Co-Chairs' Summary
2nd International Workshop on Sectoral Emission Reduction Potential
Paris, France
22nd October, 2008

1. Overview

The second International Workshop on Sectoral Emission Reduction Potential was held on 22nd Oct in Paris, hosted and organized by the Government of Japan. It was attended by approximately 100 experts of policymakers, researchers, and industrial sectors representatives from 21 countries, the European Commission, and 5 international organizations.

2. Objectives

Building upon the outcomes of the 1st workshop, this 2nd workshop aims to discuss the following two topics.

(1) How bottom-up mitigation potential analysis can contribute to setting fair and equitable quantified emission reduction targets for developed countries with ensuring comparability?

(2) How cross-border analysis can contribute to Measurable, Reportable and Verifiable actions by developing countries?

The outcomes of the workshop will be reported to the UNFCCC process including COP14 in December.

3. Participants

<Co-chairs>

Dr. Syuzo Nishioka (National Institute on Environmental Studies, Japan) and
Mr. Björn Stigson (World Business Council on Sustainable Development)

<Researchers and International Organizations>

Ecofys, Indian Institute of Management, Centre for Environment Policy Studies (CEPS), IEA, Institute on Energy and Economy Japan (IEEJ), International Institute for Applied Systems Analysis(IIASA), McKinsey & Company, Netherlands Environmental Assessment Agency (PBL), National Institute for Environmental Studies (NIES, Japan), OECD, Pacific Northwest National Laboratory (PNNL, USA), Research Institute of Innovative Technology for the Earth (RITE, Japan), Tokyo Institute of Technology, Tsinghua University (China), UK Energy Research Centre, UNEP, UNFCCC and World Bank.

<Policy makers>

Australia, Austria, Canada, Czech Republic, European Commission, Denmark, Finland, France, Germany, Hungary, Italy, Japan, Mexico, Netherlands, Norway, New Zealand, Poland, Republic of Korea, Sweden, Switzerland, United Kingdom, and United States of America.

<Industries>

The Federation of Electric Power Companies Japan, International Aluminum Institute (IAI), World Steel Association (WSA), Nippon Steel Corporation, Japan Automobile Manufactures Association, World Business Council for Sustainable Development (WBCSD)

4. Key Findings

(1) Model analysis on sectoral emission mitigation potentials and their contribution to the discussion on future framework

In the Session 1, NIES, RITE, IEEJ, PBL, and McKinsey & Company reported from their recent research outcomes through bottom-up studies on sectoral GHG emissions reduction potentials. The executive summary of these studies is found in the Appendix 1.

In the Session2, discussion between the scientists and policymakers was held on "How bottom-up mitigation potential analysis can contribute to setting fair and equitable quantified emission reduction targets for developed countries with ensuring comparability". The key findings are identified as follows;

- Aggregated reduction potentials identified by SAs, considering improvement of carbon intensity/energy efficiency and technology diffusion rate, enable developed countries to set national reduction target in a realistic and transparent manner, and can be a tool for shaping images of reduction potentials and setting an ambitious and feasible national reduction target for each country.

- Climate change is global problems and therefore substantial global reduction is needed. In order to realize this, it is essential to have meaningful participation from developing countries which account for more than half of global emissions and have relatively cost-effective mitigation potentials. Model analysis based on marginal abatement costs will contribute to assess the worldwide mitigation potentials. In comparing the reduction potentials among countries, it is important to consider national circumstances of each sector.

- How to bridge the gap that might occur between reduction potentials based on a bottom-up approach on one hand and emissions reductions levels calculated by a top-down approach on the other needs to be considered further. In such a case, potentials from lifestyle changes should be taken into account, although sometimes difficult to realize. It is important to identify barriers for realizing emission reduction opportunities with net negative cost, such as energy conservation that reduces energy cost.

- Enhanced international collaboration among researchers and research institutions, such as furthering model analyses with clarifying various assumptions, can contribute to advance negotiation by identifying reduction potentials and providing policymakers with reliable scientific information.

(2) How cross-border analysis can contribute to Measurable, Reportable and Verifiable actions by developing countries?

In the Session 3, several industry sectors and IEA introduced their activities on the development of indicators, analyses of mitigation potentials and ongoing international mitigation actions, including those under the Asia-Pacific Partnership (APP). They emphasized the importance of global sectoral actions that takes circumstances of each sectors in both developed and developing countries into account. Also, researchers from China and India, and OECD made presentations on co-benefits from mitigation actions in developing countries.

Following the presentations, discussion was conducted on "How the cross-border analysis using sectoral approach can contribute to the global mitigation actions", and following points are confirmed,

- Cross-border analyses using sectoral approaches can be utilized to promote transfer of identified best practices (BPs) and best available technologies (BATs) to developing countries. Data collection is challenging, but it has been improved in many sectors.

- Difference in the levels of regulation may cause carbon leakage in the internationally competitive sectors, and thus internationally harmonized actions should be explored.

- As many of mitigation actions have co-benefits such as energy security and alleviation of air pollution, they can contribute to sustainable development.

- Public-private partnership can promote mitigation in an unbinding manner, with financial support from governments. Mechanism for sectoral crediting can support actions in private sectors.

Session3: Issue for Future Works

- Participants agreed that, through this workshop, the latest findings from bottom-up mitigation potential studies were collected and reviewed, and that the outcomes can contribute to advancing future negotiations.

- Participants shared a view that the dialogue among policymakers, scientists and industry representatives is important and therefore shall be continued in the future. Participants welcomed to continue discussions through UNFCCC process including COP14 at the end of this year, and at the international workshop on methodologies of sectoral approaches to be held in next March under the auspices of Japan.

- To contribute to post-2012 framework negotiations, the participants agreed to continue to work on comparison among bottom-up models by focusing on clarifying modeling assumptions in such field of mitigation technology, fuel price, GDP growth rate, and discount rate in order to enable policymakers to understand the diverse outcomes from various models.

Appendix: Overview of studies on mitigation potentials analysis based on a bottom-up approach

	Model and its characteristics	Estimation of mitigation potentials
IPCC	Review of various kinds of studies	➢ Under the 100 US$/$tCO_2$ marginal abatement cost, reduction potentials are estimated as 15.8~31.1 $GtCO_2$eq in 2030 comparing to the baseline. Reduction potentials under the no-regret case are estimated at around 6$GtCO_2$eq. (See WG3 Chapger11, Table11.3)
NIES	A bottom-up analysis with detailed technology options database developed in the AIM/Enduse[Global] model (including both energy-related CO_2 and non-CO_2 GHGs)	➢ Under the 100 US$/$tCO_2$ marginal abatement cost, comparing to the baseline emissions in 2020, reduction potentials are estimated as 15.6 $GtCO_2$eq in global scale and 6.1 Gt CO_2eq and 9.5 $GtCO_2$eq in Annex I and Non-Annex I countries respectively. ➢ The reduction potentials in transportation, electricity generation and residential & commercial sectors account for 27%, 26%

	Model and its characteristics	Estimation of mitigation potentials
		and 24% of total reduction amount in Annex I, respectively, whereas, in non Annex I, the potential of electricity generation (31%) and industrial sector (19%) account for large part of reduction potential and fugitive emission (11%) and agriculture sector (8%) follow these reduction.
RITE	DNE21+ (Linear Programming model for minimizing world energy system cost. Estimated partly by top-down approach)	➢ Reduction potential below 0$/tCO2 is large, with a global potential in 2020 as 11.1 GtCO2. 4.6GtCO2 lies in developed countries, 4.0GtCO2 in major developing countries, and 2.5GtCO2 in other developing countries. ➢ As for the reduction potential below 25$/tCO2, US account for 43% of developed countries, and China and India in sum accounts for 90% of developing countries. ➢ More reduction can be achieved with cooperative efforts by both developed and developing countries. ➢ Large-scale emission reductions of 3.8 GtCO2 could be achieved even if CO2/energy intensity targets for major sectors are assumed in major developing countries.
PBL	Combination of several models including FAIR2.0 (Involving non-energy oriented GHG. Estimated partly by top-down approach)	➢ Assess “comparability” of efforts of Annex I countries using many indicators (Example of the indicators: Equal reduction from baseline, equal marginal abatement cost, equal costs per GDP, Convergence per capita emissions and Triptych Sectoral Approach) ➢ Under quantitative results, evaluation trends of each country’s effort differ by indicators.
McKinsey &Company	Estimation cost curves by major mitigation technology (Refined work is going on now. Revised version will be published in the beginning of 2009.)	➢ Below 40 EUR/tCO2eq in 2030, emission reductions of 27GtCO2eq in global scale are estimated. It includes 7GtCO2eq mitigation potentials with net negative cost opportunities. ➢ It corresponds to from 2002 emission levels, around 32% reductions in the North America, 39% reductions in Western Europe, 4% increase in Eastern Europe, 7% reductions in other industrialized countries (Japan, Australia, Korea, Mexico, etc.), 11% increase in China and 31% reductions in the rest of the world. In total, 33% reductions compared to 2002 are estimated.
IEEJ	Defining indicators to evaluate the efficiency of major sectors	➢ Penetration ratios of Best Available Technologies in each country/region are known for iron & steel sector and cement

	Model and its characteristics	Estimation of mitigation potentials
		sector, and mitigation potential for both sectors can be calculated by assuming BAT introduction. Mitigation potential in China for both sectors accounts for nearly half of global potential. ➢ In other sectors, it is necessary to set indicators removing disturbance factors and to collect data enabling the indicator setting.

Executive summary of each study

- The IPCC AR4 provides an in-depth analysis of mitigation options, GHG reduction potentials and costs by reviewing various literature based on a bottom-up approach, and summarizes economic potentials for GHG mitigation for different cost categories by sector in seven chapters on energy supply, transport, buildings, industry, agriculture, forestry and waste management. Economic mitigation potentials in 2030 under the 100 US$/tCO2 marginal abatement cost, comparing to the baseline emissions, range from 15.8 up to 31.1 GtCO2eq in 2030 (Emission in 2000 were equal to 43GtCO2eq). Sometimes, the marginal abatement cost can show negative net cost (i.e. no-regret) because a given technology may yield enough energy cost savings to more than off-set the costs of adopting and using the earlier technology, and the IPCC AR4 shows global mitigation potentials around 6.1 GtCO2eq under the no regret case in 2030.
  (See WG3 Chapter11, Table11.3, more in detail)

- The study on mitigation potentials and costs by NIES can be summarized as below;
  1) Mitigation potential is defined as reduction amount which are estimated by comparing the effect of introduction of new mitigation technologies in 2020 as compared to the effect of standard technologies fixed at the same level as in the 2005. This study is based on realistic and currently existing technologies, and future innovative technologies expected in 2020 are not taken into account.
  2) Reduction potential in 2020 are estimated as 15.6 GtCO2eq, 6.1 GtCO2eq and 9.5 GtCO2eq in global, Annex I and Non-Annex I respectively under 100 US$/tCO2 marginal abatement cost in 2020.
  3) China, US, India, Western Europe and Russia are five major regions which have large reduction potentials and account for approximately 60% of the total reduction potential in the world. In addition top ten major regions account for approximately 75 %.
  4) The major sectors which have large reduction potentials vary depending on the socio-economic characteristics of each region. The reduction potentials in transportation, electricity generation and residential & commercial sectors account for 27%, 26% and 24% of total reduction amount in Annex I, respectively, whereas, in non Annex I, the potential of electricity generation (31%) and industrial sector (19%) account for large part of reduction potential and fugitive emission (11%) and agriculture sector (8%) follow these reduction.
  5) There is a much larger potential for cost-effective measures in developing countries, therefore international cooperation such as technology transfer and financial assistance to developing countries will play an important role.
  6) In order to promote drastic GHG reductions, it is important to think of not only efficiency improvement of current technologies but also the future innovations and changes of social structure such as modal shift and compact city towards achieving the Low Carbon Society,

- The study of RITE is summarized as below;
  1) Mitigation potentials and costs were evaluated by using a consistent assessment model which has high resolutions in regions and mitigation technologies.
  2) The global CO2 emission in 2020 would increase by 86% above the current level.
  3) Reduction potential below 0$/tCO2 is large, with a global potential in 2020 as 11.1 GtCO2. 4.6GtCO2 lies in developed countries, 4.0GtCO2 in major developing countries, and 2.5GtCO2 in other developing countries.
  4) Countries which made continuous energy saving efforts, such as Japan, have relatively small reduction potentials of negative costs.
  5) Emission reduction potential at the cost of 0–25 $/tCO2 in developed countries is about 4.1 GtCO2, and at 25–50 $/tCO2, 1.0 GtCO2.
  6) On the other hand, the emission reduction potential at the cost of 0–25 $/tCO2 in major developing countries is about 4.5 GtCO2. The cooperative measures between developed and developing countries are key to large emission reductions at low cost.
  7) Large-scale emission reductions of 3.8 GtCO2 could be achieved even if CO2/energy intensity targets for major sectors are assumed in major developing countries.
  8) Looking by sectors, major negative cost potential lies in transport and residential & commercial sectors in developed countries, as well as energy saving in power sectors of developing countries. Major potential at 0~25$/tCO2 cost level lies various measures (energy saving, fuel switch, nuclear, etc.) in the power sector of all regions.

- The study of PBL is summarized as below;
  1) Many indicators are potentially available to assess “comparability” mitigation effort in allocating the overall Annex I emission reduction target (like -20% below 1990 levels) across all Annex I countries.
  2) Two categories are considered: (i) Equal future burden: Some approaches define the problem as a burden that needs to be shared among the countries (for example: equal reduction in 2020 from baseline, equal marginal abatement cost, equal costs as%- GDP). (ii) Equal future endpoint: Other approaches look at efforts needed to reach the same state in the future, e.g. defined in terms of efficiencies (for example: convergence per capita emissions, sectoral targets and the Triptych sectoral approach (Convergence of indicators in the electricity and industry (in emission intensity), “domestic sectors” (incl. transportation) (in emission per capita), and other sectors (emissions per capita))).
  3) Each indicator has pros and cons.
  4) Under quantitative results, evaluation trends of each country’s effort differ by indicators. Compared to 1990 level the EU takes the lead, the USA has lower reductions, but this is also the result that we assume the US starts at its national target instead of the Kyoto target. The choice of the overall Annex I reduction level (20% or 30%) is of major importance than the choice for an approach.

- The study of IIEJ is summarized as below;
  1) Some indicators successfully show “opportunity for emission reduction” to be realized by sharing Best Practice. For example, penetration ratios of Best Available Technologies in each country/region are known for iron & steel sector and cement sector, and mitigation potential for both sectors can be calculated by assuming that BAT will be introduced immediately. Mitigation potential in China for both sectors account for nearly half of global potential.
  2) Other indicators need some improvement in statistics to better illustrate relation with Best practice. This can be improved by taking a few steps further in data collection efforts.
  3) Setting benchmarks/indicators will enable people to imagine the path to achieve the goals.
  4) Many research results show that energy conservation and energy efficiency have major mitigation potential in the short term. Indicators will allow policy makers to recognize in which sector the potentials lie, how much are the potentials, and which technologies will contribute in achieving the reduction.