

Open Symposium
Low Carbon Society Scenario Towards 2050
March 24, 2005

The Open Symposium on Low Carbon Society Scenario Towards 2050 was held at the Shinagawa Prince Hotel, Tokyo, Japan on March 24th 2005. The workshop was co organized by NIES, Tokyo Institute of technology and IGES. The schedule of the workshop and the list of participants with their affiliations are appended.

Mr Toshiro Kojima, Director General of the Global Environment Bureau, Ministry of the Environment inaugurated the symposium and presented the opening remarks. He stressed on the importance of moving towards a low carbon society especially in the backdrop of the Kyoto protocol. He wished the symposium success and hoped that through international collaboration between researchers, Japan would be able to successfully formulate a road map for achieving the objectives of a low carbon society by 2050.

Session 1: Overview of Low Carbon Society Scenario Development

Dr Shuzo Nishioka, Executive Director, NIES, set the ball rolling by presenting on the purpose and objectives of the symposium. He explained the relationship between anthropogenic emissions, natural sequestration and dangerous level. The important question was to determine the shut down point or the level beyond which emissions would cause adverse impacts. He also pointed out that the per capita emissions of Japan was higher than European countries like Germany, UK and France and would require added efforts for Japan to meet the Kyoto challenge and to move towards a low carbon society. He stressed on the importance of global participation and cooperation in moving towards the desired goal and presented the broad structure for studying environmental options for achieving a low carbon society in Japan.

Dr Artur Runge-Metzger, Environment DG, European Commission in his presentation titled “ Winning the Battle Against Climate Change” presented on the climate challenge and its economic impacts, essential elements for a post 2012 climate strategy. He pointed out that the EU had recognized 2° C as the target, beyond which there was reason for concern. He stressed on the fact that the more action is postponed, the greater the risk of irreversible change and recommended a “keeping the door open” strategy. He recommended that the future course of action should build on the Kyoto protocol, move towards a global carbon market, and have clear rules for monitoring and reporting. There is also the need to include sectors like aviation, maritime transportation and deforestation with the global climate frameworks. He pointed out that there is no single bullet and only a portfolio of measures can help achieved the desired goals. Identifying vulnerabilities and implement measures to increase resilience are as important as mitigating efforts.

Session 2: Long Term GHG reduction Target

Dr Kanie of TiTech, Japan presented the overview of the second session. He discussed on issues concerning long-term reduction targets. The discussion focused on target setting and how participation of the entire society is important in deciding these targets. He felt it is important to discuss stabilization policies, global differentiation schemes, and ways to set socially acceptable target setting approaches. Currently the Aim Impact (Policy) model is used for the target setting exercise. According to the SRES B2 scenario for 500 ppmv a reduction of about 50% would be required over 1990 levels while that for 550 ppmv would be about 34%. The modeling exercise is in its initial stages and would benefit from discussions on similar exercises in the European Union. He also discussed on how the modeling exercise would not only

Mr Martin Weiss of German Federal Environment Agency (Germany) presented on Policy Perspective Towards Long-Term Emission Reduction Targets in International Climate Policy. To begin with he elaborated on the various perspectives, which include Bottom up, Top down and a combination of both. He pointed out the importance of setting long term goals. It is essential for guiding investments and technical change. Also it helps recognize urgent actions required to hedge against future damages. Equally important is the concept of ethics, which gives importance to life, health, personal identity, and respect for human rights and other people's property. Through his analysis (Triptych and Multi stage) he showed that for developed countries long-term target 80-90% reduction seems appropriate. However to achieve the long-term goal at least 30% reduction needs to be achieved by 2020. In the low stabilization scenarios US also would need to participate to achieve the desired goals. For Japan, 30-35% reduction in 2020 and 80% in 2050 is justified.

Dr Marleen Kerkhof, from the Institute of Environmental Studies at the University of Amsterdam presented on Stakeholder dialogue on long-term climate policy. She clarified the concept of stakeholder dialogue, which includes active participation of scientists, policymakers and actors for policy support rather than decision-making. The process is important, as climate change is a complex problem with scientific uncertainties. She presented to examples of dialogues, COOL (Climate Options for the Long Term) and HOT (Helping Operationalize Article Two). The COOL project aimed to achieve strategic insights for climate policy, through dialogue at three different levels (preparation, actual dialogue and evaluation of dialogue) and four sectors of Dutch economy. It was 'What if' exercise which aimed to ascertain if 80% reduction by 2050 was working hypothesis. The outcomes of the COOL dialogue included 80% reduction imaginable, but in some sectors easier than in others, moderate optimism about state of technology, technologies that are needed are also controversial, doubts about the social acceptance of the required policies, strong government needed, business companies recognize need for action, need for consistent government policy, dialogue appropriate tool to mobilize stakeholder knowledge. The HOT project was a dialogue to further articulate Article 2 of the UNFCCC. The important indicators recognized by the stakeholders as a result of the dialogue were Water, Food, Biodiversity and Health. In conclusion she also pointed out that for success sense of urgency was a criterion and that

stakeholder approach is less common in Japanese climate policy and needs to be given more attention in future climate change exercises.

The second session was followed by discussion. Mr Joop Lohuis, RIVM, Netherlands and Dr Ancha Srinivasan of IGES, Japan made presentations. Mr Lohuis's comments focused on the role of long term targets in policy process, stakeholder participation and experiences with instruments like taxes and emission trading systems. He felt the overview on "Why Long term goals" was highlighted well, the importance of identifying different perspectives (climate system, uncertainties, sustainability) was emphasized appropriately and that there is also an improved view on emission reduction pathways. He also stressed that participation of US should be a precondition under any climate change framework. Burden sharing approach is important: equity in the equation, but Triptych approach is top down, and there is no room for relative targets in the process. However Bottom up approaches open up space for agreements on technology development but are not a complete substitute for emission targets. On issue of stakeholder dialogue he stressed on the importance of mobilizing positive attitude towards climate action and more interaction between Ministries of Environment and Economic Affairs. He suggested that further deliberations are needed on Bottom up approaches for Long term agreements, cultural setting for participatory dialogue in Japan, importance of process, and making scenario's in which values are part of the story lines. Also inputs from sectoral representatives need to be taken seriously and their participation should be at an early stage in the process.

Dr Ancha Srinivasan presented on the Developing Countries' Perspectives on Setting Long Term Emission Reduction Targets. He stressed on the fact that technology development and transfer has not led to lower global GHG emissions so far. He also emphasized that developing countries (DCs) cannot solve the problem alone and cannot cope with consequences. Even for the higher stabilization levels beyond 550 ppm, DCs would not be able to use fossil fuels for their development in the manner that the industrialised countries (ICs) used so far. Discussions on setting targets for DCs may sound premature due to several reasons but it is important to break the stalemate through proactive cooperation between ICs and DCs. Commenting on Martin's presentation he emphasized that both Multistage and Triptych approaches are conceptually good and ambitious, seeking emission reductions in ICs of 30% by 2020 and 80-90% by 2050. Most DCs have to start reduction relative to their BAU path by 2020. However the presentation also needed to look at the issues concerning resources required, ways to address DC concerns adequately, ways to entice US to commit more, and that the proposal is very complex and requires decision making at multiple levels. Marleen's was successful in highlighting the key elements in a stakeholder process however since climate change (CC) is not a priority topic in DCs developing and maintaining interest in CC in these countries remains a challenge. He also pointed out that the main concern in developing countries was that why should DCs shoulder responsibility now for a problem largely created by ICs and what have ICs delivered in terms of their climate commitments so far? Also would ICs be ready to forego their "luxury emissions" to allow the growth of "survival emissions" by DCs? These questions point to a lack of trust between the ICs and DCs and the way forward should be through building confidence in each others roles

and policy process. In conclusion he felt it is premature and perhaps counterproductive at this stage to initiate international negotiations on setting long term targets. Major DCs should begin to visualize sector-based emission reduction targets by 2050 in their own interest. Also development of a global framework for resource transfers that provide incentives for the transition away from carbon-intensive economies is crucial.

Mr Martin Weiss in response to the observations stated that the current estimates of costs in his analysis are based on current technologies and an important next step would be to include costs and its relationship with technology development in the analysis. There is also a lot of debate on burden sharing. When cost estimates are low there is more flexibility to compromise on burden sharing.

Dr Marleen pointed out that the benefits of Dialogue approach are hard to measure though the process is important. She agreed with Dr Anchal's observation that CC is not an important concern in developing countries and hence would require extra efforts for initiating successful dialogues among stakeholders. She was of the view that there is an opposition for dialogue in Japan. CC may not hurt businesses after all. It may in fact open up new opportunities. Answering an audience question on incentive to bring stakeholders together, she pointed out that it is important that the stakeholders also need to be convinced that there is something for them too to learn and gain from the whole process. To an audience question on how values are included in the modeling process Mr Lohuis from RIVM pointed out that these are done through choices which may not be affected by costs like appreciation of risks, energy security. The long-term analysis does combine choices, values and modeling.

Session 3: Development of Low Carbon Societies Scenarios toward 2050 and their Policy Impacts

Dr. Junichi Fujino presented the background of Japan 2050 Scenarios study, and highlighted discussion points for EU experts. These points provided useful inputs for persons involved in Japan Low Carbon Society Toward 2050 research project. Background for Japan study comprised the need to (a) drastically reduce GHG emissions and (b) provide roadmap for long-term global warming policy in Japan. In this context, a team of Japanese researchers visited several EU countries to learn from their experience of undertaking similar studies. He outlined five discussion points:

- (i) Why EU countries need to restructure the economy to a low carbon one?
- (ii) How to decide country-level GHG reduction targets?
- (iii) How to develop the scenario and roadmap to achieve the society with such a target? How to consider economic impacts. Technology innovations, social infrastructure change, lifestyle change, etc.?
- (iv) How seriously is the concept of low carbon economy taken in the current policy making process and realized as concrete policy measures?
- (v) What are the common/different stances among EU countries, and between EU countries and Japan in achieving low carbon economy? What is EU countries' message of low carbon economy to future global governance?

Dr Stephan Green, Senior Economist, UK Department of Trade and Industry, presented results of modeling application to analyse technology and policy options for UK 2050 carbon scenarios. He explained the policy background in UK where an inter-departmental analysts groups was set up in response to a report by Royal Commission on Environmental Pollution which recommended 60% reduction in CO₂ emission by 2050. Review of long-term energy policy was announced by the UK government and a White Paper was published in February 2003 which committed UK on a path to reduce carbon emissions by 60% by 2050. Dr Green then analytical work including development and application of MARKAL model to set up base case projections of energy use and CO₂ emissions, and assess costs and potential of mitigation options including renewables. He presented results of three scenarios – BaU, World Markets, and Global Sustainability – together with sensitivity analysis related to limitations of energy efficiency, low carbon innovation and gas use, varying estimates of new nuclear plants, and non-consideration of new nuclear and carbon capture and storage. He summarized the outcomes as follows:

- (i) While energy efficiency is the central option, it is not sufficient to deliver the targets; a range of options are required to deliver 60% carbon reduction; These options include renewable energy, nuclear power, carbon sequestration, and hydrogen (in transport)
- (ii) Energy efficiency improvement and innovation in low carbon technologies are important to reduce costs
- (iii) Transport sector has a relatively high cost of reduction, and new transport technologies are selected only after 2030, and
- (iv) Fuel/generation mix is sensitive to the assumed technology costs
- (v) Cost of abatement is large in absolute terms but only a small proportion of growing GDP
- (vi) Major changes are needed in fuel conversion and supply systems

Dr. Manfred Fishedick, Director, Future Energy and Mobility Structures, Wuppertal Institute, presented the German scenarios. In several climate studies carried out during 2002-2005 by various organizations, 50-80% reduction goals are considered. There is a consensus on nuclear phase-out. Strategic options considered are: rational use of energy, substitution of coal to gas, adoption of renewable energy, and awareness of energy consumption. In 2002, government declared a reduction target of 40% in 2020. Combined with this, the low carbon study considered 80% reduction in 2050. Bottom-up energy systems modeling approach focusing on technology was used. Dynamic simulation methodology, considering changes in population, agriculture productivity, consumer behaviour, was adopted. Specific renewable energy options like hydro, onshore wind, offshore wind, PV, biomass, geothermal, etc. was analysed. Summary of findings are as follows:

- (i) Climate protection is feasible from technology's viewpoint
- (ii) A combination of two strategies – (a) reduction in energy consumption by one-third in 50 years and (b) 35% growth of renewable energy – can lead to 75% reduction in CO₂ in 2050 as compared to 2000. Reduction in energy consumption will require efficiency improvements in electricity, heat and transport sectors. Growth of renewable energy like solar PV, offshore wind

and biomass/biogas, will require major energy system changes like phase-out of nuclear and drastic reduction of coal.

- (iii) Significant structural changes and reliable long-term energy and climate policy are required
- (iv) Beginning earlier is critical, because structural changes in energy sector have high time constants

Dr. Michel Colombier, IDDRI, Paris, presented 2050 energy scenarios for France. Poles model, a year-by-year recursive simulation model, was used. It considers low energy/emission technologies in transport, building and other demand sectors; new and renewable energy technologies along with their diffusion curves; large scale power generation technologies with endogenous fuel costs; endogenous technological progress; technologies for hydrogen economy; and carbon capture and sequestration options. Factor 4 scenario was analysed using Poles model. The findings offered lessons to policy makers to avoid the following routes: (a) Power generation based on fossil fuels without cogeneration, (b) Transportation sector based on oil, (c) Buildings heated with fossil fuels at low efficiency, (d) Industrial production with massive use of fossil fuels, and (e) Waiting for late replacements of stocks in fear of stranded assets. Dr. Colombier emphasized that policy makers must commit to common obligations like:

- (i) High efficiency end uses
- (ii) Advanced technologies portfolio
- (iii) Investing in building stock retrofit
- (iv) Switch of industrial processes to electricity
- (v) Raw materials recycling
- (vi) Urban planning and modal switch in transportation towards fast trains and IT

Dr. Remko Ybema, ECN Policy Studies, The Netherlands, presented the low carbon scenarios for the Netherlands and strategies to drastically reduce CO₂ emissions. He explained that the climate policy adopted so far is expected to meet the Kyoto target for the Netherlands. A mix of criteria like cost, ease of implementation, social acceptance, security of supply, effect on other emissions and distribution across sectors, were used to select options. As a result both energy efficiency and renewable energy have increased. However system optimization is not sufficient to yield drastic CO₂ reduction. It requires system level changes, new roles for government, companies and citizens, and need to look beyond the current energy system. A transition process including system innovation and societal change is required. Mechanisms involving both demand pull and technology push will be important. Dr. Ybema described four scenarios and their results for the Netherlands – Strong Europe, Global Economy, Regional Communities, and Transatlantic Markets. A simulation model with energy use, energy markets, and technological detail was used for analysis. He summarized the model results as follows: (a) Energy use will continue to increase due to declining rate of efficiency improvement, (b) CO₂ emissions are expected to increase, (c) There will be no significant reduction of CO₂ emissions under the normal course, and (d) Additional policies and measures, energy transition and changes in economic structure are needed for drastic reduction. He concluded with following lessons for policy makers:

- (i) Long term CO₂ reduction will not be met with current policies

- (ii) Drastic reduction requires balanced combination of ‘classical’ policy, energy transitions and changes in economic structure
- (iii) The challenge is to design technical options and policy instruments
- (iv) Long-term strategy must include robust elements like energy efficiency, renewables, and CO2 capture and storage; Likely options include biofuels, hydrogen, nuclear, electrification and lifestyle changes; The future is too uncertain to make implementation roadmap for long term drastic reduction.
- (v) A sense of urgency is required.

Dr. Fujino presented an overview of the Japan Low Carbon Society Scenarios Toward 2050 project. He explained the framework of the study, various sectors being covered, researchers and institutes involved. He also illustrated some examples of preliminary results of reduction potential from Households, ICT, Transport and Energy supply sectors. He outlined the expected outcomes from the project as follows: (i) Reduction targets for Japan, (ii) Identification of countermeasures, (iii) Roadmap toward 2050 considering economic impact and technological feasibility, (iv) Implication for other environmental problems, and (v) Implication for policy measures with long-term carbon society vision.

Panel Discussion

Coordinator: Dr. Fujino

Panelists: Dr. Metzger, Mr. Green, Dr. Fishedick, Mr. Colombier, Mr. Ybema, and Dr. Kainuma

Dr. Fujino gave the questions to each panelist followed by each panelist’s response.

Question to Dr. Metzger: Why EU leads global warming policy involving drastic GHG reductions based on 2 degree C temperature stabilization?

Response: EU’s leadership role in the region is critical because of constant effort required at negotiation to push the countries beyond 2012 and to push their business sector as well. EU wants to lead by example. It displays consideration for the developing countries by committing to poverty eradication, respecting diversity among developing countries. Interesting coalitions are also emerging between developing and industrialized countries. EU is also playing positive role by facilitating stakeholder dialogues involving NGOs and educating citizens.

Question to Mr. Green: How is UK policy on low carbon co-ordinated between the different Government departments concerned? 2) Why does UK want to pick up global warming issue as one of the main topics in G8?

Response: New goals of UK energy policy are: (a) Putting ourselves on a path to 60% cuts in CO2 by 2050, (b) Maintaining reliability of energy supplies, (c) Promoting competitive markets in the UK and beyond, and (d) Ensuring that every home is adequately and affordably heated. These goals are to be achieved together. Several government departments/agencies are involved in this exercise. Towards this end we have created ‘Sustainable Energy Policy Network,’ ‘Programme Board,’ and ‘Sustainable Energy Policy Advisory Board.’

Question to Mr. Green: Why does UK want to pick up global warming issue as one of the main topics in G8?

Response: The G8 accounts for over 65% of global GDP and 47% of global CO₂ emissions. The G8 are the engine behind technological development and account for the lion's share of scientific effort globally, reflected in their responsibility for 70% of the world's scientific papers and 75% of science citations. G8 outcomes that reinforced the urgency of the problem, the economic cost of inaction, and demonstrated the will to take more ambitious action to cut emissions and promote innovation would be a significant achievement. This commitment was also reflected in the PM's speech in September 2003.

Question to Dr. Fishedick: Germany is already introducing a large amount of wind power. How do you evaluate stability, security, economy of large amount of renewable energy introduction? In Japan, electricity companies announce that it is difficult to introduce more than 10% wind power into grid from the point of grid stability.

Response: Wind energy is the most important but not the only renewable energy option for Germany. Hydropower and biomass/biogas also contribute. Although wind energy is not deterministic, it is a predictable source. Intelligent integration systems are necessary to address the problem of grid stability. These include forecasting systems, DSM measures, additional consumers, electricity storage systems and hybrid systems. We have estimated that up to 20% of electricity can be produced by renewables including high share of wind. Germany plans to expand its wind energy from 16000 MW in 2004 to 35000 MW in 2015 (including offshore wind). For this a construction of 845 km new high voltage transportation lines until 2015 is necessary, and will require about 1.14 Billion Euro. This, in turn, requires good planning since legal procedures could be long. However, no common position could be found on the issue of security level of electricity system, and new research programme has been launched for this.

Question to Mr. Colombier: France has already introduced a large amount of nuclear energy (more than 70% electricity comes from nuclear energy). It seems that the capacity to reduce GHG emissions further will be less because of low existing emissions due to high nuclear energy share. In such a case, how do you propose to achieve a high reduction target (by factor of 4)?

Response: Among the EU countries, the CO₂ content of power generation is one of the lowest in France. France has greater share of CO₂ emissions from transport, agriculture and industry. However, from 2000 to 2030, France's per capita CO₂ emissions are expected to increase at a rate similar to that of Europe's average. Most of this increase will come from Transport sector. This similarity of expected trend in France and Rest of Europe is because most of the nuclear capacity in France is likely to reduce drastically by 2020. Therefore, future mitigation will depend on whether (i) major substitutions will be triggered in the electricity generation sector, and (ii) adjustments on demand side will be triggered by rising electricity prices caused by carbon constraints.

Question to Mr. Ybema: Carbon capture storage (CCS) is considered as one of the key CO₂ reduction technologies in Netherlands, same as in other European countries. How to

evaluate the cost and safety of CCS? What kind of policy discussion is going on in this issue?

Response: CCS has different applications. Options with low costs are few for most countries. CCS with coal power plants has a large potential and its costs are 50-100 Euro/tC. The option of storage on-land or in underground sea has safety concerns and hence leakage needs to be avoided which may add to the cost. However this is considered an inescapable option, at least better than nuclear energy. Integrated coal gasification combined cycle is another option with high potential, and here EU and Japan can contribute to joint development.

Question to Dr. Kainuma: Though it is said that energy saving technologies in Japan are at the highest level in the world, why are the past changes in energy intensity and carbon intensity (especially 1990-2000) lower than those of European countries?

Response: Although energy intensity of GDP in Japan is lower than France, UK and Germany, the primary energy consumption increased at higher rate during 1990-2000. A majority of this increase occurred in transportation and commercial sectors. The reason for this is that, although fuel economy performance of automobiles have improved consistently, people have shifted to larger sized passenger cars. The net effect has been an increase in fuel consumption in transport sector. Moreover, actual fuel consumption performance of cars has been slightly worse than the standards. In the residential sector, Japan has much less heating consumption than other European countries like Germany, UK and Italy. Hence the potential for improvement is lower.

Other questions from the audience:

Question1: What is the role of forests to reduce CO₂?

Response from Mr. Colombier: The potential of growing forests depends on how the agriculture policies evolve especially in developing countries. The reduction potential could be between a few to 20% of emissions. The other interesting issue is that of the amount of carbon that can be obtained via biological processes. The option of forest that is harvested and simultaneously linked to economic activity is more effective from the policy viewpoint.

Question2: How is consumer behaviour incorporated in scenarios?

Response from Mr. Ybema: Consumer behaviour can be changed by policies, for instance, pricing. In the Netherlands we carried out a study to identify barriers to energy conservation measures. Governments/NGOs play important role in building consumer awareness about conservation. We incorporate such findings in the definitions of scenarios.

Messages from Panelists:

Panelists were finally requested to give messages of low carbon scenarios for global governance. The responses were as follows:

Dr. Metzger: Climate change is happening and urgent action is required. It is possible to do something if political will exists.

Mr. Green: It is important to engage countries that are not fully included at present. Structure of economies may have to change, however this need not result in severe economic damage.

Dr. Fishedick: There are technological solutions for climate change problem, but some of them are not yet available. However we cannot wait. We must increase the use of renewable energy and improve energy efficiency. International cooperation is needed to share good practices of technologies and policies. Bilateral cooperation too need to be emphasized since they may be practically more workable than multilateral cooperation.

Mr. Colombier: It is industrialized countries' responsibility to offer an alternative socio-economic model to the world, since their current consumption model is attractive for other countries. For developing countries, we need to look beyond short-term solutions and consider possibilities of developing infrastructure (including transport systems), cities, industries, that are likely to be win-win solutions.

Mr. Ybema: There are options for addressing climate change challenge, but it is not easy. Clever, complete and consistent set of policies will be required to facilitate development/penetration of new technologies, discontinuation of old ones, and participation of various stakeholders. Benchmarking among different countries will help in learning from each other's experiences.

Dr. Kainuma: Research network exists in Asia to facilitate collaborate with developing countries. Effects of behavioural change options are being evaluated. There can be a possibility that developing countries like China and India do not follow the path of industrialized countries but directly move ahead towards new socio-economic structures. Change of social structure is a key to addressing the climate change issue.

Remarks by Dr. Tsuchiya:

EU countries have combined both supply and demand side approaches in their effort to move toward low carbon society. Uncertainty in future oil prices needs to be considered in scenarios analysis. A key challenge is to facilitate shifts in lifestyles and undertake R&D to develop new energy and technology options.

Closing remarks by Dr. Nishioka:

We have learnt a lot from the experience of EU countries. There are rational reasons for drastically reducing carbon emissions. And there are feasible paths and measures to achieve such targets. Early actions are critical, so we need to set the goal for Japan as

soon as possible. However, there are some differences between Japan and EU countries. While EU has adopted an integrated approach, in Japan we still do not have adequate collaboration with other Asian countries. We need to increase such collaborations. The issues of technological innovations and linkage with sustainable society are very important. We need to learn from EU but adapt our strategies to suit Japanese conditions. We hope that the debate among experts and public will be enhanced due to our research activity.

Informal Meeting
Low Carbon Society Scenario Towards 2050
March 25, 2005

Dr Shuzo Nishioka, Executive Director, NIES, and the leader of the Low Carbon Society Scenario Towards 2050 welcomed the participants to the informal discussions and gave a presentation on the broad framework of the project. The project which covers nearly all important sectors of the economy is divided into working groups which specialize in studying each sector in detail. The working groups include those for Scenario analysis, energy, target setting, urban infrastructure, transportation, and information and communication technology. He pointed out that the dangerous level and the burden sharing mechanism has not been decided as yet for Japan. Each country has its specific situation would focus on a strategy suitable for it. It is however important to reach a consensus and device a road map to show stakeholders the direction to take.

Scenario Team

Dr Mikiko Kainuma, NIES, Japan gave a presentation on behalf of the Scenario team on Long-term Scenario Development Study to Integrate Environmental Option using Simulation Models. Through her presentation she tried to initiate discussions on developing the image of 2020/2050 society, developing demand scenarios and intervention scenarios consistently, identifying /develop technology, institution, management options for GHG reductions and developing consistent and continuous roadmap toward 2050. She presented image of results until 2050 for the reference case, normal policy case and the low carbon case. The low carbon case would require a reduction of upto 80% over 2000 levels by 2050. Through a detailed modeling framework she presented the inter linkages between bottom up and top down models and also the Environmental Options Database (EDB) which would evaluate countermeasures in each sector. She emphasized that the narrative storylines for the 2050 project are similar to SRES scenarios but are focused on Japan. Dr Kainuma also presented the Aim/Material model structure and preliminary results for some important indicators for two Scenarios A and B (corresponding to two storylines with contrasting socio economic factors and lifestyles) like GDP, CO2 emissions, and Fuel and electricity supply. She also elaborated on the collection of environmental options (technology, institution, and management options for GHG reduction) for EDB (Environmental options DataBase) and calculating GHG reduction potential by assuming diffusion rate of each environmental option in EDB using Menoco Accounting Tool. She pointed out that in order to develop a road map for 2050 back casting was important along with setting an image for 2050. It is also important to develop a consistent path for energy balance, material balance, industrial change, consumption behavior, and others.

The discussion on the scenario team's presentation looked at whether the scenario storylines focused on Japan, the role of the intervention scenarios, the sequence of the exercise (ie looking at Japan first and then the world), and the role of EDB beyond 2030.

Dr Kainuma clarified that the storylines were focused on Japan and through use of global models like AIM/CGE global dynamics would also be incorporated in the analysis. The intervention scenarios would look at options and corresponding costs for reducing emissions. The project would give insights beyond technology as option for reducing GHGs. EDB would be useful for technological analysis till 2030. It is difficult to imagine what technologies may dominate in the longer term, however EDB would be a strong tool for a shorter-term analysis.

Energy Supply Team

Dr Fujino on behalf of the energy supply working group presented on how the energy supply system is likely to emerge in the future. The main purpose of the working group is to investigate supply potential of each energy supply component toward 2050. The presentation looked in detail at the potential of CO2 free hydrogen from renewables, fossil fuels (with CCS), from industrial processes and nuclear. The key issues identified by the working group include stability of electricity system given no linkage with over sea's grid network, limit of renewables into large-scale electricity system and the demand pattern. Infrastructure for Hydrogen is also an important consideration given that there is no national-level natural gas pipeline network. The other important issues considered included storage (electricity storage or hydrogen), Nuclear and CCS and renewables. Japan leads in the research on PV technology. It was highlighted that PV is a technology with a high learning curve. PV costs in future would come down and can compete with current technologies by 2010. Also 2/3 of total land in Japan is covered by forest, and the potential for decentralized energy system in the country needs

Mr Weiss suggested that it is also important to look at the interlinkages between technologies. For example if the cost of electricity produced goes down there may be less incentive to reduce electricity consumption. Mr Green suggested evaluating new technologies from the point of view of emission abatement costs. Dr Marleen pointed out that stakeholders need to be involved in the technology identification process. Mr Ybema pointed out that the emphasis should not only been on Hydrogen but also on biomass. Dr Fujino responded that bio fuel may be expensive to produce in Japan though residual type may be cheaper. On the question of gas from the Asian continent Dr Nishioka pointed that it is a political issue and lot of uncertainty surrounds it.

Target Setting Team

Dr Kanie of TiTech, Japan presented on behalf of the long-term target setting team. the major components of the exercise include Defining socially unacceptable level of impact of climate change (value judgement), determining global differentiation regime (burden sharing), possibilities of international politics, and the target for Japan and considering the stabilization levels and the impacts. The major questions included whether temperature is the best way to communicate with the public, are there better ways to introduce value judgment into target-setting discussion and also whether there are better ideas for differentiation scheme and the kind of differentiation idea that would be useful.

Mr Lohouis pointed out that while temperature increase was the most communicable it did not highlight the impacts of climate change. Highlighting the effects that can be seen like extreme events are more communicative and effective. Mr Weiss pointed out that what is also required is simplicity in communication. An impact table would be helpful. Dr Marllen was of the opinion that impacts should be communicated by taking regional example (for wax melting of snow on Fuji san). Dr Kanie also initiated dialogue on whether stakeholder dialogue was the best way to introduce value judgement into target setting. Mr Ybema pointed out that as per a poll conducted by RIVM, the public felt that governments must take care of public goods. Dr Marleen emphasized that stakeholder process should be in addition to scientific process and neither can be substituted. Mr Green felt that the temperature target set (2⁰C) was more from a top down approach and to convince the public it is important to cite examples of extreme events.

Transportation Team:

Dr Moriguchi presented the analysis of long-term CO2 reduction strategy of transport sector in view of technological innovation and travel demand change. He gave an overview of the Transport Project, showed results of a draft 2020 scenario, and outlined the Transport vision for 2050.

Following issues were discussed after the presentation made by Transportation Team:

- Criticality of the role of government in pushing low emission vehicles and making them competitive
- 'How to increase consumer awareness' is a key challenge; The strategies must be devised keeping in mind that consumer behavior varies across world markets
- Biofuels, natural gas, synthetic fuel from wood are potential fuels
- Since lead time for building infrastructure to support new fuel choices will be long, earlier investments are necessary
- Public acceptance of Hydrogen as fuel needs to be considered

Urban Team:

Dr. Shunsuke Mori presented the research activities of the Urban Team. He introduced Tokyo Half Project, explained the detailed technological options analysed in the urban structure, the methodology being adopted by the team in selecting representative cities in Japan for carrying out detailed study, and the models under development for analyzing urban options in transport, residential and buildings sectors.

Following issues were discussed after the presentation made by Transportation Team:

- How much detail is required in database and options?
- The role of customer behavior is important to be considered
- Drivers of modal mix can be influenced
- Regional conditions influence consumer behaviour with respect to modal preferences

ICT Team:

Dr. Fujimoto presented the concept of sustainable society utilizing information and communication technologies (ICT). He explained the new eco-design method, use of ICT, framework of eco-design in networked society, and the activities of the ICT Team.

Following issues were discussed after the presentation made by Transportation Team:

- Information dissemination is critical
- Promising future systems include Eco Life Guidance system

Traditional living philosophies need to be considered to shift toward sustainable society with ICT

Dr Fujino in the end summarized the discussion for the benefit of the participants and thanked all the participants and staff for their contribution to the activities of the workshop.