The third workshop of the Japan-UK Joint Research Project

Roadmap to a Low-Carbon World

Full Report

Feb 13th to 15th, 2008
Tokyo, Japan

環境省
Ministry of the Environment

defra

NIES JAPAN

UKERC

Tyndall Centre for Climate Change Research

British Embassy Tokyo

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The third workshop and symposium of

the Japan-UK Joint Research Project

Roadmap to Low-Carbon World

Workshop and Symposium

February 13-15, 2008

Tokyo, JAPAN

Japan Low Carbon Society 2050

http://2050.nies.go.jp

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Co-chairs' Summary

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Research Director,
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In February 2006, the Ministry of Environment (MOE) Japan and the Department of Environment, Food and Rural Affairs (DEFRA) in the UK set in motion an ambitious research project aimed at informing the Gleneagles Dialogue on Climate Change, Clean Energy and Sustainable Development established during the UK's 2005 G8 Presidency (DEFRA, 2005). The Dialogue has engaged G8 countries and other interested countries with significant energy needs. It has focused on: 1) the strategic challenge of transforming our energy systems to create a more secure and sustainable future; 2) monitoring implementation of the commitments made in the associated Gleneagles Plan of Action; and 3) sharing best practice between participating governments.

The Japan-UK Low Carbon Society joint research project has contributed to the first and third of these objectives. It took as its starting point the need to stabilise greenhouse gas concentrations at a level that would avoid dangerous climate change. It then went on to create visions of low-carbon societies, identifying the concrete steps required to achieve the necessary transitions.

The two governments have worked with three of the top climate and energy research centres in Japan and the UK – the National Institute for Environmental Studies (NIES), the Tyndall Centre on Climate Change and the UK Energy Research Centre (UKERC). The Centres undertook a sequence of three workshops and symposia, involving both researchers and stakeholders from a diverse group of some 20 countries, developed and developing. A key component was an international modelling comparison exercise undertaken by ten national teams.

This project was established to create visions of a low carbon society and to identify the steps required to achieve the necessary transitions. It set the goal of a low-carbon society firmly within the context of broader sustainable development objectives. This project analysed and discussed a number of issues including : a working definition for the low carbon society concept; the need for and feasibility of achieving low carbon societies; establishing and developing low carbon society visions; evidence of the scope for action offered by existing initiatives at the country, city and sectoral levels; the roles of business, the investment community, technology, city authorities and consumers; aligning low carbon societies with wider sustainable development needs; and final conclusions and policy recommendations.

This Project has shown that low carbon societies are achievable, but also that a major coordinated effort, nationally and internationally, will be required to achieve this vision. Although advancing the

technological frontier will be vital, changes must go to a deeper level if climate change and development goals are to be reconciled.

The Prime Minister of Japan, Mr. Fukuda, in his annual speech to the Diet in 2008, described the Low Carbon Society as Japan`s vision for future generations. We sincerely hope, anticipating the G8 Summit in 2008 at Toyako, that our research results will contribute to the deliberations of world policy leaders and also guide people to act towards low carbon society and sustainable development.

Expert Workshop

February 13-14, 2008

Tokyo

The 3rd Workshop of Japan-UK Joint Research Project on Low-Carbon Societies
"Roadmap to Low-Carbon World"
Date: 13rd-14th February, 2008
Venue: Hotel Metropolitan Edmont, Iidabashi, Tokyo.

Day1: 13rd February (Wednesday)

8:30-9:00 Registration

Orientation

9:00- 9:40 Orientation

Plenary Session (1)

9:40-10:00 Charles Secrett, Special Advisor (Sustainability) The Mayor's Office/Visit London, Low Carbon London Changing Behavior

10:00-10:20 Rae Kwon Chung, Director, Environment and Sustainable Division, UNESCAP, Aligning SD with LCS

10:20-10:40 Refreshment break

10:40-11:00 Takejiro Sueyoshi (UNEP), Special Advisor in the Asia-Pacific region of the UNEP Enabling LCSs (Low-Carbon Societies): Investment

11;00-11;20 Christopher Beauman, Senior Adviser, EBRD (European Bank for Reconstruction and Development)
Reducing CO2 in Carbon-Intensive Sectors (Especially Steel): Short-term Competitiveness Issues / Long-term Paradigm Changes

11:20-11:40 Photo

Parallel (1)

11:40-12:30 group discussions including 3-6 lead speeches (each 5 minutes)

Lead speakers of Group1:

1) Jun Fujimoto (Tokyo University), ICT and lifestyle
2) Murari Lal (India),
   New Delhi plan – Low Carbon Future Road Map to Low Carbon World Bhartiya Climate Index
3) Masaru Ohara (Tokyo Metropolitan), Tokyo Climate Change Strategy
4) Ichiro Ozawa (Waseda Univ.), Behavioral Change of Planners & Developers
5) Ho Chin Shion (Malaysia),
   Malaysia vision and pathway towards Low carbon society (LCS)
6) Yasuo Takahashi (MOEJ), Building a Low Carbon Society, (13th only)

Lead speakers of Group2:

1) Mikiko Kainuma (NIES),
   Some consideration to deliver LCS from sustainable development points of view
2) Masato Kawanishi (JICA),
   SD-PAMs and LCS : Co-benefit Approach to Mitigation in Developing Countries and a Role of ODA
3) Andre Santos Pereira (COPPE, Brazil),
   Biomass and SD : Ethanol in Brazil, a single case
4) Ram Shrestha (AIT),
   CO2 Reduction and Transport Sector in Thailand: Some Insights Ram

Lead speakers of Group3:

1) Eiichiro Adachi(The Japan Research Institute),
   Roadmap to Low Carbon World through the evolution of a market
2) Yurika Ayukawa (WWF Japan),
   Domestic Emissions Trading Scheme for Decarbonizing Japan
3) Don Gunasekera (ABARE), Lowering Australia's emissions profile
4) Narito Shibaike (Panasonic, Japan),
   Market Transformation by Energy Efficiency Indicator, (13th only)
5) Ralph Torrie (ICF Canada),
   Prospects for a Low Carbon Society: The Case of Canada

Lead speakers of Group4:

1) Kimiko Hirata (KIKO network), Approaches to sensitive LCS sectors and NGO role
2) Tetsunari Iida (ISEP), renewable energy policy and politics in Japan, (13th only)
3) Teruo Okazaki, Hironobu Nose (Nippon Steel Cooperation),
   Our Challenge for Clean Development and Climate – Steel Industry's Global Sector-based & Technology-based Approach / Challenge –
4) Wang Shu (Chinese delegation), Chinese LCS Approaches on International Level
5) Isamu Yasuda (Tokyo Gas Co),Hydrogen Economy for Low Carbon Society

12:30-13:30 Lunch

13:30-14:40 Parallel (1) (cont.)

14:40-15:10 Refreshment break

Interactive (1)

15:10-15:30 Group 1 Report
15:30-15:50 Group 2 Report
15:50-16:10 Group 3 Report
16:10-16:30 Group 4 Report

Post Parallel (1)

16:30-17:00 Group discussions

17:00 Adjourn

17:30 Bus to British Embassy in Tokyo

18:00- Reception at British Embassy in Tokyo

20:00- Return Bus to Hotel Metropolitan Edmont

Day2: 14th February (Thursday)

8:30- 9:00 Registration

Plenary Session (2)

9:00- 9:20 Yuichi Moriguchi, Director of research center for material cycles and waste management, NIES,
Low carbon society in contrast to a society with mass consumption of energy and resources

9:20- 9:40 P.R.Shukla, Professor, Indian Institute of Management
Delivering Low-Carbon Society through Sustainable Development

9:40-10:00 Emma Howard Boyd, Head of Socially Responsible Investment, Director Jupiter Asset Management
Deliverling a low carbon society – mobilising the finance sector

10:00-10:20 Masayuki Sasanouchi, Project General Manager, Environmental Affairs Div. Toyota
An automotive industry's view

10:20-10:40 Refreshment break

Parallel (2)

10:40-12:00 group discussions including 3-6 lead speeches (each 5 minutes)

Lead speakers of Group1:

1) Renaud Crassous (CIRED, France), Towards a Low Carbon Society in France
2) Shobhakhar Dhakal (GCP Office, NIES),
Low carbon cities and behavioral change : Personal reflections from a recent event
3) Mariko Hanada (Osaka Sangyo University),
For " Low-Carbon Society " by Changing Citizens' behavior
4) Akiyasu Kurishima (MLIT, Japan),
Japanese Urban Policies to Tackle Climate Change
5) Teruaki Masumoto, Ikuo Nishimura (TEPCO, Japan),

Behavioral Change toward Low Carbon Society – Role of Business, Consumers and Government

6) Naoki Matsuo (Climate Expert),
Institutional Framework to Foster People's Behavioral Change for LCS
7) Mike Norton (Shinshu Univ), Barriers to a Low-Carbon Society
8) Jim Skea (UKERC, UK), Carbon Footprints and Consumers

Lead speakers of Group2:

1) Rizaldi Boer (Bogor University, Indonesia),
Indonesia's Plan towards Low Carbon Society (LCS)
2) Haroldo de Oliveira Machado Filho (Brazilian delegation),
Low carbon society (LCS) and sustainable development (SD): Perspectives of Brazil
3) Kensuke Fukushi (Tokyo University), Sustainability for all
4) Ryokichi Hirono (Seikei University),
Integrating Low Carbon Society Concept into Sustainable Development Strategy in All Countries
5) Stanford Mwakasonda (ERC, South Africa),
Sustainable development policies and measures (SD-PAMs)
6) Tomohiro Sudo (JBIC), Role of ODA Loans for enabling LCS
7) Yoshiaki Yamanaka, (Shiga Prefectural Government),
Shiga's scenario for a sustainable society in 2030

Lead speakers of Group3:

1) Yoshihiro Fujii (Sophia Univ, Japan), Put Price on Carbon Liability
2) Toshihiko Masui (NIES),
Lessons from results of integrated assessment on carbon tax in Japan
3) David Warrilow (Defra), Carbon Market

Lead speakers of Group4:

1) Jae Edmonds (PNNL, USA), Costs of LCSs and Technology – Five Principles of an Economically Efficient LCS –
2) Guido Knoche (Federal Environment Agency, Germany),
A Milestone Towards Low Carbon Society: Germany's 40% Reduction Target by 2020
3) Keisuke Matsuhashi (NIES), Lifestyle in transportation sector
4) Hannah Ryder (Stern Team, UK),
Low carbon society workshop: barriers and opportunities session
5) Haruki Tsuchiya (System-ken),
Strategy to Low Carbon Society – Barriers and Opportunities –

12:00-13:00 Lunch

13:00-13:40 Parallel (2) (cont.)

Interactive (2)

13:40-14:00 Group 1 Report
14:00-14:20 Group 2 Report
14:20-14:40 Group 3 Report
14:40-15:00 Group 4 Report

Post Parallel (2)

15:00-15:30 Group discussions

15:30-16:00 Refreshment break

All topics

16:00-18:00 Discussions

18:00 Adjourn

Allocation of Participants for Parallel Session

Group1: Behaviour change and its impact on delivering low-carbon societies

Key Questions

- What are the main levers in behaviour change, what barriers need to be overcome?, and
  - What roles exist for different actors i.e. individuals, businesses, Governments, etc?
  - What are the roles of policy options, including regulations and setting standards, for behaviour change?
  - In particular, how consumption patterns of the developed countries can be tackled in the context of behavior change?

Group chairs:

Jeremy Watson (Arup, UK)
Yuichi Moriguchi (NIES, Japan)

Rapporteur:

Steve Cornelius

Key-note speakers:

Charles Secrett, Special Advisor (Sustainability) The Mayor's Office/Visit London
Yuichi Moriguchi, Director of research center for material cycles and waste management, NIES

Lead speech (alphabetical order):

1) Renaud Crassous (CIRED, France)
2) Shobhakhar Dhakal (GCP Office, NIES)
3) Jun Fujimoto (Tokyo University)
4) Mariko Hanada (Osaka Sangyo University)
5) Akiyasu Kurishima (MLIT)
6) Murari Lal (India)
7) Teruaki Masumoto, Ikuo Nishimura (TEPCO, Japan)
8) Naoki Matsuo (Climate Expert)
9) Mike Norton (Shinshu Univ),
10) Masaru Ohara (Tokyo Metropolitan)
11) Ichiro Ozawa (Waseda Univ.)
12) Ho Chin Shiong (Malaysia)
13) Yasuo Takahashi (MOEJ)

Group2: Delivering low-carbon societies through sustainable development

Key Questions

- What are the differences among developing countries in terms of adapting to and mitigating the climate change?
- What are the differences between SDPAMs and LCS approaches and what advantages do LCS approaches provide to achieve SD?
- How approaches to LCS can be integrated into SDPAMs?

Group chairs:

Ogunlade Davidson (University of Sierra Leone)
Taka Hiraishi (IGES, Japan)

Rapporteur:

Sunil Malla (Technology Consultancy Services, Kathmandu),
Tomoki Ehara (MHIR)

Key-note speech:

Rae Kwon Chung, Director, Environment and Sustainable. Division, UNESCAP
P.R.Shukla, Professor, Indian Institute of Management

Lead speech (alphabetical order):

1) Rizaldi Boer (Bogor University, Indonesia)
2) Haroldo de Oliveira Machado Filho (Brazilian delegation)
3) Kensuke Fukushi (Tokyo University)
4) Joanna Gaches (Defra)
5) Ryokichi Hirono (Seikei Univ)
6) Mikiko Kainuma (NIES)
7) Masato Kawanishi (JICA)
8) Stanford Mwakasonda (ERC, South Africa)
9) Andre Santos Pereira (COPPE, Brazil)
10) Ram Shrestha (AIT)
11) Tomohiro Sudo (JBIC)
12) Yoshiaki Yamanaka, (Shiga Prefectural Government)

Group 3: Enabling low-carbon societies through investment

How to inspire innovation, driving force to make it happen

Key Questions

- What conditions (rules, institutions, price signals) will stimulate investment for LCSs?
- How do we create the necessary incentives to drive and enhance innovation?
- What are the roles of the governments to make necessary investments happen?

Group chairs:

Jose Garibaldi (Enegeia Mexico),
Takejiro Sueyoshi (UNDP)

Rapporteur:

Andy Bolhito

Key-note speech:

Takejiro Sueyoshi (UNEP), Special Advisor in the Asia-Pacific region of the UNEP Finance Initiative
Emma Howard Boyd, Head of Socially Responsible Investment, Director Jupiter Asset Management

Lead speech (alphabetical order):

1) Eiichiro Adachi(The Japan Research Institute)
2) Yurika Ayukawa (WWF Japan)
3) Yoshihiro Fujii (Sophia Univ, Japan)
4) Chikara Furuya (Institute for International Monetary Affairs)
5) Don Gunasekera (ABARE)
6) Toshihiko Masui (NIES)
7) Narito Shibaike (Panasonic, Japan)
8) Ralph Torrie (ICF Canada)
9) David Warrilow (Defra)

Group 4: Barriers and opportunities: approaches to sensitive LCS sectors

Wiping out concerns, bright futures, level playing fields, impacts to industry and other sectors

Key Questions

- What sectors are most sensitive and/or vulnerable in the transition to LCS?
- What kind of inertia hinders transition to LCSs (concepts, social systems, economic systems, infrastructure, etc)?
- What opportunities exist for such sectors in new "green" markets and what policy measures exist to achieve international level playing fields?

Group chairs:

Jim Watson (SPRU, UK)

Naoya Tsukamoto (MoEJ, Japan)

Rapporteur:

Jiang Kejun

Toshi Arimura

Key-note speech:

Christopher Beauman, Senior Adviser, EBRD (European Bank for Reconstruction and Development)

Masayuki Sasanouchi, Project General Manager, Environmental Affairs Div. Toyota Motor Corporation

Lead speech (alphabetical order):

1) Jae Edmonds (PNNL, USA)
2) Kimiko Hirata (KIKO network)
3) Tetsunari Iida (ISEP)
4) Teruo Okazaki (Nippon Steel Cooperation)
5) Hironobu Nose (Nippon Steel Cooperation)
6) Wang Shu (Chinese delegation)
7) Isamu Yasuda (Tokyo Gas Co)
8) Guido Knoche (Federal Environment Agency, Germany)
9) Keisuke Matsuhashi (NIES)
10) Haruki Tsuchiya (System-ken)
11) Hannah Ryder (Stern Team, UK)

Introduction of the 3rd Japan-UK LCS workshop

Naoya Tsukamoto
Director, Research and
and Information Office,
Global Environment Bureau
Ministry of Environment
(Japan)

Junichi Fujino
Senior Researcher
National Institute for
Environmental Studies
(Japan)

The 3rd Japan-UK LCS workshop was unique and innovative, where, the meeting began with a 2-day workshop (13th and 14th Feb 2008), and the results were presented at the symposium on the final day (15th Feb, 2008) to elicit the reaction of the audience. Four important topics were carefully chosen for group discussion by 79 experts and the results were compiledfor the symposium.

Selected 4 groups

Group 1: Behavior change and its impact on delivering LCSs

Group 2: Delivering LCS through Sustainable Development

Group 3: Enabling LCSs: Investment:
How to inspire innovation, driving force to make it happen

Group 4: Barriers and opportunities: approaches to sensitive LCS sectors
Wiping out concerns, bright futures, level playing fields, impacts to industry and other sectors

Structure of the Expert Workshop

- Plenary Session (20min each): Each key-note speaker will cover key discussion points for each group.
- Parallel Session (120min): Participants will be divided into 4 groups during parallel session. Each group work will cover 4-8 (1-2 slides if necessary, 5min maximum) lead speeches and discussions to explore key messages and action plans in each area. Each expert will join 4 groups.
- Interactive Session (80min): All participants will get together to report back from each group work in parallel session and have discussions with each other to fine-tune key messages and action plans.
- Post-Parallel Session (30min): Participants will divide into same groups as in parallel session and polish their outputs while taking in account discussions during interactive session.
- Overall Session (120min): Simulation for the panel discussion in symposium

Structure of the symposium on the 3rd day

1. Key note presentation was presented by Dr Emil Salim, Mr. Mitsuhiko Yamashita, and Mr. David Warrilow.

2. The results of vivid discussion by groups were presented by co-chairs of the groups and key questions were asked to the audience:

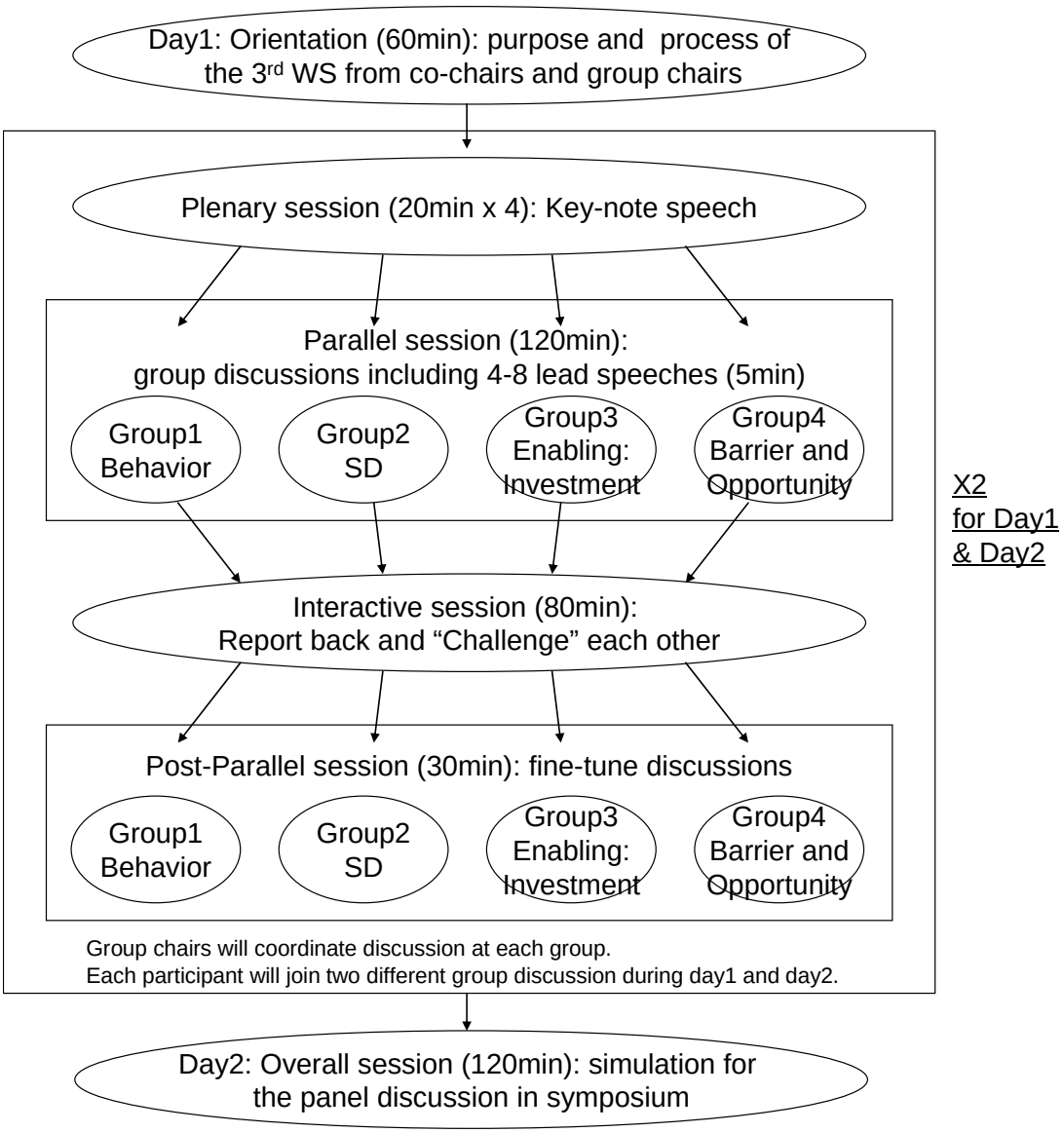
1) 15-minute presentations based on the lead speeches and discussions of the 1st and 2nd days, and

2) one or two questions and choices of answers related to those presentations that were displayed before and after these presentations and the audience were asked their opinions using electronic voting system.

Outcomes from this workshop and symposium

- Full report of the 3rd workshop
- Executive summary of the 3rd workshop

International Steering Committee "Call for Action"



Key-Note Speech

'Low Carbon London Changing Behaviour'

Charles Secrett
Special Advisor to The Mayor's Office and Visit London
Board Member of the London Development Agency
(UK)

From: Personal Research and The Mayor's London Climate Change Action Plan – 2007.

1) There are many opportunities to reduce household carbon dioxide emissions – so why don t people do them?! E.G. Switching off lights/appliances at home and office by all Londoners could reduce annual CO_2 emissions by 2.3 million tonnes; if all light bulbs were energy efficient, London would save 575,000 tonnes of CO_2 and £139 million from energy bills (2006 prices) per year; if Londoners bought the most fuel-efficient/lowest CO_2 car in their preferred class of vehicle CO_2 emissions would fall by 30% in this sector.

2) Mind sets: negative public attitudes to climate change = major blocks to personal change. People as citizens and consumers are confused – who can I trust? Which scientists, media, politicians, companies, contractors?); cynical – why bother? Where's the leadership?; Unknowledgeable – climate change is all natural isn't it? Feel powerless – what difference can I make? Apathetic – nothing to do with me – it's someone else's problem.

3) The Challenge 1 – how to turn widespread citizen/consumer aspirations to be greener into actions that matter. In UK, people now believe a sustainable home is: modern (90%); attractive (72%); hi-tech (79%); fashionable (78%); good value for money (72%). BUT while 90% of people broadly accept the science, and 70% say they are willing to change – ONLY 20% are changing carbon behaviour slightly (buying local food, recycling, driving car less) and only 5% changing significantly.

4) The Challenge 2 – turning positive public attitudes into building critical political mass: people also demonstrate that they believe the scientists and there is (just) enough time; that we're all in this together – let's work together; the solutions exist and we've got the money and resources – what's missing is political will and we can overcome that; cutting carbon emissions will bring me and my family practical and financial benefits in the here and now; tackling climate change is a moral imperative – to improve the livelihoods of billions (and especially the poor); that we need to safeguard Earth for future generations and look after LIFE itself; and recognise that millions of people, hundreds of thousands of organisations, and thousands of State and local authorities are working the world over to cut carbon emissions and waste.

5) The biggest Block to stimulating low carbon lifestyles and company behaviour is market and policy-based: as long as it is cheap, convenient and legal to waste carbon and natural resources, then that is what the great majority of individuals, households and companies will do.

6) The second biggest Block is that too many aspirational climate-changers DON'T trust: Government – expected to take the lead, but shows little urgency or action – there is no enabling policy framework (yet) - climate taxes seen as excuse just to tax + not deal with problem or strengthen known solutions (e.g. UK air levy); Other people – the free-rider problem … 'if I drive or fly less, how do I know others will as well?'; Other countries – especially major emitters like USA, China and India to curb their emissions ('President Bush refuses to act – why should we?'; 'they build masses of coal-fired power stations – why shouldn't I drive a gas-guzzler?).

7) Changing carbon-heavy behaviour ultimately means changing: Attitudes; Values; Beliefs; AND, MARKETS.

8) What works to change behaviour?
- Laws and Regulations to ban/restrict unsustainable carbon-heavy behaviour (e.g. mandatory high energy efficiency for buildings and vehicles)
- Polluter Pays Levies and Charges – *if* revenues are recycled into building up low carbon solutions - infrastructure, technologies, products (e.g. congestion charge)
- Financial Incentives – low (or no) taxes, grants, discounts and rewards for low carbon products, services, choices and behaviours (for consumers and companies)
- Focused Advice and Assistance programmes that are convenient to access for user, and help them to find, buy and use quality and affordable low carbon and energy saving products and vehicles; and, for renewables and resource saving products.
- Widely available information on problems, causes and solutions (especially which help individuals, families companies in short-term)
- Exemplar Best Practice – 'seeing is believing' (e.g. best practice new zero-low carbon and waste housing and retrofitted buildings)
- Partnerships across public, private, domestic and voluntary sectors
- Respected Champions
- Coordinated, collaborative and demonstrable international action to curb GHG emissions (e.g. C.40 Large Cities Climate Change Initiative)

9) What doesn't work …
- Endlessly highlighting the problems of environmental degradation and unsustainable behaviour
- Facts and figures on their own – data is not enough
- Moralising and exhortations
- Official pronouncements about what should be done, without the right enabling policy framework (regulations; fiscal; planning guidelines; procurement)

10) The London Climate Change Action Plan is primarily a sustainable DEVELOPMENT plan, based on an enabling framework designed to:

1. Deliver needed economic and social benefits – tens of thousands of skilled and low-skilled jobs … inward investment … lower resource costs for households and companies … boosting the City as a financial centre through carbon trading markets … increased efficiency, innovation and modernisation … higher quality of life … a cleaner, more live-able city
2. Create Partnerships – between public, private, voluntary and domestic sectors
3. Integrated cross-sector action in energy, waste, transport, buildings
4. Create the conditions for businesses, communities and families to act
5. Maintain standards of living (and improving for disadvantaged)
6. Best science-driven targets and a long-term perspective

11) The LCCAP is based on four new programmes to help Londoners and businesses change behaviour and reduce emissions:

- A Green Homes Programme
  E.G. Green Information programme – DIY Planet; Public advice scheme (web; telephone, counter); The Green Homes Service (audit, advice and implementation scheme for can-pay sector – saving 500,000 tonnes CO_2 target by 2010)
- A Green Organisations Programme
  E.G. The Better Buildings Partnership – audit, advice and awards scheme for property owners and developers; Green500 – audit, advice and awards scheme for commercial tenants.
- A Green Energy Programme
  E.G move away from centralised non-renewable energy production to decentralised energy systems based on energy efficiency, energy conservation, Combined Heat and Power, and renewables and micro-renewables – 25% by 2025.
- A Green Transport Programme
  E.G. change the way Londoners travel (already modal shift of 4% away from car use to public transport; operating vehicles more efficiently (Transport for London 'eco-driving' scheme for 2008); promoting lower-carbon vehicles, infrastructure and fuels (e.g. congestion charge) = 4 million tonnes of carbon saved p.a. by 2025.

12) There is an overwhelming need for government action and a new national policy framework to meet our target 60% cut in CO_2 emissions by 2025 (excluding aviation):

- Carbon pricing (mandatory cap-and-trade emissions market, including air travel; carbon tax)
- Regulatory and fiscal change to encourage and incentivise decentralised energy/waste networks (CCHP + bio-gas from waste streams)
- Incentives and penalties – polluter pays taxation + hypothecation

- Planning and policy support for rapid shift to renewable power (wind, wave, tidal, solar) and energy efficiencies
- Statutory reduction targets, based on best science
- Trade-able national and personal carbon allowances/quotas

13) SUMMARY: Imperatives to successfully change carbon-heavy behaviours

1. Long-term strategy with best science targets and policy drivers to transform markets to value zero/low carbon
2. Enabling policy framework of 'carrots and sticks' for companies and citizens (regulation; taxation; expenditure; procurement; planning policy)
3. Widespread public information, audit and assistance programmes for households and companies to reduce carbon dioxide emissions and resource waste
4. Cheaper, more convenient and integrated low carbon solutions
5. Verifiable, coordinated and effective international action by countries and cities
6. Partnerships between sectors – public, private, domestic, voluntary
7. Integrated changes across economic sectors – especially financial, energy, transport, waste, buildings
8. Leadership – political, professional, personal.

Key-Note Speech

Low carbon society in contrast to a society with mass consumption of energy and resources

Yuichi Moriguchi
National Institute for Environmental Studies
(Japan)

Conventionally, "wealthy" life has been coupled with massive consumption of energy and material resources. There was strong correlation between economic growth and increase in CO_2 emission in the era of Japanese rapid economic growth. A certain level of de-coupling between GDP and CO_2 emissions was observed after the first oil-crisis. This was mainly thanks to the well-known effort of energy efficiency improvement in energy-intensive industries. However, GDP and CO_2 emissions were re-coupled since late 1980's. This seems to be driven, at least partly, by consumption pattern of households.

According to our analysis employing an environmentally extended economic Input-Output analysis, contribution of household consumption to total emissions has been increasing. Household consumption contributes to CO_2 emissions not only directly by consuming energy commodities such as gasoline, kerosene, town gas and electricity but also indirectly by purchasing other goods and services. Labeling of carbon footprint of foods and daily necessaries will be informative for consumers to be aware of their link to LCS.

Private cars are one of the typical emitters of CO_2 from household consumption. Both total ownership and average size of Japanese private cars became larger since late 1980's and this had significantly contributed to the increasing emission in 1990's. Thanks to energy efficiency improvements, such as by hybrid cars, emissions from cars began to decrease recently. From the behavioral point of view, the distinction between mobility and accessibility seems to be essential, as the latter is more desire-based. Although modal shift to more efficient transport mode is often encouraged as a behavioral change, this is not effective without well-organized public transit and infrastructural changes to more compact city.

Purchasing behaviors of energy-consuming consumer durables such as cars, air conditioners, refrigerators, TV's and other electric equipment also have significant impact. Replacement to up-to-date efficient models is often encouraged, but we have to keep in mind that shorter lifetime of durables lead to excessive consumption of material resources and indirect energy consumption and CO_2 emissions. Payback time in terms of cost, energy, and CO_2 should be carefully examined for typical consumer durables. Reliable information with regard to cost payback time and CO_2 payback time of expensive mitigating technologies such as photovoltaic should be disseminated to consumers to guide their investment decision.

Undoubtedly, the improvement in energy efficiency is necessary to drastically reduce CO_2 emissions from households. However, the question is if technological change is sufficient. In our experiences, gains by efficiency improvements have been often offset by so-called re-bound effect.

In Japan, the necessity to make transition from a society characterized by mass-production,

mass-consumption and mass disposal to a “sound material cycle society (SMCS)” has been recognized to tackle with increasing solid wastes. 3Rs (reduce, reuse, recycle) policy to minimize solid waste disposal and natural resource consumption has been advocated and is being disseminated internationally through G8, OECD, etc. Behavioral changes towards LCS should be encouraged in a win-win manner with those towards SMCS.

Lead Speech

ICT and Lifestyle

Jun Fujimoto
The University of Tokyo
(Japan)

We consider hypothetical situation," Diet-food problems". In this case, overall goal is to decrease weight of people. Manufactures believes low calorie food contributes directly to decrease weight of people. However if consumers don't select this food or if they consume more because they believe it`s healthy, the goal will not be reached. This is an example of the problems of how to integrate technology with life style.

Current approaching to achieve a low carbon society has focused on linking Micro to Macro directly. Macro means overall goal of creating low-carbon society. Micro means technological innovations and approaches supported by institutions. However, this approach doesn't consider the impact of technology on society and people behavior. Therefore, I propose the concept of "Meso-level" that provides a link between macro and micro levels. On the meso-level, we can address issues related to the effect of technology on social structures and human behavior with wide-ranging implications, e.g. education, lifestyle, business, and global economy.

To tackle such problems, we need meso-level methodologies that must include:

- Techno-ontological approaches: This involves understanding how ICT affect people's behavior including mental/emotional conditions, and finding ways of integrating ICT with life-style
- Dual-Traceable Ownership System: This involves making people aware that ownership of product includes responsibility for energy consumption and recycling.
- Eco-Life Navigation System using ICT: Such a system could include several awareness raising features like easy visualization of energy consumption by individuals, information on how to spend daily life in eco-friendly manner, and automatic energy management practices.

Lead Speech

DELHI Plan - Low Carbon Future: Roadmap To Low Carbon World "Bhartiya Climate Index"

Murari Lal & Subhash Joshi
Reliance Energy Limited, Sector 63, Noida,
(India)

New Delhi is the capital of a fast growing economy, a democratic nation, India. The country has to grow while maintaining its economic liberty against nations which are developed economies. Development process entails upon the harnessing resources at affordable costs. Dispensability of resources in a developing economy is always critical. However, in global economy competition has neither political nor geographical boundaries. In such a scenario, Delhi as a Low Carbon city or state has its own challenges to exist. Despite this, efforts have been made to place the Metro on global map distinctly.

The Metro Rail system has provided a big relief to the city and placed it on higher demand for providing relief to the 100% metro with adequate feeder system. Use of CNG on public transport has experienced a journey of tough resistance to receive acceptance. It is further paving way for utilization in private vehicles.

The growth of residential and commercial multiplexes is taking place both vertically and horizontally. Management of logistics in such complexes provides an opportunity to use water and sewage for saving energy and gaseous emissions in climate as much as saving pollution of Yamuna River. Beyond this, general awareness induced by this is a compound dividend,

Information Technology has not been distinctly identified as means of reducing carbon emission. The technological advent has helped to reduce commuting as well emerge as a preferred option to save time and energy. Despite, non availability of documented benefits this dimension has been distinctly highlighted in this paper.

The science and technology which has so far been seen as adversary of nature has latent potential of its nature savvy characteristics. Needs of its wise use has been highlighted. This is, however, with the accepted fact that such non conventional uses can not become commercial reality unless reinforced with the necessary government regulations.

Disparity amongst economic conditions of local population, towns, states and countries has made it impending to look for a system of governance where each anthropogenic production or consumption activity is burdened financially. This system can not be limited to only manufacturing level. If climate damage has to be reversed it sensitivity has to percolate right up to consumer of climate endangering/savvy products and services. Then only a self regulating mechanism shall develop across consumers and producers across the globe.

These cris-cross perturbations have led to evolution of an index where all products and services are ranked on the effect on climate ranging from (+)N to (-)N. Accordingly, each product and service is taxed. Revenue generated out of such taxation is to be used for climate savvy efforts viz. education, awareness and promotion. This would yield desired dividends only if it allows flow of

resources transboundaries of municipals, states and countries. The index, underlying the philosophy, has been coined as **"Bhartiya Climate Index"**

Lead Speech

Tokyo Climate Change Strategy

Masaru Ohara
Director for Environmental Policy Division
Bureau of Environment, Tokyo Metropolitan Government
(Japan)

Tokyo announced "Tokyo climate change measures policy" on the 1st June of 2007. This indicates a clear position on climate change measures in Tokyo for the next 10 years as well as a shift in the policy outlook.

In addition to the policy explained by this announcement, Tokyo has targeted 25% CO_2 reduction by 2020 (as compared to 2000) by means of substantially new policies. These policies consist of four mechanisms of intervention (as outlined in pages 4 and 5 of aforementioned document). First, "the formulation of a mechanism for maximum CO_2 reduction using Japanese environmental engineering innovations". Second, "clarifying the role and responsibility of every large, medium and small enterprise and households to reduce CO_2 by appropriate means". Third, "treating the first 3-4 years as "the kick-off period to convert to low carbon society" and implementing strategically intensive measures for the same". Fourth, "making necessary and drastic investments by utilizing private funds, global warming measure promotion funds and taxes, etc.".

To contrast the main policies with the relations between these basic mechanisms of interventions and explain clearly, I indicate the policy package in which these four mechanisms are combined (figure on page 20). This policy package is a series of specific types of policies integrated according to the following logic. More than one policies that are simple and do not have mutual side effects on each other are combined. At first the potential of environmental engineering is utilized, after which appropriate actions by each enterprise and household are expected according to its role and responsibility. Then the implementation plan of intensive measures is drawn up and expected to begin in the first 3-4 years. Finally, adequate funds are raised to meet the requirement of the households and small and medium-sized industries which have weak funding ability.

The first mechanism, "Obligation to reduce emissions," makes all large-scale business establishments which are required to reduce CO_2 the stakeholders. This mechanism requires them to establish the level of reduction target as per the top runner method and execute it. This method sets new reduction target for an organization based on its reduction results achieved in the past five year. Therefore, for the business establishments which have already undertaken stringent measures, easier CO_2 emission reduction obligation is imposed. On the other hand, for the business establishments whose measures have been insufficient so far, obligation of severe CO_2 emission reduction is imposed.

The second mechanism, "Emission Trading System," allows business establishments to buy amounts of reduction from others which can reduce more than their reduction obligation (it premises the principle that an organization is responsible for the execution of its own emission reduction). It also allows buying the emission reduction amount of the small-to-medium-sized business

establishments which have no emission reduction obligation.

The third mechanism, "Program of encouragement and support for the installation of energy-saving facilities at small businesses and households," demands that Tokyo must aid by means of technology and funds to promote aggressive CO_2 emission reduction by small and medium enterprises and households whose measures are behind the schedule. This is required because there may not be adequate technological knowledge or access to funds in these sectors. The amount of reduction here is connected with the second mechanism and is also used for support of the reduction measures in large-scale business establishments.

Finally the fourth mechanism, "Energy conservation tax incentives, etc," provides the means to secure funds for implementation of the third mechanism. Specifically, investments from private funds are suggested and the flow of funds necessary to implement the reduction measures by each stakeholder is estimated. This is facilitated by Tokyo's promise that long term secure funds will be invested in energy conservation businesses.

The policy package explained above is a characteristic example. By combining all the policies which have been already announced and inserted in handouts, and putting them into effect, Tokyo can be transformed to a low carbon society.

Tokyo would like to host the Tokyo Olympic Games in 2016 following the London Olympics in 2012. And we’re aiming to make the people from all over the world who will gather for the Olympic Games realize the validity of the mechanisms suitable for achieving a low carbon society city. Moreover, after these two Olympic Games, we hope that we would like to reorient the consciousness in the world towards the recognition that "to discharge CO_2" is different from "to become abundant".

It will be done in the whole world after witnessing successful examples in London and Tokyo, and in this way, the reformation to low carbon society would spread all over the world. So this Olympic movement would play a big role in human history.

Lead Speech

ICT and LifestyleBehavioral Change of Planners & Developers

Ichiro Ozawa
Waseda University
(Japan)

1. Behavioral change of public policies influencing CC.

2. Structural change of “City Planning” <policy & measures> for addressing CC issues in more active manner. (*1)

3. Delivery of “Energy – related planning system” (*2) (“Spacial – Energy planning”)

***1: Carbon-related PPS & Carbon–related planning tools**
***2: Energy-related planning guidebook**

Capacity - Building of Planners & Developers

<Supporting Organization>
Supporting programmes
*** Setting–up model projects**
<good practice>
*** Toolkit (energy system)**
*** Case study, seminar, workshop**

<Zero, low-carbon projects data-base, information network>
International cooperation

Lead Speech

Malaysia vision and pathway towards Low carbon Society (LCS)

Ho Chin Siong
Faculty of Built Environment, Universiti Teknologi (Malaysia)

Malaysia being a young and fast growing nation, the role of economic growth and improving the lives of the people is significant. Presently it is undergoing a rapid industrialization process and has investment in manufacturing, infrastructure development and hence has high demand for energy consumption. The rapid economic growth places a heavy demand and stress on resources means that a continued dependence on energy, in particular on fossil fuel is important to propel further growth. Although Malaysia was blessed with relatively large tracts of natural tropical forests, (almost 60% of its total land area), just like other developing countries, some of the forest areas may be converted into agriculture and other urban use to generate job opportunities for the growing population. The pressure for more forested land and peat land being converted into plantations is becoming more serious with escalating crude palm oil (CPO) prices and the hype over bio fuel, oil palm ventures. The fact remains that peat and forest are vital carbon sink and that disturbed peat or forest will be a significant source of carbon emission

The Roadmap to achieve a Low Carbon Society certainly requires a combination of policy strategy implementation, institutional, technological innovation, and behavioral changes In the case of Malaysia, the key options to achieve Low carbon society are summarized below:-

(i) Introduction of more pragmatic and cost effective ways of reducing greenhouse gases emissions for example through greater use of public transport
(ii) Protection of the carbon sinks such as forest and peat/ wetland as Malaysia has a large green asset (forest)
(iii) Motivation of desired behavioral changes in cutting wastage or use of 3R (reuse, reduce and recycle)
(iv) Designing and building more energy efficient cities or eco villages.
(v) Allocating major investment in R &D in green technology and energy efficient technology / engines
(vi) Conducting more research collaboration between experts from Asean and developed nations on climate change and mitigation measures on CO_2 emission.

Based on the Kaya identity, we may sum up the policy recommendations on how we can achieve Low Carbon society in Malaysia by manipulating the variables in the formulae The key options in reducing GHG emission are to reduce Per capita activity, Energy intensity and Carbon intensity. The increase in population factor may be difficult to manage because Malaysia is still experiencing rather high growth rate of 2.6% p.a.

- Population (Total population)

The population growth rate of 2.6% p.a. will continue to be contributed by natural increase and migration. The rapid industrialization and modern agriculture will create job opportunities in urban as well as rural area. However, household size may fall due to high urbanization and increasing percentage of female in the workforce. The high percentage of about 50% of young population (age cohort 0-14 years old) of existing demographic profile show high potential of population growth. This increase in population will contribute to the increase in the total GHG emission. It is important for the nation building program to focus on both developing the economy and in improving the quality of the life of Malaysians. Through education, innovation and good moral values such as "safeguarding the environment" (one of the 10 principles of Islam Hadhari (Civilization Islam), the present and future generation of Malaysian will hold to noble values to protect the environment

- Per capita activity (Activity/ Population)

This parameter refers to the activity or service per population. The affluent lifestyle, environmental awareness education and urban planning may affect the CO_2 emission per capita activity. With the growing disposable income of the Malaysians, the total emission will increase significantly if lack of environmental awareness continues to persist. In order to reduce CO_2 emission, more campaigns for environmental and eco friendly lifestyles such as practicing the 3Rs (reduce, reuse and recycle) should be encourage. In addition, National Physical Plan (2005) and National Urbanization policy(2006) promoting Transit Oriented development and compact city will be able to promote greater use of public transport and non motorized transport. Both of these policies will need to be translated into development plans at local and regional levels such as Structure Plan or Local plans so that it can be implemented by the local planning authorities.

- Energy intensity (Energy/ activity)

This parameter measures the energy per activity. Reduction in energy intensity may be achieved by energy efficiency or material efficiency measures. With the setting up of the Malaysia Energy Centre (PTM), efforts to improve Energy Efficiency (EE) through the promotion of low energy building and passive architecture design in buildings would be further enhanced. Energy efficiency devices should also be used not only in buildings, but only for vehicles and industrial process.

- Carbon intensity (Carbon/Energy)

This parameter refers to the carbon content in each energy source. The present trend of our energy sources need to be further diversified to wider use renewable energy such as bio fuel, hydro, solar and possibly alternative fuel such as possibly nuclear power in the future. It is also important to establish and support cleaner production programs with the use of CDM.

- Preservation of Forest as Carbon sink

Malaysia as a tropical country which is endowed with more than 50% forest cover is a precious green asset capable of acting as carbon sink. Malaysia, among countries blessed with a wealth of tropical rainforests in recent Tropical Forest Leader meeting in New York (Joint statement, 24

September 2007) agree to intensifying collective efforts for the management, conservation and sustainable development of all types of forests, along with achievement of the internationally agreed development goals, including the Rio Conference's Declaration on Forests, Agenda 21 and the Millennium Development Goals.

For a fast growing nation with rapid urbanization such as Malaysia, implementation of planning of low carbon cities/ region concept can be an effective policy strategy to achieve the Vision and Path way towards LCS

Lead Speech

"Building a Low Carbon Society"

Yasuo Takahashi
Ministry of the Environment, Japan
(Japan)

1. Background

In May 2007, Japanese Government has announced "Cool Earth 50" and identified building Low-Carbon Society and promoting Innovative Technology Development as two keys to make global emission half in 2050.

Ministry of the Environment, Japan has started to develop ideas on Low-Carbon Society's principles, images and strategies to realize, mainly for Japan.

Images and strategies for Low-Carbon Society should be diverse among countries, depending on their natural environment, developing stages, industrial structures. But we believe elements Japan describes will be useful for other countries and we would like to work together for further development of ideas with international colleagues.

The discussion is still underway in the Central Environmental Council and a interim report will be formed in March.

2. Principles for a Low-Carbon Society

1) Carbon Minimization in all sectors
   - Minimization of carbon-dioxide emissions from all sectors
2) Toward a Simpler life style that realize richer quality of life
   - Shifting from mass-consumption society towards QOL oriented society. Revolution led by consumer' choice. "Mottainai" spirit.
3) Coexistence with Nature
   - Maintaining and restoring natural environment that is essential for Low-Carbon Society

3. Images of a Low-Carbon Society

Describe a plain image of low carbon society in 2050 by following areas;

1) Regions (cities, towns and rural areas)
2) Mobility
3) Living & Working Scene
4) Energy supply
5) Industry
6) Forests, Agriculture and Ocean
7) Consumers' choice
8) Finance, Investment and Information disclosure.

4. Strategies to realize a Low-Carbon Society

1) Desirable actions for citizens
2) Desirable actions for companies
3) Policy instrument of governments
   - Institutional infrastructures: Incentives (Prizes, regulations, economic instruments)
   - "Soft"-infrastructures: Human resources (capacity building, education), information (visualization), financial resources
   - "Hard"-infrastructures: Urban structure, buildings, transportation network, energy supply, adaptation
   - Natural capitals: Conservation of natural environment, biodiversity. Management of agricultural and forest land. Adaptation to climate change.

5. Sharing experiences and ideas among countries & International cooperation

1) Sharing the "Japan Model" with developing countries
2) Establishment of information center for a Low-Carbon Society and Promotion of international joint research activities and human development
3) Proposal to strengthen global-level incentives toward a Low-Carbon Society

Lead Speech

Towards a Low-Carbon Society in France

Renaud Crassous-Doerfler
CIRED
(France)

So far the performance of France on meeting climate change targets has been satisfactory. GHG has been kept below the Kyoto target. From 1990 to 2005, there has been 5% increase in CO_2 but it has been more than offset by 18% decline in other GHGs. However, Transportation and Buildings are two challenging sectors as they have witnessed increase in CO_2 emission by 18% and 11% respectively.

Some of the medium and long term targets for France are as follows:

- 20% reduction in 2020 (EU Commission mandate)
- 'Factor 4' in 2050 (requirement of the National Energy Law)
- A trajectory compatible with 450ppm CO_2 pathway and a Contraction and Convergence scheme for burden sharing (long-term international commitment)

There have been positive changes in the institutional structure in France to facilitate the desired climate and related actions. One such change is the setting up of a new ministry of 'environment, sustainable development and sustainable planning'. This ministry is responsible for promoting environment friendly and sustainable choices in the sectors of buildings, transportation, and infrastructures. Another example is the creation of a broad consultation forum called 'Grenelle de l'Environnement' that involves diverse communities like NGOs, administrations, unions, local authorities and scientists.

Despite such positive developments, France faces several challenges to achieve low carbon society. Some of the ideas and schemes under consideration are as follows:

- Reorientation of infrastructures: This could involve re-evaluating the need for highways, extension of high-speed networks, and assessment of new carbon value profile for cost-benefit analysis
- Establishment of new standards: This includes decreasing emission standards for vehicles, major renovation plan for existing buildings, and upgrade of construction standards for new buildings
- Broad fiscal reform: This includes a proposal for climate-energy tax currently under study, and an ongoing debate on the need for broader taxes
- GHG information on all products: This proposal, if implemented, would raise the climate awareness of consumers and citizens manifold

Lead Speech

Low carbon cities and behavioral change

Shobhakar Dhakal
Executive Director, Global Carbon Project y
(Nepal)

Urban/city at nutshell and behavioral changes

Almost half of the world population lives in urbanized areas. Cities generate a large share of global GDP, consume a high share of global commercial energy, and emit a large share of global carbon dioxide (CO_2) emissions already. In the future, the CO_2 emissions per capita in cities of developed countries is already high and will resist to decline while additional 1.8 billion new urban dwellers- most of them from developing countries- will be added in next 25 years who would demand more energy per capita and demand to emit more than before. Therefore, great challenges lie on to find how to develop low-carbon cities or to re-orient existing cities towards low carbon pathways. However, the scientific and policy responses to urban energy and carbon management challenges have been inadequate and wrongly placed. They are fragmented, follow reductionism approach (in sectoral fashion), ignore urban as a single unit, lack integration of urban system, and overlap/mismatch urban governance. Three things are urgent towards low-carbon cities: (1) better integration of urban system- infrastructure and activities (2) technological advancements to improve efficiency and effectiveness, and (2) behavioral shift to make rational choices and lifestyle changes in cities. It is important to note that the first and second are necessary but, for deep-cuts, utterly not sufficient without the third.

Limitation of current debate

Individual behavior of urban dwellers matters for carbon emissions through energy saving, less material consumption, choice of public transport over private transport, and how one choose to live in their physical space (houses, offices etc) amongst others. However, there are several limitations on current debate on behavioral change towards low carbon cities:

- The vision of low carbon city in next 100 year is unclear – the acceptable and desirable form of low carbon city solely depend on our envisioned behavioral change
- Existing discussions focus on incremental change; such conventional way is not sufficient
- Behavioral change discussions are often technology dominated, price-tagged, top-down and lacks psychology, various attributes of personal choice associated with individuals' irrationalities to the price signals
- Behavior change process in cities will be non-linear with surprises; current discussions lack the critical mass of change-agents needed and the tipping points for accelerated changes
- Behavioral shift and levers for change has to be dramatically different in post-modernized nations, rapidly developing nations and less developed nations (generality vs. specificity)

Who to lead change?

Current debates on low carbon cities and urban carbon management are largely municipal government-centric. Such municipal government-centric approach is necessary but not sufficient since that capacity and relevance of municipal government to lead the required changes are limited. Governments of multiple levels are key actors to induce behavioral changes in cities through setting-up operational framework (educational, awareness, technology, economics and regulation). Businesses can play role in by shaping choices, providing alternatives and promoting green businesses in cities. Citizen groups have role to play by campaigning to make rational choices and creating awareness and media to educate and inform public and put political pressures to act. In essence, a multi-level governance of urban carbon is necessary based on local circumstances and based on what wedges of influences are available to whom to make realistic changes.

Lead Speech

For "Low-Carbon Society" by Changing Citizens' Behavior

Mariko Hanada
Osaka Sangyo University
(Japan)

The role of household sector on CO_2 emission is not small in Japan. Though the ratio of CO_2 emission of household sector amount to over 20% of all, it keeps increasing and cannot be reduced without changing of individuals' manner and behavior. Then, how could we make individuals behave environmental-consciously?

For changing individuals' manner and behavior in daily life environmental-consciously, there are key factors such as;

1. Sense of Crisis: we exactly confront a global environmental crisis
2. Sense of Responsibility: our conventional mass consumption/waste lifestyles is to blame
3. Confidence in Effect: changing lifestyles will really improve global environment
4. Proper measures of practice: tools to make effectiveness of our practices visible easily
5. Motivation for practice: find the appropriate incentives for each individual

There are two effective drive forces to change individuals' lifestyle; to cultivate awareness for environmental value and to change social systems.

First, "environmental education" develops key factors 1, 2, and 3. As a result, individuals begin to have interests in environmental values and begin to check their lifestyles with environmental axis. Then, if they have key factors 4 and 5, they might behave environmental-consciously in their daily lives. From my research, main reasons of not to behave environmental-consciously are "not to know what they should do" and "believe that one person's action is limited and meaningless". Environmental education and tools for evaluation of individuals' own behavior can change their wrong believe. Actually, there are such tools in Japan. One example is "environmental household account book" made by local governments、companies、and citizen groups. We can calculate the amount of CO_2 emission of household just by filling in the amount of usage of energy and water on the web. We can evaluate our environmental performance with amount of CO_2 emission using "check list of eco-life". As information for decision-making, visualization of our daily lives is very important.

Additionally, the change of social system is necessary. For example, new tax system pricing to an environmental load, such as the amount of CO_2 emission, motives consumers to purchase low-carbon products and motives companies to design/produce/sell low-carbon products. Social systems which reward the decision with environmental axis accelerate individuals' behavioral changes.

At the same time, the experiences of participation in pleasant projects, which people prefer to join, strengthen ties in the participants among the community. Examples of such projects are “Environmental Learning Project to support children’s environmental activities in Nishinomiya City”, “Nanohana(Bio-Diesel-Fuel) Project to make buses run by BDF made from rape blossoms in Osaka Prefecture”, and “Mission Uchimizu, sprinkling water by hand, to remind Japanese old custom”.

In conclusion、I carry on a campaign, environmental-consciousness is ”Economical、Fun-to-do、and Ethically”. The mass media could make the consensus that ecological lifestyle is comfortable, kind of “Cool earth is so cool!”

Overall, to move many individuals, positive manner is important.

Not “DON’T”, But “LET’S DO!”

Lead Speech

Japanese Urban Policies to Tackle Climate Change

Akiyasu Kurishima
MLIT
(Japan)

There are several measures in place to reduce greenhouse gases from urban areas in Japan:

- Energy conservation measures for houses and buildings
    - Compulsory notification of energy conservation efforts
    - Tax incentives
- Low carbon urban design: Compact cities, urban greening, and utilizing the potential energy of sewage
- Promotion of public transportation system: LRT, IC card tickets, bus location system
- Low carbon distribution system: modal shift and efficient truck transport
- Improvement of traffic flow: ITS and elevation of railroad
- Improvement of fuel efficiency of automobiles: Establishing top runner standards and tax incentives

Despite these measures the urban GHG emissions have grown. Main reasons for this are growing dependence on cars, decline of urban green areas, and increase of energy consumption in houses and commercial buildings.

There is now a thrust to the urban policies to reduce GHG emissions, for instance, by promoting compact cities, increasing urban green space, improving sewerage system, and fostering area-wide energy use. Some examples of such measures are as follows:

- Promoting public transportation
    - New urban railways has been put in service from FY2003 to 2005
    - Systems for convenience of train-to-bus transfers have been introduced
    - Introduction of bus location system and non-step buses has made public transport more convenient to use
    - IT has been used to introduce IC train card tickets in several rail and bus carriers
    - LRT (light rail) is being promoted in several cities
- Greening sites and rooftops of buildings
    - Municipal authorities are designating Greening Promotion Zones in which greening of certain proportion of building sites is mandatory
    - Half of the property tax is being waived for green spaces on sites and rooftops of buildings for business use in designated urban areas including Greening Promotion Zones
- Exploiting potential energy of sewage
    - Reduction of N2O emission by raising temperature of incinerators
    - More efficient use and saving of electricity in sewage treatment

- Extraction of renewable energy from sludge and use of thermal energy of sewage, resulting in refined sewage biogas which is usable as fuel for CNG bus

Lead Speech

Behavioral Change toward Low Carbon Society : Role of business, consumers and government

Teruaki Masumoto, Ikuo Nishimura
TEPCO
(Japan)

The broad roles of business, consumers and government to achieve low carbon society are outlined below.

Businesses:

- Reduce GHG emissions from own facilities by-Installation of the best available technologies in the own production processes-consideration to the optimal energy mixture
- Develop & propose low-carbon or energy efficient products and services to the society
- Promote technological innovation

Government:

- Create enabling environment for deployment
- Support virtuous cycle for business and consumers' value creation for low-carbon or energy efficient products and services
- Facilitate international cooperation for RD&D

Consumers:

- Make a wise choice for low carbon products & services
- Create social appraisal for environmentally responsible (corporate) activities

Japan has many examples to offer for such interventions:

- Top-runner program: Introduced in 1998, it now covers 21 product categories with target standards for energy efficiency which are determined by independent experts. This program provides incentives to manufacturers to develop more efficient products, and provides comparative information to the consumers. For instance, as a result of this program, energy efficiency of TV and video recorder has increased by 25.7% and 73.6% respectively during 1997-2003, of air-conditioner by 67.8% during 1997-2004, of refrigerator and chiller by 55.2% and 29.6% respectively during 1998-2004, and of vehicles by 22% during 1995-2004.
- Programs for raising consumer awareness: Several such programs are in place, for example TEPCO's Lifestyle Laboratory that introduces consumers to comfortable, convenient and energy efficient lifestyle with electricity. Consumers can compare the performance of home appliances of different manufacturers.
- Innovations like Eco-Cute, the energy efficient water heater: Eco Cute, developed jointly by DENSO Corporation, Central Research Institute of Electric Power Industry, and TEPCO, is the world's first water heater for residential use that applies the natural

refrigerant (CO2) which has very little impact on global warming. Compared with a conventional combustion type water heater, Eco Cute can save primary energy by about 30% and reduce CO2 emission by about 50%.

The key challenges for inducing behavioral change among businesses are as follows:

- It is important to focus on all the inter-linkages through the supply-chains and not just the upstream end
- There is a need for industry and cross-industry standards and metrics, as well as global harmonization of formats for disclosure of relevant information by businesses
- It is critical to create conditions for a transformational zone of Public-Private Partnerships (PPPs) to stimulate desired change along the value chain

Lead Speech

Institutional Framework to Foster People's Behavioral Change for LCS

Naoki Matsuo
Climate Experts, Ltd.&PEAR Carbon Offset Initiative, Ltd
(Japan)

It is a challenge to change the behavior of consumers who have no obligation to do so. Two concrete and one imaginary proposals are presented below.

Carbon Management Practice Driven by Carbon-Offset

PEAR Carbon Offset Initiative considers that the offsetting can serve as a "trigger" to change the behavior of people (while it also provides real reductions somewhere else).

The original concept of carbon offsetting provides opportunities to let them realize and recognize carbon footprints of various consumption modes (possibly calculated by LCA). This information can be disseminated at each consumption point with the collaboration of B-to-C companies.

In addition, PEAR considers the importance of "carbon management" practices and provides a Web-based "carbon account" for each individual as a platform to manage his/her carbon footprints as well as to offset them. New IT system enables the automatic recording of carbon footprints in the account at the time consumption occurs. Provision of simple advices on energy-saving is also an additional service.

Household-level ETS in Minami-Senrioka Civic Zone

More than 1,200 households will live in a new civic zone "Minami-Senrioka" from March 2010. It incorporates not only the top-level hardware standards for buildings, *etc*, but also many innovative but replicable measures to change the people's behavior for a low carbon society.

One is the accurate and real-time monitoring system with custom-made energy saving advice system. The major obstacle for people (to change their behaviors) is that they neither know how much CO_2 they emit from what kind of behaviors, nor know how to save energy effectively. Even if some incentive framework is introduced, it will not work properly without such information.

Minami-Senrioka is to introduce precise and real-time (every 5 minutes) household-wise CO_2 inventory information for major appliances together with other parameters such as temperature. Using such information, optimized interactive energy-saving advices are provided.

In addition, household-level ETS is to be introduced as the incentive framework. At this moment, auction-based cap-and-trade ETS is envisaged to be introduced. It is unrealistic to penalize non-compliant households for the time being. Instead, such households will be ruled out from incentives (in the form of local currency) that will be provided to compliant households.

Individual-level ETS as the Ultimate Form of ETS [Dual-economy System]

In general, ETS cannot cover whole economy. This proposed ETS covers all CO_2 emissions from fossil fuel combustion. The key is to allocate CO_2 quota to each individual and regulate up-stream companies which import or produce fossil fuels. The companies shall surrender emission quota at the end of the period which is equivalent to the amount of fossil fuel they sold. Companies add the "carbon price (with the unit of kg CO_2e)" for their commodities or services to the their usual market prices (e.g., in $), so that the consumers shall pay for the "CO_2 quota".

The CO_2 quota can be realized as a currency and recognized similar to VAT which is levied for "additional value" at each consumption mode, so that CO_2 quota plays the role of "currency" which is deeply implanted into the whole economy.

Lead Speech

Barriers to a Low-Carbon Society

Mike Norton
Innovation Management, Shinshu University
(UK)

The current situation is that climate change is proceeding at the pessimistic end of the IPCC-predicted range. Carbon emissions are accelerating and the targets to constrain global warming within 2-3^{o} require CO2 emissions to peak within the next 10 years. So we need a major change and fast, not just adjustments at the edges!

Yet the current growth drivers are powerful. These are population, per capita emissions in developing countries and failure to reduce carbon intensity in developed countries. There are pernicious secondary effects. As wealth increases there are direct effects on emissions (more energy consumed) and indirect effects via lifestyle (e.g. increased meat = increased deforestation). Some "solutions" (e.g. biofuels) may make matters worse.

Will consumers lead the way by becoming green? No way! Green choices are limited by the market's ability to present significant choices. Those trying to consume sustainability are outnumbered by those who claim to be 'green' but do not act, and by those who are not even concerned. While we see green themes in advertising, innovations which are more carbon efficient are offset by those which add to emissions. People may be starting to accept that there may be implication for lifestyle but resist anything other than trivial measures. Politicians are not prepared to challenge this.

The current situation is a product of our economic system; yet we have not yet engaged the system in solving the problem. Energy companies prefer to challenge the science rather than invest in finding a solution. Coal companies expect the government to pay for research into clean coal. With carbon, the polluter pays principle is evaded. The Keidanren opposes emission reduction targets even though Japan's Innovation 25 initiative identified sustainable industries as having the double dividend of environment protection and economic benefit. National policies abound with examples where individual infrastructure decisions take priority over national strategy on emissions.

So moving to low carbon is like pushing water uphill. It will have little effect until the slope changes and helps it to go downhill. Environmental protection is still a cost or a duty. It needs to be made a profit centre and the only way to do this is by having a universal and unavoidable carbon price. Then consumers will start to have more realistic choices and green choices will be rewarded. However, consumers will not in the short term accept constraints to their lifestyle by foregoing their air trips, their cars, or even their patio heaters. So while a carbon price may help it will not move to a low carbon society fast enough. The only area which can be targeted to achieve large reductions is energy production, which must be decarbonised as a matter of urgency. In particular, coal must be decarbonised - effective technology must be developed with an urgency equivalent to the Manhattan

project. Those investing in coal must expect to convert to CCS well within the lifetime of the plant or pay high costs. Zero carbon electricity must receive appropriate credit for its lack of carbon emissions including nuclear.

If we can decarbononise the energy supply, then it gives more time for the slower acting processes of innovation in products, marketing and consumer tastes towards a lower carbon footprint.

Finally the 32% of emissions which come from land use/change cannot be ignored in a low-carbon society. These emissions are driven by some political 'no-go' areas - population growth, dietary changes, demand for timber, food and now biofuels. Tackling deforestation requires reduction of these growth drivers. Costs of reducing deforestation need to be transferred to the activities driving deforestation and the principle of sustainable use needs to become the essential precondition for development activities by the international organs such as the World Bank, as well as for international trade under WTO rules.

In short it is much easier to visualise what a low carbon society might look like than to get started on the long road to achieving it. That requires some 'inconvenient truths', so let's give the summit a realistic assessment of the difficulties and avoid false hopes and benign remedies which we know will be inadequate.

Lead Speech

Carbon Footprints and Consumers

Jim Skea
Research Director
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(UK)

In the UK, the Carbon Trust has been developing a methodology for assessing the lifecycle greenhouse emissions associated with consumer products and assessing ways of communicating this information to consumers. There are two desirable outcomes: this will help consumers decide which products and brands to choose; and it will drive producers to reduce the carbon footprint of their products to improve their market position.

A set of trials with a range of companies is currently under way. At the same time market research is being conducted to assess how consumers might react to carbon footprint information. In one survey, 2/3 of consumers said that a label indicating that a supplier was working to reduce their carbon footprint would make them more likely to buy a product. 70% also said that it was important to see a quantitative indicator of the carbon footprint on the label. This was not necessarily because consumers could interpret this number in a meaningful way. However, they wanted assurance that companies had done the calculations and were working to reduce their footprint.

The Carbon Trust's work is currently following three streams. There is very high agreement that a uniform methodology be used to assess carbon footprints. The Carbon Trust and DEFRA have therefore co-sponsored the British Standards Institution (BSI) to develop a Publicly Available Specification (PAS 2050) for the "Specification for the assessment of the life cycle greenhouse gas emissions of goods and services". This may be available by June 2008 but a number of issues remain to be resolved relating to Life Cycle Assessment procedures and the need, or otherwise, for third party certification. The PAS could be the starting point for an international standard at a later date.

The second stream is developing procedures to determine whether companies have reduced the carbon footprint of a product over a period of time (say two years). This will provide a *framework* rather than a specification or standard. There is least consensus among industry and retailers about the third stream dealing with communication of information relating to carbon footprints. A number of companies do not believe that a label communicating the grams of carbon associated with a product is the way forward. The Carbon Trust is developing more flexible *guidelines* for communication in this area.

The methods for calculating carbon footprints are probably not sufficiently developed for consumers to compare products like with like at the moment. But they can give consumers the assurance that companies are working to improve lifecycle emissions along a supply chain, thereby creating trust in brands.

Key-Note Speech

Aligning SD with LCS

Rae kwon Chung
UN ESCAP
(Korea)

Two key issues of Sustainable Development (SD) and Low-Carbon Society (LCS) are: (a) How to make LCS compatible with growth, and (b) How to engage developing countries in post-Kyoto climate regime?

A paradigm shift is required from quantity of growth towards quality of growth. Quality must include measures of ecological and social quality, besides economic quality. Hence, not just market cost efficiency, but also ecological efficiency needs to be emphasized. Increasing ecological efficiency implies maximizing resource efficiency and minimizing pollution impact by internalization of ecological costs into market price.

The governments have an important role to play in effecting this shift. They must modify the price structures so as to close the gap between market and ecological prices, and provide ecologically efficient infrastructure like public transport and energy efficient buildings to support ecologically efficient performance of economic activities. The concept of ecological efficiency has to be applied in the designs of cities, public transport systems, and consumption and production patterns.

We have to replace the negative perception that mitigation is a burden on economy with the positive view that mitigation is not a burden rather an opportunity to improve energy efficiency and save energy costs tus improve economic efficiency and competitiveness. Climate actions could even create new markets, employment and growth.

However, while the gains will mostly accrue in the long run, there may be certain costs to bear in the short run. Hence policy options are required to minimize short-term burdens and maximize long-term gains.

Following are the best ways to induce emission reduction in developing countries:

1. Internalize Ecological Costs into the market price of energy: Internalization of ecological costs into market price of energy can be achieved by changing tax base from Income to Carbon. Ecological tax reform of reducing income tax while increasing carbon tax could be an effective tool to move towards low carbon society by putting a price on carbon.
2. Market-Based Climate Regime and CER Discounting: CDM can be reformed to function as a full-fledged market mechanism to provide incentives to developing countries to initiate mitigation projects. Project scope of current CDM has to be further expanded by removing project and fiancial additionality criteria. Mitigation costs per ton of CO2 is cheaper in developing countries. If developing countries could be allowed to turn their mitigation into carbon credit and sell at a higher price than their actual costs, then investment for mitigation of GHG emission in developing countries will have commercial viability. Net global

recution is possible not only by imposing target on developing countries but also introducing a rule of CER discounting scheme. The CER discounting scheme means that a part or all of CDM credits, i.e., CERs, made by developing countries through unilateral CDM projects will be retired rather than sold to developed countries to increase their emissions. Then unsold protion of CER will be net global reduction. Agreeing on the CERs Discounting Scheme will have a better political chance than agreeing on imposing emission reduction targets on developing countries.

3. Domestic Voluntary Efficiency Targets as Climate Action: Explicit recognition of domestic and voluntary targets and efforts towards improvement of economic efficiency or energy efficiency as a part of climate action will provide further incentive and recognition to those countries and governments. A case in point is China's target of 20% improvement in energy efficiency. Voluntary emission reduction efforts must be allowed for carbon credits. As a lot of such voluntary actions are being taken by countries to further their own energy security and economic growth objectives, recognizing such efforts as climate action will create win-win synergy between climate and economic goals.

Key-Note Speach

Delivering Low-Carbon Society through Sustainable Development

P.R. Shukla
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(India)

A lot of debate on stabilizing GHG concentration has been limited to actions at the margins of the conventional development path. This approach involves high carbon price and is risky and unsustainable. A paradigm shift is needed to bring climate actions within the mainstream development strategy. The latter will require sustainable (alternative) development path and GHG stabilization to be pursued simultaneously.

Sustainable path to LCS will require a much wider/diverse portfolio of interventions than the conventional and high carbon path to LCS. While the latter will require mainly energy supply related options, the former will require interventions in both supply and demand sides and in a variety of areas. For example, the results of the two scenarios analysed for India indicate that the conventional path requires major penetration of CCS (with coal) and fuel switch in power sector, besides minor introduction of renewable energy and improvement of device efficiencies. The sustainable path, on the other hand, will require a variety of interventions like fuel switch in power sector, renewable energy, and a wide set of demand side measures like improvement in buildings, transport mode switch, appliance efficiency improvement, urban planning, greater recycling, reduction of consumption, and material substitutions that will result in reduced demand for steel, paper, cement and other energy intensive industries.

Key drivers of sustainable pathway to LCS are:

1. Innovations: Both changing behaviour and technology/R&D transfer are the key to LCS transition. Technological, social/institutional and management innovations will be necessary. In particular, the developing countries will need major reformation of their governance systems and institutions.
2. Co-benefits: Integrating GHG reduction with local benefits is important for developing countries. This will require aligning of different markets, exploring win-win options that deliver join benefits, and a mechanism to share the costs and risks among global and local actions. So far the climate negotiations have followed the ‘burden sharing’ metaphor which poses climate stabilization as a high cost and zero-sum game, and this has cause conflicts. The sustainable development approach, by delivering co-benefits and reducing the cost of stabilizing climate, poses stabilization as a positive-sum game that would induce cooperation between different players including developed and developing countries. For example, energy cooperation among countries in South-Asian region has a potential to reduce GHG emissions by enhancing trade of hydro, gas and oil, besides delivering co-benefits like addressing the problems of water, food security and flood control, and lowering the energy prices.

3. Sustainability: This requires long-term vision and modification of preferences so as to avoid lock-ins due to investments that have long life. Sustainable low-carbon societies shall need exclusive climate-centric actions for stabilization and adaptation, but their costs and risks are much lower.

Lead Speech

Some consideration to deliver LCS from sustainable development points of view

Mikiko Kainuma
National Institute for Environmental Studies
(Japan)

There is a development path effective for each country, but we can share the vision. Among all, it is essential to have a vision how to mitigate GHG emissions in the context of sustainable development. To realize sustainable development, actions should be taken in a bottom-up way. Combination of different approaches is required to move forward to sustainable development by taking climate actions.

Technologies that come from regional specific needs should be integrated with local natural resources. Infrastructure should be designed adequately to promote dissemination of energy-efficient technologies.

Besides large-scale technology development and transfer, local-scale technology development is important for sustainable development such as biomass cook-stoves, biogas plants for public buildings, solar cookers, and stand-alone solar PV (photovoltaic) systems. It is necessary to select and market technologies that are effective for local way of living. For this the technologies would have to: (i) contribute to economic livelihoods of local communities, and (ii) integrate with local natural resource base.

Training local youth/women is very important. Local youth/women must be equipped to take up entrepreneurial services for design, manufacturing, assembly, delivery and post-installation maintenance of new technology systems.

It is also important to provide logistical systems to support prompt availability of parts, components and equipments required for such technologies to work efficiently at the local levels. These logistical systems need to link centralized, urban sources of designing and manufacturing components/equipments to decentralized, local points of assembly, delivery, installation and maintenance of end-use technologies.

There is another point relating to local development of technologies: the existing policy regime of international trade and Intellectual property rights (IPR) may need to be re-examined (since existing policy may not facilitate easy transfer of know-how to developing countries). Thus R&D capability in developing countries may need to be strengthened.

For such local-scale technology development to work effectively, the government must provide crucial policy support to establish initial infrastructure base comprising technical resources, training facilities, and transportation and logistics networks. It is also important to provide 'financing services' to local entrepreneurs so that they can easily make investments required to start development, assembly, delivery or maintenance activities locally.

Lead Speech

SD-PAMs and LCS: Co-benefit Approach to Mitigation in Developing Countries and a Role of ODA

Masato Kawanishi
JICA
(Japan)

Japanese ODA on Climate Change

Addressing global issues, including climate change, is one of four priorities outlined in the Official Development Assistance (ODA) Charter, Japan's basic policy of ODA, which was revised in 2003. Japan's Medium-Term Policy on ODA, formulated in 2005, also underlines the importance of taking measures against climate change. Japan introduced the 'Invitation to Cool Earth 50' initiative in 2007 and announced that it would support 'developing countries with high aspirations' that make efforts to achieve both greenhouse gas (GHG) emissions reduction and economic growth. Most recently, Prime Minister Fukuda announced that Japan would establish the 'Cool Earth Partnership', a financial mechanism for assistance to developing countries on climate change.

As the agencies of implementing ODA, Japan International Cooperation Agency (JICA) and Japan Bank for International Cooperation (JBIC)[1] carry out a number of developmental projects which also produce climate benefits[2]. A co-benefit approach is emphasized, given the fact that the primary concerns of developing countries are their own development, not the climate. With co-benefit approach, ODA gives an incentive for developing countries to take a climate-friendly development path.

SD-PAMs and Co-benefits

The use of Sustainable Development Policies and Measures (SD-PAMs) is proposed as one type of mitigation action by developing countries (Bradley et al, 2005). It comes from the idea that 'a more sustainable development path has lower emissions, *even without* any explicit climate policy' (South Africa, 2007). In other words, SD-PAMs are based on co-benefits, more specifically climate benefits of sustainable development. In this sense, SD-PAMs share the common basis with JICA/JBIC approach to mitigation in developing countries. SD-PAMs are expected to play a role of engaging developing countries in the post-2012 framework.

There are a range of issues, however, that need to be defined to implement SD-PAMs, such as those on which countries and what types of policies and measures would be eligible for SD-PAMs (Ellis, 2007). How SD-PAMs could be monitored is also an important question in light of the Bali Action Plan, adopted at COP13, where the international community agreed to consider 'mitigation actions by developing countries in the context of sustainable development ... *in a measurable, reportable and verifiable manner*' (UNFCCC, 2007).

[1] In October 2008, JICA and the Overseas Economic Cooperation Operations (OECOs) of JBIC will merge to form the 'New JICA', which will offer a *one stop* service for technical assistance, grant aid and ODA loans.
[2] For our co-benefit project examples, please refer to JICA and JBIC (2007).

In addition, the real effectiveness of SD-PAMs needs to be examined. Given the scale of the climate problems we face, SD-PAMs on their own may not be enough. For more advanced developing countries in particular, SD-PAMs would need to be implemented together with other strategies, such as sectoral approaches.

Conclusion

SD-PAMs as well as a co-benefit approach are a good starting point for engaging developing countries into mitigation action. In order to achieve the ultimate objective of the Convention, however, SD-PAMs would need to be complemented by other strategic approaches. This would be particularly the case with major emitting countries, where the approaches to Low Carbon Society (LCS) should be integrated into SD-PAMs.

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Lead Speech

Biomass and SD: Ethanol in Brazil, a single case

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1) Public subsidies, now phased out, were fundamental to the Ethanol Program in Brazil. But such public effort would be in vain if the subsidized sector hadn't invested in R&D looking for productivity growth and technical progress, which have been verified in sugarcane crops, in sugarcane processing and in ethanol fired and flex fuel cars manufacturing.

2) High level oil prices, energy security concerns and the global GHG emissions reduction efforts have been pushing domestic production and exports.

3) According to government scenarios, ethanol production in Brazil is expected to grow from 18 billion litters to reach 67 billion liters in 2030, of which 12 billion liters would be exported. To make it in a sustainable way is a non-negligible challenge.

4) Kojima & Johnson (2005) show that gasoline/anhydrous ethanol blend are heavier taxed than hydrous ethanol in Brazil. This taxing policy is a very good example of how government may act if he wants to have some influence on ethanol demand levels in Brazil. The question is to know if the current policy of taxing gasoline/anhydrous ethanol blend heavier than hydrous ethanol would be enough to foster demand or if this policy would have to be deepened in order to do so.

5) A technological breakthrough in ethanol production would be using the cellulose contained in the bagasse as an input. This may double or triple ethanol productivity per hectare, and also reduce land needs in a high production scenario. (For instance, the main ethanol production equipment manufacturer in Brazil claims that after twenty years of development, the flash acid hydrolysis is now able to deliver 109 to 180 liters of additional ethanol per ton of bagasse, at competitive costs, based upon results obtained at its 5,000 liters/day demonstration plant, yet to be scaled-up to 50,000 liters/day. This may nearly double ethanol output per hectare, supplying additional up to 5,600 liters/ha/year on the top of current 6,800 liters/ha.year yield (Fairbanks, 2003). This new market for bagasse would also favor an optimization of energy use at the distilleries, allowing for maximizing bagasse surplus after meeting the heat and power process needs.

6) Pre-harvest burnings are still a problem for local air pollution next to sugar cane fields, but the practice has been progressively banned in São Paulo State, where 60 % of the production is

located. This allows for a more efficient use of the sugar cane biomass (the straw and the bagasse).

7) Bagasse is already a very important energy source in its own right, used for generating heat and electricity. The increase of energy efficiency in this process may add almost 100 TWh/year to the system, considering present levels of sugar cane production, and this only with bagasse. If 20% of the straw is also used (most of the straw should be left in the field for agronomic reasons), this extra supply might reach 140 TWh/year.

8) In Brazil, not only ethanol production tends to increase. Biodiesel has also a great potential to be developed. As for the ethanol case, at the beginning, public policies and investments are necessary and desirable to foster investments and futures economies of scale, productivity gains and to improve its contribution to sustainable development. The Biodiesel National Program intends to fill this gap, learning from the ethanol program experience. However, much has to be done yet in further detailing its guidelines to reach a consistent regulatory framework.

9) There is also scope for a potential synergy between biodiesel and ethanol programs. According to Dedini, building a biodiesel transestherification unit integrated to an ethanol distillery may reduce investment costs by 20% to 25% (Olivério, 2005).

10) Ethanol fuel in Brazil contributes to energy matrix diversification. Moreover, it also contributes to improve reliability of internal energy supply, to reduce balance of payments problems related to fossil fuel imports, to foster sustainable long term energy supply, to promote regional social development and to reduce local pollution and GHG emissions.

11) Even though those positive externalities are evident in the Brazilian case, they are very difficult to be quantified. If so, these externalities might foster even faster biofuels development.

12) Biofuels development represents a major opportunity to rethink rural development and to promote a new rural development cycle, especially in Brazil due to its natural advantages, which include the largest biodiversity in the world, the largest land area still free to agricultural use and several different climates and excellent hydro resources (Sachs, 2004).

13) Biofuels are only a part of biomass use. Biomass can be used to produce not only biofuels but also food, fibres, plastics, construction materials, industrial feedstock and pharmaceuticals. Several developing countries can foster their development on the condition of exploring their biodiversity. Biotechnology should be used both to enhance biomass output and to widen the spectrum of its by-products. In this way, such countries “may engage ahead of industrial countries into a genuinely sustainable and fairly labour intensive development pattern, on the

condition of respecting the rules for an ecologically sound management of forests, land and water" (Sachs, 2004).

14) On the long run, it is important to conduct a strategic social and environmental assessment of sugarcane production expansion, with an appropriate zoning, in order to ensure biofuels development sustainability. Air, soil and water pollution, soil erosion, impact on food prices and in land use, especially deforestation; energy balances; LCA and well-to-wheels analysis for GHG emissions reductions estimates and social conditions of manual workers are the questions at stake.

15) Sugar cane ethanol in Brazil is unique case. The energy and GHG balances are definitely very favorable due to some local factors, such as agricultural practices, including low fossil fuel use; a high yield of the culture per hectare; a high yield of fuel per unit of feedstock processed; and a large use of sugarcane biomass to replace fossil energy in the ethanol processing. Therefore, the positive conclusions of sugar cane ethanol in Brazil might be not applicable to other biofuels.

16) It is worth therefore quoting IPCC 4AR WGIII SPM "Biofuels might play an important role in addressing GHG emissions in the transport sector, depending on their production pathway"

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Lead Speech

CO_2 Reduction in Transport Sector in Thailand: Some Insights

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Thailand is the second largest economy in the ASEAN region. It is also the second largest in CO_2 emission in the region. Thailand's total CO_2 emission was 206 million tons in 2004, which was 2.62 times the corresponding figure in 1990. Thailand's share in the global total CO_2 emission increased from 0.4% in year 1990 to 0.8% in 2004. The total CO_2 emission increased by 162% during 1990-2004 in the country, which shows a much higher growth rate than that of the global CO_2 emission (28% during the period). The annual growth rate of the country's CO_2 emission per capita during 1990-2004 was 5.99%, which is substantially higher than that of OECD (0.32%) and Asia excluding China (3.06%). The transport sector accounts for 29.5% of the total CO_2 emission in Thailand due to its heavy reliance on fossil fuels. The figure is not only substantially higher than that of major emerging developing countries like China (6.3%) and India (8.8%) but is also higher than the corresponding figures of the developed countries (27.1% in OECD and 20.8% in Japan). The transport sector in Thailand is predominantly road based. This is evident from the fact that at present the total length of highway is 64,000 km and the total length of railway is less than 4,070 km. The transport sector is heavily based on fossil fuels and accounts for more than one third of final energy demand.

The Thai Government has some environment-friendly strategies and plans in the transport sector, which include substitution of existing diesel-run trains with electric trains, developing mass rapid transit to substitute private vehicles (813 km long double track trains) and intercity trains to reduce private vehicles within city area. The government has developed a very ambitious plan for biofuels promotion in the transport sector, which aims at substituting 10% of diesel use with bio-diesel by 2012. This plan requires the utilization of 85 million liters of blended biodiesel per day and production of 8.5 million liter per day of pure biodiesel production by 2012. The production will be based on palm oil and Jatropha. Also the government has a Gasohol Strategic Plan which would increase the utilization of E10 Gasohol from one million liters per day in 2006 to 3 million liters of ethanol per day by 2011.

Our study on CO_2 reduction potential in Thailand shows that increasing the use of biofuels in the base case during the planning horizon of 2000-2050 (i.e., increasing the use of biodiesel from 500 ktoe in 2005 to 30,000 ktoe by 2020 and to 40,000 ktoe by 2050 and similarly increasing the use of Gasohol from 500 ktoe in 2005 to 10,000 ktoe in 2030 and to 20,000 ktoe by 2050) would reduce the cumulative CO_2 emission during the period by 0.8% from the total emission during the period in the absence of biofuels[1]. Also, it was found that increasing the availability of biofuels during

[1] The study used a bottom-up energy system model of Thailand, which we developed using the Asia Pacific Integrated Assessment Model (AIM)/Enduse framework.

2020-2050 (i.e., biodiesel availability increasing from by 30,000 ktoe in 2020 to 80,000 ktoe in 2050 and Gasohol increasing from 10,000 ktoe in 2030 to 40,000 ktoe in 2050) would reduce the cumulative CO_2 emission during 2005-2050 by only 0.27%. This demonstrates that without a massive biofuels production/procurement program, that is far bigger in scale than conceived presently, biofuels cannot contribute significantly to total national CO_2 emission reduction. On the other hand, a program for a substantial increase in biofuels production would face the standard conflict of having to use the agricultural land for fuel production instead of food production.

Our study (Shrestha et al., 2008) shows that if passenger travel demand based on cars, vans and pickups is shifted to that based on electrified MRTS and railways by 10% in 2015 with the shift increasing up to 30% by 2050, there would be a reduction in cumulative CO_2 emission during 2015-2050 by about 1.87% as compared to the CO2 emission in the base case. This shows that shifting the passenger transport demand away from the low occupancy road based personal transport system to MRTS and railways would have a significantly large CO_2 reduction potential.

How large could be the effect of carbon tax in reducing CO_2 emission from a country like Thailand? Our study shows that introducing a uniform (i.e., constant) tax of \$100/tCO_2 during 2013-2050 would reduce total CO_2 emission by about 16.4% from that in the base case (i.e., without both carbon tax and modal shift to MRTS and railways and with limited hydropower availability and with a limited nuclear power generation capacity). If the carbon tax is applied along with the modal shift (as stated in the previous paragraph), the study shows that CO_2 emission would fall by additional 2.2% (i.e., the total emission would be reduced by about 18.6%). This clearly shows that climate policy related economic instruments like carbon tax would be more effective, when there is an option for investment in public transport systems like MRTS and electric railways. This, however, requires a major shift in the government's policies and plans to favor the development of MRTS and railway based public transport infrastructure.

Furthermore, the options of additional hydropower import (up to 93,040 GWh by 2050) from neighboring countries, enhanced nuclear power generation capacity (up to 40,000 MW by 2050) and the modal shift (as described earlier) are considered along with a carbon tax of US\$100/tCO_2, our study shows that the total CO_2 emission would be reduced by an additional 6.3% as compared to the case with the carbon tax alone. In other words, the total emission in such a case (with modal shift, additional hydropower import and nuclear power generation combined) would be about 22.7% less than that in the base case. These results show that the carbon tax would be much more effective in CO_2 reduction if the wider options of investments in non-road public transport infrastructures, regional hydropower development and nuclear power generation are considered.

Thus, if a developing country like Thailand is to pursue a development path towards a low carbon economy, it is important to orient the public policies toward those favoring climate friendly infrastructure developments (e.g., electrified MRTS and railways, regional transboundary hydropower development) besides programs to improve energy efficiency and promote greater use of renewable energy.

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Lead Speech

Toward Low Carbon Society Forestry Sector

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Climate science identifies that to avoid dangerous climate change the average global temperature increase (over pre-industrial level) should be kept below 2^{o}C. To ovoid this, the CO_2e concentration at the atmosphere by 2050 should not be more than 450 ppm. The world should be able to reduce their emission by at least 50% below 1990 level emission by 2050. Following the principle of 'common but differentiated responsibility', developed countries should target an emissions peak between 2012 and 2015 with 30% cuts by 2020 and at least 80% cuts by 2050. For developing countries, their emissions can increase up to 2020 and then have to be cut by around 20% against 1990 levels by 2050. By the end of the 21st century, per capita emissions would fall towards zero in net terms. Based on historical data, it is clear that rate of emission per capita has positive linear relationship with income per capita. Main source of emissions are also related the level of country development. Emissions from land use, land use change and forestry appear to be the main source of emissions from less developed country. In least developed countries, the contribution of LULUCF to the total GHG emissions is almost two third, while in developing countries is about one third. In developed countries, emissions from LULUCF are almost none and this sector is believed to be a net absorber of CO_2. This suggests that in the context of least developed and developing countries, controlling emissions from LULUCF would play significant role in combating global warming. As most of community in least developed and developing countries still depend very much on forest, reducing emission from land use, land use change and forestry from these countries would be difficult without assisting them in improving their land/forest management practices, providing technologies that can reduce the use of fire in opening and clearing land for agriculture practices, improving land productivity and restoring degraded land as well as diversifying economic activities to reduce their dependency on forest. Creating incentive system for reducing emission from deforestation and forest degradation (REDD) will be very important to assist these countries to reduce their emissions from LUKUCF. Government of Indonesia is now preparing strategies and pilot projects for REDD. A number of challenges are identified for the implementation of REDD activities which include governance, payment mechanisms, payment distribution, social issues and legal/regulatory.

Lead Speech

Low carbon society (LCS) and sustainable development (SD) Perspectives of Brazil

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(Brazil)

In December 2007, under the multilateral climate change regime, Parties reached an agreement on the framework to address climate change during the post-2012 period. One of the most important pillars of this framework is the Bali Plan of Action, which sets a negotiation process to be finalized by 2009 on long-term cooperative actions to address climate change by enhancing implementation of the UNFCCC.

According to the Bali Plan of Action, all countries must take part in the global efforts to reduce greenhouse gas (GHG) emissions, but these efforts must be based on the principle of common but differentiated responsibilities and respective capabilities. In this regard, the negotiation process addresses options on how to enhance national and international mitigation actions, including "nationally appropriate actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable, and verifiable manner."

Each developing country must pursue its path of development, in a sustainable manner, based on its national circumstances, and should make all the efforts to reduce GHG. These efforts must be strengthened through the provision of positive incentives, including technology transfer and financing, from the international community. Developing countries will need improved access to adequate, predictable and sustainable financial resources and technical support.

Based on its national circumstances, Brazilian efforts towards a LCS include tackling deforestation and using ethanol as a substitute for gasoline. Deforestation is the main source of GHG emissions in Brazil. However, the rate of forest loss in the last three years has decreased by almost 60%, which represents an unprecedented success in reducing deforestation. Moreover, the use of ethanol as a substitute for gasoline has avoided emitting 644 Mt of CO2 over the last 30 years. In Brazil, ethanol production from sugarcane not only reduces greenhouse gas (GHG) emissions and is socially sustainable, but it is also energy and cost- effective.

In fact, biofuels from developing countries (DCs) have a great untapped potential to reduce global GHG emissions. However, major energy consumers in the developed world have placed all kinds of barriers to biofuels from DCs. Barriers to biofuels distort markets, raise energy prices, spread poverty, endanger food security and are totally inconsistent with climate concerns. Therefore, barriers to biofuels should be removed promptly and unconditionally.

A successful conclusion to the World Trade Organization (WTO) Doha Round of negotiations, with the inclusion of ethanol and biodiesel in the list of environmental goods and services, is fundamental for the reduction of tariff barriers related to biofuel exports. Efforts should be deployed to ensure that ethanol and biodiesel will be produced in a sustainable way, but these efforts shall not

create unnecessary non-tariff barriers to international trade, especially to exports from developing countries, or validate the current unsustainable consumption of fossil fuels.

Lead Speech

Sustainability for all

Kensuke Fukushi
The University of Tokyo
(Japan)

Sustainable development has so far been considered in the domain of natural resources and environment. Climate change is a relatively recent issue. While it potentially large impacts for developing countries, the developed countries fear of losing current quality of life and property.

Large cities and medium-to-large industries in developing countries like Thailand, Malaysia and Indonesia realize the problems of waste-water, air pollutants and solid wastes, and have some mechanisms in place to treat these while simultaneously emphasizing development.

The waste-water and other local pollution treatments consume a lot of energy in developed countries. To take the example of river water treatment in Tokyo, about 20-90% of water is treated at various river bridges in Tokyo. But purification of waste-water needs energy. Purification of 1 ton of waste-water consumes equivalent of 0.5 litre of crude oil and releases 0.2 kg CO2.

A typical sewer system in developed country cities consists of the following:

- Pipeline to drain storm water
- Pipeline to drain waste-water from houses and buildings
- Treatment facility to treat waste-water; this process is energy intensive

While the cost of treatment facilities is not so high, the cost of setting up sewer pipes for all cities of the world is beyond its economic level.

Hence the developed country practices may not be suitable for developing countries.

Key issues for establishing a sustainable urban environment in developing countries are as follows:

- Model of developed country cities may not be suitable for setting up urban environmental systems in developing countries, and we may have to look for an alternate model to ensure sustainability
- Requirements of development and urban infrastructure must be balanced
- While local environmental issues are being considered in urban areas of developing countries, climate change issues are not the major driving force for action

Lead Speech

Integrating LCS Concept into SD Strategy in All Countries

Ryokichi Hirono
Seikei University
(Japan)

The concept of SD focusing on poverty reduction and capacity development of especially the poor, ever since introduced by the Commission on Environment and Development in 1986, has been endorsed by all member states of the United Nations and become a key concept in the mainstream of national and international development.

Today a new concept of Low Carbon Society (LCS) has been proposed by many countries including the United Kingdom and Japan, in the context of exploring into Post-Kyoto international arrangements for climate change up to 2050. To deliver LCS through SD, all countries, both developed and developing, are expected to do their level best in integrating LCS concept into their respective national SD strategies as well as the international SD strategy for the 21st century.

It is understood that because of vast differences not only between developed and developing but also within them in the stage of economic, social and political development, economic growth rates, resources endowment and ecological conditions, the major concerns of SD, while observing commonality, are different among countries, allowing different priorities and approaches toward SD and LCS. Today most of what is once called national environmental issues such as air, water, soil pollution and hazardous industrial wastes have become global under the on-going pressures of economic, social and political globalization. Climate change, along with deforestation and trans-boundary emission such as acid rain, sandstorms and haze, has increasingly become serious, threatening not only the economic prospects of countries concerned but also the ecological conditions of the planet Earth. It is therefore a global imperative for all countries to take immediate actions to prevent the adverse impact of climate change through adaptation and mitigation and facilitate to achieve SD by transforming their economic activities and lifestyles into lower carbon intensity and build a LCS. Developed countries, as major sources of GHG emission, have an international responsibility for transforming as soon as possible their own countries into LCSs, while advanced developing countries and other developing countries could follow under the internationally agreed principle of “Common but Differentiated Responsibility.”. Expanded international cooperation in technological transfer/development and finance, involving all stakeholders concerned around the world, is essential to assist all those developing countries in delivering LCS through SD.

Lead Speech

The Sustainable development Policies and Measures (SD-PAMs)

Stanford A.J. Mwakasonda
Energy Research Centre, University of Cape Town
(South Africa)

South Africa made a submission to the United Nations Climate Change Convention negotiation process in Bali, Indonesia, on sustainable development policies and measures (SD-PAMs) pledge that builds on existing commitments of developing countries. The basis of this approach lies in the fact that almost all developing countries are signatories to the Convention and the Kyoto Protocol, both of which take into consideration issues of sustainable development. Convention Articles 2, 3.4, and 4.1, as well as Kyoto Protocol Article 10 dwell on matters generally pertaining the implementation of commitments in a manner that promotes sustainable development.

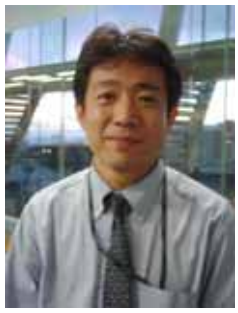
The SD-PAMs approach is built on the premise that developing countries would need to make a pledge to implement and accelerate national sustainable development plans. The pledge, and subsequently a 'commitment', would not necessarily be measured directly in GHG emissions units, but rather in Sustainable Development (SD) units – building a 50 000 energy efficient homes, rather than a specified reduction in tons of CO_2 emissions.

SD-PAMs commitments would initially be voluntary, although they could be made mandatory for at least some developing countries. To formalize the approach, some need for reporting and oversight through the Climate Change Convention would be necessary. Reporting would assist in monitoring whether SD-PAMs are actually implemented, and this would require some institutional capacity in the pledging country. At the same time, reporting can help to correct the mis-perception that developing countries are doing nothing on climate change.

At the international level, reviewing the pledges would require a decision of the Conference of the Parties to establish a registry of SD-PAMs. Rather than creating an entirely new institution, suggestions have been made to create a special SD-PAMs reporting registry within the existing framework of the UNFCCC. Such a registry would record data based on regular reporting by Parties on their SD-PAMs, and support from the Secretariat for maintaining the records of implementation. If voluntary reporting proves successful, a next step would be to make reporting of SD-PAMs mandatory for a group of middle-income developing countries. Some developing countries might view this as intergovernmental control over national policy making, which could present a political obstacle. However, there need be no prescribed list of SD-PAMs, leaving it to the country to define its own policies, much as this study has examined energy policies that would make South Africa's development more sustainable.

In short, developing countries would formulate, implement and report on SD-PAMs. Reporting and international review seem consistent with a facilitative approach to compliance.

Lead Speech



Role of official development assistance (ODA) loans for enabling low carbon society (LCS)

Tomonori Sudo
Japan Bank for International Cooperation (JBIC)
(Japan)

ODA loan is one of modalities of Official Development Assistance providing loans with concessional terms and conditions. To achieve its objectives, ODA loan has several characteristics, such as:

ODA Loans

- provide from Government to Government (G-G),
- focus on development objectives in developing countries
- support public projects and public-private partnership projects which are low commercially viable
- create enabling environment for private investors to invest in Developing countries.

Through its characteristics, ODA loans aims to encourage developing countries' ownership and self-efforts for their sustainable development.

Japanese ODA Loan offers very concessional terms and conditions for environmentally sound projects with interest rate in the range of 0.55% to 0.65% per annum and repayment period of about 40 years with 10 years grace period. ODA loans focus on development objectives; support public-, public-private partnership-, and low commercially viable- projects; and create enabling environment for private investors to invest in developing countries (DCs).

ODA loans have worked as an effective policy incentive tool. ODA loans have introduced special terms and condition for environmental projects/programs as a part of Kyoto Initiative in 1997. Since then, the number of environmental projects has been increased as shown below. ODA loans have worked as stocktaking of "know-how" to address to climate change.

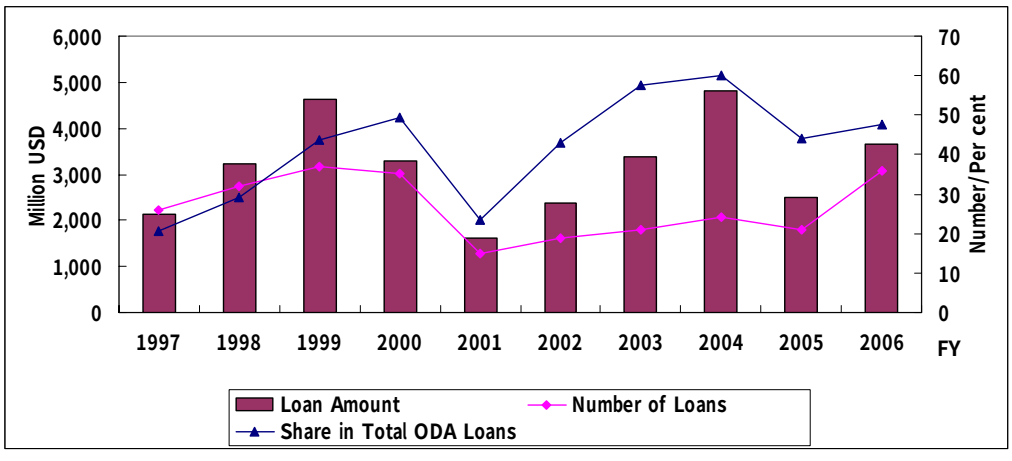


Figure 1. Trends of environmental ODA loans

ODA loans will be provided through several sorts of finance schemes, such as project loans that could support construction of LCS, development policy Loans (DPLs) that support SD-PAMs, two step loans and engineering service loans. ODA loans are sometimes provided through co-financing with the World Bank, Regional Development banks such as Asian Development Bank, Global Environment Facility and/or other bilateral donors. Technical assistance through special assistance facility (SAF) is also provided by JBIC for smooth implementation of its funded projects.
These financing schemes could be applicable to LCS as complement of private finance.

One of the key points of roadmap to low-carbon world is to create environment in realizing LCS through ownership with strong political will, result-oriented development policies and actions and access to adequate, predictable and sustainable financial resources with incentive. The other key point is to understand the investment and development environment that are different among countries due to their potential such as political stability and resource endowment.

Lead Speech

Shiga's scenario for a sustainable society in 2030

Yoshiaki Yamanaka
Shiga Prefectural Governmen
(Japan)

We are facing…
○Global warming
○Overuse of natural resources
○Ecosystem crisis

⇨

●Climate change & extreme weather events
●Environmental damage
●Damage and loss to the economy/society
●Depletion of natural resources
●Destruction of the ecosystems

Urgent and firm actions for building a sustainable society are needed.

Vision in 2030

A resource-rich, secure and prosperous society where its natural environment – first and foremost, Lake Biwa's ecosystem – is protected, and citizens' well-being is being improved continually through sustainable development in environmental, social and economic dimensions.

Why is a Vision essential?

(1) To establish a guiding principles shared by citizens, businesses, and government to build a sustainable society in Shiga.

(2) To improve well-being and increase business opportunities that will lead to sustainable development in Shiga by making full use of the creative ideas and vibrancy of citizens and industries of Shiga.

From Vision to Reality :A scenario for a Sustainable Society in Shiga

- GHG emissions are halved by the renovation of social systems and technology.
- All industries develop in an environment-friendly manner.
- We live in harmony with Lake Biwa ecosystem and make wise use of natural resources.
- Compact urban development is carried out in appropriate scale and form.
- Social infrastructure improvement accelerates the use of public transport.
- Lake Biwa retains an important role as a source of recreation for citizens. (Etc.)

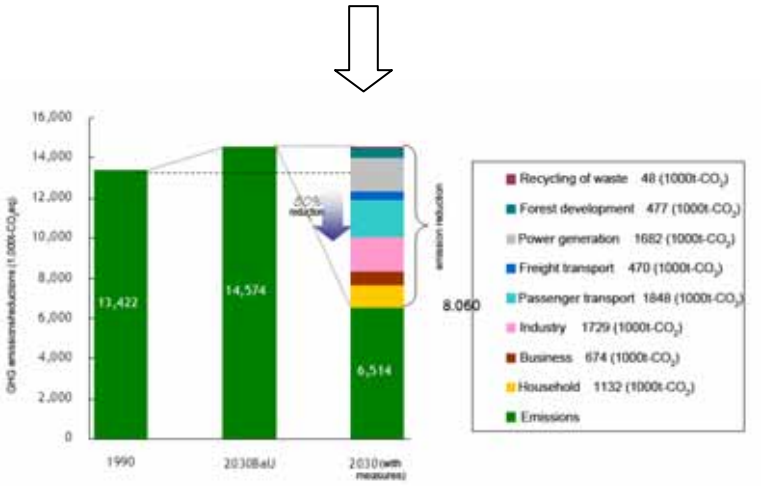
Goals to achieve the scenario

Building a low carbon society	Restore Lake Biwa healthy ecosystem
○ **GHG emissions in Shiga is reduced by 50% from its 1990 level by 2030**	○ A healthy ecosystem in Lake Biwa and its surrounding areas, as well as a safe water environment are well protected. ○ The functions of Lake Biwa, supplying food, shelter and place for recreation revitalized.

Measures to build a low carbon society

- Local production, local consumption to reduce “food mileage” and “wood mileage”
- Promotion of public transportation
- Designing compact cities
- Locally-based carbon offset system

(With other implementations)



Key-Note Speech

Enabling LCSs (Low-Carbon Societies) : Investment

Takejiro Sueyoshi
UNEP Finance Initiative
(Japan)

The key messages relating to LCS investments are as follows:

- Strong, early action is critical to reduce emissions as it can dramatically limit the long term cost of addressing climate change
- Government is expected to push behaviour of change through mitigation and adaptation policy; Clear policy initiatives, regulations and incentives are needed that encourage public-private collaboration in the desired direction of investment
- Response from financial markets is not enough, thus new regulatory framework is required to steer much greater investment from the private sector; at present the investors may find it difficult to make desired investment

Main recommendations for the policy makers are:

- To end the uncertainty over international climate policy post 2012 by coming out with clear phase-2 of Kyoto or its successor and setting binding commitments as the investors need investment horizon of 10-20 years
- To provide compatible regulation on carbon markets and further globalize the carbon markets, so as to initiate early actions in developing countries as well; this will involve widening the scope of ETS, reducing transaction costs, setting international standards; carbon market is one of the ways to achieve increased investment in renewable energy
- To overcome policy barriers by reducing subsidies in less efficient or less clean options, and removing standards that inhibit implementation of low carbon solutions
- To encourage desired investments by introducing carbon tax, tradable rights, fiscal incentives, direct support for low carbon activities, and providing data/information helpful to investors
- To encourage innovations through international collaborations and informal arrangements such as APP

Financial flows need to increase substantially in the next 10-20 years. The financial sector has the following roles to play in mobilizing the right investments:

- Act more aggressively by cutting off financial support to high carbon investments
- Factor climate risks into lending policies, investment decisions, and insurance risk calculation and pricing
- Financial institutions need to integrate climate change related risks and opportunities into their core financial operations
- Engage with government decision makers to optimize the allocation of available funds to combat climate change and to promote innovation and technology development

- Reduce one's own direct impact contributing climate change and report emissions transparently.

Financial institutions have a pivotal role to play in guiding investments towards climate friendly direction so that the world economy becomes more stable and viable

Key-Note Speech

Delivering a low carbon society - mobilising the finance sector

Emma Howard Boyd
Jupiter Asset Management
(UK)

Jupiter Asset Management has been managing green and socially responsible investment funds for over 20 years with an experienced Socially Responsible Investment (SRI) team. Whilst our early funds do have negative screens (i.e. avoiding unethical investments like arms and tobacco), we have a strong focus on investing in performance-driven environmental themes.

Over the last two decades or so the key drivers underpinning growth of environmental investments have been: growing legislation and government support, increasing commitments of corporates to allocate capital expenditure to improving environmental performance and a change in consumer purchasing habits.

For instance, the UK Society of Motor Manufacturers and Traders recently announced that in 2007 the sale of large gas guzzling cars dropped by 15% whilst the sale of low emission vehicles in UK increased by 17%. It also predicted that sales of small, greener cars will outstrip large cars in 2008. This is due to a mix of factors such as concerns about increasing fuel costs and introduction of fiscal measures such as congestions charges. A utility company in the UK claimed that over 1.5 million households in UK wanted them to conduct energy audit of their houses in response to a mailed questionnaire survey. Such trends are yet to be factored in the valuations of stocks and investments.

Some indicators that point to increasing trends in low-carbon investments are:

- Total retail sales for ethical funds in the UK increased by 3.5 times during 2007
- Total inflows into European SRI funds increases by 43% during 2007
- Venture capital in the European Cleantech sector doubled from 2006 to 2007
- Money invested in clean energy increased by 35% from 2006 to 2007
- Carbon Disclosure Project (CDP), which has 385 investors with combined $ 57.5 trillion of assets, seeks information on business risks and opportunities presented by GHG emissions data from the world's largest companies
- Principles for Responsible Investment (PRI), an investor initiative in partnership with UNEP-FI and UN Global Compact, includes over 200 investors with more than $ 11 trillion in assets
- Enhanced Analytics Initiative (EAI), an international collaboration between asset owners and asset managers, encourages investment research that takes account of the

impact of extra-financial issues on long-term investment, and represents total assets of Euro 1.85 trillion

The following are some results from the above-mentioned initiatives that are now visible:

- CDP: Morley Fund Management reports that of the 29 companies they are engaged with, 15 provided full answers to the CDP
- PRI: 88% of investment manager signatories to the PRI are conducting at least some shareholder engagement on ESG issues, while 82% of asset owners are doing so
- FairPensions: The Fund Manager Responsibility Survey by FairPensionsreveals that 75% of the top 20 fund managers do not disclose responsible investor policies that address environmental and social issues, such as climate change and human rights, as well as corporate governance matters
- EAI: Big mainstream financial companies like Citigroup, J P Morgan, Morgan Stanley, etc., have been evaluated as providing the best analytics of extra-financial issues

P8 initiative is an important initiative led by University of Cambridge Program for Industry (CPI) and representing over $ 2 trillion assets. It is made up of some of the largest global pension funds (of public money) and is looking at how to incorporate climate risks into investment strategies.

In conclustion, while there is significant investment opportunity in green and climate friendly options/businesses, there is a tension between short term investment objectives and long-term climate issues. Therefore there is a need for clear and strong signal from the government on the way policy is heading.

Lead Speech

The Japan Research Institute, Limited

Eiichiro Adachi
Japan Research Institute
(Japan)

In order to achieve the Low Carbon Society, there are several paths that we should discuss on. Of course, it is technologies that can solve many challenges we face. And making policies appropriately is also crucial for building the Low Carbon Society.

But, I would like to emphases the approach through the evolution of a market in my presentation today. Just please focus on goods and services market, labor market and financial market. The term, the evolution of a market was invented in “the 21st Century Declaration” by Japan Association of Corporate Executives on December 25, 2000.

If consumers attach importance to the ethical or socially responsible aspects of companies when they choose goods or services, companies are forced to clean up their acts into a sustainable manner. If new graduates attach importance to the ethical or socially responsible aspects of companies when they choose the place of employment, companies are forced to do the same. If investors attach importance to the ethical or socially responsible aspects of companies when they buy or sell stocks, companies are also affected. Consequently, if we make a market capable of valuing not only "economic aspects" but also "social aspects" and "human aspects", we are able to approach the Low Carbon Society even through the market mechanism.

The 21st Century Declaration mentioned as follows. Along with the strengthening of the functions of the market, we must make efforts as corporations to facilitate the evolution of a market capable of valuing not only "economic aspects" but also "social aspects" and "human aspects." The market is equipped with a mechanism for effective allocation of resources through the process of price formation. Should market participants, as a result of social changes, place added emphasis on values other than "economic aspects," namely "social aspects" and "human aspects," the market has the internal dynamism needed for refining its functions to effectively reflect these values. In other words, the market is able to evolve in step with changes occurring in society.

Then, let me briefly introduce the Japanese current situation at glance. In either market, each survey indicated lower rates of people who paid more attention to the ethical or socially responsible aspects of companies. However, with regard to consumers, about 20% of consumers were very concerned with Corporate Social Responsibility matters. The number of new graduates who consider contribution to society a primary option was growing. And with regard to individual investors, about three fourth of them are interested in Corporate Social Responsibility matters when they buy or sell stocks though the actual investors’ share in capital market is only 1.2 percent.

Nonetheless, the Japanese socially responsible investment market has a history of nine years. The volume of assets achieved more than 60 billion JPY, approximately 285 million GBP. We would like to promote this evolution of a financial market enthusiastically. In this context the UK has

fruitful precedent experiences, I believe. I would like to discuss on how to promote these ethical finance behaviors in Japan, also in the UK. And I think we have many things to learn from the UK experiences.

Lead Speech

Domestic Cap & Trade Emissions Trading Scheme

Yurika Ayukawa
WWF Japan
(Japan)

1) IPCC's Fourth Assessment Report has revealed the seriousness and the urgency of climate change very clearly. The WGI has shown that the temperature increase in the past 100 years was 0.78 degrees Centigrade, and it will increase by 0.2 degrees C per 10 years until 2030. This means that it is inevitable to see an increase of temperature of 1.48 degrees C by 2030. WGII showed how the impacts of climate change will increase according to temperature increase. The 2 degrees threshold was plainly laid out where the extent of impacts get worse when the temperature goes beyond this threshold. However, in the WGIII report, it showed several scenarios, which included one scenario that would enable the temperature rise to 2-2.4 degrees C, if the emissions peak out at 2015 and bring a deep declining curve to a 50-85% reduction from 2000 levels by 2050. This scenario is named "Category I", and only with this scenario will we be able to keep the earth from collapsing and all living nature including human beings to survive.
2) In order to make this Category I scenario happen, we need to take drastic steps now to enable deep emission cuts. Kyoto Protocol is only a very small step, but even during this first commitment period, we must start deeper cuts than obligated, and prepare for the further deep cuts that will be needed post Kyoto.
3) Most important factor to make this happen is to put a price on carbon emission. In fact, the Kyoto Protocol has already put a price on GHG emissions, and the cost of GHG emissions should be implanted into every sector economy-wide, as an economic measure. And for this, carbon tax, or cap&trade emissions trading scheme is the most efficient way. If GHG emissions are penalized by having to pay for it, people will start to think seriously how to avoid it, and this will promote innovative technology developments and make the whole society most efficient.
4) With such a system in place as a political framework, existing energy efficient technology will be dispersed more widely at a cheaper cost, shift investment to cleaner technology to make it less costly, provide incentives to research and development for new technologies for cleaner energy technology, and most of all, make general public aware to change their lifestyles to a lower carbon society.
5) Especially, making big reduction is only able from big emitting sectors, which happens to be the power sector and the industry sector. In Japan, about 65% of direct emissions comes from these two sectors. For big emitting sectors, cap& trade domestic emissions trading system is the most efficient tool, as it will secure emissions reduction and that with flexibility of trading. It also enables companies to select their strategy where to make the reductions and where they

need to buy credits in order to increase their business. It will make companies recognize the risk of climate change will have on their businesses and enable them to prepare for it as a company strategy for the future. Finally, the most attractive part of this scheme is that reductions will be made at the most inexpensive area, and will save the company, and the country of unnecessary costs that they would need to pay for making reductions without such a scheme.

6) In order to implement such a scheme, the government's decision to introduce the system is crucial. Only with such leadership from the government will the industries understand the seriousness of climate change and how the government is trying to fight against it and also avoiding the unnecessary cost that will arise from its impacts, such as strong typhoons, hurricanes, droughts, heat wave, strange disease, virus coming in that never existed before. Once the decision is made, the whole society will become serious in making necessary investments happen and industries cooperating to designing the most efficient system for their country.

7) As a matter of fact, the carbon market is developing worldwide. EU ETS has been taking place since 2005, New South Wales in Australia has been operating their own emissions trading scheme since 2003, the Australian government announced its intention to introduce a ETS by 2012, 10 northeastern states of the USA will start their Regional Greenhouse Gas Initiative in 2009, 7 western states and 2 Canadian provinces have announced a Western Climate Initiative including ETS with the regional goal of reducing aggregate reduction of 15% below 2005 by 2020, 9 midwestern states and one Canadian province signed the Midwestern Greenhouse Gas Reduction Accord, focusing on cap & trade ETS last November, and Florida is also considering a similar scheme. On the federal level in the USA, one bill among the 10 bills submitted to the Congress in 2007 which included a cap&trade system, was voted out by 11-8 at the Senate's Environment and Public Works Committee and will be brought to the Senate floor this year. The bill's name is Lieberman-Warner Climate Security Act. Along with these development in the United States, an International Carbon Action Partnership was formed by a coalition of European countries, US States, Canadian provinces, New Zealand and Norway in the end of October, 2007. ICAP mission is to provide a forum in which governments and public authorities adopting mandatory GHG cap&trade ETS to share experiences and best practices on the design of emissions trading schemes. This cooperation is to ensure that the programs are more compatible and are able to work together as the foundation of a global carbon market.

8) As such, the global carbon market is about to be made, and if Japan does not commit itself soon, Japan will be totally left out of the system and be isolated. Japan must also be aware that for example in the Lieberman-Warner bill, there is a provision that requires importers of primary goods from countries that do not have comparable GHG controls to buy and submit special allowances to cover their products' GHG emissions. If Japan sticks to just "Voluntary Actions", it may be regarded "not comparable" to the cap&trade system that may be adopted in the USA. It is really about time to seriously consider about introducing a cap&trade emissions trading system in Japan, in order to bring about a low carbon society worldwide.

Lead Speech

Lowering Australia's emissions profile

Don Gunasekera
ABARE
(Australia)

- Australia's economy is more emission intensive than most developed countries because of the strong reliance on coal as an energy source. In Australia, continued population and economic growth is projected to lead to increased demand for energy services. Continued reliance on fossil fuels to meet the demand for energy is projected to lead to considerable increases in greenhouse gas emissions in the medium to long term in Australia.
- The enhanced development and uptake of energy efficient and low emission technologies and energy sources is key to weakening the relationship between economic growth, energy consumption and greenhouse gas emissions, and thus enabling simultaneous emission reductions with continued growth in living standards.
- The uptake of more energy efficient and lower emission technologies across the economy has the potential to significantly reduce Australia's emissions relative to what would otherwise occur under current policy settings. With uptake of more energy efficient and lower emission technologies, Australia's emissions are projected to decline to a level about 23 per cent below 2004 levels in 2050, which is about 51 per cent lower than the projected levels under a business as usual case.
- However, numerous market barriers exist that prevent the socially optimal level of investment in low emission technologies. These include barriers to technology development such as the public good nature of research and development and short term time preferences. There are also barriers to the uptake of technologies that have been developed and are commercially viable. Examples of these barriers are technology lock-in, distortion of energy prices, imperfect information and lack of purchasing power.
- A range of measures have been introduced by the Australian Government to improve energy efficiency and reduce greenhouse gas emissions. These policies include an emissions trading scheme from around 2010, a clean energy target and a range of reporting requirements.
- A full range of policy responses will be required to shift the economy to a low emissions pathway. Carbon pricing will internalise environmental costs associated with greenhouse gas emissions, encourage energy efficiency by increasing the cost of energy from emission intensive sources, increase the relative returns of using low emission and energy efficient technologies and can increase investment in clean technology research and development (R&D). Carbon pricing, however, will need to be combined with other measures to overcome other market barriers and induce clean technology development and uptake across all sectors of the economy.

- Examples of other policy options include providing R&D funding for clean technology, government regulation such as performance and technology standards and international collaboration on technology development and uptake. Adaptation strategies will also be required to minimise the impacts of climate change on the economy.

Lead Speech

Low Carbon London Changing Behaviour

Narito Shibaike
Panasonic
(Japan)

Market transformation is a holistic, market-based approach designed to promote the manufacture, purchase, and use of energy efficient products, services, and/or practices. At its core, it is an integrated and dynamic strategy that coordinates separate technology push and market pull policies and programs to produce a permanent shift in the target market.

Manufacturers have two important tasks for creating market. One is to develop the energy efficient appliances and sell them at reasonable prices. The other is providing and delivering accurate and simple information to present the environmental performance of their products for customers to understand it.

Indicators on energy efficiency should be effective in both of technology push and market pull. Manufacturers can measure the position of products with the indicator, so that they will develop better ones. Consumers can know the progress of products by the indicator, so that they will buy better ones.

Worldwide indicators must respect and reflect individual economy's background. If not, the indicators cannot give practical results and environmental problems will not be solved eventually. It is difficult to make absolute evaluation on energy consumption of each industry and product. Improvement of efficiency is easier to understand and more acceptable for each market.

"Eco Efficiency" can consider two significant aspects of products; their functional performance and environmental impact. "Factor X" is a specialized indicator which can show the improvement of each product's value or benefit and environmental friendliness at the same time.

Major electronics companies in Japan have voluntarily agreed to develop the guideline for "Common Factor X" by "Eco Efficiency" evaluation to provide meaningful indicators for the market as a new powerful communication tool between manufacturers and consumers. An evaluating methodology about four energy consuming products such as air-conditioners, refrigerators, lamps, and lighting apparatus was made with designating the GHG emissions as their environmental impact. At present this collaborative works are still actively going to expand the target products and alliance companies.

Combination of measures is making up for effect which a single measure lacks, and each measure is concurrently being a "catalyst" for acceleration of market transformation; the development and diffusion of energy efficient appliances.

Lead Speech

Prospects for a Low Carbon Society: The Case of Canada

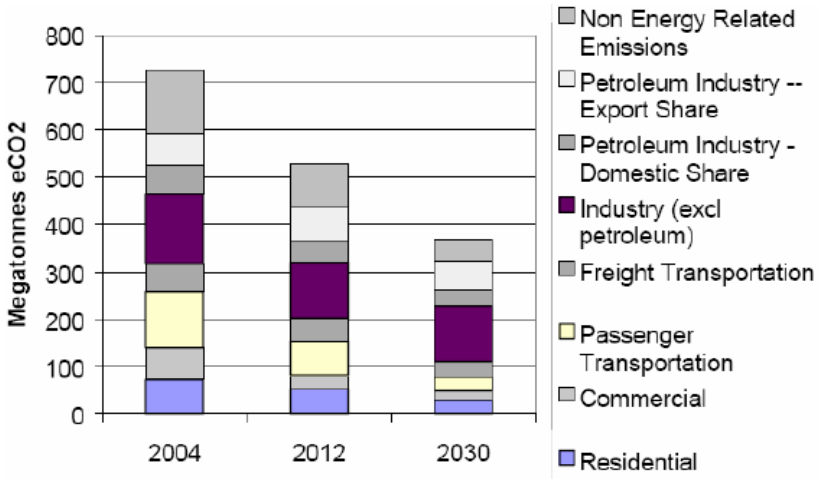
Ralph Torrie
ICF Canada
(Canada)

Low Emission Scenarios for Canada

The first low emission scenario for Canada was developed for the David Suzuki Foundation and focused on what it would take to cut Canada's greenhouse gas emissions by 50% by 2030, [1] as illustrated in Figure 1. Utilizing a standard, bottom-up, end use focused methodology; the analysis systematically evaluated the technological potential for reducing emissions in Canada with existing and economically feasible technologies. By far the most important conclusion from the study was that the key to achieving deep and sustainable reductions in greenhouse gas emissions is on the demand side of the energy economy, and it also introduced to the policy debate in Canada the idea the low emission future could bring with it significant economic benefits.

Figure 1. A Low Emission Scenario for Canada

(R. Torrie, et. a., "Kyoto and Beyond: The Low Emission Path to Innovation and Efficiency", 2002)



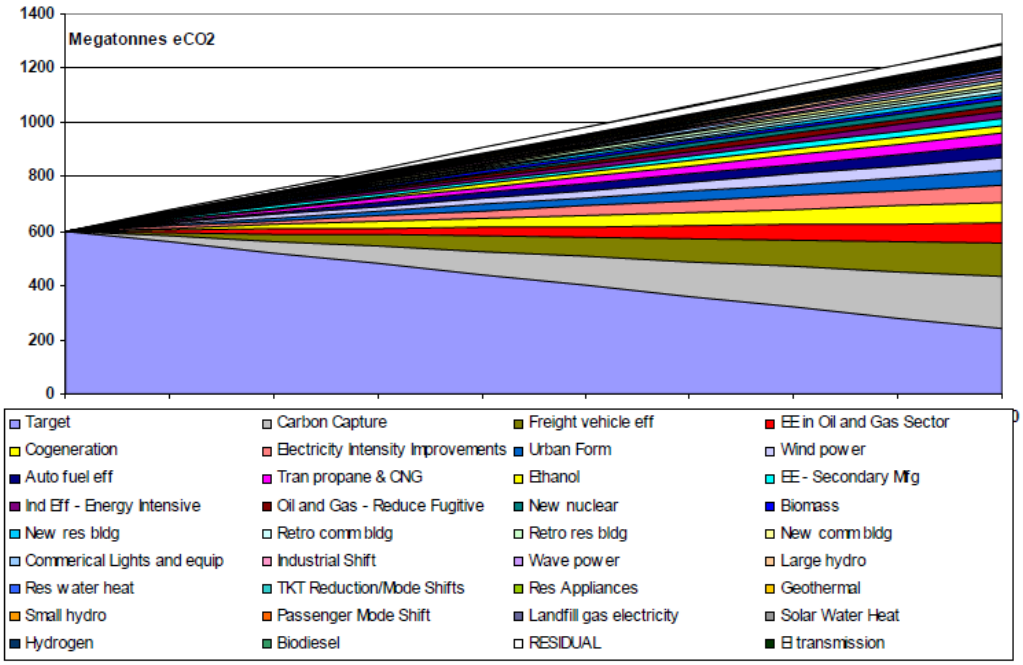
The National Round Table on the Environment and the Economy subsequently sponsored a more detailed "bottom-up" analysis of the technological potential for a deep emission reduction in Canada, this time for a 60% reduction from current levels by 2050.[2] The results were published in the form of a modified Socolow wedge, as shown in Figure 2. Based on this work, the National Round Table developed an advisory note for the government that began to set out the road map to a low emission future for Canada.[3] The key findings of the NRTEE Advisory began to shape the emerging policy for a low carbon society for Canada:

[1] Ralph Torrie et. al., "Kyoto and Beyond: The Low Emission Path to Innovation and Efficiency", David Suzuki Foundation, Vancouver, October 2002. Available on line at www.torriesmith.com.
[2] Ralph Torrie et. al., "Energy-Related Greenhouse Gas Emissions in Canada in 2050: A Low Emission Scenario", ICF International for NRTEE, Ottawa, 2006.
[3] National Round Table on Environment and the Economy, "Advice on a Long Term Strategy on Energy and Climate Change", Ottawa, June 2006.

- A low emission future for Canada is possible with domestic solutions, but can be achieved only if energy is used more efficiently and if energy is emitted while emitting less carbon. Improvement in energy efficiency is key to the low emission future.
- Canada's growing oil and gas production sector could be compatible with a low emission future, but only if carbon capture and sequestration can be perfected.
- Increased deployment of cogeneration and renewable electricity will be needed to transform the power sector to a low emission regime, along with clean coal technology incorporating CCS.
- There is an urgent need for a long term policy signal to give the private sector the confidence it needs to bring GHG considerations into investment decisions.
- Air pollution and other co-benefits of GHG emission reduction measures are important to both the implementation and the acceptance of the low emission future.

Figure 2. GHG Reduction Wedges for Canada

(From Ralph Torrie et. al., "Energy Related Greenhouse Gas Emissions in Canada in 2050 – A Low Emission Scenario", prepared for the National Round Table on Environment and the Economy, Ottawa, 2006)



Work is continuing on refining our understanding of what a low emission future would like for Canada, and the policies and programs that would get us there. Recent work has coupled macroeconomic models with multi-sector energy and emissions models in order to evaluate the economic impacts of greenhouse gas reduction policies. While the policies typically subjected to such analysis fall short of those that would be required to achieve deep emission reductions, they do indicate that the net economic impacts of the portfolio of GHG reduction policies currently in vogue in North America (e.g. carbon cap-and-trade; efficiency standards for buildings, cars and appliances; renewable portfolio standards, etc) will have modest and possible net positive impacts on employment, net output and per capita disposable income, even without, even without valuing the

environmental damage avoided by the lower emissions.

Conclusions and Strategic Directions

The roadmap to a low carbon society has begun to take shape in Canada, first in the form of an understanding of the changes in the way we use and produce energy that will have to take place, and more recently in the form of a debate over the policy responses to get there.

With regard to the technological shape of the low emission future, there are a number of key elements that must be achieved:

- ✓ New residential and commercial buildings constructed with best available energy design and technology
- ✓ Retrofit all existing buildings (except where technically not feasible) for 30-50% improvements in energy efficiency
- ✓ Double and redouble the fuel efficiency of passenger vehicles.
- ✓ Double or triple the fuel efficiency of trucks.
- ✓ Efficiency standards for office equipment, home appliances, motors, lighting to ensure rapid deployment of the new technologies
- ✓ Cogeneration of heat and power as standard practice going forward
- ✓ Continued rapid deployment of wind and other renewable electricity options
- ✓ Continued development of environmentally sustainable biofuels, commercialization of lignocellulosic ethanol technology
- ✓ Emission caps on energy-intensive industry to encourage innovation for more efficient production technologies
- ✓ More efficient utilization of industrial process heat
- ✓ Eliminate landfill methane emissions
- ✓ Alternative industrial processes for non-energy industrial GHG emission sources
- ✓ Low emission techniques and technologies for agriculture
- ✓ Reforestation and afforestation programs to alleviate net Canadian emissions on a 50 year time frame.
- ✓ Carbon capture and storage technology successfully deployed, especially in the oil and gas production industry.

There is a large variation in the types of barriers that stand in the way of more rapid and widespread deployment of the technologies and techniques we need to bring about the low carbon society, but in general these barriers are neither technological nor fundamentally economic. More often there weaknesses in the logistical or financial infrastructure needed. For example, a combination of front-end costs and a dearth of skilled and available labour hold back the acceleration of building retrofits, suggesting the need for financing and manpower training and certification. The development of more fuel efficient trucks is held back by a risk-averse manufacturing sector with limited R, D&D resources, suggesting the need for market development policies. For technologies such as home appliances and office equipment, where the energy costs are

a small contributor to the total cost of ownership and operation, well designed performance standards can be the most effective, and the most cost effective, policy approach.

The “geology of low emissions is complex” – for each of the key wedges needed to bring about low emission futures, a unique policy approach is needed that targets the particular barriers to deployment for that option.

Lead Speech

Put Price on Carbon Liability

Yoshihiro Fujii
Graduate School of Global Environmental Studies for Sophia University
(Japan)

Constructing new canal for LCSs with shared roles

Stern report said that expected cost of cutting emission consistent with a 550 ppm Co_2e will be 1% of global total GDP per year, almost $500bn by 2050. Is is huge or not? I could say no. Because there is over $125trillion in global household wealth only as of 2000 estimated by UN-WIDER. A character of this huge money is uneven distribution. The richest 2% of adults own more than half of them. If we can make new canal for those money pouring LCSs, we can secure $500b every year through new markets trading carbon and related goods. In order to make such canal, we need shared role among governments, financial authorities, accountant organizations and financial players. Governments have to regulate GHG gas as pollutants in legal framework. Financial authorities should treat carbon liabilities of companies as material issues. Accountant organizations should set up common international standards of carbon liabilities on B/S of companies.

Is it same pricing carbon and pricing carbon liabilities?

Almost similar, but slightly different. For companies, it is very big different. Because pricing carbon affects for only companies who traded carbon credits. But pricing carbon liabilities affects all of companies values not only present ones but also future ones. Carbon is priced whether regulated or not, such as voluntary carbon trading. But if governments regulate GHG gas emission, every company other than small emitter have to cost them as a certain amount whether buy or sell. That cost affects company's value. That means setting international accounting standard for carbon assets and liabilities are very important. Accountant organizations should try to corporate and coordinate to set up them with transparent, appropriate and accurate way.

Two roles for financial institutions.

Evaluating those carbon liabilities, financial institutions have two roles. One is evaluating carbon liabilities of investment and loans to companies. Second is providing suitable carbon financial products for global investors including above richest households. Carbon liabilities should be calculated in the acquisition price of the assets, and measured by an expected present value technique to estimate fair value.

Lead Speech

Lessons from results of integrated assessment on carbon tax in Japan

Toshihiko Masui
National Institute for Environmental Studies
(Japan)

From the simulation analysis based on the different 3 models -enduse model, global economy model, and country economy model-, it is concluded that the existing or practical technologies can reduce the CO_2 emissions in Japan to the target of the Kyoto Protocol in the first commitment period. In order to achieve the target of the CO_2 emissions reduction, the necessary carbon tax rate from 2004 onward is estimated to be about 45,000 yen/tC. When the carbon tax is introduced and simultaneously its tax revenue is utilized as a subsidy to lower the fixed costs of the countermeasures to reduce CO_2 emissions, the necessary carbon tax ratio becomes 3,400 yen/tC. The GDP loss in Japan by introducing this carbon tax policy with subsidy is estimated to be 0.061% compared to the GDP in the reference scenario in the first commitment period. The activity in the sectors producing the energy saving equipment such as electrical machinery industry are promoted, and as result, it can mitigate the losses caused by increase of the energy price.

One year later, the input data were updated, and the carbon tax policy was simulated again. The shorter the time period until the 1st commitment period is (it was assumed the carbon tax policy started in 2005), the more expensive CO_2 reduction options must be introduced. As a result, the price of the carbon tax is changed from 45,000 JPY/tC to 60,000 JPY/tC. The increase of the carbon price can be interpreted as the cost of inaction.

Lead Speech

Carbon Market

David Warrilow
Defra
(UK)

The carbon market is an important element of the financial package. By engaging private finance and private actors in mitigation efforts, it creates a transformational effect. If properly designed, it has the potential to deliver investments at the desired scale.

Emission trade figures in 2007 have been impressive. Total emission trade was worth $ 60 billion, up by 64% from $ 33 billion in 2006. Of this, $ 41 billion was in EU ETS and $ 17.5 billion in CDM. Emission trading, by creating a price for carbon, reduced the cost of mitigation efforts and engages the private sector. Similarly, other mechanisms like CDM and JI reduce costs and deliver investment.

However, to convert trade into substantial investment in particular sectors and countries, new supporting instruments may be necessary. Such new instruments can ensure continuity in CDM and allow those that are willing to go further in new arrangements.

Key-Note Speech

Reducing CO2 in Carbon-Intensive Sectors (Especially Steel): Short-term Competitiveness Issues/ Long-term Paradigm Changes

Christopher Beauman
European Bank for Reconstruction and Development
(UK)

A world that seeks to decarbonise poses sharp problems for carbon-intensive industry. Energy-intensive sectors make a disproportionate contribution to CO_2 emissions from industry: three sectors, iron and steel (integrated works), non-metallic minerals (mainly cement), and chemicals and petrochemicals account for 70% of direct industrial CO_2 emissions. But other sectors, such as aluminium, iron and steel (electric arc furnaces), and pulp and paper, are electricity-intensive, and account indirectly for substantial emissions in power supply.

Most of these industries are international. They compete on cost, on quality and on service. If climate change policies increase costs in one country, but not in another, then operations and jobs could move to where costs are lower – "carbon leakage". If they move from an efficient producer to a less-efficient producer, this might actually increase CO_2 emissions.

Of these industries, the iron and steel sector is the most challenging case-study. The integrated route accounts for 60-65% of steel made and about 2bn tons of CO_2. Globally, the production of steel is now rising fast, principally because of China, whose production has increased from 150mt in 2001 to 489mt in 2007. This has transformed the competitive situation in the steel industry, making access to raw materials critical and placing new pressures on the integrated steel businesses of the EU,Japan and Korea which rely on sea-borne raw materials. In this situation, they strongly oppose additional burdens from climate change policies.

What are the implications of this for a steel industry pathway to 2050? Unfortunately there are no quick technological fixes – the classic integrated works cannot easily be decarbonised. Steel industry leaders, coordinated through the International Iron and Steel Institute (IISI), are now co-funding work on more radical "breakthrough technologies", including CCS, new smelting processes based on hydrogen and electricity, and carbon from sustainable biomass.

One solution proposed to address CO_2-intensive industries is Sectoral Approaches or Agreements (SAs). SAs could set benchmarks of CO_2 intensity and encourage the fast diffusion of best practice; they could also provide a framework for public-private partnership to achieve technological breakthroughs. Beyond this, SAs could also provide incentives to reward best practice and penalise less-good practice. But if they are to avoid competitive distortions, they would also require global participation. If global SAs prove impossible, then the steel industry will call for "border tax adjustment" to limit "carbon-unfair" imports.

On the road to 2050, the steel industries of the EU and Japan will need to demonstrate their contribution to decarbonisation by (a) accelerating the development and implementation of "breakthrough technologies" (b) engaging with the steel industries of emerging – and competitor –

countries such as China to accelerate similar implementation and (c) cooperating with customer industries in developing lower-weight, higher value products.

These changes will be disruptive. They require "deep paradigm changes" (IISI). But the stakes are high – 2bnt of CO_2 in integrated steelworks (and growing), more indirectly in electric arc furnaces.

Key-Note Speech

An automotive industry's view

Masayuki Sasanouchi
Toyota Motor Corporation
(Japan)

In the Kaya identity, the terms denoting population and GDP per capita are fundamental human rights for the nation to grow, whereas the terms CO2 intensity of energy and energy intensity of GDP need to be addressed by means of innovation, evolution and deployment of technologies. While the world population is expected to grow from 6.3 billion in 2003 to 8.9 billion in 2050, in the same period the owned vehicles in the world are expected to grow from 0.8 billion to 1.1 billion (assuming 13% ownership rate, same as in 2003) or 1.3 billion (assuming 15% ownership rate).

Historical experience has shown that passenger-km per capita has grown with the GDP per capita in all nations, although the growing rate differs among different countries. Passenger-km per capita has grown in the USA at a much faster rate than in Western Europe and Pacific OECD. This indicats that the rate of transport demand growth can be influenced by appropriate strategies, especially in developing countries who are likely to witness higher growth in GDP per capita in the future.

CO2-equivalent GHG emissions up to 2050 can be reduced to approximately the same level as in 2000 by a combination of following options:

- Diesel vehicles (LDVs)
- Hybrid vehicles (LDVs and MDTs)
- Biofuels (from 80% low-GHG sources by 2050)
- Fuel cells (from fossil originated hydrogen)
- Fuel cells (from 80% low-GHG hydrogen by 2050)
- 10% improvement in fuel economy
- 10% vehicle travel reduction

Setting benchmarked standards can play an important role to achieve efficiency improvements, as happened through the 'front runner' approach in Japan. In the 'front runner' approach, fuel efficiency standard for each category of vehicles are set based on the most efficient vehicle on the latest available year. This mechanism urges innovations towards improvement of engine efficiency and powertrain, and results in a faster deployment of hybrid systems. Front runner standard was introduced in Japan in 1998, and CO2 emissions from its transport sector began declining from then onwards to their current level of about 262 million tons CO2 per year.

Innovative technology such as plug-in hybrid can significantly reduce the well-to-wheel GHG emissions. Combining with biofuels will further reduce the emissions. Several approaches are being pursued using hybrid technology, including the further development of gasoline, diesel and alternative fuel engines, and fuel cell hybrid vehicles (FCHVs) which could have a major impact on emission reduction.

Lead Speech

Approaches to sensitive LCS sectors and NGO role

Kimiko Hirata
Kiko Network
(Japan)

The Japanese policy relies more on 'voluntary actions' rather than formal standards to achieve improvements in efficiency and environmental performance in various sectors. For instance, 54.3% of the measures towards achievement of Kyoto Protocol targets have been undertaken via voluntary action plan, whereas only 11.7% of the measures could be categorized as induced by formal efficiency improvement standards.

A case in point is the Keidanren Voluntary Action Plan. It is an environment action plan devised by the Nippon Keidanren (Japan Business Federation) that makes no commitment to the Japanese government that GHG mitigation targets will be met. It uses "easy targets" through "indicators convenient to the industry," and does not aim to reduce emissions of greenhouse gases significantly. Such voluntary plans cannot become an alternative for emissions trading system.

While the energy efficiency in Japan varies from industry to industry, the average efficiency trends have saturated since the past decade or so, and Japanese industries are no longer the best in this aspect. Therefore, 'industrial structural change' (ISC) is inevitable towards achievement of low carbon society (LCS). However, to induce ISC the following issues will become important:

- New business style: in order to bring about ISC it will be difficult for heavy industry and energy conversion sectors to continue with the current business model; these sectors need to diversify their business and make best efforts to improve energy efficiency
- Pricing carbon: innovative ways to price carbon, for example environmental tax, fiscal reform, and auctions under ETS, will have to be devised to give strong signals to induce the desired shift

NGOs will play an important role to achieve these objectives. They can act as 'watchdogs', monitor government policies, suggest better alternatives, and create pressure to counter vested interests. For instance, the KIKO Network, an NGO, has observed through a study that speedy adoption of bold government policies is required to achieve the target of 30% CO2 reduction by 2020. In particular, strong governmental measures are needed to deal with homes and other buildings, promote energy conservation technologies and renewable energy sources. Independent actions by citizens will also be needed.

However, the current situation of NGOs in Japan leaves a lot for improvement. The NGOs lack critical resources like funds and human resources. Thus empowering NGOs is the key to achieve LCS in Japan.

Lead Speech

Renewable energy policy and politics in Japan

Tetsunari Iida
ISEP
(Japan)

Energy policy in Japan has not been very successful. Despite GHG increasing by 8% and CO2 increasing by 14% from 1990 to 2005, there is still no political consensus on effective policy measures like carbon tax, cap and trade. Although there is potential for renewable energy, political will has been poor, as reflected in too small national targets of 1.3% by 2010 and 1.63% by 2014. On the contrary, there has long been strong political and financial support for nuclear energy although it has high risk with respect to both safety and economics.

Energy market restructuring in Japan began in the late 1990s and it has retained the regional and functional monopolies in the electricity supply sector. Current market monopoly in electricity sector is 97.6%. The regional electricity companies are large and have big influence with the national and local governments. While the ruling party is supportive of the management of electricity companies, the main opposition party is close to their labour union.

The markets for wind and solar PV power have not grown fast enough in Japan. In 1992, ten power companies started voluntary net-metering program for solar PV and wind power as part of climate change mitigation efforts. In 1998 the ten monopolies announced to introduce “15 years fixed price program for wind” instead of fade-out of voluntary net-metering program. This program boosted the wind power market in Japan. Hokkaido Electric Power Co. raised the ‘grid stability issue’ as an excuse to limit the introduction of wind power. Following this, other companies joined and METI set barriers for wind power instead of finding solutions. Small target and slow progress set by Japanese RPS allow the monopolies to set the ceiling for new renewable and bidding.

In case of solar PV the government’s bold subsidy program began in 1994 and it boosted the PV market in combination with ten power companies’ voluntary net-metering program. However, the subsidy had cut down every year and finally ended in 2005. And RPS has been introduced in 2003, that worked reverse on solar PV rather than boosted it. Japan’s RPS targets are the least among regions/countries like EU, Germany, UK, France, China, and states in the USA. The power companies and METI have exercised strong influence to limit the quota on wind and solar PV.

Thus the wind power market has been falling into “political risk trap” in Japan, and the PV market has been falling into “absence of support policy” trap. This experience shows that there is a need for a combination of strong political commitment and innovative integration for renewable energy program in Japan.

Lead Speech

Our Challenge for Clean Development and Climate – Steel Industry's Global Sector-based & Technology-based Approach/Challenge -

Teruo Okazaki, Hironobu Nose
Nippon Steel Cooperation
(Japan)

Japan's Iron and Steel industry has reduced the CO2 emissions by maximum amount between 1990 and 2006 (by average of 10.45 million tons CO2 per year) as compared to other industries. Most other industries actually increased their emissions. Reduction in Iron and Steel industry was achieved by reducing energy consumption by 5.2% at the same time when production rose by 5.4%.

Sector based approach involves looking at reduction potentials within a given sector across the globe. In case of steel industry there are several national and international level institutional arrangements that play an important role, like:

- International Iron and Steel Institute (IISI): It includes sixty countries and cover 100% of the industry
- Kyoto Protocol (KP): Countries bound by KP cover 40% of the world steel industry; this involves unilateral commitment by each country, for example the JISF (Japan Iron and Steel Federation) action plan of Japan
- APP Steel Task Force (Asia-Pacific Partnership on Clean Development and Climate): This includes seven countries (USA, China, Japan, Canada, India, Australia, Korea) and covers 60% of the world steel industry; it also involves bilateral arrangement between China and Japan

KP and APP together cover about 90% of the world steel industry.

Unilateral Initiatives by Japan:

Under the JISF action plan, launched in 1996, Japan initiated the following actions for its steel industry:

- Target of 10% energy saving by 2010 (as compared to 1990)
- Utilization of waste plastics
- Utilization of waste energy outside the steel plants
- Contribution to society by making eco-products and by-products
- Promotion of international technology transfer

As a result of these efforts, CO2 intensity of Japan's steel industry reduced from 203.7 million tons CO2 per year in 1990 to 193.3 million tons CO2 per year in 2006. By contributing eco-products and by-products outside the steelworks, another 12.4 million tons CO2 per year was reduced.

Bilateral Initiatives between Japan and China:

There have been several exchange meetings between steel industry experts of Japan and China with the objective of environmental protection and energy saving.

APP, initiated in 2006, aims to address the issues of .energy security and climate change via regional partnerships. By promoting technology oriented, sector-based approach, and government-private partnerships, APP recognizes a huge potential for CO2 reduction. Based on the actual technical situations of each sector, it is possible to evaluate accurate and practical potential of CO2 emissions reduction. Energy efficiency of developed and developing countries can be evaluated. Best practices can be shared in the easier way. Therefore, practical projects can be implemented under the mandate of APP.

APP Steel Task Force has drawn up an action plan that involves review of diffusion of efficient processes/equipment in different countries, estimation of reduction potentials, identification of specific technological implementation projects for different countries, and setting of targets. For instance, experts from Japan have visited several steel facilities in China and India to identify improvement possibilities. From this survey they have identified CO2 reduction potential of 127 million tons CO2 per year.

Multi-lateral Initiatives:

IISI's CO2 breakthrough program, started in 2003, is an example of such an initiative. It includes phase-1 of seeding R&D until 2008 and phase-2 of starting pilot projects after 2008. IISI's new climate policy statement lists the following commitments:

1. Expanding the use of current efficient technologies.
2. New technology solutions to radically reduce the CO2 intensity.
3. Continuing to optimise and maximise the recycling of steel scrap.
4. Maximising the value of steel industry by-products.
5. Using the new generation of steels to improve the energy efficiency.
6. Developing common and verified reporting procedures
7. Adopting a global sector-specific approach

It has set out six action items for the governments including the replacement of cap and trade emission regimes with policies that allow the most efficient steel companies (in terms of CO2 emissions) to expand and the least efficient to decline.

Lead Speech

Chinese LCS Approaches on International Level

Wang Shu
Chinese delegation
(China)

Chinese LCS approach on the international level is best captured by the following points in relation with the Bali roadmap:

- Chinese government expects further actions on Bali Roadmap
- Mitigation: measurable, reportable, and verifiable actions; developed countries reduce emission first, and developing countries implement positive measures to address climate change
- Adaptation: very important for developing countries; international cooperation needs to be promoted, increase of Adaptation Fund is necessary
- Technology transfer: mechanism with guidance of governmental sectors, participation of enterprises, and market-based operation need to be designed
- Financial mechanism: fund support from developed countries are required to stimulate investment towards low carbon economy

At the domestic level, China is taking the following actions:

- Mitigation efforts are being emphasized for energy production/conversion, and energy efficiency improvement and conservation in industrial processes, agriculture, forestry and municipal waste sectors
- Adaptation efforts are being emphasized in agriculture, forests and other natural ecosystems, water resources, and coastal regions
- Programs have been initiated for promotion of climate change science and technology, public awareness on climate change, and setting up of institutions and mechanisms for such purposes

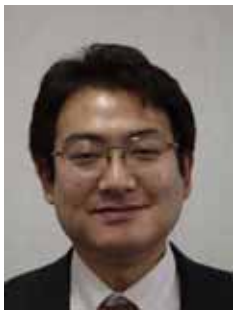
As energy sector is one of the key sectors for transition to LCS, China is taking active steps in this sector, as outlined below:

- Increasing access to energy by meeting growing energy demand and reducing energy poverty, increasing access to sustainable energy resources and infrastructure, and incorporating energy issues in national development plans and strategies
- Increasing energy R&D by identifying priority research areas, promoting energy technology collaboration, developing climate friendly products and processes, and examining the option of nuclear technology
- Promoting energy efficiency and diversity by increasing energy efficiency in production and use, making fossil fuels more climate friendly, and expanding renewable energy

- Providing benefits and incentives via energy-related climate policies like encouraging use of economic instruments, furthering climate adaptation efforts, and maximizing the potential of CDM

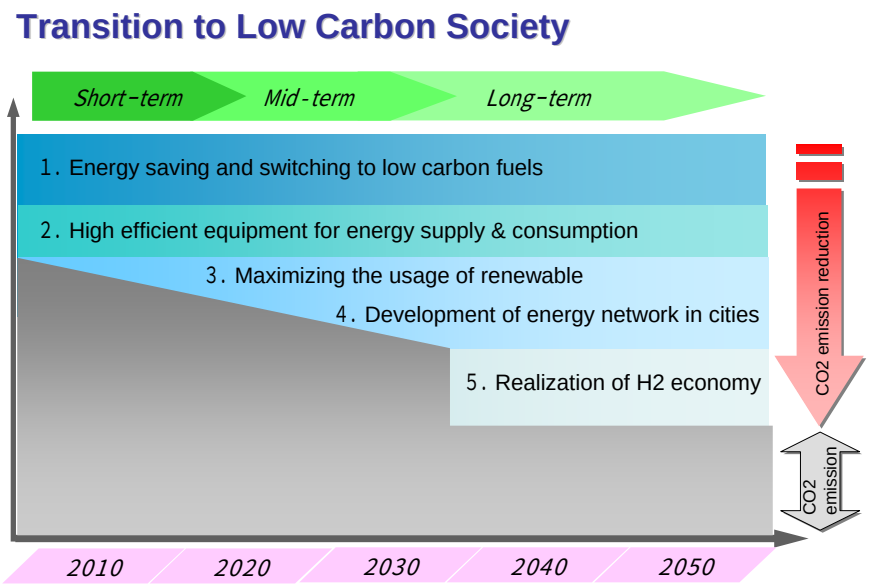
Lead Speech

Hydrogen Economy for Low Carbon Society



Isamu Yasuda
Technology Research Institute, Tokyo Gas Co., Ltd.,
(Japan)

As the largest gas utility company in Japan, we Tokyo Gas are willing to contribute to realization of the future low carbon society (LCS) by developing and promoting low carbon-intensive energy supply and utilization technologies. It's not realistic to try to jump into an ideal LCS, and it's reasonable to define a transition scenario that can be implemented in the real world. The figure shows our multi-stage pathway which has 3 phases towards the LCS.



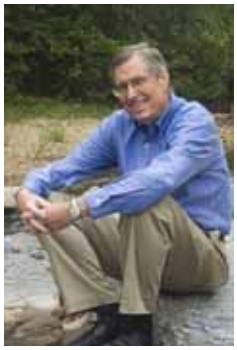
For short-term solutions, 1) energy saving and switching to low-carbon fuels and 2) highly-efficient equipment for energy supply and utilization are effective and they're already in progress. Switching from heavy oils to natural gas for large-scale industrial heating purposes has quickly been penetrating in the market with the help of skyrocketing rise of crude oil price. Great efforts in industries and government have been devoted to promote wide use of highly-efficient appliances such as fuel cell CHP (combined heat and power) systems for residential markets and gas engine and gas turbine CHP systems for industrial and commercial markets. The Japanese government especially METI is leading the world's effort to fully commercialize the residential fuel cell CHP with annual funding of over 30 billion yen. The number of residential fuel cells installed at customers' homes all over Japan will be around 1,000 at the end of FY 2007. These systems can reduce CO_2 emissions from residential houses by 45% under the best conditions. The key issue for the market penetration is cost reduction.

For mid-term solutions, 3) more use of renewable energy and 4) energy network in populated cities will be effective. Many projects are in progress to demonstrate the viability of gasification and utilization of biomass resources. In the near future, biomass wastes from industries and commercial sectors will be widely and highly utilized to reduce energy consumption and as a result CO_2 emissions. A “Compact City” concept in which thermal and electrical energy demands in densely populated areas are integrated and aggregated will effectively maximize the overall energy use efficiency and thereby reduce CO_2 emissions from urban areas. The key issues for these mid-term solutions are the best mix of the available energy sources and efficient utilization technologies which depend on energy supply/demand characteristics of the targeted areas. Micro-grid technology will be essential for successful realization of the best mix, which can mitigate the fluctuating energy supplies from renewables by integrating them with more stable energy conversion systems such as fuel cells and other conventional CHP systems.

For long-term solutions, 5) hydrogen economy is expected to play an important role. Hydrogen in combination with stationary and mobile fuel cell technologies will greatly reduce CO_2 emissions; it can even realize a carbon-free society when hydrogen is produced from renewables or an ultra-low carbon society even when hydrogen is produced from fossil fuels with proper management of the byproduct CO_2 such as CCS. There is a big project called “JHFC (Japan Hydrogen and Fuel Cell demonstration project)” going on led by the Japanese government to demonstrate technical feasibility of hydrogen production and supply to fuel cell vehicles (FCV) and environmental advantages of FCV. More than 10 hydrogen refueling stations have been built and successfully operated in mega cities (Tokyo, Osaka and Nagoya). The fuel economy of FCV has been proved to be 3 times as high as that of conventional gasoline engine vehicles and the CO_2 emissions on the Well-To-Wheel basis are estimated to be reduced by 50% or more even when hydrogen is assumed to be produced from fossil fuels. Recently major stakeholders such as car OEMs, energy supply companies and engineering companies get together at the same table to discuss and share a scenario of transition to hydrogen economy in the transportation market sector. They have reached a consensus that the present demonstration phase will move on to an early market entry phase around 2015 and hydrogen supply infrastructure will have to be in place ahead of roll out of FCV. The key issues to pave this pathway are identified as significant cost reduction of both vehicle manufacturing and hydrogen production and supply equipment, who will pay for the new infrastructure establishment and byproduct CO_2 management including CCS when hydrogen is produced from fossil fuels. Government leadership and support are strongly expected.

Lead Speech

Five Characteristics of an Economically Efficient LCS



Jae Edmonds
Chief Scientist and Laboratory Fellow
Pacific Northwest National Laboratory's (PNNL)
Joint Global Change Research Institute
(USA)

Reductions in emissions associated with a Low Carbon Society (LCS) will require dramatic changes to the global energy and land-use systems. Carbon emissions reductions needed to achieve that goal globally could be 50 percent or more by 2050 and emissions reductions could be greater in developed nations. The challenge of affecting such changes cannot be overestimated.

Economics offers several important insights that can help minimize the cost of achieving such dramatic transformations. Here we articulate five.

1. *Carbon emissions should be priced.*

The global climate is a public good. Anthropogenic climate change is therefore a public goods problem in which private decisions taken in the context of private markets will not achieve a socially optimal solution. The anthropogenic climate change problem cannot be adequately addressed by simply asking individuals to make better private decisions. Better and more environmentally aware private decision making helps, but public intervention is required to create a market consistent with the public interest in the climate that in turn reflects the social value of carbon. Until carbon is valued, emissions will always exceed the socially desirable level and key technologies, such as CO_2 capture and storage, that directly address climate change but at additional cost, will remain on the shelf.

2. *All carbon emissions count the same to the atmosphere.*

All carbon affects the Earth's climate and the introduction of an additional ton of carbon from any source has exactly the same effect regardless of the activity that produced it or the location of the emissions. Whenever the marginal cost of emissions reductions varies from one activity to another or one place to another, there is room for society to have more reductions and at lower total cost. This means that costs are higher every time an exemption is granted to an individual economic sector or particular regions or countries undertake emissions reductions while others do not. This also means that all of the carbon in the terrestrial biosphere needs to carry the same value as fossil fuel and industrial carbon emissions. Leaving that carbon unvalued creates the potential for ancillary environmental consequences from over-deployment of bioenergy in the context of a LCS.

3. *Expectations should be that the price of carbon will rise at a regular rate.*

Unlike other airborne pollutants, such as NO_X, SO_X and CO_2 is a stock pollutant. To stabilize CO_2 concentrations at any level, emissions must eventually be driven to **zero**, requiring increasingly stringent emissions reductions over time and, therefore, an increasing price of carbon. Cost

minimization over time calls for a price path that rises at roughly the rate of interest adjusted by the rate of ocean carbon uptake. This does not mean that future prices can be set today at this rate and be entirely predictable for a century. Uncertainty about a range of factors, including improvements to technology and the damages from climate change, will necessitate regular review of the adequacy of policies and measures; however, it does mean that subsequent to each time the price is revised that the price rate of change of the price over time should return to its upward trajectory roughly consistent with cost-effective reductions over time.

4. *Climate policy should be predictable.*

Many elements of energy and related infrastructure have lifetimes in excess of 50 years. Decisions regarding investment in this infrastructure are based primarily on expectations about future economic conditions, including the price of carbon. If decision makers anticipate substantial uncertainty in the viability or character of future carbon policy, it will retard critical investments needed to address climate change. If decision makers can anticipate that prices will rise at a regular rate, the date at which emissions reducing technologies will be selected will be earlier and the present price of carbon and other GHG's can be lower and still induce investment consistent with an economically-efficient path towards stabilization. A succession of a dozen emissions limitation regimes that each last five years without a meaningful expectation about the consistency between regimes is a recipe for high cost and delayed introduction of technologies associated with capital stocks living longer than five years.

5. *Technology instruments are fundamental to a climate policy portfolio.*

The role of technology is to help control the cost of achieving an LCS. While it is always feasible to stabilize concentrations of CO_2 at any level with any technology, the cost society bears will depend to a large extent on the suite of available technologies. Near term emissions mitigation must inevitably rely on existing technology, but in the mid- and long-term, better technologies could potentially be made available. Policies are needed to establish the conditions that encourage the creation of improved versions of existing technologies and completely new technologies can come into being. Both public and private sector investments will be needed. This includes public sector investments in the basic sciences. Basic science is a field of human endeavor in which the private sector classically under-invests because no individual firm can fully appropriate the benefits of its investments. More than two thirds of all emissions mitigation in an LCS occurring after 2050, more than enough time for investments in science and technology to lay down the foundations for lower cost, better technologies of the future—and not simply improved versions of today's technologies, but also potentially completely new technologies for which there are as yet be no names.

In addition to the characteristics noted above, technology will never deploy absent facilitating institutional infrastructure. Large-scale deployment of any technology will be mediated by institutions. And, while the particular institutional requirements will be different for such technologies as bioenergy, hydrogen systems, CO_2 capture and storage, nuclear power, wind, solar and end-use energy technologies, institutions will play a critical role in shaping deployment. The choice of institutional mechanism will vary both from place to place and over time.

Lead Speech

A Milestone Towards Low Carbon Society: Germany's 40% Reduction Target by 2020

Guido Knoche
Climate Change Division, Federal Environment Agency, Dessau-Rosslau
(Germany)

In order to limit climate change to a temperature rise of 2°C compared to a preindustrial level, developed countries must reduce their GHG emissions by 30% until 2020 and 80% until 2050 compared to 1990. In this regard Germany can support a 30% reduction by the EU with an own commitment of 40% by 2020. At present the Kyoto Protocol targets for 2012 are within reach for Germany and the EU, but they are only the very first step on the way to a Low Carbon Society.

Energy related CO_2 emissions account for over four fifth of German GHG emission budget, of which nearly the half is emitted by the energy production sector. Thus addressing these emissions is key for any considerable climate protection strategy which targets on a climate-friendly and sustainable energy supply. Meanwhile a bunch of opportunities across several sectors have been raised and discussed so far – sometime very controversially. However technical development has led to strong cost reductions in many areas, e.g. renewable energies, and this will continue in the future. Thus, these technologies can be used intensively for electricity generation at moderate additional costs. Modernising and replacing coal-fired power plants provides significantly increases of energy efficiency of the plants. Furthermore the expansion of electricity generation based on natural gas provides a less carbon intensive and more efficient alternative in the energy sector. In addition to these key issues the following options are also claimed: expanded combined heat and power production and optimal heat distribution across heating networks; heat production by district heating systems; improvement of building insulation; promotion of energy efficient products in households and industry; reducing of specific consumption in the transport sector; traffic avoidance; and a shift of the modal split to rail and water ways. Although some of these climate-protecting options still require widespread market penetration in order to be able to compete against conventional technologies, highly industrialized countries will be able to profit from their forthcoming global implementation because billions of Euros will have to be invested in the next decades, especially in the energy supply sector. For this the German Government adopted a comprehensive package of measures on climate protection in December 2007 which underlines Germany's pioneering role in this field. The package consists of 14 acts and ordinances and additional seven further measures.

Lead Speech

Lifestyle in transportation sector

Keisuke Matsuhashi
National Institute for Environmental Studies
(Japan)

1) People will choose hybrid vehicles or other low carbon vehicles in middle term in order to save the total cost of the vehicle, petrol and various taxes. Government should enhance the economic incentives (green taxes for car registration and possession) to encourage the popularization of low carbon vehicles. To win in the markets, it is important to reduce the price of low carbon vehicles and to increase production capacity quickly.

2) Combinations of countermeasures which reduce 20% each could cause over 70% reduction as total.

3) If low carbon vehicles could not become reasonable options, people would choose combinations of walking, cycling and public transport instead of cars in order to keep their accessibilities in lower costs. It is thought to be more difficult to control average trip frequencies or average trip lengths themselves without modal shifts. To promote this modal shifts, self-support accounting systems should not be adopted to public transport management, and urban developments should comply with the concept of Transit Oriented Development.

4) If public transport systems could not be improved in countryside, people would move to metropolitan areas to avoid extra costs of travel in a long term. Light and small electric vehicles (i.e. Toyota i-REAL, all weather bikes and power-assisted bicycles) will be other options to ensure reasonable personal mobility in low-density areas.

5) It is important to examine various countermeasures toward low carbon society in order to respond to the changes in advance.

Lead Speech

Barriers and Opportunities - Approaches to sensitive LCS sectors

Hannah Ryder
Economist, Defra,
(UK)

The Stern Review on the Economics of Climate Change provided a clear case for urgent and strong action on climate change, by demonstrating that the costs of taking action would be significantly lower than the costs of climate change left unabated.

However, a key barrier to action on climate change and making the transition to a low-carbon, climate resilient economy is the effect of imposing constraints on emissions – whether by emissions trading, carbon taxation or regulation – on sectors that are highly-carbon or energy intensive and highly internationalised in developed countries before such action is taken in developing countries. Might these sectors face such high costs that they relocate to areas where emissions constraints are less stringent? The Stern Review found that these negative competitiveness effects would be limited to a very few, identifiable sectors, and even when identified, the potential for carbon leakage was limited further by the effect of other cost differentials. Recent pan-European work by "climate strategies" has reinforced these findings. However, more evidence for non-EU countries is needed.

On the other hand, new markets are expected to be created by taking action on climate change. The Stern Review suggested that investment in low-carbon electricity sources could be worth over $500bn a year by 2050. Bringing in credible and early policies can create these new opportunities –with the right signals, firms can move ahead to capture markets and flourish.

Therefore, the question for international policy is what tools can help balance these barriers and opportunities? Three alternatives are usually proposed to address competitiveness and carbon leakage concerns. The first brings in wider participation than purely nationally-based policy – e.g. through sectoral approaches/ agreements, the second penalises firms outside current nationally-based policies – e.g. through border adjustment mechanisms (BAMs), and the third provides exemptions to general climate policies – e.g. lower carbon taxes, or free allocation under emissions trading[1].

BAMs have some short-term logic: they make operators from all countries price carbon equally; could be interpreted as an attempt by countries to reduce the carbon footprint of their entire basket of consumption; and could be applied to particular vulnerable sectors. But they can severely challenge future cooperation by being seen to punish other countries, and would not really be considered to be a long-term, first-best solution to climate change, especially as they may not lead to a reduction of global emissions (they act as a tax and could be set at an inappropriate level).

On the other hand, free allocations, though they don't necessarily distort the carbon price signal from emissions trading schemes, are inefficient as they do not have any long-term impact on the conditions that lead to carbon leakage, and auctioned revenues can have more productive

[1] Though the economic implications of exemptions to carbon taxes and auctioning under emissions trading are quite different.

applications in the rest of the economy.

In comparison to penalties and exemptions, a sector-based approach that, *inter alia*, covers installations in the large energy-intensive sectors from all or major-emitting countries could represent a positive way forward. But, to be most cost-effective compared to the alternatives, they will need to be robust enough to send comparably strong signals to industries globally (as those in the EU) and consistent with existing policies such as binding national caps and emissions trading. They can also be tailored to make the most of wider opportunities (e.g. if they give a clear signal through stringent caps, this will encourage early innovation across sectors) and they can be designed to upscale and target technology transfer to developing countries. Progress on such approaches can be made within and outside of wider international agreement, and countries and industries are already considering how to implement them.

The world will need to work strongly and quickly on sectoral approaches if these potential merits – especially as an alternative to other two proposals – are to become a reality. But doing so will ensure the world is seen to be doing something to create a level playing field – to help in this transition to a low-carbon, climate-resilient economy.

Lead Speech

Strategy to Low Carbon Society

Haruki Tsuchiya
Research Institute for Systems Technology, Tokyo
(Japan)

This is memo of discussion points on LCS with Barriers and opportunities for the sensitive sectors.

1. Basic Strategy

The basic strategy to Low Carbon Society in 2050 is to reduce energy demand to half of today's level by increasing energy efficiency tiwce and to increase renewable energy supply to nearly half of the energy demand. This will make the carbon emission to roughly one fourth (1/2 * 1/2=1/4).

The facts are as follows,

1) There are many energy efficient technologies which will drastically decrease energy consumption while keeping the same performance.
2) Some of the energy efficient technologies are expensive, but they will become economical because of higher oil price and peak oil predictions.
3) Some of the energy efficient technologies, such as compact fluorescent bulb, hybrid car and advance industrial furnace are already economical and save money today.
4) Renewable energy such as photovoltaics (PV) and wind power are increasing rapidly. As PV is expensive now but wind power is already cost effective. Diffusion of PV was supported by government subsidies and the cost of PV has been on the line of learning curve with progress ratio 82%(When cumulative production doubles, then the cost goes down to 82%)
5) It will take long time to introduce these new technologies, some political climate changes are necessary.

2. Barriers and Opportunities to Sensitive sectors in transition to LCS

There are sensitive sectors in the transition to LCS. Analysis of barriers and opportunities are shown as follows.

1) Basic Material Industries

Iron & Steel, Cement, Paper & Pulp industries are very energy intensive industries. They use coal for their main material and energy sources. Some of coal consumption can be substituted with natural gas but they still remain using coal in 2050. One of the possibilities is to increase recycle of basic materials (steel and paper) and use waste in their production process. Today the blast furnaces in iron & steel industry use plastic waste as substitute of coal. Cement industry use waste materials as fuel.

Economists predict the production of iron & steel, and cement will go down to lower level in 2050. They suggest the transition to Post material society, Service based economy, and IT based industrial activities.

2) Transportation

Transportation sector mainly use portable liquid fuel, gasoline and diesel oil as they have largest energy intensity per weight and are relatively safe to convey. Internal combustion engine vehicles will be substituted with Electric vehicle and Hydrogen fuel cell in the long run. But weight of battery and hydrogen tank are still problems to be solved. There are redesign activities of internal combustion engine, and they will be more improved, 20% or more, than have been expected. Gasoline hybrid vehicles proved twice efficient compared with conventional gasoline cars and can be a good problem solving technology for the next decade.

Efficient technologies should be introduced urgently before old inefficient vehicles will be massively produced.

3) Household and Commercial Buildings

There is revolution of lighting technologies. Compact fluorescent bulb can be use for frequent on/off purpose as it has now long life time of 30,000 times of 10 seconds on/off. 12W compact fluorescent bulb becomes economical within 1,000 hours when it is substituted with 60 W incandescent bulb. The light emitting diode（LED）is widely used for 20% of traffic signals as it saves the maintenance cost. The efficiency of LED will be better than fluorescent bulbs. It will be used for automobiles when it is produced massively with cost reduction and will be used widely for general lighting propose.

The problems are the time for the turn- over of stock materials. Even compact fluorescent bulb,, passive solar house, well-insulated house and new refrigerator are energy efficient, consumer will buy new products only when they are broken. So it will take long time to improve energy efficiency in social scale. Some policy measures are necessary to promote the introduction of efficient technologies.

Open Symposium

February 15, 2008

Tokyo

The 3rd Symposium of the Japan-UK Joint Research Project "Roadmap to Low-Carbon World"

Date: 15th February, 2008

Venue: Hotel Metropolitan Edmont, Iidabashi, Tokyo.

Welcome Address

9:30-9:40 Dr. Ichiro Kamoshita, Minister of the Environment, Japan

9:40-9:50 Sir Graham Fry, British Ambassador to Japan

Purpose of this symposium

9:50-10:10 Co-chairs: Dr. Shuzo Nishioka (NIES) and Dr. Jim Skea (UKERC)

High-level Speech (25min. speech and 5 min. Q&A)

10:10-10:40 Roadmap to Low-Carbon World – Asian Consciousness
Dr. Emil Salim, President's Council of Advisors,
(Former Minister of the Environment), Indonesia

10:40-11:10 Roadmap to Low-Carbon Society from a Business Perspective: Nissan's Challenge
Mr. Mitsuhiko Yamashita, Executive Vice President, Nissan Motor Co., Ltd.

11:10-11:40 Towards a Low-Carbon UK
Mr. David Warrilow, Head of Science Policy on Climate Change, Defra, UK

Lunch Break

Panel Discussion: Interactive discussion using electronic voting system

13:00-15:30 Co-chairs: Dr. Shuzo Nishioka (NIES) and Dr. Jim Skea (UKERC)

Topic 1: Behavior change and its impact on delivering LCSs
Jeremy Watson (Arup, UK) and
Yuichi Moriguchi (NIES, Japan)

Topic 2: Delivering LCSs through sustainable development
Ogunlade Davidson (University of Sierra Leone) and
Taka Hiraishi (IGES, Japan)

Topic 3: Enabling LCSs through investment
Jose Alberto Garibaldi (Energeia, Mexico) and
Takejiro Sueyoshi (Special Advisor to the UNEP Finance Initiative)

Topic 4: Barriers and Opportunities: Approaches to sensitive LCS sectors
Jim Watson (SPRU and Tyndall Centre, UK) and
Naoya Tsukamoto (MoEJ, Japan)

Overall Discussion

Closing Remarks

15:30-15:40 Ryutaro Ohtsuka, D.Sc., President, NIES

Welcome Address

Dr. Ichiro Kamoshita
Minister of the Environment, Japan

Good morning. On behalf of the organizers, I would like to extend a cordial welcome and express my appreciation to all of you who have taken time out of your busy schedules to attend this symposium on the issues surrounding climate change.

The Japan-UK joint research project was initiated by the British and Japanese Ministers of the Environment two years ago this month. A later joint statement by the prime ministers of the two countries positioned the project as a bilateral joint research initiative. Since then, a meeting has been held in Tokyo (June 2006), another in London (June 2007), and this year marks the third such event of this kind.

Last year we made good progress toward the development of a low carbon society. The first step was marked by the publication of the Fourth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC AR4). The report asserts that there is no doubt that climate change is occurring, and discusses the likelihood that it is caused by human activity. In addition, it states that the impact of climate change has been confirmed in almost all of the ecosystems currently under observation and that the situation is worsening. Furthermore, it maintains that if, in the next few decades, drastic measures are implemented that make use of currently available technologies and those that are to be commercialized in the future, it would be possible to limit the total emissions in 2030 to current levels. Therefore, the international community must heed the alarms being sounded by scientists around the world and implement policies and measures to stabilize climate change.

In December of last year, the United Nations Climate Change Conference (COP13) was held in Bali, Indonesia. The focus of the Bali meeting was to initiate a new framework beyond 2013 with the participation of the major CO2 emitting countries. In the past, developing countries have insisted that industrialized countries take responsibility for the climate change issue, but the IPCC, tackling the problem from the perspective of science, insists that the earth cannot be protected without the participation of the developing world. As a result, developing countries have also come to an agreement to reduce their emissions in the next generation of the framework. I was in attendance at this meeting and I can state from experience that the negotiation process was long and difficult. The meeting was extended for an extra day and in the last minutes of that day, an

agreement was finally reached that by 2009 a new framework would be created with the participation of major emitting countries including the US, China, and India.

The international community has started building a "post-Kyoto" framework. In order for our children and grandchildren to live safely on the earth for many years to come, we have to adopt a long term perspective for the reduction of GHGs. Last year, Japan proposed its "Cool Earth 50" initiative which calls for halving the world's greenhouse gas emissions by 2050. At the World Economic Forum in Davos this year, Prime Minister Fukuda put forth the Cool Earth initiative and stated that as a part of Japan's involvement in the new framework, it plans to set national targets for total emission reductions and strongly promote strategies to fight climate change. Climate change will be one of the biggest topics of discussion at the G8 Summit to be held at Lake Toya in July. As the host country, Japan is determined to lead discussions in the international community towards the realization of the Cool Earth 50 objectives.

In his policy statement speech, and during his speech at the World Economic Forum in Davos, Prime Minister Fukuda clearly stated that the low carbon society concept is to be the basic national policy for Japan. Halving greenhouse gas emissions by 2050 cannot be achieved by simply continuing on in the same manner as we are today. In addition to technological innovation, we must revise our production mechanisms, lifestyles, and transport and urban systems to achieve a fundamental shift in our social systems.

In the near future, Japan will become an aging society and the proportion of elderly people in the population will be much higher than it used to be. Elderly people will find driving difficult and will not be able to travel long distances to go shopping. They will have to be able to access medical services and buy food within walking distance of their houses. Compact and concise urban planning will be imperative to progress in this regard. The "community within walking distance" concept can be used as an example of one effort towards achieving a low carbon society. In this way, the joint Japan-UK project aims to show the international community what is meant by "low carbon society" and how such a society can be realized.

At today's symposium, we will hear from developing countries, businesses, and the UK government, all of whom who are working towards the realization of a low carbon society. We will also hear a report from the expert meeting which was held over the past two days and which was attended by about eighty experts from 22 countries including developed, emerging, and developing countries such as China, India, and Thailand. Researchers and representatives from governmental and international organizations participated in this meeting to discuss sustainable development and investment barriers and opportunities related to climate change. They have come up with concrete measures to be implemented, and they will be presenting them to us this afternoon.

We have only just taken the first steps towards a low carbon society in the long journey towards 2050. I hope that this symposium will give us a roadmap to follow into the future. Thank you very much.

Welcome Address

Sir Graham Fry
British Ambassador to Japan

Mr. Kamoshita, ladies and gentlemen, thank you very much for inviting me to say a few words at the opening of this symposium. I can remember clearly standing on a platform with one of Mr. Kamoshita's predecessors, when we first launched this joint research project, and I am delighted that Minister Kamoshita has so enthusiastically continued Japanese support for it. We have done a number of UK-Japan projects on climate change, and I think this one may be the most valuable, partly because it involves not only the UK and Japan but many other countries as well.

There is sometimes what seems to me a slightly strange argument about whether one should tackle this problem with what is called a top-down approach or with what is called a bottom-up approach. The top-down approach means that you set an overall target, and we all know that Mr. Abe proposed a 50% global reduction by 2050. The European Union has set clear overall targets for itself. The bottom-up approach is to look at individual things which you can do and add them all together - whether it is energy efficiency or new technology or whatever. It seems to me a strange argument because it seems to me obvious that you need both. Only the top-down target can tell you whether you are doing enough to solve the problem, but without the bottom-up approach, working out individual measures, you won't solve the problem. You have to do things as well as targeting things. The value of this workshop is to look at what things you can do in order to meet a particular vision of the future. When you set big targets they can look very hard to achieve. Nobody wants to give up economic growth or economic development; so I think we need to offer a vision of how you can achieve the target without tremendously negative consequences.

I think the first two UK-Japan Low Carbon Society workshops were very successful in looking at low carbon scenarios for particular countries and feeding the results into discussions at other international meetings. The subjects under the discussion this time - behaviour change, sustainable development, investment frameworks and particular industries like steel and cement - are critical elements of transition to the low carbon society, and the output from this workshop will be fed into the G8 process later this year.

What seems to me very important, and what I hope you will do, is also to explain your ideas to ordinary people and to the general public. It is good if leaders understand these things, but a lot of other people also need to understand low carbon societies. The more that we can popularize the concept and the more that we can explain it through the media and other channels, then the more we can get people to understand what the future will look like.

So let me finish by thanking the Japanese Ministry of the Environment and specially thanking everybody who has taken such an active and enthusiastic part in the workshop. Thank you all very much indeed.

High-level Speech

Roadmap to Low-Carbon World -Asian Consciousness –

Dr. Emil Salim, President's Council of Advisors, (Former Minister of the Environment), Indonesia

Dr. Emil Salim, whose background is in Engineering and Economics, received a Ph. D. from the University of California, Berkley. After he became Minister of State for Administrative Reform in 1971 at the age of 41, Dr. Salim served four terms of ministerial positions in Indonesia over 22 years, including being the first Minister of the Environment. Dr. Salim has addressed from early on the environmental problems in developing nations in Asia, and as the chairman of the ASEAN Environment Ministerial Congress set the target, the scope, the program and the action plan for the ASEAN nations to cooperate on environmental issues. He also contributed to establishing the concept of sustainable development and furthering global environmental policies through various United Nations committees. He is currently serving on the President's Council of Advisers in Indonesia.

Abstract

Developing countries can learn from the mistakes made when development neglects the environment. The time has come to ask the questions what has development in the globe achieved thus far, what has gone wrong with the development model that we have pursued and in what direction do we have to go?

The needs of the world today is in changing the course of development from an increased materially based style of life into an increased enrichment of immaterial, cultural, spiritual, knowledge and science based style of life.

There are increased efforts today to critically review the economically based Gross Domestic Product and to strive for Green GDP to make the necessary corrections through internalizing externalities, by incorporating resource depletion and by including social and environmental benefits.

The life style of tomorrow does not imply reducing consumption, but consuming differently. What is needed is changing the quantity of consumption from resource exhaustion with finite energy inefficiency to raising the quality of consumption with resource enrichment and sustained by perpetual energy efficiency.

To reach for this different life style, plain living is the most ideal, supported by the creativity of high thinking on the basis of science, technology, culture and spiritual ideas.

High-level Speech

Roadmap to Low Carbon Society from a Business Perspective: Nissan's Challenge

Mitsuhiko Yamashita, Vice President, Nissan Motor Co., Ltd., Japan

Mitsuhiko Yamashita received a master's degree in aeronautical engineering from Kyoto University in 1979, and he joined Nissan Motor Co., Ltd. in the same year. In 1983, he was sent to study abroad at Massachusetts Institute of Technology. He became a director of the section 1 vehicle development department in 2001. After working three years in the Nissan Technical Center North America from 2002, he became a vice president specializing in company research and development from 2005.

1. Nissan's Perspective

Climate Change was one of the major issues discussed at the Annual Meeting of the World Economic Forum in Davos in January, 2008. In the meeting, Collaboration and Innovation were recognized anew as the solutions for the climate issue facing the world.

2. Nissan's Challenge

2.1 Nissan Green Program 2010

Ultimate goal of this program is to reduce environmental pollutants below natural absorption level. The program focuses on three major issues, i.e., CO2 emissions, exhaust emission, and recycling resources.

As for the reduction of CO2 emissions from motor vehicles, improvement of energy efficiency of Internal Combustion Engine (ICE) will bring a maximum of 30% reduction from the current level. The hybrid vehicle can halve CO_2 emissions. In order to achieve the goal set in Nissan Green program 2010, 70% reduction of CO_2 emissions, electric vehicles and/or fuel cell vehicles with renewable energy will play the key role.

2.2 Triple Layered Approach

To reduce CO2, Nissan employs a Triple Layered Approach. The approach aims to make connections among cars, drivers and society, and to implement countermeasures for each actor. 40% reduction in 2015 is set as our internal technical target, which will come from 30% of countermeasures for cars, and 10% each for drivers and society.

(1) Challenges for vehicle technology

For both gasoline engine and diesel engine, high combustion efficiency and less environmental pollutants are the common goals, but feasible paths for the two are different. Some of the measures we are taking are a Variable Valve Event and Lift (VVEL) system for gasoline engine, and joint development of clean diesel engine by Renault and Nissan. These technological breakthroughs are expected to occur within a few years. After that, hybrid vehicle, electric vehicles and fuel cell vehicle will gradually contribute to reduction of CO2 emissions from transport vehicles.

Technological innovation of batteries is a key to performance of electric vehicles. As the first step, the innovation has led to the introduction of small community EV for short distance transportation. Further development of batteries will bring bigger cars with long distance.

At the last Tokyo Motor Show, we exhibited a new concept car of electric vehicle, which consists of several technologies currently developed by Nissan. The first one is “By-Wire”. This system has been already installed in airplane control system, and controls vehicles by electrical instead of mechanical way. The second is robotic interface which gives advices to a driver. The third is in-wheel 4WD motor, and the forth is compact Lithium-Ion battery. Further technological innovations of these four technologies will bring us to a future transportation system with electric driven cars.

Burden sharing between public transportation and private transportation is a key for future society. A concept for future urban transportation system is under review. It puts EV as a core system, and the vehicle is assisted by Intelligent Transportation System (ITS), and has four key factors: Park & Ride from Rental Station, Efficient Traffic Control, Regenerating Electricity Sharing, and CO2 free electricity.

(2) Challenges for “Driving Life”
Nissan’s Eco Drive Navigation System not only informs the drivers their current gasoline mileage but also ranks monthly average mileage. Last year, Nissan started the service which ranks drivers according to its actual fuel efficiency. Using this system, some drivers could improve 18% of mileage on the average. This implies that there is a lot of room to improve gasoline mileage by changing driving methods.

(3) Challenges for Society
Nissan has been conducting several demonstration programs for future transportation system, such as the program for the Intelligent Transportation System in Kanagawa prefecture. The ITS determines traffic condition by using road information gathered by Probe Car, and tells driver the fastest route through car navigation system. A similar program was carried out in Beijing, China.

3. Toward Low Carbon Society
Pathways toward Low Carbon Society will face three challenges. The first is how to create “Sense of Urgency” in the society to avoid the so-called boiled frog syndrome. The role of media is vital and how the manufactures like Nissan provide information is also important.

The second challenge is to realize sustainable LCS through “Collaboration and Innovation.” It is well recognized that global warming could not be solved by one entity alone, for instance, one nation, one society, or one company. How to integrate key stakeholders involved is quite important. Technology development is also an important factor. Nissan is committed to make full effort on technology development and engineering development.

The third challenge is how to develop global mechanism to combine CO_2 reduction and economic growth. It is quite possible that adequate regulation may lead to economical effect.

4. ad finem
The issue we really have to ask now is “What kind of energy do we use?” During the 20^{th} century, development of our society depended on crude oil. I think the 21^{st} century is the new era towards diversified energy society. Transition might take some more time, but coming 20 or 30 years will be the key.

High-level Speech

Towards a Low-Carbon UK

Mr. David Warrilow, Head of Science Policy on Climate Change, Department for Environment, Food and Rural Affairs (Defra), UK

David Warrilow is Head of Science Policy on Climate Change at the UK's Department for Environment, Food and Rural Affairs (DEFRA). He is responsible for ensuring that the UK Government receives sound scientific advice on climate change with regard to both its domestic activities and international negotiations. He heads the UK's delegation to the IPCC and also leads on the technical matters covered by the Subsidiary Body on Science and Technology of the Climate Change Convention. He is also responsible for managing a £15 million research programme which provides policy relevant scientific advice. His own scientific background covers climate modeling, land-surface processes and hydrology.

Abstract

The UK has long accepted the need to dramatically reduce greenhouse gas emissions to avoid dangerous climate change. Although the UK's emissions are only about 2% of global emissions, it has been keen to show leadership in this area. This talk will review what actions have been taken to date, what progress has been made, and will consider in more detail the latest moves to enshrine emission reductions in UK legislation in the "Climate Change Bill." The Bill has so far focussed on reducing CO2 emissions, but also covers adaptation to climate change. As well as providing a legal basis for action, the Bill will set up the "Climate Change Committee," an independent body which will provide impartial advice to Government on the potential to reduce emissions, and will scrutinise the actions that it has taken. The Bill is currently being debated in parliament and is expected to become law by this summer.

Panel Discussion Summary

Topic 1: Behaviour Change and its impact on delivering a Low-Carbon Society

Leadership

- **Governments are expected to play a leading role by creating enabling frameworks**
  - business want a framework with an appropriate balance of incentives and penalties and with long-term policy certainty
  - consumers welcome leadership and clear vision from governments rather government inaction
- **Each group sees the onus to act first as being the responsibility of the others (government / business / individuals)**

Instruments to drive Behaviour Change

- **Regulation**
  - standards – e.g. worst choices made less attractive or removed
  - obligations – e.g. mandatory emissions reduction targets
- **Monetary**
  - fiscal (taxes and incentives – e.g. London congestion charge)
  - procurement – e.g. C40 (energy efficiency purchases for public buildings)
  - emissions trading
- **Exemplar projects**
  - low-carbon, low waste housing (e.g. BedZED)

Tools for Behaviour Change

- **Information / guidance**
  - product labelling – e.g. life-cycle costs, energy ratings
  - household- and company-level emission inventory – e.g. energy meters & accounting
  - web resources – e.g. carbon calculator
  - support on how to change behaviour – e.g. advice helpline
  - learning networks
  - mass media
- **Availability of suitable alternatives / choices**
  - product versus service choice
  - transport modal shift

Markets

- **Recognise the value of market-based instruments to influence behaviours in the medium to long-term**
  - need a price on carbon (i.e. value on emission reduction)
  - power of informed consumer choice (e.g. consumer-durables)
- **Supply (production) and Demand (consumption)**
  - decarbonising energy supply (e.g. renewables, CCS, nuclear)
  - the benefit of incremental efficiency improvements may be offset by increased consumption (rebound effect) and switching to more energy intensive alternatives

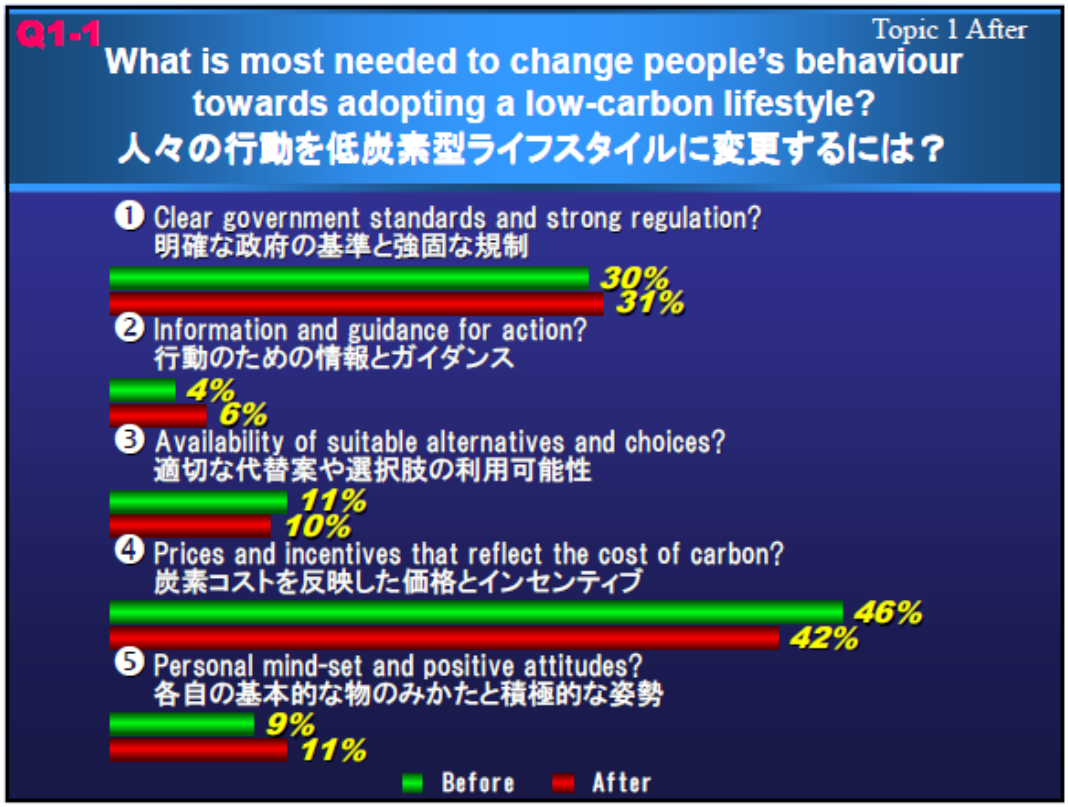
Psychology of Behaviour Change

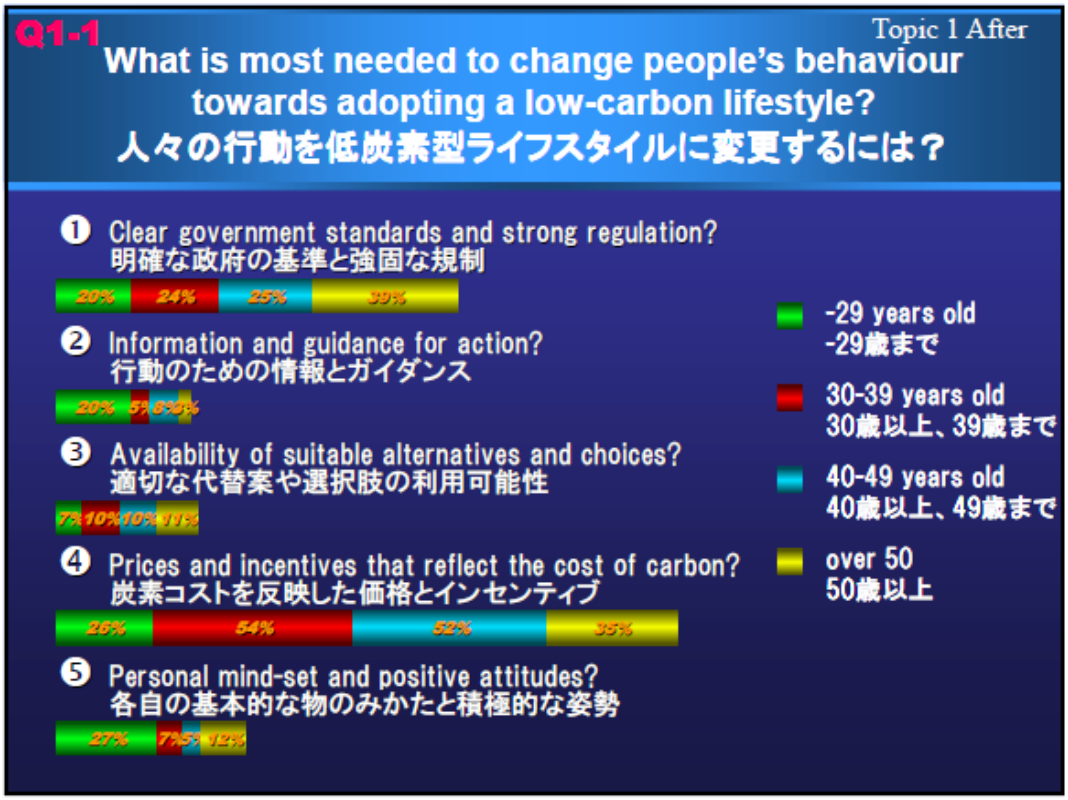
- **Encourage positive attitude**
  - not "don't" but "let's do"
  - small individual actions can be cumulatively powerful (e.g. recycling)
  - turn aspirations to be greener into actions that matter
  - Change should be desirable – fashionable and fun!
- **Change mind-set**
  - consumer items not as important as the service they provide
  - become aware that ownership carries responsibility
  - focus on quality-of-life rather than on mass-consumption and disposal
- **Social responsibility and peer pressure**
  - family, neighbours, colleagues

Timely and appropriate Behaviour Change

- **Need more than incremental changes to rapidly transition to LCS**
  - move LCS philosophy from the periphery into the mainstream
  - likely to involve paradigm shifts
- **Recognising difference in circumstance**
  - strategies for LCS will vary for different countries – depending on national circumstance (resource endowment, development level etc)
  - city-level action may also differ due to varying opportunity to act
  - leapfrogging – assistance to develop on a low-carbon pathway through appropriate technology transfer, financing and investment, joint venture exemplar projects etc


Engagement
Broad participation is needed to achieve a LCS
actions are required by all stakeholders – citizens, corporations and government
Government
city plans should be at least enabled and preferably supported by national frameworks
advanced city-level action can be used as pilots for national action


Q1-1
Topic 1 After
What is most needed to change people's behaviour towards adopting a low-carbon lifestyle?
人々の行動を低炭素型ライフスタイルに変更するには？
1 Clear government standards and strong regulation?
明確な政府の基準と強固な規制
30%
31%
2 Information and guidance for action?
行動のための情報とガイダンス
4%
6%
3 Availability of suitable alternatives and choices?
適切な代替案や選択肢の利用可能性
11%
10%
4 Prices and incentives that reflect the cost of carbon?
炭素コストを反映した価格とインセンティブ
46%
42%
5 Personal mind-set and positive attitudes?
各自の基本的な物のみかたと積極的な姿勢
9%
11%
Before
After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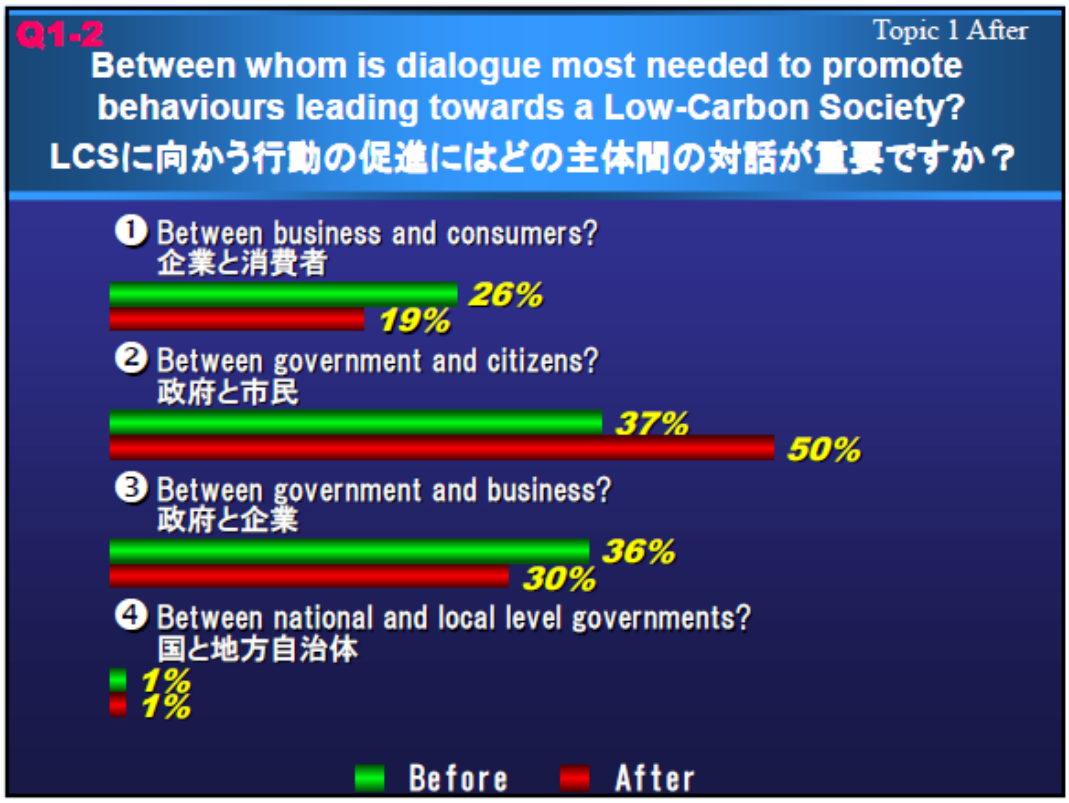
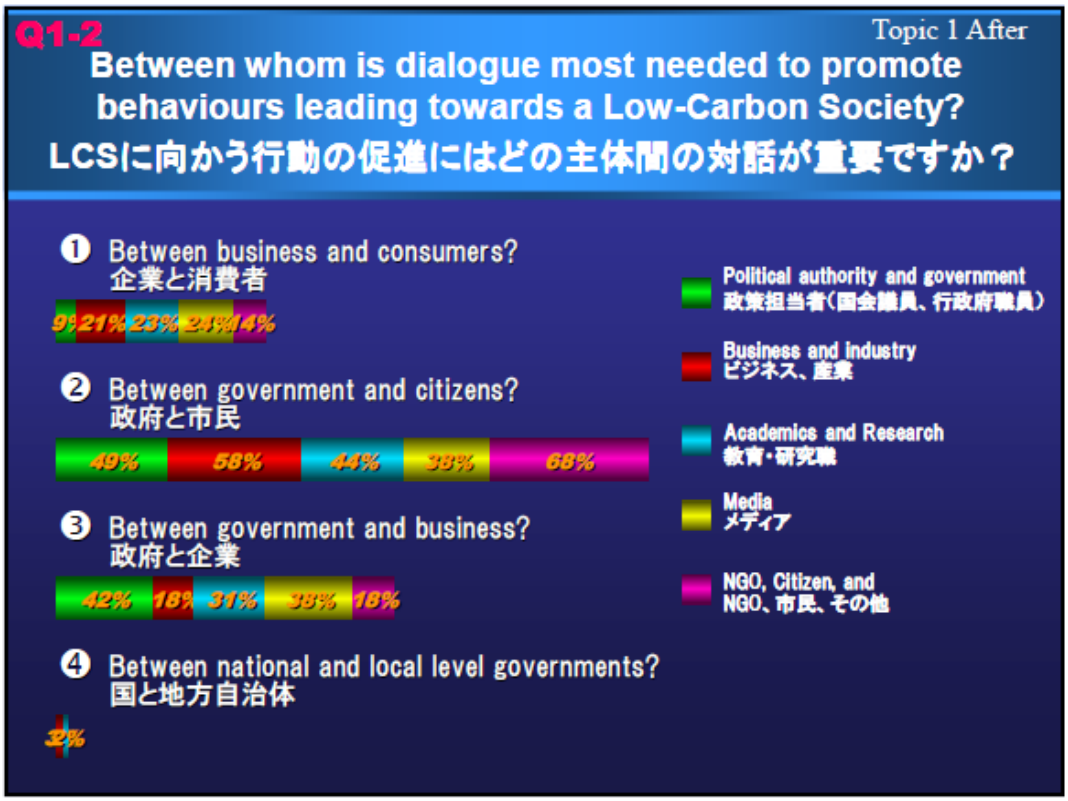
5%
3 Availability of suitable alternatives and choices?
適切な代替案や選択肢の利用可能性
7%
10%
10%
11%
4 Prices and incentives that reflect the cost of carbon?
炭素コストを反映した価格とインセンティブ
26%
54%
52%
35%
5 Personal mind-set and positive attitudes?
各自の基本的な物のみかたと積極的な姿勢
27%
7%
5%
12%
-29 years old
-29歳まで
30-39 years old
30歳以上、39歳まで
40-49 years old
40歳以上、49歳まで
over 50
50歳以上


Q1-2
Topic 1 After
Between whom is dialogue most needed to promote behaviours leading towards a Low-Carbon Society?
LCSに向かう行動の促進にはどの主体間の対話が重要ですか？
1 Between business and consumers?
企業と消費者
26%
19%
2 Between government and citizens?
政府と市民
37%
50%
3 Between government and business?
政府と企業
36%
30%
4 Between national and local level governments?
国と地方自治体
1%
1%
Before
After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企業と消費者
9%
21%
23%
24%
4%
2 Between government and citizens?
政府と市民
49%
58%
44%
38%
68%
3 Between government and business?
政府と企業
42%
18%
31%
38%
18%
4 Between national and local level governments?
国と地方自治体
2%
Political authority and government
政策担当者(国会議員、行政府職員)
Business and industry
ビジネス、産業
Academics and Research
教育・研究職
Media
メディア
NGO, Citizen, and
NGO、市民、その他

Panel Discussion Summary

Topic 2: Delivering LCS through Sustainable Development

Report from Group 2: "Delivering LCS through Sustainable Development"

Co-chairs: P.R.Shukla, Ogunlade Davidson, Taka Hiraishi
Rapporteurs: Sunil Malla, Tomoki Ehara

1

Lead speeches

13th February:

- Mikiko Kainuma: LCS, overall and required actions
- Ram Shrestha: Thailand, esp. transport
- Andre Pereira: Biofuel, Brazil
- Masato Kawanishi, JICA. Co-benefits.

14th February:

- Ryokichi Hirono: Developments in international discussions on SD.)
- Rizaldi Boer: Forests
- Haroldo Filho: Bali agreements
- Kensuke Fukushi: SD considerations
- Stanford Mwakasonda: SD PAMs
- Tomohiro Sudo: ODA for SD and LCS
- Yoshiaki Yamakawa: Shiga Prefecture's SD Scenario
- Ogunlade Davidson: SD overview.

2

Group Recognitions

- "Developing countries" include a vast range of countries, with differences in, for instance, population, natural resource endowment, stage of economic development, as well as political or geological conditions. Therefore, It is not proper to elaborate LCS questions monotonally on "developing countries".
- LCS actions and SD actions are required in both developed and developing countries, in line with their needs, priorities and within the available resources.
- The Group elaborated the LCS issues with a broad time framework of "LCS by 2050", while the Group was fully cognizant of the urgency of climate actions, in particular, viz. extremely vulnerable countries. The Group also considered that actions towards "by 2050" would contain many early actions even in the near future term".

3

Recognition (2)

- SD is meant to achieve sound development, addressing many important issues such as; poverty, equity, health, technology, etc., which would not prevent development of future generations.
- SD concept has been with us for a couple of decades (cf. Brundtland Report (1987)), but there are numerous "definitions", reflecting the underlying background and the purpose of use. While essentially all the countries are committed to its implementation, many countries are faced with a variety of difficulties.
- LCS concept was elaborated by the LCS WS at its 1st and 2nd sessions.

4

Major Conclusions

5

Relationship between LCS and SD

- The Group believes that between LCS and SD, there are many commonalities and, possibly, many mutually supportive components.
- Detailed analysis of this aspect might be not only academically interesting, but it might accrue to valuable hints for future international actions on LCS/SD and on leap-frogging of developing countries, though It would take significant time and resources.

6

Provision of Visions on LCS

- Rather, the Group considered, as a matter of priority, elaboration and wide dissemination of **visions on LCS** to the world community is imperative, so that governments and relevant stakeholders can take well-informed and timely actions towards LCS. The "Visions" should be a detailed information/guidance package, and should be elaborated taking SD needs and synergies into account.
- The Group recommends that this should be considered in the future Japan-UK LCS scheme.

7

"Visions on LCS" (1)

The "Visions on LCS" should address issues such as: Principles, Issues for Consideration, Means or Options. More specifically, the Visions should;

- clarify that **LCS and SD should be synergistic**.
- be clear that appropriate pathways to (certain types of) LCS, would not hamper economic growth.
- be clear on societal benefits, expected from LCS.
- propose a set of principles on Government's intervention.
- allow dynamic and proactive changes in the course of process towards LCS.

8

"Visions on LCS" (2)

The **Visions** should also;

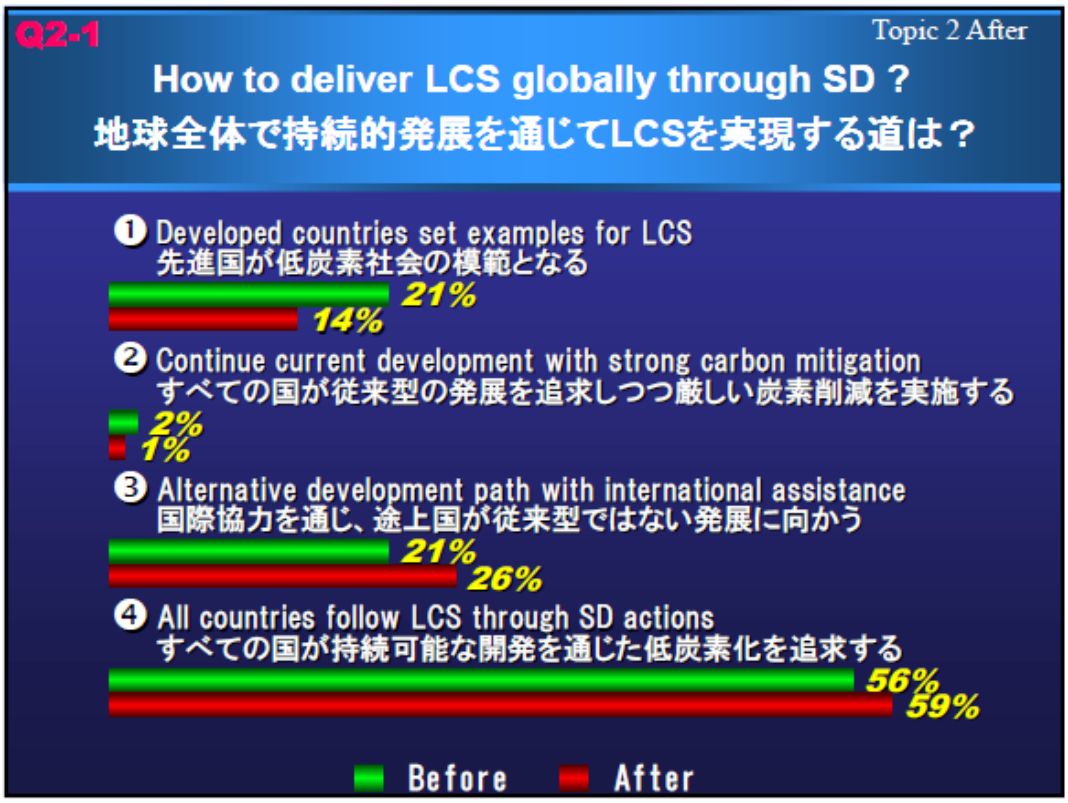
- offer options (of individual policies), tools, and means (including international actions), possible phased approaches and steps, as well as proposed timeline of actions.
- address requirements (especially, funds, technologies and human resources), and possible actions or means to obtain them.
- contain considerations on implications on, and, by other policies, including fiscal policies (e.g., subsidies).

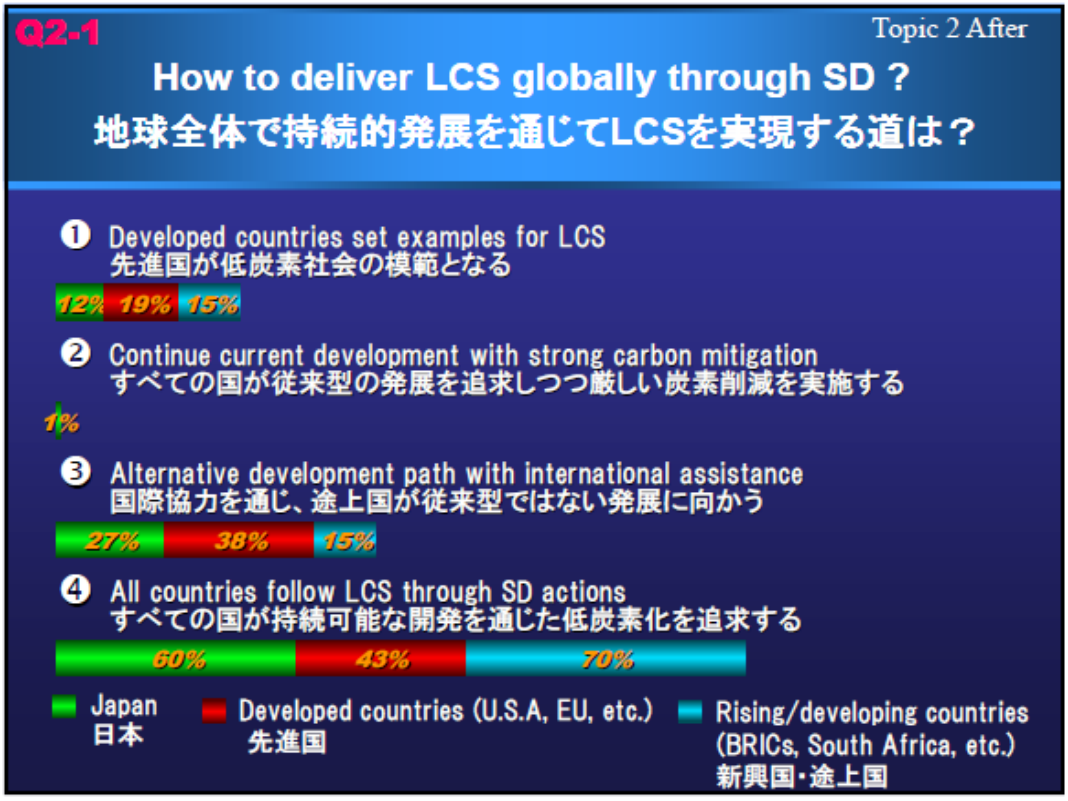
9

"Visions on LCS" (3):
For the purpose of **facilitation**, the Visions should also;

- share good examples, or show cases.
- contain discussions on cautions: eventual problems in policy implementation (use of LCA?).
- consideration of issues on LCA and immediate (developmental) needs, in particular of developing countries.

10


Q2-1
Topic 2 After
How to deliver LCS globally through SD ?
地球全体で持続的発展を通じてLCSを実現する道は？
1 Developed countries set examples for LCS
先進国が低炭素社会の模範となる
21%
14%
2 Continue current development with strong carbon mitigation
すべての国が従来型の発展を追求しつつ厳しい炭素削減を実施する
2%
1%
3 Alternative development path with international assistance
国際協力を通じ、途上国が従来型ではない発展に向かう
21%
26%
4 All countries follow LCS through SD actions
すべての国が持続可能な開発を通じた低炭素化を追求する
56%
59%
Before
After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How to deliver LCS globally through SD ?
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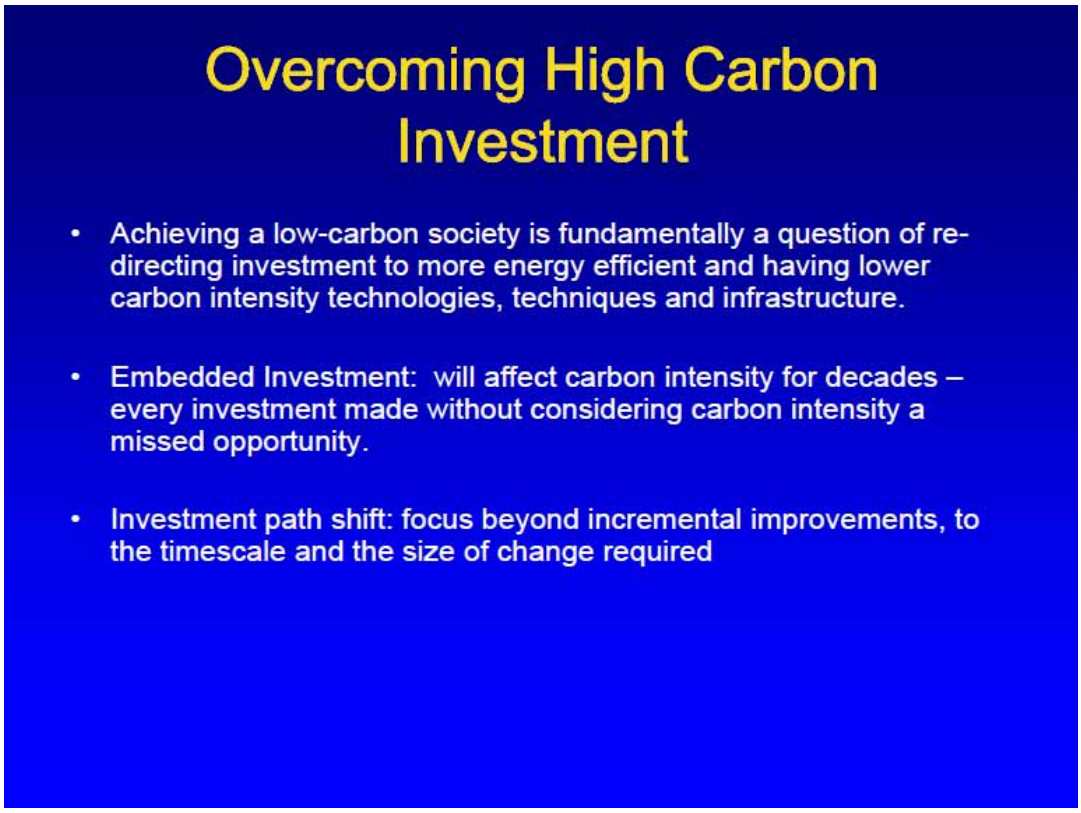
1 Developed countries set examples for LCS
先進国が低炭素社会の模範となる
12%
19%
15%
2 Continue current development with strong carbon mitigation
すべての国が従来型の発展を追求しつつ厳しい炭素削減を実施する
1%
3 Alternative development path with international assistance
国際協力を通じ、途上国が従来型ではない発展に向かう
27%
38%
15%
4 All countries follow LCS through SD actions
すべての国が持続可能な開発を通じた低炭素化を追求する
60%
43%
70%
Japan
日本
Developed countries (U.S.A, EU, etc.)
先進国
Rising/developing countries
(BRICs, South Africa, etc.)
新興国・途上国

Panel Discussion Summary

Topic 3: Enabling LCSs: Investment



Additional investment and financial flows in 2030

Mitigation Sector	Global (billion USD)	Share of developing countries
Energy Supply	(-) 67	55%
Industry	36	53%
Building	51	29%
Waste	0.9	67%
Transport	88	41%
Agriculture	35	66%
Forestry	21	99.5%
Energy RD&D	35 - 45	-

Global: 200 – 210 billion USD *(0.92% of projected global investment and 0.26% of global GDP in 2030)*
Non Annex I Parties: 76 - 77 billion USD *(0.86% of Investment and 0.29% of GDP in 2030)*
Amount large in absolute terms, but small relative to GDP and total investment

Additional investment and financial flows - adaptation in 2030

Sector	Global (billion USD)	Share of developing countries
Agriculture, forestry and fisheries	**14**	**50%**
Water supply	**11**	**80%**
Human Health	**5**	**100%**
Coastal zone	**11**	**40%**
Infrastructure	**8–130**	**25%**

Global: Overall needs identified in this study correspond to 0.2–0.8% of global investment flows or 0.06-0.21 % of projected GDP in 2030.

Developing countries: USD 28 to 67 billion in 2030.

Amount large in absolute terms, but small relative to GDP and investment

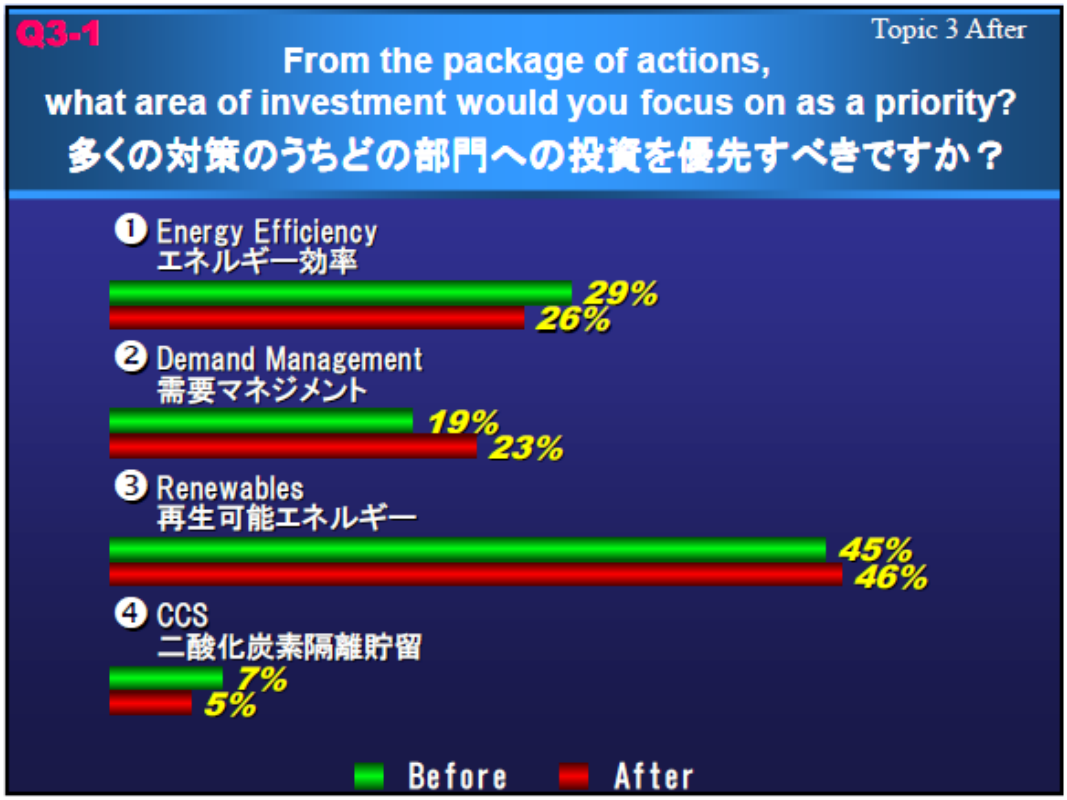
Reduction gains from untapped sources

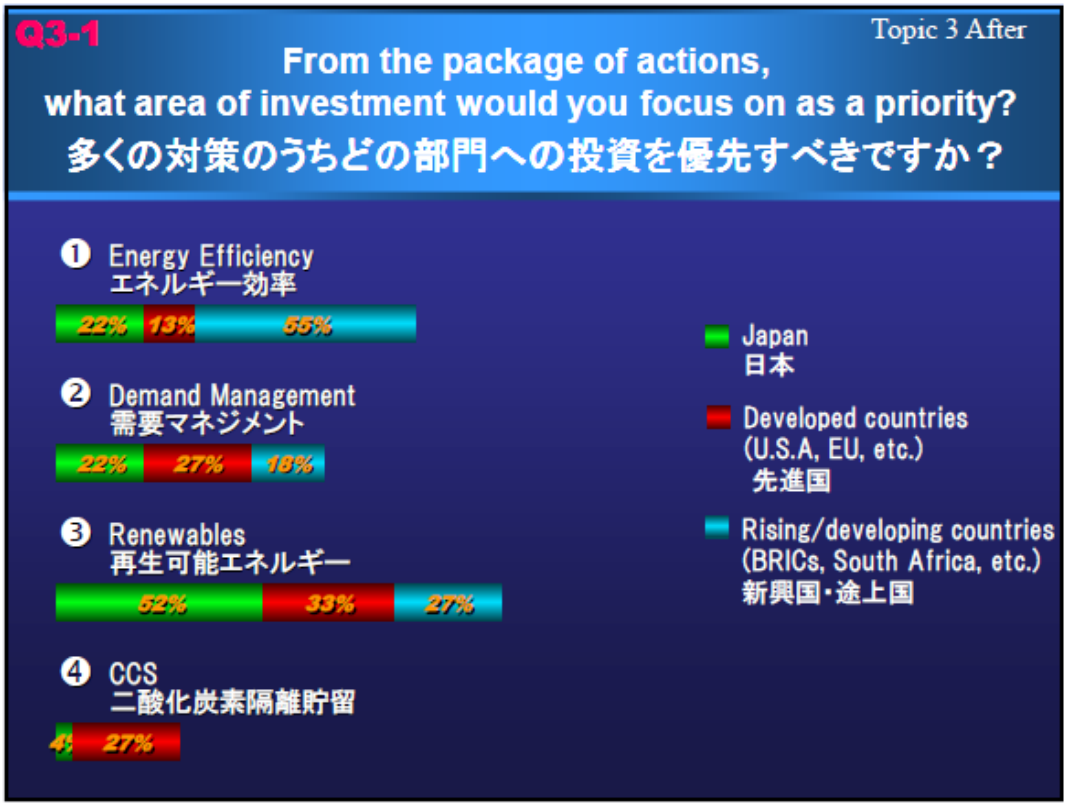
- Low carbon intensive sector untapped:
  - need to direct investment in both high and low carbon intensive industries - wider range of low cost measures in the latter
- Range of Interventions:
  - basic information,
  - logistical and financial innovations to maximise the cumulative potential of individual actions,
  - regulation and programme based approaches to carbon finance when these are appropriate.
  - Carbon pricing
- Frequent mismatches in companies between contribution to carbon emissions and associated carbon production costs
  - Carbon pricing capable of addressing mismatches, but not in appropriate time scale
  - Carbon management at appropriate scale and time requires measures to accompany entry of emissions trading.

A Portfolio of Technologies and Interventions

- Increase R&D in new LCS technologies and techniques required
- Urgent need to increase investment in the deployment of already existing low-carbon technologies.
- unique barriers in each of the major contributors to the technology options to LCS -need to be addressed in an integrated fashion for investment to flow.
- Credible Government actions for a robust carbon price signal necessary but not on their own sufficient.


Leveraging Domestic and International Action – NOW!!
• Reduction opportunities frequently less expensive on a per tonne basis in the developing world.
– International cooperation to facilitate appropriate measures that encourage scaling up of investment.
– Cooperation to extract these reductions increase global benefits.
• Delaying the implementation of actions on a domestic and global perspective
– Significantly increase costs of achieving a low-carbon society,
– Measures implemented in a shorter and more expensive timeframe,
– Costs currently not associated with Climate Change impacts increments.


Q3-1
Topic 3 After
From the package of actions,
what area of investment would you focus on as a priority?
多くの対策のうちどの部門への投資を優先すべきですか？
1 Energy Efficiency
エネルギー効率
29%
26%
2 Demand Management
需要マネジメント
19%
23%
3 Renewables
再生可能エネルギー
45%
46%
4 CCS
二酸化炭素隔離貯留
7%
5%
Before
After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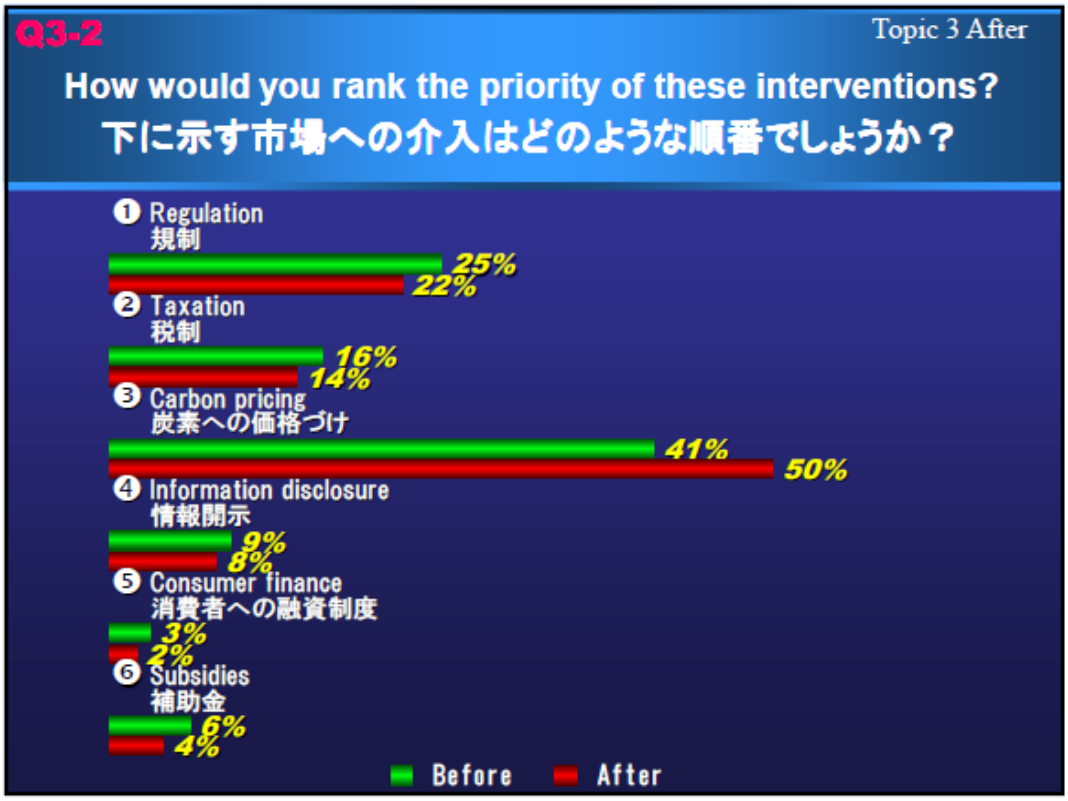
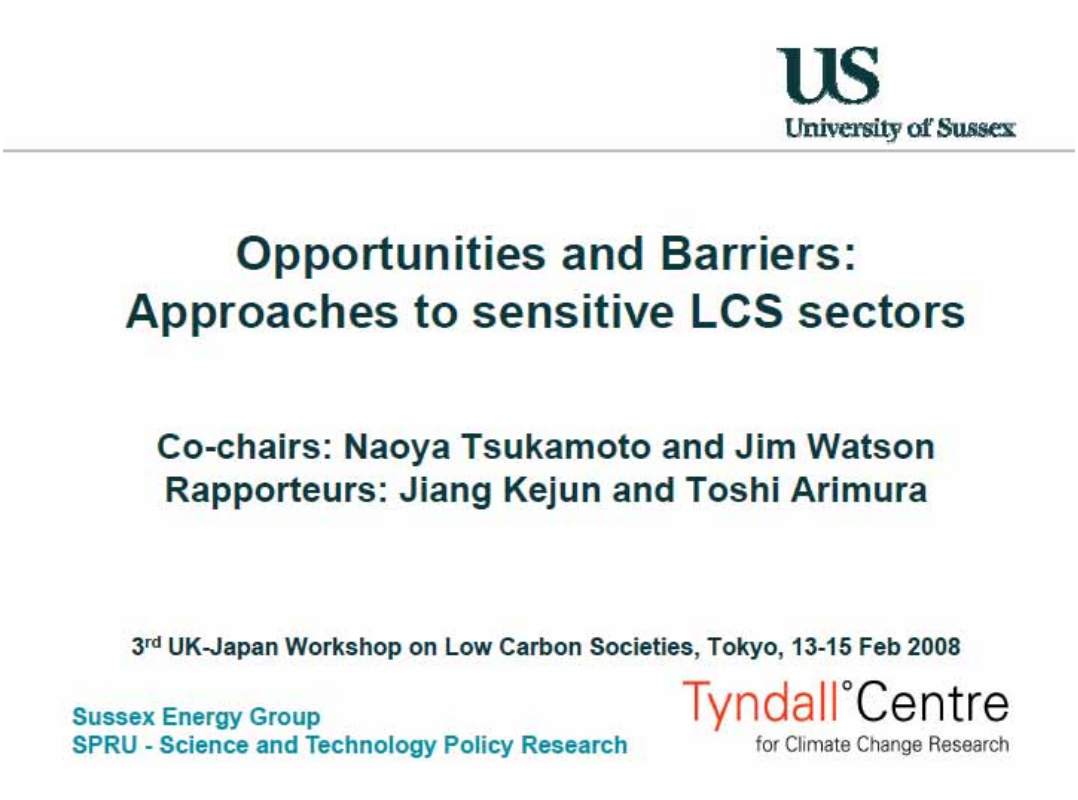
1 Energy Efficiency
エネルギー効率
22%
13%
55%
2 Demand Management
需要マネジメント
22%
27%
18%
3 Renewables
再生可能エネルギー
52%
33%
27%
4 CCS
二酸化炭素隔離貯留
27%
Japan
日本
Developed countries
(U.S.A, EU, etc.)
先進国
Rising/developing countries
(BRICs, South Africa, etc.)
新興国・途上国

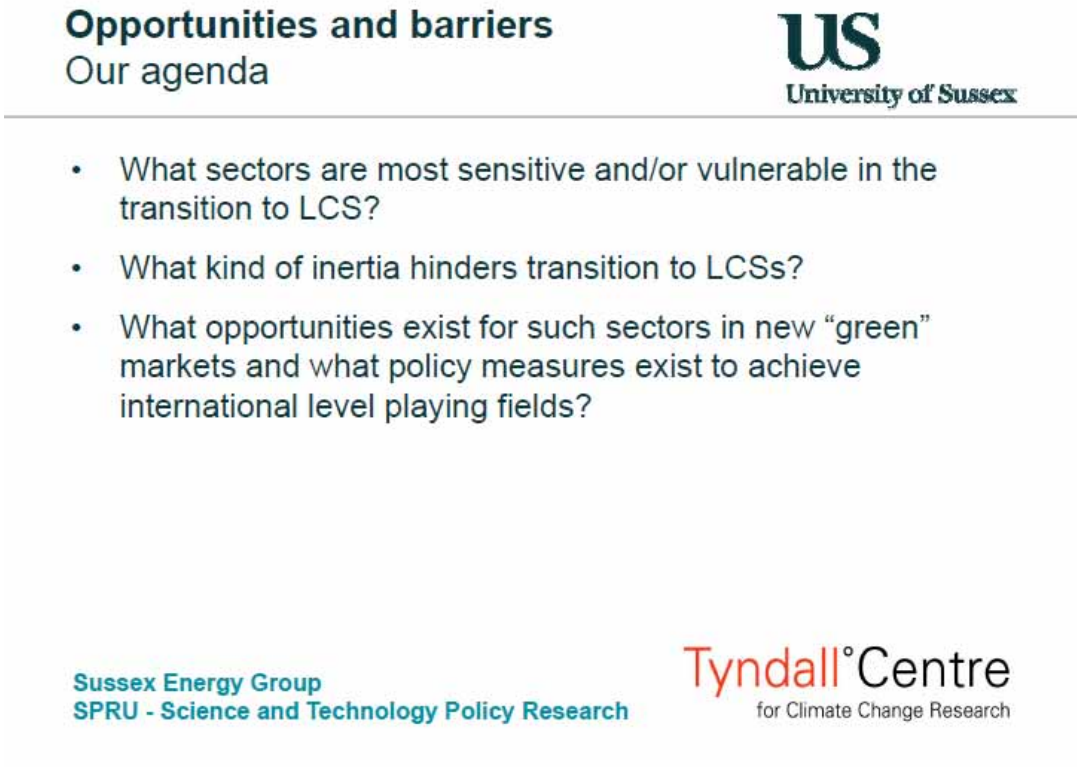

Q3-2
Topic 3 After
How would you rank the priority of these interventions?
下に示す市場への介入はどのような順番でしょうか？
1 Regulation 規制
25%
22%
2 Taxation 税制
16%
14%
3 Carbon pricing 炭素への価格づけ
41%
50%
4 Information disclosure 情報開示
9%
8%
5 Consumer finance 消費者への融資制度
3%
2%
6 Subsidies 補助金
6%
4%
Before
After


Q3-2
Topic 3 After
How would you rank the priority of these interventions?
下に示す市場への介入はどのような順番でしょうか？
1 Regulation 規制
17%
33%
8%
2 Taxation 税制
12%
59%
3 Carbon pricing 炭素への価格づけ
55%
67%
25%
4 Information disclosure 情報開示
10%
8%
5 Consumer finance 消費者への融資制度
1%
6 Subsidies 補助金
5%
Japan 日本
Developed countries (U.S.A, EU, etc.) 先進国
Rising/developing countries (BRICs, South Africa, etc.) 新興国・途上国

Panel Discussion Summary

Topic 4: Opportunities and Barriers: Approaches to sensitive LCS sectors





Opportunities and barriers
Question 1

University of Sussex

Which sector faces the biggest challenges in the transition to low carbon societies?

- Electricity
- Surface transport
- Iron and steel
- Forestry conservation
- Aviation

Sussex Energy Group
SPRU - Science and Technology Policy Research

Tyndall Centre for Climate Change Research

Opportunities and barriers
Question 2

University of Sussex

What is the most important challenge for energy intensive industries such as iron and steel?

- development and deployment of radical low carbon technologies to low-carbonize its production
- closing the efficiency gap between industries in different countries and to achieve a level playing field
- Retain competitiveness as domestic climate change policy is implemented by restricting import
- Securing subsidies to retain competitiveness

Sussex Energy Group
SPRU - Science and Technology Policy Research

Tyndall Centre for Climate Change Research

Opportunities and barriers

University of Sussex

- Our starting point has been sectors such as iron and steel which are energy / carbon intensive and are exposed to substantial international trade
- We have also considered other sectors (e.g. electricity and transport) which are critical for the transition to a low carbon society
- The barriers and opportunities differ between these sectors – some are more 'sensitive' than others
- Key issue of data and transparency: especially if sectoral approaches to emissions reductions are considered

Sussex Energy Group
SPRU - Science and Technology Policy Research

Tyndall Centre for Climate Change Research

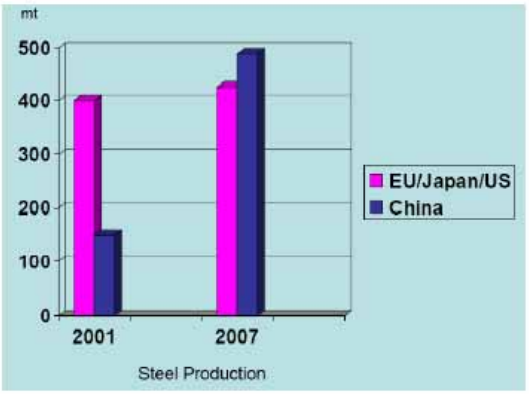
Opportunities and barriers
Which sectors are sensitive?

University of Sussex

Sector	Share of global emissions	Exposure to international competition
Electricity and heat	25%	
Transport	14%	
Buildings	15%	
Motor vehicle manufacture	10%	
Aviation	2%	
Chemicals	5%	
Cement	4%	
Steel	3%	
Aluminium	1%	
Other industry	21%	

Energy intensive traded sectors
Characteristics

University of Sussex



- Relatively high carbon intensity.
- Increasing demand in the international market
- Competition between developed and newly emerging economies – potential for carbon leakage

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Energy intensive traded sectors
Opportunities and barriers

University of Sussex

- Opportunities for engaging within sectors – especially with developing countries (e.g. through technology transfer)
- Technological options require investment – short term efficiency and long term radical
- Policy options include:
  - Technology incentives (carbon pricing and R,D,D&D funds)
  - Sectoral approaches have a lot of potential
  - Links between sectoral approaches and targets / trading schemes are important in some Annex I countries
  - Modification of trade policy is an option: but is it protectionist?

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Tyndall Centre for Climate Change Research

Power industry

University of Sussex

- Low carbon societies require fundamental changes on the supply and demand side of electricity systems
- There are many existing and potential low carbon options in this sector - some could also help energy security
- A key challenge is 'lock-in' to established infrastructure, and long timescales for capital stock turnover
- Incentives to develop and deploy low carbon options – there is an issue of consumer acceptance due to costs
- Technology transfer to deploy new technologies in developing countries – including efficiency improvements

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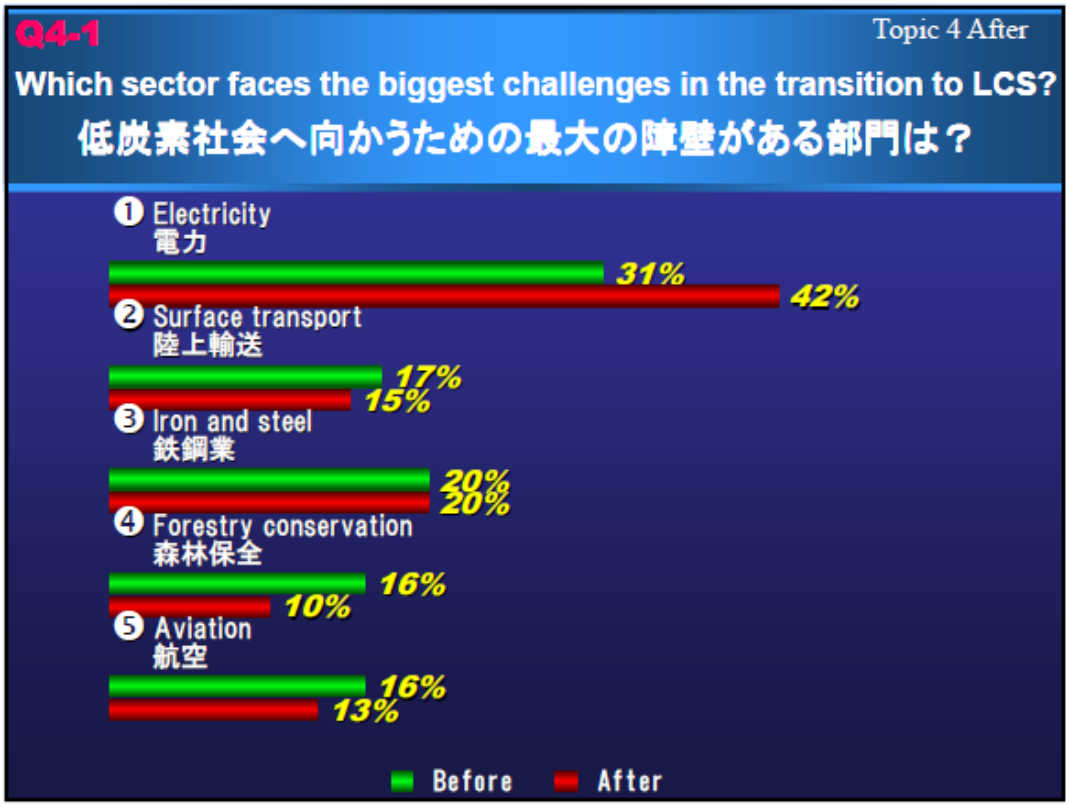
Transport (cars)

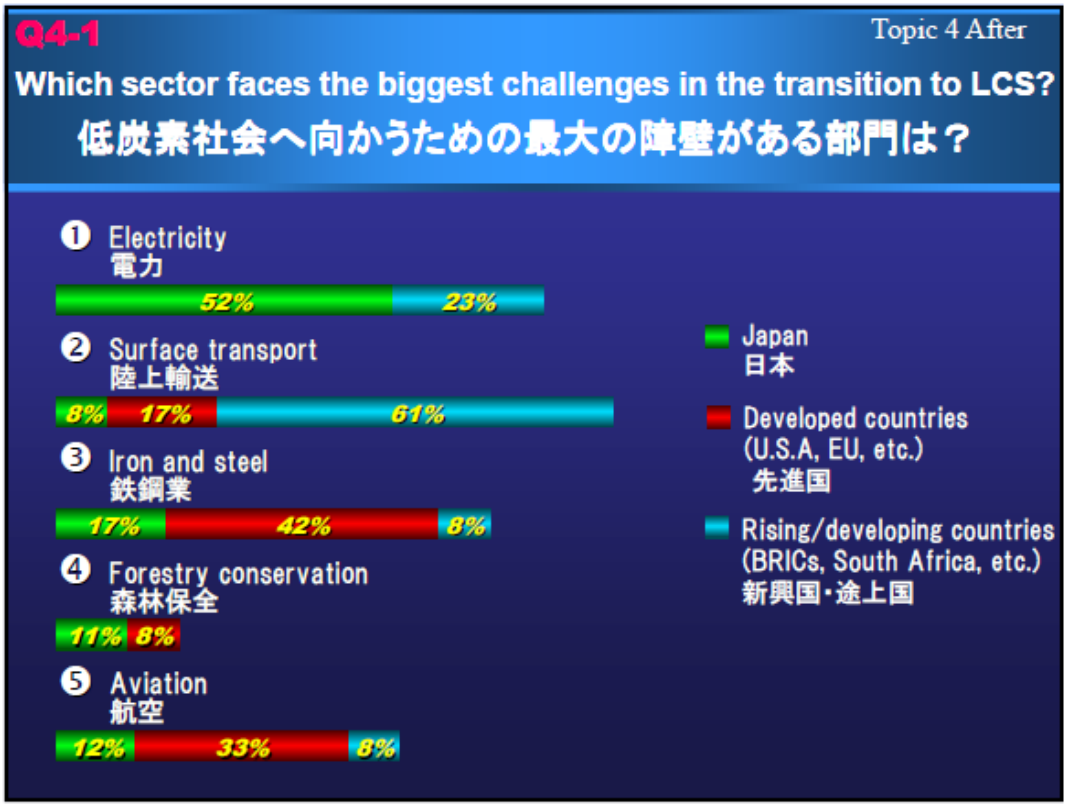
University of Sussex

- Transport emissions rising in many countries.
- Many options for emissions reductions: efficiency increase, low carbon fuels, modal shift, behavioural and demographic change
- Biofuels have some potential but are controversial
- New standards on carbon intensity of new vehicles play a critical role: manufacturers differ in their attitudes

Sussex Energy Group
SPRU - Science and Technology Policy Research

Tyndall Centre for Climate Change Research


Q4-1
Topic 4 After
Which sector faces the biggest challenges in the transition to LCS?
低炭素社会へ向かうための最大の障壁がある部門は？
1 Electricity
電力
31%
42%
2 Surface transport
陸上輸送
17%
15%
3 Iron and steel
鉄鋼業
20%
20%
4 Forestry conservation
森林保全
16%
10%
5 Aviation
航空
16%
13%
Before
After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Topic 4 After
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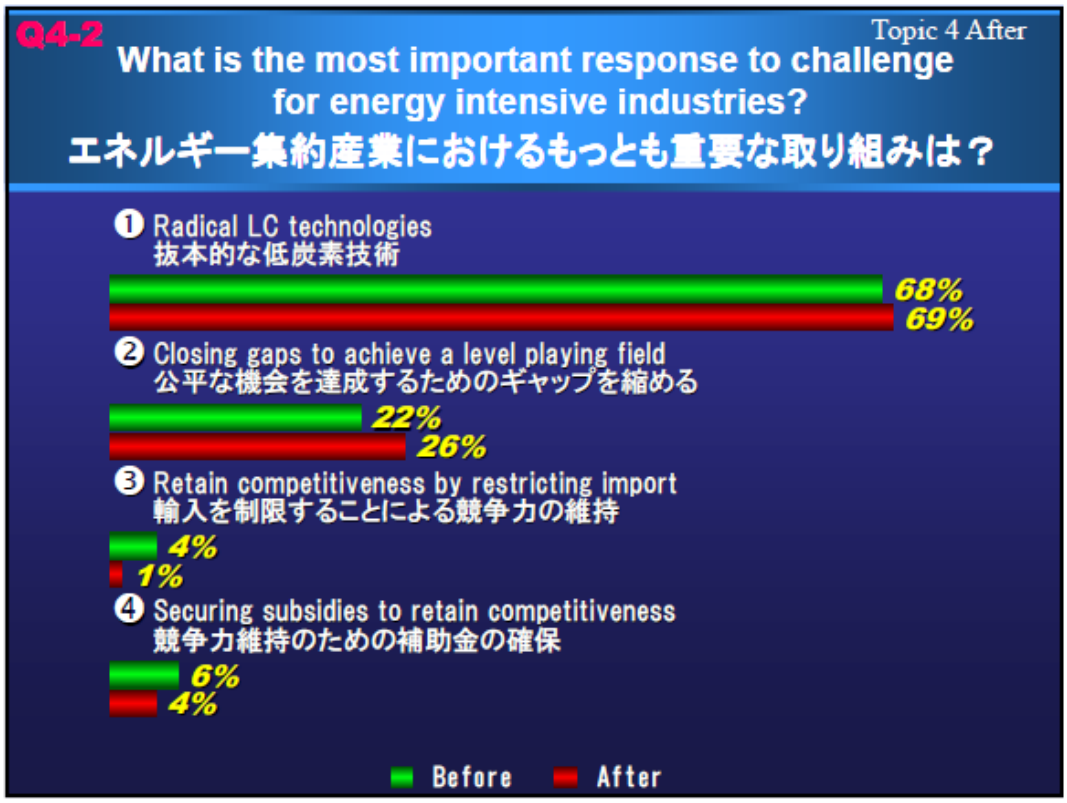
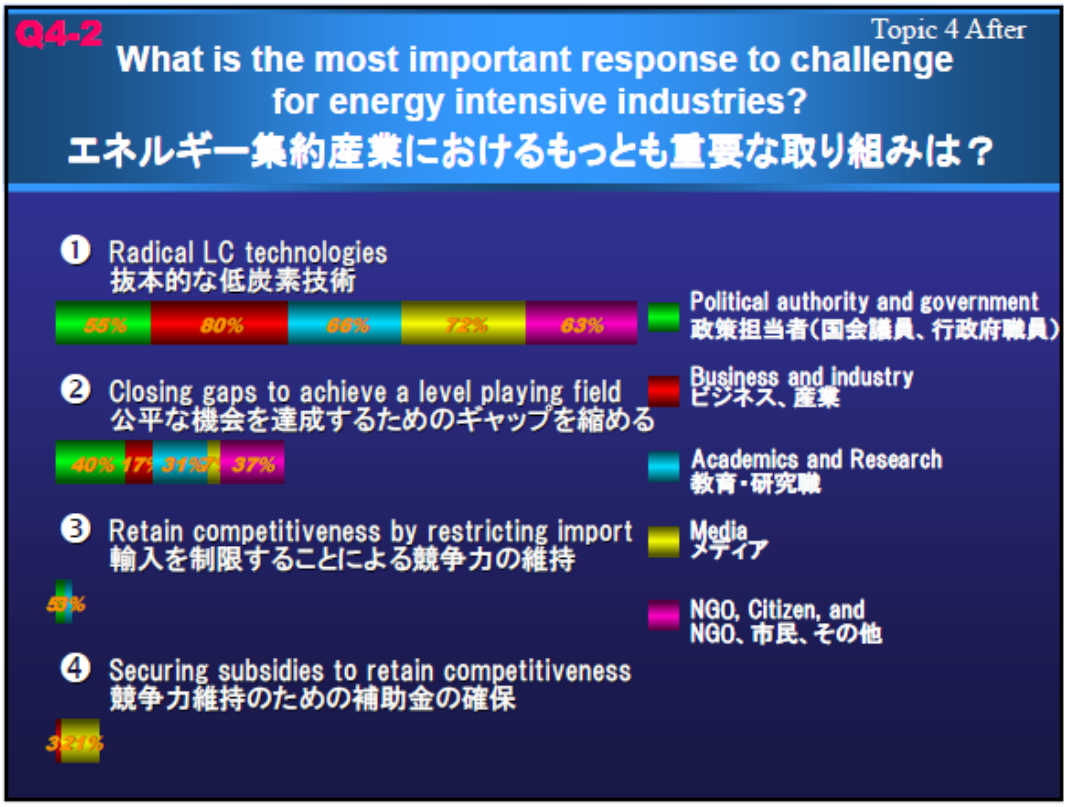
電力
52%
23%
2 Surface transport
陸上輸送
8%
17%
61%
3 Iron and steel
鉄鋼業
17%
42%
8%
4 Forestry conservation
森林保全
11%
8%
5 Aviation
航空
12%
33%
8%
Japan
日本
Developed countries
(U.S.A, EU, etc.)
先進国
Rising/developing countries
(BRICs, South Africa, etc.)
新興国・途上国


Q4-2
Topic 4 After
What is the most important response to challenge for energy intensive industries?
エネルギー集約産業におけるもっとも重要な取り組みは？
1 Radical LC technologies
抜本的な低炭素技術
68%
69%
2 Closing gaps to achieve a level playing field
公平な機会を達成するためのギャップを縮める
22%
26%
3 Retain competitiveness by restricting import
輸入を制限することによる競争力の維持
4%
1%
4 Securing subsidies to retain competitiveness
競争力維持のための補助金の確保
6%
4%
Before
After


Q4-2
Topic 4 After
What is the most important response to challenge for energy intensive industries?
エネルギー集約産業におけるもっとも重要な取り組みは？
1 Radical LC technologies
抜本的な低炭素技術
55%
80%
66%
72%
63%
2 Closing gaps to achieve a level playing field
公平な機会を達成するためのギャップを縮める
40%
17%
31%
37%
3 Retain competitiveness by restricting import
輸入を制限することによる競争力の維持
4 Securing subsidies to retain competitiveness
競争力維持のための補助金の確保
Political authority and government
政策担当者(国会議員、行政府職員)
Business and industry
ビジネス、産業
Academics and Research
教育・研究職
Media
メディア
NGO, Citizen, and
NGO、市民、その他

Interactive Discussion using Electronic Voting System

1. Overview

In the symposium's afternoon session, an electronic voting system was used to gather audience opinion regarding what were considered to be the most important points for each topic, based on the discussions of the 1st and 2nd day expert workshop. In addition to the questions submitted by each group (total: 7 questions), we asked 2 further questions regarding awareness of the CO_2 reduction targets for 2050 that the symposium is aiming for, making for a total of 9 questions. We gathered audience response twice, once before and once after explaining the key findings of the discussions on each topic, so as to ascertain mind-setted audience awareness and any change in that awareness as a result of hearing about the key findings through discussions conducted in the experts workshop. We offered 4-6 responses for each question.

Before the afternoon session, we used electronic voting system to ask the audience to provide their age (4 categories), region (3 categories), and profession (5 categories), these questions also serving to familiarize the audience with the system. Participant profiles are shown in Table 1. N/A represents participants who joined the session part way through and so had not provided answers to the profile questions. Results showed that most of the 198 persons who participated in the afternoon session were Japanese, and that most were spread evenly over the 30–39, 40–49, and over 50 years age groups. Participants were distributed fairly evenly among each of the profession categories, with a slight bias towards academia and industry.

Table 1. Participant profiles

Age		Region		Profession	
Under 29 years old	17	Japan	138	Political authority and government	33
30-39 years old	43	Developed country	18	Business and Industry	40
40-49 years old	42	Developing/ Rising country	14	Academics and Research	50
Over 50 years old	66	N/A	28	Media	24
N/A	30			NGO, Citizens, and others	23
				N/A	28

* A total of 198 persons participated in the session. Those who joined the session part way through were classified as N/A since they were unable to answer profile questions.

2. Results

At the session, the results of key findings through discussions conducted in the experts workshop up to the previous day on the 4 themes of (1) Behaviour Change and its Impact on Delivering LCSs, (2) Delivering LCS through Sustainable Development, (3) Enabling LCSs: Investment, and (4) Barriers and Opportunities: Approaches to Sensitive LCS Sectors were announced and questions put to the audience. The questions are shown in Table 2. All of the questions produced interesting results, but we would like to focus here on the 2 questions (Q1, Q2) on awareness regarding CO_2 reduction and 2 questions (Q4-1, Q4-2) on industrial sectors and activities that demand the greatest attention from the viewpoint of CO_2 reduction. We present overall results to the questions in Figs. 1 to 3 and Table 3.

Table 2. Questions

Overall questions: Awareness of the CO_2 reduction targets for 2050			
Q1	In 2050, our world HAS TO reduce CO_2 to ? (1) 0% of 1990 levels or increasing from current levels (2) About 30% of 1990 levels (3) About 50% of 1990 levels (4) About 70% of 1990 levels	Q2	In 2050, our world CAN reduce CO_2 to ? (1) 0% of 1990 levels or increasing from current levels (2) About 30% of 1990 levels (3) About 50% of 1990 levels (4) About 70% of 1990 levels
Topic1：Behaviour change and its impact on delivering LCSs			
Q1-1	What is most needed to change people's behavior towards adopting a low-carbon lifestyle? (1) Clear government standards and strong regulation (2) Information and guidance for action (3) Availability of suitable alternatives and choices (4) Prices and incentives that reflect the cost of carbon (5) Personal mind-set and positive attitudes	Q1-2	Between whom is dialogue most needed to promote behaviours leading towards a LCS? (1) Between business and consumers (2) Between government and citizens (3) Between government and business (4) Between national and local level governments
Topic2：Delivering LCS through Sustainable Development			
Q2-1	How to deliver LCS globally through SD? (1) Developed countries set examples for LCS (2) Continue current development with strong carbon mitigation (3) Alternative development path with international assistance (4) All countries follow LCS through SD actions		
Topic3：Enabling LCSs: Investment			
Q3-1	From the package of actions, what area of investment would you focus on as a priority? (1) Energy efficiency (2) Demand management (3) Renewables (4) CCS	Q3-2	How would you rank the priority of these interventions? (Choose 1st one only) (1) Regulation (2) Taxation (3) Carbon pricing (4) Information disclosure (5) Consumer finance (6) Subsidies
Topic4：Barriers and opportunities: Approaches to sensitive LCS sectors			
Q4-1	Which sector faces the biggest challenges in the transition to LCS? (1) Electricity (2) Surface transport (3) Iron and steel (4) Forestry conservation (5) Aviation	Q4-2	What is the most important response to challenge for energy intensive industries? (1) Radical LC technologies (2) Closing gaps to achieve a level playing field (3) Retain competitiveness by restricting import (4) Securing subsidies to retain competitiveness

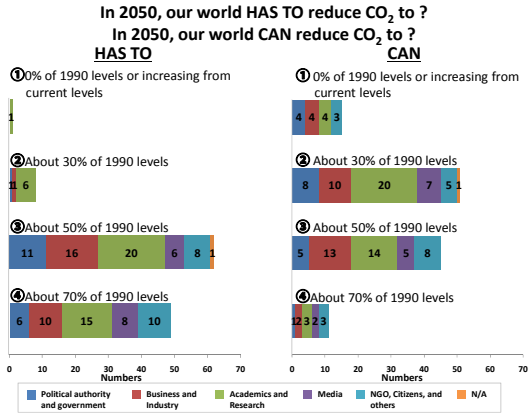


Figure 1. Awareness regarding CO_2 reduction (before afternoon session)

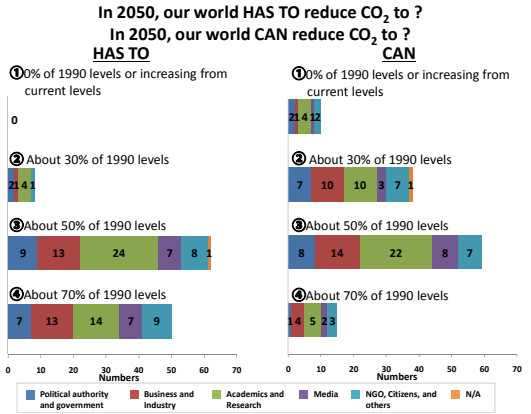


Figure 2. Awareness regarding CO_2 reduction (after symposium)

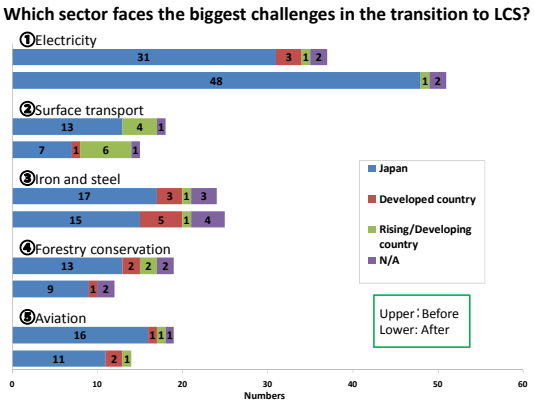


Figure 3. Q4-1 results

Table 3. Q4-2 results

What is the most important response to challenge for energy intensive industries?

		After				
		1	2	3	4	N/A
Before	1	79	4			14
	2	6	23			3
	3	3	1	2		
	4	1	1		5	1
	N/A	4	6			

1: Radical LC technologies
2: Closing gaps to achieve a level playing field
3: Retain competitiveness by restricting import
4: Securing subsidies to retain competitiveness

Owing in part to the fact that the symposium was invitation-only, awareness regarding CO_2 reduction was probably relatively high right from the start. Regarding the level of worldwide CO_2 reduction by 2050, irrespective of the timing of the question, a majority of participants responded that a reduction of over about 50% was required. A closer look at the results shows that several of those who chose 70% reduction before the session switched to 50% after the session. This is thought to have been caused by confusion before the start of the session over required worldwide CO_2 reduction level and the reduction level that Japan needs to achieve.

Looking at the question of feasibility of CO_2 reduction worldwide, the majority of participants felt before the start of the session that at best, no more than 30%–50% reduction would be feasible, despite their view that reduction of over about 50% was required. When the question was put to the audience again after the session, results show an increase in the number of participants who considered a higher reduction level to be feasible. However, the results also show that while the gap between participant perceptions of necessary and feasible reduction levels that existed before the symposium closed to a certain degree, the audience remained insufficiently convinced as a whole on the feasibility of achieving a level of CO_2 required for the abatement of climate change risks and assurance of a sustainable future.

Q4-1 asks which industrial sector faces the biggest challenges in relation to the implementation of political, institutional, and technological measures for the transition to the LCS. Responses to this question revealed a difference in views between Japanese participants and those from other countries. Before the announcement of the key findings of Topic 4 discussions, a great many participants irrespective of nationality held the view that the electricity sector faced the biggest challenges in transitioning to LCS. However, Topic 4 discussion included arguments to the effect that Japan's electricity sector in particular is in a favorable position for transitioning to the LCS owing to Japanese technological capabilities and lack of international competition. We consequently anticipated that the number of people choosing the electricity sector as a response to the question would decrease, but the number of Japanese choosing the sector in fact increased. While the discussion session suggested that the possibilities for the electricity sector to transition to LCS were high, Japanese participants appear to have thought that if the "challenges" mentioned in the question were surmountable, Japan's electricity sector needs to make greater efforts to transition to LCS. Non-Japanese participants, on the other hand, appear to have interpreted

"challenges" as meaning hurdles that are difficult to surmount, and as such, chose other sectors (iron and steel, surface transport) as facing more difficult challenges than the electricity sector, for which the possibilities for transitioning to LCS were described as being relatively high.

Q4-2 solicited opinions on the most important response to challenges for energy intensive industries, offering participants a choice of 4 responses: 1 response proposing the development of radical low carbon (LC) technology, and 3 responses related to maintaining a level playing field for international competition. Results show that irrespective of timing of the question, the great majority of participants considered the development of radical LC technology to be the most important, with very few participants selecting responses related to the international competition environment. The announcement of discussion results explained that electricity and heating supply sector accounted for the largest share (25%) of per-sector global emissions, followed by transport, buildings, and motor vehicle manufacture. The announcement also touched on the sectors most exposed to international competition, but motor vehicle manufacture is the only such sector among those mentioned above, and the announcement explained that even if international competition is fierce, the auto industry is not considered to be hugely significant in terms of CO_2 emissions. As a result, participants appear to have decided that domestic countermeasures are the most important, and accordingly chose technological innovation rather than responses related to the structuring of the international competition environment.

Closing Address

Ryutaro Ohtsuka, D.Sc.
President, National Institute for Environmental Studies, Japan

Good afternoon, everyone. As the President of the National Institute for Environmental Studies, NIES, I would like to express my sincere thanks to the keynote speakers, co-chairs of the symposium, chairs of panel discussions for report of their achievements in the preceding two-day workshops, and all participants for actively contributing to this symposium.

The symposium began with welcome addresses of Dr. Ichiro Kamoshita, Minister of the Environment, Japan, and Sir Graham Fry, British Ambassador to Japan, who represented the Japanese and UK sponsors/partners, respectively. Then, Dr. Shuzo Nishioka and Dr. Jim Skea, co-chairs of the symposium, stated the purpose of today's symposium, followed by three keynote presentations. Dr. Emil Salim, President's Council of Advisors (Former Minister of the Environment), Indonesia, pointed out key issues which should be considered together with low carbon society (LCS), paying special attention to the current and changing situations of developing countries. Mr. Mitsuhiko Yamashita, Executive Vice-President, Nissan Motor Co. Ltd., showed us hardware and software approaches to LCS from the viewpoint of motorized transport system. Mr. David Warrilow, Head of Climate, Energy and Ozone, UK Defra, outlined the up-to-date roadmap to LCS, stressing the significance of both technological innovations and lifestyle changes.

In the afternoon panel discussion, led by the same co-chairs, the achievements of the two–day workshop on four themes were reported by the workshop chairs, followed by questions and answers, and the participants' opinion poll of preferred answers to several questions prepared by the chairs. I was most impressed by the appropriate selection of the four themes, i.e. "behaviour change", "aligning with sustainable development", "investment" and "barriers and opportunities", because all of them need our urgent attention. Both the chairs' reviews and the participants' comments/questions were extremely meaningful and constructive. For instance, the chairs answered a participant's question about the reasons as to why nuclear energy was excluded from the source options in the workshop, and other participants suggested usefulness of cooperation with NGOs and information media to achieve LCS.

Since the contents of panel discussion were summarized very well by the co-chairs, I will briefly explain my idea about how we should develop our study from now on. In the NIES, we carry out four priority research programmes, and each of them targets a desired society, i.e. low carbon society, sound material-cycle society, nature friendly society, and safe, secure and healthy society. I think it is crucial to consider the interrelations among these desired societies. I was very happy to

learn that the chairs of “aligning with sustainable development” workshop suggested a strong possibility of win–win relation between LCS and sustainable development. My hope is that further consideration will be given to this matter and this research group will take the lead in it.

Finally, I would like to again express my great appreciation to all participants and close this year’s fruitful symposium. Thank you very much.

Appendix I

Eiichiro Adachi	Japan Research Institute, Japan
Toshi Arimura	Sophia University, Japan
Yurika Ayukawa	WWF Japan, Japan
Christopher Beauman	European Bank for Reconstruction and Development,UK
Rizaldi Boer	Bogor Agricultural University, Indonesia
Andrew Bolitho	Defra, UK
Emma Howard Boyd	Jupiter Asset Management, UK
Rae Kwon Chung	UNESCAP, Korea
Steve Cornelius	Defra, UK
Renaud Crassous	CIRED, France
Ogunlade Davidson	University of Sierra Leone, Sierra Leone
Shobhakar Dhakal	National Institute for Environmental Studies, Nepal
Jae Edmonds	JGCRI/PNNL, USA
Tomoki Ehara	Mizuho Information & Research Institute, Japan
Haroldo de Oliveira Machado Filho	Ministry of Science and Technology, Brazil
Yoshihiro Fujii	Sophia Univ., Japan
Jun Fujimoto	University of Tokyo, Japan
Junichi Fujino	National Institute for Environmental Studies, Japan
Kensuke Fukushi	University of Tokyo, Japan
Chikara Furuya	Institute for International Monetary Affairs, Japan
Jose Albert Garibaldi	Energeia, Mexico
Guido Knoche	Federal Environment Agency, Germany
Don Gunasekera	Australian Bureau of Agricultural and Resource Economics, Australia
Mariko Hanada	Osaka Sangyo University, Japan
Taka Hiraishi	IGES, Japan
Kimiko Hirata	KIKO Network, Japan
Ryokichi Hirono	Seikei University, Japan
HO Chin Siong	Universiti Teknologi Malaysia, Malaysia
Tetsunari Iida	ISEP, Japan
Kejun Jiang	Energy Research Institute, China
Tae Yong Jung	Asian Development Bank, Korea
Mikiko Kainuma	National Institute for Environmental Studies, Japan
Yasuko Kameyama	National Institute for Environmental Studies, Japan
Masato Kawanishi	Japan International Cooperation Agency, Japan
Kejun Jiang	Energy Research Institute, China
Hitomi Kimura	IGES, Japan
Akiyasu Kurishima	MLIT, Japan
Murari LAL	REL, India
Kathy Leach	British Embassy in Tokyo, UK
Myung-kyu Lee	OPC, Korea

Sunil Malla	Technology Consultancy Services, Kathmandu, Nepal
Toshihiko Masui	National Institute for Environmental Studies, Japan
Teruaki Masumoto	Tokyo Electric Power Company, Japan
Keisuke Matsuhashi	National Institute for Environmental Studies, Japan
Naoki Matsuo	Climate Expert, PEAR Japan
Yuichi Moriguchi	National Institute for Environmental Studies, Japan
Stanford Mwakasonda	Energy Research Centre, South Africa
Ikuo Nishimura	Tokyo Electric Power Company, Japan
Shuzo Nishioka	National Institute for Environmental Studies, Japan
Michael Norton	Shinshu University, UK
Masa Ohara	Tokyo prefecture, Japan
Yasukuni Okubo	METI, Japan
Ichiro Ozawa	JEF, Japan
Andre Santos Pereira	COPPE, UFRJ, Brazil
Chris Pook	British Embassy in Tokyo, UK
Hannah Ryder	Stern Team from Defra, UK
Emil Salim	Former Minister of Environment, Indonesia
Yasuhiro Sasano	National Institute for Environmental Studies, Japan
Masayuki Sasanouchi	Toyota, Japan
Charles Secrett	London Mayor's Office, UK
Narito Shibaike	Panasonic, Japan
Ram Manohar Shrestha	Asian Institute of Technology, Thailand
P.R.Shukla	Indian Institute of Management, India
Jim Skea	UKERC, UK
Tomonori Sudo	Japan Bank for International Cooperation,Japan
Takejiro Sueyoshi	UNEP, Japan
Yasuo Takahashi	MOEJ, Japan
Ralph Torrie	ICF International, Canada
Haruki Tsuchiya	RIST, Japan
Sachiko Tsukahara	MOEJ, Japan
Naoya Tsukamoto	MOEJ, Japan
Wang Shu	National Development and Reform Commission, China
David Warrilow	Defra, UK
Jim Watson	SPRU and Tyndall Centre, UK
Jeremey Watson	Arup, UK
Yoshiaki Yamanaka	Shiga Prefecture, Japan
Suguru Yamaryo	Itocyu Corporation, Japan
XU Yan	National Institute for Environmental Studies, China
Sungho Yang	OPC,Korea
Isamu Yasuda	Tokyo Gas, Japan

Appendix II

Mr. Eiichiro Adachi, Research Chief, Head of ESG Research Center, The Japan Research Institute, Limited, Japan

Mr. Adachi is a research chief and the head of ESG research center at The Japan Research Institute Limited, which was founded in 1989 and sponsored by companies in the Sumitomo group. He is now engaged in ESG screening of listed Japanese companies for socially responsible investment products of UBS Global Asset Management, Sumitomo Trust and Banking Co., Ltd, STB Asset Management Co., Ltd and Daiwa Asset Management Co. Ltd. He is also a project manager of research works regarding environmental finance and CSR that several ministries entrusted and one of the national experts among Japanese delegation to ISO/ Social Responsibility Standards (ISO26000) Working Group.

Dr. Toshi H. Arimura, Visiting Scholar, Resources for the Future, USA, George Mason University, USA and Associate Professor, Sophia University, Japan

He is an associate professor of environmental economics at Sophia University. He is currently a visiting scholar at Resources for the Future and George Mason University. His research interests encompass climate change policies, emission trading and environmental technological innovation. He has received Abe Fellowship for analyzing the effects of environmental policy instrument choice on technological innovation. He has also participated in an international collaboration project by the OECD to examine the effectiveness of corporate environmental actions. He received his BA from Tokyo University, MS from Tsukuba University and Ph.D. in economics from the University of Minnesota in USA.

Yurika Ayukawa, Has a BA from Sophia University, Foreign Language Faculty, English Language Division、and a Master's Degree in Public Administration from Harvard University.

Climate Change Programme Special Advisor at WWF（World Wide Fund for Nature）Japan since July, 2007. Has been working on Climate Change Programme at WWF Japan since 1997.Lobbied the governments on international negotiations and domestic climate policy of Japan. Proposed a cap & trade domestic emissions trade scheme in 2007. Worked on Climate Savers Programme to make companies commit to absolute GHG reductions(Sagawa Express and Sony Corporation from Japan). Testified at the Lower House Environmental Committee in 2002, and in 2005.Was a member of the advisory committee of the Ministry of Environment on carbon tax, and now "Capacity Building of Environment-conscious Workforce for a Sustainable Asia in Universities" since July, 2007. Vice-Representative for "2008 G8 NGO Forum".

Christopher Beauman, Senior Adviser, European Bank for Reconstruction and Development (EBRD)

He joined EBRD when it was set up in 1991 to assist the former communist countries of Eastern Europe and the Former Soviet Union in their transition to a market economy, and has responsibility for coordinating EBRD's financing of steel projects, including Russia, Ukraine, Kazakhstan, Poland, Romania, Croatia and Georgia. He has worked closely with EBRD's Energy Efficiency and Climate Change Team, especially the EUR300m Energy Efficiency Loan to Severstal (Russia). Previously he has worked in corporate finance for three London merchant banks, as Director, Planning, Morgan Grenfell Group, as Adviser to the Chairman of British Steel during its period of major restructuring (1976-81), and for the Central Policy Review Staff, UK Cabinet Office. He is also a member of the Climate Policy group of the British Institute of Energy Economists.

Dr. Rizaldi Boer, Head of Climatology Laboratory, Faculty of Mathematics and Natural Sciences, Bogor Agricultural University, Indonesia

Dr. Boer received his B.S. from Bogor Agriculture University-Indonesia in 1983 and Ph.D. degree from University of Sydney-Australia in 1994. He specialized in agroclimatology. He is one of Lead Authors of GPG-LULUCF and IPCC Fourth Assessment Report under WGIII and also serving UNFCCC Secretariat as lead reviewer for the National Greenhouse Gas Inventory of Annex 1 countries. Since 1996, he has been working in many regional projects related to climate mitigation and adaptation. He is now working under IFCA (Indonesia Forest-Climate Alliance) for the preparation of REDDI (Reduction of Emission from Deforestation and forest degradation in Indonesia).

Andrew Bolitho is a policy advisor in International Climate Change Policy team at the Department for Environment, Food and Rural Affairs (DEFRA).

The role of the team is to provide advice on the position of other countries involved in the Gleneagles Dialogue and developing strategies for their engagement in the Dialogue and the broader climate change process. This involves liaising with policy makers in other national, state level administrations, as well as forming links with the business and NGO communities. The team is also involved in promoting research and development of currently available technologies, and technologies in development, through programmes of work under the Gleneagles Plan of Action. Mr. Bolitho has work in others areas in DEFRA including implementation of the EU Emissions Trading Scheme and Climate Change Impacts and Adaptation.

Emma Howard Boyd, Head of Socially Responsible (SRI) Investment and Governance, Director Jupiter Asset Management

Emma joined Jupiter in 1994 and has overall responsibility for the management and development of Jupiter's Socially Responsible Investment business. She is also responsible for building Jupiter's corporate governance and engagement services for institutional clients and Jupiter's UK retail funds. Emma was a member of Commission on Environmental Markets and Economic Performance in 2006 and is a director of the Triodos Renewable Energy Fund. She is also a guest faculty member of The Prince of Wales's Business and the Environment Programme. Prior to working at Jupit er, Emma specialised in corporate finance at Hill Samuel and Banque Nationale de Paris. She has also worked as a researcher and campaigner for various Non-Governmental Organisations. Emma is a director of Jupiter Asset Management.

CHUNG Rae Kwon. Director of the Environment and Sustainable Development Division of United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Bangkok

Rae Kwon majored in economics in Korea and obtained an MSc in Foreign Service from Georgetown University in Washington D.C.. As a former career diplomat, he was the Korean Chief Negotiator for many global environment conferences. Rae Kwon has been posted at Korean Missions to the UN and the OECD. He served as the Director-General for the International Economic Affairs Bureau at the Ministry of Foreign Affairs and Trade until July 2004 before joining the UNESCAP.

Dr. Stephen Cornelius, Senior Scientific Officer, Department for Environment, Food and Rural Affairs (DEFRA) UK

Steve Cornelius works in the Response Strategies Branch in Defra's Climate Energy and Ozone: Science and Analysis Division. For the past 3 years he has advised the UK Government on climate change mitigation options, future action under the Kyoto Protocol and on UK greenhouse gas inventory and projections. He has been a delegate to IPCC meetings and UNFCCC negotiations.In June 2007 he coordinated the 2nd Japan-UK LCS workshop.Dr. Cornelius received a B.E. (Chem) from the University of New South Wales in Sydney, Australia and Ph.D., on modelling and control of automotive catalysts, from the engineering department of the University of Cambridge in the UK.He has previously worked as an engineering consultant developing physicochemical models of automotive
pollution control devices.

Renaud Crassous, Researcher, Centre International de Recherche sur l'Environnement et le Développement (CIRED), France

Renaud Crassous, a civil servant of the French Ministry of Agriculture, is an economist and a project leader of the Imaclim-R framework, a world Economy Energy Environment Hybrid Model developed at CIRED. The model has been used to assess energy and climate policies in several projects with industrials, ministries and international agencies, e.g. the World Energy Outlook in 2006. Renaud Crassous is also a member of the French delegation to the IPCC.

Dr. Shobhakar Dhakal, Executive Director, Global Carbon Project – Tsukuba International Office, National Institute for Environmental Studies (NIES), Japan

Dr. Dhakal works with international scientific programs on global carbon cycle and its management- called Global Carbon Project, whose one of the two offices is hosted by National Institute for Environmental Studies. He is leading urban and regional carbon management initiative (www.gcp-urcm.org) and his expertise are with urban energy use and carbon emission and mitigation analyses in Asian mega-cities, and transport and CO2 issues in developing cities. He works at the interface of science and policy and has extensive experiences with intercity co-operation networks, UN agencies, science-policy dialogues, and served as expert member to agencies like International Energy Agency and others. He is author of two books, guest editors of journals, several articles in well established journals, several book chapters and has been to committee of various scientific and policy initiatives.

Dr.Jae Edmonds , Chief Scientist and Laboratory Fellow at the Pacific Northwest National Laboratory's (PNNL) Joint Global Change Research Institute, and Adjunct Professor of Public Policy at the University of Maryland at College Park.

He is the principal investigator for the Global Energy Technology Strategy Program to Address Climate Change, an international, public-private research collaboration. His research in the areas of long-term, global, energy, economy, and climate change spans three decades, during which time he published several books, numerous scientific papers and made countless presentations. His most recent book, ***Global Energy Technology Strategy, Addressing Climate Change***, distills more than a decade of research on the role of technology in addressing climate change. Dr. Edmonds has served in the capacity of Lead Author on every major IPCC assessment to date and presently serves on the IPCC Steering Committee on "New Integrated Scenarios". He serves on numerous panels and advisory boards related to energy, technology, the economy and climate change. His received his Ph.D. in the field of Economics from Duke University in 1975.

Mr. Yoshihiro Fujii, Professor for Sophia University, Graduate School of Global Environmental Studies, Japan.

Yoshihiro Fujii, a professor for Sophia University, Graduate School of Global Environmental Studies, is focusing his concern on environmental finance in which using financial tools to mitigate environmental costs and enhance economic profits for society. Before then, Mr. Fujii was a former senior staff writer for Nihon Keizai Shimbun (Nikkei) as a financial journalist. He has written lots of books both environmental and financial fields. He is also a visiting research fellow for Japan Center for Economic Research(JCER).

Dr. Junichi Fujino, Senior Researcher, Climate Policy Assessment Section, Center for Global Environmental Research (CGER), National InstituteforEnvironmental Studies (NIES) Japan

He is a senior researcher in the Climate Policy Assessment Section Center for Global Environmental Research (CGER) at the National Institute for Environmental Studies (NIES), Japan. His fields of research include environmental modeling analysis, especially on energy-economy system modeling and bioenergy study. He is involved in the development of the Asia-Pacific Integrated Model (AIM) to estimate climate change impact and to assess policy options for stabilizing global climate. He is currently fully engaging on “Japan Low-Carbon Society Scenario Project” since 2004.He received his B.S./M.S and Ph.D. in Electrical Engineering from the University of Tokyo, Japan. He has been working in current position since April 2000. He is visiting Associate professor, Japan Advanced Institute of Science and Technology (JAIST) and adjunct instructor, Tokyo University of Science

Dr. Kensuke Fukushi, Associate Professor, Transdisciplinary Initiative for Global Sustainability, Integrated Research System for Sustainability Science, The University of Tokyo, Japan

Kensuke Fukushi, an environmental engineer, is specialized in risk assessment and hazardous material management, especially in arsenic research. He has been conducting field work in developing region in South and Southeast Asia since 1999 while he served as an Associate Professor at Asian Institute of Technology, Thailand. Kensuke Fukushi received B.S. and M.S. from Tohoku University, Japan in Civil Engineering, and Ph.D. in Civil-Environmental Engineering from the University of Utah, U.S.A.

Mr. Jose Alberto Garibaldi, Director General, Energeia (Mexican NGO), Mexico

Jose Alberto Garibaldi is currently director General of Energeia, an Advisor to the UK Departments of Food and Rural Affairs (DEFRA) and for International Development (DFID). He has previously been a Director General in the Mexican Energy Ministry, and Head of the Energy Policy Unit there. He has worked with the World Bank, the Asian Development Bank, the African Development Bank and the Asian Development on issues related to the financing of low carbon and climate change, in the aftermath of the Gleneagles G8 summit. He has worked in all continents on issues related to climate change policy.

Dr. Guido Knoche, Project Manager, Climate Change Division, Federal Environment Agency, Dessau-Rosslau (Germany)

Guido Knoche, project manager in the Climate Change Division of the Federal Environment Agency, is conducting integrated analysis of global climate change mitigation options, in particular in energy relevant sectors of industrialized and newly industrialized countries. With his interdisciplinary background he aims at environmental sound and resource efficient policy options of sustainable development. Guido Knoche received his Diploma degree in Geo-ecology at Bayreuth University and holds a Dr. degree in Environmental Engineering Sciences of Stuttgart University (both Germany) focusing on Underground Thermal Energy Storage.

Don Gunasekera, ABARE's Chief Economist,

He manages and leads ABARE's applied research effort in fields as diverse as impacts of and response measures to climate change, and domestic and international economic issues. Don has published on—and continues to work in—a wide range of topics including the economic impacts of climate change, international agricultural trade, and the economic value of weather information.Prior to joining ABARE, Dr Gunasekera has worked in the National Competition Council, Productivity Commission,Environment Australia and the Bureau of Meteorology. Don has a PhD in economics from the Australian National University and has completed the Senior Managers in Government Program at the John F Kennedy School of Government in Harvard University.

Mariko Hanada、Associate Professor、Graduate School of Human Environment, Osaka Sangyo University

has B.A. in Economics from the University of Tokyo and Master's Degree in Behavioral Sciences from California State University, Dominguez Hills.

Her major concern is how to motivate citizens to behave with environmental-consciousness in their daily life. She and her students teach both kids and adults about the relation between their lifestyle and the global environmental problems through "learning by doing". She is the leader of "NANOHANA PROJECT" of Osaka Prefecture and a chair of home division of the agenda forum in Nara Prefecture. Her goal is to realize "sustainable local society" in partnership with local government, companies, and citizens.

Taka Hiraishi, Member of Board of Directors and Senior Consultant, Institute for Global Environmental Strategies

Obtained M.Sc in 1968, and worked in Ministry of Labour, (then) Environment Agency, Embassy of Japan in Kenya, OECD Secretariat (Environment Directorate), and UNEP (1989-1998). Since 1999, he works, among others, (part-time) for IGES, and is Co-chair of the IPCC Inventory Programme and since 2002 an IPCC Bureau Member.

Ms. Kimiko Hirata, Director, Kiko Network, Japan

She is a director of Kiko Network Japan, which is an environmental NGO specifically working on climate change issues and a domestic network of 150 organization members. She joined Kiko Network when it's founded in 1998. As a policy researcher and an activist, she has been involved in UNFCCC process since COP3 and analyzed international regime as well as domestic climate policies. Recently she led Kiko Network's project on "30% reduction scenario and policy proposals for Japan's residential and commercial sectors in 2020". Currently she also serves as Environmental Council member of the Tokyo metropolitan government, Climate Change Committee member of the Chiyoda ward, and climate issue leader of the Environmental Unit of G8 Summit NGO Forum.

HIRONO, Ryokichi, Professor Emeritus, Seikei University, Tokyo,

He graduated from the University of Chicago in 1959, and now Visiting Professor, Graduate Institute for Policy Studies (GRIPS) in Tokyo, participated in many meetings concerned with environment and development at home and overseas including many sessions of COP. Having chaired various subcommittees of Central Environment Council, Economic Deliberations Council and ODA Council of the Government of Japan (Tokyo) since 1980s and the Committee for Development Policy, U.N. Economic and Social Council (New York) since the 1990s, Prof. Hirono developed a number of international initiatives for promoting Sustainable Development. in Asia and elsewhere. Over 800 books, reports and journal articles have been published at home and overseas.

Dr. Chin Siong HO, Faculty of Built Environment, Universiti Teknologi Malaysia, Johor Bahru, Malaysia

Chin Siong, HO, professor at Faculty of Built Environment, *Universiti Teknologi Malaysia*, Johor Bahru, Malaysia**,** is conducting an integrated analysis of urban planning and energy saving cities with Kyoto university and Toyohashi University Technology under the JSPS program. Recently, he has been working on the Low carbon society study using AIM model of NIES with Kyoto University. Dr. CS HO received his B Sc in Urban and Regional Planning at UTM Malaysia, M Sc Construction Management at Herriot Watt University Edinburgh, UK and Doctor of Engineering at Toyohashi University of Technology in Japan

Tetsuya Iida is a head of the corporate NPO environmental energy policy laboratory.

Tetsuya IIDA is a chief researcher of The Japan Research Institute, Ltd.. He is taking an active part as a pioneer and Inobata in the natural energy market in Japan such as the citizens pinwheels and green electric powers inside and outside the country with the natural energy policy at the top.

Prof. Jim Skea, Research Director, Energy Research Centre (UKERC), UK

Jim Skea is Research Director of the UK Energy Research Centre, an interdisciplinary initiative supported by three UK Research Councils. Until 2004, he was Director of the Policy Studies Institute, London. He has previously been Director of the Economic and Social Research Council's Global Environmental Change Programme, and Leader of the Environment Programme at SPRU University of Sussex. In 2002-03, acting as Launch Director, he established the Low Carbon Vehicle Partnership (LowCVP), a new UK initiative bringing together government departments, automotive and fuel companies, NGOs and the research base. He was awarded the OBE for services to UK sustainable transport in 2004.

Dr. Mikiko Kainuma, Project Leader, Climate Policy Assessment Project, Global Environment Research Center (CGER), National Institute for Environmental Studies (NIES), Japan

Mikiko Kainuma, a project leader of Climate Policy Assessment Project at NIES, is conducting an integrated analysis of climate change mitigation strategies by using AIM model, which she has developed with Kyoto University and several other institutes across Asia. AIM started as a tool to evaluate policy options to mitigate climate change and its impacts, and now extended its function to analyze various environmental issues. Dr. Kainuma received her B.S., M.S., and Ph.D. degrees in applied mathematics and physics from Kyoto University in Kyoto, Japan. She is a Lead Author of IPCC Fourth Assessment Report and UNEP/GEO4.

Masato Kawanishi (Mr.), Senior Advisor, Japan International Cooperation Agency (JICA)

Masato Kawanishi is a senior advisor on climate change at JICA, an implementing agency of Japanese ODA, where he is involved in a number of developmental projects, training courses and research activities. He receives a Master of Science in Environmental Technology from Imperial College London.

Dr. Jiang Kejun, Director of Energy System Analysis and Market Analysis Research Center, Energy Research Institute, China

He received his Ph. D in Tokyo Institute of Technology in 1999. From 1993, Kejun Jiang began the research on climate change relative to energy policy analysis, which focuses on energy technology policy assessment, energy supply policy assessment, renewable energy development and energy conservation. Leading Integrated Policy Assessment Model for China (IPAC) team, he is mainly working on policy assessment. Major focus includes energy policy, energy system, energy market analysis, and climate change, local environment policies and international negotiation. Since 1997, he has worked with IPCC for Special Report on Emission Scenario and Working Group III Third Assessment Report. He is leader author for IPCC WGIII AR4 Chapter 3, and leader author for GEO-4 Chapter 2.

Akiyasu Kurishima, Director of Urban and Regional Policy Division, Urban and Regional Development Bureau, MLIT (Ministry of Land, Infrastructure, Transport and Tourism)

In 1981,he graduated from The University of Tokyo (LLB), and joined the Ministry of Construction. He was posted at the OECD Secretariat; Executive Officer for Housing Planning, and Director for General Policy Planning in MLIT; and Director of Traffic Enforcement Division in the National Police Agency.

LAL, Murari. Advisor and Head (EHS), Reliance Energy Limited, Noida, INDIA

Lal holds a Doctoral Degree in Geophysics and has over 35 years of professional experience in specialised areas like Global and Regional / Monsoon Climate and its Variability – Scenario Development, Regional Environmental Change – Integrated Approach, Sectoral Vulnerability Assessment, Air Quality - EIA/SEA Methods and Practices including Management of Risks and Hazards, Regional Adaptation and Mitigation Approaches, Carbon Sequestration Potentials and Energy Efficiency – Clean Development Mechanism Opportunities and Options, Natural Resource Management and Environmental Planning and Management, Technological Options and Interventions – Environmental and Economic Feasibility, Policy Development including Multilateral Environmental Agreements in Asia – Pacific Regional Context, Social Dimensions and Sustainable Development.

MALLA, Sunil. Consultant, Technology Consultancy Services (TCS), Kathmandu, Nepal.

Prior to joining TCS in 2007, Sunil worked as a senior researcher and faculty (adjunct) at Asian Institute of Technology (AIT), Thailand. In the past, he has also worked as a researcher and a consultant for United Nations Environment Programme and Asian Development Bank. His major area of research includes modeling of energy systems development and its environmental implications. Born in Nepal, he received his B.E. in electrical engineering from National Institute of Technology – Rourkela (India), M.E. in energy technology from AIT and Ph.D. in economics from University of Hawai'i – Manoa

Dr.ToshihikoMasui,Head of the Integrated Assessment Section Social and Environmental System DivisionNational Institute for Environmental Stuides Japan

Toshihiko Masui is a head of the Integrated Assessment Section, Social and Environmental Systems Division at the National Institute for Environmental Studies (NIES). He is a member of the Asia-Pacific Integrated Model (AIM) team in NIES, and in charge of development of the emission module in the AIM model. He is also Associate Professor of Social Engineering at Tokyo Institute of Technology, in Japan. He received a doctoral degree from Osaka University.

Teruaki Masumoto, Executive Advisor to Tokyo Electric Power

Teruaki Masumoto is one of the representatives of speaker for industry group of Japan on "Energy and Climate". He was a Chairman, Subcommittee on Global Environment and Committee on Environment and Safety, Japan Business Federation (Keidanren). He was also a Member, Central Environment Council, Ministry of the Environment.

After graduated from Political Science and Economics, Waseda University, Japan at 1962, he joined Tokyo Electric Power Company. Masumoto has held a number of important positions in the company including : 1999, Director of corporate Communications Department; 2001-02, Executive Vice-President; 2002-2004. He became Director and Vice-Chairman of the Federation of Electric Power Companies. 2007, he retired director and assumed present position. Currently Masumoto is a Member of Executive Committee, WBCSD.

Dr. Keisuke Matsuhashi, Senior Researcher, Transport and Urban Environment Section, Social and Environmental Systems Division, National Institute for Environmental Studies (NIES), Japan

Keisuke Matsuhashi, a senior researcher of Transport and Urban Environment Section at NIES, is conducting a comprehensive assessment of future transport systems and urban forms by using automobile CO_2 emission inventories in city scale, which he has estimated. His research interests include public participation in regional planning.

Dr. Matsuhashi received his B.E, M.E, and Ph.D. degrees in urban engineering from Tokyo University, Japan.

Dr. Naoki Matsuo CEOs of Climate Experts, Ltd. and PEAR Carbon Offset Initiative, Ltd.

Naoki Matsuo has been a researcher of climate mitigation for 18 years at IEE, GISPRI and IGES. His field covers international negotiation, P&Ms, CDM to consumers' behavior. He participated in in-depth review processes under UNFCCC. He started his consultancy business for Japanese companies and JBIC in 2002. Among others, he was the developer of the first approved CDM methodology. He has just initiated an innovative carbon offsetting social venture which is trying to realize co-benefits type CDM projects as well as to provide a platform of carbon management practices for individual consumers.

Dr. Yuzuru Matsuoka,Professor, Hall of Global Environmental Study Kyoto University

Professor, Hall of Global Environmental studies, Kyoto University, Japan. Born in Japan, 1950,. he graduated Faculty of Engineering, Kyoto University in 1973, and received M. Engineering and Doctor of Engineering from Kyoto University in 1975, and 1986, respectively. His major research area is on global environmental change, especially integrated assessment modeling of global environmental problem. He is one of the founders of Asian-Pacific Integrated Model (AIM), and has developed energy-economic models and impact models. He is now on developing and organizing the models of the Japan low-carbon society project.

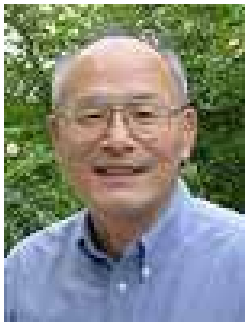
Dr. Yuichi Moriguchi, Director, Research Center for Material Cycles and Waste Management, NIES / Visiting Professor, Graduate School of Frontier Sciences, The University of Tokyo.
Yuichi Moriguchi, who holds Dr. Eng., graduated from the Faculty of Engineering at Kyoto University and joined the NIES in 1982. His research field covers the prevention of transport pollution, GHG emission inventory, life cycle assessment, material flow analysis, and environmental indicators. He has engaged in the Japanese LCS project as one of the team-leaders. In his early career, he had also worked for the Environment Agency of Japan and for the OECD Environment Directorate in Paris. He is appointed to the chairperson of the Working Group on Environmental Information and Outlooks in OECD, and to an initial member of the International Panel for Sustainable Resource Management.

Stanford Mwakasonda senior researcher at the Energy Research Centre (ERC), University of Cape Town, South Africa
He belongs to be with over ten years of experience on energy and climate change. His current work is on energy and climate change policies, Clean Development Mechanism (CDM), GHG inventories and sustainable development. His previous experience includes renewable energy analysis, environment impact assessment programs and petroleum policy and management. He served on the CDM Methodology Panel from 2004-6, and is a Lead Reviewer in the UNFCCC roster of experts for Annex I countries GHG inventory review program. He has made a number of publications, including journal articles and book chapters. His background academic qualification includes a Masters degree in Business Administration (MBA) and a Bachelors degree in Engineering. Mr. Mwakasonda has worked as a consultant for a number of international companies and organizations, within and outside Africa.

Ikuo Nishimura, Group Manager, International Environmental Business Group, Environment Department, Tokyo Electric Power Company

B.E., Department of Architecture, School of Science & Engineering, Waseda University (1987). Master of City Planning, Department of Urban Studies & Planning, School of Architecture & Planning, Massachusetts Institute of Technology (1993).Joined the Tokyo Electric Power Company in 1987. Since 1994, has been engaged in the corporate climate strategy and supported the development of voluntary environmental initiatives of Japanese industries. Since 2007, holding the current position. Member of the Working Group on Global Environment Strategy, Nippon-Keidanren (Japan Business Federation).

From 1999 to 2002, seconded to the Global Climate Change Unit, the World Bank as a senior environmental specialist. During this period, contributed to the National AIJ/JI/CDM Strategy Studies, as the Programme Coordinator, and also engaged in the technical assessment and the preparation of GHG reduction projects for the Prototype Carbon Fund.



Dr. Shuzo Nishioka, Senior Advisor, National Institute for Environmental Studies

Senior Research Advisor, Institute for Global Environmental Strategies(IGES)] Japan

PhD.(University of Tokyo, engineering). Served as Professor of Tokyo Institute of Technology, Keio University, Visiting Researcher of MIT, Executive Director of the National Institute for Environmental Studies (NIES) Japan, also as Coordinating Lead Author and Vice Chair of IPCCWGII since 1988. Project leader of “Japan Low Carbon Society Scenarios toward 2050”, which is research project to establish methodology for evaluating middle to long term environmental policy options toward low carbon society in Japan

Dr. Michael Norton PhD FRSC; Professor, Innovation Management Shinshu University

He has been teaching innovation management at Shinshu University since 2006. Prior to that (2004-6) he taught graduate courses at Tokyo Institute of Technology on innovation and wealth creation, environmental protection and sustainable development, and in science communication. He graduated in chemistry (degree and PhD) at Bristol University, and carried out postdoctoral research at the University of Alberta, Canada. After four years research in the UK chemical industry (ICI Ltd), he joined the UK government science service in the field of environmental pollution control and biosciences. He acted as science adviser to the UK Parliament from 1989 to 1998 before becoming Counsellor (Science and Technology) at the British Embassy in Tokyo (1998-2004). During that time he started a series of collaborative research programmes and expert workshops between UK in Japan on global warming and other environmental fields (e.g. sustainable engineering)

Masa OHARA, Director for Environmental Policy Division, Bureau of Environment Tokyo Metropolitan Government

Masa OHARA participated in "My bag campaign" beginning that aimed at the garbage loss in weight in 1994 and designed the naming of 'My bag'. Moreover, he planned "Diesel car NO operation" in 1999. And he led making of light oil in Japan super-low sulfur, and contributed to the diesel car restriction achievement in the metropolitan area. He takes charge of Global warming measures up to the present time in 2006. He expand a coordinated relation among the enterprise, the citizens, the municipality all over Japan, and Win-Win and ..project that expands the use of renewable energy.. promote it. He is moving the biodiesel fuel practical use project the green energy purchase forum and generateon 2 and the solar energy use expansion conferences, etc. now.

Professor Ogunlade R. Davidson has been a Professor of Engineering for the past 16 years and is presently Dean of Post Graduate Studies at the University of Sierra Leone. Internationally, he is the Co-Chair of Working Group III of (IPCC) where is has chaired the approval of seven reports, Co-Chair of the Steering Committee of the Global Network on Energy for Sustainable Development and Chair of the Energy Task Force on Sustainable Energy of the Regional Office of ICSU. His research interests include development of African Energy Systems and Policies (Transportation, Power sector, Renewable Energy), Climate Change (GHG Mitigation, National Climate Change strategies). He is a member of many international bodies and has worked as a Consultant for several national and international bodies including UNESCO, UNIDO, ILO, UNECA, UNDP, UNEP, GEF, UNFCCC, NEPAD, African Development Bank, World Bank, Batelle laboratories and Carnegie Corporation New York.. He has undertaken many national international funded R&D projects

Dr. Teruo OKAZAKI, General Manager, Global Environmental Affairs Department, Environmental Affairs Division, Nippon Steel Corporation (NSC)

Teruo OKAZAKI joined NSC as a mechanical engineer in 1978 after graduating from Tokyo Institute of Technology. Since then in Oita works and Nagoya works, worked in steelmaking and production management field. In 1997, moved to the current department in the head office, Tokyo. Currently a chair of the international environment strategic committee in Japan Iron and Steel Federation. Received Ph.D. degree in Materials Science of Imperial College, London. Is a Contributing Author for the WG3 chapter 7of IPCC Fourth Assessment Report.

Ichiro OZAWA、Vice president, City Planning Institute of JAPAN
Visiting Professor, WASEDA Univ.Special advisor, JFE steel co.Counselor, CHIYODA ward
He has been engaged in city planning for more than 30 years in Ministry of Construction (now Ministry of Land, Infrastructure and Transportation)
Especially he has been making lots of contribution to the development of national policies and projects on “Urban Renaissance” which has been aiming to regenerate cities and towns of the country. Recently he has been making a new contribution to develop low carbon policy and action program in the field of city planning and urban regeneration projects. These have been incorporated both in the activities of CPIJ and the policy-making on low carbon urban renewal for CHIYODA ward and other municipalities.

Mr. André Santos Pereira, researcher, Center for Integrated Studies on Climate Change and the Environment (CentroClima), Coordination of Post-Graduation Programmes in Engineering (COPPE), Federal University of Rio de Janeiro (UFRJ), Brazil.
Since 1999 André Pereira has been collaborating in several CentroClima research projects in cross-cutting issues among energy, environment, development and climate change. He is a Ph.D candidate in Environmental Economics (School of High Studies in Social Sciences, Paris), with a M.Sc. in Energy Planning and a Bachelor degree in Economics, both at Federal University of Rio de Janeiro. He has also been collaborating with some CIRED research projects. Among his research topics Brazilian Proposal, CDM and Biofuels can be highlighted.

Chris Pook
Chris Pook was appointed Counsellor, Science and Innovation at the British Embassy Tokyo in December 2005. Before moving to Tokyo, Chris was Secretary to the UK’s Technology Strategy Board and was Science Attaché at the British Embassy in Washington from 2001-4. He has held various posts in the Department of Trade and Industry covering innovation policy, mergers and acquisitions and nuclear liabilities management. Chris was Private Secretary to successive Ministers of State from 1995 to 1997 and spent two years on secondment to BG plc. Chris has a degree in microbiology and a research background in genetics and biotechnology.

M. Sasanouchi, Senior General Manager of CSR Environmental Affairs Division

He received bachelor's degree of electric engineering (1974 Keio Univ.) and has spent his professional career of 30 years in Toyota Motor Corporation. He was a member of working group of Keidanren Industrial Technology Committee from 1994 to 1998. He is currently a liaison delegate of WBCSD, the chairperson of the sub-committee on environmental policy of the Environment Committee of Japan Automobile Manufacturers Association, and Working Group on Global Environment Strategy of Nippon Keidanren.

Dr. Yasuhiro Sasano, Director of Center for Global Environmental Research (CGER), National Institute for Environmental Studies (NIES), Japan

Yasuhiro Sasano, who was assigned the director of CGER in April 2006, has been working mainly in the fields of remote sensing of the atmospheric environment since he joined NIES in 1977, and has expanded his interests to climate change issues. He was in charge of the satellite observation project (ILAS and ILAS-II) for the stratospheric ozone layer from 1990 to 2004. He also served the Secretariat Office for the Council for Science and Technology Policy (CSTP), Cabinet Office of the Japanese Government, as the Director for Environment and Energy from 2002 to 2004. He received his B. S., M. S., and D. Sc. degrees from Tohoku University, Japan.

Charles Secrett, Special Advisor on Climate, Environment and Sustainability to the Office of The Mayor of London and Visit London.

He is a Board Member of the London Development Agency, and Chair of its Health and Sustainability Advisory Group. He was part of the core team that developed the London Climate Change Action Plan, and has been instrumental in developing and promoting a number of other key London climate and sustainability initiatives, including the Green Homes Service programme, the Sustainable Industries Business Park and 'Wild London, Open London'. He has been Chair of the Triodos Bank Renewable Energy Fund since 2004, a community-oriented enterprise whose investment portfolio has grown from £7 million since then to £40 million today. He was a member of the UK Government's Roundtable/Commission for Sustainable Development between 1993-2003.

Dr.NaritoShibaike, Councillor Corporate Environmental Affairs Division Matsushita Electric Industrial Co., Ltd.

In 1978, he graduated The University of Tokyo, and joined Panasonic. His background is mechanical engineering and material science. In 1994-1995, he worked for the University of Cambridge researching into environmentally conscious design methodology focusing on materials selection in mechanical design. After conducting the three years' national program of "Demonstration test of stationary fuel cell cogeneration systems," Dr Shibaike is presently involved in the APP (Asia Pacific Partnership on Clean Development & Climate) as a representative from Japanese industry. His current interest is to develop appropriate indicators for promoting energy efficient appliances in many countries.

Mr. Shigeru Hikone, Principal, Ove Arup & Partners Japan Limited, Japan

Shigeru Hikone, a group leader of Japan office transferred from Ove Arup & Partners in London. He has over 35 years of experience of engineering design for a wide range of buildings and industrial facilities. He received BCs and MS degree in Architectural Engineering from Tokyo Institute of Technology in Tokyo. He is a member of AIJ and the Institution of Structural Engineering (UK). He is a qualified in First class licensed Architect and Chartered Engineer (UK). He is a member of Arup's research network hosted by Jeremy Watson and motivates the research activities in Tokyo office linking with business.

Dr. Emil Salim, President's Council of Advisors, (Former Minister of the Environment), Indonesia

Dr. Emil Salim, whose background is in Engineering and Economics, received a Ph. D. from the University of California, Berkley. After he became Minister of State for Administrative Reform in 1971 at the age of 41, Dr. Salim served four terms of ministerial positions in Indonesia over 22 years, including being the first Minister of the Environment. Dr. Salim has addressed from early on the environmental problems in developing nations in Asia, and as the chairman of the ASEAN Environment Ministerial Congress set the target, the scope, the program and the action plan for the ASEAN nations to cooperate on environmental issues. He also contributed to establishing the concept of sustainable development and furthering global environmental policies through various United Nations committees. He is currently serving on the President's Council of Advisers in Indonesia.

Prof. Ram Manohar Shrestha, Professor, Asian Institute of Technology (AIT), Thailand

Ram Shrestha is currently a professor of Energy Economics and Planning at the Asian Institute of Technology (AIT), Thailand. Professor Shrestha serves as the Editor of International Energy Journal and as an Associate Editor of Energy-The International Journal and Energy Economics. He is also a member of the Editorial Board of the ASCE Journal of Energy Engineering. He is a coauthor of 3 books (namely, Energy Policies in Asia, Bio-coal Technology and Economics, and Baseline Methodologies for Clean Development Mechanism Project: A Guidebook) and has published extensively in refereed international journals including Journal of Environmental Economics and Management, Energy Economics, The Energy Journal, Energy Policy, Resource and Energy Economics. He is a recipient of The Energy Journal's Best Paper Award from International Association for Energy Economics (IAEE).

Prof. P. R. Shukla, Professor in Public Systems Group, Indian Institute of Management, India

P.R. Shukla is a Professor in Public Systems Group at the Indian Institute of Management, Ahmedabad, India. He holds a Ph.D. from Stanford University. He is a consultant and advisor to Governments and international organizations. He has been a member of official Indian delegation to the Conference of Parties to the UNFCC. Prof. Shukla is a member of several international teams working on energy and environment modeling and policy studies. He is a lead author of several international reports including eight IPCC reports. His publications include twelve books and numerous publications in international journals in the areas of development, energy, environment and climate change policies.

Mr. Tomonori Sudo, Advisor, Coordination Division, Development Assistance Strategy Department, Japan Bank for International Cooperation (JBIC), JAPAN

Tomonori Sudo, an advisor of Development Assistance Department at JBIC, is in charge of climate policy planning in JBIC's Overseas Economic Cooperation Operations (ODA Loan operation) and member of Japanese Delegation to the OECD Development Assistance Committee (DAC). He has experiences of ODA loan operation to Indonesia, Malaysia, Bangladesh and China. In addition, he was conducted researches on climate policy in Asian countries at IGES. Mr. Sudo received his B.A. in Economics from Osaka University in Osaka, Japan and M.Sc in Environmental & Resource Economics from University of London (UCL).

Mr. Takejiro Sueyoshi, special adviser of Asia-Pacific region, UNEP Finance Initiative, and former Deputy president of Nikko Asset Management Co., Ltd. in Tokyo.

Mr. Sueyoshi, after his long carrier in banking, is involved in UNEP Finance Initiative as a steering committee member and currently served as special adviser of the Asia-pacific region. Mr. Sueyoshi received bachelor's degree in economics from Tokyo University in 1967. Since then he has spent his professional career of 31 years in the Mitsubishi Bank Ltd. From 1989 he was working at North America Head Quarters in New York and the New York branch and served as a president of the Bank of Tokyo-Mitsubishi Trust Co., Ltd. New York from 1996 to 1998. Then he has served as Deputy President and an Executive Committee member of Nikko Asset Management Co., Ltd. in Tokyo.

Tae Yong JUNG, Ph.D., Senior Economist, The Asian Development Bank (ADB), Philippines

His research areas are energy and environmental modeling, clean energy financing. He has special interest in economic development and environmental concerns. He was one of lead authors of IPCC Special Report on Emission Scenario (SRES). He has been a visiting fellow at Pacific Northwest National Laboratory of USA, Economic Research Institute of Kyoto University, and National Institute for Environmental Studies of Japan. He was in Korea Energy Economics Institute. He joined Institute for Global Environmental Strategies (IGES), Japan in 1999, where he was a project leader for the Climate Policy Project. Before he joined the ADB, he worked at the World Bank where he was involved in the World Bank's activity on 'clean energy and development: towards an investment framework'. Dr. Jung received his Ph.D. in Economics from Rutgers University.

Mr.Yasuo Takahashi, Director, Office of Market Mechanisms, Climate Change Policy Division, Global Environment Bureau, Ministry of the Environment, Japan

Yasuo Takahashi, in the Ministry of the Environment, is responsible for issues relating to Kyoto Mechanisms, domestic emission trading, and low carbon society. After receiving his M. Engineering from the University of Tokyo in 1983, he started to work at the Environment Agency (Ministry of the Environment since 2001). From 1991 to 1994, he was posted at Japanese Delegation to the OECD. On climate change, Mr. Takahashi was a member of the Japanese negotiation team from COP6 to COP10.

Mr. Ralph Torrie, Vice President, ICF International, Canada

Ralph Torrie is an expert in the field of energy and environment with 30 years of entrepreneurial and consulting experience that includes hundreds of initiatives in research, business development, and advocacy. He is the co-inventor of environmental planning software that has been translated into several languages and is used by more than 300 municipalities, companies and institutions on five Continents. He has just completed a scenario analysis for the National Round Table on Environment and Economy in which Canadian greenhouse gas emissions are reduced to 40% of current levels by 2050. He is a recipient of the Canadian Environment Silver Award for his work on the climate change issue.

Haruki Tsuchiya ,The president of Research Institute for Systems Technology

He founded it in 1979. He has worked in energy system analysis and published books and many articles on future energy scenarios emphasizing efficiency improvement and renewable energy toward sustainable development. His energy concept is " To Energy Cultivating Civilization based on renewable energy from Energy Hunting Civilization of digging fossil fuels underground" He calculated that man has 10 slaves in terms of carbon dioxide emission as he emits 1 kg CO2 every day by breathing while he consumes fossil fuels to emit 10 kg CO2 daily on the earth. He was as an author of 2nd Group of IPCC 2nd report in 1995. He worked as a member of several national committees on future energy technology. He is an advisor to Low Carbon Society Project of National Institute for Environmental Studies. He received B.E, M.E and Dr of Engineering at University of Tokyo.

Mr. Naoya Tsukamoto,Director Research and Information Office Global Environment Bureau Ministry of the Environment

Mr.Tsukamoto started his job at the Ministry of the Environment of Japan in 1986. Since then he worked on a wide range of issues from local pollution control to regional and global environment and now he is working mostly on the climate change. During his service, he has worked at the World Bank for four years and at Delegation of Japan to OECD for three years.Mr. Tsukamoto received his Bachelor of Science from the University of Tokyo, Japan and Master of Environment Science from Johns Hopkins University, USA.

Mr. Shu WANG, Project officer, Office of National Climate Coordination Committee, National Development and Reform Commission, China

He has a Master of Environmental Economics, is responsible for CDM project application and management in DNA of China, and other issues related to climate change.

Mr. David Warrilow, Deputy Director for Climate, Energy and Ozone, Science and Analysis in the UK's Department for Environment, Food and Rural Affairs (DEFRA).

David Warrilow is responsible for scientific, technical and analytical aspects of climate change, ozone depletion and energy use at the UK's Department for Environment, Food and Rural Affairs (DEFRA). He is also the policy lead for the UK's international policies on adaptation to climate change and for the UK's international and domestic policies on Protection of the Stratosphere under the Montreal Protocol. He is responsible for ensuring that the UK Government receives sound scientific advice on climate change with regard to both its domestic activities and international negotiations. He heads the UK's delegation to the IPCC and leads on the technical matters covered by the Subsidiary Body on Science and Technology of the Climate Change Convention. He manages a £20 million research programme which provides policy relevant scientific advice and evidence. His own scientific background covers climate modeling, land-surface processes and hydrology.

Professor Jeremy Watson, MSc DPhil CEng FIET MIEEE

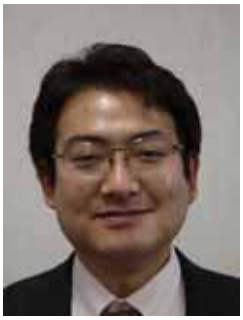
He is Arup's Global Research Director, responsible for Group Research Strategy and the Research Consulting Business. He has held research and technical management roles in industry and academe including service with the DTI and EPSRC. His specialities include Strategic Technology Development and Transfer, Innovation Processes and NPD Management. He also has technical expertise in Industrial Instrumentation and Control, Power Electronics, Signal Processing and Biomedical Engineering. Current research interests include Renewable Energy, Control for Energy Efficiency and Ambient Assistive Technologies.He is a Chartered Engineer and Fellow of the IET (Chairman: IET Control & Instrumentation Sector Panel), a Senior Member of IEEE and Visiting Professor at the Universities of Southampton and Sussex, and has recently been appointed as a Board Member of the UK Government Technology and Strategy Board.

Dr. Jim Watson, Senior Fellow at SPRU, University of Sussex, UK

He trained as an engineer, and has worked at SPRU since 1997. He is Deputy Director of the Sussex Energy Group, an interdisciplinary team of social scientists conducting research on economic, policy and social aspects of energy and climate change. Is also a deputy leader of the Tyndall Centre's Climate Change and Energy Programme. His research includes work on distributed energy systems, carbon capture and storage, and energy in China. He frequently provides advice to UK government departments, foreign governments and international bodies. This has included working with the China Council from 1998 to 2003 to advise the Chinese government on cleaner technologies. He is currently a Specialist Adviser to the Environment, Food and Rural Affairs Committee within the UK House of Commons.

Mr. Suguru Yamaryo, Project Leader, MOTTAINAI Campaign, Media Business Division, ITOCHU Corporation, Japan

Suguru Yamaryo, a project leader of MOTTAINAI Campaign at ITOCHU Corporation, is conducting an environmentally-friendly brand "MOTTAINAI", which was proposed by honorary professor Wangari Maathai, the first environmental activist who won the Nobel Peace Prize in 2004. MOTTAINAI, whose origin is a Buddhist term has a meaning of respects for ties with everything, intends to commercialize products incorporating the concept of "3R's (Reuse, Reduce, Recycle) + Respect" in world wide basis.



Dr. Isamu Yasuda, General Manager, Technology Research Institute, Tokyo Gas Co., Ltd., Japan

Isamu Yasuda, a General Manager of Technology Research Institute of Tokyo Gas Co., Ltd., has been long involved in research and development of fuel cells and hydrogen production technologies and is now managing fundamental technology research areas in gas industries such as biomass, LCA, hydrogen, pipeline corrosion and maintenance and chemical analyses. His recent concerns have extended to LCS based on hydrogen with/without distributed CCS. Dr. Yasuda received his B.S., M.S., and Ph.D. degrees in applied chemistry from University of Tokyo, Japan.

Mr. Yoshiaki Yamanaka, Director General, Environment Department, Shiga Prefectural Government

Yoshiaki Yamanaka is a head of the Environment Department of Shiga, which covers environmental protection, forestry and waste & sewerage management. As Shiga has Lake Biwa, the largest fresh water body in Japan supplying water for fourteen million people, the sustainable lake management is the key challenge. Lake Biwa is sensitive to global warming, being categorized as an ancient lake with the indigenous ecosystem. Mr. Yamanaka contributed to making "World Lake Vision, launched at the 3rd World Water Forum with the cooperation of UNEP, ILEC and other international organizations. He started Sustainable Shiga Project in 2004 that aims to cut Co2 emissions by 50% until 2030.

Appendix III

Japan-UK

Dear Colleagues,

The Governments of Japan and the UK are pleased to announce the results of the third workshop in the Japan-UK joint research project on *a Sustainable Low-Carbon Society*. The workshop, held in Tokyo 13-15 February 2008, focused on the synergies in developing low-carbon societies and sustainable development.

Consumers have the power to drive the transition to a low-carbon society through the choices in the goods, products and services they use. However strong Government leadership is required through the delivery of policies and legislation that will enable to removal of high-carbon intensive choices for consumers whilst creating positive benefits for consumers in making low-carbon choices.

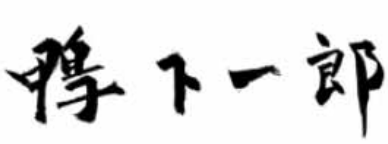
Discussion occurred on the synergies that exist in the transition to a low-carbon society and sustainable development in both developed and developing countries. Significant co-benefits in climate change mitigation and adaptation and in development were identified.

The workshop saw that a shift in investment towards low-carbon technologies in both developed and developing countries is required. Investment in low-carbon technologies should be supported by frameworks set in place by Governments to create the enabling conditions under which the necessary scale of financing in making the transition to low-carbon societies can be achieved.

It was also recognised that making the transition to a low-carbon society will have implications for export-oriented industries. Internationally coordinated sectoral approaches can address the issue of competitiveness, whilst facilitating the acceleration of technology transfer. However, any sectoral approach must be transparent, to the general public as well as to industry.

The Executive Summary from the third in the series of workshops is attached for information. A full report together with the presentations from the workshop will shortly be available. A "Call for Action" to G20 ministers that the international steering committee for this project voluntarily developed is also included as information.

We hope you find the results of the third workshop useful in your consideration of future activities under the Gleneagles Dialogue.



Ichiro Kamoshita
Minister for the Environment,
Japan

Hilary Benn
Secretary of State for Environment,
Food & Rural Affairs,
UK

The Japan-UK joint research project on Achieving a Sustainable Low-Carbon Society

Call for Action

Introduction

During the past two years, Japan and the UK have jointly hosted a series of expert workshops to explore both visions of low-carbon societies and practical steps to achieve them. Through the workshop series we have studied the necessity, urgency and feasibility of local, national and international action on reducing global greenhouse gas emissions through sustainable development, and have developed a shared understanding of low-carbon societies and their impacts on future development pathways and economic growth.

Key Findings

A set of key areas have been identified as being critical to put us on global low-carbon pathways which are consistent with achieving climate change and development goals:

- The development of low-carbon societies is essential and plays an integral part in addressing climate change mitigation and adaptation;
- It is less costly to move towards low-carbon societies than to delay climate change mitigation and pay the resulting increased adaptation costs;
- A suite of policy options is required to facilitate the transition to low-carbon societies. Government leadership is crucial to set the enabling conditions under which individuals, business and organisations can benefit from the opportunities in new low-carbon markets, technologies, products and services;
- Substantial changes will be required in the built environment, transport, utilities, industrial and service sectors. These will need to be implemented in harmony with development goals. A portfolio of sustainable emission reduction measures is required, which take into account regional and national circumstances;
- Synergies between sustainable development approaches and the transition to low-carbon societies can deliver significant economic, social and environmental co-benefits;
- A shift to investment in low-carbon technology research, development, demonstration and deployment (RDD&D), emerging markets, products and services is required to deliver the long-term certainty needed to create incentives to invest in low-carbon choices; and
- The creation of low-carbon consumption options, coupled with enhanced consumer awareness, can help to enable the level of behaviour change required to make the transition to low-carbon societies

Key recommendations

Based on our findings from the workshop series, we the International Steering Committee for the Japan-UK collaboration on achieving low-carbon societies call

upon the Heads of State for the G8 and emerging economies to place a priority in delivering necessary measures in the following areas, in order to enable the transition to a low-carbon world. The series of workshops have identified essential actions to be:

- The establishment of a long-term goal for global greenhouse gas emissions reductions of at least 50% of 2000 levels by 2050;
- A rapid enhancement of international cooperation and sharing of expertise and best practise on achieving low-carbon societies between nations and in national, regional and international stakeholders;
- The Creation of appropriate incentives for business using long-term policy signals to strengthen carbon pricing e.g. through taxation and enhanced international emissions trading;
- The need to shift the focus of development investment in developing countries towards lower-carbon approaches, and towards a significant expansion in the deployment of existing low-carbon technologies in both developed and developing countries;
- Acceleration in energy efficiency improvement using incentives to encourage institutional and behavioural change;
- The expansion of current financial flows, international cooperation in low-carbon approaches and the development of new financing mechanism;
- A significant increase in funding for research and development for advanced technologies;
- Greater investment in the demonstration and deployment of near-market technologies and, in particular, the rapid deployment of carbon capture and storage technology at scale
- Adjusting trade regimes to encourage rapid deployment of technologies and products that enhance sustainable development while lowering carbon emissions;
- The Implementation of policies and frameworks which enable and promote a change in human behaviour and lifestyle, through providing consumers with necessary information and the opportunity to benefit from low-carbon approaches and in the removal of high carbon-intensive choices;
- A Shift, in a revenue neutral manner, taxation structures from income-based to environmental-based to encourage behaviour from business and individuals which internalises the cost of choices on global emissions;
- the development of new indicators that measure quality of life in a more meaningful way than GDP which effectively measures quantity of consumption;
- The building of trust within and between nations is essential to reinforce the credibility of long term goals and policies. Trust can only be built by continuing and enhancing dialogue between stakeholder groups within countries and between countries with diverse national circumstances.

International Steering Committee
Tokyo, Japan
February, 2008

The third workshop of the Japan-UK Joint Research Project on Achieving a Sustainable Low-Carbon Society

"Roadmap to a Low-Carbon World"
Executive Summary

Introduction

In 2006, the Governments of Japan and the UK established an innovative joint research project with participation from a diverse group of some 20 countries. The project created visions of low-carbon societies and identified the concrete steps required to achieve the necessary transitions. The project took as its starting point the need to stabilise greenhouse gas concentrations at a level that would avoid dangerous climate change.

The features of this project were:

- **consensus on a definition of a low-carbon society that embraced the circumstances of both developing and developed countries;**
- **a long-term perspective focusing on the need for urgent action to at least halve global greenhouse gas emissions through to 2050;**
- a broad approach addressing human behaviour, social change and links to sustainable development as well as the specific roles of the private sector and public policy;
- an evidence-based approach that established the feasibility of the low-carbon society through scenarios, modelling and case studies at the country, sectoral and city level; and
- the engagement of experts and stakeholders from government, business and civil society who provided insights into the practical steps that could make the low-carbon society a reality.

The project consisted of a series of three workshops and symposia that progressively addressed: the need for, and feasibility of, low-carbon societies; the concrete steps needed to enable the transition; and key findings and policy recommendations. Each workshop disseminated findings and tested conclusions with a wider group of stakeholders. In a parallel process, leading energy modellers from a range of countries elaborated a set of consistent scenarios exploring pathways to a low-carbon society.

Key findings of the third workshop

The third and final workshop and symposium took place in Tokyo on 13-15 February 2008. Participants identified several themes and key findings including:

- that there is a pressing need to establish a global long-term goal in greenhouse gas emissions reductions;
- that it is important to build trust between countries and between stakeholders through enhancement of communications and through mutually supportive action programmes based on partnership delivery;
- that developing countries need a sustainable development model focusing equally on poverty eradication and climate change co-benefits – and further that technology transfer, funding, investment switching and capacity building will enable developing countries to reach for low-carbon and low-poverty society; and
- that the delivery of low-carbon societies will require significant changes in lifestyles and practices in both developed and developing countries. To encourage these changes, raising awareness of the impact of our actions on all aspects of the global environment in governments, business, individuals and organisations is vital.

The key findings from the four parallel breakout groups were:

1. Behaviour change and its impact on delivering low-carbon societies

- Consumers have the power to drive significant emissions reductions through the goods and services they purchase, but need information and expert advice and audit programmes to inform their choices.
- The potential impact of informed consumer choice can only be enabled through strong government leadership and a supportive policy framework. This should:
    - ensure that low-carbon options are widely available in all economic sectors, and that these are competitively attractive through pricing signals or other side-benefits;
    - promote education and the raising of awareness in individuals, business and organisations to inform and support the rapid and widespread adoption of good practice low-carbon living and working;
    - stimulate low-carbon markets for exemplar technologies, buildings, products and services through private and public sector procurement and consumer purchasing; and
    - deliver low-carbon enabling policy frameworks, based on long-term targets, regulation and fiscal incentives;

2. Delivering low-carbon societies through sustainable development

- Making the link between sustainable development and the transition to low-carbon societies is vital, and must be done in a mutually supportive manner. Low-carbon society pathways should not hamper economic growth and should ensure that poverty eradication occurs whilst delivering significant climate change co-benefits, including increased adaptation capacity.
- Low-carbon society and sustainable development actions are required in both developed and developing countries.
- Strategies for promoting a low-carbon society should:
    - be clear on societal and environmental benefits;
    - take into account immediate development needs;
    - offer a suite of options of individual policies, tools, and means (including international actions), phased approaches and steps;
    - address the challenge of policy implementation;
    - take into account the interplay with other policies notably in the fiscal domain;
    - be supported by the necessary scale of investment, technologies and capacity building; and
    - recognise that there may be ways of developing in a more sustainable manner using best available and near commercialised technologies which avoid lock-in to high carbon-intensive infrastructure.
- Sharing expertise and good practice, alongside enhanced international collaboration, will be needed to ensure the timely delivery of low-carbon societies through sustainable development.

3. Enabling low-carbon societies through investment

- Achieving low-carbon societies is fundamentally a question of re-directing investment to increase energy efficiency and encourage a shift towards low-carbon technologies, techniques and infrastructure. Missed investment opportunities will lock-in high carbon intensity for decades.
- There is a need to act with urgency, because delaying the implementation of actions on a domestic and global perspective will have serious cost and social implications in terms of climate change impacts, the disruption to human societies the world over and the efficacy of subsequent mitigation and adaptation measures.
- Investment pathways must increase overall investment in the research, development, demonstration and deployment (RDD&D) of new low-carbon technologies and techniques. We must recognise the urgency and the scale of change required, and move beyond inadequate incremental improvements.
- Long-term and robust carbon pricing can deliver certainty to business and raise awareness of the environmental costs of production. New policies and measures are also required to enable the necessary scale of investment to facilitate the transition to low-carbon societies.
- Emission reduction opportunities are frequently less expensive in the developing world. Financial frameworks to finance low-carbon investments, both at International Financial

Institutions (IFI's) and at private banks, and enhanced international cooperation to extract these, can significantly increases global benefits.

4. Barriers and Opportunities: approaches to sensitive low-carbon sectors

- Moving to a low-carbon society has implications for carbon intensive industries such as iron and steel that are exposed to significant international competition. Sectoral approaches at the international level can start to address competitiveness issues.
- Sectoral approaches can also facilitate investment and technology transfer to firms within these industries in developing countries.
- Such sectoral approaches must be transparent, to the general public as well as to industry. The establishment of clear and internationally agreed methods for measuring carbon emissions is necessary, and would aid the process of levelling the international playing field.
- Disclosure of carbon emissions per sector or product across all countries is necessary in order for a sectoral approach to be feasible;
- Low-carbon society pathways provide opportunities for a new type of development for sensitive sectors, through recycling and the production of environment friendly technologies which could underpin future economic development. By using these opportunities, countries could increase their national competitiveness.
- Some carbon-intensive sectors may require radical technologies to be developed if they are to form part of a low-carbon society. Governments must support early stage R&D within these sectors, and aid promising technologies with further demonstration and deployment funding.

Essential actions from the third workshop

The third low-carbon society workshop identified the following actions which governments are urged to consider:

- The establishment of a long-term goal for global greenhouse gas emissions reductions of at least 50% of 2000 levels by 2050;
- A rapid enhancement of cooperation and sharing of expertise and best practise on achieving low-carbon societies at city-, national- and regional-levels;
- The creation of appropriate incentives for business using long-term policy signals to strengthen carbon pricing e.g. through taxation and enhanced international emissions trading;
- The need to shift the focus of development investment in developing countries towards lower-carbon approaches, and towards a significant expansion in the deployment of existing low-carbon technologies in both developed and developing countries;
- A significant increase in funding for research and development for advanced technologies, and greater investment in the demonstration and deployment of near-market technologies and, in particular, the rapid deployment of carbon capture and storage technology at scale; and
- The implementation of policies and frameworks which enable and promote a change in human behaviour and lifestyle, through providing consumers with necessary information and the opportunity to benefit from low-carbon approaches and in the removal of high carbon-intensive choices.

International Steering Committee
Tokyo, Japan
February, 2008

International Steering Committee

Co-chairs:	Shuzo Nishioka (NIES, Japan) Jim Skea (UKERC, UK)
International Steering Committee	Andrew Bolitho (Defra, UK) Stephen Cornelius (Defra, UK) Ogunlade Davidson (University of Sierra Leone, Sierra Leone) Junichi Fujino (NIES, Japan) Jose Alberto Garibaldi (Energeia, Mexico) Kejun Jiang (Energy Research Institute, China) Mikiko Kainuma (NIES, Japan) P.R. Shukla (Indian Institute of Management, India) Sachiko Tsukahara (MoEJ, Japan) Naoya Tsukamoto (MoEJ, Japan) David Warrilow, (Defra, UK) Jeremy Watson (ARUP, UK) Jim Watson (SPRU and Tyndall Centre, UK) Martin Weiss (European Commission, Germany)

Group Chairs

Group 1	Jeremy Watson (ARUP, UK) Yuichi Moriguchi (NIES, Japan)
Group 2	Ogunlade Davidson (University of Sierra Leone, Sierra Leone) Taka Hiraishi (IGES, Japan)
Group 3	Jose Alberto Garibaldi (Energeia, Mexico) Takejiro Sueyoshi (Special Advisor to the UNEP Finance Initiative, Japan)
Group 4	Jim Watson (SPRU and Tyndall Centre, UK) Naoya Tsukamoto (MoEJ, Japan)

Rapporteur

Group 1	Stephen Cornelius (Defra, UK)
Group 2	Sunil Malla (Technology Consultancy Services, Nepal) Tomoki Ehara (Mizuho Information & Research Institute, Inc., Japan)
Group 3	Andrew Bolitho (Defra, UK)
Group 4	Kejun Jiang (Energy Research Institute, China) Toshi Arimura (Sophia University, Japan)

Appendix IV

Science & Innovation / Science & Innovation News

UK's Chief Scientific Advisor Sir David King Announces 3rd UK-Japan Low Carbon Workshop

2007-10-10

During a speech recommending urgent action on climate change at the British Embassy Tokyo on 9 October, Sir David King announced that the 3rd Japan-UK workshop on Low-Carbon Societies will be held between13 and15 February 2008 in Tokyo.

Findings from the workshop series will provide an input to the Japanese G8 Presidency in 2008.

Four key messages from the workshops so far are that:

- low-carbon societies are needed
- they are feasible
- they can be achieved through sustainable development
- urgency of action is required.

The UK-Japan Low Carbon Society collaboration is a leading forum for consideration of developing a low-carbon society. The 3rd workshop will highlight the relationship with sustainable development and will work towards achieving a consensus on the feasibility of low-carbon societies amongst a wide range of stakeholders.

Background:

The low-carbon society workshop series is a collaboration between the UK Department of Environment, Food and Rural Affairs (DEFRA) and The Ministry of Environment Japan (MoEJ). The Japanese National Institute for Environmental Studies (NIES), the UK Energy Research Centre and the Tyndall Centre are partners. The first workshop was in Tokyo June 2006, the second was in London in June 2007. The work has also been supported by research workshops on modelling future low-carbon scenarios.

The first workshop focussed on the rationale for moving to low carbon societies and presented visions on how this would be achieved in selected countries.

The second workshop developed the theme by looking at the practical challenges in making the transition to a low-carbon society. The 2nd workshop executive summary provides recommendations on how to move towards a low-carbon society. Available online at:
http://www.ukerc.ac.uk/Downloads/PDF/07/0706LCS/0706LCSReport.pdf

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About the Hosts

This symposium and workshop - sponsored by the Ministry of the Environment Japan (MoEJ) - is hosted by the MoEJ and the Department for Environment, Food and Rural Affairs in the UK (Defra), in collaboration with partners National Institute for Environmental Studies (NIES), UK Energy Research Centre (UKERC), the Tyndall Centre for Climate Change Research and the British Embassy to Tokyo, under the direction of the international steering committee.

About the Partners

Established in 1974, the National Institute for Environmental Studies (NIES) is a research organisation for environmental issues. The NIES provides a scientific and technological infrastructure for environmental administration with integrated and interdisciplinary research on a wide range of issues. The NIES has supported the MoEJ in the arrangement of the workshop contents and logistics.

The UK Energy Research Centre (UKERC) was set up in 2004 to provide a focus for energy research in the UK while galvanising collaborative international energy research. A key supporting function of UKERC is the UKERC Meeting Place, based in Oxford, which aims to bring together members of the UK energy community and overseas experts from different disciplines, to learn, identify problems, develop solutions and further the energy debate.

The Tyndall Centre for Climate Change Research brings together scientists, economists, engineers and social scientists, who together are working to develop sustainable responses to climate change through trans-disciplinary research and dialogue on both a national and international level - not just within the research community, but also with business leaders, policy advisors, the media and the public in general.

“Japan Low-Carbon Society Scenarios toward 2050”

This research project, initiated in 2004, is sponsored by Global Environment Research Fund (S-3) of MoEJ. The objective of the project is to propose concrete countermeasures to achieve LCSs in Japan by 2050, including institutional change, technology development and lifestyle change. More than 50 research experts have studied together to develop visions and roadmaps.
This project supports the “Japan-UK joint Research Project.”

http://2050.nies.go.jp/

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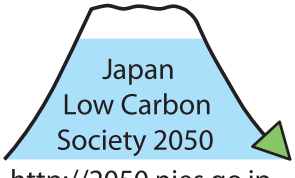

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