

Evaluation of the nexus of risks under global climate change

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Climate change caused by the increase in atmospheric greenhouse gas has various impacts on human society and ecosystem. Features of the impacts have a large variety, and most part them is adverse impact (damage), although some part is positive impact (benefit) in some locations. It is very important to have reliable predictions of possible damage and benefit (= risks) under the climate change, in order for us to have effective adaptation and mitigation measures.

Future risks caused by the climate change can happen in various sectors. In addition, the various risks are connected across sectors. Especially, a “ nexus ” between the water, food and energy sectors is considered to be very important (Hoff 2011, Understanding the Nexus. Stockholm Environment Institute).

In this study, we are going to present our two activities related to the nexus of risks under the climate change. One is the investigation of qualitative feature of the various links of risks caused by the future climate change. We made a comprehensive list of the possible damage and benefit in the human society and ecosystem possibly caused by the future climate change (“ item of risk ”). This list is generated by the experts of climate, water resources, energy, food, health, security, industry, society, and ecosystem sectors. The experts of these fields in our group members choose all of the possible impacts related to the climate change based on their “ expert judgment ”. The number of items of risks is about 200 currently, such as “ decrease in river runoff ”, “ decrease in crop productivity ”, and “ increase in forest fire ”. Then, we also made a comprehensive list of the possible causal link between the items of risks as described above (“ item of causal link ”). This list is also generated by the experts of the various fields as described above. The number of items of causal link is about 400 currently, such as “ decrease in river runoff ” causes “ decrease in crop productivity ”. Finally, we visualize all of the causal links based on the network diagram using the Fruchtmann & Reingold force-directed layout algorithm. Using the data of item of risks and causal links as well as the network diagram, we are going to discuss the nexus of the risks under the climate change.

The other topic is on the development of a “ terrestrial integrated model ” of our group. We coupled a global climate model called “ MIROC5 ” (Watanabe et al. 2010, J. Climate), global water resources model called “ H08 ” (Hanasaki et al. 2008, HESS), global terrestrial ecosystem model called “ VISIT ” (Ito and Inatomi 2012, Biogeosciences, and global crop model called “ PRYSBI2 ” (Iizumi et al. 2013, J. Agricultural Meteorology). The status of our model development and analysis on the nexus of the risks under the climate change as described above are discussed.

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