Co-Chairs' Summary
International Workshop on Sectoral Emission Reduction Potential
Paris, France
8th May, 2008

1. Overview

International Workshop on Sectoral Emission Reduction Potential was held on 8th May in Paris, hosted and organized by the Government of Japan. It was attended by approximately 80 experts of policymakers, researchers, and industrial sectors representatives from 17 countries, the European Commission, and 3 international organizations.

2. Objectives

In order to establish an effective framework for a post-2012 period, it is essential for the international community to enhance understanding in the potentials of GHG emissions reduction potentials across various sectors and regions. Bottom-up approach can evaluate sectoral and regional mitigation potentials in a scientific and transparent manner. Such an approach can serve as one of the useful tools to contribute to setting an equitable quantified national target in the emissions reduction as emphasized by the Japanese Prime Minister Yasuo Fukuda in his special address in Davos January, 2008.

Various research institutions have been conducting studies on sectoral emissions reduction potentials. In addition, cooperative sectoral activities through several international partnerships, such as Asia-Pacific Partnership on Clean Development and Climate (APP) and those undertaken by various international industry associations (IISI, CSI, etc.) have been promoted in order to identify and realize GHG emissions reduction potentials.

As part of Japan's initiative under the G8 Summit process, the Government of Japan held this international workshop to share among researchers, industry sectors representatives, and policymakers the latest information on analysis of mitigation potentials in each sector and the common understanding in the so-called sectoral approaches.

The outcomes from the workshop will be reported to the G8 Environmental Ministers Meeting held in Kobe, Japan from 24th to 26th May, 2008.

3. Participants

<Co-chairs>

Dr. Ryutaro Yatsu (Ministry of the Environment, Japan) and
Dr. Kazuhiko Hombu (Ministry of Economy, Trade and Industry, Japan)

<Researchers and International Organizations>

Cambridge University, CentroClima (Brazil), Ecofys, Indian Institute of Management, International Conference on Electricity Distribution (CIRED), IEA, International Institute for Applied Systems Analysis(IIASA), Institute for Global Environmental Strategies (IGES), Lawrence Berkeley National Laboratory (LBNL, USA), McKinsey & Company, Netherlands Environmental Assessment Agency (MNP), National Institute for Environmental Studies (NIES, Japan), OECD, Pacific Northwest National Laboratory (PNNL, USA), Research Institute of Innovative Technology for the Earth (RITE, Japan), Tohoku University, Tokyo Institute of Technology, UK Energy Research Centre, and UNFCCC (Many of the participants are also IPCC authors.)

<Policy makers>

Australia, Canada, Czech Republic, European Commission, France, Germany, Italy, Japan, Latvia, Mexico, Norway, New Zealand, Slovenia, United Kingdom, and United States of America.

<Industries>
ArcelorMittal, International Aluminium Institute (IAI), International Iron and Steel Institute (IISI), Nippon Steel Corporation, Taiheiyo Cement, Tokyo Electric Power Corporation, World Business Council for Sustainable Development (WBCSD)

4. Key Findings

Session1: A Role of Bottom-up Studies on Sectoral GHG Emissions Reduction Potentials

In the Session 1, NIES, RITE, LBNL, MNP, 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.

Following presentations, discussion between the scientists and policymakers was held and the key findings are identified as follows;

- The negotiations on the emissions reduction targets at the COP3 in 1997 could have involved more scientific knowledge on mitigation potentials. The bottom-up studies could provide useful information on a range of technical mitigation estimates that could be used as a basis for discussions to achieve effective future framework and fair national emission reductions target.

- In general, potential for mitigation is relatively small in countries where energy-efficient technologies have been widely introduced, whereas there are greater potentials in countries where the technologies have not fully been introduced. This is the case especially in most of the developing countries. It is essential, therefore, to provide the developing countries with support in terms of technology, finance, and capacity building in order to realize their emissions reduction potentials.

- Although sector types with large mitigation potentials vary depending on the socio-economic circumstances in each country, according to recent analysis, relatively large reduction potentials at low mitigation costs are found in power generation, industry and transport sectors. It is important to consider mitigation costs in addition to technical mitigation potentials. There are several net negative cost opportunities and cost-effective mitigation opportunities. The realization of these opportunities should be accompanied by providing appropriate incentives. Co-benefits from mitigation actions can offset a large fraction of mitigation costs, and therefore, they should be taken into account in promoting mitigation measures.

- It is anticipated that there would be a gap between reduction potentials based on bottom-up approach and required emissions reductions levels calculated by top-down approach. It is necessary not only to account for wider range of mitigation potentials, but also to take into account additional mitigation strategies including policies, innovative technologies, and behavioral change (through e.g. national campaign).

- Enhanced international collaboration among researchers and research institutions can be effective in furthering meta-analyses of modeling assumptions. Such analyses can identify mitigation potentials and provide policymakers with reliable scientific information. A unique opportunity for dialogue between policymakers and scientists has been proved effective and, therefore, shall be continued in the future.

Session2: A Role of Cooperative Sectoral Activities for Identifying and Realizing Emission Reduction Potential

In the Session 2, representatives from several governments provided their perspectives on the sectoral approach, and several industry sectors introduced their activities on the analysis of mitigation potentials and ongoing international mitigation actions, including those under the Asia-Pacific Partnership (APP).

As future tasks for realizing the mitigation potentials that were calculated through research, the following points were suggested:

- In order to implement specific mitigation actions, it is necessary to include political and social factors, which are not reflected in the modeling analysis.

- Targets and commitments of each country, which will be determined through international negotiations, should take into account differences in national circumstances, and sector-specific characteristics, under the principle of "common but differentiated responsibility and respective capabilities." Sectoral approach does not substitute national reduction target and does not intend to apply a uniform standard to the developed and the developing countries.

In general, following points are confirmed,

- Discussing how to promote mitigation actions and cooperation and tranforming these ideas into actions through public-private partnership in each sector will be effective for achieving global GHG emissions reduction.

- Appropriate introduction of the sectoral approach will ensure measurable, reportable, verifiable mitigation actions.

- It is important to consider the differences in national circumstances of each country and characteristics of each sector.

- For seamless implementation of sectoral approach, further efforts in enhancement of data collection are crucial.

Session3: Issue for Future Works

- The latest findings from bottom-up mitigation potential studies were collected and reviewed as one of the scientific bases for future negotiations.

- It is crucial to promote wider coverage of data collection, especially in developing countries, as well as identification of mitigation measures, timing of technology adoption its diffusion rate, and other relevant information and data in order to enhance robustness of modeling results on mitigation potentials.

- To contribute to post-2012 framework negotiations, the participants shared a view that it would be necessary to continue to work on comparison among bottom-up models by focusing on identifying modeling assumptions in such field of fuel price, GDP growth rate, and discount rate in order to enable policymakers to understand the diverse outcomes from various models.

- It is urgent to investigate how cooperative sectoral activities can be integrated into a post-2012 framework.

Appendix1: Several studies on mitigation potential analysis

1. 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$/tCO2 marginal abatement cost, reduction potentials are estimated as 15.8~31.1 GtCO2eq in 2030 comparing to the baseline. Reduction potentials under the no-regret case are estimated at around 6GtCO2eq. (See WG3 Chapger11, Table11.3)
NIES	A bottom-up analysis with detailed technology options database developed in the AIM/Enduse[Global] model (including both energy-related CO2 and non-CO2 GHGs)	➢ Under the 100 US$/tCO2 marginal abatement cost, comparing to the baseline emissions in 2020, reduction potentials are estimated as 8.8~11.3 GtCO2eq in global scale and 2.5~3.6 GtCO2eq and 6.4~7.7 GtCO2eq in Annex I and Non-Annex I countries respectively.
RITE	DNE21+ (Linear Programming model for minimizing world energy system cost. Estimated partly by top-down approach)	➢ Below around 50 US$/tCO2, around 7 GtCO2 of potential emission reductions from baseline emissions in Annex I in 2020 (corresponds to around 20% reductions from 2005 emission levels). ➢ This potential reduction from the 2005 emission level in Japan, EU27 and US is around 15%, 20% and over 30%, respectively. ➢ 50% emission reduction in 2050 from 2005 ➢ Marginal abatement cost in 2050 is 330US$/tCO2.
MNP	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 in the allocation of an Annex I 2020 emissions reduction target (like -20% below 1990 levels) across all Annex I countries, using many indicators (Example of the indicators: Equal reduction from baseline, equal marginal abatement cost, equal costs as%- GDP, Convergence per capita emissions and Triptych Sectoral Approach) ➢ Under quantitative results, evaluation trends of each country’s effort differ by indicators.

McKinsey &Company	Modeling of mitigation potential and cost (cost curves) by sector and mitigation technology (Refined global study (regions, industries, scenarios) will be available in summer 2008 and published in fall 2008.)	➢ 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.

2. 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 of NIES is summarized as below;
  1) Considering the difference of annual discount rate, reduction potentials of 8.8~11.3 GtCO2eq in global scale and 2.5~3.6 GtCO2eq and 6.4~7.7 GtCO2eq in Annex I and Non-Annex I countries respectively, under the 100 US$/tCO2 marginal abatement cost in 2020 comparing to the baseline emissions in 2020, are estimated. (Note: Reduction potentials from target sectors assessed in the study, but not from all anthropogenic GHGs)
  2) China, US, India, Western Europe and Russia are five major regions where there are large reduction potentials, and they account for approximately 60% of the total reduction potential in the world, and top ten major regions account for approximately 80 %.
  3) The major sectors which have large reduction potentials vary depending on the socio-economic characteristics of each region. In general, large reduction potentials exist in power generation and industry due to the use of low energy-efficient technologies especially in Non-Annex I countries, and these sectors account for approximately 50% of total global reduction potential.
  4) 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.

5) 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) According to the analyses, if mitigation measures below around 50 US$/tCO2 in developed countries are adopted, around 7GtCO2 of potential emission reductions from baseline emissions are expected in Annex I in 2020 (corresponds to around 20% reductions from 2005 emission levels). The potential reduction from the 2005 emission level in Japan, EU27 and US is around 15%, 20% and over 30%, respectively.
  3) Emission reductions will be required also in developing countries even in 2020-30 to achieve low carbon future. Around 10-25% reductions from baseline emissions are desired in 2030.
  4) Power sectors have large potentials to reduce CO2 emissions for long-term.
  5) Energy efficiency and/or CO2 intensity by sector and by country will be also good indicators to consider the targets. (In equalization of marginal abatement cost, energy intensity and CO2 intensity tend to convergent.)

- The study of LBNL is summarized as below;
  1) Detailed technology representation provides insight and understanding of technology and fuel mix choices
  2) Accounting for principal agent problems and other market failures is important and will provide better insights for types of climate policies that will be effective. In realizing net negative cost opportunities, identifications of barriers and creation of incentives are essential.
  3) Inclusion of non-energy benefits (co-benefits) in accounting enhances cost effectiveness and reduces costs increases emissions reduction potential.
  4) Bottom-up cost curves vary in accordance with assumed technology efficiency.

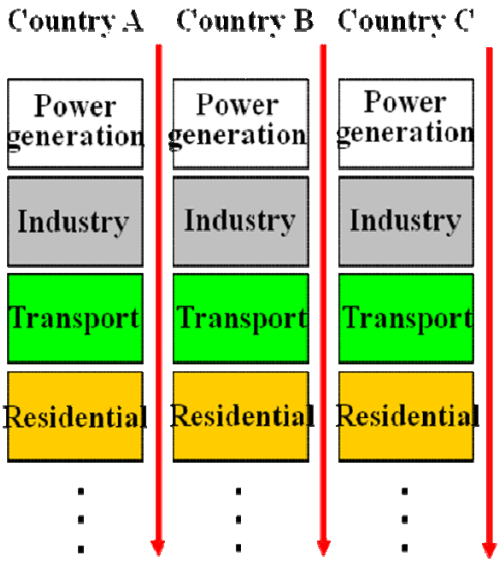
- The study of MNP is summarized as below;
  1) Many indicators potentially available to assess “comparability” mitigation effort in allocating the overall Annex I emission reduction target (like -25% below 1990 levels) across all Annex I countries.
  2) Two categories are considered: (i) Equal future 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. Differences between approaches are little for large countries (dominate the average) and higher for small countries. The choice of the overall Annex I reduction level (20% or 30%) is of major importance.

- The study of McKinsey & Company is summarized as below; global scale, 6 world regions, 6 sectors
  1) 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.
  2) Emission reductions below 40 EUR/tCO2eq in 2030 correspond to from 2005 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, NZ, Korea, Singapore, Taiwan, UAE, Saudi Arabia, Qatar, Oman, Kuwait, Israel, Bahrain, and Mexico), 11% increase in China and 31% reductions in the rest of the world. In total, 33% reductions compared to 2002 are estimated.
  3) More detailed national cost curves have been published for US, UK, Germany, Australia and Sweden. For China, Italy, Japan, South Korea, Czech Republic cost curves are in progress. Cost curves for the remaining G8+5 countries are in preparation. The Chemicals sector cost curve was prepared for the WEF, the Land-Use/Forestry deep dive is in progress. As the reference fact base for abatement thinking, the updated global cost curve with increased regional and industry resolution, cash-flow analysis and implementation scenarios will be published in fall 2008.
  4) Assessment of realistic abatement volumes indicates that there are net negative cost opportunities mainly in transportation and buildings. Emission reductions from power and industry sectors and forestry, agriculture and waste sectors can be achieved at relatively low cost. In higher cost mitigation measures, a mechanism to drive selected key technologies down the learning curve is needed to quickly make these globally viable.
  5) Marginal abatement cost analysis can be used for ① sectoral “emission intensity” thinking linked to emission benchmarking, ② simulating national impact of different global emission target setting approaches, clarifying the relationship with a global need to reach “allowable emissions”, and assessing financial requirements per sector and country to achieve reduction targets, and ③ supporting national governments with essential data for national reduction potential and with guidance for deriving national sector targets.

Appendix2: Application of Sectoral Approach

1) Bottom-up estimation of national emissions reduction potentials

A sectoral approach that can assemble sector-based mitigation potentials in each country to contribute to the estimation of a quantified national emission reduction target. The bottom-up analysis of mitigation potentials together with given marginal costs can inform the debate for setting a fair emission reduction target in each country.



2) Cooperative sectoral activities across the world

The sectoral approach can be also applied to identify the best practices of technologies for each sector and policy measures and encourages transfer of the practices through public-private cooperation according to energy efficiency and technology diffusion rate in each country.