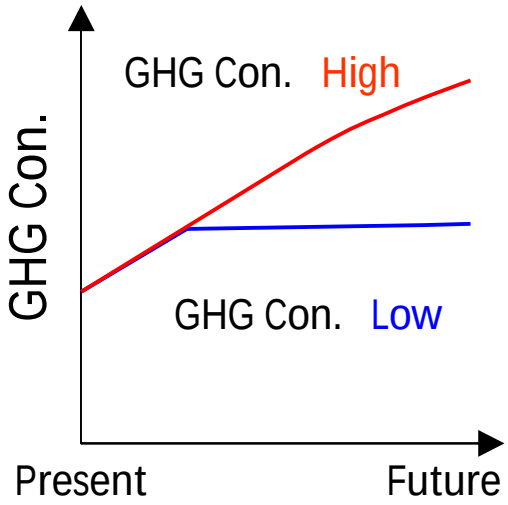
Objectives

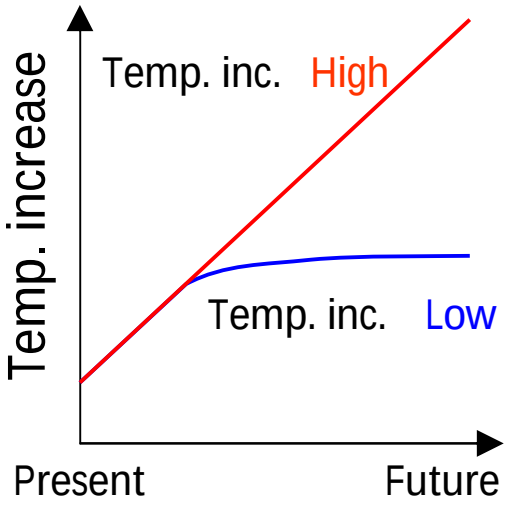
- Development of ***integrated assessment model***, AIM/Impact[Policy], for comprehensive analysis and assessment of GHG stabilization concentration targets and emission pathways for realizing them, as well as impacts and risks under such targets

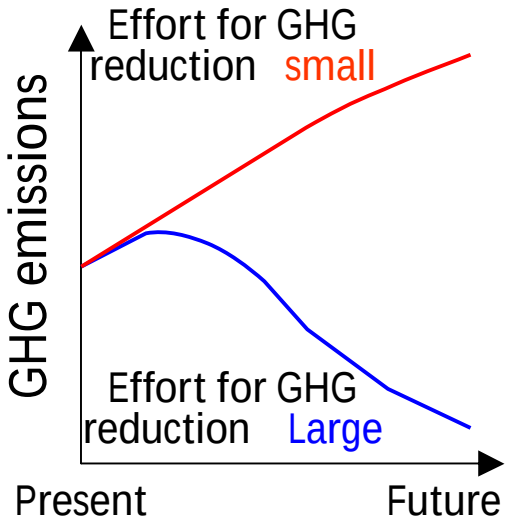
- Assist policymakers'decision in action programs to arrest global warming

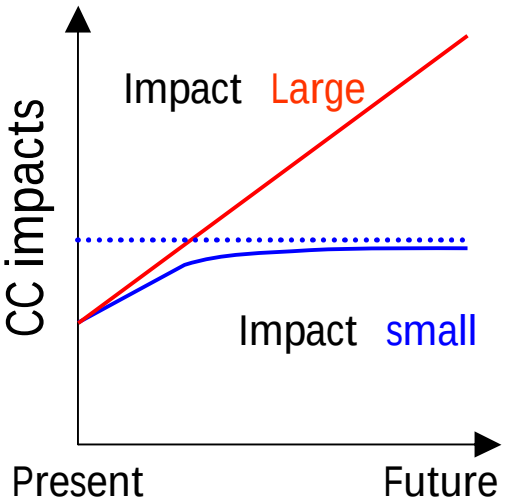
Concept of Integrated Assessment model

- Integrated assessment model, AIM/Impact[Policy]
- ✓ Projection of future GHG emissions and climate change impacts under stabilization targets



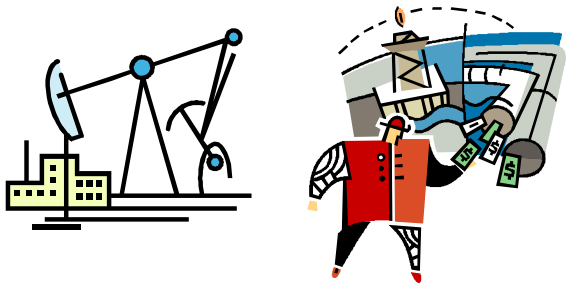






Overview of integrated assessment model

GHG Emissions



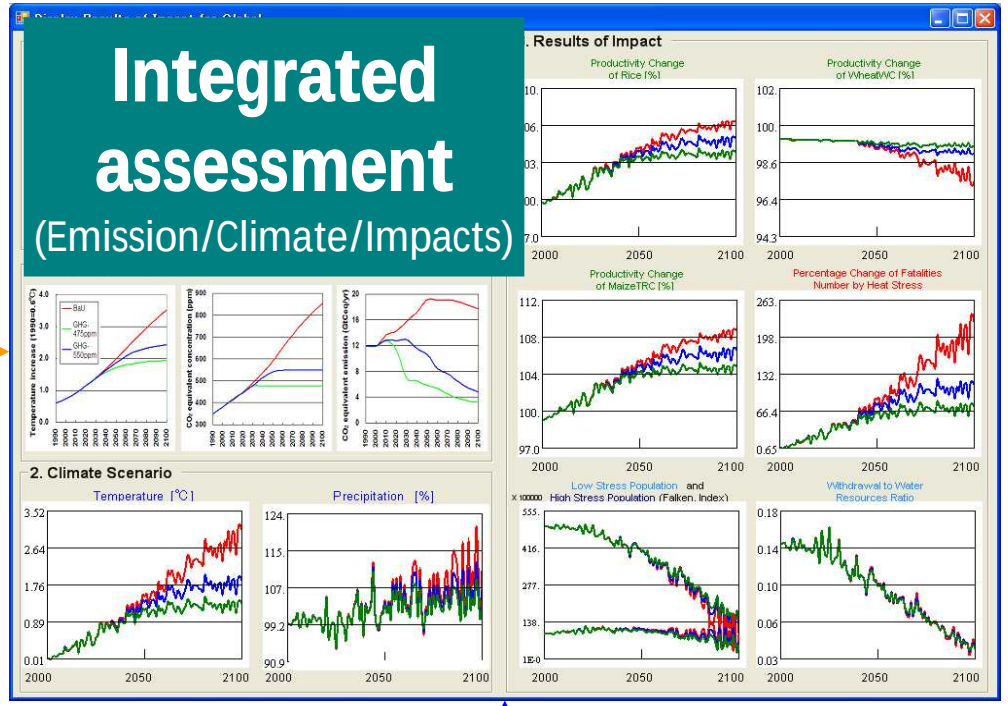
Energy-economic model

Global GHG emission path

Simple climate model

GMTI

Integrated assessment
(Emission/Climate/Impacts)



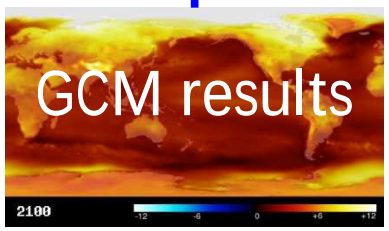
Impact/ Adaptation

National/ Sector-wise impacts

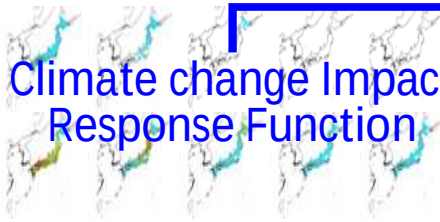
Pattern scaling module

Climate Scenario by country

Potential impact estimation module



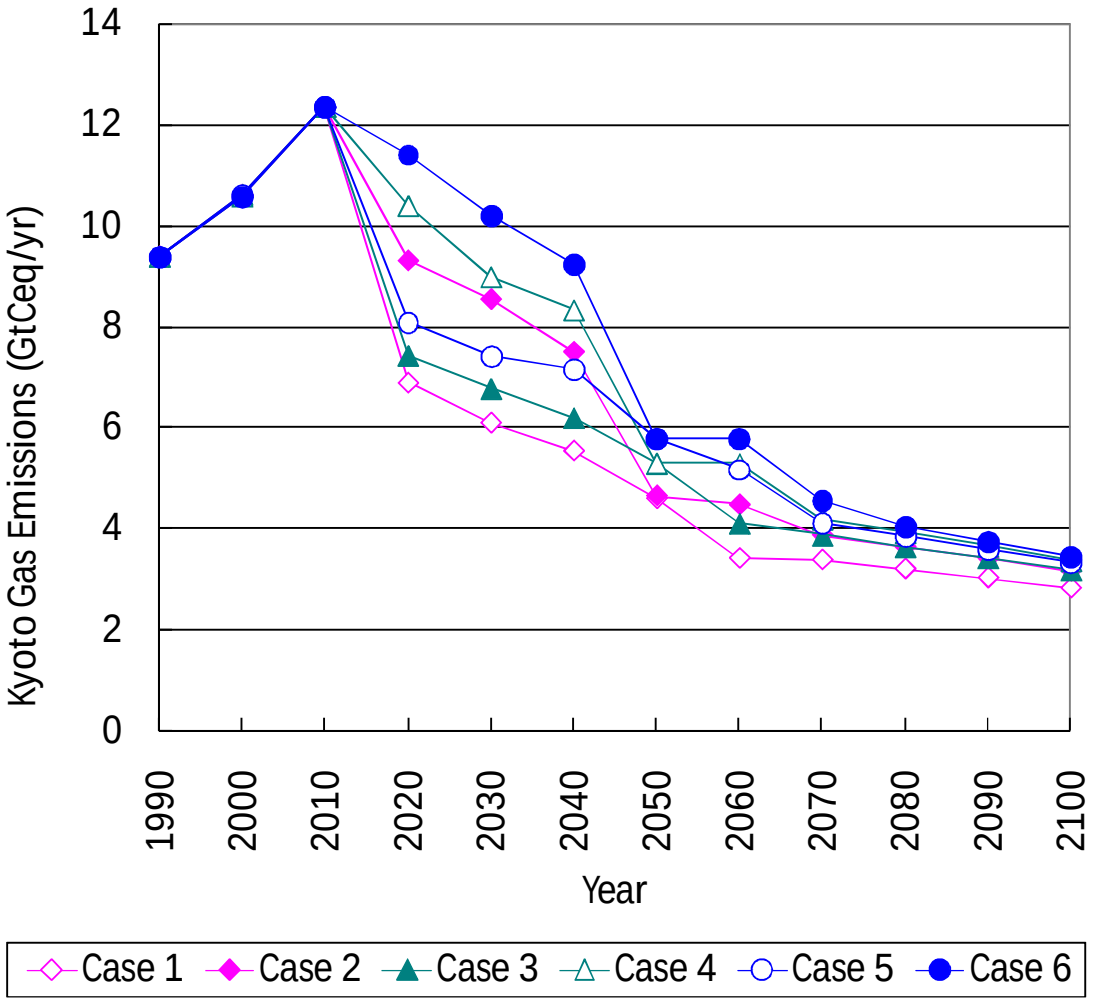
GCM results



Climate change Impact Response Function

Adaptation

Example of global GHG emissions to achieve 50% GHG reduction

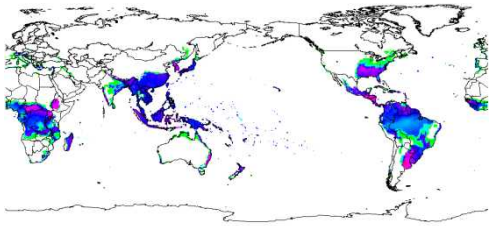
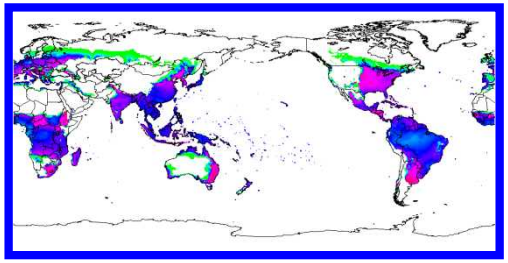
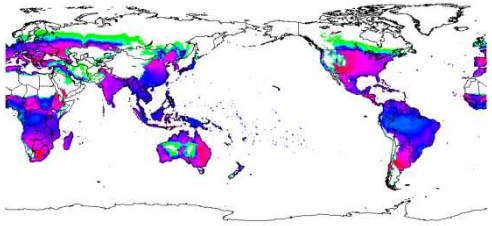
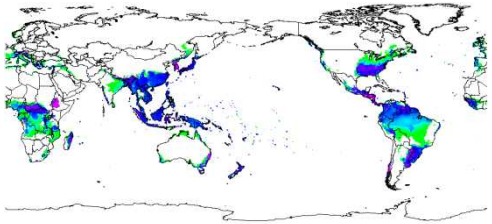
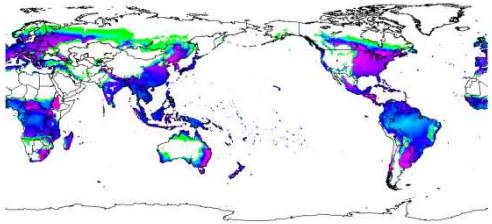
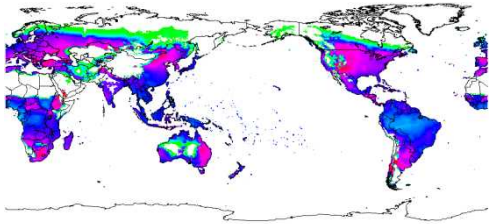
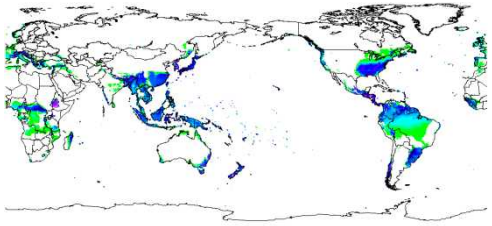
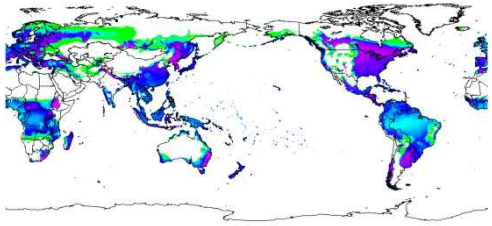
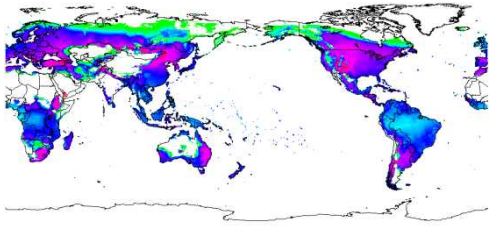
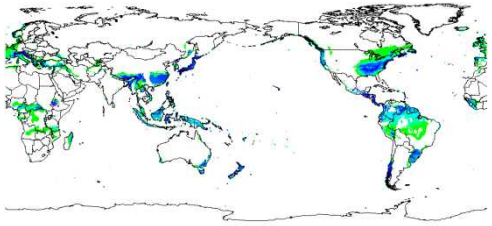
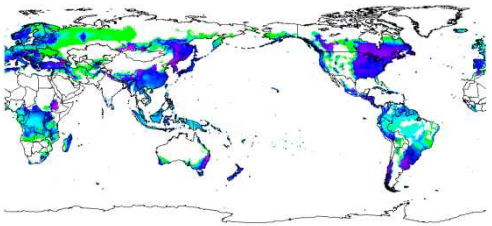
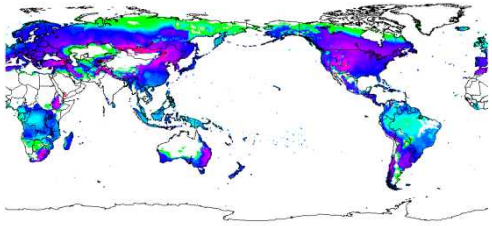


Base year: Case1,2(1990), Case3,4(2000), Case5,6: 2004

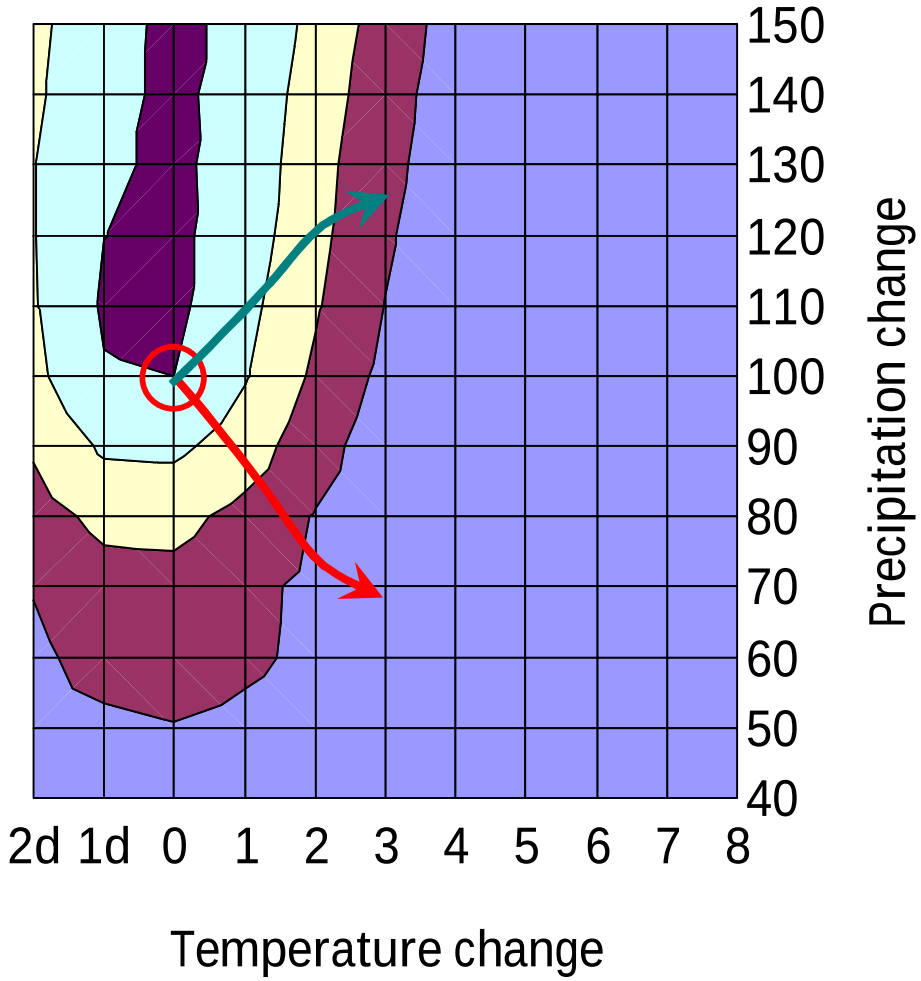
Impact assessment and adaptation model

- Database type model (pre-simulated results of process type models)
  - Using existing detailed sector-level impact assessment models, the impact on each lattice point is estimated by sensitivity analysis using the two climate factors of temperature and precipitation
  - Spatially averaged country-level and sector-level impact functions are to be prepared.
  - This database can also contain knowledge obtained by other impact studies.

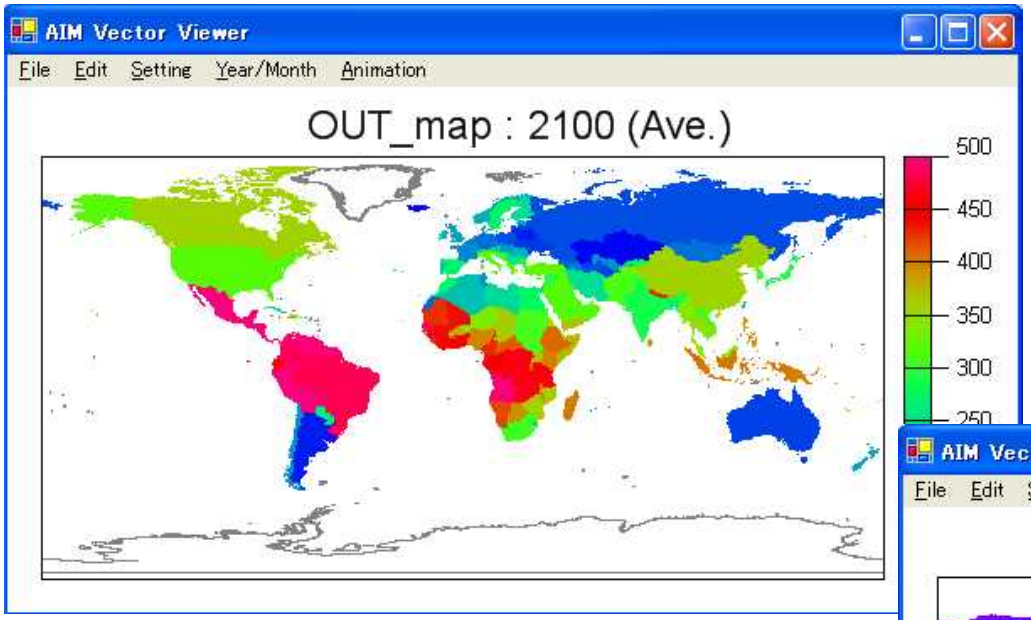
Change of potential crop productivity (rice)

	Precipitation -50%	Precipitation 0%	Precipitation 100%
Temperature +0ºC			
Temperature +3ºC			
Temperature +6ºC			
Temperature +9ºC			

Example of Impact Response Function

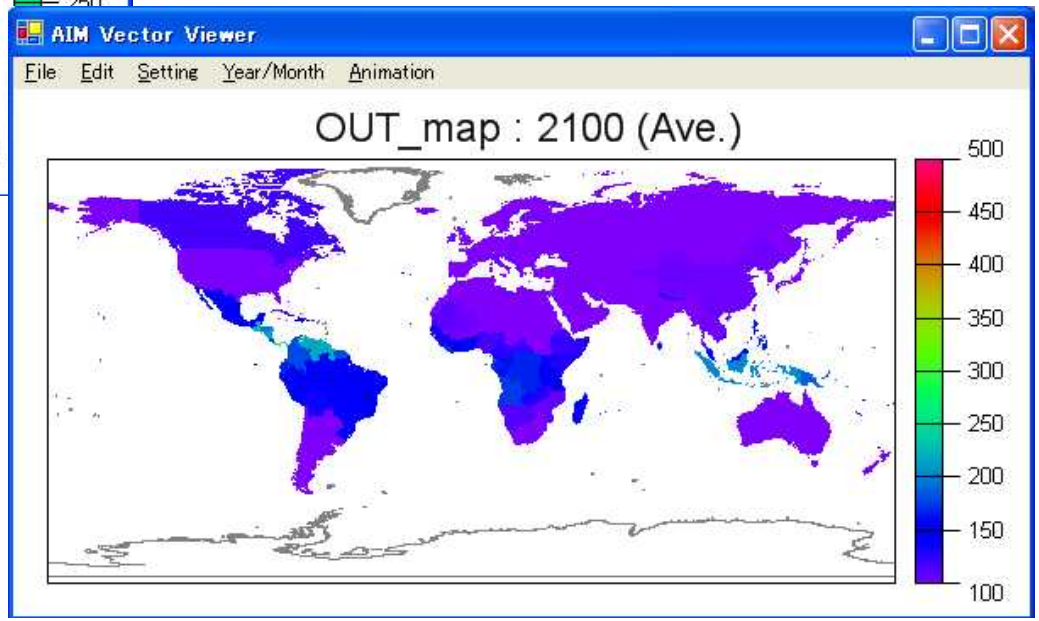


Example of global impact assessment -Probability of Heat Stress Mortality-

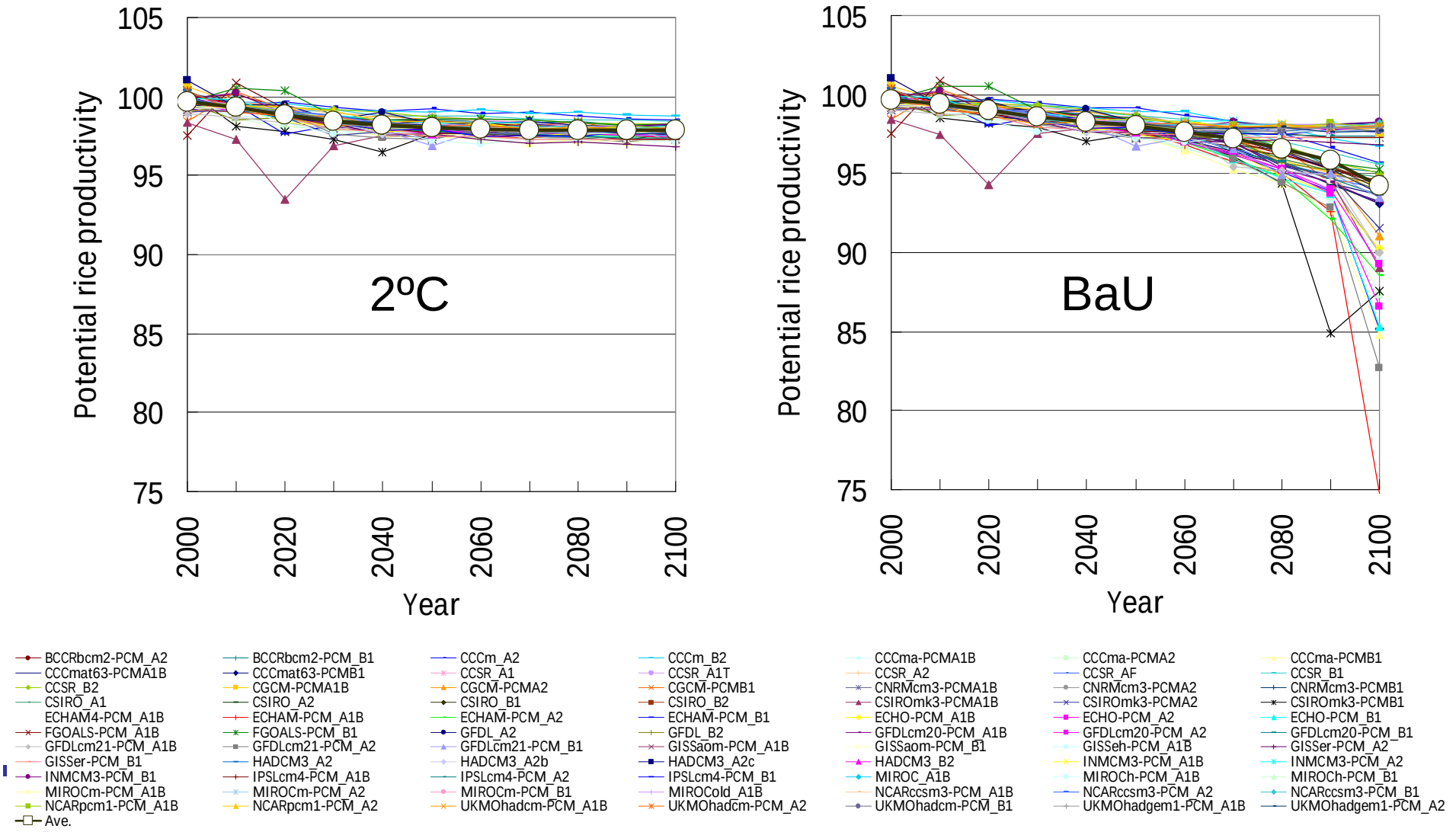


BaU

2 degree celsius increase



Example of uncertainty analysis



Improvement of AIM/Impact[Policy]

- Revision of parameters reflecting AR4 scientific information, such as climate sensitivity, radiative forcing
- Improvement of carbon cycle module
  - From box type model to impulse function type model
- **Additional integration of impact response functions**
  - **Research outcomes by the Project for Comprehensive Projection of Climate Change Impacts [S-4 project]**

The Project for Comprehensive Projection of Climate Change Impacts

- Global Environment Research Fund **S-4** by Ministry of the Environment
- Targeted area: **Asian region** including **Japan**
- Targeted fields: **Water resources**, **forests**, **agriculture**, **coastal zones**, **human health**
- Research period:
  - Period I (**2005**-2007) + Period II (2008-**2009**)
- Project leader: **Nobuo MIMURA**, Ibaraki University
- Number of sub-themes: **Seven**
  - Number of participating research institutions: **20** (2007)
  - Number of participating researchers: **44** (2007)

Objectives of the research project

- To obtain quantitative knowledge on climate change impacts in key fields in the Asian region including Japan, targeting the period up to the end of the present century while focusing on the period up to around 2050.
  - Water resources, Forests, Agriculture, Coastal zones, and Human health
- To comprehensively grasp the impacts on Japan and elucidate the relationships with the level of global warming.

S-4 research method

Improvement of Impact Projection

Water

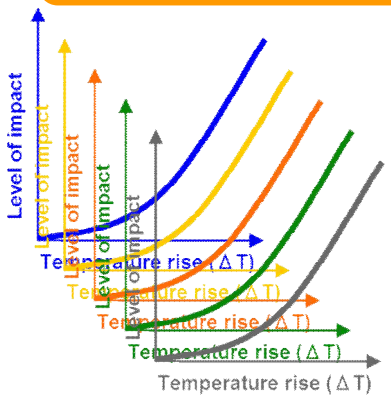
Human health

Agri.

Forests

Coasts

Development of Impact Functions



Risk Map

Without adaptation measures

With adaptation measures

Adaptation measures

Common scenario

Climate scenario

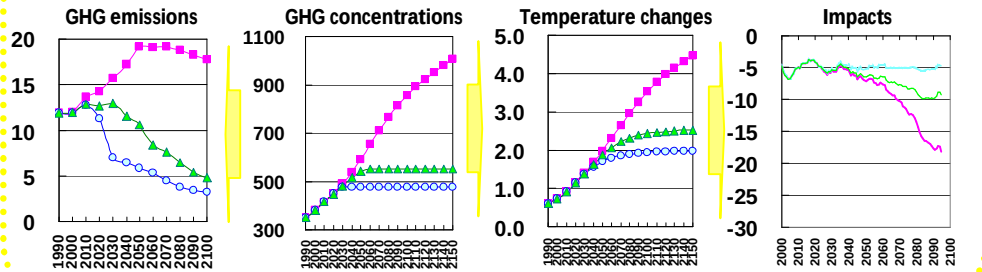
Population scenario

Economic assessment

Proposal of economic assessment method

Development of monetary assessment basic unit

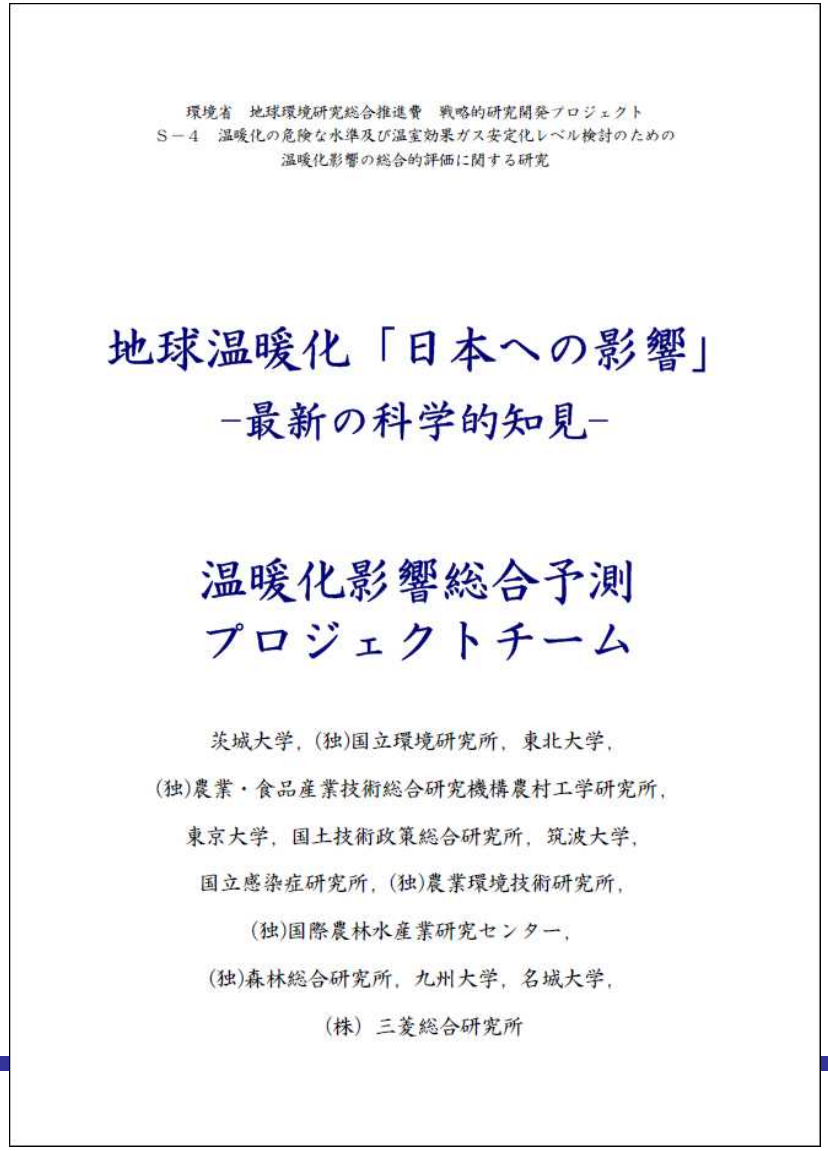
Integrated assessment model



Integrated Assessment

Climate Change Impacts on Japan - Latest Scientific Findings -

- Press Release:
  29th May, 2008
  - ➢ Results for the first three years
  - ✓ Full report: 94 pages
  - ✓ Brief summary: 15 pages
  - ➢ http://www-cger.nies.go.jp/climate/rrpj-impact-s4report.html



環境省　地球環境研究総合推進費　戦略的研究開発プロジェクト
S－4　温暖化の危険な水準及び温室効果ガス安定化レベル検討のための
温暖化影響の総合的評価に関する研究

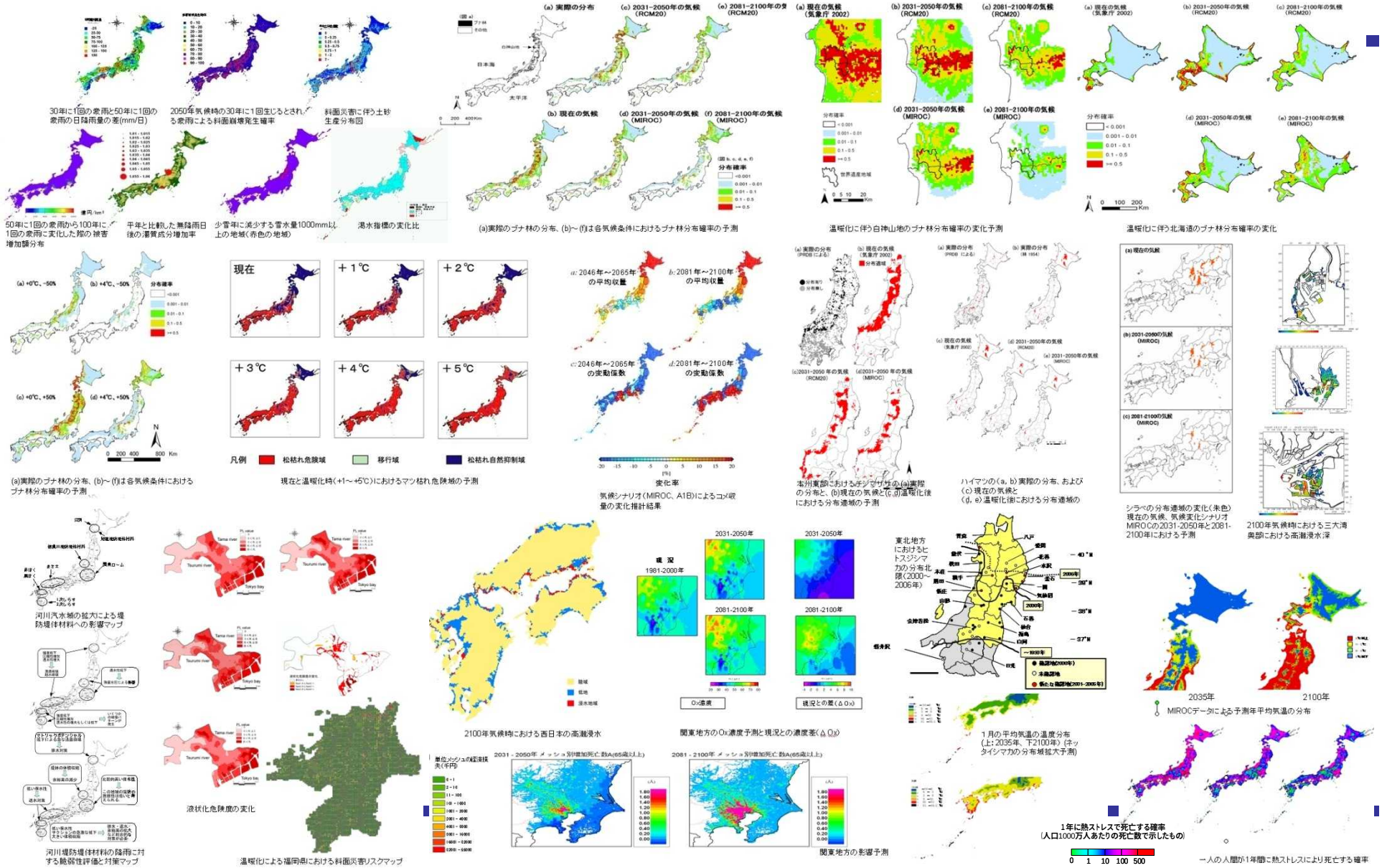
地球温暖化「日本への影響」
－最新の科学的知見－

温暖化影響総合予測
プロジェクトチーム

茨城大学，(独)国立環境研究所，東北大学，
(独)農業・食品産業技術総合研究機構農村工学研究所，
東京大学，国土技術政策総合研究所，筑波大学，
国立感染症研究所，(独)農業環境技術研究所，
(独)国際農林水産業研究センター，
(独)森林総合研究所，九州大学，名城大学，
(株) 三菱総合研究所

Reported risk maps

http://www-cger.nies.go.jp/climate/rrpj-impact-s4report.html



Summary of the report

1. While impact levels and rates of increase will vary by region, there are especially vulnerable regions for each field.

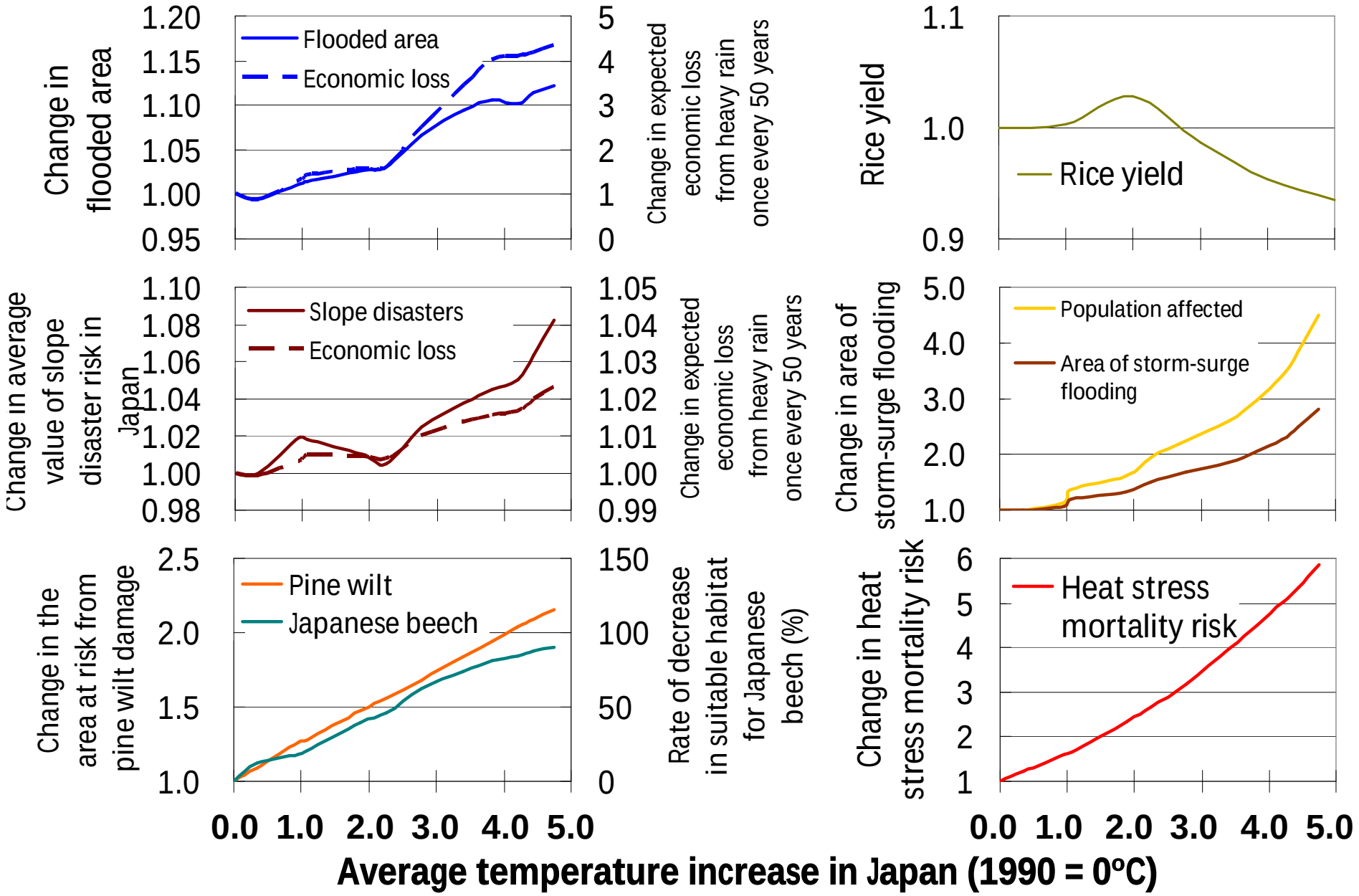
2. Although the level of impact and rate of increase vary according to the field, Japan will also experience significant impacts even with a relatively low temperature rise.

3. In view of the fact that the impacts of climate change have been appearing in various fields in recent years, the immediate planning of appropriate adaptation measures is necessary.

Impact Response Functions (Japan)

- Flood area and economic loss
  - Tohoku University
- Risk of slope disaster and economic loss
  - Tohoku University
- Suitable habitat for Japanese beech
  - Forestry and Forest Products Research Institute and NIES
- Risk area of pine wilt
  - Forestry and Forest Products Research Institute
- Rice yield
  - National Institute for Agro-Environmental Sciences
- Area, affected population and economic loss of storm-surge flooding
  - National Institute for Land and Infrastructure Management
- Heat stress mortality risk
  - Tsukuba University and NIES

Comprehensive assessment of climate change impacts



Conclusion and Future plan

- **AIM/Impact[Policy] has been improved and applied to several projects**
  - Energy-economic model has been applied to develop stabilization scenario, such as AR5 RCP and Japanese middle term GHG reduction targets
  - Impact assessment and adaptation model has been applied Japanese impact assessment

1. **Implementation of new Japanese impact response functions, such as risk of vector-borne infectious diseases, fruit productivity, etc**
2. **Improvement of AIM/Impact[Policy]**
   - Development of new functions to assess adaptation options
   - Development of distributed version
   - User and Technical Manual and report

Thank you for your attention!