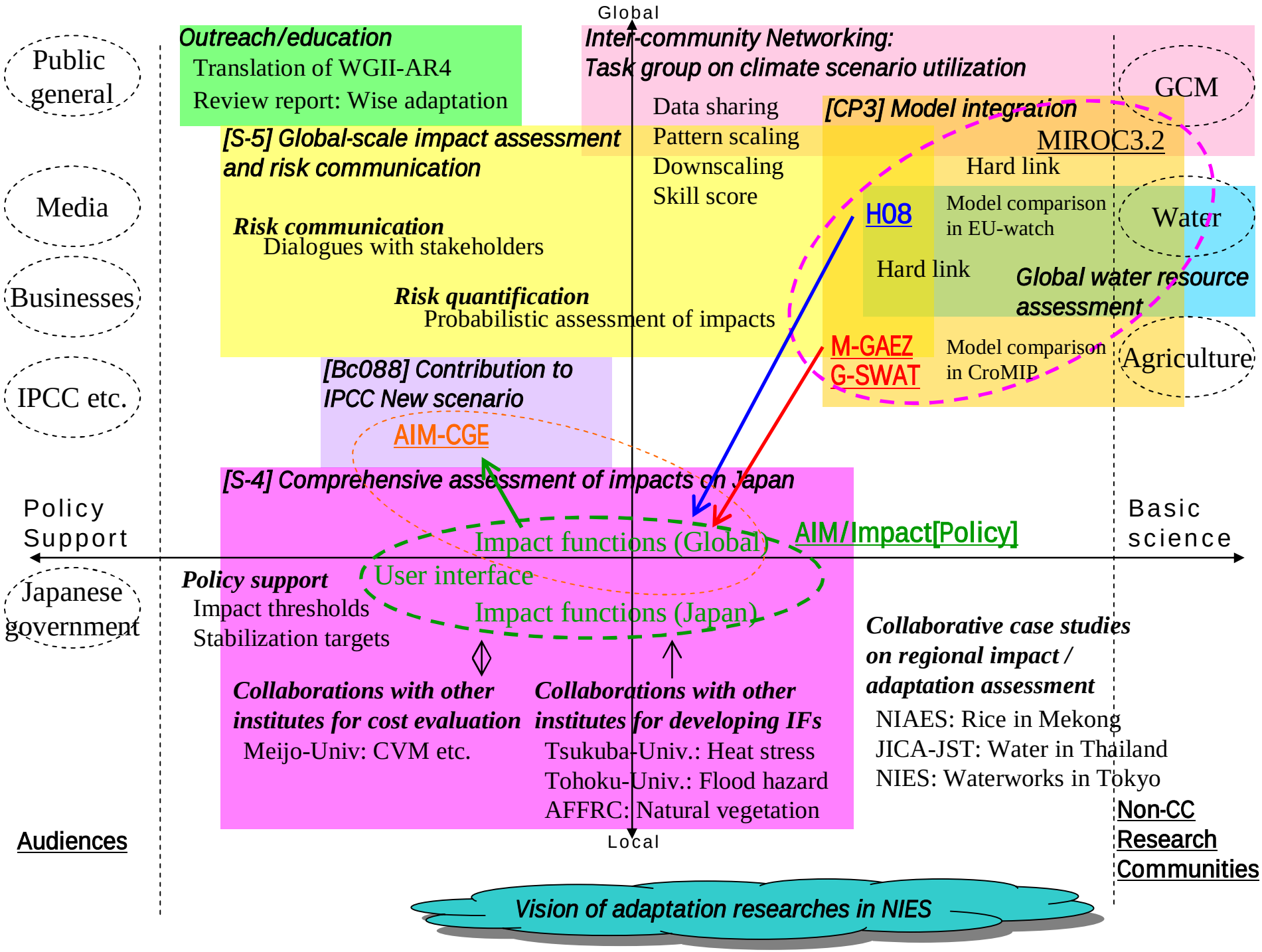
Research activities of AIM/Impact team in Japan

K. Takahashi, Y. Hijioka, N. Hanasaki,
Y. Masutomi, and H. Harasawa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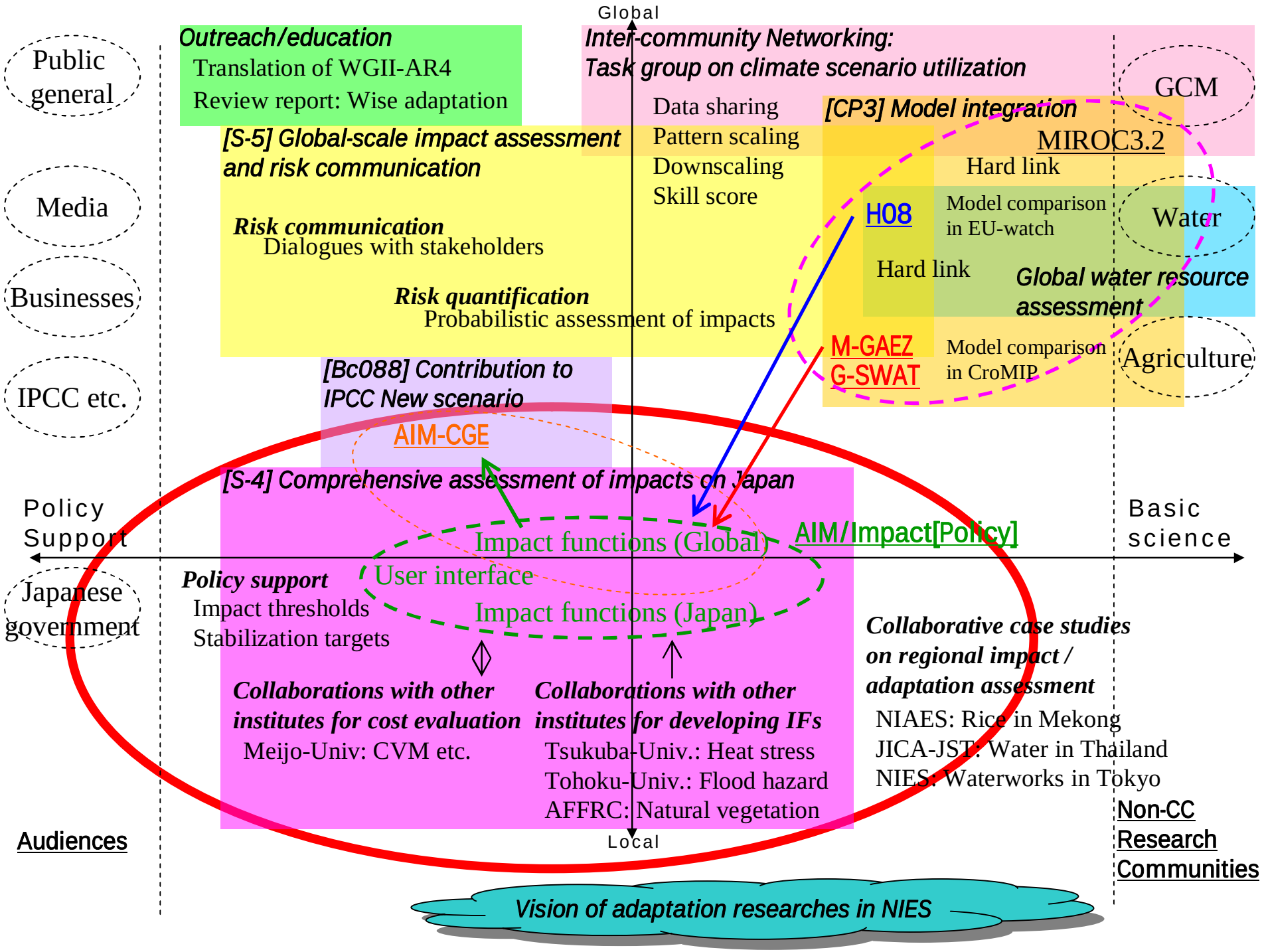
Activities in FY2008

- Apr.
  - Food Security and Environmental Change, Oxford, UK [Masutomi]
  - EU-WATCH, Wageningen, The Netherlands [Hanasaki]
- May.
  - Report: Research project for comprehensive projection of climate change impacts in Japan [S-4]
  - Launch of Task Group on Climate Scenario Utilization [Takahashi, Hanasaki, Hijioka, Masutomi]
- Jun.
  - Report: Wise adaptation to climate change [MoE]
  - Open Symposium by NIES, Tokyo and Sapporo, Japan [Kainuma, Hijioka]
- Jul.
  - Trip to Shijiazhuang in China for on-site inspection of Chinese agriculture [Hanasaki, Masutomi]
- Aug.
  - Symposium on global environment engineering research, Okayama, Japan [Takahashi, Hanasaki, Masutomi]
- Sep.
  - Awards given by Society of Environmental Science [Harasawa, Takahashi]
- Oct.
  - International workshop on integrated responses to climate change, Seoul, Korea [Takahashi]
  - Symposium on Global Environment Research Fund, Tokyo, Japan [Hijioka]
- Nov.
  - EU-WATCH, Bratislava, Slovakia [Hanasaki]
  - Report: Vision of adaptation researches in NIES. [Takahashi, Hijioka and others]
- Jan
  - Workshop on Climate Change Impacts, Adaptation and Vulnerability (IAV) Community Coordination, Boulder, USA [Hijioka, Takahashi]
- Feb.
  - Acceptance of Special Research Project of NIES (Development of water demand and trade models for a global water resources model and their application to long term scenario analyses) [Hanasaki and others]
- Mar.
  - Symposium for enhancing dialogue with media persons, Tokyo [Takahashi, Harasawa, planed on 11 March]
  - International Symposium on Agricultural Meteorology, Fukushima, Japan [Masutomi, planed on 25-27 March]

(Refereed) Articles accepted or published in FY2008

- Hanasaki, N., Masutomi, Y., Hijioka, Y. and Takahashi, K.: Development and application of a global water-stressed population estimation scheme for climate policy assistance models, Annual Journal of Hydraulic Engineering, accepted. (in Japanese)
- Hanasaki, N., Kanae, S., Oki, T., Masuda, K., Motoya, K., Shirakawa, N., Shen, Y., and Tanaka, K.: An integrated model for the assessment of global water resources – Part 1: Model description and input meteorological forcing, Hydrol. Earth Syst. Sci., 12, 1007-1025, 2008.
- Hanasaki, N., Kanae, S., Oki, T., Masuda, K., Motoya, K., Shirakawa, N., Shen, Y., and Tanaka, K.: An integrated model for the assessment of global water resources – Part 2: Applications and assessments, Hydrol. Earth Syst. Sci., 12, 1027-1037, 2008.
- Hanasaki, N., Masutomi, Y., Hijioka, Y. and Takahashi, K.:An intercomparison of future projections on domestic and industrial water withdrawal in global water resources assessments, Global Environment Engineering Research , 16, 1-8, 2008 (in Japanese)
- Masutomi, Y., Takahashi K., Harasawa, H., Matsuoka, Y.: Impact assessment of climate change on rice production in Asia in comprehensive consideration in process/parameter uncertainty in general circulation models, Agric. Ecosyst. Environ, accepted.
- Masutomi, Y., Inui Y., Takahashi K., Matsuoka, Y.: Development of highly accurate global polygonal drainage basin data, Hydrol. Process., 23, 572-584, 2009.
- Masutomi, Y., Takahashi K., Harasawa, H., Matsuoka, Y.: Assessments of climate change impacts and effects of adaptation policies in the near future on paddy rice production in Asia in consideration of uncertainties in climate projections, Global Environment Engineering Research , 16, 121-130, 2008 (in Japanese)
- Takahashi, K., Matsui, T., Hijioka, Y., Tanaka, N., and Harasawa, H.: Development of an impact function of buna (Fagus crenata) forests for climate change policy support models, Global Environment Engineering Research , 16, 2008 (in Japanese)
- Matsui, T. , Takahashi, K., Tanaka, N., Hijioka, Y., Horikawa, M., Yagihashi, T., and Harasawa, H. : Evaluation of habitat sustainability and vulnerability for beech (Fagus crenata) forests under 110 hypothetical climatic change scenarios in Japan, Applied Vegetation Science, accepted.
- Hijioka, Y., Matsuoka, Y., Nishimoto, H., Masui, T., Kainuma, M.: Global GHG Emission Scenarios under GHG Concentration Stabilization Targets, Journal of Global Environment Engineering, Vol.13, pp.97-108, 2008
- Kawagoe, S., Kazama, S., Hijioka, Y., and Takahashi, K.: Evaluation of future slope failure risk using general circulation model output, Annual Journal of Hydraulic Engineering, accepted. (in Japanese)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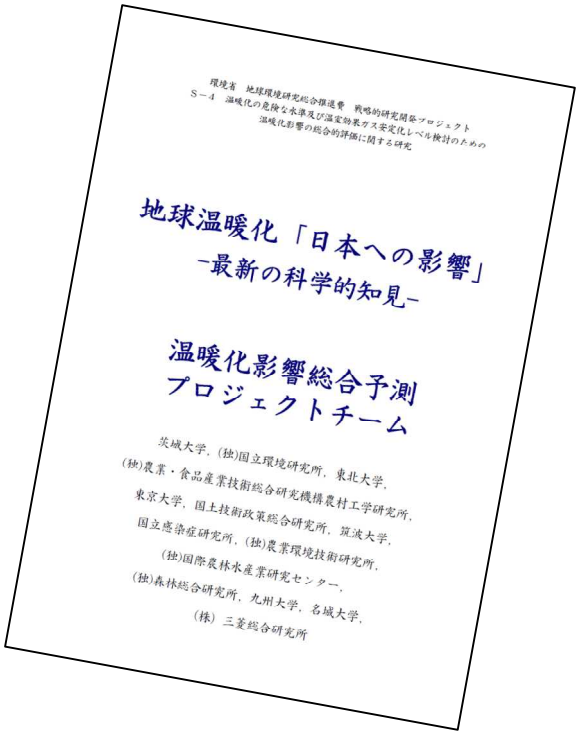
Progress report (published in May 2008. 94 pages)

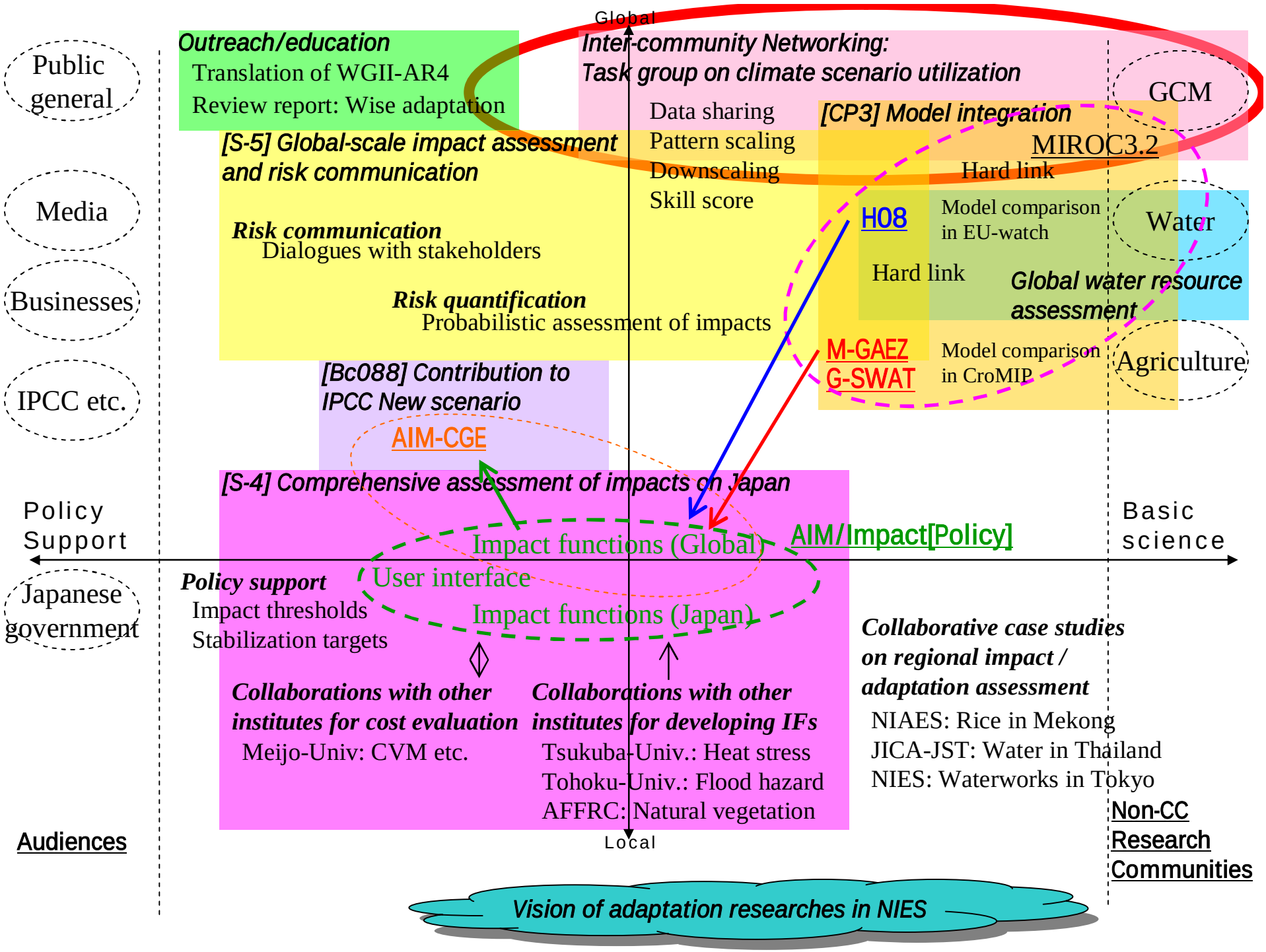
Results for the first three years of the project

- The development of quantitative assessment methods by field and projection of the impacts on Japan are described, together with risk maps (nationwide as well as regional assessments) that show the level of and regional distribution of the impacts.

- Comprehensive studies are described on the increasing impacts on Japan when global warming proceeds under various climate scenarios, using climate change impact functions that have been developed to show the relationship between the progress of global warming and impact levels.



http://www-cger.nies.go.jp/climate/rrpj-impact-s4report.html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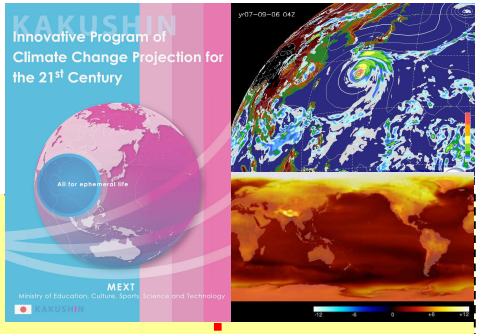
Collaborations between research projects



Climate projection (funded by MEXT)

Kyosei (2002-2006)

- 100km AO-GCM by CCSR/NIES/FRCGC (-2100)
- 20km time-slice experiments by MRI/JMA

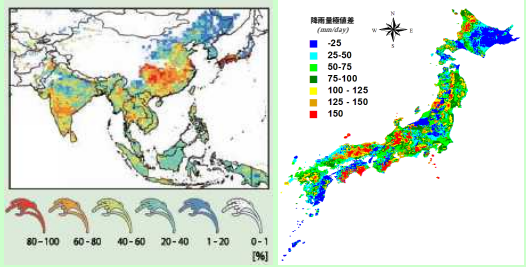
Kakushin

- [Long-term] 280km Earth System Model by FRCGC (-2300)
- [Near-term] 50km AO-GCM by CCSR/NIES/FRCGC (-2030)
- [Extreme event] 20km time-slice experiments by MRI/JMA

Task Group on Climate Scenario Utilization

- Co-ordination of data exchange
- Share of know-how on climate scenario utilization

Impact assessment (funded by MOE)



S-5

- Spatial downscaling of climate scenarios (with RCM / SD)
- Downscaling of socio-economic scenarios (global)
- Sectoral impact assessment at global scale
- Risk communication with public citizen and business

S-4

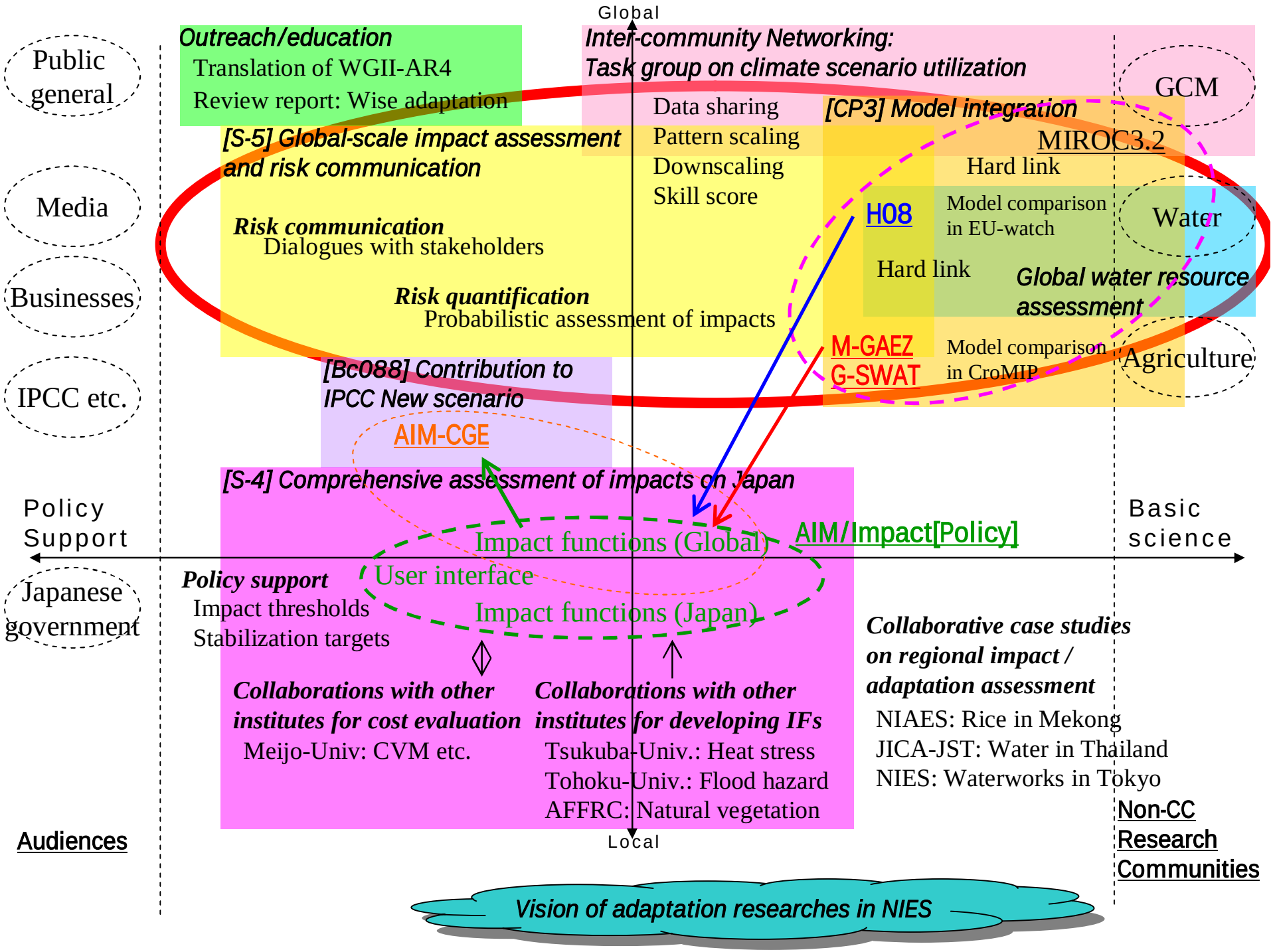
- Sectoral impacts and adaptation strategies in Japan and Asia

Progress report

Extension of the project

AR4 AR5

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014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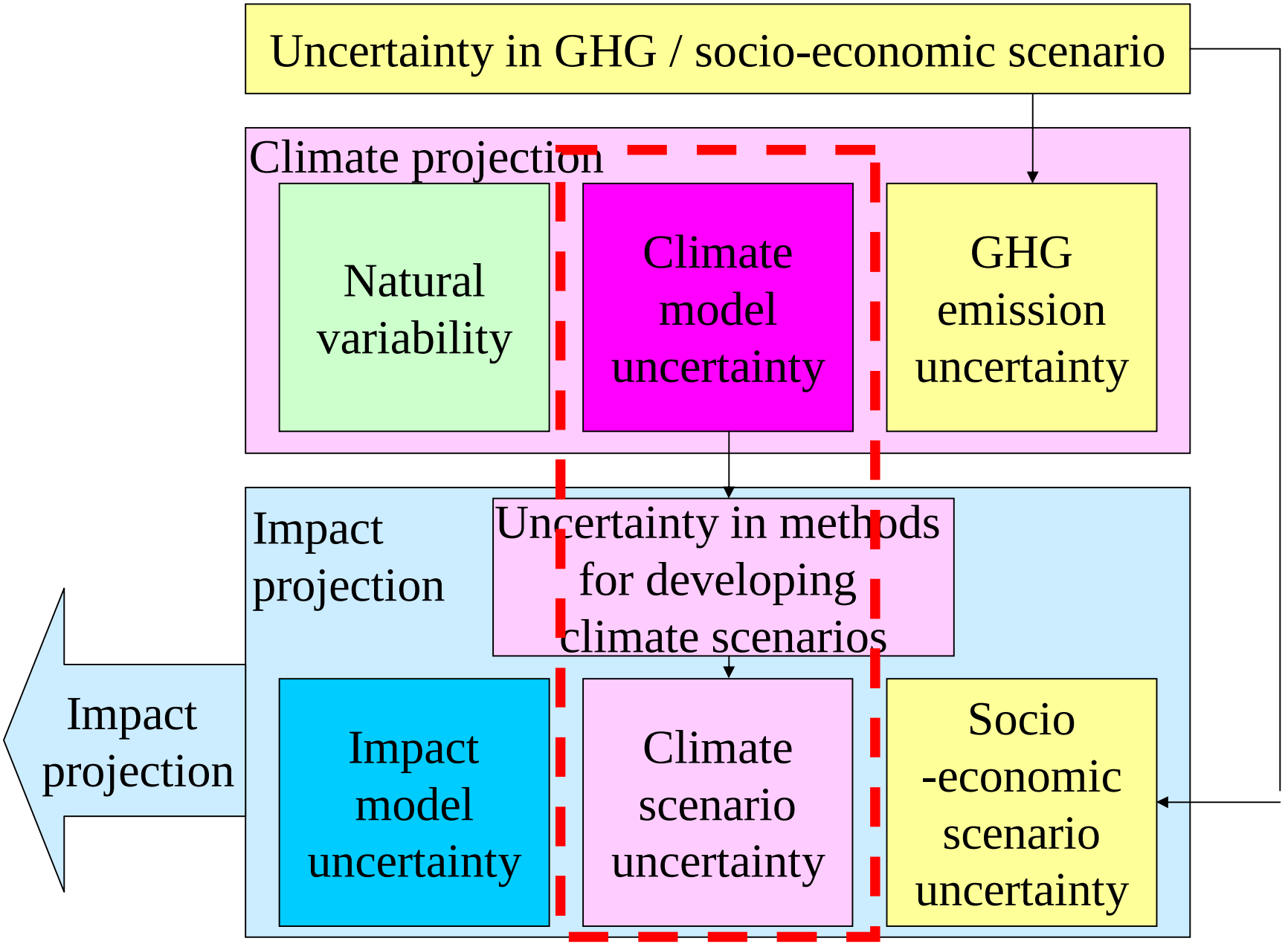
Workshop on CCIAV Community Coordination, Boulder

- In face of the processes of IPCC new scenario development and AR5 writing, global coordination of CCIAV (Climate Change Impacts, Adaptation and Vulnerability) research community is expected for better communication both with other research communities (climate modelers, IAM modelers) and within CCIAV community.
- A workshop which focused on the community coordination was held in NCAR (Boulder, US) in January 2009.
- Nine research areas, or organizational nuclei were proposed in the workshop.
  - Impacts and adaptation assessment
  - Investigation of risk uncertainty and decision making
  - Storyline and scenario development, their application, communication (within the community) and distribution at a range of scales.
  - Adaptation: past, present and future
  - Processes interacting with vulnerability
  - Costing and valuation: monetary and non-monetary and social
  - Observations and data systems.
  - Integration of impacts, adaptation and vulnerability
  - Extreme events, thresholds, key vulnerabilities

Various uncertainties contained in impact projection



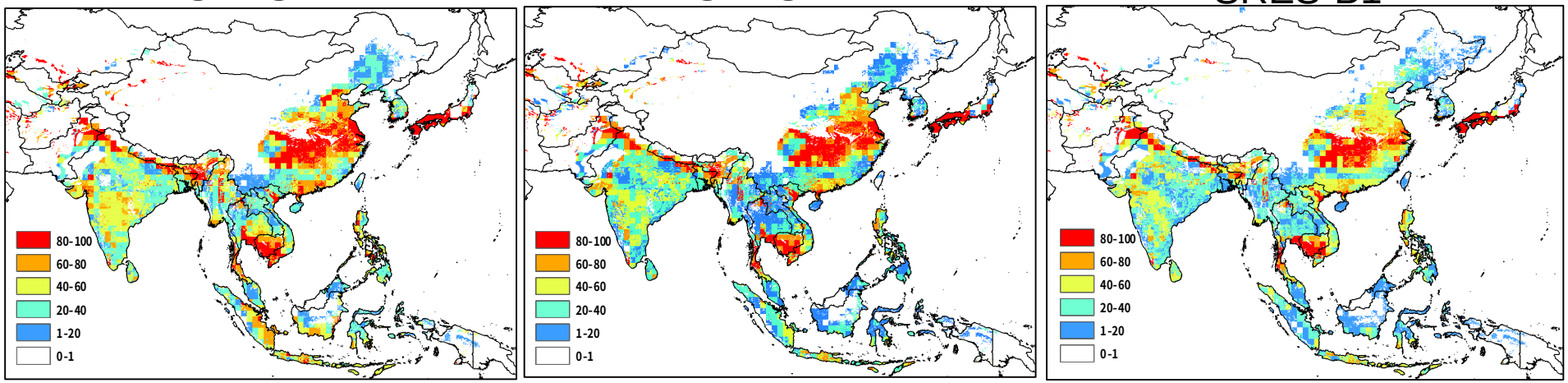
Example of impact assessment considering uncertainty of climate projection

Masutomi, Y. et al.,
Agric. Ecosyst. Environ. (accepted)

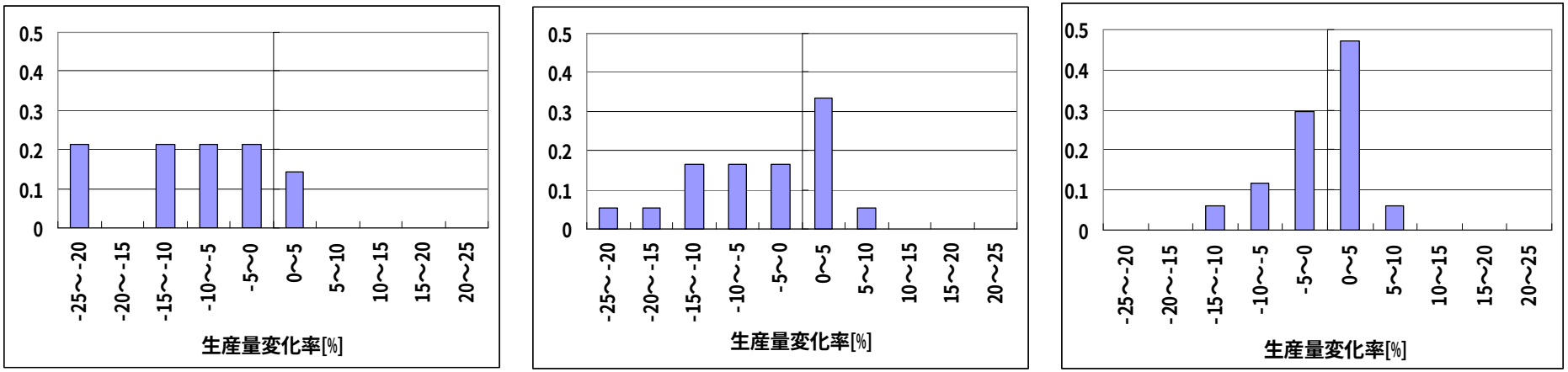
Impact on rice productivity

Crop productivity assessments using multi-GCM projections evaluated in IPCC-AR4

SRES-A2 | SRES-A1B | SRES-B1

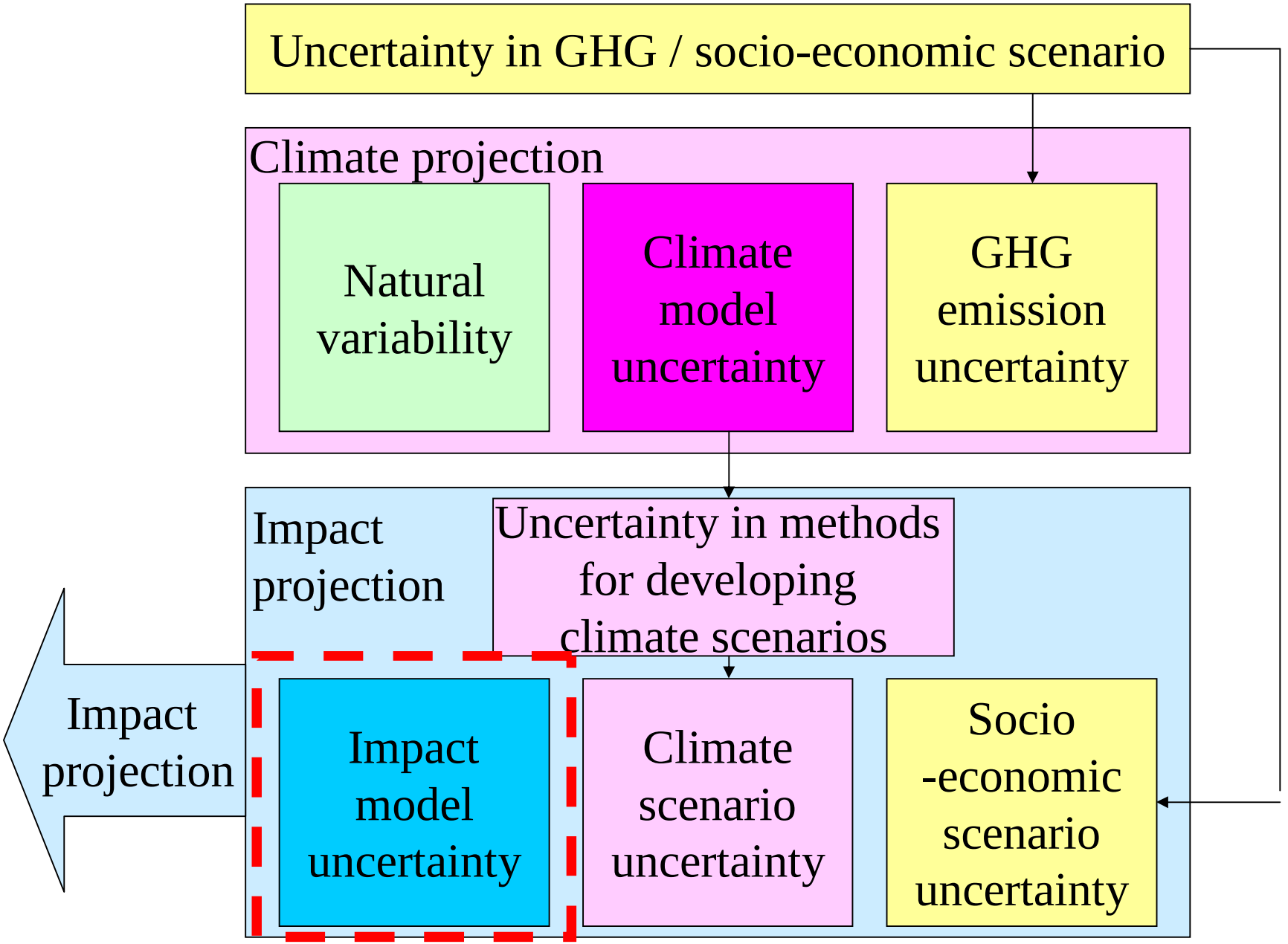


Probability of crop productivity decrease [%] (with CO2 fertilization; 2080s-1990s)



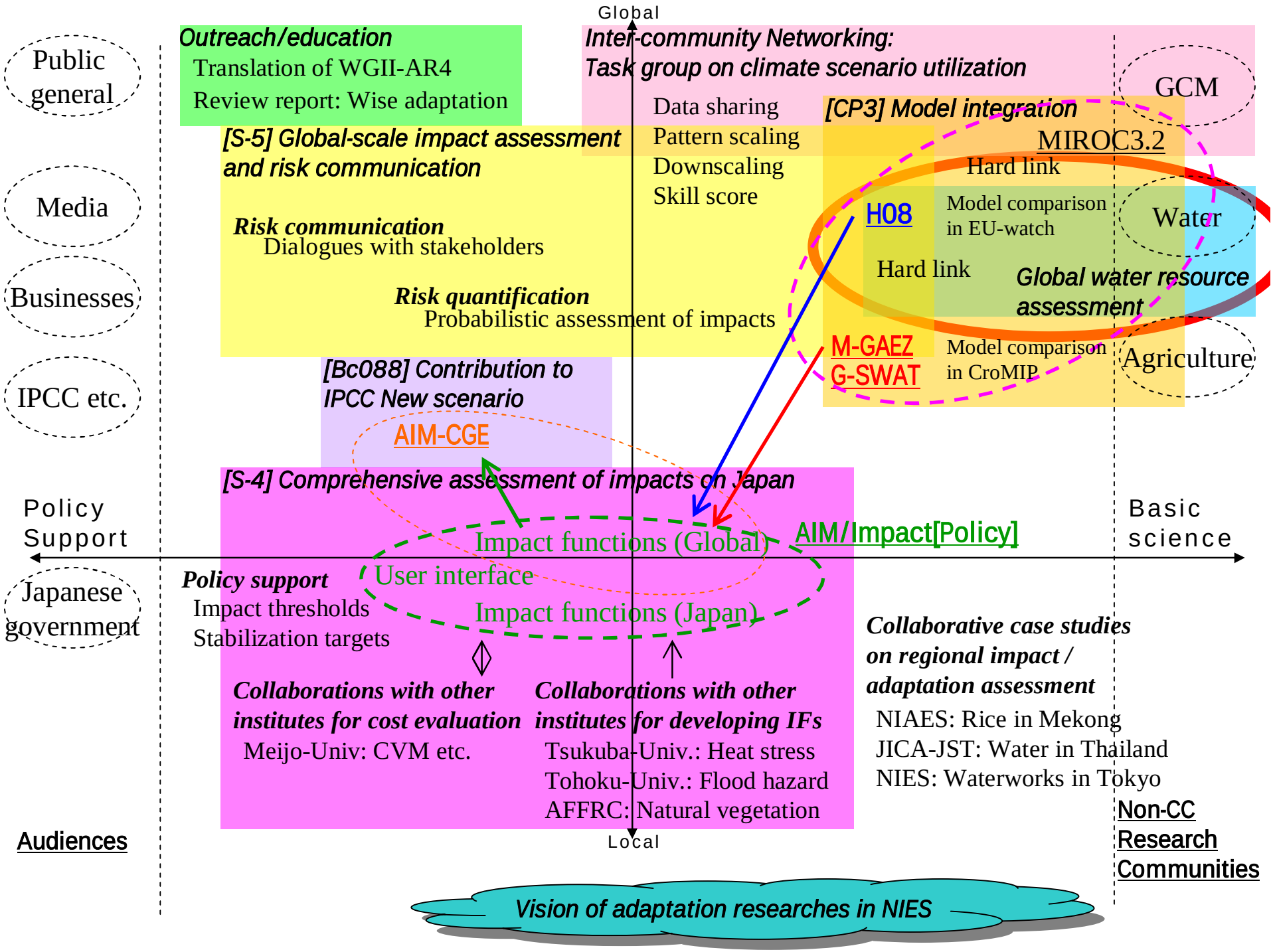
PDFs of estimated productivity change (Asia; with CO2 fertilization; 2080s-1990s)

Various uncertainties contained in impact projection



Inter-comparison of sector impact assessment models

- Quantification of uncertainties in impact projections is an important research challenge in AR5 process. AIM/Impact team thinks that inter-comparison of sector impact assessment models will be promoted rapidly.
- Water: Hanasaki has been involved in "EU-WATCH" project for inter-comparing global-scale water resource models.
  - Details are explained in Dr. Hanasaki's presentation.
- Crop: With crop modelers in the University of Tokyo, Masutomi and Hanasaki launched a global-scale crop model inter-comparison study named CroMIP.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Special Research Project of NIES: Development of water demand and trade models for a global water resources model and their application to long term scenario analyses (2009-2011)

- Global water resources model is a useful tool to project climate change impact on water resources globally.
- To project future domestic and industrial water, cooperation between water and economic models is essential.
- Our goal is to obtain national domestic, industrial, and virtual water scenarios in the 21st century.