



SUMMARY OF THE INTERNATIONAL CONFERENCE ON POST-KYOTO CLIMATE CHANGE MITIGATION MODELING: 17 JUNE 2010

The International Conference on Post-Kyoto Climate Change Mitigation Modeling was held following the Second East Asia Climate Forum from 17-18 June 2010 in Seoul, Korea. It provided a forum for climate modeling experts from around the world to discuss greenhouse gas (GHG) reduction analysis. The conference addressed the advancement of GHG reduction modeling in the post-Kyoto GHG emissions reduction regime and facilitated cooperation to improve infrastructure for continued developing country participation in GHG reduction modeling. Sessions at the conference on Thursday, 17 June included: GHG Reduction Analysis Models in Annex I Countries; and GHG Reduction Analysis Models in Non-Annex I Countries.

This report covers the first day of the conference. However, proceedings continued on Friday with discussions of GHG Reduction Analysis Model Related Issues using bottom-up and top-down models.

A BRIEF HISTORY OF THE INTERNATIONAL CONFERENCE ON POST-KYOTO CLIMATE MITIGATION MODELING

Climate change is considered to be one of the most serious threats to sustainable development, with adverse impacts on the environment, human health, food security, economic activity, natural resources and physical infrastructure. The UN Intergovernmental Panel on Climate Change (IPCC) has demonstrated the critical need for accurate and timely GHG mitigation models, particularly those providing analysis of scenarios enabling educated policy choices at the national level. While GHG mitigation models are well advanced in many countries, capacity to develop and apply them is often limited in developing countries. Therefore, building capacity related to GHG mitigation modeling as well as addressing the challenges faced by developing countries in applying these models is of vital importance. The government of the Republic of Korea is focusing on its neighboring region, East Asia, which has experienced rapid economic growth, but increasingly depends on the use of fossil fuels for energy and depletes its natural resources.

EAST ASIA CLIMATE PARTNERSHIP: The East Asia Climate Partnership (EACP) was announced by President Lee Myung-bak, Republic of Korea, at the 34th Expanded Group of Eight (G-8) Summit on 9 July 2008 in Toyako, Japan. The EACP aims to mitigate climate change, without stifling economic growth, by identifying an East Asian low



Group photo of speakers and moderators at the International Conference on Post-Kyoto Climate Mitigation Modeling

carbon development path that promotes: win-win synergies between the climate and the economy; awareness raising and capacity building to combat climate change; and international cooperation toward solving climate change and achieving the Millennium Development Goals (MDGs). The Republic of Korea called for the establishment of a US \$200 million assistance package (2008-2012) for developing countries in East Asia and beyond through the EACP.

FIRST EAST ASIA CLIMATE FORUM: The first East Asia Climate Forum was held on 29 May 2009 in Seoul, Republic of Korea, and was attended by high-level officials, experts and researchers from international, regional and non-governmental organizations. Officials adopted the Seoul Initiative for Low Carbon Green Growth in East Asia, which calls for sustainable water and forest management, sustainable urban planning and increased renewable energy use. The Forum is closely linked to the Republic of Korea's Green Growth policy and the EACP.

COPENHAGEN CLIMATE CONFERENCE: The United Nations Climate Change Conference in Copenhagen, Denmark took place from 7-19 December 2009, including the fifteenth Conference of the Parties (COP15) to the United Nations

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The *Post-Kyoto Climate Change Mitigation Modeling Conference Bulletin* is a publication of the International Institute for Sustainable Development (IISD) <info@iisd.ca>, publishers of the *Earth Negotiations Bulletin* © <enb@iisd.org>. This issue was written and edited by William McPherson, Ph.D. and Anna Schulz. The Digital Editor is Francis Dejon. The Editor is Robynne Boyd <robynne@iisd.org>. The Director of IISD Reporting Services is Langston James "Kimo" Goree VI <kimo@iisd.org>. Funding for coverage of this meeting has been provided by the Greenhouse Gas Inventory & Research Center of Korea. IISD can be contacted at 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba R3B 0Y4, Canada; tel: +1-204-958-7700; fax: +1-204-958-7710. The opinions expressed in the *Bulletin* are those of the authors and do not necessarily reflect the views of IISD. Excerpts from the *Bulletin* may be used in other publications with appropriate academic citation. Electronic versions of the *Bulletin* are sent to e-mail distribution lists (in HTML and PDF formats) and can be found on the Linkages WWW-server at <http://www.iisd.ca/>. For information on the *Bulletin*, including requests to provide reporting services, contact the Director of IISD Reporting Services at <kimo@iisd.org>, +1-646-536-7556 or 300 East 56th St., 11A, New York, New York 10022, United States of America.

Framework Convention on Climate Change (UNFCCC) and the fifth Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP 5). On issues related to green growth, delegates at COP 15 made progress on the architecture for finance, adaptation, capacity building and technology transfer. The Copenhagen Accord was also produced containing funding commitments for fast-start financing through 2012. During the high level segment, President of the Republic of Korea, Lee Myung-bak, pledged creation of the Global Green Growth Institute (GGGI) to promote low-carbon green growth.

SECOND EAST ASIA CLIMATE FORUM: The Second East Asia Climate Forum, held on 16 June 2010, provided a forum for dialogue on reducing greenhouse gas emissions in East Asia and for turning the challenges of climate change into sustainable economic opportunities. It was an opportunity for high-level officials from Asian countries, experts from international organizations, think tanks and other stakeholders to discuss various issues related to low-carbon green growth. Also during the Forum, the Republic of Korea launched the GGGI to undertake research on shifting towards low-carbon economies.

REPORT OF THE CONFERENCE

OPENING CEREMONY

Vice Minister of Environment Mun Jeong-ho, Republic of Korea, welcomed participants to the conference and mentioned



Mun Jeong-ho, Vice Minister of Environment, Republic of Korea

recent landmark events in his country, including: the 2009 national decision for a 30% reduction of GHGs from business as usual levels by 2020; the 60th Anniversary of the Republic of Korea when President Lee Myung-bak announced a national policy of low-carbon

green growth; the Framework Act on Low Carbon Green Growth adopted in April 2010; establishment of the Greenhouse Gas Inventory & Research Center of Korea (GIR) on 15 June 2010; and the inauguration of the GGGI on 16 June 2010. He said that Korea is leading the world in green growth innovation and building a network of overseas experts in this field.

Kim Sang-hup, Secretary to the President for National Future and Vision, Republic of Korea, discussed the role of the green growth institutes and policies, which will enable Korea to create new jobs and businesses, and control GHG emissions. He noted that the IPCC has identified causes of climate change while countries are undertaking political action to reduce emissions through the UNFCCC. Kim emphasized that the GGGI and GIR “give us new tools for measuring and controlling GHG emissions.” He said that efforts by modeling experts will contribute knowledge about reduction potentials and that all countries need to use this information.



Kim Sang-hup, Secretary to the President for National Future and Vision, Republic of Korea

KEYNOTE SESSION

Paul Ekins, University College London, discussed modeling low carbon futures at the United Kingdom Energy Research



Paul Ekins, University College London

Center (UKERC). He listed elements of climate models: climate systems for forecasting scenarios based on climate sensitivities; energy systems for analyzing technological and supply/demand developments; economic systems for economic impacts of developments in the energy systems; and financial systems

for analysis of carbon markets and energy investments. He said that these elements are combined in the Integrated Assessment Modeling used by IPCC. He described some of the UKERC models in detail, including the:

- Energy Systems model, which analyzes the effects of price changes and provided input to IPCC assessment reports, the Stern Review on the Economics of Climate Change and other climate-related analyses;
- Energy 2050 model, designed to show pathways to a low-carbon economy through energy security, technological innovation, changing lifestyles and behavior, global energy markets, sensitivity to environmental constraints and policy drivers; and
- Market Allocation (MARKAL) model, which uses time series data, energy system organization and a flexible “what-if” framework to analyze resource supply, fuel processing, conversion technology, transmission and distribution networks, and energy use.

Ekins emphasized that modeling is: essential to understanding the implications of climate change and mitigation; technically



Woo Ki-Jong, Secretary-General, Presidential Committee on Green Growth, Republic of Korea

demanding; and a highly skilled activity. He said international collaboration is crucial, especially for increasing modeling expertise in developing countries for use in negotiations.

Woo Ki-Jong, Secretary-General of the Presidential Committee on Green Growth, Republic of Korea, highlighted Korea’s strategy on climate change, which is based on the vision of low-carbon green-growth. He said low-carbon green-growth aims to create economic growth through investment in green technology, improve people’s quality of life and contribute to the wellbeing of the global community. Emphasizing the importance of global partnerships, which Korea has been fostering through the launch of the EACP, its leadership in smart grid technology and establishment of the GGGI, he said that Korea will continue its climate leadership through information and knowledge sharing and active participation at UNFCCC COP 16 in Cancún, Mexico, in December.

FORUM SESSIONS ON GHG REDUCTION ANALYSIS

GHG REDUCTION ANALYSIS MODELS IN ANNEX I COUNTRIES: This session, chaired by Warwick McKibbin, Australia National University, included discussions of GHG reduction analysis models used primarily in developed countries.



L-R: Janusz Cofala, International Institute for Applied Systems Analysis; Keigo Akimoto, Research Institute of Innovative Technology for the Earth; and Mattia Romani, London School of Economics

Janusz Cofala, International Institute for Applied Systems Analysis (IIASA), presented IIASA's GHG – Air Pollution Interactions and Synergies (GAINS) Model, which integrates analysis of multiple pollutants and their effects, including health impacts, vegetation damage and radiative forcing. For a given set of assumptions, he said the model can calculate emissions, their costs and their impacts. Cofala emphasized that the GAINS model is a useful tool that can be deployed to address climate change and air pollution. Noting analysis undertaken using the GAINS model, he said findings indicate that: estimates of GHG mitigation potentials and mitigation costs are sensitive to assumptions on economic growth; GHG mitigation costs for Annex I countries (industrialized countries and economies in transition that are party to the UNFCCC) are low compared to gross domestic product (GDP) and have significant co-benefits for human health, vegetation and crops; and well selected air pollution control measures can, in the short-term, reduce the lifespan of GHGs and reduce radiative forcing.

Keigo Akimoto, Research Institute of Innovative Technology for the Earth, Japan, analyzed GHG mitigation costs and measures in Japan, in comparison to other Annex I countries, with analysis of: historical trends of industrial transfer and carbon leakage; industrial energy efficiency and intensity; and emission reductions targets proposed in the Copenhagen Accord. He noted that the pledged 2020 targets use different base years and the marginal GHG abatement costs vary by country, and said that Japan's marginal abatement costs are high relative to those of the US and EU. He suggested that balanced mitigation efforts for sustainable GHG reductions require: reducing mitigation technology costs through innovation; removing social barriers to deployment of energy efficient technologies; and increasing environmental consciousness.

Mattia Romani, London School of Economics, presented the "Roadmap 2050," which he called a "practical guide to a prosperous, low-carbon Europe," based on an 80% reduction of GHG emissions by 2050 through full decarbonization of power, road transport and building energy. He suggested emission reductions could be realized through higher energy efficiency and fuel shifts, such as electrifying transport and industry. He said that GDP growth rates would be similar in both the baseline and low-carbon pathways and that clean technology exports, such as wind turbines, would increase growth. Conversely, he said a fossil fuel price spike could ignite a global recession that would be cushioned by a low-carbon pathway. He concluded that the negative economic impact of decarbonization would be small, depending on both energy efficiency gains and innovative technology to achieve such savings.

Discussion: Ferenc Toth, International Atomic Energy Agency, noted progress in the GHG mitigation modeling field over the last twenty years and highlighted the enormous diversity of models today. He said models often provide useful insight into the dynamics of the interactions between the top-



L-R: Warwick McKibbin, Australia National University; Ferenc Toth, International Atomic Energy Agency; and Ahn Young-Hwan, GIR

down macroeconomic systems and bottom-up technologic methods. He emphasized that there is no single best model to address climate change as it depends on which aspects you want to explore and underscored that policy relevant insights come from comparing the results of many models and trying to understand the reasons why they differ.

Ahn Young-Hwan, GIR, said the presentations demonstrate the need for bold, up-front investment in decarbonization and that the costs of such action will be offset by, *inter alia*, co-benefits, such as air quality improvements and cost savings, and increased employment. He emphasized the need to demonstrate a viable transition path. Noting the importance of innovation and technology, Ahn called for increasing confidence in the viability of transition paths through further research on how technological innovation takes place and suggested creation of a financial tool to analyze the optimal distribution of costs between generations.

In conclusion, Chair McKibbin highlighted that: there are many ways to see the world; explicit models force you to write down assumptions; and the value of models extends far beyond the numbers that emerge from them. He emphasized that policies must function regardless of models and that policies must therefore be carefully designed to ensure their robustness.

GHG REDUCTION ANALYSIS MODELS IN NON-ANNEX I COUNTRIES: The afternoon session, which focused on the applications of GHG reduction analysis in non-Annex I countries (mostly developing countries that are particularly vulnerable to the impacts of climate change), was chaired by Shin Dong Cheon, Yonsei University.

Charles Marpaung, Asian Institute of Technology, Thailand, spoke on climate policy assessment models for GHG emission mitigation in Thailand. He described energy policies in Thailand, including: the Strategic Plan on Climate Change (2008-2012), which emphasizes capacity building, mitigation, research and international cooperation; and the Alternative Energy Development Plan (2008-2022), which focuses on energy security and promotion of commercial alternative energies. He outlined models used in Thailand, including the: Asia-Pacific Integrated Assessment (AIM) model, involving energy types, costs, availability and infrastructures; MARKAL model for a low carbon economy with long-term emission reduction targets and scenarios; and computable general equilibrium (CGE) model, used for analysis of emissions of twenty-seven sectors over the period from 1998 to 2030. He concluded that use of several models enables utility planning and co-benefit analysis of pollution reduction and energy supply security.

Ritu Mathur, Energy and Resources Institute, India, presented on securing low-carbon pathways in India. She said that modeling, particularly the application of MARKAL in India, allows for: analysis of energy security; a choice of technological options; identification of financial challenges; national energy



L-R: Shin Dong Cheon, Yonsei University; Charles Marpaung, Asian Institute of Technology, Thailand; Charlie Heaps, Stockholm Environmental Institute; and Lee Kihoon, Chungnam National University, Republic of Korea

mapping for detailed electricity sector analysis; and climate change assessment. She promoted international support for development goals and energy access in India through development of mitigation options, particularly through better modeling. She outlined key modeling results, including that: energy security drives development; moving from business as usual to emissions reductions requires tremendous effort and extensive financing; and GHG mitigation strategies involve accelerating alternative energy transitions and increasing energy efficiency. She concluded that the sustainable development pathway is the best way forward, technological options are critical and substantial investment flows are necessary for a low-carbon future.

Abul Quasem Al-Amin, University of Malaya, Malaysia, reviewed impacts of climate change on Malaysia and the governments' policies created in response. He noted that the results of nine atmosphere-ocean coupled general circulation models predict that Malaysia will experience between a 1.1°C and 3.6°C increase in temperature and increased rainfall variability by 2095. Al-Amin underscored Malaysia's policy responses, including implementing energy efficiency in the industrial sector, and using photovoltaics and demand-side management of energy. He also highlighted modeling efforts to support adaptive policy making, including using a CGE model and a social accounting matrix to estimate the impacts of a carbon tax.

Kejun Jiang, Energy Research Institute, China, discussed low GHG emission scenarios up to 2050 in China. He said the Integrated Policy Model for China (IPAC) is one way to assess economic impacts, technology needs and their relation to global emission reduction objectives. Emphasizing uses of IPAC, such as projecting primary energy demand in China and sectoral comparisons of a low carbon scenario with a business as usual baseline, Jiang noted that the analysis shows, in most cases, that the low carbon scenario is less costly than the business as usual baseline scenario that they modeled. He emphasized use of models to develop policy roadmaps to encourage adoption of new technologies. He also noted monitoring, reporting and verification initiatives by China, through of the setting and measuring of policy benchmarks, and said that the EU and US should also undertake monitoring, reporting and verification in this manner.

Yoo Seung-jick, GIR, presented the experiences of modeling GHG reduction goals in Korea. He reiterated the importance of the Seoul Initiative for Low Carbon Green Growth in East Asia and the GHG reduction target of 30% by 2020. He described the methodology by which Korea set its reduction target, which entailed: multiple models being reviewed by an interagency committee; projection of GHG emissions under business as usual levels and at the reduction targets of 21%, 27% and 30%; a decision on the reduction target of 30% was made after consultations with industry and the public; and institutes, such as GIR, were established to implement the goal. He

described use of various models in attaining the goal, including MARKAL, CGE, LEAP (Long-range Energy Alternative Planning) and AIM models. He proposed collaboration in modeling among experts in different countries to: improve the quality of models and share experiences; develop national models for participating countries; compare modeling outcomes; establish a platform for sharing information; and build modeling capacity. He said that GIR could put this collaboration into effect via workshops, joint research and capacity building.

Discussion: In the ensuing discussion, Charlie Heaps, Stockholm Environmental Institute, noted that modeling is a new area of research that is rapidly maturing. He said it is important to separate science and policy, but that communicating results of the models is also important. He noted that the costs of inaction are four-to-five times the costs of changing energy usage, and that is important to communicate this to the public by sharing data.

Lee Kihoon, Chungnam National University, Republic of Korea, suggested that modelers need to: develop common terms to find consensus; address risk and uncertainty in more detail; apply models to regional and global levels to address carbon leakage; and concentrate on communication and networking. He summarized the main points of the panelists presentations.

In response, Marpuang emphasized that the models used by developing countries frequently rely on data from developed countries, making reliable projections challenging. Al-Amin stressed the choices faced by Malaysia on whether to focus on mitigation or adaptation policies and he also noted that development of mitigation policies requires international assistance, including data sharing. Mathur noted the importance of discussing assumptions and creating standard procedures due to the use of many different reference scenarios.

GLOSSARY

AIM	Asia-Pacific Integrated Assessment Model
COP	Conference of the Parties
EACF	East Asian Climate Forum
EACP	East Asian Climate Partnership
GAINS	Greenhouse Gas and Air Pollution Interactions and Synergies
GGGI	Global Green Growth Institute
GHG	greenhouse gas
GIR	Greenhouse Gas Inventory & Research Center of Korea
IPAC	Integrated Policy Model for China
IPCC	Intergovernmental Panel on Climate Change
MARKAL	Market Allocation Model
PCGG	Presidential Commission on Green Growth
UNFCCC	United Nations Framework Convention on Climate Change