

Model Inter-comparison projects of Integrated Assessment Models and the Collaboration with Impact Assessments

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This presentation talks about two topics; namely model inter-comparison projects (MIP) of integrated assessment models (IAM) and the collaboration with impact assessments.

MIP of IAM is carried out by sharing main themes, assuming model conditions and parameter settings, and comparing results. The themes dealt with the last couple of years were, for example the influence of the technological availability (e.g. nuclear) and mitigation starting year on the mitigation cost. The outcomes are eventually summarized as special issues of international journals. The harmonization of the scenario assumptions is generally quite limited to narrative story. The numerical future socioeconomic conditions are dependent on individual models. This intends to encourage as many as IAMs participating MIPs since IAMs have several types and some variables which are exogenous parameters for some IAMs can be endogenous variables for others. The activities relevant to model validation have become much more important than before and some MIPs treat such themes. The activities are ongoing now and model documentations, development of model diagnostics protocol and comparison hind-casting with historical observation are discussed. In regard to the collaboration with Impact, Adaptation and Vulnerability (IAV) assessment, we can classify two types according to the way how the IAM is used. First is the case where IAMs are used as a provider of socioeconomic conditions to IAV. RCP (Representative Concentration Pathways) and SSP (Shared Socioeconomic Pathways) are well known such information. Hanasaki, et al. is an example and AIM/CGE provided information to the water assessment model H08. They assessed the water scarcity. Second is the case where IAMs assess climate change impacts by themselves. Hasegawa, et al. is an example and crop productivity model GAEZ calculated a potential crop productivity change and it is fed into AIM/CGE. They assessed a risk of hunger. The fields of water and agriculture overlap with the IAM coverage through land use and energy supply. We expect one of the possibilities for the further studies would incorporate transactions between them. All studies are made by the combination of emissions scenarios and the outcome of the Earth System Models (ESM). The release of SSP would encourage much more IAV studies.

Meanwhile, several issues might remain even after SSP processes are completed. Here we show two issues. First, SSPs exclude information relevant to climate mitigation and the case with climate mitigation would be different from the case without climate mitigation. The combination of the RCP and CMIP5 (Coupled Model Intercomparison Project Phase 5) is not consistent for such case. Second, we would face the case where the stabilization targets other than existing four RCPs needed to be assessed. The accuracy of the pattern scaling would be the key point. If the pattern scaling had an accuracy which is acceptable for IAV, the existing RCP and CMIP5 are available with the pattern scaling. Otherwise, a set of new climate scenarios is required. However, multi-model ensemble examination similar to CMIP5 takes extra a few years and it would be unrealistic for IAV. Hence, a specific combination of IAM and ESM in Japan (e.g. AIM/CGE and MIROC) associated with the new set of emissions scenarios might be one of the solutions. Although it would take many efforts in order to achieve it, we might be able to identify the usefulness for society and scientific novelty. We hope that this presentation would be one of the indications for such discussions.

Hanasaki, N. et al. A global water scarcity assessment under Shared Socio-economic Pathways ? Part 1: Water use. *Hydrol. Earth Syst. Sci.* 17, 2375-2391, doi:10.5194/hess-17-2375-2013 (2013).

Hasegawa, T. et al. Climate Change Impact and Adaptation Assessment on Food Consumption Utilizing a New Scenario Framework. *Environmental science & technology* 48, 438-445, doi:10.1021/es4034149 (2014).

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