Strategic R&D Area Project of the Environment Research and Technology Development Fund of the Ministry of the Environment
ICA-RUS: Integrated Climate Assessment-Risks, Uncertainties and Society
S10-4-2-1: Model Development and Gaming Simulations Focusing on the Interactions of Multiple Decision Makers in the Global Policy Agreement

January 22, 2013

Workshop Announcement:

2013 International Workshop on Game Theory and Simulation Model for Climate Change

Aim and Scope

The climate crisis has received global attention throughout this century, with "global warming" and "climate change" becoming important key words and drivers of controversial debates throughout academia, various government and scientific institutions and broad areas of society. Since the early nineties, many scholars have developed integrated assessment models (IAMs) to analyze global warming.

This workshop held in Sophia University, Tokyo was organized with the aim to share international and domestic researches on climate change, promote discussion of their works in the field of climate change impacts and provide an exchange platform for game theory and simulation models both theoretically and empirically in the area of climate change impacts with funding from the Environment Research and Technology Development Fund (S-10) of the Ministry of the Environment, Japan.

Dates: February 23-24, 2013

Location: Sophia University, Bldg 2, Rm510 (5F)

Special Guest Faculty:

Johan Eyckmans (The Hogeschool-Universiteit Brussel)

Zili Yang (State University of New York at Binghamton)

Takashi Yano (Institute for Global Environmental Strategies)

Organizer:

Toyoaki Washida (Sophia University)

Shin Sakaue (Sophia University)

Koichi Yamaura (Sophia University)

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Schedule

23-Feb-2013	
13:00-13:10	Opening Remarks: Toyoaki Washida
13:10-14:10	Johan Eyckmans "The impact of heterogeneity on the effectiveness and stability of international climate agreements"
14:25-15:25	Takashi Yano "Dynamic Games within an Integrated Assessment Model"
15:40-16:40	Zili Yang "Climate Damage and Mitigation Costs vs. the Core Sustaining Climate Coalition"
16:40-16:50	Closing Remarks: Toyoaki Washida
24-Feb-2013	
09:30-09:40	Announcement: Toyoaki Washida
09:40-10:40	Koichi Yamaura "Computable General Equilibrium Analyses of Global Climate Agreements: The Case of Tropical Cyclones"
10:50-11:50	Toyoaki Washida "Computable General Equilibrium Analyses of Global Climate Agreements: A Game Approach"
12:00-13:30	Lunch
13:30-14:30	Discussion (All presented papers)
14:30-14:40	Closing Remarks: Toyoaki Washida

Presenter:

Dr. Johan Eyckmans Professor Environmental Economics at the Hogeschool-Universiteit Brussel
Associated Professor at the Katholieke Universiteit Leuven KU Leuven
The Vice Dean Research of the HUB

"The impact of heterogeneity on the effectiveness and stability of international climate agreements"

This paper investigates the fundamental drivers of effectiveness (in welfare and environmental terms) and game theoretic stability (in terms of Internal / External stability or the core) of international climate policy agreements. So far, most of the environmental economics literature has focused on the symmetric players case only. Typically, only very few and small coalitions were found to be stable (see for example Barrett 1994) and general results for the heterogeneous players case

are lacking. We use an integrated assessment model (the 18 regions CLIMNEG World Simulation CWS) and we try to explain by means of regression analysis the fundamental drivers of effectiveness and game theoretic stability of coalitions. In particular we focus on how the symmetric players result carry over to the non-symmetric players case and how heterogeneity in emission abatement costs and climate change damages affect effectiveness and stability of future climate agreements.

Dr. Zili Yang Professor, Department of Economics,
State University of New York at Binghamton

"Climate Damage and Mitigation Costs vs. the Core Sustaining Climate Coalition"

Climate damages and GHG mitigation costs are two important factors that affect regions' incentives to join a global climate coalition. However, the relationship between the coalition formation and climate damages/mitigation costs are difficult to quantify. In this paper, such connections are investigated numerically in the RICE model through the following methods: identifying the shifts of the core and the changes of the core sizes from the perturbations of regional climate damages or mitigation costs. The movements of the core capture the regional incentives in joining the global coalition of GHG mitigation as well as strategic interactions among the regions facing damage/cost shocks.

Dr. Takashi Yano Policy Researcher, Economy and Environment Group,
Institute for Global Environmental Strategies (IGES)

"Dynamic Games within an Integrated Assessment Model"

Since climate change is one of the borderless global issues, climate change policies in a single country have only a limited effect on greenhouse gas emission reduction. This shows that international cooperation to globally mitigate greenhouse gas emissions is quite important to solve the issue.

Nations which consist of the world economy are inter-linked in many aspects. Same as other economic policies, climate change policies in a country also affect the other countries economically and environmentally through their interdependence. In order to describe these interactions at a national level, game theory is often applied to integrated assessment models.

Basically, applications of game theory to climate change issues can be divided into the following two major topics: 1) future estimates of environmental benefits (e.g., reduction of greenhouse gas emissions) and economic costs (e.g., loss in output) under full cooperation to combat climate change compared to non-cooperation 2) the possibility of coalition formations and the stability of the coalitions.

In reality, countries decide whether or not to participate in a coalition to mitigate greenhouse gas emissions as a result of repeated games among players rather than a one-shot game. However, repeats or iterations of games are not seriously taken into consideration in most of the previous

relevant studies. Based on these observations, this study deals with the dynamics of climate change games and introduces them in an integrated assessment model.

Dr. Toyoaki Washida Professor, Graduate School of Global Environmental Studies, Sophia University

"Computable General Equilibrium Analyses of Global Climate Agreements: A Game Approach"

This article studies the global climate agreements to abate the GHGs with the interactions and heterogeneity among countries by using Evaluation Model for Environmental Damage and Adaption (EMEDA) for simulating global economic impacts under global warming. We define a sub-global CO2 abatement game: players are three regions (Japan, China and U.S.), their strategies are levels of CO2 reduction rate, and their payoffs are the sum of discounted utilities which are affected by global warming. Simulated results show that each country chooses lower CO2 reduction rate at Nash equilibria than at Nash bargaining solutions. Since simulated CO2 emissions under the CO2 reduction rate of these solutions are much more than those of the objectives which are officially announced, this result suggests that it is difficult to attain adequate CO2 abatement without suitable environmental policies.

Dr. Koichi Yamaura Postdoctoral Fellow, Graduate School of Global Environmental Studies, Sophia University

"Computable General Equilibrium Analyses of Global Economic Impacts and Adaptation for Climate Change: The Case of Tropical Cyclones"

Computable general equilibrium models have been widely used for simulating global warming and evaluating economic damages caused by climate change. However, to date little research has focused on the economic consequences incurred across several industry sectors at a global level. This article uses the Evaluation Model for Environmental Damage and Adaption (EMEDA) to simulate direct economic damages caused by tropical cyclones any losses that are offset through growth in other sectors to measure the global economic impacts arising from climate change. Simulated results by EMEDA indicate that: i) several regions experience economic growth, with other regions offsetting economic damages in the primary industry sector; ii) five regions show economic growth whilst only Japan and Southeast Asia neutralize damage in their secondary sectors, with the other regions revealing more severe losses; iii) several regions are able to offset their tertiary sector losses yet other regions show an increase in damages; and iv) the equivalent variation in all regions except East Asia decreases as temperature increases.